# Appendix K. Traffic Analyses

MEMORANDUM

# Summary of Traffic Documentation in Appendix K

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|---|---|
| **Date:** | 4/26/2024 |
| **Topic:** | Summary of Traffic Documentation in Appendix K |
| **From:** | Tim Flynn, HNTB Corporation |

This technical memorandum briefly summarizes each of the traffic-related memos located in Appendix K of the I-39/90/94 Interstate North and South Segments' EIS document.

*Design Hour Volume Justification, May 3, 2023*

This document provides recommendations on establishing the design hour volume (DHV) to use in establishing the traffic operations of the I-39/90/94 subject facility based on analyzing traffic data along the corridor and guidance from the WisDOT Facilities Development Manual (FDM). It was determined that **The I-39/90/94 mainline north of US 151 would use K30 volumes, the I-39/90/94 mainline south of US 151 would use K100 volumes, and the ramp terminals and cross streets would use K250 volumes.** The design hour volumes were approved by the Bureau of Project Development and the Federal Highway Administration.

*Design Considerations and Representative Day Methodology, August 8, 2022*

This document determines what representative days will be used for the project for the purposes of traffic volume development and VISSIM micro-simulation validation. The representative days were identified through a cluster analysis using continuous count site (CCS) traffic data, National Performance Management and Research Data Set (NPMRDS) speeds, precipitation data, and corridor crashes. The desirable Levels of Service (LOS) are also determined. Locations north of CTH I were determined to have a LOS C desirable threshold, and locations south of CTH I were determined to have a LOS D desirable threshold. **Therefore, the Interstate North segment is assigned an LOS C desirable threshold, and the Interstate South segment is assigned an LOS D desirable threshold.** The US 51 corridor has a desirable threshold of LOS D.

*COVID Pandemic Impacts on Corridor Traffic, August 9, 2022*

This document analyzed traffic volumes during the pre- and post-COVID-19 pandemic period of 2020. **I-39/90/94 daily traffic volumes in the year 2021 recovered to pre-pandemic levels of the year 2019 after decreasing in the year 2020**. However, US 51 daily volumes were still about 10-15% lower than pre-pandemic year 2019 levels. This is because the higher levels of work-from-home behavior impacted US 51 traffic patterns more than I-39/90/94 traffic patterns.

*Traffic Forecasting Methodology, May 1, 2023*

This document describes the methodology for developing traffic forecasts in the I-39/90/94 and US 51 project. The existing year for the Interstate North corridor is 2021 and the existing year for the Interstate South corridor is 2019. The project study limits are described, including what intersections will be included in the VISSIM micro-simulation analysis and the Synchro traffic operations analysis. This document also summarizes other memos regarding COVID-19 Pandemic Impacts on Corridor Traffic (also described above), Design Hour Volume Identification (also described above), and Boat and Trailer Impact Truck Percentages, which compared truck percentage data collected by video and by axle classification system. The truck percentage results were similar, except for vehicle class 8, which showed a difference of approximately 5% between the two collection systems.

The document also briefly summarizes the use of the Statewide Travel Demand Model, which was utilized for the Interstate North corridor, and the Dane County Travel Demand Model, which was utilized for the Interstate South corridor and both the US 51 North and South corridors. The Statewide model only includes daily volumes. Therefore, daily model growth was applied in the traffic forecasting process in the Interstate North corridor. The Dane County model includes peak period volumes, including AM, PM, midday, and night-time, therefore peak period volume model assignment growth could be used in the traffic forecasting process in the Interstate South corridor. Traffic Analysis and Forecasting Information System (TAFIS) data was utilized, where available, to compare against the travel demand model growth and was used in the development of the project's future traffic forecasts. This document describes the workflow in developing traffic forecasts. This workflow generally includes comparing the forecasts developed from TAFIS and from the travel demand model, if they are within 10%, then the demand model-derived forecasts are used. If they are not within 10%, then the two forecasts are averaged, and if the average is within 10% of the TAFIS-based forecasts, then the average forecast is selected as the forecast. If the average is not within 10% of the TAFIS-based forecasts, then engineering judgment is applied to develop the forecast. This forecasting process is consistent with the process outlined in the *WisDOT Transportation Planning Manual (Chapter 9, Figure 10.5.1).*

*Dane County Travel Demand Model Validation, August 2022*

This report documents the validation of the Dane County travel demand model (DCTDM) by HNTB. The base year of the DCTDM is the year 2016. The validation efforts included an initial check on the model, trip distribution result validation, mode split validation, and highway assignment validation. Various data sets were used for the validation efforts, including origin-destination data from Replica and Streetlight, time-of-day traffic count data from WisDOT's Traffic Data System (TRADAS), and travel time and speed data from NPMRDS data in the Dane County road network. The initial check on the model identified a cluster-related issue within the current version of the model, causing the model to generate different results for every independent run. The solution was to rename an intermediate file and modify the corresponding code to accommodate the file name change. Generally, the validation review found good performance related to trip distribution, mode split, and highway assignment. However, two issues were uncovered, including the model overestimating the intra-district level traffic flow compared with Streetlight and Replica data and the model overestimating the travel speed on five major corridors in Dane County. The recommendations to correct these issues included implementing reduction factors on the intra-zonal terminal time to encourage the intra-zonal trip flows in the trip distribution step, and activating the intersection delay function to reduce travel speed in the major corridors and downtown areas.

*Safety Analysis Methodology, November 21, 2022*

This document provides guidance on the predictive safety models used Interactive Highway Safety Design Manual software (IHSDM) for the I-39/90/94 and US 51 corridors. It includes descriptions of the software version, analysis years, model development, model attributes and coding.

*VISSIM Analysis Methodology, July 8, 2022*

This document provides guidance on the development of the VISSIM microsimulation models for the I-39/90/94 and US 51 corridors. It includes descriptions of the software version, model geometric coding, driving behavior coding procedures, project area limits describing what intersections are modeled, peak periods modeled, calibration and validation procedures, and performance measures.

*High-Level Traffic Impacts of Various Interstate and US 51 Alternatives, April 4, 2024*

This document provides high-level assessments of traffic impacts from potential interchange and mainline alternatives in the Interstate and US 51 corridors. The DCTDM was generally used for these traffic impact assessments through the use of difference plots that compare the alternative model's traffic volumes to the no build model's traffic volumes. The year 2050 DCTDM baseline model included committed roadway improvements and the Greater Madison Area MPO's recommended bike, pedestrian, and transit improvements, including additional bike and pedestrian connections, bus rapid transit north-south and east-west alignments through Madison, and updated Madison Metro routes. Future alternatives that were assessed include Interstate capacity expansion, new interchanges at Hoepker Road and Milwaukee Street, various alternative interchange designs in the US 151/High Crossing Blvd/American Pkwy area, reduced speed along the US 51 South segment, and reduced speed along East Washington Avenue.

*HCS 2050 No Build LOS Results*

These documents show the results of the year 2050 future no build level of service (LOS) traffic operations conducted for the I-39/90/94 North and South Segment Corridor Study. The documents provide further details about the analyzed limits, methodology, and results of the year 2050 no build traffic operations *I-39/90/94 South Segment No Build Traffic Operations* and *I-39/90/94 North Segment No Build Traffic Operations*. The year 2050 No Build forecasted daily and peak hour volume exhibits are also provided.

The year 2050 No Build Friday PM and Sunday PM peak hour traffic operations are analyzed for the North Segment and the weekday AM, weekday PM, Friday PM, and Sunday PM peak hour traffic operations for the South Segment. The document shows there are several unacceptable year 2050 No Build peak hour traffic operations in the Interstate corridor. Unacceptable peak hour traffic operations include LOS D or worse in the North Segment and LOS E or worse in the South Segment. Every I-39/90/94 segment in the North Segment observes unacceptable LOS D conditions or worse along at least one direction during the Friday PM or Sunday PM peak hour. Along the South Segment, every I-39/90/94 segment except between WIS 60 and CTH V observes unacceptable LOS E conditions or worse under year 2050 No Build conditions. In addition, several locations along the I-94/WIS 30, US 151, and US 151 C-D corridors also observe unacceptable LOS E conditions or worse under year 2050 No Build conditions.

Table 1 summarizes the year 2050 No Build peak hour traffic LOS operations. The Highway Capacity Software (HCS) Version 2022 was used for these analyses. The key is below, which describes the coloring used for Table 1.

| | |
|---|---|
| | Better than acceptable LOS operations (LOS A or B in North Segment; LOS A, B, or C in South Segment) |
| | At the acceptable LOS operations (LOS C in North Segment; LOS D in South Segment) |
| | Worse than acceptable LOS operations but not LOS F (LOS D or E in North Segment; LOS E in South Segment) |
| | Failing LOS operations (LOS F in North or South Segments) |

*Table 1. Future 2050 No-Build Level of Service Summary*

| Interstate Corridor (North/South) | Highway | I-39/90/94 Location (Interchange to Interchange) | LEVEL OF SERVICE (LOS) SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM | | PM | | FRI | | SUN | |
| | | | SB/EB | NB/WB | SB/EB | NB/WB | SB/EB | NB/WB | SB/EB | NB/WB |
| Interstate North (LOS C or better is acceptable) | I-90/94 | N of US 12/WIS 16 | -- | -- | -- | -- | D | E | F | D |
| | | US 12/WIS 16 to WIS 13 | -- | -- | -- | -- | D | E | F | D |
| | | WIS 13 to WIS 23 | -- | -- | -- | -- | D | E | F | E |
| | | WIS 23 to US 12 | -- | -- | -- | -- | D | D | F | D |
| | | US 12 to WIS 33 | -- | -- | -- | -- | D | E | D | D |
| | | WIS 33 to I-39 | -- | -- | -- | -- | D | D | D | D |
| | I-39/90/94 | I-39 to Rest Area | -- | -- | -- | -- | C | D | D | C |
| | | Rest Area TO CTH CS | -- | -- | -- | -- | C | D | D | C |
| | | CTH CS to WIS 60 | -- | -- | -- | -- | C | D | D | C |
| Interstate South (LOS D or better is acceptable) | | WIS 60 to CTH V | B | B | B | B/C | C | D | D | B/C |
| | | CTH V to WIS 19 | B | B | B | C | C | D | E | C |
| | | WIS 19 to US 51 | C | B | C | D | D | F | E | C |
| | | US 51 to US 151 | C | C | C | D | D | F | E | C |
| | | US 151 to Badger Interchange | C | C/D | D | D | F | F | E | C |
| | I-39/90 | Badger Interchange to Beltline Interchange | E | E | E | E | F | F | E | D |
| | I-94/WIS 30 | Fair Oaks to US 51 | B | D | D | B | D/E | C | B | B |
| | | US 51 to Thompson | B | F | E | B/C | E | C | B | B |
| | | Thompson to Badger Int. | B | D/E | D | B/C | D | C | A/B | B |
| | | Badger Int. to CTH N | B | C | C | B | C | C | C | B |
| | US 151 | SB I-90 to NB I-90 | D | B | F | B/C | F | C | C | B |
| | | NB I-90 to American Pkwy | D | C | D | C | D | D | C | B |
| | | American Pkwy to Grand Ave | D | A/B | C | C/D | C/D | C | C | B |
| | | Grand Ave to Main St | C | A | B | C | B | B | B | B |
| | | North of Main St | -- | A/B | -- | C | -- | C | -- | B |
| | NB US 151 CD | From NB I-90 | -- | F | -- | F | -- | F | -- | B/C |
| | | Diverge to NB US 151 | -- | F | -- | F | -- | F | -- | A |
| | SB US 151 CD | SB US 151 to NB US 151 | F | -- | F | -- | C | -- | B/C | -- |
| | | South of Weave | E | -- | E | -- | F | -- | D | -- |

**LIST OF ACRONYMS**

| | |
|---|---|
| AADT | Average Annual Daily Traffic |
| ATR | Automatic Traffic Recorder |
| AWDT | Average Weekday Daily Traffic |
| BRT | Bus Rapid Transit |
| CCS | Continuous Count Sites |
| DCTDM | Dane County Travel Demand Model |
| DHV | Design Hour Volume |
| EB/NB/SB/WB | Eastbound, Northbound, Southbound, Westbound |
| EE | External-to-External Trips |
| EI-IE | External-to-Internal / Internal-to-External trips |
| EWA | East Washington Avenue |
| FDM | WisDOT's Facilities Development Manual |
| GMMPO | Greater Madison Metropolitan Planning Organization |
| K30 | 30$^{th}$ highest hour volume |
| K100 | 100$^{th}$ highest hour volume |
| LOS | Level of Service |
| NHS | National Highway System |
| NPMRDS | National Performance Management and Research Data Set |
| OD | Origin-Destination |
| ODME | Origin-Destination Matrix Estimation |
| SWTDM | Statewide Travel Demand Model |
| TAFIS | Traffic Analysis and Forecasting Information System |
| TPM | Transportation Planning Manual |
| VISSIM | A micro-simulation traffic engineering software used for traffic analysis |
| VHT | Vehicle-hours Traveled |
| VMT | Vehicle-miles Traveled |
| WisDOT | Wisconsin Department of Transportation |

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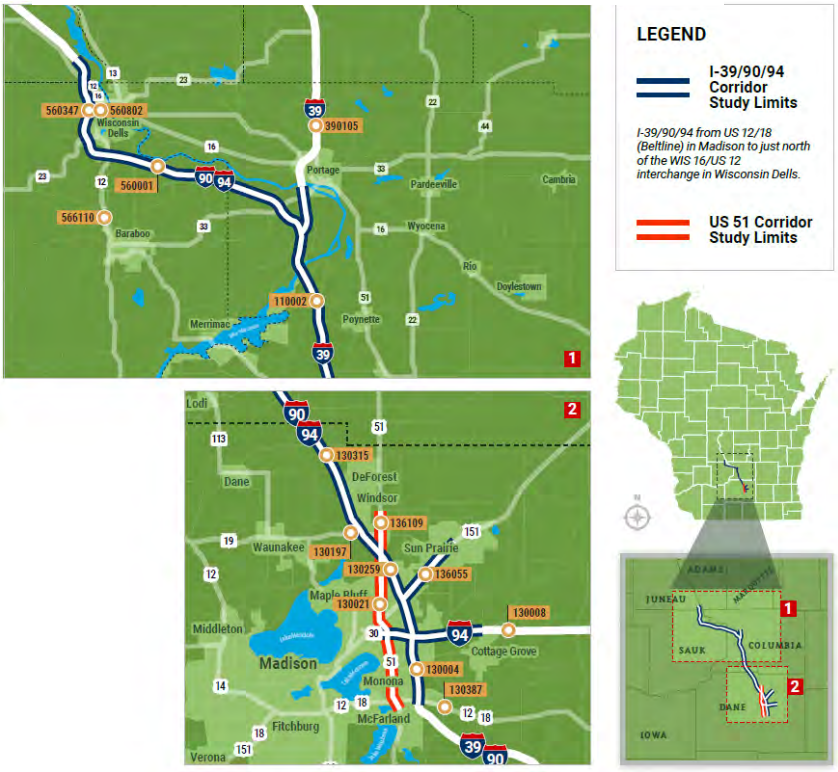
# Design Hour Volume Justification

| | |
|---|---|
| **Date:** | May 3, 2023 |
| **Topic:** | Design Hour Volume Justification |
| **From:** | CDMCT |

## 1. Overview

*Figure 1: Continuous Count Sites in the I-39/90/94 Study Limits*




The Wisconsin Department of Transportation (WisDOT) is studying the Interstate 39/90/94 (I-39/90/94) corridor between US 12/18 in Madison to US 12/WIS 16 north of Wisconsin Dells. WisDOT's Transportation Planning Manual Chapter 9 and Facilities Development Manual (FDM) provide recommendations on establishing the design hour volume (DHV) to use in establishing the operations of the subject facility. The FDM identifies the 30th highest hour of the day as the generally recommended design hour volume for a freeway facility including I-39/90/94. The FDM provides exceptions to this general recommendation when level of service using the 30th highest design hour is financially cost prohibitive or for urbanized areas with a population over 200,000 residents. Figure 1 shows the I-39/90/94 corridor along with the US 51 corridor that is being studied in parallel with I-39/90/94. The I-39/90/94 analysis is divided into two design sections with the north and south section limits transitioning south of WIS 60 in Columbia County. Based on analysis detailed below, the 30th highest hourly volume is recommended as the DHV for all Interstate segments in Columbia, Juneau and Sauk counites highlighted in Figure 1 and for all Interstate segments in Dane County except the segments between US 12/18 and US 151, which is recommended to use the 100th highest hourly volume.

## 2. Traffic Count Analysis

COVID 19 impacted traffic volumes both nationally and in the study corridor. Average annual daily traffic from available continuous count sites (CCS) were compared for years 2019, 2020 and 2021 as shown in Table 1, with 2021 post-COVID traffic volumes at or exceeding 2019 pre-COVID volumes at most locations.

*Table 1: Summary of Interstate's Average Annual Daily Traffic 2019-2021*

| Facility | Location | 2019 | 2020 | 2021 | % Recovery |
|---|---|---|---|---|---|
| Interstate | N of US 12/18 (Beltline), Dane Cty | 97,500 | 79,500 | 92,500 | 95% |
| Interstate | Btwn US 51 and US 151, Dane Cty | 71,200 | 62,000 | 72,000 | 101% |
| Interstate | Dane/Columbia Cty Line | 59,100 | 50,400 | 58,400 | 99% |
| Interstate | Wisc River Bridge, Columbia Cty | 56,900 | 49,100 | 58,100 | 102% |
| Interstate | Wisconsin Dells, Sauk Cty | 42,900 | 36,200 | 43,400 | 101% |

Figure 2 and Figure 3 show detailed monthly average traffic volumes for I-39/90/94 north of US 151 and I-90/94 north of US 12/18. Traffic volumes dropped significantly in March of 2020 due to the State of Wisconsin's Safer at Home restrictions. Monthly traffic volumes continued to lag 2019 monthly averages through the remainder of 2020 and into early 2021. March 2021 volumes north of US 151 showed similar volumes to 2019 data with subsequent monthly volumes in 2021 indicating traffic demands were similar to or were exceeding 2019 volumes. Volumes on I-90/94 north of US 12/18 show 2021 and 2022 traffic volumes still slightly lower than 2019 volumes.

*Figure 2: Monthly Volumes on I-39/90/94 N of US 151 During COVID*

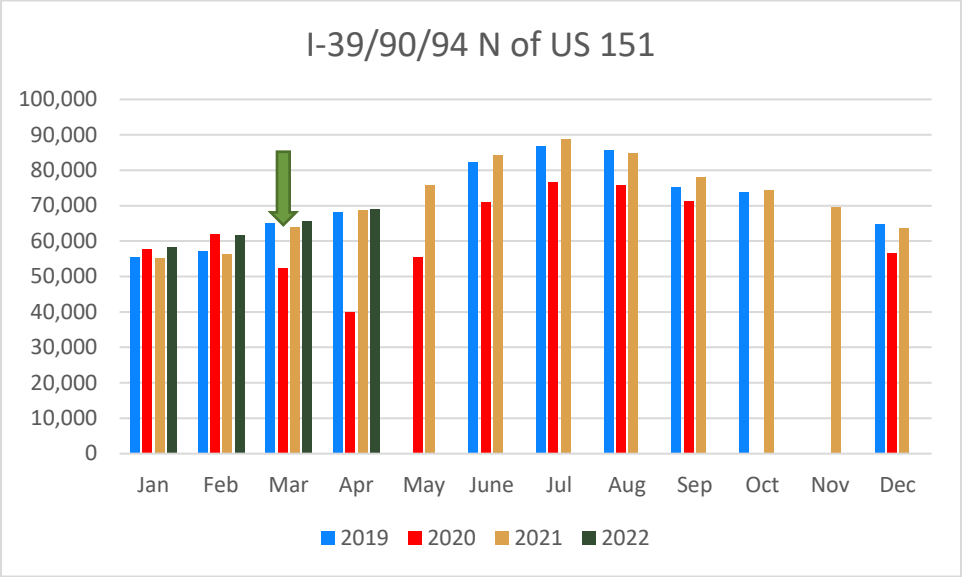
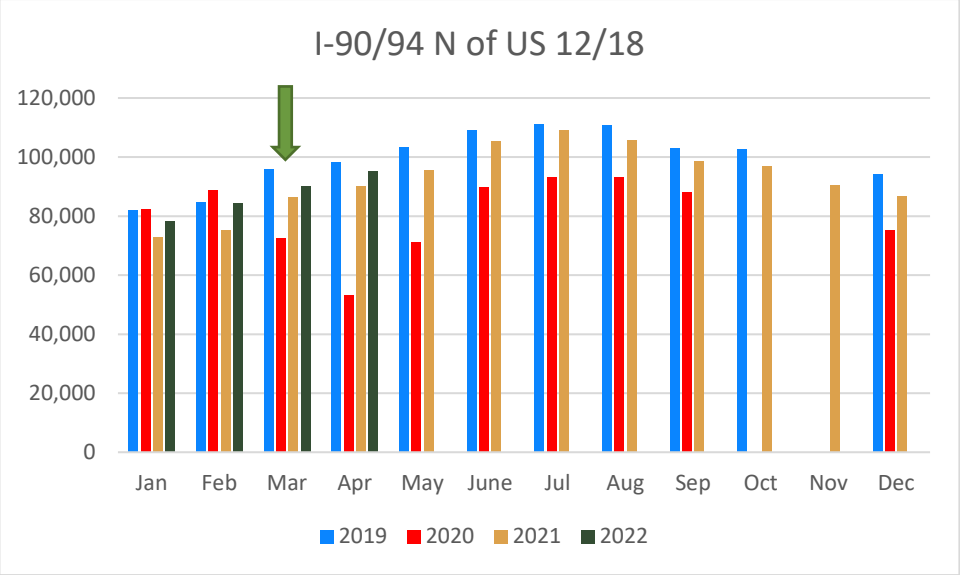


*Figure 3: Monthly Volumes on I-90/94 N of US 12/18 During COVID*




The south design section is using previously developed traffic data from 2019 for operations and forecasting purposes. The 2019 count data set is being used to maximize the investment in data collection and traffic analysis already completed with the 2019 data. The north design section is using 2021 data as a new data collection effort was required and 2021 daily counts show higher volumes than do 2019 daily counts.

Available year 2021 continuous count site data on and in proximity to the I-39/90/94 corridor were reviewed to determine the highest traffic demands periods. Figure 1 and Table 1 show the locations along I-39/90/94 analyzed along with support locations. Table 3 shows the number of high-volume hours that occur in each day of the week in year 2021 for I-39/90/94 locations. Note that Friday and Sunday contain most of the high-volume hours along the Interstate. Table 2 shows the observed K30 and K100 hourly volumes in year 2021 and includes K250 in urbanized areas.

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*Table 2: Summary of Observed Peak Traffic Demands from Continuous Count Sites – Year 2021*

| Station | Direction | Segment | K30 | K100 | K250 |
|---|---|---|---|---|---|
| 560347 | I-90/94 WB (NB) | Between WIS 13 & WIS 23 | 2,802 | 2,514 | |
| | I-90/94 EB (SB) | | 3,004 | 2,686 | |
| 560001 | I-90/94 WB (NB) | Between WIS 12 & WIS 33 | 2,697 | 2,507 | |
| | I-90/94 EB (SB) | | 2,847 | 2,592 | |
| 110002 | I-39/90/94 NB (WB) | Between I-39 Split & CTH CS | 4,071 | 3,720 | |
| | I-39/90/94 SB (EB) | | 4,410 | 4,095 | |
| 130315 | I-39/90/94 NB (WB) | Between WIS 60 & CTH V | 4,111 | 3,741 | |
| | I-39/90/94 SB (EB) | | 4,330 | 4,000 | |
| 130259 | I-39/90/94 NB (WB) | Between US 51 & US 151 | 4,385 | 4,100 | 3,677 |
| | I-39/90/94 SB (EB) | | 4,518 | 4,215 | 3,558 |
| 130004 | I-39/90 NB (WB) | Between I-94/WIS 30 & US 12/18 | 4,588 | 4,327 | 4,019 |
| | I-39/90 SB (EB) | | 4,518 | 4,236 | 3,972 |
| 130006 | I-39/90 NB (WB) | South of US 12/18 | 2,736 | 2,605 | 2,465 |
| | I-39/90 SB (EB) | | 3,347 | 3,064 | 2,809 |

Table 3 through Table 5 show the number of days in which the highest 30, 100 and 250 hours of traffic were observed throughout the year. Note the high number of hours that occur during the Friday and Sunday timeframe.

*Table 3: Summary of 30th Highest Hour Traffic Demands by Day of Week – Year 2021*

| Station | Roadway | Segment | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|---|---|---|
| 560347 | I-90/94 EB | Between WIS 13 & WIS 23 | 6 | 7 | 7 | 2 | 2 | 3 | 3 |
| | I-90/94 WB | | 0 | 17 | 6 | 5 | 2 | 0 | 0 |
| 560001 | I-90/94 EB | Between WIS 12 & WIS 33 | 25 | 5 | 0 | 0 | 0 | 0 | 0 |
| | I-90/94 WB | | 11 | 0 | 0 | 0 | 0 | 15 | 4 |
| 110002 | I-39/90/94 NB | Between I-39 Split & CTH CS | 0 | 0 | 0 | 0 | 0 | 25 | 5 |
| | I-39/90/94 SB | | 22 | 8 | 0 | 0 | 0 | 0 | 0 |
| 130315 | I-39/90/94 NB | Between WIS 60 & CTH V | 0 | 0 | 0 | 0 | 0 | 27 | 3 |
| | I-39/90/94 SB | | 26 | 4 | 0 | 0 | 0 | 0 | 0 |
| 130259 | I-39/90/94 NB | Between US 51 & US 151 | 0 | 0 | 0 | 0 | 0 | 29 | 1 |
| | I-39/90/94 SB | | 24 | 6 | 0 | 0 | 0 | 0 | 0 |
| 130004 | I-39/90 NB | Between I-94/WIS 30 & US 12/18 | 0 | 0 | 0 | 0 | 5 | 25 | 0 |
| | I-39/90 SB | | 19 | 1 | 0 | 0 | 1 | 9 | 0 |
| 130006 | I-39/90 NB | South of US 12/18 | 11 | 0 | 0 | 0 | 0 | 10 | 9 |
| | I-39/90 SB | | 18 | 11 | 0 | 1 | 0 | 0 | 0 |

Contains 1/3 to 2/3 of 2021's Highest Hourly Volumes

Contains More than 2/3 of 2021's Highest Hourly Volumes

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*Table 4: Summary of 100th Highest Hour Traffic Demands by Day of Week – Year 2021*

| Station | Roadway | Segment | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|---|---|---|
| 560347 | I-90/94 EB | Between WIS 13 & WIS 23 | 17 | 18 | 12 | 3 | 15 | 13 | 22 |
| | I-90/94 WB | | 10 | 28 | 18 | 19 | 17 | 0 | 8 |
| 560001 | I-90/94 EB | Between WIS 12 & WIS 33 | 89 | 9 | 0 | 2 | 0 | 0 | 0 |
| | I-90/94 WB | | 33 | 2 | 0 | 0 | 0 | 47 | 18 |
| 110002 | I-39/90/94 NB | Between I-39 Split & CTH CS | 1 | 0 | 0 | 0 | 1 | 78 | 20 |
| | I-39/90/94 SB | | 80 | 20 | 0 | 0 | 0 | 0 | 0 |
| 130315 | I-39/90/94 NB | Between WIS 60 & CTH V | 1 | 0 | 0 | 0 | 2 | 78 | 19 |
| | I-39/90/94 SB | | 87 | 13 | 0 | 0 | 0 | 0 | 0 |
| 130259 | I-39/90/94 NB | Between US 51 & US 151 | 0 | 0 | 0 | 0 | 1 | 85 | 14 |
| | I-39/90/94 SB | | 80 | 20 | 0 | 0 | 0 | 0 | 0 |
| 130004 | I-39/90 NB | Between I-94/WIS 30 & US 12/18 | 0 | 0 | 0 | 0 | 18 | 71 | 11 |
| | I-39/90 SB | | 50 | 8 | 1 | 4 | 8 | 29 | 0 |
| 130006 | I-39/90 NB | South of US 12/18 | 26 | 0 | 1 | 2 | 0 | 44 | 27 |
| | I-39/90 SB | | 74 | 15 | 3 | 3 | 0 | 5 | 0 |

Contains 1/3 to 2/3 of 2021's Highest Hourly Volumes

Contains More than 2/3 of 2021's Highest Hourly Volumes

*Table 5: Summary of 250th Highest Hour Traffic Demands by Day of Week – Year 2021*

| Station | Roadway | Segment | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|---|---|---|
| 560347 | I-90/94 EB | Between WIS 13 & WIS 23 | 38 | 39 | 32 | 14 | 43 | 26 | 58 |
| | I-90/94 WB | | 36 | 51 | 34 | 40 | 41 | 21 | 27 |
| 560001 | I-90/94 EB | Between WIS 12 & WIS 33 | 201 | 19 | 0 | 4 | 0 | 21 | 5 |
| | I-90/94 WB | | 65 | 3 | 0 | 4 | 1 | 134 | 43 |
| 110002 | I-39/90/94 NB | Between I-39 Split & CTH CS | 33 | 2 | 0 | 2 | 5 | 161 | 47 |
| | I-39/90/94 SB | | 203 | 30 | 1 | 2 | 0 | 8 | 6 |
| 130315 | I-39/90/94 NB | Between WIS 60 & CTH V | 28 | 1 | 0 | 1 | 6 | 167 | 47 |
| | I-39/90/94 SB | | 212 | 21 | 1 | 2 | 0 | 6 | 8 |
| 130259 | I-39/90/94 NB | Between US 51 & US 151 | 25 | 0 | 0 | 3 | 8 | 173 | 41 |
| | I-39/90/94 SB | | 189 | 29 | 2 | 3 | 1 | 19 | 7 |
| 130004 | I-39/90/94 NB | Between I-94/WIS 30 & US 12/18 | 20 | 5 | 5 | 12 | 41 | 124 | 43 |
| | I-39/90/94 SB | | 86 | 25 | 15 | 14 | 24 | 65 | 21 |
| 130006 | I-39/90 NB | South of US 12/18 | 50 | 3 | 2 | 4 | 6 | 136 | 49 |
| | I-39/90 SB | | 135 | 36 | 9 | 15 | 15 | 37 | 3 |

Contains 1/3 to 2/3 of 2021's Highest Hourly Volumes

Contains More than 2/3 of 2021's Highest Hourly Volumes

Table 3 through Table 5 show that the count locations along I-39/90/94 typically have the majority of the 30 highest hours and 100 highest hours occur during Friday in the I-39/90/94 NB (WB) direction, and during Sunday in the I-39/90/94 SB (EB) direction. The exception is the northernmost location (ID 560347) near Wisconsin Dells, which does not have a strong discernable pattern of highest hours of travel.

Table 6 compares the K30 and K100 hourly volumes between year 2019 and year 2021 for the south design section in Dane County to assess if the volume profiles have changed significantly. K30 and K100 volumes along I-39/90/94 are fairly similar during year 2019 and year 2021 with 2021 volumes slightly higher than 2019 volumes on average. Typically, the year 2019 and year 2021 K30 and K100 volumes are within 7% of each other. The one exception is station 130006 [I-39/90 EB (SB)], which is between 11 to 15% higher in year 2021 than year 2019, during which time construction activities on I-39/90 between Madison and the Illinois state line impacted traffic patterns south of Madison. 2019 counts are being used to represent the base condition for the south design section as 2021 counts were not higher than 2019 and considerable investment was made to collect 2019 traffic data and develop traffic analysis tools based on that data. Published 2022 counts show a mix of locations with volumes higher or lower than 2021 counts.

*Table 6: Comparison of Year 2019 and Year 2021 K30 and K100 Hourly Volumes in South Design Section*

| Station | Direction | Segment | 2019 K30 | 2021 K30 | K30 %Diff | 2019 K100 | 2021 K100 | K100 %Diff |
|---|---|---|---|---|---|---|---|---|
| 130315 | I-39/90/94 NB (WB) | Between WIS 60 & CTH V | 4,138 | 4,111 | -0.7% | 3,750 | 3,741 | -0.2% |
| | I-39/90/94 SB (EB) | | 4,348 | 4,330 | 0.4% | 3,865 | 4,000 | 3.5% |
| 130259 | I-39/90/94 NB (WB) | Between US 51 & US 151 | 4,458 | 4,385 | -1.6% | 4,005 | 4,100 | 2.4% |
| | I-39/90/94 SB (EB) | | 4,478 | 4,518 | 0.9% | 4,021 | 4,215 | 4.8% |
| 130004 | I-39/90 NB (WB) | Between I-94/ WIS 30 & US 12/18 | 4,884 | 4,588 | -6.1% | 4,627 | 4,327 | -6.5% |
| | I-39/90 SB(EB) | | 4,762 | 4,518 | -5.1% | 4,552 | 4,236 | -6.9% |
| 130006 | I-39/90 NB (WB) | South of US 12/18 | 2,774 | 2,736 | -1.4% | 2,563 | 2,605 | 1.6% |
| | I-39/90 SB (EB) | | 2,896 | 3,347 | 15.6% | 2,742 | 3,064 | 11.7% |

Table 7 below shows the AADT's for 2019 and 2021 at the 3 available CCS in the north design section. Unlike the south design section, the 2021 volumes are consistently higher in the north design section compared to 2019 volumes and new traffic analysis models are being developed for this section. Therefore 2021 volumes will be used as the baseline for the north design section. Published 2022 AADT's at the three sites in Table 7 note a slight

reduction (1-2%) in volumes compared to 2021 but these slight reductions are within regular annual fluctuations and do not invalidate the use of the data.

*Table 7: Comparison of Year 2019 and Year 2021 K30 and K100 Hourly Volumes in North Design Section*

| Station | Segment | 2021 AADT | 2019 AADT | AADT %Diff |
|---|---|---|---|---|
| 560347 | Between WIS 13 and WIS 23 | 43,400 | 42,900 | +1.1% |
| 560001 | Between US 12 & STH 33 | 40,100 | 39,800 | +0.7% |
| 110002 | Between I-39 & CTH CS | 58,100 | 56,900 | +2.1% |

## 3. Design Hour Volume Determination

WisDOT FDM 11-5-3.5.1 defines the determination of DHV for the LOS analysis. The process varies depending on the type of facility. The existing year DHV will be used as the base line for forecasting future year no build and alternative scenarios DHVs. Existing, future no build and future build alternative DHVs will be analyzed with a combination of VISSIM and VISTRO/Synchro to estimate traffic operations such as delay, density and travel times during the design hours.

## 3.1. I-39/90/94 Design Hour Volume Determination

FDM 11-5-3.1.1 provides guidance on the DHV for freeways, multilane highways and two-lane highways. This applies to both the north and south I-39/90/94 sections. The general guidance is to use the 30$^{th}$ highest hourly volume of year as the DHV which the design team intends to do for all Interstate segments north of Dane County and for most segments of the Interstate in Dane County. The FDM notes that the higher design hours may be used in urbanized areas or the 200$^{th}$ or 250$^{th}$ highest hour may be justified in areas where there is little difference between the 30$^{th}$ and 250$^{th}$ hour and the 250$^{th}$ hour volumes are consistent with AM or PM peak hours. Therefore, a project-specific evaluation of the appropriate design hour is conducted.

2018 is the most recent year that coverage counts were available that have been seasonally adjusted, Table 8 and Figure 4 show that the Interstate traffic volumes in Dane County are significantly higher in the two segments between US 151 and US 12/18 compared to the rest of the Interstate corridor. Selecting the 30$^{th}$ highest hour for all segments of the Interstate in Dane County would lead to the two high volume segments driving capacity needs throughout the corridor.

*Table 8: 2018 Average Annual Daily Traffic Volumes on Madison Area Interstate System*

| Station | Facility | Segment | 2018 AADT |
|---|---|---|---|
| 130315 | I-39/90/94 | Between WIS 60 and CTH V | 59,300 |
| 130989 | I-39/90/94 | Between CTH V and WIS 19 | 66,600 |
| 131566 | I-39/90/94 | Between WIS 19 and US 51 | 74,400 |
| 130259 | I-39/90/94 | Between US 51 & US 151 | 70,700 |
| 130611 | I-39/90/94 | Between US 151 & I-94/WIS 30 | 108,000 |
| 130004 | I-39/90 | Between I-94/WIS 30 & US 12/18 | 98,900 |
| 130006 | I-39/90 | South of US 12/18 | 54,500 |

*Figure 4: 2018 Interstate AADT in Madison area*

Table 2 shows 250th hour volumes for site 130004 on I-39/90 in the urbanized Madison area are 12 to 21 percent lower than the 30th highest hour and therefore do not fit the FDM's definition of 'little difference between the 30th and 250th hour'. By contrast, the 100th highest hours are all approximately six to seven percent lower than the 30th highest hour.

Table 6 shows the 100th highest volumes in the high daily volume segment (130004) are 2-4% higher than the 30th highest volume in the adjacent segment (130259). Selecting the 100th highest volume as the DHV for the two high volume segments with the 30th highest volume for the remainder of the Dane County segments and all Interstate segments north of Dane County provides a volume set that is consistent with higher observed volumes between US 151 and US 12/18 but minimizes the potential for level of service to drive towards financially cost prohibitive solutions.

Note that FDM 11-5.3.1.1 does not pertain to the ramp terminal intersections or cross streets at interchanges. These locations are covered by FDM 11-5.3.1.2 which provides guidance on the determination of DHVs for urban streets, intersections and ramp terminals. At these locations, DHVs should be based on the AM or PM peak hour volumes for individual turning and through movements. This will result in a variation in traffic volumes between ramps (driven by the representative day to achieve K30/100 volumes on the Interstate mainline) and the turning movements at the ramp terminal (driven by the peak hour volumes).

Table 9 summarizes the designated DHVs identified per the FDM 11-5-3 guidance by facility type and location.

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*Table 9: Summary of Design Hour Volume Designation*

| Corridor | Facility Type | Designated Design Hour Volume | Volume Set |
|---|---|---|---|
| Interstate North | Interstate Mainline -Northbound | K30 | Summer Fridays |
| | Interstate Mainline -Southbound | | Summer Sundays |
| | Ramp Terminals and Cross Streets | K250 | Weekend Peaks |
| Interstate South | Interstate (N of US 151) Mainline - Northbound | K30 | Summer Fridays |
| | Interstate (N of US 151) Mainline - Southbound | | Summer Sundays |
| | Urban (US 12/18 to I-94 and I-94 to US 151) Interstate Mainline | K100 | AM/PM Peaks |
| | Ramp Terminals and Cross Streets | K250 | AM/PM Peaks |

**WisDOT**
**Southwest Regional Office**
Madison Office
2101 Wright Street
Madison, WI 53704

**Governor Tony Evers**
**Secretary Craig Thompson**
wisconsindot.gov
Telephone: (608) 246-3800
FAX: (608) 246-7996
Email: swr.dtsd@dot.wi.gov

Date: May 3, 2023

To: Beth Cannestra
Director, Bureau of Project Development
Attn: Michael Hoelker, P.E.

From: Frank Pritzlaff, P.E.
DTSD, Southwest Region Project Manager

Subject: Design Hour Volume Variance for Interstate 39/90/94 Between US 12/18 and US 151
Project ID 1012-05-03
Interstate 39/90/94 from US 12/18 in Madison to US 12/WIS 16 in Wisconsin Dells

The project team has reviewed traffic volumes and patterns on the Interstate system for the I-39/90/94 Interstate Corridor EIS within the study limits of US 12/18 in Madison and US 12/WIS 16 in Wisconsin Dells. For the purpose of reviewing traffic volumes and patterns, the Interstate in the study area was broken up into segments, demarcated by marked changes in traffic characteristics of volumes and patterns. Two segments of Interstate within the Interstate study area experience higher traffic volumes than the rest of the segments in the Interstate study area: the segment of Interstate 39/90 between US 12/18 and Interstate 94 and the segment of Interstate 39/90/94 between Interstate 94 and US 151 in Dane County. The team is requesting approval of the attached memorandum to use the 100th highest hour as the design hour volume for these two segments of the Interstate as allowed in the Department's Facilities Development Manual (FDM). All other corridor Interstate segments within the NEPA limits between US 151 and US 12/WIS 16 will use the 30th highest hour as the design hour volume per the Depa tm DM.

Jim Oettinger, P.E.
Digitally signed by Jim Oettinger, P.E.
DN: C=US, E=james.oettinger@dot.wi.gov, CN="Jim Oettinger, P.E."
Date: 2023.05.23 12:43:28-05'00'

Southwest Region Project Development Chief — Date

Concur: William Strobel
Digitally signed by William Strobel
Date: 2023.05.24 13:12:29 -05'00'

Bureau of Project Development, — Date
Design Standards and Oversight Section Chief

July 25, 2023

Federal Highway Administration — Date

**WisDOT, Division of Transportation Development**
Bureau of State Highway Programs
4822 Madison Yards Way
6th Floor South
Madison, WI 53705

**Governor Tony Evers**
**Secretary Craig Thompson**
wisconsindot.gov
Telephone: (608) 267-7754
Email: Jeffrey.Gust@dot.wi.gov

*Date:* May 2, 2023
*To:* Daniel Schave, P.E.
DTSD, Southwest Region Supervisor
Attn: Jim Oettinger, P.E.
*From:* Jeff Gust, P.E. JRG
DTIM, Bureau of State Highway Programs
*Subject:* Design Hour Volume Variance for I-39/90/94 Between US 12/18 and US 151

The Wisconsin Department of Transportation (WisDOT) is studying the Interstate 39/90/94 (I-39/90/94) corridor between US 12/18 in Madison and US 12/WIS 16 north of Wisconsin Dells. WisDOT's Facilities Development Manual (FDM) 11-5-3.5.1.1 provides recommendations on establishing the design hour volume (DHV) to use in establishing the operations of the subject facility. While the FDM identifies the 30th highest hour of the day as the generally recommended design hour volume for freeway facilities, exceptions to this general recommendation apply when level of service using the 30th highest design hour is financially cost prohibitive or for urbanized areas with a population over 200,000 residents. Selection of an appropriate DHV is to be based on an analysis of traffic volume data.

The existing year DHV will be used as the base line for forecasting future year no build and alternative scenarios DHVs. Existing, future no build and future build alternative DHVs will be analyzed with a combination of VISSIM and VISTRO/Synchro to estimate traffic operations such as delay, density and travel times during the design hours. Note that the majority of both the top 30 and top 100 hourly volumes occur on Fridays and Sundays due to the large volume of summer tourist traffic.

A thorough analysis of data from several years at traffic count stations on the I-39/90/94 corridor led the project team, in collaboration with the Bureau of State Highway Programs, to select the 100th highest hour as the DHV for the two Interstate segments between US 12/18 and US 151. Given their location in the heart of the Madison metropolitan area, these segments carry significant commuter traffic as well as traditional Interstate demands (freight, long distance trips, and recreational travel). Neither the typical 30th highest hour nor the 200th or 250th highest hour recommended for highly urbanized freeways seemed appropriate given the demand profile of the corridor, but the 100th highest hour is fitting not only as middle ground but also for volume consistency along the entire corridor. Using the 100th highest hour between US 12/18 and US 151, which is only 2-4% higher than the 30th highest hour at other Dane County segments, provides a volume set that is consistent with higher observed volumes on these segments but minimizes the potential for level of service to drive towards financially cost prohibitive solutions. The 30th highest hour will be used throughout the remainder of the corridor. These design hours are consistent with the applicable FDM policy (11-5-3.5.1.1).

Thank you for the opportunity to comment. Please contact me or Ben Rouleau if you have any questions.

# Design Considerations and Representative Day Methodology

| | |
|---|---|
| **Date:** | August 8, 2022 |
| **Topic:** | Design Considerations and Cluster Analysis for Determining Representative Days |
| **From:** | CDMCT |

## 1. Overview

The Wisconsin Department of Transportation (WisDOT) Facilities Development Manual (FDM) provides recommendations on which traffic data to use in establishing the operations of the subject facility. The FDM also recommends the desirable level of service (LOS) a facility should be designed to accommodate. These recommendations applications are detailed in this memorandum.

Representative days will be identified for the I-39/90/94 and US-51 corridors for the purposes of traffic volume development and VISSIM microsimulation validation. The representative day will be identified through a k-means cluster analysis using available continuous count site (CCS) traffic data, National Performance Management and Research Data Set (NPMRDS) speeds, precipitation data, and corridor crashes. Cluster analysis is the process of grouping a set of objects based on similar characteristics. The targeted condition will vary between the I-39/90/94 analysis targeting K30 or K100 conditions while the US 51 segments will be analyzed with peak hour volumes in the K200 to K250 range.

## 2. Desirable Levels of Service

WisDOT FDM 11-5-3.1 defines the desirable LOS thresholds as the desirable degree of design year congestion. The desirable LOS is determined by the type of roadway facility and whether the roadway is in an urban or rural area as shown in Table 1.

*Table 1: Desirable Levels of Service*

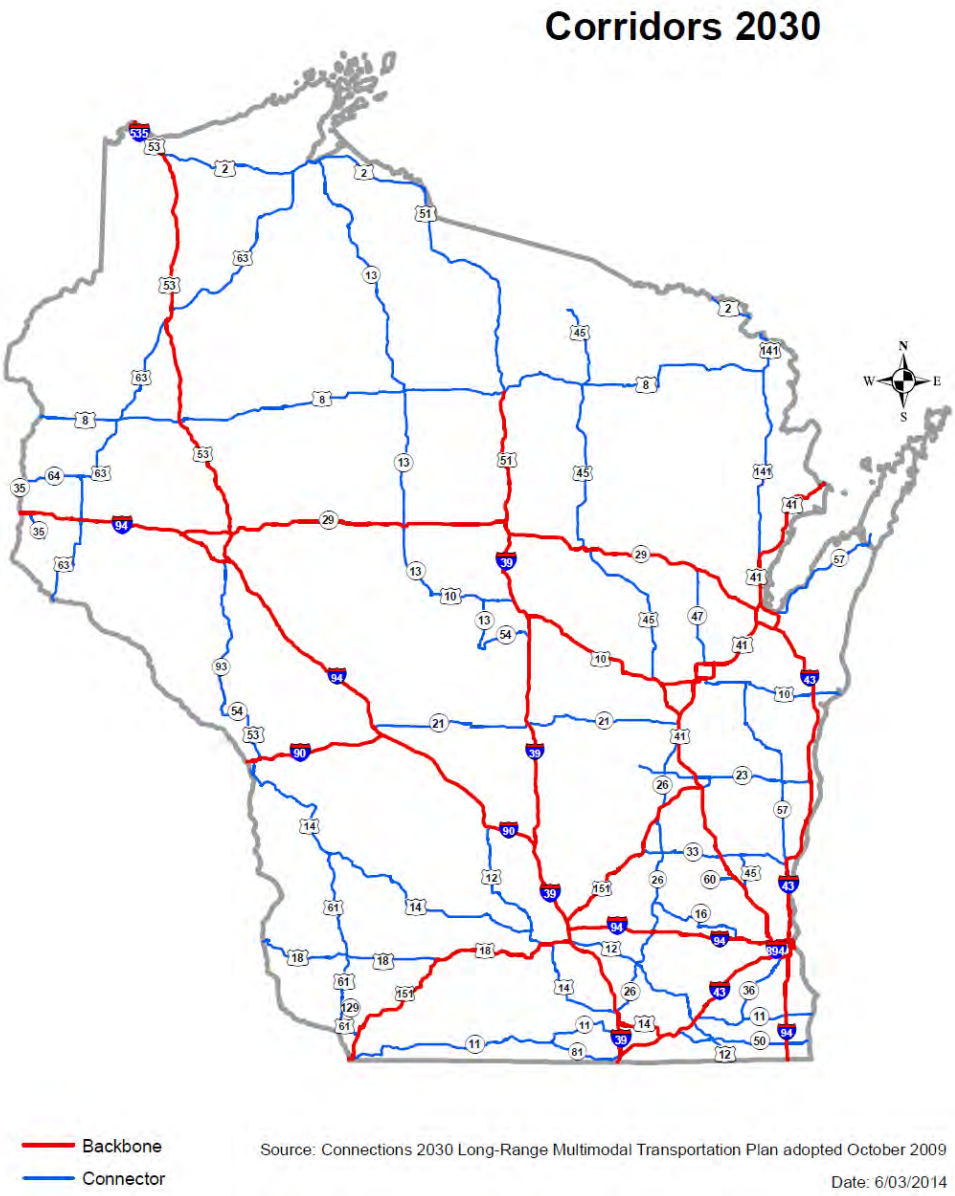
| STH Sub System | Rural and Small Urban Areas | Urbanized Areas with Population >50,000 |
|---|---|---|
| C2030 Backbone and Connector Routes | LOS C (≤ 4.0) | LOS D (≤ 5.0) |
| National Highway System (NHS) Routes | LOS D (≤ 5.0) | LOS D (≤ 5.0) |
| Non-NHS Routes | LOS D (≤ 5.0) | Mid LOS E (≤ 5.5) |

Source: WisDOT FDM 11-5-3 Table 3.1

## 2.1. I-39/90/94 Desirable Level of Service

Figure 1 displays the facilities defined by the Connections 2030 plan as Backbone and Connector facilities. The entire Wisconsin Interstate system including the segment between US 12/18 (Beltline) and north US 12 interchange in Wisconsin Dells is defined as a Backbone facility.

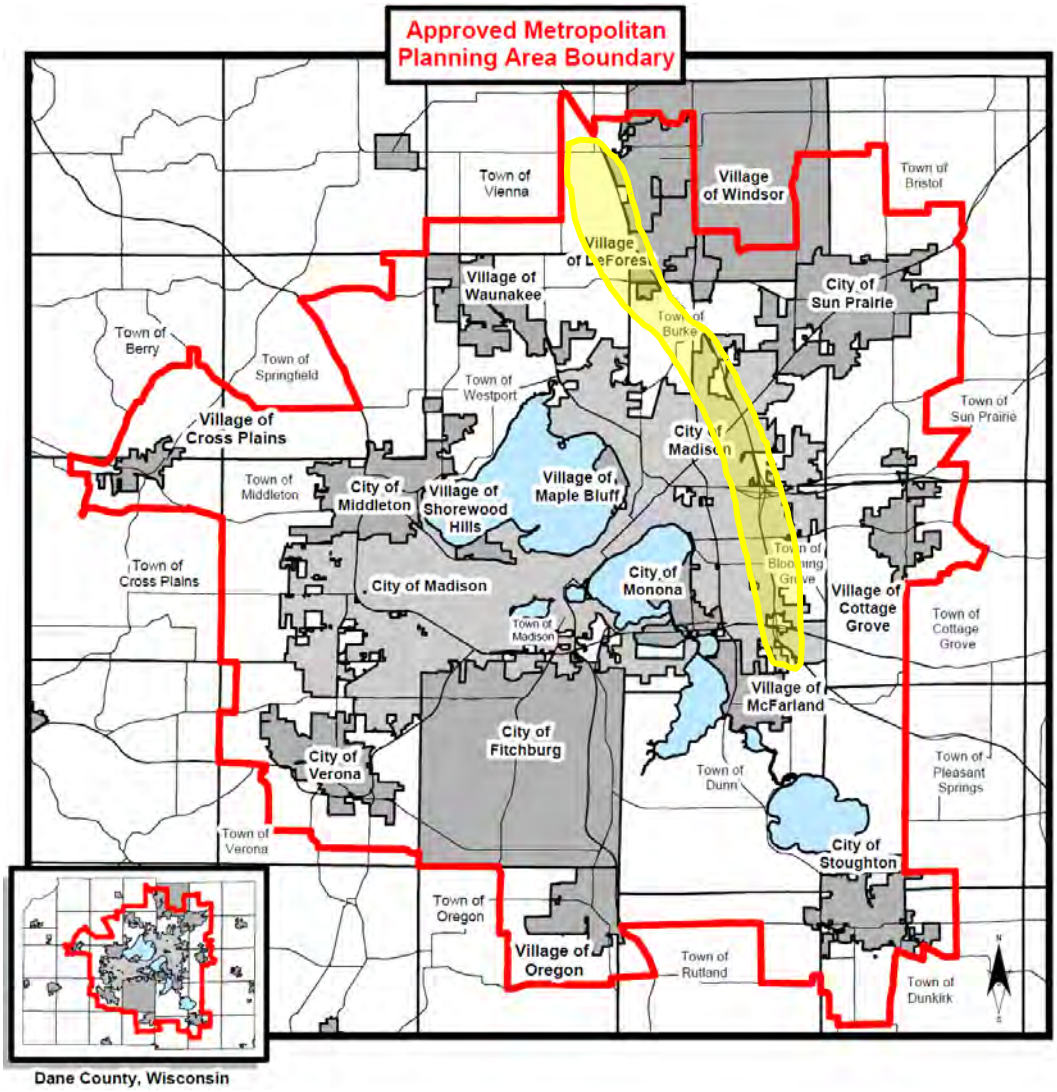
*Figure 1: Corridors 2030 Facilities Map*




The area type does change within the Interstate's project limits. The Madison metropolitan planning boundary mapping shown in Figure 2 shows existing city boundaries along with the planning boundary. The planning

boundary is used to define the spatial limits of the urban area to provide a consistent designation through the greater Madison area. This provides an urban designation for I 39/90/94 from the project's southern limit at the Beltline to the CTH I overpass near DeForest with a desirable LOS threshold of D. Interstate segments north of CTH I are defined as rural with a desirable LOS threshold of C.

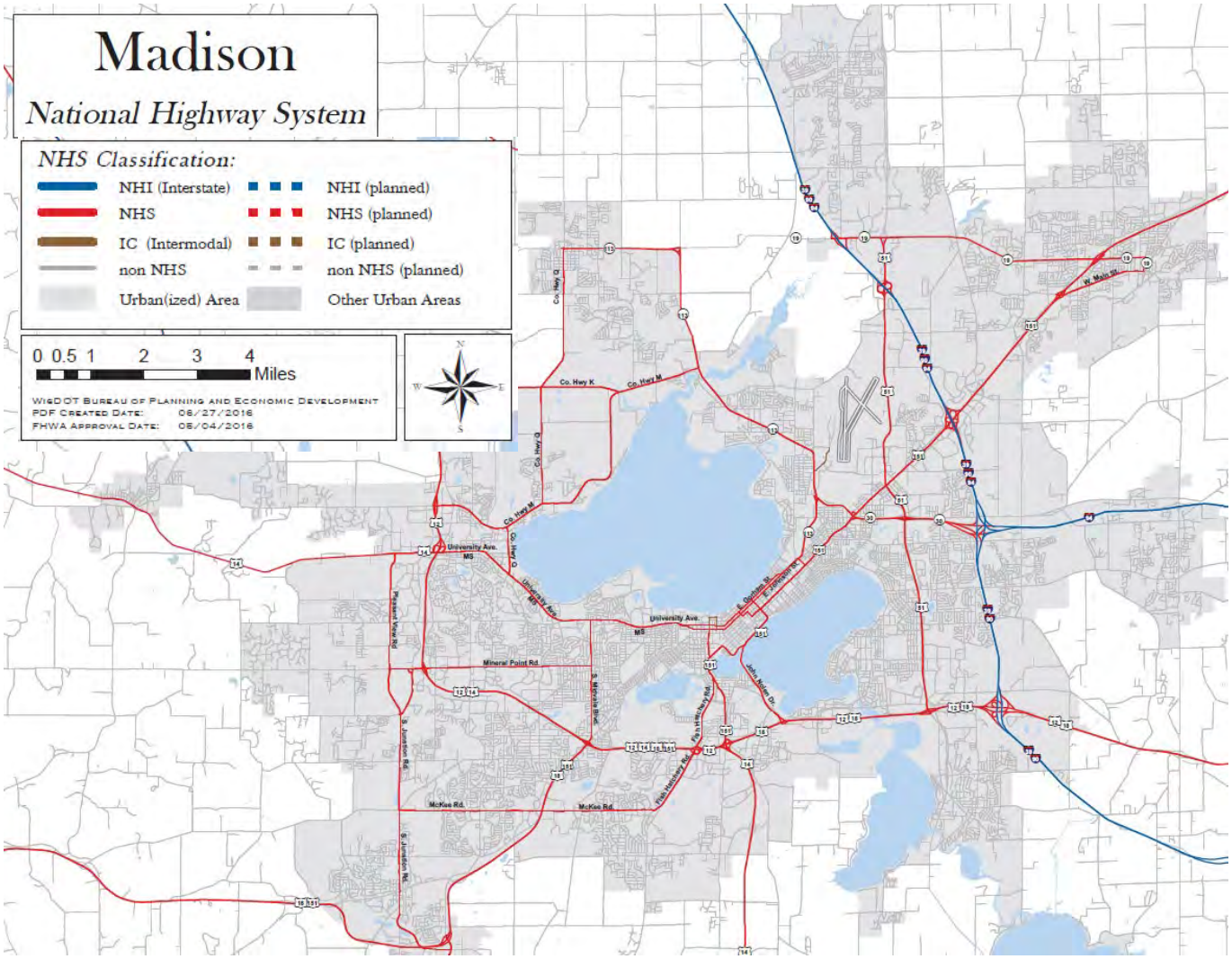
*Figure 2: Approved Madison Metropolitan Planning Area Boundary*




## 2.2. US 51 Desirable Level of Service

Figure 3 shows that US 51 between the US 12/18 (Beltline) and STH 19 is defined as part of the National Highway System (NHS). The limits of US 51 are also within the planning boundary and, therefore, considered urban. All segments of US 51 north of US 12/18 (Beltline) have a desirable LOS threshold of D. Segments of US 51 south of US 12/18 are not part of NHS and therefore have a desirable LOS of mid-E.

*Figure 3: National Highway System in the Madison area*




## 3. Traffic Count Analysis

Available year 2021 CCS data on and in proximity to the corridors were reviewed to determine the time periods when the highest traffic demands were predominantly occurring. Figure 4 below shows the locations along IH 39/90/94 and US 51 analyzed along with support locations. Table 3 shows the number of high volume hours occur in each day of the week in year 2021 for Interstate and US 51 CCS locations. Note that Friday and Sunday contain most of the high volume hours along the Interstate while the high volume hours occur primarily on weekdays along US 51. Table 2 shows the observed K30 and K100 hourly volumes in year 2021 along with the K250 in urbanized areas.

*Figure 4: Continuous Count Sites in the Study Limits*

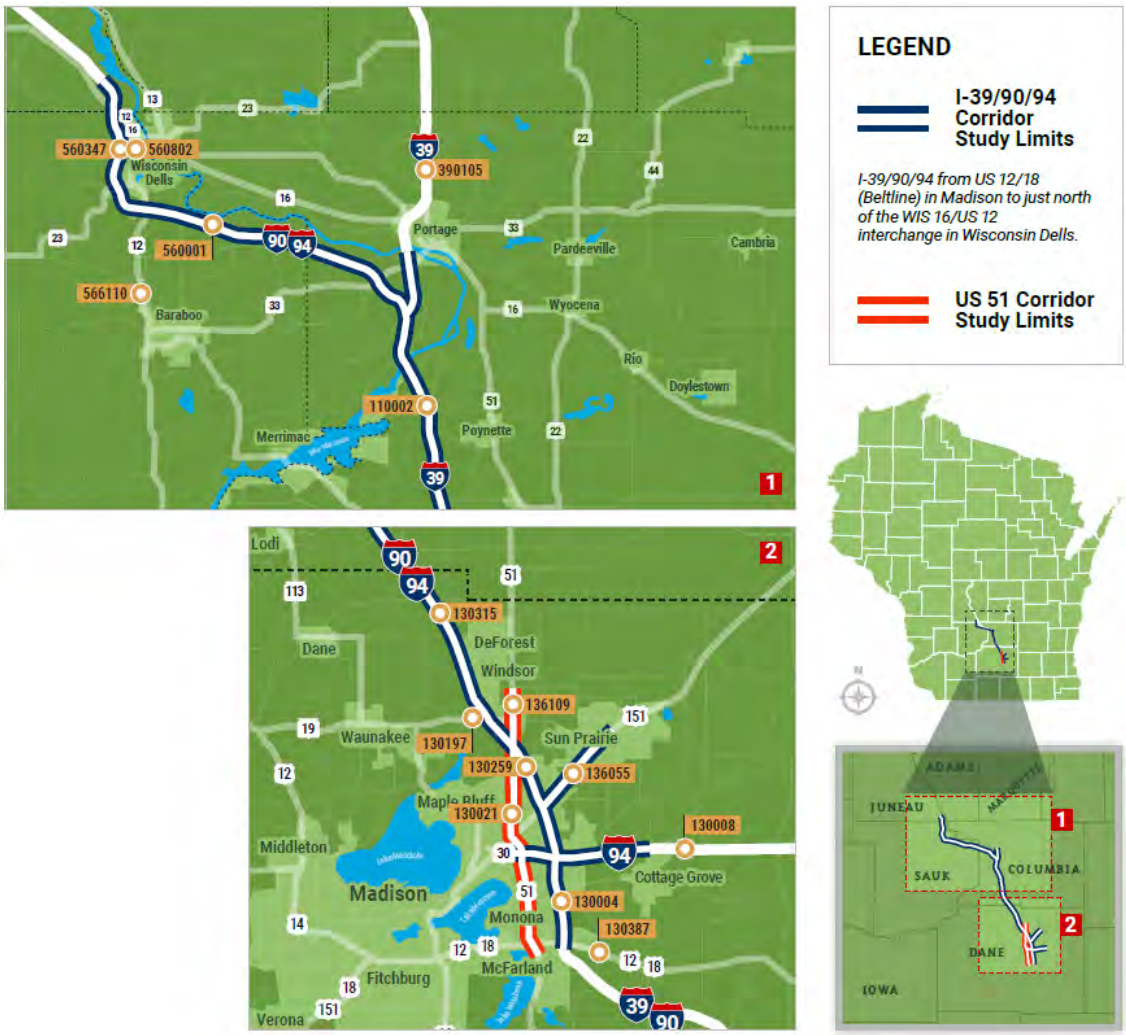


*Table 2: Summary of Observed Peak Traffic Demands – Year 2021*

| Station | Direction | Segment | K30 | K100 | K250 |
|---|---|---|---|---|---|
| 560347 | IH 90/94 WB (NB) | Between WIS 13 & WIS 23 | 2,802 | 2,514 | |
| | IH 90/94 EB (SB) | | 3,004 | 2,686 | |
| 560001 | IH 90/94 WB (NB) | Between WIS 12 & WIS 33 | 2,697 | 2,507 | |
| | IH 90/94 EB (SB) | | 2,847 | 2,592 | |
| 110002 | IH 39/90/94 NB (WB) | Between IH 39 Split & CTH CS | 4,071 | 3,720 | |
| | IH 39/90/94 SB (EB) | | 4,410 | 4,095 | |
| 130315 | IH 39/90/94 NB (WB) | Between WIS 60 & CTH V | 4,111 | 3,741 | |
| | IH 39/90/94 SB (EB) | | 4,330 | 4,000 | |
| 130259 | IH 39/90/94 NB (WB) | Between US 51 & US 151 | 4,385 | 4,100 | 3,677 |
| | IH 39/90/94 SB (EB) | | 4,518 | 4,215 | 3,558 |
| 130004 | IH 39/90 NB (WB) | Between IH 94/WIS 30 & US 12/18 | 4,588 | 4,327 | 4,019 |
| | IH 39/90 SB (EB) | | 4,518 | 4,236 | 3,972 |
| 130006 | IH 39/90 NB (WB) | South of US 12/18 | 2,736 | 2,605 | 2,465 |
| | IH 39/90 SB (EB) | | 3,347 | 3,064 | 2,809 |
| 136109 | US 51 NB | North of WIS 19 | 1,337 | 1,260 | 1,121 |
| | US 51 SB | | 1,191 | 1,082 | 1,003 |
| 130021 | US 51 NB | North of US 151 | 939 | 865 | 774 |
| | US 51 SB | | 747 | 700 | 643 |

Table 3 shows the days in which the highest 30 hours, 100 hours and 250 hours of traffic throughout the year. Note the high number of hours that occur during the Friday and Sunday timeframe.

*Table 3: Summary of Traffic Demands by Day of Week – Year 2021*

| **Top 30 Hrs.** | Roadway | Segment | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|---|---|---|
| 560347 | IH 90/94 EB | Between WIS 13 & WIS 23 | 6 | 7 | 7 | 2 | 2 | 3 | 3 |
| | IH 90/94 WB | | 0 | 17 | 6 | 5 | 2 | 0 | 0 |
| 560001 | IH 90/94 EB | Between WIS 12 & WIS 33 | 25 | 5 | 0 | 0 | 0 | 0 | 0 |
| | IH 90/94 WB | | 11 | 0 | 0 | 0 | 0 | 15 | 4 |
| 110002 | IH 90/94 NB | Between IH 39 Split & CTH CS | 0 | 0 | 0 | 0 | 0 | 25 | 5 |
| | IH 90/94 SB | | 22 | 8 | 0 | 0 | 0 | 0 | 0 |
| 130315 | IH 90/94 NB | Between WIS 60 & CTH V | 0 | 0 | 0 | 0 | 0 | 27 | 3 |
| | IH 90/94 SB | | 26 | 4 | 0 | 0 | 0 | 0 | 0 |
| 130259 | IH 90/94 NB | Between US 51 & US 151 | 0 | 0 | 0 | 0 | 0 | 29 | 1 |
| | IH 90/94 SB | | 24 | 6 | 0 | 0 | 0 | 0 | 0 |
| 130004 | IH 39/90 NB | Between IH 94/WIS 30 & US 12/18 | 0 | 0 | 0 | 0 | 5 | 25 | 0 |
| | IH 39/90 SB | | 19 | 1 | 0 | 0 | 1 | 9 | 0 |
| 130006 | IH 39/90 NB | South of US 12/18 | 11 | 0 | 0 | 0 | 0 | 10 | 9 |
| | IH 39/90 SB | | 18 | 11 | 0 | 1 | 0 | 0 | 0 |
| 136109 | US 51 NB | North of WIS 19 | 0 | 1 | 6 | 7 | 4 | 12 | 0 |
| | US 51 SB | | 2 | 2 | 11 | 11 | 4 | 0 | 0 |
| 130021 | US 51 NB | North of US 151 | 0 | 1 | 11 | 11 | 5 | 2 | 0 |
| | US 51 SB | | 0 | 1 | 14 | 8 | 3 | 4 | 0 |
| 136055 | US 151 NB | Between American Pkwy & Reiner Rd | 0 | 2 | 11 | 4 | 8 | 5 | 0 |
| | US 151 SB | | 0 | 5 | 11 | 11 | 2 | 1 | 0 |

Contains 1/3 to 2/3 of 2021's Highest Hourly Volumes

Contains More than 2/3 of 2021's Highest Hourly Volumes

| **Top 100 Hrs.** | Roadway | Segment | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|---|---|---|
| 560347 | IH 90/94 EB | Between WIS 13 & WIS 23 | 17 | 18 | 12 | 3 | 15 | 13 | 22 |
| | IH 90/94 WB | | 10 | 28 | 18 | 19 | 17 | 0 | 8 |
| 560001 | IH 90/94 EB | Between WIS 12 & WIS 33 | 89 | 9 | 0 | 2 | 0 | 0 | 0 |
| | IH 90/94 WB | | 33 | 2 | 0 | 0 | 0 | 47 | 18 |
| 110002 | IH 90/94 NB | Between IH 39 Split & CTH CS | 1 | 0 | 0 | 0 | 1 | 78 | 20 |
| | IH 90/94 SB | | 80 | 20 | 0 | 0 | 0 | 0 | 0 |
| 130315 | IH 90/94 NB | Between WIS 60 & CTH V | 1 | 0 | 0 | 0 | 2 | 78 | 19 |
| | IH 90/94 SB | | 87 | 13 | 0 | 0 | 0 | 0 | 0 |
| 130259 | IH 90/94 NB | Between US 51 & US 151 | 0 | 0 | 0 | 0 | 1 | 85 | 14 |
| | IH 90/94 SB | | 80 | 20 | 0 | 0 | 0 | 0 | 0 |
| 130004 | IH 39/90 NB | Between IH 94/WIS 30 & US 12/18 | 0 | 0 | 0 | 0 | 18 | 71 | 11 |
| | IH 39/90 SB | | 50 | 8 | 1 | 4 | 8 | 29 | 0 |
| 130006 | IH 39/90 NB | South of US 12/18 | 26 | 0 | 1 | 2 | 0 | 44 | 27 |
| | IH 39/90 SB | | 74 | 15 | 3 | 3 | 0 | 5 | 0 |
| 136109 | US 51 NB | North of WIS 19 | 0 | 10 | 28 | 21 | 22 | 19 | 0 |
| | US 51 SB | | 2 | 15 | 31 | 25 | 20 | 7 | 0 |
| 130021 | US 51 NB | North of US 151 | 0 | 14 | 26 | 26 | 21 | 13 | 0 |
| | US 51 SB | | 1 | 10 | 33 | 34 | 16 | 6 | 0 |
| 136055 | US 151 NB | Between American Pkwy & Reiner Rd | 0 | 7 | 23 | 24 | 26 | 20 | 0 |
| | US 151 SB | | 0 | 17 | 25 | 22 | 17 | 17 | 2 |

| Top 250 Hrs. | Roadway | Segment | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|---|---|---|
| 560347 | IH 90/94 EB | Between WIS 13 & WIS 23 | 38 | 39 | 32 | 14 | 43 | 26 | 58 |
| | IH 90/94 WB | | 36 | 51 | 34 | 40 | 41 | 21 | 27 |
| 560001 | IH 90/94 EB | Between WIS 12 & WIS 33 | 201 | 19 | 0 | 4 | 0 | 21 | 5 |
| | IH 90/94 WB | | 65 | 3 | 0 | 4 | 1 | 134 | 43 |
| 110002 | IH 90/94 NB | Between IH 39 Split & CTH CS | 33 | 2 | 0 | 2 | 5 | 161 | 47 |
| | IH 90/94 SB | | 203 | 30 | 1 | 2 | 0 | 8 | 6 |
| 130315 | IH 90/94 NB | Between WIS 60 & CTH V | 28 | 1 | 0 | 1 | 6 | 167 | 47 |
| | IH 90/94 SB | | 212 | 21 | 1 | 2 | 0 | 6 | 8 |
| 130259 | IH 90/94 NB | Between US 51 & US 151 | 25 | 0 | 0 | 3 | 8 | 173 | 41 |
| | IH 90/94 SB | | 189 | 29 | 2 | 3 | 1 | 19 | 7 |
| 130004 | IH 39/90 NB | Between IH 94/WIS 30 & US 12/18 | 20 | 5 | 5 | 12 | 41 | 124 | 43 |
| | IH 39/90 SB | | 86 | 25 | 15 | 14 | 24 | 65 | 21 |
| 130006 | IH 39/90 NB | South of US 12/18 | 50 | 3 | 2 | 4 | 6 | 136 | 49 |
| | IH 39/90 SB | | 135 | 36 | 9 | 15 | 15 | 37 | 3 |
| 136109 | US 51 NB | North of WIS 19 | 0 | 35 | 51 | 50 | 56 | 58 | 0 |
| | US 51 SB | | 2 | 44 | 74 | 60 | 50 | 20 | 0 |
| 130021 | US 51 NB | North of US 151 | 0 | 36 | 57 | 63 | 55 | 39 | 0 |
| | US 51 SB | | 1 | 35 | 69 | 69 | 59 | 17 | 0 |
| 136055 | US 151 NB | Between American Pkwy & Reiner Rd | 0 | 31 | 52 | 51 | 55 | 60 | 1 |
| | US 151 SB | | 3 | 34 | 38 | 37 | 41 | 83 | 14 |

Table 3 shows that the count locations along I-39/90/94 typically have the majority of the 30 highest hours and 100 highest hours occur during Friday in the I-39/90/94 NB (WB) direction, and during Sunday in the I-39/90/94 SB

(EB) direction. The exception is the northernmost location (ID 560347) near Wisconsin Dells, which does not have a strong discernable pattern of highest hours of travel.

The south design segment is using previously developed traffic data from 2019 for operations and forecasting purposes. Table 4 compares the K30 and K100 hourly volumes between year 2019 and year 2021 for the south design segment in Dane County to assess if the volume profiles have changed significantly. It also shows that K30 and K100 volumes along I-39/90/94 are fairly similar during year 2019 and year 2021 with 2021 volumes slightly higher than 2019 volumes on average. Typically, the year 2019 and year 2021 K30 and K100 volumes are within 7% of each other. The one exception is station 130006 [I-39/90 EB (SB)], which is between 11 to 15% higher in year 2021 than year 2019, during which time construction activities on I-39/90 between Madison and the Illinois state line impacted traffic patterns south of Madison.

*Table 4: Comparison of Year 2019 and Year 2021 K30 and K100 Hourly Volumes*

| Station | Direction | Segment | 2019 K30 | 2021 K30 | K30 %Diff | 2019 K100 | 2021 K100 | K100 %Diff |
|---|---|---|---|---|---|---|---|---|
| 110002 | I-39/90/94 NB (WB) | Between I-39 Split & CTH CS | 4,007 | 4,071 | 1.6% | 3,603 | 3,720 | 3.2% |
| | I-39/90/94 SB (EB) | | 4,282 | 4,410 | 3.0% | 3,842 | 4,095 | 6.6% |
| 130315 | I-39/90/94 NB (WB) | Between WIS 60 & CTH V | 4,138 | 4,111 | -0.7% | 3,750 | 3,741 | -0.2% |
| | I-39/90/94 SB (EB) | | 4,348 | 4,330 | 0.4% | 3,865 | 4,000 | 3.5% |
| 130259 | I-39/90/94 NB (WB) | Between US 51 & US 151 | 4,458 | 4,385 | -1.6% | 4,005 | 4,100 | 2.4% |
| | I-39/90/94 SB (EB) | | 4,478 | 4,518 | 0.9% | 4,021 | 4,215 | 4.8% |
| 130004 | I-39/90 NB (WB) | Between I-94/ WIS 30 & US 12/18 | 4,884 | 4,588 | -6.1% | 4,627 | 4,327 | -6.5% |
| | I-39/90 SB(EB) | | 4,762 | 4,518 | -5.1% | 4,552 | 4,236 | -6.9% |
| 130006 | I-39/90 NB (WB) | South of US 12/18 | 2,774 | 2,736 | -1.4% | 2,563 | 2,605 | 1.6% |
| | I-39/90 SB (EB) | | 2,896 | 3,347 | 15.6% | 2,742 | 3,064 | 11.7% |

Table 4 shows that K30 and K100 volumes along IH 39/90/94 are fairly similar during year 2019 and year 2021. Typically, the year 2019 and year 2021 K30 and K100 volumes are within 7% of each other. The one exception is IH 39/90 EB (SB), which is between 11 to 15% higher in year 2021 than year 2019. The US 51 count location K30 and K100 volumes are somewhat lower in year 2021 compared to year 2019. Year 2021 K30 and K100 hourly volumes are about 18 to 30% lower than the year 2019 K30 and K100 volumes.

## 4. Design Hour Volume Determination

WisDOT FDM 11-5-3.5.1 defines the determination of design hour volumes (DHV) for the LOS analysis. The process varies depending on the type of facility. The existing year DHV will be used as the base line for forecasting future year no build and alternative scenarios DHV's. Existing, future no build, and future build alternative DHV's will be analyzed with a combination of VISSIM and VISTRO/Synchro to estimate traffic operations such as delay, density and travel times during the design hours. Table 5 summarizes the designated DHV's identified per the FDM 11-5-3 guidance by facility type and location.

*Table 5: Summary of Design Hour Volume Designation*

| Corridor | Facility Type | Designated Design Hour Volume | Volume Set |
|---|---|---|---|
| Interstate North | Interstate Mainline and Ramps-Northbound | K30 | Summer Fridays |
| | Interstate Mainline and Ramps-Southbound | | Summer Sundays |
| | Ramp Terminals and Cross Streets | K250 | Weekend Peaks |
| Interstate South | Interstate (N of 151) Mainline and Ramps-Northbound | K30 | Summer Fridays |
| | Interstate (N of 151) Mainline and Ramps-Southbound | | Summer Sundays |
| | Urban (12/18 to 151) Interstate Mainline and Ramps | K100 | AM/PM Peaks |
| | US 151 Freeway Mainline and Ramps | K30 | AM/PM Peaks |
| | Ramp Terminals and Cross Streets | K250 | AM/PM Peaks |
| US 51 North | Arterials, Intersections and Ramp Terminals | K250 | AM/PM Peaks |
| US 51 South | Arterials, Intersections and Ramp Terminals | K250 | AM/PM Peaks |

## 4.1. I-39/90/94 Design Hour Volume Determination

FDM 11-5-3.1.1 provides guidance on the DHV for freeways, multilane highways and two-lane highways. This applies to both the north and south I-39/90/94 segments. The general guidance is to use the 30$^{th}$ highest hourly volume of year as the DHV. The FDM notes that the 100$^{th}$ highest volume may be used in urbanized areas or the 200$^{th}$ or 250$^{th}$ highest hour may be justified in areas where there is little difference between the 30$^{th}$ and 250$^{th}$ hour and the 250$^{th}$ hour volumes are consistent with AM or PM peak hours. Therefore, a project-specific evaluation of the appropriate design hour is conducted.

2018 is the most recent year that coverage counts were available that have been seasonally adjusted, Table 6 and Figure 1 show that the Interstate traffic volumes in Dane County are significantly higher in the two segments between US 151 and US 12/18 compared to the rest of the Interstate corridor. Selecting the 30$^{th}$ highest hour for all segments of the Interstate in Dane County would lead to the two high volume segments driving capacity needs throughout the corridor.

*Table 6: 2018 Average Annual Daily Traffic Volumes on Madison Area Interstate System*

| Station | Facility | Segment | 2018 AADT |
|---|---|---|---|
| 130315 | I-39/90/94 | Between WIS 60 and CTH V | 59,300 |
| 130989 | I-39/90/94 | Between CTH V and WIS 19 | 66,600 |
| 131566 | I-39/90/94 | Between WIS 19 and US 51 | 74,400 |
| 130259 | I-39/90/94 | Between US 51 & US 151 | 70,700 |
| 130611 | I-39/90/94 | Between US 151 & I-94/WIS 30 | 108,000 |
| 130004 | I-39/90 | Between I-94/WIS 30 & US 12/18 | 98,900 |
| 130006 | I-39/90 | South of US 12/18 | 54,500 |

Table 7 shows the 250th hour volumes for the segments of the Interstate in the urbanized Madison area are 12 to 21 percent lower than the 30th highest hour. By contrast, the 100th highest hours are all approximately six to seven percent lower than the 30th highest hour. Table 4 shows the 100th highest volumes in the high daily volume segment (130004) are 2-4% higher than the 30th highest volume in the adjacent segment (130259). Selecting the 100th highest volume as the DHV for the two high volume segments with the 30th highest volume for the remainder of the Dane County provides a volume set that is consistent with higher observed volumes between US 151 and US 12/18 but minimizes the potential for level of service to drive towards financially cost prohibitive solutions.

*Table 7: Hourly Volume Comparison for Madison Area Interstate Segments*

| Station | Direction | Segment | K30 | K100 | K250 |
|---|---|---|---|---|---|
| 130259 | IH 39/90/94 NB (WB) | Between US 51 & US 151 | 4,385 | 4,100 | 3,677 |
| | IH 39/90/94 SB (EB) | | 4,518 | 4,215 | 3,558 |
| 130004 | IH 39/90 NB (WB) | Between IH 94/WIS 30 & US 12/18 | 4,588 | 4,327 | 4,019 |
| | IH 39/90 SB (EB) | | 4,518 | 4,236 | 3,972 |

Note that FDM 11-5.3.1.1 does not pertain to the ramp terminal intersections or cross streets at interchanges. These locations are covered by FDM 11-5.3.1.2 which provides guidance on the determination of DHV's for urban streets, intersections and ramp terminals. At these locations, DHV's should be based on the AM or PM peak hour volumes for individual turning and through movements. This will result in a variation in traffic volumes between ramps (driven by the representative day to achieve K30/100 volumes on the Interstate mainline) and the turning movements at the ramp terminal (driving by the peak hour volumes).

## 4.2. US 51 Design Hour Volume Determination

The segment of US 51 crossing Milwaukee Street and Cottage Grove Road operates as a freeway with interchanges at the two cross streets and may be covered by FDM 11-5-3.1.1. The remainder of US 51 operates as an expressway with side-street stop control (Hoepker Road, Hanson Road and Reider Road intersections) or as an urban arterial and covered by FDM 11-5-3.1.2. Current CCS data does not exist for the freeway segments around Milwaukee Street and Cottage Grove Road which prohibits a thorough review of observed hourly volumes. Additionally, previous traffic operations indicate the freeway segments were not controlling the overall traffic operations of the corridor.

DHV's for US 51 are therefore based on the AM or PM peak hour volumes for individual turning and through movements.

## 5. Temporal Analysis Periods

Based on the CCS data analysis and the DHV determination, the Representative Day Cluster analysis was completed for the following corridors and time periods:

- I-39/90/94 North Segment (Clusters for Northbound and Southbound traffic)
    - 2021, Friday, 12-6 PM
    - 2021, Sunday 10 AM – 6PM
- I-39/90/94 South Segment (Clusters for Northbound and Southbound traffic)
    - 2019, Friday, 12-6 PM
    - 2019, Sunday, 10 AM – 6PM
    - 9/2018 - 2019, Weekday, 6- 9 AM
    - 9/2018 - 2019, Weekday, 3 – 7 PM
- US-51 North Segment (Clusters for Northbound and Southbound traffic)
    - 2021, Weekday, 6 - 9 AM
    - 2021, Weekday, 3 - 7 PM
- US-51 South Segments (Clusters for Northbound and Southbound traffic)
    - 2022, Weekday, 6 - 9 AM
    - 2022, Weekday, 3 - 7 PM

The selected representative day cluster will have the following characteristics:

- No operational impact from crashes
- No influence of poor weather conditions
- Highest traffic demand tier
- No travel speed anomalies

From the representative day clusters, a single day was chosen that best matches the targeted K volume for each project segment.

## 6. K-Means Clustering Methodology

As part of WisDOT's traffic microsimulation guidelines, a single day is selected as the basis for calibrating a model. This proposed cluster methodology seeks to find a group of days that fit the design hour and target operating conditions. A single day is then selected from this group to serve as the target for model calibration. The target operations conditions are days void of severe weather events, unusual traffic volume, and incidents that impact travel speeds beyond normal operating conditions.

Data clustering is a process of grouping a set of objects based on similar characteristics. Cluster methodologies are not specified in the Trip Generation Manual nor in the Traffic Engineering, Operations & Safety Manual, but WisDOT approved the clustering approach for this project. One common algorithm is the k-means, which is proposed for this project. The k-means algorithm requires the analyst to identify the number of *k* clusters for the data set. The algorithm uses an iterative refinement approach to minimize the squared Euclidean distance within

each cluster. The Euclidean distance is measured between a data point and its cluster's centroid using normalized input data sets, including precipitation, travel speeds, traffic volume, and crashes. For this project, the k-means function in R is applied for a *k* input from 2 to 20. The optimal *k* for each analysis set is determined by graphing the within-cluster sum of squares (WCSS) for each *k* input and identifying the elbow of the trend line (the point at which the rate of decrease for the WCSS levels off). The WCSS will continue to decrease with an increased *k input* beyond the elbow, however, the new clusters that are developed do not provide meaningful division of data. Using the optimal *k,* the representative day cluster is determined from a manual review of the input data to find the largest set of days with the highest volumes and void of influence from crashes and weather events.

## 6.1. Input Data

Four input data sets were considered: precipitation, travel speeds, traffic volume, and crashes. The datasets were developed for every applicable day for the identified scenarios. Each input data set is normalized on a scale of 0 to 1.

### 6.1.1. Precipitation

Precipitation data was obtained from the Iowa Environmental Mesonet website. The total precipitation data for station DLL, located near Wisconsin Dells and Baraboo was considered for the cluster analysis. The precipitation data is normalized between 0 (no precipitation) and 1 (max precipitation), with values in between calculated using linear interpolation.

### 6.1.2. Travel Speeds

A corridor average travel speed is calculated for each directional segment using INRIX data available through NPMRDS. The travel speed data in normalized between 0 (lowest travel speed) to 1 (maximum travel speed), with values in between calculated using linear interpolation.

### 6.1.3. Traffic Volume

The project team reviewed all available traffic counts in the corridor and included all stations that are reliably providing data through the analysis period. The traffic input value at each station is the sum of traffic for the specified time-period. Each CCS location is normalized between 0 (lowest volume) to 1 (maximum volume), with values in between calculated using linear interpolation.

### 6.1.4. Crashes

The total crashes for the direction of travel are considered for each cluster analysis. The north segment freeway example uses the total mainline crashes as its target input. The crash data is normalized between 0 (no crashes) to 1 (most crashes), with values in between calculated using linear interpolation.

## 6.2. Cluster Selection Process

The representative day cluster is identified using the optimal *k* through an inspection of the clustering results. The goal of the selection process is to identify the largest group of days that achieve four criteria:

1) No operational impact from crashes
2) No influence of poor weather conditions
3) Highest traffic demand tier
4) No travel speed anomalies

## 7. Representative Day Cluster Results

The cluster analysis was completed for the I-39/90 north segments, I-39/90 south segment, and US-51 North segments. The US-51 south segment will be completed later using 2022 data.

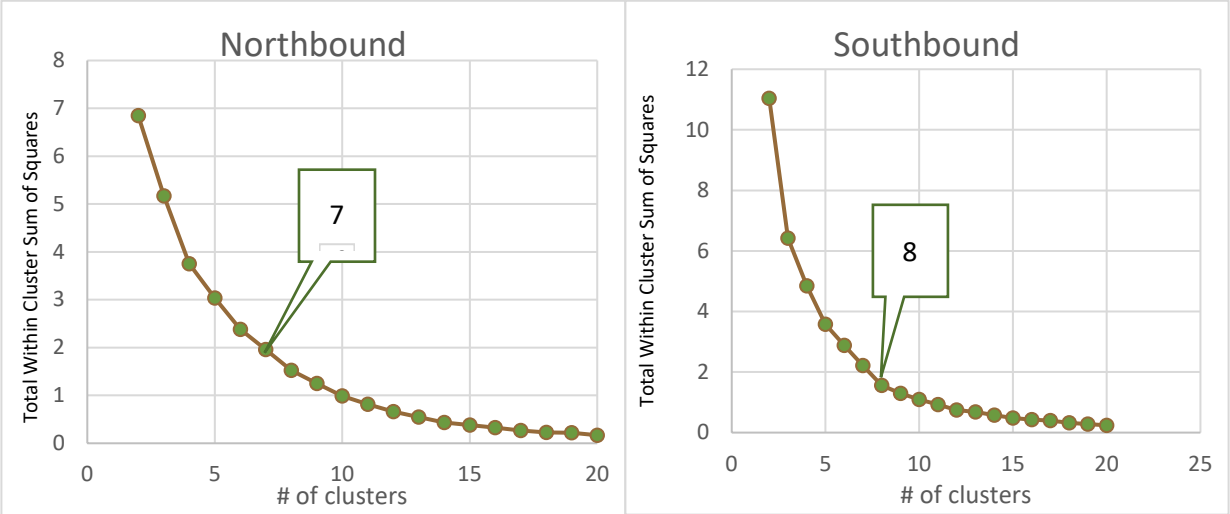
## 7.1. I-39/90 North Segment Results

Representative day clusters are developed for 2021 Friday and 2021 Sunday. The analysis results in a grouping of days that are representative of peak summer Friday and Sunday travel conditions that are void of major incident or weather events. From the representative day cluster, a single day is chosen that best represents a K30 travel condition. See for summary of highest hour volumes at each ATR station.

### 7.1.1. 2021 Friday (2-8 PM)

Data clusters were evaluated for NB and SB I-39/90. The within cluster sum of squares, used for choosing the optimal *k*, is shown in Figure 5. The selected *k* is identified in the figure.

*Figure 5: Within Cluster Sum of Squares – 2021 Friday*




The representative day cluster for northbound includes twelve days and southbound has eight days. There are seven overlapping representative days, these days are summarized in Table 8. A single representative day out of the cluster is chosen that best represents a K30 travel conditions for NB I-39/90. The K30 for the northbound ATR

counts is 4,007 (ATR 110002) and 2,697 (ATR 560001). The chosen day is 8/6/2021, which experiences free flow travel conditions for both directions, with no crashes, no precipitation, and a peak hour volume 91 vehicles greater than K30 at ATR 110002 and 45 vehicles greater than the K30 at ATR 560001.

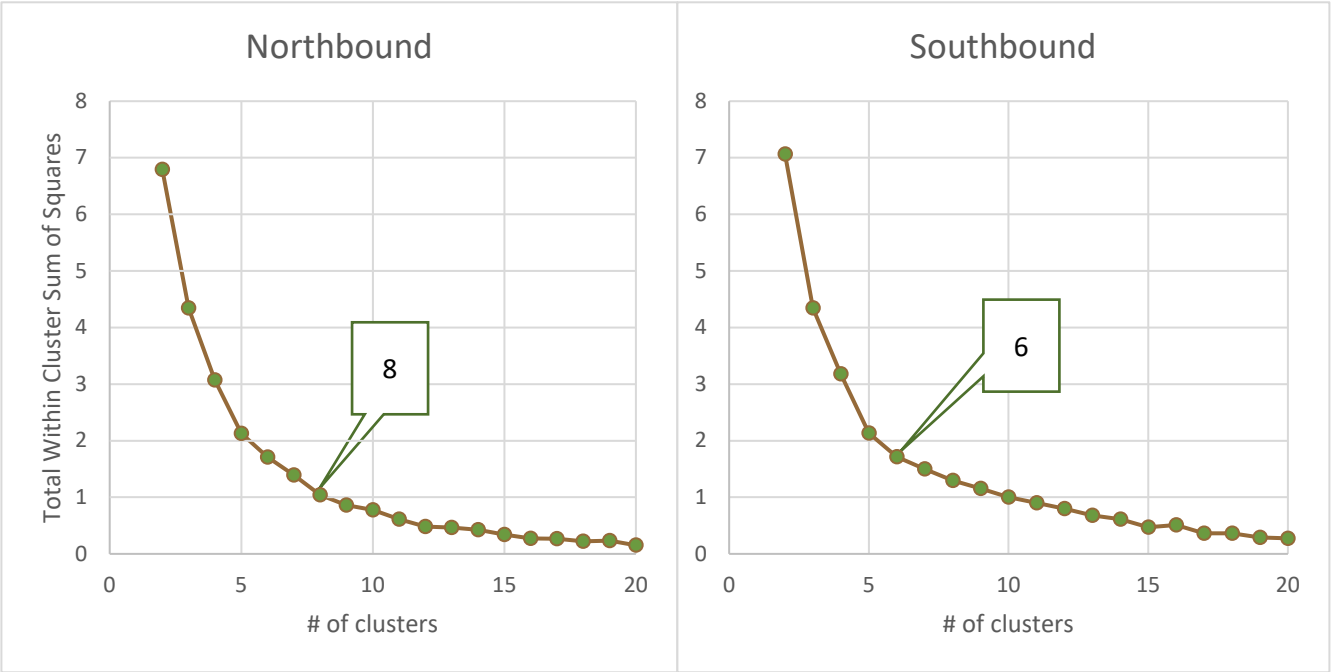
*Table 8: 2021 Friday – Representative Days*

| Date | Precip. | Average Speed | | ATR 110002 (peak hour volume) | | ATR 560001 (peak hour volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| 6/18/2021 | 0 | 67 | 71 | 3883 | 3027 | 2560 | 2163 | 0 | 0 |
| 7/9/2021 | 0 | 65 | 71 | 4030 | 3333 | 2548 | 2253 | 1 | 0 |
| 7/23/2021 | 0 | 69 | 71 | 4333 | 3343 | 2782 | 2322 | 0 | 0 |
| 7/30/2021 | 0 | 70 | 71 | 4337 | 3332 | 2818 | 2300 | 0 | 0 |
| 8/6/2021 | 0 | 71 | 71 | 4098 | 3380 | 2742 | 2454 | 0 | 0 |
| 8/13/2021 | 0 | 70 | 72 | 4147 | 3127 | 2651 | 2259 | 0 | 0 |
| 8/20/2021 | 0 | 71 | 70 | 3885 | 3086 | 2551 | 2292 | 0 | 0 |

### 7.1.2. 2021 Sunday (10 AM – 6 PM)

Data clusters were evaluated for NB and SB I-39/90 using 2021 Sunday data. The internal cluster sum of squares, used for identifying the optimal cluster, is shown in Figure 6. Northbound uses eight clusters and southbound uses six clusters.

*Figure 6: Within Cluster Sum of Squares – 2021 Sunday*




The representative day cluster for northbound includes five days and southbound has eight days. There are three overlapping representative days, these days are summarized in Table 9. A single representative day out of the cluster is chosen that best represents southbound K30 travel conditions. The southbound K30 for ATR 110002 is 4,410 and ATR 560001 is 2,847. The chosen representative day is 6/27/2021, which experiences reduced speeds for SB, free flow travel conditions for NB, there are two total crashes in the corridor (crashes on summer Sunday's is common in this corridor), no precipitation, and a peak hour volume 74 vehicles greater than K30 at ATR 110002 and 65 vehicles greater than the K30 at ATR 560001.

*Table 9: 2021 Sunday – Representative Days*

| Date | Precip. | Average Speed | | ATR 110002 (peak hour volume) | | ATR 560001 (peak hour volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| 6/27/2021 | 0 | 71 | 57 | 3498 | 4484 | 2749 | 2912 | 0 | 2 |
| 7/11/2021 | 0 | 72 | 56 | 3375 | 4489 | 2620 | 3012 | 0 | 2 |
| 7/25/2021 | 0 | 71 | 62 | 3614 | 4625 | 2734 | 3017 | 1 | 2 |

## 7.2. I-39/90 South Segment Results

The I-39/90 south segment corridor will use 2019 as the base year condition for the VISSIM microsimulation modeling. These models were already calibrated using representative days selected before this cluster analysis. Therefore, the cluster analysis for the I-39/90 south segment is used only to validate the representative days' selection. The Friday PM and Sunday PM volumes along the I-39/90/94 segment align with the K30 volumes for 2019 and 2021.

The selected representative days from the previous study are shown in Table 10. The cluster analysis detailed in this section indicates that the selected days for Weekday AM, Friday peak, and Sunday Peak are within the representative day clusters.

The Weekday PM (11/15/2018) is not included in the desirable representative day cluster due to lower traffic volumes on the Interstate. Previous analysis to establish the representative day for the I-39/90/94 south segment included US 151 volumes. The selected day (11/15/2018) included PM peak hours equivalent to K30 volumes for the US 151 corridor. Friday and Sunday volumes on the Interstate are higher than weekday AM and PM volumes, so selecting the highest PM peak hour volume was unnecessary. Selecting a K30 equivalent volume on US 151 provides an appropriate volume for analyzing US 151 and the interchange between US 151 and the Interstate.

*Table 10: I-39/90 South Segment Representative Days*

| Time Period | Date | Analysis Hour | Contained in Representative Cluster |
|---|---|---|---|
| Weekday AM Peak Hour | 9/17/2018 | 7:00 – 8:00 AM | Yes |
| Weekday PM Peak Hour | 11/15/2018 | 4:00 – 5:00 PM | No* |
| Friday Peak Hour | 7/19/2019 | 4:00 – 5:00 PM | Yes |
| Sunday Peak Hour | 8/18/2019 | 1:00 – 2:00 PM | Yes |

* - Weekday PM Peak Hour was selected to provide K30 equivalent volumes for US 151 corridor as Interstate volumes are highest on Friday and Sunday.

### 7.2.1. 2019 Friday (2-8 PM)

The representative day cluster for northbound includes 17 days and southbound has 24 days. There are 12 overlapping representative days, summarized in Table 11. The previously selected representative day (7/19/2019) is in the representative day cluster with a *k* set to four for NB and five for SB. For the NB cluster, six is the ideal *k*, but this value omits the selected representative day because on 7/19/2019 there was one crash recorded. However, the volume and speed metrics align with the other representative days, indicating this day is acceptable for representing design hour volumes. The K30 for ATR 130006 is 2,716, and ATR 130315 is 4,131. Traffic on 7/19/2019 experienced nearly free flow travel conditions for both directions, with no precipitation and one crash.

The peak hour volume is 17 vehicles fewer than the K30 at ATR 130006 and 97 vehicles greater than the K30 at ATR 130315.

*Figure 7: Within Cluster Sum of Squares – 2019 Friday*

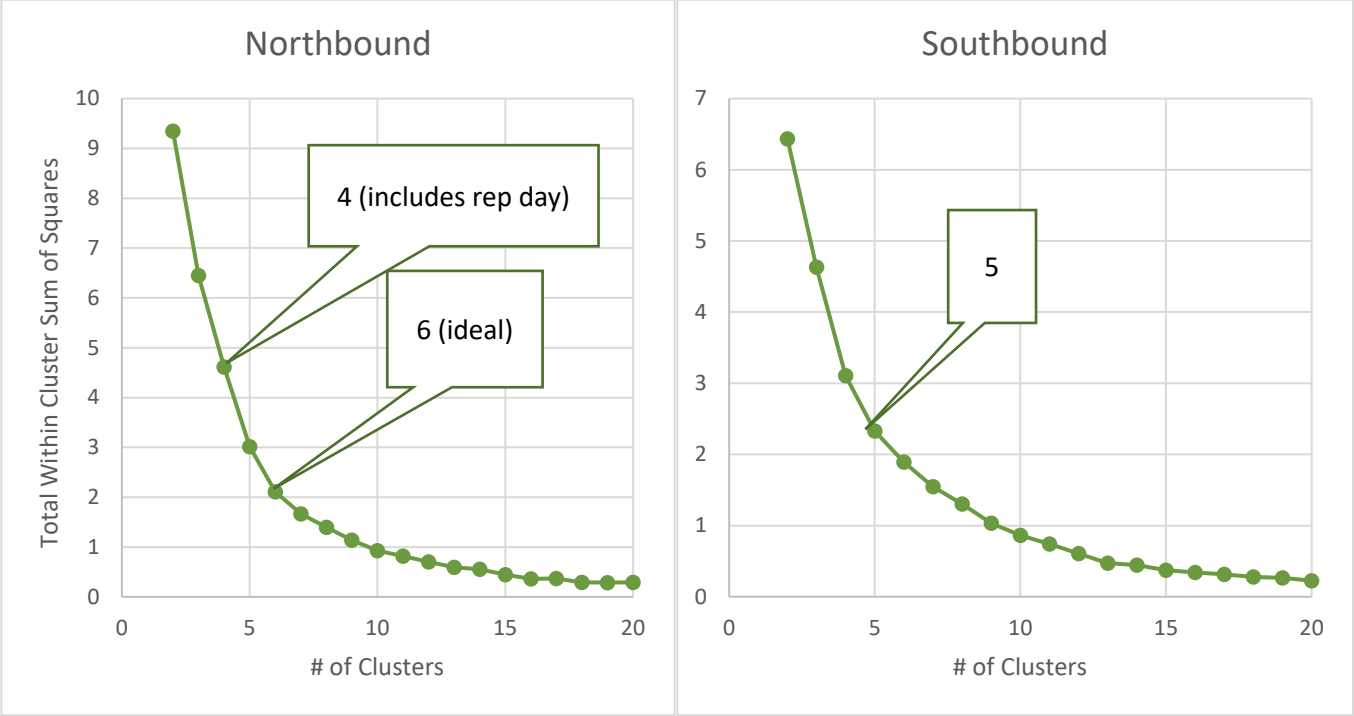


*Table 11: 2019 Friday – Representative Days*

| Date | Precip. | Average Speed | | ATR 130006 (peak hour volume) | | ATR 130315 (peak hour volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| 6/7/2019 | 0 | 70 | 66 | 2651 | 2270 | 3804 | 2416 | 0 | 0 |
| 6/21/2019 | 0 | 70 | 66 | 2790 | 2183 | 4290 | 2394 | 0 | 0 |
| 6/28/2019 | 0 | 70 | 67 | 2831 | 2235 | 4158 | 2439 | 0 | 0 |
| 7/12/2019 | 0 | 69 | 66 | 2829 | 2348 | 4177 | 2573 | 0 | 0 |
| 7/19/2019 | 0 | 69 | 66 | 2816 | 2204 | 4287 | 2503 | 1 | 0 |
| 7/26/2019 | 0 | 70 | 66 | 2888 | 2387 | 4441 | 2614 | 0 | 0 |
| 8/9/2019 | 0 | 68 | 67 | 2892 | 2331 | 4602 | 2673 | 0 | 0 |
| 8/16/2019 | 0 | 69 | 67 | 2699 | 2291 | 4228 | 2479 | 0 | 0 |
| 8/23/2019 | 0 | 67 | 67 | 2567 | 2361 | 3996 | 2433 | 0 | 0 |
| 8/30/2019 | 0 | 66 | 67 | 2916 | 2007 | 4811 | 2178 | 1 | 0 |
| 9/27/2019 | 0 | 69 | 66 | 2568 | 2146 | 4084 | 2197 | 0 | 0 |
| 10/4/2019 | 0 | 58 | 68 | 2494 | 1978 | 4115 | 2233 | 0 | 0 |

### 7.2.2. 2019 Sunday (10 AM – 6 PM)

The representative day cluster for northbound includes 12 days, and southbound has 13 days. There are nine overlapping representative days, summarized in Table 5. The previous study selected 8/18/2019 as the representative day, which reflects a design hour volume. The travel conditions for this day include no precipitation, no crashes, free-flow travel conditions, and the volume is only 172 vehicles lower than K30 at ATR 130006 and 30 fewer vehicles at ATR 130315. The within-cluster sum of squares for the tested *k* values is summarized in Figure 8.

*Figure 8: Within Cluster Sum of Squares – 2019 Sunday*

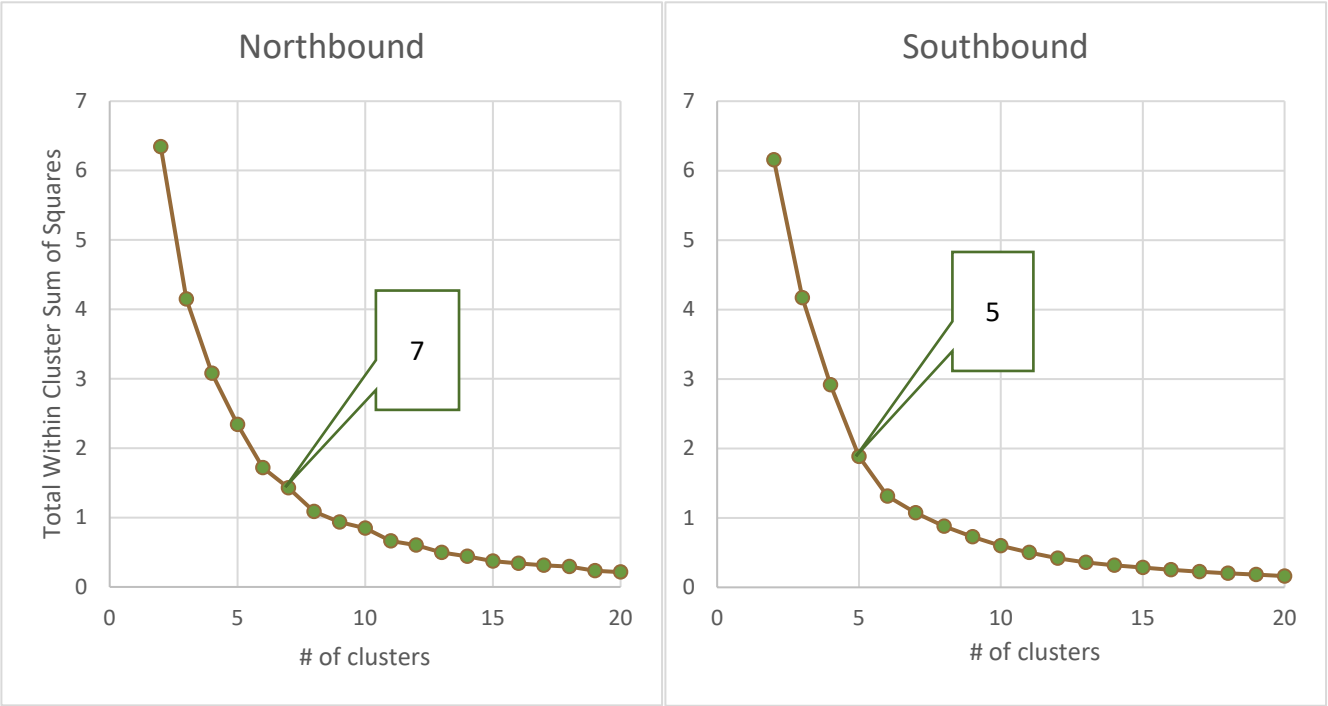


*Table 12: 2019 Sunday – Representative Days*

| Date | Precip. | Average Speed | | ATR 130006 (peak hour volume) | | ATR 130315 (peak hour volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| 6/9/2019 | 0 | 69 | 66 | 2305 | 2506 | 2926 | 3599 | 0 | 0 |
| 6/16/2019 | 0 | 69 | 68 | 2490 | 2501 | 3153 | 3846 | 0 | 0 |
| 7/14/2019 | 0 | 70 | 67 | 2616 | 2562 | 3363 | 3803 | 0 | 1 |
| 7/21/2019 | 0 | 69 | 67 | 2576 | 2558 | 3596 | 4028 | 0 | 1 |
| 7/28/2019 | 0 | 70 | 66 | 2678 | 2656 | 3636 | 4278 | 0 | 0 |
| 8/4/2019 | 0 | 70 | 67 | 2650 | 2583 | 3498 | 4085 | 0 | 0 |
| 8/11/2019 | 0 | 70 | 66 | 2784 | 2568 | 3454 | 4173 | 0 | 0 |
| 8/18/2019 | 0 | 69 | 66 | 2343 | 2596 | 3152 | 4107 | 0 | 0 |
| 8/25/2019 | 0 | 70 | 67 | 2371 | 2460 | 3124 | 3924 | 0 | 0 |

### 7.2.3. 2018/2019 AM Weekday (6-9 AM)

A cluster analysis was completed for September 2018 through 2019 for AM Weekday. The 2018 days were added to 2019 to include the representative days chosen from the previous analysis. The representative day cluster for northbound includes 104 days, and southbound has 141 days. There are 89 overlapping representative days (Table 14), these days are summarized by min, max, and average values in Table 13. The previously selected representative day of 9/17/2018 is contained within the cluster and has no precipitation, no crashes, and near-free-flow travel conditions. The traffic volume on I-39/90/94 is well below the K30, as the peak conditions occur on Friday and Sunday. However, the selected day represents a typical weekday AM travel condition. The K30 for ATR 130315 is 2,752, and ATR 130006 is 2,300.

*Figure 9: Within Cluster Sum of Squares – 2019 Weekday AM Peak Period*

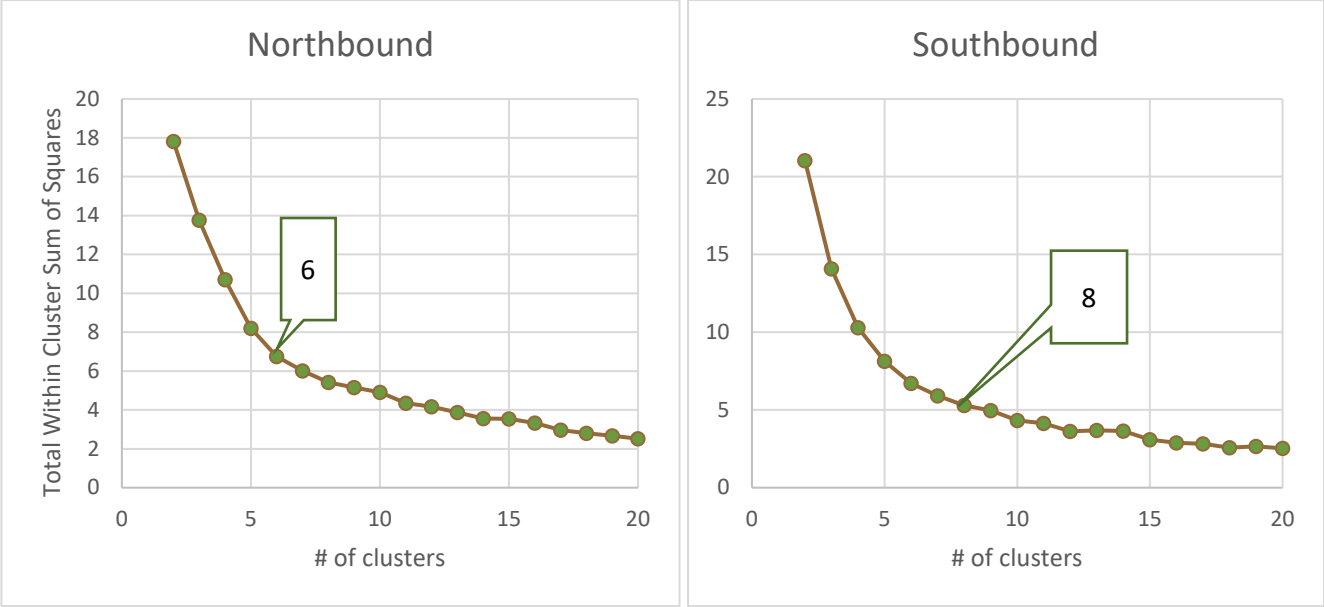



*Table 13: 2019 Weekday AM Peak Period Summarized – Representative Days*

| Data (85 days) | Precip. | Average Speed | | ATR 130006 (peak hour volume) | | ATR 130315 (peak hour volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| Max | 0.07 | 71 | 69 | 2359 | 1522 | 1938 | 1987 | 0 | 0 |
| Min | 0 | 66 | 65 | 2006 | 1206 | 1320 | 1658 | 0 | 0 |
| Average | 0 | 69 | 67 | 2222 | 1312 | 1543 | 1848 | 0 | 0 |
| 9/17/2018 | 0 | 68 | 67 | 2091 | 1259 | 1520 | 1987 | 0 | 0 |

*Table 14: Representative Days – 2018/2019 AM Weekday – I-39/90 South Segment*

| Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|
| 9/17/2018 | 4/16/2019 | 9/12/2018 | 9/20/2018 |
| 4/15/2019 | 5/28/2019 | 9/19/2018 | 10/4/2018 |
| 4/22/2019 | 6/4/2019 | 9/26/2018 | 10/25/2018 |
| 5/13/2019 | 6/11/2019 | 10/3/2018 | 11/15/2018 |
| 5/20/2019 | 6/18/2019 | 11/14/2018 | 4/4/2019 |
| 6/3/2019 | 6/25/2019 | 4/24/2019 | 4/18/2019 |
| 6/17/2019 | 7/2/2019 | 5/22/2019 | 4/25/2019 |
| 6/24/2019 | 7/9/2019 | 5/29/2019 | 5/9/2019 |
| 7/8/2019 | 7/16/2019 | 6/5/2019 | 5/23/2019 |
| 7/15/2019 | 7/23/2019 | 6/12/2019 | 5/30/2019 |
| 7/22/2019 | 7/30/2019 | 6/19/2019 | 6/6/2019 |
| 7/29/2019 | 8/6/2019 | 6/26/2019 | 6/27/2019 |
| 8/5/2019 | 8/13/2019 | 7/10/2019 | 7/11/2019 |
| 8/12/2019 | 8/27/2019 | 7/17/2019 | 7/25/2019 |
| 9/16/2019 | 9/10/2019 | 7/24/2019 | 8/1/2019 |
| 9/23/2019 | 9/17/2019 | 8/7/2019 | 8/8/2019 |
| 9/30/2019 | 10/8/2019 | 8/14/2019 | 8/15/2019 |
| 10/14/2019 | | 8/21/2019 | 8/22/2019 |
| 11/4/2019 | | 8/28/2019 | 8/29/2019 |
| 11/25/2019 | | 9/4/2019 | 9/5/2019 |
| 12/2/2019 | | 9/11/2019 | 9/12/2019 |
| | | 9/25/2019 | 9/19/2019 |
| | | 10/9/2019 | 9/26/2019 |
| | | 10/16/2019 | 10/3/2019 |
| | | 11/20/2019 | 10/10/2019 |
| | | | 11/7/2019 |

### 7.2.4. 2018/2019 PM Weekday (3-7 PM)

The PM weekday cluster analysis was completed for I-39/90 south segment. The representative day cluster for northbound includes 45 days, and southbound has 70 days. There are 30 overlapping representative days (Table 15), these days are summarized by min, max, and average values in Table 16. The previous study selected 11/15/18 as the representative day; this day is not included in the representative day cluster identified by this analysis. On 11/15/18, there was no precipitation, no crashes, and speed was near free flow conditions. While the traffic volume on I-39/90 is much lower than the K30, the PM volume on US 151 on 11/15/18 was equivalent to

the K30 for US 151, which makes this day suitable for representing PM weekday conditions. The K30 for ATR 130315 is 3,981, and ATR 130006 is 2,822.

*Figure 10: Within Cluster Sum of Squares – 2019 Weekday PM Peak Period*

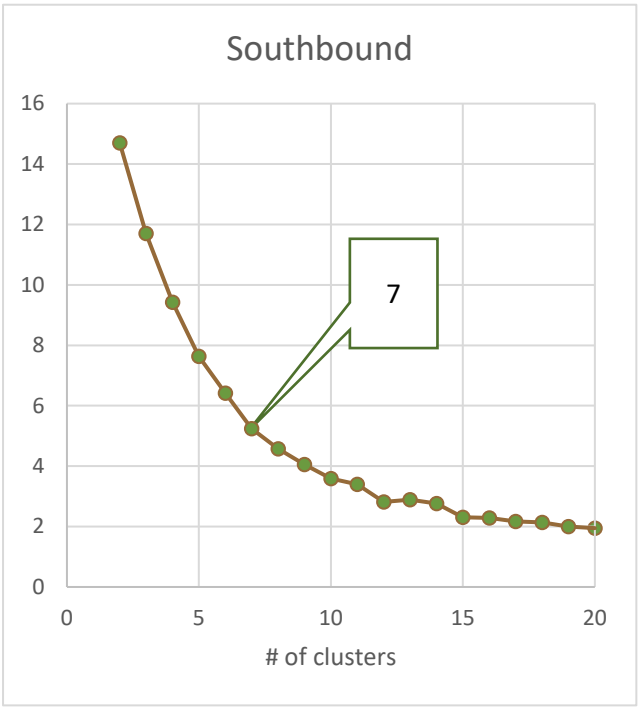


*Table 15: Representative Days – 2018/2019 AM Weekday – I-39/90 South Segment*

| Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|
| 7/1/2019 | 7/2/2019 | 12/26/2018 | 10/4/2018 |
| 7/29/2019 | 7/9/2019 | 6/26/2019 | 10/25/2018 |
| 8/5/2019 | | 7/10/2019 | 3/28/2019 |
| 11/25/2019 | | 7/17/2019 | 4/18/2019 |
| | | 7/24/2019 | 5/2/2019 |
| | | 8/7/2019 | 5/9/2019 |
| | | 8/28/2019 | 5/16/2019 |
| | | 11/27/2019 | 5/23/2019 |
| | | | 6/6/2019 |
| | | | 6/13/2019 |
| | | | 6/20/2019 |
| | | | 8/22/2019 |
| | | | 9/26/2019 |
| | | | 10/10/2019 |
| | | | 10/24/2019 |
| | | | 12/26/2019 |

*Table 16: 2019 Weekday PM Peak Period Summarized – Representative Days*

| Data (30 days) | Precip. | Average Speed | | ATR 130006 (peak hour volume) | | ATR 130315 (peak hour volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| Max | 0.04 | 71 | 67 | 2342 | 3081 | 3326 | 2812 | 0 | 0 |
| Min | 0 | 68 | 65 | 1498 | 2420 | 2534 | 1877 | 0 | 0 |
| Average | 0 | 69 | 67 | 1931 | 2631 | 2846 | 2272 | 0 | 0 |
| 11/15/18 | 0 | 68 | 66 | 1409 | 2022 | 2014 | 1925 | 0 | 0 |

## 7.3. US 51 Corridor

Cluster analysis was not conducted. The average peak hour data was used for the study. Traffic counts were collected in year 2022. Year 2022 counts along US 51 were generally lower than year 2018 because US 51 is more of a commuter route for workers and students at Madison Area Technical College (MATC). A separate memo was developed ("US 51 Forecast Methodology Memo"), which documented the decision to use year 2022 volumes as the base for future forecasts. Furthermore, the higher Year 2018 counts were used as the basis for forecasts at some US 51 corridor locations for a sensitivity analysis to confirm that the future design could also accommodate the year 2018-based future forecasts.

# 8. Traffic Count Balancing

Representative day hourly volume traffic count balancing will use CCS count data, non-CCS mainline and ramp coverage counts, and Streetlight data. The CCS count data from the representative day will be used to establish control points along the corridor within the traffic balancing process. Streetlight data collected from the representative day and from the various coverage count dates will be used by the CDMCT to factor available ramp and non-CCS mainline coverage counts to the representative day as described below.

## 8.1. Streetlight Factoring

Coverage counts collected along the corridor typically did not occur on the selected representative day. Therefore, a process was developed using Streetlight data to factor the coverage counts to mimic the representative day. The Streetlight data for this project is being provided at locations related to the external zones in the VISSIM network for origin-destination data purposes, instead of the actual non-CCS mainline and ramp segment locations. Therefore, an origin-destination matrix estimation (ODME) process was used to establish non-CCS mainline and ramp segment volumes. These non-CCS segment volumes from Streetlight are used to develop factors between the representative day and coverage count date. The factor is then applied to the actual coverage count to develop a representative day target volume.

## 8.2. Balancing

The CCS control volumes and the non-CCS developed target volumes are balanced along the corridor to develop the representative day traffic volumes. This process results in volumes throughout the corridor that equate to conditions on the representative day and not necessarily the K30 volume everywhere. Year 2022 intersection turning volume counts, where available, are compared to the balanced volumes to refine the traffic balancing process.

## 8.3. OD

Streetlight origin-destination data from the representative day will be used as a seed matrix for an origin-destination matrix estimation process to establish peak hour vehicle trip tables for each required model set. CDMCT will provide each design team with the peak hour volumes on mainline and ramp segments along with an OD trip table for ramp-to-ramp movements that matches the peak hour volume sets.

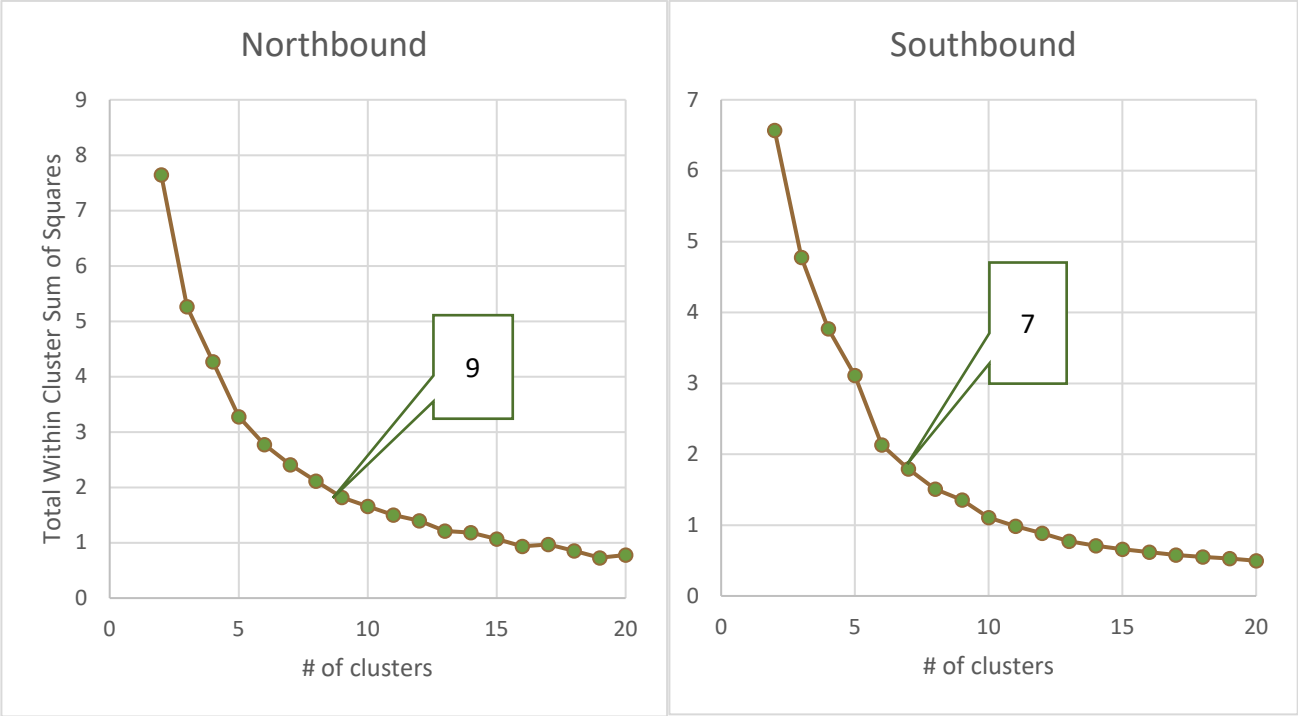
## 9. APPENDIX A

Cluster Analysis Results for US 51 North Segment

### 9.1.1. 2021 AM Weekday

The optimal *k* value was determined through an evaluation of the within cluster sum of squares for various *k* scenarios. Northbound analysis selected a *k* of 9 and southbound a *k* of 7.

*Figure 11: Within Cluster Sum of Squares – 2021 Weekday AM Peak Period*




The representative day cluster for northbound includes 46 days and southbound has 49 days. There are 27 overlapping representative days (Table 17), these days are summarized by min, max, and average values in . A single representative day out of the cluster is chosen that best represents SB K30 travel conditions. The K30 for ATR 130021 is 686 and ATR 136109 is 1188. The selected representative day is 9/8/21. This day has no precipitation and no crashes. The southbound volume matches closely with the K30 at ATR 130021 and ATR 136109.

*Table 17: US-51 North Segment – AM Peak – Representative Days*

| Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|
| 9/20/2021 | 9/7/2021 | 9/8/2021 | 9/9/2021 |
| 10/11/2021 | 9/14/2021 | 9/15/2021 | 9/23/2021 |
| 10/18/2021 | 9/28/2021 | 9/22/2021 | 9/30/2021 |
| | 10/5/2021 | 9/29/2021 | 10/14/2021 |
| | 10/12/2021 | 10/20/2021 | |
| | 10/19/2021 | 10/27/2021 | |
| | 10/26/2021 | 11/10/2021 | |
| | 11/9/2021 | 11/17/2021 | |
| | 11/16/2021 | 12/1/2021 | |
| | 11/30/2021 | | |

*Table 18: 2021 Weekday AM Peak Period Summarized – Representative Days*

| Data (27 days) | Precip. | Average Speed | | ATR 130021 (peak volume) | | ATR 136109 (peak volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| Max | 0.03 | 38 | 39 | 608 | 755 | 678 | 1288 | 0 | 0 |
| Min | 0 | 34 | 35 | 470 | 636 | 613 | 1128 | 0 | 0 |
| Average | 0 | 35 | 37 | 523 | 690 | 639 | 1211 | 0 | 0 |
| Rep. Day (9/8/21) | 0 | 38 | 38 | 514 | 691 | 658 | 1182 | 0 | 0 |

Table 17 and Table 18 represent the K30 volumes in year 2021, however the traffic volumes in the first part of year 2021 were still suppressed by the COVID-19 pandemic. Table 13 shows that all the days in the K30 representative days cluster are from the fourth quarter of 2021. Therefore, a comparison was conducted of the year 2021 and year 2019 traffic volumes at the two ATR locations along US 51. Table 19 shows that the K250 volumes of year 2019 are actually pretty similar to the K30 volumes of year 2021. The US 51 weekday volumes should be represented by K250 volumes instead of K30, therefore the K30 year 2021 volumes can be used to represent K250 volumes in normal, non-pandemic years.

*Table 19: 2021 Weekday AM Peak Period Comparison – Year 2019 K250 vs Year 2021 K30*

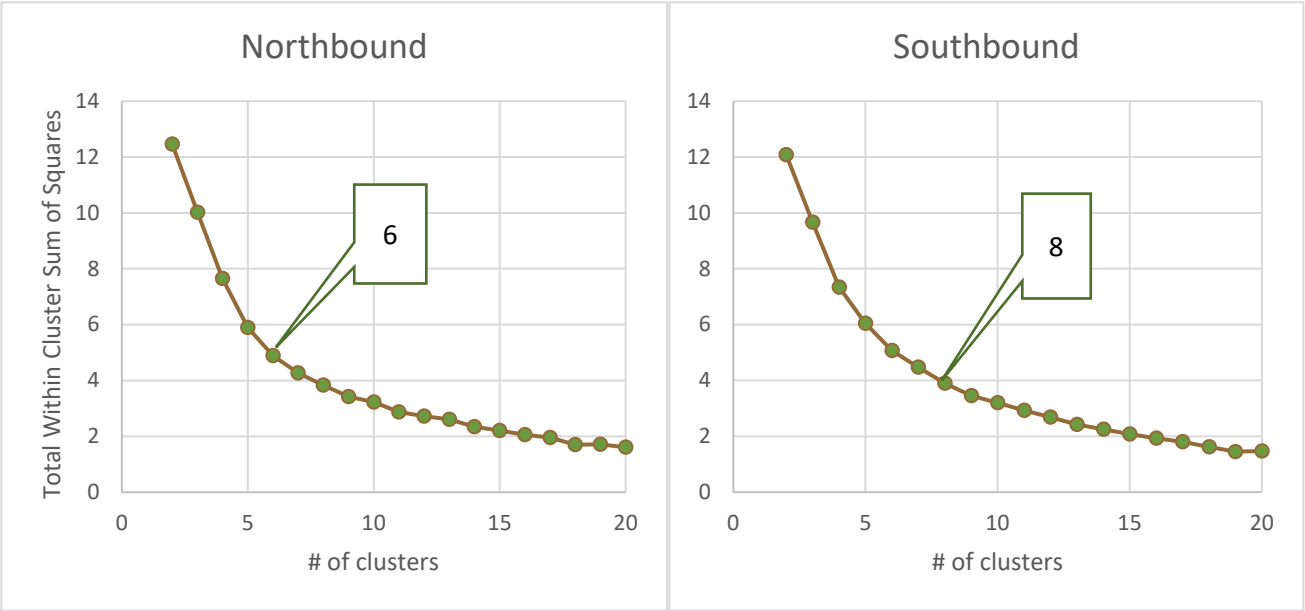
| Data | ATR 130021 (peak volume) | | ATR 136109 (peak volume) | |
|---|---|---|---|---|
| | NB | SB | NB | SB |
| Rep. Day (9/8/21) | 514 | 691 | 658 | 1182 |
| K250 Year 2019 | 480 | 767 | 358 | 1340 |
| Coverage Count North of ATR 130021 (130212 on 7/12/22) | 440 | 737 (approx. K316 of 2019) | -- | -- |
| From Coverage Count South of ATR 130021 (131909 on 7/12/22) | 547 | 645 (approx. K632 of 2019) | -- | -- |
| From Coverage Count South of ATR 136109 (130201 & ramps on 5-7/22) | -- | -- | 576 | 1135 (approx. K444 in 2019) |

Table 19 also shows the traffic volumes from the coverage counts located to the adjacent north and south of the ATR counts. The volumes from the coverage count feeding into the ATR is compared to the ATR K250 year 2019 volume. In most cases they are comparable. The coverage counts can be factored to better align with the K250 volume.

### 9.1.2. 2021 PM Weekday

The optimal *k* value was determined through an evaluation of the within cluster sum of squares for various *k* scenarios. Northbound analysis selected a *k* of 6 and southbound a *k* of 8 as shown in Figure 12.

*Figure 12: Within Cluster Sum of Squares – 2021 Weekday PM Peak Period*




The representative day cluster for northbound includes 65 days and southbound has 73 days. There are 38 overlapping representative days (Table 20). These days are summarized by min, max, and average values in . A single representative day out of the cluster is chosen that best represents NB K30 travel conditions. The K30 for ATR 130021 is 939 and ATR 136109 is 1337. The selected representative day is 10/19/2021, which has no precipitation, no crashes, and peak hour volumes for SB US 51 similar to the K30 volumes.

*Table 20: US-51 North Segment – PM Peak – K30 Representative Days*

| Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|
| 5/17/2021 | 5/11/2021 | 5/5/2021 | 4/22/2021 |
| 8/30/2021 | 8/3/2021 | 8/18/2021 | 5/13/2021 |
| | 9/21/2021 | 9/1/2021 | 6/17/2021 |
| | 9/28/2021 | 9/8/2021 | 7/29/2021 |
| | 10/5/2021 | 9/22/2021 | 8/5/2021 |
| | 10/12/2021 | 10/6/2021 | 8/19/2021 |
| | 10/19/2021 | 10/20/2021 | 8/26/2021 |
| | 10/26/2021 | 10/27/2021 | 9/2/2021 |
| | 11/9/2021 | 11/3/2021 | 9/9/2021 |
| | 11/16/2021 | 11/10/2021 | 9/30/2021 |
| | 11/30/2021 | 12/1/2021 | 10/14/2021 |
| | 12/14/2021 | 12/8/2021 | 10/21/2021 |

*Table 21: 2021 Weekday PM Peak Period Summarized – Representative Days*

| Data (38 days) | Precip. | Average Speed | | ATR 130021 (peak volume) | | ATR 136109 (peak volume) | | Total Crashes | |
|---|---|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB | NB | SB |
| K30 Max | 0 | 34 | 34 | 1073 | 793 | 1529 | 791 | 0 | 0 |
| K30 Min | 0 | 31 | 30 | 838 | 658 | 1195 | 663 | 0 | 0 |
| K30 Average | 0 | 32 | 31 | 924 | 716 | 1297 | 719 | 0 | 0 |
| K30 Rep. Day (10/19/21) | 0 | 33 | 31 | 914 | 671 | 1326 | 753 | 0 | 0 |

Table 20 and Table 21 represent the K30 volumes in year 2021, however the traffic volumes in the first part of year 2021 were still suppressed by the COVID-19 pandemic.  shows that most of the days in the K30 representative days cluster are from the fourth quarter of 2021. Therefore, a comparison was conducted of the year 2021 and year 2019 traffic volumes at the two ATR locations along US 51. Table 22 shows that the K250 volumes of year 2019 are actually pretty similar to the K30 volumes of year 2021. The US 51 weekday volumes should be represented by K250 volumes instead of K30, therefore the K30 year 2021 volumes can be used to represent K250 volumes in normal, non-pandemic years.

*Table 22: 2021 Weekday PM Peak Period Comparison – Year 2019 K250 vs Year 2021 K30*

| Data | ATR 130021 (peak volume) | | ATR 136109 (peak volume) | |
|---|---|---|---|---|
| | NB | SB | NB | SB |
| K30 Rep. Day (10/19/21) | 914 | 671 | 1326 | 753 |
| K250 Year 2019 | 940 | 617 | 1357 | 604 |
| Coverage Count North of ATR 130021 (130212 on 7/12/22) | 845 (approx. K439 of 2019) | 570 | -- | -- |
| Coverage Count South of ATR 130021 (131909 on 7/12/22) | 768 (approx. K547 of 2019) | 683 | -- | -- |
| From Coverage Count South of ATR 136109 (130201 & ramps on 5-7/22) | | -- | 1324 (approx. K292 of 2019) | 727 |

Table 22 also shows the traffic volumes from the coverage counts located to the adjacent north and south of the ATR counts. The volumes from the coverage count feeding into the ATR is compared to the ATR K250 year 2019 volume. In most cases they are comparable. The coverage counts can be factored to better align with the K250 volume.

MEMORANDUM

# Traffic Forecasting Methodology

| | |
|---|---|
| **Date:** | May 1, 2023 |
| **Topic:** | Traffic Forecasting Methodology |
| **From:** | CDMCT |

## 1. Overview

Traffic forecasts are being developed for the I-39/90/94 and US 51 (Stoughton Road) corridors to help establish the Purpose and Need for the corridors including quantifying impacts to safety, mobility, environmental impacts, access to services and user transportation costs. The traffic forecasts will also be used for determining the preferred alternative and during any subsequent facility design. Forecasts developed by the CDMCT will be submitted to WisDOT Southwest Region Traffic and the Traffic Forecasting Section for review and approval prior to use by the segment design teams. The limits of the projects are shown in Figure 1.

## 2. Forecasting Inputs

Traffic forecasts are developed using historic, existing and projected future year datasets including traffic counts, housing, employment and transportation system attributes such as number of lanes and facility speeds.

The Wisconsin Department of Transportation (WisDOT) traffic forecasting methodology relies on the most recent traffic count and average annual daily traffic volume growth rates estimated through the use of travel demand models. This methodology is described in the Transportation Planning Manual (TPM), available at: https://wisconsindot.gov/Documents/projects/data-plan/plan-res/tpm/9.pdf

Streetlight origin-destination (OD) data will be used to calculate the existing differences in travel patterns between weekday PM period movements and both Friday afternoon and Sunday afternoon movements. These differences are applied to the scenario-specific trip tables to estimate Friday and Sunday trip tables by scenario with peak period growth rates and subarea trip tables extracted for traffic forecast development. See section 3.6 for more details.

### 2.1. Existing Traffic Counts

The existing year for the design segments varies based on the year traffic counts were conducted as shown below:

- Interstate north – Existing year=2021
- Interstate south – Existing year =2019
- Stoughton Road north – Existing year =2022
- Stoughton Road south – Existing year =2022

*Figure 1: I-39/90/94 and US 51 Study Limits*

**A** North Interstate
VISSIM + ***VISTRO***
I-39/90/94 NORTH

- US 12 North & NB/SB I-90/94 ramps
- WIS 13 & County H
- WIS 23 & I-90/94 EB/WB ramps
- WIS 23 & Commerce Ave
- ***WIS 23 & US 12***
- US 12 South & I-90/94 EB/WB ramps
- US 12 & Gasser Rd
- ***County BD & US 12 NB/SB ramps***
- WIS 33 & I-90/94 NB/SB ramps
- WIS 33 & NB/SB I-39 ramps
- WIS 33 & County U
- Cascade Mtn Rd & NB/SB I-39 ramps
- Cascade Mtd Rd & County U
- WIS 78 & Petro gas station access
- WIS 78 & Arco Dr
- County CS & I-39/90/94 NB/SB ramps
- County CS & Love's gas station access
- County CS & County J/Smokey Hollow Rd
- WIS 60 & I-39/90/94 NB/SB ramps
- WIS 60 & Sunset Dr

**B** South Interstate
VISSIM + ***SYNCHRO***
I-39/90/94 SOUTH

- ***County V & SB/NB I-39/90/94 ramps***
- ***County V & Hickory Ln***
- ***County V & Morrisonville Rd***
- WIS 19 & SB I-94 ramps
- ***WIS 19 & NB I-94 ramps***
- ***WIS 19 & County CV***
- ***WIS 19 & Tierney Crossing/Liuna Way***
- ***WIS 19 & Pepsi Way***
- ***WIS 19 & N Towne Rd***
- ***US 51 & NB/SB I-39/90/94***
- US 51 & Williamsburg Way
- WIS 19 & NB/SB US 51
- NB/SB I-39/90 & High Crossing Blvd
- US 151 & E Springs Dr
- US 151 & RIRO
- American Parkway & Eastpark Blvd
- High Crossing Blvd & Nelson Rd
- ***Grand Ave & NB/SB 151***
- ***Main St NB/SB 151***
- ***EB/WB WIS 30 & N Thompson Dr***
- ***EB/WB I-94 & County N***
- ***County N & County TT***
- ***County N & Gaston Rd***

**C** US 51 North
VISSIM + ***SYNCHRO***
US 51 NORTH-CENTRAL

- ***US 51 & Daentl Rd***
- ***US 51 & County CV***
- ***US 51 & Hoepker Rd***
- ***US 51 & Hanson Rd***
- ***US 51 & Rieder Rd***
- ***US 51 & Pierstorff Rd***
- US 51 & Kinsman Blvd
- US 51 & Anderson St
- US 51 & E Washington Rd (US 151)
- E Washington Rd (US 151) & Mendota St
- E Washington Rd (US 151) & Wright St
- US 51 & Commercial Ave
- Commercial Ave & Frontage Rd
- US 51 & EB/WB WIS 30

**D** US 51 South
VISSIM + ***SYNCHRO***
US 51 SOUTH

- ***US 51 & Corporate Dr***
- ***SB US 51 & Milwaukee St***
- ***Milwaukee St & Regas Rd***
- ***Milwaukee St & Dempsey Rd***
- ***Milwaukee St & Stoughton Frontage Rd***
- ***Milwaukee St & Walbridge Ave***
- ***NB/SB US 51 & Cottage Grove Rd***
- ***Cottage Grove Rd & Dempsey Rd***
- ***Cottage Grove Rd & Atlas Ave***
- US 51 & Buckeye Rd
- Buckeye Rd & E Frontage Rd
- Buckeye Rd & W Frontage Rd
- US 51 & Pflaum Rd
- Pflaum Rd & E Frontage Rd
- Pflaum Rd & W Frontage Rd
- US 51 & Broadway
- Broadway & Copps Ave
- Broadway & Femrite Dr
- US 51 & EB/WB Beltline
- US 51 & Voges Rd
- Terminal Dr & Terminal Dr
- Voges Rd & Triangle St

Average Annual Daily Traffic (AADT) as published by WisDOT will form the target daily traffic volumes for the corridor. These daily traffic volumes are checked, then balanced through the interchange ramps for limited access facilities within the I-39/90/94 segments and through the major intersections for the US 51 segments. Design hour volumes (DHV) will also be developed for each corridor. Design segment teams will develop balanced volume sets for interchange ramp terminals and cross streets along the Interstate segments and for major nearby intersections along the US 51 segments.

Existing DHV traffic counts are established for each mainline and ramp segment using the Representative Typical Day methodology available in the "Design Considerations and Cluster Analysis for Determining Representative Days" memo.

### 2.1.1. Boat and Trailer Impacts on Truck Percentages

The impacts of personal vehicles pulling boats and trailers on truck percentages was investigated. The Interstate system provides a critical transportation link for freight movements across the system. The I-39/90/94 corridor through Wisconsin is also critical for recreational vehicles traveling to and from Northern Wisconsin, especially during the summer. A comparison of video and axle classification data has shown that existing vehicle classification counters that rely on axle patterns may classify personal vehicles with trailers as commercial trucks. Specifically, vehicle class 8, defined as four or fewer axle single-trailer trucks, may include both commercial trucks with trailer or personal vehicles with trailers. This analysis process was detailed in a memorandum called "Boat/Trailer Impacts on Truck Percentages" (August 19, 2022) and is provided in Appendix A.

In summary of this memorandum, the comparison between truck percentage data collected by video and by the axle classification system shows that the difference between the two truck percentage collection systems was minimal during non-tourist days. However, on more heavily traveled tourist days during the summer weekends, particularly in the northbound direction on Fridays and the southbound direction on Sundays, the difference is approximately 5%. Most of this difference was due to data differences in the vehicle class 8.

### 2.1.2. COVID-19 Pandemic Impacts on Corridor Traffic

The COVID-19 pandemic impacted traffic volumes throughout the US including the I-39/90/94 and US 51 corridors. A memorandum called "Impacts of COVID pandemic on Corridor Traffic Patterns and Volumes" (August 9, 2022) was produced to detail this COVID-19 impact to the project area corridors.

The memo can be found located in Appendix B.

The memo shows that the year 2021 I-39/90/94 corridor volumes within the project study area have returned to the pre-COVID-19 year 2019 levels. However, the year 2021 US 51 corridor volumes are still 10-15% below pre-pandemic year 2019 volumes. The memo shows Replica data revealing levels of Dane County residents working from home is still higher than pre-pandemic levels. The resulting lower number of commuter vehicles has impacted the US 51 corridor volumes, which more directly serves commuter trips than the varied uses of Interstate trips.

## 2.2. Design Hour Volume Identification

WisDOT FDM 11-5-3.5.1 defines the determination of design hour volumes (DHV) for the LOS analysis. The process varies depending on the type of facility. The existing year DHV will be used as the base line for forecasting future year no build and alternative scenarios DHV's. Existing, future no build and future build alternative DHV's will be analyzed with a combination of VISSIM and VISTRO/Synchro to estimate traffic operations such as delay, density and travel times during the design hours.

## 2.3. I-39/90/94 and US 51 Design Hour Volume Determination

Desired level of service and development of the design hour volumes (DHV) through the representative day process are described in the "Design Considerations and Cluster Analysis for Determining Representative Days" memo.

The document also reviews 2019 and 2021 counts along the Interstate and US 51 corridors.

### 2.3.1. I-39/90/94 Design Hour Volumes

Per FDM 11-5-2.1.1, K30 volumes are used for DHV's on I-39/90/94 from the northern limits of the project to US 51 in Dane County. K100 volumes are used on I-39/90/94 between US 51 in Dane County to the southern limits.

Note that FDM 11-5.3.1.1 does not pertain to the ramp terminal intersections or cross streets at interchanges. These locations are covered by FDM 11-5.3.1.2 which provides guidance on the determination of DHV's for urban streets, intersections and ramp terminals. At these locations, DHV's should be based on the AM or PM peak hour volumes for individual turning and through movements. This will result in a variation in traffic volumes between ramps (driven by the representative day to achieve K30/100 volumes on the Interstate mainline) and the turning movements at the ramp terminal (driving by the peak hour volumes).

### 2.3.2. US 51 Design Hour Volumes

The segment of US 51 crossing Milwaukee Street and Cottage Grove Road operates as a freeway with interchanges at the two cross streets and may be covered by FDM 11-5-3.1.1. The remainder of US 51 operates as an expressway with side-street stop control (Hoepker Road, Hanson Road and Reider Road intersections) or as an urban arterial and covered by FDM 11-5-3.1.2. Current CCS data does not exist for the freeway segments around Milwaukee Street and Cottage Grove Road which prohibits a thorough review of observed hourly volumes. Additionally, previous traffic operations indicate the freeway segments were not controlling the overall traffic operations of the corridor.

DHV's for US 51 are therefore based on the AM or PM peak hour volumes for individual turning and through movements.

## 2.4. Travel Demand Models

Two travel demand model sets, the Dane County travel demand model (DCTDM) and the Statewide travel demand model (SWTDM) are available for use in traffic forecasting for the I-39/90/94 and US 51 corridors.

### 2.4.1. Statewide Travel Demand Model

SWTDM covers all of the state of Wisconsin along with decreasing detail in neighboring states and a skeleton network for national freight travel. The SWTDM uses networks, zones and socio-economic data from available regional travel demand models including the DCTDM. SWTDM analyzes travel at the average annual daily traffic level and does not include peak period components or outputs. While the DCTDM and SWTDM both cover Dane

County and utilize the same model inputs, the results of the two models will not exactly match but are typically similar in nature. WisDOT's current approach is that the SWTDM may be used for traffic forecasting in areas that are not covered by regional travel demand models (the DCTDM in this case). Given the regional nature of the project and the noted change in housing in the Baraboo area, the project team determined that using SWTDM was appropriate for this project to analyze and forecast traffic demands in Columbia, Sauk and Juneau counties.

The CDMCT used SWTDM version STDM 2.1.0.0 for the I-39/90/94 project. Version 2.1.0.0 includes model years 2017 and 2050 and was provided by the Department on April 14, 2022.

Due to the geographic extent of the proposed I-39/90/94 project, the SWTDM and DCTDM have an iterative relationship. Lane additions on I-39/90/94 in one county may impact traffic demand in other counties. The SWTDM input network geodatabases were updated for Future build scenarios to include additional capacity, then resulting assignments and subarea extractions from SWTDM were used to update the DCTDM external trip input files. This iterative approach provides consistency between the DCTDM and the SWTDM.

Future year 2050 land use and transportation system attributes are used by the SWTDM to estimate future traffic demands. 2050 housing, employment and transportation system data were provided by WisDOT as part of the SWTDM model set. Recently identified land developments were reviewed by CDMCT, region staff and stakeholders for inclusion into the 2050 input data. The City of Baraboo noted an increase in their projected housing growth and the City of Wisconsin Dells noted a change in the planned location of the new high school facility, both updates were incorporated into the SWTDM's 2050 socio-economic files. Documentation related to conversations with all stakeholders is available in Appendix C. The process used to update the SWTDM to incorporate updated housing and enrollment data, network edits to improve local calibration and the updating of all Dane County projection data is detailed in Appendix D. Mapping of final housing and employment totals by TAZ are available in Appendix E. Committed roadway improvements were also reviewed by CDMCT, region staff and stakeholders for inclusion into the 2050 input data. Mapping of the final committed transportation projects is also available in Appendix F.

### 2.4.2. Dane County Travel Demand Model

DCTDM covers all of Dane County and thereby encompasses three of the four subject corridors. DCTDM includes a 2016 base analysis year and a 2050 future analysis year. DCTDM models four distinct time periods of the day, AM, midday, PM and night. The traffic assignments from the four time periods are aggregated to a daily value that represents an Average Weekday Daily Traffic (AWDT), with the 2016 daily model assignments validated to 2016 observed traffic counts. The peak period component of DCTDM is desirable for the complex congested urban corridors of this project and was further validated as part of this project to provide a more reliable platform for forecasting peak period traffic patterns. Appendix G provides documentation on the peak period validation efforts and results for the DCTDM.

Future year 2050 land use and transportation system attributes are used by the DCTDM to estimate future traffic demands. 2050 housing, employment and transportation system data were provided by the Greater Madison Metropolitan Planning Organization (GMMPO). Recently identified land developments were reviewed by CDMCT, region staff, GMMPO staff and stakeholders for inclusion into the 2050 input data. Mapping of final housing and employment totals by TAZ are available in Appendix E. Committed transportation improvements including both

roadway and transit projects were also reviewed by CDMCT, region staff, GMMPO staff and stakeholders for inclusion into the 2050 input data. Mapping of the final committed transportation projects is in Appendix F.

Vehicle travel that crosses the Dane County line, defined as external trips of the DCTDM, are calculated with the aid of the SWTDM. Two types of external travel are modeled by DCTDM and updated as described below:

- External to external (EE) trips are those trips that start and end outside of Dane County. These trips are observable from the Streetlight OD data, entered into the DCTDM as trip tables, and can be forecasted using the SWTDM. Future year DCTDM EE inputs are estimated by comparing scenario-specific subarea extractions from the SWTDM and applying those differences to the calibrated base year trip tables.
- External to internal and corresponding internal to external (EI-IE) trips have one trip end inside of Dane County and one trip end outside Dane County. These trips are observable from the Streetlight OD data, entered into the DCTDM as trip ends for inclusion in the destination choice, and can be forecasted using the SWTDM.

Peak period traffic assignments and ramp-to-ramp subarea trip table extractions from the DCTDM will be used for traffic forecasting purposes.

### 2.5. TAFIS

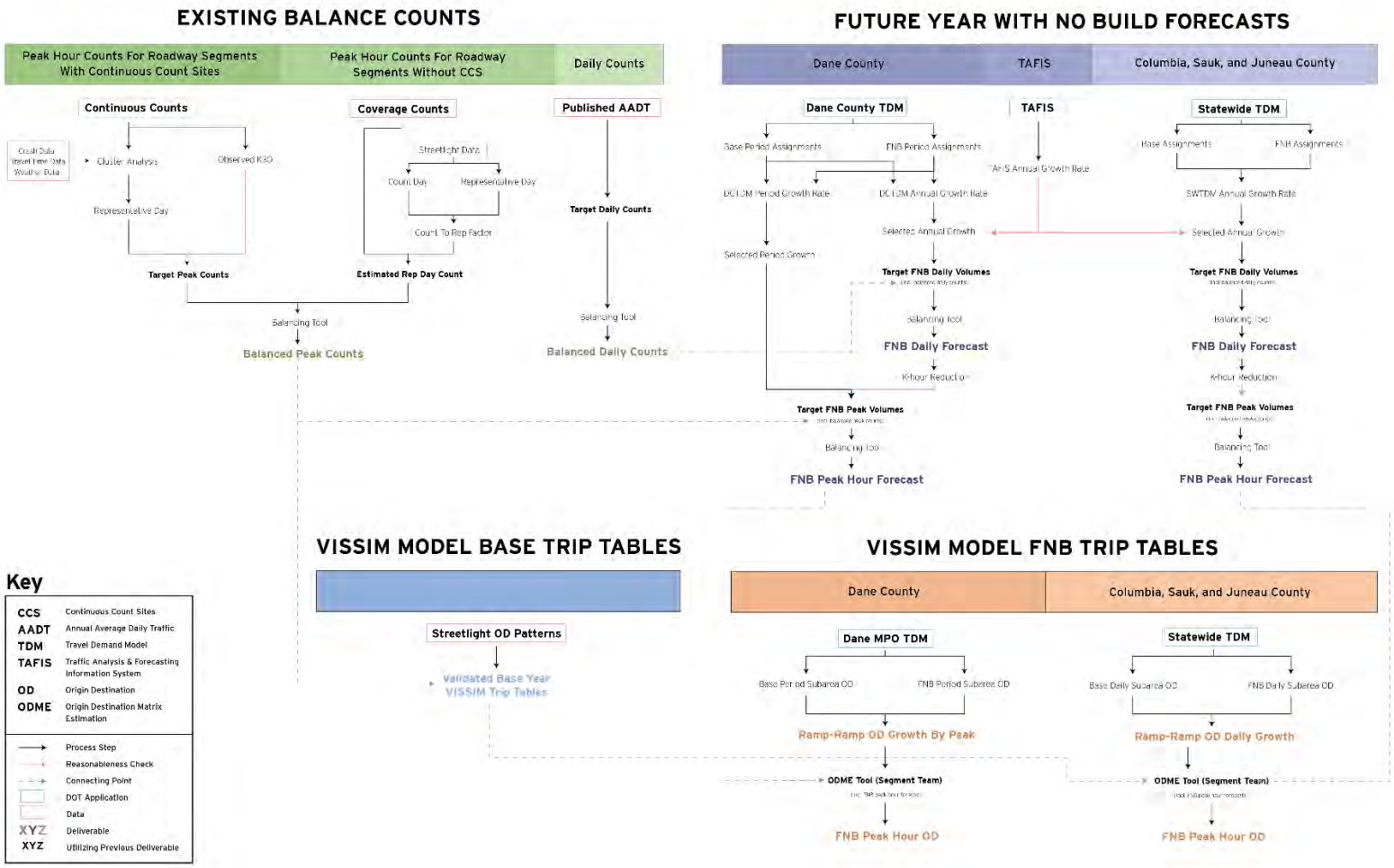
Traffic Analysis and Forecasting Information System (TAFIS) data provides a historical look at traffic demands at count sites across Wisconsin. TAFIS traffic growth rates are estimated with statistical methods applied to available historic counts. The resulting growth rate is applied to the most recent traffic count at the location to forecast future traffic demands. This process does not use projected changes in land use or transportation system attributes. TAFIS provides a benchmark for checking the reasonableness of traffic forecasts developed through demand models.

CDMCT will review TAFIS projections for all design segments. In locations where the TAFIS and travel demand model generated growth rates are not similar, CDMCT will coordinate with WisDOT traffic forecasting section and region staff to verify the appropriate growth rate to apply in developing the Future No Build forecasts. Appendix H includes a comparison of the TAFIS forecasts to the E+C No Build forecasts developed as part of the project.

## 3. Future No Build Growth

The traffic projection process is outlined in Figure 2. Balanced traffic counts are used in conjunction with demand model generated growth rates to produce target values for daily and design hour traffic projections. Those target values are then balanced to produce the traffic forecasts. The traffic forecasts are then used to produce OD tables for VISSIM model analysis.

*Figure 2: Traffic Projection Workflow*



## 3.1. AADT Growth

The 2050 travel demand models described in Section 2.4 and the historic-based TAFIS growth rates described in Section 2.5 are used to develop growth rates for the mainline and ramps throughout the corridors. Per WisDOT's TPM Chapter 9, both the demand model and TAFIS generated growth rates will be reviewed and considered. Traffic forecasts developed using the growth rates from TAFIS and the demand model will be compared and if these two forecasts are within 10% of each other, the demand model-generated traffic forecast is selected. If the TAFIS and demand model forecasts are more than 10% apart, then the average between the TAFIS and demand model forecasts is calculated, and if that average value is within 10% of the TAFIS forecast, the averaged value is selected. In cases where the TAFIS and average forecasts are not within 10%, engineering judgement is used. For locations that do not have a TAFIS forecast, the demand model growth is used to generate the forecast. A 0.25% minimal growth rate was also applied to generate the traffic forecasts, which effected few locations within the corridor. In areas with higher land use growth, the demand model generated growth rates will be given greater consideration. For areas inside of Dane County, the DCTDM will be used to generate daily growth rates, while areas outside of Dane County will use the SWTDM to generate daily growth rates.

The selected growth rate at each location will be applied to the location's existing year daily traffic count to establish the future year daily target value. A traffic balancing exercise is conducted through the corridor to establish the 2050 No Build AADT values for mainline and ramps.

## 3.2. Future No Build Peak Period Growth (Dane Only)

The 2050 DCTDM includes four time periods which sum to the daily values including trip tables by purpose and traffic assignment by link. The AM and PM period model outputs are validated and will be used to provide 3-hour peak period specific growth rates by location. The peak period modeling is sensitive to congestion that varies between peak and off-peak conditions. This approach provides for off-peak traffic volumes to grow while congested peak period traffic volumes may be constrained by capacity resulting in potentially lower peak period growth rates compared to the daily growth rate.

Unlike the daily traffic growth rate, the peak period growth rates estimated by the DCTDM cannot be compared directly to historic growth rates using TAFIS. Prior to using peak period growth rates, the K-design hour reduction factor described in Section 3.3 should be estimated and applied to the daily growth rate to form an estimated design hour volume for comparison purposes.

Example below is for an illustrative northbound Interstate group 5 segment in Dane County:

2016 DCTDM link AM period assignment: 4000

2016 DCTDM link PM period assignment: 4800

2016 DCTDM link daily assignment: 15,000

2021 AM peak hour balanced count: 1900

2021 PM peak hour balanced count: 2300

2050 DCTDM link AM period assignment: 5000

2050 DCTDM link PM period assignment: 5700

2050 DCTDM link daily assignment: 19,600

2021 daily directional balanced count: 17,700

AM growth = $\left(\frac{5000}{4000}\right)^{\frac{1}{2050-2016}} - 1$ = 0.66% CAGR 2050 AM TDM target value = $1900 * (1.0066)^{2050-2021}$=2299

PM growth = $\left(\frac{5700}{4800}\right)^{\frac{1}{2050-2016}} - 1$ = 0.51% CAGR 2050 PM TDM target value = $2300 * (1.0051)^{2050-2021}$=2666

Daily growth = $\left(\frac{19,600}{15,000}\right)^{\frac{1}{2050-2016}} - 1$ = 0.79% CAGR 2050 AADT TDM target value = $17,700 * (1.0079)^{2050-2021}$= 22,236

## 3.3. Future No Build K-Design Hours

The portion of the daily traffic anticipated to occur in the design hour decreases as the AADT of the facility increases. The K-design hour process is directly. applicable for weekday AM/PM, Friday and Sunday analysis. WisDOT uses the following equation to estimate the design hour by K-hour.

$$K\% = (Constant + AADT * Coefficient)/AADT$$

Table 1 below provides the Constant and Coefficient by Seasonal Factor Group and K-Factor.

*Table 1: K-Factor Equation Values by Seasonal Factor Group*

| | K30 | | K100 | | K250 | |
|---|---|---|---|---|---|---|
| | Const | Coeff | Const | Coeff | Const | Coeff |
| Group 1 Urban Interstate | 1463.45 | 0.07557 | 1254.81 | 0.07415 | 1068.46 | 0.07188 |
| Group 2 Urban Other 4+ Lanes | 433.8571 | 0.09422 | 358.2153 | 0.09152 | 277.8403 | 0.08796 |
| Group 3 Rural Interstate | 796.1749 | 0.08746 | 586.8914 | 0.08463 | 289.6699 | 0.08482 |
| Group 5 Rec Interstate | 445.5 | 0.12687 | 374.9063 | 0.11213 | 246.2874 | 0.10064 |
| Group 6 Rec Other | 695.0795 | 0.08429 | 443.7057 | 0.08946 | 253.2792 | 0.08988 |

Data published June 2020 by WisDOT.

At each location, the K% equation is applied for K30, K100 and K250 parameters, then the K-hour that most closely matches the balanced hourly volume at that location is selected. The corresponding K% equation is then applied to the future AADT value by location, resulting in an estimated reduction in the percent of daily traffic occurring within the K design hour. This reduction is consistent with peak spreading that occurs as congestion levels build with increased traffic volumes. The K% reduction is applied in conjunction with the growth factor to estimate the target design hour volumes. These target design hour volumes are used directly for balancing within areas outside of Dane County.

The example below uses the illustrative northbound Interstate location from section 3.2.

2021 direction balanced count: 17,700 AADT=35,400 K30=2468,
K100=2172~PM count of 2300,
K250=1904~ AM count of 1900

2050 target directional value: 22,236 AADT=44,470 K100= 374.9+44,470*0.11213 = 2,680 PM (directional)
K250= 246.3+44,470*0.10064 = 2,361 AM (directional)

## 3.4. Future No Build Design Hour Volume Comparison (Dane Only)

The DCTDM generated peak period growth rates are applied to balanced base year design hour volumes to develop target design hour counts. The K-hour factors are applied to the target daily volumes. These two processes generate design hour volumes which are reviewed and a target value for balancing selected. Based on WisDOT guidance, the forecast generated by the travel demand model shall be selected if within 10% of the alternative approach (in this case the K-hour estimation process). The comparison using the illustrative values from Section 3.2 are shown below.

| Time Period | DCTDM generated | K-hour generated | Percent Difference | Target Value Selected |
|---|---|---|---|---|
| AM hour | 2299 | 2361 | -2.7% | 2299 |
| PM hour | 2666 | 2680 | -0.5% | 2666 |

## 3.5. Future No Build Design Hour Trip Tables

The projected design hour target volumes selected in section 3.2 are balanced to form the design hour volumes for analysis. To aid in VISSIM operations analysis, CDMCT provides each design segment team with vehicle trip tables extracted from the DCTDM or SWTDM that include mainline and ramp movements.

### 3.5.1. Dane County (DCTDM)

Subarea trip tables are extracted from the DCTDM to represent the ramp to ramp movements through the I-39/90/94 South corridor and external to external movements through the two US 51 VISSIM models. Year 2016 AM and PM period trip tables are extracted from the base DCTDM, along with year 2050 AM and PM period tables. While the 2016 tables could be used as starting points for the VISSIM analysis, the design teams will use Streetlight-derived trip tables as their seed matrices. CDMCT will use the 2016 and 2050 subarea tables to develop forecasted growth matrices following NCHRP 765's section 6.12 technique guidance which incorporates differences in ramp to ramp trip movements between the 2016 subarea extraction and the 2050 subarea extraction. Additionally, the trip table row and columns sums are maintained such that traffic volumes and entry and exit points are held constant. This process will allow the proportion of the movements to align with the demand model generated trip matrix while keeping the total volume on each ramp consistent with the forecasted value. Using ramp-to-ramp level analysis allows the trip table forecasting process to respond to projected changes in housing, employment and transportation system input data. Ramp-to-ramp forecasting also provides detail to potential weave analyses for both No Build and subsequent alternatives.

Each design segment team then applies the forecasted growth matrices to their base year VISSIM trip tables to formulate target 2050 No Build trip tables. An Origin-Destination Matrix Estimation (ODME) process is then applied by the segment teams to adjust the target trip tables to align with design hour traffic projections. The resulting adjusted trip tables are then used in subsequent traffic operations analysis.

### 3.5.2. Areas outside of Dane County (SWTDM)

The SWTDM does not model peak periods, therefore, only daily growth rates and subarea trip tables are available. Streetlight data will be used to establish existing year design hour trip tables for VISSIM analysis. As note in Section 3.3, design hour traffic forecasts are developed for areas outside of Dane County using the K-design hour values estimated from projected AADT values. Ramp to ramp trip growth is also calculated using daily data extracted from SWTDM's 2017 and 2050 model sets using a subarea matrix extraction. Ramp to ramp growth matrices are then forecasted using NCHRP 765's section 6.12 technique which incorporates differences in ramp to ramp trip movements between the 2017 subarea extraction and the 2050 subarea extraction.

### 3.5.3. Future Developments (DCTDM)

A study was conducted to identify new developments in the I-39/90/94 and US 51 corridor study areas and determine if the DCTDM socio-economic projections accurately reflect the latest development plans. This study was detailed in the "Land Development Status with 2050 DCTDM" memorandum (April 3, 2023). The memo can be found in Appendix I. The study identified several TAZs within the project corridor area that should include updated socio-economic data.

## 3.6. Friday/Sunday Trip Table Development

Neither the DCTDM nor SWTDM explicitly model the unique nature of the tourist travel along the I-39/90/94 corridor beyond what is averaged into available summary count data. The northbound tourist travel on Friday afternoons and the complimentary southbound Sunday during the summer tourist season form the highest demands for a majority of the I-39/90/94 corridor.

Streetlight origin-destination data is available to provide differences between the demand models' definitions of trips (average annual or average weekday) and the Friday-Sunday patterns within the corridor. CDMCT will analyze the Streetlight OD data to establish factors to convert the available weekday PM period trip tables from the DCTDM to represent the Friday-Sunday patterns. These factors will then be applied to future model scenario (No Build and Alternatives) PM peak period trip tables for assignment within the DCTDM. Forecasting of peak period growth rates are estimated using NCHRP 765's 6.12 technique using demand model subarea trip table extractions for both 2016 and 2050 similar to the processes noted for the design hour analysis above.

## 4. Cross Street Growth Rates

CDMCT provided the segment design teams with growth rates for interchange cross streets and facilities crossing the Interstate. These growth rates were developed using the approach defined above, namely demand model assignments and TAFIS where available were compared and a resulting forecasted value was calculated. A growth rate for each side of the interchange was estimated based on the rates from the various links in the respective area. The segment design teams then applied the growth rate to the intersection counts to establish target volumes and completed the traffic balancing. This effort was delegated to the segment design teams to more closely align with the activities of establishing design alternatives and conducting the subsequent traffic operational analysis.

## 5. Speed Reduction Sensitivity Testing

The City of Madison lowered the posted speed on US 151 (East Washington Avenue) on the east side of Madison. In October 2020, speeds on East Washington Avenue (EWA) were reduced from 35 mph to 25 mph between Pinckney Street and Baldwin Street, and from 35 mph to 30 mph between Baldwin Street and Marquette Street In July 2022, the section of East Washington Avenue between Stoughton Road and East Springs Drive had its speed limit reduced from 40 mph to 35 mph.

Traffic counts were collected by WisDOT along EWA during 2020 from WisDOT continuous count sites (CCS). Tables 2 and 3 show counts in September, October, and November 2020 at two control sites where the posted speed limit did not change. Table 4 shows traffic counts during the same period along East Washington Avenue where the speed limit was reduced in October 2020. These observed traffic volume sets indicate that the speed reduction from September to November 2020, before and after the East Washington Avenue speed reductions at both control sites was an average of about 7-8%. The observed traffic volume counts on East Washington Avenue showed a reduction of about 14%. Therefore, the speed limit change had an impact of 6-7% reduction in traffic volumes, because the East Washington Avenue observed counts were reduced by about 6-7% beyond what the control site locations observed in traffic volume counts.

*Table 2: 2020 ATR Data for Count Site 136055, located on US 151 Northeast of I-39/90/94 corridor*

| | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Total | Avg. |
|---|---|---|---|---|---|---|---|---|---|
| **September** | 42,719 | 52,046 | 56,520 | 57,619 | 59,307 | 64,601 | 50,942 | 383,214 | 54,744.86 |
| **October** | 41,408 | 53,730 | 54,914 | 56,193 | 57,899 | 63,676 | 49,561 | 366,381 | 52,340.14 |
| **November** | 38,981 | 54,001 | 52,933 | 56,765 | 48,125 | 59,386 | 47,681 | 357,872 | 51,124.57 |
| **Sept to Nov Shift** | 92.4% | 103.8% | 93.7% | 98.5% | 81.1% | 91.9% | 93.6% | 93.4% | 93.4% |

*Table 3: 2020 ATR Data for Count Site 130011, located on the Beltline near the Park St. interchange*

| | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Total | Avg. |
|---|---|---|---|---|---|---|---|---|---|
| **September** | 81,239 | 106,138 | 115,991 | 117,932 | 119,158 | 125,416 | 95,878 | 761,752 | 108,821.7 |
| **October** | 79,775 | 109,899 | 114,289 | 116,912 | 117,595 | 125,288 | 95,409 | 759,167 | 108,452.4 |
| **November** | 71,343 | 108,949 | 107,470 | 113,497 | 99,203 | 114,721 | 87,655 | 702,838 | 100,405.4 |
| **Sept to Nov Shift** | 87.8% | 102.6% | 92.7% | 96.2% | 83.3% | 91.5% | 91.4% | 92.3% | 92.3% |

*Table 4: 2020 ATR Data for Count Site 130032, located on East Washington Avenue at Yahara River Bridge.*

| | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Total | Average |
|---|---|---|---|---|---|---|---|---|---|
| **September (before)** | 23,206 | 30,466 | 33,629 | 34,139 | 35,064 | 37,326 | 28,382 | 222,212 | 31,744.57 |
| **October** | 21,481 | 29,767 | 31,597 | 32,081 | 32,414 | 35,129 | 26,506 | 208,975 | 29,853.57 |
| **November (after)** | 19,929 | 28,868 | 29,576 | 30,744 | 27,219 | 30,402 | 24,157 | 190,895 | 27,270.71 |
| **Sept to Nov Shift** | 85.9% | 94.8% | 87.9% | 90.1% | 77.6% | 81.4% | 85.1% | 85.9% | 85.9% |
| **Control Group % Reduction** | 89.0% | 103.0% | 93.0% | 97.0% | 82.6% | 91.6% | 92.2% | 92.6% | 92.6% |
| **EWA posted speed change impact** | -3.10% | -8.21% | -5.08% | -6.89% | -4.95% | -10.23% | -7.08% | -6.74% | -6.74% |

The DCTDM was modified to reflect lower speeds on EWA using the user-speed function, which allows a specific speed to be allocated to a model link rather than the speed identified in a model-wide lookup table. DCTDM was tested with the two different sets of user-speeds. One set included reducing the model speed by 50% of the posted speed limit reduction, and one included reducing the model speed by 80% of the posted speed limit reduction. The 80% reduction lowered the model assignment volumes too low, therefore the 50% reduction was

assessed further. The 50% reduction means that in areas where the posted speed limit was reduced by 10 mph, the model speed was reduced by 5 mph, and in areas where the speed limit was reduced by 5mph, the model speed was reduced by 2.5 mph. Table 5 shows how the 50% model speed reduction impacted the model volume outputs.

*Table 5: Dane County Travel Demand Model Simulated 50% Speed Reductions along East Washington Ave. using a 2016 Base Year*

| Segment of Road | Original Posted Speed | New Posted Speed | Original Model Speed | Tested Model Speed | Model Assignment; Original Speed | Model Assignment; Tested Speed | Assignment Reduction Due to Tested Speed |
|---|---|---|---|---|---|---|---|
| Outbound Traffic | | | | | | | |
| W. of Blair | 35 mph | 25 mph | 36 mph | 31 mph | 10,062 | 9,233 | 8% reduction |
| W. of Ingersoll | 35 mph | 25 mph | 36 mph | 31 mph | 20,544 | 17,676 | 14% reduction |
| Yahara River | 35 mph | 30 mph | 38 mph | 36 mph | 21,306 | 19,022 | 11% reduction |
| W. of 5th | 35 mph | 30 mph | 40 mph | 36 mph | 19,494 | 16,643 | 15% reduction |
| W. of Marquette | 35 mph | 30 mph | 38 mph | 36 mph | 23,870 | 22,152 | 7% reduction |
| Inbound Traffic | | | | | | | |
| W. of Blair | 35 mph | 25 mph | 36 mph | 31 mph | 15,982 | 10,764 | 33% reduction |
| W. of Ingersoll | 35 mph | 25 mph | 36 mph | 31 mph | 22,634 | 16,964 | 25% reduction |
| Yahara River | 35 mph | 30 mph | 38 mph | 36 mph | 22,283 | 17,114 | 23% reduction |
| W. of 5th | 35 mph | 30 mph | 40 mph | 36 mph | 20,021 | 16,090 | 20% reduction |
| W. of Marquette | 35 mph | 30 mph | 38 mph | 36 mph | 22,170 | 20,953 | 5% reduction |

Table 5 shows that even reducing the model speed by half of the total posted speed limit reduction still reduces the model assignments between 5% to 33%. This is generally much higher than the expected 6-7% reduction that was shown in Table 4, based on the observed traffic volumes. Therefore, the model speeds were not adjusted along East Washington Avenue.

## Appendix A
## Boat/Trailer Impacts on Truck Percentages

MEMORANDUM

# Boat/Trailer Impacts on Truck Percentages

| | |
|---|---|
| **Date:** | August 19, 2022 |
| **Topic:** | Impacts of Personal Vehicles Pulling Boats and Trailers on Truck Percentages |
| **From:** | CDMCT |

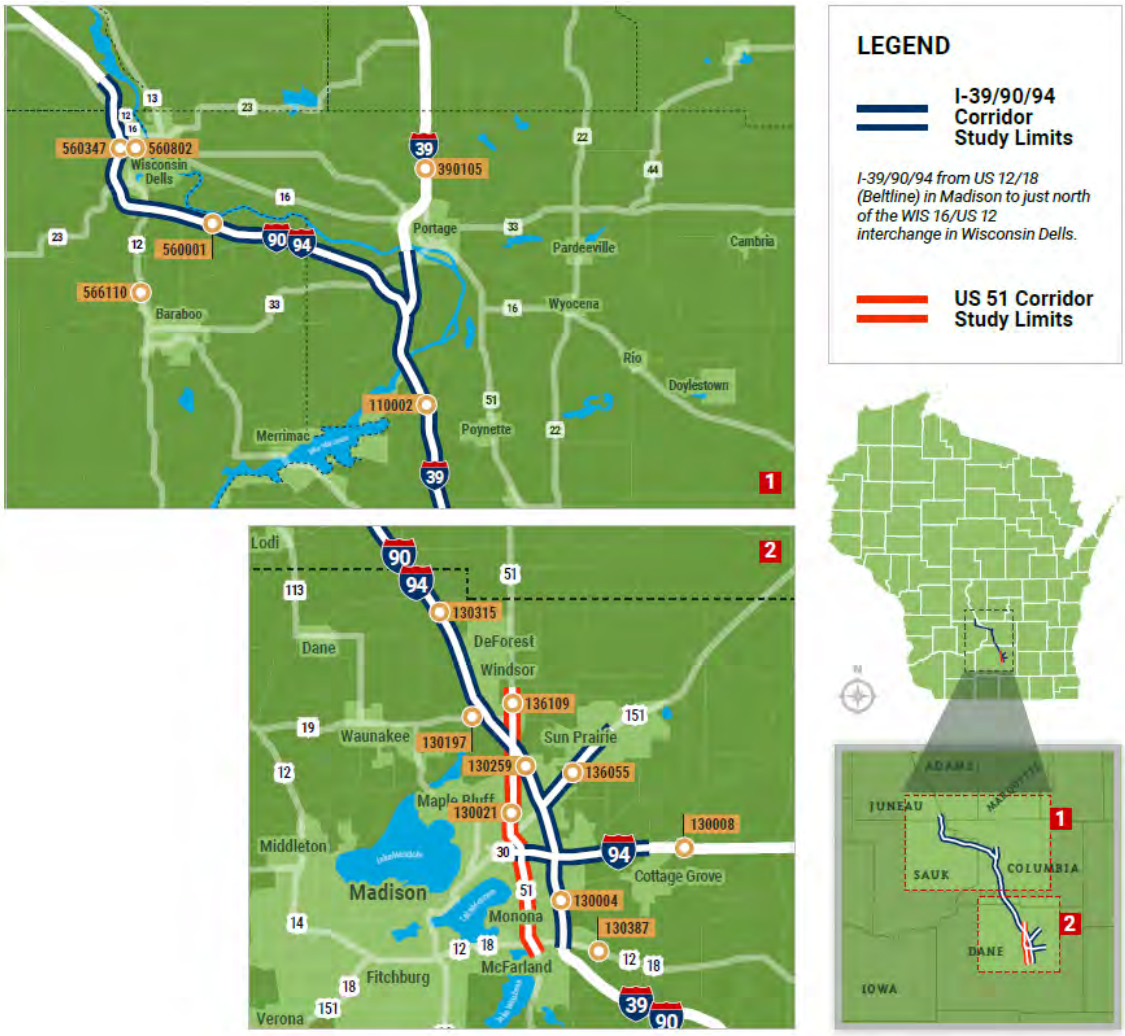
The Interstate system provides a critical transportation link for freight movements across the country. The Interstate 39/90/94 corridor serves as a route for nationwide movement and is also the primary connection between Chicago and points east with Minneapolis/St Paul and points west. Table 1 shows that annual truck percentages (total annual trucks divided by total annual vehicles) ranges from 21 to 31 percent in 2021. The location of each count site is shown in Figure 1.

*Table 1 Annual Truck Percentages along I-39/90/94 in 2021*

| Site ID | Location | 2021 Truck Percentage |
|---|---|---|
| 110002 | I-39/I-90/I-94 BTWN CTH CS & I-39/STH 78 - DEKORRA | 25.3% |
| 130005 | I-39/I-90 - BTWN STH 30 AND USH 12-18 - COTTAGE GROVE | 21.0% |
| 130259 | I-39/I-90/I-94 BTWN USH 151 AND USH 51- HOEPKER RD | 24.8% |
| 130315 | I-39/I-90/I-94 BTWN CTH V AND STH 60 - VIENNA TNSHP | 24.8% |
| 560001 | I-90/I-94 EAST OF CTH A - DELTON TNSHP | 31.2% |
| 560347 | I-90/I-94 NORTH OF STH 23 DELTON TNSHP HPMS | 28.3% |

The truck classifications in Table 1 are calculated at these locations using the length of vehicle and the pattern of axles.

*Figure 1: Traffic Count Sites*




The I-39/90/94 corridor also serves a robust tourist market. Northern Wisconsin recreational areas are heavily used during weekends, particularly between Memorial Day and Labor Day. The tourist travelers are regularly hauling personal recreational equipment including boat trailers and snowmobile trailers. The existing vehicle classification counters that rely on axle patterns may classify these personal vehicles with trailers as commercial trucks. Specifically, vehicle class 8, defined as four or fewer axle single-trailer trucks, may include both commercial trucks with trailers or personal vehicles with trailers. Table 2 provides a description of each vehicle classification.

*Table 2: Descriptions of Vehicle Classifications*

| | |
|---|---|
| FHWACLS1 | Percent of total traffic classified as a motorcycle |
| FHWACLS2 | Percent of total traffic classified as a passenger car |
| FHWACLS3 | Percent of total traffic classified as other two-axle four-tire single-unit trucks |
| FHWACLS4 | Percent of total traffic classified as a bus |
| FHWACLS5 | Percent of total traffic classified as two-axle six-tire single-unit trucks |
| FHWACLS6 | Percent of total traffic classified as three-axle single-unit trucks |
| FHWACLS7 | Percent of total traffic classified as four or more single-unit trucks |
| FHWACLS8 | Percent of total traffic classified as four or fewer axle single-trailer trucks |
| FHWACLS9 | Percent of total traffic classified as five-axle single-trailer trucks |
| FHWACLS10 | Percent of total traffic classified as six or more axle single-trailer trucks |
| FHWACLS11 | Percent of total traffic classified as five or fewer axle multi-trailer trucks |
| FHWACLS12 | Percent of total traffic classified as six-axle multi-trailer trucks |
| FHWACLS13 | Percent of total traffic classified as seven-axle multi-trailer trucks |

A video collection effort was conducted near count station 130315, located between CTH V and STH 60 near the Dane/Columbia County line. The video collection allowed for more clear classification of personal vehicles with trailers compared to trucks with trailers. Three sets of counts were conducted as noted below:

10:00 AM Wednesday, May 11 to 2:00 PM Thursday, May 12, 2022 – mid-week and prior to Memorial Day representing a non-tourist activity day. This day serves as a control for non-tourist days.

1:00 PM Thursday, May 26 to 11:59 PM Friday, May 27, 2022 – the Thursday and Friday leading into Memorial Day weekend with high northbound tourist activity

8:00 AM Sunday, May 29 to 11:59 PM Monday, May 30, 2022 – the Sunday and Monday of Memorial Day weekend with high southbound tourist activity

Table 3 provides the volumes by vehicle classification for the three count sets. Note that the axle classification method predicts vehicles classified as type 8 at a rate 103 to 434 percent greater than the video detection method. Review of video by DOT staff determined this difference is the misclassification of personal vehicles pulling trailers that are being classified by the axle method as trucks. Also note that classification 4 (buses) is counted at a higher rate using the axle method, however the overall magnitude of vehicles is lower than class 8. It should be noted that some of the class 4 (buses) difference may be due to a known issue with traffic counts that can misidentify class 5 vehicles as class 4 vehicles, however both class 4 and 5 are represented in the 2D bin in WisPAVE, so this issue has no effect on pavement design.

Overall truck percentage is calculated by summing the total vehicles in classes 4 through 13 and dividing by the total vehicles counted. The non-tourist days on May 11$^{th}$ and 12$^{th}$ show a difference in overall truck percentage between the two count methods of 1.14 percent, well within expected accuracy for vehicle classification. The tourist days of May 26 through May 30 show a difference between the count methods of 5.19 percent in the northbound direction and 3.4 percent in the southbound direction. The bulk of that difference is from vehicle class 8, indicating the misclassification of personal vehicles with trailers as trucks with trailers is impacting the reported truck percentage.

*Table 3: Video and Axle Classification County Data at 130315, May 2022*

| Date | 5/11/2022 | | | 5/26-27/2022 | | | 5/29-30/2022 | | |
|---|---|---|---|---|---|---|---|---|---|
| Direction | SB | | | NB | | | SB | | |
| Data Source | Video | Axle | %Diff | Video | Axle | %Diff | Video | Axle | %Diff |
| Class 1 | 96 | 76 | -20.8% | 581 | 64 | -89% | 321 | 230 | -28% |
| Class 2 | 17,629 | 18,328 | 4.0% | 48,719 | 47,881 | -2% | 62,130 | 61,684 | -1% |
| Class 3 | 5,168 | 4,947 | -4.3% | 14,890 | 13,536 | -9% | 14,828 | 14,156 | -5% |
| Class 4 | 64 | 420 | 556.3% | 96 | 444 | 363% | 48 | 174 | 263% |
| Class 5 | 909 | 986 | 8.5% | 1,365 | 2,106 | 54% | 845 | 1,414 | 67% |
| Class 6 | 295 | 234 | -20.7% | 414 | 314 | -24% | 156 | 122 | -22% |
| Class 7 | 50 | 42 | -16.0% | 71 | 69 | -3% | 6 | 2 | -67% |
| Class 8 | 362 | 736 | 103.3% | 848 | 3,600 | 325% | 510 | 2,723 | 434% |
| Class 9 | 8,236 | 8,328 | 1.1% | 8,421 | 8,866 | 5% | 4,311 | 4,422 | 3% |
| Class 10 | 150 | 107 | -28.7% | 149 | 123 | -17% | 61 | 47 | -23% |
| Class 11 | 286 | 272 | -4.9% | 359 | 376 | 5% | 28 | 37 | 32% |
| Class 12 | 161 | 166 | 3.1% | 115 | 140 | 22% | 39 | 52 | 33% |
| Class 13 | 2 | 6 | 200.0% | 0 | 72 | n/a | 1 | 17 | 1600% |
| Total Vehicles | 33,408 | 34,648 | 3.7% | 76,028 | 77,591 | 2% | 83,284 | 85,080 | 2% |
| Total Trucks (4-13) | 10,515 | 11,297 | 7.4% | 11,838 | 16,110 | 36% | 6,005 | 9,010 | 50% |
| Truck Percentage | 31.47% | 32.61% | | 15.57% | 20.76% | | 7.2% | 10.6% | |

Note that the tourist activity is focused on the northbound direction on Fridays and southbound on Sundays (or Mondays for Memorial Day and Labor Day). This leads to a limited number of days per year that the misclassification of personal vehicles with trailers is impacting the truck percentage value calculated using the axle classification method. In a given year, approximately 15 weeks fall within the Memorial Day to Labor Day window. Assuming two days of counts are impacted per direction per summer weekend, then 30 days per year are experiencing a bias in the truck percentages. While vehicle counts on these weekend days are higher than average daily counts, the net effect on overall average truck percentage is expected to align with the 330 non-tourist days which show little overall difference in total truck percentages between the two collection methods.

Operational analysis conducted during the Friday and Sunday peak tourist days should consider the noted shift in traffic from trucks with trailers to personal vehicles with trailers. The overall length of the total vehicle and trailer is not anticipated to vary greatly between the two vehicle types, therefore, the impacts to traffic operations are not anticipated to be significant.

**Appendix B**
**COVID Impacts on Corridor Traffic**

MEMORANDUM

# COVID Pandemic Impacts on Corridor Traffic

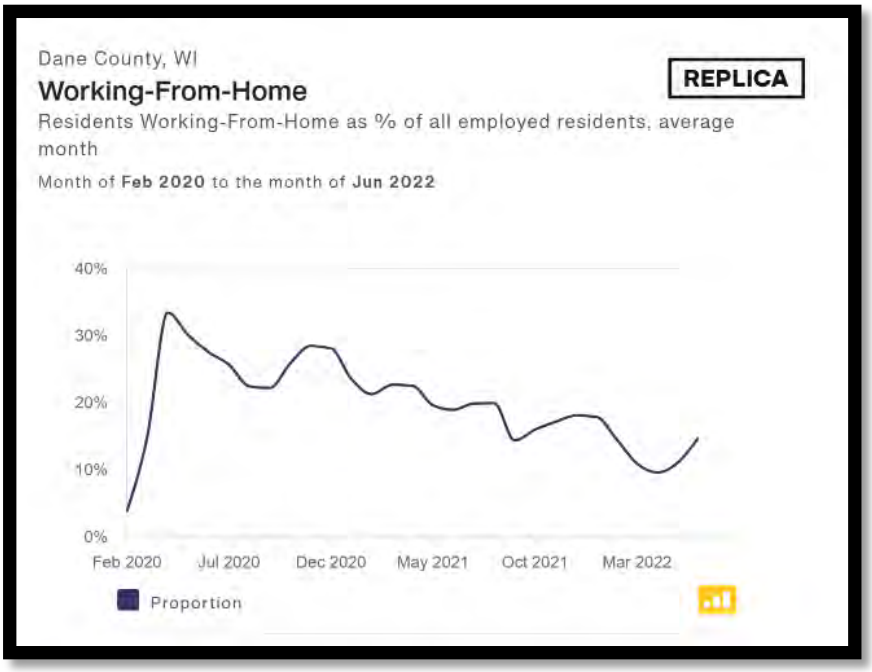
| | |
|---|---|
| **Date:** | August 9, 2022 |
| **Topic:** | Impacts of COVID Pandemic on Corridor Traffic Patterns and Volumes |
| **From:** | CDMCT |

The COVID-19 pandemic impacted traffic volumes throughout the US including the Interstate 39/90/94 and US 51 corridors. These two facilities serve different travel markets with the Interstate system serving a combination of regional commuters, long distance travelers and freight movements while the US 51 corridor is utilized by commuters and travelers to local businesses. These travel markets have responded differently to the pandemic in both volume reductions and subsequent volume recoveries.

Continuous traffic count sites along the Interstate and US 51 corridors provide insight into the traffic volume patterns along each corridor as shown below. Interstate corridor volumes have recovered to 2019 pre-pandemic volumes while US 51's 2021 volumes are 10-15% below pre-pandemic volumes.

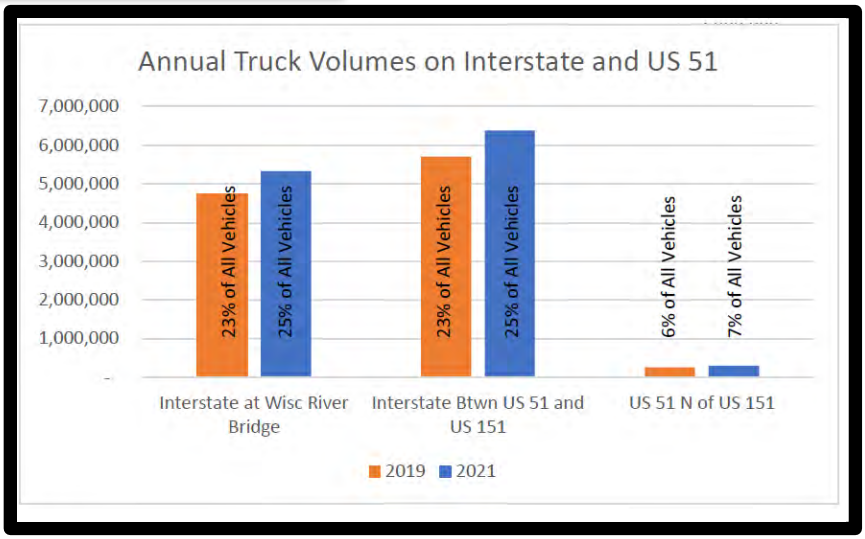
Average Daily Traffic Volumes by Year

| Facility | Location | 2019 | 2020 | 2021 | % Recovery |
|---|---|---|---|---|---|
| Interstate | N of US 12/18 (Beltline), Dane Cty | 97,500 | 79,500 | 92,500 | 95% |
| Interstate | Btwn US 51 and US 151, Dane Cty | 71,200 | 62,000 | 72,000 | 101% |
| Interstate | Dane/Columbia Cty Line | 59,100 | 50,400 | 58,400 | 99% |
| Interstate | Wisc River Bridge, Columbia Cty | 56,900 | 49,100 | 58,100 | 102% |
| Interstate | Wisconsin Dells, Sauk Cty | 42,900 | 36,200 | 43,400 | 101% |
| US 51 | S of US 12/18 (Beltline), Dane Cty | 28,900 | 23,200 | 25,900 | 90% |
| US 51 | N of US 151, Dane Cty | 15,200 | 12,100 | 12,800 | 84% |




Replica data shown in the figure to the left reveals that the portion of Dane County residents Working From Home peaked during the pandemic lockdown and have not yet returned to pre-pandemic levels. The lower commuter volumes have impacted US 51, which more directly serves commuters compared to the varied uses of the Interstate.

Total truck volumes along both the Interstate and US 51 corridors have increased 12-16% between the 2019 and 2021 data, consistent with national trends of increased product shipping. This results in trucks representing a slightly higher portion of total traffic as shown in the figure to the right.




Interstate 39/90/94 volumes have returned to pre-pandemic levels as increased truck volumes have offset the lagging commuter volumes. Those lagging commuter volumes more dramatically impact the US 51 corridor resulting in the delayed recovery of volumes from pre-pandemic values and a determination to delay traffic analysis on the US 51 corridor until 2022 counts are collected.

**Appendix C**
**Land Use Meeting Notes**

Notes regarding Statewide Model Housing, Employment and Project Updates for I-39/90/94 Study

**Sauk County – phone conversation with Patrick Gavinski, provided high resolution mapping on 6/9, awaiting details from Melanie PlattGibson (608-963-3871)**

Call on 7/11 with Melanie: Melanie noted Baraboo's large housing growth planned for next 5 years with upwards of 3000 housing units planned. Melanie initiated discussions with Tim McCumber and Tom Diehl regarding Lake Delton growth, no major housing planned. Melanie was going to follow up with Tim and Tom for employment growth related to TIF/TID. Melanie to review housing and employment growth maps provided to determine if any updates are required.

**Columbia County - phone conversation, awaiting details**

Table of roadway projects provided on 6/24 by Chris Hardy. Housing and employment data coordination initiated with Kurt Calkins. Discussed project with Renee Johnson of Columbia County Planning and Zoning. Columbia County noted their recent plan update include coordination with townships within the Interstate study limits. Provided detailed mapping of housing and employment for review. Received email from Columbia County on August 12 concurring with housing and employment values for 2050 model.

**Juneau County – left message (along with email), awaiting details**

With limits of project pulling back to US 12/STH 16 interchange and discussions with Town of Lyndon, no further outreach was conducted.

**City of Wisconsin Dells 6/3/22 Chris Tollaksen**

Exit 87 and Trout Road is the focus of upcoming development. 75 new multifamily units going in currently, another 150 anticipated in next 5-6 years. There is room for more development but nothing planned, including plans for hotel and commercial development. City is interested in pushing WIS 13 through to CTH H to open area for more development.

60 housing units on E side of Wis Dells, in area originally planned for new high school.

Jerry reviewed 2050 SE data in SW model, new HS was located in the E side. Needs to be relocated to the NW portion of city as it was built there a couple years back.

WIS 13 north of town, plans for 30-40 housing units.

No roadway projects identified.

6/29/22 - Nutura discussed via email. Restaurant for 300 seats plus rooms, but no specifics available.

**City of Portage 6/6/22 Phil Livingston**

Philip provided a list of resurfacing projects for Portage on 6/17. Reconstruction projects have not been identified as of 6/17.

Meeting with Steve Sobiek to discuss SE data info on 7/13. Steve noted employment growth anticipated for north side of Portage, consistent with statewide model numbers. Housing was also discussed with agreement in the areas and general magnitudes of growth identified by the statewide model.

**City of Baraboo 6/6/22 Casey Bradley**

3000 new housing units anticipated for Baraboo in next 5+ years.

281 new HH on WIS 33 east of town

500-700 in downtown area, specifics include:

Vine-Walnut 150

Lynn & River 66

2nd&3rd, near Broadway – 100-200 apartments

4th/5th/Ash/Oak – 100-200, the employment here to be split and moved, half to WIS 136/Sauk(Old 12?) and half to east side new fire station

12/CTH W, west of interchange, 300 units plus hotel, restaurant, gas station, mixed use, new VA clinic (15k sf)

12/CTH W east of interchange, hotel by pizza ranch

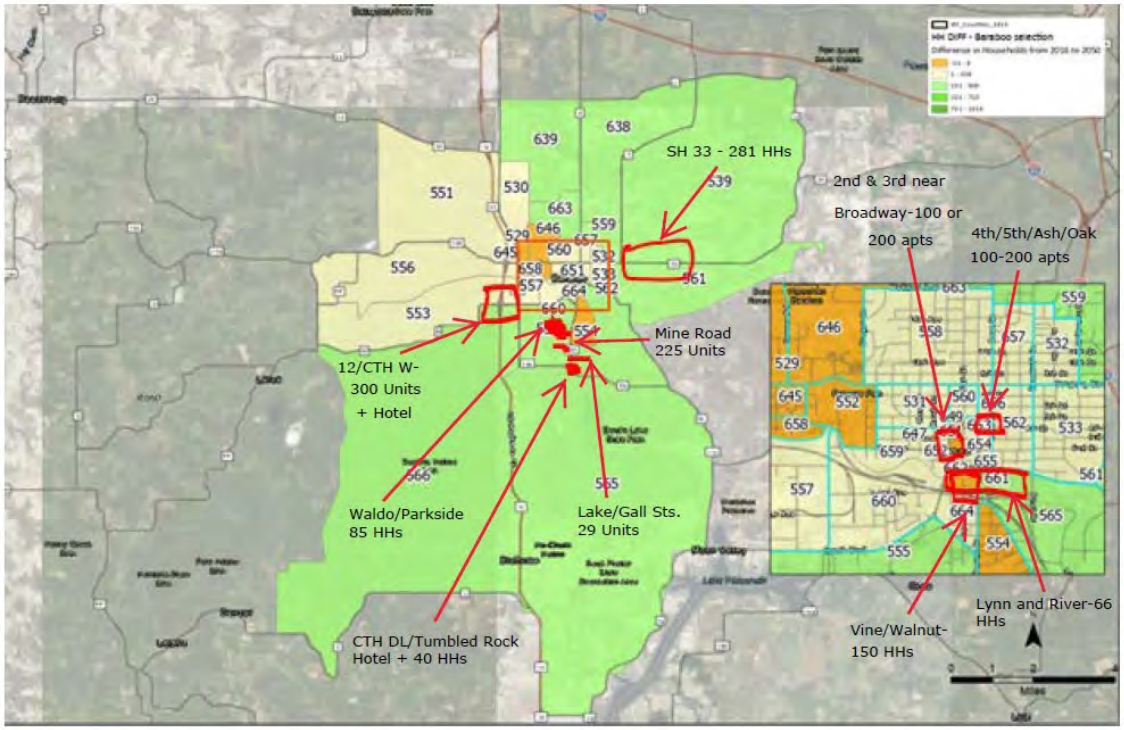
Waldo/Parkside, 85 new HH

Mine Road – 225 units

CTH DL/Tumbled Rock, hotel & 40 HH

Lake St/Gall – 29 units

STH 33 speed reduction on east side of town to 25 mph. Other Roadway projects were primarily local in nature to connect to the new developments.




**Village of Lake Delton – Tim McCumber, last contact 6/13/22.** Tim provided info to Melanie Platt Gibson from Sauk County which was included in notes identified above.

**Town of Fairfield – email from Mark Steward, Town chariman on 6/13 indicating: "**There are no plans for increased housing or employment in the Town. Road projects remain as resurfacing projects. No new roads or bridges are planned at this time."

**Town of Delton – email from Deb Kowakle, town clerk on 6/13: "** [W]e [the town of Delton] have no way of knowing or even guessing what the projections might be on any of these issues. Please keep us informed on any of these issues that will effect the Town of Delton in the future. If you have further suggestions or wish to discuss this further, please let me know."

**Town of Arlington –** no response, covered by Columbia County review.

**Town of Caledonia –** no response, covered by Columbia County review.

**Town of Dekorra –** no response, covered by Columbia County review.

**Town of Lyndon – S. Mitchell, call 6/6/2022**

No roadway or development projects to note. Sent summary email and graphics showing housing and employment growth along with WisDOT 6 year transportation projects map for reference.

**Appendix D**
**Statewide Model Input Updates**

MEMORANDUM

# Input Updates to Statewide Travel Demand Model

| | |
|---|---|
| **Date:** | August 29, 2022 |
| **Topic:** | Statewide Travel Demand Model Input Updates |
| **From:** | CDMCT |

## 1. Introduction

The Wisconsin Department of Transportation (WisDOT) is conducting a study of the Interstate 39/90/94 (I-39/90/94) corridor. The study includes developing new traffic forecasts for the I-39/90/94 between Wisconsin Dells and Madison. The limits of I-39/90/94 extend from Sauk County through Columbia County and into Dane County. WisDOT's traffic forecasting policy notes the use of travel demand models to develop future year traffic projections. Due to the geographic limits of the I-39/90/94 study, both the Dane County travel demand model (DCTDM) and Wisconsin's Statewide travel demand model (STDM) are used in traffic forecasting. This memo gives a brief overview of the updates that were made to the model sets.

## 2. Input Updates

The CDMCT developed mapping showing the DCTDM and STDM housing and employment values by transportation analysis zone (TAZ), along with future transportation improvements. The housing and employment growth maps were circulated to project stakeholders along the extent of the corridor. Details pertaining to changes noted in housing are available in the Baraboo Housing Memo.

The stakeholders noted edits need for the STDM. The Greater Madison Metropolitan Planning Organization (GMMPO) maintains the housing and employment data for the DCTDM. GMMPO provided the most recent input data for the DCTDM, however the DCTDM data is an input into the STDM and required reformatting and recalculation to comply with STDM format and required attributes. Changes were made to four different .xlsx files for updates in statewide models and one .xlsx file for the Dane County specific model.

The two main districts in Wisconsin that needed to be adjusted for the corridor model updates were District 2 (Dane County), and District 11 (Sauk and Columbia Counties). Before the updates were made, Dane County's employment numbers were last updated for the model in 2021. Baraboo's Housing counts were performed this year, but the corridor model for Baraboo needed to be tweaked to represent our client's estimates more accurately. A new school district in Wisconsin Dells had also been relocated to a new high school location, and those changes between TAZs had not been accounted for, so changes were made to get those enrollment numbers in the correct location. And, after the employment numbers were updated for Dane County, an additional TAZ had to have their employment numbers updated.

Files Updated:

- Dane_SE_2050 (Dane County Specific File)
- DIST_ALL_NAIC_2050 (Lists all the Wisconsin Counties, Districts with NAICS Industry Codes)
- NAICS_2050 (List all NAICS Industry Code Counts per TAZ)
- SE_2050_totals (Lists Statewide Totals for each County, District, and TAZ)

- Wisconsin_All_District_2050 (Similar to the SE_2050_totals file)

## 2.1. Updates to the Baraboo Housing Numbers in the Statewide Housing Model files

Based on the recommendations from the Sauk County/Baraboo Housing Memo, the household number additions to Baraboo were updated in each of the respective TAZs for all the 2050 Statewide Model Files (Dane_SE_2050 not included). The district specific file (d11_SE_2050) was updated to include these numbers as well. The additional household counts were added to the five specific TAZs (539, 555, 561, 565, & 566) specified in the Baraboo Housing memo for each of the files. The original housing data file (Baraboo_Housing.xlsx) which showed 2016 base year counts and 2050 projections was updated by manually hardcoding the additional housing counts into each respective TAZ, and then linked using the equals function to each Statewide Model spreadsheet so that the housing counts could be easily updated for every file without having to copy and paste data repetitively. Based on the recommendations, a total of 1,000 households were added to the Statewide and district specific model files.

## 2.2. Updates to the Employment Numbers for the Statewide and Dane County Models

Since the employment numbers per TAZ have changed for the 2050 projections, each of the Statewide Model files and the Dane County file were updated to include these changes. The new employment numbers were already calculated beforehand in the NAICS_2050 file. In the NAICS 2050 file, the changes in employment numbers per TAZ were grouped by NAICS industry codes. The process for updating was by grouping these different codes into basic industry groups (Service, Retail, Manufacturing, etc.) and calculating a sum for each industry group. We used the NAICS_2050 file's proportions and applied them to the DIST_ALL_NAIC_2050 file via the copy/paste method. We also used the NAICS_2050 file and applied it to the Dane_SE_2050 file for the county specific model using that same method. Any missing numbers or extra information was accounted for, as well as numbers by SV and WV category (SV10, SV20, SV30). SV denotes the combination of the size of household and the number of vehicles they own, while WV denotes the combination of workers and vehicles, and the numbers next to WV (WV10, WV21) denote how many workers live at each residence and how many vehicles each of workers own. For example, if it reads WV12, that means there is a certain percentage of households with one worker and two vehicles in that TAZ. For the SV and WV fields, we would link those to the spreadsheet with all the updated data and have them read out as percentages, not have them copied and pasted for each spreadsheet. For spreadsheet files with missing fields, we would calculate a combined percentage of one field already in the spreadsheet and the field not in the spreadsheet. For the Wisconsin_All_District_2050 and SE_2050_totals files, the sums for each industry group were calculated via a simple equals function which would link the new employment counts in the NAICS_2050 and DIST_ALL_NAICS_2050 files to the other two spreadsheets.

## 2.3. Relocation of School District Population Counts between TAZs for the Statewide Model

The Wisconsin Dells High School had moved to a recently opened and constructed building near the US 12 Corridor, which is in a different TAZ than where it was located previously. Although the current counts are correct (1,012 enrolled in the school district), all Statewide Model files had to be updated to include the relocation of the counts from one TAZ to another. For each of the files updated to include these numbers, the SCHENR (reflecting school enrollment) column was updated. Calculations for these updates were done on a separate tab for each statewide model excel file, and then copied or linked back to other statewide model spreadsheets.

## 2.4. Updates to Employment Numbers in the Industry and Retail NAICS Sectors for TAZ 1076 (Dane County)

Later in the process, new updates in employment numbers in TAZ 1076 needed to be accounted for in the statewide model and Dane County specific files. TAZ 1076 is in a triangular boundary, marked by the interstate (going diagonally from Northwest to Southeast) as the area's hypotenuse, US 51 which runs north to south forming the eastern boundary, and WIS 19 which runs east to west serving as the northern boundary. In terms of land-use categorization, this triangular area is mostly office industrial. This area characteristically caters to truckers and delivery drivers as there are many large industrial distribution centers and warehouses such as Pepsi-Cola Center of Madison, North American Mechanical, and Badger State Freight. The retail and service sectors in this area are tied to the industrial/manufacturing sector here, as many of the stores and services cater to truck drivers or other employees that travel far distances on a regular basis. Those stores include smaller auto-repair shops, tire shops, and auto parts stores, as well as travel-based retail with hotel chains, chain restaurants, and Gander RV of Madison. As such, most of the trips generated in and around this area are trucks and other larger vehicles. Destination choices from office industrial settings such as this are usually Home-Based Work Trips, shopping trips, or other trips.

Starting with the SE_2050_totals file, an update tab (usually titled updates_1076) would be added to show the mathematical process of changes made to the employment numbers for the zone, and then that data would be copied back to the main data tab on the same spreadsheet. All copied data would then be linked to all the other spreadsheets (NAICS_2050, DIST_ALL_NAIC_2050, Dane_SE_2050, and Wisconsin_All_District_2050) that needed the same update via the equals function on excel. For these updates, an additional 232.5 jobs were added to the industry sector and an additional 273 jobs were added to the Retail sector as per recommendations from GMMPO.

The Dane County model's input socio-economic file was also updated to include the additional employment. The employment numbers were updated based on the already existing employment in the TAZ and tied to the NAICS industry codes. The changes to employment numbers in the statewide model files were simple increases in counts based on the specific industry codes for the Retail and Industrial sectors. Employment numbers were only updated for those two categories, which accurately reflect the majority of employment in TAZ 1076.

## 3. Statewide Model Results

Table 1and Table 2 below provide a summary of the change in model inputs for Districts 2 and 11.

*Table 1: District 2 Housing and Employment Totals*

| Category | Before Updates | After Updates | Difference |
|---|---|---|---|
| Households | 333,229 | 347,785 | +14,556 |
| Retail Emp. | 96,985 | 58,039.26 | -38,945.74 |
| Service Emp. | 263,178 | 315,394.67 | +52,216.67 |
| Total Emp. | 452,720 | 470,769.83 | +18,049.83 |
| Emp. per HH | 1.36 | 1.35 | -0.01 |
| School Enrollment | 109,466 | 109,466 | 0 |

*Table 2: District 11 Housing and Employment Totals*

| Category | Before Updates | After Updates | Difference |
|---|---|---|---|
| Households | 144,538 | 145,538 | +1,000 |
| Retail Emp. | 40,730 | 40,730 | 0 |
| Service Emp. | 34,207 | 34,207 | 0 |
| Total Emp. | 175,027 | 175,027 | 0 |
| Emp. per HH | 1.21 | 1.20 | -0.01 |
| School Enrollment | 46,045 | 46,405 | 0 |

## 3.1. Trip Balancing

Ultimately, the number of attractions within a geographic area should be equivalent to the number of productions so that each production has exactly one attraction with a factor of 1.00. Travel demand models will scale the number of attractions to equal the number of productions.

## 3.2. Trip Balancing Table Overall

Due to the geographic scale of the STDM, the balancing of attractions to productions is done at a regional scale for multiple geographies independently. The STDM balances attractions by trip purpose to force attractions to equal productions within geographic areas defined by the Bureau of Economic Analysis (BEA). The BEA that includes Columbia, Dane and Sauk counties is shown in Figure 1 below. Increasing housing in this area will increase trip productions which will result in an equal increase in attractions, even with no change in employment.

*Figure 1: BEA 101*

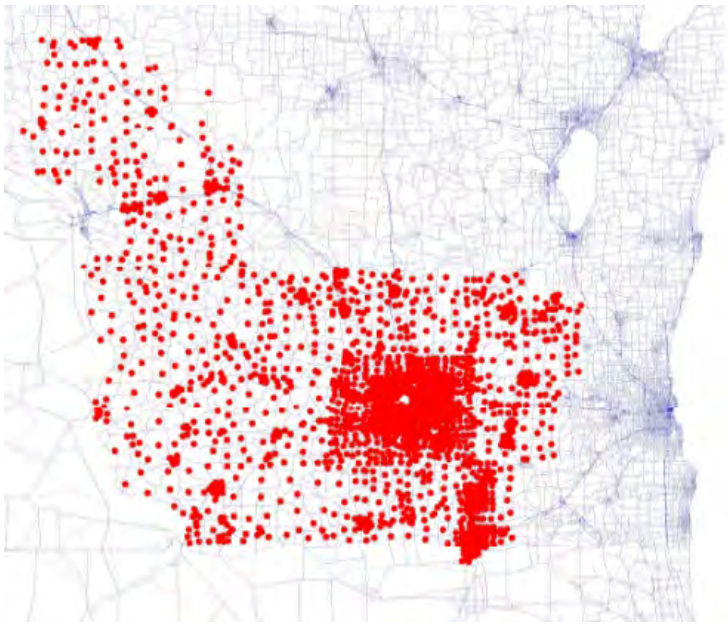


Table 3 shows the resulting number of trip productions and attractions prior to trip balancing for BEA 101. Note the increase in productions for each trip purpose. Trip attractions did not increase for all purposes prior to balancing based on the changes in employment used in the Dane County area. Balancing attractions to productions results in an increase in trip attractions despite an initial calculation of lower attractions based on employment. This also results in an increase in trips between the original and updated input sets for TAZ that did not have a change in employment data due to the attractions being balanced to a higher total to align with overall production increases.

*Table 3: Trip Productions and Attractions with Original and Updated Socio-Economic Data*

| | Original | | | Updated | | |
|---|---|---|---|---|---|---|
| **Type** | **Productions** | **Attractions** | **Factor** | **Productions** | **Attractions** | **Factor** |
| **HBW** | 1,157,937 | 1,078,588 | 1.073567 | 1,401,007 | 1,066,781 | 1.313304 |
| **HBSHOP** | 911,171 | 987,219 | 0.922967 | 934,874 | 770,680 | 1.21305 |
| **HBSCH** | 406,050 | 217,657 | 1.865549 | 416,512 | 218,717 | 1.904337 |
| **HBO** | 1,541,347 | 1,365,532 | 1.128752 | 1,583,777 | 1,317,393 | 1.202206 |
| **NHB** | 1,883,803 | 1,928,423 | 0.976862 | 1,939,354 | 1,627,723 | 1.191452 |
| **UNIV** | 147,680 | 12,375 | 11.9337 | 158,773 | 12,375 | 12.83011 |
| **TOTALS** | 6,047,987 | 5,589,794 | 1.08197 | 6,434,296 | 5,013,669 | 1.283351 |

*HBW = Home Based Work Trips, HBSHOP = Home Based Shopping Trips,

HBSCH = Home Based School Trips, HBO = Home Based Other Trips, NHB = Non Home Based Trips,

UNIV = University Based Trips

## 4. Network Edits

Minor edits were made to the STDM input geodatabases used to create the model networks. The two specific locations include:

## 4.1. US 12 interchange in Lake Delton

The 2017 STDM assignments at the US 12 interchange with I-90/94 in Lake Delton were initially showing two ramp movements with zero traffic movements. Figure 2 shows the on the left side of the figure that southbound US 12 to westbound I-90/94 and the eastbound I-90/94 exit to northbound US 12 both had zero traffic assignment. A review of shortest paths in the area indicated that trips to/from the north or west of the WIS 23 interchange with I-90/94 were using US 12 through Lake Delton rather than using the subject ramps and I-90/94. The centroid connection to zone 10379 was modified to provide an effective route to US 12 just north of I-90/94, consistent with the actual access provided at Meadow View Court as shown in Figure 3.

The modified geodatabase was rerun through the STDM with revised results available on the right side of Figure 2. The resulting traffic assignments are non-zero and similar in magnitude to published AADT as shown in Figure 3.

*Figure 2: 2017 STDM Assignments at US 12 interchange with I-90/94 in Lake Delton*

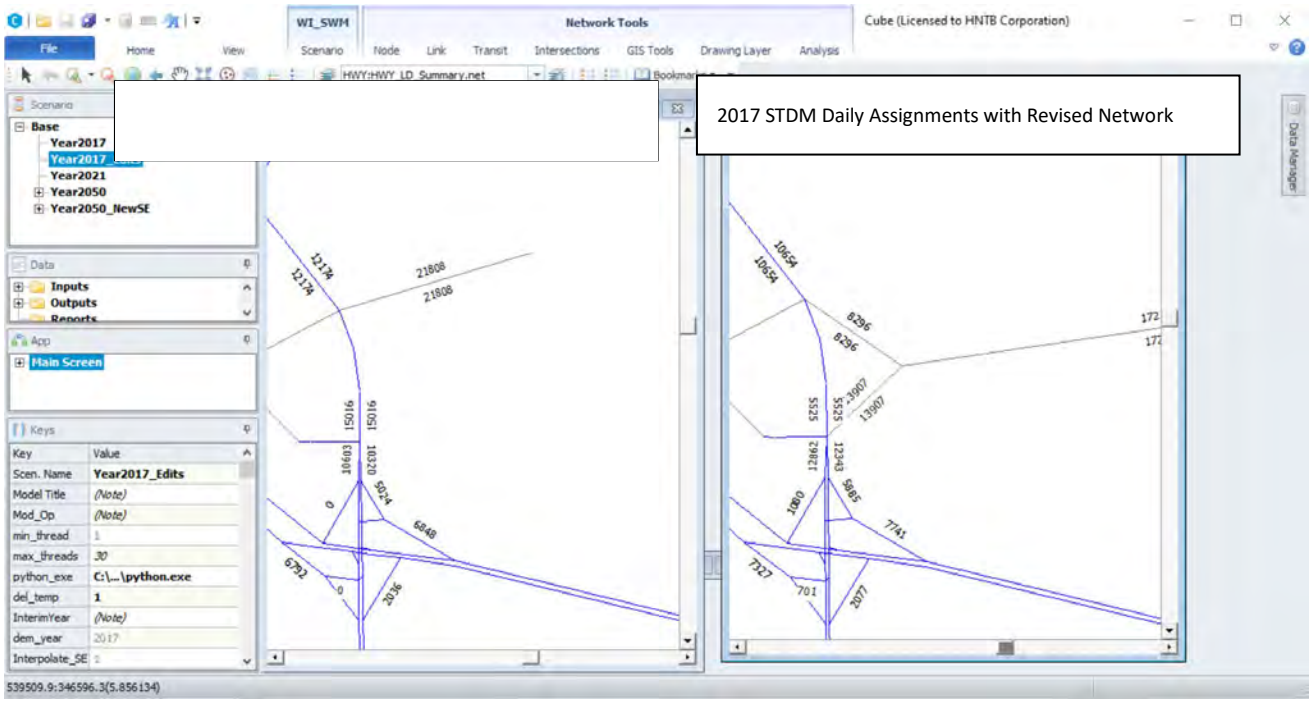
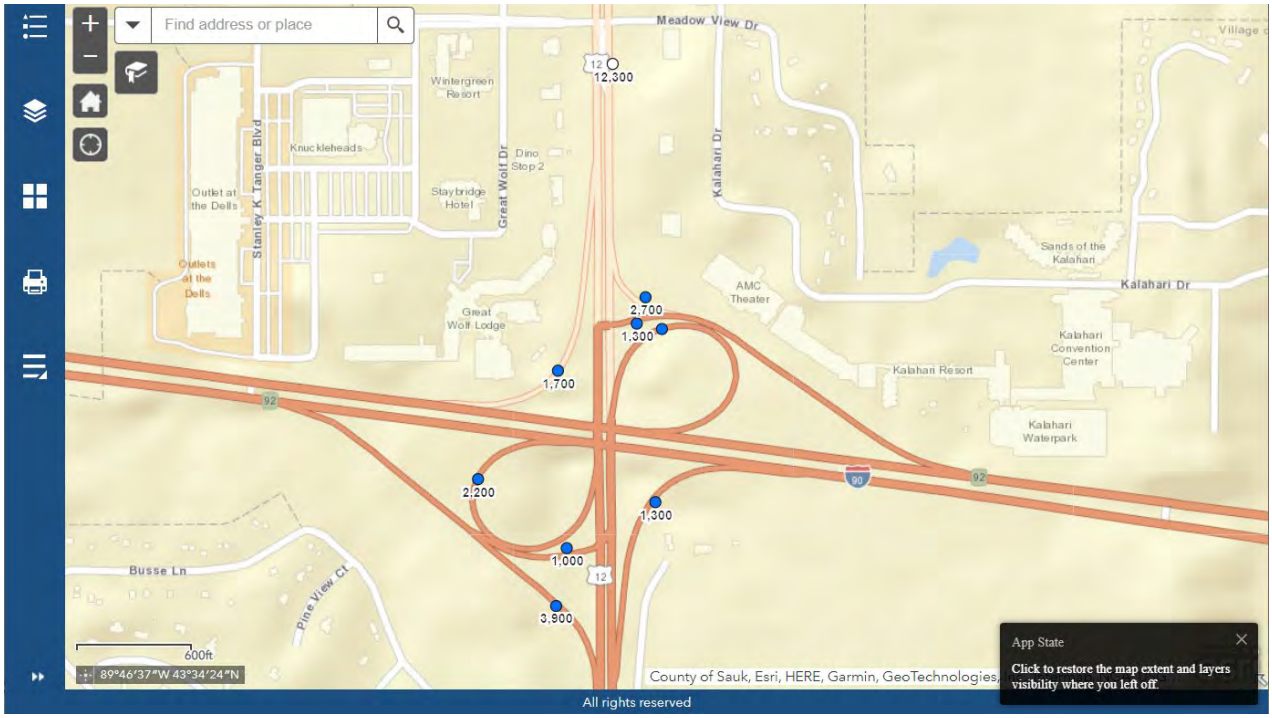



*Figure 3: Traffic counts and street map in area of US 12 interchange with I-90/94 in Lake Delton*



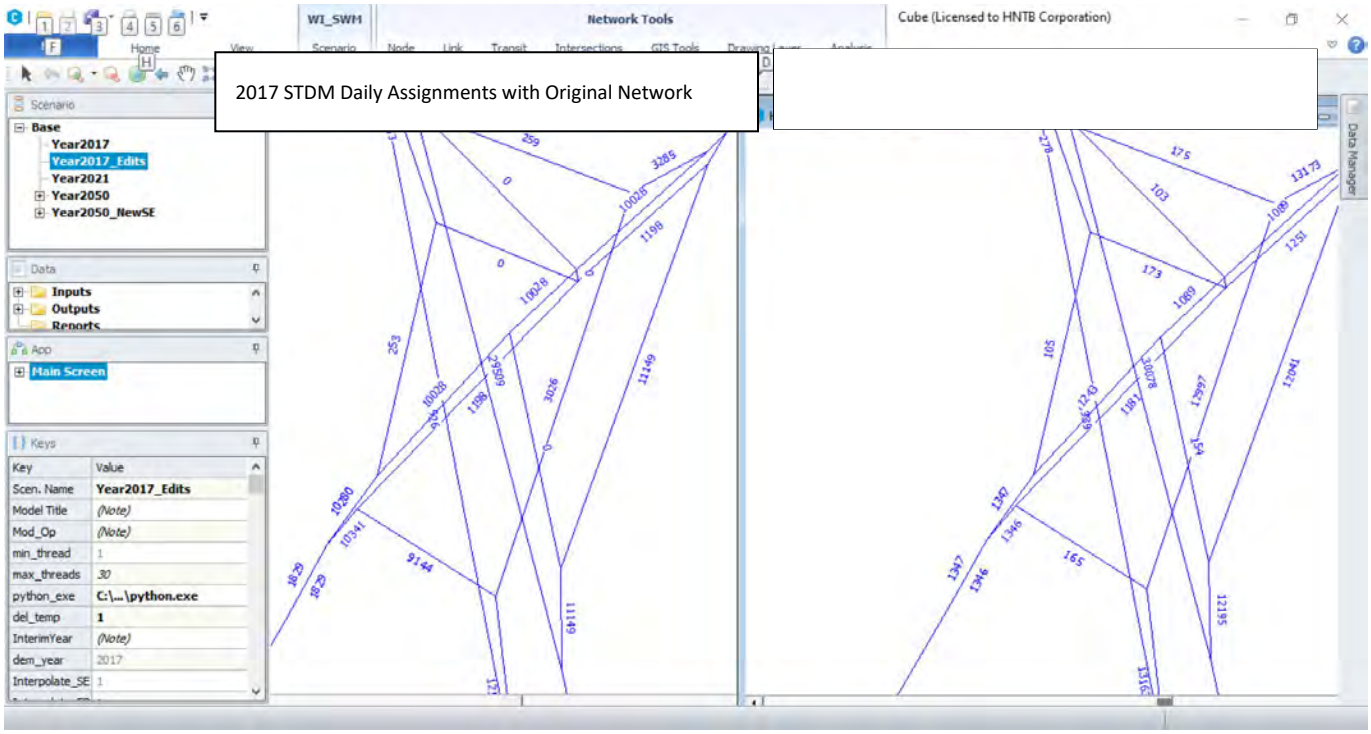
## 4.2. I-39/90/94 system interchange south of Portage

The 2017 STDM assignments at the I-39 interchange with I-90/94 south of Portage indicated an issue with how the southbound I-39 to south/eastbound I-39/90/94 movement was routed. The original geodatabase coded the system ramps that carry I-39 as service ramps with a speed of 35 miles per hour. The southbound mainline of I-39 that becomes WIS 78 was coded as interstate with a speed of 65 miles per hour. The left side of Figure 4 shows that this speed differential resulted in southbound I-39 traffic routing along WIS 78 then making a U-turn at the Petro gas station and returning north to enter I-39/90/94 as the service ramp. Modifying the link classification of both the I-39 system ramps and the segment of WIS 78 within the system interchange addressed the mis-routing as shown on the right side of Figure 4.

A second modification in the area was made to provide local access between zone 1111 and WIS 78. The initial geodatabase provided access only to CTH U. Local trips in the vicinity of the system interchange were forced to use CTH U and Cascade Road interchange with I-39. The modified access at 1111 allows those trips to use WIS 78 and the local ramps at the system interchange as shown in Figure 4.

A final modification was made to incorporate a turn prohibitor along WIS 78 at the transition from a median divided to undivided roadway south of the entrance ramp to southbound I-39/90/94. The divided roadway network in the model allowed for U-turn type movements. This provided an unrealistically shorter path than using the eastbound exit ramp to northbound I-39.

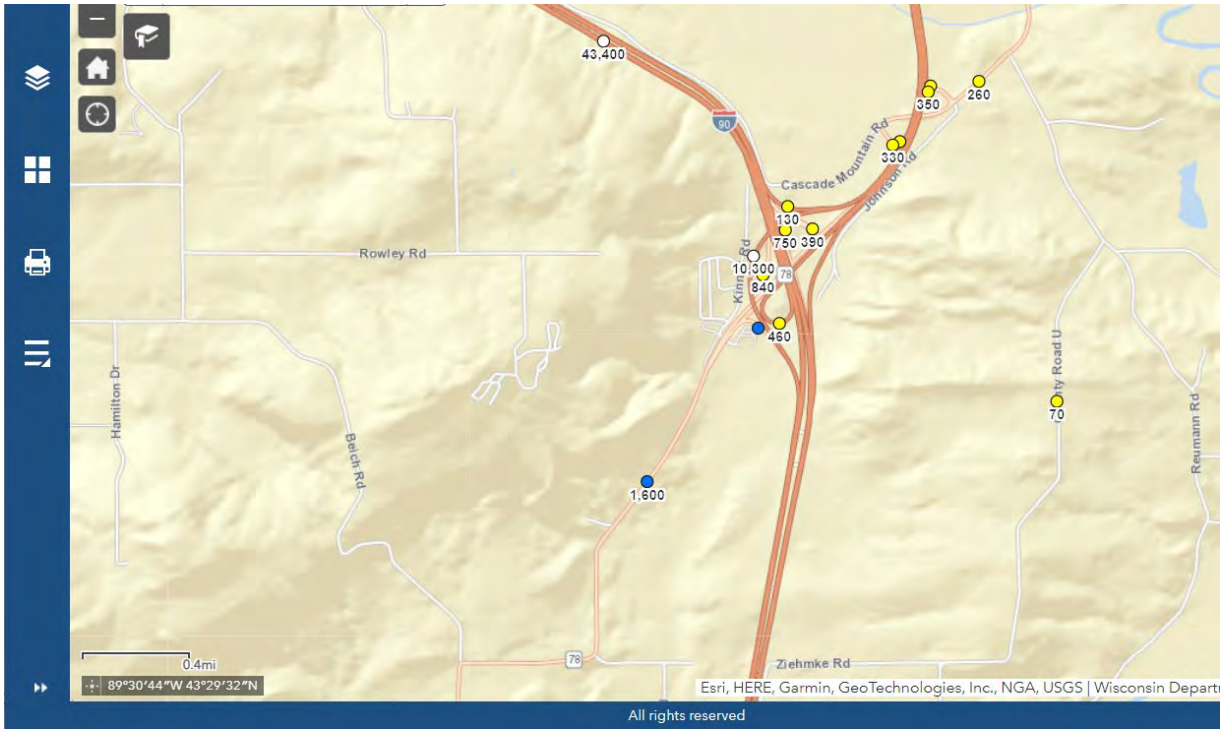
*Figure 4: 2017 STDM Assignments at I-39 interchange with I-90/94 south of Portage*




Traffic counts shown in Figure 5 indicate the modified functional classification of the I-39 ramps, the modified access to zone 1111 and the turn prohibition along WIS 79 provide improved assignments in the system interchange area. Assignments for movements between I-90/94 to the northwest and I-39 are lower than counts

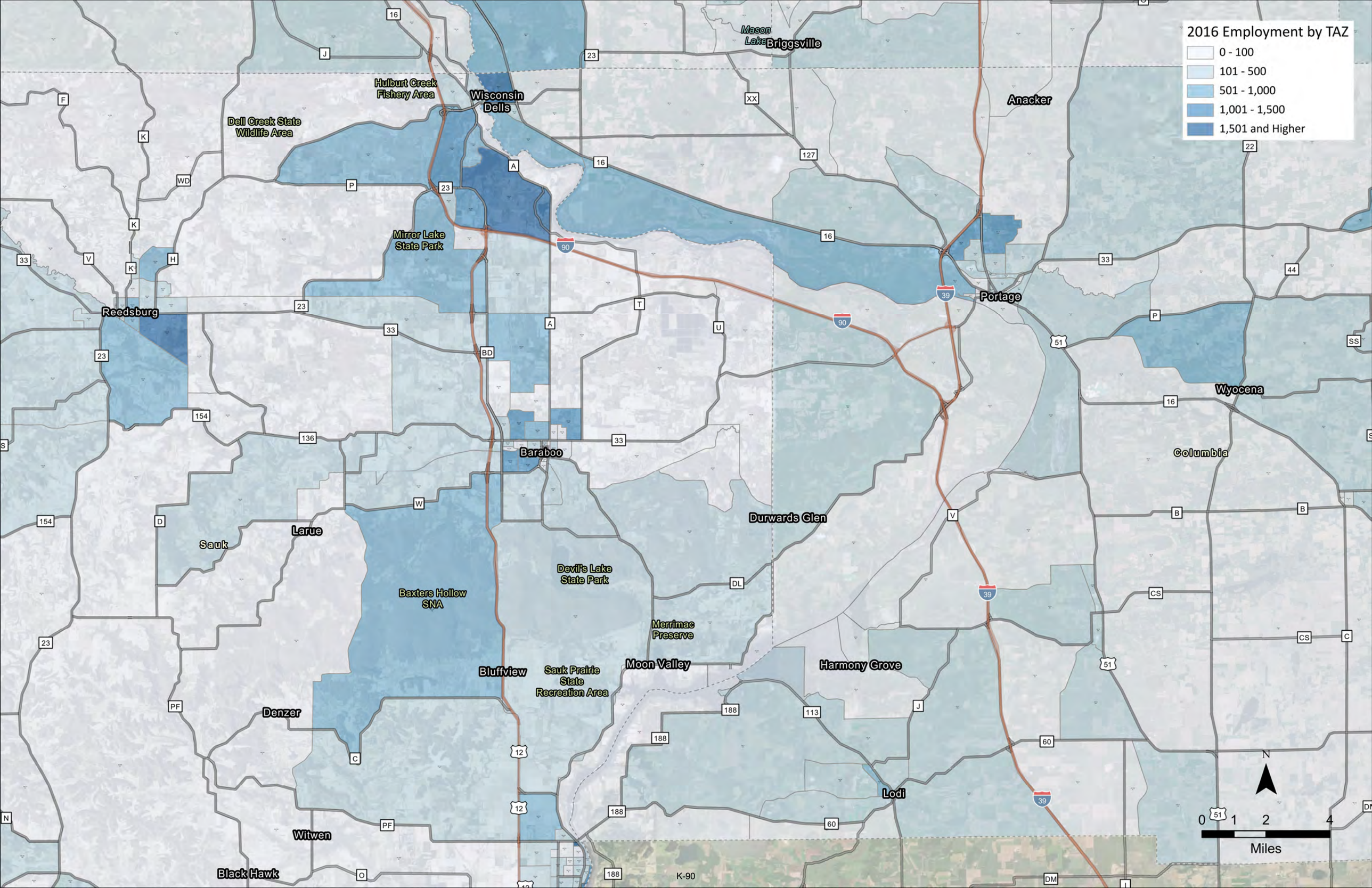
due to WIS 33 providing a faster route that the model assignments utilize compared to actual drivers who are not aware of WIS 33's connection between I-39 and I-90/94. Initial assignments on CTH U to the south and east of the system interchange were approximately 800 vehicles per day while the published count is under 100. The modified access at zone 1111 brought assignments on CTH U to under 100 vehicles per day.

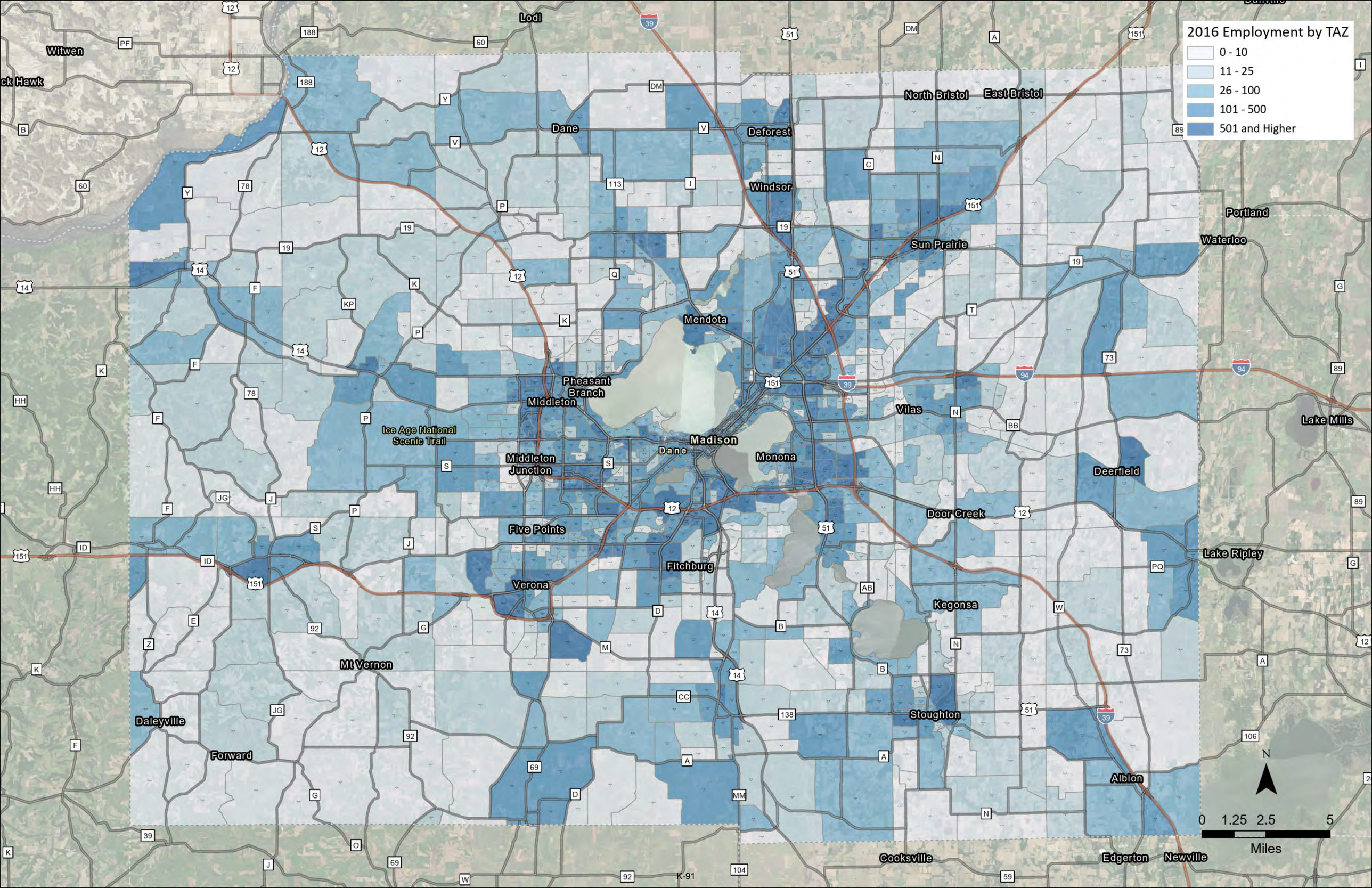
*Figure 5: Traffic counts and street map in area of I-39 interchange with I-90/94 south of Portage*



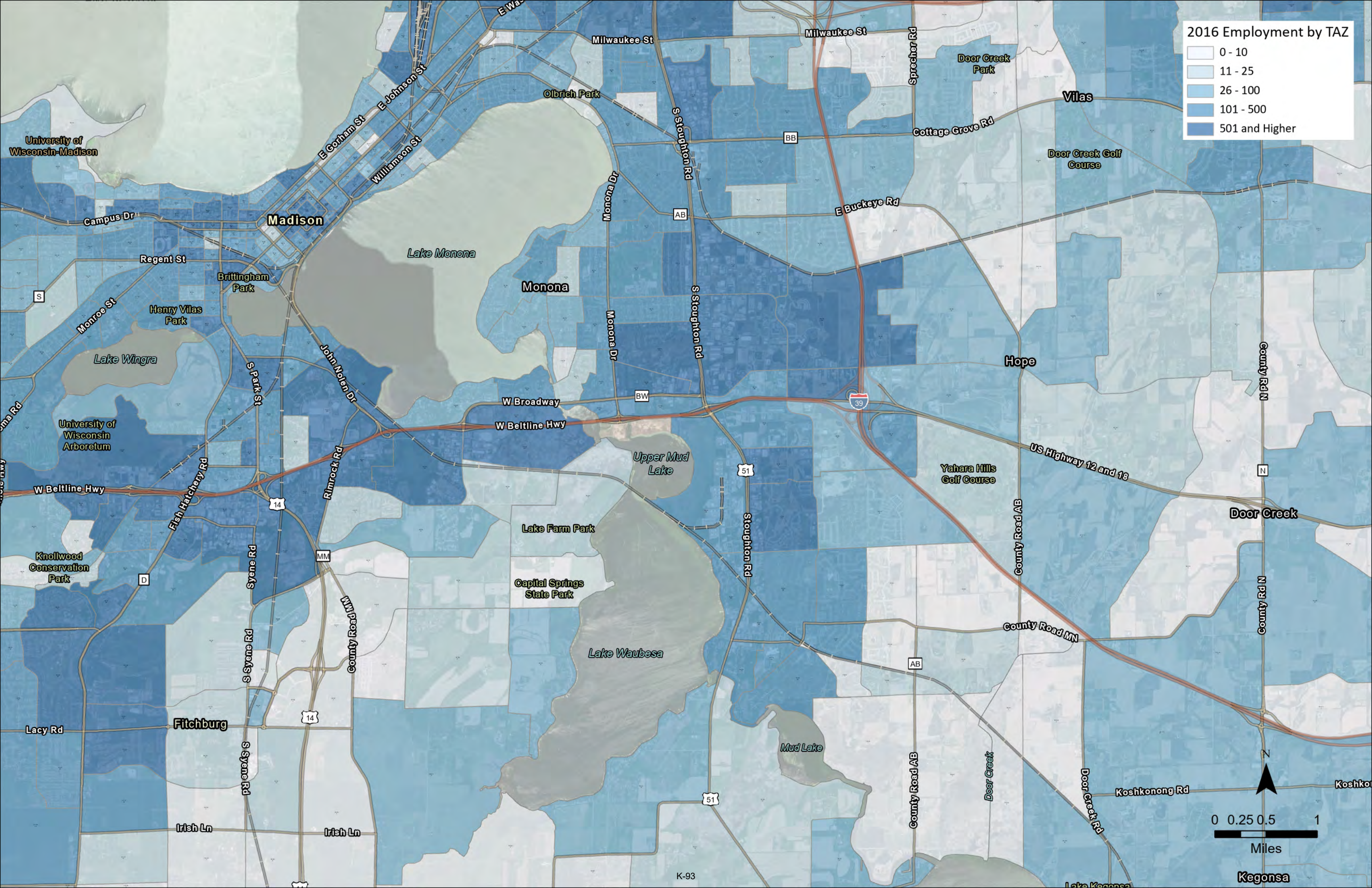
**Appendix E**
**Land use mapping**

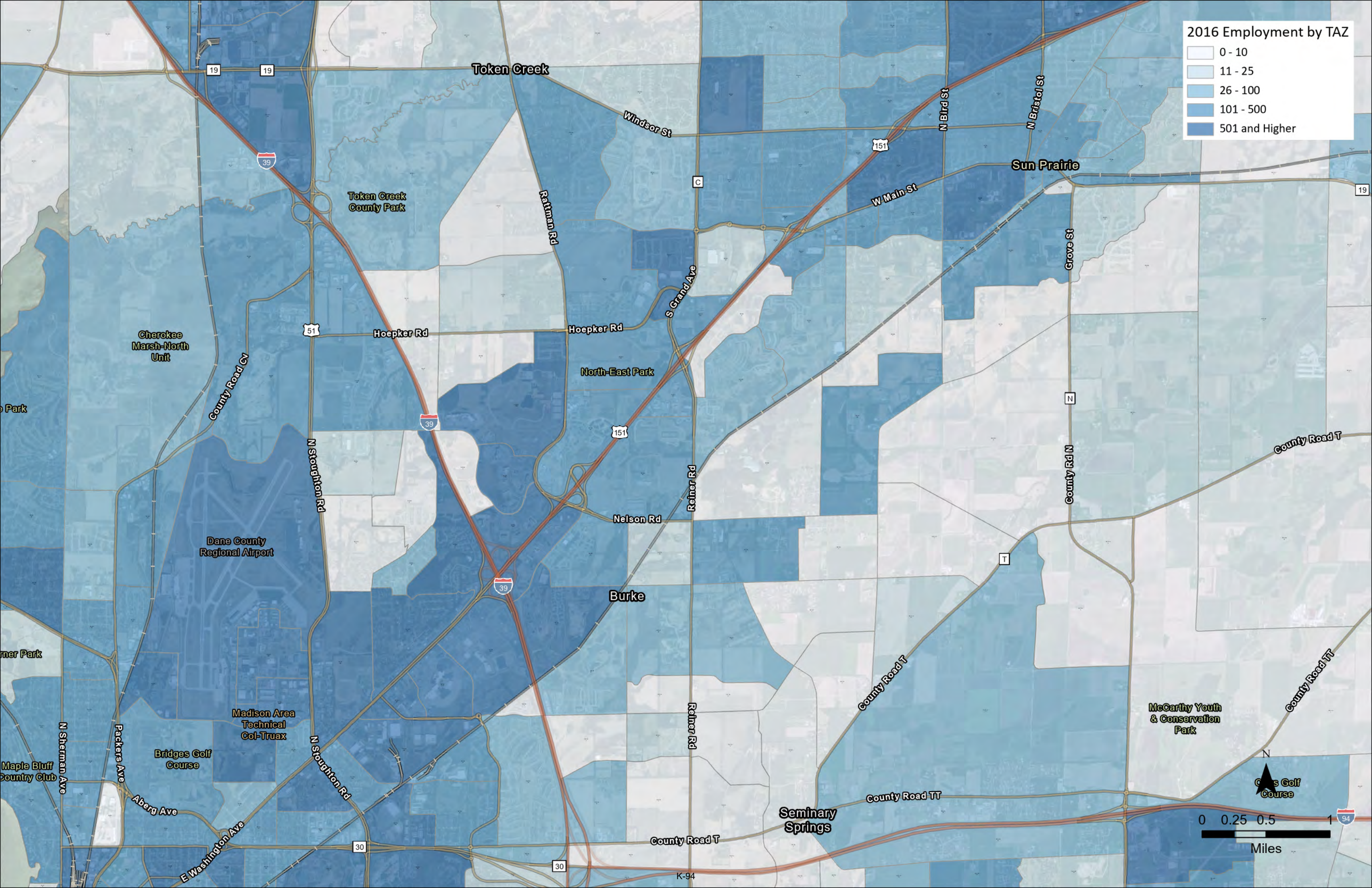
2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Lake Mendota
Lake Monona
Lake Wingra
Madison
Monona
Tenney Park
Demetral Field
Brittingham Park
Hudson Park
Olbrich Park
Heistand Park
East Morland Park
Bridges Golf Course
Maple Bluff Country Club
Madison Area Technical Col-Truax
Monona Municipal Golf Course
University of Wisconsin-Madison
University Hospital
SSM Health St. Mary's Hospital – Madison
Edgewood College
Glenway Municipal Golf Course
Resurrection Cemetery
Forest Hill Cemetery
Hoyt Park
James Madison Park
Goodman Park
Quann Park
Duane F Bowman Park
Harvey E Schmidt Park
Alliant Energy Center
Turville Point Conservation Park
Edna Taylor Conservation Park
Roselawn Memorial Park
Anderson St
Aberg Ave
Lexington Ave
Burke Ave
Commercial Ave
Webb Ave
Union St
N 5th St
Atwood Ave
E Washington Ave
Winnebago St
Dempsey Rd
Tulane Ave
Johns St
Lien Rd
E Washington Ave
Farwell Dr
Sheridan Dr
N Sherman Ave
Ruskin St
Huxley St
Oak St
Garnet Ln
Onyx Ln
Meadowlark Dr
Retana Dr
Topaz Ln
Atlas Ave
S Stoughton Rd
Leo Dr
Helgesen Dr
Daniels St
Dairy Dr
Agriculture Dr
Progress Rd
Femrite Dr
E Buckeye Rd
Vondron Rd
Ellen Ave
Monona Dr
Hegg Ave
Drexel Ave
Maher Ave
Turner Ave
Camden Rd
E Dean Ave
W Dean Ave
Douglas Trl
Acacia Ln
Nichols Rd
Owen Rd
Tonyawatha Trl
Winneyhaha Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
Langdon St
Linden Dr
Campus Dr
University Ave
W Johnson St
Locust Dr
Harvey St
Price Pl
Van Hise Ave
Rowley Ave
Regent St
Hillcrest Dr
Keating Ter
Ames St
Odana Rd
Council Crst
Yuma Dr
Oxford Rd
Edgehill Dr
Lake Mendota Dr
Owen Dr
Larkin St
Toepfer Ave
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
N Wingra Dr
S Park St
S Midvale Blvd
John Nolen Dr
E Dayton St
E Main St
Williamson St
Spaight St
Bram St
Bay Club
Club
30
39
BB
0 0.25 0.5
Miles
N

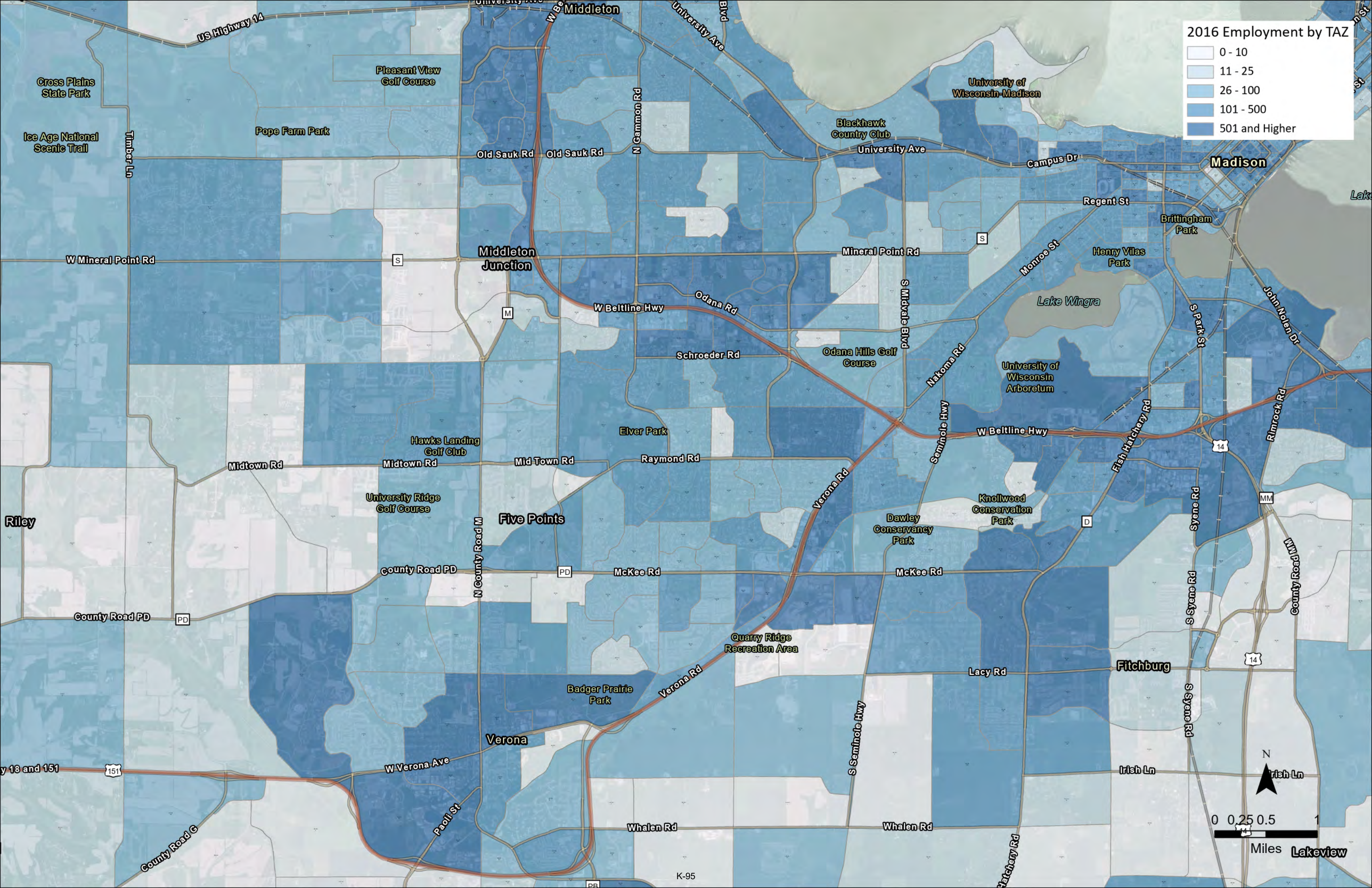

2016 Employment by TAZ
0 - 100
101 - 500
501 - 1,000
1,001 - 1,500
1,501 and Higher
Mason Lake
Briggsville
Hulburt Creek Fishery Area
Wisconsin Dells
Anacker
Dell Creek State Wildlife Area
Mirror Lake State Park
Portage
Reedsburg
Baraboo
Wyocena
Columbia
Durwards Glen
Sauk
Larue
Devil's Lake State Park
Baxters Hollow SNA
Merrimac Preserve
Bluffview
Sauk Prairie State Recreation Area
Moon Valley
Harmony Grove
Denzer
Lodi
Witwen
Black Hawk
K-90
N
0 1 2 4
Miles

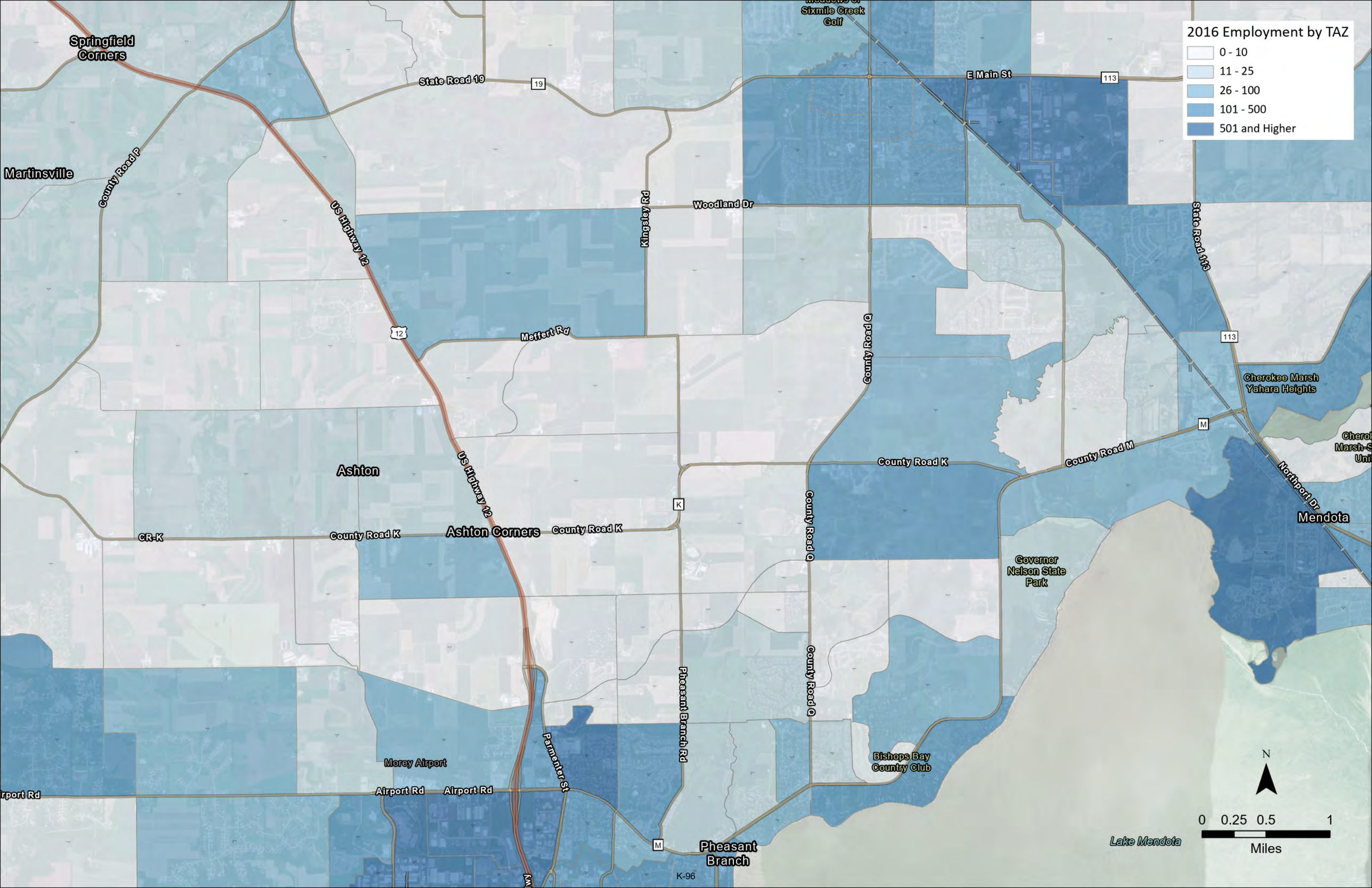

2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Lodi
Witwen
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Ice Age National Scenic Trail
Madison
Middleton Junction
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Stoughton
Daleyville
Forward
Albion
Cooksville
Edgerton
Newville
N
0 1.25 2.5 5
Miles

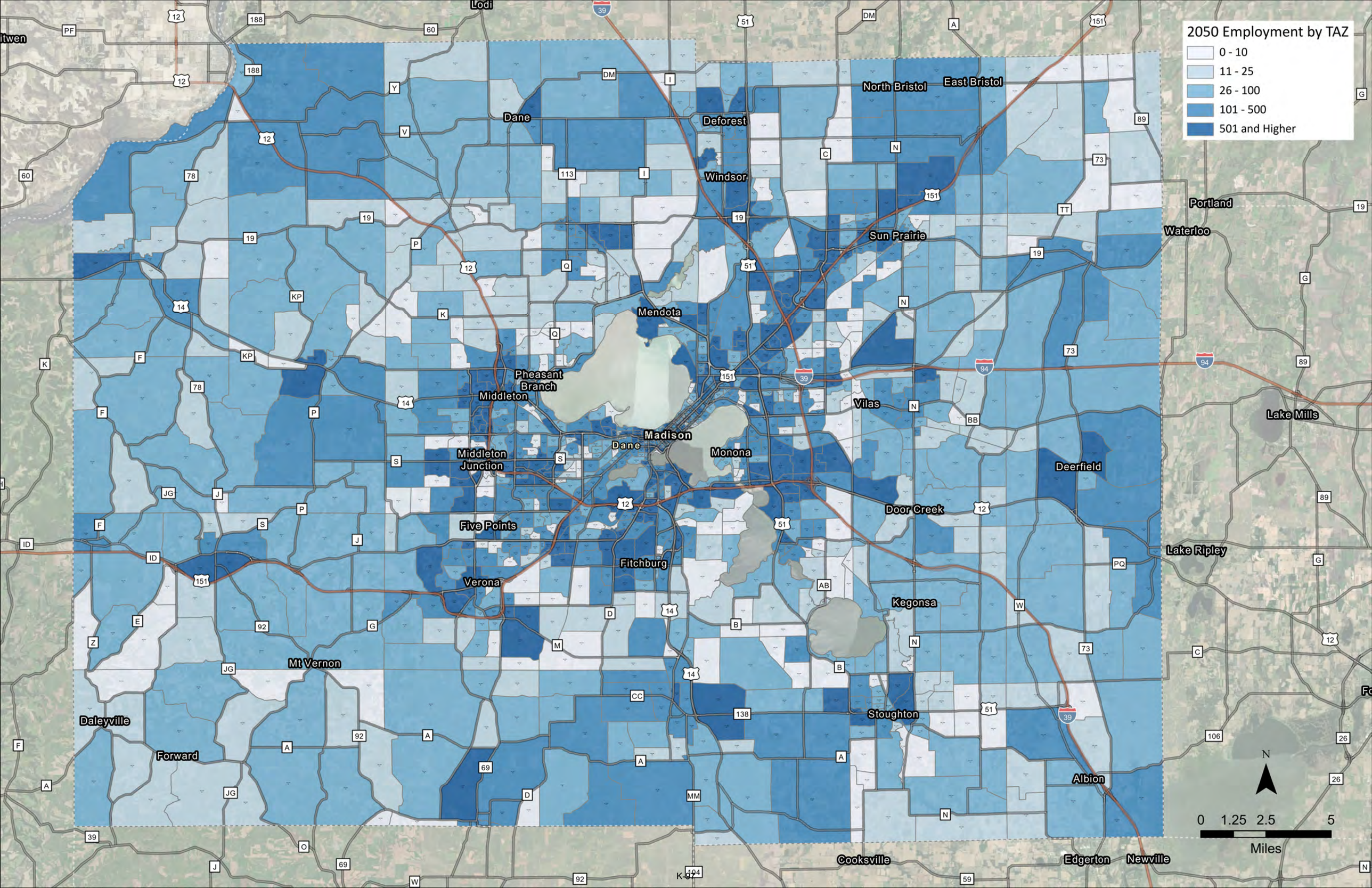
2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Lake Mendota
Lake Monona
Lake Wingra
Madison
Monona
Maple Bluff Country Club
Bridges Golf Course
Madison Area Technical Col-Truax
Lien Rd
Anderson St
Sheridan Dr
Farwell Dr
N Sherman Ave
Ruskin St
Huxley St
Packers Ave
N Stoughton Rd
Lexington Ave
Myrtle St
Burke Ave
Commercial Ave
Webb Ave
Demetral Field
Oak St
Union St
N 5th St
Heistand Park
East Morland Park
Garnet Ln
Meadowlark Dr
Onyx Ln
Retana Dr
Tenney Park
Winnebago St
Atwood Ave
E Washington Ave
Olbrich Park
Hudson Park
Dennett Dr
Johns St
Dempsey Rd
Atlas Ave
Topaz Ln
E Dayton St
James Madison Park
E Main St
Williamson St
Spaight St
Langdon St
Observatory Dr
University Hospital
University Ave
Harvey St
Campus Dr
Kendall Ave
W Johnson St
Van Hise Ave
Hoyt Park
Regent St
Resurrection Cemetery
Rowley Ave
Forest Hill Cemetery
Hillcrest Dr
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
Brittingham Park
John Nolen Dr
Edgewood College
SSM Health St. Mary's Hospital – Madison
N Wingra Dr
Glenway Municipal Golf Course
Larkin St
Toepfer Ave
S Owen Dr
S Midvale Blvd
Goodman Park
Turville Point Conservation Park
S Park St
Quann Park
Alliant Energy Center
Duane F Bowman Park
Bram St
Harvey E Schmidt Park
Council Crst
Yuma Dr
Tonyawatha Trl
Monona Municipal Golf Course
W Dean Ave
E Dean Ave
Nichols Rd
Douglas Trl
Acacia Ln
Owen Rd
Winnequah Rd
Bridge Rd
Edna Taylor Conservation Park
Roselawn Memorial Park
Femrite Dr
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
Monona Dr
Hegg Ave
Drexel Ave
Maher Ave
Buckeye Rd
Turner Ave
Camden Rd
E Buckeye Rd
S Stoughton Rd
Helgesen Dr
Vondron Rd
Daniels St
Progress Rd
Dairy Dr
Agriculture Dr
Leo Dr
Ellen Ave
Lake Mendota Dr
Edgehill Dr
Oxford Rd
University of Wisconsin-Madison
Locust Dr
University Ave
Price Pl
Keating Ter
Ames St
Odana Rd
Yuma Dr
Koma Rd
Lake Mendota Bay Club
30
39
BB
N
0 0.25 0.5
Miles

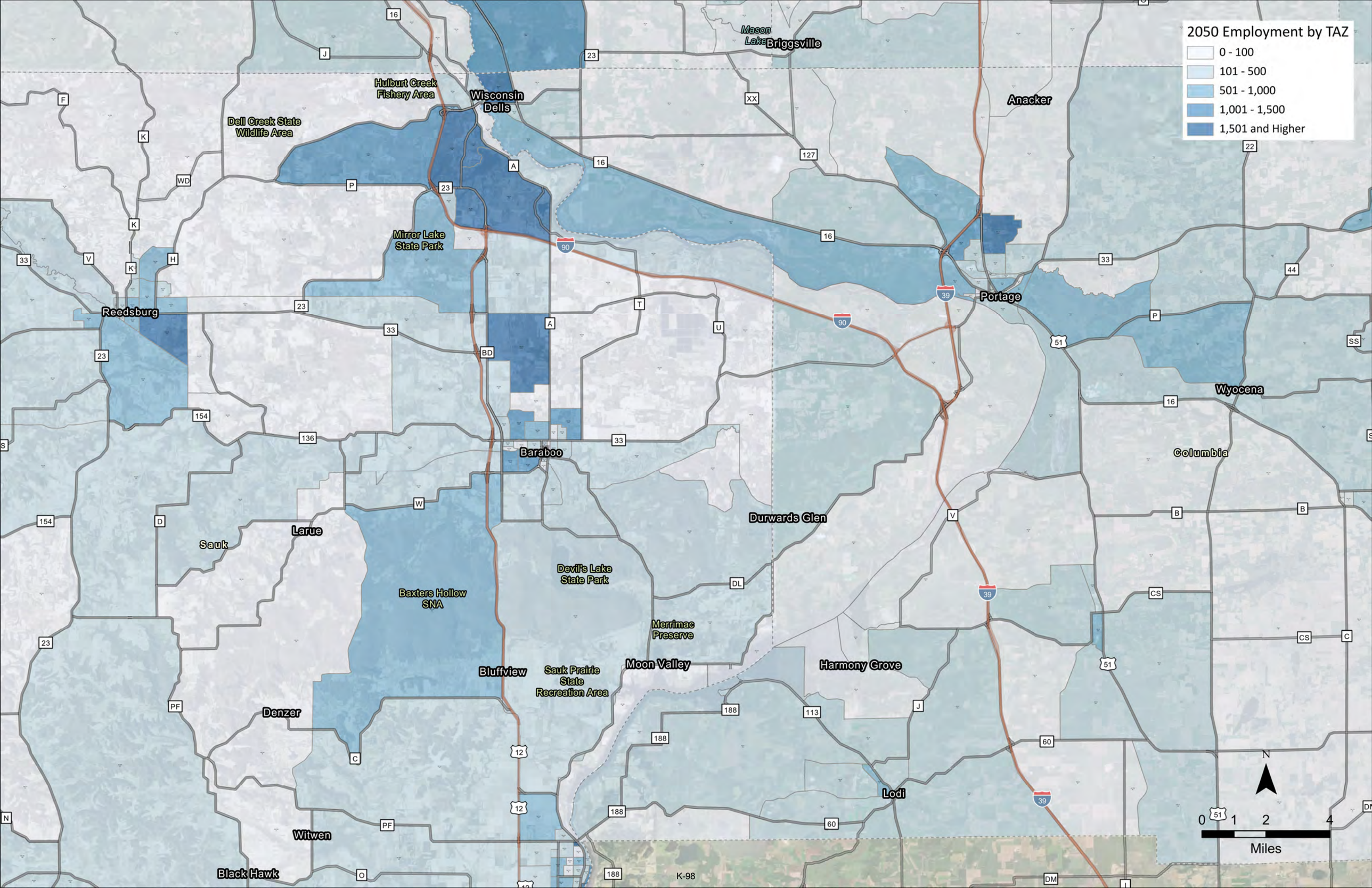

2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Milwaukee St
Olbrich Park
Sprecher Rd
Door Creek Park
Vilas
Cottage Grove Rd
Door Creek Golf Course
University of Wisconsin-Madison
E Gorham St
E Johnson St
Williamson St
S Stoughton Rd
BB
Monona Dr
AB
E Buckeye Rd
Campus Dr
Madison
Regent St
Brittingham Park
Lake Monona
Monona
S
Monroe St
Henry Vilas Park
Lake Wingra
John Nolen Dr
S Park St
Hope
W Broadway
BW
39
W Beltline Hwy
University of Wisconsin Arboretum
Upper Mud Lake
51
US Highway 12 and 18
Yahara Hills Golf Course
County Rd N
Door Creek
Rimrock Rd
Fish Hatchery Rd
14
Lake Farm Park
Knollwood Conservation Park
D
Syene Rd
MM
Capital Springs State Park
County Road MN
Lake Waubesa
Mud Lake
Door Creek
Door Creek Rd
Koshkonong Rd
Lacy Rd
Fitchburg
Irish Ln
S Syene Rd
County Road MN
Kegonsa
N
0 0.25 0.5 1
Miles

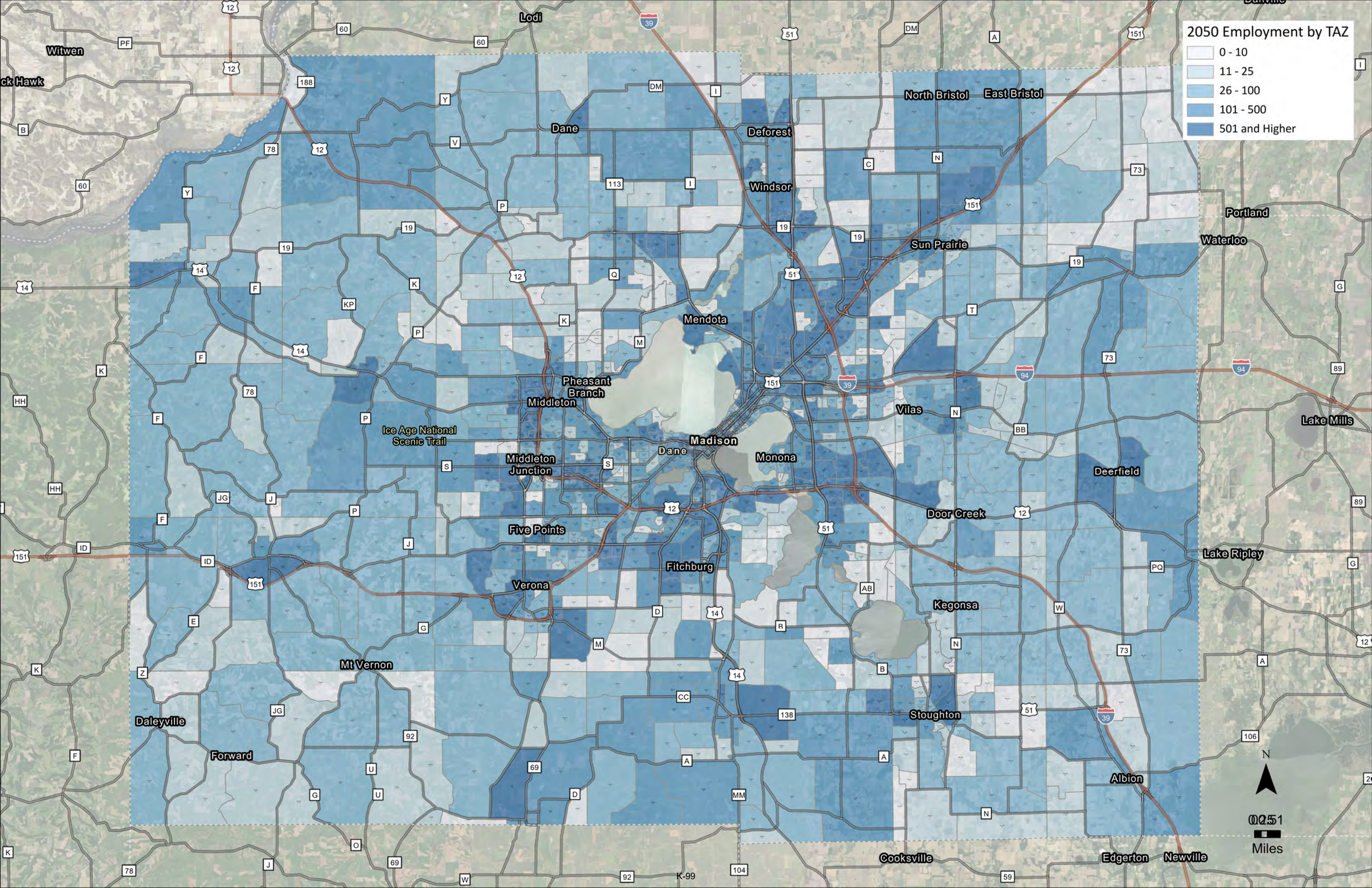

2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Token Creek
Windsor St
Token Creek County Park
Rattman Rd
C
N Bird St
N Bristol St
151
Sun Prairie
W Main St
Grove St
19
S Grand Ave
Hoepker Rd
Hoepker Rd
51
Cherokee Marsh-North Unit
North-East Park
County Road CV
39
N Stoughton Rd
Nelson Rd
Reiner Rd
County Rd N
County Road T
Dane County Regional Airport
Burke
T
Madison Area Technical Col-Truax
Bridges Golf Course
Packers Ave
N Sherman Ave
Aberg Ave
E Washington Ave
30
Seminary Springs
County Road TT
McCarthy Youth & Conservation Park
K-94
94
N
0 0.25 0.5 1
Miles


2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
US Highway 14
Middleton
University Ave
Cross Plains State Park
Pleasant View Golf Course
University of Wisconsin-Madison
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
Blackhawk Country Club
University Ave
Campus Dr
Madison
Regent St
Brittingham Park
W Mineral Point Rd
Middleton Junction
Mineral Point Rd
Monroe St
Henry Vilas Park
W Beltline Hwy
Odana Rd
S Midvale Blvd
Lake Wingra
John Nolen Dr
S Park St
Schroeder Rd
Odana Hills Golf Course
Nakoma Rd
University of Wisconsin Arboretum
Seminole Hwy
Fish Hatchery Rd
Rimrock Rd
Elver Park
Hawks Landing Golf Club
Midtown Rd
Mid Town Rd
Raymond Rd
University Ridge Golf Course
Five Points
Verona Rd
Dawley Conservancy Park
Knollwood Conservation Park
Syene Rd
County Road M
County Road MM
Riley
County Road PD
McKee Rd
Quarry Ridge Recreation Area
Fitchburg
Lacy Rd
Badger Prairie Park
Verona
S Seminole Hwy
S Syene Rd
W Verona Ave
Irish Ln
Paoli St
Whalen Rd
County Road G
K-95
Lakeview
N
0 0.25 0.5 1
Miles

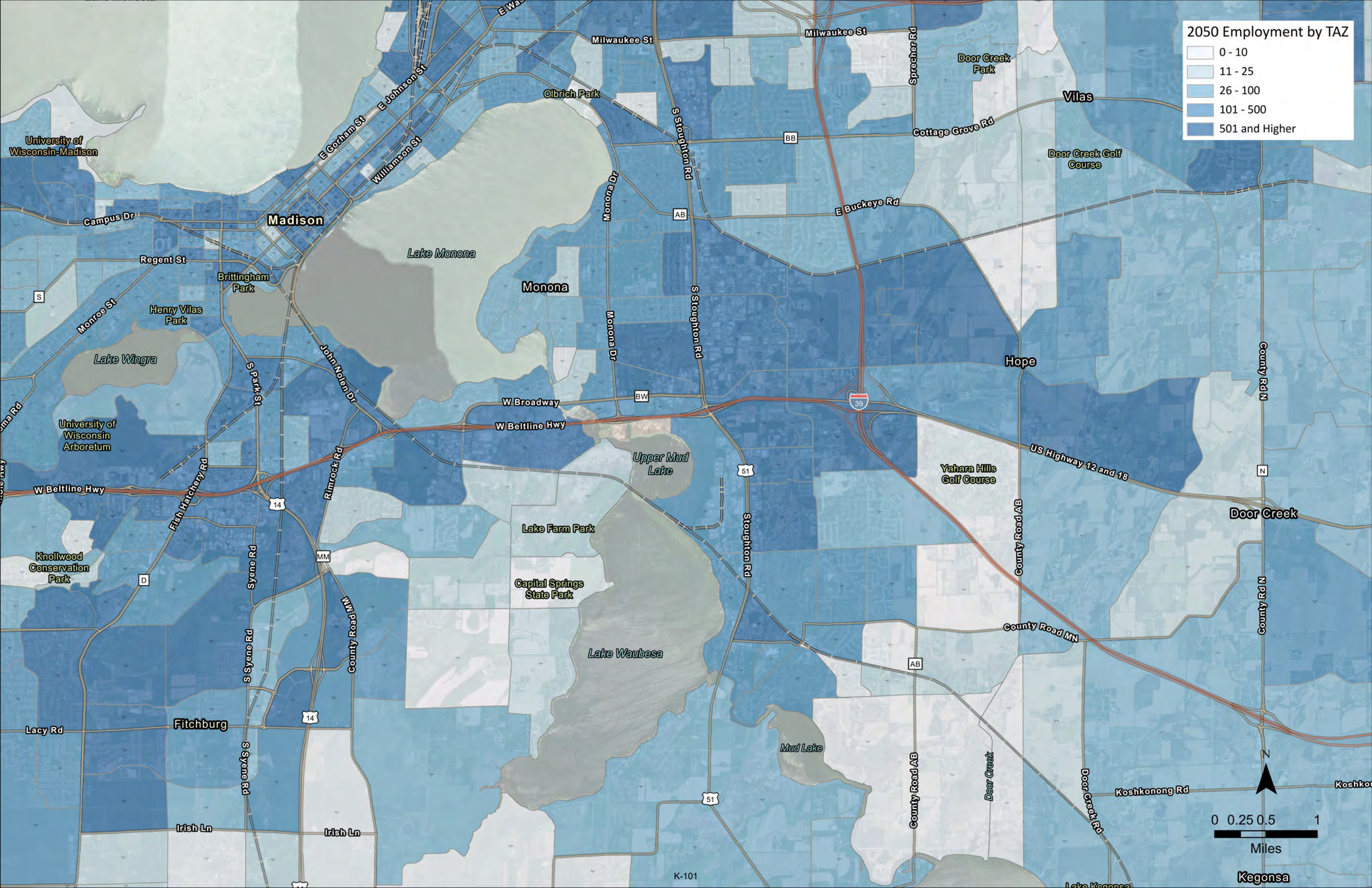

2016 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Springfield Corners
Martinsville
County Road P
State Road 19
19
US Highway 12
12
Kingsley Rd
Woodland Dr
Metfert Rd
Sixmile Creek Golf
E Main St
113
State Road 113
County Road Q
Cherokee Marsh Yahara Heights
M
Ashton
CR-K
County Road K
Ashton Corners
K
County Road M
Northport Dr
Mendota
Governor Nelson State Park
Pheasant Branch Rd
Parmenter St
Morey Airport
Airport Rd
Bishops Bay Country Club
Pheasant Branch
K-96
Lake Mendota
N
0 0.25 0.5 1
Miles

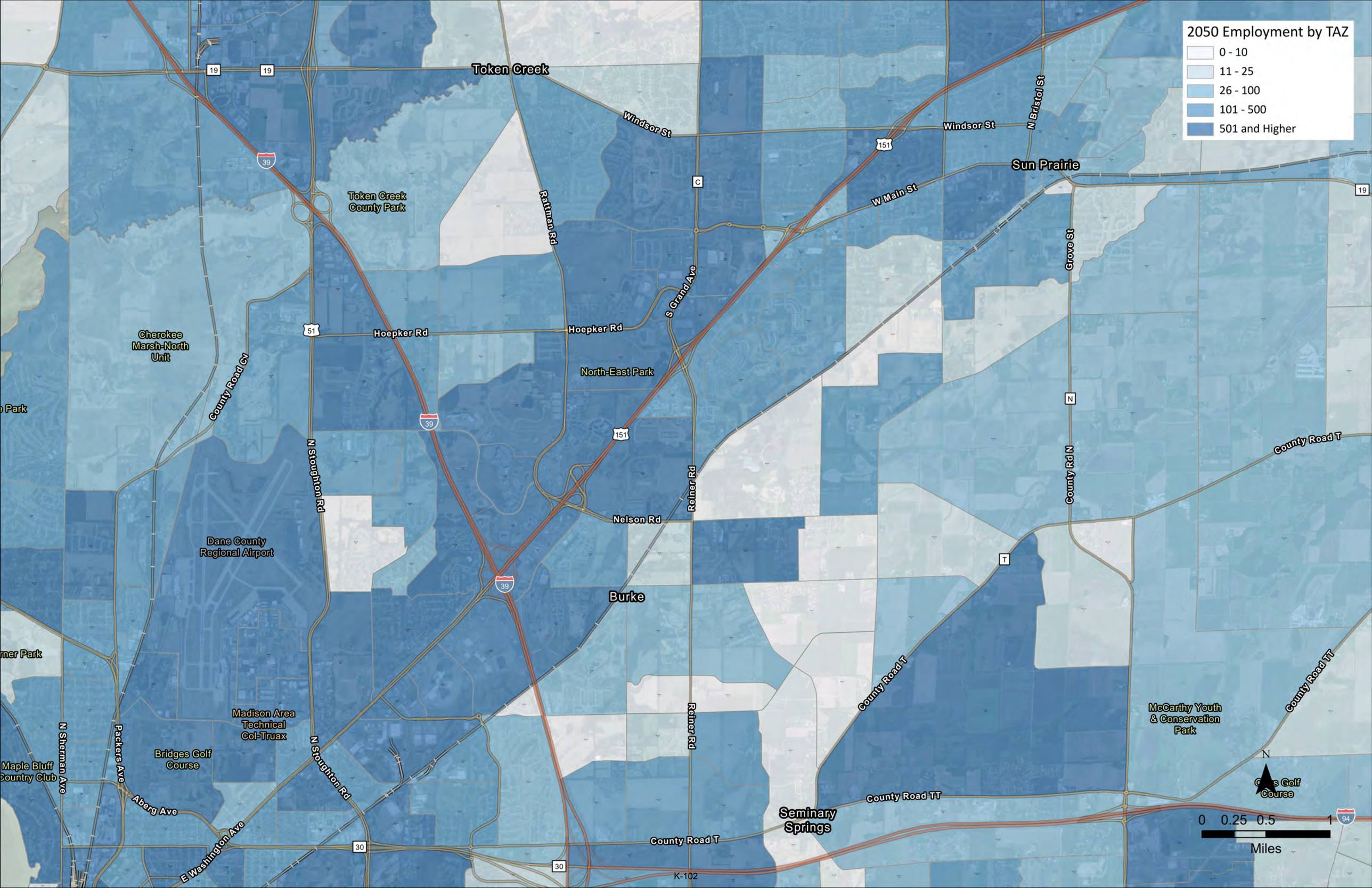

2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Madison
Middleton Junction
Monona
Vilas
Deerfield
Door Creek
Lake Ripley
Lake Mills
Five Points
Fitchburg
Verona
Kegonsa
Stoughton
Mt Vernon
Daleyville
Forward
Albion
Cooksville
Edgerton
Newville
N
0 1.25 2.5 5
Miles

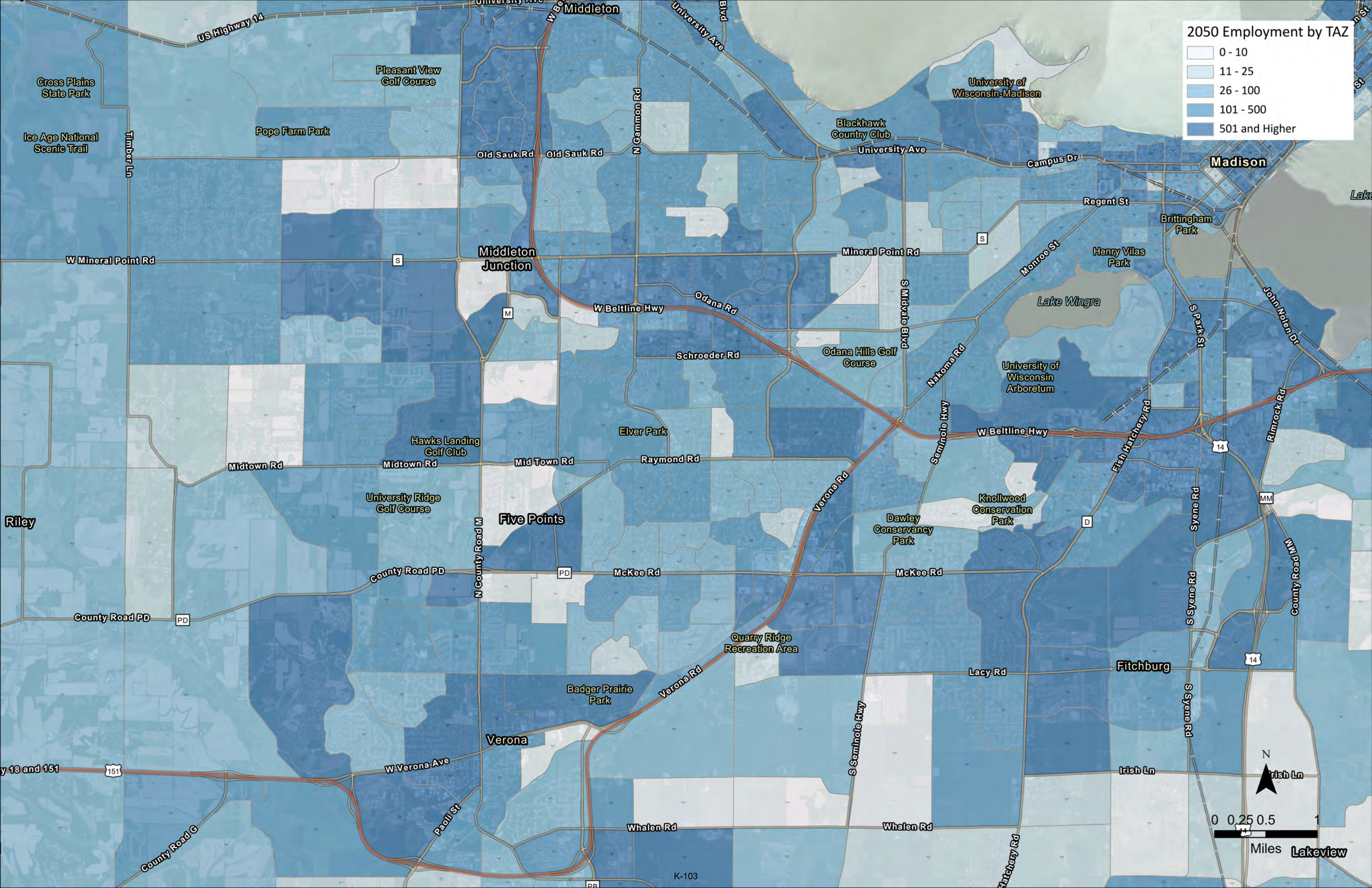

2050 Employment by TAZ
0 - 100
101 - 500
501 - 1,000
1,001 - 1,500
1,501 and Higher
Mason Lake
Briggsville
Hulburt Creek Fishery Area
Wisconsin Dells
Dell Creek State Wildlife Area
Anacker
Mirror Lake State Park
Reedsburg
Portage
Wyocena
Baraboo
Columbia
Durwards Glen
Sauk
Larue
Devil's Lake State Park
Baxters Hollow SNA
Merrimac Preserve
Bluffview
Sauk Prairie State Recreation Area
Moon Valley
Harmony Grove
Denzer
Lodi
Witwen
Black Hawk
K-98
N
0 1 2 4
Miles

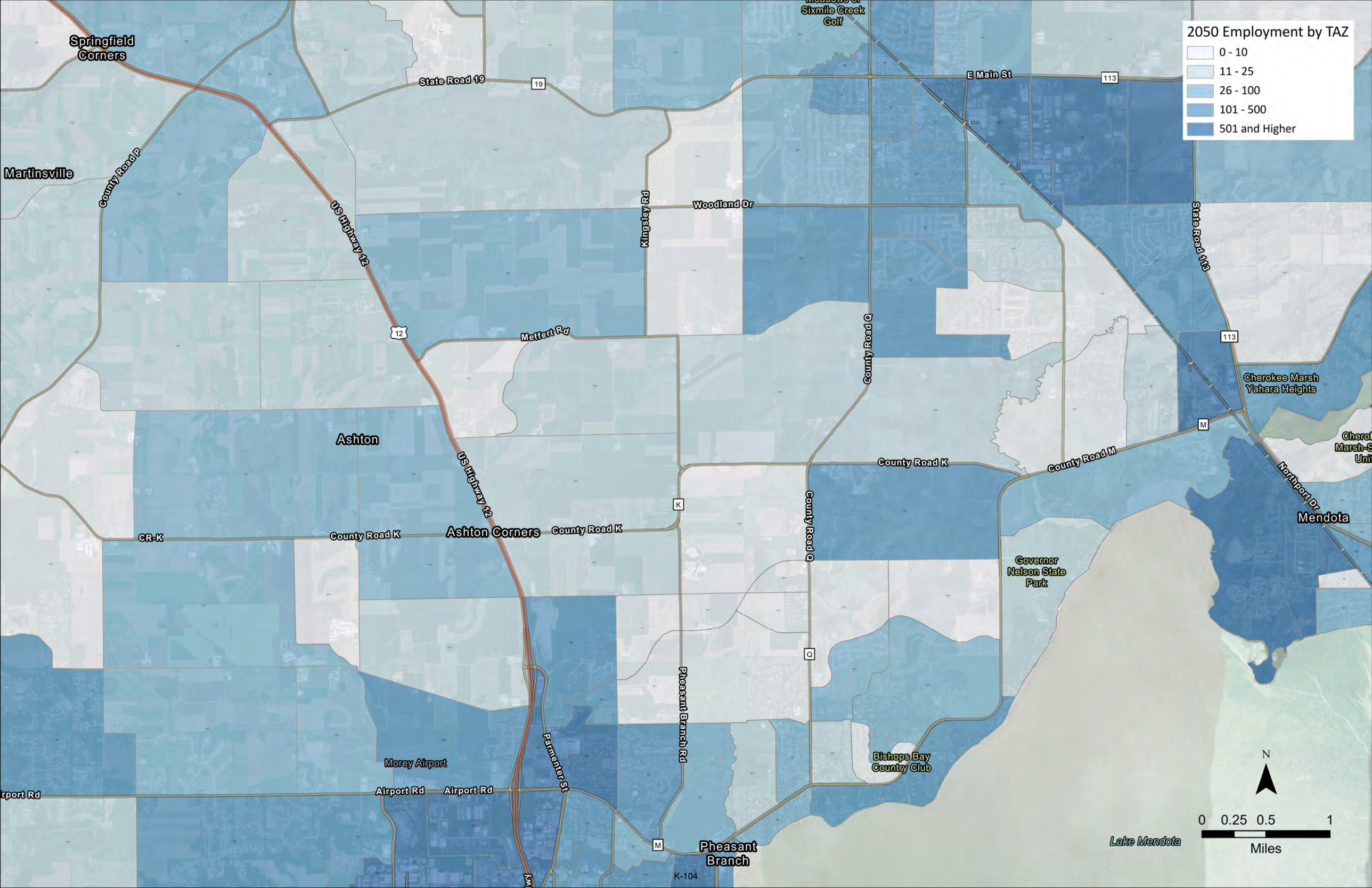

2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Lodi
Witwen
Dane
Deforest
North Bristol
East Bristol
Windsor
Portland
Waterloo
Sun Prairie
Mendota
Pheasant Branch
Middleton
Ice Age National Scenic Trail
Middleton Junction
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Stoughton
Daleyville
Forward
Albion
Cooksville
Edgerton
Newville
K-99
N
0 0.25 0.5
Miles

2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Lake Mendota
Lake Monona
Lake Wingra
Madison
Monona
Maple Bluff Country Club
Bridges Golf Course
Madison Area Technical Col-Truax
Demetral Field
Tenney Park
Hudson Park
Olbrich Park
East Morland Park
Heistand Park
Brittingham Park
James Madison Park
University of Wisconsin-Madison
University Hospital
Hoyt Park
Resurrection Cemetery
Forest Hill Cemetery
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
Goodman Park
Turville Point Conservation Park
Quann Park
Alliant Energy Center
Duane F Bowman Park
Harvey E Schmidt Park
Monona Municipal Golf Course
Edna Taylor Conservation Park
Rcselawn Memorial Park
Myrtle St
Lexington Ave
Burke Ave
Commercial Ave
Webb Ave
Union St
Atwood Ave
Richard St
Tulane Ave
Dempsey Rd
Onyx Ln
Garnet Ln
Meadowlark Dr
Merryturn Rd
Topaz Ln
Atlas Ave
S Stoughton Rd
N Stoughton Rd
Lien Rd
Anderson St
Sheridan Dr
Farwell Dr
N Sherman Ave
Ruskin St
Huxley St
Packers Ave
Oak St
N 5th St
Winnebago St
E Washington Ave
E Dayton St
E Main St
Williamson St
Spaight St
Johns St
Observatory Dr
University Ave
Campus Drive
W Johnson St
Van Hise Ave
Regent St
Rowley Ave
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
John Nolen Dr
N Wingra Dr
S Park St
Lake Mendota Dr
Edgehill Dr
Oxford Rd
Locust Dr
Harvey St
Price Pl
Hillcrest Dr
S Owen Dr
Larkin St
Toepfer Ave
Keating Ter
Ames St
S Midvale Blvd
Odana Rd
Council Crst
Yuma Dr
Koma Rd
W Dean Ave
E Dean Ave
E Buckeye Rd
Drexel Ave
Hegg Ave
Buckeye Rd
Maher Ave
Turner Ave
Camden Rd
Vondron Rd
Ellen Ave
Helgesen Dr
Daniels St
Dairy Dr
Agriculture Dr
Progress Rd
Tonyawatha Trl
Midmoor Rd
Douglas Trl
Acacia Ln
Owen Rd
Monona Dr
Winnebah Rd
Bridge Rd
Femrite Dr
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
Leo Dr
30
39
BB
N
0 0.25 0.5
Miles


2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Milwaukee St
Olbrich Park
E Johnson St
E Gorham St
Williamson St
University of Wisconsin-Madison
Campus Dr
Madison
Regent St
Brittingham Park
Monroe St
Henry Vilas Park
Lake Wingra
S Park St
John Nolen Dr
Lake Monona
Monona
Monona Dr
S Stoughton Rd
BB
AB
BW
Cottage Grove Rd
E Buckeye Rd
Milwaukee St
Sprecher Rd
Door Creek Park
Vilas
Door Creek Golf Course
Hope
County Rd N
W Broadway
W Beltline Hwy
39
51
University of Wisconsin Arboretum
Fish Hatchery Rd
Rimrock Rd
14
MM
D
Knollwood Conservation Park
Syene Rd
S Syene Rd
County Road MN
Upper Mud Lake
Lake Farm Park
Capital Springs State Park
Lake Waubesa
Mud Lake
Stoughton Rd
Yahara Hills Golf Course
US Highway 12 and 18
County Road AB
Door Creek
Door Creek Rd
Koshkonong Rd
Fitchburg
Lacy Rd
Irish Ln
N
0 0.25 0.5 1
Miles
Kegonsa


2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Token Creek
Windsor St
Sun Prairie
W Main St
Rattman Rd
S Grand Ave
Grove St
N Bristol St
Token Creek County Park
Cherokee Marsh-North Unit
Hoepker Rd
North-East Park
County Road CV
N Stoughton Rd
Dane County Regional Airport
Nelson Rd
Reiner Rd
Burke
County Road T
County Rd N
County Road TT
McCarthy Youth & Conservation Park
Madison Area Technical Col-Truax
Bridges Golf Course
Maple Bluff Country Club
N Sherman Ave
Packers Ave
Aberg Ave
E Washington Ave
Seminary Springs
K-102
0 0.25 0.5 1
Miles
N


2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
US Highway 14
Middleton
University Ave
Cross Plains State Park
Pleasant View Golf Course
University of Wisconsin-Madison
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
Blackhawk Country Club
Campus Dr
Madison
Regent St
Brittingham Park
W Mineral Point Rd
Middleton Junction
Mineral Point Rd
Monroe St
Henry Vilas Park
W Beltline Hwy
Odana Rd
S Midvale Blvd
Lake Wingra
John Nolen Dr
S Park St
Schroeder Rd
Odana Hills Golf Course
Nakoma Rd
University of Wisconsin Arboretum
Seminole Hwy
Fish Hatchery Rd
Rimrock Rd
Elver Park
Hawks Landing Golf Club
Midtown Rd
Mid Town Rd
Raymond Rd
Verona Rd
University Ridge Golf Course
Riley
Five Points
N County Road M
Knollwood Conservation Park
Dawley Conservancy Park
Syene Rd
S Syene Rd
County Road MM
County Road PD
McKee Rd
Quarry Ridge Recreation Area
Fitchburg
Badger Prairie Park
Lacy Rd
S Seminole Hwy
Verona
W Verona Ave
Irish Ln
Paoli St
County Road G
Whalen Rd
Lakeview
N
0 0.25 0.5 1
Miles
K-103


2050 Employment by TAZ
0 - 10
11 - 25
26 - 100
101 - 500
501 and Higher
Springfield Corners
Martinsville
County Road P
State Road 19
19
US Highway 12
12
Kingsley Rd
Woodland Dr
Meffert Rd
Sixmile Creek Golf
E Main St
113
State Road 113
County Road Q
Cherokee Marsh Yahara Heights
M
Ashton
County Road K
CR-K
Ashton Corners
K
County Road M
Northport Dr
Mendota
Governor Nelson State Park
Pheasant Branch Rd
Q
Parmenter St
Morey Airport
Airport Rd
Bishops Bay Country Club
Pheasant Branch
K-104
Lake Mendota
N
0 0.25 0.5 1
Miles

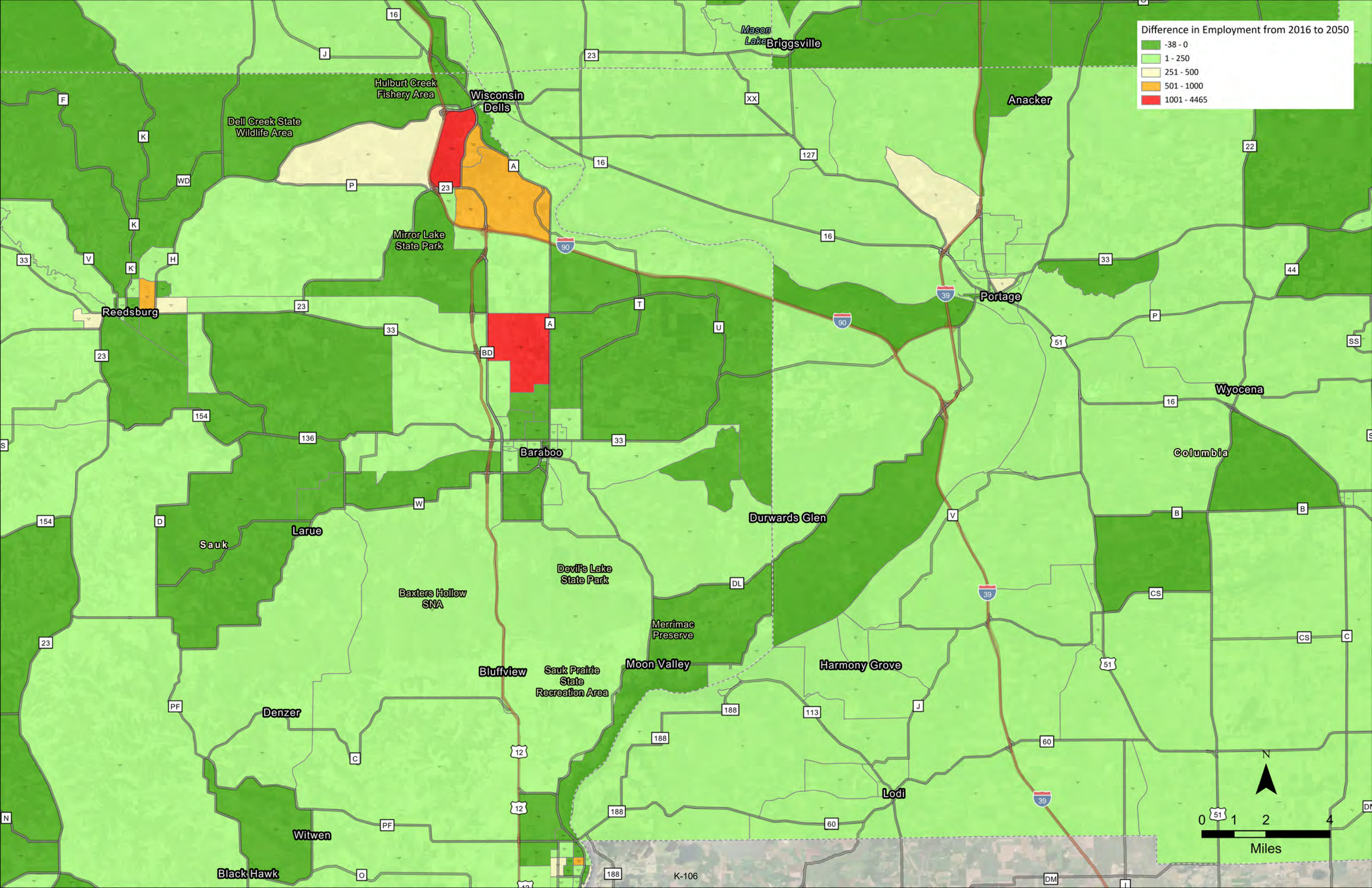
Difference in Employment from 2016 to 2050

- Loss of 501 or more
- Loss between 1 and 500
- Gain between 0 and 100
- Gain between 101 and 500
- Gain of 501 and Higher

Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Portland
Waterloo
Sun Prairie
Mendota
Pheasant Branch
Middleton
Ice Age National Scenic Trail
Middleton Junction
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Daleyville
Forward
Stoughton
Albion
Cooksville
Edgerton
Newville
Fort Atkin

N

0 1.25 2.5 5
Miles


Difference in Employment from 2016 to 2050
-38 - 0
1 - 250
251 - 500
501 - 1000
1001 - 4465
Mason Lake
Briggsville
Hulburt Creek Fishery Area
Wisconsin Dells
Dell Creek State Wildlife Area
Anacker
Mirror Lake State Park
Reedsburg
Portage
Baraboo
Wyocena
Columbia
Durwards Glen
Larue
Sauk
Devil's Lake State Park
Baxters Hollow SNA
Merrimac Preserve
Moon Valley
Harmony Grove
Bluffview
Sauk Prairie State Recreation Area
Denzer
Witwen
Black Hawk
Lodi
K-106
N
0 1 2 4
Miles

Difference in Employment from 2016 to 2050

- Loss of 500 or more
- Loss between 1 and 500
- Gain between 0 and 100
- Gain between 101 and 500
- Gain of 501 and Higher

Witwen
Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Middleton Junction
Ice Age National Scenic Trail
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Stoughton
Daleyville
Forward
Albion
Cooksville
Edgerton
Newville

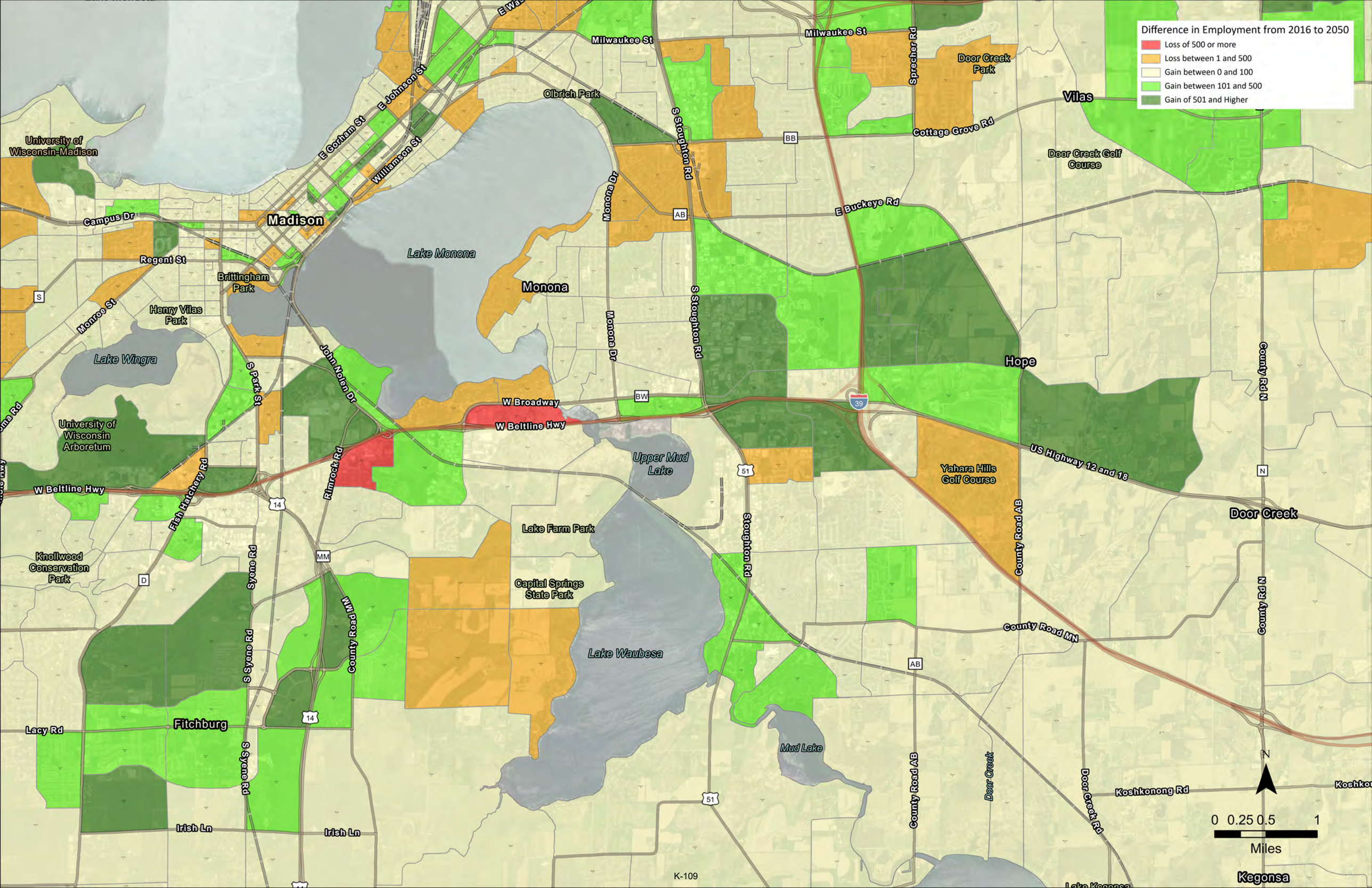
N

0 0.5 1 2 Miles

Difference in Employment from 2016 to 2050

- Loss of 500 or more
- Loss between 1 and 500
- Gain between 0 and 100
- Gain between 101 and 500
- Gain of 501 and Higher

Lake Mendota
Lake Monona
Lake Wingra
Madison
Monona
Sycamore Park
Heistand Park
East Morland Park
Tenney Park
Hudson Park
Olbrich Park
James Madison Park
Brittingham Park
Goodman Park
Turville Point Conservation Park
Quann Park
Alliant Energy Center
Duane F Bowman Park
Harvey E Schmidt Park
Edna Taylor Conservation Park
Roselawn Memorial Park
Monona Municipal Golf Course
Maple Bluff Country Club
Bridges Golf Course
Madison Area Technical Col-Truax
Demetral Field
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
University of Wisconsin-Madison
University Hospital
Hoyt Park
Resurrection Cemetery
Forest Hill Cemetery
Sheridan Dr
Farwell Dr
N Sherman Ave
Ruskin St
Huxley St
Packers Ave
Anderson St
N Stoughton Rd
Lexington Ave
Myrtle St
Commercial Ave
Burke Ave
Webb Ave
Oak St
Union St
N 5th St
Winnebago St
Atwood Ave
E Washington Ave
E Dayton St
Richard St
Tulane Ave
Dempsey Rd
Johns St
Garnet Ln
Onyx Ln
Topaz Ln
Meadowlark Dr
Merryturn Rd
Atlas Ave
S Stoughton Rd
E Main St
Williamson St
Spaight St
Observatory Dr
University Ave
W Johnson St
Campus Dr
Harvey St
Locust Dr
Oxford Rd
Edgehill Dr
Lake Mendota Dr
Price Pl
Van Hise Ave
Regent St
Rowley Ave
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
Hillcrest Dr
Larkin St
S Owen Dr
Toepfer Ave
Keating Ter
Ames St
S Midvale Blvd
Odana Rd
Council Crst
Yuma Dr
John Nolen Dr
N Wingra Dr
S Park St
Bld
Waunona Way
W Broadway
W Beltline Hwy
E Broadway
Femrite Dr
Progress Rd
Dairy Dr
Agriculture Dr
Daniels St
Helgesen Dr
Vondron Rd
Ellen Ave
Leo Dr
E Buckeye Rd
Drexel Ave
Hegg Ave
Buckeye Rd
Maher Ave
Turner Ave
Camden Rd
Monona Dr
W Dean Ave
E Dean Ave
Douglas Trl
Acacia Ln
Owen Rd
Midmoor Rd
Monona Dr
Tonyawatha Trl
Winnequah Rd
Bridge Rd
Femrite Dr
Dempsey Rd
Johns St
Atlas Ave
Tulane Ave
Richard St
Olbrich Park
Hudson Park
Tenney Park
Wingra Park
Lake Mendota Dr
Edgehill Dr
Oxford Rd
Locust Dr
Harvey St
Price Pl
Hoyt Park


Difference in Employment from 2016 to 2050
Loss of 500 or more
Loss between 1 and 500
Gain between 0 and 100
Gain between 101 and 500
Gain of 501 and Higher
Milwaukee St
Olbrich Park
E Johnson St
E Gorham St
Williamson St
University of Wisconsin-Madison
Campus Dr
Madison
Regent St
Brittingham Park
Lake Monona
Monona
Monona Dr
S Stoughton Rd
BB
AB
Cottage Grove Rd
Sprecher Rd
Door Creek Park
Vilas
Door Creek Golf Course
E Buckeye Rd
Monroe St
Henry Vilas Park
Lake Wingra
S Park St
John Nolen Dr
W Broadway
W Beltline Hwy
BW
39
Hope
County Rd N
University of Wisconsin Arboretum
Fish Hatchery Rd
Rimrock Rd
Upper Mud Lake
51
US Highway 12 and 18
Yahara Hills Golf Course
Door Creek
Knollwood Conservation Park
Syene Rd
MM
Lake Farm Park
Capital Springs State Park
Stoughton Rd
County Road AB
Lake Waubesa
County Road MN
Fitchburg
Lacy Rd
Mud Lake
Door Creek
Door Creek Rd
Koshkonong Rd
Irish Ln
N
0 0.25 0.5 1
Miles
Kegonsa

Difference in Employment from 2016 to 2050

- Loss of 500 or more
- Loss between 1 and 500
- Gain between 0 and 100
- Gain between 101 and 500
- Gain of 501 and Higher

Token Creek
Windsor St
N Bristol St
Sun Prairie
W Main St
Grove St
Token Creek County Park
Rattman Rd
S Grand Ave
Hoepker Rd
Cherokee Marsh-North Unit
County Road CV
North-East Park
N Stoughton Rd
Reiner Rd
Nelson Rd
Dane County Regional Airport
Burke
County Rd N
County Road T
County Road TT
Madison Area Technical Col-Truax
Bridges Golf Course
McCarthy Youth & Conservation Park
Maple Bluff Country Club
N Sherman Ave
Packers Ave
Aberg Ave
E Washington Ave
Seminary Springs
K-110

N

0 0.25 0.5 1
Miles

Difference in Employment from 2016 to 2050
- Loss of 500 or more
- Loss between 1 and 500
- Gain between 0 and 100
- Gain between 101 and 500
- Gain of 501 and Higher

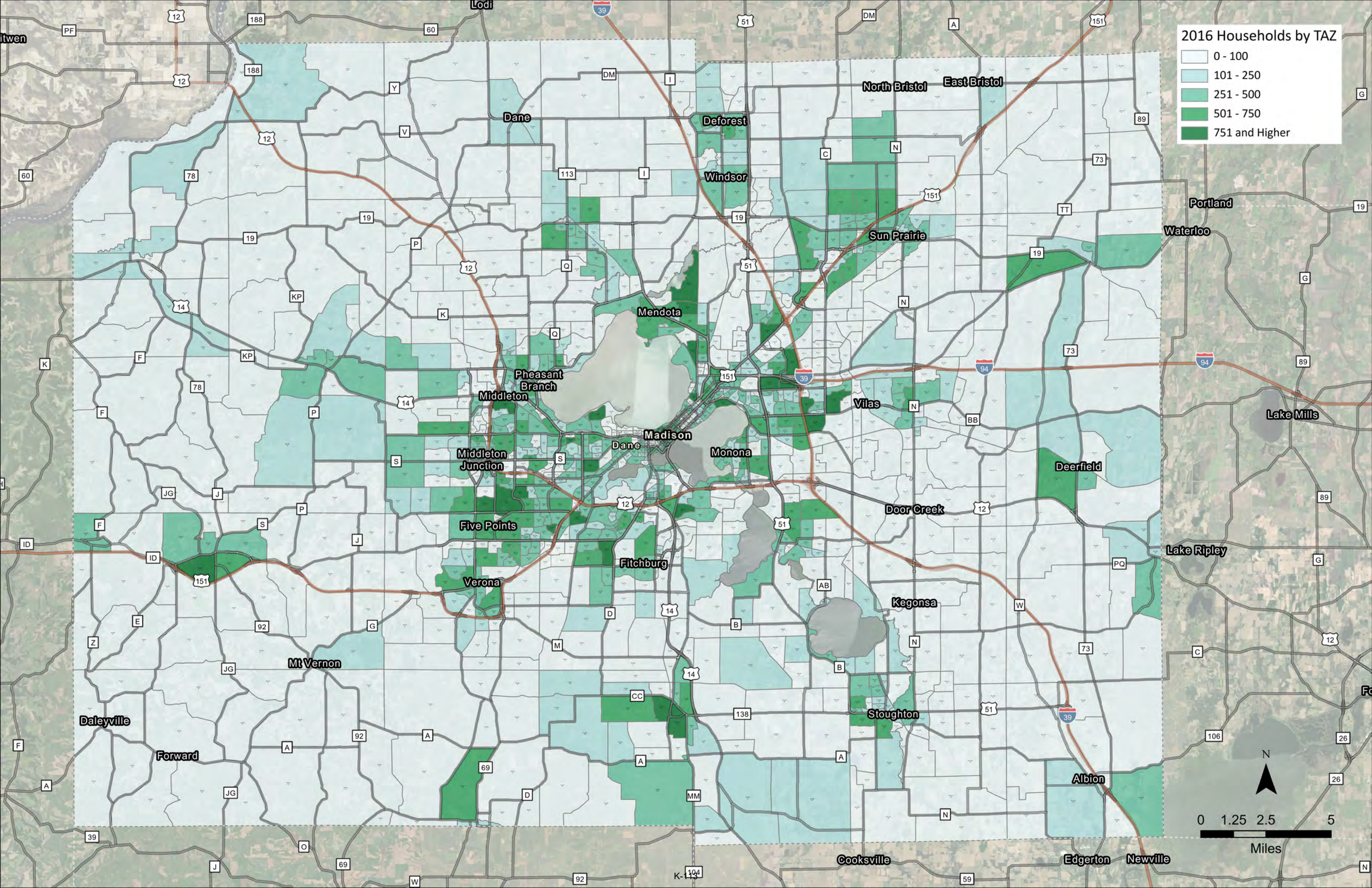
Middleton
Cross Plains State Park
Pleasant View Golf Course
University of Wisconsin-Madison
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
Blackhawk Country Club
University Ave
Campus Dr
Madison
Regent St
Brittingham Park
W Mineral Point Rd
Middleton Junction
Mineral Point Rd
Monroe St
Henry Vilas Park
W Beltline Hwy
Odana Rd
S Midvale Blvd
Lake Wingra
John Nolen Dr
S Park St
Schroeder Rd
Odana Hills Golf Course
Nakoma Rd
University of Wisconsin Arboretum
Seminole Hwy
Fish Hatchery Rd
Rimrock Rd
Elver Park
Hawks Landing Golf Club
Midtown Rd
Mid Town Rd
Raymond Rd
University Ridge Golf Course
Five Points
Verona Rd
Dawley Conservancy Park
Knollwood Conservation Park
Riley
N County Road M
County Road PD
McKee Rd
Syene Rd
County Road MM
Quarry Ridge Recreation Area
Badger Prairie Park
Fitchburg
Lacy Rd
Verona
W Verona Ave
Irish Ln
Paoli St
Whalen Rd
County Road G
K-111
Lakeview

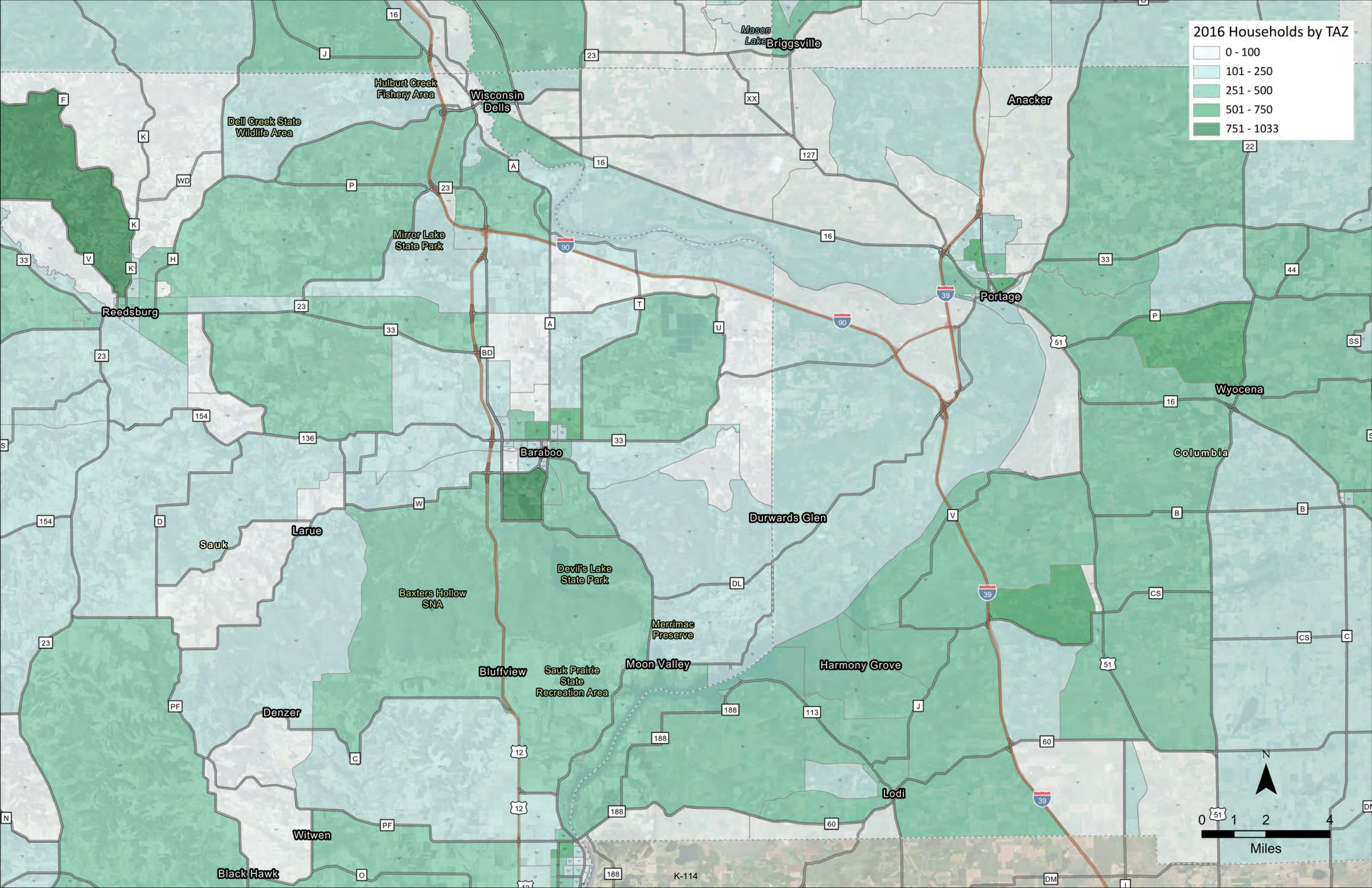
0 0.25 0.5 1 Miles

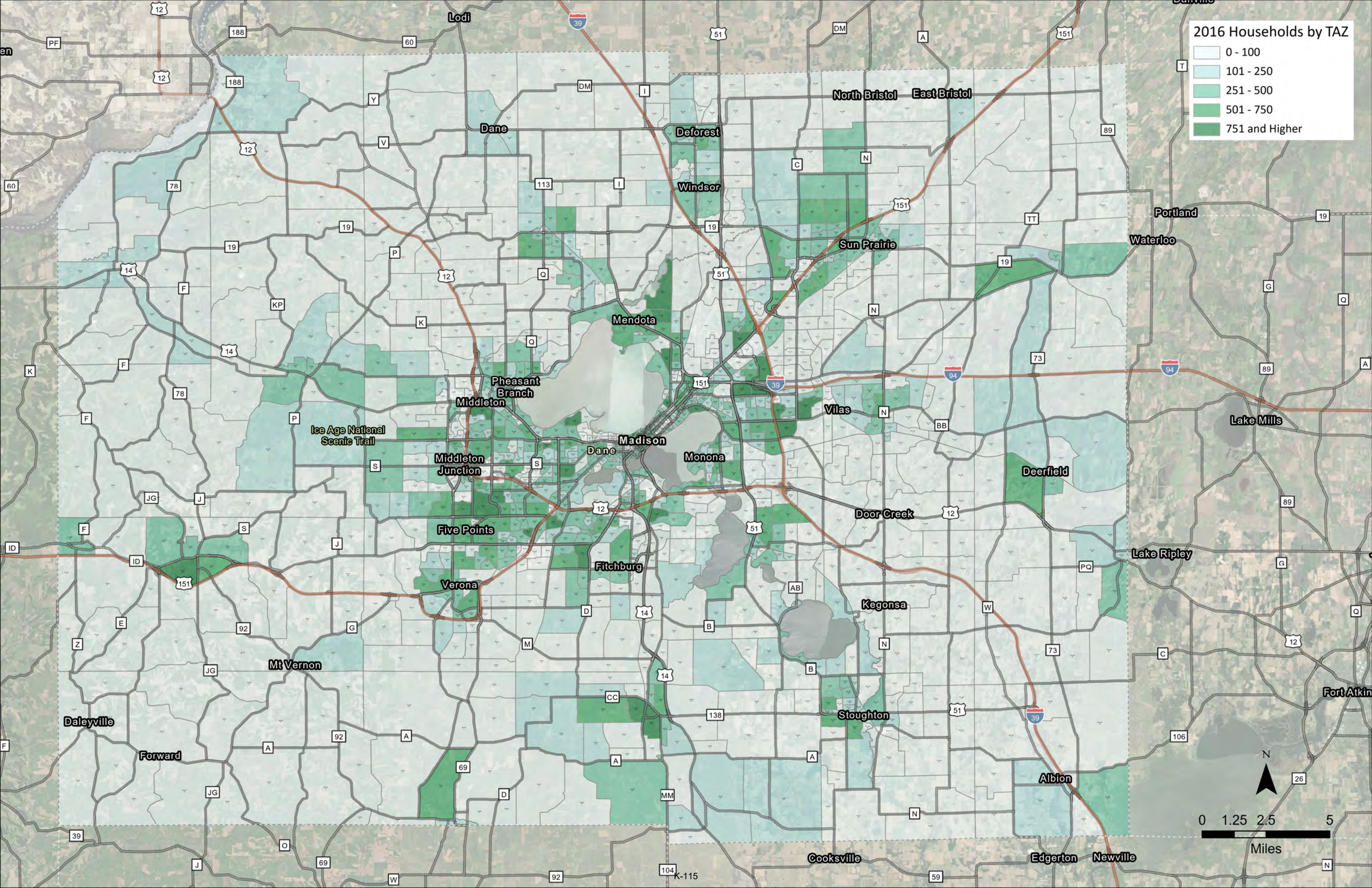
Difference in Employment from 2016 to 2050

- Loss of 500 or more
- Loss between 1 and 500
- Gain between 0 and 100
- Gain between 101 and 500
- Gain of 501 and Higher

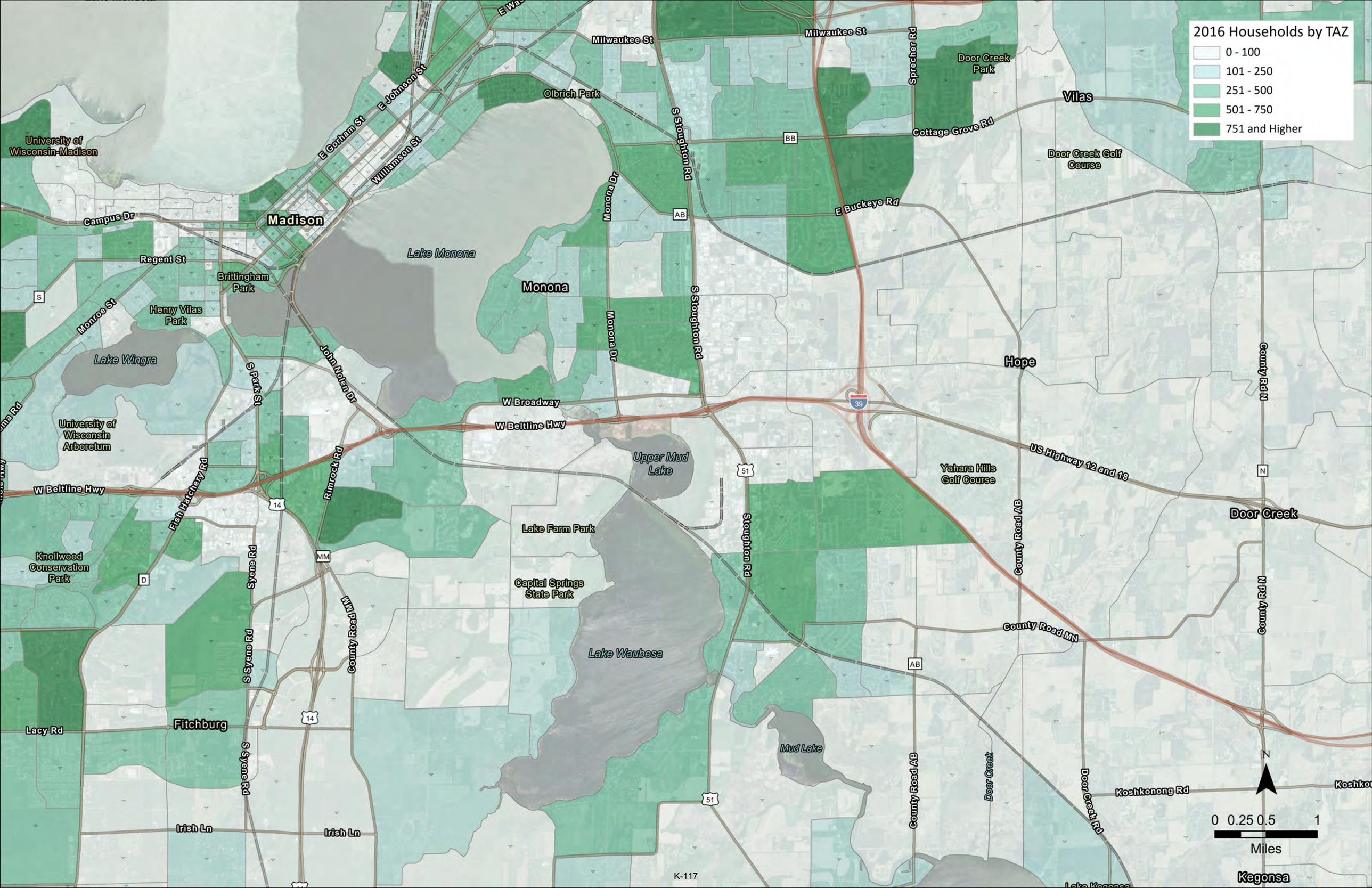
Springfield Corners
Martinsville
County Road P
State Road 19
19
US Highway 12
12
Kingsley Rd
Woodland Dr
Sixmile Creek Golf
E Main St
113
State Road 113
Meffert Rd
County Road Q
Cherokee Marsh Yahara Heights
M
Ashton
US Highway 12
County Road K
CR-K
Ashton Corners
K
Pheasant Branch Rd
Q
Governor Nelson State Park
Bishops Bay Country Club
Morey Airport
Airport Rd
Parmenter St
Pheasant Branch
Lake Mendota
Northport Dr
Mendota
N
0 0.25 0.5 1
Miles

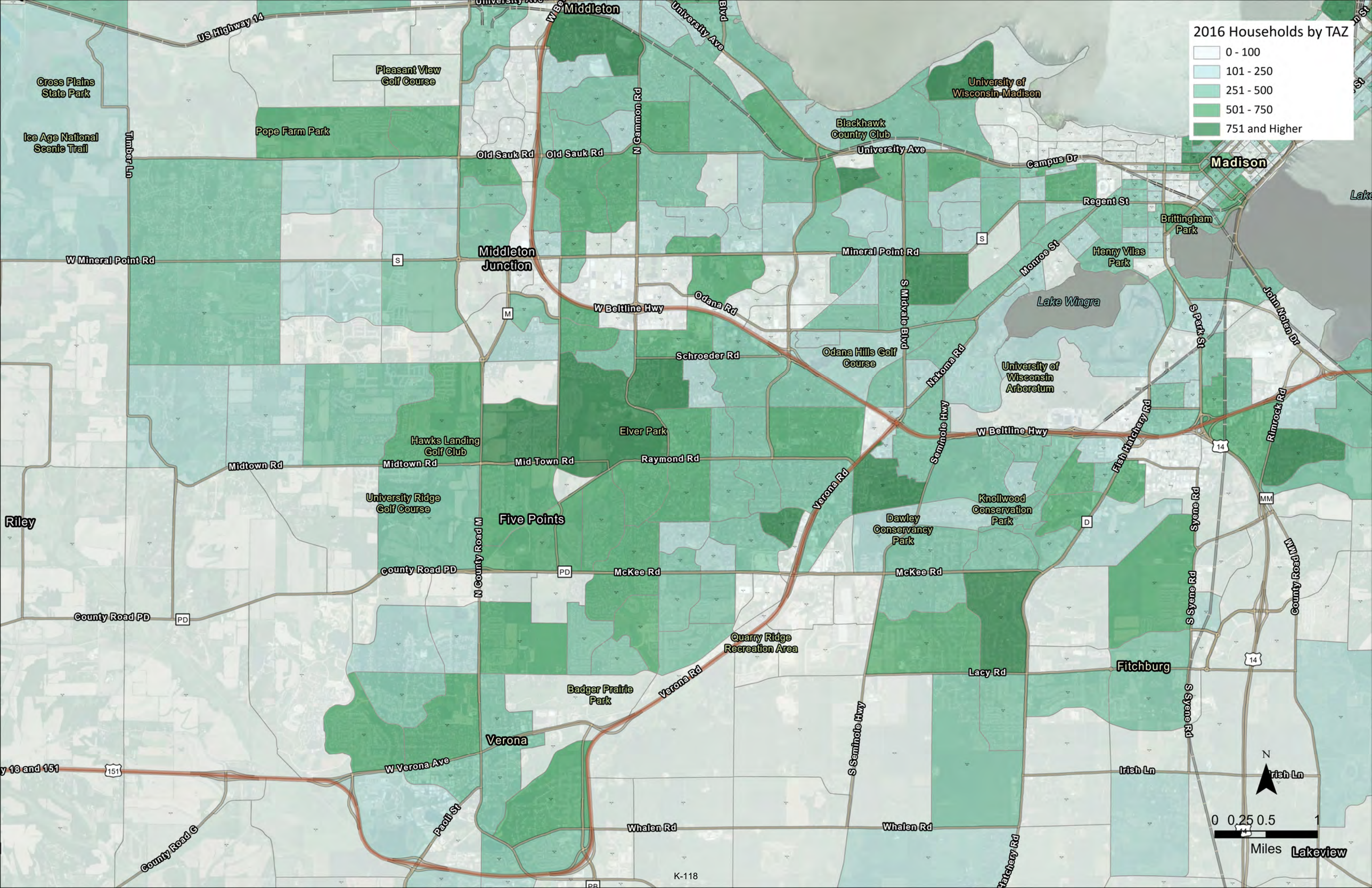

2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Middleton Junction
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Stoughton
Daleyville
Forward
Albion
Cooksville
Edgerton
Newville
N
0 1.25 2.5 5
Miles

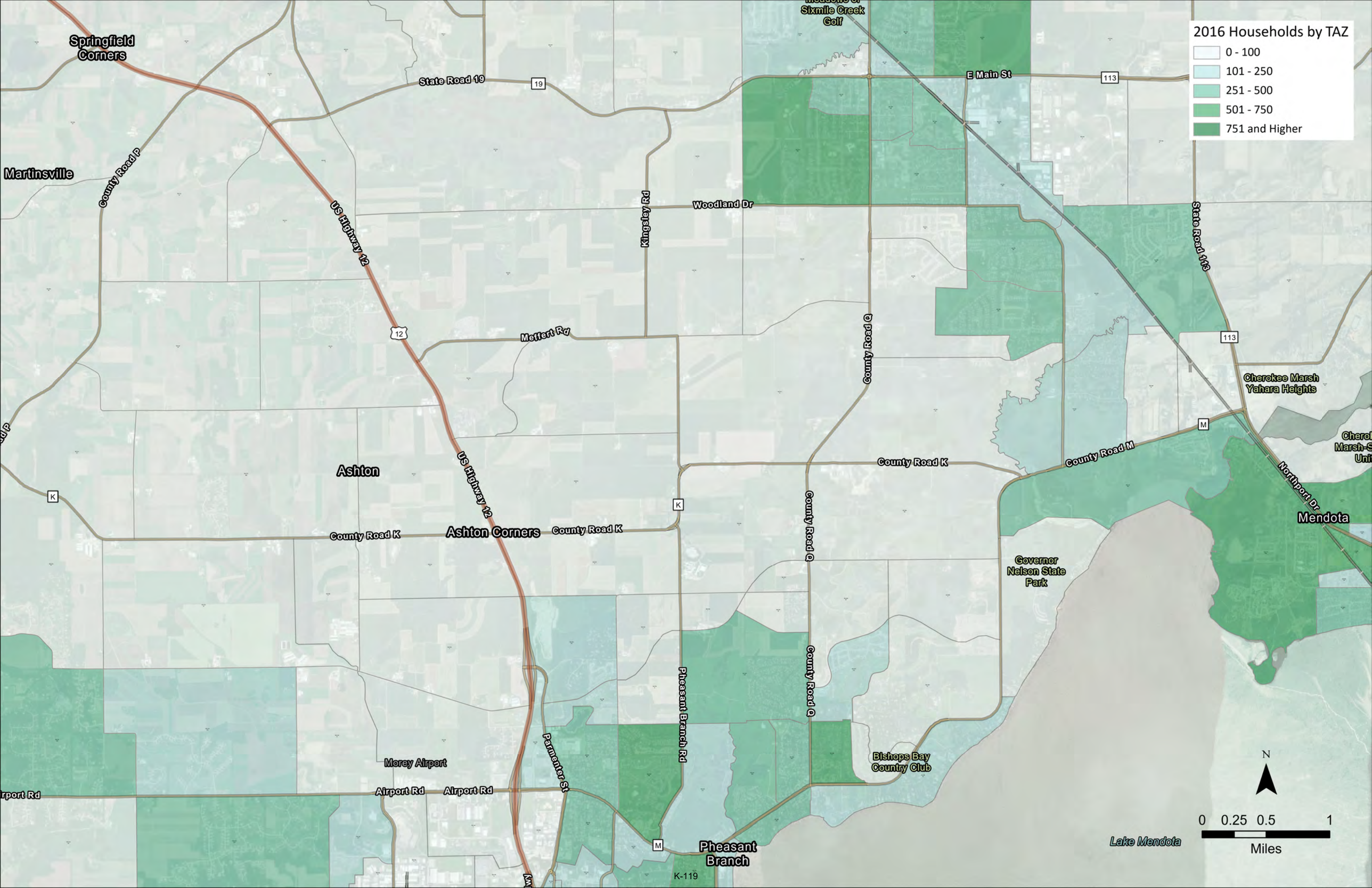

2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 - 1033
Mason Lake
Briggsville
Hulburt Creek Fishery Area
Wisconsin Dells
Dell Creek State Wildlife Area
Anacker
Mirror Lake State Park
Reedsburg
Portage
Wyocena
Columbia
Baraboo
Durwards Glen
Larue
Sauk
Devil's Lake State Park
Baxters Hollow SNA
Merrimac Preserve
Bluffview
Sauk Prairie State Recreation Area
Moon Valley
Harmony Grove
Denzer
Lodi
Witwen
Black Hawk
K-114
0 1 2 4
Miles
N

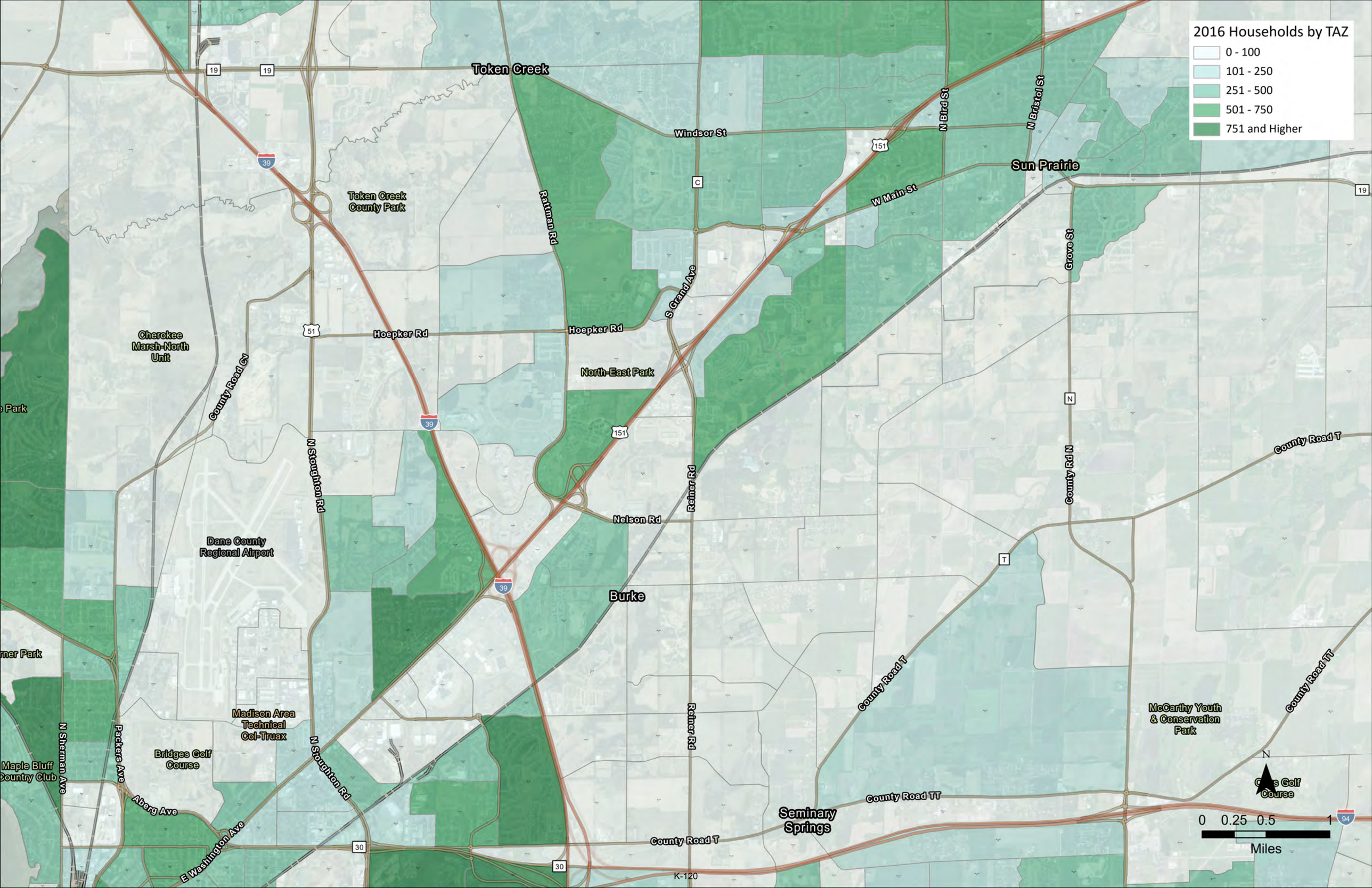

2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Lodi
North Bristol
East Bristol
Dane
Deforest
Windsor
Portland
Waterloo
Sun Prairie
Mendota
Pheasant Branch
Middleton
Ice Age National Scenic Trail
Middleton Junction
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Daleyville
Forward
Stoughton
Albion
Fort Atkin
Cooksville
Edgerton
Newville
N
0 1.25 2.5 5
Miles

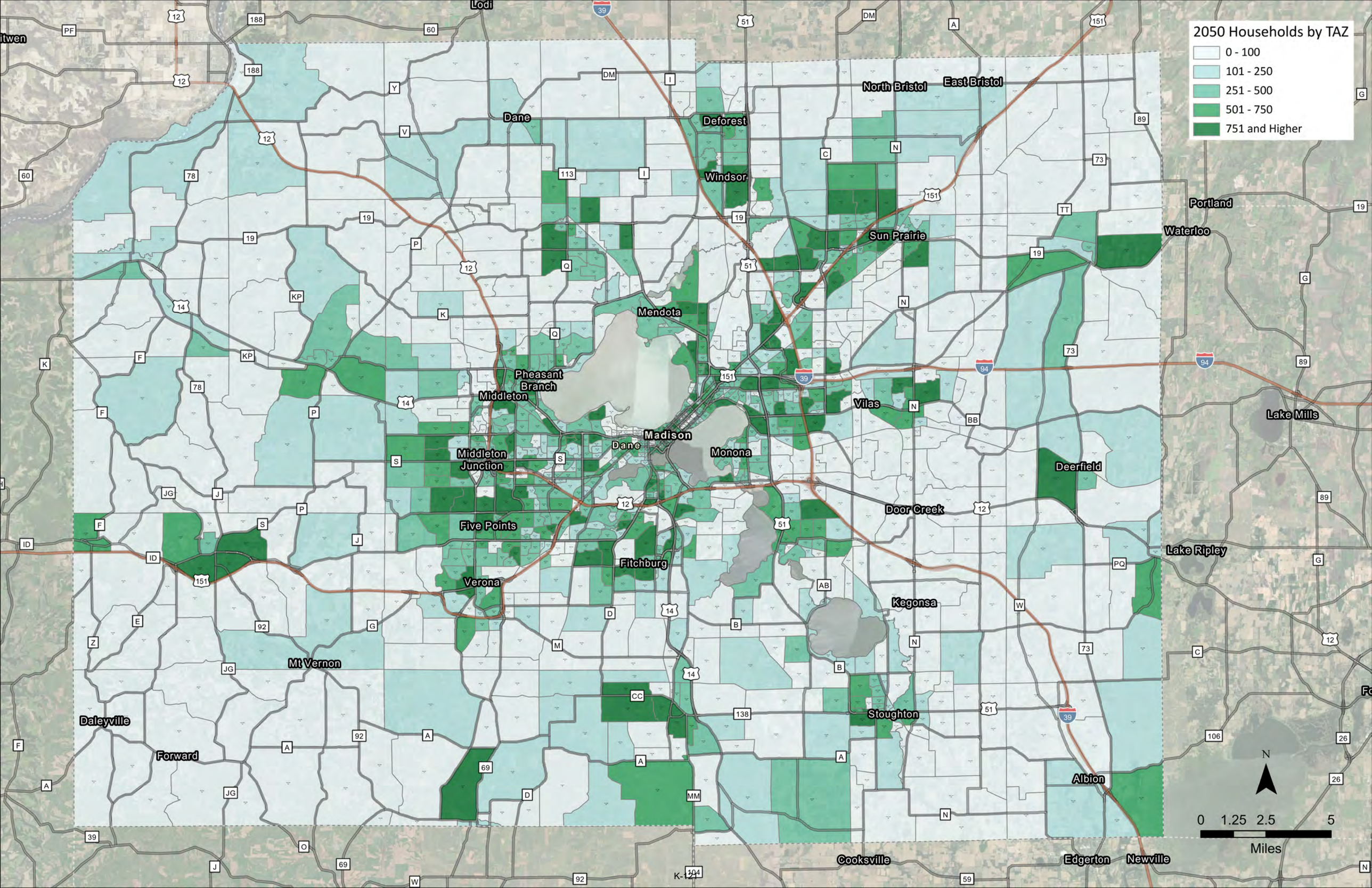
2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Madison
Monona
Lake Mendota
Lake Monona
Lake Wingra
University of Wisconsin-Madison
Madison Area Technical Col-Truax
Bridges Golf Course
Maple Bluff Country Club
Demetral Field
Heistand Park
East Morland Park
Tenney Park
Hudson Park
Olbrich Park
James Madison Park
University Hospital
Resurrection Cemetery
Forest Hill Cemetery
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
Brittingham Park
Goodman Park
Turville Point Conservation Park
Quann Park
Alliant Energy Center
Duane F Bowman Park
Harvey E Schmidt Park
Monona Municipal Golf Course
Edna Taylor Conservation Park
Roselawn Memorial Park
Anderson St
Aberg Ave
Lexington Ave
Burke Ave
Commercial Ave
Webb Ave
Union St
Atwood Ave
E Washington Ave
Lien Rd
Sheridan Dr
Parwell Dr
N Sherman Ave
Ruskin St
Huxley St
Oak St
N 5th St
Winnebago St
Tulane Ave
Dempsey Rd
Johns St
Garnet Ln
Onyx Ln
Meadowlark Dr
Retana Dr
Leo Dr
Ellen Ave
Vondron Rd
E Buckeye Rd
Hegg Ave
Drexel Ave
Maher Ave
Turner Ave
Monona Dr
Helgesen Dr
Daniels St
Progress Rd
Dairy Dr
Agriculture Dr
Femrite Dr
Douglas Trl
Acacia Ln
Owen Rd
Nichols Rd
Tonyawatha Trl
Winnebago Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
Lake Mendota Dr
Edgehill Dr
Oxford Rd
Locust Dr
University Ave
Harvey St
Linden Dr
Campus Dr
Langdon St
E Main St
Williamson St
Spaight St
E Dayton St
Price Pl
Hoyt Park
Van Hise Ave
Regent St
Rowley Ave
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
John Nolen Dr
N Wingra Dr
S Park St
Beld St
Bram St
Hillcrest Dr
Larkin St
S Owen Dr
Toepfer Ave
Keating Ter
Ames St
S Midvale Blvd
Odana Rd
Council Crst
Yuma Dr
Tokay Blvd
Lake Mendota Dr
Sheridan Dr
Anderson St
Madison Area Technical Col-Truax
Lien Rd
E Washington Ave
Bridges Golf Course
Maple Bluff Country Club
Parwell Dr
N Sherman Ave
Ruskin St
Huxley St
Aberg Ave
Lexington Ave
Burke Ave
Commercial Ave
Webb Ave
Demetral Field
Oak St
Union St
N 5th St
Heistand Park
East Morland Park
Garnet Ln
Onyx Ln
Meadowlark Dr
Retana Dr
Tenney Park
Winnebago St
Atwood Ave
E Washington Ave
Hudson Park
Olbrich Park
Tulane Ave
Dempsey Rd
Johns St
Alias Ave
S Stoughton Rd
Leo Dr
Ellen Ave
Vondron Rd
E Buckeye Rd
Hegg Ave
Drexel Ave
Maher Ave
Turner Ave
Monona Dr
Helgesen Dr
Daniels St
Progress Rd
Dairy Dr
Agriculture Dr
Femrite Dr
Douglas Trl
Acacia Ln
Owen Rd
Nichols Rd
Tonyawatha Trl
Winnebago Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
James Madison Park
E Main St
Williamson St
Spaight St
E Dayton St
Langdon St
Linden Dr
Campus Dr
University Ave
W Johnson St
Madison
University of Wisconsin-Madison
Lake Mendota Dr
Edgehill Dr
Oxford Rd
Locust Dr
University Ave
Harvey St
University Hospital
Price Pl
Hoyt Park
Van Hise Ave
Regent St
Rowley Ave
Resurrection Cemetery
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
Brittingham Park
John Nolen Dr
Forest Hill Cemetery
Hillcrest Dr
Larkin St
S Owen Dr
Toepfer Ave
Keating Ter
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
N Wingra Dr
Ames St
S Midvale Blvd
Monroe St
Lake Wingra
Goodman Park
Turville Point Conservation Park
S Park St
Beld St
Quann Park
Alliant Energy Center
Duane F Bowman Park
Bram St
Harvey E Schmidt Park
Odana Rd
Council Crst
Yuma Dr
Tokay Blvd
Lake Monona
Monona
Monona Municipal Golf Course
Edna Taylor Conservation Park
Roselawn Memorial Park
Femrite Dr
W Dean Ave
E Dean Ave
Nichols Rd
Douglas Trl
Acacia Ln
Owen Rd
Monona Dr
Winnebago Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
Tonyawatha Trl
Helgesen Dr
Daniels St
Progress Rd
Dairy Dr
Agriculture Dr
Vondron Rd
E Buckeye Rd
Hegg Ave
Drexel Ave
Maher Ave
Turner Ave
Monona Dr
Leo Dr
Ellen Ave
S Stoughton Rd
Alias Ave
Johns St
Dempsey Rd
Tulane Ave
Garnet Ln
Onyx Ln
Meadowlark Dr
Retana Dr
Tokay Blvd
Femrite Dr
Roselawn Memorial Park
Edna Taylor Conservation Park
Monona Municipal Golf Course
Monona
Lake Monona
Lake Wingra
Madison
N
0 0.25 0.5
Miles
30
BB
39

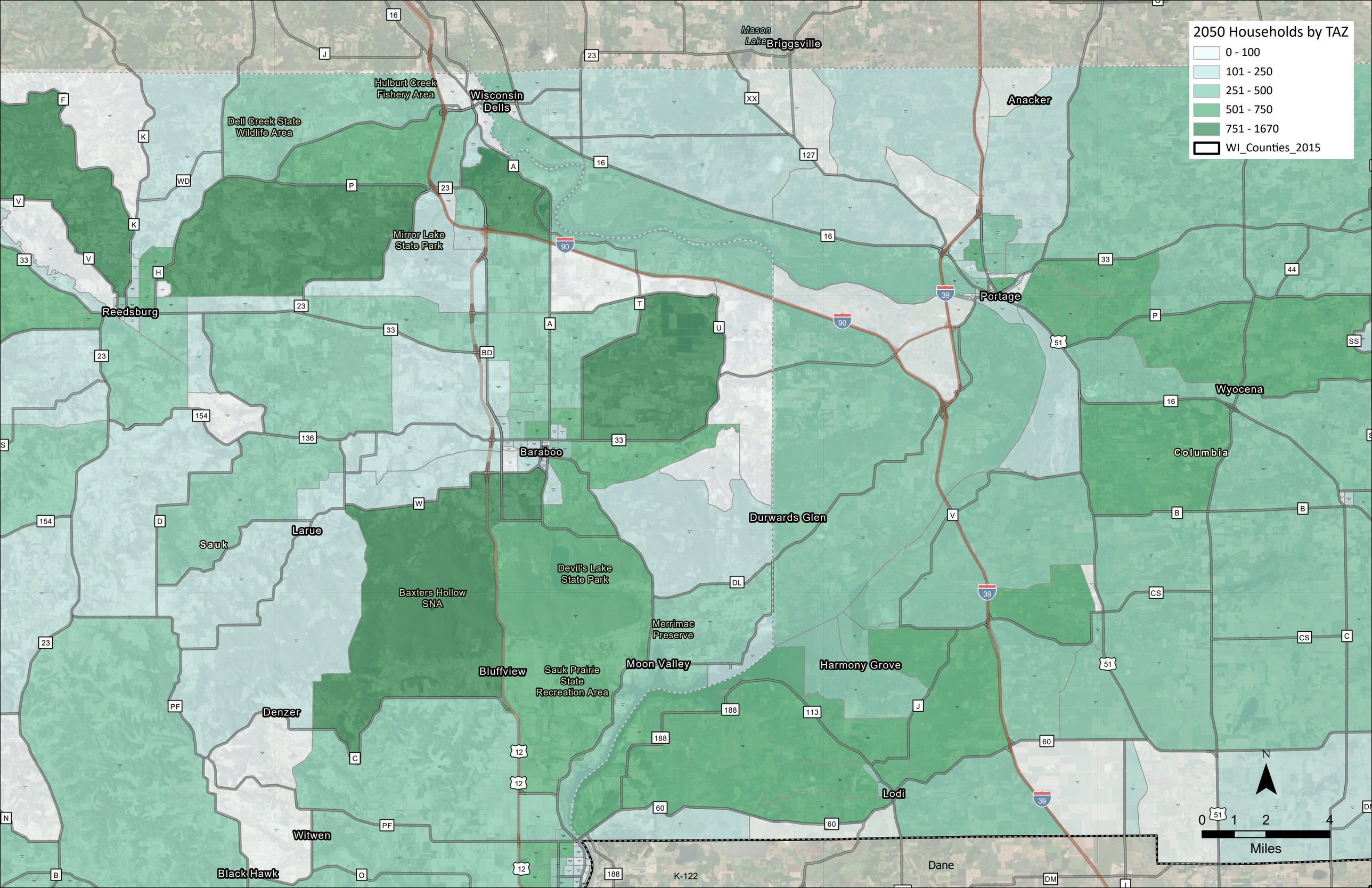

2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Milwaukee St
Milwaukee St
Sprecher Rd
Door Creek Park
Vilas
Olbrich Park
S Stoughton Rd
BB
Cottage Grove Rd
Door Creek Golf Course
E Johnson St
E Gorham St
Williamson St
University of Wisconsin-Madison
Monona Dr
AB
E Buckeye Rd
Campus Dr
Madison
Lake Monona
Regent St
Brittingham Park
Monona
S
Monroe St
Henry Vilas Park
Lake Wingra
John Nolen Dr
S Park St
Monona Dr
S Stoughton Rd
Hope
39
County Rd N
W Broadway
W Beltline Hwy
University of Wisconsin Arboretum
Upper Mud Lake
51
US Highway 12 and 18
Yahara Hills Golf Course
N
Door Creek
W Beltline Hwy
Fish Hatchery Rd
14
Rimrock Rd
Stoughton Rd
County Road AB
Knollwood Conservation Park
D
Lake Farm Park
MM
Syene Rd
Capital Springs State Park
County Road MN
County Rd N
Lake Waubesa
AB
S Syene Rd
County Road MN
Fitchburg
Lacy Rd
14
Mud Lake
Door Creek
Door Creek Rd
Koshkonong Rd
Irish Ln
Irish Ln
51
N
0 0.25 0.5 1
Miles
Kegonsa

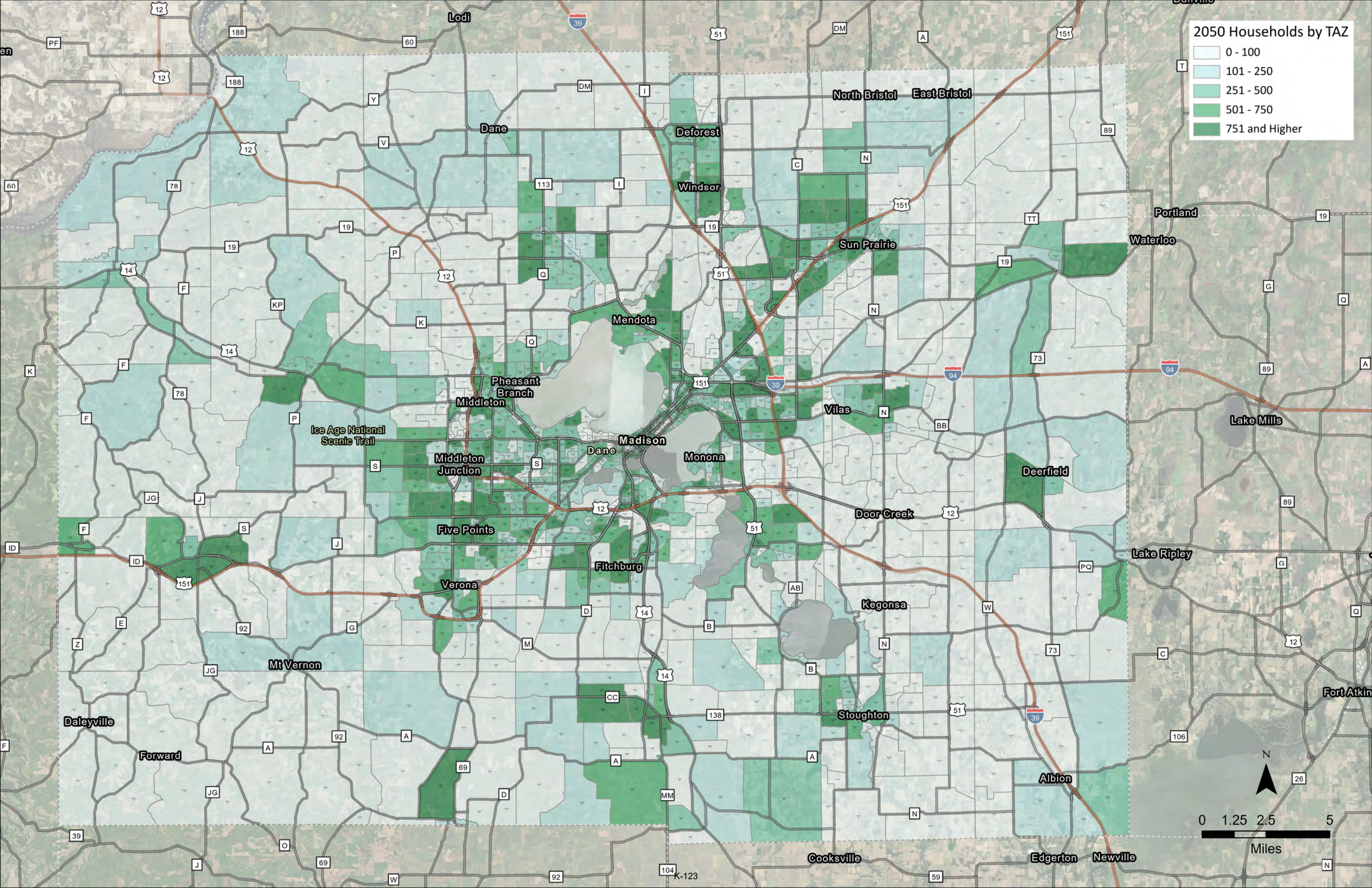

2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
US Highway 14
Middleton
University Ave
Pleasant View Golf Course
University of Wisconsin-Madison
Cross Plains State Park
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
Blackhawk Country Club
Campus Dr
Madison
Regent St
Brittingham Park
W Mineral Point Rd
Middleton Junction
Mineral Point Rd
Monroe St
Henry Vilas Park
Lake Wingra
W Beltline Hwy
Odana Rd
S Midvale Blvd
John Nolen Dr
S Park St
Schroeder Rd
Odana Hills Golf Course
Nakoma Rd
University of Wisconsin Arboretum
Seminole Hwy
Elver Park
Hawks Landing Golf Club
Midtown Rd
Mid Town Rd
Raymond Rd
Fish Hatchery Rd
Rimrock Rd
University Ridge Golf Course
Riley
Five Points
N County Road M
Verona Rd
Dawley Conservancy Park
Knollwood Conservation Park
Syene Rd
County Road MM
County Road PD
McKee Rd
Quarry Ridge Recreation Area
Badger Prairie Park
Fitchburg
Lacy Rd
S Syene Rd
Verona
W Verona Ave
Irish Ln
Pacll St
County Road G
Whalen Rd
Lakeview
N
0 0.25 0.5 1
Miles


2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Springfield Corners
Martinsville
State Road 19
19
County Road P
US Highway 12
12
Kingsley Rd
Woodland Dr
Sixmile Creek Golf
E Main St
113
State Road 113
Cherokee Marsh Yahara Heights
Meffert Rd
County Road Q
M
Ashton
K
County Road K
Ashton Corners
Pheasant Branch Rd
Parmenter St
Morey Airport
Airport Rd
Pheasant Branch
Bishops Bay Country Club
Governor Nelson State Park
Mendota
Northport Dr
Lake Mendota
N
0 0.25 0.5 1
Miles


2016 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Token Creek
Windsor St
N Bird St
N Bristol St
Sun Prairie
W Main St
Grove St
Token Creek County Park
Ratfman Rd
S Grand Ave
Hoepker Rd
Cherokee Marsh-North Unit
North-East Park
County Road CV
N Stoughton Rd
Reiner Rd
County Road T
Dane County Regional Airport
Nelson Rd
Burke
Madison Area Technical Col-Truax
Bridges Golf Course
Maple Bluff Country Club
N Sherman Ave
Packers Ave
Aberg Ave
E Washington Ave
County Road TT
Seminary Springs
McCarthy Youth & Conservation Park
K-120
N
0 0.25 0.5 1
Miles


2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Madison
Middleton Junction
Monona
Vilas
Deerfield
Lake Mills
Five Points
Fitchburg
Verona
Door Creek
Lake Ripley
Kegonsa
Stoughton
Mt Vernon
Daleyville
Forward
Albion
Cooksville
Edgerton
Newville
N
0 1.25 2.5 5
Miles


2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 - 1670
WI_Counties_2015
Mason Lake
Briggsville
Hulburt Creek Fishery Area
Wisconsin Dells
Dell Creek State Wildlife Area
Anacker
Mirror Lake State Park
Reedsburg
Portage
Baraboo
Wyocena
Columbia
Durwards Glen
Sauk
Larue
Baxters Hollow SNA
Devil's Lake State Park
Merrimac Preserve
Bluffview
Sauk Prairie State Recreation Area
Moon Valley
Harmony Grove
Denzer
Lodi
Witwen
Black Hawk
Dane
K-122
N
0 1 2 4
Miles


2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Portland
Waterloo
Sun Prairie
Mendota
Pheasant Branch
Middleton
Ice Age National Scenic Trail
Middleton Junction
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Daleyville
Forward
Stoughton
Albion
Fort Atkin
Cooksville
Edgerton
Newville
N
0 1.25 2.5 5
Miles

2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Lake Mendota
Lake Monona
Lake Wingra
Madison
Monona
Maple Bluff Country Club
Bridges Golf Course
Madison Area Technical Col-Truax
Demetral Field
Heistand Park
East Morland Park
Tenney Park
Hudson Park
Olbrich Park
James Madison Park
University of Wisconsin-Madison
University Hospital
Brittingham Park
Forest Hill Cemetery
Resurrection Cemetery
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
Goodman Park
Turville Point Conservation Park
Quann Park
Alliant Energy Center
Duane F Bowman Park
Harvey E Schmidt Park
Monona Municipal Golf Course
Edna Taylor Conservation Park
Roselawn Memorial Park
Anderson St
Sheridan Dr
Farwell Dr
N Sherman Ave
Ruskin St
Huxley St
Aberg Ave
Lexington Ave
Burke Ave
Commercial Ave
Webb Ave
Union St
Oak St
N 5th St
Winnebago St
Atwood Ave
E Washington Ave
Lien Rd
Garnet Ln
Onyx Ln
Meadowlark Dr
Retana Dr
Tulane Ave
Dempsey Rd
Atlas Ave
Topaz Ln
Johns St
S Stoughton Rd
Leo Dr
Drexel Ave
Hegg Ave
Buckeye Rd
Maher Ave
Turner Ave
E Buckeye Rd
Vondron Rd
Ellen Ave
Helgesen Dr
Daniels St
Dairy Dr
Agriculture Dr
Progress Rd
Femrite Dr
Monona Dr
Tonyawatha Trl
Nichols Rd
Douglas Trl
Acacia Ln
Owen Rd
Winnebago Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
E Dean Ave
W Dean Ave
E Dayton St
E Main St
Williamson St
Spaight St
Langdon St
Linden Dr
Campus Dr
University Ave
W Johnson St
Van Hise Ave
Regent St
Rowley Ave
Hillcrest Dr
Keating Ter
Ames St
Odana Rd
Council Crst
Yume Dr
Locust Dr
Harvey St
Price Pl
Oxford Rd
Edgehill Dr
Lake Mendota Dr
Larkin St
S Owen Dr
Teepfer Ave
S Midvale Blvd
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
S Mills St
John Nolen Dr
N Wingra Dr
S Park St
Bedford St
Bram St
Yellowstone Dr
Burning Wood Dr
Lien Rd
Elder Pl
Sheboygan Ave
Lake Point Dr
Lakeside St
Lake Shore Dr
Lake Mendota Dr
Observatory Dr
Babcock Dr
Charter St
Mills St
Randall Ave
Park St
Midvale Blvd
Whitney Way
Femrite Dr
Agriculture Dr
Daniels St
Dairy Dr
Progress Rd
Helgesen Dr
Vondron Rd
Ellen Ave
Leo Dr
Maher Ave
Turner Ave
Drexel Ave
Hegg Ave
Buckeye Rd
E Buckeye Rd
Monona Dr
Tonyawatha Trl
Nichols Rd
Douglas Trl
Acacia Ln
Owen Rd
Winnebago Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
W Beltline Hwy
E Dean Ave
W Dean Ave
Lexington Ave
Burke Ave
Commercial Ave
Webb Ave
Union St
Oak St
N 5th St
Winnebago St
Atwood Ave
E Washington Ave
Lien Rd
Garnet Ln
Onyx Ln
Meadowlark Dr
Retana Dr
Tulane Ave
Dempsey Rd
Atlas Ave
Topaz Ln
Johns St
S Stoughton Rd
Leo Dr
Drexel Ave
Hegg Ave
Buckeye Rd
Maher Ave
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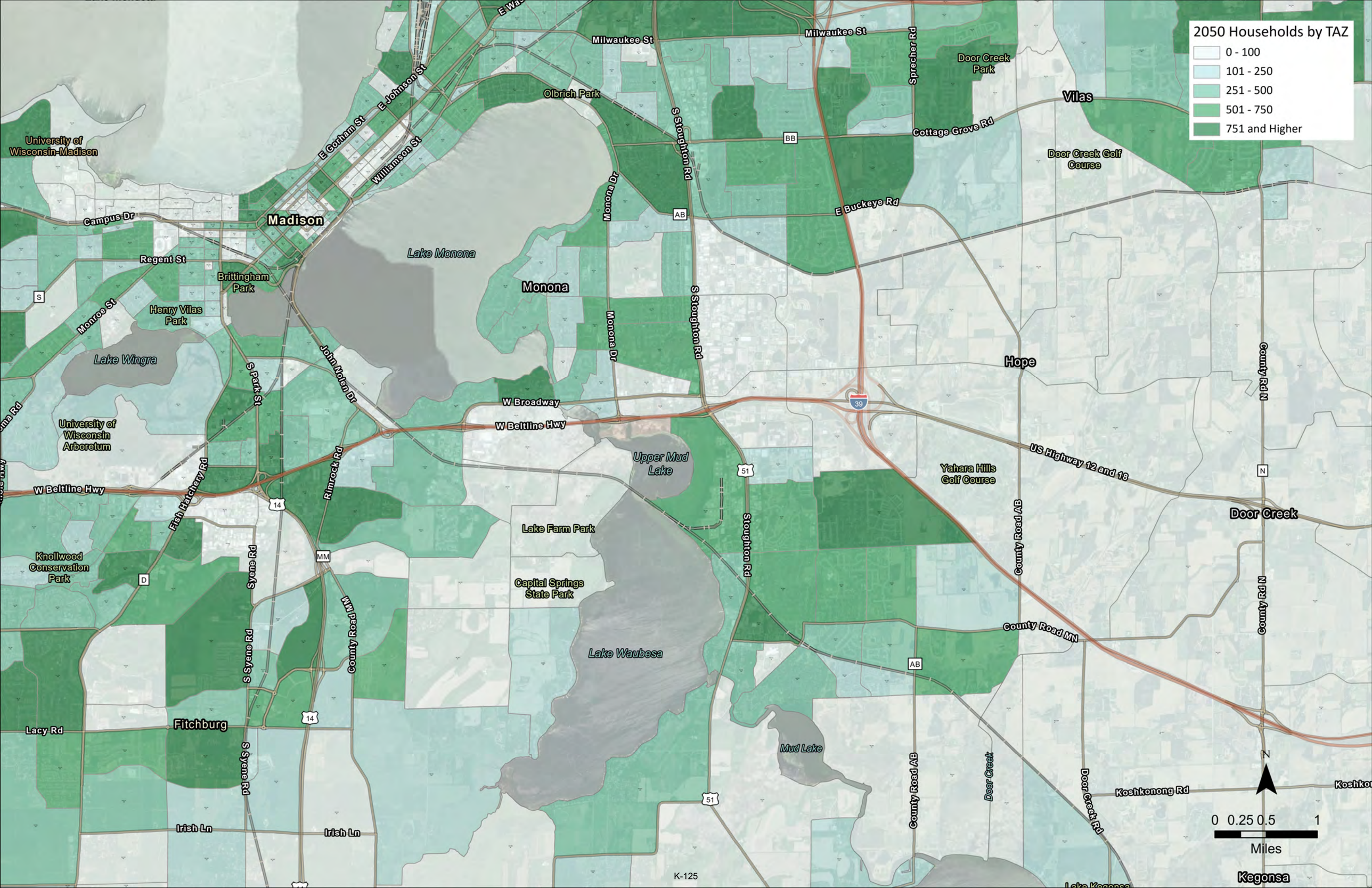
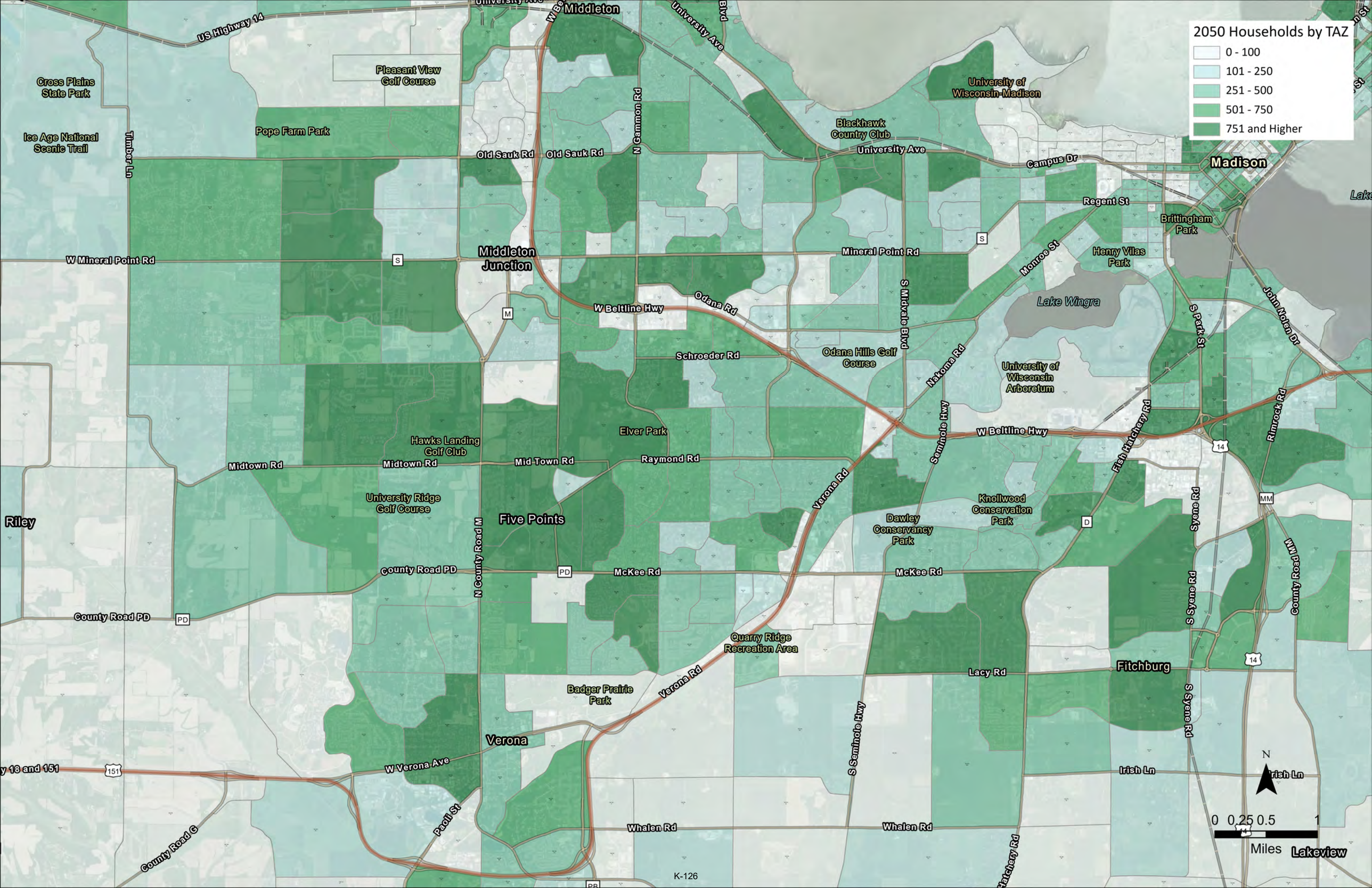
Dairy Dr
Agriculture Dr
Progress Rd
Femrite Dr


2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Milwaukee St
Olbrich Park
S Stoughton Rd
Sprecher Rd
Door Creek Park
Vilas
Cottage Grove Rd
BB
Door Creek Golf Course
E Johnson St
E Gorham St
Williamson St
University of Wisconsin-Madison
Campus Dr
Madison
Monona Dr
AB
E Buckeye Rd
Lake Monona
Regent St
Brittingham Park
Monona
S
Monroe St
Henry Vilas Park
Lake Wingra
S Park St
John Nolen Dr
Hope
W Broadway
W Beltline Hwy
39
University of Wisconsin Arboretum
Fish Hatchery Rd
Rimrock Rd
Upper Mud Lake
51
Yahara Hills Golf Course
US Highway 12 and 18
Door Creek
N
County Road AB
County Rd N
14
MM
Knollwood Conservation Park
D
Syene Rd
Lake Farm Park
Capital Springs State Park
Stoughton Rd
County Road MN
Lake Waubesa
Fitchburg
Lacy Rd
S Syene Rd
Mud Lake
Door Creek
Door Creek Rd
Koshkonong Rd
Irish Ln
0 0.25 0.5 1
Miles
Kegonsa
K-125


2050 Households by TAZ
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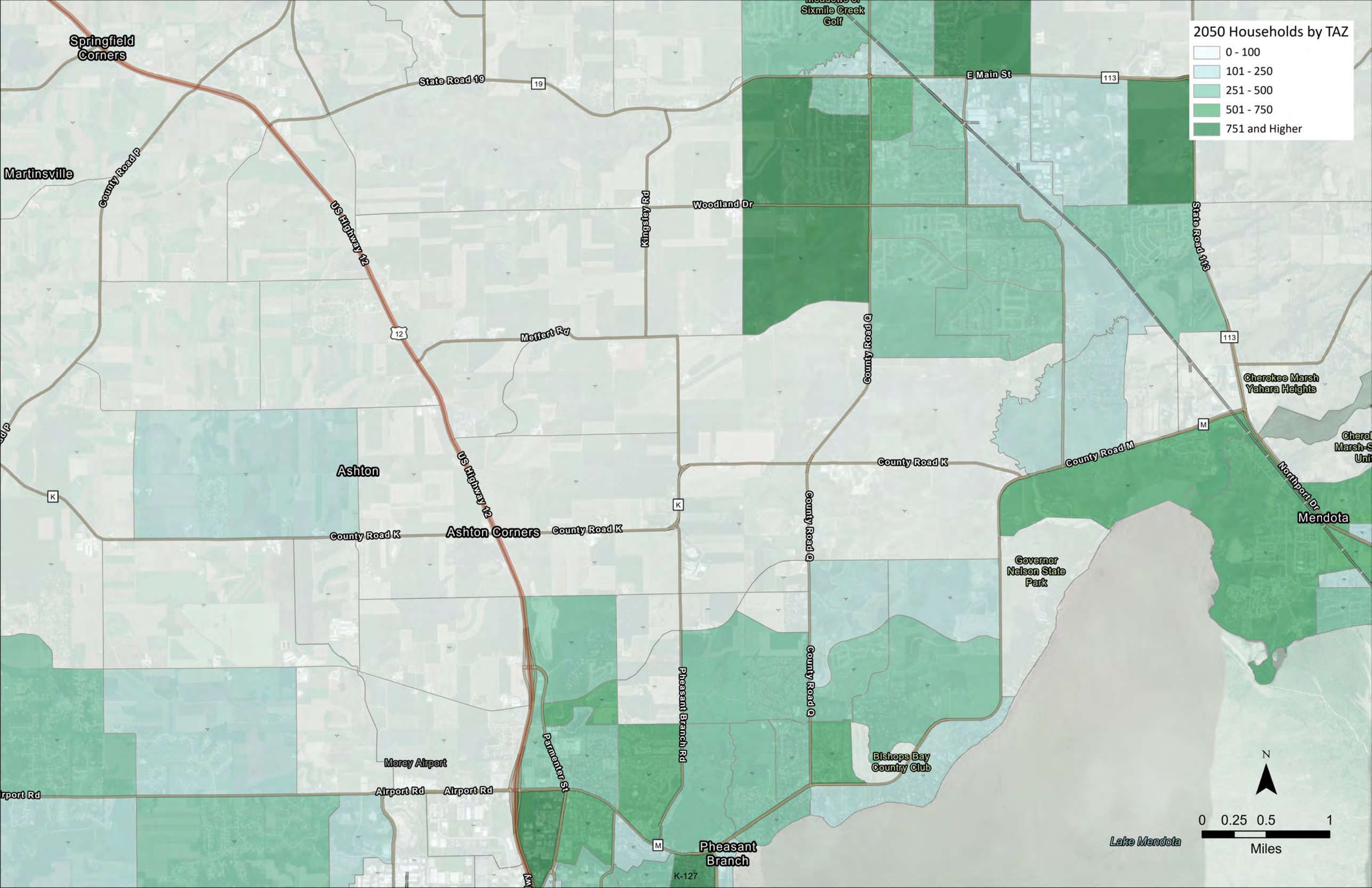
251 - 500
501 - 750
751 and Higher
US Highway 14
Middleton
University Ave
Pleasant View Golf Course
Cross Plains State Park
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
University of Wisconsin-Madison
Blackhawk Country Club
Campus Dr
Madison
Regent St
Brittingham Park
W Mineral Point Rd
Middleton Junction
Mineral Point Rd
Monroe St
Henry Vilas Park
Odana Rd
W Beltline Hwy
S Midvale Blvd
Lake Wingra
John Nolen Dr
S Park St
Schroeder Rd
Odana Hills Golf Course
Nakoma Rd
University of Wisconsin Arboretum
Seminole Hwy
Fish Hatchery Rd
Rimrock Rd
Elver Park
Hawks Landing Golf Club
Midtown Rd
Mid Town Rd
Raymond Rd
Verona Rd
University Ridge Golf Course
Riley
Five Points
N County Road M
Dawley Conservancy Park
Knollwood Conservation Park
Syene Rd
County Road MM
County Road PD
McKee Rd
Quarry Ridge Recreation Area
Badger Prairie Park
Fitchburg
Lacy Rd
S Syene Rd
Verona
W Verona Ave
Irish Ln
Paoli St
Whalen Rd
County Road G
N
0 0.25 0.5 1
Miles
Lakeview


2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
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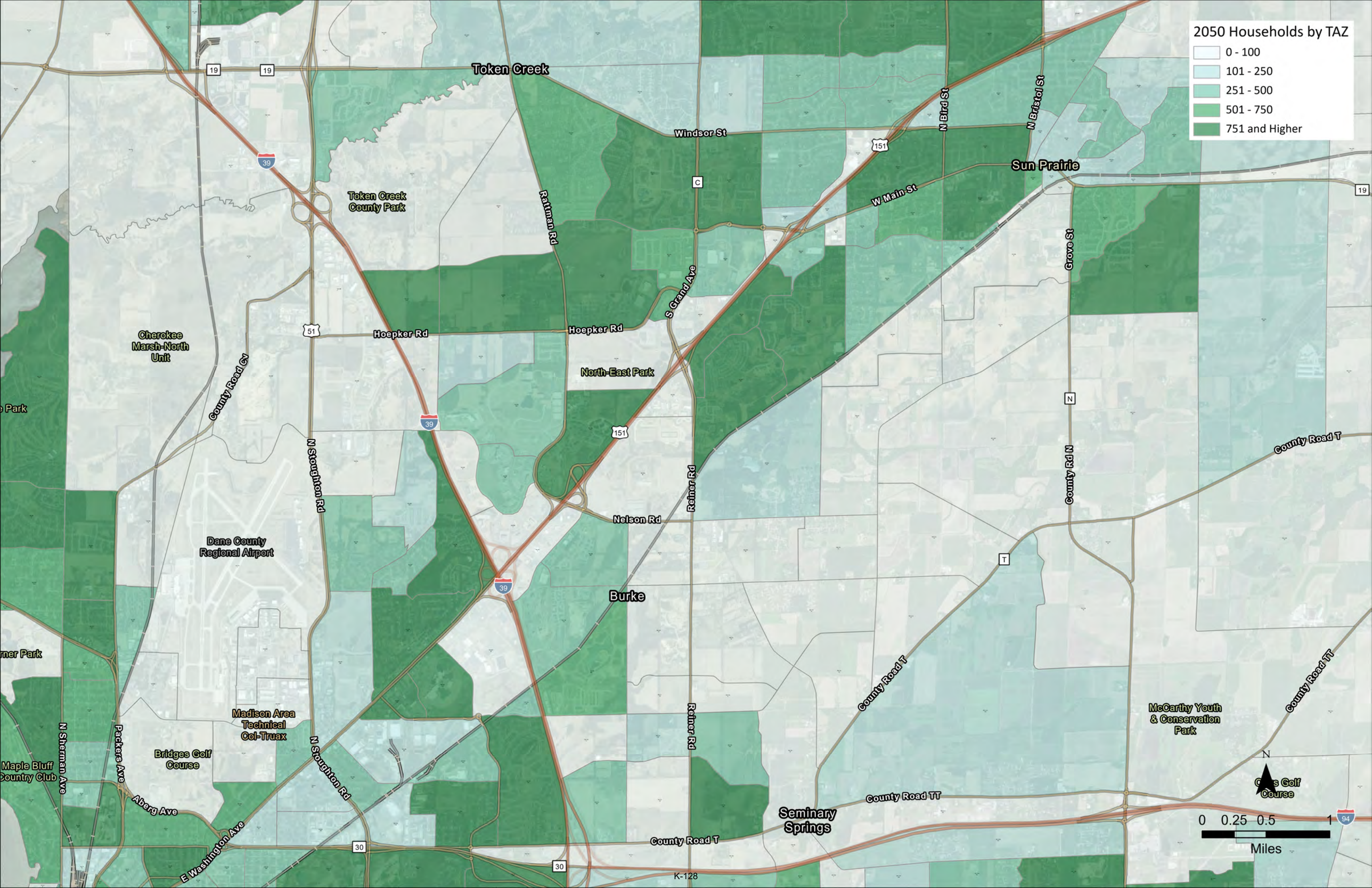
Martinsville
State Road 19
19
County Road P
US Highway 12
12
Kingsley Rd
Woodland Dr
Sixmile Creek Golf
E Main St
113
State Road 113
Cherokee Marsh Yahara Heights
Meffert Rd
County Road Q
Ashton
Ashton Corners
County Road K
K
County Road M
M
Northport Dr
Mendota
Governor Nelson State Park
Pheasant Branch Rd
Parmenter St
Morey Airport
Airport Rd
Bishops Bay Country Club
Pheasant Branch
K-127
Lake Mendota
N
0 0.25 0.5 1
Miles


2050 Households by TAZ
0 - 100
101 - 250
251 - 500
501 - 750
751 and Higher
Token Creek
Windsor St
Sun Prairie
W Main St
Token Creek County Park
Rattman Rd
S Grand Ave
N Bird St
N Bristol St
Grove St
Hoepker Rd
Cherokee Marsh-North Unit
North-East Park
County Road CV
N Stoughton Rd
Reiner Rd
County Road T
Dane County Regional Airport
Nelson Rd
Burke
Madison Area Technical Col-Truax
Bridges Golf Course
Maple Bluff Country Club
N Sherman Ave
Packers Ave
Aberg Ave
E Washington Ave
County Road TT
Seminary Springs
McCarthy Youth & Conservation Park
0 0.25 0.5 1
Miles

Difference in Households from 2016 to 2050

- -75 - -1
- 0 - 250
- 251 - 500
- 501 - 1500
- 1501 - 3831

Lodi
North Bristol
East Bristol
Dane
Deforest
Windsor
Portland
Waterloo
Sun Prairie
Mendota
Pheasant Branch
Middleton
Ice Age National Scenic Trail
Middleton Junction
Madison
Dane
Monona
Vilas
Lake Mills
Deerfield
Door Creek
Five Points
Fitchburg
Verona
Lake Ripley
Kegonsa
Mt Vernon
Daleyville
Forward
Stoughton
Albion
Fort Atkin
Cooksville
Edgerton
Newville

N

0 1.25 2.5 5
Miles

Difference in Households from 2016 to 2050

-75 - -1

0 - 250

251 - 500

501 - 1500

1501 - 3831

Lake Mendota

Lake Monona

Lake Wingra

Madison

Monona

Sycamore Park

Heistand Park

East Morland Park

Tenney Park

Hudson Park

Olbrich Park

Bridges Golf Course

Maple Bluff Country Club

Madison Area Technical Col-Truax

Demetral Field

Union St

Webb Ave

Commercial Ave

Burke Ave

Lexington Ave

Aberg Ave

Anderson St

Sheridan Dr

Farwell Dr

N Sherman Ave

Ruskin St

Huxley St

E Washington Ave

N 5th St

Oak St

Winnebago St

Atwood Ave

Tulane Ave

Dempsey Rd

Johns St

Garnet Ln

Onyx Ln

Meadowlark Dr

Retana Dr

Topaz Ln

Alias Ave

S Stoughton Rd

Lake Mendota Dr

Edgehill Dr

Oxford Rd

University of Wisconsin-Madison

University Hospital

Locust Dr

University Ave

Harvey St

Linden Dr

Campus Dr

Langdon St

James Madison Park

E Dayton St

E Main St

Williamson St

Spaight St

W Johnson St

Price Pl

Hoyt Park

Van Hise Ave

Regent St

Resurrection Cemetery

Rowley Ave

Hillcrest Dr

Forest Hill Cemetery

Larkin St

S Owen Dr

Commonwealth Ave

Keyes Ave

Monroe St

Adams St

S Randall Ave

S Mills St

Brittingham Park

John Nolen Dr

SSM Health St. Mary's Hospital – Madison

Edgewood College

N Wingra Dr

Glenway Municipal Golf Course

Keating Ter

Ames St

Tecumseh Ave

S Midvale Blvd

Odana Rd

Council Crst

Yume Dr

Monroe St

Goodman Park

Turville Point Conservation Park

S Park St

Bedford St

Quann Park

Duane F Bowman Park

Bram St

Alliant Energy Center

Harvey E Schmidt Park

Waunona Way

W Broadway

E Broadway

W Beltline Hwy

Tonyawatha Trl

Monona Municipal Golf Course

Nichols Rd

Douglas Trl

Acacia Ln

Owen Rd

Winnequah Rd

Bridge Rd

Monona Dr

Edna Taylor Conservation Park

Roselawn Memorial Park

Femrite Dr

Progress Rd

Daniels St

Daly Dr

Agriculture Dr

Helgesen Dr

Vondron Rd

Ellen Ave

Leo Dr

Drexel Ave

Hegg Ave

Buckeye Rd

Maher Ave

Turner Ave

Cowpath Rd

E Buckeye Rd

E Dean Ave

W Dean Ave

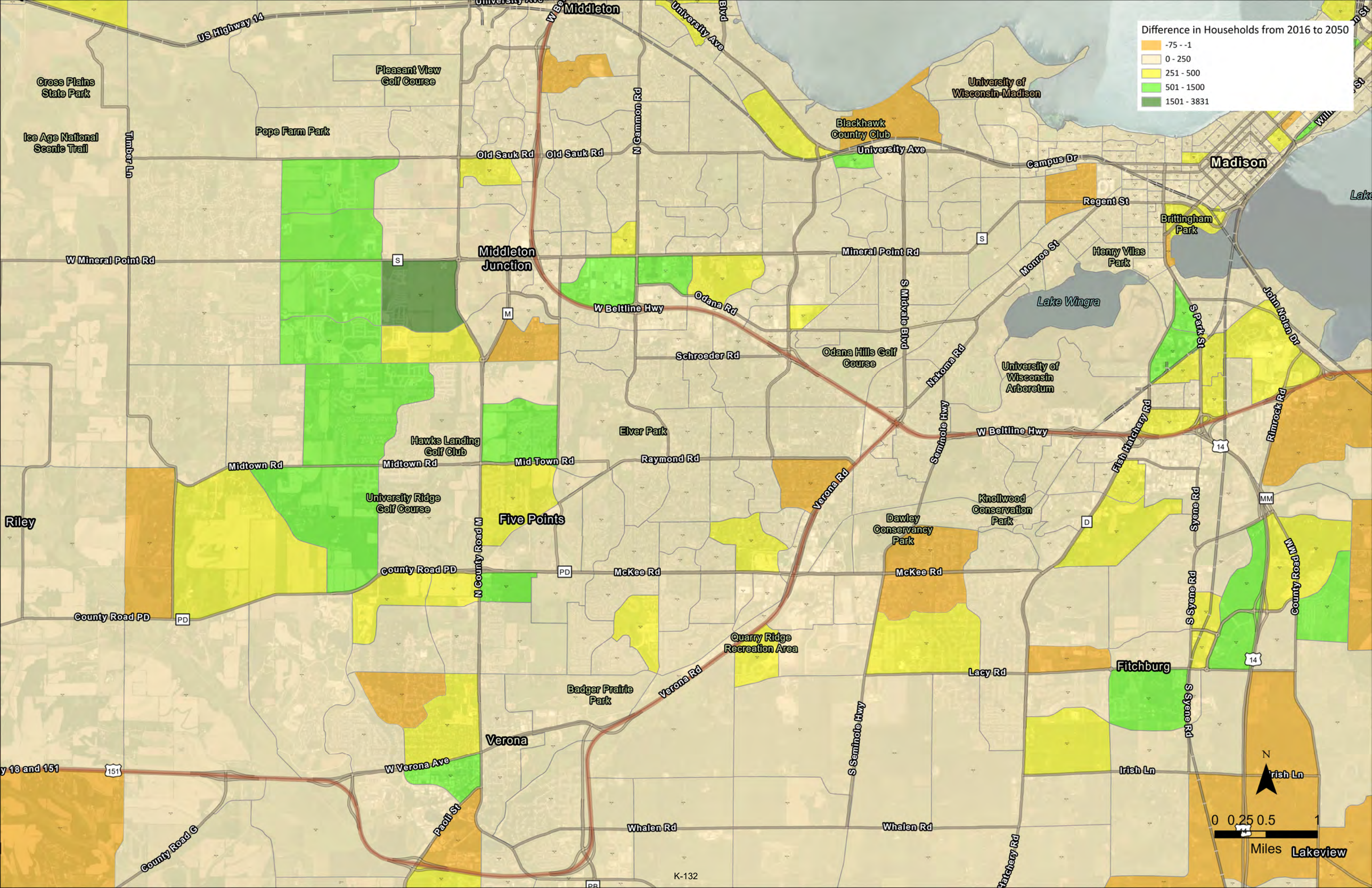
N

0 0.25 0.5 1

Miles

Difference in Households from 2016 to 2050
-75 - -1
0 - 250
251 - 500
501 - 1500
1501 - 3831

Milwaukee St
Olbrich Park
E Johnson St
E Gorham St
Williamson St
University of Wisconsin-Madison
Campus Dr
Madison
Regent St
Brittingham Park
Lake Monona
Monona
Monona Dr
S Stoughton Rd
AB
BB
Cottage Grove Rd
Sprecher Rd
Door Creek Park
Vilas
Door Creek Golf Course
E Buckeye Rd
Monroe St
Henry Vilas Park
Lake Wingra
S Park St
John Nolen Dr
W Broadway
W Beltline Hwy
University of Wisconsin Arboretum
Hope
39
US Highway 12 and 18
Yahara Hills Golf Course
County Rd N
Door Creek
Fish Hatchery Rd
Rimrock Rd
Upper Mud Lake
51
Stoughton Rd
Knollwood Conservation Park
Syene Rd
MM
County Road MM
Lake Farm Park
Capital Springs State Park
Lake Waubesa
County Road AB
County Road MN
Door Creek
Koshkonong Rd
Lacy Rd
Fitchburg
S Syene Rd
Irish Ln
Mud Lake
Kegonsa
N
0 0.25 0.5 1
Miles


Difference in Households from 2016 to 2050
-75 - -1
0 - 250
251 - 500
501 - 1500
1501 - 3831
US Highway 14
Middleton
University Ave
Pleasant View Golf Course
Cross Plains State Park
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
University of Wisconsin-Madison
Blackhawk Country Club
Campus Dr
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Regent St
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Middleton Junction
Mineral Point Rd
Monroe St
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Raymond Rd
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Riley
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County Road PD
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McKee Rd
Verona Rd
Dawley Conservancy Park
Knollwood Conservation Park
Syene Rd
S Syene Rd
County Road MM
Quarry Ridge Recreation Area
Fitchburg
Lacy Rd
Badger Prairie Park
Verona
S Seminole Hwy
W Verona Ave
Irish Ln
Paoli St
Whalen Rd
County Road G
Lakeview
N
0 0.25 0.5 1
Miles

Difference in Households from 2016 to 2050
-75 - -1
0 - 250
251 - 500
501 - 1500
1501 - 3831

Springfield Corners
Martinsville
Ashton
Ashton Corners
Morey Airport
Pheasant Branch
Cherokee Marsh
Yahara Heights
Mendota
Governor Nelson State Park
Bishops Bay Country Club
Lake Mendota
K-133

State Road 19
E Main St
Woodland Dr
Mefferd Rd
County Road K
County Road M
Airport Rd
Parmenter St
Pheasant Branch Rd
Northport Dr
Sixmile Creek Golf

County Road P
US Highway 12
Kingsley Rd
County Road Q
State Road 113

0 0.25 0.5 1
Miles
N

Difference in Households from 2016 to 2050
-75 - -1
0 - 250
251 - 500
501 - 1500
1501 - 3831

Token Creek
Windsor St
Sun Prairie
Token Creek County Park
Ratliman Rd
S Grand Ave
N Bird St
N Bristol St
W Main St
Grove St
Hoepker Rd
Cherokee Marsh-North Unit
County Road CV
North-East Park
N Stoughton Rd
Nelson Rd
Reiner Rd
Dane County Regional Airport
Burke
County Road T
County Rd N
County Road TT
McCarthy Youth & Conservation Park
Madison Area Technical Col-Truax
Bridges Golf Course
N Sherman Ave
Packers Ave
Aberg Ave
E Washington Ave
Seminary Springs
K-134
0 0.25 0.5 1
Miles

Difference in Households from 2016 to 2050

-475 - 0

0 - 250

251 - 500

501 - 1,500

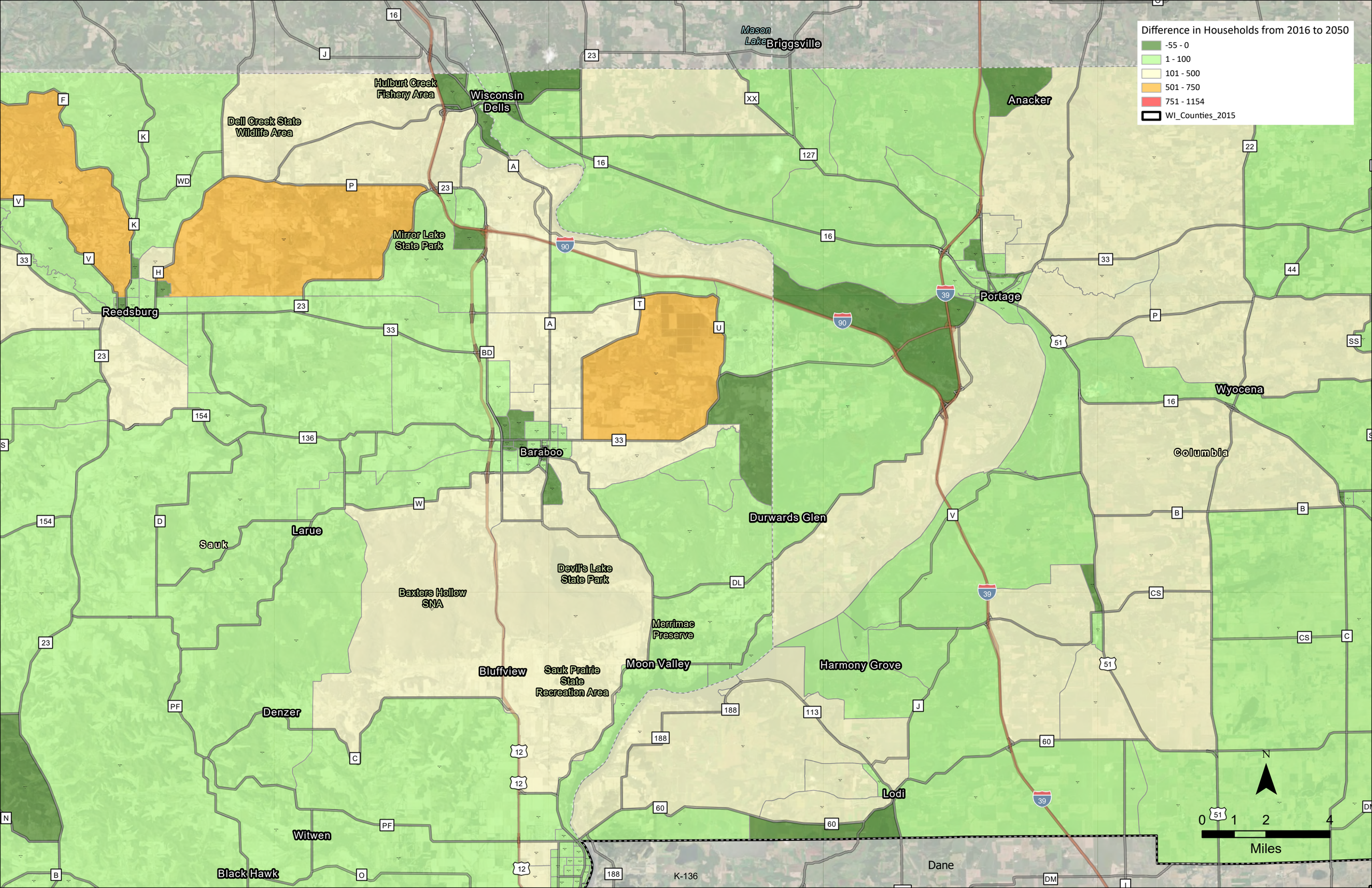
1,501 and Higher

Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Madison
Monona
Middleton Junction
Five Points
Fitchburg
Verona
Vilas
Deerfield
Door Creek
Lake Ripley
Lake Mills
Kegonsa
Stoughton
Albion
Mt Vernon
Daleyville
Forward
Cooksville
Edgerton
Newville

N

0 1.25 2.5 5

Miles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101 - 500
501 - 750
751 - 1154
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Briggsville
Hulburt Creek Fishery Area
Wisconsin Dells
Dell Creek State Wildlife Area
Anacker
Mirror Lake State Park
Reedsburg
Portage
Baraboo
Wyocena
Columbia
Durwards Glen
Larue
Sauk
Devil's Lake State Park
Baxters Hollow SNA
Merrimac Preserve
Moon Valley
Harmony Grove
Bluffview
Sauk Prairie State Recreation Area
Denzer
Lodi
Witwen
Black Hawk
Dane
K-136
N
0 1 2 4
Miles

Difference in Households from 2016 to 2050
-475 - 0
0 - 250
251 - 500
501 - 1,500
1,501 and Higher

Lake Mendota
Lake Monona
Lake Wingra
Madison
Maple Bluff Country Club
Bridges Golf Course
Madison Area Technical Col-Truax
Sycamore Park
Demetral Field
Heistand Park
East Morland Park
Tenney Park
Hudson Park
Olbrich Park
James Madison Park
University of Wisconsin-Madison
University Hospital
Hoyt Park
Resurrection Cemetery
Forest Hill Cemetery
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
Brittingham Park
Goodman Park
Turville Point Conservation Park
Quann Park
Alliant Energy Center
Duane F Bowman Park
Harvey E Schmidt Park
Monona
Monona Municipal Golf Course
Edna Taylor Conservation Park
Roselawn Memorial Park
Anderson St
Farwell Dr
Sheridan Dr
Fremont Ave
N Sherman Ave
Ruskin St
Huxley St
Packers Ave
Coolidge St
Commercial Ave
Webb Ave
Burke Ave
Mayfair Ave
E Washington Ave
Walsh Rd
Oak St
Union St
N 5th St
Winnebago St
Atwood Ave
Garnet Ln
Onyx Ln
Meadowlark Dr
Merryturn Rd
Dennett Dr
Johns St
Dempsey Rd
Atlas Ave
Topaz Ln
Lake Mendota Dr
Edgehill Dr
Oxford Rd
Locust Dr
University Ave
Harvey St
Campus Dr
Observatory Dr
Kendall Ave
Van Hise Ave
Rowley Ave
Regent St
Hillcrest Dr
Keating Ter
Orchard Dr
Charles Ln
Odana Rd
Council Crst
Monroe St
S Midvale Blvd
Toepfer Ave
Larkin St
S Owen Dr
Commonwealth Ave
Keyes Ave
Monroe St
Adams St
S Randall Ave
Vilas Ave
N Wingra Dr
S Park St
S Bird St
Langdon St
E Main St
Williamson St
Spaight St
John Nolen Dr
W Johnson St
University Ave
Price Pl
Tonyawatha Trl
Nichols Rd
Douglas Trl
Acacia Ln
Owen Rd
Monona Dr
Winnequah Rd
Bridge Rd
Waunona Way
W Broadway
E Broadway
Femrite Dr
W Beltline Hwy
Progress Rd
Daniels St
Dairy Dr
Agriculture Dr
Helgesen Dr
Pflaum Rd
W Dean Ave
E Dean Ave
E Buckeye Rd
Buckeye Rd
Hegg Ave
Drexel Ave
Maher Ave
Turner Ave
Camden Rd
Monona Dr
Vondron Rd
Ellen Ave
Leo Dr
Stoughton Rd
Lake Mendota Dr
Bay Club
151
30
39
BB
N
0 0.25 0.5 1
Miles

Difference in Households from 2016 to 2050
-475 - 0
0 - 250
251 - 500
501 - 1,500
1,501 and Higher

Milwaukee St
Milwaukee St
Sprecher Rd
Door Creek Park
Vilas
Olbrich Park
S Stoughton Rd
BB
Cottage Grove Rd
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E Johnson St
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Williamson St
University of Wisconsin-Madison
Monona Dr
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E Buckeye Rd
Campus Dr
Madison
Lake Monona
Regent St
Brittingham Park
Monona
S
Monroe St
Henry Vilas Park
Lake Wingra
S Park St
John Nolen Dr
Hope
W Broadway
39
W Beltline Hwy
University of Wisconsin Arboretum
Upper Mud Lake
US Highway 12 and 18
Yahara Hills Golf Course
51
N
Door Creek
Fish Hatchery Rd
14
Rimrock Rd
Syene Rd
MM
Knollwood Conservation Park
D
Lake Farm Park
Stoughton Rd
County Road AB
County Rd N
Capital Springs State Park
County Road MN
Lake Waubesa
AB
Fitchburg
Lacy Rd
S Syene Rd
County Road MM
Mud Lake
Door Creek
Koshkonong Rd
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Door Creek Rd
N
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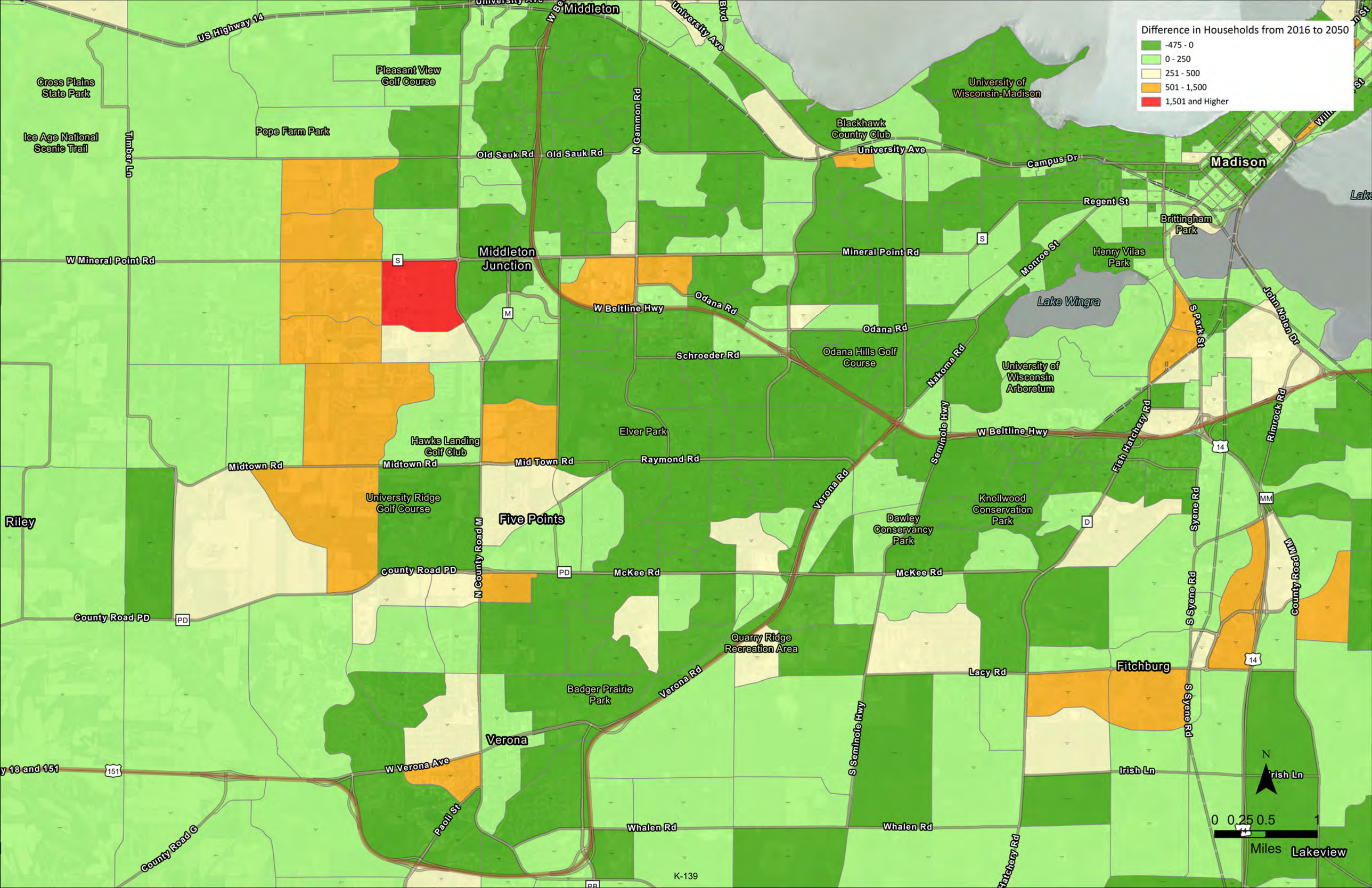
Miles
Kegonsa
K-138


Difference in Households from 2016 to 2050
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501 - 1,500
1,501 and Higher
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Middleton
University Ave
Blvd
Pleasant View Golf Course
Cross Plains State Park
Ice Age National Scenic Trail
Timber Ln
Pope Farm Park
Old Sauk Rd
N Gammon Rd
University of Wisconsin-Madison
Blackhawk Country Club
Campus Dr
Madison
Regent St
Brittingham Park
Monroe St
Henry Vilas Park
W Mineral Point Rd
Middleton Junction
Mineral Point Rd
Lake Wingra
W Beltline Hwy
Odana Rd
Schroeder Rd
Odana Hills Golf Course
Nakoma Rd
University of Wisconsin Arboretum
S Park St
John Nolen Dr
Elver Park
Hawks Landing Golf Club
Midtown Rd
Mid Town Rd
Raymond Rd
Seminole Hwy
Fish Hatchery Rd
Rimrock Rd
University Ridge Golf Course
Riley
Five Points
Verona Rd
Dawley Conservancy Park
Knollwood Conservation Park
Syene Rd
S Syene Rd
County Road MM
County Road PD
McKee Rd
N County Road M
Quarry Ridge Recreation Area
Fitchburg
Lacy Rd
Badger Prairie Park
Verona
S Seminole Hwy
W Verona Ave
Irish Ln
Paoli St
Whalen Rd
County Road G
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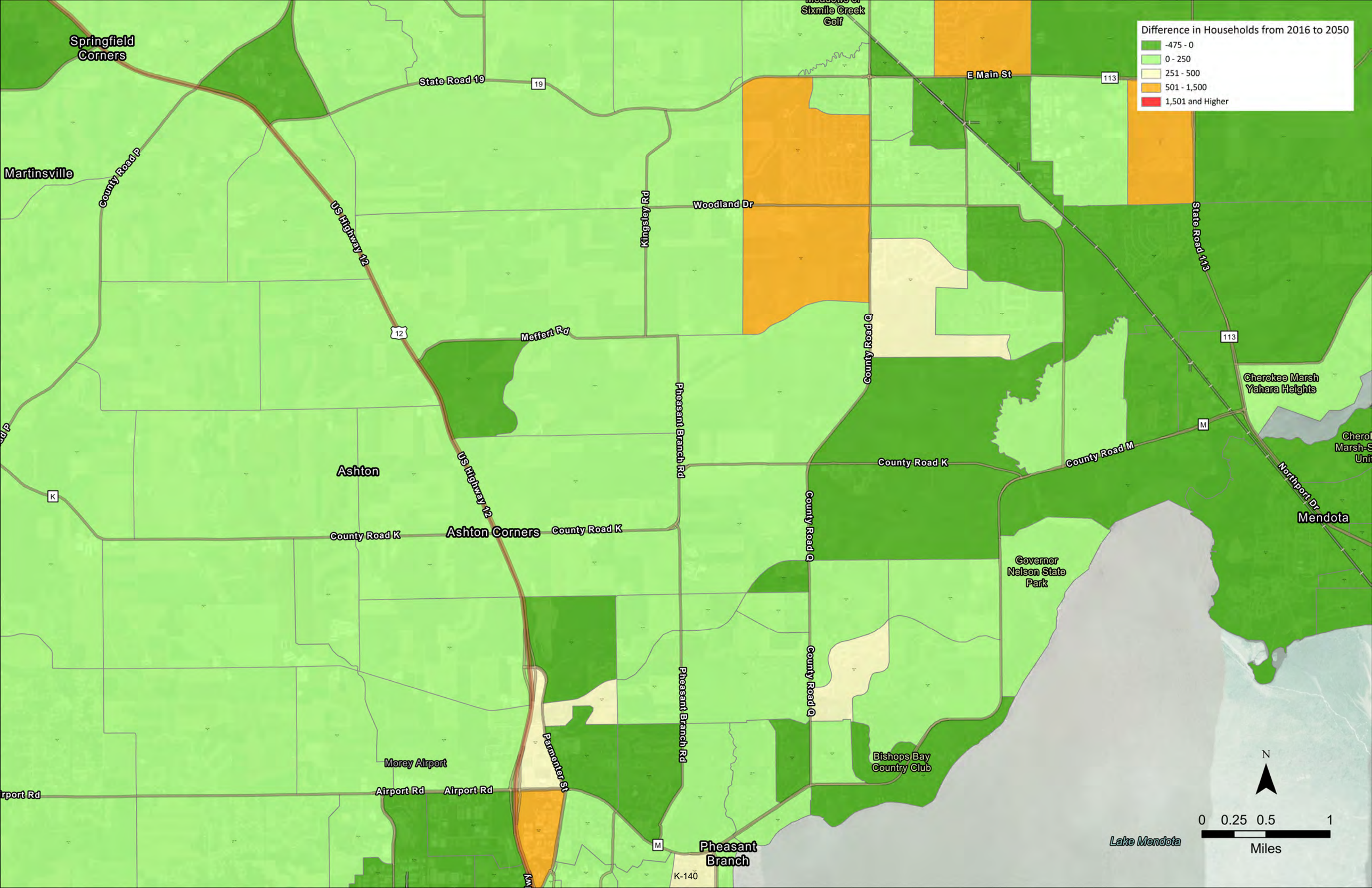
Miles
Lakeview
K-139


Difference in Households from 2016 to 2050
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501 - 1,500
1,501 and Higher
Springfield Corners
Martinsville
Ashton
Ashton Corners
Morey Airport
Pheasant Branch
Mendota
Governor Nelson State Park
Bishops Bay Country Club
Cherokee Marsh Yahara Heights
Lake Mendota
Sixmile Creek Golf
State Road 19
E Main St
Woodland Dr
Meffert Rd
County Road K
Airport Rd
K-140
County Road P
US Highway 12
Kingsley Rd
Pheasant Branch Rd
County Road Q
State Road 113
County Road M
Northport Dr
Parmenter St
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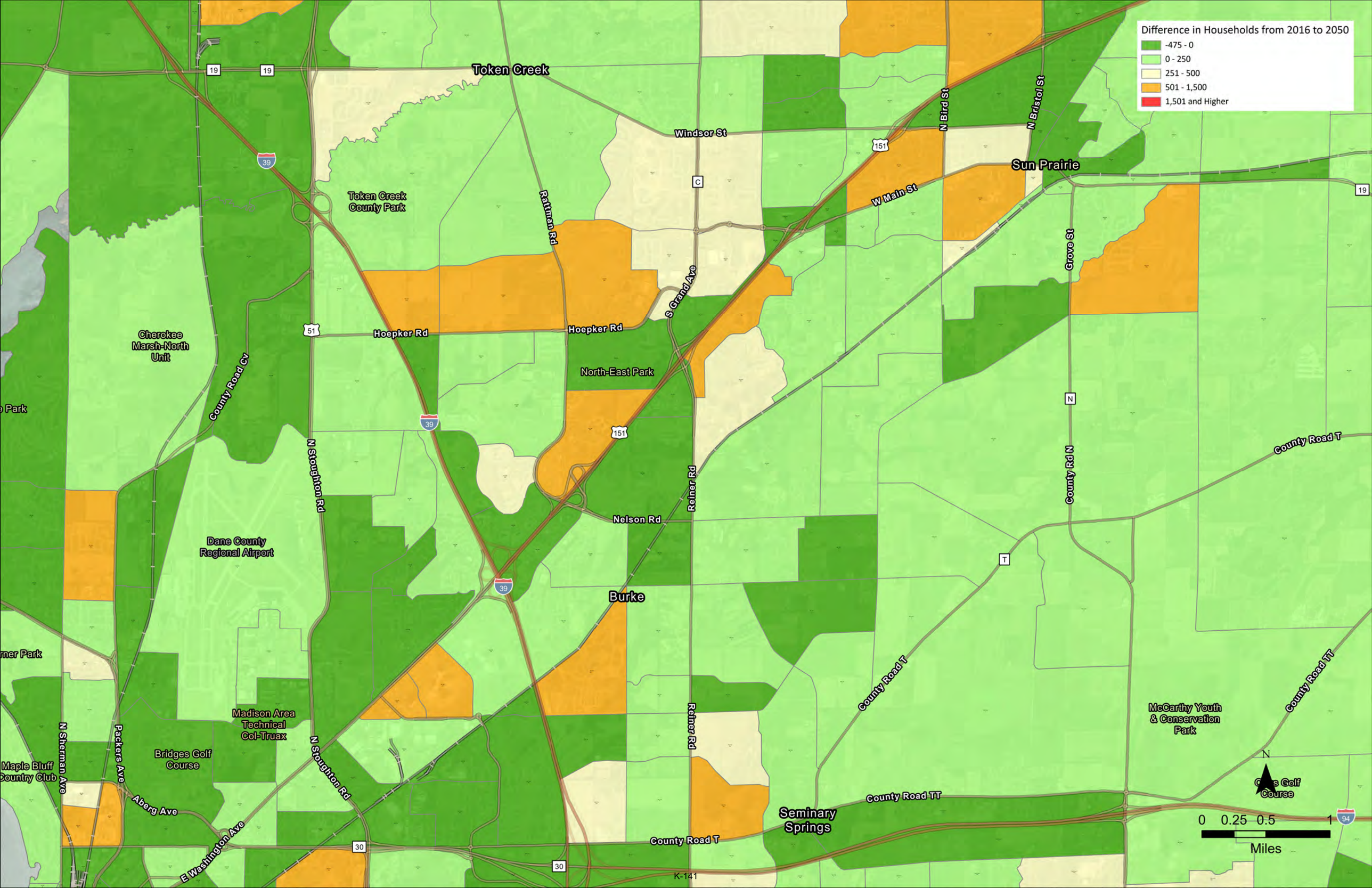
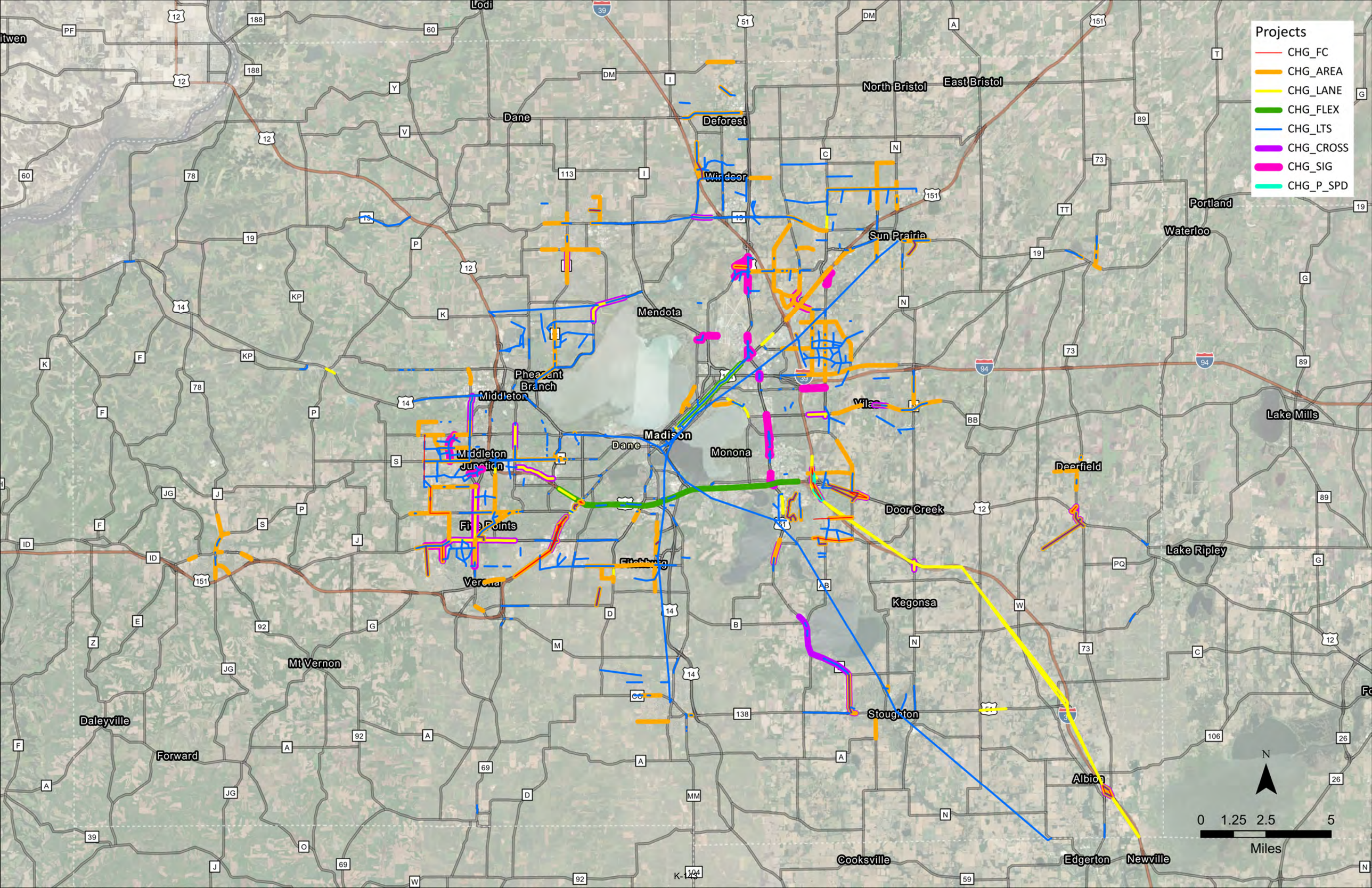
0 0.25 0.5 1
Miles


Difference in Households from 2016 to 2050
-475 - 0
0 - 250
251 - 500
501 - 1,500
1,501 and Higher
Token Creek
Windsor St
Sun Prairie
N Bird St
N Bristol St
W Main St
Grove St
Token Creek County Park
Rattman Rd
S Grand Ave
Hoepker Rd
Cherokee Marsh-North Unit
County Road CV
North-East Park
Dane County Regional Airport
N Stoughton Rd
Nelson Rd
Reiner Rd
Burke
County Rd N
County Road T
County Road TT
Madison Area Technical Col-Truax
Bridges Golf Course
Packers Ave
N Sherman Ave
Aberg Ave
E Washington Ave
Maple Bluff Country Club
Seminary Springs
McCarthy Youth & Conservation Park
K-141
0 0.25 0.5 1
Miles
N

**Appendix F**
**Committed improvement mapping**


Projects
CHG_FC
CHG_AREA
CHG_LANE
CHG_FLEX
CHG_LTS
CHG_CROSS
CHG_SIG
CHG_P_SPD
Lodi
Dane
Deforest
North Bristol
East Bristol
Windsor
Sun Prairie
Portland
Waterloo
Mendota
Pheasant Branch
Middleton
Madison
Monona
Middleton Junction
Five Points
Verona
Fitchburg
Mt Vernon
Daleyville
Forward
Kegonsa
Stoughton
Deerfield
Door Creek
Lake Ripley
Albion
Cooksville
Edgerton
Newville
Lake Mills
N
0 1.25 2.5 5
Miles

Projects
CHG_FC
CHG_AREA
CHG_LANE
CHG_FLEX
CHG_LTS
CHG_CROSS
CHG_SIG
CHG_P_SPD
Lake Mendota
Lake Monona
Lake Wingra
Madison
Monona
Maple Bluff Country Club
Bridges Golf Course
Madison Area Technical Col-Truax
University of Wisconsin-Madison
University Hospital
James Madison Park
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Tenney Park
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Brittingham Park
Goodman Park
Turville Point Conservation Park
Quann Park
Alliant Energy Center
Duane F Bowman Park
Harvey E Schmidt Park
Hoyt Park
Resurrection Cemetery
Forest Hill Cemetery
Glenway Municipal Golf Course
Edgewood College
SSM Health St. Mary's Hospital – Madison
Monona Municipal Golf Course
Edna Taylor Conservation Park
Roselawn Memorial Park
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Coolidge St
Commercial Ave
Burke Ave
Webb Ave
Union St
Langdon St
Observatory Dr
University Ave
Campus Dr
Kendall Ave
Van Hise Ave
Regent St
Rowley Ave
Vilas Ave
Nichols Rd
Douglas Trl
Acacia Ln
Owen Rd
Dennett Dr
Johns St
Femrite Dr
W Broadway
E Broadway
Waunona Way
E Buckeye Rd
Helgesen Dr
Pflaum
W Dean Ave
E Dean Ave
Leo Dr
Lien Rd
Sycamore
Onyx Ln
Garnet Ln
Topaz Ln
Meadowlark Dr
Merryturn Rd
Vondron Rd
Ellen Ave
Daniels St
Dairy Dr
Agriculture Dr
Progress Rd
Dempsey Rd
Atlas Ave
Mayfair Ave
Walsh Rd
Turner Ave
Camden Rd
Maher Ave
Drexel Ave
Hegg Ave
Buckeye Rd
Monona Dr
Tonyawatha Trl
Wimmenauch Rd
Bridge Rd
Packers Ave
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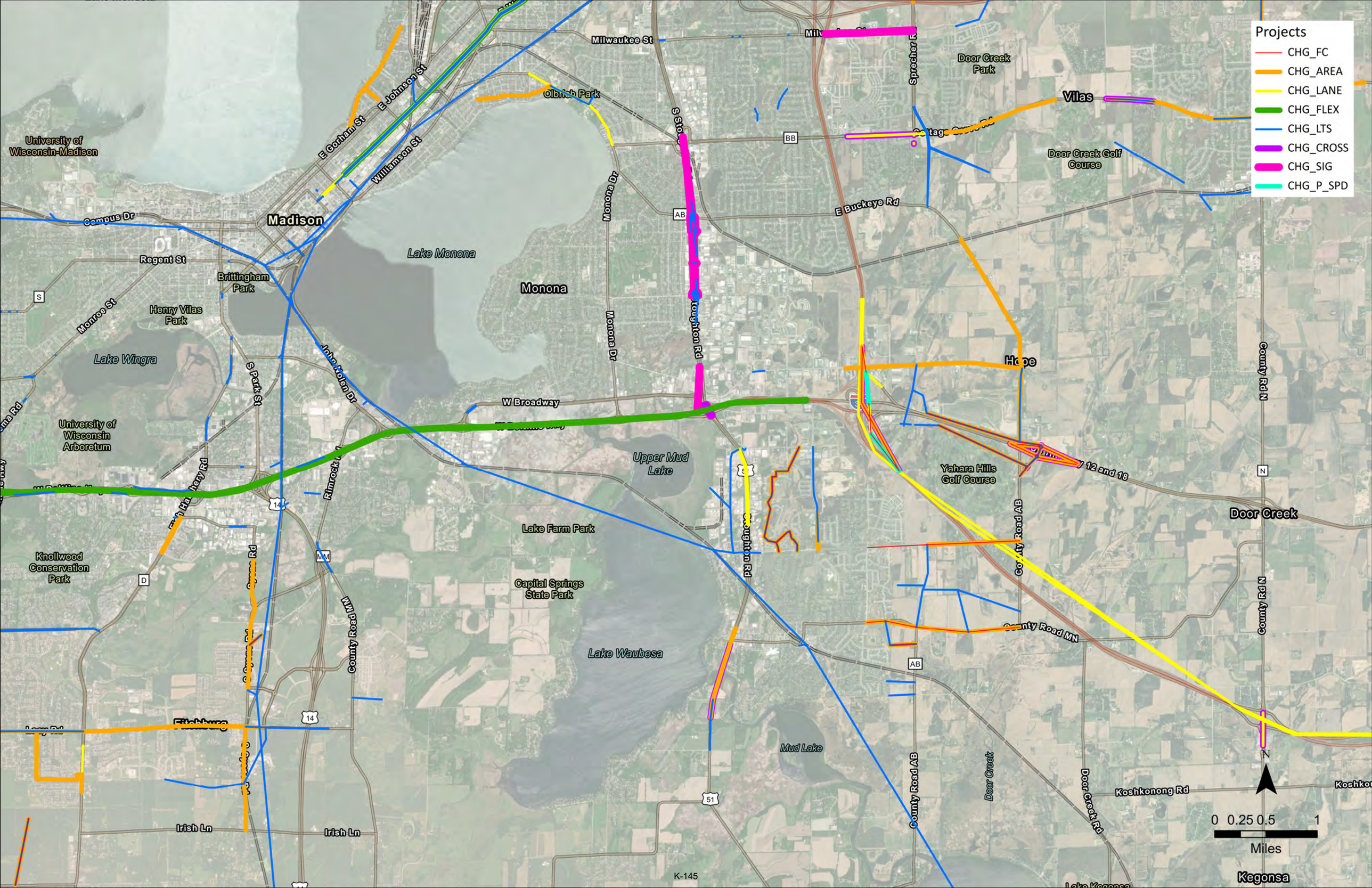
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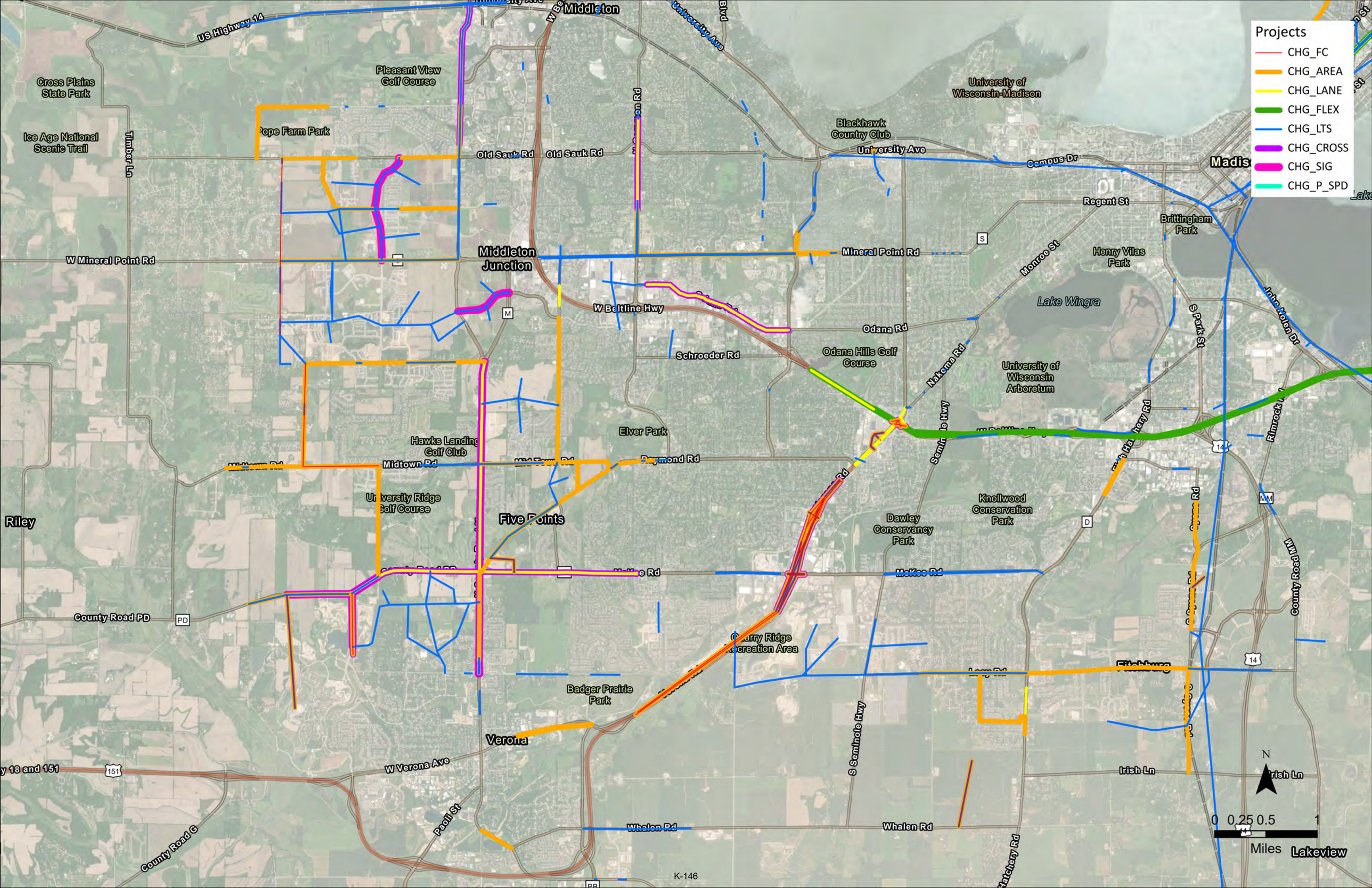
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Blackhawk Country Club
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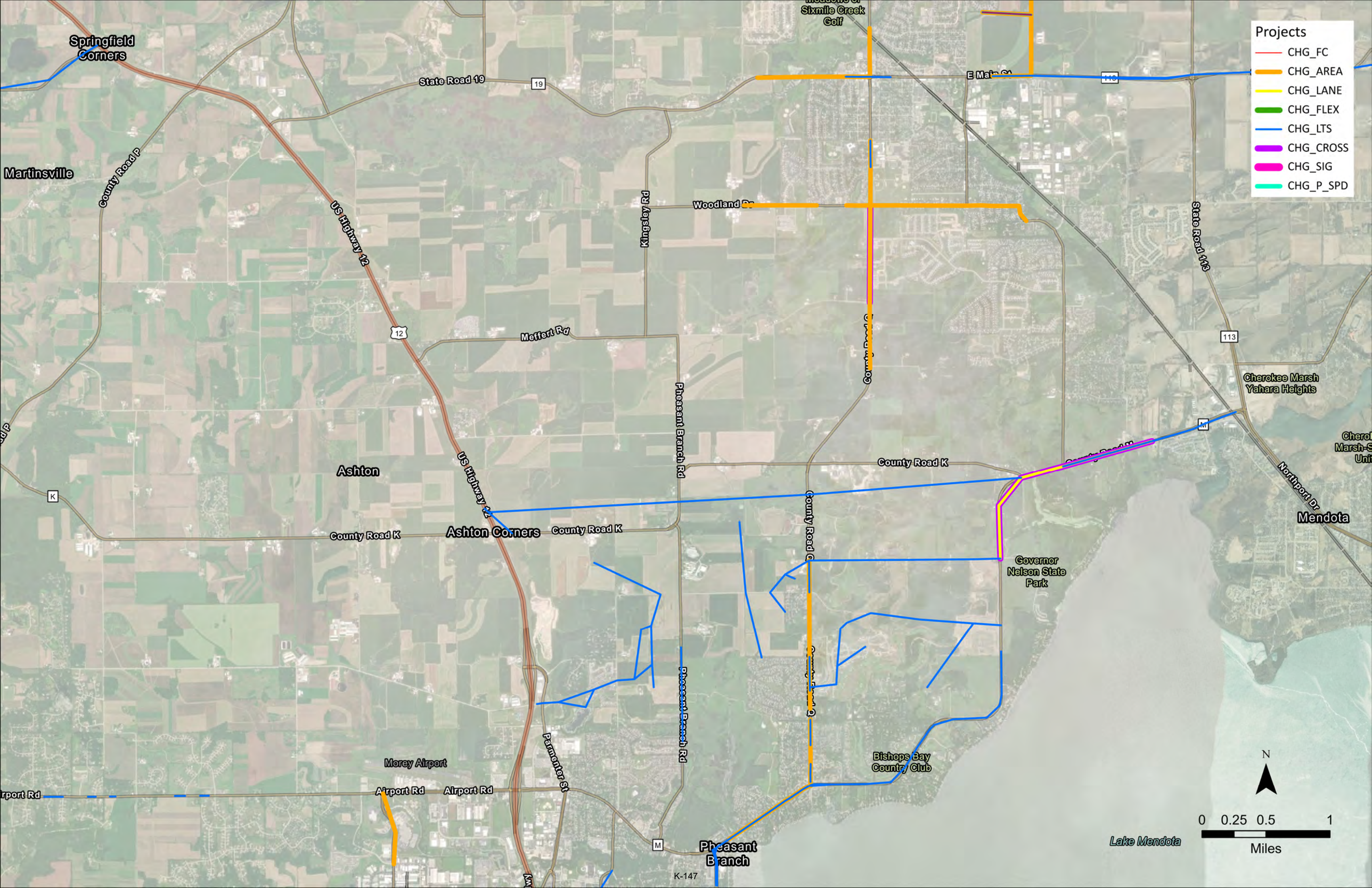
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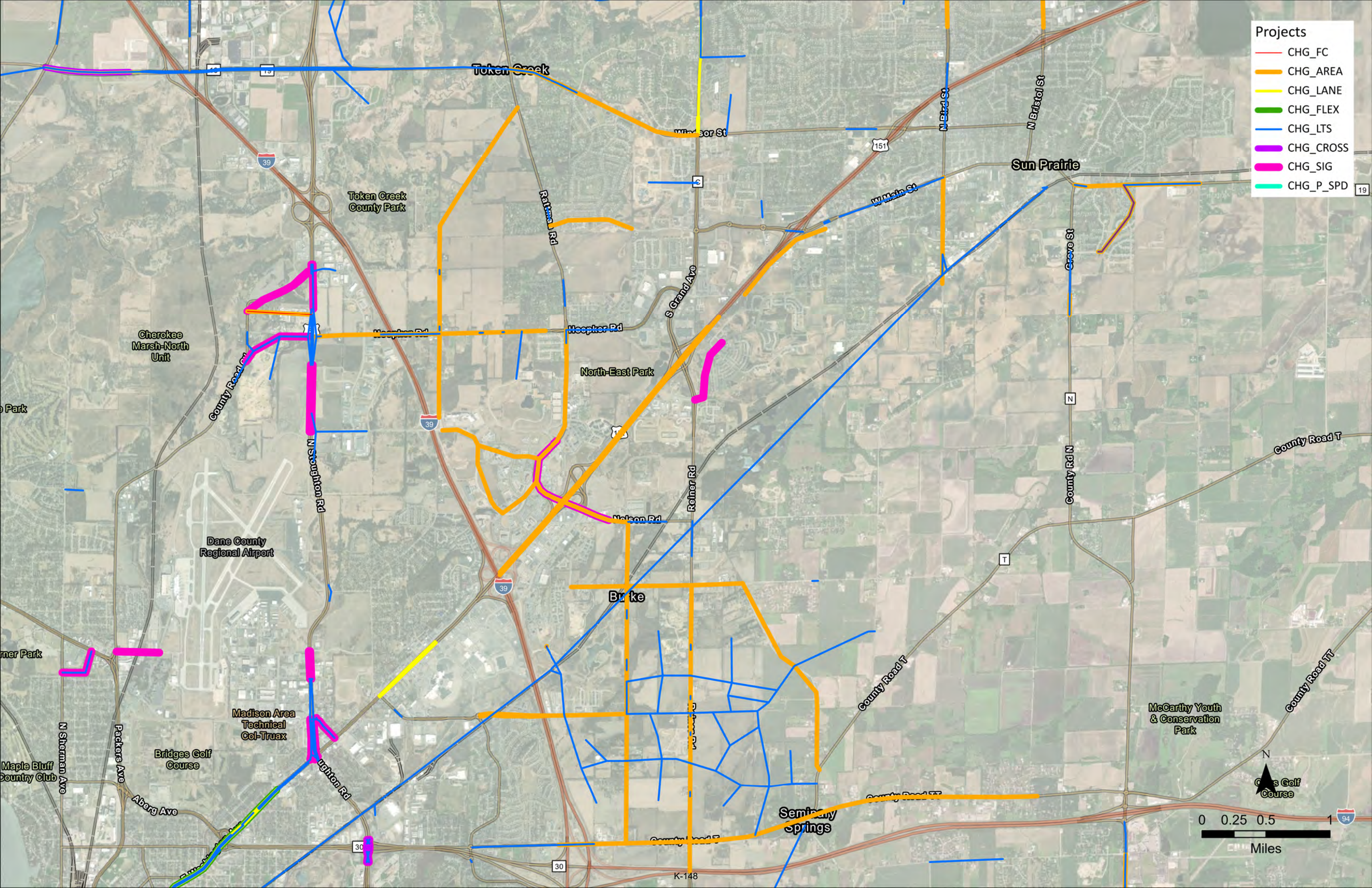
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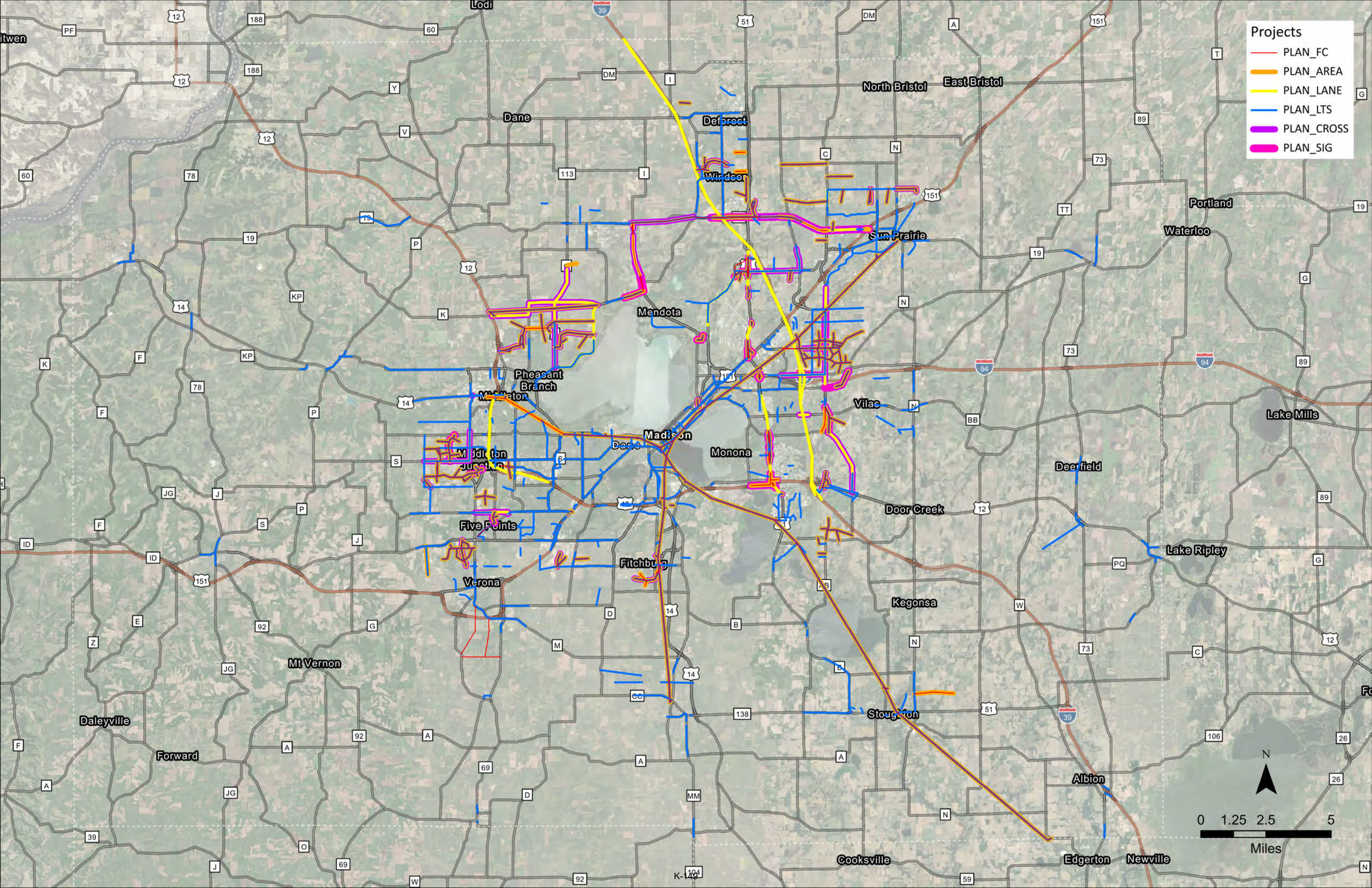
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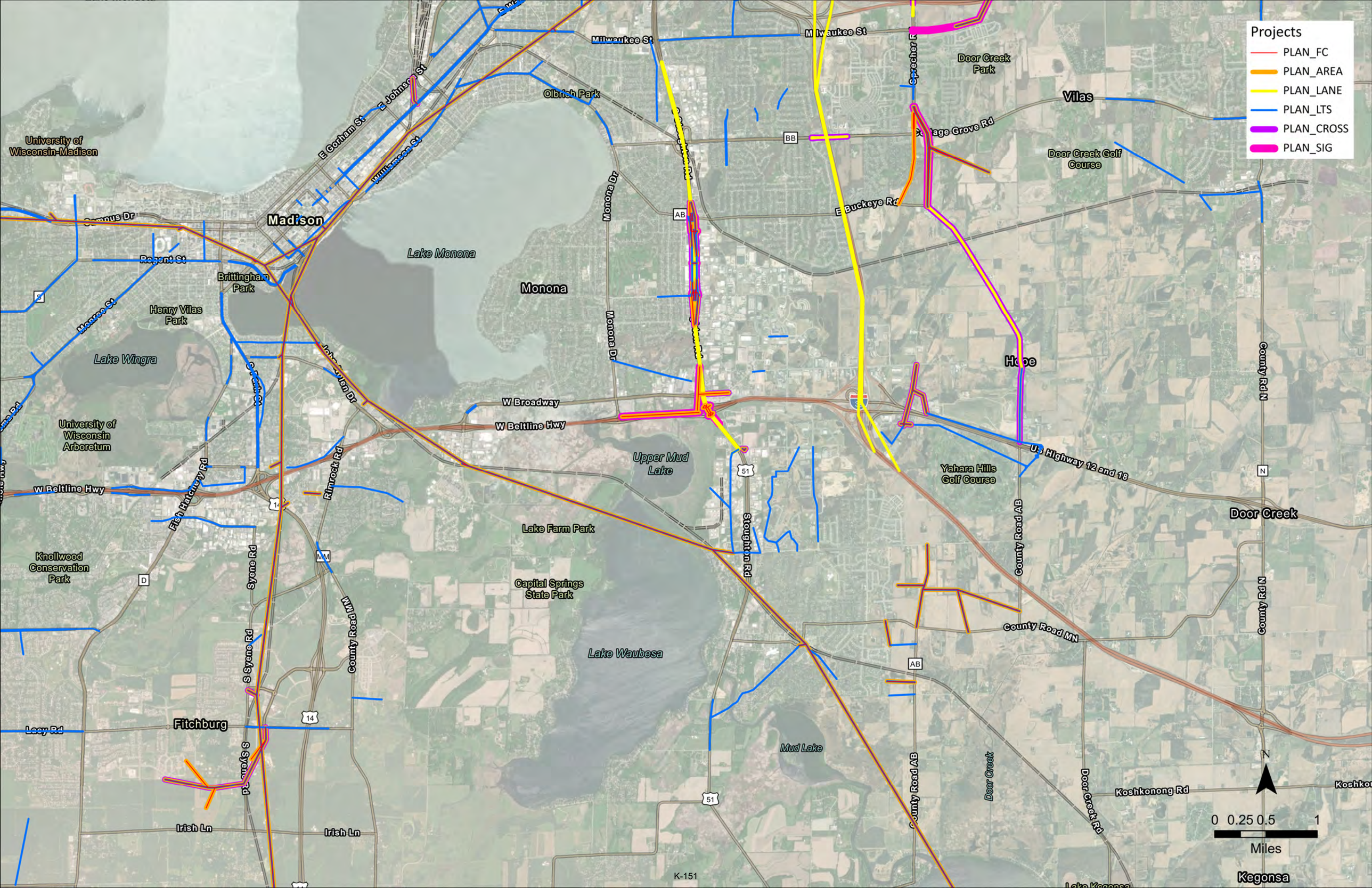
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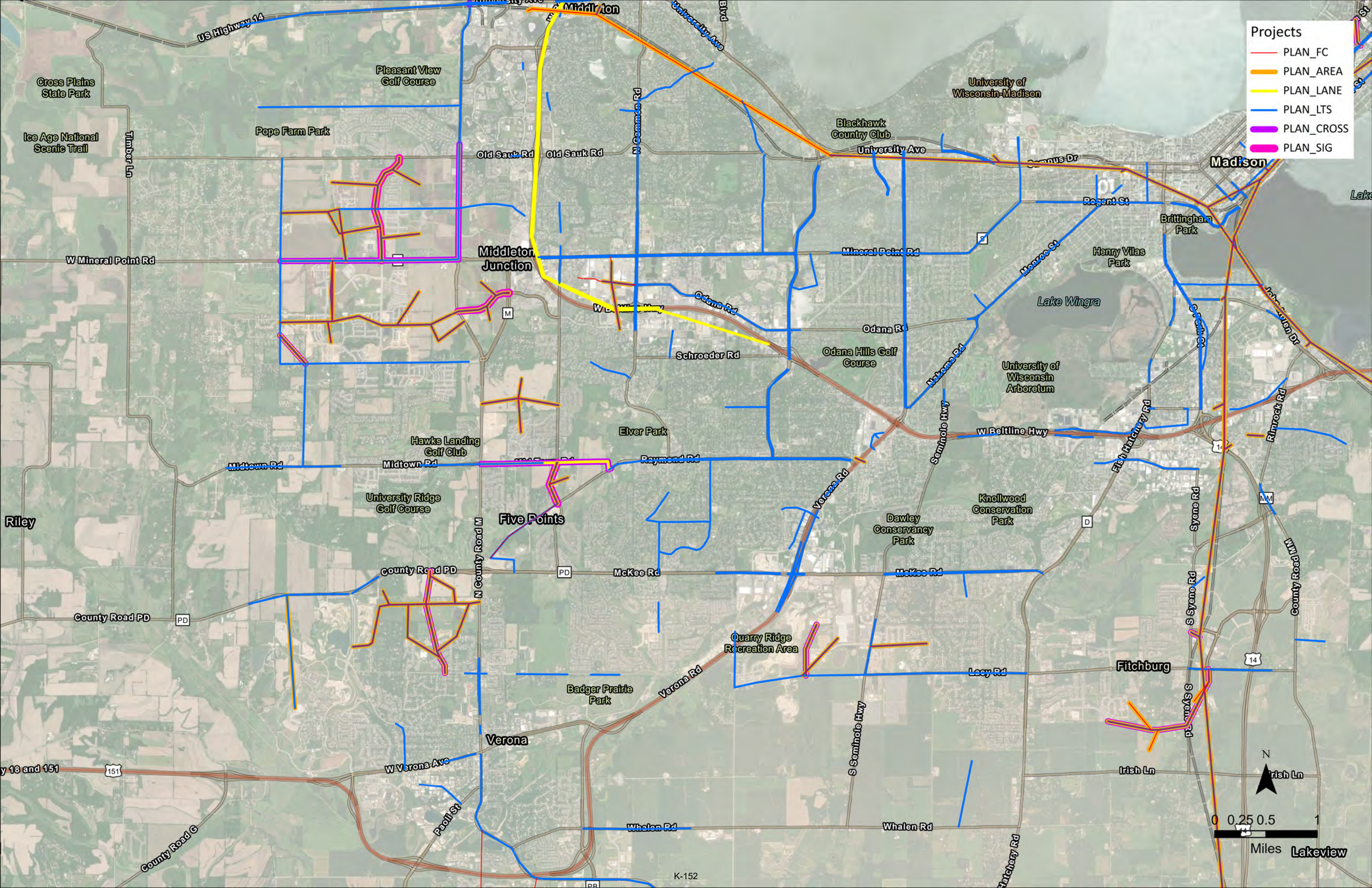
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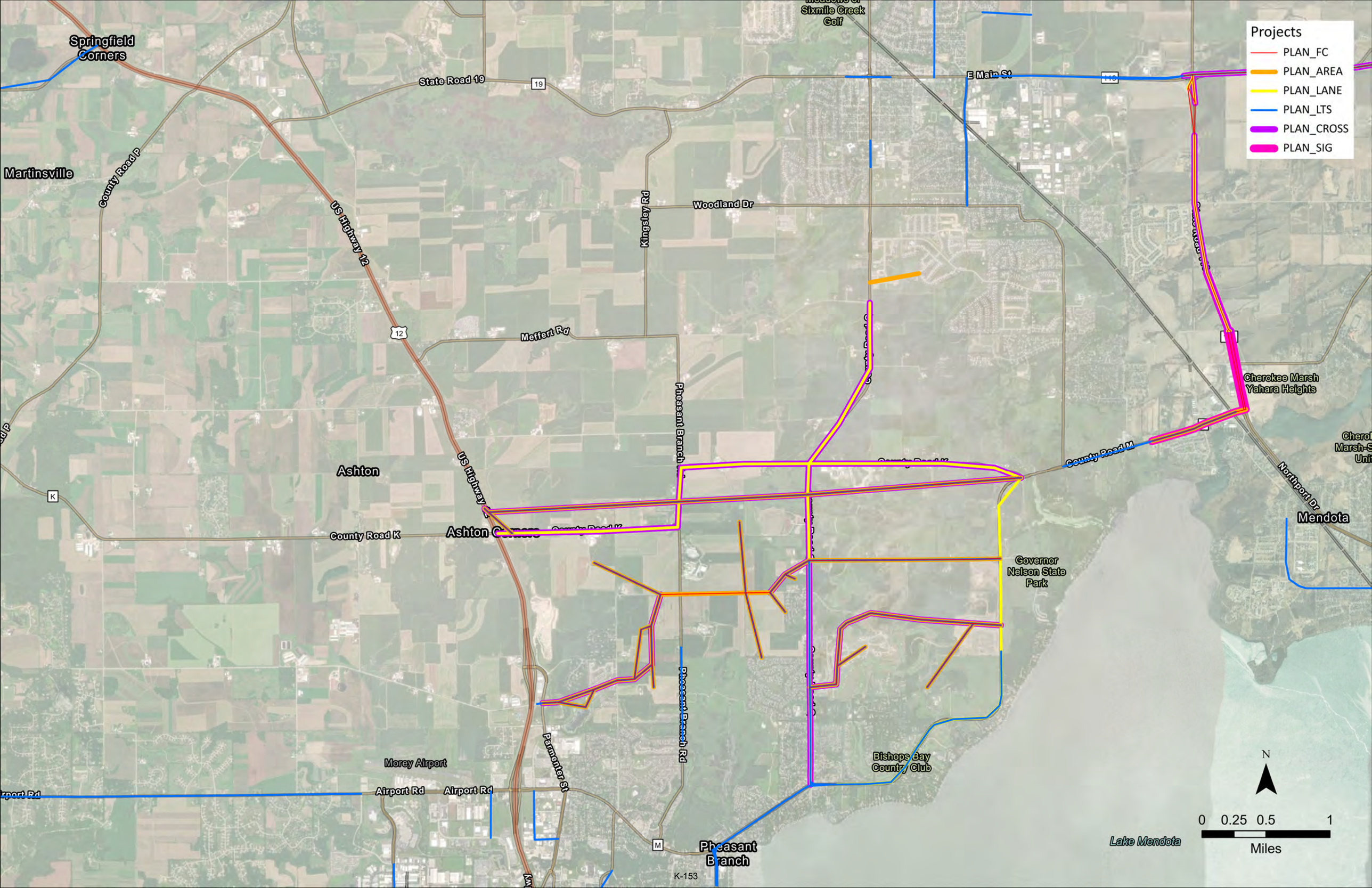
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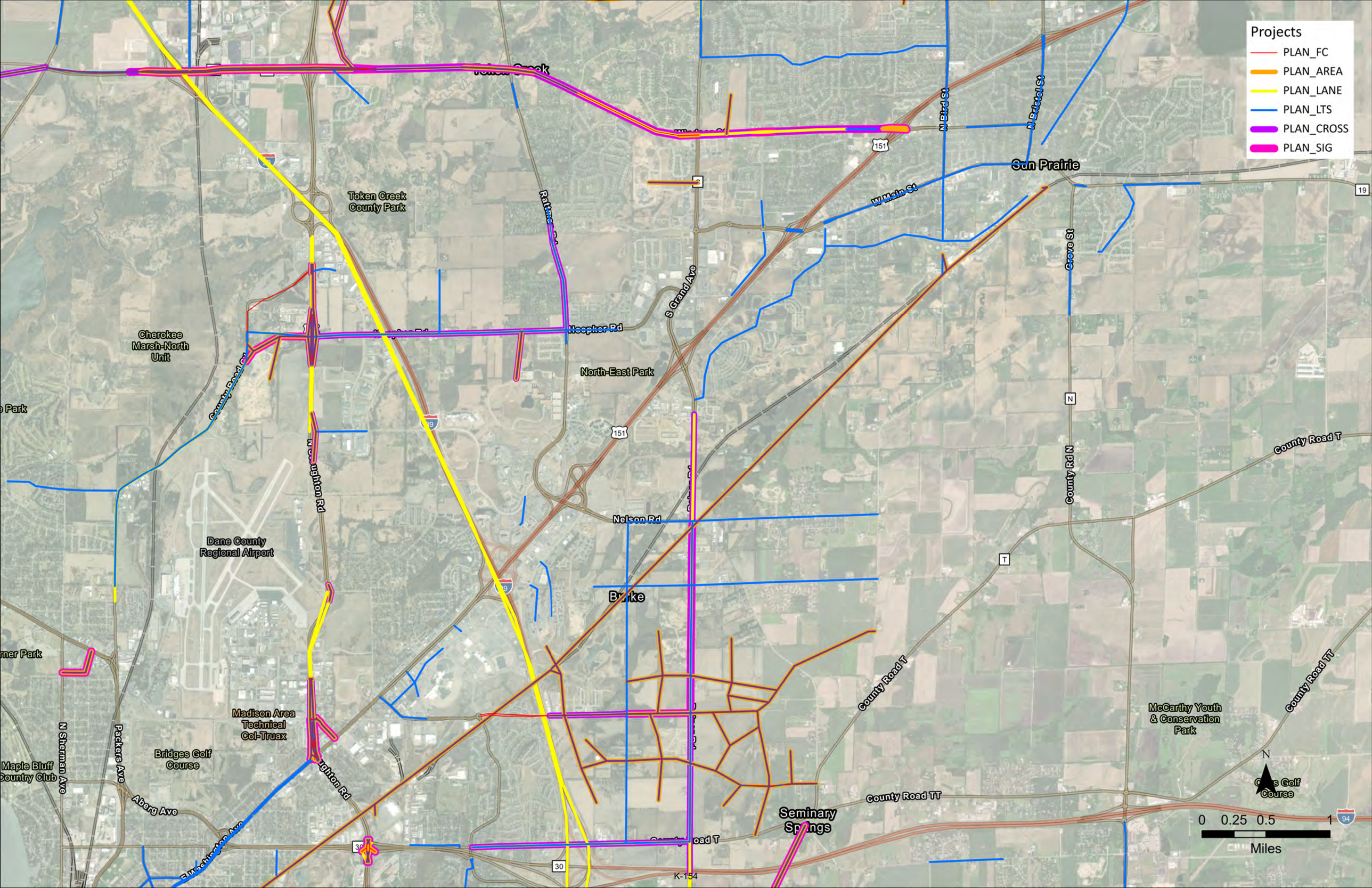
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**Appendix G**
**Dane County Travel Demand Model Peak Period Validation Memo**

# Dane County Travel Demand Model Validation Report

August 2022

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# 1. INTRODUCTION

## 1.1 OVERVIEW

This report documents the validation effort for Dane County TDM base year model (Dane_Version_7_2_1_0_toHNTB_20220413) by HNTB modeling team. The major two efforts involve validation on the base year model and recommendation on the updates on the base year model

## 1.2 BASE YEAR MODEL VALIDATION

The base year of the Dane County is 2016. The following efforts were performed on the validation:

- Initial check on the model
- Trip distribution result validation
- Mode split validation
- Highway assignment validation.

The data set used for the validation efforts includes:

- Third-party OD data including Replica and Streetlight data from 2026
- Time of day traffic count data from WisDOT's TRAffic Data System (TRADAS, a product from Chaparral Systems)
- Travel time/speed data from NPMRDS data set in Dane County region road network.

## 1.3 RECOMMENDATION ON THE UPDATES OF THE BASE YEAR MODEL

With the base year validation, some updates on the TDM model are proposed, including the following three aspects:

- Cluster related update to fix random result
- Intersection signal delay integration to reduce speed error percentage
- Interzonal terminal time modification to reduce the district-to-district flow pattern difference.

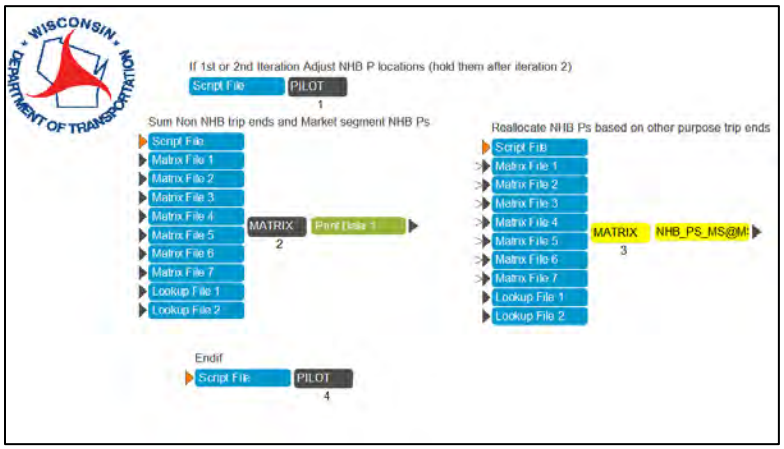
# 2. BASE YEAR MODEL VALIDATION

This chapter discusses the efforts committed for the base year model validation.

## 2.1 MODEL INITIAL CHECKING

Some initial checks were performed on the Dane County TDM model (Dane_Version_7_2_1_0_toHNTB_20220413) from WisDOT. A cluster related issue was identified within current version of model, causing model generating different results for every independent run. The problem happens in the NHB destination choice module, where the program generates an intermediate file without TOD and MS token in the name when reallocating NHB personal trip based on other purpose trip ends. This issue cause multi-thread of Cube cluster shares some intermediate file. The quick solution is the rename the intermediate file with TOD and MS token and modify the corresponding code to accommodate this file name change. After this modification, the problem is solved. Figure 2-1 illustrates the location of the problematic file name.

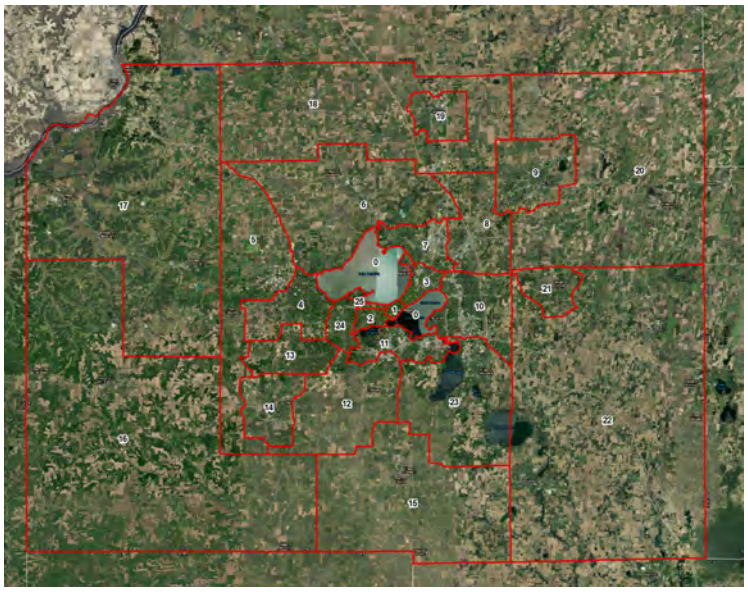
Figure 2-1: File name changing




## 2.2 TRIP DISTRIBUTION VALIDATION

There are two sets of 2016 traffic flow OD data available for trip distribution purpose. One set of data is from 2016 Replica data and anther is from 2016 Streetlight data. For both data set, the data were collected based on 2010 census tracts within Dane County area. For the model validation purpose, the 2010 census tracts are aggregated into the following 25 districts. Figure 2-2 illustrates the boundary of the 25 districts within Dane County area.

Figure 2-2: District definition



The following two chapters are mainly focusing on the validation on the trip distribution model results based on Replica and Streetlight data. There are two general types of aggregate checks of trip distribution results: trip length checks and O-D pattern checks on base year scenarios.

### 2.2.1 Trip Length Validation

The main trip length checks for base year scenarios involve comparing average trip lengths and trip length frequency distributions between model results and observed data from the Replica and Streetlight data sets. Trip lengths are represented in minutes. Trip length checks are performed separately for trip purposes and TODs. Figure 2-3 shows an example trip length distribution.

We check trip length frequency distributions by using coincidence ratios (CR). When the observed and modeled trip length frequency distributions are plotted, the CR is defined as the quotient between the sum of the lower value of the two distributions and the sum of the higher value of the two distributions at each increment. Generally, the CR measures the percent of area that "coincides" for the two curves. The procedure to calculate the coincidence of distributions is as follows:

$$CR = \frac{\sum_T [\min (PM_T, PO_T)]}{\sum_T [\max (PM_T, PO_T)]}$$

Where *CR* is the Coincidence Ratio; $PM_T$ is the proportion of modeled distribution in interval *T*; $PO_T$ is the proportion of observed distribution in interval *T*; and the *T* is histogram interval for time.

The coincidence ratio lies between 0 and 1.0, where a ratio of 1.0 indicates identical distributions.

Figure 2-3: Trip length distribution comparison

The following Table 2-1 and Table 2-2 are the Coincidence ratio values between model and Streetlight data and between model and Replica data. All the CR values are within the reasonable range, namely greater than 0.6 for purpose-specific peak periods and greater than 0.7 for all-purpose peak periods.

Table 2-1: Coincidence ratio between model and Streetlight data

| Trip Purpose | AM | MD | PM | NT | Daily |
|---|---|---|---|---|---|
| HB Work | 0.75 | 0.66 | 0.70 | 0.70 | 0.72 |
| HB Other | 0.74 | 0.73 | 0.68 | 0.73 | 0.73 |
| No HB | 0.72 | 0.66 | 0.66 | 0.67 | 0.68 |
| All Purpose | 0.76 | 0.73 | 0.70 | 0.73 | 0.73 |

Table 2-2: Coincidence ratio between model and Replica data

| Trip Purpose | AM | MD | PM | NT | Daily |
|---|---|---|---|---|---|
| HB Work | 0.74 | 0.78 | 0.72 | 0.78 | 0.76 |
| HB School | 0.68 | 0.72 | 0.67 | 0.68 | 0.72 |
| HB Shopping | 0.71 | 0.71 | 0.63 | 0.71 | 0.69 |
| HB Other | 0.66 | 0.73 | 0.70 | 0.73 | 0.72 |
| All Purpose | 0.75 | 0.74 | 0.70 | 0.75 | 0.74 |

### 2.2.2 District to District Traffic Flow Pattern Validation

It is difficult to validate origin-destination trip table at the zone interchange level due to low sample rate in survey data set from Replica or Streetlight. For example, the sample rate for the 2016 streetlight data within Dane County area is less than 3%. It is therefore necessary to check origin-

destination patterns at a more aggregate level. Generally, this is described as a district-level validation. Twenty-five districts we defined in Figure 2-1 is used for this purpose. The following tables show the difference of trip flow percentage between model and Replica and Streetlight data respectively.

In this validation process, the normalized Levenshtein distance for OD matrices (NLOD, Behara (2020)) is first utilized to perform OD matrix pattern comparison between model and Streetlight and Replica data. Compared with traditional method, the NLOD can take the OD matrix structural information into consideration. Levenshtein distance is a measure of proximity between two strings. It is mainly applied to compare sequences in linguistics domain such as plagiarism detection and speech recognition; in molecular biology for comparing sequences of macro molecules, etc. Levenshtein distance calculates least expensive set of insertions, deletions or substitutions that are required to transform one string into another one. For the OD matrices similarity comparison, the Levenshtein distance is modified into an optimization approach to estimate the minimum cost required to transform each sorted row of query OD matrix into sorted row of reference OD matrix. The formula of the levenshtein distance can be illustrated in the following three equation:

$$LOD_n(R_Y^n - R_X^n) = \min_S\left(\sum_{k=0}^{k=s}\beta_k\right) \quad \text{Eq(1)}$$

$$NLOD_n(R_Y^n - R_X^n) = \frac{LOD_n(R_Y^n - R_X^n)}{(\sum_{j=1}^{j=M} A_{xj}^n + \sum_{i=1}^{i=M} A_{xi}^n)} \quad \text{Eq(2)}$$

$$NLOD(Y,X) = \frac{\sum_{n=1}^{n=M} NLOD_n(R_Y^n - R_X^n)}{M} \quad \text{Eq(3)}$$

Where,

$X$ is the reference matrix(M*M)

$Y$ is the query matrix (M*M)

$R$ is the sorted rows for X and Y

n is the current row number for both matrix

S is the sequence of edit operations to transform $R_Y^n$ to $R_X^n$

$\beta_k$ is the cost associated with each edit operation

$A_{xj}^n$ is the cell value of OD matrix X in row n and jth column

The overall comparison between OD matrices is the normalized Levenshtein distance NLOD, which has the value between 0 and 1. One stands for two matrices are identical and zero means no similarity at all. The following Table 2-3 shows the normalized levenshtein distance for TOD matrices between model and observed data from Streetlight and Replica. According to the table, there are two observations: 1. The OD trip patterns from model and observed data set are comparable, the average Levenshtein distance is 0.63 for Streetlight data and 0.6 for Replica data. 2. The OD from model is more similar to Streetlight data. It should be noted that the data from Streetlight or Replica data are not ground-true data, which are expanded based on some collected sample data. When the sample rate is small, the accuracy of the data is questionable.

## Table 2-3: Normalized LevenShtein distance summary

| TOD | NLOD with Streetlight data | NLOD with Replica data |
|---|---|---|
| AM | 0.63 | 0.61 |
| MD | 0.64 | 0.59 |
| PM | 0.63 | 0.59 |
| NT | 0.64 | 0.59 |

The second effort for the similarity comparison is to visually compare the OD trip pattern to identity some potential problems. For simplification, the trip flow percentage difference between model and observed OD matrices are produced. The following Table 2-4 to Table 2-7 are the trip flow percentage difference between model and Streetlight data and Table 2-8 to Table 2-11 are trip flow percentage difference between model and Replica data. The values in the table are highlighted with colors. Blue color means the negative values and red means positive values.

Compared with Streetlight and Replica data, one of the common observations is that the model underestimate the intra-district TOD flows, especially for district 14-17 and 22-23. In order to alleviate this issue, a recommendation is to reduce the terminal time in zone level to encourage more intra-district level trip flows.

## Table 2-4: Trip flow percentage difference between model and Streetlight for AM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -5% | -8% | 2% | -3% | 1% | 2% | 0% | 0% | 0% | 0% | -3% | -1% | 0% | -4% | 4% | 9% | 9% | 2% | 0% | 1% | 0% | 5% | 5% | -3% | -12% | 0% |
| 2 | -5% | -4% | 4% | -3% | 2% | 3% | 2% | 0% | 0% | 0% | -7% | -1% | -1% | -2% | 3% | 9% | 11% | 2% | 0% | 1% | 0% | 4% | 5% | -4% | -19% | 0% |
| 3 | -13% | 2% | -6% | 1% | 2% | 2% | -4% | -3% | -1% | -4% | -5% | 2% | -1% | 0% | 4% | 10% | 8% | 1% | 0% | 1% | 0% | 5% | 6% | -2% | -3% | 0% |
| 4 | -6% | -1% | 0% | -9% | 0% | 2% | -1% | 0% | 0% | -1% | -4% | -1% | -2% | 0% | 1% | 9% | 8% | 4% | 1% | 0% | 0% | 3% | 2% | 1% | -4% | 0% |
| 5 | -1% | 1% | 1% | -16% | -4% | 2% | 0% | 0% | 0% | 0% | -2% | -1% | -1% | -3% | 1% | 7% | 6% | 5% | 1% | 0% | 0% | 3% | 2% | 1% | -1% | 0% |
| 6 | 0% | -1% | 1% | -5% | -1% | -8% | 1% | -2% | 2% | 0% | -2% | 0% | 0% | 0% | 2% | 4% | 5% | 3% | -1% | 2% | 0% | 2% | 2% | 0% | -3% | 0% |
| 7 | -5% | 1% | -8% | -2% | 2% | 3% | -7% | -6% | 1% | -5% | -1% | 2% | -1% | 1% | 5% | 4% | 4% | 2% | 0% | 2% | 0% | 3% | 6% | 0% | -1% | 0% |
| 8 | -4% | 0% | -3% | 2% | 1% | 3% | -7% | -2% | -4% | -4% | -1% | 1% | 0% | 0% | 3% | 3% | 3% | 2% | -1% | 2% | 0% | 2% | 5% | 0% | -1% | 0% |
| 9 | -4% | 0% | 0% | 0% | 0% | 5% | 0% | -9% | -8% | 0% | 0% | 2% | 0% | 0% | 2% | 2% | 2% | 1% | -1% | 4% | 0% | 1% | 4% | 0% | -1% | 0% |
| 10 | -2% | -1% | -4% | -1% | 0% | 2% | -3% | -7% | 0% | 5% | -3% | 3% | -1% | 1% | 3% | 3% | 2% | 1% | 0% | 2% | -2% | 3% | 3% | 0% | -1% | 0% |
| 11 | -6% | -6% | 0% | -8% | -1% | 2% | 0% | 2% | 1% | 5% | 1% | -4% | -3% | -1% | 4% | 4% | 3% | 1% | 0% | 2% | 0% | 3% | 7% | -5% | -2% | 0% |
| 12 | -2% | -2% | 1% | -7% | 1% | 2% | 0% | 0% | 0% | 3% | -8% | -10% | -3% | -4% | 3% | 9% | 5% | 1% | 0% | 1% | 0% | 5% | 6% | -2% | -1% | 0% |
| 13 | -3% | -1% | 0% | -12% | 1% | 1% | -1% | -2% | 0% | -1% | -7% | -6% | 5% | -3% | 1% | 10% | 7% | 3% | 0% | 0% | 0% | 4% | 2% | 0% | -1% | 0% |
| 14 | -3% | 0% | 2% | -2% | 2% | 1% | 0% | -1% | 0% | 0% | -3% | -4% | 0% | -20% | 1% | 11% | 6% | 2% | 0% | 1% | 1% | 6% | 3% | 0% | -1% | 0% |
| 15 | 0% | 1% | 3% | -2% | -1% | 2% | 3% | 2% | 1% | 2% | -7% | 0% | 0% | -2% | -24% | 5% | 4% | 1% | 0% | 1% | 0% | 3% | 10% | 0% | -2% | 0% |
| 16 | 2% | 4% | 3% | -2% | -1% | 1% | 0% | 1% | 0% | 1% | -4% | 0% | 1% | -5% | 1% | -25% | 6% | 2% | 0% | 0% | 0% | 7% | 5% | 1% | 2% | 0% |
| 17 | 4% | 5% | 4% | -7% | -14% | 2% | 1% | -1% | 0% | 0% | -4% | 1% | 1% | 2% | 2% | 8% | -17% | 3% | 0% | 0% | 0% | 4% | 3% | 1% | 2% | 0% |
| 18 | -2% | 1% | 1% | 8% | 6% | -1% | -5% | -8% | -5% | -5% | -2% | 0% | 2% | 2% | 1% | 5% | 6% | 1% | -12% | 0% | -1% | 2% | 2% | 4% | -1% | 0% |
| 19 | -4% | 1% | -5% | 6% | 5% | 0% | -6% | -5% | -6% | 0% | -1% | 0% | 1% | 2% | 0% | 3% | 3% | -4% | 5% | 1% | 0% | 2% | 0% | 3% | -2% | 0% |
| 20 | -3% | 0% | 1% | 2% | 1% | 4% | 0% | -6% | -16% | 5% | 3% | 2% | 1% | 1% | 2% | 3% | 2% | 1% | 0% | -7% | -3% | 1% | 5% | 1% | 0% | 0% |
| 21 | -4% | 0% | -3% | 3% | 3% | 0% | -3% | -9% | -5% | -11% | -2% | -3% | 4% | 4% | 1% | 7% | 4% | 2% | 1% | 0% | -1% | 11% | 1% | 2% | -2% | 0% |
| 22 | 1% | 0% | 1% | 2% | 1% | 0% | 0% | -3% | 0% | -3% | -5% | 1% | 2% | 3% | 1% | 9% | 4% | 0% | 0% | 0% | -2% | -15% | 1% | 1% | 1% | 0% |
| 23 | 0% | 0% | 2% | -2% | 0% | 1% | 1% | -2% | 0% | -10% | -5% | 2% | 0% | 0% | 5% | 8% | 4% | 1% | 0% | 1% | 0% | 5% | -10% | 0% | 0% | 0% |
| 24 | -6% | -9% | 0% | -3% | 6% | 4% | -1% | -1% | 0% | -1% | -5% | 0% | 0% | 1% | 1% | 9% | 7% | 5% | 1% | 0% | 0% | 3% | 1% | 2% | -13% | 0% |
| 25 | -2% | -14% | 4% | 1% | 2% | 2% | 2% | 0% | 0% | 0% | -1% | 0% | -1% | 1% | 2% | 10% | 10% | 2% | 0% | 1% | 0% | 4% | 5% | -6% | -23% | 0% |
| Sum | -3% | -1% | -1% | -3% | 1% | 1% | -2% | -3% | -2% | -2% | -4% | -1% | 0% | -1% | 2% | 8% | 6% | 2% | 0% | 1% | -1% | 4% | 4% | 0% | -3% | 0% |

## Table 2-5: Trip flow percentage difference between model and Streetlight for MD

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -4% | -5% | -3% | -1% | 2% | 2% | 0% | -2% | 0% | -2% | -5% | 1% | -1% | 0% | 3% | 9% | 11% | 1% | 0% | 1% | 0% | 4% | 4% | -3% | -11% | 0% |
| 2 | -6% | -10% | 2% | 0% | 2% | 2% | 1% | 0% | 0% | -1% | -7% | 0% | -1% | 0% | 4% | 9% | 12% | 2% | 0% | 1% | 0% | 4% | 4% | -6% | -14% | 0% |
| 3 | -3% | 4% | -17% | 1% | 2% | 2% | -7% | -8% | 0% | -8% | -2% | 2% | 0% | 1% | 4% | 9% | 9% | 1% | 0% | 0% | 0% | 5% | 5% | -1% | 1% | 0% |
| 4 | 0% | 0% | 0% | -12% | 0% | 1% | 0% | 0% | 0% | 0% | -3% | -1% | -10% | 2% | 1% | 8% | 8% | 4% | 0% | 0% | 0% | 3% | 1% | -1% | 0% | 0% |
| 5 | 1% | 1% | 1% | -14% | -10% | 0% | 0% | 0% | 0% | 0% | -2% | -1% | -6% | 1% | 1% | 7% | 7% | 5% | 0% | 0% | 0% | 3% | 1% | 3% | 1% | 0% |
| 6 | 1% | 2% | 0% | -2% | 0% | -21% | -1% | -2% | 2% | 1% | 0% | 1% | -1% | 0% | 2% | 3% | 5% | 3% | 0% | 2% | 0% | 1% | 3% | 1% | 0% | 0% |
| 7 | 1% | 3% | -9% | 0% | 2% | 5% | -15% | -13% | 0% | -4% | 0% | 3% | -1% | 0% | 6% | 4% | 4% | 2% | -1% | 2% | -1% | 3% | 6% | 0% | 1% | 0% |
| 8 | 1% | 2% | -3% | 2% | 2% | 4% | -4% | -17% | -6% | -4% | 1% | 3% | 0% | 0% | 4% | 3% | 3% | 1% | 0% | 2% | -1% | 2% | 5% | 0% | 1% | 0% |
| 9 | 0% | 1% | 0% | 1% | 1% | 7% | 1% | -12% | -18% | 3% | 2% | 2% | 0% | 0% | 2% | 2% | 1% | 0% | -1% | 4% | -1% | 1% | 4% | 0% | 0% | 0% |
| 10 | -1% | 0% | -5% | 0% | 0% | 1% | -2% | -8% | 0% | -2% | 0% | 3% | 0% | 1% | 3% | 2% | 2% | 1% | 0% | 3% | -1% | 2% | 0% | 0% | 0% | 0% |
| 11 | -2% | -2% | -1% | -5% | 0% | 2% | 1% | 1% | 1% | 5% | -10% | -4% | -5% | 0% | 5% | 3% | 3% | 1% | 0% | 3% | 0% | 3% | 4% | -3% | 0% | 0% |
| 12 | 1% | 0% | 1% | -3% | 1% | 2% | 1% | 2% | 1% | 4% | -8% | -20% | -8% | -4% | 4% | 8% | 5% | 1% | 0% | 1% | 0% | 5% | 6% | -2% | 0% | 0% |
| 13 | 0% | 0% | 0% | -11% | 2% | 1% | -1% | 0% | 0% | 0% | -5% | -6% | -10% | 1% | 0% | 10% | 7% | 3% | 0% | 0% | 1% | 5% | 1% | 1% | 0% | 0% |
| 14 | 1% | 1% | 1% | 5% | 4% | 1% | 0% | 0% | 0% | 1% | -1% | -7% | -2% | -37% | 0% | 9% | 6% | 2% | 0% | 1% | 1% | 7% | 2% | 3% | 0% | 0% |
| 15 | 2% | 3% | 3% | 0% | 0% | 2% | 3% | 3% | 1% | 3% | 0% | 1% | -1% | -1% | -41% | 5% | 3% | 1% | 0% | 1% | 0% | 0% | 9% | 0% | 1% | 0% |
| 16 | 4% | 4% | 3% | 6% | 2% | 1% | 1% | 1% | 0% | 1% | 0% | 2% | 1% | -2% | 2% | -50% | 6% | 2% | 0% | 0% | 0% | 7% | 5% | 2% | 2% | 0% |
| 17 | 5% | 5% | 4% | 0% | -2% | 1% | 1% | 0% | 0% | 1% | -1% | 2% | -1% | 1% | 2% | 6% | -38% | 3% | 0% | 0% | 0% | 4% | 3% | 2% | 2% | 0% |
| 18 | 1% | 2% | 1% | 12% | 8% | 0% | -1% | -12% | -9% | -1% | -1% | 1% | 2% | 2% | 1% | 5% | 7% | -8% | -17% | 0% | 0% | 1% | 1% | 4% | 1% | 0% |
| 19 | -1% | 0% | -1% | 9% | 5% | 1% | -1% | -4% | -5% | 3% | 0% | 0% | 2% | 1% | 0% | 3% | 3% | -8% | -13% | 1% | 1% | 1% | 0% | 3% | 0% | 0% |
| 20 | 0% | 1% | 0% | 2% | 1% | 4% | 1% | -7% | -12% | 6% | 3% | 4% | 1% | 1% | 2% | 2% | 2% | 0% | 0% | -15% | -3% | 1% | 5% | 0% | 0% | 0% |
| 21 | 0% | 1% | 0% | 5% | 2% | 0% | -3% | -9% | -3% | -7% | -2% | 1% | 4% | 4% | 1% | 6% | 3% | 1% | 1% | -1% | -16% | 9% | 1% | 2% | 0% | 0% |
| 22 | 2% | 2% | 2% | 4% | 2% | 1% | 1% | -1% | 0% | -1% | -1% | 3% | 2% | 2% | 0% | 9% | 4% | 1% | 0% | 0% | -1% | -35% | 3% | 1% | 1% | 0% |
| 23 | 1% | 2% | 2% | 1% | 1% | 2% | 2% | 0% | 1% | -14% | -5% | 3% | -1% | 0% | 6% | 8% | 4% | 1% | 0% | 1% | 0% | 4% | -20% | 0% | 1% | 0% |
| 24 | -3% | -7% | -1% | -1% | 6% | 2% | 0% | 0% | 0% | 0% | -5% | -3% | -2% | 2% | 1% | 9% | 8% | 4% | 1% | 0% | 0% | 3% | 1% | -9% | -6% | 0% |
| 25 | -7% | -15% | 3% | 0% | 2% | 2% | 2% | 0% | 0% | 0% | -2% | 2% | 0% | 1% | 3% | 10% | 11% | 2% | 0% | 0% | 0% | 4% | 4% | -6% | -17% | 0% |
| Sum | -1% | 0% | -2% | -2% | 2% | 1% | -2% | -6% | -3% | -2% | -4% | -1% | -3% | -1% | 2% | 7% | 7% | 2% | -1% | 1% | -1% | 4% | 3% | -1% | -2% | 0% |

## Table 2-6: Trip flow percentage difference between model and Streetlight for PM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0% | -1% | -9% | -4% | 1% | 2% | -1% | -3% | -2% | -2% | -4% | 0% | -2% | -1% | 4% | 9% | 9% | 1% | -1% | 0% | -1% | 4% | 4% | -4% | 0% | 0% |
| 2 | -7% | -3% | -1% | -2% | 2% | 2% | 1% | 0% | 0% | -1% | -7% | -2% | -2% | 0% | 4% | 9% | 10% | 2% | 0% | 0% | 0% | 4% | 3% | -8% | -3% | 0% |
| 3 | -1% | 5% | -16% | 1% | 2% | 2% | -8% | -8% | -1% | -8% | -3% | 2% | 0% | 1% | 5% | 9% | 7% | 1% | -1% | 0% | -1% | 4% | 4% | -1% | 3% | 0% |
| 4 | -1% | 0% | 0% | -6% | 2% | 0% | 0% | 0% | 0% | 0% | -4% | -3% | -11% | 0% | 0% | 7% | 7% | 5% | 0% | 0% | 0% | 3% | 1% | -1% | 0% | 0% |
| 5 | 0% | 1% | 0% | -9% | 1% | -2% | 0% | 0% | -1% | 0% | -4% | -1% | -7% | -1% | 0% | 6% | 4% | 5% | 0% | 0% | 0% | 2% | 1% | 2% | 1% | 0% |
| 6 | 1% | 2% | 0% | -1% | 1% | -21% | 0% | 0% | 1% | 1% | 0% | 2% | -1% | 0% | 2% | 3% | 4% | 1% | -2% | 2% | 0% | 1% | 2% | 1% | 1% | 0% |
| 7 | 1% | 3% | -7% | 0% | 2% | 5% | -10% | -12% | -1% | -4% | 0% | 3% | -1% | 0% | 6% | 3% | 3% | 1% | -2% | 2% | -1% | 3% | 5% | 0% | 2% | 0% |
| 8 | 1% | 2% | -3% | 1% | 1% | 4% | -2% | -7% | -8% | -4% | 1% | 3% | -1% | 0% | 4% | 2% | 2% | 1% | -1% | 1% | -2% | 1% | 4% | 0% | 1% | 0% |
| 9 | 0% | 1% | 0% | 1% | 1% | 7% | 2% | -9% | -19% | 3% | 2% | 2% | 0% | 0% | 2% | 1% | 1% | 0% | -2% | 3% | -1% | 1% | 3% | 0% | 0% | 0% |
| 10 | 0% | 0% | -5% | 0% | 1% | 1% | -2% | -7% | -1% | 3% | 0% | 3% | 0% | 1% | 3% | 2% | 1% | 1% | 0% | 3% | -2% | 1% | 0% | 0% | 0% | 0% |
| 11 | -1% | -1% | -2% | -4% | 0% | 2% | 1% | 1% | 1% | 5% | -3% | -5% | -6% | -2% | 4% | 2% | 2% | 1% | 0% | 3% | 0% | 2% | 4% | -3% | 1% | 0% |
| 12 | 0% | 1% | 1% | -1% | 1% | 1% | 1% | 1% | 1% | 4% | -8% | -15% | -10% | -4% | 3% | 7% | 4% | 1% | 0% | 1% | -1% | 5% | 6% | -1% | 1% | 0% |
| 13 | -1% | 0% | -1% | -8% | 2% | 1% | 0% | 0% | 0% | 0% | -5% | -7% | -8% | 1% | 0% | 9% | 6% | 3% | 0% | 1% | 1% | 5% | 1% | 0% | 0% | 0% |
| 14 | -1% | 0% | 0% | 5% | 2% | 1% | 0% | 0% | 0% | 2% | -2% | -8% | -5% | -22% | 0% | 8% | 5% | 2% | 0% | 1% | 1% | 7% | 1% | 2% | 1% | 0% |
| 15 | 3% | 4% | 3% | 0% | 0% | 3% | 3% | 3% | 1% | 4% | 1% | 1% | -1% | 0% | -44% | 4% | 2% | 1% | 0% | 1% | 0% | 0% | 9% | 0% | 2% | 0% |
| 16 | 3% | 4% | 3% | 6% | 2% | 2% | 1% | 1% | 0% | 1% | 0% | 3% | 2% | -1% | 2% | -54% | 5% | 2% | 0% | 0% | 0% | 8% | 4% | 2% | 2% | 0% |
| 17 | 5% | 6% | 3% | 3% | -4% | 2% | 1% | 1% | -1% | 1% | 1% | 3% | 1% | 2% | 2% | 4% | -43% | 3% | 0% | 0% | 0% | 4% | 2% | 1% | 3% | 0% |
| 18 | 0% | 2% | -1% | 12% | 8% | 0% | -1% | -9% | -8% | -1% | -1% | 2% | 3% | 2% | 1% | 4% | 6% | -2% | -23% | 0% | 0% | 1% | 0% | 5% | 1% | 0% |
| 19 | 0% | 1% | 0% | 8% | 4% | 1% | -1% | -1% | -6% | 3% | 0% | 1% | 2% | 1% | 0% | 2% | 3% | -4% | -20% | 1% | 1% | 1% | 0% | 3% | 0% | 0% |
| 20 | 0% | 1% | 0% | 2% | 1% | 5% | 2% | -5% | -12% | 8% | 4% | 3% | 1% | 1% | 3% | 2% | 2% | 1% | 0% | -22% | -2% | 1% | 4% | 1% | 1% | 0% |
| 21 | 0% | 1% | 0% | 5% | 2% | 0% | -1% | -10% | -2% | -10% | -1% | 2% | 4% | 4% | 0% | 5% | 3% | 1% | 1% | -1% | -12% | 8% | -1% | 2% | 0% | 0% |
| 22 | 2% | 2% | 1% | 3% | 2% | 1% | 1% | -1% | 0% | 1% | 0% | 3% | 2% | 2% | 1% | 8% | 3% | 1% | 0% | 0% | -1% | -36% | 3% | 1% | 1% | 0% |
| 23 | 1% | 3% | 1% | 1% | 1% | 1% | 1% | 0% | 0% | -9% | -2% | 4% | 0% | 1% | 7% | 7% | 3% | 1% | 0% | 1% | -1% | 2% | -24% | 0% | 1% | 0% |
| 24 | -4% | -5% | -2% | 0% | 6% | 2% | 0% | 0% | 0% | 0% | -6% | -3% | -3% | 1% | 0% | 8% | 7% | 5% | 1% | 0% | 0% | 3% | 1% | -5% | -2% | 0% |
| 25 | -8% | -11% | -1% | -2% | 2% | 0% | 1% | 0% | -1% | 0% | -2% | 1% | -1% | 0% | 3% | 9% | 10% | 2% | 0% | 0% | 0% | 4% | 4% | -10% | -1% | 0% |
| Sum | -1% | 0% | -2% | -1% | 2% | 1% | -1% | -5% | -3% | -2% | -3% | -1% | -3% | -1% | 2% | 7% | 5% | 2% | -1% | 1% | -1% | 4% | 2% | -1% | 0% | 0% |

## Table 2-7: Trip flow percentage difference between model and Streetlight for NT

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10% | -4% | -9% | 0% | 2% | 2% | 0% | -1% | -1% | -2% | -5% | 1% | -2% | 0% | 4% | 9% | 10% | 1% | 0% | 0% | 0% | 4% | 4% | -3% | -1% | 0% |
| 2 | -11% | -10% | 0% | 0% | 2% | 2% | 1% | 0% | 0% | -1% | -6% | 0% | -2% | 1% | 4% | 9% | 11% | 2% | 0% | 1% | 0% | 4% | 4% | -7% | -3% | 0% |
| 3 | -3% | 4% | -19% | 2% | 2% | 2% | -6% | -6% | -1% | -10% | -3% | 2% | -1% | 1% | 4% | 9% | 8% | 2% | 0% | 1% | 0% | 5% | 5% | -1% | 2% | 0% |
| 4 | 0% | 0% | -1% | -8% | 2% | 0% | 0% | 0% | 0% | 0% | -3% | -2% | -14% | 1% | 1% | 9% | 7% | 4% | 0% | 0% | 0% | 3% | 1% | -1% | 0% | 0% |
| 5 | 0% | 2% | 1% | -15% | 0% | -2% | 0% | 0% | 0% | 0% | -2% | -2% | -5% | 0% | 1% | 7% | 3% | 6% | 0% | 1% | 0% | 3% | 1% | 2% | 1% | 0% |
| 6 | 1% | 2% | 1% | -2% | 3% | -24% | 0% | -1% | 2% | 0% | 0% | 1% | -1% | 0% | 2% | 3% | 5% | 2% | -1% | 2% | 0% | 1% | 3% | 2% | 1% | 0% |
| 7 | 1% | 3% | -9% | 0% | 2% | 4% | -13% | -10% | 0% | -4% | 0% | 3% | -1% | 0% | 6% | 4% | 4% | 1% | -1% | 1% | -1% | 3% | 6% | 0% | 1% | 0% |
| 8 | 1% | 2% | -3% | 2% | 1% | 4% | -4% | -9% | -7% | -5% | 1% | 3% | -1% | 0% | 4% | 3% | 3% | 1% | -1% | 1% | -2% | 2% | 4% | 0% | 1% | 0% |
| 9 | 0% | 1% | 0% | 1% | 1% | 7% | 1% | -8% | -18% | 1% | 2% | 2% | 0% | 0% | 2% | 2% | 1% | -1% | -1% | 2% | -1% | 1% | 4% | 0% | 0% | 0% |
| 10 | -1% | 1% | -6% | 0% | 1% | 1% | -2% | -6% | 0% | -1% | 0% | 3% | -1% | 0% | 3% | 3% | 2% | 1% | 0% | 3% | -2% | 2% | 1% | 0% | 0% | 0% |
| 11 | -2% | -2% | -2% | -3% | -1% | 2% | 1% | 1% | 1% | 5% | -7% | -5% | -5% | 0% | 5% | 3% | 3% | 1% | 0% | 2% | 0% | 2% | 5% | -2% | 0% | 0% |
| 12 | 0% | 0% | 1% | 1% | 2% | 2% | 1% | 2% | 0% | 4% | -8% | -20% | -11% | -4% | 4% | 8% | 5% | 1% | 0% | 1% | 0% | 5% | 6% | -2% | 1% | 0% |
| 13 | -1% | 0% | 0% | -6% | 3% | 0% | 0% | 0% | 0% | 0% | -4% | -7% | -12% | 0% | 0% | 10% | 7% | 3% | 0% | 0% | 0% | 5% | 1% | 1% | 0% | 0% |
| 14 | 0% | 1% | 1% | 8% | 3% | 1% | 0% | 0% | 0% | 1% | -3% | -9% | -7% | -25% | 0% | 9% | 6% | 2% | 0% | 1% | 1% | 7% | 1% | 3% | 1% | 0% |
| 15 | 3% | 4% | 3% | 1% | 1% | 2% | 3% | 3% | 1% | 3% | 1% | 0% | -1% | -1% | -43% | 5% | 3% | 1% | 0% | 1% | 0% | 1% | 8% | 1% | 1% | 0% |
| 16 | 4% | 4% | 3% | 7% | 2% | 2% | 1% | 1% | 0% | 1% | 0% | 3% | 2% | -1% | 2% | -54% | 6% | 2% | 0% | 0% | 0% | 7% | 5% | 3% | 2% | 0% |
| 17 | 5% | 6% | 4% | 2% | -1% | 2% | 1% | 1% | 0% | 1% | -1% | 1% | 1% | 1% | 1% | 5% | -43% | 3% | 0% | 0% | 0% | 4% | 3% | 2% | 1% | 0% |
| 18 | 1% | 2% | -1% | 11% | 8% | 1% | 0% | -7% | -7% | -2% | 0% | 2% | 2% | 2% | 1% | 5% | 6% | -5% | -23% | 0% | -1% | 1% | 1% | 4% | 1% | 0% |
| 19 | 0% | 1% | 0% | 8% | 5% | 3% | -2% | -2% | -6% | 1% | -3% | 0% | 2% | 1% | 0% | 3% | 3% | -8% | -12% | 1% | 0% | 2% | 0% | 3% | 0% | 0% |
| 20 | -1% | 0% | 0% | 2% | 1% | 5% | 1% | -4% | -8% | 8% | 3% | 3% | 0% | 1% | 3% | 2% | 2% | -1% | 0% | -23% | -2% | 1% | 4% | 1% | 1% | 0% |
| 21 | 0% | 1% | 0% | 6% | 2% | 0% | -2% | -7% | -5% | -12% | -1% | 1% | 4% | 4% | 1% | 6% | 3% | 1% | 1% | 0% | -14% | 10% | 1% | 2% | 1% | 0% |
| 22 | 2% | 2% | 2% | 4% | 2% | 1% | 0% | 0% | 0% | -2% | -2% | 2% | 2% | 2% | 0% | 9% | 4% | 1% | 0% | 0% | -1% | -33% | 4% | 1% | 1% | 0% |
| 23 | 2% | 3% | 1% | 2% | 1% | 2% | 2% | 1% | 1% | -10% | -3% | 3% | -1% | 0% | 7% | 8% | 4% | 1% | 0% | 1% | -1% | 3% | -29% | 0% | 1% | 0% |
| 24 | -4% | -9% | -3% | 0% | 6% | 2% | 0% | 0% | 0% | 0% | -4% | -4% | -3% | 2% | 1% | 9% | 7% | 5% | 1% | 0% | 0% | 3% | 1% | -8% | -2% | 0% |
| 25 | -12% | -11% | 1% | -1% | 3% | 1% | 2% | 1% | -1% | 1% | -2% | 1% | -3% | 0% | 3% | 10% | 10% | 2% | 0% | 0% | 0% | 4% | 4% | -9% | -4% | 0% |
| Sum | -2% | 0% | -3% | 0% | 3% | 1% | -2% | -4% | -3% | -3% | -3% | -2% | -4% | 0% | 2% | 7% | 6% | 2% | -1% | 1% | -1% | 4% | 3% | -1% | 0% | 0% |

## Table 2-8: Trip flow percentage difference between model and Replica for AM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4% | 0% | 3% | -2% | 0% | 1% | -2% | 0% | 0% | -3% | -5% | 2% | -2% | -10% | 1% | 8% | 9% | 1% | -1% | 0% | 0% | 4% | 3% | -2% | -10% | 0% |
| 2 | -2% | -7% | 4% | -3% | 1% | 2% | -1% | 0% | 0% | -2% | -3% | 0% | -1% | -4% | 2% | 9% | 11% | 2% | 0% | 0% | 0% | 3% | 3% | -3% | -10% | 0% |
| 3 | -3% | 1% | -7% | -2% | 1% | 2% | -6% | -3% | -1% | -4% | -3% | 2% | 1% | -2% | 4% | 10% | 8% | 1% | 0% | 1% | 0% | 4% | 4% | -2% | -4% | 0% |
| 4 | -5% | -4% | 0% | -7% | 2% | 1% | -1% | -1% | 0% | -1% | -3% | 0% | 1% | 0% | 1% | 9% | 7% | 4% | 0% | 0% | 0% | 3% | 2% | 0% | -9% | 0% |
| 5 | -3% | -1% | 1% | -6% | -5% | 2% | -1% | 0% | 0% | -1% | -2% | -1% | 0% | -1% | 1% | 6% | 3% | 5% | 1% | 0% | 0% | 3% | 2% | 3% | -6% | 0% |
| 6 | -2% | -2% | 1% | -4% | 2% | -7% | -1% | 0% | 2% | 0% | -1% | 0% | -1% | 0% | 2% | 4% | 5% | 3% | -1% | 1% | 0% | 1% | 3% | 0% | -6% | 0% |
| 7 | -1% | 0% | -5% | -3% | 0% | 3% | -3% | -4% | 0% | -2% | -2% | 2% | -1% | 0% | 5% | 4% | 4% | 2% | -1% | 1% | 0% | 2% | 6% | -1% | -4% | 0% |
| 8 | -3% | 0% | -2% | -1% | 2% | 4% | -5% | 6% | -10% | -2% | -2% | 2% | -1% | 0% | 3% | 3% | 3% | 1% | -1% | 1% | -1% | 2% | 4% | 0% | -3% | 0% |
| 9 | -3% | -1% | -1% | 0% | 1% | 6% | -2% | -6% | -3% | 0% | 0% | 2% | -1% | 0% | 2% | 2% | 1% | -1% | -1% | 5% | -1% | 0% | 4% | 0% | -3% | 0% |
| 10 | -5% | -4% | -3% | -3% | 0% | 1% | -3% | -4% | -1% | 12% | 0% | 3% | 0% | 0% | 2% | 3% | 2% | 1% | 0% | 2% | 0% | 2% | 3% | -2% | -4% | 0% |
| 11 | -3% | -3% | -1% | -7% | -1% | 1% | 0% | 0% | 1% | 2% | 3% | 2% | -3% | -3% | 3% | 3% | 3% | 0% | 0% | 2% | 0% | 2% | 6% | -3% | -5% | 0% |
| 12 | -2% | -4% | 0% | -4% | 1% | 0% | 0% | 0% | 0% | 1% | -1% | -6% | -1% | -7% | 2% | 8% | 5% | 1% | 0% | 1% | 0% | 5% | 6% | 0% | -6% | 0% |
| 13 | -3% | -3% | 0% | -4% | 3% | 1% | -2% | -1% | 0% | -2% | -3% | -3% | 2% | -4% | 0% | 10% | 7% | 2% | 0% | 0% | 0% | 4% | 1% | 2% | -7% | 0% |
| 14 | -3% | -3% | 1% | -1% | 2% | 1% | -1% | -1% | -1% | 0% | -3% | -5% | 3% | -11% | 0% | 10% | 5% | 2% | 0% | 1% | 1% | 5% | 2% | 2% | -6% | 0% |
| 15 | 0% | -1% | 3% | -5% | 0% | 2% | 2% | 2% | 1% | 0% | -2% | 1% | -1% | -1% | -18% | 5% | 3% | 0% | 0% | 1% | 0% | 2% | 10% | -1% | -5% | 0% |
| 16 | 0% | 1% | 3% | -2% | 1% | 1% | 0% | 0% | 0% | 0% | -2% | -1% | 1% | -4% | 1% | -16% | 5% | 1% | 0% | 0% | 0% | 7% | 5% | 1% | -2% | 0% |
| 17 | 3% | 4% | 3% | -5% | -2% | -1% | -1% | 0% | 0% | 0% | -1% | 1% | 0% | 0% | 1% | 7% | -17% | 2% | 0% | 0% | 0% | 3% | 3% | 1% | -2% | 0% |
| 18 | -1% | 1% | 1% | 8% | 7% | -3% | -4% | -6% | -3% | -2% | -1% | 1% | 1% | 1% | 1% | 5% | 6% | 0% | -10% | 0% | 0% | 1% | 1% | 3% | -4% | 0% |
| 19 | -2% | -2% | -3% | 5% | 5% | 0% | -8% | -5% | -4% | -1% | -3% | -1% | 1% | 2% | 0% | 2% | 3% | 1% | 10% | 1% | 0% | 1% | 1% | 2% | -4% | 0% |
| 20 | 0% | 0% | 1% | 1% | 1% | 4% | 0% | -4% | -14% | 5% | 2% | 2% | 1% | 1% | 3% | 3% | 2% | 1% | -1% | -8% | -2% | 1% | 4% | 0% | -2% | 0% |
| 21 | -2% | -2% | -2% | 2% | 3% | -2% | -5% | -6% | -6% | -6% | -4% | 1% | 4% | 3% | 1% | 7% | 4% | 2% | -1% | 0% | 1% | 10% | 0% | 0% | -4% | 0% |
| 22 | -1% | 0% | 1% | 0% | 2% | -1% | -3% | -3% | -1% | -5% | -3% | 0% | 1% | 2% | 1% | 9% | 4% | 0% | 0% | 0% | -1% | -6% | 3% | 1% | -2% | 0% |
| 23 | -1% | 0% | 1% | -2% | 1% | 2% | 0% | -2% | 0% | -5% | -3% | 2% | 0% | 0% | 4% | 7% | 3% | -1% | 0% | 1% | 0% | 3% | -7% | 0% | -3% | 0% |
| 24 | -7% | -8% | 0% | 2% | 7% | 3% | -2% | -1% | -1% | -2% | -3% | -1% | 3% | 1% | 1% | 8% | 7% | 5% | 1% | 0% | 0% | 3% | 2% | -2% | -12% | 0% |
| 25 | 1% | -4% | 3% | -7% | 2% | 0% | 2% | 0% | -1% | -4% | -1% | 1% | -2% | -1% | 2% | 9% | 9% | 1% | 0% | 0% | 0% | 4% | 3% | -6% | -12% | 0% |
| Sum | -2% | -1% | 0% | -2% | 2% | 0% | -2% | -2% | -3% | -1% | -2% | 0% | 0% | -2% | 1% | 7% | 5% | 2% | -1% | 0% | 0% | 3% | 3% | 0% | -5% | 0% |

## Table 2-9: Trip flow percentage difference between model and Replica for MD

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2% | -2% | 0% | -3% | 1% | 1% | -2% | -2% | -2% | -4% | -2% | 0% | -3% | -2% | 2% | 8% | 10% | 1% | 0% | 0% | 0% | 3% | 3% | -3% | -8% | 0% |
| 2 | 0% | -8% | 1% | -2% | 1% | 0% | 0% | -1% | -1% | -2% | -3% | -1% | -3% | -1% | 2% | 8% | 12% | 1% | 0% | 0% | -1% | 3% | 3% | -4% | -7% | 0% |
| 3 | 0% | 2% | -10% | 0% | 2% | 1% | -6% | -5% | -1% | -7% | -2% | 1% | -1% | 0% | 4% | 9% | 9% | 1% | -1% | 1% | 0% | 4% | 4% | -1% | -3% | 0% |
| 4 | -2% | -1% | 0% | -9% | 2% | 1% | -1% | -1% | 0% | -1% | -3% | -1% | -3% | 1% | 0% | 8% | 6% | 4% | 0% | 0% | 0% | 3% | 1% | 1% | -3% | 0% |
| 5 | 0% | 0% | 0% | -4% | -10% | 0% | 0% | 0% | 0% | -1% | -2% | -1% | -2% | 0% | 0% | 6% | 3% | 5% | 0% | 0% | 0% | 3% | 1% | 3% | -2% | 0% |
| 6 | 0% | 0% | 0% | -1% | 2% | -12% | 0% | 0% | 1% | 0% | -1% | 0% | -1% | 0% | 2% | 3% | 5% | 2% | -2% | 2% | 0% | 1% | 2% | 0% | -2% | 0% |
| 7 | 1% | 2% | -5% | -1% | 1% | 4% | -13% | -6% | -1% | -2% | 1% | 2% | -1% | 0% | 5% | 4% | 4% | 1% | -1% | 1% | 0% | 2% | 6% | -1% | -1% | 0% |
| 8 | -1% | 1% | -3% | 1% | 1% | 3% | -4% | 1% | -8% | -3% | 0% | 2% | -1% | 0% | 3% | 2% | 2% | 1% | -1% | 1% | -1% | 1% | 4% | 0% | -1% | 0% |
| 9 | -1% | 0% | -1% | 1% | 1% | 6% | -1% | -7% | -9% | 1% | 0% | 2% | -1% | 0% | 2% | 1% | 1% | 0% | -2% | 4% | -1% | 0% | 3% | 0% | -1% | 0% |
| 10 | -3% | -1% | -4% | -1% | 0% | 1% | -2% | -5% | -2% | 7% | 0% | 3% | -1% | 0% | 2% | 2% | 2% | 0% | 0% | 3% | -1% | 1% | 2% | -1% | -2% | 0% |
| 11 | -2% | -2% | -1% | -5% | -1% | 1% | 0% | 0% | 0% | 5% | -3% | 0% | -4% | -1% | 4% | 3% | 3% | 0% | 0% | 2% | 0% | 2% | 5% | -3% | -3% | 0% |
| 12 | 0% | -1% | 0% | -2% | 1% | 0% | 1% | 1% | 0% | 3% | -3% | -16% | -4% | -4% | 3% | 7% | 4% | 1% | 0% | 1% | 0% | 4% | 6% | -1% | -2% | 0% |
| 13 | -2% | -2% | -1% | -2% | 2% | 0% | -2% | -1% | -1% | -1% | -4% | -4% | -5% | 0% | 0% | 9% | 7% | 2% | 0% | 0% | 0% | 4% | 1% | 2% | -4% | 0% |
| 14 | -1% | -1% | 1% | 3% | 2% | 0% | -1% | -1% | 0% | 1% | -2% | -6% | -1% | -17% | -1% | 7% | 5% | 2% | 0% | 1% | 0% | 6% | 2% | 3% | -2% | 0% |
| 15 | 0% | 1% | 2% | -2% | -1% | 2% | 2% | 1% | 0% | 1% | 0% | 1% | -1% | -2% | -19% | 4% | 3% | 0% | 0% | 1% | 0% | 1% | 8% | -1% | -1% | 0% |
| 16 | 2% | 2% | 3% | 3% | 1% | 1% | 1% | 0% | 0% | 1% | -1% | 1% | 1% | -3% | 1% | -32% | 6% | 1% | 0% | 0% | 0% | 7% | 4% | 2% | 0% | 0% |
| 17 | 4% | 4% | 3% | 0% | -3% | 1% | 0% | 0% | -1% | 1% | -1% | 1% | 0% | 0% | 1% | 7% | -29% | 2% | 0% | 0% | 0% | 3% | 3% | 2% | 0% | 0% |
| 18 | 1% | 1% | 0% | 11% | 7% | -2% | -1% | -6% | -4% | -1% | -2% | 0% | 2% | 1% | 1% | 4% | 6% | -10% | -13% | 0% | 0% | 1% | 1% | 4% | -1% | 0% |
| 19 | -1% | -1% | -2% | 7% | 4% | -1% | -3% | -3% | -6% | 1% | -1% | 0% | 1% | 1% | 0% | 2% | 3% | 0% | -4% | 1% | 0% | 1% | 0% | 3% | -1% | 0% |
| 20 | 0% | 0% | 0% | 1% | 1% | 4% | 1% | -3% | -8% | 8% | 3% | 3% | 1% | 1% | 3% | 2% | 2% | 1% | -1% | -21% | -2% | 1% | 4% | 0% | -1% | 0% |
| 21 | 0% | -1% | -2% | 3% | 2% | -1% | -3% | -9% | -6% | -4% | -2% | 2% | 3% | 3% | 0% | 6% | 3% | 1% | -1% | -1% | -2% | 8% | -1% | 1% | -1% | 0% |
| 22 | 1% | 1% | 1% | 2% | 2% | 0% | -1% | -3% | -1% | -2% | -1% | 2% | 1% | 1% | 1% | 9% | 4% | 0% | 0% | 0% | -1% | -19% | 3% | 1% | -1% | 0% |
| 23 | 0% | 0% | 0% | -1% | 0% | 1% | 1% | -2% | 0% | -5% | -3% | 3% | -1% | 0% | 5% | 7% | 4% | 0% | 0% | 1% | -1% | 3% | -11% | 0% | -2% | 0% |
| 24 | -5% | -6% | -1% | 5% | 6% | 1% | -1% | -1% | 0% | -2% | -4% | -2% | 1% | 2% | 0% | 8% | 7% | 4% | 0% | 0% | 0% | 3% | 1% | -8% | -8% | 0% |
| 25 | 1% | -1% | 1% | -1% | 1% | 0% | 0% | 0% | -2% | -1% | -1% | 0% | -3% | 0% | 2% | 9% | 10% | 1% | 0% | 0% | 0% | 3% | 3% | -5% | -17% | 0% |
| Sum | -1% | 0% | -1% | -1% | 2% | 0% | -2% | -3% | -3% | -1% | -2% | -1% | -2% | -1% | 1% | 6% | 6% | 1% | -1% | 0% | -1% | 3% | 3% | -1% | -3% | 0% |

## Table 2-10: Trip flow percentage difference between model and Replica for PM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3% | 2% | 0% | -4% | 1% | 0% | 0% | -2% | -3% | -5% | -2% | 0% | -4% | -1% | 2% | 7% | 8% | 1% | -1% | 0% | -1% | 2% | 2% | -3% | -1% | 0% |
| 2 | 1% | -3% | 2% | -3% | 1% | -1% | 1% | 0% | -2% | -3% | -2% | -2% | -3% | -2% | 2% | 7% | 9% | 1% | -1% | 0% | -1% | 2% | 2% | -4% | -1% | 0% |
| 3 | 4% | 5% | -12% | 0% | 2% | 1% | -6% | -5% | -3% | -7% | -2% | 0% | -2% | 0% | 4% | 9% | 7% | 1% | -2% | 0% | -1% | 3% | 3% | -1% | 2% | 0% |
| 4 | -1% | 1% | 0% | -4% | 2% | -1% | -1% | 0% | -1% | -2% | -3% | -3% | -5% | 0% | -1% | 6% | 5% | 4% | 0% | 0% | 0% | 2% | 0% | 2% | 0% | 0% |
| 5 | 0% | 1% | 0% | -1% | -7% | 0% | 0% | 1% | -1% | -2% | -2% | -1% | -4% | -1% | -1% | 5% | 2% | 5% | 0% | 0% | 0% | 2% | 1% | 3% | 0% | 0% |
| 6 | 1% | 1% | 0% | 1% | 2% | -17% | 0% | 1% | 1% | 1% | 0% | 0% | -1% | 0% | 1% | 2% | 3% | 1% | -2% | 1% | -1% | 0% | 2% | 1% | 0% | 0% |
| 7 | 1% | 3% | -4% | -1% | 1% | 4% | -5% | -9% | -2% | -2% | 1% | 2% | -2% | -1% | 5% | 3% | 2% | 1% | -3% | 1% | -1% | 0% | 5% | 0% | 1% | 0% |
| 8 | 0% | 1% | -2% | 0% | 1% | 3% | -1% | 3% | -8% | -3% | 1% | 2% | -2% | -1% | 3% | 2% | 1% | 1% | -2% | 0% | -1% | -1% | 2% | 0% | 0% | 0% |
| 9 | 0% | 0% | 0% | 1% | 1% | 6% | 1% | -9% | -8% | 2% | 1% | 2% | -1% | 0% | 2% | 1% | 1% | 0% | -2% | 0% | -2% | 0% | 3% | 0% | 0% | 0% |
| 10 | -1% | 0% | -3% | -1% | 0% | 1% | -2% | -4% | -2% | 9% | 0% | 2% | -2% | 0% | 1% | 2% | 1% | 0% | -1% | 2% | -2% | -1% | 1% | -1% | 0% | 0% |
| 11 | 0% | 0% | -1% | -5% | -1% | 0% | 0% | 0% | -1% | 7% | -1% | 0% | -5% | -2% | 3% | 2% | 2% | 0% | -1% | 2% | -1% | 0% | 4% | -2% | 0% | 0% |
| 12 | 1% | 1% | 0% | -1% | 0% | 0% | 1% | 1% | 0% | 4% | -1% | -14% | -7% | -4% | 2% | 6% | 3% | 1% | 0% | 1% | 0% | 4% | 5% | -1% | 0% | 0% |
| 13 | -2% | -1% | 0% | 1% | 3% | -1% | -1% | -1% | -1% | -1% | -4% | -5% | -4% | 1% | -1% | 7% | 5% | 2% | 0% | 0% | 0% | 4% | 0% | 2% | -1% | 0% |
| 14 | -3% | 0% | -1% | 5% | 2% | 1% | 0% | 0% | 0% | 2% | -2% | -7% | -4% | -15% | -1% | 7% | 4% | 2% | 0% | 1% | 0% | 6% | 1% | 3% | 0% | 0% |
| 15 | 2% | 3% | 2% | -1% | 0% | 2% | 3% | 2% | 1% | 2% | 1% | -1% | -2% | -2% | -29% | 3% | 2% | 1% | 0% | 1% | 0% | 2% | 7% | -1% | 1% | 0% |
| 16 | 3% | 3% | 3% | 5% | 1% | 1% | 1% | 1% | 0% | 1% | 0% | 1% | 2% | 0% | 1% | -41% | 4% | 1% | 0% | 0% | 0% | 8% | 4% | 2% | 1% | 0% |
| 17 | 4% | 6% | 3% | 2% | -2% | 1% | 1% | 1% | -1% | 1% | 0% | 2% | 0% | 0% | 1% | 4% | -36% | 2% | 0% | 0% | 0% | 3% | 2% | 2% | 2% | 0% |
| 18 | 1% | 2% | -1% | 11% | 8% | 1% | 0% | -6% | -8% | -1% | -2% | 0% | 1% | 0% | 0% | 3% | 5% | -7% | -11% | 0% | 0% | 0% | -1% | 4% | 0% | 0% |
| 19 | -1% | 0% | -1% | 7% | 4% | 0% | -2% | -3% | -6% | 3% | -1% | 0% | 1% | 1% | 0% | 2% | 2% | -8% | -1% | 0% | 0% | 0% | 0% | 3% | -1% | 0% |
| 20 | 0% | 1% | 0% | 1% | 1% | 5% | 2% | -1% | -1% | 9% | 3% | 4% | 0% | 1% | 3% | 2% | 1% | 1% | 0% | -31% | -2% | -1% | 4% | 1% | 0% | 0% |
| 21 | 0% | 1% | -1% | 4% | 2% | 0% | -1% | -7% | -5% | -2% | -2% | 2% | 4% | 3% | 0% | 5% | 2% | 1% | 0% | -3% | -10% | 7% | -2% | 2% | 0% | 0% |
| 22 | 1% | 1% | 1% | 3% | 1% | 0% | 0% | -1% | -2% | -1% | 0% | 3% | 1% | 1% | -1% | 8% | 3% | 0% | 0% | 0% | -1% | -21% | 2% | 1% | 1% | 0% |
| 23 | 1% | 2% | 0% | 0% | 1% | 2% | 1% | -1% | -1% | -6% | -1% | 3% | -1% | 0% | 6% | 7% | 3% | 0% | -1% | 1% | -2% | 1% | -15% | 0% | 1% | 0% |
| 24 | -3% | -3% | -2% | 5% | 6% | -1% | -1% | -1% | -1% | -3% | -3% | -3% | 0% | 1% | -1% | 7% | 6% | 4% | 0% | 0% | 0% | 2% | 0% | -7% | -2% | 0% |
| 25 | 0% | 1% | 1% | -4% | 1% | -1% | 1% | 0% | -1% | -2% | -1% | -1% | -4% | -2% | 1% | 8% | 8% | 1% | -1% | 0% | -1% | 3% | 2% | -5% | -5% | 0% |
| Sum | 0% | 1% | -1% | 0% | 1% | 0% | -1% | -3% | -4% | -1% | -2% | -1% | -2% | -1% | 1% | 5% | 4% | 1% | -1% | 0% | -1% | 2% | 2% | 0% | 0% | 0% |

Table 2-11: Trip flow percentage difference between model and Replica for NT

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3% | 0% | -1% | -3% | 1% | 1% | 0% | -2% | -3% | -4% | -3% | -1% | -5% | -1% | 2% | 8% | 9% | 1% | -1% | 0% | 0% | 2% | 3% | -5% | -1% | 0% |
| 2 | -1% | -5% | 1% | -3% | 2% | 1% | 1% | 1% | -2% | -2% | -3% | -1% | -5% | -1% | 2% | 8% | 10% | 2% | 0% | 0% | -1% | 3% | 3% | -5% | -4% | 0% |
| 3 | 2% | 4% | -13% | 1% | 2% | 1% | -7% | -5% | -2% | -8% | -3% | 1% | -1% | 1% | 4% | 9% | 8% | 1% | -1% | 0% | -1% | 3% | 4% | -2% | 2% | 0% |
| 4 | -1% | -1% | 0% | -5% | 3% | -1% | -1% | 0% | 0% | -1% | -3% | -2% | -6% | 0% | 0% | 7% | 6% | 4% | 0% | 0% | 0% | 2% | 1% | 1% | -1% | 0% |
| 5 | 0% | 0% | 1% | 0% | -7% | -1% | 0% | 0% | -1% | -1% | -2% | -1% | -4% | -2% | 0% | 5% | 2% | 5% | 0% | 0% | 0% | 2% | 0% | 3% | 1% | 0% |
| 6 | 1% | 1% | 1% | 0% | 3% | -19% | 1% | 1% | 1% | 1% | 0% | -1% | -1% | 0% | 2% | 3% | 3% | 2% | -2% | 1% | 0% | 0% | 2% | 1% | -1% | 0% |
| 7 | 1% | 3% | -5% | 0% | 2% | 5% | -10% | -7% | -2% | -3% | 0% | 2% | -2% | 0% | 5% | 3% | 3% | 1% | -1% | 1% | -1% | 1% | 5% | 0% | 1% | 0% |
| 8 | 0% | 2% | -2% | 1% | 1% | 3% | -3% | 2% | -6% | -5% | 0% | 2% | -1% | 0% | 3% | 2% | 2% | 1% | -2% | 0% | -2% | 0% | 2% | 0% | 0% | 0% |
| 9 | -1% | 0% | 0% | 0% | 1% | 6% | 0% | -5% | -10% | 0% | 1% | 2% | -1% | 0% | 2% | 1% | 1% | 0% | -2% | 2% | -2% | 0% | 3% | 0% | 0% | 0% |
| 10 | -1% | 0% | -3% | -1% | 0% | 1% | -2% | -4% | -2% | 4% | 2% | 3% | -2% | 0% | 2% | 2% | 1% | 1% | -1% | 2% | -2% | 0% | 2% | -1% | 0% | 0% |
| 11 | 0% | 0% | -1% | -4% | 0% | 1% | 1% | 0% | 0% | 6% | -4% | -1% | -6% | -2% | 3% | 2% | 2% | 0% | 0% | 2% | -1% | 1% | 3% | -3% | 0% | 0% |
| 12 | 1% | 0% | 1% | -1% | 1% | 1% | 1% | 1% | 0% | 4% | -2% | -16% | -8% | -4% | 2% | 7% | 4% | 1% | 0% | 1% | 0% | 3% | 5% | -1% | 0% | 0% |
| 13 | -2% | -2% | 0% | 1% | 3% | 0% | -1% | -2% | -1% | -1% | -4% | -5% | -9% | 1% | 0% | 9% | 6% | 2% | 0% | 0% | 0% | 4% | 1% | 2% | -1% | 0% |
| 14 | -3% | 0% | 0% | 5% | 2% | 1% | 0% | 0% | 0% | 1% | -2% | -7% | -4% | -15% | -1% | 7% | 5% | 2% | 0% | 1% | 0% | 6% | 2% | 2% | 0% | 0% |
| 15 | 2% | 2% | 3% | -1% | 1% | 2% | 3% | 2% | 0% | 2% | 1% | 1% | -1% | -2% | -30% | 4% | 3% | 1% | 0% | 1% | 0% | 1% | 8% | 0% | 0% | 0% |
| 16 | 3% | 3% | 3% | 5% | 2% | 2% | 1% | 0% | 0% | 1% | -1% | 1% | 2% | 0% | 1% | -45% | 5% | 1% | 0% | 0% | 0% | 7% | 5% | 2% | 1% | 0% |
| 17 | 5% | 6% | 3% | 3% | 0% | 2% | 1% | 0% | 0% | 0% | 0% | 1% | 1% | 1% | 1% | 6% | -43% | 2% | 0% | 0% | 0% | 4% | 3% | 2% | 2% | 0% |
| 18 | 1% | 2% | 0% | 10% | 8% | 1% | -1% | -3% | -5% | -1% | -2% | 0% | 1% | 1% | 0% | 4% | 5% | -16% | -12% | 0% | 0% | 0% | 0% | 4% | 0% | 0% |
| 19 | 0% | 0% | -1% | 6% | 4% | -2% | -3% | -1% | -4% | 1% | -1% | 0% | 2% | 1% | 0% | 2% | 3% | -4% | -7% | 0% | -1% | 1% | -1% | 3% | 0% | 0% |
| 20 | 1% | 1% | 1% | 1% | 1% | 4% | 2% | -2% | -2% | 8% | 3% | 3% | 0% | 1% | 2% | 2% | 2% | 0% | -1% | -31% | -2% | 1% | 4% | 0% | 0% | 0% |
| 21 | -1% | 0% | -1% | 4% | 2% | 0% | -1% | -6% | -5% | -6% | -2% | 1% | 4% | 3% | 1% | 6% | 3% | 1% | 0% | -2% | -9% | 7% | -1% | 2% | -1% | 0% |
| 22 | 1% | 2% | 1% | 3% | 2% | 0% | 0% | -1% | -1% | -1% | -1% | 2% | 2% | 2% | 0% | 9% | 4% | 1% | 0% | 0% | -1% | -27% | 3% | 1% | 0% | 0% |
| 23 | 0% | 2% | 2% | 1% | 1% | 2% | 1% | -1% | 0% | -4% | -1% | 3% | -2% | 0% | 6% | 7% | 4% | 0% | 0% | 1% | -1% | 3% | -23% | 0% | 0% | 0% |
| 24 | -4% | -5% | -3% | 4% | 6% | 1% | -1% | 0% | -1% | -2% | -4% | -2% | 0% | 2% | 0% | 7% | 6% | 4% | 0% | 0% | 0% | 3% | 1% | -10% | -3% | 0% |
| 25 | -3% | -2% | 1% | -2% | 2% | 0% | 1% | 0% | -1% | -1% | -1% | -1% | -6% | -1% | 1% | 9% | 9% | 1% | -1% | 0% | 0% | 3% | 3% | -6% | -5% | 0% |
| Sum | 0% | 0% | -1% | 0% | 2% | 0% | -1% | -3% | -3% | -2% | -2% | -1% | -3% | -1% | 1% | 6% | 5% | 1% | -1% | 0% | -1% | 2% | 2% | -1% | -1% | 0% |

## 2.3 MODE CHOICE VALIDATION

The Dane County TDM model utilize a nest logit mode choice model to produce the mode share for the eight modes: Drive Alone, Shared Ride, Walk, Bike, Walk to Bus, Drive to Bus, Walk to Premium and Drive to Premium.

The most basic checks of mode choice model results are comparison of modeled trips by mode, or mode shares, to observed data by market segment. Market segments includes trip purposes as well as demographic segments, such as income or vehicles availability levels and geographically defined segments. Mode choice models are typically applied using trip tables as inputs. The model choice model's results, therefore, are shares of the total trip table for each market segment that use each of the modal alternatives. Validation of the model's aggregate results involves checking the shares of the model's base year scenarios results against observed mode shares. The following Table 2-12 is the target model share from survey. Table 2-13 is the mode share from model. Table 2-14 contains the model share difference between model and survey. It shows that mode share difference between model and survey are minimal, which means mode choice of the model is reasonable.

## Table 2-12: Target mode share from survey

| | Survey Shares | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DA | SR | WALK | BIKE | BUS_W | BUS_D | SCHOOLBUS | Total |
| HBW | 75.6% | 10.6% | 2.4% | 5.9% | 4.7% | 0.7% | | 100.0% |
| | 86.2% | | 8.4% | | 5.4% | | | 100.0% |
| HBU | 34.7% | 17.3% | 21.8% | 8.4% | 17.8% | 0.1% | | 100.0% |
| | 52.0% | | 30.2% | | 17.8% | | | 100.0% |
| HB Shop | 49.3% | 38.8% | 8.1% | 2.4% | 1.4% | 0.0% | | 100.0% |
| | 88.1% | | 10.5% | | 1.4% | | | 100.0% |
| HB School | 12.6% | 41.5% | 10.1% | 6.8% | 4.1% | 0.0% | 25.1% | 100.0% |
| | 54.1% | | 16.8% | | 4.1% | | 25.1% | 100.0% |
| HB SocRec | 33.8% | 34.2% | 24.2% | 6.8% | 1.1% | 0.0% | | 100.0% |
| | 68.0% | | 31.0% | | 1.1% | | | 100.0% |
| HBO | 34.3% | 48.7% | 14.5% | 1.5% | 0.9% | 0.0% | | 100.0% |
| | 83.1% | | 16.0% | | 0.9% | | | 100.0% |
| NHB | 45.8% | 33.5% | 14.7% | 2.9% | 1.6% | 0.1% | 1.4% | 100.0% |
| | 79.3% | | 17.6% | | 1.7% | | 1.4% | 100.0% |

## Table 2-13: Mode share from model

| | Model Share | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DA | SR | WALK | BIKE | BUS_W | BUS_D | SCHOOLBUS | Total |
| HBW | 76.0% | 9.9% | 2.1% | 7.7% | 3.4% | 0.8% | | 100.0% |
| | 85.9% | | 9.9% | | 4.3% | | | 100.0% |
| HBU | 33.1% | 17.4% | 21.7% | 10.5% | 17.1% | 0.3% | | 100.0% |
| | 50.5% | | 32.2% | | 17.3% | | | 100.0% |
| HB Shop | 51.3% | 37.7% | 6.4% | 3.9% | 0.6% | 0.0% | | 100.0% |
| | 89.0% | | 10.4% | | 0.6% | | | 100.0% |
| HB School | 12.5% | 44.1% | 10.0% | 5.8% | 2.6% | 0.0% | 24.9% | 100.0% |
| | 56.6% | | 15.9% | | 2.6% | | 24.9% | 100.0% |
| HB SocRec | 33.0% | 34.7% | 24.7% | 7.0% | 0.6% | 0.0% | | 100.0% |
| | 67.8% | | 31.7% | | 0.6% | | | 100.0% |
| HBO | 32.9% | 49.1% | 16.2% | 1.1% | 0.7% | 0.0% | | 100.0% |
| | 82.0% | | 17.3% | | 0.7% | | | 100.0% |
| NHB | 45.5% | 33.3% | 15.5% | 3.2% | 0.9% | 0.0% | 1.5% | 100.0% |
| | 78.8% | | 18.8% | | 0.9% | | 1.4% | 100.0% |

Table 2-14: Model share difference between model and survey

| | Model Share - Survey Shares | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DA | SR | WALK | BIKE | BUS_W | BUS_D | SCHOOLBUS | Total |
| HBW | 0.4% | -0.8% | -0.3% | 1.8% | -1.3% | 0.1% | | 0% |
| | -0.4% | | 1.5% | | -1.1% | | | 0% |
| HBU | -1.6% | 0.1% | -0.1% | 2.1% | -0.7% | 0.2% | | 0% |
| | -1.5% | | 2.0% | | -0.5% | | | 0% |
| HB Shop | 2.0% | -1.1% | -1.7% | 1.5% | -0.7% | 0.0% | | 0% |
| | 0.9% | | -0.2% | | -0.7% | | | 0% |
| HB School | -0.1% | 2.6% | 0.0% | -0.9% | -1.5% | 0.0% | -0.1% | 0% |
| | 2.6% | | -0.9% | | -1.5% | | -0.1% | 0% |
| HB SocRec | -0.8% | 0.6% | 0.5% | 0.2% | -0.5% | 0.0% | | 0% |
| | -0.2% | | 0.7% | | -0.5% | | | 0% |
| HBO | -1.5% | 0.4% | 1.7% | -0.4% | -0.2% | 0.0% | | 0% |
| | -1.1% | | 1.3% | | -0.2% | | | 0% |
| NHB | -0.3% | -0.2% | 0.8% | 0.4% | -0.8% | -0.1% | 0.1% | 0% |
| | -0.5% | | 1.2% | | -0.9% | | 0.0% | 0% |

## 2.4 HIGHWAY ASSIGNMENT VALIDATION

Traffic assignment is the culmination of the modeling process. There are two major parts of validation efforts: 1. traffic volume validation and 2 travel time and speed validation. The two parts of work are introduced in the following two sub segments.

### 2.4.1 Peak period Traffic Volume Validation

The TOD traffic count data for volume validation is from WisDOT's TRAffic Data System (TRADAS, a product from Chaparral Systems). TRADAS is managed by the Bureau of State Highway Programs. It houses continuous (e.g., from fixed automated traffic recorders (ARTS) and short duration volume, speed, and vehicle classification data). TOD traffic counts are from 1,408 TRADAS sites, which were collected in different years in all available locations in Dane County. The countywide annual growth rate of 0.5% is applied to factor those collected traffic counts to convert them from various different years into 2016 traffic counts. There are two standard approaches for TOD volume validation. The first one is to compare the observed TOD traffic counts to model volumes for different links aggregated by various facility types. The second one is to compare the TOD traffic counts and mode volume by count groups. The following two tables show the peak period validation targets.

## Table 2-15: Peak period RMSE% target by volume group

| Volume group | Daily RMSE% | Peak RMSE% |
|---|---|---|
| 0-1000 | 60% | 100% |
| 1000-2500 | 47% | 62% |
| 2500-5000 | 36% | 50% |
| 5000-1000 | 29% | 40% |
| 10000-20000 | 25% | 33% |
| 20000-30000 | 22% | 26% |
| 30000 and up | 22% | 25% |

## Table 2-16: Peak period V/C error% target by facility type

| Function Class | Daily V/C error% | Peak V/C error% |
|---|---|---|
| Interstate | 7% | 10% |
| Freeway | 7% | 15% |
| Ramp | - | - |
| Expressway | 10% | 15% |
| Urban principal arterial | 10% | 15% |
| Urban minor arterial | 15% | 20% |
| Urban major collector | 25% | 30% |
| Urban minor collector | 25% | 35% |
| Urban local | - | - |
| Rural principal arterial | 7% | 15% |
| Rural minor arterial | 10% | 15% |
| Rural major collector | 15% | 20% |
| Rural minor collector | 25% | 30% |
| Rural local | 25% | 35% |
| Rural other | - | - |

For the base year model, the peak period volume validation by volume group and facility type result is illustrated in the Table 2-17 and Table 2-18. The tables show the base year model has good peak period performance on both RMSE% and VC error%, except for some minor road facilities such as urban minor collector, and rural minor collectors.

## Table 2-17: Peak period RMSE% by volume group for base year model

| Volume Group | RMSE% AM | RMSE% PM | Allowable RMSE% |
|---|---|---|---|
| 0 - 1,000 | 74% | 84% | < 100% |
| 1,000 - 2,500 | 38% | 41% | < 62% |
| 2,500 - 5,000 | 31% | 29% | < 50% |
| 5,000 - 10,000 | 24% | 22% | < 40% |
| 10,000 - 20,000 | 20% | 16% | < 33% |
| 20,000 - 30,000 | 17% | 11% | < 26% |
| >30,000 | N/A | 8% | <25% |

## Table 2-18: Peak period V/C error% by facility type for base year model

| Functional Class | AM V/C Error% | PM V/C Error% | Allowable V/C Error% |
|---|---|---|---|
| Interstate | 8% | -1% | < 10% |
| freeway | -1% | -4% | < 15% |
| ramp | -6% | 0% | |
| expressway | 3% | 2% | < 15% |
| urban principal arterial | 1% | -9% | < 15% |
| urban minor arterial | -11% | -15% | < 20% |
| urban major collector | -22% | -28% | < 30% |
| urban minor collector | -65% | -56% | <35% |
| rural principal arterial | -14% | -5% | < 15% |
| rural minor arterial | 6% | 17% | < 15% |
| rural major collector | -9% | 2% | < 20% |
| rural minor collector | 61% | 69% | < 30% |
| rural local | 20% | 30% | <35% |

For the base year model, the daily volume validation by volume group and facility type result is illustrated in Table 2-19 and Table 2-20. Table 2-19 shows that in the daily level, the RMSE% measures of the model are mostly exceeding the allowable range. There might be two potential reasons for it: 1. The daily RMSE% allowable ranges are stricter than those for peak period 2. Off peak period RMSE% measures are large. Table 2-20 indicates that in the daily, the V/C error% measures are within the allowable ranges for most of the major roads.

## Table 2-19: Daily RMSE% by volume group for base year model

| Volume Group | RMSE% Daily | Allowable RMSE% |
|---|---|---|
| 0 - 1,000 | 145% | 60% |
| 1,000 - 2,500 | 89% | 47% |
| 2,500 - 5,000 | 51% | 36% |

| | | |
|---|---|---|
| 5,000 - 10,000 | 39% | 29% |
| 10,000 - 20,000 | 29% | 25% |
| 20,000 - 30,000 | 25% | 22% |
| >30,000 | 14% | 22% |

Table 2-20: Daily V/C error% by facility type for base year model

| Functional Class | Daily V/C Error% | Daily Allowable V/C Error% |
|---|---|---|
| Interstate | -9% | 7% |
| freeway | -4% | 7% |
| ramp | 0% | - |
| expressway | -1% | 10% |
| urban principal arterial | -9% | 10% |
| urban minor arterial | -12% | 15% |
| urban major collector | -27% | 25% |
| urban minor collector | -61% | 25% |
| rural principal arterial | 0% | 7% |
| rural minor arterial | 22% | 10% |
| rural major collector | 7% | 15% |
| rural minor collector | 74% | 25% |
| rural local | 35% | 25% |

### 2.4.2 Travel speed validation

Speed data from NPMRDS (2017) data are utilized to validate the model speed data. The nine corridors are selected for this purpose. The following Figure illustrate the location of the selected 9 corridors.

## Figure 2-4: Corridors selected for travel speed validation

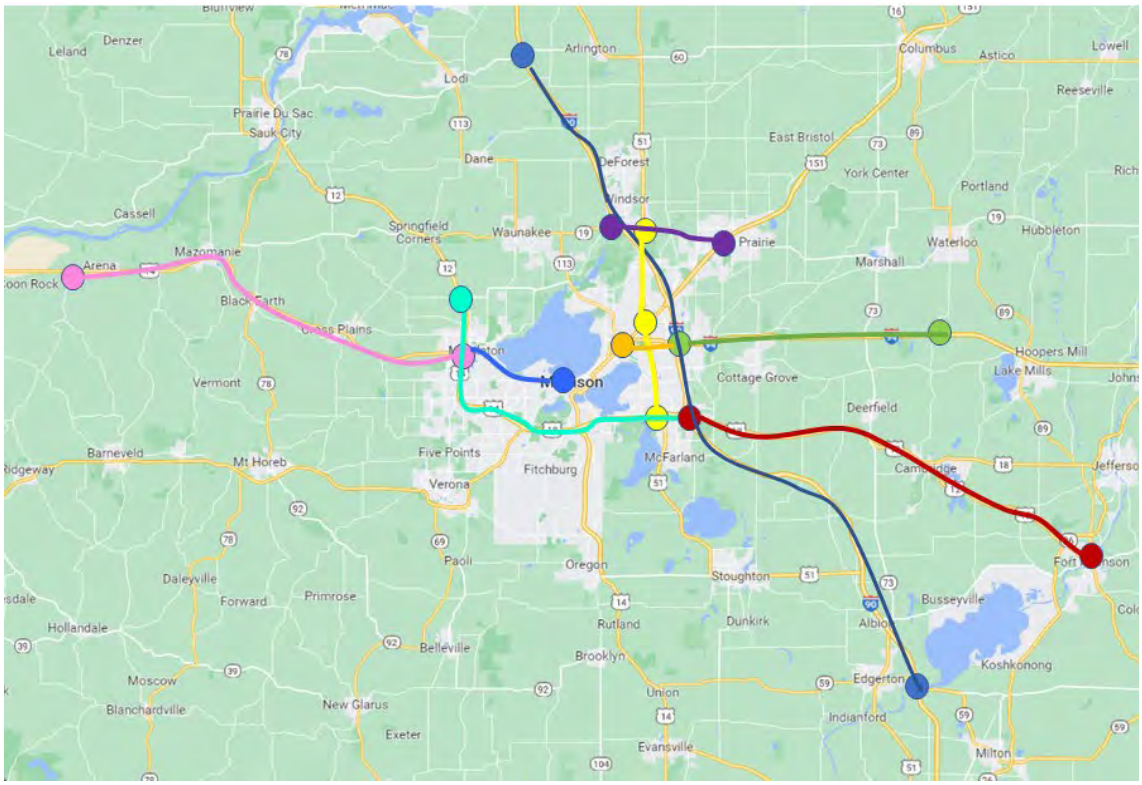



Table 2-21 shows the peak period speed validation result for the 9 corridors. There are 4 corridors with large speed error percentage (>20%), which are highlighted in the tables.

## Table 2-21: Peak period travel speed validation

| Route Information | | | | AM Speed (mph) | | | PM Speed (mph) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Route** | **From** | **To** | **Dir** | **NPMRDS** | **Model** | **Diff%** | **NPMRDS** | **Model** | **Diff%** |
| I-90 | County Line | County Line | N | 64 | 70 | 9% | 62 | 70 | 12% |
| I-90 | | | S | 65 | 70 | 8% | 62 | 69 | 12% |
| I-94 | I-90 | County Line | E | 67 | 69 | 3% | 68 | 69 | 2% |
| I-94 | | | W | 68 | 70 | 3% | 67 | 70 | 4% |
| US 51 | US 151 | S of SR 19 | N | 34 | 49 | 45% | 33 | 49 | 49% |
| US 51 | | | S | 35 | 49 | 41% | 30 | 49 | 61% |
| US 51 | US 18 | SR 19 | N | 32 | 46 | 44% | 32 | 45 | 43% |
| US 51 | | | S | 33 | 49 | 48% | 31 | 48 | 53% |
| SR 30 | US 151 | I 90 | W | 54 | 65 | 20% | 55 | 65 | 19% |
| SR 30 | | | E | 57 | 66 | 17% | 58 | 66 | 14% |
| SR 19 | US 151 | I-94 | W | 28 | 43 | 51% | 26 | 42 | 60% |
| SR 19 | | | E | 30 | 43 | 40% | 28 | 42 | 50% |
| US 14 | | | W | 44 | 49 | 12% | 43 | 49 | 13% |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| US 14 | US 12/14 | County Line | E | 45 | 49 | 9% | 42 | 49 | 17% |
| US 18/12 | I 90 | SR 89 | W | 56 | 55 | -3% | 56 | 55 | -2% |
| US 18/12 | | | E | 56 | 55 | -1% | 57 | 55 | -3% |
| University Ave | US 12 | N Bassett St | W | 22 | 35 | 61% | 19 | 33 | 71% |
| University Ave | | Farley Ave | E | 24 | 36 | 51% | 19 | 36 | 87% |
| Beltline | Century Rd | I-90 | W | 45 | 58 | 29% | 48 | 58 | 22% |
| Beltline | | | E | 57 | 62 | 10% | 42 | 61 | 46% |

## 2.5 SUMMARY

This chapter performs some initial validation on the base year of the Dane County TDM model. The initial check identifies a cluster related issue which cause model produce different result for each independent run. General speaking, the based year model demonstrates reasonable performance on the trip distribution, mode split and highway assignment model. However, there are two potential issues which need to be aware of:

1. The model overestimates the intra-district level flow compared with Streetlight and Replica data
2. The model overestimates the travel speed on 5 major corridors in the Dane County areas.

In addition, the original model before updates were made (Chapter 3) does not meet all the daily level RMSE% measures by volume group.

# 3. BASE YEAR MODEL UPDATE RECOMMENDATION

This chapter proposes some recommendation on model updates based on the model validation result from Chapter 2 and implement these updates on the model and perform some analysis on it.

## 3.1 BASE YEAR MODEL RECOMMENDTATION

According to the initial validation results, the base year model looks reasonable, however there are still some potential issues need to be solved:

- Model underestimates the intra-distract level flows compared with Streetlight and Replica data
- Model overestimates the peak period travel speed on 5 major corridors

The recommendations to alleviate the above issues are:

- Implement reduction factors on the intra-zonal terminal time to encourage the intra-zonal trip flows in the trip distribution step
- Activate the intersection delay function to reduce travel time in the major corridors and downtown areas.

To verify the above recommendations, the following modifications are performed on the model. The results of the updated model are analyzed.

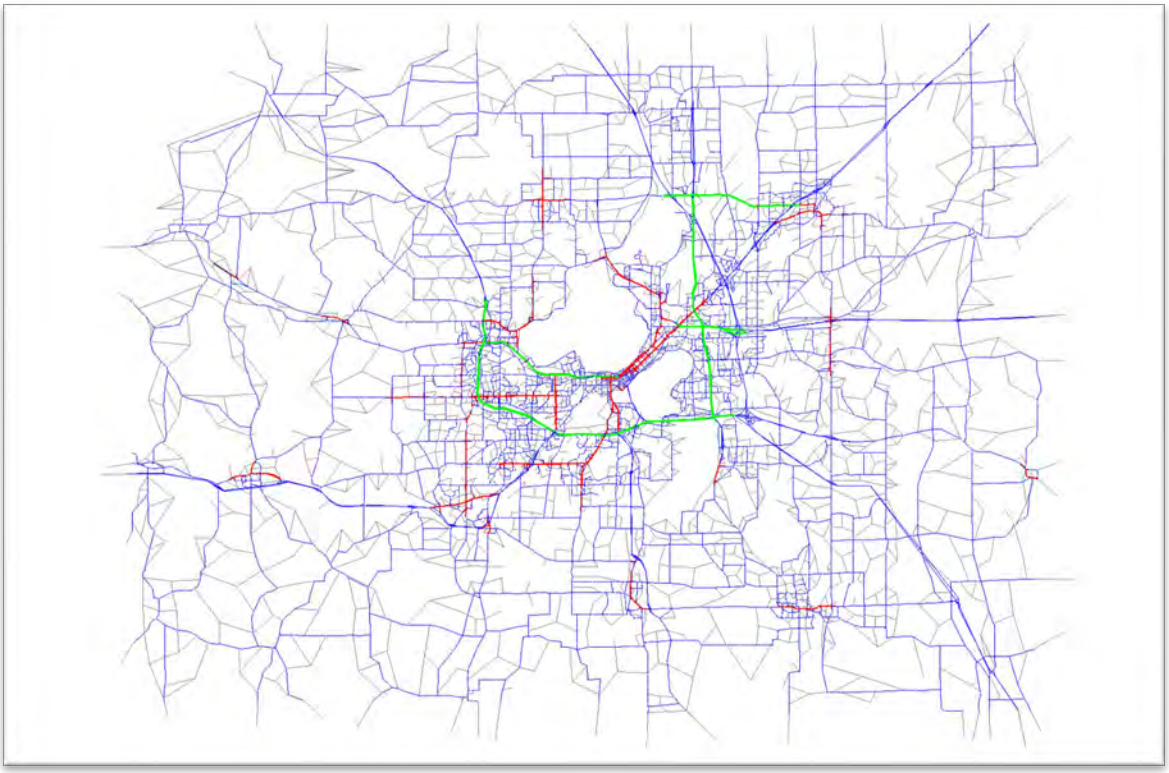
Table 3-1: The recommended modifications on the TDM model

| Order | Purpose | Suggested modification on model |
|---|---|---|
| 1 | Increase Intra-district level traffic flow | Reduce the intra-zonal terminal time by 2/3 for the TAZs within district 12,14-17,20,22-23 |
| 2 | Reduce model speed in some major corridors and downtown Madison area | Activate the model default intersection delay function.<br>Apply the TOD intersection delay to the facilities including the 4 selected corridors US 51, SR 19, University Ave and Beltline.<br>Use the factor of 0.5 to reduce the intersection delay for AM, MD, and PM period. |

Figure 3-1 illustrates the selected links/corridors selected for implementing intersection delay. The green colored links are five selected corridors, and the red links are the default links selected by

the model for implementing intersection delay (low_FC=11), including local roads in downtown areas.

Figure 3-1: Corridors selected for implementing TOD intersection delay



## 3.2 TRIP DISTRIBUTION MODEL VALIDATION FOR UPDATED MODEL

### 3.2.1 Trip Length Validation

With the model updated, the trip length distribution can be validated based on the Streetlight and Replica data. the Coincidence ratios are calculated as the following Table 3-2 and Table 3-3. Compared with the base model the CR ratios change insignificantly and all of the CR ratios are within the allowable range.

Table 3-2: Coincidence ratio between model and Streetlight data

| Trip Purpose | AM | MD | PM | NT | Daily |
|---|---|---|---|---|---|
| HB Work | 0.76 | 0.72 | 0.71 | 0.74 | 0.76 |
| HB Other | 0.76 | 0.78 | 0.72 | 0.77 | 0.78 |
| No HB | 0.70 | 0.73 | 0.72 | 0.73 | 0.75 |
| All Purpose | 0.77 | 0.76 | 0.72 | 0.77 | 0.77 |

Table 3-3: Coincidence ratio between model and Replica data

| Trip Purpose | AM | MD | PM | NT | Daily |
|---|---|---|---|---|---|
| HB Work | 0.71 | 0.80 | 0.72 | 0.76 | 0.75 |
| HB School | 0.65 | 0.68 | 0.65 | 0.58 | 0.69 |
| HB Shopping | 0.73 | 0.74 | 0.68 | 0.74 | 0.73 |
| HB Other | 0.66 | 0.73 | 0.71 | 0.74 | 0.73 |
| All Purpose | 0.72 | 0.75 | 0.72 | 0.76 | 0.74 |

### 3.2.2 District to District Traffic Flow Pattern Validation

Table 3-4 shows the normalized levenshtein distance for TOD matrices between the updated model and observed data from Streetlight and Replica. The updated model does not change the Levenshtein distance significantly, compared with Table 2-3.

Table 3-4: Normalized LevenShtein distance summary for updated model

| TOD | NLOD with Streetlight data | NLOD with Replica data |
|---|---|---|
| AM | 0.64 | 0.61 |
| MD | 0.66 | 0.59 |
| PM | 0.64 | 0.59 |
| NT | 0.64 | 0.59 |

The following Table 3-5 to Table 3-8 are the TOD trip flow percentage difference between the updated model and Streetlight data and Table 3-9 to Table 3-12 are the TOD trip flow percentage difference between the updated model and Replica data. The values in the table are highlighted with colors. Blue color means the negative values and red means positive values.

Compared with the corresponding TOD trip flow percentage difference between the original model and the Streetlight data (Table 2-4 to Table 2-7) and Replica data (Table 2-8 to Table 2-11), the intra-district level flow difference percentage drops by roughly 10% for the selected districts in Table 3-1, indicating that approach of reducing intra-zonal terminal time works.

## Table 3-5: Trip flow percentage difference between model and Streetlight for AM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -5% | -9% | 1% | -3% | 0% | 2% | 0% | 0% | 0% | 0% | -3% | 0% | 0% | -4% | 4% | 10% | 10% | 1% | 0% | 1% | 0% | 5% | 5% | -3% | -12% | 0% |
| 2 | -5% | -5% | 3% | -3% | 1% | 2% | 1% | 0% | 0% | 0% | -7% | 0% | -1% | -2% | 4% | 10% | 12% | 2% | 0% | 1% | 0% | 4% | 5% | -4% | -20% | 0% |
| 3 | -14% | 1% | -6% | 0% | 2% | 2% | -5% | -3% | -1% | -4% | -5% | 2% | -1% | 0% | 4% | 11% | 9% | 1% | 0% | 1% | 0% | 5% | 6% | -2% | -3% | 0% |
| 4 | -6% | -2% | 0% | -11% | -1% | 2% | -1% | 0% | 0% | -1% | -4% | -1% | -3% | 0% | 1% | 10% | 9% | 4% | 1% | 0% | 0% | 4% | 2% | 1% | -4% | 0% |
| 5 | -1% | 1% | 1% | -16% | -5% | 1% | 0% | 0% | 0% | 0% | -2% | -1% | -2% | -3% | 1% | 8% | 7% | 5% | 1% | 0% | 0% | 3% | 2% | 0% | -1% | 0% |
| 6 | 0% | -1% | 0% | -5% | -2% | -9% | 1% | -2% | 2% | 0% | -2% | 0% | 0% | 0% | 2% | 4% | 6% | 3% | -1% | 2% | 0% | 2% | 2% | 0% | -3% | 0% |
| 7 | -5% | 1% | -8% | -2% | 2% | 3% | -8% | -6% | 1% | -5% | -1% | 2% | -1% | 1% | 5% | 5% | 5% | 2% | 0% | 2% | 0% | 4% | 6% | 0% | -1% | 0% |
| 8 | -4% | 0% | -3% | 1% | 1% | 3% | -7% | -2% | -4% | -4% | -1% | 1% | 0% | 1% | 4% | 3% | 3% | 2% | -1% | 2% | 0% | 2% | 5% | 0% | -1% | 0% |
| 9 | -4% | 0% | -1% | 0% | 0% | 5% | 0% | -10% | -9% | 0% | 0% | 3% | 0% | 0% | 2% | 3% | 2% | 1% | -1% | 5% | 0% | 2% | 5% | 0% | -1% | 0% |
| 10 | -2% | -1% | -4% | -1% | 0% | 1% | -3% | -7% | 0% | 3% | -3% | 3% | -1% | 1% | 3% | 3% | 2% | 1% | 0% | 2% | -2% | 3% | 4% | -1% | -1% | 0% |
| 11 | -6% | -6% | 0% | -8% | -2% | 2% | 0% | 2% | 1% | 4% | 0% | -3% | -3% | -1% | 5% | 4% | 4% | 1% | 0% | 2% | 0% | 3% | 8% | -5% | -3% | 0% |
| 12 | -2% | -2% | 1% | -8% | 0% | 1% | -1% | 0% | 0% | 2% | -8% | -2% | -4% | -4% | 3% | 9% | 5% | 1% | 0% | 1% | 0% | 5% | 6% | -2% | -1% | 0% |
| 13 | -3% | -1% | 0% | -13% | 0% | 1% | -1% | -2% | 0% | -1% | -7% | -5% | 4% | -3% | 1% | 11% | 8% | 3% | 0% | 0% | 0% | 5% | 2% | 0% | -1% | 0% |
| 14 | -4% | 0% | 1% | -4% | 1% | 1% | 0% | -1% | 0% | 0% | -4% | -4% | -1% | -11% | 1% | 10% | 6% | 2% | 0% | 1% | 0% | 5% | 2% | -1% | -1% | 0% |
| 15 | -1% | 1% | 2% | -3% | -1% | 2% | 2% | 1% | 1% | 1% | -7% | 0% | 0% | -2% | -14% | 5% | 3% | 1% | 0% | 1% | 0% | 2% | 9% | 0% | -3% | 0% |
| 16 | 1% | 3% | 2% | -3% | -1% | 1% | 0% | 1% | 0% | 1% | -4% | -1% | 1% | -5% | 1% | -16% | 6% | 1% | 0% | 0% | 0% | 6% | 5% | 1% | 1% | 0% |
| 17 | 4% | 4% | 4% | -9% | -14% | 1% | 1% | -1% | 0% | -1% | -4% | 1% | 0% | 2% | 2% | 8% | -10% | 2% | 0% | 0% | 0% | 4% | 3% | 0% | 1% | 0% |
| 18 | -2% | 1% | 1% | 8% | 6% | -2% | -5% | -8% | -5% | -5% | -2% | 0% | 2% | 2% | 1% | 6% | 7% | 1% | -12% | 0% | -1% | 2% | 2% | 4% | -1% | 0% |
| 19 | -4% | 1% | -5% | 6% | 4% | 0% | -6% | -5% | -6% | 0% | -1% | 0% | 1% | 2% | 0% | 4% | 4% | -4% | 4% | 1% | 0% | 2% | 0% | 3% | -2% | 0% |
| 20 | -3% | 0% | 0% | 2% | 1% | 3% | 0% | -7% | -17% | 3% | 2% | 2% | 1% | 1% | 2% | 3% | 2% | 1% | 0% | 0% | -3% | 1% | 5% | 1% | 0% | 0% |
| 21 | -4% | 0% | -3% | 3% | 3% | 0% | -3% | -9% | -5% | -11% | -2% | -3% | 3% | 5% | 1% | 8% | 5% | 2% | 1% | 0% | -2% | 11% | 1% | 2% | -2% | 0% |
| 22 | 0% | 0% | 1% | 1% | 0% | 0% | -1% | -3% | 0% | -4% | -5% | 0% | 2% | 2% | 1% | 9% | 4% | 0% | 0% | 0% | -2% | -7% | 1% | 0% | 0% | 0% |
| 23 | -1% | -1% | 1% | -3% | 0% | 1% | 0% | -2% | 0% | -10% | -5% | 2% | -1% | 0% | 5% | 7% | 4% | 1% | 0% | 1% | 0% | 5% | -3% | 0% | -1% | 0% |
| 24 | -6% | -9% | 0% | -4% | 6% | 3% | -1% | -1% | 0% | -1% | -5% | 0% | -1% | 1% | 1% | 10% | 8% | 4% | 1% | 0% | 0% | 3% | 2% | 1% | -13% | 0% |
| 25 | -2% | -14% | 4% | 1% | 2% | 2% | 1% | 0% | 0% | 0% | -1% | 0% | -1% | 1% | 3% | 11% | 12% | 2% | 0% | 1% | 0% | 4% | 5% | -6% | -24% | 0% |
| Sum | -4% | -1% | -1% | -4% | 1% | 1% | -2% | -4% | -2% | -2% | -5% | -1% | -1% | -1% | 2% | 9% | 7% | 2% | -1% | 1% | -1% | 5% | 4% | -1% | -3% | 0% |

## Table 3-6: Trip flow percentage difference between model and Streetlight for MD

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -5% | -6% | -4% | -1% | 2% | 2% | -1% | -2% | 0% | -2% | -5% | 1% | -1% | 1% | 3% | 9% | 12% | 1% | 0% | 1% | 0% | 4% | 5% | -3% | -11% | 0% |
| 2 | -6% | -11% | 2% | 0% | 2% | 2% | 1% | 0% | 0% | -1% | -7% | 0% | -1% | 0% | 4% | 10% | 14% | 2% | 0% | 1% | 0% | 4% | 4% | -6% | -14% | 0% |
| 3 | -3% | 4% | -18% | 1% | 2% | 2% | -7% | -8% | 0% | -8% | -3% | 3% | 0% | 1% | 4% | 10% | 10% | 1% | 0% | 0% | 0% | 5% | 5% | -1% | 1% | 0% |
| 4 | 0% | 0% | 0% | -13% | -1% | 1% | 0% | 0% | 0% | 0% | -3% | -1% | -11% | 2% | 1% | 9% | 9% | 4% | 1% | 0% | 0% | 3% | 2% | -1% | -1% | 0% |
| 5 | 1% | 1% | 1% | -15% | -10% | 0% | 0% | 1% | 0% | 0% | -2% | -1% | -6% | 1% | 1% | 7% | 7% | 5% | 0% | 0% | 0% | 3% | 2% | 2% | 0% | 0% |
| 6 | 1% | 1% | 0% | -3% | 0% | -22% | -1% | -2% | 2% | 1% | 0% | 1% | -1% | 0% | 2% | 4% | 6% | 2% | 0% | 2% | 0% | 1% | 3% | 1% | 0% | 0% |
| 7 | 1% | 3% | -9% | 0% | 2% | 5% | -15% | -13% | 0% | -4% | 0% | 3% | -1% | 0% | 6% | 4% | 4% | 2% | -1% | 2% | -1% | 3% | 7% | 0% | 1% | 0% |
| 8 | 1% | 2% | -3% | 2% | 1% | 4% | -4% | -17% | -6% | -4% | 1% | 3% | 0% | 0% | 4% | 3% | 3% | 1% | 0% | 2% | -1% | 2% | 5% | 0% | 1% | 0% |
| 9 | 0% | 1% | 0% | 1% | 1% | 7% | 1% | -13% | -19% | 3% | 1% | 3% | 0% | 0% | 2% | 2% | 2% | 0% | -1% | 4% | -1% | 1% | 4% | 0% | 0% | 0% |
| 10 | -1% | 0% | -5% | 0% | 0% | 1% | -2% | -8% | 0% | -3% | -1% | 4% | 0% | 1% | 3% | 3% | 2% | 1% | 0% | 3% | -1% | 2% | 1% | 0% | 0% | 0% |
| 11 | -3% | -3% | -1% | -5% | 0% | 2% | 1% | 1% | 1% | 5% | -10% | -3% | -5% | 0% | 5% | 4% | 4% | 1% | 0% | 3% | 0% | 3% | 5% | -3% | 0% | 0% |
| 12 | 0% | 0% | 1% | -3% | 0% | 2% | 1% | 1% | 1% | 3% | -8% | -12% | -9% | -4% | 3% | 7% | 5% | 1% | 0% | 1% | 0% | 4% | 6% | -2% | 0% | 0% |
| 13 | 0% | 0% | 0% | -12% | 2% | 1% | -1% | 0% | 0% | 0% | -5% | -5% | -10% | 1% | 0% | 11% | 8% | 3% | 0% | 0% | 0% | 5% | 2% | 1% | 0% | 0% |
| 14 | 1% | 1% | 1% | 3% | 3% | 1% | 0% | 0% | 0% | 1% | -2% | -7% | -3% | -28% | 0% | 8% | 6% | 2% | 0% | 1% | 1% | 6% | 2% | 2% | 0% | 0% |
| 15 | 1% | 3% | 2% | 0% | 0% | 2% | 3% | 2% | 1% | 2% | 0% | 0% | -1% | -1% | -30% | 5% | 3% | 1% | 0% | 1% | 0% | -1% | 8% | 0% | 1% | 0% |
| 16 | 3% | 3% | 3% | 4% | 1% | 1% | 1% | 1% | 0% | 1% | 0% | 2% | 0% | -2% | 2% | -42% | 6% | 1% | 0% | 0% | 0% | 6% | 4% | 2% | 1% | 0% |
| 17 | 4% | 5% | 3% | -1% | -2% | 1% | 0% | 0% | 0% | 0% | -1% | 2% | -1% | 1% | 2% | 6% | -31% | 2% | 0% | 0% | 0% | 3% | 3% | 2% | 2% | 0% |
| 18 | 0% | 2% | 0% | 12% | 8% | 0% | -1% | -12% | -9% | -1% | -1% | 1% | 2% | 2% | 1% | 5% | 8% | -8% | -17% | 0% | 0% | 1% | 1% | 4% | 1% | 0% |
| 19 | -1% | 0% | -1% | 8% | 4% | 1% | -1% | -4% | -5% | 3% | 0% | 0% | 2% | 1% | 0% | 3% | 4% | -8% | -13% | 1% | 1% | 1% | 0% | 3% | 0% | 0% |
| 20 | 0% | 0% | 0% | 2% | 1% | 4% | 1% | -7% | -13% | 5% | 3% | 4% | 0% | 1% | 2% | 2% | 2% | 0% | 0% | -8% | -3% | 0% | 4% | 0% | 0% | 0% |
| 21 | 0% | 1% | -1% | 5% | 2% | 0% | -3% | -9% | -3% | -7% | -2% | 1% | 3% | 4% | 1% | 7% | 4% | 1% | 1% | -1% | -17% | 9% | 1% | 2% | 0% | 0% |
| 22 | 2% | 2% | 1% | 3% | 2% | 1% | 0% | -2% | 0% | -2% | -1% | 2% | 1% | 2% | 0% | 8% | 4% | 0% | 0% | 0% | -1% | -27% | 3% | 1% | 1% | 0% |
| 23 | 1% | 2% | 1% | 1% | 0% | 2% | 1% | -1% | 1% | -14% | -5% | 3% | -1% | 0% | 6% | 7% | 4% | 1% | 0% | 1% | 0% | 4% | -13% | 0% | 1% | 0% |
| 24 | -3% | -7% | -1% | -1% | 6% | 2% | 0% | 0% | 0% | 0% | -5% | -3% | -2% | 2% | 1% | 9% | 8% | 4% | 1% | 0% | 0% | 3% | 1% | -10% | -6% | 0% |
| 25 | -7% | -15% | 3% | 0% | 2% | 2% | 2% | 0% | 0% | 0% | -2% | 2% | 0% | 1% | 4% | 10% | 12% | 2% | 0% | 0% | 0% | 4% | 4% | -6% | -18% | 0% |
| Sum | -1% | -1% | -2% | -3% | 1% | 1% | -2% | -6% | -3% | -3% | -4% | -1% | -3% | 0% | 3% | 8% | 8% | 2% | -1% | 1% | -1% | 5% | 4% | -1% | -2% | 0% |

## Table 3-7: Trip flow percentage difference between model and Streetlight for PM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0% | -2% | -9% | -4% | 1% | 2% | -1% | -3% | -2% | -2% | -4% | 0% | -2% | -1% | 3% | 9% | 9% | 1% | -1% | 0% | -1% | 4% | 4% | -4% | 0% | 0% |
| 2 | -7% | -3% | -1% | -2% | 2% | 2% | 1% | 0% | 0% | -1% | -7% | -2% | -2% | 0% | 4% | 9% | 11% | 2% | 0% | 0% | 0% | 3% | 3% | -8% | -3% | 0% |
| 3 | -1% | 4% | -16% | 1% | 2% | 2% | -8% | -8% | -1% | -8% | -3% | 2% | 0% | 1% | 5% | 9% | 8% | 1% | -1% | 0% | -1% | 4% | 4% | -1% | 3% | 0% |
| 4 | -1% | 0% | 0% | -6% | 2% | 0% | 0% | 0% | 0% | 0% | -4% | -3% | -11% | 0% | 0% | 7% | 7% | 5% | 0% | 0% | 0% | 3% | 1% | -1% | 0% | 0% |
| 5 | 0% | 1% | 0% | -9% | 1% | -2% | 0% | 0% | -1% | 0% | -4% | -1% | -7% | -1% | 0% | 6% | 4% | 6% | 0% | 0% | 0% | 2% | 1% | 2% | 1% | 0% |
| 6 | 1% | 2% | 0% | -1% | 1% | -21% | 0% | 0% | 1% | 1% | 0% | 2% | -1% | 0% | 2% | 3% | 5% | 1% | -2% | 2% | 0% | 1% | 2% | 1% | 1% | 0% |
| 7 | 1% | 2% | -7% | 0% | 2% | 5% | -10% | -12% | -1% | -4% | 0% | 3% | -1% | 0% | 6% | 3% | 3% | 2% | -2% | 2% | -1% | 3% | 5% | 0% | 2% | 0% |
| 8 | 1% | 2% | -3% | 1% | 1% | 4% | -2% | -6% | -8% | -4% | 1% | 3% | -1% | 0% | 4% | 2% | 2% | 1% | -1% | 1% | -2% | 1% | 4% | 0% | 1% | 0% |
| 9 | 0% | 1% | 0% | 1% | 1% | 7% | 2% | -9% | -19% | 3% | 2% | 2% | 0% | 0% | 2% | 1% | 1% | 0% | -2% | 3% | -1% | 1% | 3% | 0% | 0% | 0% |
| 10 | 0% | 0% | -5% | 0% | 1% | 1% | -2% | -8% | -1% | 3% | 0% | 3% | 0% | 1% | 3% | 2% | 1% | 1% | 0% | 3% | -2% | 1% | 0% | 0% | 0% | 0% |
| 11 | -2% | -1% | -2% | -4% | 0% | 2% | 1% | 1% | 1% | 5% | -3% | -4% | -6% | -2% | 4% | 3% | 2% | 1% | 0% | 3% | 0% | 1% | 4% | -3% | 1% | 0% |
| 12 | 0% | 0% | 1% | -2% | 0% | 1% | 1% | 1% | 0% | 4% | -8% | -7% | -10% | -4% | 3% | 6% | 4% | 1% | 0% | 1% | -1% | 4% | 5% | -2% | 1% | 0% |
| 13 | -1% | 0% | -1% | -8% | 2% | 1% | 0% | 0% | 0% | 0% | -5% | -6% | -8% | 1% | 0% | 9% | 6% | 3% | 0% | 0% | 1% | 5% | 1% | 0% | 0% | 0% |
| 14 | -1% | 0% | 0% | 3% | 1% | 1% | 0% | 0% | 0% | 2% | -2% | -8% | -6% | -14% | 0% | 7% | 5% | 2% | 0% | 1% | 1% | 6% | 1% | 2% | 1% | 0% |
| 15 | 2% | 3% | 2% | 0% | 0% | 2% | 3% | 3% | 1% | 3% | 0% | 0% | -1% | 0% | -34% | 3% | 2% | 1% | 0% | 1% | 0% | -1% | 8% | 0% | 2% | 0% |
| 16 | 3% | 4% | 3% | 6% | 2% | 1% | 1% | 1% | 0% | 1% | 0% | 3% | 1% | -1% | 1% | -46% | 5% | 2% | 0% | 0% | 0% | 7% | 4% | 2% | 2% | 0% |
| 17 | 4% | 6% | 3% | 2% | -4% | 2% | 1% | 1% | -1% | 1% | 1% | 2% | 1% | 2% | 2% | 3% | -36% | 3% | 0% | 0% | 0% | 3% | 2% | 1% | 3% | 0% |
| 18 | 0% | 2% | -1% | 11% | 8% | 0% | -1% | -9% | -8% | -1% | -1% | 2% | 3% | 2% | 1% | 4% | 6% | -2% | -23% | 0% | 0% | 1% | 1% | 4% | 1% | 0% |
| 19 | 0% | 1% | 0% | 8% | 4% | 1% | -1% | -1% | -6% | 3% | 0% | 1% | 2% | 1% | 0% | 2% | 3% | -4% | -20% | 1% | 1% | 1% | 0% | 3% | 0% | 0% |
| 20 | 0% | 1% | 0% | 2% | 1% | 4% | 2% | -6% | -12% | 7% | 3% | 3% | 1% | 1% | 3% | 2% | 1% | 1% | 0% | -15% | -3% | 0% | 4% | 1% | 0% | 0% |
| 21 | 0% | 1% | 0% | 5% | 2% | 0% | -1% | -10% | -2% | -9% | -1% | 2% | 4% | 4% | 0% | 6% | 3% | 1% | 1% | -1% | -12% | 8% | -1% | 2% | 0% | 0% |
| 22 | 2% | 2% | 1% | 3% | 1% | 1% | 1% | -1% | 0% | 1% | 0% | 2% | 1% | 2% | 1% | 7% | 3% | 1% | 0% | 0% | -1% | -30% | 2% | 1% | 1% | 0% |
| 23 | 1% | 2% | 0% | 1% | 1% | 1% | 1% | -1% | 0% | -9% | -3% | 4% | 0% | 0% | 6% | 6% | 3% | 1% | 0% | 1% | -1% | 1% | -18% | 0% | 1% | 0% |
| 24 | -4% | -6% | -2% | 0% | 6% | 2% | 0% | 0% | 0% | 0% | -6% | -4% | -3% | 1% | 0% | 8% | 7% | 5% | 1% | 0% | 0% | 3% | 1% | -5% | -2% | 0% |
| 25 | -8% | -11% | -1% | -2% | 2% | 1% | 1% | 0% | -1% | 0% | -2% | 1% | -1% | 0% | 3% | 10% | 10% | 2% | 0% | 0% | 0% | 4% | 4% | -10% | -1% | 0% |
| Sum | -1% | 0% | -3% | -1% | 2% | 1% | -1% | -5% | -3% | -2% | -3% | -1% | -4% | -1% | 2% | 7% | 6% | 2% | -1% | 1% | -1% | 4% | 3% | -1% | 0% | 0% |

## Table 3-8: Trip flow percentage difference between model and Streetlight for NT

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10% | -4% | -9% | -1% | 2% | 2% | 0% | -1% | -1% | -2% | -5% | 1% | -2% | 0% | 4% | 9% | 11% | 1% | 0% | 0% | 0% | 4% | 4% | -4% | -1% | 0% |
| 2 | -12% | -11% | 0% | 0% | 2% | 2% | 1% | 0% | 0% | -1% | -6% | 0% | -2% | 1% | 4% | 10% | 12% | 2% | 0% | 1% | 0% | 4% | 4% | -7% | -3% | 0% |
| 3 | -3% | 4% | -19% | 2% | 2% | 2% | -6% | -6% | -1% | -10% | -3% | 2% | -1% | 1% | 4% | 10% | 9% | 2% | 0% | 1% | 0% | 5% | 5% | -1% | 2% | 0% |
| 4 | 0% | 0% | -1% | -9% | 2% | 0% | 0% | 0% | 0% | 0% | -3% | -2% | -14% | 1% | 1% | 9% | 7% | 4% | 0% | 0% | 0% | 3% | 2% | -1% | 0% | 0% |
| 5 | 0% | 2% | 1% | -15% | 0% | -2% | 0% | 0% | 0% | 0% | -2% | -2% | -6% | 0% | 1% | 7% | 4% | 6% | 0% | 1% | 0% | 3% | 1% | 2% | 1% | 0% |
| 6 | 1% | 2% | 1% | -2% | 3% | -24% | 0% | -1% | 2% | 0% | 0% | 1% | -1% | 0% | 2% | 4% | 5% | 2% | -1% | 2% | 0% | 1% | 3% | 2% | 0% | 0% |
| 7 | 1% | 3% | -9% | 0% | 2% | 4% | -14% | -11% | 0% | -4% | 0% | 3% | -1% | 0% | 6% | 4% | 4% | 1% | -1% | 1% | -1% | 3% | 6% | 0% | 1% | 0% |
| 8 | 0% | 2% | -3% | 2% | 1% | 4% | -5% | -9% | -7% | -5% | 1% | 3% | -1% | 0% | 4% | 3% | 3% | 1% | -1% | 1% | -2% | 2% | 4% | 0% | 1% | 0% |
| 9 | 0% | 1% | 0% | 1% | 1% | 7% | 1% | -8% | -19% | 1% | 1% | 3% | 0% | 0% | 2% | 2% | 2% | -1% | -1% | 2% | -1% | 1% | 4% | 0% | 0% | 0% |
| 10 | -1% | 1% | -6% | 0% | 1% | 1% | -2% | -6% | 0% | -1% | -1% | 3% | -1% | 1% | 3% | 3% | 2% | 1% | 0% | 3% | -2% | 2% | 1% | 0% | 0% | 0% |
| 11 | -3% | -2% | -3% | -3% | -1% | 2% | 1% | 1% | 1% | 5% | -8% | -4% | -5% | 0% | 5% | 3% | 3% | 1% | 0% | 2% | 0% | 2% | 5% | -2% | 0% | 0% |
| 12 | -1% | 0% | 1% | 0% | 1% | 2% | 1% | 2% | 0% | 4% | -8% | -12% | -11% | -4% | 3% | 7% | 5% | 1% | 0% | 1% | 0% | 4% | 5% | -2% | 0% | 0% |
| 13 | -1% | 0% | 0% | -7% | 3% | 0% | -1% | 0% | 0% | 0% | -4% | -7% | -13% | 1% | 0% | 10% | 8% | 3% | 0% | 0% | 0% | 5% | 1% | 1% | 0% | 0% |
| 14 | 0% | 1% | 0% | 6% | 2% | 1% | 0% | 0% | 0% | 1% | -3% | -9% | -8% | -17% | 0% | 8% | 6% | 2% | 0% | 1% | 1% | 6% | 1% | 2% | 1% | 0% |
| 15 | 2% | 3% | 2% | 1% | 1% | 2% | 3% | 2% | 1% | 2% | 0% | -1% | -1% | -1% | -33% | 5% | 3% | 1% | 0% | 1% | 0% | 0% | 7% | 0% | 0% | 0% |
| 16 | 3% | 4% | 3% | 6% | 1% | 1% | 1% | 1% | 0% | 0% | 0% | 2% | 1% | -1% | 2% | -47% | 5% | 1% | 0% | 0% | 0% | 6% | 4% | 2% | 2% | 0% |
| 17 | 5% | 6% | 3% | 1% | -2% | 2% | 0% | 1% | 0% | 1% | -1% | 1% | 1% | 1% | 1% | 5% | -37% | 2% | 0% | 0% | 0% | 4% | 2% | 2% | 1% | 0% |
| 18 | 1% | 1% | -1% | 11% | 7% | 0% | 0% | -7% | -7% | -2% | 0% | 2% | 2% | 2% | 1% | 5% | 7% | -5% | -23% | 0% | -1% | 1% | 1% | 4% | 1% | 0% |
| 19 | 0% | 1% | 0% | 8% | 5% | 3% | -2% | -2% | -6% | 0% | -3% | 0% | 2% | 1% | 0% | 3% | 3% | -8% | -12% | 1% | 0% | 2% | 0% | 3% | 0% | 0% |
| 20 | -2% | 0% | 0% | 2% | 1% | 4% | 1% | -5% | -8% | 7% | 3% | 3% | 0% | 1% | 2% | 2% | 2% | -1% | 0% | -16% | -2% | 1% | 4% | 1% | 0% | 0% |
| 21 | -1% | 1% | 0% | 6% | 2% | -1% | -2% | -7% | -5% | -12% | -1% | 1% | 4% | 4% | 1% | 7% | 4% | 1% | 1% | 0% | -15% | 9% | 1% | 2% | 1% | 0% |
| 22 | 2% | 2% | 1% | 3% | 1% | 1% | 0% | 0% | 0% | -2% | -2% | 1% | 2% | 2% | 0% | 8% | 4% | 1% | 0% | 0% | -1% | -26% | 3% | 1% | 1% | 0% |
| 23 | 1% | 2% | 1% | 2% | 1% | 2% | 1% | 0% | 1% | -11% | -3% | 3% | -1% | 0% | 6% | 7% | 4% | 1% | 0% | 1% | -1% | 3% | -22% | 0% | 1% | 0% |
| 24 | -4% | -9% | -3% | 0% | 6% | 2% | 0% | 0% | 0% | 0% | -4% | -4% | -4% | 2% | 1% | 9% | 8% | 5% | 1% | 0% | 0% | 3% | 2% | -8% | -2% | 0% |
| 25 | -12% | -12% | 1% | -1% | 3% | 1% | 2% | 1% | -1% | 1% | -2% | 1% | -3% | 0% | 3% | 11% | 11% | 2% | 0% | 0% | 0% | 4% | 5% | -9% | -4% | 0% |
| Sum | -2% | 0% | -3% | -1% | 2% | 1% | -2% | -4% | -3% | -3% | -4% | -1% | -4% | 0% | 3% | 8% | 7% | 2% | -1% | 1% | -1% | 4% | 3% | -1% | 0% | 0% |

## Table 3-9: Trip flow percentage difference between model and Replica for AM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3% | 0% | 3% | -2% | 0% | 1% | -2% | 0% | -1% | -3% | -5% | 2% | -2% | -10% | 1% | 9% | 10% | 1% | -1% | 0% | 0% | 4% | 4% | -2% | -11% | 0% |
| 2 | -3% | -8% | 3% | -4% | 1% | 2% | -1% | 0% | 0% | -3% | -3% | 0% | -1% | -4% | 3% | 10% | 12% | 2% | 0% | 0% | 0% | 3% | 4% | -3% | -10% | 0% |
| 3 | -3% | 1% | -8% | -2% | 0% | 2% | -6% | -3% | -1% | -5% | -3% | 2% | 1% | -2% | 4% | 10% | 9% | 1% | 0% | 1% | 0% | 4% | 5% | -2% | -4% | 0% |
| 4 | -5% | -4% | 0% | -9% | 1% | 1% | -1% | -1% | 0% | -1% | -3% | 1% | 1% | 0% | 1% | 10% | 7% | 4% | 0% | 0% | 0% | 3% | 2% | 0% | -9% | 0% |
| 5 | -3% | -2% | 1% | -7% | -6% | 2% | -1% | 0% | 0% | -1% | -2% | -1% | 0% | -1% | 1% | 7% | 4% | 5% | 1% | 0% | 0% | 3% | 2% | 3% | -6% | 0% |
| 6 | -2% | -2% | 1% | -5% | 2% | -8% | -1% | 0% | 2% | 0% | -1% | 0% | -1% | 0% | 2% | 4% | 5% | 3% | -1% | 1% | 0% | 2% | 3% | 0% | -6% | 0% |
| 7 | -1% | 0% | -5% | -3% | 0% | 3% | -4% | -4% | 0% | -3% | -2% | 2% | -1% | 0% | 5% | 5% | 4% | 1% | -1% | 1% | 0% | 2% | 6% | -1% | -4% | 0% |
| 8 | -3% | 0% | -2% | -1% | 1% | 3% | -5% | 6% | -10% | -2% | -2% | 2% | -1% | 1% | 3% | 3% | 3% | 1% | -1% | 1% | -1% | 2% | 5% | 0% | -3% | 0% |
| 9 | -3% | -1% | -1% | 0% | 1% | 6% | -2% | -6% | -4% | 0% | 0% | 2% | -1% | 0% | 2% | 2% | 2% | -1% | -1% | 5% | -1% | 1% | 4% | 0% | -3% | 0% |
| 10 | -5% | -4% | -3% | -3% | 0% | 1% | -4% | -4% | -1% | 10% | -1% | 3% | 0% | 1% | 2% | 3% | 2% | 0% | 0% | 2% | 0% | 2% | 3% | -2% | -4% | 0% |
| 11 | -3% | -4% | -1% | -7% | -1% | 1% | 0% | 0% | 1% | 1% | 2% | 3% | -3% | -3% | 4% | 4% | 4% | 0% | 0% | 2% | 0% | 3% | 7% | -3% | -5% | 0% |
| 12 | -2% | -4% | 0% | -5% | 0% | 0% | 0% | -1% | 0% | 0% | -2% | 2% | -2% | -7% | 2% | 8% | 5% | 1% | 0% | 1% | 0% | 5% | 6% | -1% | -6% | 0% |
| 13 | -3% | -4% | 0% | -5% | 2% | 1% | -2% | -1% | 0% | -2% | -4% | -2% | 1% | -3% | 0% | 11% | 8% | 2% | 0% | 0% | 0% | 4% | 2% | 1% | -7% | 0% |
| 14 | -3% | -3% | 1% | -3% | 1% | 0% | -2% | -1% | -1% | -1% | -3% | -5% | 2% | -2% | 0% | 10% | 5% | 1% | 0% | 1% | 0% | 4% | 2% | 1% | -6% | 0% |
| 15 | 0% | -2% | 2% | -5% | 0% | 1% | 1% | 1% | 0% | -1% | -3% | 1% | -1% | -1% | -8% | 5% | 3% | 0% | 0% | 1% | 0% | 2% | 9% | -1% | -5% | 0% |
| 16 | 0% | 0% | 3% | -3% | 0% | 0% | 0% | 0% | 0% | 0% | -2% | -1% | 0% | -4% | 1% | -6% | 5% | 1% | 0% | 0% | 0% | 6% | 4% | 0% | -3% | 0% |
| 17 | 3% | 3% | 3% | -6% | -3% | -1% | -1% | 0% | 0% | 0% | -2% | 1% | 0% | 0% | 1% | 7% | -10% | 2% | 0% | 0% | 0% | 3% | 3% | 1% | -2% | 0% |
| 18 | -1% | 1% | 1% | 7% | 6% | -3% | -4% | -6% | -3% | -2% | -1% | 1% | 1% | 1% | 1% | 5% | 7% | -1% | -10% | 0% | 0% | 1% | 1% | 3% | -4% | 0% |
| 19 | -2% | -2% | -3% | 5% | 5% | -1% | -8% | -5% | -4% | -1% | -3% | 0% | 1% | 2% | 0% | 3% | 4% | 1% | 10% | 1% | 0% | 1% | 1% | 2% | -4% | 0% |
| 20 | -1% | -1% | 0% | 1% | 1% | 3% | 0% | -5% | -14% | 3% | 2% | 2% | 1% | 1% | 3% | 3% | 2% | 1% | -1% | -1% | -2% | 1% | 4% | 0% | -2% | 0% |
| 21 | -2% | -2% | -2% | 2% | 3% | -2% | -5% | -6% | -6% | -7% | -4% | 2% | 3% | 4% | 1% | 8% | 5% | 2% | -1% | 0% | 0% | 11% | 0% | 0% | -4% | 0% |
| 22 | -1% | -1% | 1% | -1% | 1% | -1% | -3% | -4% | -1% | -5% | -3% | 0% | 0% | 2% | 1% | 9% | 4% | 0% | 0% | 0% | -1% | 2% | 3% | 0% | -2% | 0% |
| 23 | -1% | -1% | 0% | -3% | 1% | 1% | -1% | -3% | 0% | -5% | -4% | 2% | -1% | 0% | 4% | 7% | 3% | -1% | 0% | 1% | 0% | 4% | 0% | -1% | -4% | 0% |
| 24 | -7% | -8% | -1% | 1% | 7% | 3% | -2% | -1% | -1% | -2% | -3% | -1% | 2% | 1% | 1% | 9% | 8% | 4% | 1% | 0% | 0% | 3% | 2% | -3% | -12% | 0% |
| 25 | 0% | -4% | 3% | -7% | 2% | -1% | 2% | 0% | -1% | -4% | -1% | 1% | -2% | -1% | 2% | 10% | 11% | 1% | 0% | 0% | 0% | 4% | 3% | -6% | -13% | 0% |
| Sum | -2% | -2% | 0% | -3% | 1% | 0% | -2% | -2% | -3% | -1% | -2% | 1% | 0% | -1% | 2% | 8% | 6% | 1% | -1% | 1% | -1% | 4% | 4% | 0% | -5% | 0% |

## Table 3-10: Trip flow percentage difference between model and Replica for MD

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1% | -2% | 0% | -3% | 1% | 1% | -2% | -2% | -2% | -4% | -2% | 0% | -3% | -2% | 2% | 9% | 11% | 1% | 0% | 0% | 0% | 3% | 3% | -3% | -8% | 0% |
| 2 | -1% | -8% | 1% | -3% | 1% | 0% | 0% | -1% | -1% | -2% | -3% | -1% | -3% | -1% | 3% | 9% | 13% | 1% | 0% | 0% | -1% | 3% | 3% | -5% | -7% | 0% |
| 3 | 0% | 2% | -11% | 0% | 2% | 1% | -6% | -5% | -1% | -7% | -2% | 1% | -1% | 0% | 4% | 10% | 10% | 1% | -1% | 1% | 0% | 4% | 4% | -1% | -3% | 0% |
| 4 | -2% | -1% | 0% | -10% | 2% | 0% | -1% | -1% | 0% | -1% | -3% | -1% | -3% | 1% | 0% | 8% | 7% | 4% | 0% | 0% | 0% | 3% | 1% | 0% | -3% | 0% |
| 5 | 0% | 0% | 0% | -4% | -10% | 0% | 0% | 0% | 0% | -1% | -2% | -1% | -2% | 0% | 0% | 6% | 4% | 5% | 0% | 0% | 0% | 3% | 1% | 3% | -2% | 0% |
| 6 | 0% | 0% | 0% | -1% | 2% | -13% | -1% | 0% | 1% | 0% | -1% | 0% | -1% | 0% | 2% | 4% | 5% | 2% | -2% | 2% | 0% | 1% | 3% | 0% | -2% | 0% |
| 7 | 1% | 2% | -5% | -1% | 1% | 4% | -14% | -6% | -1% | -2% | 0% | 3% | -1% | 0% | 6% | 4% | 4% | 1% | -1% | 1% | 0% | 2% | 6% | -1% | -1% | 0% |
| 8 | -1% | 1% | -3% | 1% | 1% | 3% | -4% | 1% | -8% | -3% | 0% | 2% | -1% | 0% | 3% | 3% | 3% | 1% | -1% | 1% | -1% | 1% | 4% | 0% | -1% | 0% |
| 9 | -1% | 0% | -1% | 1% | 1% | 6% | -1% | -7% | -9% | 1% | 0% | 2% | -1% | 0% | 2% | 2% | 1% | 0% | -2% | 4% | -1% | 1% | 4% | 0% | -1% | 0% |
| 10 | -3% | -1% | -4% | -1% | 0% | 1% | -3% | -5% | -2% | 7% | 0% | 3% | -1% | 0% | 2% | 3% | 2% | 0% | 0% | 3% | -1% | 1% | 2% | -1% | -2% | 0% |
| 11 | -3% | -2% | -1% | -5% | -1% | 1% | 0% | 0% | 0% | 4% | -4% | 1% | -4% | -1% | 4% | 3% | 3% | 0% | 0% | 2% | 0% | 2% | 6% | -3% | -3% | 0% |
| 12 | -1% | -1% | 0% | -2% | 1% | 0% | 0% | 0% | 0% | 2% | -3% | -8% | -5% | -4% | 2% | 6% | 4% | 1% | 0% | 1% | 0% | 4% | 6% | -2% | -2% | 0% |
| 13 | -2% | -2% | -1% | -2% | 2% | 0% | -2% | -1% | -1% | -1% | -4% | -4% | -6% | 0% | 0% | 10% | 7% | 2% | 0% | 0% | 0% | 4% | 1% | 2% | -4% | 0% |
| 14 | -2% | -1% | 0% | 1% | 1% | 0% | -1% | -1% | 0% | 0% | -2% | -6% | -2% | -9% | -1% | 7% | 5% | 1% | 0% | 1% | 0% | 5% | 2% | 2% | -2% | 0% |
| 15 | -1% | 0% | 2% | -2% | -1% | 1% | 2% | 0% | 0% | 0% | -1% | 0% | -1% | -2% | -9% | 4% | 3% | 0% | 0% | 1% | 0% | 0% | 7% | -1% | -1% | 0% |
| 16 | 2% | 1% | 2% | 1% | 1% | 1% | 0% | 0% | 0% | 0% | -1% | 1% | 1% | -3% | 1% | -24% | 5% | 1% | 0% | 0% | 0% | 6% | 4% | 1% | 0% | 0% |
| 17 | 4% | 4% | 2% | -1% | -4% | 0% | 0% | 0% | -1% | 0% | -1% | 1% | 0% | 0% | 1% | 6% | -22% | 2% | 0% | 0% | 0% | 3% | 3% | 1% | 0% | 0% |
| 18 | 1% | 1% | 0% | 11% | 7% | -2% | -2% | -6% | -4% | -1% | -2% | 0% | 1% | 1% | 1% | 5% | 6% | -10% | -13% | 0% | 0% | 1% | 1% | 4% | -1% | 0% |
| 19 | -1% | -1% | -2% | 6% | 4% | -1% | -3% | -3% | -6% | 1% | -1% | 0% | 1% | 1% | 0% | 2% | 3% | 0% | -4% | 1% | 0% | 1% | 0% | 3% | -1% | 0% |
| 20 | 0% | 0% | 0% | 1% | 1% | 4% | 0% | -4% | -8% | 6% | 2% | 3% | 0% | 1% | 2% | 2% | 2% | 1% | -1% | -14% | -2% | 0% | 4% | 0% | -1% | 0% |
| 21 | 0% | -1% | -2% | 3% | 2% | -1% | -3% | -9% | -6% | -4% | -2% | 2% | 3% | 3% | 1% | 6% | 4% | 1% | -1% | -1% | -2% | 8% | -1% | 1% | -1% | 0% |
| 22 | 1% | 1% | 0% | 1% | 1% | 0% | -1% | -3% | -1% | -2% | -1% | 1% | 1% | 1% | 1% | 8% | 4% | 0% | 0% | 0% | -1% | -12% | 3% | 1% | -1% | 0% |
| 23 | 0% | 0% | 0% | -2% | 0% | 1% | 0% | -2% | 0% | -6% | -4% | 3% | -1% | 0% | 4% | 7% | 4% | 0% | 0% | 1% | -1% | 2% | -4% | -1% | -2% | 0% |
| 24 | -5% | -6% | -1% | 4% | 6% | 1% | -1% | -1% | 0% | -2% | -4% | -2% | 1% | 2% | 0% | 9% | 7% | 4% | 0% | 0% | 0% | 3% | 1% | -8% | -8% | 0% |
| 25 | 0% | -1% | 1% | -2% | 1% | 0% | 0% | 0% | -2% | -1% | -2% | 0% | -3% | 0% | 2% | 10% | 12% | 1% | 0% | 0% | 0% | 3% | 3% | -6% | -17% | 0% |
| Sum | -1% | -1% | -1% | -1% | 1% | 0% | -2% | -3% | -3% | -2% | -2% | 0% | -2% | -1% | 2% | 7% | 6% | 1% | -1% | 0% | -1% | 4% | 3% | -1% | -3% | 0% |

## Table 3-11: Trip flow percentage difference between model and Replica for PM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3% | 2% | 0% | -4% | 1% | 0% | 0% | -2% | -3% | -5% | -2% | 0% | -4% | -1% | 2% | 8% | 9% | 1% | -1% | 0% | -1% | 2% | 3% | -3% | -1% | 0% |
| 2 | 1% | -4% | 1% | -3% | 1% | -1% | 1% | 0% | -2% | -3% | -2% | -2% | -3% | -2% | 2% | 8% | 10% | 1% | -1% | 0% | -1% | 2% | 2% | -4% | -1% | 0% |
| 3 | 3% | 5% | -12% | 0% | 2% | 1% | -6% | -5% | -3% | -7% | -2% | 0% | -2% | 0% | 4% | 9% | 7% | 1% | -2% | 0% | -1% | 3% | 3% | -1% | 2% | 0% |
| 4 | -1% | 0% | 0% | -4% | 2% | -1% | -1% | 0% | -1% | -2% | -3% | -3% | -5% | 0% | -1% | 6% | 5% | 4% | 0% | 0% | 0% | 2% | 0% | 2% | 0% | 0% |
| 5 | 0% | 1% | 0% | -1% | -7% | 0% | 0% | 1% | -1% | -1% | -2% | -1% | -4% | -1% | -1% | 5% | 3% | 5% | 0% | 0% | 0% | 2% | 1% | 3% | 0% | 0% |
| 6 | 1% | 1% | 0% | 0% | 2% | -17% | 0% | 1% | 1% | 1% | 0% | 0% | -1% | 0% | 1% | 2% | 3% | 1% | -2% | 1% | -1% | 0% | 2% | 1% | 0% | 0% |
| 7 | 1% | 3% | -4% | -1% | 1% | 4% | -5% | -9% | -2% | -2% | 1% | 2% | -2% | -1% | 5% | 3% | 2% | 1% | -3% | 1% | -1% | 0% | 5% | 0% | 1% | 0% |
| 8 | 0% | 1% | -2% | 0% | 1% | 3% | -1% | 4% | -8% | -3% | 0% | 2% | -2% | -1% | 3% | 2% | 2% | 1% | -2% | 0% | -1% | -1% | 2% | 0% | 0% | 0% |
| 9 | 0% | 0% | 0% | 1% | 1% | 6% | 1% | -9% | -8% | 2% | 1% | 2% | -1% | 0% | 2% | 1% | 1% | 0% | -2% | 0% | -2% | 0% | 3% | 0% | 0% | 0% |
| 10 | -1% | 0% | -3% | -1% | 0% | 1% | -2% | -4% | -2% | 10% | 0% | 2% | -2% | 0% | 1% | 2% | 1% | 0% | -1% | 2% | -2% | -1% | 1% | -1% | 0% | 0% |
| 11 | 0% | 0% | -1% | -5% | -1% | 1% | 0% | 0% | -1% | 7% | -2% | 0% | -5% | -2% | 3% | 2% | 2% | 0% | -1% | 2% | -1% | 0% | 4% | -2% | 0% | 0% |
| 12 | 0% | 0% | 0% | -1% | 0% | 0% | 0% | 1% | 0% | 3% | -1% | -6% | -7% | -5% | 1% | 5% | 3% | 1% | -1% | 1% | 0% | 3% | 5% | -1% | 0% | 0% |
| 13 | -2% | -1% | 0% | 0% | 2% | 0% | -1% | -1% | -1% | -1% | -4% | -5% | -5% | 1% | -1% | 8% | 5% | 2% | 0% | 0% | 0% | 3% | 0% | 2% | -1% | 0% |
| 14 | -3% | 0% | -1% | 4% | 1% | 1% | 0% | 0% | 0% | 2% | -2% | -7% | -5% | -7% | -1% | 6% | 4% | 2% | 0% | 1% | 0% | 5% | 1% | 2% | 0% | 0% |
| 15 | 1% | 2% | 2% | -1% | 0% | 2% | 2% | 2% | 1% | 1% | 0% | -2% | -2% | -2% | -19% | 3% | 2% | 1% | 0% | 1% | 0% | 1% | 6% | -1% | 1% | 0% |
| 16 | 2% | 3% | 2% | 4% | 1% | 1% | 1% | 0% | 0% | 1% | -1% | 1% | 1% | 0% | 0% | -34% | 3% | 1% | 0% | 0% | 0% | 6% | 3% | 2% | 1% | 0% |
| 17 | 4% | 5% | 2% | 1% | -3% | 1% | 1% | 0% | -1% | 1% | 0% | 2% | 0% | 0% | 1% | 4% | -30% | 2% | 0% | 0% | 0% | 3% | 2% | 2% | 2% | 0% |
| 18 | 1% | 2% | -1% | 11% | 7% | 1% | 0% | -6% | -8% | -1% | -2% | 0% | 1% | 0% | 0% | 4% | 5% | -7% | -11% | 0% | 0% | 0% | -1% | 4% | 0% | 0% |
| 19 | -1% | 0% | -1% | 7% | 4% | 0% | -2% | -3% | -6% | 3% | -1% | 0% | 1% | 1% | 0% | 2% | 2% | -8% | -1% | 0% | 0% | 0% | 0% | 3% | -1% | 0% |
| 20 | 0% | 1% | 0% | 0% | 1% | 4% | 1% | -1% | -2% | 8% | 3% | 3% | 0% | 1% | 2% | 2% | 1% | 1% | 0% | -25% | -2% | -1% | 4% | 0% | 0% | 0% |
| 21 | 0% | 1% | -1% | 4% | 2% | 0% | -1% | -7% | -5% | -2% | -2% | 2% | 4% | 3% | 0% | 5% | 3% | 1% | 0% | -3% | -10% | 6% | -2% | 2% | 0% | 0% |
| 22 | 1% | 1% | 1% | 2% | 1% | 0% | 0% | -2% | -2% | -1% | -1% | 2% | 1% | 1% | -1% | 7% | 3% | 0% | 0% | -1% | -1% | -15% | 1% | 1% | 0% | 0% |
| 23 | 1% | 2% | 0% | -1% | 0% | 1% | 1% | -1% | -1% | -6% | -1% | 3% | -1% | 0% | 5% | 6% | 3% | 0% | -1% | 0% | -2% | 0% | -9% | 0% | 1% | 0% |
| 24 | -3% | -3% | -2% | 5% | 6% | 0% | -1% | -1% | -1% | -3% | -3% | -3% | 0% | 1% | -1% | 7% | 6% | 4% | 0% | 0% | 0% | 2% | 0% | -7% | -2% | 0% |
| 25 | 0% | 1% | 1% | -4% | 1% | -1% | 1% | 0% | -1% | -2% | -1% | -1% | -4% | -2% | 1% | 8% | 9% | 1% | -1% | 0% | -1% | 2% | 2% | -5% | -5% | 0% |
| Sum | 0% | 1% | -1% | -1% | 1% | 0% | -1% | -3% | -4% | -1% | -2% | -1% | -3% | -1% | 1% | 6% | 5% | 1% | -1% | 0% | -1% | 3% | 2% | 0% | -1% | 0% |

## Table 3-12: Trip flow percentage difference between model and Replica for NT

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3% | 0% | -1% | -3% | 1% | 1% | 0% | -2% | -3% | -4% | -3% | -1% | -5% | -1% | 2% | 8% | 9% | 1% | -1% | 0% | 0% | 2% | 3% | -5% | -1% | 0% |
| 2 | -1% | -5% | 1% | -3% | 2% | 1% | 1% | 1% | -2% | -2% | -3% | -1% | -5% | -1% | 2% | 8% | 10% | 2% | 0% | 0% | -1% | 3% | 3% | -5% | -4% | 0% |
| 3 | 2% | 4% | -13% | 1% | 2% | 1% | -7% | -5% | -2% | -8% | -3% | 1% | -1% | 1% | 4% | 9% | 8% | 1% | -1% | 0% | -1% | 3% | 4% | -2% | 2% | 0% |
| 4 | -1% | -1% | 0% | -5% | 3% | -1% | -1% | 0% | 0% | -1% | -3% | -2% | -6% | 0% | 0% | 7% | 6% | 4% | 0% | 0% | 0% | 2% | 1% | 1% | -1% | 0% |
| 5 | 0% | 0% | 1% | 0% | -7% | -1% | 0% | 0% | -1% | -1% | -2% | -1% | -4% | -2% | 0% | 5% | 2% | 5% | 0% | 0% | 0% | 2% | 0% | 3% | 1% | 0% |
| 6 | 1% | 1% | 1% | 0% | 3% | -19% | 1% | 1% | 1% | 1% | 0% | -1% | -1% | 0% | 2% | 3% | 3% | 2% | -2% | 1% | 0% | 0% | 2% | 1% | -1% | 0% |
| 7 | 1% | 3% | -5% | 0% | 2% | 5% | -10% | -7% | -2% | -3% | 0% | 2% | -2% | 0% | 5% | 3% | 3% | 1% | -1% | 1% | -1% | 1% | 5% | 0% | 1% | 0% |
| 8 | 0% | 2% | -2% | 1% | 1% | 3% | -3% | 2% | -6% | -5% | 0% | 2% | -1% | 0% | 3% | 2% | 2% | 1% | -2% | 0% | -2% | 0% | 2% | 0% | 0% | 0% |
| 9 | -1% | 0% | 0% | 0% | 1% | 6% | 0% | -5% | -10% | 0% | 1% | 2% | -1% | 0% | 2% | 1% | 1% | 0% | -2% | 2% | -2% | 0% | 3% | 0% | 0% | 0% |
| 10 | -1% | 0% | -3% | -1% | 0% | 1% | -2% | -4% | -2% | 4% | 2% | 3% | -2% | 0% | 2% | 2% | 1% | 1% | -1% | 2% | -2% | 0% | 2% | -1% | 0% | 0% |
| 11 | 0% | 0% | -1% | -4% | 0% | 1% | 1% | 0% | 0% | 6% | -4% | -1% | -6% | -2% | 3% | 2% | 2% | 0% | 0% | 2% | -1% | 1% | 3% | -3% | 0% | 0% |
| 12 | 1% | 0% | 1% | -1% | 1% | 1% | 1% | 1% | 0% | 4% | -2% | -16% | -8% | -4% | 2% | 7% | 4% | 1% | 0% | 1% | 0% | 3% | 5% | -1% | 0% | 0% |
| 13 | -2% | -2% | 0% | 1% | 3% | 0% | -1% | -2% | -1% | -1% | -4% | -5% | -9% | 1% | 0% | 9% | 6% | 2% | 0% | 0% | 0% | 4% | 1% | 2% | -1% | 0% |
| 14 | -3% | 0% | 0% | 5% | 2% | 1% | 0% | 0% | 0% | 1% | -2% | -7% | -4% | -15% | -1% | 7% | 5% | 2% | 0% | 1% | 0% | 6% | 2% | 2% | 0% | 0% |
| 15 | 2% | 2% | 3% | -1% | 1% | 2% | 3% | 2% | 0% | 2% | 1% | 1% | -1% | -2% | -30% | 4% | 3% | 1% | 0% | 1% | 0% | 1% | 8% | 0% | 0% | 0% |
| 16 | 3% | 3% | 3% | 5% | 2% | 2% | 1% | 0% | 0% | 1% | -1% | 1% | 2% | 0% | 1% | -45% | 5% | 1% | 0% | 0% | 0% | 7% | 5% | 2% | 1% | 0% |
| 17 | 5% | 6% | 3% | 3% | 0% | 2% | 1% | 0% | 0% | 0% | 0% | 1% | 1% | 1% | 1% | 6% | -43% | 2% | 0% | 0% | 0% | 4% | 3% | 2% | 2% | 0% |
| 18 | 1% | 2% | 0% | 10% | 8% | 1% | -1% | -3% | -5% | -1% | -2% | 0% | 1% | 1% | 0% | 4% | 5% | -16% | -12% | 0% | 0% | 0% | 0% | 4% | 0% | 0% |
| 19 | 0% | 0% | -1% | 6% | 4% | -2% | -3% | -1% | -4% | 1% | -1% | 0% | 2% | 1% | 0% | 2% | 3% | -4% | -7% | 0% | -1% | 1% | -1% | 3% | 0% | 0% |
| 20 | 1% | 1% | 1% | 1% | 1% | 4% | 2% | -2% | -2% | 8% | 3% | 3% | 0% | 1% | 2% | 2% | 2% | 0% | -1% | -31% | -2% | 1% | 4% | 0% | 0% | 0% |
| 21 | -1% | 0% | -1% | 4% | 2% | 0% | -1% | -6% | -5% | -6% | -2% | 1% | 4% | 3% | 1% | 6% | 3% | 1% | 0% | -2% | -9% | 7% | -1% | 2% | -1% | 0% |
| 22 | 1% | 2% | 1% | 3% | 2% | 0% | 0% | -1% | -1% | -1% | -1% | 2% | 2% | 2% | 0% | 9% | 4% | 1% | 0% | 0% | -1% | -27% | 3% | 1% | 0% | 0% |
| 23 | 0% | 2% | 2% | 1% | 1% | 2% | 1% | -1% | 0% | -4% | -1% | 3% | -2% | 0% | 6% | 7% | 4% | 0% | 0% | 1% | -1% | 3% | -23% | 0% | 0% | 0% |
| 24 | -4% | -5% | -3% | 4% | 6% | 1% | -1% | 0% | -1% | -2% | -4% | -2% | 0% | 2% | 0% | 7% | 6% | 4% | 0% | 0% | 0% | 3% | 1% | -10% | -3% | 0% |
| 25 | -3% | -2% | 1% | -2% | 2% | 0% | 1% | 0% | -1% | -1% | -1% | -1% | -6% | -1% | 1% | 9% | 9% | 1% | -1% | 0% | 0% | 3% | 3% | -6% | -5% | 0% |
| Sum | 0% | 0% | -1% | 0% | 2% | 0% | -1% | -3% | -3% | -2% | -2% | -1% | -3% | -1% | 1% | 6% | 5% | 1% | -1% | 0% | -1% | 2% | 2% | -1% | -1% | 0% |

## 3.3 MODE CHOICE VALIDATION

The following Table 3-13 is the mode share from the updated model. Table 3-14contains the model share difference between updated model and survey. It shows that updated mode share difference between model and survey are minimal, which means mode choice of the updated model is reasonable.

### Table 3-13: Mode share from the updated model

| | Model-Share | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DA | SR | WALK | BIKE | BUS_W | BUS_D | SCHOOLBUS | Total |
| HBW | 76.1% | 9.9% | 2.3% | 7.4% | 3.5% | 0.8% | | 100.0% |
| | 86.0% | | 9.7% | | 4.3% | | | 100.0% |
| HBU | 33.2% | 17.5% | 21.5% | 10.4% | 17.1% | 0.3% | | 100.0% |
| | 50.7% | | 31.9% | | 17.4% | | | 100.0% |
| HB Shop | 51.1% | 37.4% | 7.1% | 3.8% | 0.6% | 0.0% | | 100.0% |
| | 88.5% | | 10.9% | | 0.6% | | | 100.0% |
| HB School | 12.4% | 43.5% | 11.7% | 6.0% | 2.9% | 0.0% | 23.5% | 100.0% |
| | 55.8% | | 17.7% | | 2.9% | | 23.5% | 100.0% |
| HB SocRec | 32.4% | 33.8% | 26.4% | 6.9% | 0.6% | 0.0% | | 100.0% |
| | 66.2% | | 33.3% | | 0.6% | | | 100.0% |
| HBO | 32.7% | 48.8% | 16.7% | 1.1% | 0.7% | 0.0% | | 100.0% |
| | 81.6% | | 17.7% | | 0.7% | | | 100.0% |
| NHB | 45.0% | 32.8% | 16.7% | 3.2% | 0.9% | 0.0% | 1.5% | 100.0% |
| | 77.8% | | 19.9% | | 0.9% | | 1.4% | 100.0% |

### Table 3-14: Model share difference between model and survey

| | Model-Share - Survey Share | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DA | SR | WALK | BIKE | BUS_W | BUS_D | SCHOOLBUS | Total |
| HBW | 0.5% | -0.7% | -0.2% | 1.5% | -1.2% | 0.1% | | 0.0% |
| | -0.2% | | 1.3% | | -1.1% | | | 0.0% |
| HBU | -1.5% | 0.2% | -0.3% | 2.0% | -0.6% | 0.2% | | 0.0% |
| | -1.3% | | 1.7% | | -0.4% | | | 0.0% |
| HB Shop | 1.8% | -1.4% | -1.0% | 1.4% | -0.8% | 0.0% | | 0.0% |
| | 0.4% | | 0.4% | | -0.8% | | | 0.0% |
| HB School | -0.2% | 2.0% | 1.6% | -0.7% | -1.1% | 0.0% | -1.5% | 0.0% |
| | 1.8% | | 0.9% | | -1.2% | | -1.5% | 0.0% |
| HB SocRec | -1.4% | -0.4% | 2.2% | 0.1% | -0.5% | 0.0% | | 0.0% |
| | -1.8% | | 2.3% | | -0.5% | | | 0.0% |
| HBO | -1.6% | 0.1% | 2.1% | -0.4% | -0.2% | 0.0% | | 0.0% |
| | -1.5% | | 1.7% | | -0.2% | | | 0.0% |
| NHB | -0.8% | -0.7% | 2.0% | 0.3% | -0.8% | -0.1% | 0.1% | 0.0% |

| | | | | | |
|---|---|---|---|---|---|
| | -1.6% | 2.3% | -0.9% | 0.0% | 0.0% |

## 3.4 HIGHWAY ASSIGNMENT VALIDATION

### 3.4.1 Peak period Traffic Volume Validation

For the base year model, the peak period volume validation by volume group and facility type results are illustrated in the Table 3-15 and Table 3-16. The peak period RMSE% values are all within the allowable ranges. Some of the V/C error% become worse in Table 3-16., such as AM V/C error% on Interstates, however most of V/C error% are still within the allowable ranges.

Table 3-15: Peak period RMSE% by volume group for base year updated model

| Volume Group | RMSE% AM | RMSE% PM | Allowable RMSE% |
|---|---|---|---|
| 0 - 1,000 | 73% | 87% | < 100% |
| 1,000 - 2,500 | 39% | 43% | < 62% |
| 2,500 - 5,000 | 32% | 37% | < 50% |
| 5,000 - 10,000 | 23% | 32% | < 40% |
| 10,000 - 20,000 | 21% | 25% | < 33% |
| 20,000 - 30,000 | 17% | 11% | < 26% |
| >30,000 | N/A | 8% | <25% |

Table 3-16: Peak period V/C error% by facility type for base year model

| Functional Class | AM V/C Error% | PM V/C Error% | Allowable V/C Error% |
|---|---|---|---|
| Interstate | 13% | 6% | < 10% |
| freeway | -1% | -3% | < 15% |
| ramp | -7% | 0% | |
| expressway | -4% | -9% | < 15% |
| urban principal arterial | -15% | -33% | < 15% |
| urban minor arterial | -12% | -16% | < 20% |
| urban major collector | -22% | -24% | < 30% |
| urban minor collector | -66% | -56% | <35% |
| rural principal arterial | -20% | -16% | < 15% |
| rural minor arterial | 3% | 12% | < 15% |
| rural major collector | -12% | 1% | < 20% |
| rural minor collector | 59% | 71% | < 30% |
| rural local | 17% | 39% | <35% |

Table 3-17 and Table 3-18 contain the RMSE% and V/C error% in daily level, which become a little bit worse compared with the original base year model.

Table 3-17: Daily RMSE% by volume group for base year model

| Volume Group | RMSE% Daily | Allowable RMSE% |
|---|---|---|
| 0 - 1,000 | 160% | 60% |
| 1,000 - 2,500 | 92% | 47% |
| 2,500 - 5,000 | 52% | 36% |
| 5,000 - 10,000 | 41% | 29% |
| 10,000 - 20,000 | 34% | 25% |
| 20,000 - 30,000 | 29% | 22% |
| >30,000 | 17% | 22% |

Table 3-18: Daily V/C error% by facility type for base year model

| Functional Class | Daily V/C Error% | Daily Allowable V/C Error% |
|---|---|---|
| Interstate | 2% | 7% |
| freeway | 4% | 7% |
| ramp | 6% | - |
| expressway | -2% | 10% |
| urban principal arterial | -21% | 10% |
| urban minor arterial | -10% | 15% |
| urban major collector | -23% | 25% |
| urban minor collector | -61% | 25% |
| rural principal arterial | -4% | 7% |
| rural minor arterial | 22% | 10% |
| rural major collector | 7% | 15% |
| rural minor collector | 76% | 25% |
| rural local | 36% | 25% |

### 3.4.2 Peak period Travel Speed Validation

Table 3-19 shows the peak period speed validation result for the 9 corridors for the updated model. There are 4 corridors with large speed error%, which are highlighted in the tables. With the proposed intersection delay function integration, the travel speed error% (Diff1% Vs. Diff0%) is reduced for the highlighted corridors.

Table 3-19: Peak period travel speed validation

| Route Information | | | | AM Speed Comparison | | | PM Speed Comparison | | |
|---|---|---|---|---|---|---|---|---|---|
| Route | From | To | Dir | Model | Diff0% | Diff1% | Model | Diff0% | Diff1% |
| I-90 | County Line | County Line | N | 70 | 9% | 9% | 70 | 12% | 12% |
| I-90 | | | S | 70 | 8% | 7% | 69 | 12% | 12% |
| I-94 | I-90 | | E | 69 | 3% | 3% | 69 | 2% | 2% |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| I-94 | | County Line | W | 70 | 3% | 3% | 70 | 4% | 4% |
| US 51 | US 151 | S of SR 19 | N | 46 | 45% | 37% | 44 | 49% | 35% |
| US 51 | | | S | 46 | 41% | 32% | 43 | 61% | 41% |
| US 51 | US 18 | SR 19 | N | 42 | 44% | 31% | 38 | 43% | 19% |
| US 51 | | | S | 45 | 48% | 36% | 41 | 53% | 31% |
| SR 30 | US 151 | I 90 | W | 65 | 20% | 20% | 65 | 19% | 19% |
| SR 30 | | | E | 66 | 17% | 17% | 66 | 14% | 14% |
| SR 19 | US 151 | I-94 | W | 38 | 51% | 35% | 34 | 60% | 29% |
| SR 19 | | | E | 37 | 40% | 23% | 33 | 50% | 17% |
| US 14 | US 12/14 | County Line | W | 48 | 12% | 9% | 47 | 13% | 8% |
| US 14 | | | E | 47 | 9% | 5% | 46 | 17% | 9% |
| US 18/12 | I 90 | SR 89 | W | 55 | -3% | -3% | 55 | -2% | -2% |
| US 18/12 | | | E | 55 | -1% | -2% | 54 | -3% | -4% |
| University Ave | US 12 | N Bassett St | W | 32 | 61% | 44% | 28 | 71% | 43% |
| University Ave | | Farley Ave | E | 33 | 51% | 37% | 30 | 87% | 59% |
| Beltline | Century Rd | I-90 | W | 56 | 29% | 25% | 53 | 22% | 12% |
| Beltline | | | E | 62 | 10% | 9% | 61 | 46% | 47% |

## 3.5 SUMMARY

In this Chapter, some recommendations are proposed to alleviate the issue of the existing base year model, namely underestimated intra-district trip flows and overestimated peak period travel speed on some major corridors. The additional validation efforts are performed to demonstrate that the updated models can improve the model performance while not sacrificing the other aspect of the original model on trip distribution, mode choice and highway assignment.

**Appendix H**
**Comparison of TAFIS Forecasts to the E+C No Build Forecasts**

**Interstate North Corridor – TAFIS Comparison to Daily E+C No Build Forecast**

| Road | Segment | TAFIS Count Site | TAFIS | Forecast | Difference | Ratio Difference |
|---|---|---|---|---|---|---|
| WB I-90 | Between WI 60 & CTH CS | 110311 | 29360 | 31680 | 2320 | 8% |
| WB I-90 | Between CTH CS & I-39 split/WI 78 | 110002 | 34110 | 32130 | -1980 | -6% |
| WB I-90 | Between I-39 split/WI 78 & WI 33 | 110190 | 25465 | 21860 | -3605 | -14% |
| WB I-90 | Between WI 33 & US 51 | 560001 | 21765 | 23270 | 1505 | 7% |
| WB I-90 | Between US 12 & WI 23 | 560351 | 27575 | 25320 | -2255 | -8% |
| WB I-90 | Between WI 23 & WI 13 | 560347 | 25115 | 25370 | 255 | 1% |
| I-90 ramp | NB Ramp from WI 13 | 560683 | 780 | 1090 | 310 | 40% |
| WB I-90 | Between WI 13 & US 12/16 | 290157 | 18755 | 22760 | 4005 | 21% |
| WB I-90 | North of US 12/16 | 290156 | 21400 | 22100 | 700 | 3% |
| EB I-90 | North of US 12/16 | 290156 | 21400 | 21500 | 100 | 0% |
| EB I-90 | Between WI 13 & US 12/16 | 290157 | 18755 | 22020 | 3265 | 17% |
| I-90 ramp | SB ramp to WI 13 | 560684 | 920 | 1000 | 80 | 9% |
| EB I-90 | Between WI 23 & WI 13 | 560347 | 25115 | 24890 | -225 | -1% |
| EB I-90 | Between US 12 & WI 23 | 560351 | 27575 | 23780 | -3795 | -14% |
| EB I-90 | Between WI 33 & US 51 | 560001 | 21765 | 23180 | 1415 | 7% |
| EB I-90 | Between I-39 split/WI 78 & WI 33 | 110190 | 25465 | 21970 | -3495 | -14% |
| I-39 ramp | SB Ramp from I-39 | 111007 | 10280 | 10800 | 520 | 5% |
| EB I-90 | Between CTH CS & I-39 split/WI 78 | 110002 | 34110 | 32240 | -1870 | -5% |
| EB I-90 | Between WI 60 & CTH CS | 110311 | 29360 | 31720 | 2360 | 8% |
| EB I-90 | South of WI 60 | 130315 | 34390 | 33100 | -1290 | -4% |
| WB WI 23 | West of CTH P | 560348 | 1800 | 2000 | 200 | 11% |
| EB WI 23 | West of CTH P | 560348 | 1800 | 1940 | 140 | 8% |
| WB WI 33 | West of I-90/94 | 110188 | 4625 | 4100 | -525 | -11% |
| EB WI 33 | West of I-90/94 | 110188 | 4625 | 4100 | -525 | -11% |
| WB WI 60 | West of Sunset Dr | 110312 | 2860 | 3500 | 640 | 22% |
| EB WI 60 | West of Sunset Dr | 110312 | 2860 | 3500 | 640 | 22% |
| EB WI 60 | East of I-39/90/94 | 110624 | 1615 | 1800 | 185 | 11% |
| WB WI 60 | East of I-39/90/94 | 110624 | 1615 | 1800 | 185 | 11% |
| EB WI 33 | East of CTH U | 110595 | 4675 | 4840 | 165 | 4% |
| WB WI 33 | East of CTH U | 110595 | 4675 | 4880 | 205 | 4% |
| EB WI 13 | East of Trout Rd | 560803 | 5285 | 6000 | 715 | 14% |
| WB WI 13 | East of Trout Rd | 560803 | 5285 | 5790 | 505 | 10% |
| EB WI 13 | Between I-90/94 & Trout Rd | 560804 | 3100 | 4700 | 1600 | 52% |
| WB WI 13 | Between I-90/94 & Trout Rd | 560804 | 3100 | 4960 | 1860 | 60% |
| EB US 12 | East of I-90/94 | 290177 | 1740 | 2120 | 380 | 22% |
| WB US 12 | East of I-90/94 | 290177 | 1740 | 2130 | 390 | 22% |
| SB US 12 | South of I-90/94 | 560356 | 10500 | 11400 | 900 | 9% |
| NB US 12 | South of I-90/94 | 560356 | 10500 | 11700 | 1200 | 11% |
| SB US 12 | North of I-90/94 | 560822 | 6150 | 8790 | 2640 | 43% |
| NB US 12 | North of I-90/94 | 560822 | 6150 | 7640 | 1490 | 24% |
| SB US 12 | North of WI 23 | 560353 | 5845 | 8610 | 2765 | 47% |
| NB US 12 | North of WI 23 | 560353 | 5845 | 8610 | 2765 | 47% |
| SB I-39 | North of WI 33 | 110115 | 10050 | 12250 | 2200 | 22% |
| SB I-39 | Between WI 33 & Cascade Mtn | 110775 | 9855 | 11660 | 1805 | 18% |
| WB WI 78 | West of Arco Dr | 110194 | 785 | 2600 | 1815 | 231% |
| EB WI 78 | West of Arco Dr | 110194 | 785 | 2600 | 1815 | 231% |
| NB I-39 | Between WI 33 & Cascade Mtn | 110775 | 9855 | 11780 | 1925 | 20% |
| NB I-39 | North of WI 33 | 110115 | 10050 | 11900 | 1850 | 18% |
| WB I-90 | South of WI 60 | 130315 | 34390 | 33000 | -1390 | -4% |

**Interstate South Corridor – TAFIS Comparison to Daily E+C No Build Forecast**

| Road | Segment | TAFIS Count Site | TAFIS | Forecast | Difference | Ratio Difference |
|---|---|---|---|---|---|---|
| NB I-90 | South of Beltline | 130006 | 32320 | 31600 | -720 | -2% |
| NB I-90 | Between Beltline & I-94 | 130004 | 58940 | 63700 | 4760 | 8% |
| I-94 ramp | Ramp from I-94 WB to I-39/90 WB | 131335 | 12330 | 14600 | 2270 | 18% |
| WB I-90 | Between I-94 & US 151 | 130611 | 62200 | 70800 | 8600 | 14% |
| WB I-90 | Between US 151 & US 51 | 130259 | 42040 | 47200 | 5160 | 12% |
| WB I-90 | Thru US 51 interchange | 131068 | 36220 | 37300 | 1080 | 3% |
| WB I-90 | Between US 51 & WI 19 | 131566 | 40835 | 44600 | 3765 | 9% |
| WB I-90 | Between WI 19 & CTH V | 130189 | 33305 | 37200 | 3895 | 12% |
| WB I-90 | North of CTH V | 130315 | 34390 | 34100 | -290 | -1% |
| EB I-90 | North of CTH V | 130315 | 34390 | 33700 | -690 | -2% |
| EB I-90 | Between WI 19 & CTH V | 130189 | 33305 | 38100 | 4795 | 14% |
| EB I-90 | Between US 51 & WI 19 | 131566 | 40835 | 44500 | 3665 | 9% |
| EB I-90 | Thru US 51 interchange | 131068 | 36220 | 36400 | 180 | 0% |
| EB I-90 | Between US 151 & US 51 | 130259 | 42040 | 46700 | 4660 | 11% |
| SB I-90 | Between I-94 & US 151 | 130611 | 62200 | 70900 | 8700 | 14% |
| SB I-90 | Between Beltline & I-94 | 130004 | 58940 | 63000 | 4060 | 7% |
| SB I-90 | South of Beltline | 130006 | 32320 | 31200 | -1120 | -3% |
| WB WI 19 | West of Tierney Crossing | 130197 | 11615 | 13300 | 1685 | 15% |
| EB WI 19 | West of Tierney Crossing | 130197 | 11615 | 13600 | 1985 | 17% |
| EB WI 19 | East of I-90/94 | 130200 | 6980 | 9700 | 2720 | 39% |
| WB WI 19 | East of I-90/94 | 130200 | 6980 | 9400 | 2420 | 35% |
| EB WI 19 | Between Pepsi Way & Towne Rd | 130199 | 11570 | 11900 | 330 | 3% |
| WB WI 19 | Between Pepsi Way & Towne Rd | 130199 | 11570 | 10800 | -770 | -7% |
| SB US 51 | Between WI 19 & Williamsburg | 130201 | 12210 | 17000 | 4790 | 39% |
| NB US 51 | Between WI 19 & Williamsburg | 130201 | 12210 | 15400 | 3190 | 26% |
| SB US 51 | North of WI 19 | 136109 | 12055 | 13300 | 1245 | 10% |
| NB US 51 | North of WI 19 | 136109 | 12055 | 13600 | 1545 | 13% |
| SB US 51 | South of I-90/94 | 130208 | 12825 | 16850 | 4025 | 31% |
| NB US 51 | South of I-90/94 | 130208 | 12825 | 15570 | 2745 | 21% |
| EB US 151 | West of East Springs Dr | 131943 | 23670 | 26800 | 3130 | 13% |
| WB US 151 | West of East Springs Dr | 131943 | 23670 | 25800 | 2130 | 9% |
| EB US 151 | Between I-90/94 & American Pkwy | 131944 | 43840 | 51200 | 7360 | 17% |
| WB US 151 | Between I-90/94 & American Pkwy | 131944 | 43840 | 51700 | 7860 | 18% |
| EB US 151 | Between American Pkwy & Reinder Rd | 136055 | 41865 | 45500 | 3635 | 9% |
| EB US 151 | Between American Pkwy & Reinder Rd | 136055 | 41865 | 45700 | 3835 | 9% |
| EB Wis 30 | Between Thompson & US 51 | 130576 | 25130 | 32100 | 6970 | 28% |
| I-94 ramp | Ramp from I-39/90 EB to I-94 EB | 131329 | 14460 | 15400 | 940 | 7% |
| EB I-94 | Between I-90/94 & CTH N | 130250 | 23675 | 35000 | 11325 | 48% |
| EB I-94 | East of CTH N | 130008 | 29835 | 28100 | -1735 | -6% |
| WB I-94 | East of CTH N | 130008 | 29835 | 28100 | -1735 | -6% |
| WB I-94 | Between I-90/94 & CTH N | 130250 | 23675 | 35300 | 11625 | 49% |
| WB Wis 30 | Between Thompson & US 51 | 130576 | 25130 | 33100 | 7970 | 32% |
| EB US 151 | Between Reiner & Main St | 131327 | 29655 | 34000 | 4345 | 15% |
| EB US 151 | East of Main St | 130958 | 22550 | 24400 | 1850 | 8% |
| WB US 151 | East of Main St | 130958 | 22550 | 25600 | 3050 | 14% |
| WB US 151 | Between Reiner & Main St | 131327 | 29655 | 33900 | 4245 | 14% |
| EB WIS 30 | Between US 51 & Fair Oaks | 131067 | 23340 | 28200 | 4860 | 21% |
| WB WIS 30 | Between US 51 & Fair Oaks | 131067 | 23340 | 26200 | 2860 | 12% |
| WIS 30 ramp | WIS 30 WB ramp to US 151 WB | 131179 | 5940 | 6600 | 660 | 11% |

**US 51 North Corridor – TAFIS Comparison to Daily E+C No Build Forecast**

| Road | Segment | TAFIS Count Site | TAFIS | Forecast | Difference | Ratio Difference |
|---|---|---|---|---|---|---|
| SB US 51 | North of Daentl | 130208 | 12825 | 16980 | 4155 | 32% |
| SB US 51 | Between Daentl & Anderson | 130208 | 12825 | 16850 | 4025 | 31% |
| SB US 51 | Between Anderson & Acker | 130204 | 6905 | 9500 | 2595 | 38% |
| SB US 51 | Between Hanson & Amelia Earhart | 130212 | 6535 | 9500 | 2965 | 45% |
| SB US 51 | Between Pierstorff & Kinsman | 130021 | 8665 | 9230 | 565 | 7% |
| SB US 51 | Between Kinsman & Stoughton Service Rd | 131909 | 8175 | 8940 | 765 | 9% |
| SB US 51 | Between Stoughton Service Rd & US 151 | 131957 | 12945 | 14000 | 1055 | 8% |
| SB US 51 | Between US 151 & Commercial | 130215 | 11100 | 13100 | 2000 | 18% |
| SB US 51 | Between Commercial & WIS 30 | 130573 | 14095 | 15000 | 905 | 6% |
| SB US 51 | Between WIS 30 & Milwaukee | 130575 | 24465 | 30470 | 6005 | 25% |
| NB US 51 | Between WIS 30 & Milwaukee | 130575 | 24465 | 26480 | 2015 | 8% |
| NB US 51 | Between Commercial & WIS 30 | 130573 | 14095 | 16200 | 2105 | 15% |
| NB US 51 | Between US 151 & Commercial | 130215 | 11100 | 14500 | 3400 | 31% |
| NB US 51 | Between Stoughton Service Rd & US 151 | 131957 | 12945 | 13880 | 935 | 7% |
| NB US 51 | Between Kinsman & Stoughton Service Rd | 131909 | 8175 | 8860 | 685 | 8% |
| NB US 51 | Between Pierstorff & Kinsman | 130021 | 8665 | 9170 | 505 | 6% |
| NB US 51 | Between Hanson & Amelia Earhart | 130212 | 6535 | 8200 | 1665 | 25% |
| NB US 51 | Between Anderson & Acker | 130204 | 6905 | 8800 | 1895 | 27% |
| NB US 51 | Between Daentl & Anderson | 130208 | 12825 | 15570 | 2745 | 21% |
| WB US 151 | East of Mendota | 131939 | 28000 | 26200 | -1800 | -6% |
| EB US 151 | East of Mendota | 131939 | 28000 | 25690 | -2310 | -8% |
| EB US 151 | West of Wright/Fair Oaks | 131937 | 16200 | 680 | -15520 | -96% |
| WB US 151 | West of Wright/Fair Oaks | 131937 | 16200 | 26010 | 9810 | 61% |
| EB US 151 | Between US 51 & Rowland | 130222 | 16895 | 17110 | 215 | 1% |
| WB US 151 | Between US 51 & Rowland | 130222 | 16895 | 18510 | 1615 | 10% |
| EB US 151 | Between MacArthur & Mendota | 130219 | 20860 | 21910 | 1050 | 5% |
| WB US 151 | Between MacArthur & Mendota | 130219 | 20860 | 26000 | 5140 | 25% |

**US 51 South Corridor – TAFIS Comparison to Daily E+C No Build Forecast**

| Road | Segment | TAFIS Count Site | TAFIS | Forecast | Difference | Ratio Difference |
|---|---|---|---|---|---|---|
| SB US 51 | North of Milwaukee | 130575 | 24465 | 30500 | 6035 | 25% |
| SB US 51 | Between Milwaukee & Cottage Grove | 130268 | 28050 | 26800 | -1250 | -4% |
| SB US 51 | Between Cottage Grove & Buckeye | 130266 | 27305 | 27600 | 295 | 1% |
| SB US 51 | Between Buckeye & Pflaum | 132212 | 23445 | 25000 | 1555 | 7% |
| SB US 51 | Between Pflaum & Broadway | 130604 | 22335 | 24400 | 2065 | 9% |
| SB US 51 | Between Broadway & Beltline | 131507 | 27965 | 28400 | 435 | 2% |
| SB US 51 | Between Beltline & Terminal Dr | 131505 | 19070 | 20800 | 1730 | 9% |
| SB US 51 | South of Terminal Drive | 136056 | 15595 | 15400 | -195 | -1% |
| NB US 51 | South of Terminal Drive | 136056 | 15595 | 16200 | 605 | 4% |
| NB US 51 | Between Beltline & Terminal Dr | 131505 | 19070 | 20300 | 1230 | 6% |
| NB US 51 | Between Broadway & Beltline | 131507 | 27965 | 30300 | 2335 | 8% |
| NB US 51 | Between Pflaum & Broadway | 130604 | 22335 | 24400 | 2065 | 9% |
| NB US 51 | Between Buckeye & Pflaum | 132212 | 23445 | 25400 | 1955 | 8% |
| NB US 51 | Between Cottage Grove & Buckeye | 130266 | 27305 | 26000 | -1305 | -5% |
| NB US 51 | Between Milwaukee & Cottage Grove | 130268 | 28050 | 25600 | -2450 | -9% |
| NB US 51 | North of Milwaukee | 130575 | 24465 | 26500 | 2035 | 8% |

**Appendix I**
**Land Developments Status within 2050 DCTDM**

MEMORANDUM

# Land Developments Status within 2050 DCTDM

| | |
|---|---|
| **Date:** | April 3, 2023 |
| **Topic:** | Land Developments Status within 2050 DCTDM |
| **From:** | CDMCT |

A study is being conducted to identify new developments and their effects on traffic patterns on facilities within the limits of the Interstate 39/90/94 and US 51 corridors, primarily in Dane County. Traffic patterns are being modeled with the Dane County Travel Demand Model (DCTDM) with an original model base year of 2016 and a future year TDM model for 2050.

The DCTDM includes year 2016 and 2050 socio-economic data in Traffic Analysis Zones (TAZs) that make up Dane County. Each of these TAZs includes data such as the number of households, the number of people employed in retail, service, manufacturing jobs, and the number of workers and non-workers that own vehicles, etc. Capital Area Regional Planning Commission (CARPC) and the Greater Madison Metropolitan Planning Organization (MPO) developed county-wide totals for 2050 housing and employment, then distributed that growth to TAZ's throughout the county. While development plans and community input are used in this process, new development plans are regularly being submitted. This report identifies TAZ's where development plans indicate higher growth in housing or employment than what has been allocated by CARPC and the MPO. These additional housing or employment estimates will be referred to as "additions" in this report.

The objective of this study is to clarify whether the DCTDM projections accurately reflect the incoming new plans proposed by developers. These proposals either have been or still need to be approved by the City of Madison. Ultimately, the DCTDM will have to be constantly updated to account for new developments.

### List of Developments

Table 1 provides a summary of proposed or existing developments in the study area. Most of the developments in Table 1 can be separated into three land use categories. These developments are either residential (apartment complexes or neighborhoods) with varying amounts of units, or they are commercial developments, or industrial developments. Commercial and industrial developments range in variety from smaller sized (in terms of acreage) fast-food chains to large distribution centers that employ well over 100 people. There are a few public/institutional developments as well, including the UW Health Clinic at the American Center, and 4151 Nekoosa Trail, which currently serves as a fleet, fire, and radio center (public institution owned by the City of Madison). The 4151 Nakoosa Trail development is classified as industrial use.

Most of these developments are located within the city limits of Madison. However, a few of the multi-family residential apartment developments are in Sun Prairie near US 151 and Jenny Wren Trail and along Windsor Rd. There are also developments located in the village of Cottage Grove near the County Road N corridor, which include mostly commercial or industrial developments contributing to new job markets in this area. There are also two large, planned developments in the village of DeForest, including a top-golf like facility known as PinSeekers alongside River Road close to suburban single-family housing developments and a planned development for the

Texas gas station chain, Buc-ee's, along County Highway V. One Kwik Trip facility has also been proposed in the village of McFarland along the Stoughton Road corridor.

The status and timeframe of these development projects varies. Some are in the proposal or development phases. Some proposals were submitted as recently as 2022. However, other developments are currently under construction or are existing developments that have been recently surveyed. Developments that are existing still should be accounted for in the demand model for the purposes of ensuring the demand model makes projections that line up with real world traffic impacts, given that the base year for the model is 2016 and numerous developments on this list have been opened since then.

*Table 1 Development Summary*

| Development | Location | Land Use | Additions | Timeframe | Acres | TAZ |
|---|---|---|---|---|---|---|
| Jenny Wren MF | US 151 and Jenny Wren Trail, Sun Prairie | Residential (MF) | 108 HHs | Under C. since 2022 | 3.9 | 642 |
| Sprecher & Milwaukee | 4605 Sprecher (SW corner with Milwaukee St), Madison | Residential (MF) | 160 HHs | Proposed in 2022 | 3.3 | 750 |
| 4151 Nakoosa Trail | Nakoosa Trail and Commercial Ave. (near WIS 30/US 51 interchange), Madison | Public/Institutional/Industrial (Fleet Services) | 30 new employees | Existing (as of 2021) | 2.5 | 702 |
| Meadowlands | Close to I-39/90 and I-94 Interchange, along Milwaukee/Sprecher corridors, Madison (6583 Milwaukee St) | Residential (MF) | 341 HHs | Under C. since 2022 | 17.1 | 752/755 |
| Hidden Creek Res/Portage Rd Apts. | Portage Rd and Diloreto Ave., Alongside I-39/90/94 near US 151 Interchange and Airport, Madison | Residential (MF) | 276 HHs | Existing (as of 2018) | 14.6 | 686 |
| Platos Madison | 3841 E. Washington Ave., Madison | Residential (MF) | 190 HHs | Approved 2022 | 7.5 | 693 |
| Café Zupas/Chapter Aesthetic Studio | 4522 E. Washington Ave., Madison | Commercial | 20 new employees | Approved 2023 | 1.1 | 689 |
| Signature Pointe Apartments | 2101 – 2115 East Springs Dr., Madison | Residential (MF) | 463 HHs | Approved 2022 | 14.6 | 697 |

| Development | Location | Land Use | Additions | Timeframe | Acres | TAZ |
|---|---|---|---|---|---|---|
| Panera Bread | 2649 East Springs Dr., on the corner of East Washington Ave., Madison | Commercial (Restaurant) | 30 new employees | Existing | 1 | 697 |
| Lakeland University | 2310 Crossroads Dr., Burke-Madison | Commercial-Institutional (Private University) | 100 new employees | Approved 2022 | 3 | 700 |
| American Center Apts. | 5622 Eastpark Blvd. and American Center Dr/American Family Dr., Madison | Residential (MF)/Mixed Use | 363 HHs | Under C (as of 2023) | 7.8 | 688 |
| Winston @ Churchill | 4205 Portage Rd, Close to Hidden Creek Residences and Churchill Heights Park, Madison | Residential (MF) | 487 HHs | Proposed in 2022 | 11.3 | 680/686 |
| Acadia Behavioral Health Hospital | 2335 City View Dr., Burke-Madison | Institutional (Private) | 240 new employees | Approved 2023 | 4.5 | 700 |
| Nelson Addition to Rustic Acres | Milwaukee St. and Rustic Dr., Madison | Residential (MF) | 4 HHs | Existing (as of 2022) | 1.4 | 750/752 753/755 |
| Oak Park Place Madison East | 5817 Halley Way, Madison | Residential (MF – Senior Living) | 99 New HHs | Approved 2021 | 5.2 | 749 |
| Capitol View Townhomes | 5818 Gemini Dr., Madison | Residential (MF) | 12 HHs | Approved 2021 | 1 | 749 |
| DeForest Golf Range (PinSeekers) | River Rd close to I-39/90/94, DeForest | Commercial/Recreational | 100 employees | Under C (as of 2023) | 30.1 | 1041/ 1048/ 1052 |
| Jannah Village | Felland Rd close to I-39/90 and I-94 split off, Madison | Residential (MF) | 242 HHs | Under C (as of 2023) | 9.4 | 716 |
| UW Health Clinic at American Center | Eastpark Blvd and N. Biltmore Ln, Madison | Institutional (Medical)/Mixed Use | 1,000 employees | Under C (as of 2023) | 10.8 | 682 |

| Development | Location | Land Use | Additions | Timeframe | Acres | TAZ |
|---|---|---|---|---|---|---|
| Alliant Energy | N. Biltmore Ln. and American Family Dr., Madison | Commercial/ Industrial (Office) | 600+ employees | Existing (since 2002) | 26 | 685 |
| American Family Insurance | American Family Dr., Madison | Commercial (Office) | 1,000+ employees | Existing | 100 | 681 |
| American Family Apts | In Eastpark/American Center Generally, Madison | Residential (MF) | 900 HHs | Proposed 2022 | 35 | 681/682 685/678 620 |
| 6501 Town Center | NW Corner of Milwaukee and Sprecher, Madison/Cottage Grove | Mixed Use (primarily Residential and Commercial) | 200 HHs (100 HHs for 6501) | Under C (as of 2023) | 5 | 744 |
| Van Buren Apts | Jenny Wren Trail, bordered by US 151 Sun Prairie | Residential (MF) | 92 HHs | Proposed 2022 | 2.8 | 642 |
| The Dog Den | 410 Atlas Ave., Madison | Commercial | 15 new employees | Existing | 0.7 | 738 |
| Young Blood Beer Company | S. Stoughton Rd., Madison | Industrial (Manufacturing) | 20 new employees | Existing | <1 | 781 |
| Home2Suites | 2301 East Springs Dr, Near I-39/90/94 and High Crossing Blvd | Commercial (Hotel) | Max. 100 employees | Proposed 2019 | 4.6 | 697 |
| Buc-ee's | I-39/90/94 and CTH V, Northwest Corner to the east of CTH I, DeForest | Commercial (Travel/Gas) | 200 employees | Proposed 2023 | 1.7 | 1028 |
| Window Tint Auto Repair | 2425 S. Stoughton Rd., Madison | Commercial/ Industrial | 10 employees | Approved 2022 | 0.5 | 781 |
| The Hair Suites | 4914 Pflaum Rd., Madison | Commercial | 10 employees | Existing | 0.1 | 781 |
| Kwik Trip | Terminal Dr and Stoughton Road (US 51), McFarland | Commercial (Travel/Gas) | 35 employees | Proposed 2021 | 3.85 | 801 |

| Development | Location | Land Use | Additions | Timeframe | Acres | TAZ |
|---|---|---|---|---|---|---|
| Discovery Storage Madison | 4408 Pflaum Rd and 2505 Seiferth Rd, Madison | Industrial (Warehouse/Storage) | 25 employees | Approved 2022 | 1.18 | 787 |
| FedEx Distribution Center | NE Corner of Hoepker Rd and US 51 (Stoughton Rd), Burke | Industrial (Warehouse/ Distribution Center) | 260 employees | Existing | 8.8 | 588 |
| Red Rooster | 2513 Seiferth Rd., Madison | Commercial | 10 employees | UC/Existing | 0.5 | 787 |
| Precision Diagnostics | 2702 Agriculture Dr., Madison | Commercial/ Industrial | 17 employees | Existing | 2.5 | 787 |
| K9 Crush Dog Daycare | 2918 Progress Rd., Madison | Commercial | 12 employees | Existing | 0.6 | 787 |
| South Central Library System Warehouse | 5426 Fen Oak Dr., Madison | Industrial (Warehouse/Office) | 62 employees | Approved 2022 | 4.1 | 789 |
| Saturday Properties | US 151 and Windsor (WIS 19) Dr, Sun Prairie | Residential (Adult Housing) | 150 HHs | Proposed 2022 | 3.7 | 636 |
| Truck Stop (Caledonia Grocery) | STH 33 and I 90/94, | Commercial (Travel/Gas/Hotel) | 100 employees | Proposed 2021 | 14 | D11 TAZ 88 |
| Metro Tech Apartments | 6321 Town Center Dr Near NW Corner of Milwaukee and Sprecher | Residential (MF) | 74 HHs | In Dev. Phase | 2.98 | 744 |
| Wyoming Project Unit 1 | 4800 Voges Rd., Madison/McFarland | Industrial (Warehouse) | 10 employees | Under C (as of 2023) | 14.8 | 805 |
| Wyoming Project Unit 2 | 4800 Voges Rd., Madison/McFarland | Industrial (Warehouse) | 10 employees | Under C (as of 2023) | 8.1 | 805 |
| All Metals Recycling Center | 5651 Tradesmen Dr. | Industrial/Other | 300 employees | Proposed 2022 | 36 | 805 |

| Development | Location | Land Use | Additions | Timeframe | Acres | TAZ |
|---|---|---|---|---|---|---|
| Grand Appliance & TV | SE Corner of Landmark Dr and Limestone Pass, Cottage Grove | Industrial (Utilities/Parking) | 5 employees currently | Under C (as of 2023) | 2.55 | 1158 |
| BRANDtek Biodome | Landmark Dr and Commerce Pkwy, Cottage Grove | Industrial/Research (Biodome Facility) | 40 employees | Proposed 2021 | 2.47 | 1155 |
| Atlantis Valley Foods | SE Corner of Commerce Pkwy and Erb Rd, Cottage Grove | Industrial (Food Production) | 65 employees | Under C (as of 2023) | 5.34 | 1158 |
| JEK Multi-Tenant Retail | NW Corner of Landmark Dr and Limestone Pass, Cottage Grove | Commercial (Retail/Office Space) | 7 units | Under C (as of 2023) | 2.75 | 1155 |
| Jump Around Gymnastics | NE Corner of Landmark Dr and Limestone Pass, Cottage Grove | Recreational (Kids Gymnastics) | 15 employees | Proposed 2021 | 1.4 | 1155 |
| Project Silver Eagle | NW Corner of CTH N and CTH TT, Cottage Grove | Industrial (Distribution Center) | 1000 employees | Proposed 2022 | 145 | 1121 |
| Grace Coffee Co. | SW Corner of CTH N and Gaston Rd, Cottage Grove | Commercial (Restaurant/Coffee) | 20 employees | Existing (as of 2022) | 0.08 | 1150 |

Color Coding for Table 1

*Light Green = Additions Accommodated for in the Demand Model*

*Dark/Navy Blue = Additions Not Accommodated for in the Demand Model*

*Yellow = Estimated Addition Amounts*

**Model Growth for Relevant TAZs**

Table 2 summarizes the growth in socio-economic data at the TAZ level based on the development locations given in Table 1. TAZs that were listed in the rightmost column of Table 1 are noted in Table 2 below to mark their projections of growth or loss in additions relevant to the new developments proposed in the TAZs. Table 2 shows the variance in characteristics between TAZs as well as the model's projections of additions or losses signified in the Delta columns for each socio-economic field.

*Table 2 DCTDM Housing and Employment Summary*

| TAZ | 2016 HH | 2050 HH | Delta | 2016 Retail | 2050 Retail | Delta | 2016 Service | 2050 Service | Delta | Total 2016 Employed | Total 2050 Employed | Delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 588 | 2 | 2 | 0 | 50 | 37 | -13 | 204 | 356 | 152 | 381 | 1509 | 1128 |
| 620 | 141 | 981 | 840 | 7 | 4 | -3 | 3 | 117 | 114 | 23 | 124 | 101 |
| 636 | 44 | 44 | 0 | 3 | 58 | 55 | 250 | 1313 | 1063 | 253 | 1411 | 1158 |
| 642 | 177 | 770 | 593 | 0 | 208 | 208 | 0 | 206 | 206 | 0 | 414 | 414 |
| 678 | 13 | 179 | 166 | 0 | 0 | 0 | 8 | 38 | 30 | 8 | 49 | 41 |
| 680 | 121 | 221 | 100 | 0 | 0 | 0 | 5 | 9 | 4 | 5 | 105 | 100 |
| 681 | 139 | 392 | 253 | 11 | 25 | 14 | 4166 | 7100 | 2934 | 4392 | 7456 | 3064 |
| 682 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1081 | 1081 | 0 | 1093 | 1093 |
| 685 | 0 | 388 | 388 | 7 | 0 | -7 | 696 | 1550 | 854 | 1496 | 2295 | 799 |
| 686 | 721 | 906 | 185 | 0 | 0 | 0 | 529 | 529 | 0 | 539 | 539 | 0 |
| 688 | 741 | 1873 | 1132 | 6 | 9 | 3 | 219 | 431 | 212 | 227 | 615 | 388 |
| 689 | 860 | 860 | 0 | 127 | 130 | 3 | 730 | 695 | -35 | 857 | 825 | -32 |
| 693 | 3 | 759 | 756 | 156 | 207 | 51 | 687 | 527 | -160 | 857 | 738 | -119 |
| 697 | 0 | 38 | 38 | 1035 | 1033 | -2 | 918 | 1543 | 625 | 1971 | 2678 | 707 |
| 700 | 321 | 414 | 93 | 13 | 13 | 0 | 1124 | 1576 | 452 | 1290 | 1696 | 406 |
| 702 | 128 | 128 | 0 | 365 | 406 | 41 | 110 | 122 | 12 | 556 | 631 | 75 |
| 716 | 21 | 298 | 277 | 0 | 0 | 0 | 12 | 325 | 313 | 37 | 325 | 288 |
| 727 | 15 | 769 | 754 | 11 | 16 | 5 | 282 | 471 | 189 | 722 | 917 | 195 |
| 738 | 200 | 313 | 113 | 72 | 62 | -10 | 796 | 880 | 84 | 1726 | 1964 | 238 |
| 744 | 115 | 116 | 1 | 0 | 0 | 0 | 0 | 283 | 283 | 51 | 334 | 283 |

| TAZ | 2016 HH | 2050 HH | Delta | 2016 Retail | 2050 Retail | Delta | 2016 Service | 2050 Service | Delta | Total 2016 Employed | Total 2050 Employed | Delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 749 | 842 | 1056 | 214 | 0 | 0 | 0 | 127 | 336 | 209 | 127 | 337 | 210 |
| 750 | 196 | 633 | 437 | 0 | 0 | 0 | 5 | 0 | -5 | 5 | 0 | -5 |
| 752 | 1 | 274 | 273 | 0 | 0 | 0 | 0 | 2100 | 2100 | 0 | 2100 | 2100 |
| 753 | 431 | 442 | 11 | 0 | 0 | 0 | 15 | 15 | 0 | 23 | 24 | 1 |
| 755 | 332 | 512 | 180 | 0 | 0 | 0 | 0 | 87 | 87 | 2 | 90 | 88 |
| 781 | 2 | 2 | 0 | 120 | 120 | 0 | 1074 | 1149 | 75 | 2582 | 2923 | 341 |
| 787 | 56 | 55 | -1 | 201 | 197 | -4 | 2062 | 2311 | 249 | 3377 | 4415 | 1038 |
| 789 | 1 | 1 | 0 | 92 | 88 | -4 | 1925 | 1937 | 12 | 2465 | 2862 | 397 |
| 801 | 75 | 627 | 552 | 72 | 74 | 2 | 16 | 103 | 87 | 258 | 326 | 68 |
| 805 | 7 | 6 | -1 | 0 | 0 | 0 | 2 | 222 | 220 | 64 | 710 | 646 |
| 1028 | 23 | 39 | 16 | 14 | 14 | 0 | 3 | 2 | -1 | 159 | 197 | 38 |
| 1041 | 34 | 500 | 466 | 12 | 41 | 29 | 125 | 169 | 44 | 137 | 329 | 192 |
| 1048 | 418 | 431 | 13 | 10 | 10 | 0 | 37 | 37 | 0 | 63 | 60 | -3 |
| 1052 | 63 | 301 | 238 | 0 | 96 | 96 | 0 | 441 | 441 | 200 | 857 | 657 |
| 1121 | 121 | 126 | 5 | 5 | 33 | 28 | 12 | 761 | 749 | 34 | 1120 | 1086 |
| 1150 | 290 | 789 | 499 | 15 | 26 | 11 | 3 | 8 | 5 | 21 | 35 | 14 |
| 1155 | 7 | 4 | -3 | 75 | 200 | 125 | 204 | 1454 | 1250 | 629 | 2250 | 1621 |
| 1158 | 399 | 753 | 354 | 150 | 296 | 146 | 49 | 153 | 104 | 232 | 501 | 269 |

**Observations – Developments of Concern**

Most of the developments in Table 1 are accounted for in the DCTDM's forecasted household and employment numbers. However, a few of these developments have additions that exceed the forecasted amounts for TAZs in 2050 according to Table 2. TAZs highlighted in these observations are shown in Table 3.

Two of these developments are located near Portage Dr., near the Dane County Regional Airport and US 151. These developments are The Winston at Churchill Park and Hidden Creek Residences. The Winston development plans to add 487 units of housing, but forecasted amounts for its location in either TAZ 686 or 680, show 100 additional housing units for TAZ 680 and 185 more units for TAZ 686. This new apartment development would exceed both TAZ household additions combined by over 200 housing units. In addition to The Winston development, Hidden Creek Residences, which already has existing buildings for dwelling units, is currently in the construction phase of adding on another building to the development. In summary, The TAZs in this area need to be modified to accommodate more growth in households.

Three more apartment complexes also require updated household TAZ data. The 6501 Town Center Apartments development is one of the many residential complexes in the Rustic Acres/Milwaukee-Sprecher area, which is projected to have marginal growth in the model compared to what the developers of the projects anticipate. The Milwaukee Street Special Area Plan (SAP) is what justifies the inclusion of many of these future or currently existing developments as they will be connected to the planned area via Milwaukee Street pedestrian and automobile routes. The City of Madison is currently fostering much of this future development along Milwaukee Street in anticipation of the SAP being carried out. Another development is the Metro Tech Apartment Complex, located next to the 6501 Town Center apartments. Combined, these apartment complexes are located in a TAZ with little projected growth in households. Both 6501 Town Center and Metro Tech apartments have units that exceed the amount projected for TAZ 744, which only projects one household to be added from 2016 to 2050 according to the DCTDM. The third development is The Meadowlands, an existing neighborhood development that plans for more multifamily household additions. The development is primarily single-family with 341 multifamily household units. TAZ 752 is where the multifamily housing will be located, but most of the existing development is located in TAZ 755.

A 900-unit development complex was proposed in association with American Family Insurance. This development plan was discussed in a regional planning meeting but had no specific locations proposed for the development. The combined number of household additions in the associated TAZs should more than account for the proposed new developments, so no adjustments to the housing units in this area are likely necessary.

An adult residential complex has been proposed in Sun Prairie at the southwest corner of US 151 and Windsor Rd (Wisconsin State Highway 19), with 150 housing units. No residential additions have been proposed for the TAZ this development is in.

The potential Buc-ee's Development would be located in TAZ 1028, which includes no growth in retail workers, a loss of one service worker, and overall employment numbers increasing by 38 employees overall in the TAZ between 2016 and 2050 according to the DCTDM. The potential Buc-ee's development anticipates around 200 hires to work either full or part time, so this new development has not yet been accounted for in the DCTDM TAZ projections.

A minor commercial development on East Washington Avenue near East Towne Mall is a small commercial strip where two tenants, Café Zupas and Chapter Aesthetic Studio, are planned. This development is located in TAZ 689. TAZ 689 projects a loss of 35 jobs according to the DCTDM, so the TAZ needs to be updated to accommodate the job growth, though overall employment is not expected to increase by a large margin.

Another large development projected for the Madison area is called Project Silver Eagle, which is a proposed warehouse/distribution center development at CTH N and CTH TT in Cottage Grove. This development, according to the proposal, is likely to serve as an Amazon Distribution Center with an estimated 1,000 to 1,500 jobs. The TAZ 1121 model growth does project an additional 1,086 employees in overall employment numbers, which would have the projection allowing for the lower end of the estimate proposed by Project Silver Eagle It is recommended that the TAZ project the higher end of the estimated jobs planned for this development.

One existing development classified as a public institutional land use is the City of Madison Fleet and Fire Services Center on Nakoosa Trail. The development is not fully accommodated for in the demand model. The number of total service jobs added in TAZ 12 does not account for the number of service jobs planned for the fleet/fire training center. At minimum, there should be at least 30 service workers employed at this location including job training staff. Overall employment numbers are less defined.

The Truck Stop in Columbia County at the southeast corner of WIS 33 and I-90/94 is the only development listed outside of Dane County and thus is not accounted for in the DCTDM but is accounted for in the Statewide Demand Model (STDM). Still, it is important as it is located within WisDOT's I-39/90/94 corridor study area. The STDM attributes in Dane County TAZs list the same socio-economic data attributes but use different coding for TAZ IDs in Dane County given that it is accounting for all TAZs in the state of Wisconsin. Thus, it will not be accounted for in the DCTDM. However, the STDM also does not account for any employment growth for the TAZ where this truck stop will be located, so the TAZ's socio-economic data for the STDM need to be updated to account for the new truck stop, which proposes more retail jobs for the convenience store development, a fast food restaurant add-on, which will increase the number of service and retail jobs, and a 4-story hotel with 70 rooms, which will create at minimum 30-40 jobs. Overall, there will be at least 100 jobs created by the new development.

**Recommended TAZ Adjustments**

*Table 3 Recommended DCTDM Updates*

| TAZ | Land Use Assoc. with Adjustments | Model Attribute Delta (MAD) | Rec. Delta | Delta (Rec-MAD) | Developments Concerned |
|---|---|---|---|---|---|
| 636 | Residential | 0 HHs | 150 HHs | +150 HHs | Saturday Properties (Adult Residential) |
| 680 | Residential | 100 HHs | 500 HHs | +400 HHs | The Winston @ Churchill Park |
| 686 | Residential | 186 HHs | 300 HHs | +114 HHs | Hidden Creek Residences (or lot additions to HCR) |
| 689 | Commercial | -35 Total Emp. | 35 Total Emp. | +70 Emp. | Café Zupas/CAS |
| 697 | Residential | 38 HHs | 501 HHs | +463 HHs | Signature Point Apts. |
| 702 | Public Industrial | 12 Service Emp. | 100 Service Emp. | +88 Service Emp. | 4151 Nakoosa Trail (City of Madison Fleet Services) |
| 744 | Residential | 1 HH | 250 HHs | +249 HHs | 6501 Town Center/Metro Tech Apts. |
| 752 | Residential | -1 HH | 400 HHs | +401 HHs | The Meadowlands |
| 1028 | Commercial | 38 Total Emp. | 238 Total Emp. | +200 Total Emp. | Buc-ee's |
| 1121 | Private Industrial | 1,086 Total Emp. | 1,586 Total Emp. | +500 Total Emp. | Project Silver Eagle |
| STDM TAZ 88 | Commercial | 0 Total Emp. | 200 Total Emp. | +200 Total Emp. | Truck Stop near Caledonia Grocery |

It is recommended to modify and adjust the Dane County TDM TAZ files to accommodate more growth. Eleven TAZs should have their attributes modified to represent future developments more accurately in the DCTDM as well as the TAZ for the truck stop in the statewide model. Furthermore, there may be more recommended developments in the future that might change this current list.

MEMORANDUM

# Safety Analysis Methodology

| | |
|---|---|
| **Date:** | November 21, 2022 |
| **Topic:** | Safety Analysis Methodology |
| **From:** | CDMCT |

## 1. Introduction

This document is intended to provide guidance of project specific IHSDM predictive safety models to be developed as part of the Interstate 39/90/94 (I-39/90/94) and Stoughton Road (United States Highway 51 [US 51]) studies and coordinated by the corridor manager.

## 2. IHSDM Software Version

The Interactive Highway Safety Design Model (IHSDM) software should be used for the predictive safety analysis. The software version and configuration files should remain consistent across models.

- Software version
  - Use IHSDM version 16 for model development and analysis
- Configuration files
  - Use IHSDM XML configuration files from the (upcoming) August 2022 Facilities Development Manual (FDM) update. This will incorporate 2021 crash rates.
  - The upcoming FDM update may add functionality for IHSDM version 17, but as noted above version 16 should be used.

## 3. IHSDM Modeling Standards

Basic guidelines for IHSDM modeling are outlined in this section. The analysis years and model input methods should remain consistent across models. Some specific non-traditional situations are also defined in this section, if other non-traditional elements arise guidance will be added.

- Analysis years
  - 10-year analysis, starting with the one year after construction is complete.
  - 20-year analysis shall also be conducted to provide further insight into benefit-cost analysis.
  - IHSDM will interpolate between any two values to determine the interim year volumes.
  - Design teams shall interpolate between build forecast volumes to be accurate, do not interpolate between a no build and build volume CDMCT to provide No Build and Build growth rates as defined below.
- Empirical-Bayes (EB) Method

  - EB Method will not be used for this project
- Non-traditional interchanges with IHSDM (if needed)
  - Use calibrated models and apply crash modification factors (CMF)
  - Diverging Diamond Interchanges (DDI) should be modeled as traditional diamond interchange with user defined CMF's (0.374 FI and 0.649 PD) applied at the ramp terminal intersections
  - Single Point Urban Interchanges (SPUI) should be modeled as a traditional diamond interchange with user defined CMF's (0.62 Total) applied for both ramp terminal intersections.
  - Approaches for modeling other non-traditional interchanges or intersections should be coordinated with Bureau of Traffic Operations (BTO)
- Rumble strips
  - It is assumed the existing model will include rumble strips where they are present in the field. Rumble strips are denoted in the shoulder inputs and shall be included within the model using the rumble strip checkbox.
  - If locations within the corridor exist without rumble strips and rumble strips are being introduced as part of the project as part of alternatives analyses, then the IHSDM model should be set up without using the rumble strip checkbox but rather utilize crash modification factor 3422[1].
- High volume hour calculations
  - There is a built-in function to calculate high volume hour sections, but this does not consider the unique volume profile seen in this corridor. For this reason, the high volume hour sections should be calculated outside of IHSDM and then imported.
  - This corridor has peaks during the Summer on Friday and Sunday, a volume profile should be used to calculate the proportion of high volume hours. This profile will be derived by segment teams from continuous count data provided by the corridor manager.
  - This data is defined based on station range. The station ranges should match those of the average daily traffic (ADT) as well as where the number of through lanes change.
  - IHSDM does not count auxiliary lanes as through lanes for this calculation. These lanes should be designated as acceleration or deceleration lanes in the model, a specific 'auxiliary' designation is not currently available.
- Model development and coding
  - Models may be developed using either a location based methodology or a Site Set methodology for ramp terminal intersections. Terminals that are anticipated to have alternatives that move the center point of the intersection by more than 100 feet should consider using location based analysis to capture the safety benefits in the reconstructed area.
  - A clear zone width of 30' should be used.

[1] *https://www.cmfclearinghouse.org/detail.cfm?facid=3422. Accessed November 2022.*

  - Alignments and cross sections will be developed by the segment's design team, for all build alternatives and the base condition.
  - A request was put in by the geometrics team for any available alignments from past projects, which will be pieced together for IHSDM by the design teams.
  - Profiles can be struck as vertical is not an applicable CMF in the freeway mainline Highway Safety Model (HSM) methods.
  - ADT's and projected growth rates will be provided by the corridor manager.
- Model review
  - Design teams shall submit existing crash analysis, IHSDM model inputs, IHSDM result summaries, and the design recommendation.

## 4. Safety Analysis Documentation Requirements

A signed safety certification document (SCD) is not a requirement for the corridor analysis because the project is a reconstruction with capacity expansion. In place of the SCD, a safety technical memorandum is to be completed for each project segment. The memorandum should cover key components of the SCD and include the following sections:

1) Network Screening of Safety Sites of Promise
   a. Develop a report from the Safety Certification Mapping (SCM) tool for segments. Segment teams shall access through WisTransPortal.
   b. Develop readable maps and tables that highlight project segments with crash rate flags.
2) Diagnosis of Safety Sites of Promise
   a. Develop tables, maps, and/or charts that summarize existing crash trends in the corridor using 2017-2021 crash data. The crash data for 2021 has been published on WisTransportal.
      i. Segment teams to obtain crash data from WisTransportal.
      ii. The crash vetting spreadsheet is not a requirement.
      iii. The review of individual crash reports is not a requirement.
      iv. Intersection crash diagrams are not required for the overall segment safety analysis. Each intersection will be further evaluated during the Intersection Control Evaluation (ICE) process.
      v. The total number of animal crashes shall be noted in the safety documentation. The animal crashes will be removed from all subsequent analysis.
3) Countermeasure identification
   a. The Safety Certification Worksheet (SCW) is not required, as it may be cumbersome for this project. The design teams are encouraged to use a format that best conveys existing safety concerns and how the build alternatives mitigate these issues.
4) Safety Evaluation of Alternatives using IHSDM predictive analysis.

a. Include predictive crash summaries by each severity type and total crash costs for the No Build and Build alternatives. Use the most current version of crash costs available as detailed within FDM 11-38.
b. Provide a summary table which should be formatted to allow for direct comparison of sub-corridor alternatives. For instance, interchange alternatives should be separated from mainline alternatives.
c. A benefit costs analysis should be completed using the IHSDM Economic Analysis Module. This analysis will be based on the predictive crash analysis years, which in this case is both 10 and 20 years.

MEMORANDUM

# VISSIM Analysis Methodology

| | |
|---|---|
| **Date:** | July 8, 2022 |
| **Topic:** | VISSIM Analysis Methodology |
| **From:** | CDMCT |

## 1. Introduction

This document is intended to provide guidance of project specific VISSIM microsimulation models to be developed as part of the Interstate 39/90/94 (I-39/90/94) and Stoughton Road (United States Highway 51 [US 51]) studies and coordinated by the corridor manager. There are four project teams that will be developing project specific VISSIM models:

- I-39/90/94 North Segment
- I-39/90/94 South Segment
- US 51 North/Central Segment
- US 51 South Segment

In general, guidance and processes described in the Wisconsin Department of Transportation's (WisDOT) Traffic Engineering and Operations Safety Manual (TEOpS) Chapter 16 will be followed by all project teams. This document provides more detailed guidance on specific VISSIM model inputs, methodologies, and assumptions specific to these study corridors for consistency and ease of model peer review and acceptance. Any model inputs or parameters not discussed as part of this document shall follow guidance from TEOpS Chapter 16.

The use of VISTRO or Synchro shall follow guidance from TEOpS Chapter 16 when analyzing the operations of intersections or as a supplement to aid in signal timing updates to support VISSIM.

This version of this document (version 1 – dated 7/8/2022) is intended to provide a high level overview of items that will be expanded on as part of a subsequent version and allow the project teams, WisDOT staff, and others as needed to review and provide feedback.

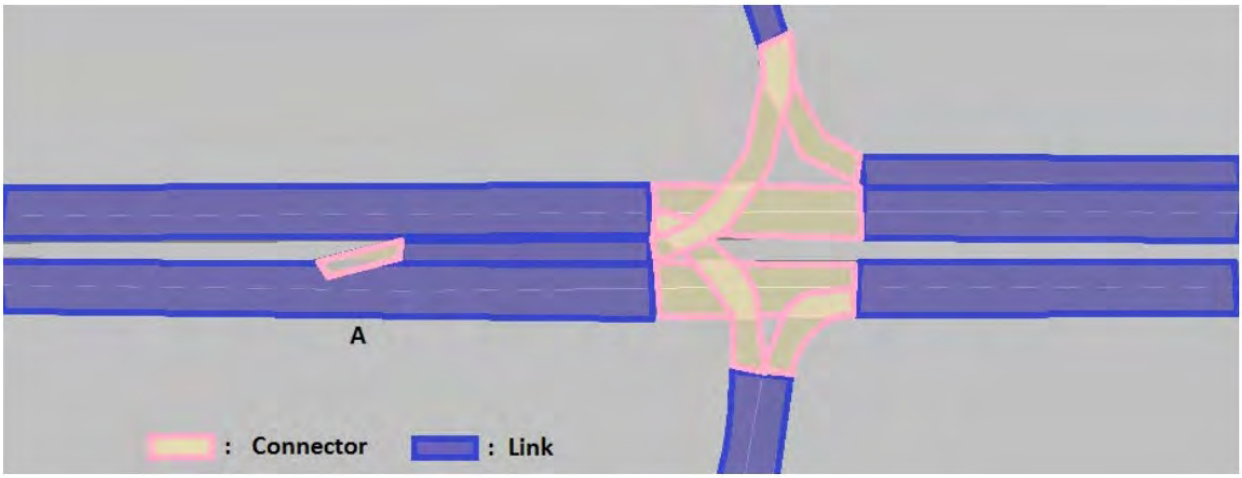
## 2. Software Version and Base Network

- All project and peer review teams to utilize the same version of VISSIM throughout the duration of the study
- I-39/90/94 south segment utilized VISSIM version 2020 SP10; recommend utilization of the same version for I-39/90/94 north segment and US 51 segments
  - Note that WisDOT now supports VISSIM version 2022 SP04 as of 4/21/2022
- All segment models to utilize the WisDOT base file to begin model development
  - Identifies Wisconsin specific vehicle fleet, distributions, and default speed profiles

## 3. Model Geometrics and Coding

- Ramp merge/diverge
  - I-39/90/94 models shall utilize "parallel" style ramp coding technique
    - Acceleration and deceleration lane shall be coded to encompasses the full length of the taper
- Intersection turn lanes
  - See recommended intersection coding technique as shown in Figure 1

*Figure 1: Intersection Coding Example*




Source: WSDOT Protocol for VISSIM Simulation (Figure 9 – page 37, report page 28)

- I-39/90/94 models shall include ramp terminal intersections at locations where the ramp terminal may impact operations of the mainline. See Section 5 for specific location details.
- Reduced speed areas shall be placed associated with advisory speeds on ramps and on connectors at intersections for left and right turn movements
- Desired speed decision points shall be placed associated with signed speed limits in the field

## 4. Driving Behaviors

- I-39/90/94 models:
  - Utilize Wiedemann 99 car following model for basic segments and cooperative behaviors (merge/weaves), and adjust behavior parameters as needed (see TEOpS 16-20 Attachment 6.3 for recommended ranges)
  - Utilize Wiedemann 74 for ramp terminal intersections
- US 51 models:

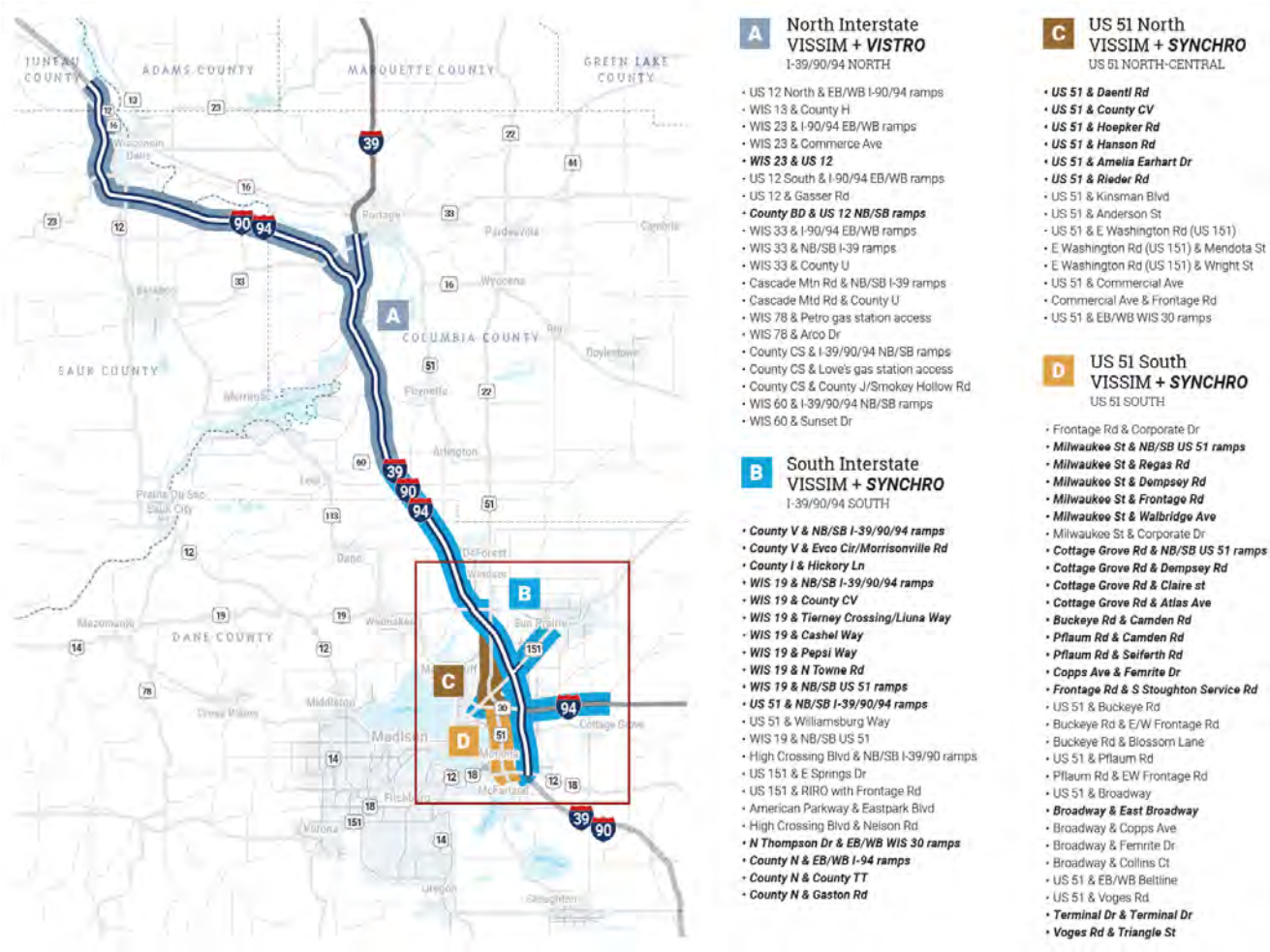
- Utilize Wiedemann 74 car following model and adjust behavior parameters as needed (see TEOpS 16-20 Attachment 6.3 for recommended ranges)

## 5. Spatial Limits

Spatial limits for each project team have been defined using a shared Google Earth kmz developed by the corridor manager. Figure 2 below shows the overall layout of the limits of the four design segment's VISSIM models.

- The Interstate north and south segment limits are separated by the approximate seven-mile gap between CTH V and STH 60 interchanges. The Interstate north team will include the STH 60 interchange.
- The Interstate south segment will include the US 51 interchange ramps, excluding the ramp terminals. The Interstate south segment will also include STH 30 west of the Interstate excluding the US 51 ramp terminals.
- The US 51 north and central segment VISSIM model will include the intersections with US 151 and STH 30. The ramp gores and mainline operations of STH 30 will be analyzed by the Interstate south team. The US 51 north and central segment VISSIM model includes the mainline US 51 segment south of WIS 30 including the northern ramp gores but terminates north of the interchange of US 51 with Milwaukee Street and does not include the Milwaukee Street intersections.
- The US 51 south segment VISSIM model limits extend from the Buckeye Road interchange south through the Beltline interchange and terminate at the Voges/Terminal Drive intersection. The Cottage Grove Road and Milwaukee Street interchanges will be modeled utilizing deterministic software and will follow HCM7 methodologies. The US 51/Stoughton Road mainline and the interchange merge and diverge areas will be modeled in HCS and the intersections along Cottage Grove Road and Milwaukee Street will be modeled in Synchro. Substantial operational issues were not found in the previous study along US 51/Stoughton Road at these interchanges and the alternatives for the current study are not anticipated to need microsimulation to effectively analyze the operations in and around these interchange areas. An example would be with US 51/Stoughton Road southbound at the Cottage Grove Road interchange, which was recently reconstructed and is unlikely to change.

*Figure 2: VISSIM Model Spatial Limits*




**A North Interstate VISSIM + *VISTRO***
I-39/90/94 NORTH

- US 12 North & EB/WB I-90/94 ramps
- WIS 13 & County H
- WIS 23 & I-90/94 EB/WB ramps
- WIS 23 & Commerce Ave
- ***WIS 23 & US 12***
- US 12 South & I-90/94 EB/WB ramps
- US 12 & Gasser Rd
- ***County BD & US 12 NB/SB ramps***
- WIS 33 & I-90/94 EB/WB ramps
- WIS 33 & NB/SB I-39 ramps
- WIS 33 & County U
- Cascade Mtn Rd & NB/SB I-39 ramps
- Cascade Mtd Rd & County U
- WIS 78 & Petro gas station access
- WIS 78 & Arco Dr
- County CS & I-39/90/94 NB/SB ramps
- County CS & Love's gas station access
- County CS & County J/Smokey Hollow Rd
- WIS 60 & I-39/90/94 NB/SB ramps
- WIS 60 & Sunset Dr

**B South Interstate VISSIM + *SYNCHRO***
I-39/90/94 SOUTH

- ***County V & NB/SB I-39/90/94 ramps***
- ***County V & Evco Cir/Morrisonville Rd***
- ***County I & Hickory Ln***
- ***WIS 19 & NB/SB I-39/90/94 ramps***
- ***WIS 19 & County CV***
- ***WIS 19 & Tierney Crossing/Liuna Way***
- ***WIS 19 & Cashel Way***
- ***WIS 19 & Pepsi Way***
- ***WIS 19 & N Towne Rd***
- ***WIS 19 & NB/SB US 51 ramps***
- ***US 51 & NB/SB I-39/90/94 ramps***
- US 51 & Williamsburg Way
- WIS 19 & NB/SB US 51
- High Crossing Blvd & NB/SB I-39/90 ramps
- US 151 & E Springs Dr
- US 151 & RIRO with Frontage Rd
- American Parkway & Eastpark Blvd
- High Crossing Blvd & Nelson Rd
- ***N Thompson Dr & EB/WB WIS 30 ramps***
- ***County N & EB/WB I-94 ramps***
- ***County N & County TT***
- ***County N & Gaston Rd***

**C US 51 North VISSIM + *SYNCHRO***
US 51 NORTH-CENTRAL

- ***US 51 & Daentl Rd***
- ***US 51 & County CV***
- ***US 51 & Hoepker Rd***
- ***US 51 & Hanson Rd***
- ***US 51 & Amelia Earhart Dr***
- ***US 51 & Rieder Rd***
- US 51 & Kinsman Blvd
- US 51 & Anderson St
- US 51 & E Washington Rd (US 151)
- E Washington Rd (US 151) & Mendota St
- E Washington Rd (US 151) & Wright St
- US 51 & Commercial Ave
- Commercial Ave & Frontage Rd
- US 51 & EB/WB WIS 30 ramps

**D US 51 South VISSIM + *SYNCHRO***
US 51 SOUTH

- Frontage Rd & Corporate Dr
- ***Milwaukee St & NB/SB US 51 ramps***
- ***Milwaukee St & Regas Rd***
- ***Milwaukee St & Dempsey Rd***
- ***Milwaukee St & Frontage Rd***
- ***Milwaukee St & Walbridge Ave***
- Milwaukee St & Corporate Dr
- ***Cottage Grove Rd & NB/SB US 51 ramps***
- ***Cottage Grove Rd & Dempsey Rd***
- ***Cottage Grove Rd & Claire st***
- ***Cottage Grove Rd & Atlas Ave***
- ***Buckeye Rd & Camden Rd***
- ***Pflaum Rd & Camden Rd***
- ***Pflaum Rd & Seifarth Rd***
- ***Copps Ave & Femrite Dr***
- ***Frontage Rd & S Stoughton Service Rd***
- US 51 & Buckeye Rd
- Buckeye Rd & E/W Frontage Rd
- Buckeye Rd & Blossom Lane
- US 51 & Pflaum Rd
- Pflaum Rd & EW Frontage Rd
- US 51 & Broadway
- ***Broadway & East Broadway***
- Broadway & Copps Ave
- Broadway & Femrite Dr
- Broadway & Collins Ct
- US 51 & EB/WB Beltline
- US 51 & Voges Rd
- ***Terminal Dr & Terminal Dr***
- ***Voges Rd & Triangle St***

Based on discussions on May 18, 2022 with FHWA staff, the determination to include specific intersections within the VISSIM model shall rely on analysis to verify there are no adverse impacts from the intersection's operations on the mainline lanes. Each project team shall provide documentation detailing the factors used to exclude ramp terminal or adjacent intersections from the VISSIM models. A summary is available below by analysis segment and a map is shown in Figure 2. Figure 3 through Figure 6 show the complex areas in the Madison area that have adjacent or overlapping analysis limits.

- The Interstate north VISSIM model includes the following intersections:
  - WB I-90/94 ramp terminal at US 12 (north)
  - EB I-90/94 ramp terminal at US 12 (north)
  - WIS 13 and CTH H

- WB I-90/94 ramp terminal at WIS 23
- EB I-90/94 ramp terminal at WIS 23
- WIS 23 and Commerce Avenue
- US 12 (south) and Gasser Road
- WB I-90/94 ramp terminal at US 12 (south)
- EB I-90/94 ramp terminal at US 12 (south)
- WB I-90/94 ramp terminal at WIS 33
- EB I-90/94 ramp terminal at WIS 33
- NB I-39 ramp terminal at WIS 33
- SB I-39 ramp terminal at WIS 33
- WIS 33 & CTH U
- NB I-39 ramp terminal & Cascade Mtn Rd
- SB I-39 ramp terminal & Cascade Mtn Rd
- Cascade Mtn Rd & County U
- WIS 78 & Petro gas station access
- WIS 78 & Arco Dr
- WB I-39/90/94 ramp terminal at CTH CS
- EB I-39/90/94 ramp terminal at CTH CS
- CTH CS & Love's gas station access
- CTH CS & CTH J/Smokey Hollow Rd
- WB I-39/90/94 ramp terminal at WIS 60
- EB I-39/90/94 ramp terminal at WIS 60
- WIS 60 & Sunset Dr

- Interstate South VISSIM model includes the following intersections:
  - SB I-39/90/94 ramp terminal at WIS 19
  - US 51 & Williamsburg Way
  - WIS 19 & NB US 51 ramp terminal
  - WIS 19 & SB US 51 ramp terminal
  - US 151 (East Washington Avenue) right-in, right-outs with Frontage Road/Annamark Drive
  - US 151 and East Springs Drive
  - American Pkwy and Eastpark Drive
  - Nelson Rd and High Crossing Boulevard
  - SB I-39/90/94 ramp terminal at High Crossing Boulevard
  - NB I-39/90/94 ramp terminal at High Crossing Boulevard

- US 51(Stoughton Road) North VISSIM model includes the following intersections:
  - US 51 and Kinsman Boulevard
  - US 51 and Anderson Street
  - US 51 and US 151 (East Washington Avenue)
  - US 151 and Mendota Street
  - US 151 and Wright Street
  - US 51 and Commercial Avenue
  - Commercial Avenue/Lexington Street/Service Road intersection
  - WB STH 30 ramp terminal at US 51
  - EB STH 30 ramp terminal at US 51
- US 51 (Stoughton Road) South VISSIM model includes the following intersections:
  - US 51 and Buckeye Road
  - Buckeye Road and West Frontage Road
  - Buckeye Road and East Frontage Road
  - US 51 and Pflaum Road
  - Pflaum Road and West Frontage Road
  - Pflaum Road and East Frontage Road
  - US 51 and Broadway
  - Broadway and Copps Avenue
  - Broadway and Femrite Drive/Collins Court/Service Drive
  - WB US 12/18 (Beltline) ramp terminal at US 51
  - EB US 12/18 (Beltline) ramp terminal at US 51
  - US 51 and Terminal Drive/Voges Road
  - Terminal Drive intersection
  - Voges Road and S Dutch Mill Road/Triangle Street

*Figure 3: STH 19/US 51 Study Intersections*

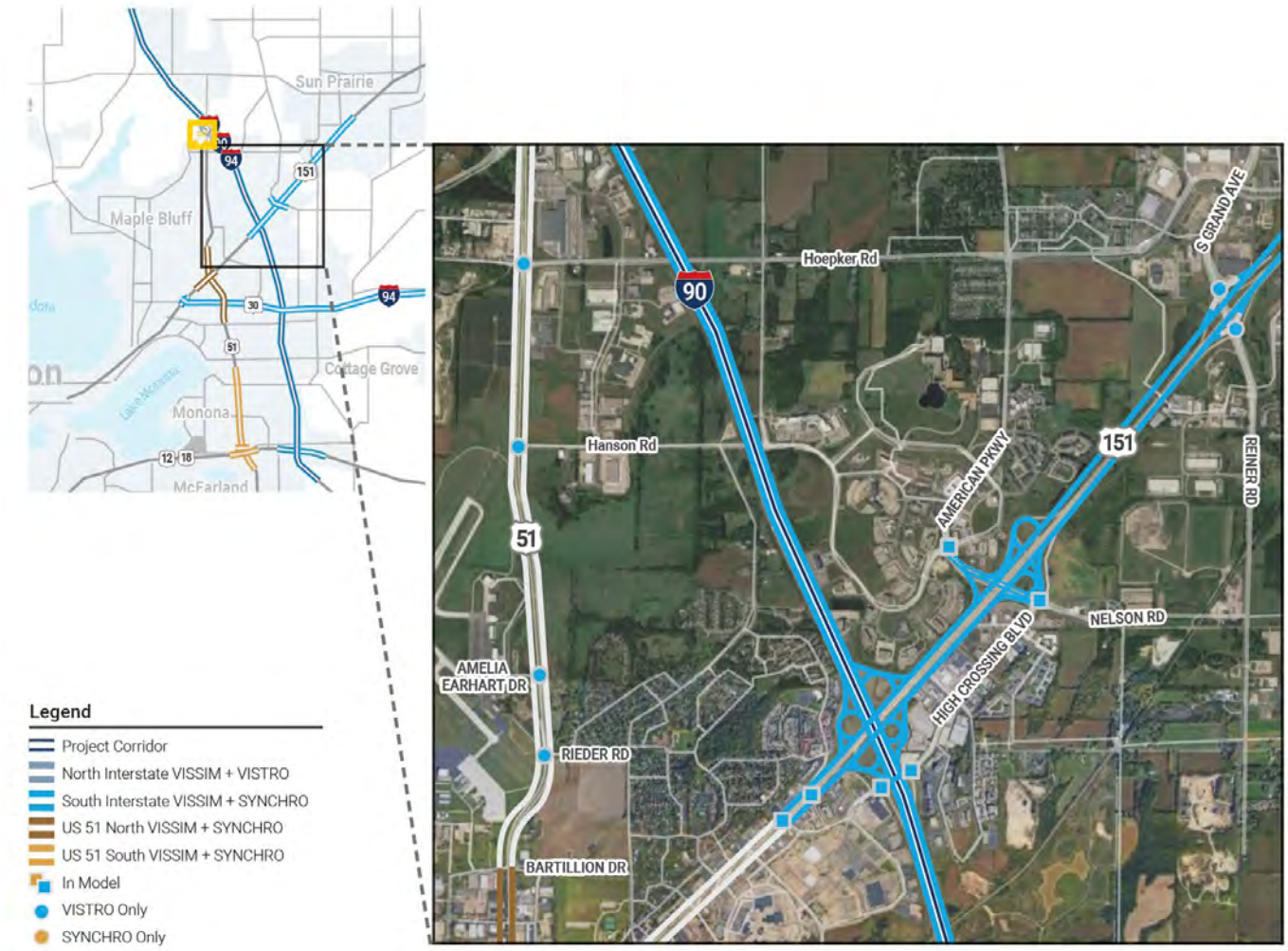


*Figure 4: US 151 Study Intersections*

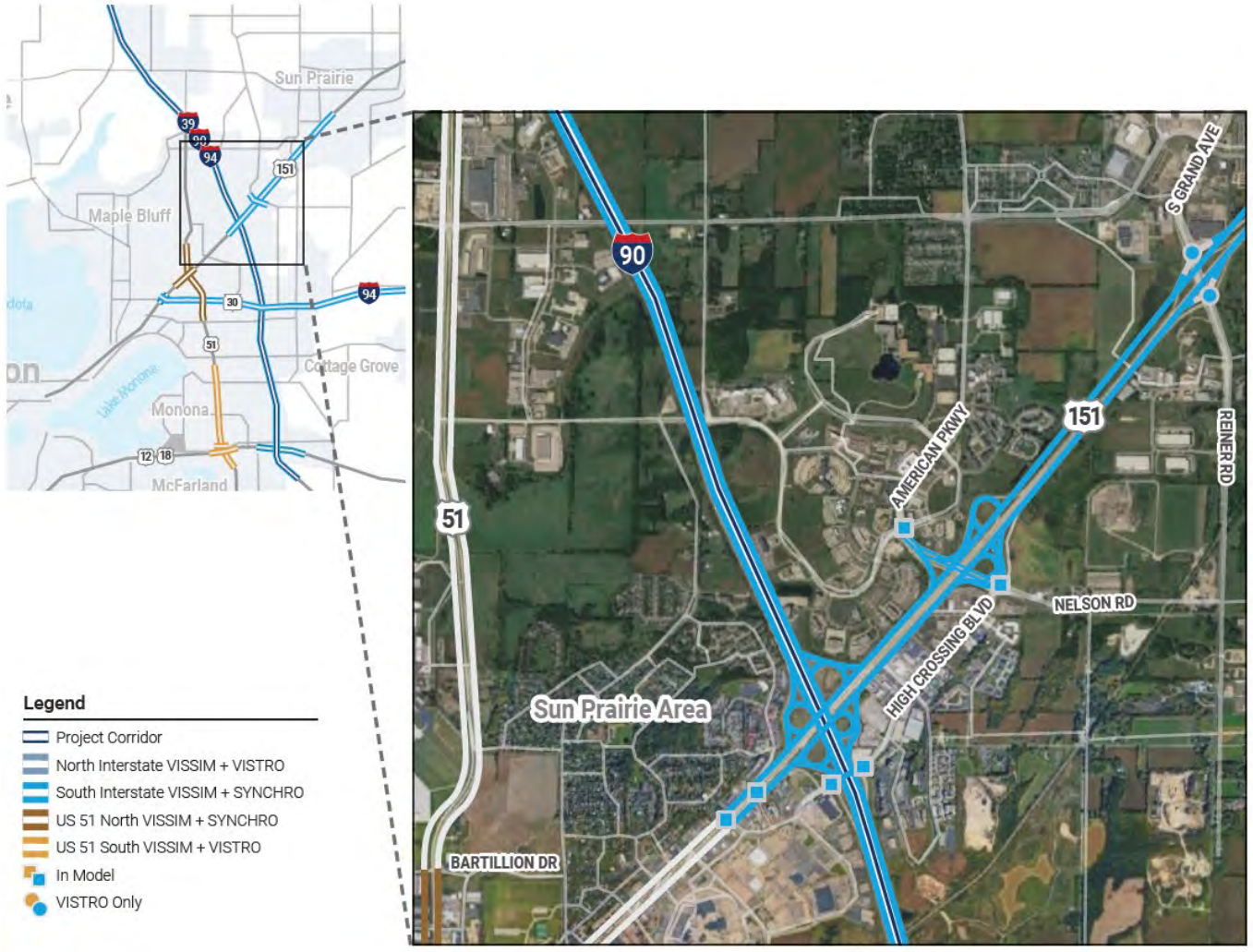


*Figure 5: US 51 at East Washington and STH 30 Study Intersections*

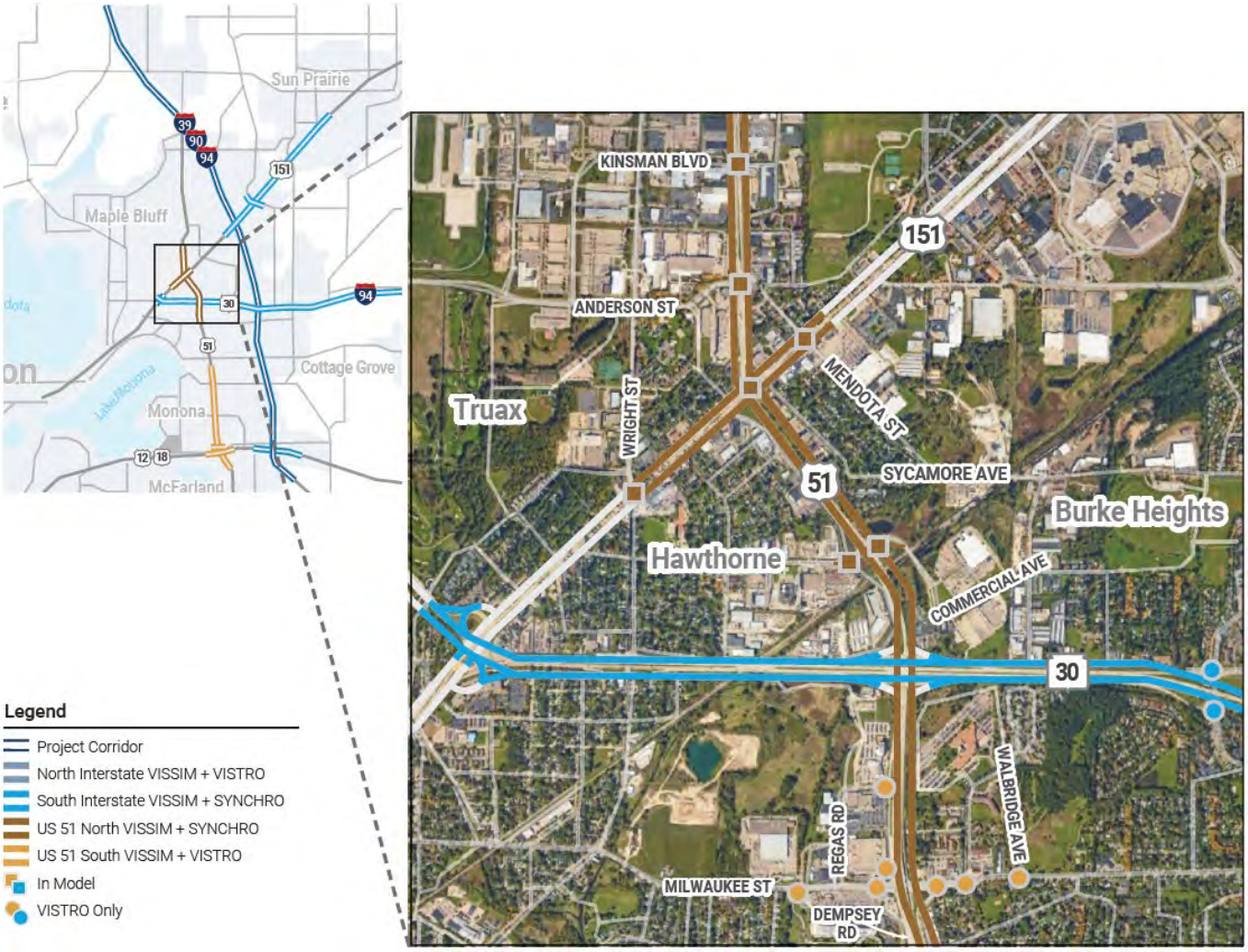
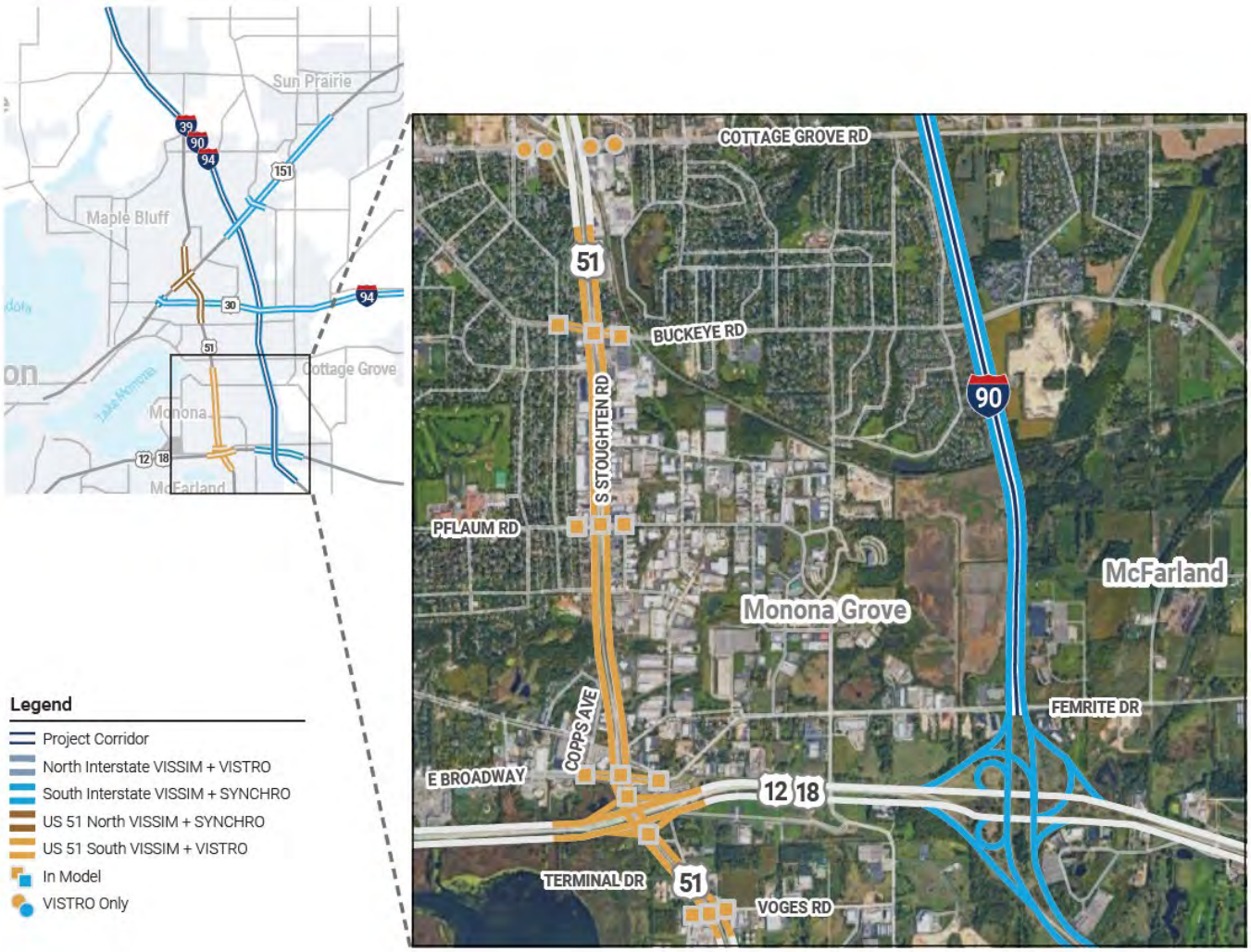


*Figure 6: South Stoughton Road intersections*




## 6. Typical Day Clusters and Temporal Limits

The traffic counts and travel times that represent a 'typical day' will be determined for each design segment through a cluster analysis. This process is coordinated through the corridor manager and is described in more detail within the Representative Day Methodology document.

The result of the 'typical day' analysis is a group of days that have similar traffic operational characteristics and form the range of operational metrics including auto and truck volumes, travel times and delays that the VISSIM model is validated to.

Model temporal analysis periods vary for each project team as follows:

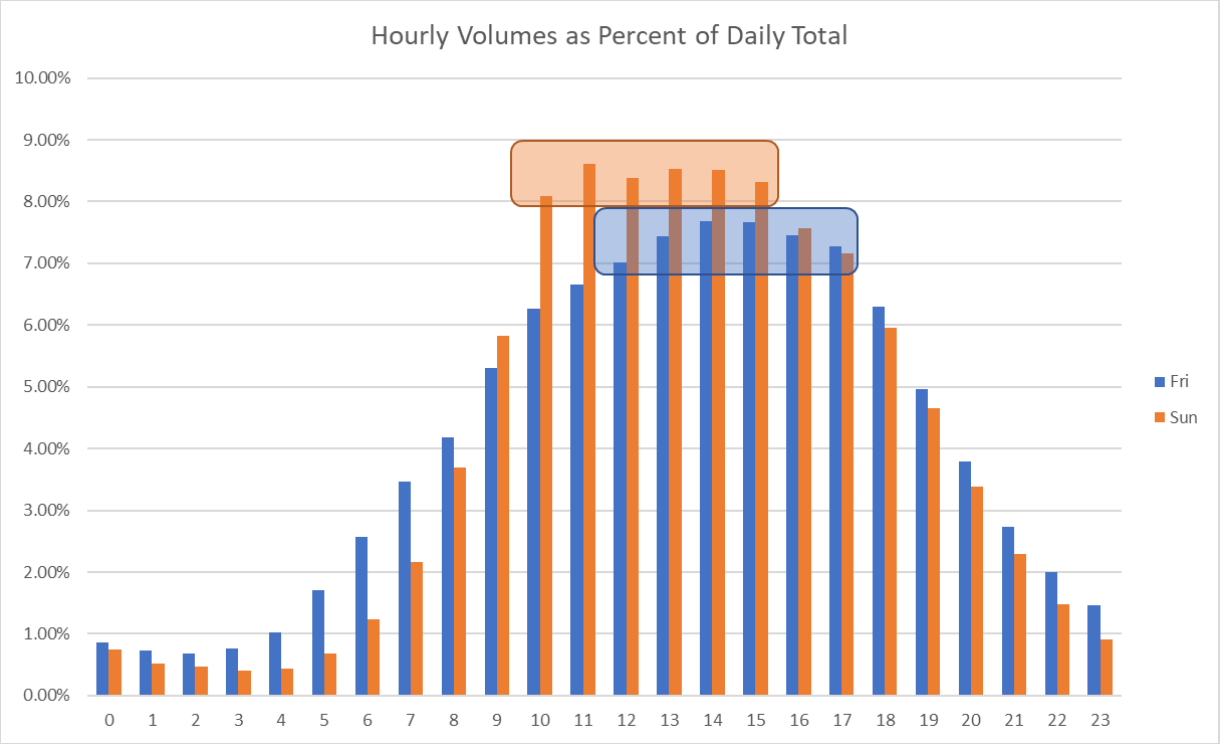
- I-39/90/94 north segment – Friday PM and Sunday PM only
- I-39/90/94 south segment – Weekday AM, Weekday PM, Friday PM, and Sunday PM
- US 51 north/central segment – Weekday AM and PM peak hours only
- US 51 south segment – Weekday AM and PM peak hours only

The exact analysis hours shall be based on continuous count site traffic data (CCS). The period shall encompass the duration of existing congestion or the project team shall provide documentation detailing the factors used to develop a shorter set of analysis hours.

## 6.1. I-39/90/94 North Segment Temporal Limits

The I-39/90/94 design team evaluated the traffic count data within their specific project limits as shown in Figure 7 and determined the hours of analysis to be Fridays between 12 PM and 6 PM and Sundays between 10 AM and 4 PM. Additional details regarding the determination of the temporal limits is available in the document "Design Considerations and Representative Day."

*Figure 7 Hourly Volumes for Interstate North segment*




## 6.2. I-39/90/94 South Segment

Four peak periods as determined by the previous I-90 Madison-Tomah Study and I-90 Vissim are being modeled:

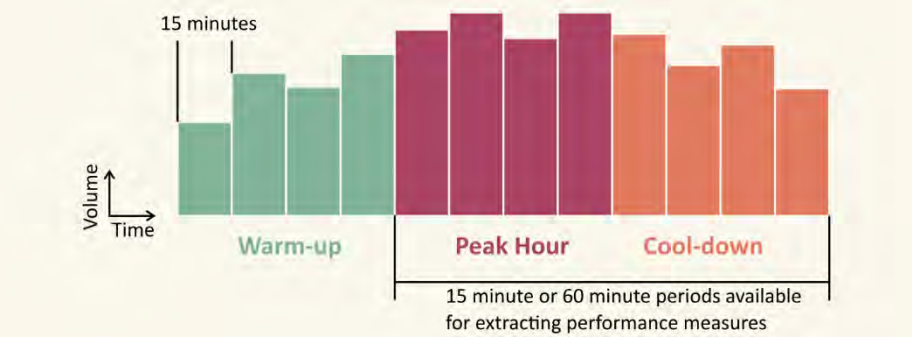
- Weekday AM (6-9 AM)
- Weekday PM (3-6 PM)
- Summer Friday PM (3-6 PM)
- Summer Sunday PM (1-4 PM)

The simulation will include **three hours** (warm-up, peak, and cool-down) for each peak period being evaluated as illustrated in **Figure 8**. The terms “warm-up”, “peak”, and “cool-down” are simply labels for each hour within the simulation; performance measures can be extracted anytime after the warm-up is complete. The longest end-to-end distance within the south segment limits suggests that approximately the first 30 to 60 minutes of the simulation is the “warm-up” time required before volumes in the model reflect peak hour conditions.

Field speed heatmap data demonstrates that a three-hour simulation captures existing typical congestion for AM, PM and FRI peak periods. For SUN, the congestion is highly variable in both location and duration. Previous analyses suggested that a 9-10 hour simulation would be needed to cover all future year FRI/SUN congestion. This is; however, neither practical nor useful due to time/budget constraints and the fact that one congested hour looks the same as 10 congested hours.

The Vissim model objective is to estimate the **level** of congestion rather than duration of congestion. A different type of model would be required to estimate the duration of congestion such as a spreadsheet estimate, meso, macro, etc. Additional information is available in the document "Design Considerations and Representative Day."

*Figure 8. Example Vissim Simulation Duration and Flow Profile*




*(for illustration purposes only)*

## 6.3. US North Segment

The US 51 North segment VISSIM analysis includes weekday AM and PM peak hour models. The segment team utilized available Streetlight data to formulate an AM and PM seed matrix to represent the existing traffic distributions along US 51. Ten random seed VISSIM model runs were utilized and the average output of the ten seeds was used for calibration purposes.

## 6.4. US 51 South Segment

Warm-up and cool down periods shall be incorporated by each project team to include:

- The warm-up period shall be at least double the free-flow travel time from one end of the network to the other
- The cool down period shall be incorporated that adequately models the dissipation of existing congestion

## 7. StreetLight Data

StreetLight is a data analysis company that processes cellular phone data to estimate the movement of people. StreetLight's data is processed such that individual phone users are not identifiable, thus maintaining privacy. StreetLight data provides subscribers with access to various transportation-specific data elements including custom origin to destination traffic volumes and travel times by specific days and times. StreetLight also combines other data sets such as US Census information to estimate the purpose of the trips.

- Corridor manager will develop StreetLight zone sets that can be utilized by each project team
- Each project team has access to the StreetLight online platform and is responsible for running analyses specific to their model
- Each project team shall utilize Streetlight data as part of their existing origin-destination matrix estimation (ODME) procedure
    - Data shall be utilized for days included in the typical clusters
    - Day types shall match temporal analysis periods
    - Day parts shall match hours within each temporal analysis period

## 8. Vehicle Inputs and Types

Vehicle input and vehicle type requirements include:

- Traffic volumes shall be input into the models in 15 minute intervals
- I-39/90/94 models shall utilize passenger car, single unit trucks, and tractor trailer trucks vehicle types
    - Vehicle classification data may be used to modify vehicle profile data including incorporating personal vehicles towing boats and trailers
    - Slow and fast vehicle types are likely necessary to match field lane utilization percentages
- US 51 models shall utilize passenger car and truck vehicle types (single unit and tractor trailer combined)
    - Slow and fast vehicle types are unlikely to be needed as part of an arterial model

## 9. Speed Distributions

Speed distribution requirements include:

- Existing speed distributions developed for the Interstate south segment shall be used as a starting point for the Interstate north model. WisDOT default speed distributions may be used as a starting point for the US 51 models. Speed distribution values can be modified for specific segments based on segment characteristics such as weaving or merge/diverge by each project team based on NPMRDS data and documented appropriately
- Utilize separate car and truck speed distributions

## 10. Calibration

Follow TEOpS Chapter 16-20 Attachment 6.3 (VISSIM Calibration Parameters) for global and local parameter typical ranges

## 11. Validation

I-39/90/94 models shall be validated based on the following metrics:

- Hourly traffic volumes (mainlines, ramps, and turning movements)
- Sub-hour (15 min) travel times (logical segments of 1.5 miles or more)
  - Each project team shall gather speed and travel time data from the National Performance Measures Research Data Set (NPMRDS)
- Sub-hour (15 min) spot speeds
- Sub-hour (15 min) lane utilization

- US 51 models shall be validated based on the following metrics:
  - Hourly turning movement volumes
  - Sub-hour (15 min) travel times (logical segments of 1.5 miles or more)
  - Intersection queues (based on field observation)

## 12. Performance Measures

VISSIM microsimulation analysis is intended to provide the design teams with the following performance measures:

- Vehicle volumes and density for use in accessing level of service. This data shall be collected such as to provide analysis for mainline, merge, diverge and weave segment analysis.
- Spot speeds by lane by 15 minute period for further processing to developing speed contour maps of the corridor.
- Travel times between key locations throughout the corridor by 15 minute period.

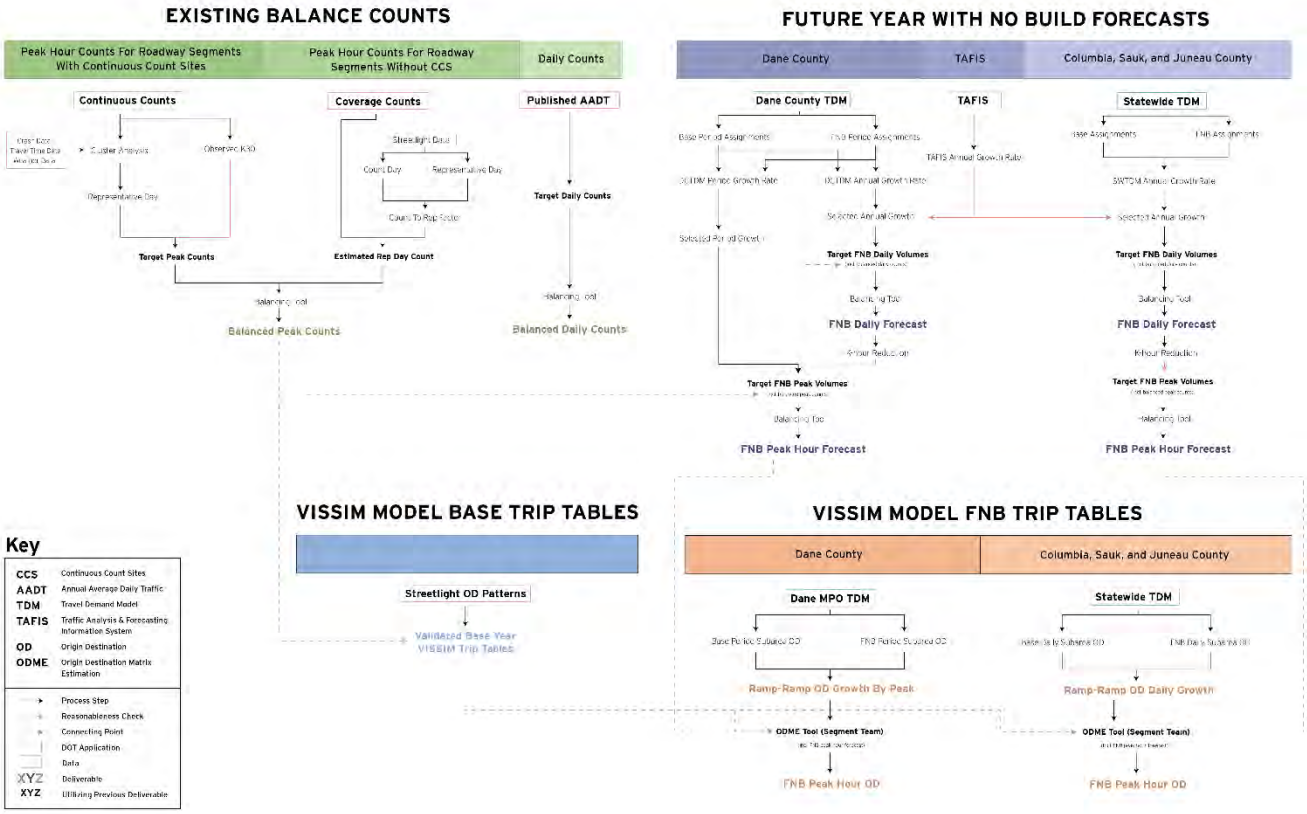
## 13. Traffic Forecasts

Traffic forecasts shall be provided to the project teams as peak hour line diagrams and demand model generated trip tables. Project teams shall develop required VISSIM model demands for all analysis hours to be consistent with the provided peak hour forecasts. This process is outlined in the "Traffic Forecasting Methodology."

The demand model generated trip tables provide ramp to ramp movements for the Interstate segments and external to external movements for the Stoughton Road segments. The demand model tables include base year, future no build and future build outputs. Segments within Dane County shall receive peak period tables from the Dane County travel demand model. Columbia, Juneau and Sauk county segments shall receive daily trip table information from the Wisconsin statewide travel demand model.

Figure 9 below shows a flow chart of the VISSIM model future trip table development process described in this section. The demand model tables shall be used in conjunction with the peak hour line diagram values to generate trip tables for use within VISSIM through the use of an origin-destination matrix estimation (ODME) process. The validated base year VISSIM tables form the basis for future year VISSIM tables. The change in demands as projected by the demand models between ramps or externals is applied to the validated base year VISSIM trip table to form a future year seed table. That future year seed table is then processed through the ODME to align with the forecasted future year peak hour forecasts.

*Figure 9. VISSIM Model Future No Build Trip Tables' Flow Chart*




## 14. Documentation

Each project team shall submit corresponding reports with existing and subsequent future year model peer review submittals which details model specific edits/calibration, ODME, and validation results.

# I-39/90/94 and US 51 Corridor Studies

| | |
|---|---|
| **Date:** | 4/4/2024 |
| **Topic:** | High Level Traffic Impacts of Various Interstate South and US 51 Alternatives |
| **From:** | Jerry Shadewald, PE, PTOE |

## 1. Introduction

The purpose of this briefing paper is to provide a high-level assessment of traffic impacts from potential interchange and mainline alternatives for the Interstate South and US 51 studies.

## 2. Methodology

The Dane County Travel Demand Model (DCTDM) is maintained by the Madison Metropolitan Planning Organization (MPO) and was made available to WisDOT for use on the Interstate South project and both US 51 north and south studies. DCTDM was used by the CDMCT and the Interstate South design teams to estimate changes in travel patterns for evaluating alternatives and developing traffic forecasts. CDMCT conducted additional validation efforts on the 2016 model, particularly regarding the AM and PM peak period components as documented in the Dane County Travel Demand Model Validation Report.

DCTDM inputs for 2050 were shared with the design teams and local stakeholders with revisions made to anticipated land uses to more closely align with current planning efforts. Additional employment was added to the DCTDM 2050 input files for the Epic area in Verona and the Interstate 39/90/94, WIS 19 and US 51 triangle south of DeForest. The DCTDM 2050 baseline condition model included committed roadway improvements and the MPO's following recommended bike, pedestrian and transit networks:

- Additional bicycle and pedestrian connections throughout Dane County
- Bus Rapid Transit (BRT) for both east-west and north-south alignments along with local service extensions.
- Routes in the Metro Network Redesign that focus resources on frequent service to densely developed corridors
- Regional express routes to outlying communities
- Routes added based on projected development along corridors including:
    - BRT to southwest and east Madison
    - N-S BRT to Fitchburg
    - BRT to Middleton
    - High frequency routes along Johnson/Gorham, Williamson Street, Monroe Street, Atwood Avenue, Old University Avenue and Watts Road

The DCTDM was then executed with the 2050 baseline conditions (no modifications to model inputs including no changes of the roadway with the Interstate south limits). The DCTDM was then rerun with various changes in 2050 model inputs including combinations of roadway alternative improvements. The following section provides a high-level assessment of the DCTDM's predicted changes in travel patterns with particular alternatives.

## 3. Base Year 2016 to 2050 Traffic Shifts

The DCTDM was executed with both the 2016 and 2050 datasets to estimate the changes in travel patterns resulting in the projected growth in housing and employment throughout Dane County. Figure 1 shows changes in daily directional traffic volumes for eastern Dane County. Note the major roadways throughout the area are predicted to have higher traffic volumes in 2050, many by more than 10,000 vehicles per day compared to the 2016 condition as indicated by the red coloring. Traffic forecasts for the Interstate 39/90/94 corridor were developed using both the DCTDM and WisDOT's Traffic Analysis and Forecasting Information System (TAFIS), consistent with WisDOT policy. The Interstate 39/90/94 corridor traffic volumes are predicted to grow between 0.37% and 1.19% annually. Total person trips for all of Dane County are predicted to increase by 1.15% annually while transit trips are predicted to increase 1.65% annually due in part to the increased transit service in the 2050 model input.

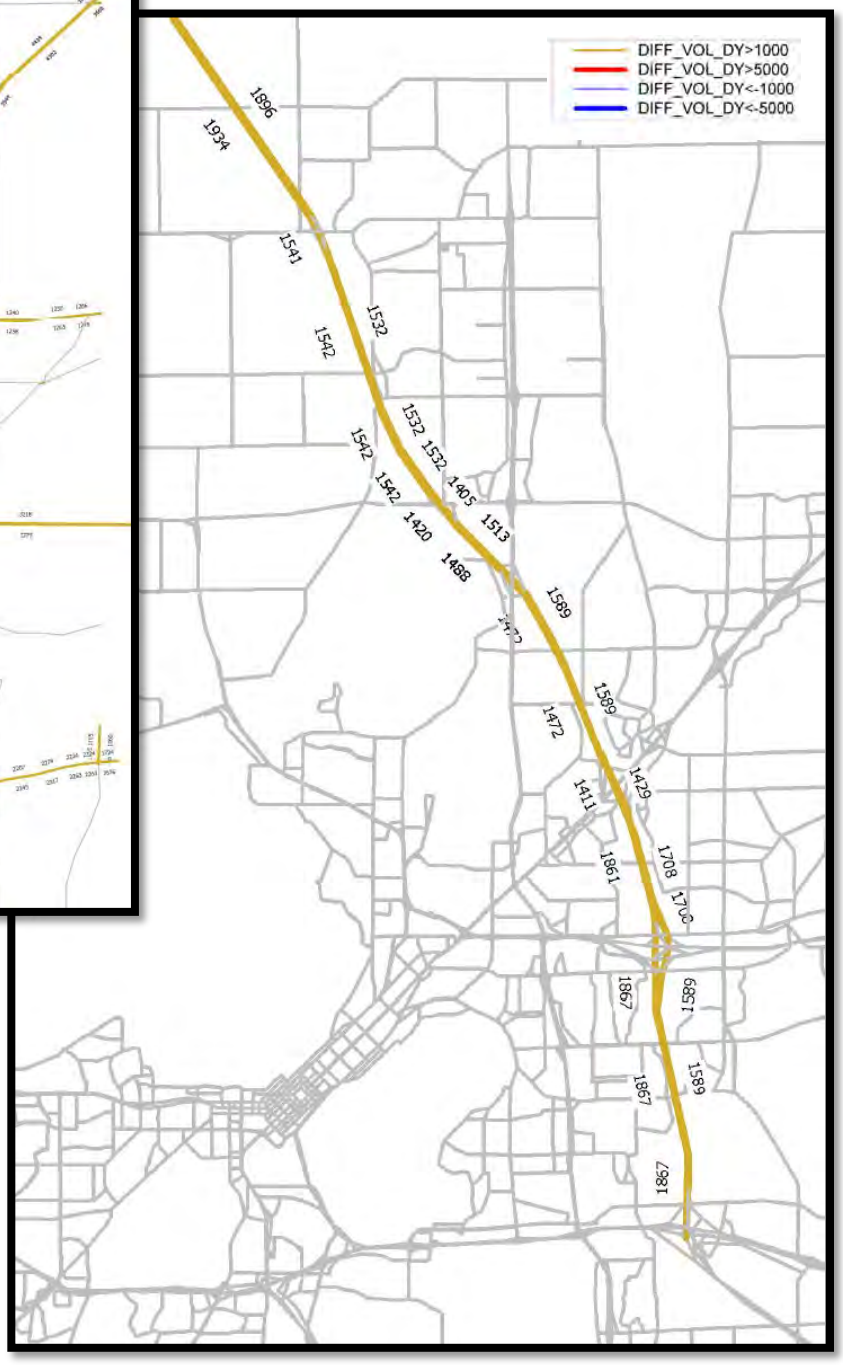
## 4. Additional Interstate Capacity

The Interstate South and Interstate North studies are both considering additional roadway capacity to improve traffic operations and improve travel time reliability between US 12/18 in Madison to US 12/WIS 16 in Wisconsin Dells. Since the DCTDM only covers Dane County, the Wisconsin Statewide Travel Demand Model (SWTDM) was used to project travel pattern changes from an additional Interstate lane between Madison and Wisconsin Dells. The SWTDM's predicted change in travel at the Dane/Columbia county line was then entered into the 2050 DCTDM. The 2050 DCTDM roadway network was then updated to include additional capacity on the Interstate system between the US 12/18 interchange and the Dane/Columbia county line. The expansion included one additional lane each direction, with a second additional lane each direction between US 12/18 and US 51. Figure 2 shows that the additional capacity on the Interstate increases volumes along the Interstate corridor. The increased volume is very regional in nature with the projected increase ranging from 1400 to 2000 vehicles per day each direction. This alternative results in the US 12 corridor between Madison and Wisconsin Dells having a small statewide travel demand model-projected reduction in volume. PM peak period volumes also indicate a minor decrease in volumes along the US 51 corridor between US 12/18 and WIS 30.

Vehicle miles traveled (VMT) increase 71,800 miles per day (0.37% of Dane County total) with the additional capacity.

*Figure 1 Traffic Volume Growth Between 2016 and 2050*

*Figure 2 2050 Traffic Volume Shift From Additional Interstate Capacity*



## 5. Hoepker Road Interchange

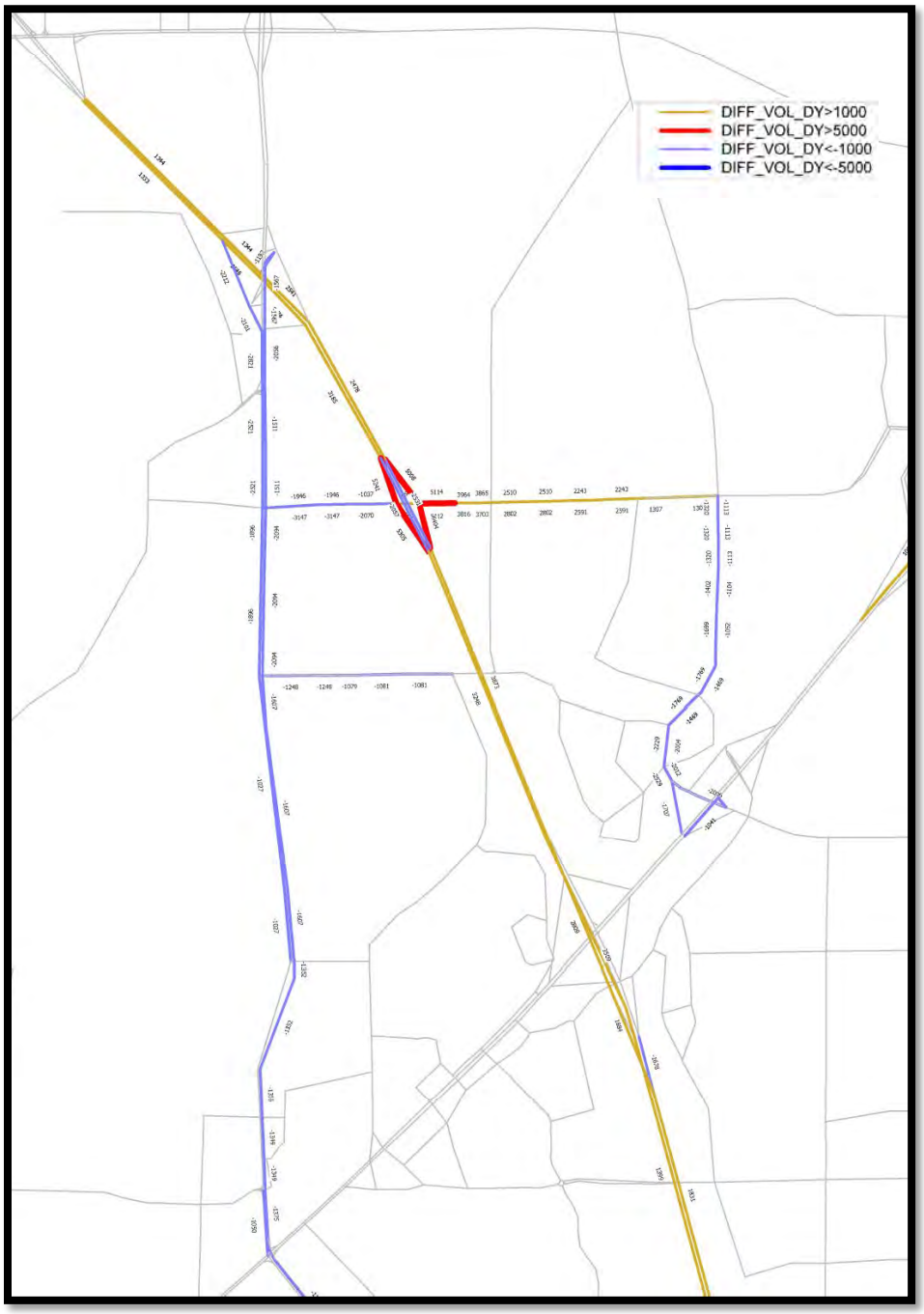
Hoepker Road connects CTH CV and US 51 with American Parkway and Grand Avenue, passing over Interstate 39/90/94. Constructing an interchange between Interstate 39/90/94 and Hoepker Road is being considered. The DCTDM network was updated to include the new Hoepker Road access.

Figure 6 shows the daily traffic differences with a proposed Hoepker Road interchange. The Interstate system volumes would be anticipated to increase between 2500 and 3900 vehicles per day per direction between US 51 and US 151, with smaller increases for the adjacent sections between WIS 19 and I-94. These volumes are primarily traffic diverted from US 51 and American Parkway which are projected to have traffic reductions of 1000 to 2000 vehicles per direction.

Volumes are projected to also increase on Hoepker Road east of the proposed interchange, however Hoepker Road volumes west of the interchange are projected to decrease. This reduction is due in part to regional travelers from the north exiting I-39/90/94 at US 51 destined for activities along Hoepker east of the Interstate who would use the Hoepker Road interchange instead.

County-wide VMT increases 8,400 miles per day, 0.04% of county total with access to the high-speed Interstate facility.

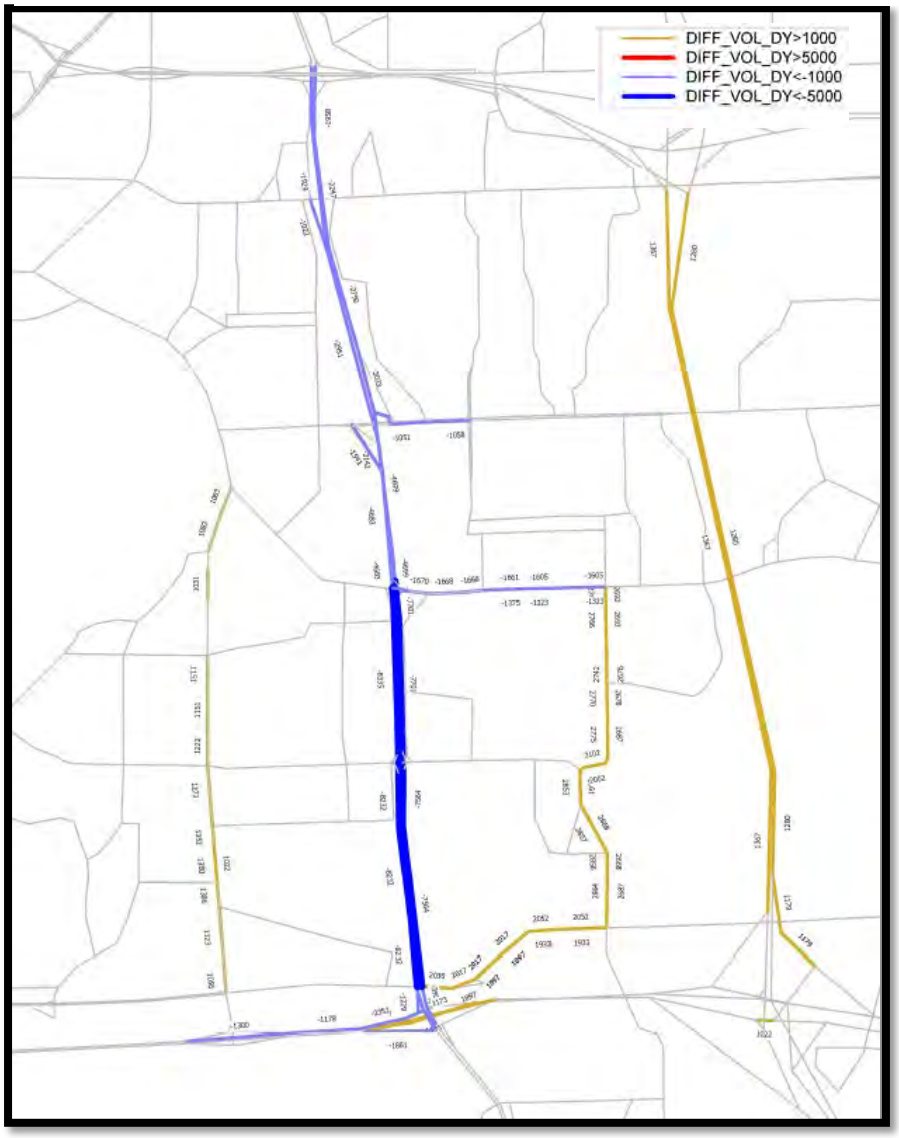
*Figure 3 2050 Daily Traffic Volume Shifts from Hoepker Road Interchange*




A similar scenario was evaluated that included the additional capacity on the Interstate with and without the Hoepker Road interchange. Hoepker's traffic shifts with an expanded I-39/90/94 are similar in extent with approximately 200 additional daily vehicles per direction on I-39/90/94.

## 6. Stoughton Road South

*Figure 4 2050 Daily Traffic Volume Shifts from South Stoughton Road Speed Reduction*




The South Stoughton Road (US 51) corridor is being studied between Voges Road and WIS 30. The initial discussions include a potential reconfiguration of US 51 to be less of a barrier to the community. While the study has not progressed sufficiently to provide detailed alternatives, the City of Madison would like to investigate a configuration that effectively reduces the speed along US 51 between US 12/18 and Buckeye Road. The DCTDM was coded with a 20% speed reduction along this stretch of US 51.

Figure 4 shows daily traffic is projected to decrease approximately 27-30% on US 51 through the impacted stretch with traffic diverting to I-39/90, Monona Drive to the west and Agriculture Drive/Vondron Drive to the east. The 1300 vehicles per day increase on I-39/90 represents less than 2.5% increase in projected volume. DCTDM also predicted nearly 1000 trips shifting to the non-motorized mode due to the speed reduction.

Impacts to US 51 north of WIS 30 are projected to be under 1000 vehicles per day per direction. VMT decreases in Dane County by 27,600 miles per day in Dane County, due in part to the shift to non-motorized travel and in part from the lower speed discouraged the out of direction travel afforded to drivers who used the higher speed Stoughton Road corridor.

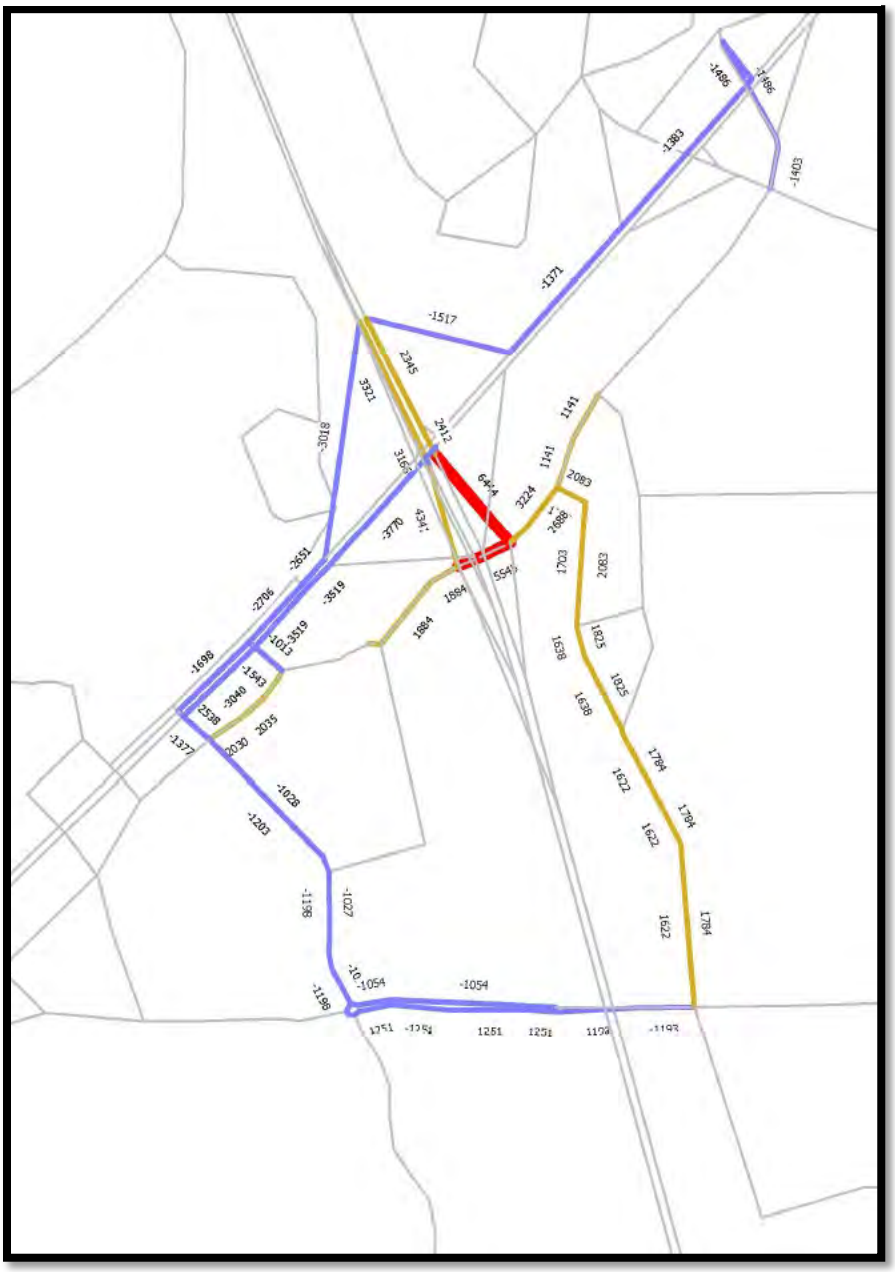
A similar scenario was evaluated that included the additional capacity on the Interstate with and without the Stoughton Road South speed reduction. The speed reduction's traffic shifts with an expanded I-39/90 are similar in extent with approximately 200 additional daily vehicles per direction on I-39/90.

## 7. High Crossing Boulevard Interchange North Ramps

High Crossing Boulevard currently has a half interchange with I-39/90/94 with northbound exit and southbound entrance ramps. There are currently no northbound entrance or southbound exit ramp. The DCTDM was coded to include the two missing movements to/from the north. Figure 5 shows that projected daily traffic shifts are local in nature with essentially no change in traffic patterns on I-39/90/94. Vehicles using US 151 to make movements to/from the north via I-39/90/94 could get directly to I-39/90/94.

Dane County VMT decreases nearly 5000 miles per day by replacing the longer distance access/egress routes between High Crossing Boulevard and I-39/90/94 to/from the north with direct ramp connections.

*Figure 5 2050 Daily Traffic Volume Shifts from North Ramps at High Crossing Boulevard*



## 8. Milwaukee Street Interchange

The City of Madison is planning to construct an extension of Milwaukee Street to cross under I-94 east of the Badger (I-39/90 and I-94) interchange. This extension is part of the 2050 committed improvements included in the DCTDM's 2050 network. A potential alternative is to construct a full interchange with I-94 as part of the extension. DCTDM was coded to include the interchange ramps and rerun. Figure 6 shows that traffic diverts from CTH N and the CTH N interchange and instead uses CTH T to access I-94 via the Milwaukee Street interchange. Volumes are projected to shift from CTH TT between CTH T and CTH N as those trips can be facilitated on I-94. Vehicles from the southern Sun Prairie area heading to I-39/90/94 north of US 151 are projected to travel south and access the Interstate system via Milwaukee Street, which is leading to the 15,600 mile (0.08%) increase in Dane County VMT.

## 9. Doubling Transit

The DCTDM was executed with an alternative that doubled the number of people using transit and removing those person trips from the auto mode. For this exercise, each person trip between an origin and destination as determined by the DCTDM to use transit was doubled up to the total amount of trips for each origin to destination pair, resulting in 182,000 total transit trips. The person trips shifted from the auto mode were reduced from the auto trip tables using an average auto occupancy of 1.5 persons per vehicle (which is a conservative approach which is removing more auto trips than using a more anticipated value of 1.7 persons per vehicle would remove). This results in approximately 60,000 fewer auto trips across Dane County. Figure 7 shows the regional nature of the auto volume reductions related to the doubling of transit, with I-39/90/94 auto volumes projected to decrease between US 12/18 and US 151 by 1125 to 1350 vehicles per direction per day.

0.7 to 2.3% fewer auto trips are projected on Interstate 39/90/94 between WIS 19 and US 12/18 if transit ridership were doubled. Interstate volumes are essentially unimpacted for segments north of WIS 19.

0.3 to 2.7% fewer auto trips are projected on US 51 between WIS 19 and WIS 30 if transit ridership were doubled.

0.9 to 2.5% fewer auto trips are projected on US 51 between WIS 30 and Voges Road if transit ridership were doubled.

Vehicle miles traveled (VMT) by automobiles in Dane County with a doubling of transit ridership are projected to decrease 2.2%. Doubling the transit ridership would likely require additional transit vehicles to serve the additional riders which would offset at least a portion of the auto VMT reduction.

*Figure 6 2050 Daily Traffic Volume Shifts with Milwaukee Street Interchange.*

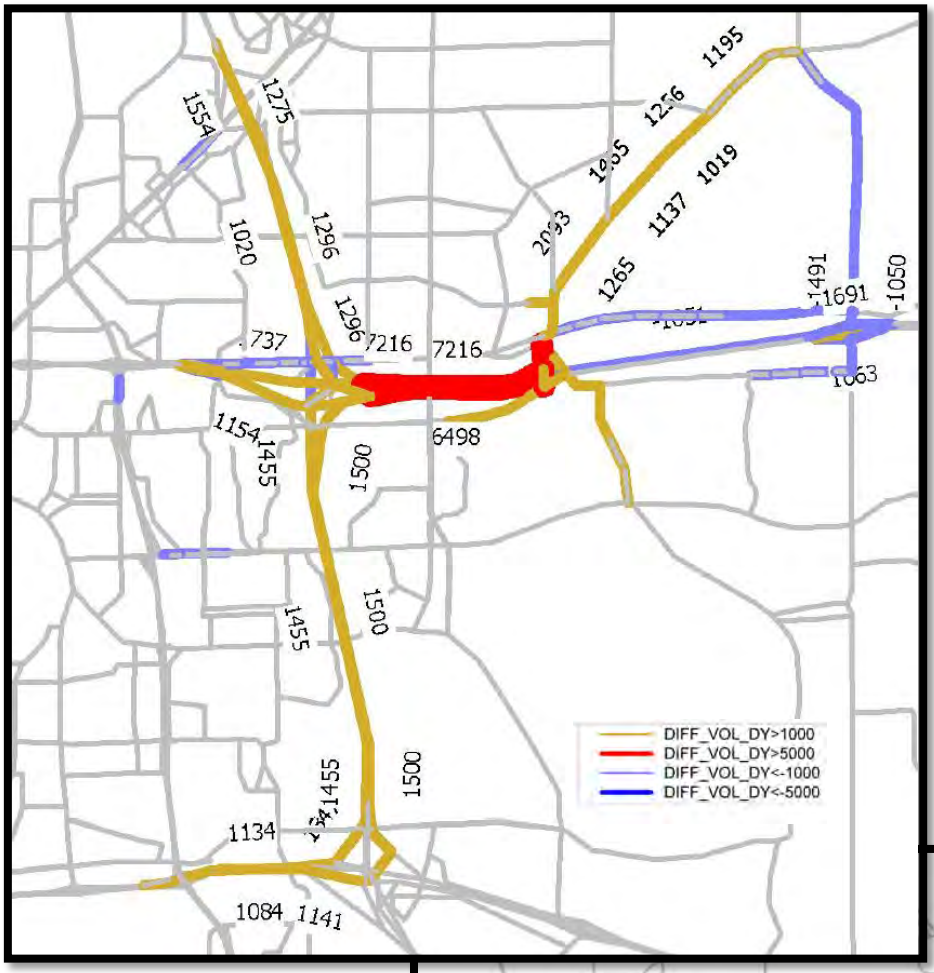
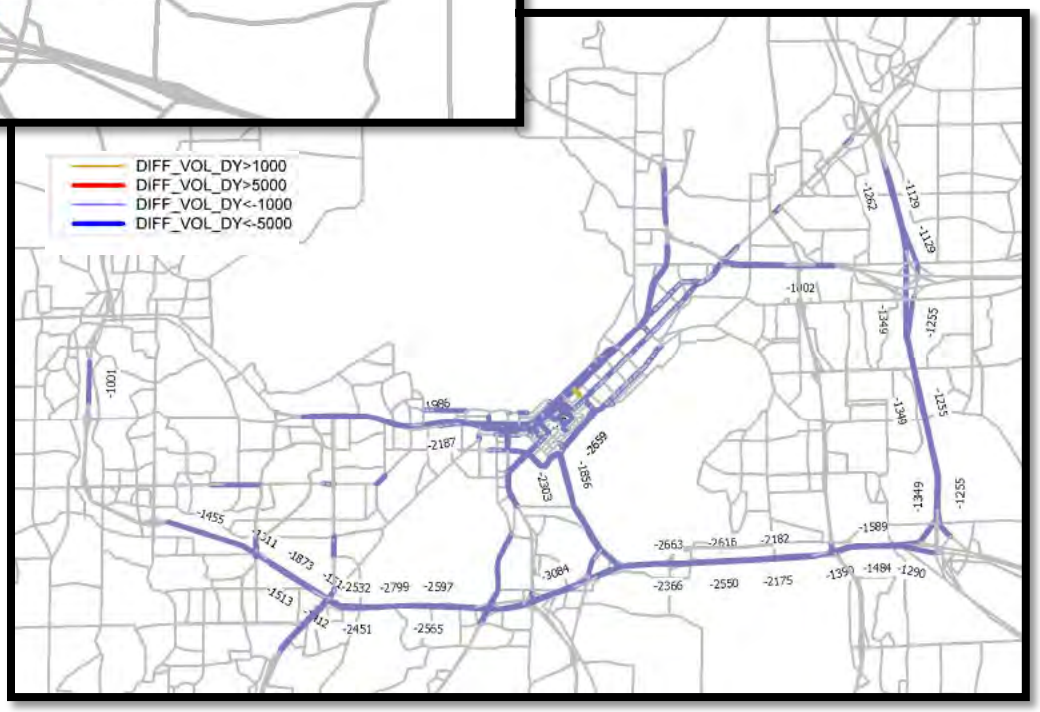



*Figure 7 2050 Daily Traffic Volume Shifts with Doubled Transit Trips*

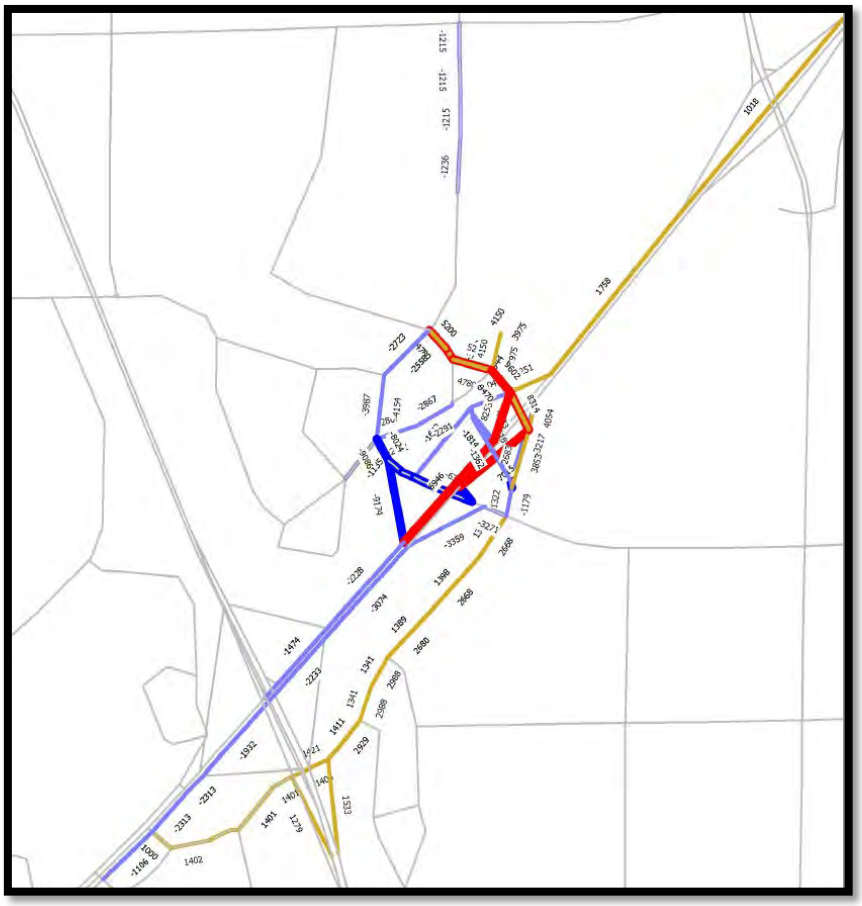


## 10. American Parkway Interchange Reconfiguration

The interchange between US 151 and I-39/90/94 may require modifications to improve traffic operations on the Interstate. These modifications may require modification of the US 151 interchange with American Parkway, aligning the ramps with an extended American Family Drive. A scenario was tested within the DCTDM to evaluate the impacts of a realigned American Parkway and ramping to/from US 151 along with associated minor changes in transit routes using the American Parkway interchange.

Figure 8 indicates changes in traffic patterns to be local in nature, with 4000-5000 vehicles shifting from US 151/East Washington Avenue to High Crossing Boulevard between American Parkway/Nelson Road and East Springs Drive. VMT and VHT both decrease with this scenario, due in part to removal of loop ramps that require out of direction travel to access US 151.

*Figure 8 2050 Daily Traffic Volume Shifts from American Parkway Reconfiguration*



## 11. WIS 19 Widening

WIS 19 between River Road and Williamsburg Way is being considered for expansion to improve traffic operations within the I-39/90/94 interchange. DCTDM was executed with a 6-lane cross section to estimate the shift in traffic from the additional capacity, but impacts were predicted to be less than 500 vehicles per day in either direction. An increase of up to 50 vehicles on WIS 19 at the I-39/90/94 ramp terminals and points west for peak hour analysis is recommended but no other traffic shifts are predicted.

## 12. Hoepker Road and High Crossing North Ramps

A scenario was tested with both the Hoepker Road interchange and the two High Crossing Boulevard ramps to/from the north included. The projected traffic shifts are shown in Figure 9. Comparing the shifts from the two projects combined with the two individual project's projected shifts from Figure 3 and Figure 5, the extents and magnitudes are similar. Hoepker Road interchange and the north High Crossing Boulevard projects have impacts that are essentially exclusive from each other.

## 13. Hoepker Road and Milwaukee Street Interchanges

The DCTDM was updated to include both the Hoepker Road interchange and the Milwaukee Street interchange.

Figure 10 shows the shifts in traffic with both the Hoepker Road and Milwaukee Street interchanges included. Comparing Figure 3 and Figure 6 to Figure 10, the combination of the two interchanges have similar diversions both individually as when combined. The increase in volume on I-39/90/94 with both interchanges is slightly higher through the US 151 interchange (4700 to 5300 per direction per day) compared to combining the two single scenarios (4400 to 4800 per direction per day). Hoepker Road interchange and the Milwaukee Street interchange projects have impacts that are relatively exclusive from each other with a small increase in additional volume on the I-39/90/94 mainline.

*Figure 9 2050 Daily Traffic Volume Shifts from Hoepker and High Cross Interchanges*

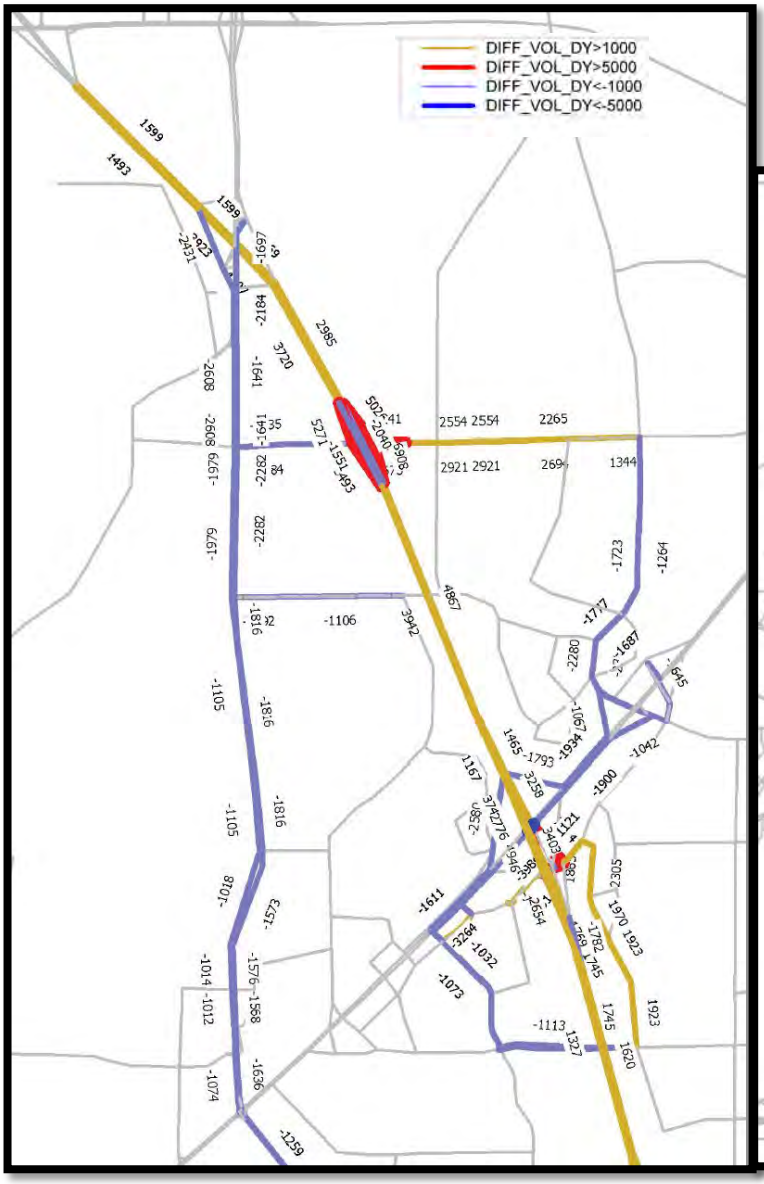
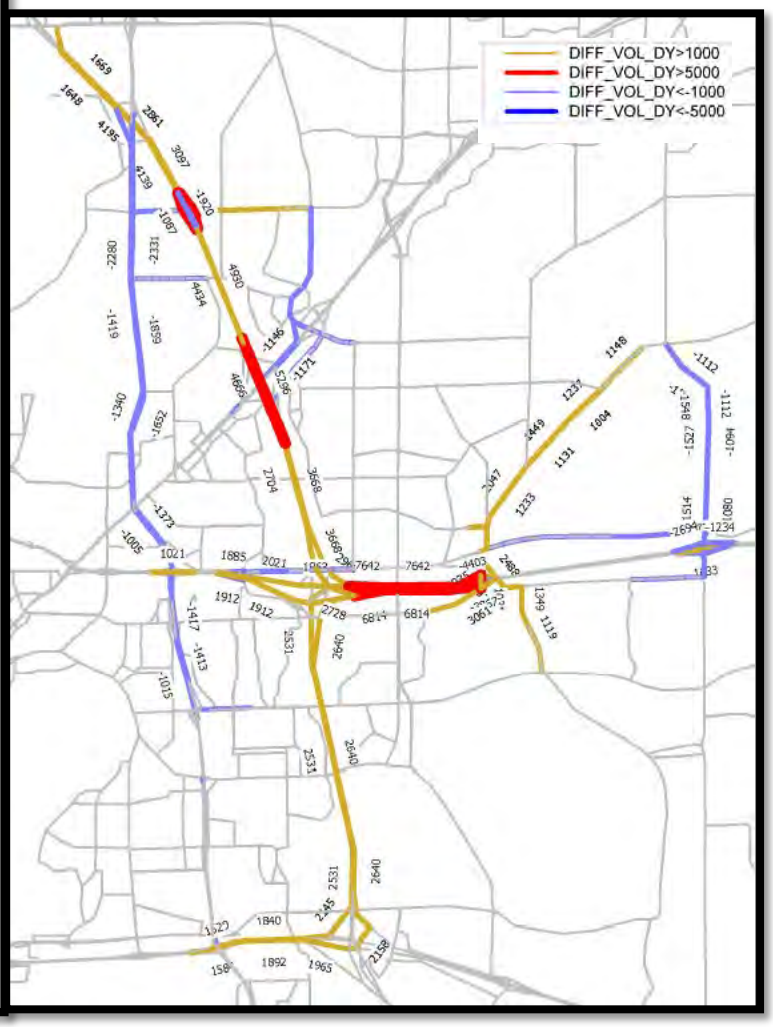


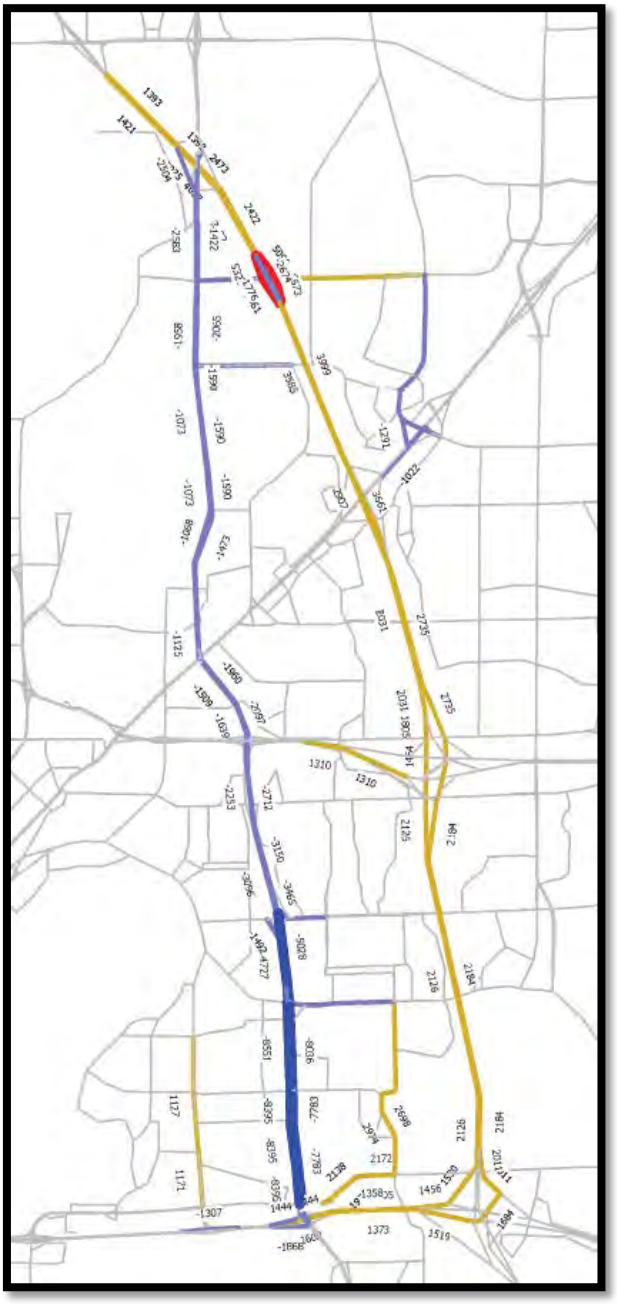

*Figure 10 2050 Daily Traffic Volume Shifts from Hoepker and Milwaukee Interchanges*



## 14. Stoughton Road South, Hoepker and Interstate Capacity

A scenario was evaluated that included the Stoughton Road South speed reduction, the potential interchange at Hoepker Road and the additional capacity on the Interstate system. Figure 12 shows that the scenario shifts traffic demands from US 51 to the Interstate system, which increases use of the ramps between the Interstate and the US 12/18 corridor to the west in addition to the ramps to/from WIS 30. The inclusion of the Hoepker interchange reduces traffic on US 51 between the Interstate and US 151 along with American Parkway and Hanson Road corridors.

*Figure 11 2050 Daily Traffic Volume Shifts from Stoughton Road, Hoepker and Interchange Capacity*

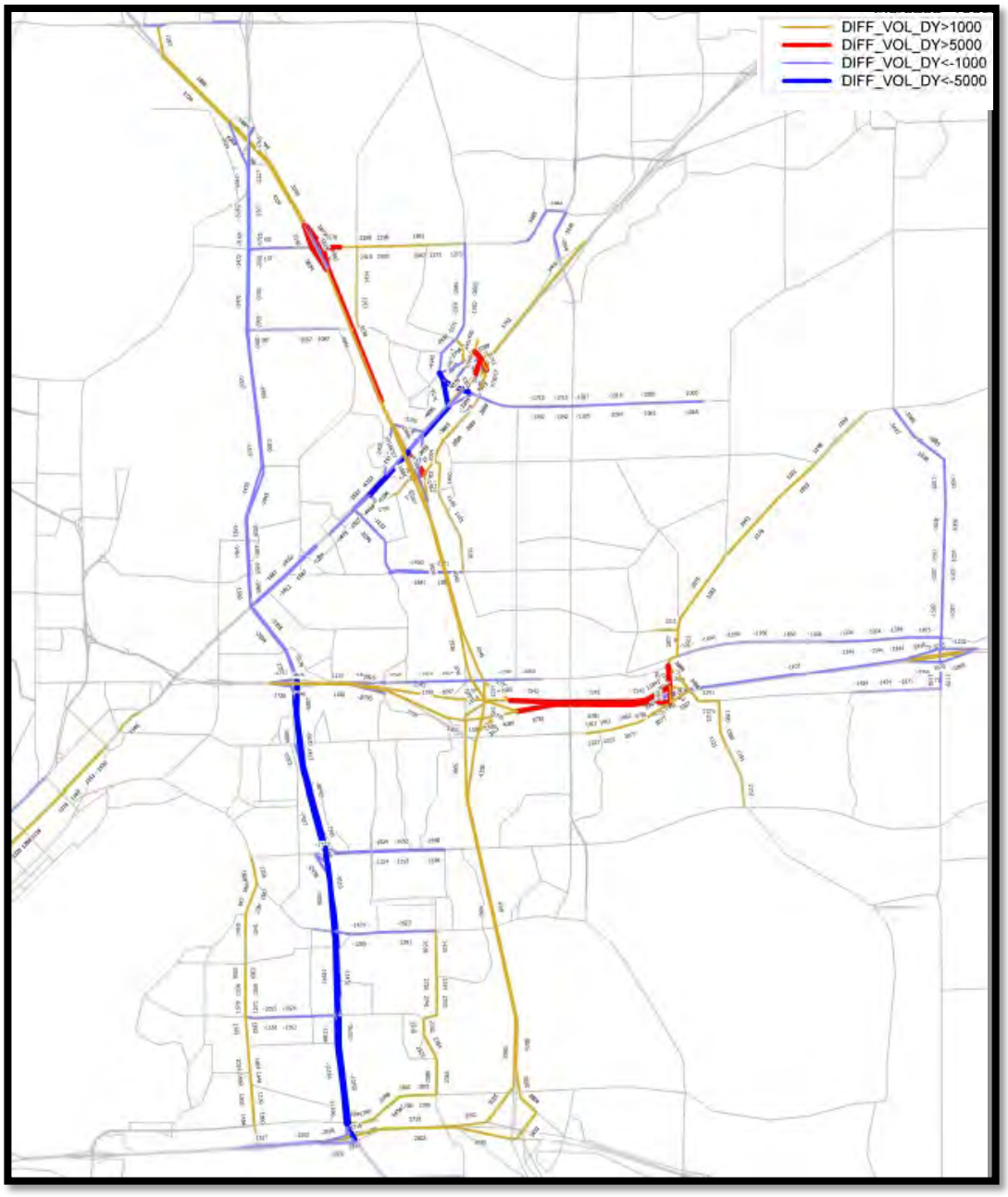


## 15. Stoughton Road South, Milwaukee Street, Hoepker Road, American Parkway and High Crossing Interchanges

A scenario was tested with speed reductions on South Stoughton Road, new interchanges at Milwaukee Street and Hoepker Road, reconfigured American Parkway and the inclusion of the north ramps at High Crossing Boulevard. Figure 12 shows the various impacts across the Madison area from the implementation of these four projects. Note that nearly all roadways that are shown as being impacted with the four projects were also shown as being impacted by one of the four facilities individually with a few notable exceptions:

- additional traffic reduction on WIS 19 west of US 151,
- additional traffic reduction on Cottage Grove Road west of I-39/90,
- additional traffic reduction on Nelson Road east of US 151.

*Figure 12 2050 Daily Traffic Volume Shifts from Stoughton Road South, Hoepker and Milwaukee Interchanges, American Parkway reconfiguration and High Crossing North Ramps*

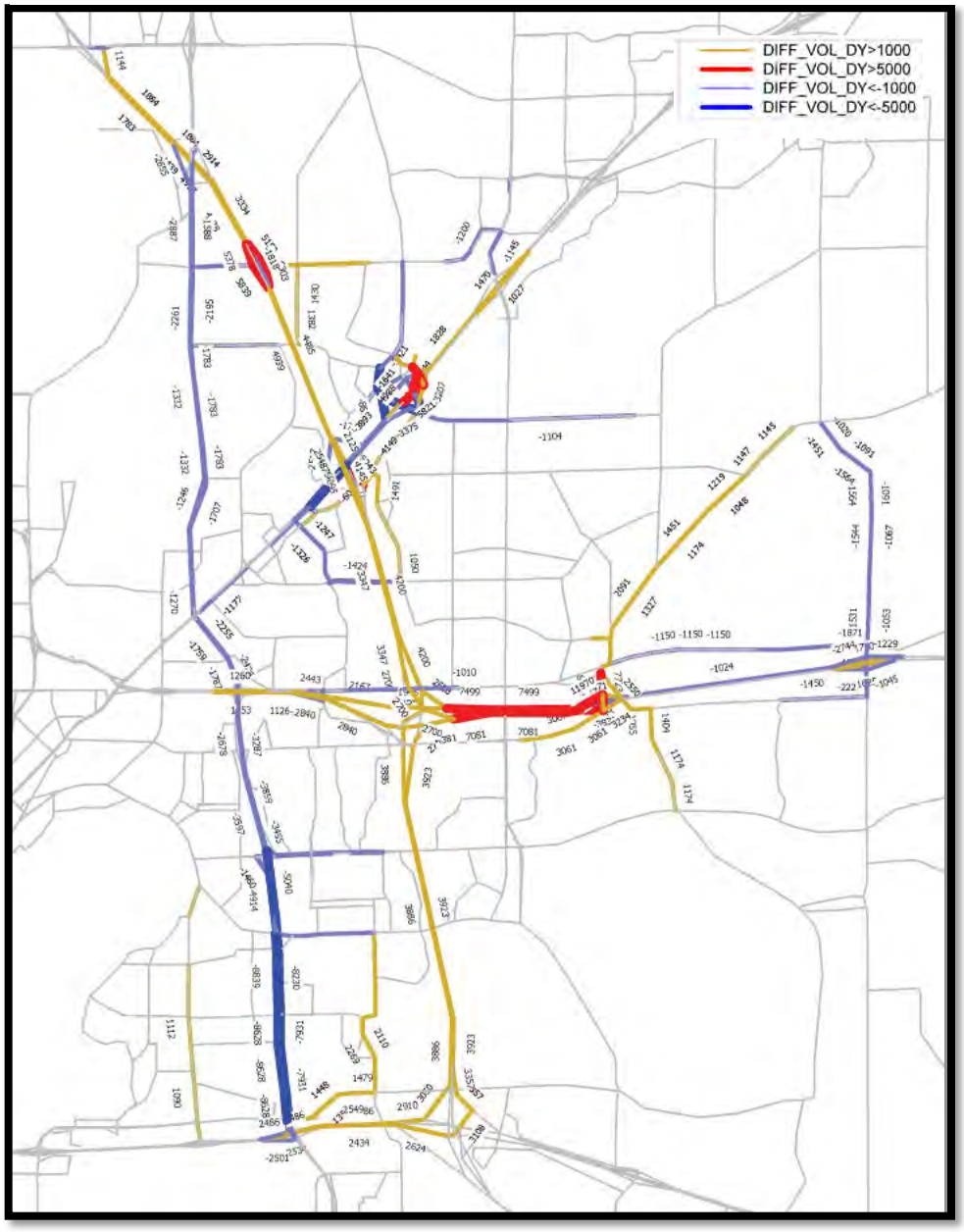


## 16. Plus 1 with Stoughton Road South, Milwaukee Street, Hoepker Road, American Parkway and High Crossing Interchanges

A similar scenario was tested with the Stoughton Road South speed reductions, added interchanges at Milwaukee and Hoepker, the High Crossing ramps to/from the north, the reconfigured American Parkway interchange with US 151 and the additional Interstate capacity. Figure 13 shows the various impacts across the Madison area. Noticeable differences between the base network comparison and added lane network comparison are that the decreases in volume along the Stoughton Road corridor (especially the middle and southern portions) are more marginal than the more drastic decreases along the Stoughton Road corridor in the base network.

The impacts of this scenario are similar to those noted for the previous scenario, which included all potential modifications except for the additional mainline capacity.

*Figure 13 2050 Daily Traffic Volume Shifts from Stoughton Road South, Hoepker and Milwaukee Interchanges, American Parkway reconfiguration and High Crossing North Ramps with additional Interstate capacity*

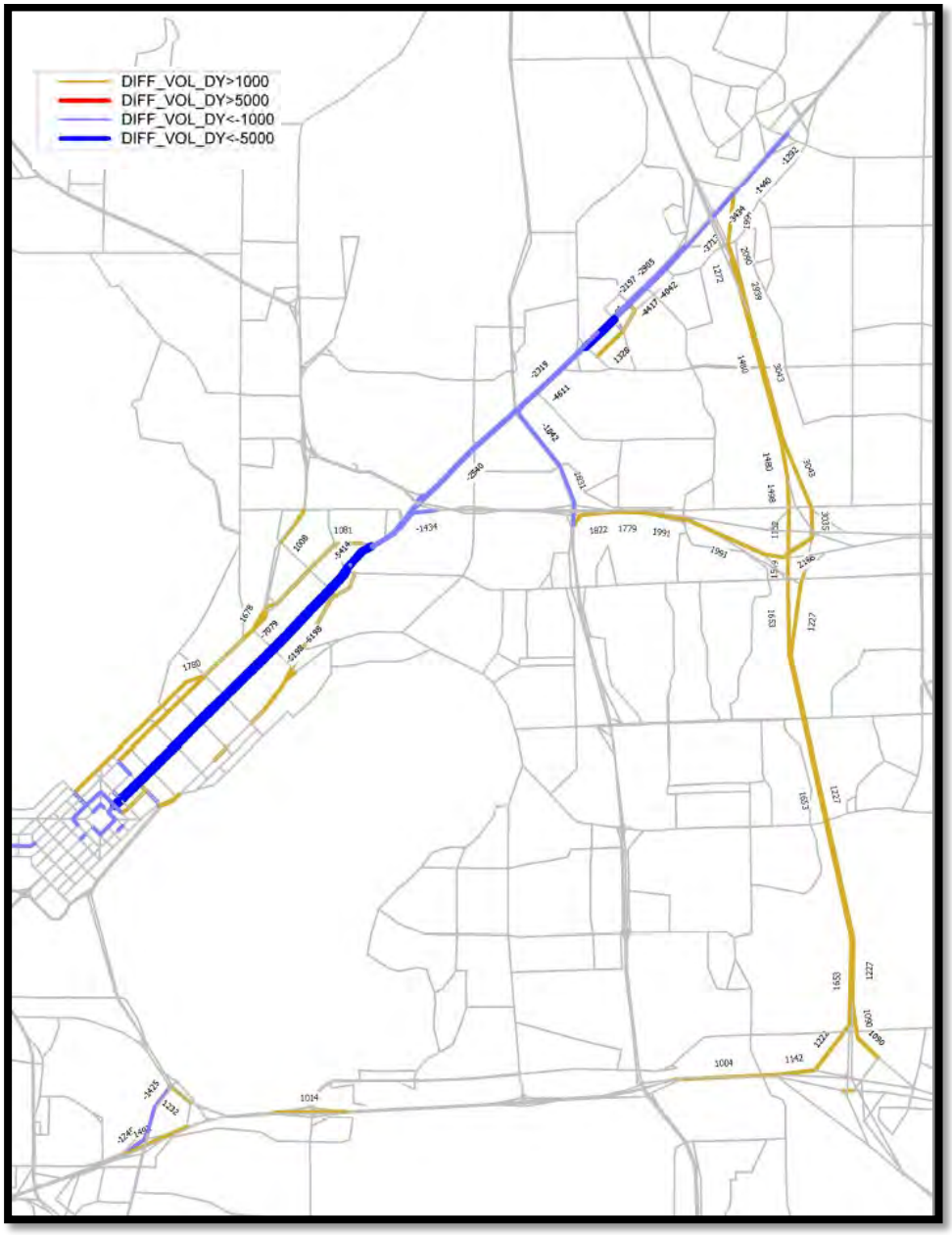


## 17. East Washington Avenue Speed Reduction

The City of Madison has recently lowered the posted speed on US 151 (East Washington Avenue) on the east side of Madison. In October 2020, speeds on East Washington Avenue (EWA) were reduced from 35 mph to 25 mph between Pinckney St. and Baldwin St., and from 35 mph to 30 mph between Baldwin St. and Marquette St. In July 2022, the section of East Washington Ave. between Stoughton Road and East Springs Dr. had its speed limit lowered to 35 miles per hour. These speed reductions were not incorporated into the future baseline project set and were therefore not incorporated into the No Build traffic forecasts. Figure 14 shows the DCTDM estimated traffic diversions to the Johnson/Gorham and Williamson Street corridors, along with WIS 30 and the Interstate due to the reduced EWA speeds. DCTDM also predicts a small shift away from automobiles with a corresponding reduction in VMT and VHT.

A review of 2020 traffic counts at the continuous count site along EWA indicates the reduction in traffic demand to be approximately 10-15%. This does not include the impacts of reducing speeds in the Stoughton Road to East Springs segment. Note the DCTDM's projected 30% reduction includes speed reductions in all three segments.

*Figure 14 2050 Daily Traffic Volume Shifts from East Washington Avenue speed reductions*



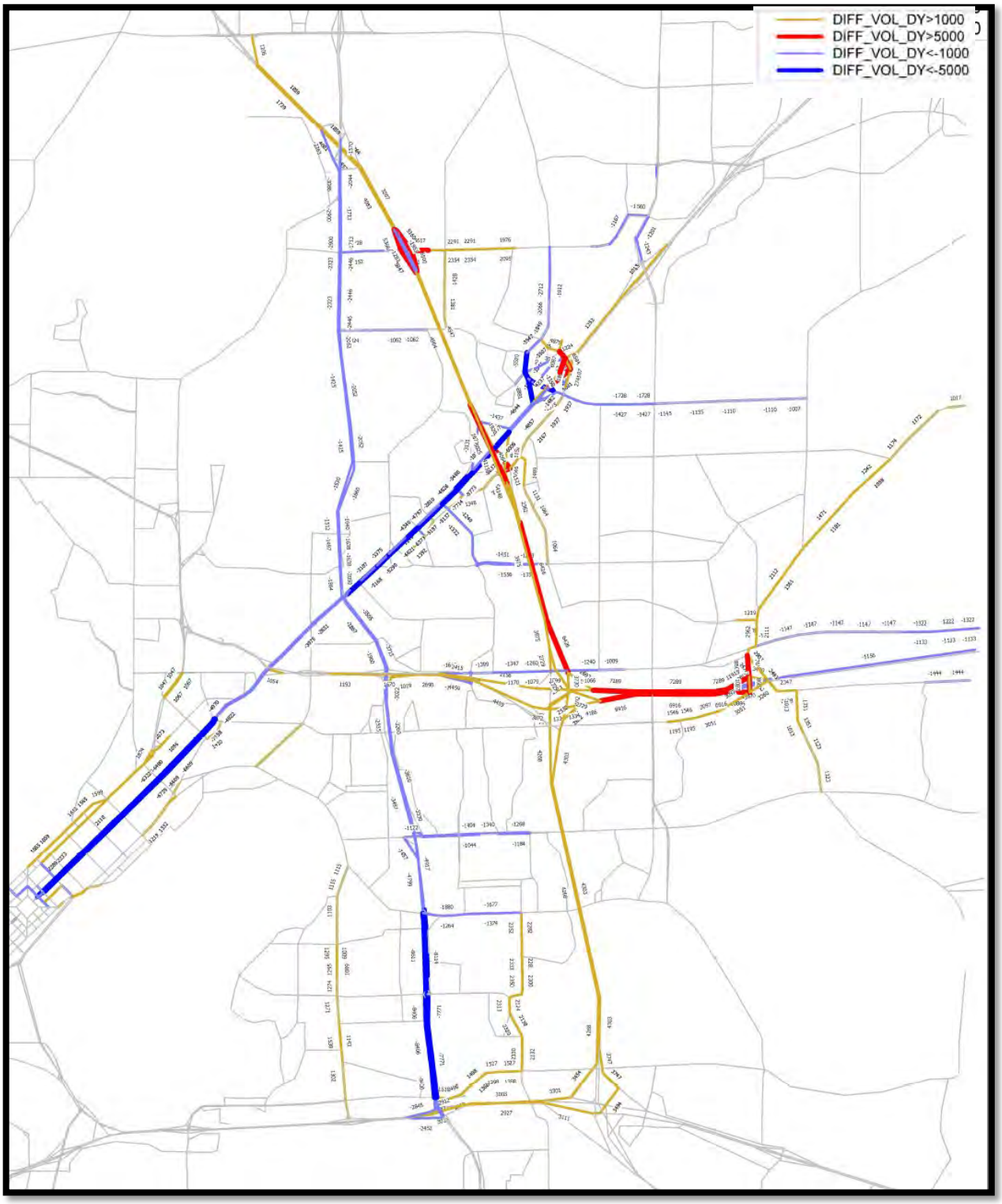
## 18. 6in1 plus 1

The DCTDM was executed with 6 potential projects incorporated into the input network plus the additional Interstate mainline capacity. These improvements include:

- Hoepker Road interchange
- Milwaukee Street interchange
- High Crossing Road interchange north ramps
- American Parkway reconfiguration at US 151
- Stoughton Road South speed reduction
- East Washington Avenue speed reduction
- Interstate capacity expansion between US 12/18 and Wisconsin Dells

Figure 15 shows the DCTDM estimated diversion with the 6 projects plus the additional Interstate lanes. This combination of projects generally generates the highest volumes along the Interstate between US 12/18 and the Columbia County line.

*Figure 15 2050 Daily Traffic Volume Shifts with 6 projects and additional Interstate lanes*



## 19. Traffic Forecasting Impacts By Critical Alternative

A traffic forecast was developed for each roadway segment of the Interstate South, US 51 North and US 51 South study areas. The forecast is the highest anticipated volume based on the various scenarios tested with the DCTDM. Each peak period's highest assignment was established on a link-by-link basis for all roadway segments that are to be forecasted for Interstate South. Table 1 shows that the 6in1 plus 1 scenario generated the critical forecast at 64 of the 341 links in the Interstate South corridor. Table 2 shows which scenarios were impactful to the respective influence areas across the three Dane County projects. Note that some scenarios that were less impactful were omitted from Table 2. General observations including combining multiple projects into one scenario typically increased demands along the Interstate system. Adding capacity or access to the Interstate system reduced demands along US 51 and lowering the speed on US 51 increased demands on the Interstate system.

*Table 1 Number of Links Controlled by Scenario*

| Scenario | Number of Links |
|---|---|
| All6P1 | 64 |
| 5in1 P1 | 51 |
| HpkrAmpk P1 | 25 |
| AmPk | 24 |
| 5in1 | 22 |
| SRS P1 | 19 |
| W19 P1 | 18 |
| MkeHpkr P1 | 17 |
| Base | 16 |
| SRSHpkr P1 | 15 |
| SRS | 12 |
| HC P1 | 11 |
| Hoepker P1 | 10 |
| HCHpkr P1 | 9 |
| High Xing | 7 |
| Hoepker | 7 |
| Milwaukee | 7 |
| P1 | 4 |
| MkeHpkr | 3 |

*Table 2 Critical Scenarios by Interchange Influence Area*

| Seg | Influence Area | Plus 1 Lane | | Hoepker I/C | | SRS Spd | | Milw St I/C | | Hi Cr Ramps | | Amer Pk . | | WIS 19 P1 | | HpkAmP1 | | Hi X P1k | | HpkHi X P1 | | MkeHpkP1 | | SRSHpkP1 | | SRSP1 | | 5in1 | | 5in1P1 | | 6 Alts P1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing | ML | Xing |
| I-39/90/94 | CTH V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WIS 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | US 51 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Hoepker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | US 151/HCB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | I-94 (Badger) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I-39/90 | US 12/18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I-94 | Milwaukee St | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CTH N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| US 151 | American Pkwy | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Grand/Reiner | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WIS 19/ Main | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIS 30 | I-39/90/94 to US 151 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| US 51 North | I-39/90/94 to Hoepker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Hoepker to US 151 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | US 151 to WIS 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| US 51 South | WIS 30 to Cot Gr Rd | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Cot Gr Rd to Pflaum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pflaum to US 12/18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | US 12/18 to Voges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Critical Forecasted Growth  Forecasted Growth  Forecasted Decline  Check for Impact (May include increases and decreases)  No Impact Forecasted

## 20. US 151 Interchanges with I-39/90/94 & American Parkway Original Alternative 1 – Directional Diamond

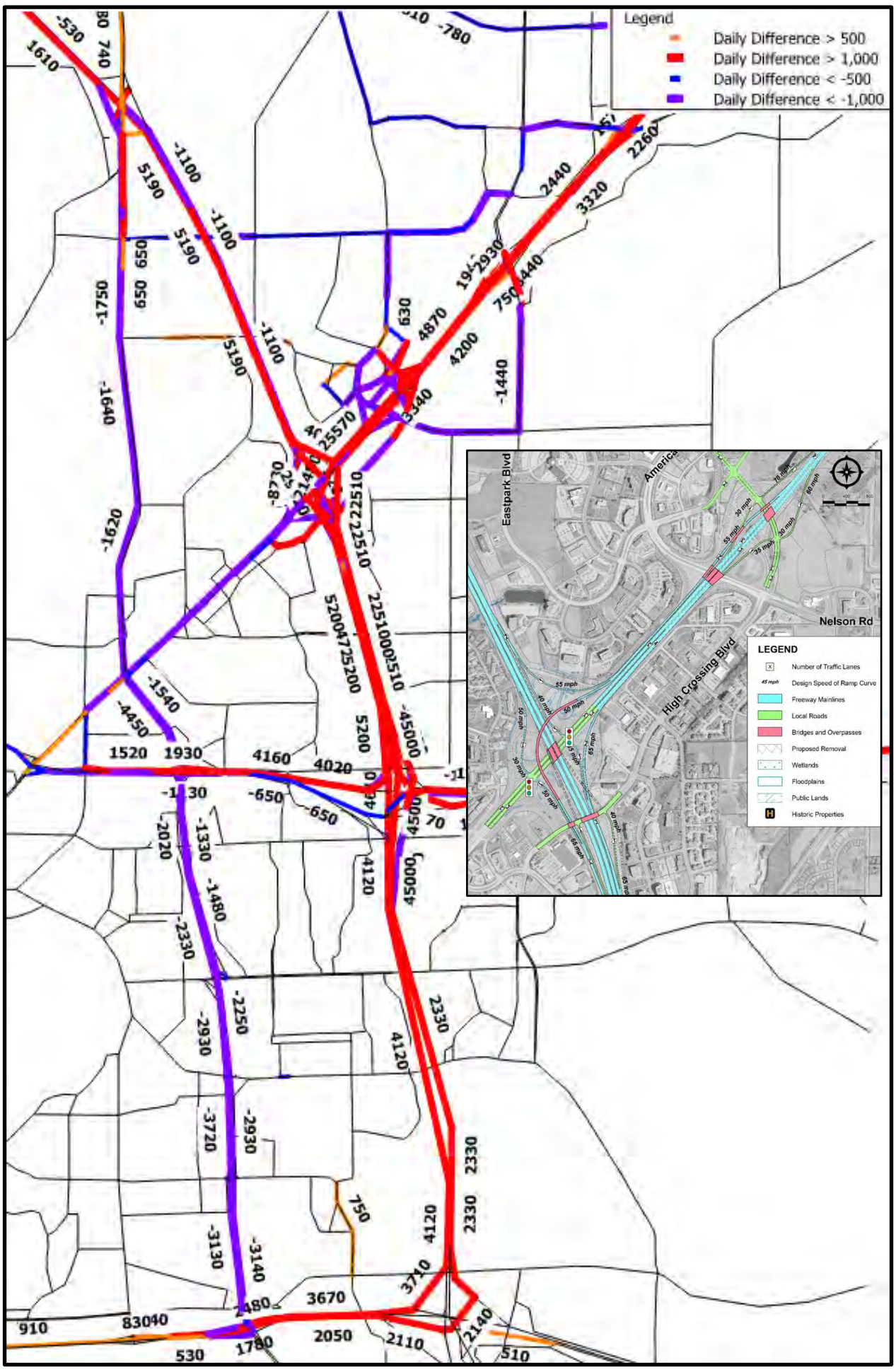
Several alternative designs were assessed at the US 151 interchanges with I-39/90/94 and with American Parkway. The original Alternative 1 design includes the following characteristics:

- Mover American Pkwy Interchange to High Crossing/American Family Drive.
- Two signals at East Washington Avenue
- Slows down US 151 traffic approaching East Washington Avenue.

The highest volume traffic movements within the US 151 interchange are to/from I-39/90/94 south of the interchange and US 151 northeast of the Interstate. Alternative 1 is a directional interchange, the primary movements to/from the freeway portion of US 151 are free-flow ramps, but there is also an embedded diamond interchange that services East Washington Avenue. New signals will be needed on either side of the interstate at the diamond interchange ramps. Like most of the alternatives in this area, this alternative aims to keep speeds down at the local road portion of the interchange while allowing for freeway-to-freeway traffic to keep a reasonable rate of speed. The interchange at High Crossing/American Family Drive matches Madison neighborhood plans to connect HC and AmFam Drive. This alternative moves US 151 traffic away from American Pkwy/Nelson Road, which is designed as the main road to American Center. US 151 becomes a conventional diamond interchange with signals.

Figure 16 shows that about 6,000 daily vehicles are diverted from US 51 and from East Washington Avenue to I-39/90/94 and to WIS 30.

*Figure 166 2050 Daily Traffic Volume Shifts with original Alternative 1*



## 21. US 151 Interchanges with I-39/90/94 & American Parkway Alternative 2 – Loop Ramp Freeflow

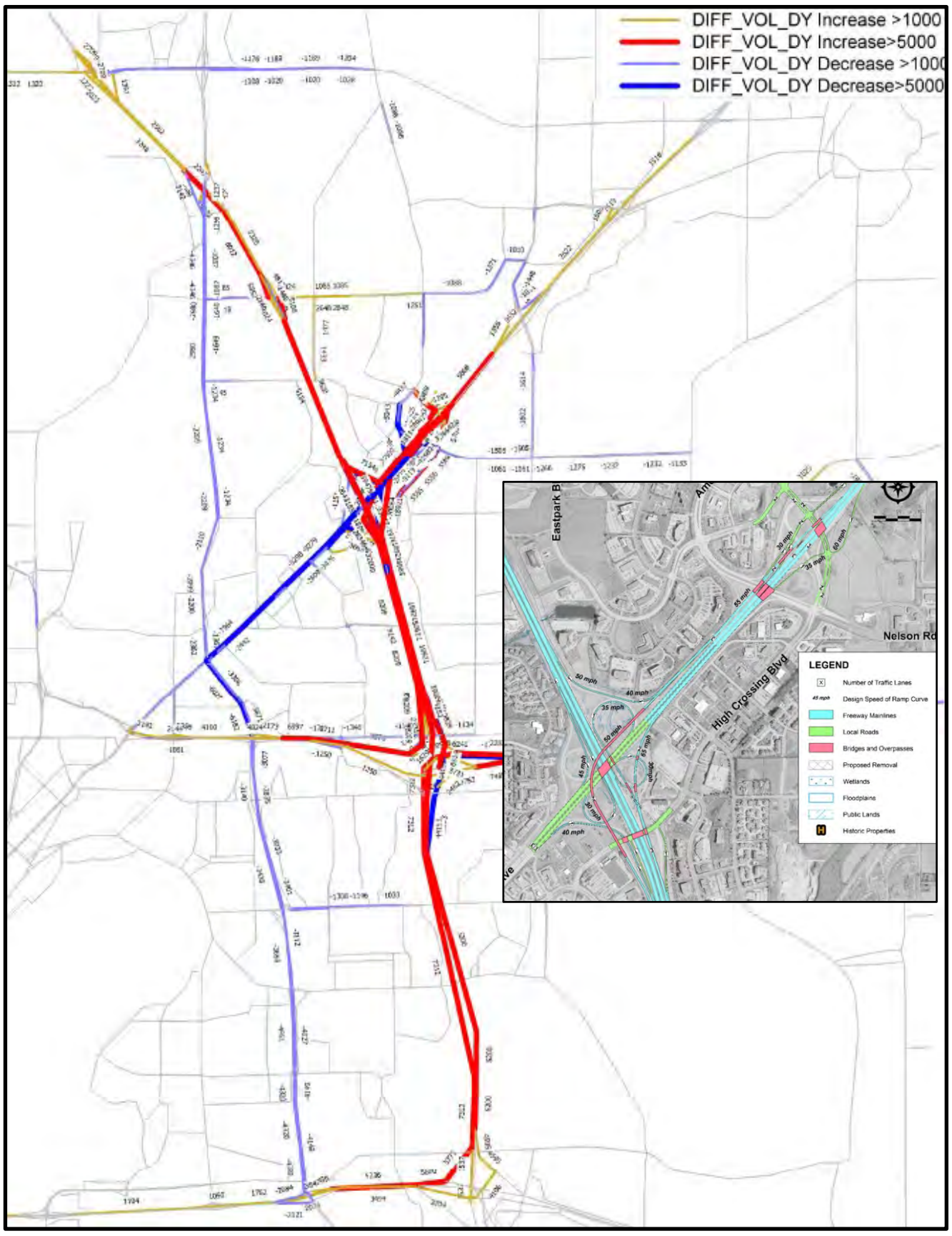
The Alternative 2 design for the US 151 interchanges with I-39/90/94 and with American Parkway includes the following characteristics:

- Move American Parkway interchange to High Crossing Blvd/American Family Drive.
- Freeflow loop ramps replace traffic signals.
- US 151 to southbound I-90 traffic flyover

Alternative 2 is a loop ramp free-flow interchange that is somewhat similar to the existing cloverleaf design that exists today except the two primary movements from South-to-East and from East-to-South are allowed freeflow movements for better operations. US 151 traffic travels through the I-39/90/94 & US 151 interchange without having to go through a controlled intersection before accessing East Washington. This alternative most closely resembles the current design but fixes the two pinch points with the East-to-South and South-to-East ramps. The loops reduce flexibility with the East-to-South flyover and getting it under High Crossing Blvd. Alternative 2 moves US 151 traffic away from American Pkwy/Nelson Road, which is designed as the main road to American Center. This alternative maintains the system interchange westbound on East Washington at higher speeds.

Figure 17 shows that about 8,000 daily vehicles are diverted from US 51 and from East Washington Avenue to I-39/90/94 and to WIS 30.

*Figure 177 2050 Daily Traffic Volume Shifts with Alternative 2*



## 22. US 151 Interchanges with I-39/90/94 & American Parkway Alternative 3 – East Washington Blvd - South

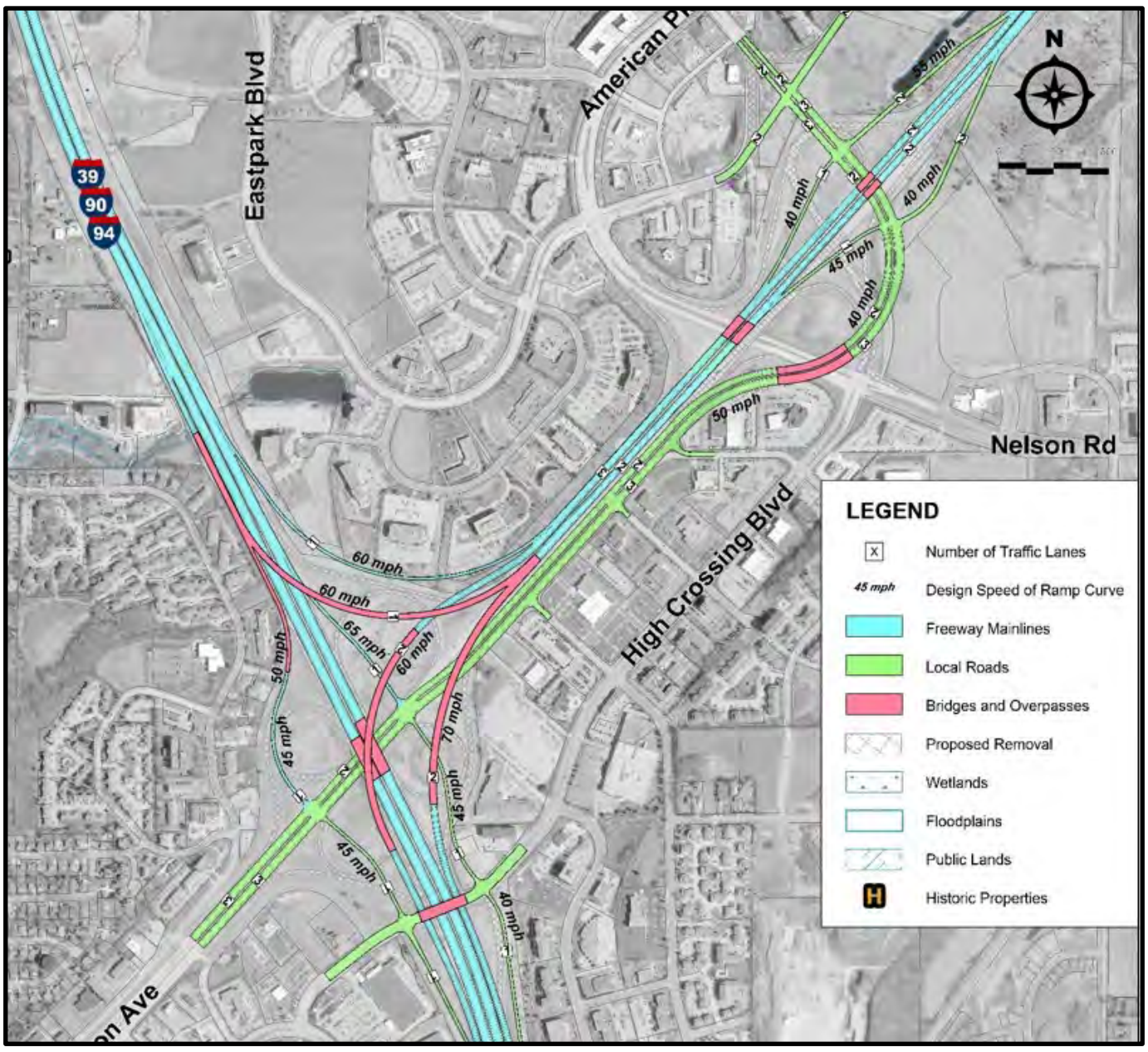
The Alternative 3 design for the US 151 interchanges with I-39/90/94 and with American Parkway includes the following characteristics:

- Extend East Washington Avenue into the business park connecting American Family Drive.
- Two signals at East Washington Avenue.
- High Crossing Blvd access from the north.
- East Washington Avenue extension increases local connectivity and redevelopment prospects.

Alternative 3 separates the movements of East Washington Avenue from US 151 to the east. The movements to the east are treated like a system interchange with freeflow movements while the combination of High Crossing Boulevard and East Washington Avenue forms a split diamond interchange. Alternative 3 extends East Washington Avenue to replace what is now Wayne Terrace and ties into an extension of American Family Drive. This would allow for better connectivity between the neighborhoods east and west of the interstate. This alternative also moves the interchange that is currently at American Parkway/Nelson Road to American Family Drive/East Washington Avenue. Alternative has three flyover ramps at the US 151 interchange. The East Washington Avenue extension provides connections in High Crossing Blvd area, as well as a direct urban connection to American Center.

This alternative is not high on the consideration list as traffic will excessively queue at the Tancho intersection and the off-ramp to American Family Drive. Three intersections here are just too closely spaced. Therefore, a traffic difference plot was not created for this Alternative. Figure 18 shows the Alternative 3 design.

*Figure 188 2050 Alternative 3 Interchange Design*



## 23. US 151 Interchanges with I-39/90/94 & American Parkway Alternative 4 – East Washington Blvd – North

The Alternative 4 design for the US 151 interchanges with I-39/90/94 and with American Parkway includes the following characteristics:

- Extend East Washington Avenue into business park connecting to American Parkway.
- Two signals at East Washington Avenue.
- High Crossing Blvd access from the north.
- East Washington extension connects to American Center.

Alternative 4 extends East Washington Avenue to the east, but ties it into American Parkway rather than American Family Drive. This alternative also reroutes Nelson Road to tie into Eastpark Boulevard, with access to American Family Drive. Similar to Alternative 3, this alternative also moves the current American Parkway/Nelson Road interchange to the northeast to the realigned Nelson Road/Eastpark Boulevard. The Nelson Road/American Family Drive interchange opens up new parcels for development. High Crossing Blvd is a split diamond with the Interstate, but East Washington Avenue has direct connect ramps to/from the south. East Washington Avenue extension provides direct urban connection to American Center, but the extension doesn't provide new urban development opportunities.

Figure 19 shows that about 20,000-25,000 daily vehicles are diverted from US 51 and from East Washington Avenue to I-39/90/94 and to WIS 30.

*Figure 199 2050 Daily Traffic Volume Shifts with Alternative 4*

## 24. US 151 Interchanges with I-39/90/94 & American Parkway Alternative 5 – East Washington Blvd – High Crossing Blvd

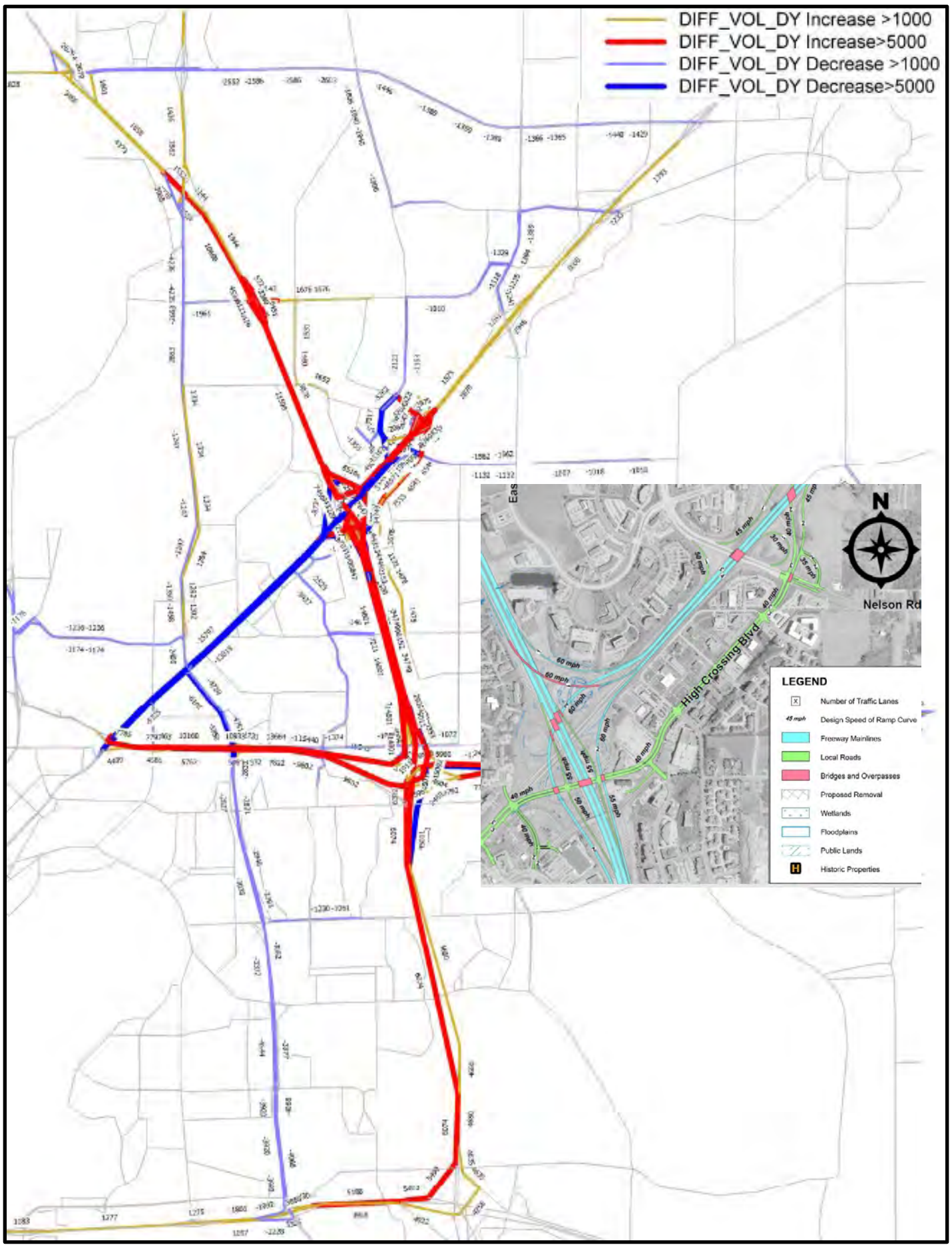
The Alternative 5 design for the US 151 interchanges with I-39/90/94 and with American Parkway includes the following characteristics:

- Extend East Washington Avenue to High Crossing Blvd into American Parkway.
- High Crossing Blvd becomes an extension of East Washington Avenue.
- Two signals at East Washington Avenue/High Crossing Blvd.
- Many freeflow ramps go below I-39/90/94.
- Increases local connectivity and redevelopment opportunities.

Alternative 5 uses existing High Crossing Boulevard to extend East Washington Avenue. This creates a lower speed transition into the City of Madison. High Crossing Blvd would be expanded to 6 lanes, within the existing right-of-way. Compared to Alternatives 3 and 4, it reduces the structure complexity and cost for the backbone directional ramps with 3 of the 4 ramps being at existing ground level. Alternative 5 extends and provides the potential for bicycle and pedestrian access beyond the Interstate to the Nelson Road area and a connection to the Daniel Morgan Path. This alternative provides a full diamond interchange between I-39/90/94 and East Washington Avenue/High Crossing Boulevard. This will provide direct access to both eastbound and westbound Interstate for businesses along High Crossing Boulevard. The US 151 southbound connection to East Washington Avenue is a free flow movement with geometry to reduce speeds. The partial jug handle interchange at Nelson Road provides a free flow connection for northbound East Washington Avenue/High Crossing Boulevard traffic to northbound US 151. Alternative 5 provides an improved connection to Hayes Road compared to the current frontage road intersections. This alternative also creates available land in the area of the current interchange loop ramps for potential additional development, stormwater facilities, or a park and ride lot. Access to the American Center area will be re-directed by use of the proposed East Washington Boulevard/High Crossing Blvd. The East Washington Avenue extension provides a direct urban connection to American Center and opens up High Crossing Blvd.

Figure 20 shows that about 25,000-28,000 daily vehicles are diverted from US 51 and from East Washington Avenue to I-39/90/94 and to WIS 30.

*Figure 20 2050 Daily Traffic Volume Shifts with Alternative 5*



## 25. US 151 Interchanges with I-39/90/94 & American Parkway Preferred Alternative 1

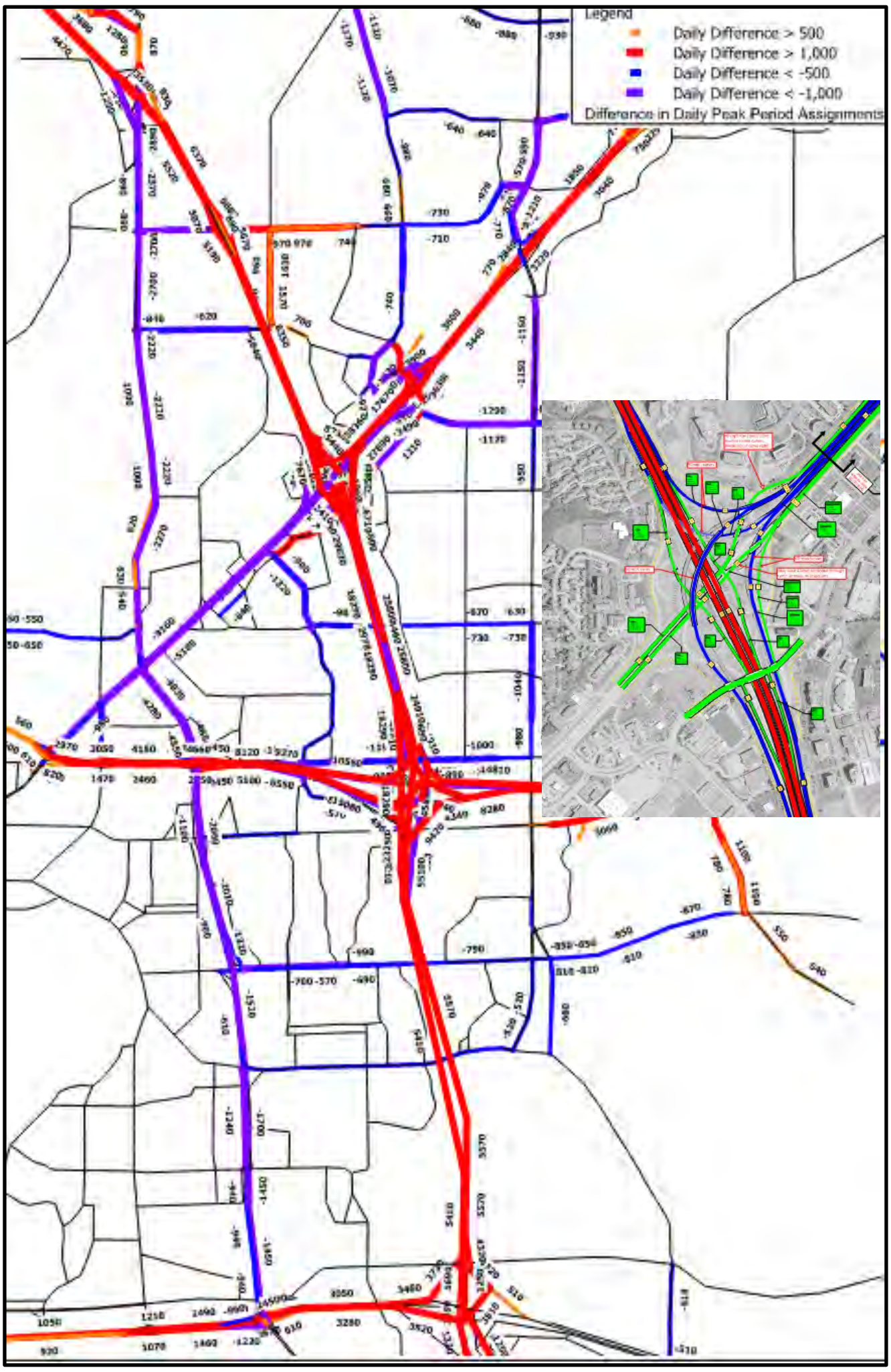
The Preferred Alternative 1 design for the US 151 interchanges with I-39/90/94 and with American Parkway includes the following characteristics:

- Mover American Pkwy Interchange to High Crossing/American Family Drive.
- Replace the loop ramps at US 151/East Washington Avenue with a conventional diamond with two signals at East Washington Avenue.
- High Crossing Blvd remains a half-diamond interchange with no connection to/from East Washington Avenue.
- Four flyover ramps that directly connect I-39/90/94 and US 151 to/from the east.

The highest volume traffic movements within the US 151 interchange are to/from I-39/90/94 south of the interchange and US 151 northeast of the Interstate. Four flyover ramps that directly link I-39/90/94 to US 151 to and from east are part of the preferred Alternative 1. Additionally, there is an embedded diamond interchange that services East Washington Avenue that replaces the loop ramps. New signals will be needed on either side of the interstate at the East Washington Avenue diamond interchange ramps. Like most of the alternatives in this area, this alternative aims to keep speeds down at the local road portion of the interchange while allowing for freeway-to-freeway traffic to keep a reasonable rate of speed. The interchange at High Crossing/American Family Drive matches Madison neighborhood plans to connect HC and AmFam Drive.

Figure 21 shows that about 13,000-18,000 daily vehicles are diverted from US 51 and from East Washington Avenue to I-39/90/94 and to WIS 30.

*Figure 21 2050 Daily Traffic Volume Shifts with Preferred Alternative 1*



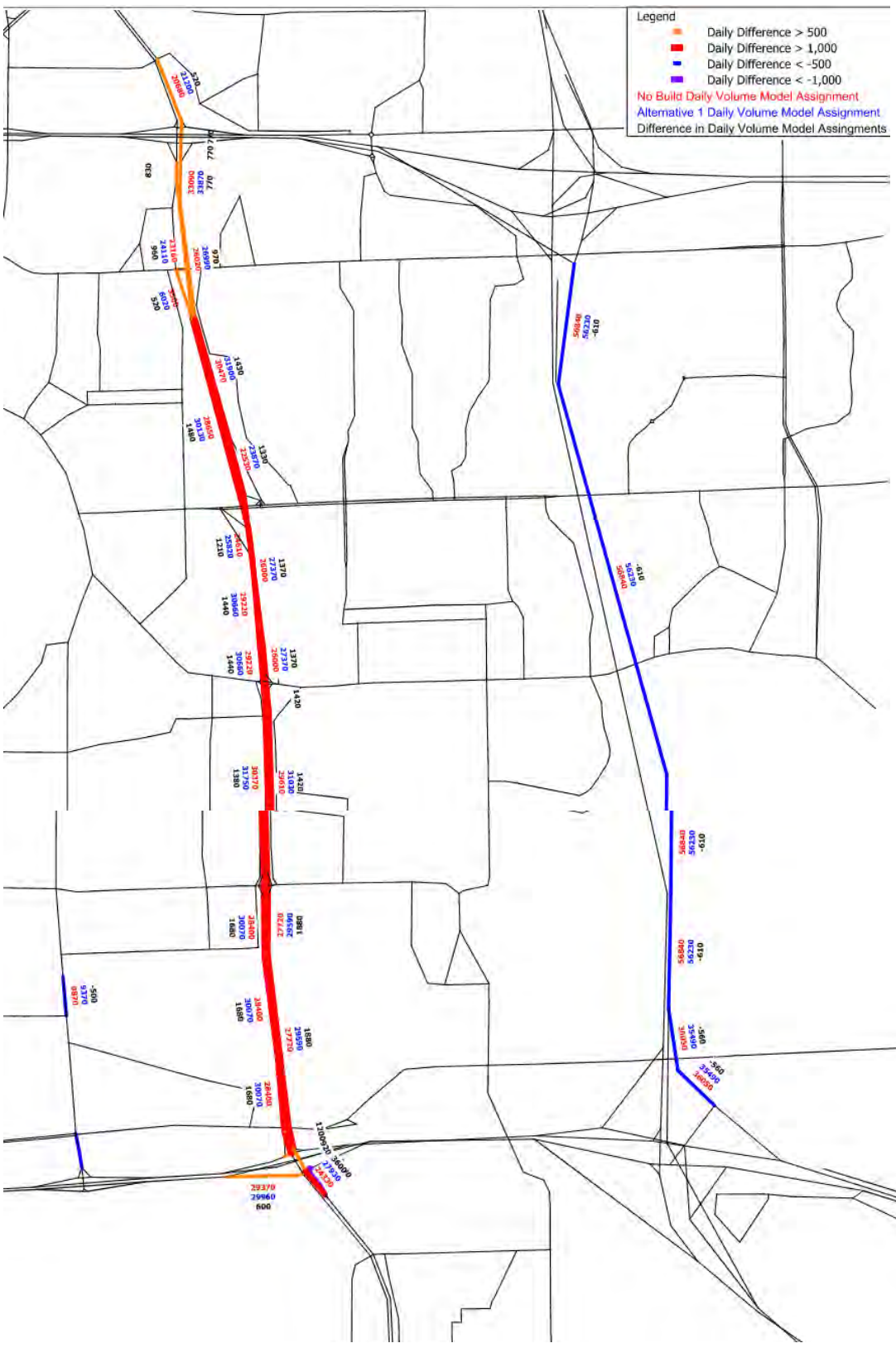
## 26. US 51 South Alternative 1 – US 51 Expansion only

The US 51 South Alternative 1 includes the following characteristics:

- Expansion of US 51 South from 4 lanes to 6 lanes between WIS 30 to the Beltline.
- The posted speed of US 51 South remains the same as existing conditions. Capacity is increased due to the lane expansion.

The US 51 South Alternative 1 includes an expansion of US 51 and no other change to US 51. However, the expansion increases the total capacity from 3,680 to 5,520 vehicles per hour per lane in each direction. Figure 22 shows the daily volume impact of Alternative 1 compared to the No Build conditions. It shows that US 51 South increases by about 3,000 daily vehicles with Alternative 1 in place. Adjacent north-south corridors such as I-39/90 decrease.

*Figure 22 2050 US 51 South Daily Traffic Volume Shifts with Alternative 1*



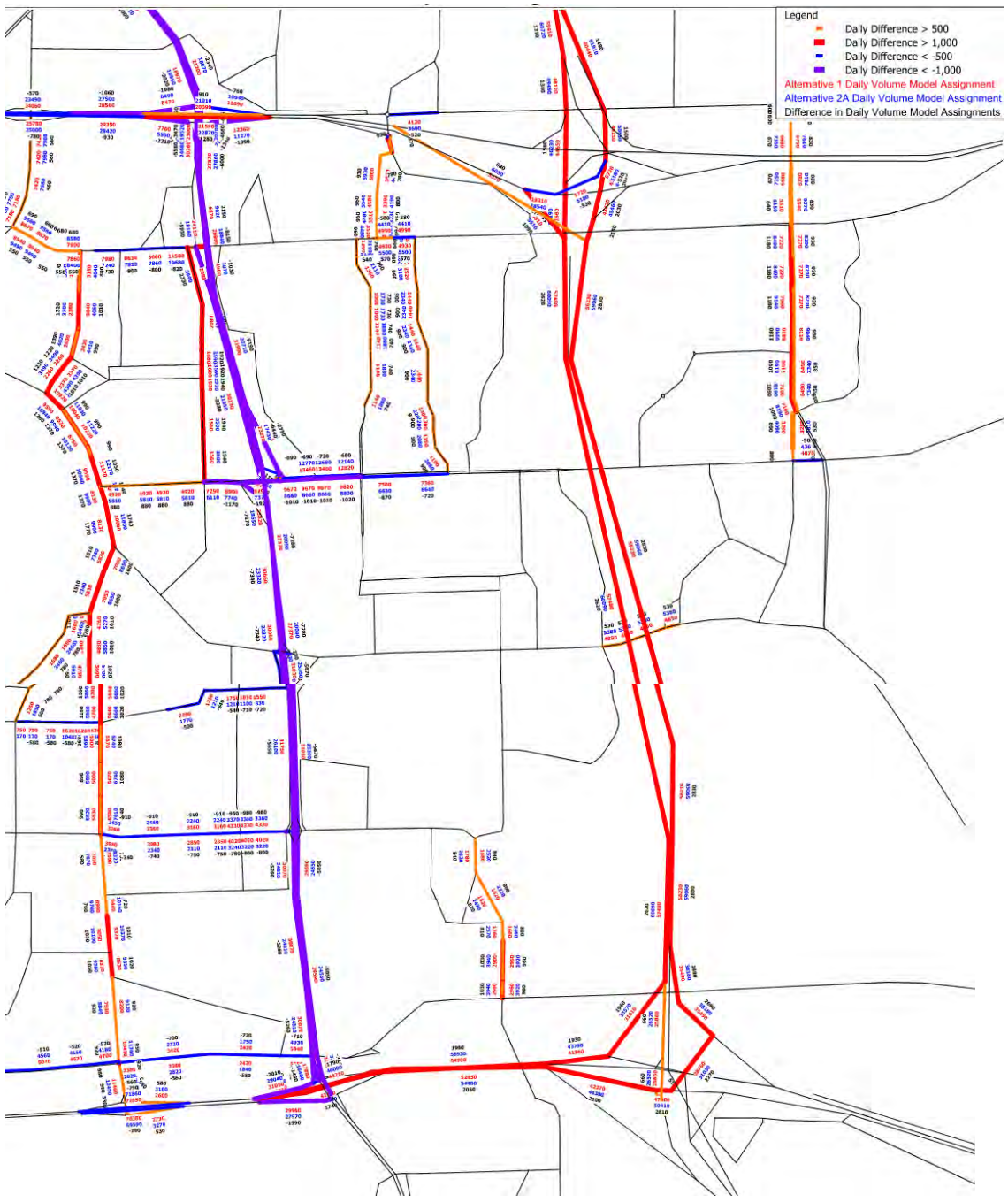
## 27. US 51 South Alternative 2A – US 51 Expansion & Coded as Urban Expressway

The US 51 South Alternative 2A includes the following characteristics:

- Expansion of US 51 South from 4 lanes to 6 lanes between WIS 30 to the Beltline.
- The posted speed of US 51 South is decreased from 55 mph to 35 mph. This speed reduction is represented in the model by coding US 51, between WIS 30 and the Beltline, as an Urban Expressway, which reduces the model speed to 42 mph and the capacity per lane to 1,350 vehicles per lane.

US 51 South Alternative 2A codes US 51 South from WIS 30 to the Beltline as an Urban Expressway rather than as a Suburban Expressway. This lowers the model speed from 55 mph to 42 mph between WIS 30 and Buckeye Road, and from 48 mph to 42 mph between Buckeye Road and the Beltline. In addition, the capacity per lane along US 51 between WIS 30 to the Beltline is reduced from 1,840 vehicles per hour per lane to 1,350 vehicles per hour per lane. However, the overall capacity has actually increased from 3,680 vehicles per hour per lane to 4,050 vehicles per hour per lane in each direction due to the lane expansion from 4 lanes to 6 lanes. Figure 23 shows the daily volume impact of Alternative 2A compared to Alternative 1 conditions. It shows that US 51 South decreases by about 10,000 to 17,000 vehicles per day with Alternative 2A in place compared to Alternative 1 conditions. Adjacent north-south corridors such as I-39/90 and Monona Drive increase.

*Figure 23 2050 US 51 South Daily Traffic Volume Shifts with Alternative 2A*



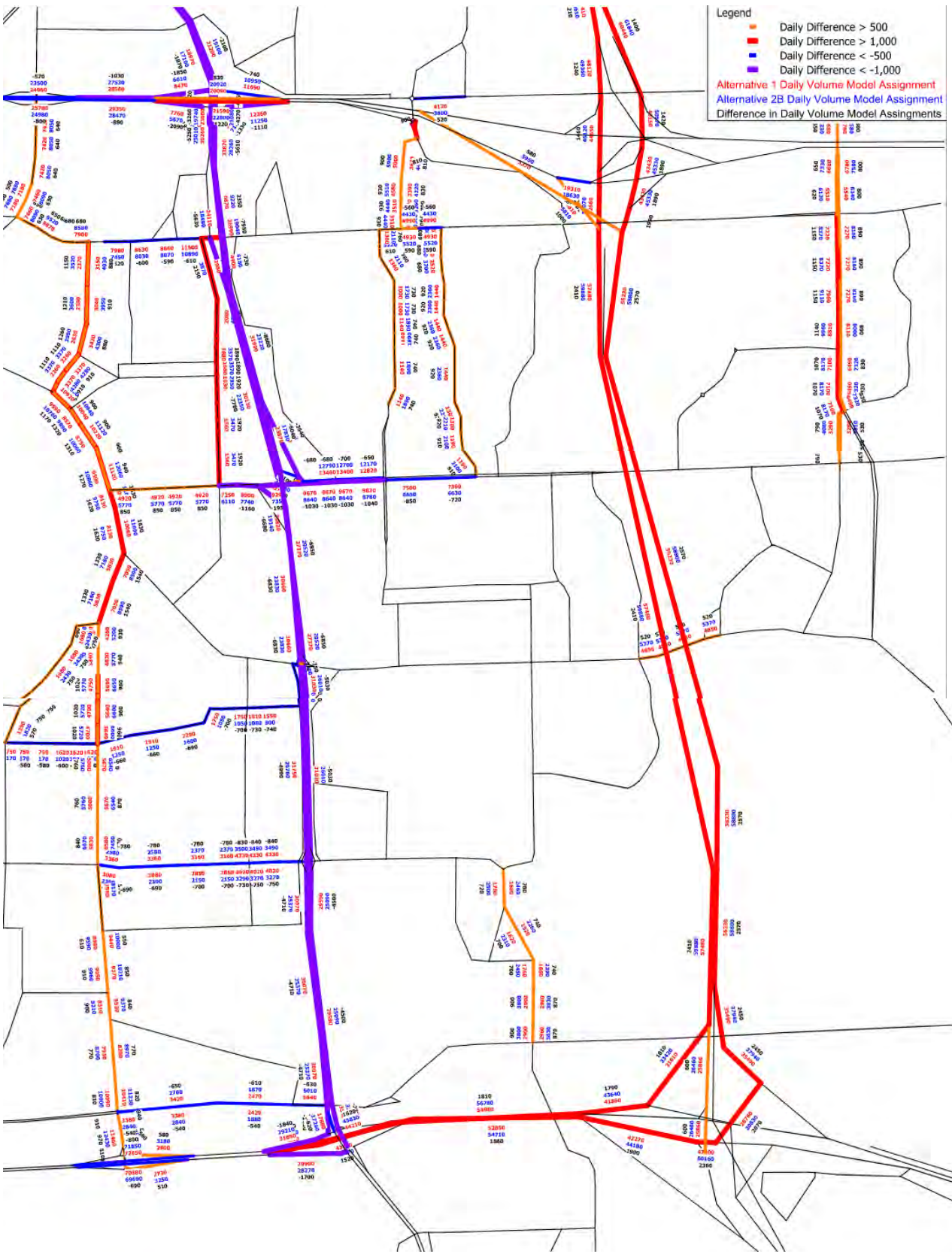
## 28. US 51 South Alternative 2B – US 51 Expansion & Coded as Suburban Expressway with 42 mph User Speed

The US 51 South Alternative 2B includes the following characteristics:

- Expansion of US 51 South from 4 lanes to 6 lanes between WIS 30 to the Beltline.
- The posted speed of US 51 South is decreased from 55 mph to 35 mph. This speed reduction is represented in the model by keeping US 51, between WIS 30 and the Beltline, as a Suburban Expressway, however with a 42 mph user speed designation.

US 51 South Alternative 2B keeps US 51 South from WIS 30 to the Beltline as a Suburban Expressway in the model, however with a user speed of 42 mph. This lowers the model speed from 55 mph to 42 mph between WIS 30 and Buckeye Road, and from 48 mph to 42 mph between Buckeye Road and the Beltline. The capacity per lane stays at 1,840 per hour per lane throughout the corridor, however the overall capacity increases from 3,680 vehicles to 5,520 vehicles per hour per lane in each direction due to the lane expansion from 4 lanes to 6 lanes. Figure 24 shows the daily volume impact of Alternative 2B compared to Alternative 1 conditions. It shows that US 51 South decreases by about 9,000 to 16,000 vehicles per day with Alternative 2B in place compared to Alternative 1 conditions. Adjacent north-south corridors such as I-39/90 and Monona Drive increase.

*Figure 24 2050 US 51 South Daily Traffic Volume Shifts with Alternative 2B*



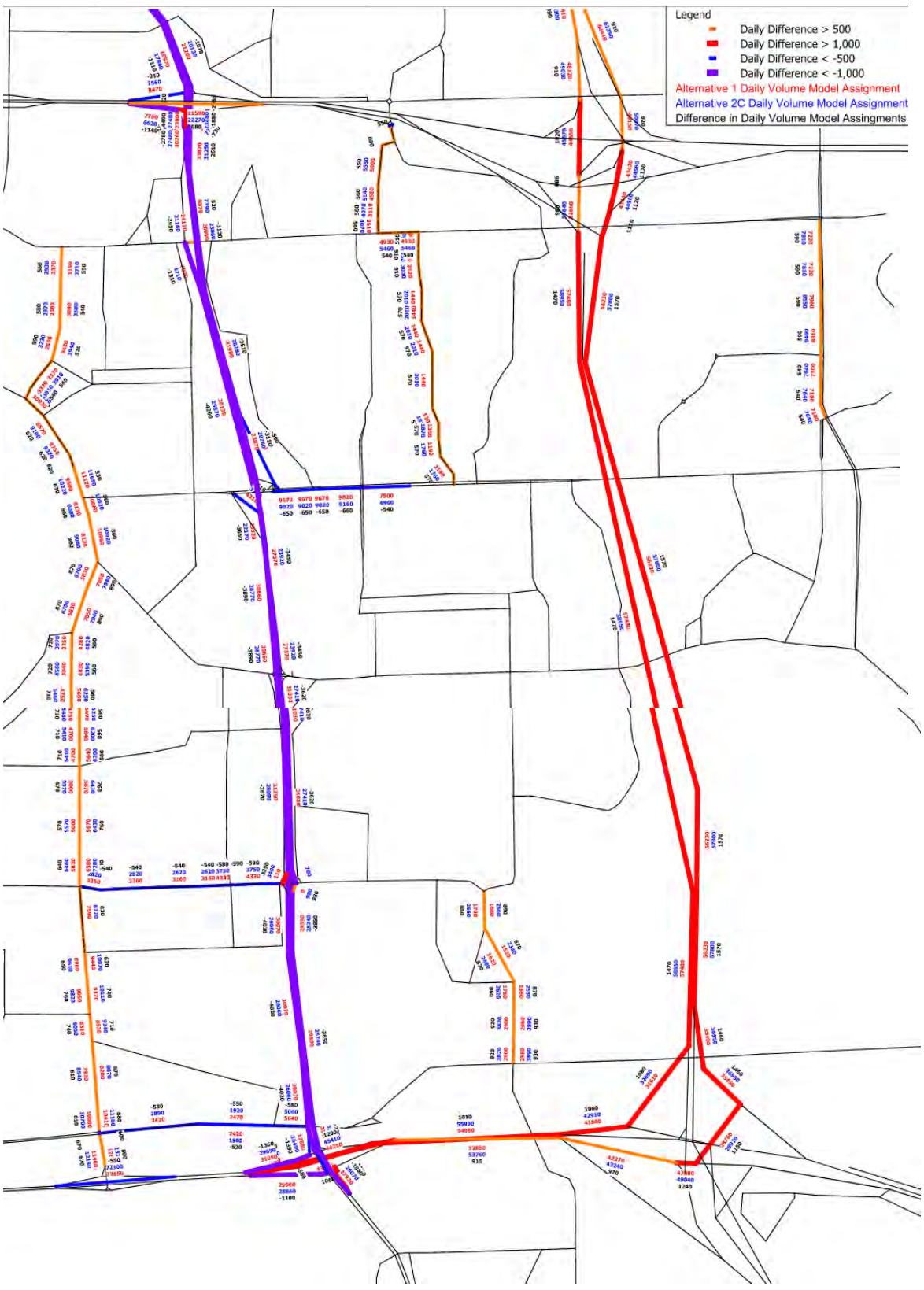
## 29. US 51 South Alternative 2C – US 51 Expansion and Coded as Suburban Expwy in North & Urban Expwy in South

The US 51 South Alternative 2C includes the following characteristics:

- Expansion of US 51 South from 4 lanes to 6 lanes between WIS 30 to the Beltline.
- The posted speed of US 51 South is decreased from 55 mph to 35 mph. This speed reduction is represented in the model by keeping US 51, between WIS 30 and Buckeye Road as a Suburban Expressway, however removing the 55 mph user speed, and by changing US 51 between Buckeye Road and the Beltline to an Urban Expressway.

US 51 South Alternative 2C keeps US 51 South from WIS 30 to Buckeye Road as a Suburban Expressway in the model, however it removes the 55 mph user speed, thereby reducing the model speed to 42 mph. Between Buckeye Road and the Beltline, US 51 is changed from a Suburban Expressway to an Urban Expressway in the model. This lowers the model speed from 48 mph to 42 mph between Buckeye Road and the Beltline. The capacity per lane per hour stays at 1,840 between WIS 30 and Buckeye Road, but is lowered from 1,840 to 1,350 per hour per lane. However, the overall capacity increases from 3,680 vehicles per hour per lane in each direction to 5,520 vehicles per hour per lane in each direction between WIS 30 and Buckeye Road and to 4,050 vehicles per hour per lane between Buckeye Road and the Beltline due to the lane expansion from 4 lanes to 6 lanes. Figure 24 shows the daily volume impact of Alternative 2C compared to Alternative 1 conditions. It shows that US 51 South decreases by about 7,000 to 8,000 vehicles per day with Alternative 2 in place compared to Alternative 1 conditions. Adjacent north-south corridors such as I-39/90 and Monona Drive increase.

*Figure 24 2050 US 51 South Daily Traffic Volume Shifts with Alternative 2C*



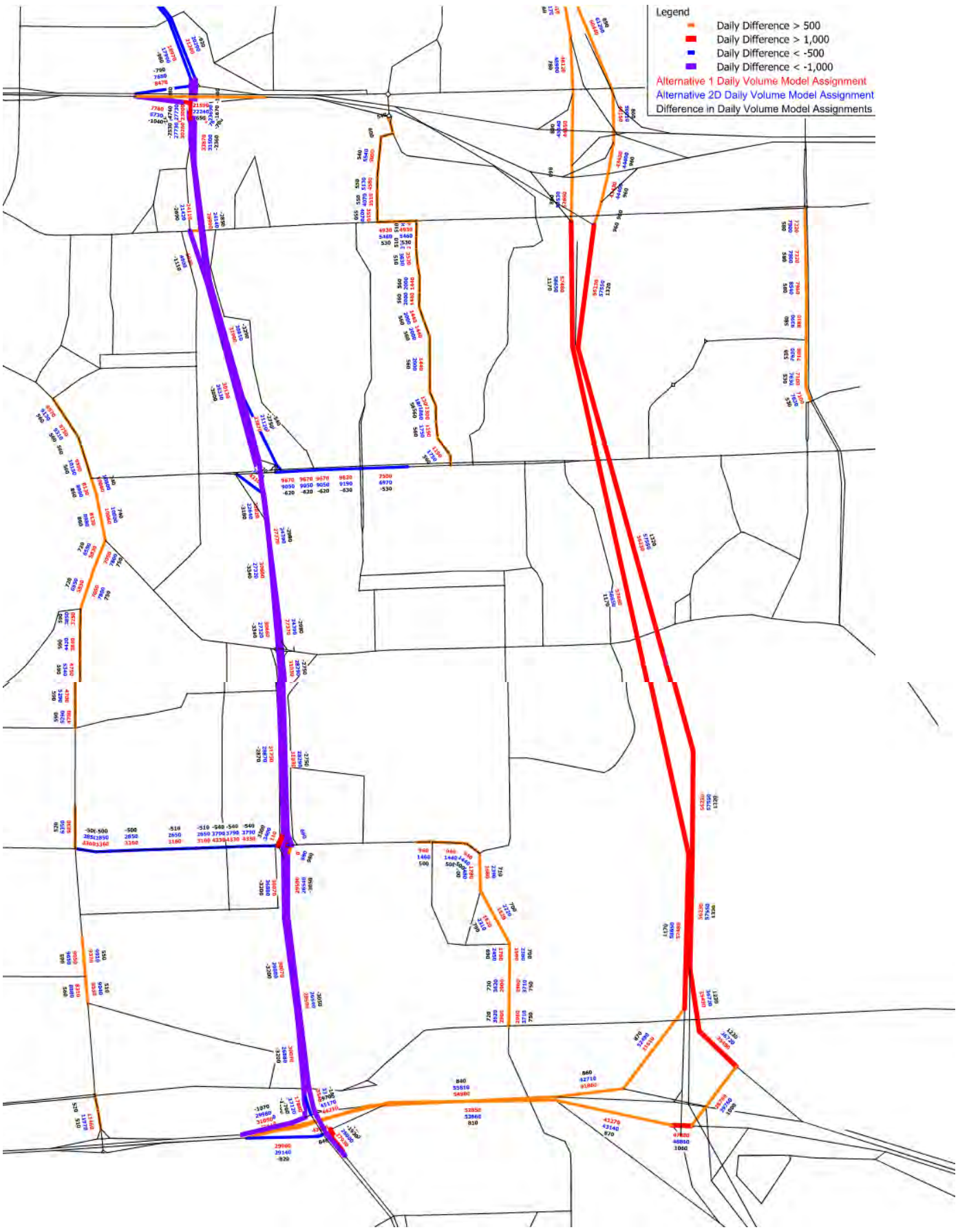
## 30. US 51 South Alternative 2D – US 51 Expansion & Coded as Suburban Expwy with User Speeds of 48 mph (in the North) & 42 mph (in the South)

The US 51 South Alternative 2D includes the following characteristics:

- Expansion of US 51 South from 4 lanes to 6 lanes between WIS 30 to the Beltline.
- The posted speed of US 51 South is decreased from 55 mph to 35 mph. This speed reduction is represented in the model by keeping US 51, between WIS 30 and Buckeye Road as a Suburban Expressway, however changing the 55 mph user speed to 48 mph between WIS 30 and Buckeye Road, and by adding a user speed of 42 mph along US 51 between Buckeye Road and the Beltline.

US 51 South Alternative 2D keeps US 51 South from WIS 30 to the Beltline as a Suburban Expressway in the model, however it changes the 55 mph user speed to 48 mph between WIS 30 and Buckeye Road. Additionally, between Buckeye Road and the Beltline, a user speed of 42 mph is included. These changes reduce the speeds along the US 51 South corridor from 55 mph in the north and 48 mph in the south to 48 mph in the north and 42 mph in the south. The capacity per hour per lane along US 51 stays at 1,840, however the overall capacity per hour per lane is increased from 3,680 to 5,520 in each direction due to the lane expansion from 4 lanes to 6 lanes. Figure 24 shows the daily volume impact of Alternative 2D compared to Alternative 1 conditions. It shows that US 51 South decreases by about 6,000 to 7,000 vehicles per day with Alternative 2D in place compared to Alternative 1 conditions. Adjacent north-south corridors such as I-39/90 and Monona Drive increase.

*Figure 24 2050 US 51 South Daily Traffic Volume Shifts with Alternative 2D*



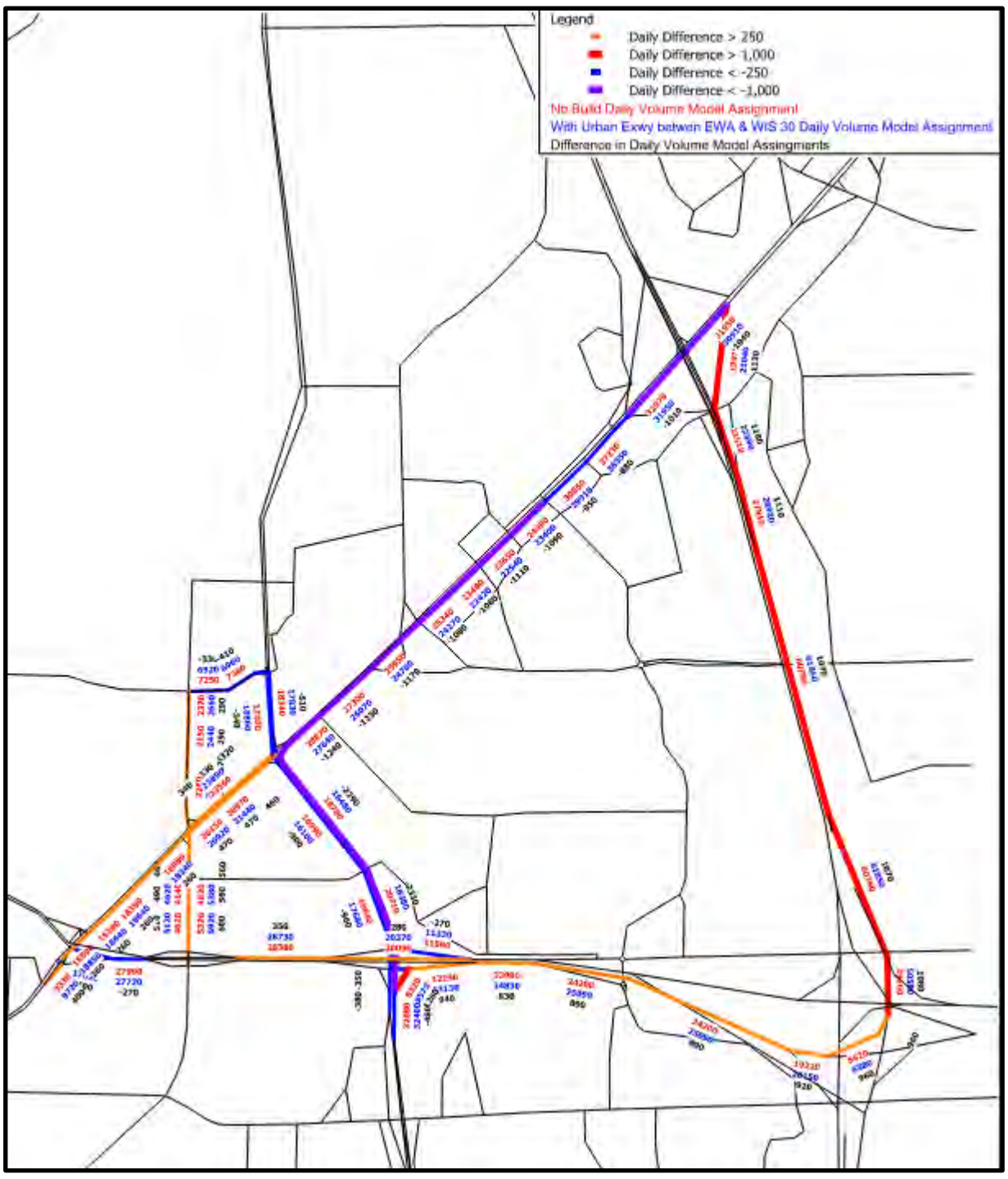
## 31. US 51 North Alternative 1 – US 51 at WIS 30 DDI with 35 mph Design Speed & US 51 at Commercial Ave with Raised 3-Leg

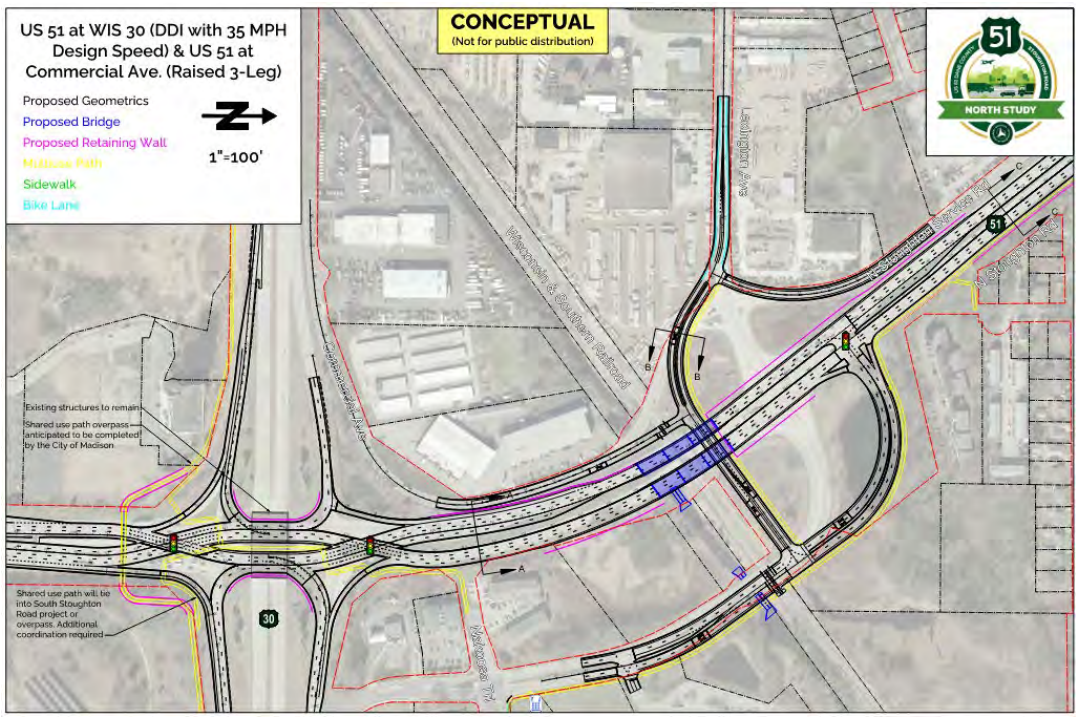
One Alternative for US 51 North Corridor has been proposed. US North Alternative 1 includes the following characteristics:

- A DDI Interchange at US 51 with WIS 30
- A Raised 3-leg configuration at US 51 with Commercial Avenue.
- US 51 between East Washington Avenue and WIS 30 posted speed is reduced from 55 mph to 35 mph.

In order to determine whether to adjust the model speed based on the proposed posted reduction from 55 mph to 35 mph, the functional class of US 51 between East Washington Avenue and WIS 30 was changed from a Suburban Expressway to an Urban Expressway. This area type change reduced the model input speed from 48 mph to 42 mph. Figure 25 below shows the impacts of this model input speed change would be a shift of about 3,000 daily vehicles from US 51 to parallel north-south routes such as I-39/90/94 and Fair Oaks Avenue. However, ultimately, similar to the East Washington Avenue speed reduction study described in a previous alternative above (See #17), this facility type change and resulting model input speed will not be incorporated in this Alternative. The reduction in posted speed along East Washington Avenue, described in #17 above, did not have the impact to traffic counts that the model predicted. Therefore, it was decided that the model input speed will not be changed for this US 51 North Alternative either.

*Figure 25 2050 US 51 North Daily Traffic Volume Shifts with Alternative 1*



MEMORANDUM

# I-39/90/94 Interstate North and South Segments - Future No Build Traffic Operations

| | |
|---|---|
| **Date:** | 4/18/2024 |
| **Topic:** | Interstate North and South Segments – No Build Traffic Operations |
| **From:** | Tim Flynn, HNTB Corporation |

This technical memorandum provides an overview of the year 2050 future no build level of service (LOS) traffic operations conducted for the I-39/90/94 North and South Segment Corridor Study. Further details about the analyzed limits, methodology, and results of the year 2050 no build traffic operations can be found in Appendix A (*I-39/90/94 South Segment No Build Traffic Operations*) and Appendix B (*I-39/90/94 North Segment No Build Traffic Operations*).

The Interstate North corridor study area extends from US 12/16 in the north to WIS 60 in the south. The Interstate South corridor study area extends from CTH V in the north to US 12/18 (Madison Beltline) in the south.

Level of service (LOS) serves as a planning-level measure of congestion and traffic operations on a transportation system. The measures of LOS range from A to F with LOS A having the least congestion and LOS F having the most congestion. For purposes of this project, LOS C was deemed an acceptable freeway LOS for rural areas, and LOS D was deemed acceptable for urban areas. This is based on the "Design Considerations and Representative Day Methodology" memo that cites the WisDOT Facilities Development Manual (FDM), Section 11.5-3.2.1. The Interstate North Segment is considered rural, and the Interstate South Segment is considered urban. Therefore, for the North Segment, a freeway LOS C or better was considered acceptable, and for the South Segment, a freeway LOS D or better was considered acceptable.

The Highway Capacity Manual 7$^{th}$ Edition (HCM 7) methodology was used to define the basic, merge, diverge, and weave segments along the freeway facilities. Table 1 shows the density-based LOS scale for the freeways and individual segments.

*Table 1. HCM 7$^{th}$ Edition - Density-Based LOS Definition*

| LOS | Basic Freeway Segment Density (pc/mi/ln) | Merge/Diverge Density (pc/mi/ln) |
|---|---|---|
| **A** | ≤ 11 | ≤ 10 |
| **B** | > 11-18 | > 10 – 20 |
| **C** | > 18-26 | > 20 – 28 |
| **D** | > 26-35 | > 28 – 35 |
| **E** | > 35-45 | > 35 - 45 |
| **F** | > 45 or any segment $v_{d/c}$>1.00 | > 45 |

Table 2 summarizes the year 2050 No Build peak hour traffic LOS operations. The Highway Capacity Software (HCS) Version 2022 was used for these analyses. The key is below, which describes the coloring used for Table 2.

| | |
|---|---|
| | Better than acceptable LOS operations (LOS A or B in North Segment; LOS A, B, or C in South Segment) |
| | At the acceptable LOS operations (LOS C in North Segment; LOS D in South Segment) |
| | Worse than acceptable LOS operations but not LOS F (LOS D or E in North Segment; LOS E in South Segment) |
| | Failing LOS operations (LOS F in North or South Segments) |

*Table 2. Future 2050 No-Build Level of Service Summary*

| Interstate Corridor (North/South) | Highway | I-39/90/94 Location (Interchange to Interchange) | LEVEL OF SERVICE (LOS) SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM | | PM | | FRI | | SUN | |
| | | | SB/EB | NB/WB | SB/EB | NB/WB | SB/EB | NB/WB | SB/EB | NB/WB |
| Interstate North (LOS C or better is acceptable) | I-90/94 | N of US 12/WIS 16 | -- | -- | -- | -- | D | E | F | D |
| | | US 12/WIS 16 to WIS 13 | -- | -- | -- | -- | D | E | F | D |
| | | WIS 13 to WIS 23 | -- | -- | -- | -- | D | E | F | E |
| | | WIS 23 to US 12 | -- | -- | -- | -- | D | D | F | D |
| | | US 12 to WIS 33 | -- | -- | -- | -- | D | E | D | D |
| | | WIS 33 to I-39 | -- | -- | -- | -- | D | D | D | D |
| | I-39/90/94 | I-39 to Rest Area | -- | -- | -- | -- | C | D | D | C |
| | | Rest Area TO CTH CS | -- | -- | -- | -- | C | D | D | C |
| | | CTH CS to WIS 60 | -- | -- | -- | -- | C | D | D | C |
| Interstate South (LOS D or better is acceptable) | | WIS 60 to CTH V | B | B | B | B/C | C | D | D | B/C |
| | | CTH V to WIS 19 | B | B | B | C | C | D | E | C |
| | | WIS 19 to US 51 | C | B | C | D | D | F | E | C |
| | | US 51 to US 151 | C | C | C | D | D | F | E | C |
| | | US 151 to Badger Interchange | C | C/D | D | D | F | F | E | C |
| | I-39/90 | Badger Interchange to Beltline Interchange | E | E | E | E | F | F | E | D |
| | I-94/WIS 30 | Fair Oaks to US 51 | B | D | D | B | D/E | C | B | B |
| | | US 51 to Thompson | B | F | E | B/C | E | C | B | B |
| | | Thompson to Badger Int. | B | D/E | D | B/C | D | C | A/B | B |
| | | Badger Int. to CTH N | B | C | C | B | C | C | C | B |
| | US 151 | SB I-90 to NB I-90 | D | B | F | B/C | F | C | C | B |
| | | NB I-90 to American Pkwy | D | C | D | C | D | D | C | B |
| | | American Pkwy to Grand Ave | D | A/B | C | C/D | C/D | C | C | B |
| | | Grand Ave to Main St | C | A | B | C | B | B | B | B |
| | | North of Main St | -- | A/B | -- | C | -- | C | -- | B |
| | NB US 151 CD | From NB I-90 | -- | F | -- | F | -- | F | -- | B/C |
| | | Diverge to NB US 151 | -- | F | -- | F | -- | F | -- | A |
| | SB US 151 CD | SB US 151 to NB US 151 | F | -- | F | -- | C | -- | B/C | -- |
| | | South of Weave | E | -- | E | -- | F | -- | D | -- |

Table 2 shows the year 2050 No Build Friday PM and Sunday PM peak hour traffic operations for the North Segment and the weekday AM, weekday PM, Friday PM, and Sunday PM peak hour traffic operations for the

South Segment.

Table 2 shows that there are several unacceptable year 2050 No Build traffic operations in the Interstate corridor. Unacceptable traffic operations include LOS D or worse in the North Segment and LOS E or worse in the South Segment. Every I-39/90/94 segment in the North Segment observes unacceptable LOS D conditions or worse along at least one direction during the Friday PM or Sunday PM peak hour. Along the South Segment, every I-39/90/94 segment except between WIS 60 and CTH V observes unacceptable LOS E conditions or worse under year 2050 No Build conditions. In addition, several locations along the I-94/WIS 30, US 151, and US 151 C-D corridors also observe unacceptable LOS E conditions or worse under year 2050 No Build conditions.

# Appendix A – I-39/90/94 South Segment No Build Traffic Operations

MEMORANDUM

# I-39/90/94 Corridor Study

| | |
|---|---|
| **Date:** | 03/09/2023 |
| **Topic:** | Future No-Build LOS |
| **From:** | I-39/90/94 South Segment Team |

This memo provides an overview of the 2050 future no-build conditions level of service (LOS). The following sections describe the analyzed limits, methodology, limitations, and results.

## 1. HCS Model Development

The 2050 future no-build models inherited the core components of the 2019 existing year model:

- Highway Capacity Software (HCS) Version 2022
- Spatial limits as shown in Figure 1
- Temporal limits of four peak periods
  - Weekday **AM**: 6-9 AM
  - Weekday **PM**: 3-6 PM
  - Summer Friday PM (**FRI**): 3-6 PM
  - Summer Sunday PM (**SUN**): 1-4 PM
- The no-build models inherit the parameters from the existing conditions model.

### 1.1. Committed Improvements

The no-build model incorporates the infrastructure changes on I-39/90, listed below, that were completed in the year 2021. There are no other committed projects included in the models beyond those listed here:

**I-39/90 & US 12/18 Beltline Interchange (BIC) configuration** – Lane layout is shown in Exhibit 1. Reconfiguration within the HCS model limits includes:

- Expansion from 3 lanes to 5 lanes on SB I-39/90 between the Wisconsin Southern Railroad bridge and the exit to WB US 12/18.
- Reconfiguration to allow 3 lanes from US 12/18 to join NB I-29/90. Within the interchange core, NB I-39/90 drops from 3 lanes to 2 lanes to accommodate the US 12/18 merge – *the HCS no-build model starts at the 3-lane basic segment downstream of the merge due to HCS limitations discussed in Section 2.2.*
- NB I-39/90 includes consecutive lane drops to go from 5 lanes to 3 lanes to tie into existing conditions at the Wisconsin & Southern Railroad bridge – *not included in the HCS model.*

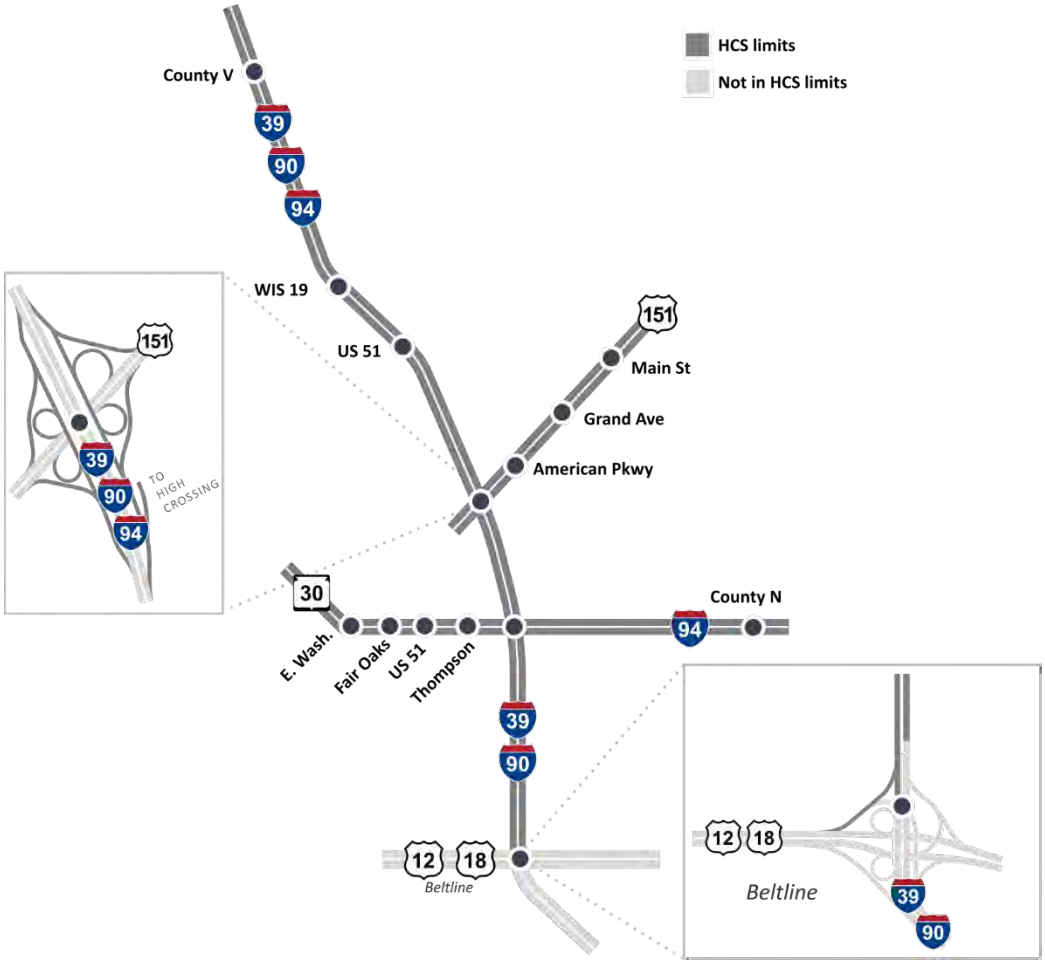



*Figure 1: LOS Analysis Limits*

## 2. Level of Service

### 2.1. Methodology

The Highway Capacity Manual 7th Edition (HCM 7) methodology was used to define the new segments along I-90. Peak hour volumes were obtained from the 2050 no-build forecast provided by the CDMCT. The flow profile of the future peak hour is assumed flat, while the warm-up and cool-down periods follow the same trend as the existing conditions. The existing Vissim OD matrix was used as a basis to estimate the future no-build OD. The 15-minute volumes and truck percentages were derived from the OD estimation. Model parameters were inherited from the existing conditions, one of which is the driver population factor. Same as existing, the driver population factor for AM and PM peaks was assumed to be “balanced mix” while FRI and SUN peaks were assumed to have a “mostly unfamiliar” driver population.

## 2.2. Results and Limitations

Table 1 shows the density-based LOS scale for the urban freeway facilities. Table 2 summarizes the LOS results for select locations for each peak period. A full set of results for all segments is shown in Exhibit 2. Exhibit 3 demonstrates LOS comparisons for 2019 and 2050 for all segments and peak periods. Table 2 contains the following performance measures:

- ***Density & LOS*** – The density-based LOS results reflect the 15-minute analysis period with the maximum density. All performance measures are reported for this same time period. The maximum density for each influence area within the peak and cool-down hours, time periods #5 through #12, is reported. The inclusion of the cool-down hour was crucial to account for queues spilling back onto the upstream segments in the subsequent time periods. During the oversaturated segment evaluation, all unserved vehicles within one analysis period get added to the following period. Given that the future no-build volumes are at or exceeding capacity at multiple locations, adding the cool-down hour results better represents the LOS and queues.

  For segments analyzed as merge/diverge influence areas, the density in the ramp influence area is reported when the freeway average density is less than 45 pc/mi/ln. For all other segments, the freeway average density is reported.

- ***d/c*** – The demand-to-capacity ratio was exported from HCS for the freeway (F) for all influence areas. For the merge/diverge influence areas, the d/c ratio for the ramp (R) was also reported.

- ***% Demand Met*** – The percent of demand met is based on the HCS volumes served (v) and target volumes (d). The root normalized square error (RNSE) was computed to validate the served volumes. The % of demand met shown in red indicates an RNSE ≥ 3.0, meaning that HCS results might not reflect the effects of the entire traffic demand.

- ***LOS Summary*** – The summary column combines all information in the table into one letter. It shows the reported density-based LOS and the upper bound LOS when the density is within 1.0 pc/mi/ln of LOS boundary (ex. LOS C/D). When the location is on the border between LOS letters, this can indicate that any minimal increase in volumes or shift in flow profiles could result in worse LOS. For the influence areas that experience d/c >= 1.0, the LOS was replaced with "F" based on the HCM 7 guidance, regardless of the density-based LOS. The asterisk next to the LOS (ex. LOS F*) indicates RNSE >= 3.0.

*Table 1. Density Based LOS Definition*

| HCM 7th Edition Density-Based LOS Scale (pc/mi/ln) | | |
|---|---|---|
| **LOS** | **Basic Freeway** | **Merge/ Diverge/ Weave** |
| **A** | ≤ 11 | ≤ 10 |
| **B** | > 11 – 18 | > 10 – 20 |
| **C** | > 18 – 26 | > 20 – 28 |
| **D** | > 26 – 35 | > 28 – 35 |
| **E** | **> 35 – 45** | **> 35 – 45*** |
| **F** | **> 45** | **> 45*** |

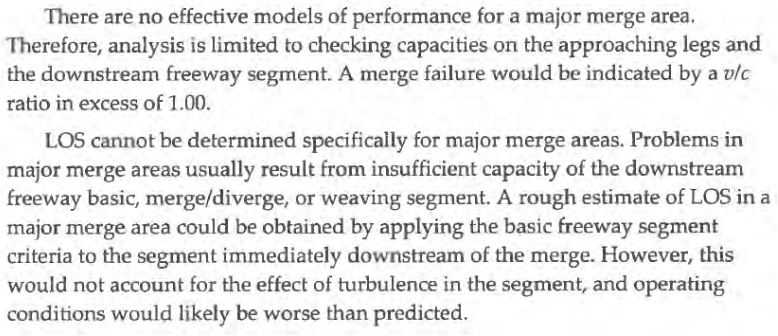
(*) 43 for Weave

*Table 2. Level of Service Summary*

| Corridor | Location | LOS Summary | | | | Density (pc/mi/ln) & LOS | | | | d/c | | | | | | | | % Demand Met | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | PM | FRI | SUN | AM | PM | FRI | SUN | AM | | PM | | FRI | | SUN | | AM | PM | FRI | SUN |
| | | | | | | | | | | F | R | F | R | F | R | F | R | | | | |
| **NB I-39/90/94** | **BIC - Badger** | **E** | **E** | **F*** | D | **39 E** | **42 E** | **56 F** | 32 D | **0.94** | | **0.97** | | **1.09** | | 0.86 | | 100% | 100% | **85%** | 100% |
| | Badger - US 151 | C/D | D | **F*** | C | 25 C | 31 D | **36 E** | 23 C | 0.73 | | 0.83 | | **1.01** | | 0.70 | | 100% | 100% | **91%** | 100% |
| | Diverge to US 151 | D | D | **F*** | B | 28 D | 30 D | 30 D | 19 B | 0.72 | 0.87 | 0.82 | 0.87 | **1.01** | 0.88 | 0.70 | 0.58 | 100% | 100% | **91%** | 100% |
| | US 151 - US 51 | C | D | **F*** | C | 19 C | 27 D | **41 E** | 24 C | 0.57 | | 0.76 | | **1.01** | | 0.71 | | 100% | 100% | **95%** | 100% |
| | US 51 - WIS 19 | B | D | **F*** | C | 17 B | 26 D | **39 E** | 21 C | 0.52 | | 0.75 | | **1.01** | | 0.65 | | 100% | 100% | **93%** | 100% |
| | WIS 19 - County V | B | C | D* | C | 13 B | 21 C | 33 D | 19 C | 0.40 | | 0.62 | | **0.92** | | 0.59 | | 100% | 100% | **94%** | 100% |
| | North of County V | B | B/C | D* | B/C | 12 B | 17 B | 30 D | 18 B | 0.38 | | 0.54 | | 0.87 | | 0.56 | | 100% | 100% | **95%** | 100% |
| **SB I-39/90/94** | **North of County V** | B | B | C | D | 12 B | 14 B | 19 C | 33 D | 0.37 | | 0.43 | | 0.59 | | 0.88 | | 100% | 100% | 100% | 100% |
| | County V - WIS 19 | B | B | C | **E** | 15 B | 15 B | 21 C | **37 E** | 0.46 | | 0.47 | | 0.64 | | **0.92** | | 100% | 100% | 100% | 100% |
| | WIS 19 - US 51 | C | C | D | **E** | 19 C | 19 C | 27 D | **41 E** | 0.57 | | 0.57 | | 0.76 | | **0.97** | | 100% | 100% | 100% | 100% |
| | US 51 - US 151 | C | C | D | **E** | 19 C | 21 C | 29 D | **42 E** | 0.54 | | 0.63 | | 0.80 | | **0.98** | | 100% | 100% | 99% | 100% |
| | US 151 - Badger | C | D | **F*** | **E** | 24 C | 30 D | **67 F** | **39 E** | 0.65 | | 0.81 | | 0.86 | | **0.94** | | 100% | 100% | **90%** | 100% |
| | Merge from Badger | D | D | **F*** | D | 31 D | 34 D | **56 F** | 31 D | 0.82 | 0.16 | **0.94** | 0.37 | **1.01** | 0.32 | **0.96** | 0.14 | 100% | 100% | **91%** | 100% |
| | Badger - BIC | **E** | **E** | **F*** | **E** | **36 E** | **39 E** | **38 E** | **40 E** | 0.83 | | **0.94** | | **1.02** | | **0.96** | | 100% | 100% | **91%** | 100% |
| **EB I-94/WIS 30** | **Fair Oaks - US 51** | B | D | **D/E** | B | 14 B | 33 D | 35 D | 14 B | 0.39 | | 0.77 | | 0.81 | | 0.38 | | 100% | 100% | 100% | 100% |
| | US 51 - Thompson | B | **E** | **E** | B | 14 B | **38 E** | **41 E** | 16 B | 0.45 | | 0.86 | | **0.94** | | 0.44 | | 100% | 100% | 100% | 100% |
| | Thompson - Badger | B | D | D | A/B | 11 B | 27 D | 27 D | 11 A | 0.36 | | 0.76 | | 0.77 | | 0.35 | | 100% | 100% | 100% | 100% |
| | Badger - County N | B | C | C | C | 12 B | 21 C | 24 C | 20 C | 0.37 | | 0.65 | | 0.71 | | 0.63 | | 100% | 100% | 100% | 100% |
| **WB I-94/WIS 30** | **County N - Badger** | C | B | C | B | 20 C | 13 B | 20 C | 14 B | 0.62 | | 0.40 | | 0.61 | | 0.45 | | 100% | 100% | 100% | 100% |
| | Badger - Thompson | **D/E** | B/C | C | B | 35 D | 18 B | 20 C | 13 B | 0.88 | | 0.48 | | 0.53 | | 0.36 | | 100% | 100% | 100% | 100% |
| | Thompson - US 51 | **F** | B/C | C | B | **44 F** | 20 B | 23 C | 15 B | **0.96** | | 0.53 | | 0.61 | | 0.42 | | 100% | 100% | 100% | 100% |
| | US 51 - Fair Oaks | D | B | C | B | 30 D | 15 B | 23 C | 11 B | 0.72 | | 0.42 | | 0.71 | | 0.31 | | 100% | 100% | 100% | 100% |
| **NB US 151** | **SB I-90 - NB I-90** | B | B/C | C | B | 11 B | 19 B | 21 C | 13 B | 0.42 | | 0.49 | | 0.54 | | 0.37 | | 100% | 100% | 100% | 100% |
| | NB I-90 - AM Pkwy | C* | C* | D* | B | 19 C | 24 C | 29 D | 16 B | 0.44 | | 0.57 | | 0.60 | | 0.44 | | **88%** | **90%** | **87%** | 100% |
| | AM Pkwy - Grand Ave | A/B | C*/D* | C* | B | 11 A | 26 C | 24 C | 16 B | 0.34 | | 0.75 | | 0.70 | | 0.51 | | 95% | **90%** | **86%** | 100% |
| | Grand Ave - Main St | A | C* | B* | B | 9 A | 19 C | 17 B | 11 B | 0.28 | | 0.59 | | 0.51 | | 0.36 | | 100% | **88%** | **85%** | 100% |
| | North of Main St | A/B | C* | C* | B | 10 A | 20 C | 19 C | 13 B | 0.33 | | 0.62 | | 0.54 | | 0.42 | | 100% | **84%** | **80%** | 100% |
| **SB US 151** | **Main St - Grand Ave** | C | B | B | B | 21 C | 14 B | 15 B | 12 B | 0.65 | | 0.45 | | 0.47 | | 0.37 | | 100% | 100% | 100% | 100% |
| | Grand Ave - AM Pkwy | D | C | C/D | C | 31 D | 23 C | 26 C | 21 C | 0.80 | | 0.62 | | 0.69 | | 0.57 | | 100% | 100% | 100% | 100% |
| | AM Pkwy - NB I-90 | D | D | D | C | 30 D | 31 D | 33 D | 20 C | 0.68 | | 0.75 | | 0.77 | | 0.51 | | 100% | 100% | 100% | 100% |
| | NB I-90 - SB I-90 | D | **F** | **F** | C | 31 D | 28 D | 33 D | 22 C | **0.99** | | **1.06** | | **1.15** | | 0.83 | | 100% | 100% | 100% | 100% |
| **NB US 151 CD** | **From NB I-90** | **F*** | **F*** | **F*** | B/C | **97 F** | **99 F** | **110 F** | 17 B | 0.80 | | 0.71 | | 0.82 | | 0.54 | | **80%** | **88%** | **67%** | 100% |
| | Diverge to NB US 151 | **F*** | **F*** | **F*** | A | 11 B | 11 B | 10 A | 9 A | **1.12** | **1.27** | **1.18** | **1.28** | **1.29** | **1.39** | 0.87 | **0.94** | **83%** | **79%** | **72%** | 100% |
| **SB US 151 CD** | **SB US 151 - NB US 151** | **F** | **F** | C | B/C | 28 C | 28 C | 23 C | 19 B | **1.22** | | **1.23** | | **0.91** | | 0.88 | | 97% | 95% | 100% | 100% |
| | South of Weave | **E** | **E** | **F*** | D | **36 E** | **36 E** | 32 D | 28 D | **0.90** | | **0.90** | | **1.03** | | 0.78 | | 96% | 99% | **82%** | 100% |

Overall, the 2050 no-build models suggest that due to increased demand, the corridors experience several bottlenecks and failing segments along with longer queues during all peak periods. LOS F conditions in the no-build model generally occur due to over-capacity connections on freeway adjacent to I-90 for the AM and PM peaks. For FRI and SUN peaks, LOS F conditions generally occur due to over-capacity ramps and basic freeway sections that accommodate both commuter and recreational traffic. In addition, the 2050 no-build traffic volumes push d/c ratios over 1.0 and cause LOS F conditions at key locations. This could lead to congestions spilling back from key bottlenecks. The project limits are suspected to experience capacity values lower than the HCM's theoretical value, suggesting that HCS might be over-estimating LOS. In addition to the HCS limitations identified for existing conditions (complex weaves, lane imbalances, one-lane CD, and limited demand), two other limitations have been encountered while analyzing no-build conditions:

- Analyzing a major merge. With the reconfiguration of the BIC, a lane was added to the on-ramp from US 12/18 to NB I-39/90 (2 to 3 lanes). It is to be noted that HCS cannot model on-ramps with more than 2 lanes. In addition, HCM 7 cannot reliably evaluate major merges, as shown in Figure 2. Due to software limitations, the NB I-90 corridor starts at the 3-lane basic segment downstream of this major merge. HCM 7 recommends using a microsimulation software to analyze such segments.



There are no effective models of performance for a major merge area. Therefore, analysis is limited to checking capacities on the approaching legs and the downstream freeway segment. A merge failure would be indicated by a *v/c* ratio in excess of 1.00.

LOS cannot be determined specifically for major merge areas. Problems in major merge areas usually result from insufficient capacity of the downstream freeway basic, merge/diverge, or weaving segment. A rough estimate of LOS in a major merge area could be obtained by applying the basic freeway segment criteria to the segment immediately downstream of the merge. However, this would not account for the effect of turbulence in the segment, and operating conditions would likely be worse than predicted.

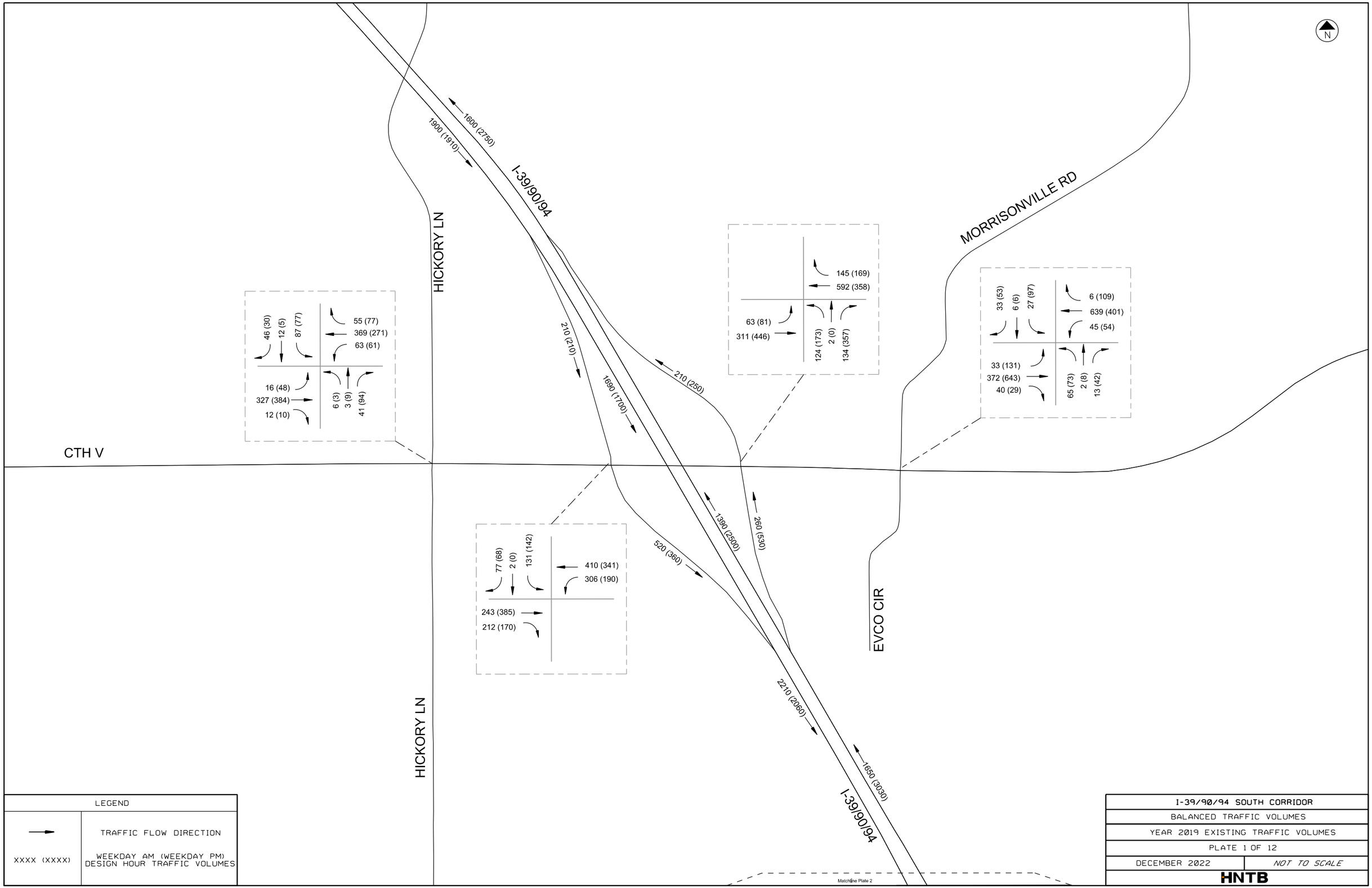
*Figure 2. HCM Chapter 14 Section 4 (Major Merge)*

- Oversaturation conditions at the first segment or time period. If the demand exceeds capacity on the first segment of the facility or on any segment during the first analysis period, the HCS results are expected to be unreliable due to constraining the model and limiting the throughput to the segment's capacity (ex. NB and SB I-90, BIC - Badger during the FRI peak). These locations may require unconstrained sensitivity analysis or additional time periods to capture the entire demand downstream of the bottlenecks.

Taking into consideration all software limitations, the LOS results reported from HCS should be used with caution. The following section discusses the general results on each of the corridors:

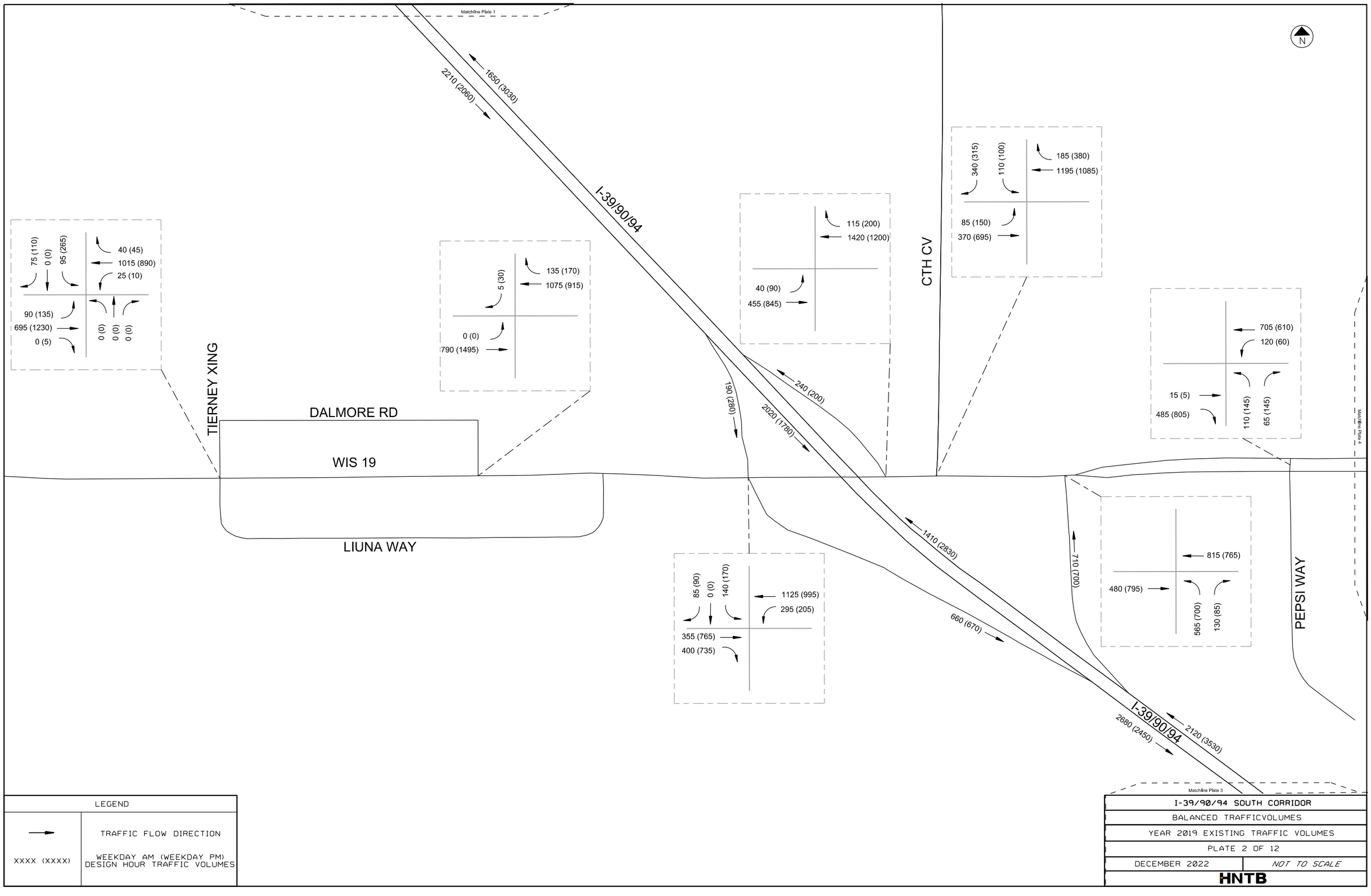
- ***I-39/90/94*** – Going northbound, the demand on the BIC to Badger, first segment of the facility, exceeds capacity during the FRI peak resulting in unreliable HCS LOS results for the downstream segments. The d/c of segments between BIC to WIS 19 is mostly greater than one indicating LOS F conditions. The corridor experience LOS E in the weekday PM peak between the BIC and Badger and LOS D between the Badger and WIS 19. Existing field conditions and future volumes suggest that the NB I-90 off-ramp to NB US 151 CD is expected to exceed capacity in 2050 during the AM and PM peak periods causing congestion backing up on the I-90 mainline. The HCS over-estimated the density-based LOS at this location due to various reasons such as lane utilization, capacity estimates, and capacity drop phenomenon. Going southbound, the corridor is anticipated to experience LOS E starting at County V all the way to the BIC on summer Sundays with demand approaching capacity at most locations. During the FRI peak, the demand on the BIC to Badger segment exceeds capacity in the first analysis period indicating unreliable HCS LOS results. The consecutive merges from the Badger ramps are expected to be over capacity and are ultimately constrained by the downstream 3-lane segment between the Badger and the BIC. This bottleneck results in backups to US 151 and beyond.
- ***I-94/WIS 30*** – Going eastbound, the existing bottleneck at the weave between US 51 and Thompson Dr is expected to get worse in the PM and FRI peaks. Traffic volumes in 2050 are approaching capacity causing LOS E with potential backups upstream. Going westbound, the weave between Thompson Dr and US 51 fails in the AM peak causing spill backs to the Badger.
- ***US 151*** – Going northbound, the reported results suggest acceptable conditions; however, this is an over-estimation of conditions for certain locations, especially at the merge from NB I-90 during AM, PM, and FRI peaks. The NB I-90 ramp is over capacity reaching d/c of 1.46 in the FRI peak which is constraining the downstream segments from experiencing the entire traffic demand. The demand on the off-ramp to Grand Ave is at capacity as well causing LOS F at the diverge influence area and potential backups upstream. Going southbound, the main bottleneck is at the weave between SB I-90 and NB I-90 ramps with d/c ratios approaching 1.15 during the FRI peak. Although the reported density-based LOS is D, this weave is expected to experience LOS F causing queues to spill back to Grand Ave.
- ***US 151 CD*** – Going northbound, the key bottleneck is at the diverge to NB US 151 in the AM, PM, and FRI peaks, same as existing. Although the reported HCS LOS is A/B, the demand on the diverge influence as well as the off-ramp exceeds capacity causing failures on the upstream diverge to High Crossing Blvd as well as the CD mainline causing potential queue spill backs onto the NB I-90 mainline. Going southbound, the demand on the weave between SB US 151 on-ramp and NB US 151 off-ramp and the downstream basic segment is nearing/exceeding capacity for all peak periods except for SUN resulting in LOS E/F. The following merge from NB US 151 adds a lane to the CD and reports LOS C or better; however, this segment is anticipated to have worse LOS due to imbalanced lane utilizations where all the SB US 151 on-ramp volume tend to stay in the left lane anticipating a downstream lane drop after the merge onto SB I-90.

The HCS reported results suggest that HCS may over-estimate LOS on multiple segments along the interstate and connecting freeways in the Madison area. Considering d/c ratios as well as % demand met provides better insight on the corridor operations and congestions. Due to multiple HCS limitations and oversaturation conditions, it is recommended to confirm the LOS results by conducting an analysis in a different tool.




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 1 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

I-39/90/94 SOUTH CORRIDOR

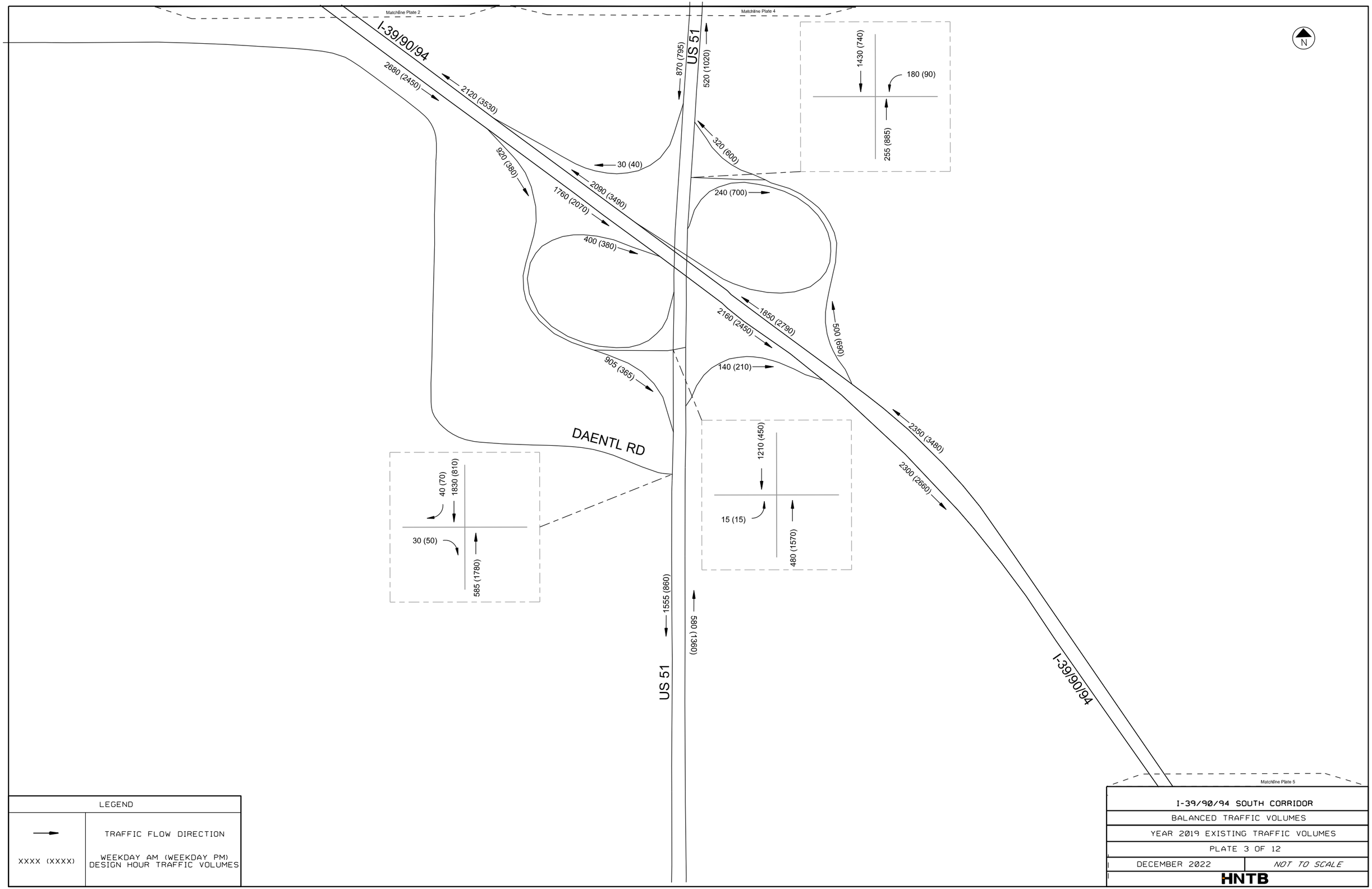
BALANCED TRAFFICVOLUMES

YEAR 2019 EXISTING TRAFFIC VOLUMES

PLATE 2 OF 12

DECEMBER 2022 | *NOT TO SCALE*

HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90/94 SOUTH CORRIDOR**

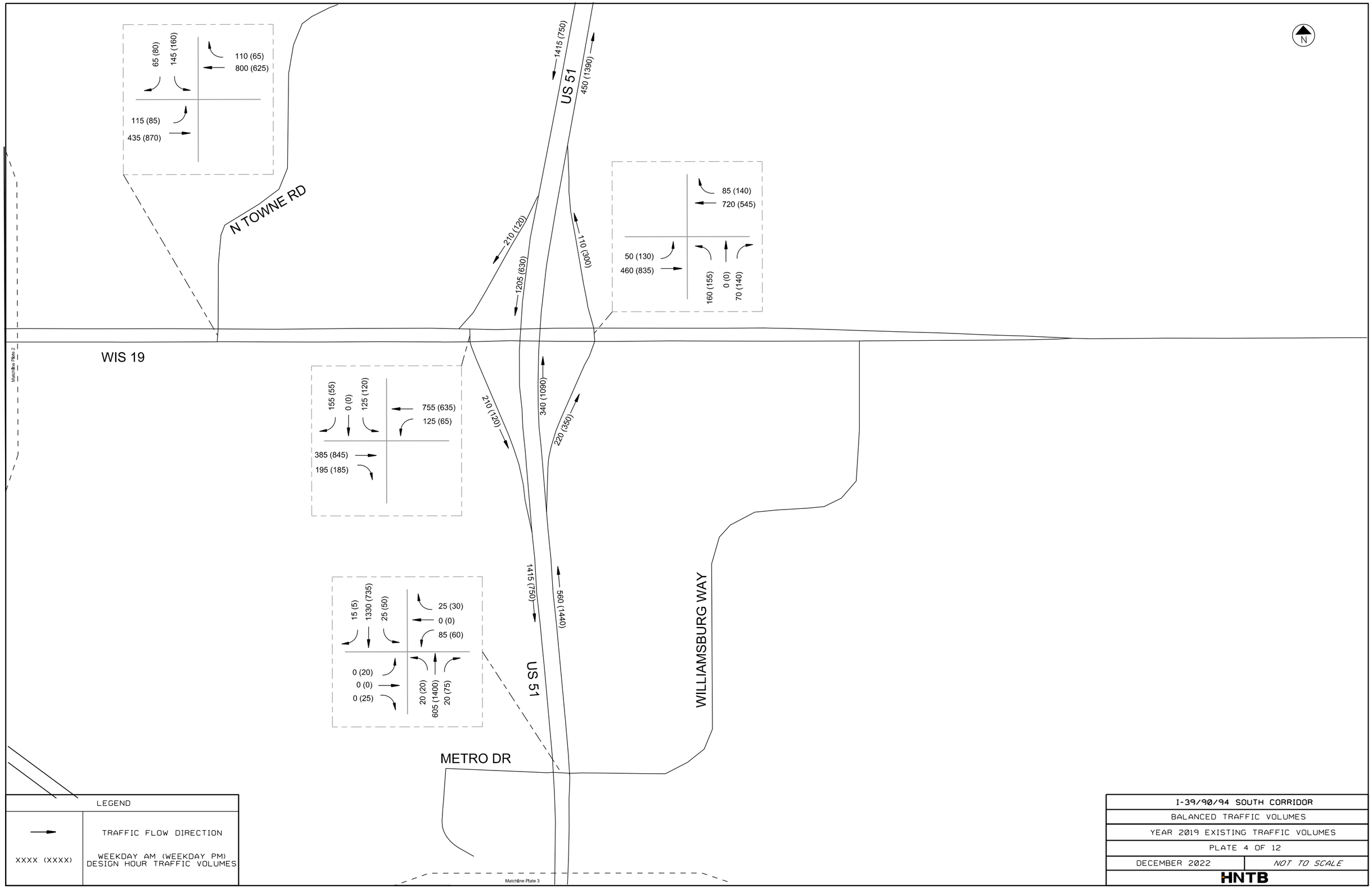
BALANCED TRAFFIC VOLUMES

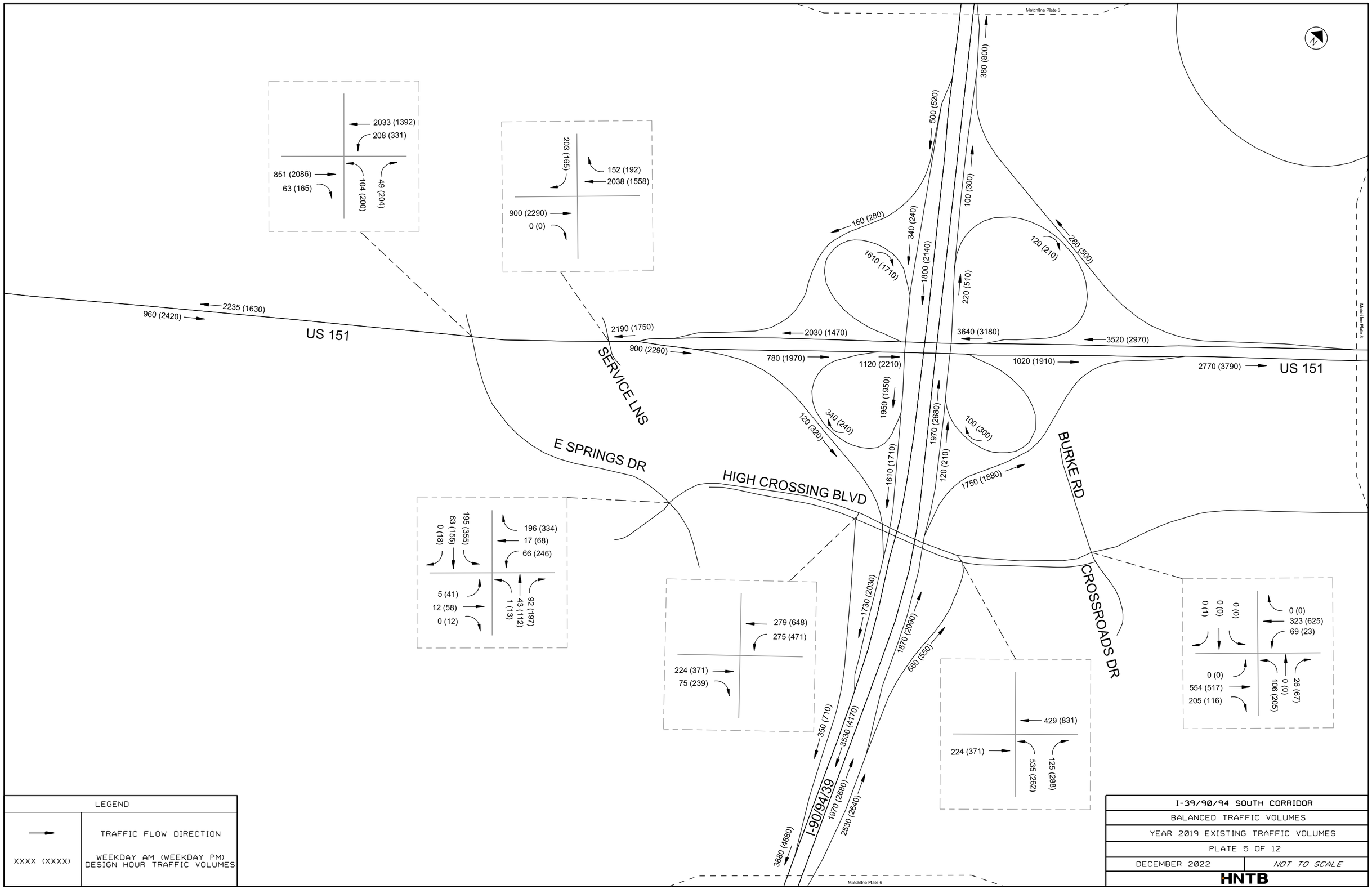
YEAR 2019 EXISTING TRAFFIC VOLUMES

PLATE 3 OF 12

DECEMBER 2022 | *NOT TO SCALE*

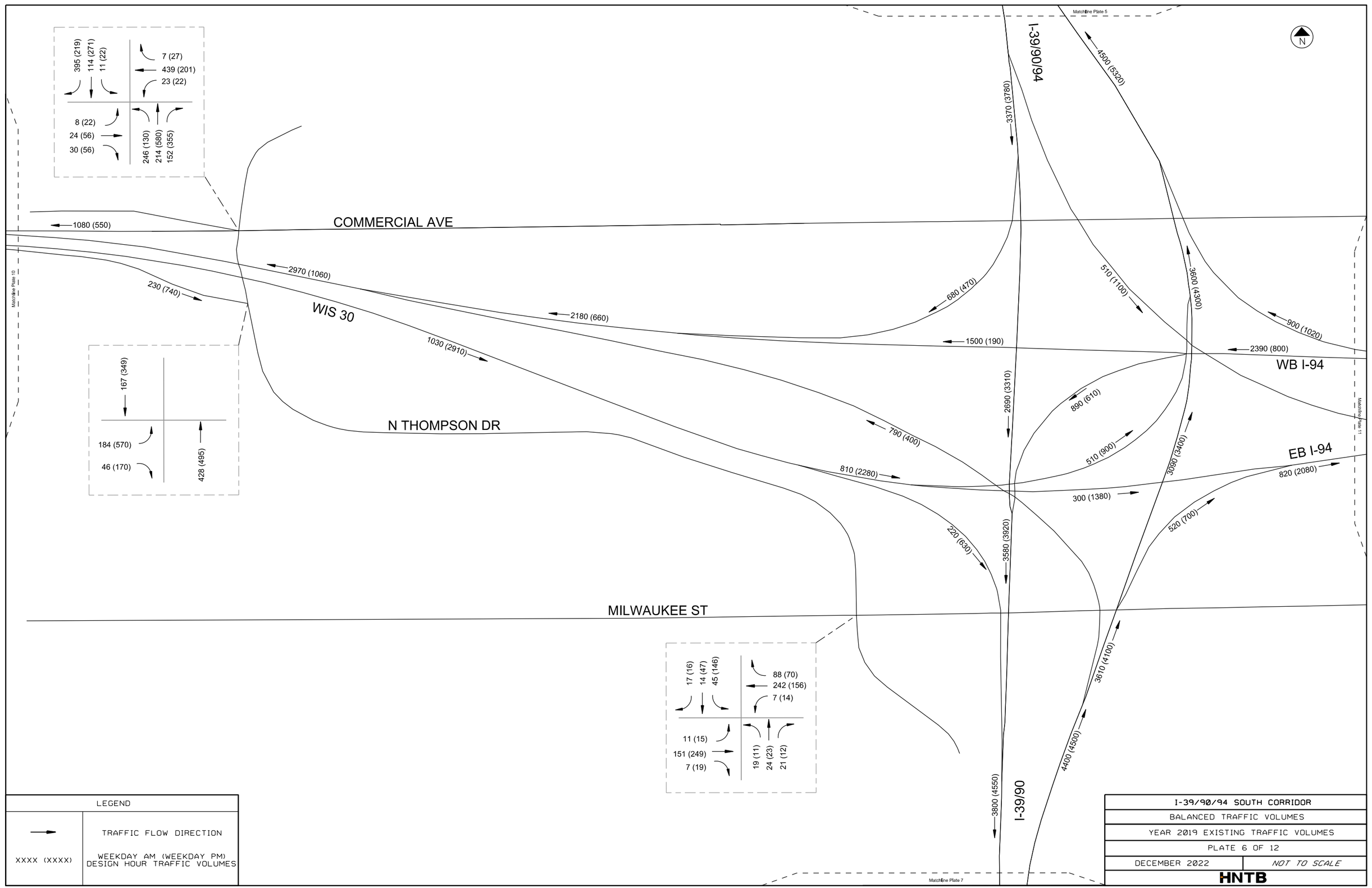
**HNTB**


N
N TOWNE RD
WIS 19
US 51
WILLIAMSBURG WAY
METRO DR
65 (80)
145 (160)
110 (65)
800 (625)
115 (85)
435 (870)
1415 (750)
450 (1390)
210 (120)
1205 (630)
110 (300)
85 (140)
720 (545)
50 (130)
460 (835)
160 (155)
0 (0)
70 (140)
155 (55)
0 (0)
125 (120)
755 (635)
125 (65)
385 (845)
195 (185)
210 (120)
340 (1090)
220 (350)
1415 (750)
560 (1440)
15 (5)
1330 (735)
25 (60)
25 (30)
0 (0)
85 (60)
0 (20)
0 (0)
0 (25)
20 (20)
605 (1400)
20 (75)
Matchline Plate 2
Matchline Plate 3
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 4 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 5 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 6 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 6

N

I-39/90

3800 (4550)

4400 (4500)

2720 (2590)

1080 (1960)

2920 (3225)

890 (500)

3610 (3090)

30 (20)

1480 (1275)

410 (275)

US 12/18

1110 (1980)

2370 (1775)

2510 (2950)

US 12/18

530 (950)

240 (350)

30 (25)

870 (1630)

1400 (2580)

2400 (1800)

I-39/90

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 7 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

AMERICAN PKWY

EASTPARK BLVD

HIGH CROSSING BLVD

NELSON RD

US 151

US 151

Matchline Plate 5

Matchline Plate 9

N

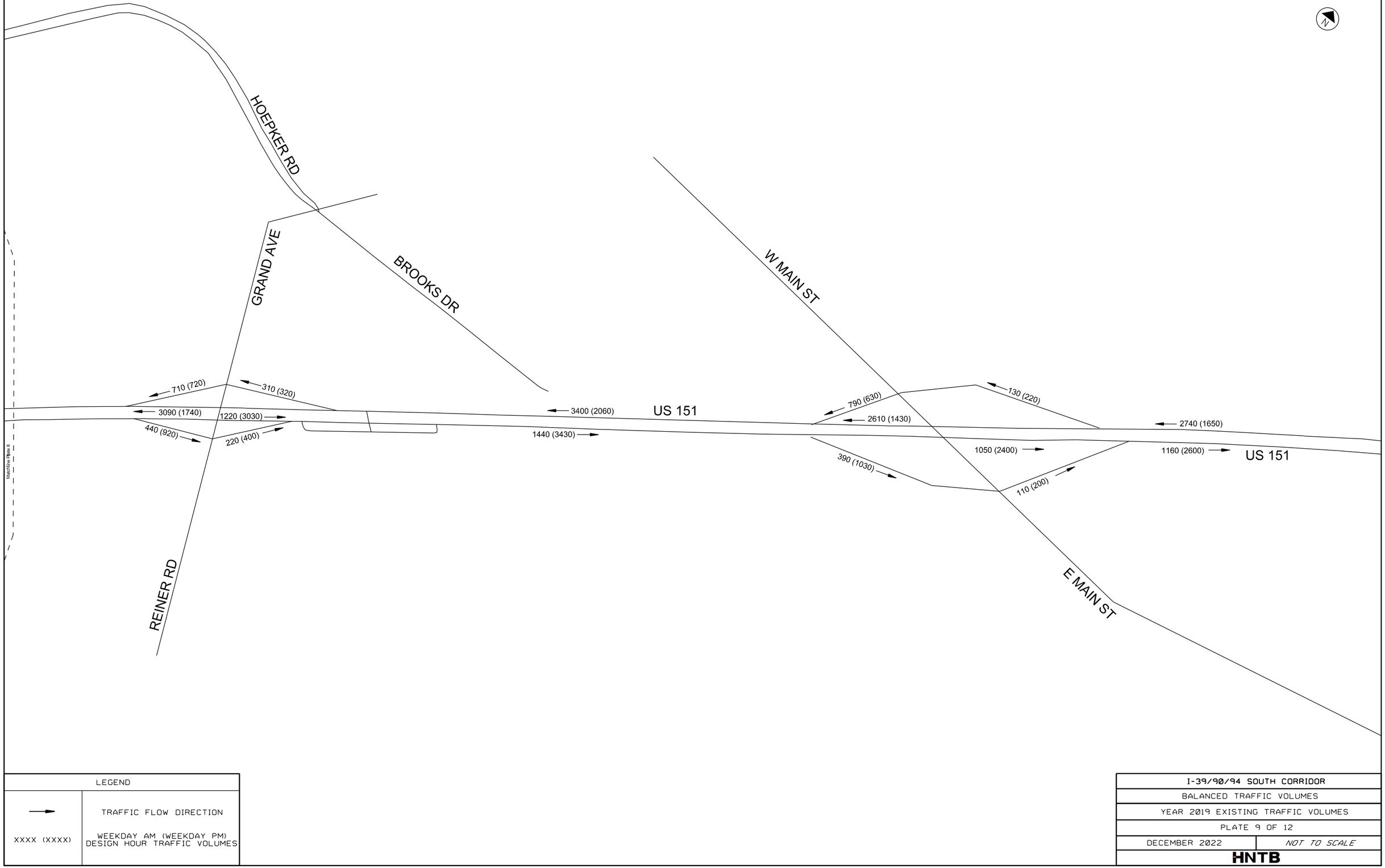
52 (15)
398 (819)
7 (23)
10 (17)
25 (13)
157 (210)
21 (61)
10 (52)
105 (693)
781 (128)
762 (454)
163 (204)

420 (1120)
340 (120)
210 (160)
130 (170)
550 (280)
3800 (3470)
3380 (2350)
3250 (2180)
3800 (2460)
2550 (3620)
220 (170)
1040 (390)
1510 (3230)
150 (720)
1660 (3950)
280 (890)

219 (232)
163 (292)
78 (286)
0 (0)
169 (130)
41 (30)
154 (180)
135 (496)
49 (87)
95 (135)
172 (96)
67 (109)

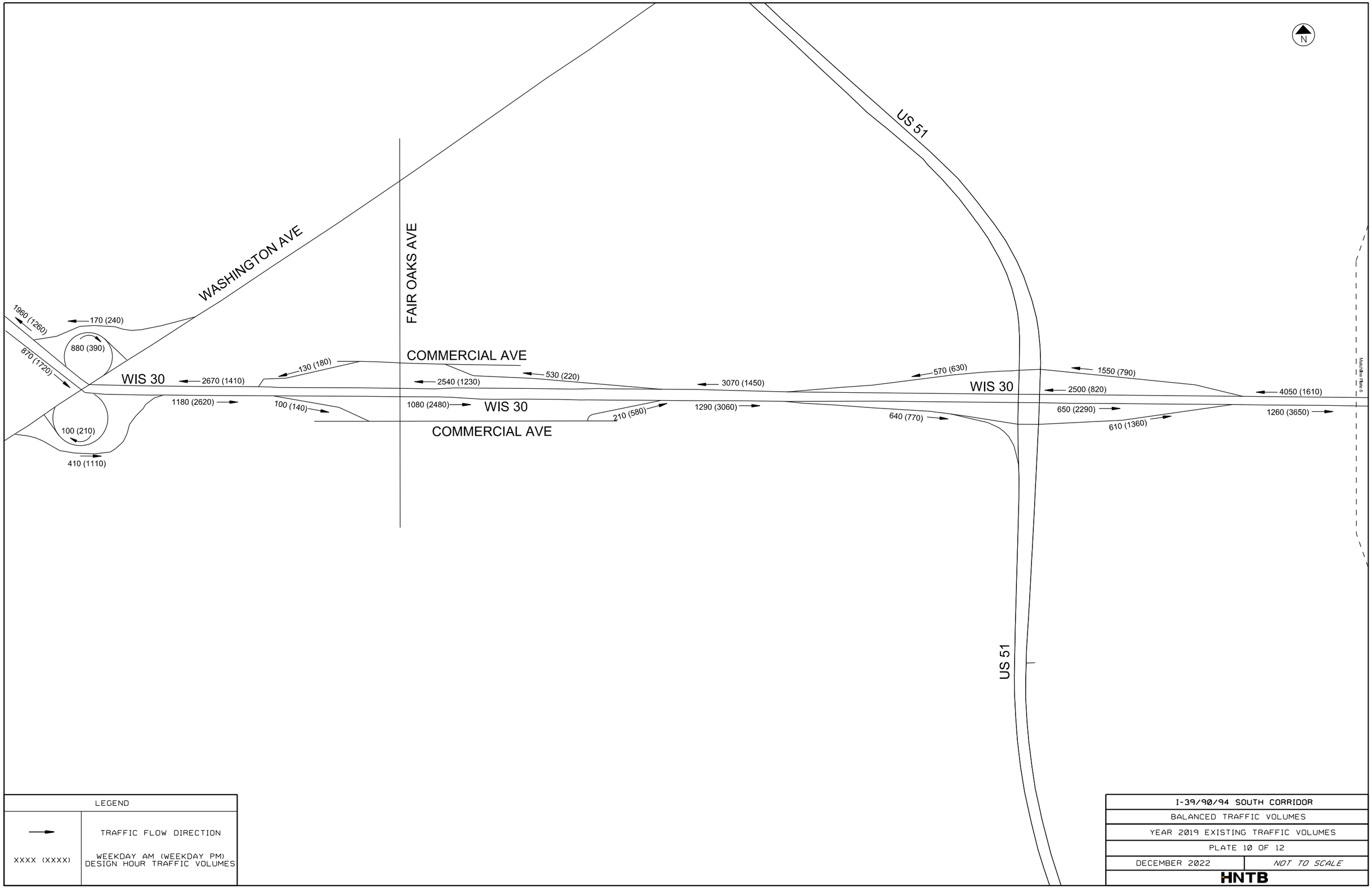
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 8 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |



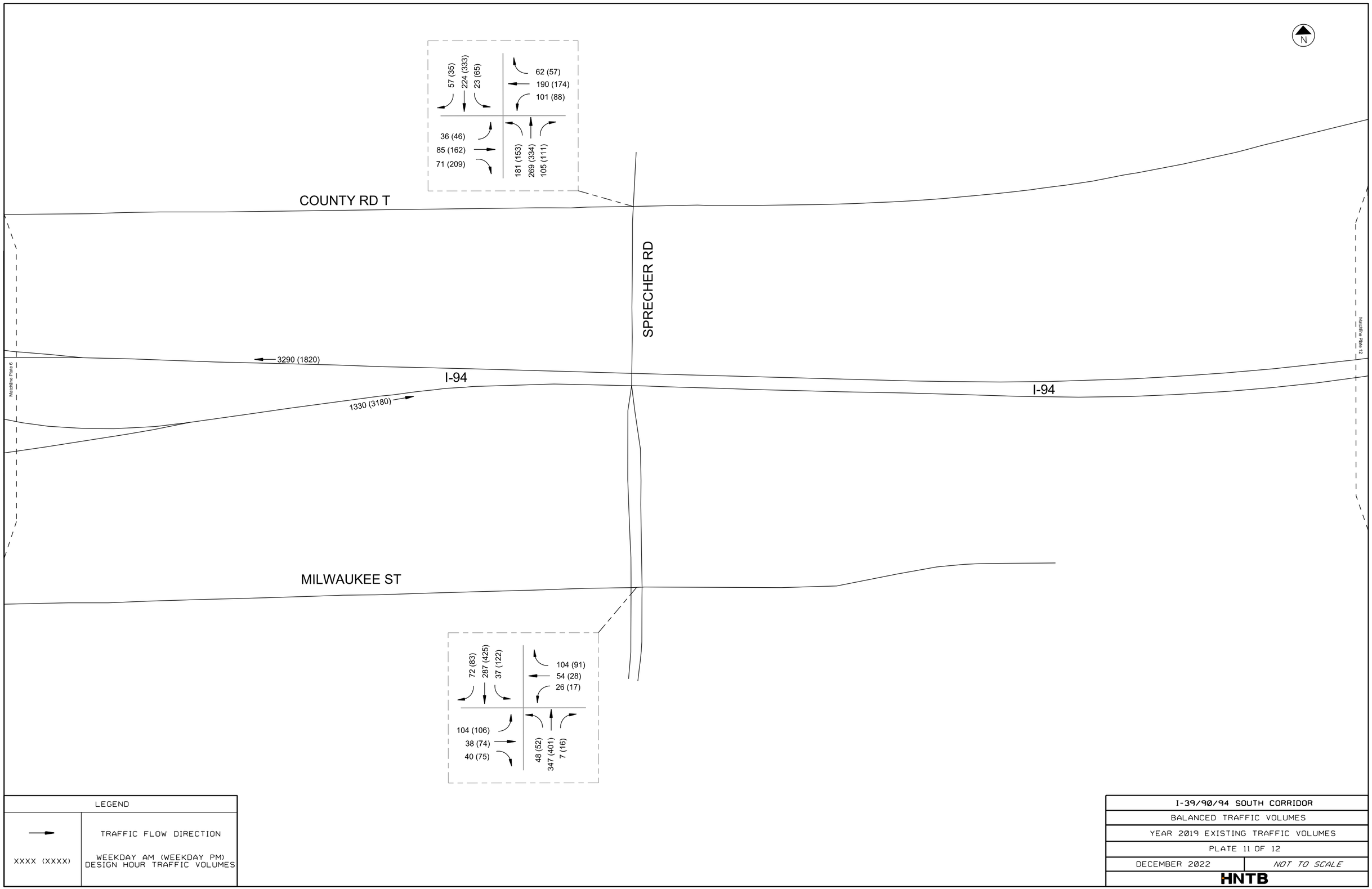

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 9 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |



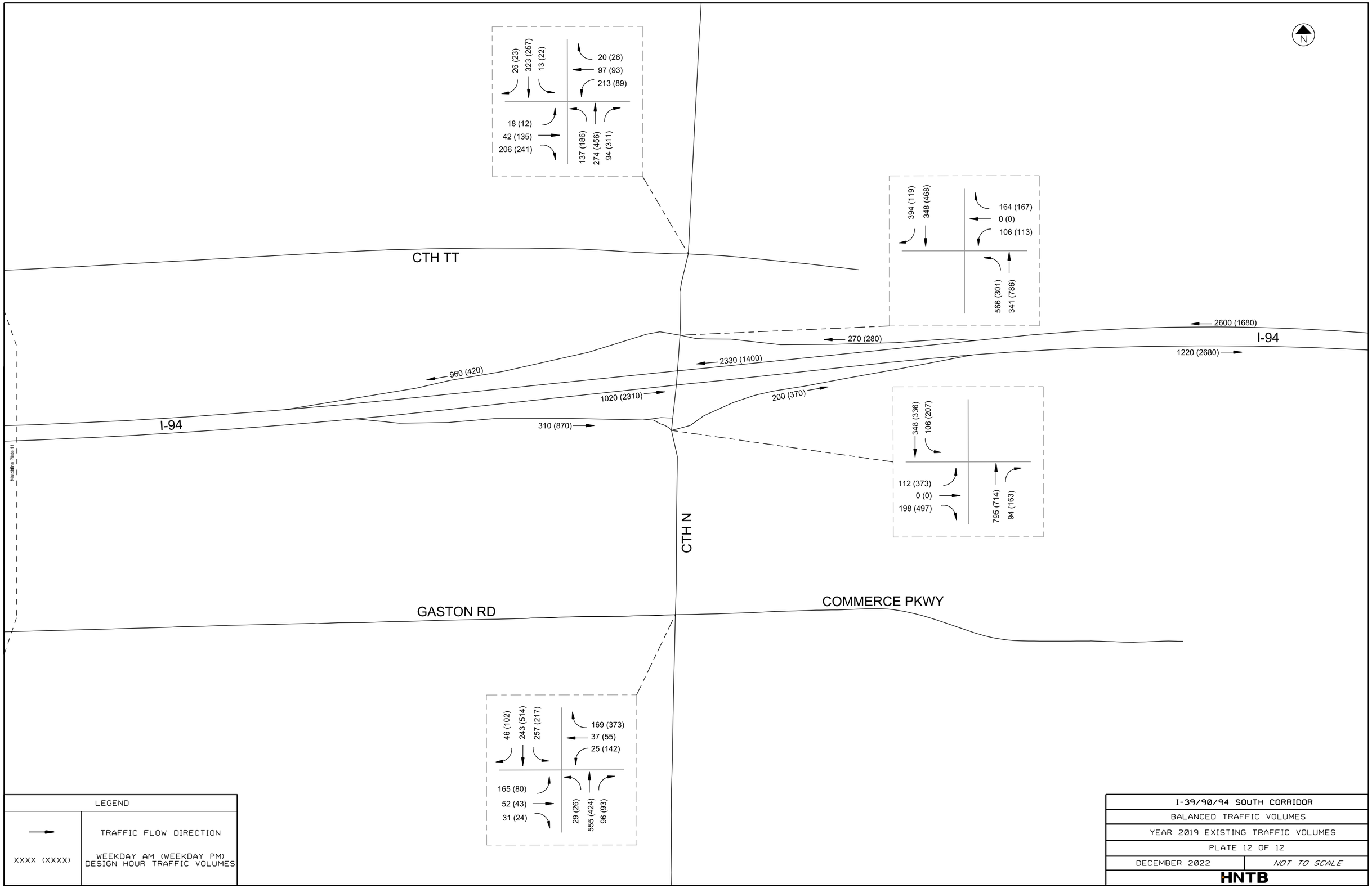

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

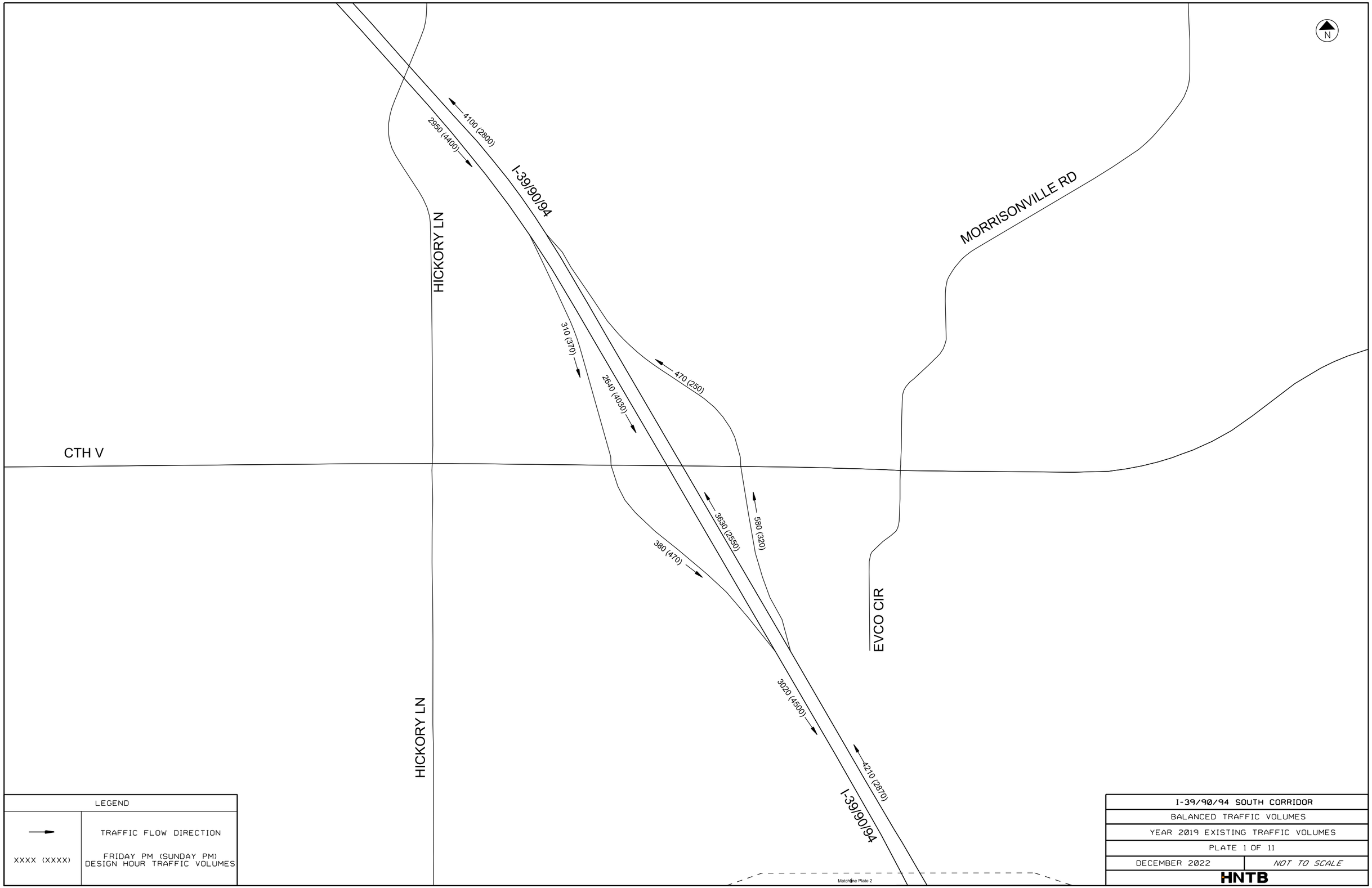
| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 10 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 11 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |


N
CTH TT
I-94
I-94
CTH N
GASTON RD
COMMERCE PKWY
26 (23)
323 (257)
13 (22)
20 (26)
97 (93)
213 (89)
18 (12)
42 (135)
206 (241)
137 (186)
274 (456)
94 (311)
394 (119)
348 (468)
164 (167)
0 (0)
106 (113)
566 (301)
341 (786)
2600 (1680)
270 (280)
1220 (2680)
2330 (1400)
960 (420)
1020 (2310)
200 (370)
310 (870)
348 (336)
106 (207)
112 (373)
0 (0)
198 (497)
795 (714)
94 (163)
46 (102)
243 (514)
257 (217)
169 (373)
37 (55)
25 (142)
165 (80)
52 (43)
31 (24)
29 (26)
555 (424)
96 (93)
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 12 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 1 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 1

N

3020 (4500)

4210 (2870)

I-39/90/94

CTH CV

TIERNEY XING

DALMORE RD

WIS 19

LIUNA WAY

260 (330)

420 (260)

2760 (4170)

3790 (2610)

700 (410)

730 (460)

PEPSI WAY

I-39/90/94

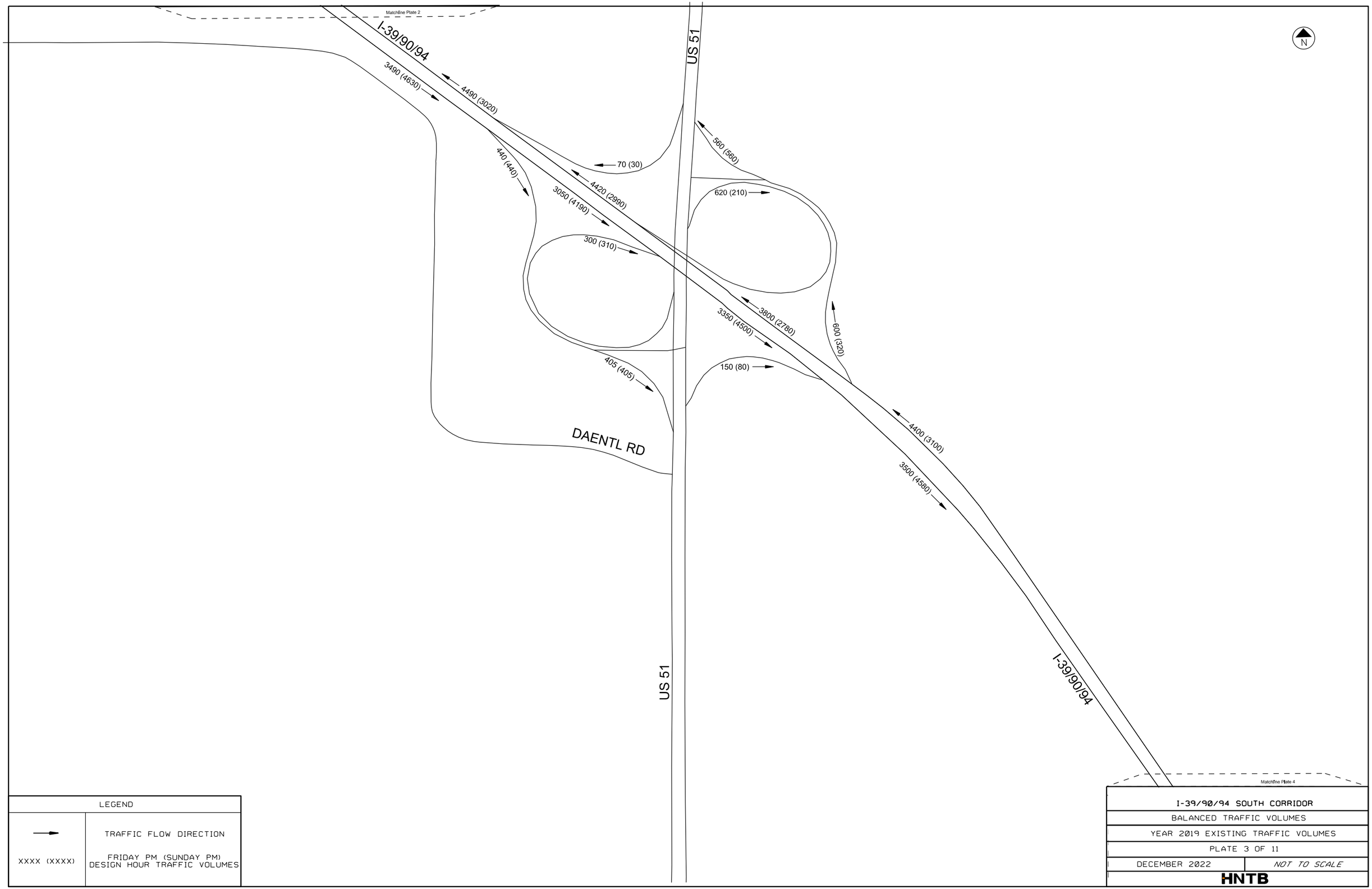
3490 (4630)

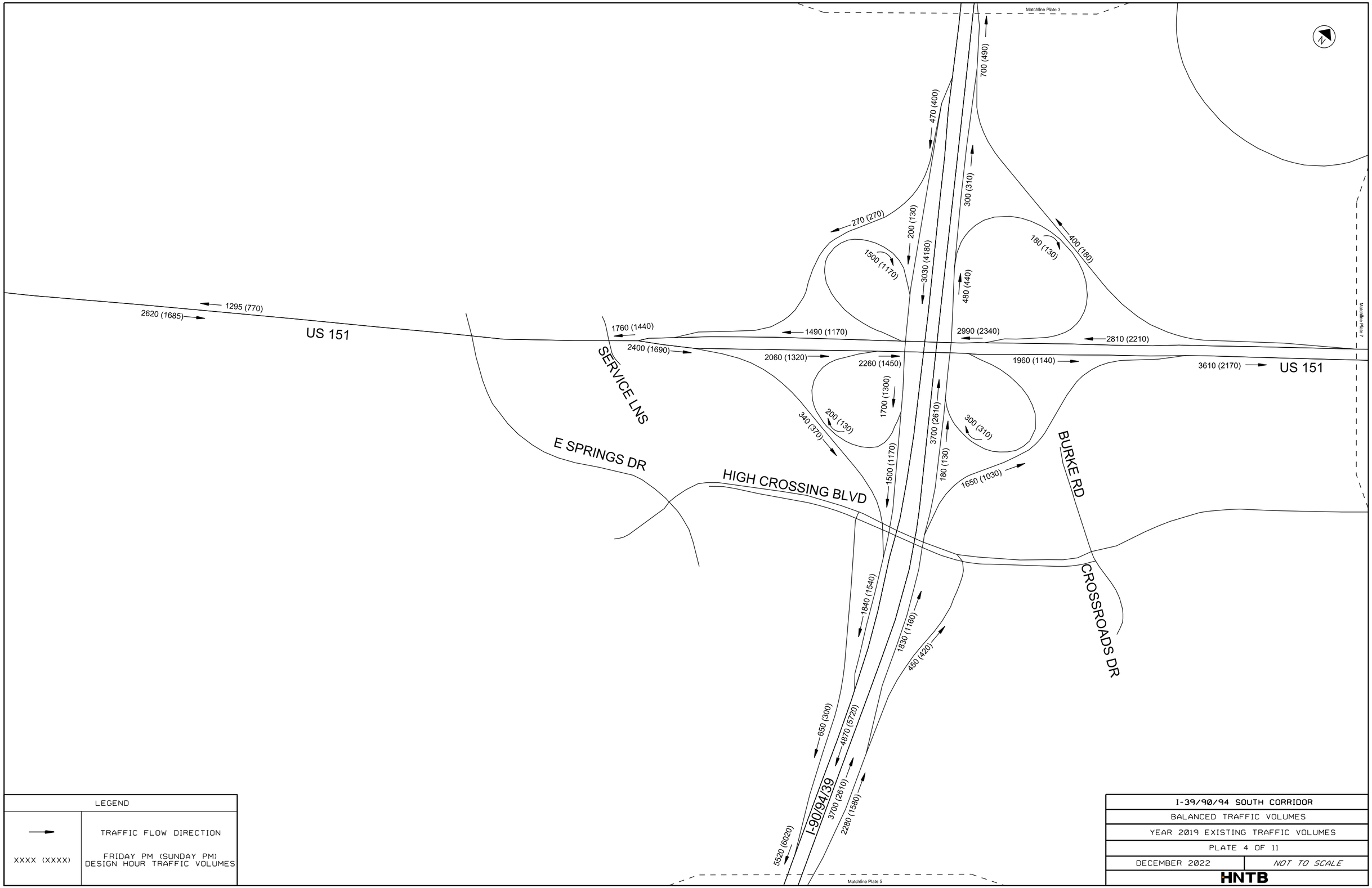
4490 (3020)

Matchline Plate 3

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

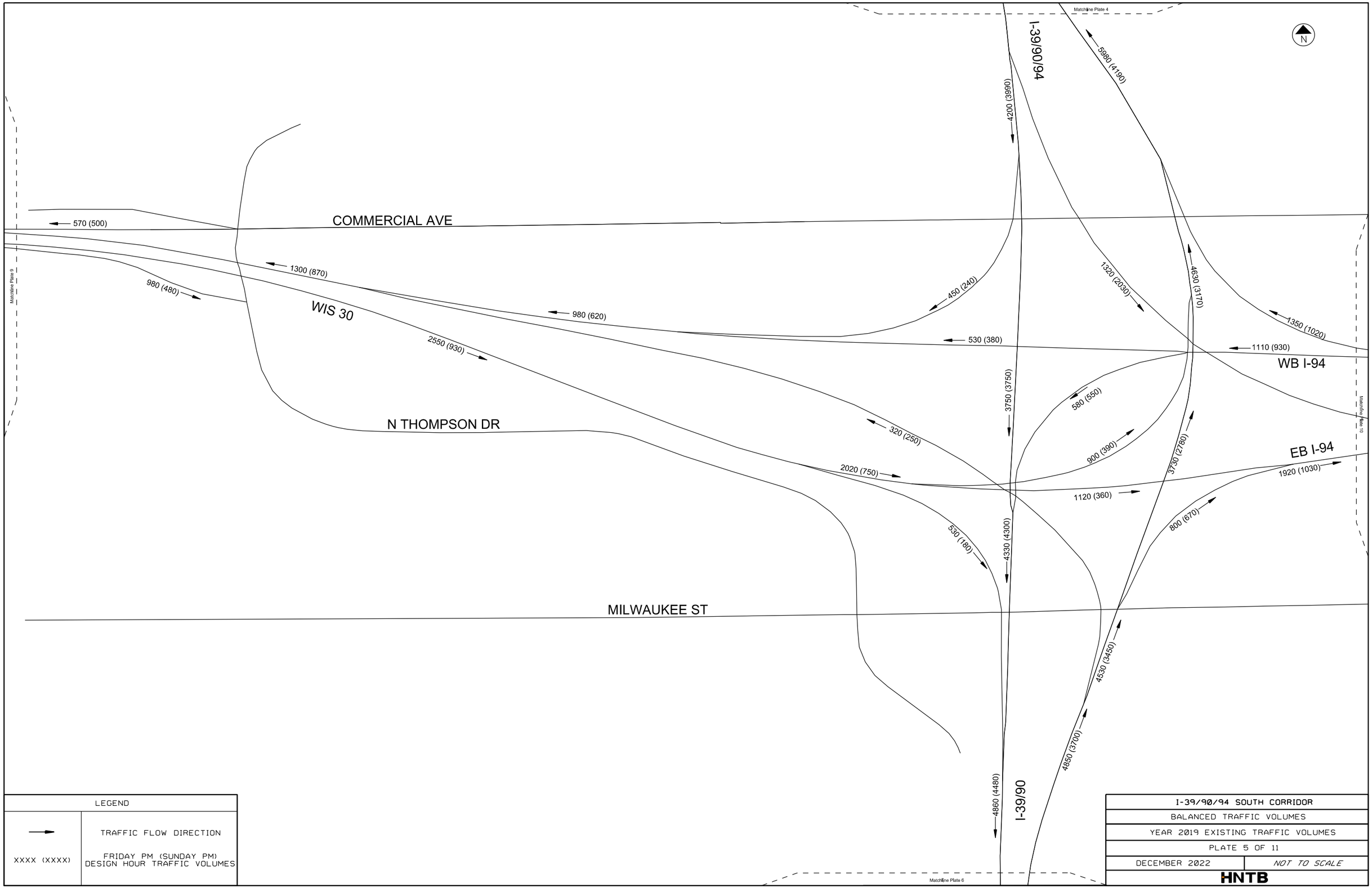
| |
|---|
| I-39/90/94 SOUTH CORRIDOR |
| BALANCED TRAFFIC VOLUMES |
| YEAR 2019 EXISTING TRAFFIC VOLUMES |
| PLATE 2 OF 11 |
| DECEMBER 2022 \| *NOT TO SCALE* |
| HNTB |


Matchline Plate 2
I-39/90/94
US 51
3490 (4630)
4490 (3020)
70 (30)
560 (360)
440 (440)
4420 (2990)
620 (210)
3050 (4190)
300 (310)
3800 (2780)
3350 (4500)
600 (320)
405 (405)
150 (80)
DAENTL RD
4400 (3100)
3500 (4580)
N
US 51
I-39/90/94
Matchline Plate 4
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
FRIDAY PM (SUNDAY PM)
DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 3 OF 11
DECEMBER 2022
NOT TO SCALE
HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 4 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |


Matchline Plate 4
I-39/90/94
5980 (4190)
4200 (3990)
COMMERCIAL AVE
570 (500)
Matchline Plate 9
1300 (870)
980 (480)
WIS 30
980 (620)
450 (240)
1320 (2030)
4630 (3170)
1350 (1020)
530 (380)
1110 (930)
WB I-94
2550 (930)
3750 (3750)
580 (550)
Matchline Plate 10
N THOMPSON DR
320 (250)
900 (390)
3730 (2780)
EB I-94
2020 (750)
1920 (1030)
1120 (360)
530 (180)
4330 (4300)
800 (670)
MILWAUKEE ST
4530 (3450)
4850 (3700)
4860 (4480)
I-39/90
Matchline Plate 6
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
FRIDAY PM (SUNDAY PM)
DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 5 OF 11
DECEMBER 2022
NOT TO SCALE
HNTB

Matchline Plate 5

N

I-39/90

4860 (4480)

4850 (3700)

2380 (1800)

2480 (2680)

2910 (1990)

640 (550)

3020 (2350)

30 (20)

1940 (1710)

360 (220)

US 12/18

2510 (2700)

2580 (2260)

2550 (1770)

US 12/18

880 (570)

530 (380)

70 (40)

1980 (2320)

2860 (2890)

2650 (2300)

I-39/90

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 6 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

AMERICAN PKWY

EASTPARK BLVD

770 (210)

110 (70)

110 (70)

160 (40)

220 (120)

3210 (2390)

2440 (2180)

2280 (2140)

2500 (2260)

US 151

US 151

3460 (2110)

150 (60)

3090 (1910)

3650 (2190)

370 (200)

560 (280)

720 (320)

HIGH CROSSING BLVD

NELSON RD

Mainline Plate 6

Mainline Plate 8

N

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90/94 SOUTH CORRIDOR**

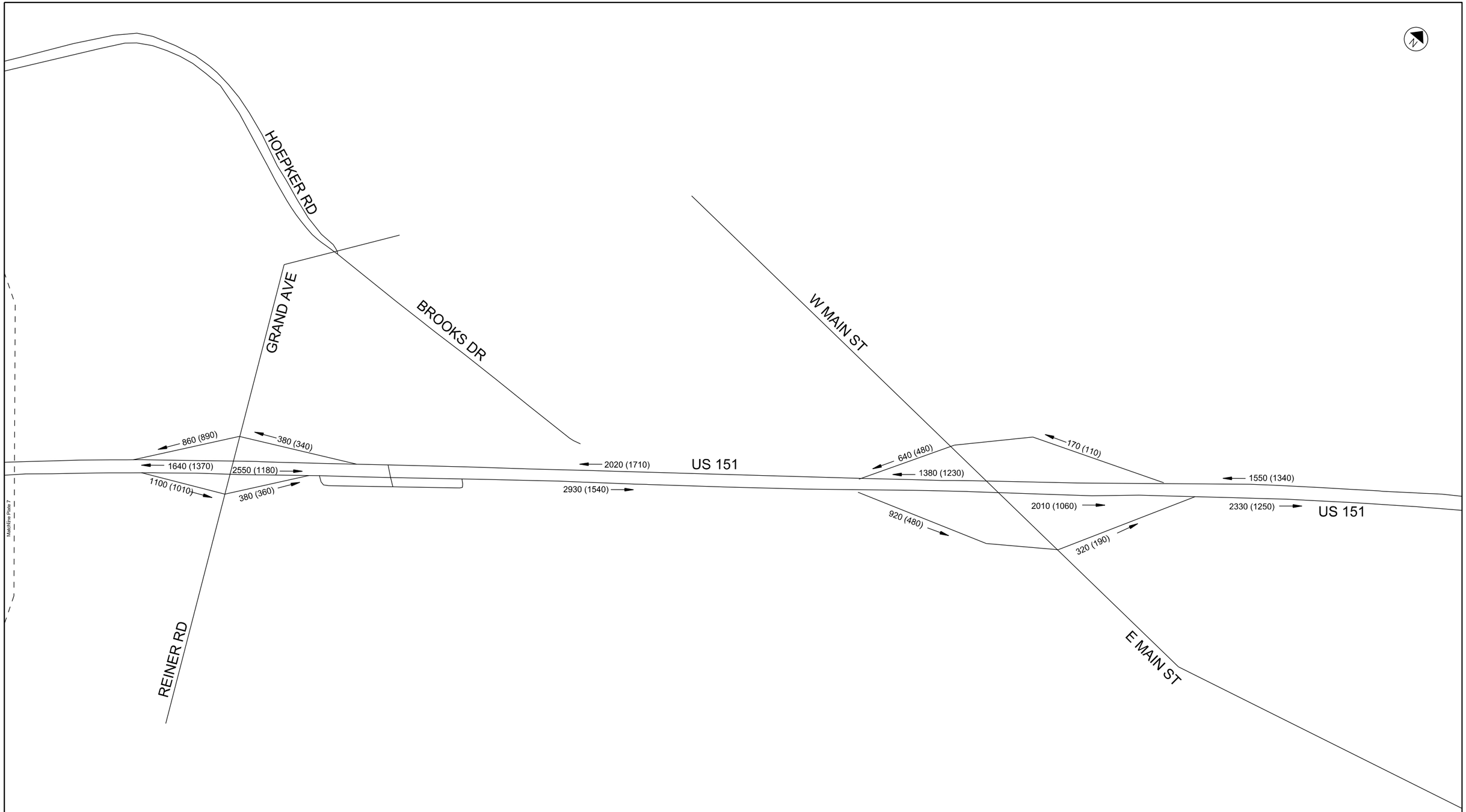
BALANCED TRAFFIC VOLUMES

YEAR 2019 EXISTING TRAFFIC VOLUMES

PLATE 7 OF 11

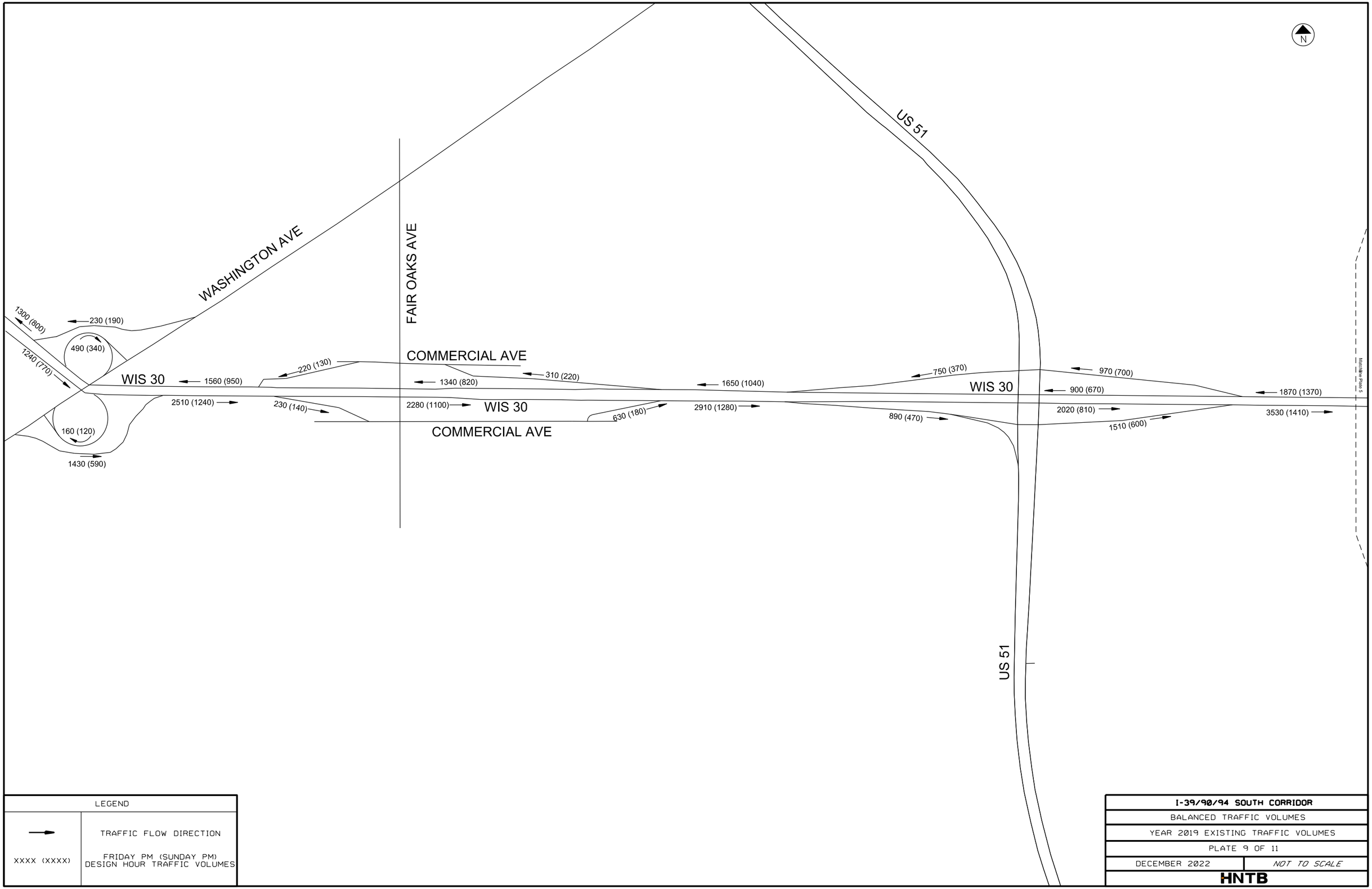
DECEMBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 8 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90/94 SOUTH CORRIDOR**

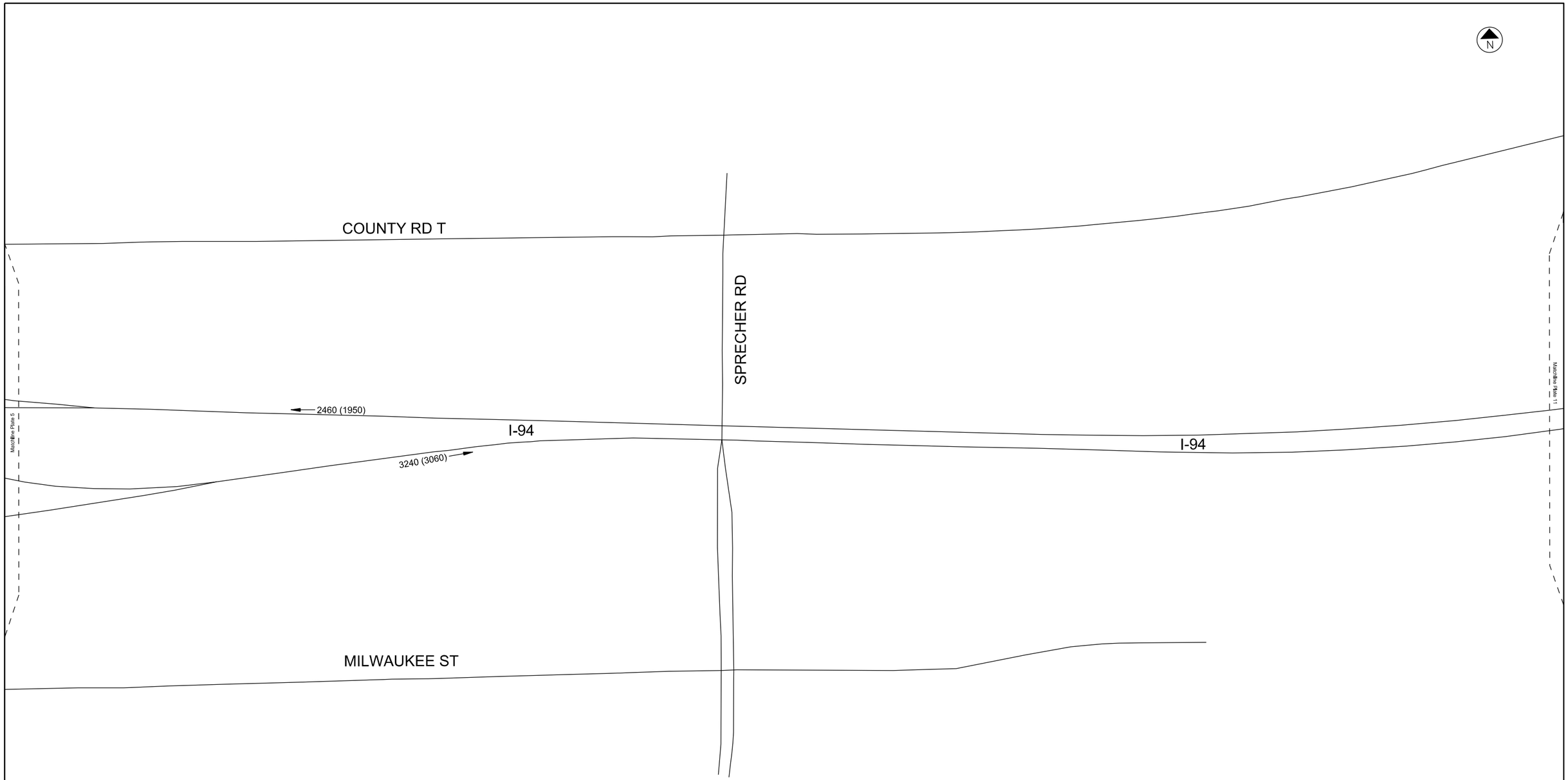
BALANCED TRAFFIC VOLUMES

YEAR 2019 EXISTING TRAFFIC VOLUMES

PLATE 9 OF 11

DECEMBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 10 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

N

CTH TT

I-94

560 (450)

1900 (1500)

310 (370)

2210 (1870)

I-94

2930 (2610)

2480 (2290)

760 (770)

450 (320)

Matchline Plate 10

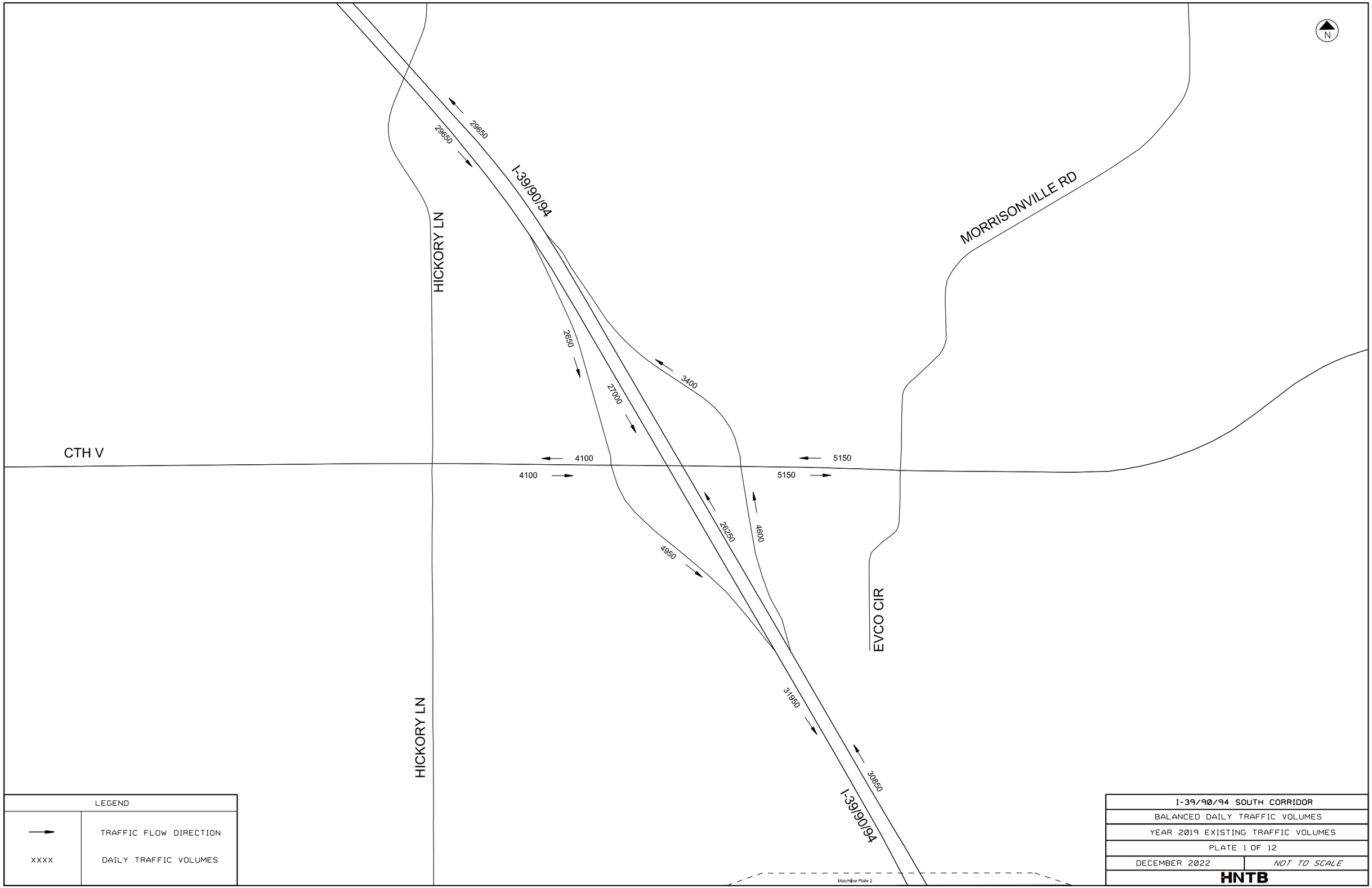
CTH N

GASTON RD

COMMERCE PKWY

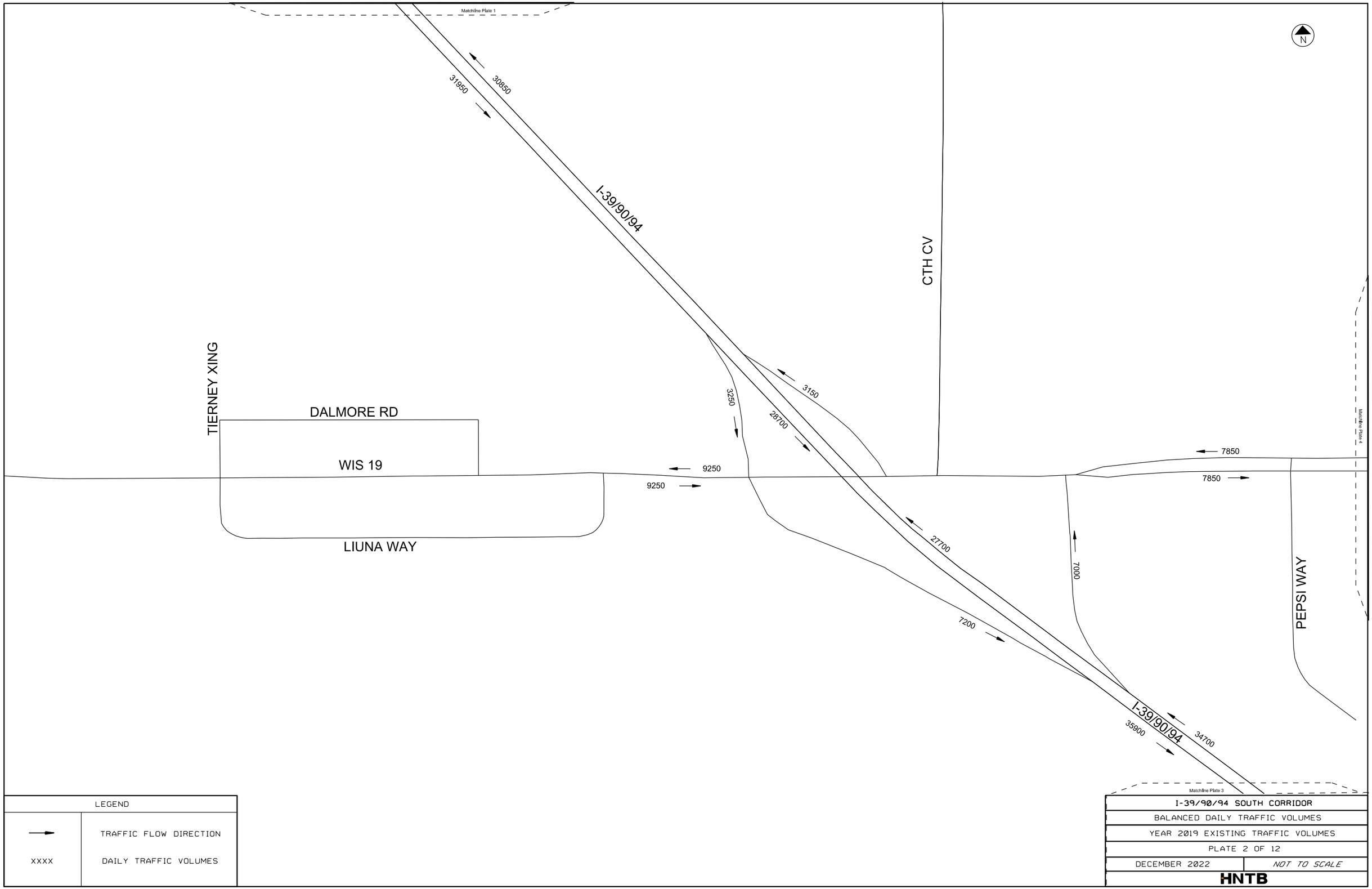
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 11 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 1 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |


Matchline Plate 1
N
I-39/90/94
31950
30850
3150
3250
28700
CTH CV
TIERNEY XING
DALMORE RD
WIS 19
LIUNA WAY
9250
9250
7850
7850
Matchline Plate 4
27700
7000
7200
PEPSI WAY
I-39/90/94
35900
34700
Matchline Plate 3
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 2 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB

Matchline Plate 2

Matchline Plate 4

I-39/90/94

US 51

N

35900

34700

10650

11050

5250

650

6450

34050

29450

4900

4250

33700

29150

6800

6250

2250

DAENTL RD

35950

35950

12800

12800

US 51

I-39/90/94

Matchline Plate 5

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 3 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

N

US 51

9450

9950

N TOWNE RD

2100

2300

7350

7850

7000

7850

WIS 19

7000

Matchline Plate 2

3300

7650

3400

10650

11050

US 51

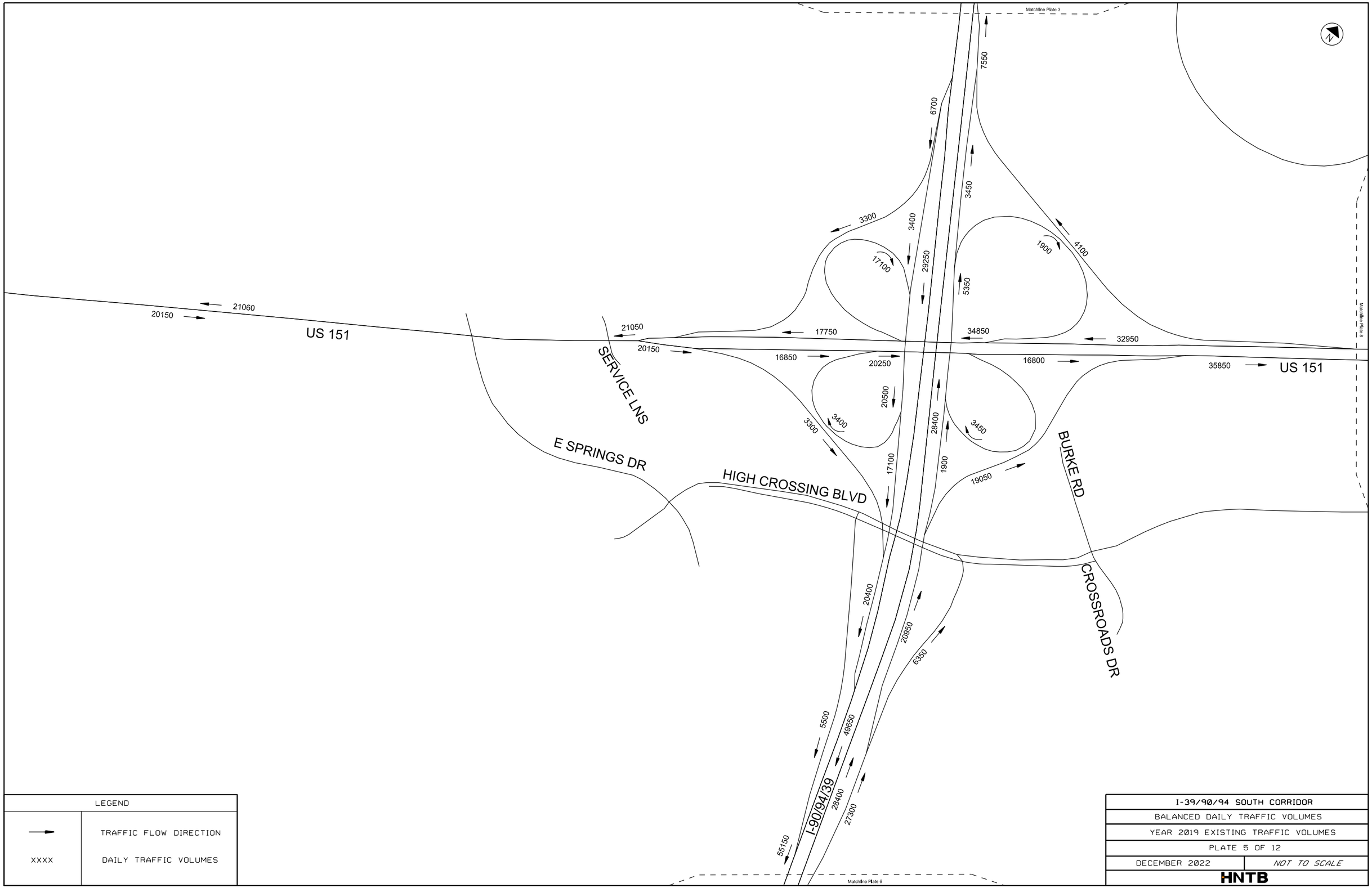
WILLIAMSBURG WAY

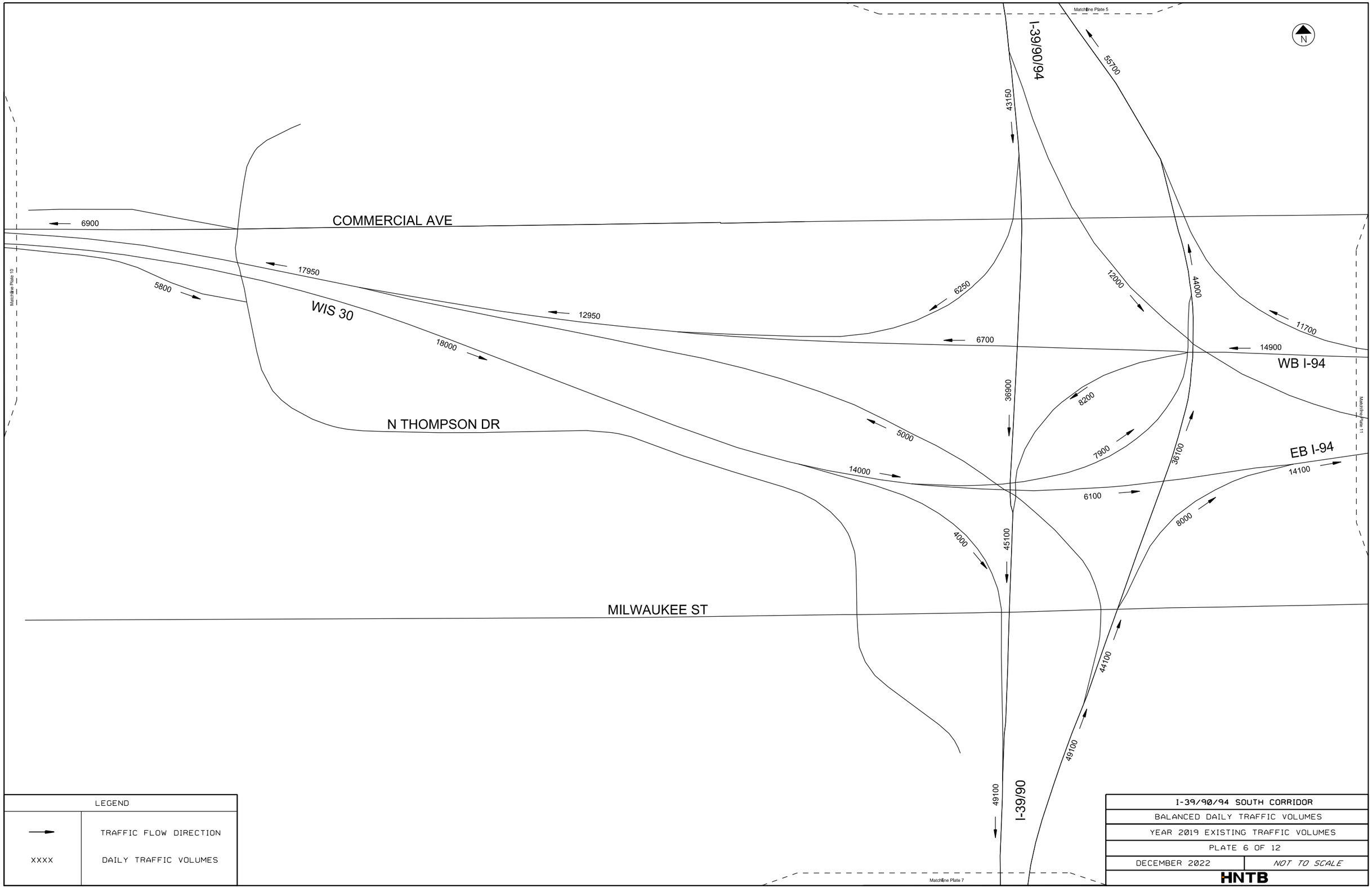
METRO DR

Matchline Plate 3

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 4 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |


Matchline Plate 3
Matchline Plate 6
Matchline Plate 8
US 151
US 151
SERVICE LNS
E SPRINGS DR
HIGH CROSSING BLVD
BURKE RD
CROSSROADS DR
I-90/94/39
20150
21060
21050
20150
17750
34850
32950
16850
20250
16800
35850
3300
3400
17100
29250
6700
7550
3450
5350
1900
4100
20500
28400
19050
20400
20950
6350
5500
49650
28400
27300
55150
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 5 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB


Matchline Plate 5
Matchline Plate 10
Matchline Plate 11
Matchline Plate 7
I-39/90/94
I-39/90
COMMERCIAL AVE
WIS 30
N THOMPSON DR
MILWAUKEE ST
WB I-94
EB I-94
6900
17950
5800
18000
12950
6250
6700
14900
11700
55700
43150
12000
44000
36900
8200
7900
36100
5000
14000
6100
14100
8000
4000
45100
44100
49100
49100
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2019 EXISTING TRAFFIC VOLUMES
PLATE 6 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB

Matchline Plate 6

N

I-39/90

49100

49100

20600

28500

31900

9000

37500

400

17200

3300

45350

US 12/18

45350

21000

26200

28600

7750

US 12/18

7750

8700

3200

500

17800

26500

26700

I-39/90

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 7 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

AMERICAN PKWY

EASTPARK BLVD

8300

2200

1900

1100

4100

37050

28750

27650

31750

US 151

US 151

33550

2300

7200

26350

5400

31750

6500

HIGH CROSSING BLVD

NELSON RD

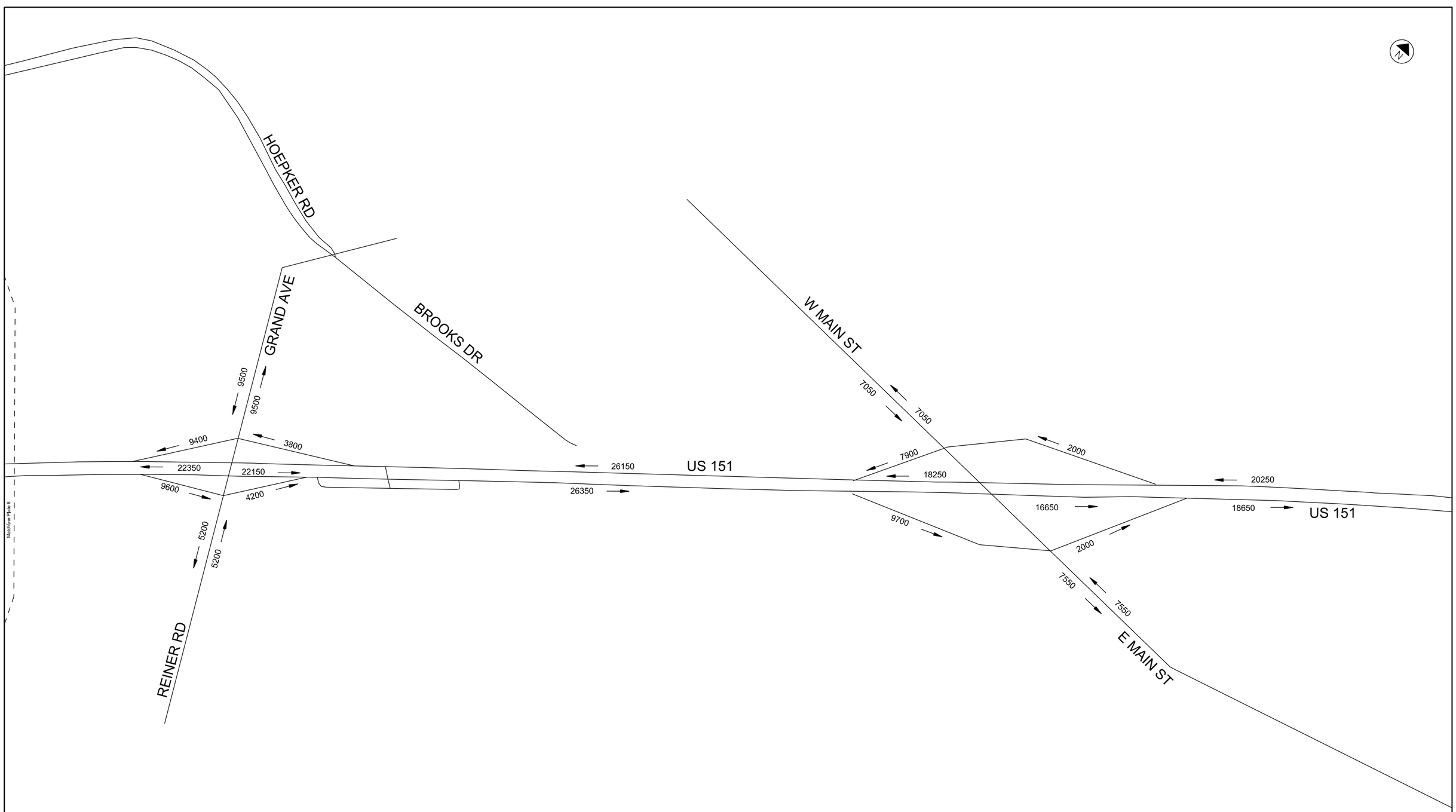
Matchline Plate 5

Matchline Plate 9

N

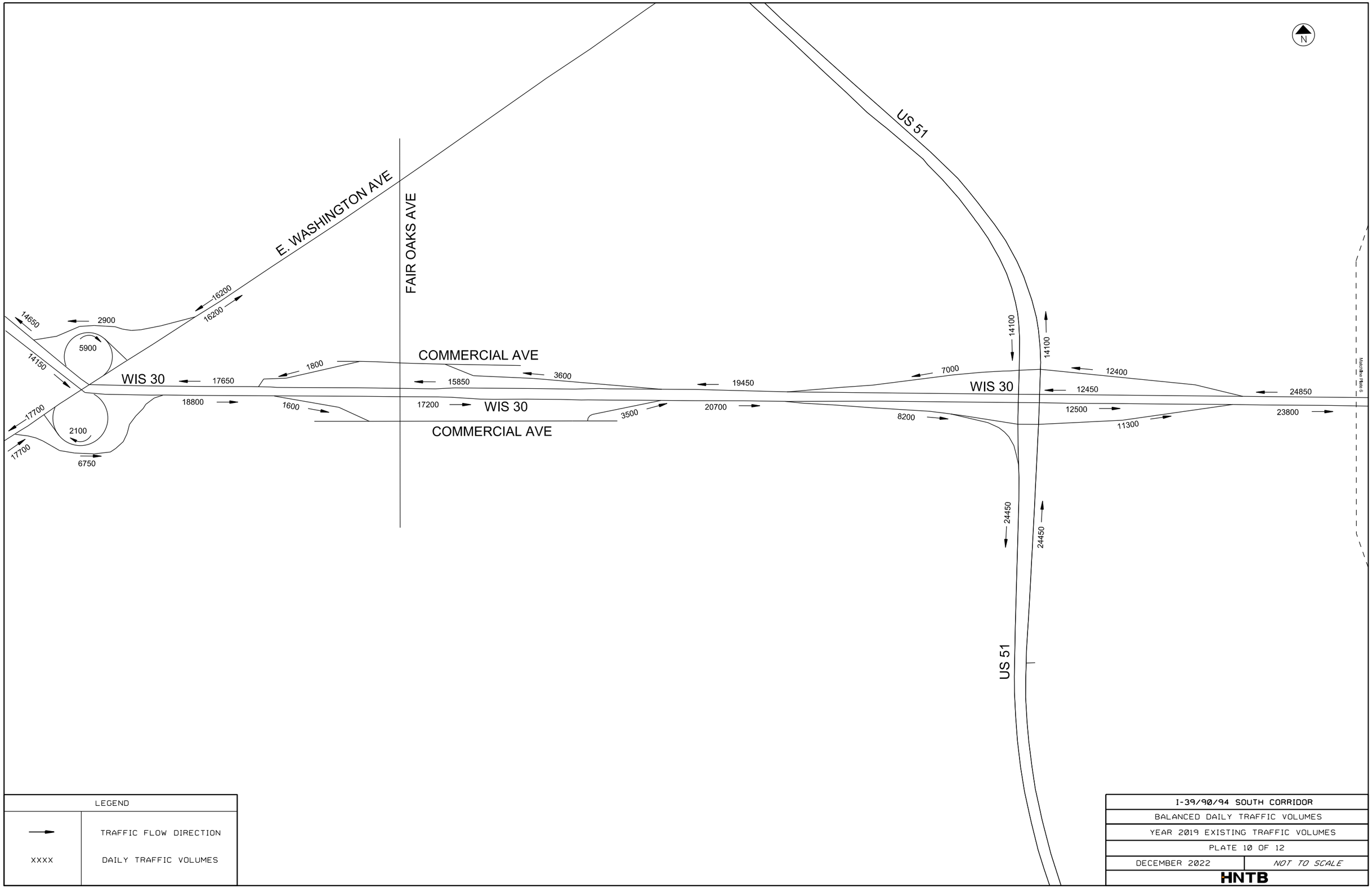
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 8 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |



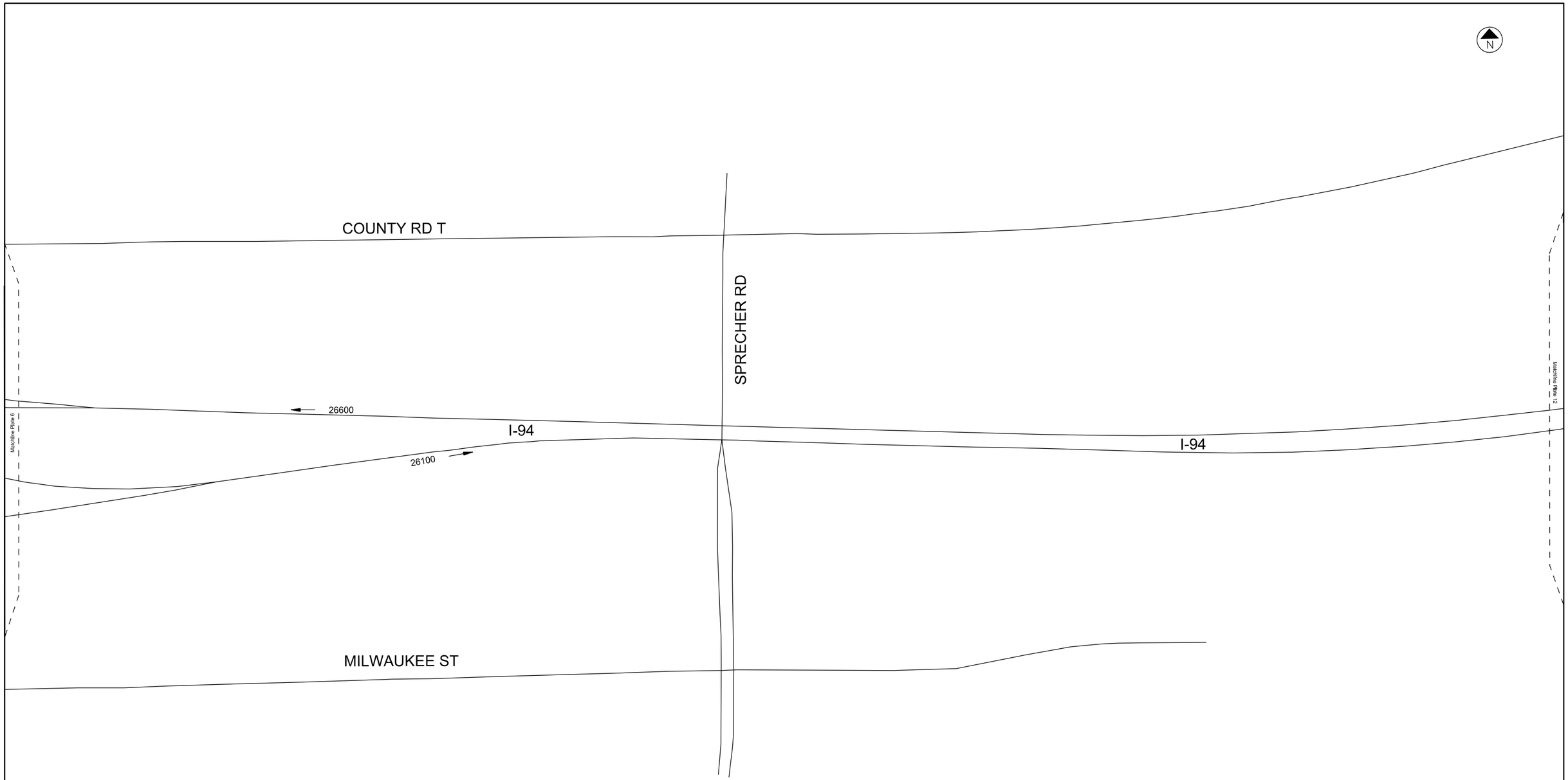

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 9 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 10 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 11 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |

N

3050

3050

CTH TT

22900

2900

I-94

22900

20000

6600

19900

3000

I-94

6200

Match line Plate 11

CTH N

COMMERCE PKWY

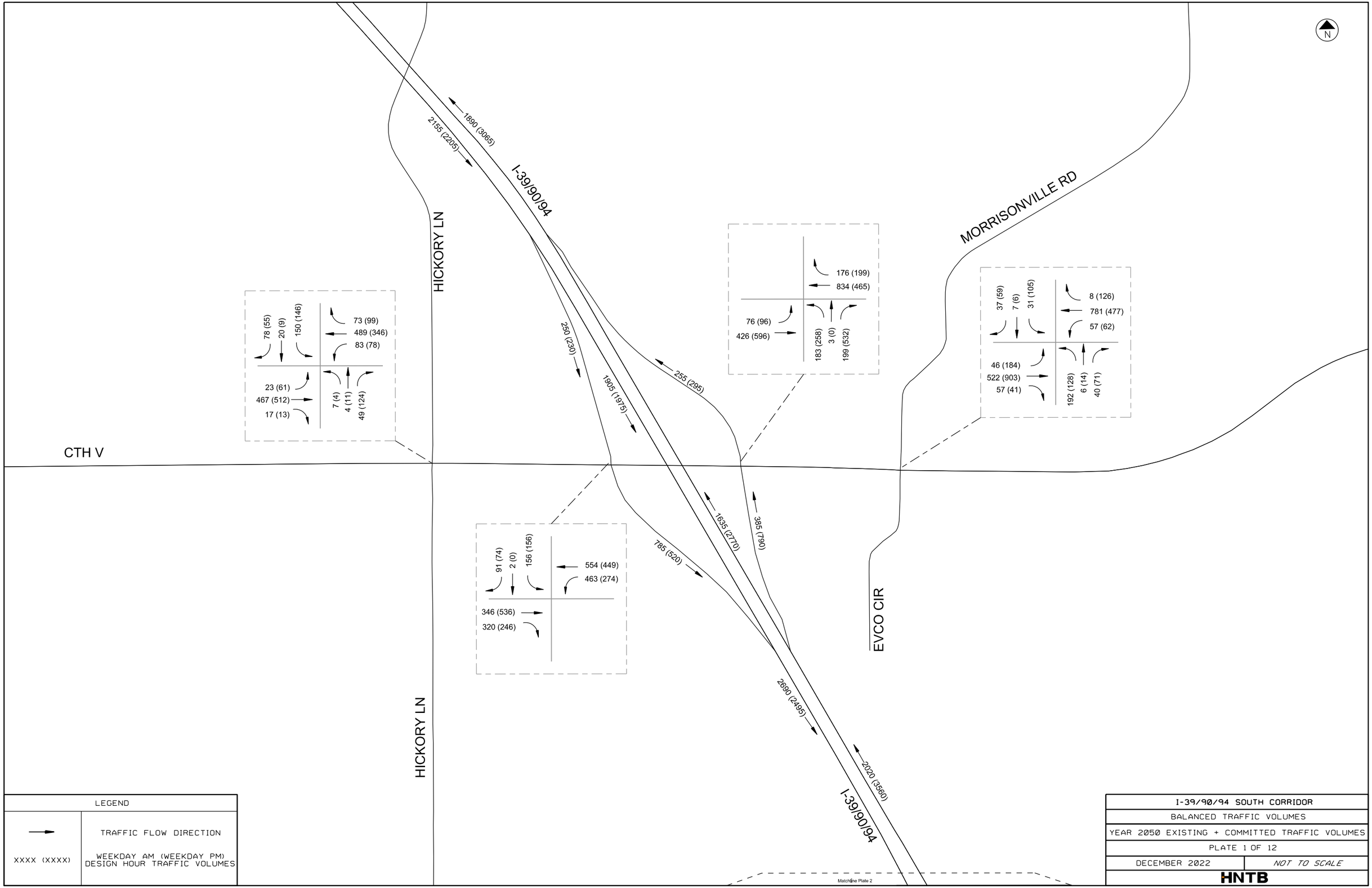
GASTON RD

5350

5350

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2019 EXISTING TRAFFIC VOLUMES | |
| PLATE 12 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 1 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 1

N

I-39/90/94

2690 (2495)

2020 (3560)

315 (295)

260 (395)

2430 (2100)

1705 (3265)

945 (980)

I-39/90/94

3375 (3080)

2835 (4310)

CTH CV

TIERNEY XING

DALMORE RD

WIS 19

LIUNA WAY

PEPSI WAY

1130 (1045)

Matchline Plate 4

250 (405)
0 (0)
280 (740)
60 (70)
1390 (1320)
35 (20)
145 (180)
920 (1270)
5 (10)
45 (35)
0 (0)
35 (40)

40 (150)
175 (260)
1445 (1260)
0 (0)
1235 (2050)

225 (205)
1900 (1590)
90 (90)
685 (1445)

435 (385)
140 (110)
235 (585)
1690 (1410)
120 (295)
565 (1150)

880 (875)
145 (100)
20 (15)
745 (1250)
130 (185)
80 (170)

90 (140)
0 (0)
170 (255)
1530 (1380)
370 (210)
605 (1280)
575 (770)

1010 (1080)
705 (1260)
915 (915)
215 (130)

Matchline Plate 3

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| | |
|---|---|
| I-39/90/94 SOUTH CORRIDOR | |
| BALANCED TRAFFICVOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 2 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 2

Matchline Plate 4

I-39/90/94

3375 (3080)

2835 (4310)

1780 (1515)

US 51

870 (1790)

1630 (1355)

225 (110)

325 (900)

545 (890)

150 (160)

1160 (485)

2685 (4150)

2215 (2595)

295 (775)

650 (665)

2390 (3375)

2865 (3260)

770 (1000)

1110 (435)

195 (275)

3160 (4375)

3060 (3535)

DAENTL RD

1205 (800)

50 (50)

570 (1625)

65 (90)

2485 (1045)

35 (75)

850 (2350)

2165 (1170)

765 (1900)

US 51

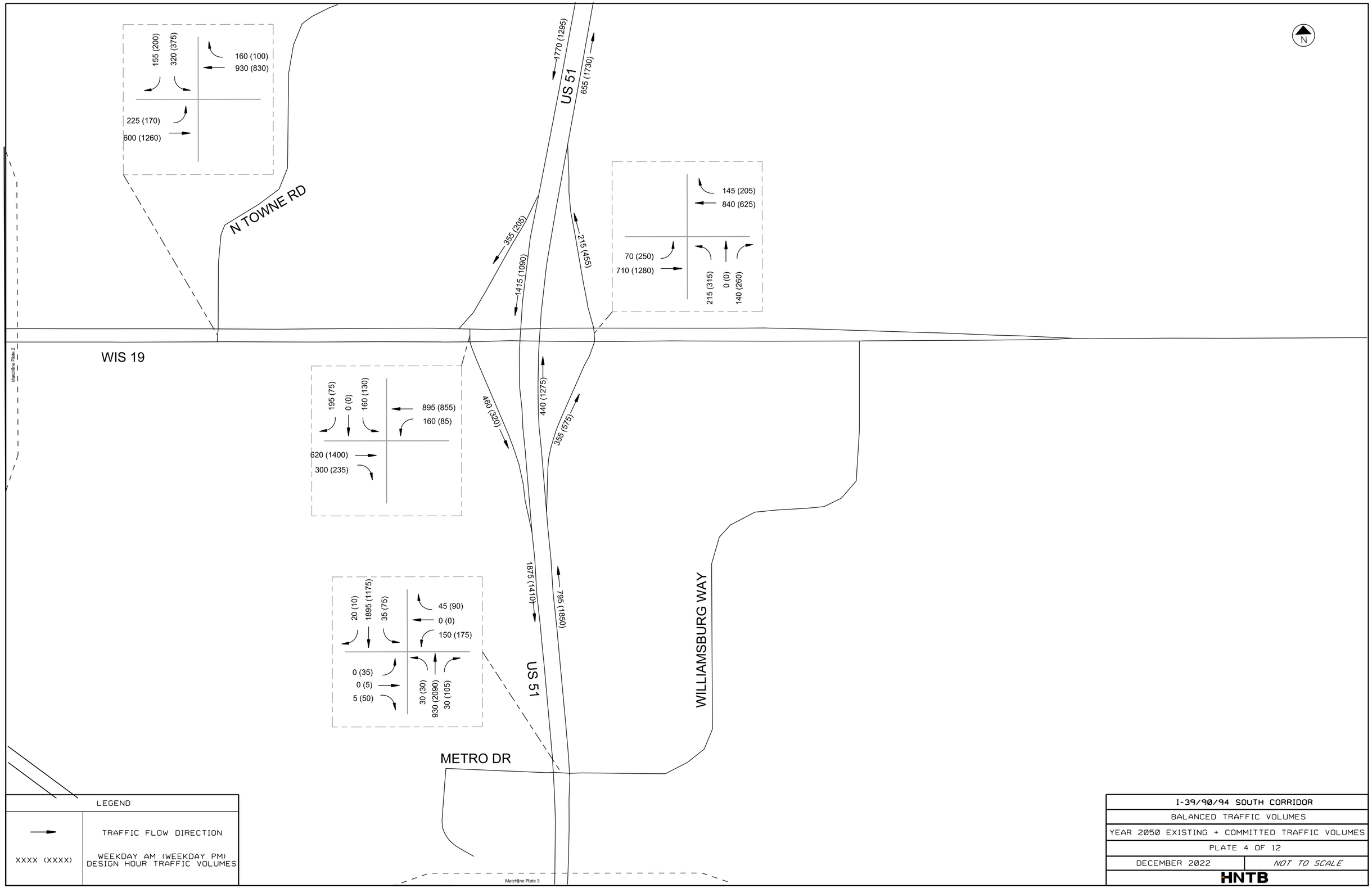
I-39/90/94

Matchline Plate 5

N

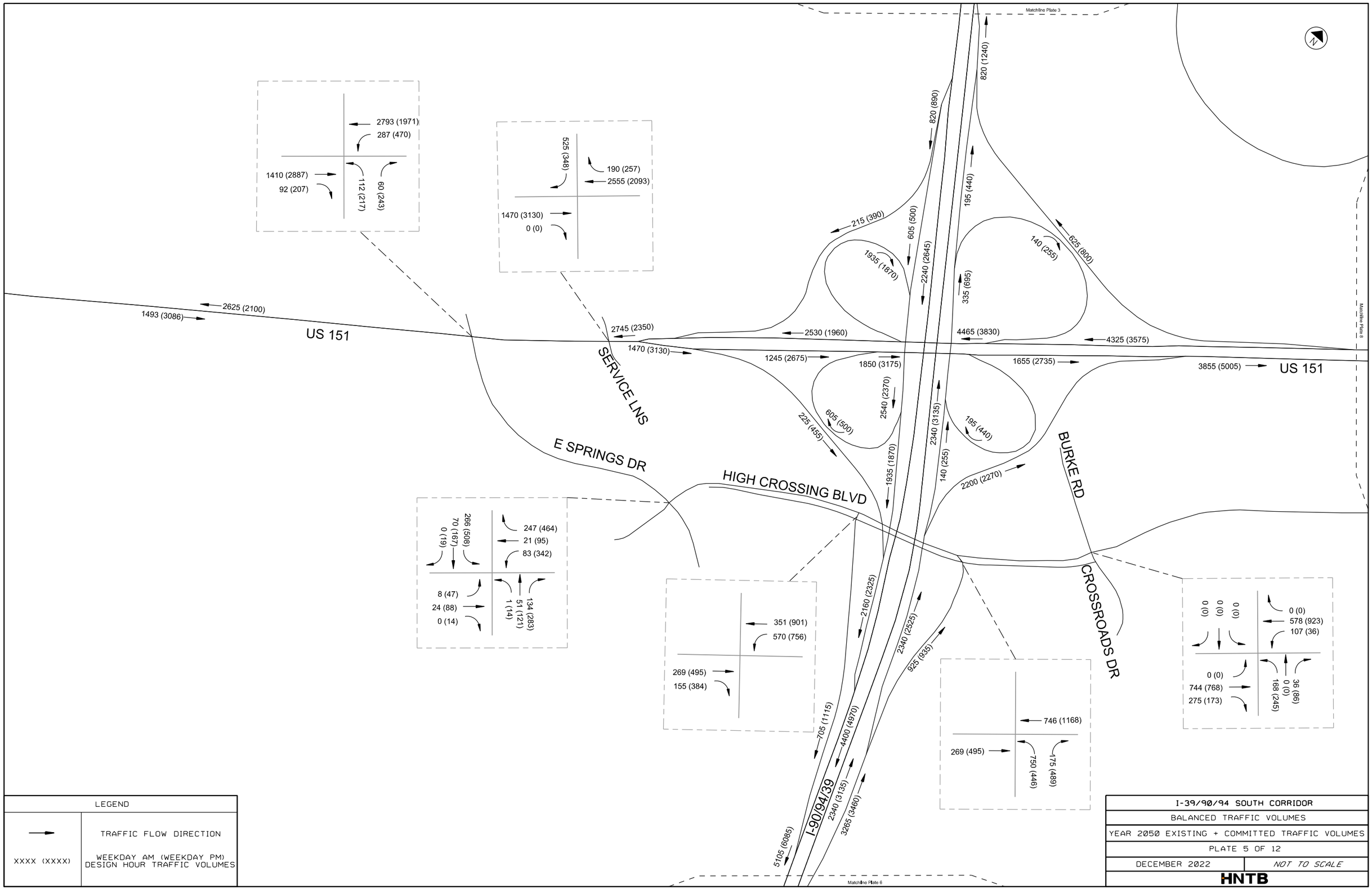
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| |
|---|
| I-39/90/94 SOUTH CORRIDOR |
| BALANCED TRAFFIC VOLUMES |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES |
| PLATE 3 OF 12 |
| DECEMBER 2022 \| *NOT TO SCALE* |
| HNTB |



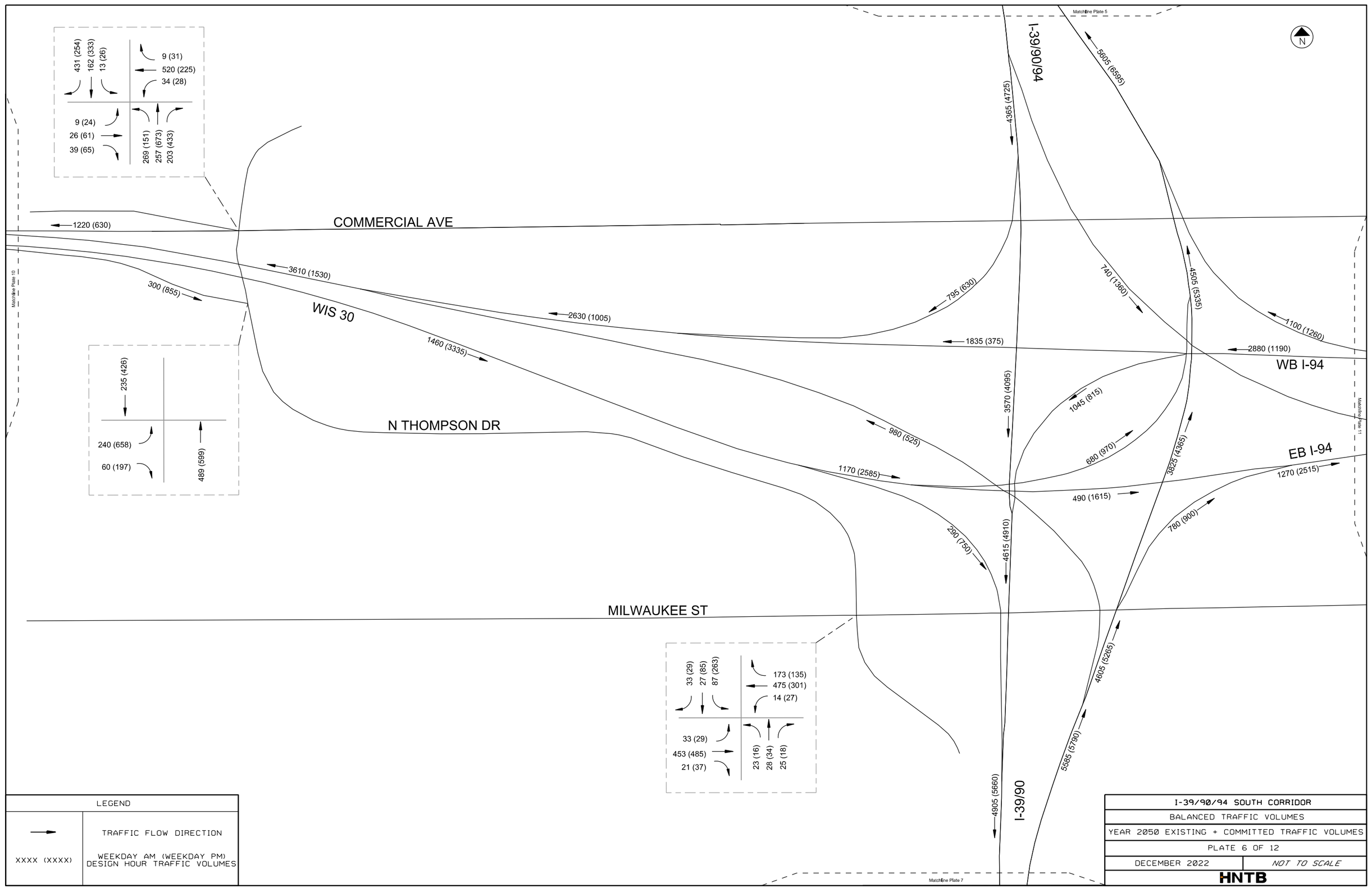

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 4 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |



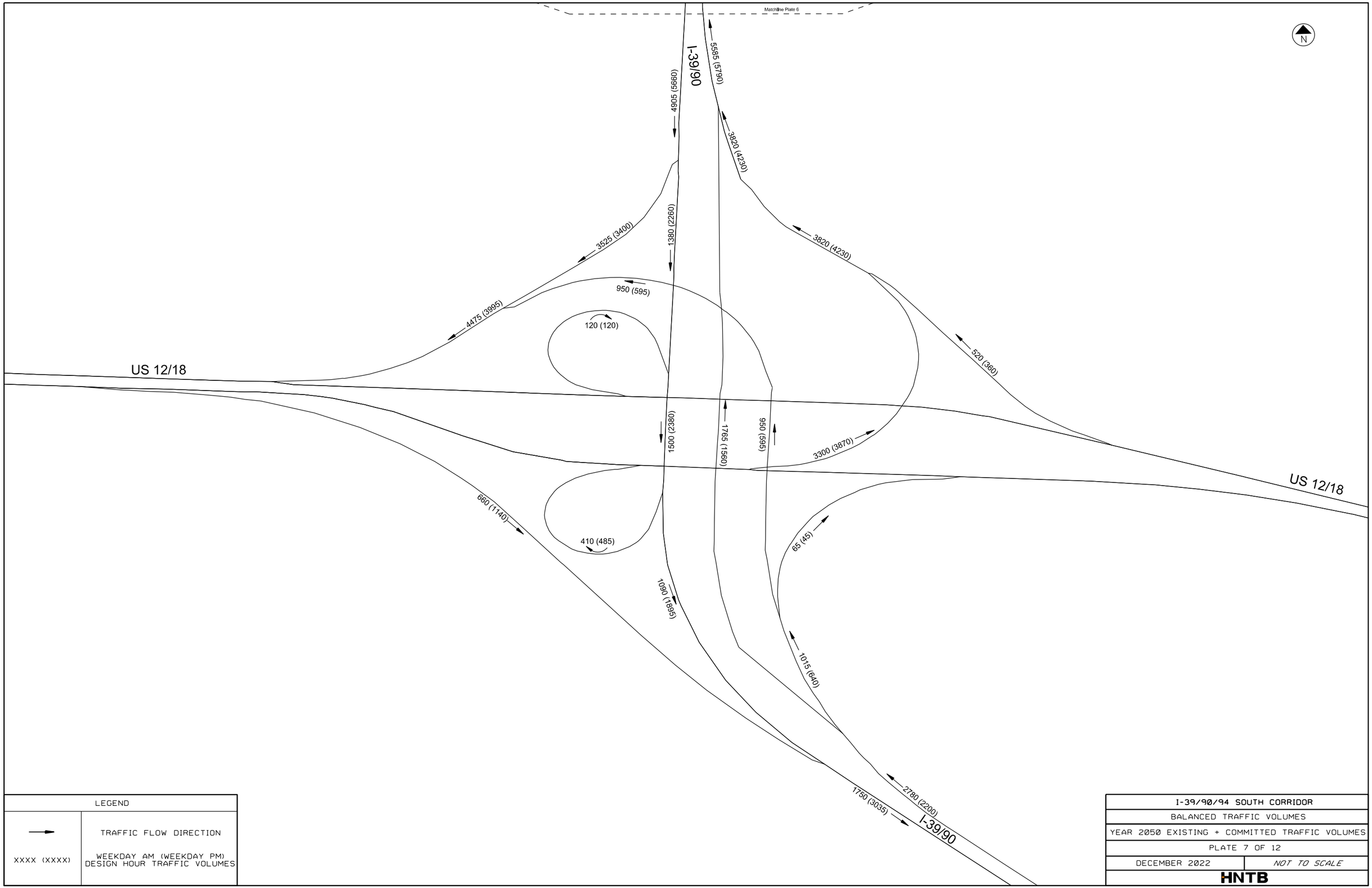

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 5 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 6 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 7 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

AMERICAN PKWY

EASTPARK BLVD

93 (30)
630 (847)
3 (47)
11 (32)
41 (12)
179 (297)
56 (68)
19 (15)
203 (493)
948 (182)
1244 (641)
146 (287)

555 (1210)
440 (220)
250 (205)
150 (190)
690 (425)
4950 (4375)
4395 (3165)
4245 (2975)
4935 (3400)
US 151

Matchline Plate 5

US 151
3470 (4770)
385 (235)
1250 (465)
2220 (4305)
230 (875)
2450 (5180)

Matchline Plate 9

380 (1105)

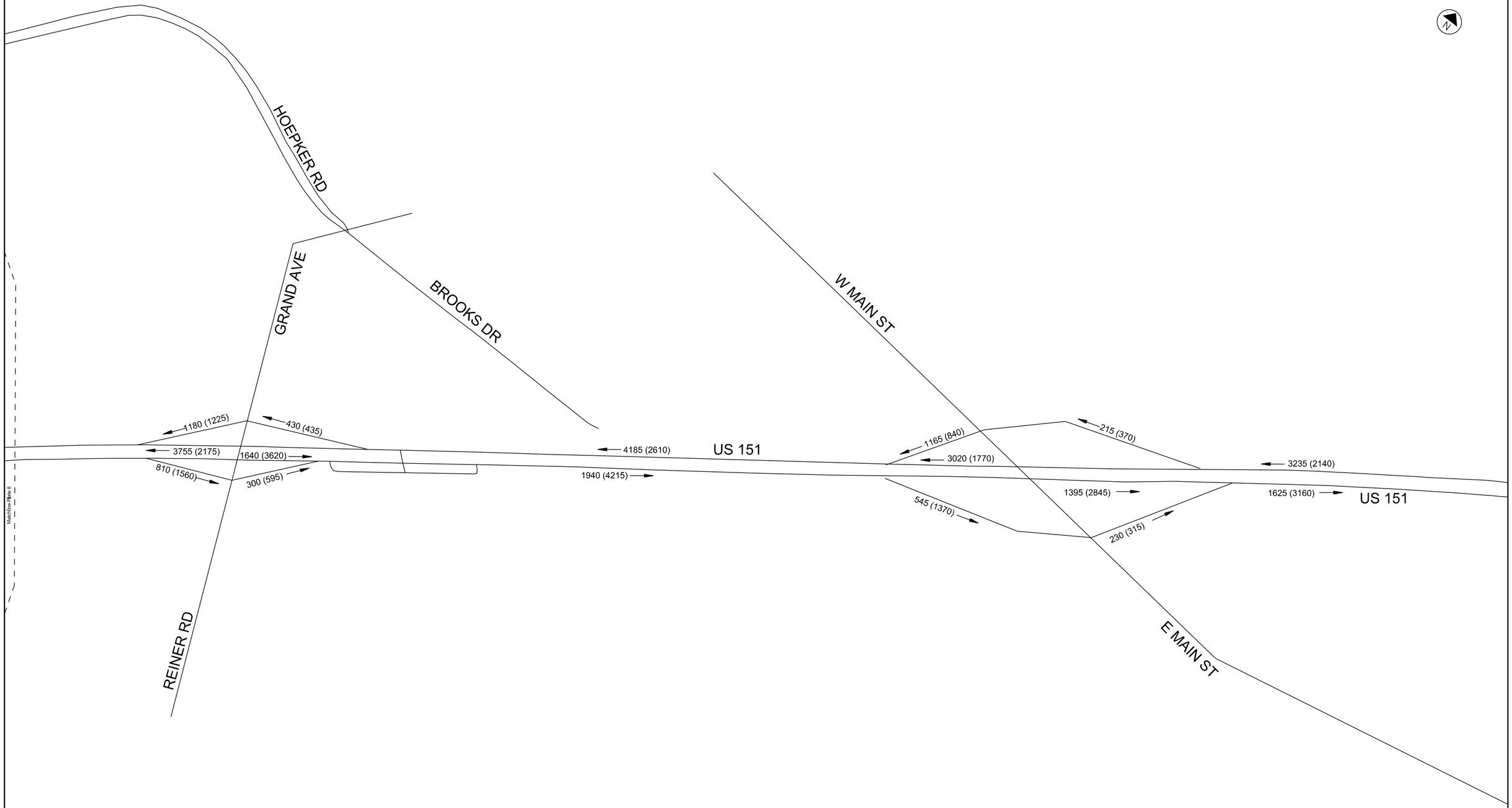
HIGH CROSSING BLVD

444 (170)
304 (93)
94 (399)
0 (0)
207 (182)
43 (23)
285 (269)
200 (604)
103 (172)
145 (167)
363 (156)
86 (102)

NELSON RD

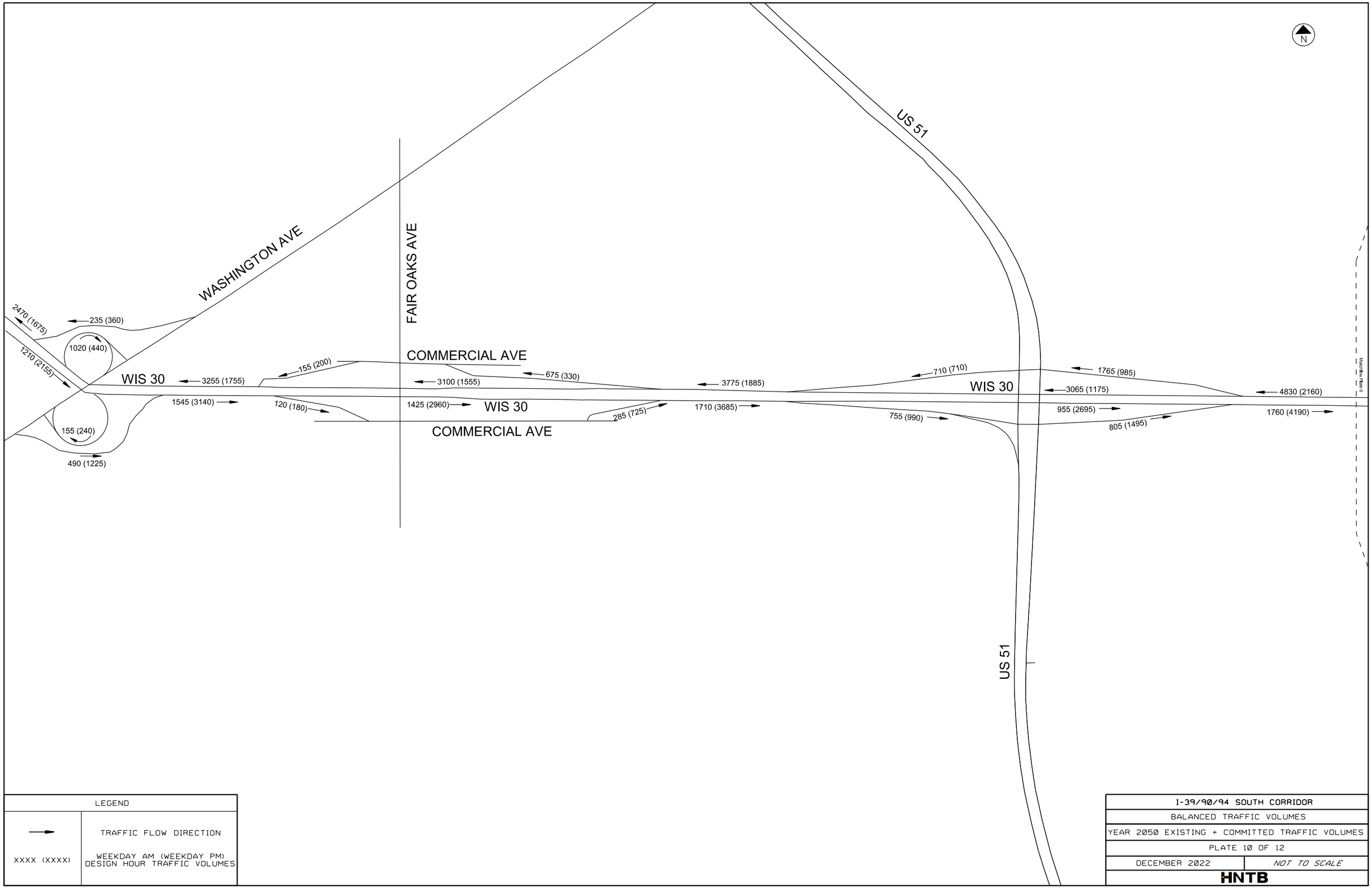
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 8 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |



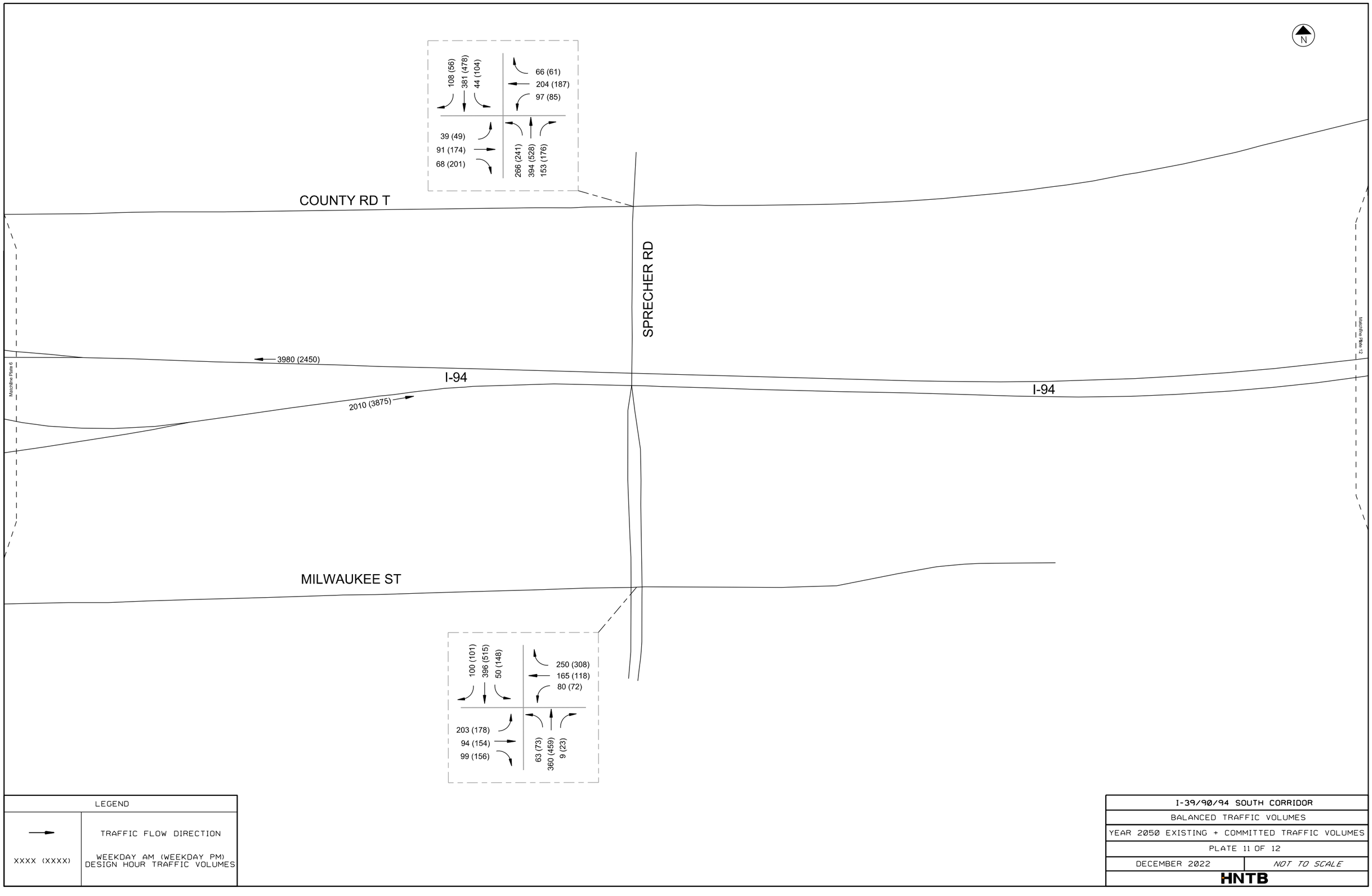

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 9 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |



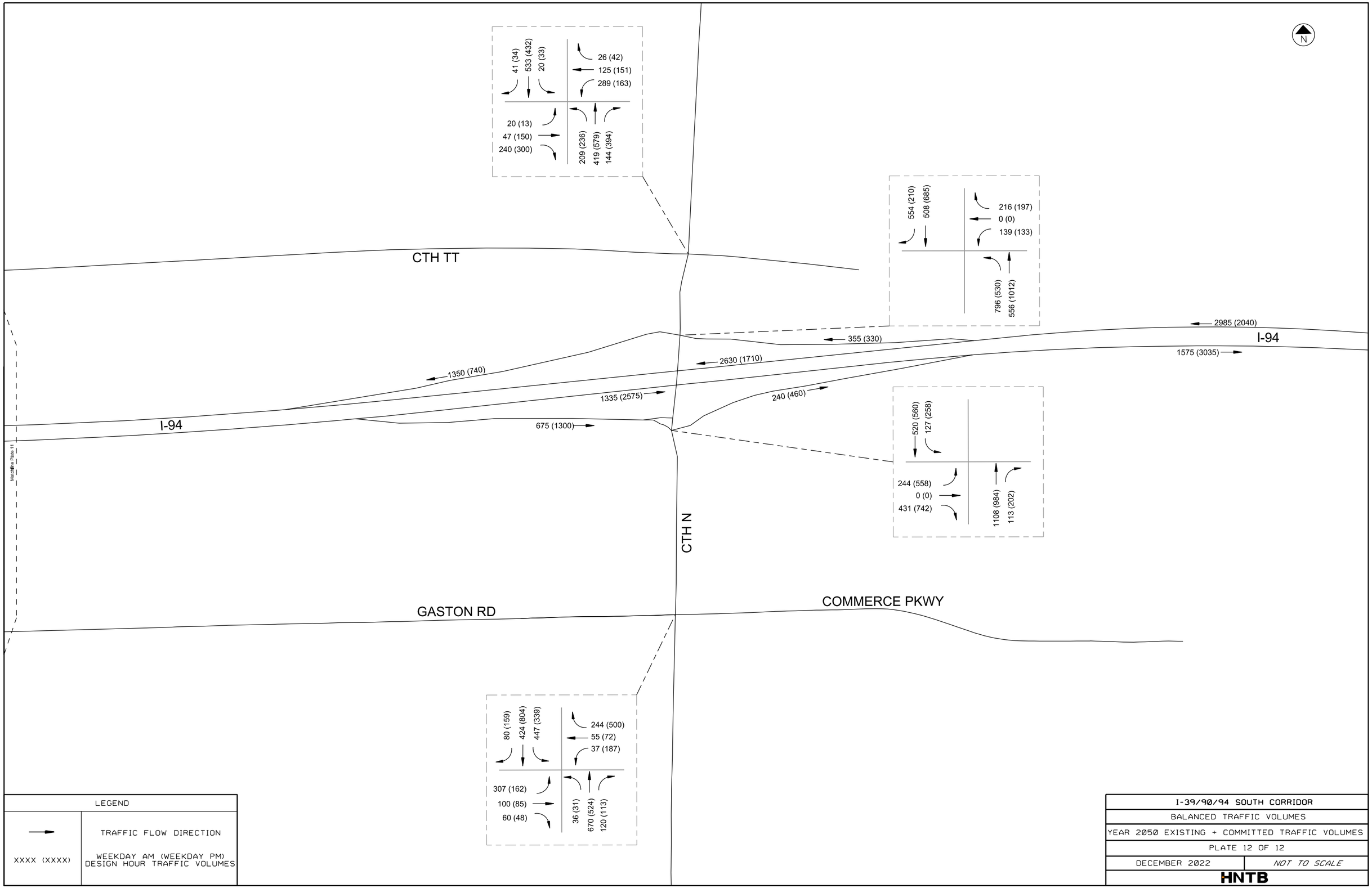

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

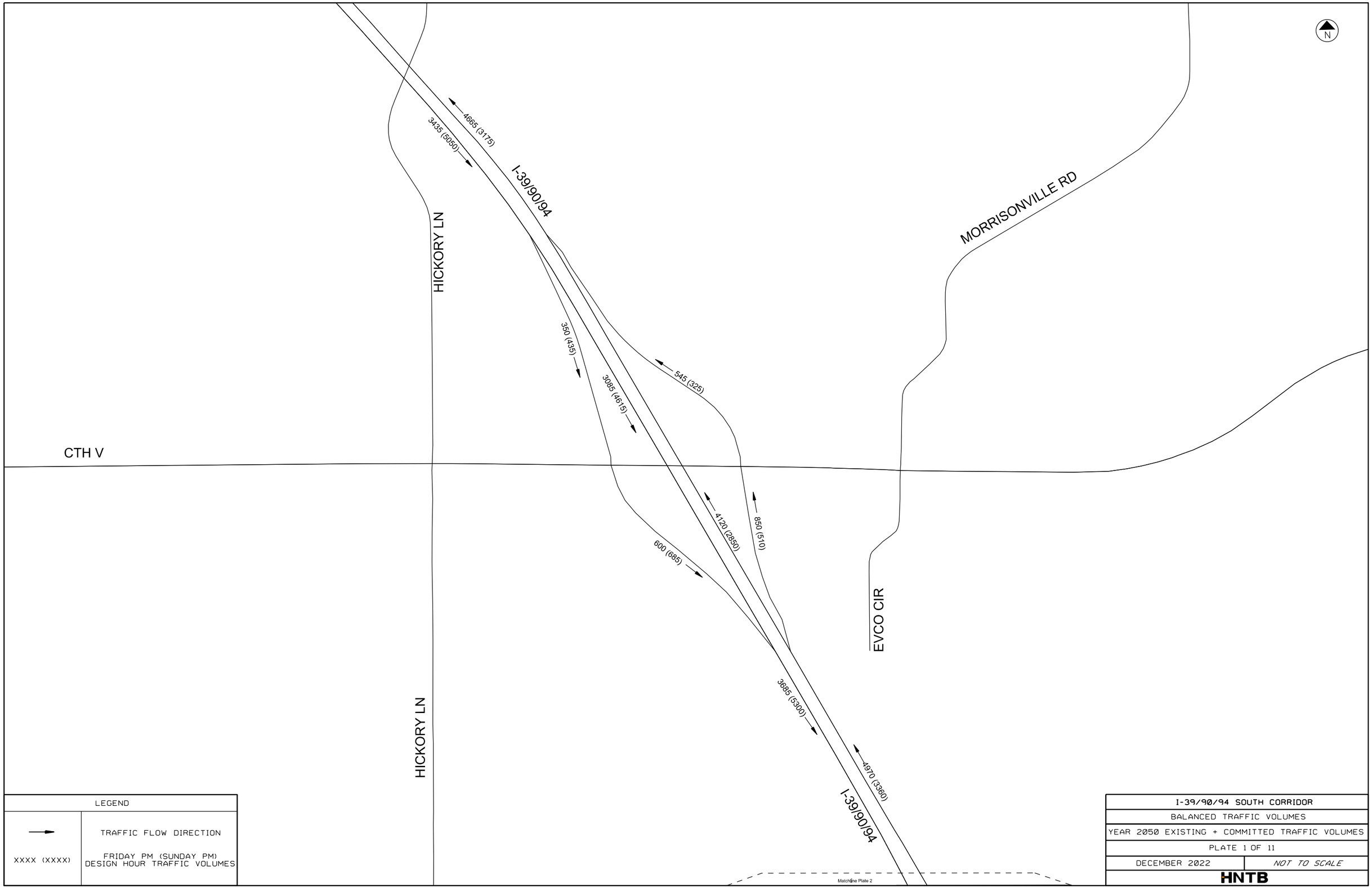
| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 10 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 11 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |


N
CTH TT
I-94
I-94
CTH N
GASTON RD
COMMERCE PKWY
41 (34)
533 (432)
20 (33)
26 (42)
125 (151)
289 (163)
20 (13)
47 (150)
240 (300)
209 (236)
419 (579)
144 (394)
554 (210)
508 (685)
216 (197)
0 (0)
139 (133)
796 (530)
556 (1012)
2985 (2040)
355 (330)
1575 (3035)
2630 (1710)
1350 (740)
1335 (2575)
240 (460)
675 (1300)
520 (560)
127 (258)
244 (558)
0 (0)
431 (742)
1108 (984)
113 (202)
80 (159)
424 (804)
447 (339)
244 (500)
55 (72)
37 (187)
307 (162)
100 (85)
60 (48)
36 (31)
670 (524)
120 (113)
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
WEEKDAY AM (WEEKDAY PM) DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 12 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 1 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 1

N

3685 (5300)

4970 (3360)

I-39/90/94

CTH CV

TIERNEY XING

DALMORE RD

365 (440)

630 (405)

3320 (4980)

WIS 19

LIUNA WAY

4340 (2955)

1125 (730)

PEPSI WAY

1160 (750)

I-39/90/94

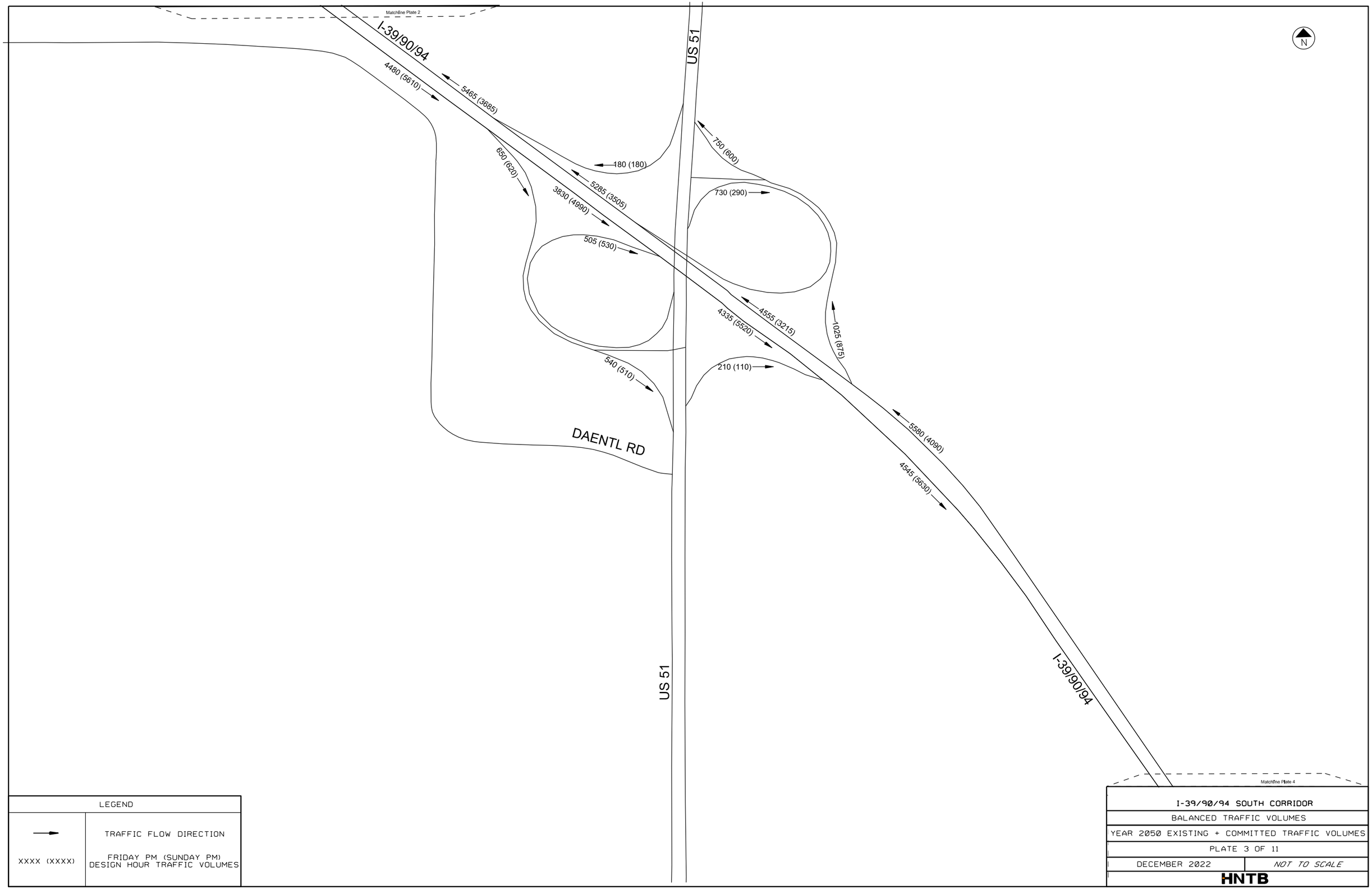
4480 (5610)

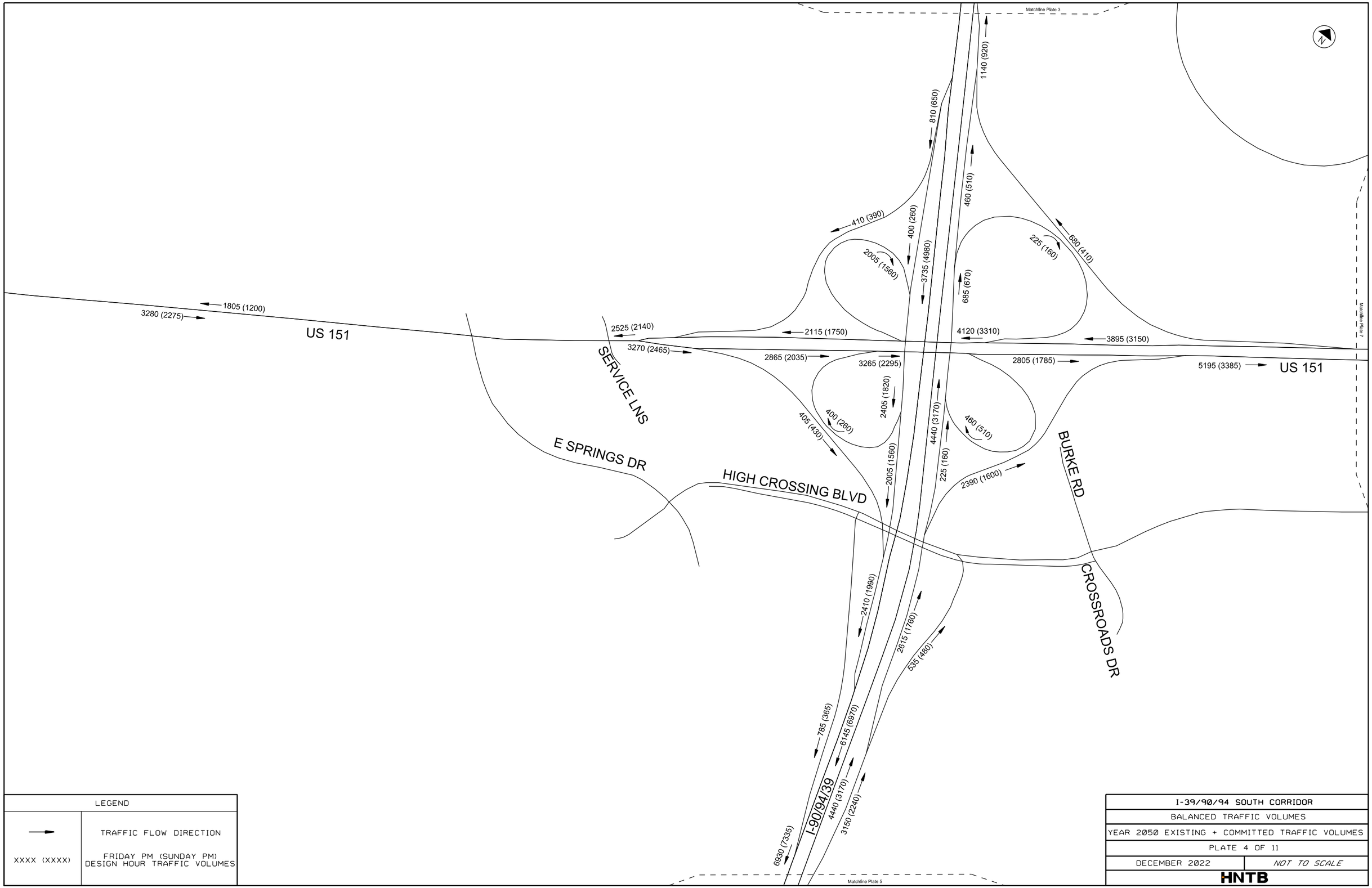
5465 (3685)

Matchline Plate 3

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

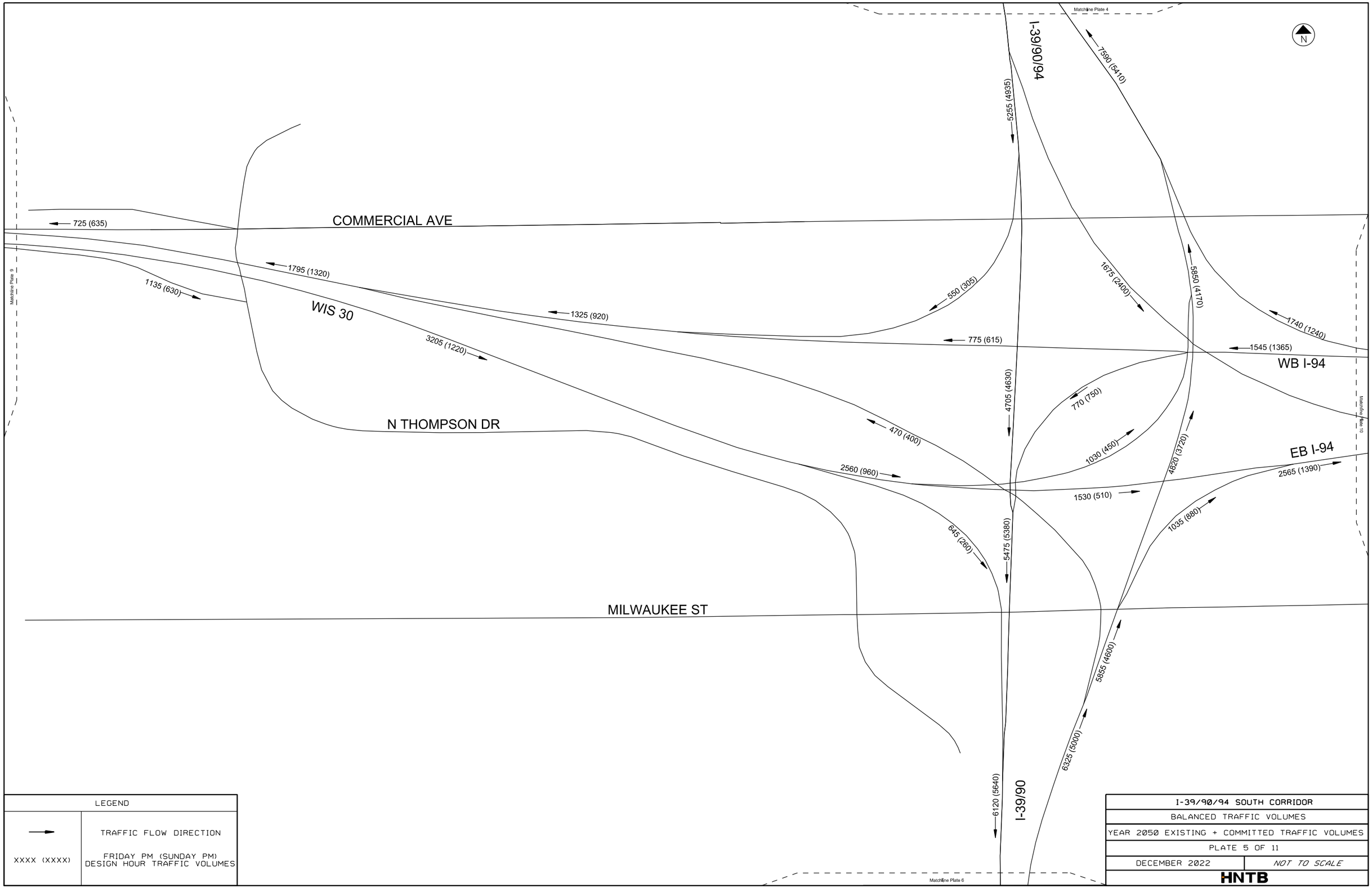
| |
|---|
| I-39/90/94 SOUTH CORRIDOR |
| BALANCED TRAFFIC VOLUMES |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES |
| PLATE 2 OF 11 |
| DECEMBER 2022 — *NOT TO SCALE* |
| HNTB |


Matchline Plate 2
I-39/90/94
US 51
4480 (5610)
5465 (3685)
650 (620)
180 (180)
750 (600)
5285 (3505)
3830 (4990)
730 (290)
505 (530)
4555 (3215)
4335 (5520)
1025 (875)
540 (510)
210 (110)
DAENTL RD
5580 (4090)
4545 (5630)
US 51
I-39/90/94
Matchline Plate 4
N
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
FRIDAY PM (SUNDAY PM)
DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 3 OF 11
DECEMBER 2022
NOT TO SCALE
HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 4 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |


Matchline Plate 4
I-39/90/94
7590 (5410)
5255 (4935)
725 (635)
COMMERCIAL AVE
1795 (1320)
1135 (630)
Matchline Plate 9
WIS 30
550 (305)
1325 (920)
3205 (1220)
775 (615)
1675 (2400)
5850 (4170)
1740 (1240)
1545 (1365)
WB I-94
4705 (4630)
770 (750)
N THOMPSON DR
470 (400)
1030 (450)
4820 (3720)
EB I-94
2560 (960)
2565 (1390)
1530 (510)
1035 (880)
645 (260)
5475 (5380)
MILWAUKEE ST
5855 (4600)
6325 (5000)
6120 (5640)
I-39/90
Matchline Plate 10
Matchline Plate 6
LEGEND
TRAFFIC FLOW DIRECTION
XXXX (XXXX)
FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 5 OF 11
DECEMBER 2022
NOT TO SCALE
HNTB

Matchline Plate 5

N

I-39/90

6120 (5640)

6325 (5000)

3985 (2810)

3985 (2810)

3135 (2410)

2985 (3230)

780 (630)

120 (105)

3915 (3040)

485 (320)

US 12/18

3105 (3335)

2340 (2190)

780 (630)

3500 (2490)

US 12/18

1060 (695)

735 (570)

120 (70)

2370 (2765)

900 (700)

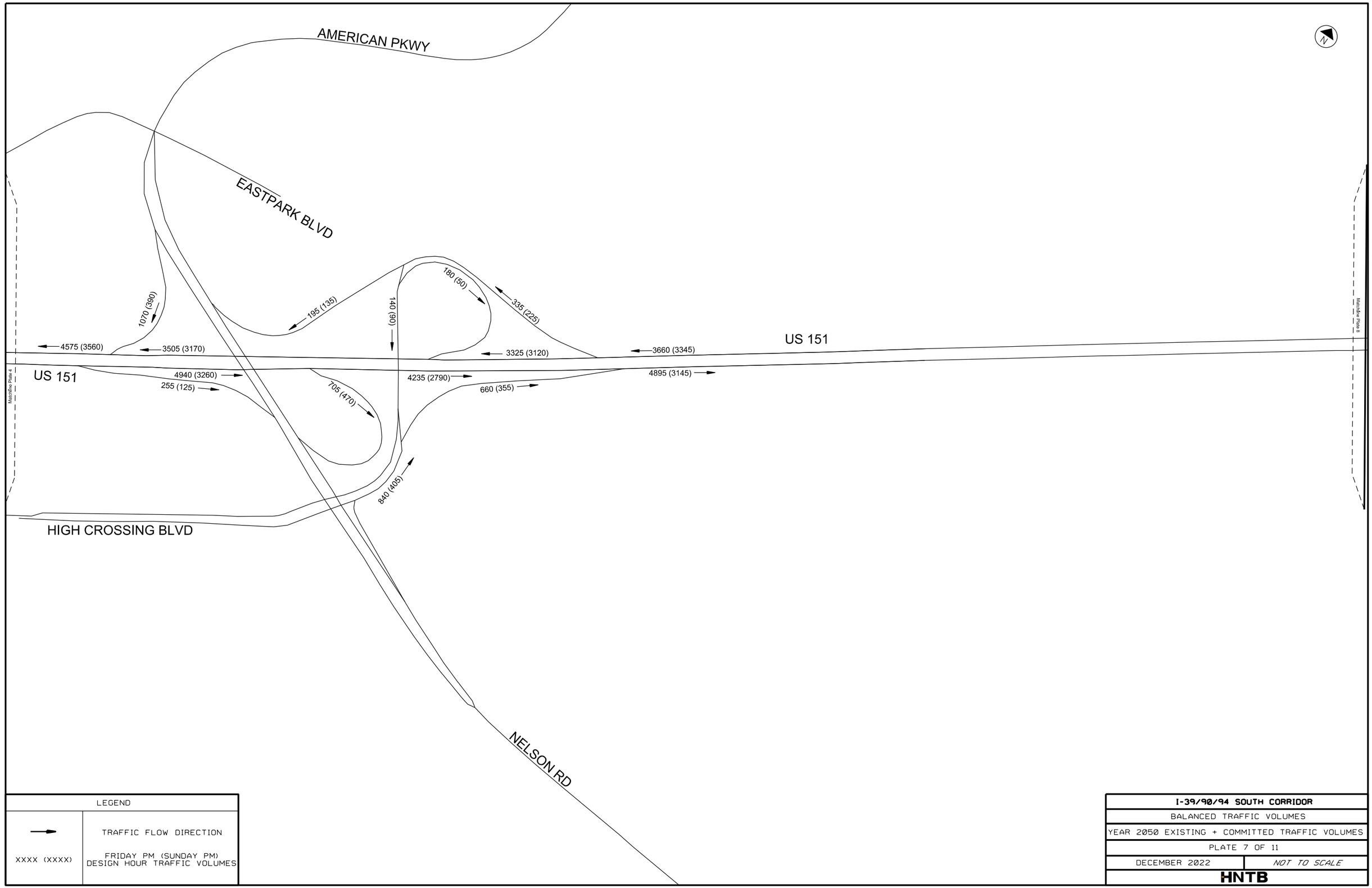
3430 (3460)

3240 (2890)

I-39/90

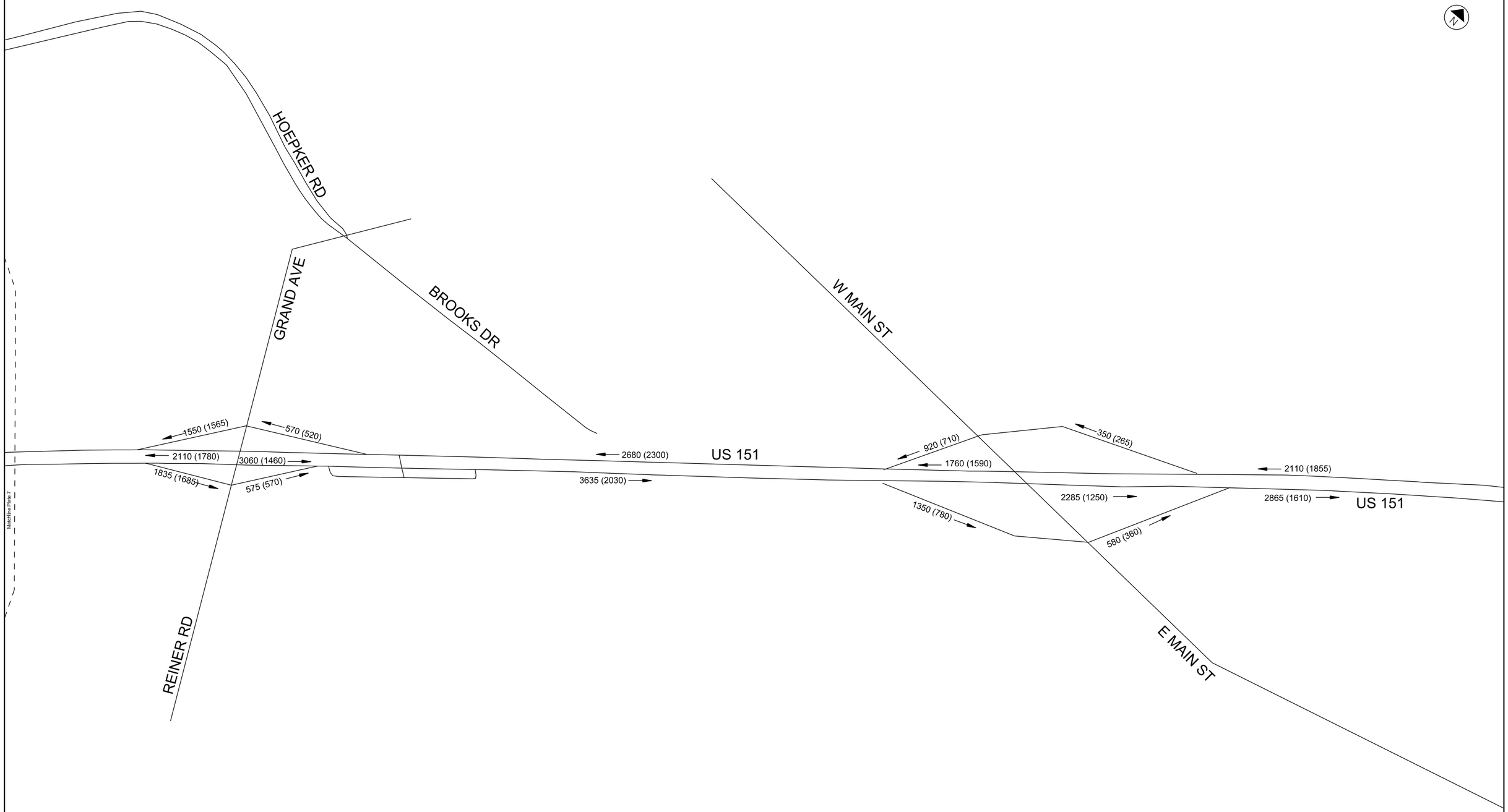
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 6 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |



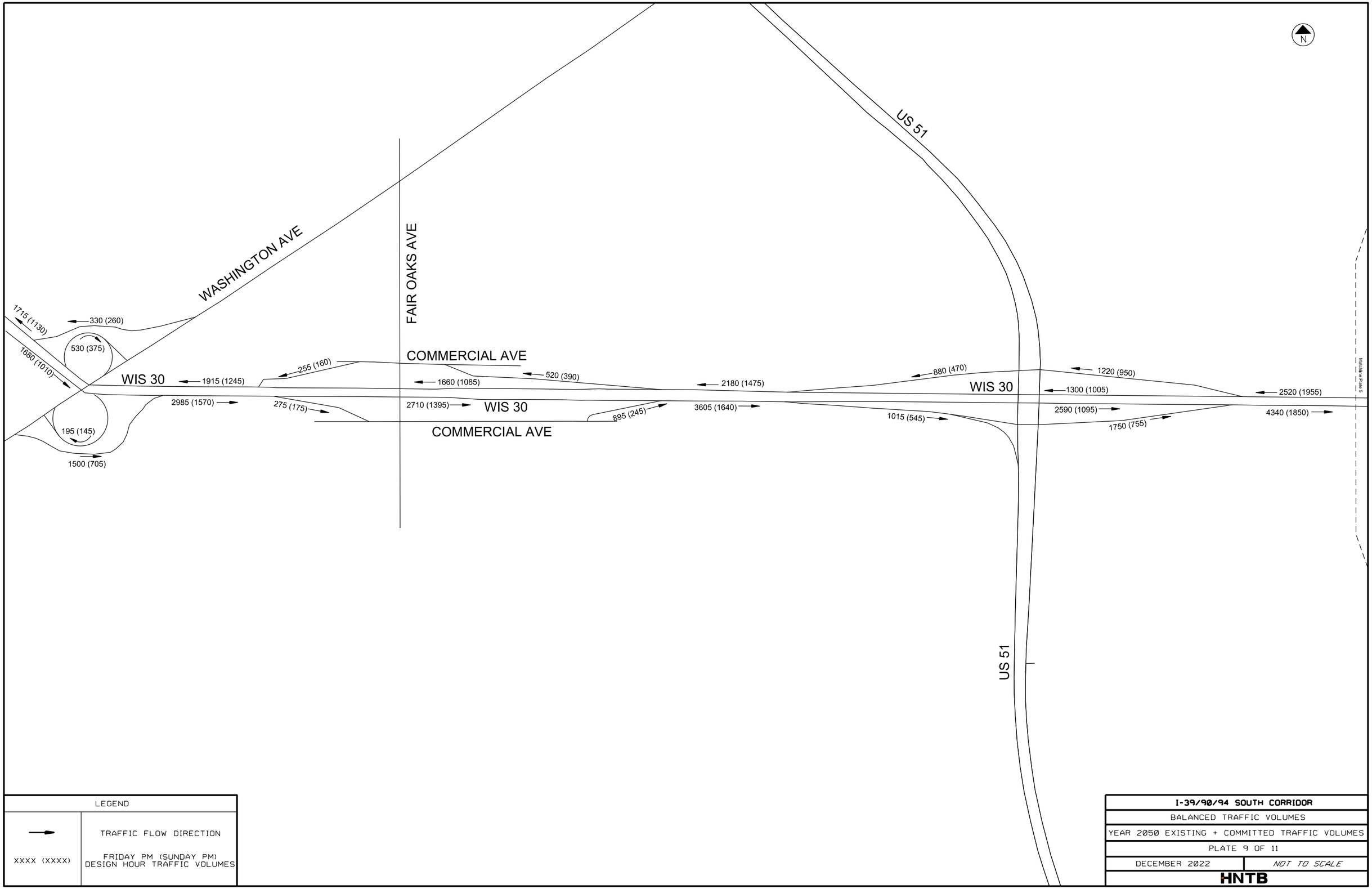

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 7 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 8 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90/94 SOUTH CORRIDOR**

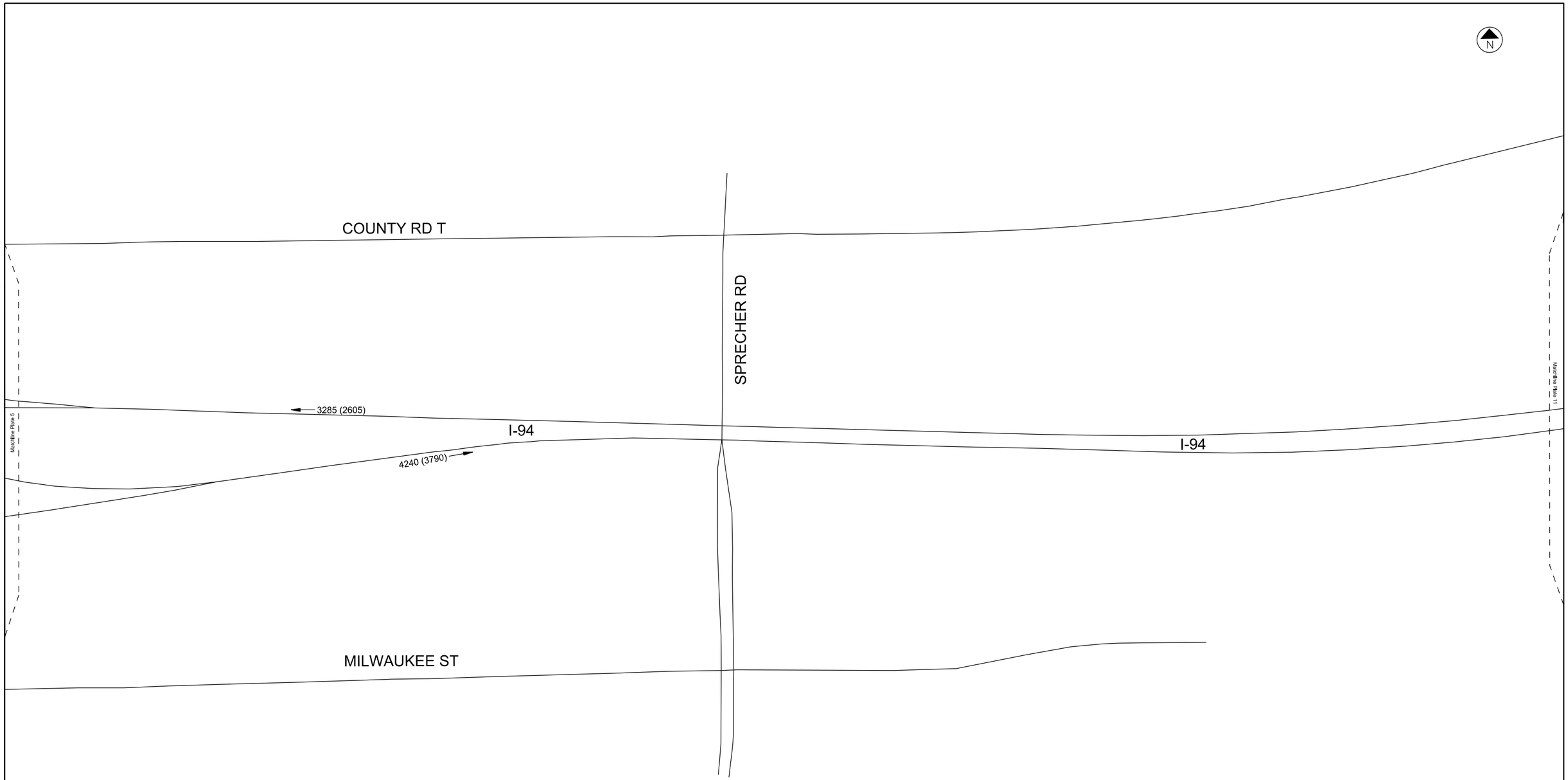
BALANCED TRAFFIC VOLUMES

YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES

PLATE 9 OF 11

DECEMBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 10 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

N

CTH TT

I-94

970 (820)

2315 (1785)

2930 (2580)

1310 (1210)

415 (405)

535 (430)

2730 (2190)

I-94

3465 (3010)

Matchline Plate 10

CTH N

GASTON RD

COMMERCE PKWY

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 11 OF 11 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

N

I-39/90/94

HICKORY LN

MORRISONVILLE RD

CTH V

EVCO CIR

34100

33700

3000

3900

30700

6600

6600

7000

7000

30200

7000

7400

38100

37200

Matchline Plate 2

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 1 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 1

38100

37200

I-39/90/94

CTH CV

TIERNEY XING

DALMORE RD

WIS 19

LIUNA WAY

4600

4600

33500

13450

13450

11350

11350

Matchline Plate 4

32600

12000

PEPSI WAY

11000

I-39/90/94

44500

44600

Matchline Plate 3

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

I-39/90/94 SOUTH CORRIDOR

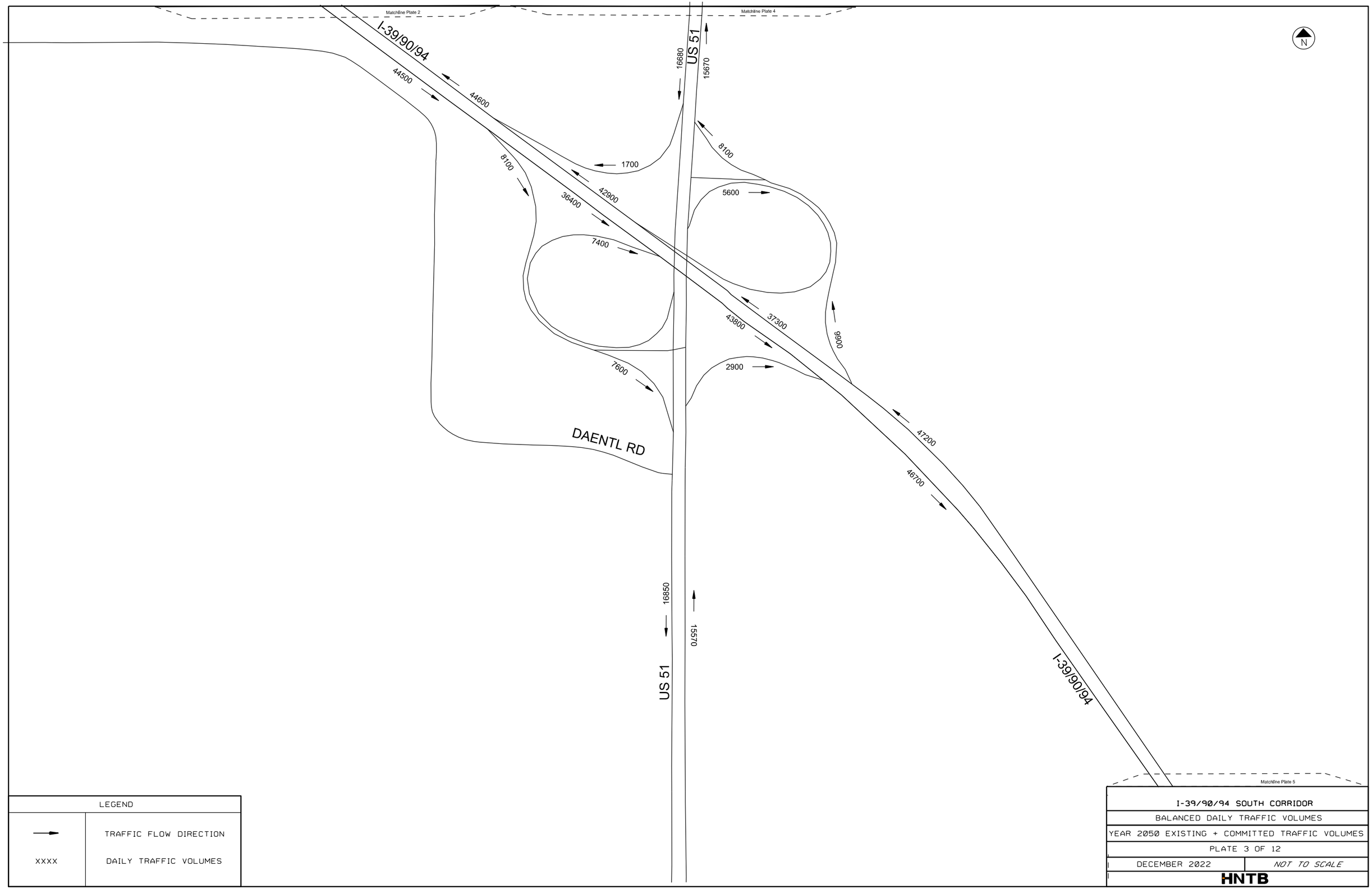
BALANCED DAILY TRAFFIC VOLUMES

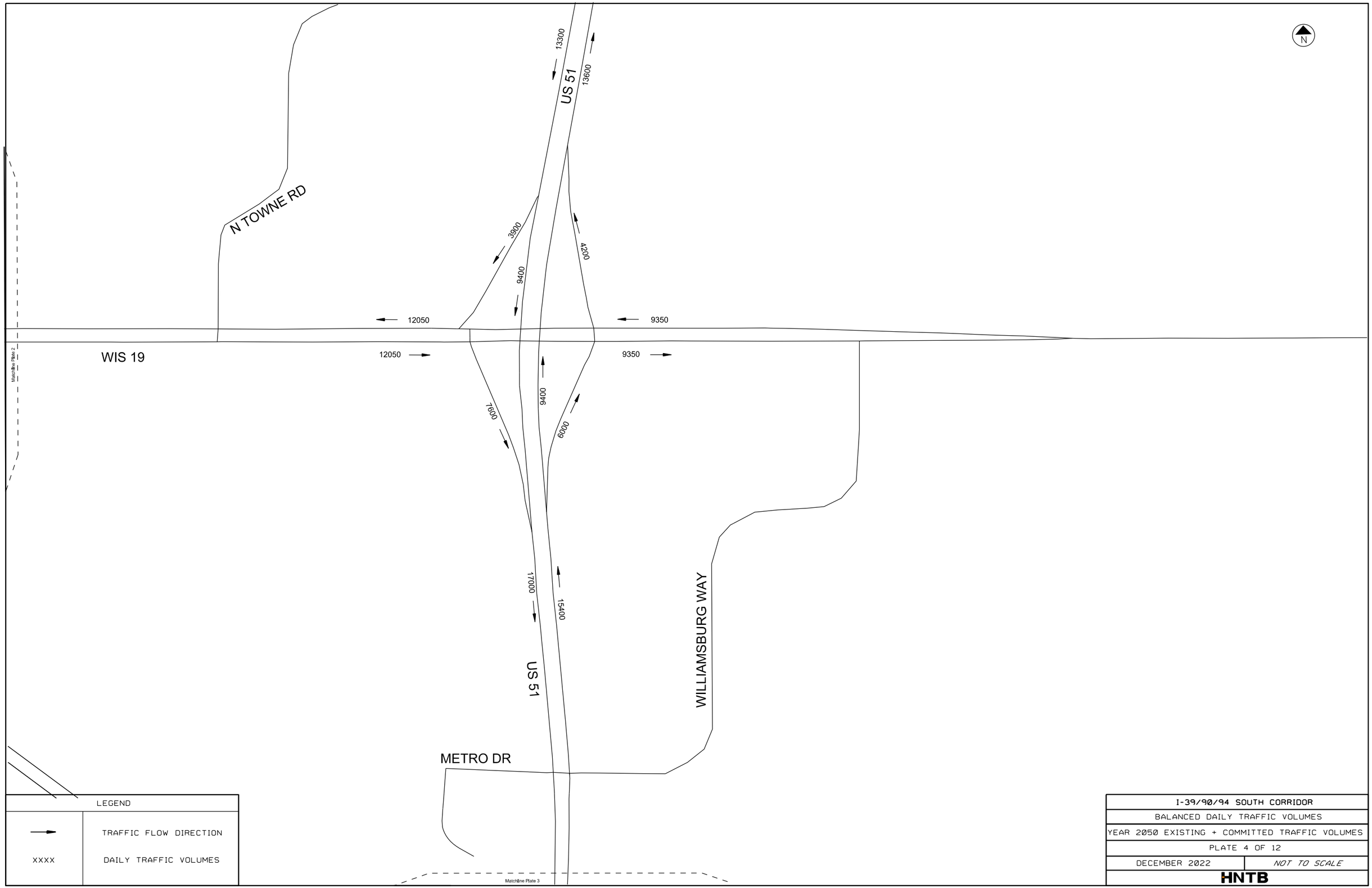
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES

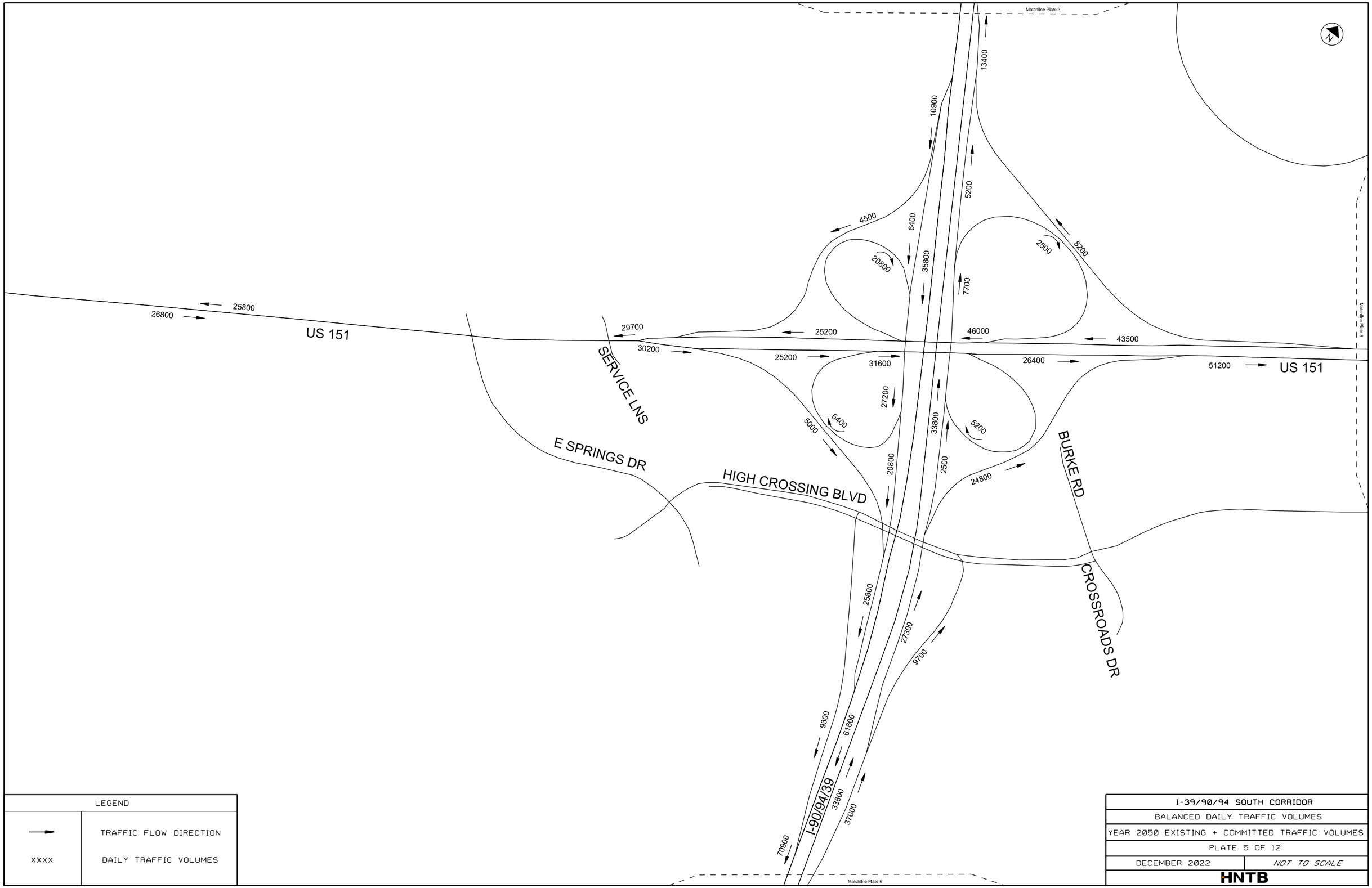
PLATE 2 OF 12

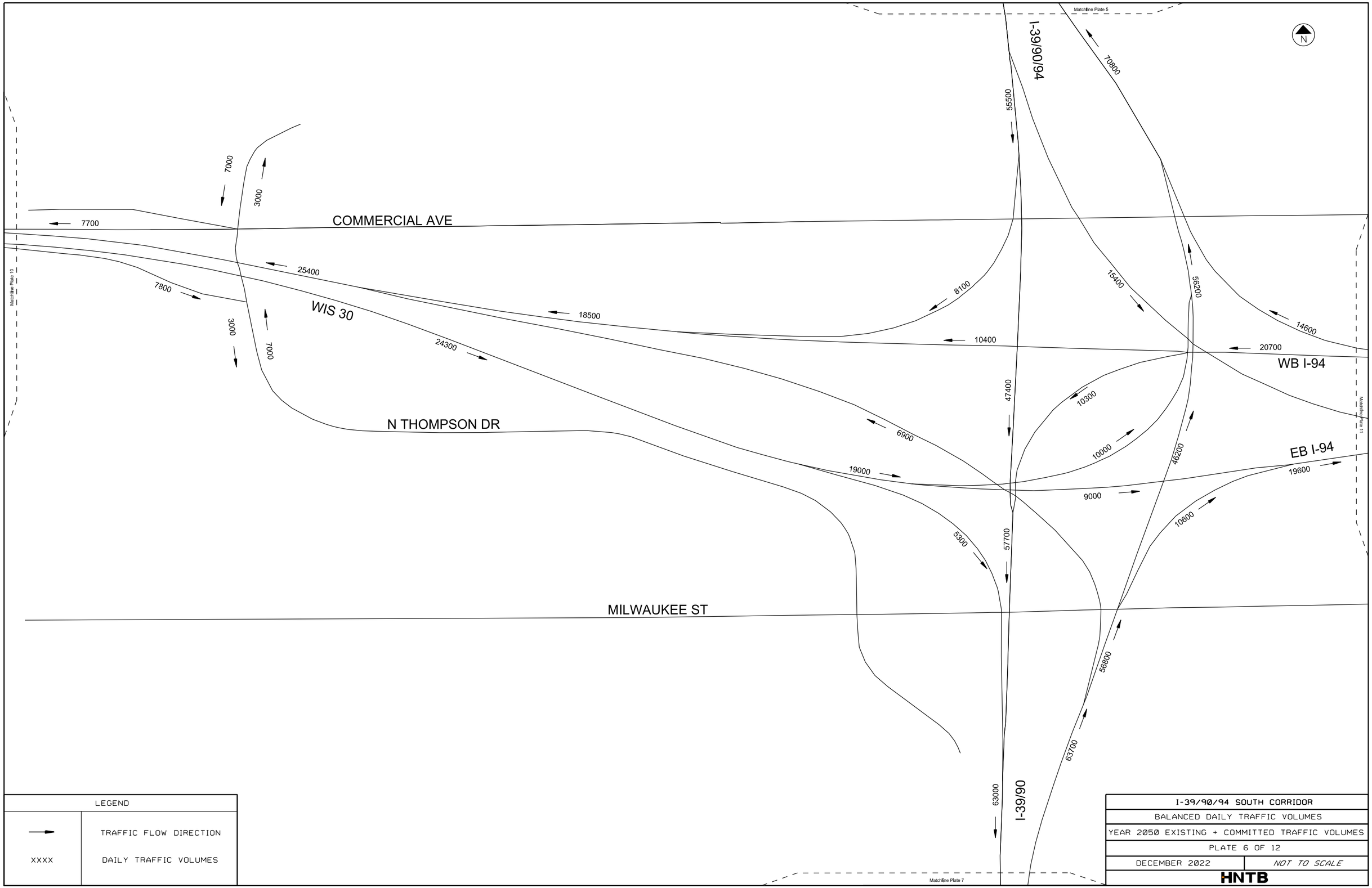
DECEMBER 2022 | *NOT TO SCALE*

HNTB


Matchline Plate 2
Matchline Plate 4
I-39/90/94
US 51
16680
15670
44500
44600
8100
1700
8100
42900
36400
5600
7400
37300
43500
9900
7600
2900
DAENTL RD
47200
46700
16850
15570
US 51
I-39/90/94
N
Matchline Plate 5
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 3 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB


N
N TOWNE RD
US 51
13300
13600
3900
9400
4200
12050
9350
WIS 19
12050
9350
Matchline Plate 2
7600
9400
6000
17000
15400
US 51
WILLIAMSBURG WAY
METRO DR
Matchline Plate 3
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 4 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB


Matchline Plate 3
Matchline Plate 5
Matchline Plate 6
US 151
US 151
SERVICE LNS
E SPRINGS DR
HIGH CROSSING BLVD
BURKE RD
CROSSROADS DR
I-90/94/39
26800
25800
29700
30200
25200
31600
25200
46000
43500
26400
51200
13400
10900
5200
4500
6400
35800
20800
2500
8200
7700
27200
6400
5000
33800
5200
20800
2500
24800
25800
27300
9700
9300
61600
33800
37000
70900
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 5 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB


Matchline Plate 5
I-39/90/94
70800
55500
7000
3000
7700
COMMERCIAL AVE
Matchline Plate 10
25400
7800
WIS 30
3000
7000
18500
8100
15400
56200
14600
24300
10400
20700
WB I-94
47400
10300
N THOMPSON DR
6900
10000
46200
EB I-94
19000
19600
9000
10600
5300
57700
MILWAUKEE ST
56800
63700
63000
I-39/90
Matchline Plate 7
Matchline Plate 11
N
LEGEND
TRAFFIC FLOW DIRECTION
XXXX
DAILY TRAFFIC VOLUMES
I-39/90/94 SOUTH CORRIDOR
BALANCED DAILY TRAFFIC VOLUMES
YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES
PLATE 6 OF 12
DECEMBER 2022
NOT TO SCALE
HNTB

Matchline Plate 6

N

I-39/90

63700

63000

42900

25200

37800

42900

9900

47700

900

4700

53450

US 12/18

53450

26100

20800

9900

38200

19250

US 12/18

19250

10500

5400

900

20700

10800

31200

31600

I-39/90

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 7 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

AMERICAN PKWY

EASTPARK BLVD

US 151

US 151

HIGH CROSSING BLVD

NELSON RD

Matchline Plate 5

Matchline Plate 9

51700

41200

10500

3400

2300

1200

5700

40000

45700

47600

3600

9200

38400

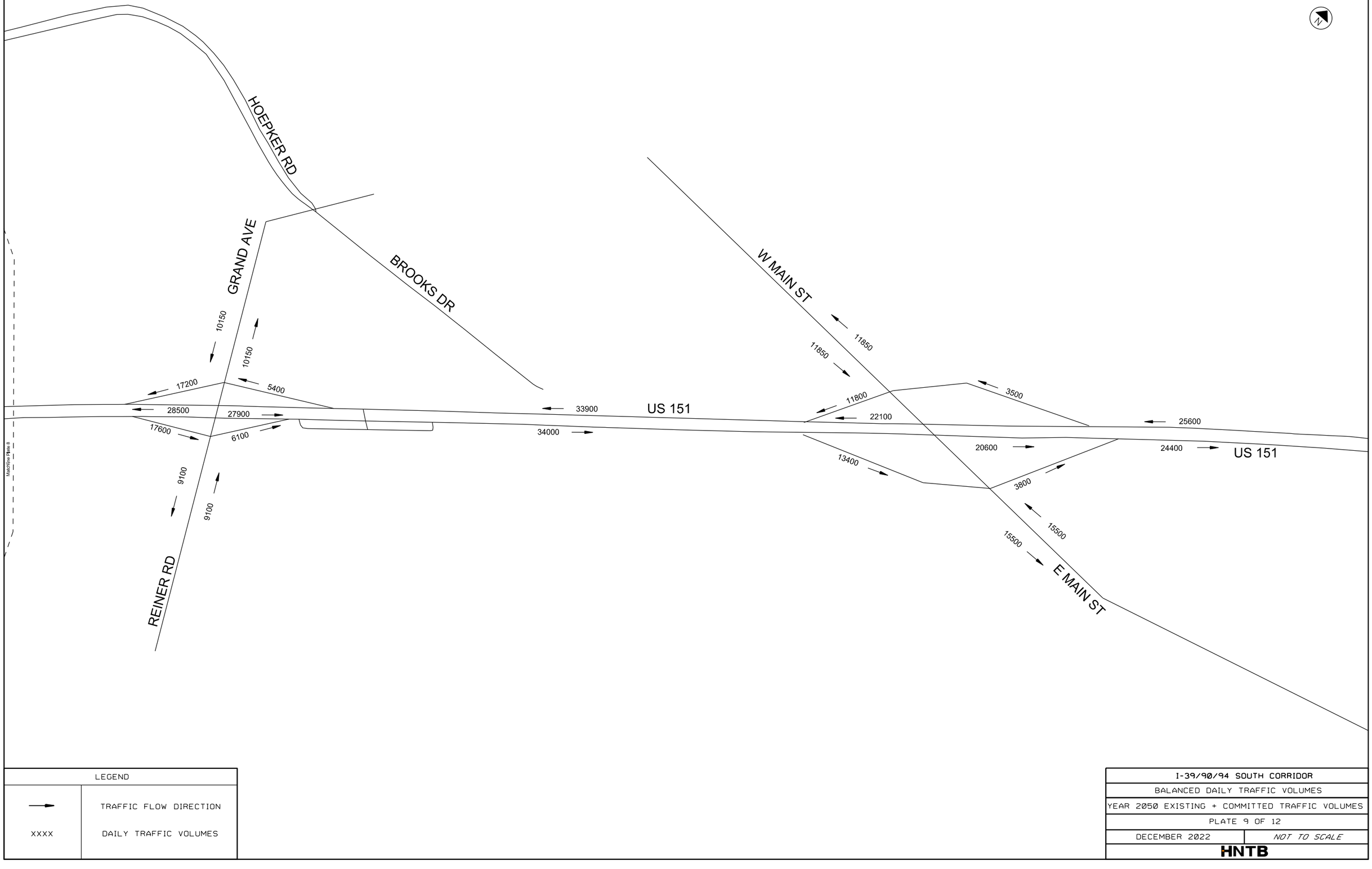
7100

45500

8300

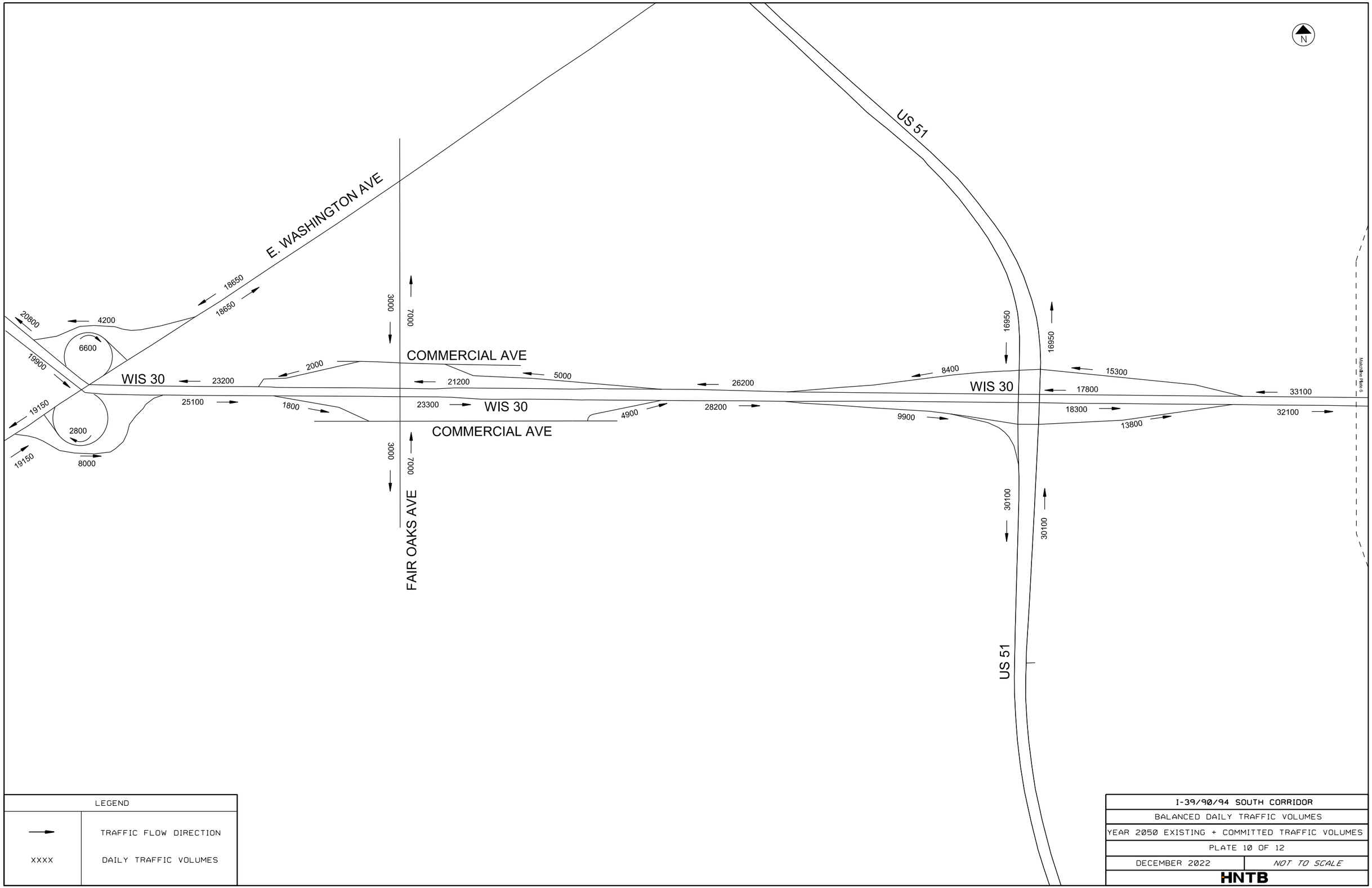
| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 8 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |



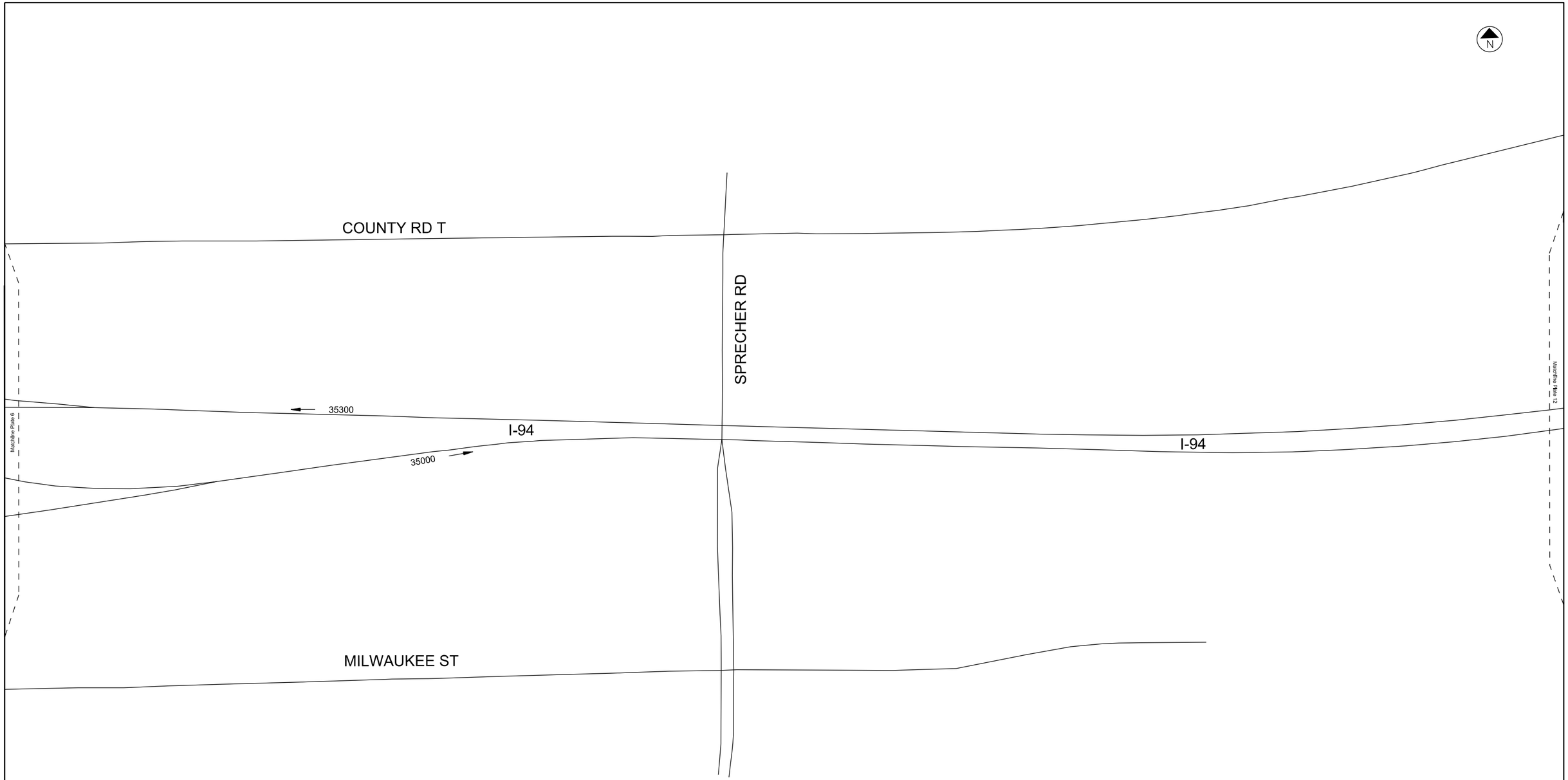

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 9 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 10 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 11 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| **HNTB** | |

N

CTH TT

4500

4500

I-94

11000

24300

10700

24300

3800

3800

28100

28100

I-94

Matchline Plate 11

CTH N

GASTON RD

COMMERCE PKWY

8000

8000

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90/94 SOUTH CORRIDOR | |
|---|---|
| BALANCED DAILY TRAFFIC VOLUMES | |
| YEAR 2050 EXISTING + COMMITTED TRAFFIC VOLUMES | |
| PLATE 12 OF 12 | |
| DECEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

# Appendix B – I-39/90/94 North Segment No Build Traffic Operations

MEMORANDUM

# I-39/90/94 Corridor Study

| | |
|---|---|
| **Date:** | 3/9/2023 |
| **Topic:** | HCS LOS Methodology – North Segment |
| **From:** | Neal Styka, P.E., RSP1, PTOE, Kapur & Associates |

This memo provides an overview of the existing conditions (2021) and 2050 future no build level of service (LOS) conducted for the I-39/90/94 Corridor Study - North Segment and follows the format of the South Segment Memo. The Highway Capacity Software (HCS) Version 2022 was used for these analyses. The following sections describe the analyzed limits, methodology, and results.

## 1. Level of Service

The level of service (LOS) serves as a planning-level indicator of congestion, driver discomfort, frustration, and increased travel time on the transportation system. **Figure 1** shows the differences between levels of service, ranging from A to F. Roadways are typically designed to provide LOS that balances driver's desire against financial resources and environmental impacts. The WisDOT Facilities Development Manual (FDM), Section 11.5-3.2.1 sets LOS C as acceptable in rural areas, such as this segment of the I-39/90/94 corridor.

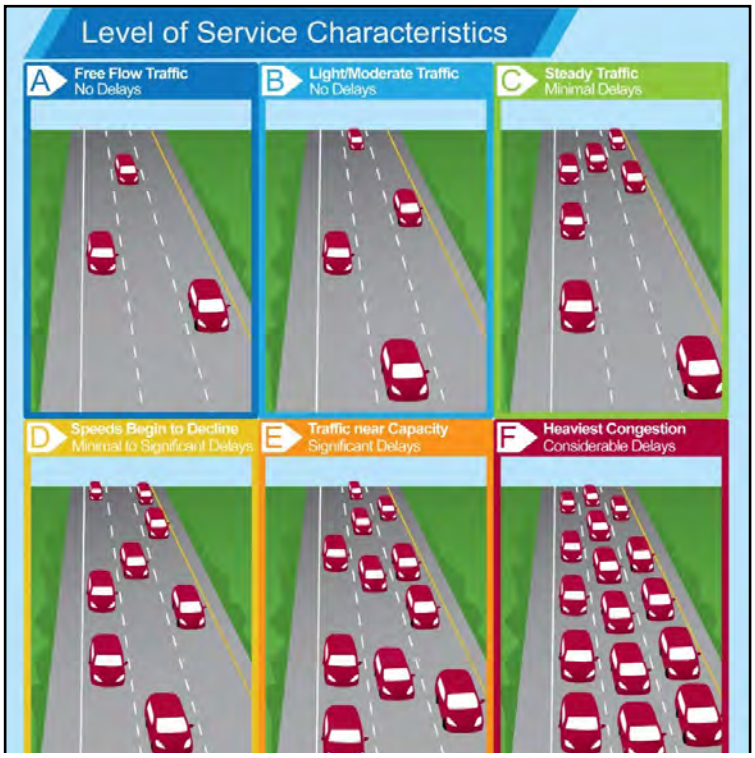



*Figure 1. Level of Service*

The LOS analysis builds on the work previously done on the I-90 Madison to Tomah Needs Study conducted in 2019. The HCS models for the I-39/90/94 corridor were carried over from that previous study and updated for this study.

## 1.1. Analysis Limits

The HCS model limits contain the Interstate and connecting freeways in the Wisconsin Dells area as shown in **Figure 2**:

- ***I-39/90/94*** – extending from the WIS 60 Interchange to the I-39/WIS 78 Split (Petro Interchange)
- ***I-90/94*** – From the I-39/WIS 78 Split (Petro Interchange) to the WIS 16/US 12 Interchange

  Two HCS Models were made from this corridor. The first extends from WI 60 to WIS 33 (South Section) and second extends from WI 33 to WIS 16/US 12 (North Section).

The HCS models were created for the Friday and Sunday peak periods. The volumes were based on the representative days, Friday June 21st, 2021, and Sunday August 6th, 2021. The technical memorandum, "Representative Day Methodology" explains why those two days were chosen. Each peak period extended for 3 hours with 15-minute analysis periods. The peak hours were the middle hour of the 3 time periods and are defined as follows:

- Summer Friday PM (**FRI**): 11 AM-1 PM
- Summer Sunday PM (**SUN**): 1-4 PM

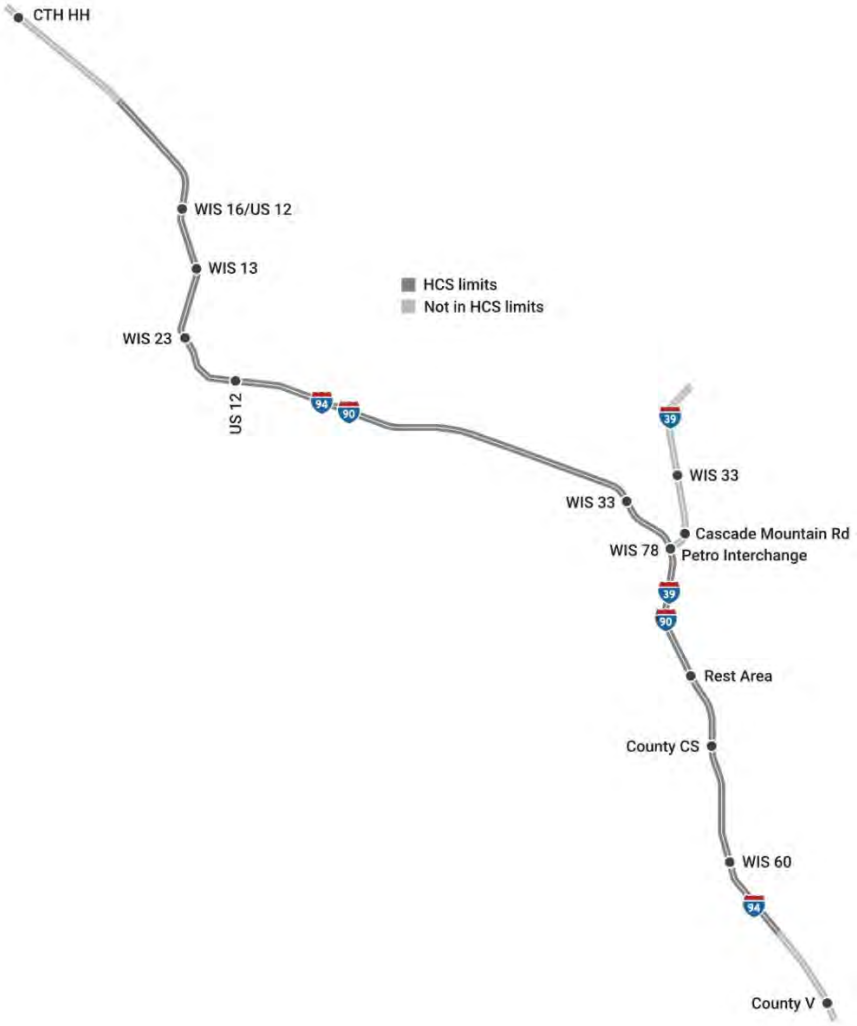



*Figure 2. North Segment Analysis Limits*

## 1.2. Methodology and Results

The Highway Capacity Manual 7th Edition (HCM 7) methodology was used to define the basic, merge, diverge, and weave segments along the freeway facilities. Model inputs including volumes and truck percentages required for the LOS analysis were obtained from the 2021 existing year data collection. Model parameters were inherited from the previous study models and adjusted as needed for the purpose of this study.

The peak hour volumes and truck percentages were derived from the Vissim origin destination (OD) models and 15-minute flow profiles. The hour before and the hour after the peak hour were multiplied by a ratio of that hour's volumes compared to the peak hour volumes. These non-peak hour volumes were taken from the Continuous Count Station (CCS) on the same representative days as the target volumes. ATR Site 110002 was used for the South Section between WIS 60 and WIS 33 including the WIS 78 Interchange, and ATR Site 560001 was used for analysis between WIS 33 and the WIS 16/US 12 Interchange. The ratios can be seen in **Table 1**. The Friday ratios for the different time periods are generally in similar ranges from 92-98% of the peak hour, except for eastbound I-90/94 traffic in the southern section on Friday from 3-4 PM. In that period, it was 0.4% higher than the peak hour. Sunday volumes primarily fall within the same range as Friday. The exception is in the northern section which has 0.5% increase in volumes between 11 AM and 12 PM hour compared to the peak hour and 74% compared to the peak hour volumes between 1 PM and 2 PM.

The Friday, 3-4 PM period, where the volumes are slightly higher than the peak hour, was compared to Fridays in June, July, and August for the same hours. Four out of the 13 Fridays in June, July, and August also had a volume that was higher than the 3-4 PM hour. The higher volume on Sunday at 11 AM is consistent with all 13 Sundays, and the lower Sunday southbound volume between 1 and 2 PM is lower than all the other summer volumes in that period. The next two closest in value are 87% and 88%. The peak hour at the CCS differs from the overall peak hour of the representative day. The peak hour of the representative day includes all segments, ramps, and intersections of the study area and not just the two CCSs located within this study area.

*Table 1. Percentage Difference Between Adjacent Hour and Peak Hour*

| | | | South Section (Site 110002) | | North Section (Site 560001) | |
|---|---|---|---|---|---|---|
| Day | Direction | Time | Volume | % Difference to Peak Hour | Volume | % Difference to Peak Hour |
| Friday | EB 90/94 -SB 39 | 1:00 PM | 3904 | 95.62% | 2316 | 94.38% |
| Friday | EB 90/94 -SB 39 | 2:00 PM | 4083 | | 2454 | |
| Friday | EB 90/94 -SB 39 | 3:00 PM | 4098 | 100.37% | 2258 | 92.01% |
| Friday | WB 90/94-NB 39 | 1:00 PM | 3201 | 94.70% | 2512 | 91.61% |
| Friday | WB 90/94-NB 39 | 2:00 PM | 3380 | | 2742 | |
| Friday | WB 90/94-NB 39 | 3:00 PM | 3278 | 96.98% | 2617 | 95.44% |
| Sunday | EB 90/94 -SB 39 | 11:00 AM | 4239 | 95.82% | 2813 | 96.60% |
| Sunday | EB 90/94 -SB 39 | 12:00 PM | 4424 | | 2912 | |
| Sunday | EB 90/94 -SB 39 | 1:00 PM | 3252 | 73.51% | 2802 | 96.22% |
| Sunday | WB 90/94-NB 39 | 11:00 AM | 3498 | 100.46% | 2686 | 97.71% |
| Sunday | WB 90/94-NB 39 | 12:00 PM | 3482 | | 2749 | |
| Sunday | WB 90/94-NB 39 | 1:00 PM | 3376 | 96.96% | 2623 | 95.42% |

At the Rest Area, the volumes for the entrance and exit ramps were taken from the Vissim OD model. However, no truck percentages were provided. For the sake of this analysis, a value of 10% was assumed on the ramps and the percentage of trucks on the freeway was left unchanged from the previous segment.

The HCM 7 defines LOS on a freeway facility based on density and differentiates between the density thresholds on urban and rural freeway facilities. **Table 2** shows the density-based LOS scale for the rural freeway facilities and individual segments. Density-based LOS, speeds, and demand-to-capacity ratios were exported from the HCS models for each of the corridors and directions. **Tables 3 & 4** summarizes the LOS results for mainline freeway segments between interchanges for existing conditions and a future no build scenario. The results show the lowest LOS of the peak hour. A full set of results exported from the HCS models are in **Appendix 1 - Existing 2021 HCS Summaries and Appendix 2 - Future 2050 No-Build HCS Summaries**.

*Table 2. HCM 7th Edition - Density Based LOS Definition*

| LOS | Basic Rural Freeway Facility Density (pc/mi/ln) | Basic Freeway Segment Density (pc/mi/ln) | Merge/Diverge Density (pc/mi/ln) |
|---|---|---|---|
| **A** | ≤ 6 | ≤ 11 | ≤ 10 |
| **B** | > 6 - 14 | > 11-18 | > 10 – 20 |
| **C** | > 14 - 22 | > 18-26 | > 20 – 28 |
| **D** | > 22 - 29 | > 26-35 | > 28 – 35 |
| **E** | > 29 - 39 | > 35-45 | > 35 - 45 |
| **F** | > 39 or any segment $v_{d/c}$>1.00 | > 45 or any segment $v_{d/c}$>1.00 | > 45 |

*Table 3. Existing 2021 Level of Service Summary*

| **I-39/90/94 Location (Interchange to Interchange)** | **Existing** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUN** | | | | | | **FRI** | | | | | |
| | **SB/EB** | | | **NB/WB** | | | **SB/EB** | | | **NB/WB** | | |
| | **Density** | **LOS** | **d/c** | **Density** | **LOS** | **d/c** | **Density** | **LOS** | **d/c** | **Density** | **LOS** | **d/c** |
| N of US 12/WIS 16 | 28.6 | D | 0.80 | 24.6 | C | 0.73 | 23 | C | 0.7 | 26.9 | D | 0.77 |
| US 12/WIS 16 to WIS 13 | 31.1 | D | 0.84 | 25.4 | C | 0.74 | 24.3 | C | 0.72 | 28.8 | D | 0.81 |
| WIS 13 to WIS 23 | 33.8 | D | 0.88 | 27.6 | D | 0.78 | 26.2 | D | 0.76 | 29.3 | D | 0.81 |
| WIS 23 to US 12 | 36.5 | E | 0.91 | 26.3 | D | 0.76 | 24.7 | C | 0.73 | 26.9 | D | 0.77 |
| US 12 to WIS 33 | 28.8 | D | 0.81 | 25.3 | C | 0.75 | 22.3 | C | 0.68 | 28.6 | D | 0.8 |
| WIS 33 to I-39 | 29.3 | D | 0.82 | 25.2 | C | 0.74 | 24.2 | C | 0.72 | 27.1 | D | 0.78 |
| I-39 to REST AREA | 25.0 | C | 0.74 | 20.4 | C | 0.63 | 20.9 | C | 0.64 | 26.2 | D | 0.76 |
| REST AREA TO CTH CS | 25.5 | C | 0.75 | 20.4 | C | 0.63 | 20.5 | C | 0.64 | 26.2 | D | 0.76 |
| CTH CS to WIS 60 | 24.6 | C | 0.73 | 20.4 | C | 0.63 | 20.5 | C | 0.63 | 28 | D | 0.79 |

Overall, the HCS results show that most of the corridor operates at LOS D or better in all existing peak periods. However, the segment between WIS 23 and US 12 travelling eastbound on a peak Sunday operates at LOS E. Based on the FDM standards, LOS C is the lowest acceptable LOS for a rural freeway. Based on the speed data collected from the National Performance Management Research Dataset (NPMRDS), the biggest reduction in freeway speeds on a Sunday occurred south of the US 12 entrance ramps in part due to the frequency in which crashes occur (see the *I-39/90/94 North Segment Sunday Peak Period Modeling Memo* dated March 3, 2023). However, the HCS analysis shows the reduction in LOS directly north of the US 12 exit ramps suggesting that the congestion may already be forming before causing a reduction in speeds.

Both Sunday northbound/westbound and Friday southbound/eastbound corridors, which are the non-peak directions, experienced LOS D around the WIS 12, WIS 23, and WIS 13 interchanges which are the primary interchanges serving the Wisconsin Dells.

On Fridays the entire corridor basic freeway segments between interchanges experienced LOS D. The density on some of these segments is very close to the threshold of becoming LOS E. The segments between the diverge and merge movements experienced LOS C or D.

*Table 4. Future 2050 No-Build Level of Service Summary*

| I-39/90/94 Location (Interchange to Interchange) | Future No Build | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUN | | | | | | | | | FRI | | | | | |
| | SB/EB Unconstrained* | | | SB/EB-Metered | | | NB/WB | | | SB/EB | | | NB/WB | | |
| | Density | LOS | d/c | Density | LOS | d/c | Density | LOS | d/c | Density | LOS | d/c | Density | LOS | d/c |
| N of US 12/WIS 16 | | | | 52.7 | F | 0.91 | 32.8 | D | 0.87 | 28.8 | D | 0.81 | 36.5 | E | 0.92 |
| US 12/WIS 16 to WIS 13 | | | | 58.6 | F | 0.87 | 33.6 | D | 0.88 | 30.2 | D | 0.83 | 39.1 | E | 0.94 |
| WIS 13 to WIS 23 | | | | 37.5 | F | 1 | 36.1 | E | 0.91 | 31.9 | D | 0.85 | 38.1 | E | 0.93 |
| WIS 23 to US 12 | | | | 37.1 | F | 1.01 | 33.1 | D | 0.87 | 28 | D | 0.79 | 33.7 | D | 0.88 |
| US 12 to WIS 33 | 36.6 | E | 0.92 | 33.6 | D | 0.92 | 30.8 | D | 0.84 | 26.4 | D | 0.77 | 36.5 | E | 0.92 |
| WIS 33 to I-39 | 35.2 | E | 0.9 | 32.6 | D | 0.9 | 28.4 | D | 0.8 | 28.2 | D | 0.8 | 31.1 | D | 0.84 |
| I-39 to REST AREA | 29.2 | D | 0.82 | 23.2 | D | 0.82 | 23.2 | C | 0.7 | 24 | C | 0.71 | 30.7 | D | 0.84 |
| REST AREA TO CTH CS | 29.8 | D | 0.82 | 23.2 | D | 0.82 | 23.2 | C | 0.7 | 23.5 | C | 0.71 | 30.7 | D | 0.84 |
| CTH CS to WIS 60 | 27.9 | D | 0.79 | 23 | D | 0.79 | 23 | C | 0.69 | 23 | C | 0.69 | 32.6 | D | 0.87 |

*The SB/EB Unconstrained model begins south the eastbound I-90/94 exit ramp to US 12

Overall, the 2050 No-Build scenario has lower LOS as a result of the increased demand. The bottlenecks and failing conditions that were observed in the existing conditions were exacerbated.

Looking at a future no-build scenario, Sunday southbound/eastbound would experience LOS F beginning at the first segment. Only the first 15-minute period was not oversaturated. After that period, all the other periods are oversaturated and operations breakdown. This situation continued south to the I-39/WIS 78 interchange.

The Highway Capacity Manual (HCM) in Chapter 12 defines breakdown "as a sudden drop in speed of at least 25% below the free-flow speed for a sustained period of at least 15-minutes." The speeds in these segments drop from the upper 50-60 MPH range to around 25-35 MPH and stay in that range for at least 15 minutes. Once this bottleneck is formed, queues begin to form and the flow rate discharging from the bottleneck is less than the original prebreakdown flow. The HCM uses an average value of a 7% reduction to estimate the rate at which queues will form and dissipate once the demand is lower than the capacity. This methodology is applied within the HCS. The limitations of this methodology include:

- When the first or last segment's demand to capacity ratio exceeds 1.
- Multiple or overlapping breakdowns or bottlenecks.
- Queue spill back from off-ramps where demand exceeds capacity.
- Vehicles using an alternative route or vehicles leaving before or after the analysis period.
- Queue discharge rates vary with location and magnitude of prebreakdown flow.

To better understand what the LOS would be if the full demand was being met, a separate model was created south of US 12. The model starts south the eastbound I-90/94 exit ramp to US 12 and continued south to the southern limits of the North Section. The LOS for this scenario is shown in the SB/EB-Unconstrained column. The SB/EB-Metered column shows the LOS if the full demand is not able to be met and the segments upstream of I-39/WIS 78 are oversaturated creating a bottleneck.

Friday southbound in the 2050 No-Build scenario would experience worse operations in the northern section north of the I-39/WIS 78 interchange in large part due to there being only 2 lanes instead of 3 lanes in each direction as there is south of the I-39/WIS 78 Interchange.

Overall, the Sunday northbound/westbound corridor in a future no-build scenario would experience acceptable LOS south of I-39/WIS 78. North of I-39/WIS 78 it would operate at LOS D, except for the segment between WIS 13 and WIS 23 where it would operate at LOS E. This segment was the worst in the existing conditions due to the increase of volume from the WIS 23 entrance ramp, which is the largest increase of volume north of WIS 33.

In the Friday northbound/westbound 2050 No-Build scenario, LOS in the basic segment south of the US 12 exit ramp is expected to operate at LOS E for 2 of the 12 time periods analyzed. The remaining 10 periods are expected to operate at LOS D. The lower LOS in the 2 time periods is caused by fluctuations in the demand volume that increase the density and push the LOS over D/E threshold. The basic segment between US 12 and WIS 23 is expected to operate at LOS D. The improved LOS from the segment upstream is a result of fewer vehicles entering the freeway from the US 12 entrance ramps than exiting resulting in a lower volume. The lower volume in this basic segment provides a density of 33.7 pc/mi/ln (LOS D) which is slightly below the LOS D/E threshold of 35 pc/mi/ln. More vehicles enter westbound I-90/94 from WIS 23 than exit, thereby decreasing the LOS over the LOS D/E threshold.

## 1.3. Summary and Future Analysis

The results of the HCS analysis for the existing year conditions showed that in peak periods the LOS drops below the acceptable standard of LOS C, especially for the peak directions. In the future if volumes grow as they are expected to without any improvements, operations will decline, and the majority of the North Section of I-39/90/94 will operate below acceptable standards. Additionally, some segments will operate with a LOS F and significant queuing will occur.

To better understand freeway operations, especially in the oversaturated conditions, more analysis is necessary. The HCS reported results suggest that HCS may over-estimate LOS on multiple segments along the interstate due to recurring congestion on Sundays that cause incidents and the high demand in the Wisconsin Dells area. Evaluating the LOS in a different tool such as Vissim can supplement the HCS representation of existing field conditions.

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

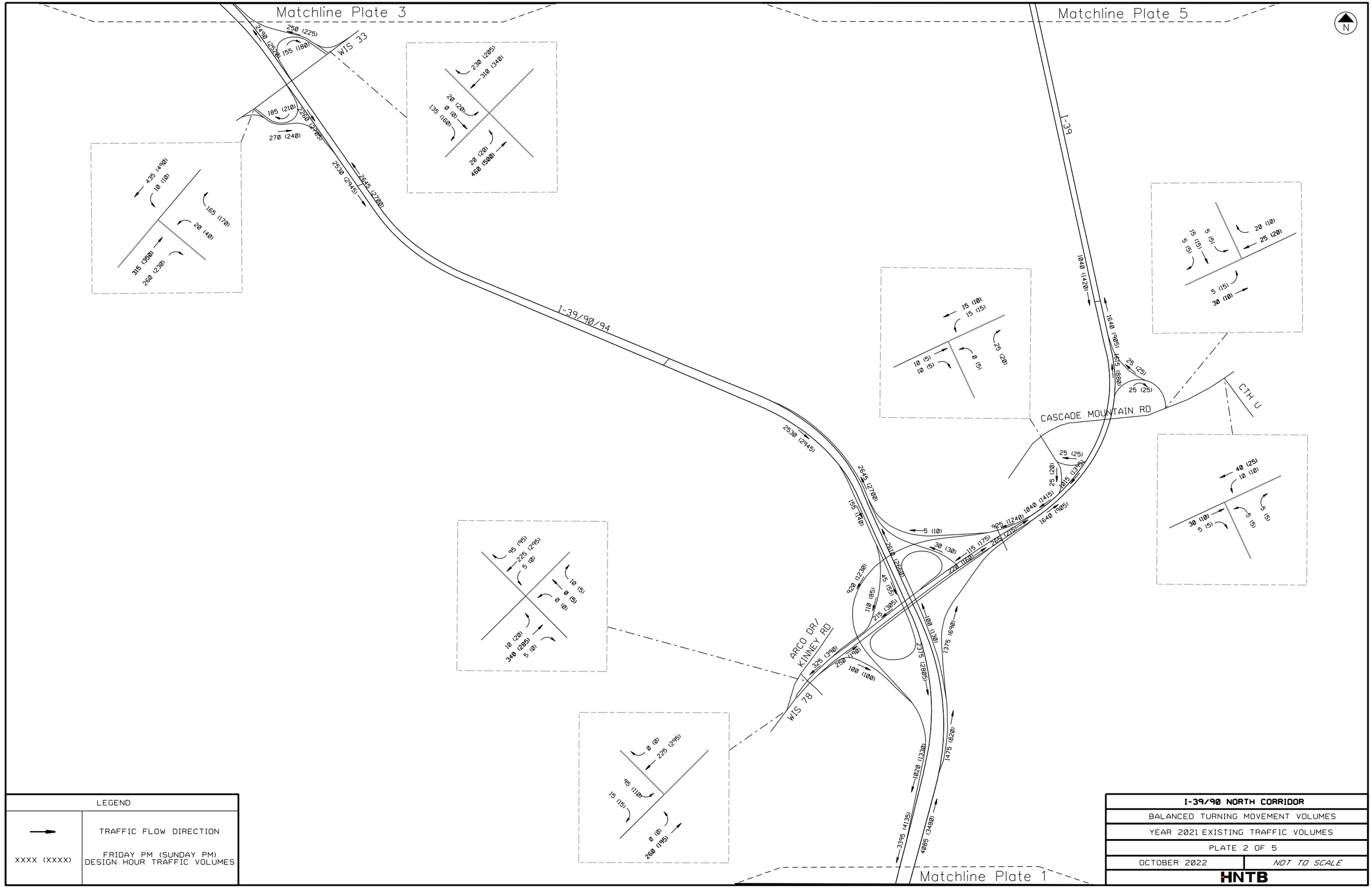
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 1 OF 5

OCTOBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 2 OF 5

OCTOBER 2022 | *NOT TO SCALE*

**HNTB**

Matchline Plate 4

N

US 12

WHITLOCK ST

WIS 23

CTH P

COMMERCE ST

2890 (2795)
2675 (3170)
325 (285)
355 (275)
2350 (2885)
2535 (2520)
190 (205)
220 (340)

245 (245)
10 (15)
515 (575)
545 (550)
370 (300)
5 (5)
230 (265)
240 (290)
10 (20)

155 (95)
460 (450)
200 (180)
420 (500)
130 (130)
0 (0)
60 (75)

5 (5)
75 (110)
130 (180)
200 (120)
95 (80)
440 (450)
10 (5)
85 (130)
35 (25)
35 (30)
100 (90)
445 (495)

225 (195)
0 (0)
100 (90)
510 (455)
80 (125)
520 (590)
140 (215)

175 (260)
325 (345)
150 (190)
115 (135)
130 (130)
225 (280)
170 (215)
120 (160)
295 (360)
330 (360)
470 (485)
225 (345)

GASSER RD

MEADOWVIEW DR

US 12

845 (985)
1025 (1011)

615 (710)
255 (155)
465 (645)

230 (275)
560 (545)
255 (155)
570 (405)
815 (700)
1925 (2045)
2740 (2745)
2445 (2915)
2725 (2725)
2570 (3225)
2495 (2450)
2065 (2505)
2355 (2785)
505 (720)
290 (280)
100 (155)
405 (565)
90 (130)

I-90/94

I-90/94

580 (585)
100 (155)
935 (895)

985 (1150)
1025 (1011)
215 (245)
365 (285)
770 (905)
690 (1071)

Matchline Plate 2

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

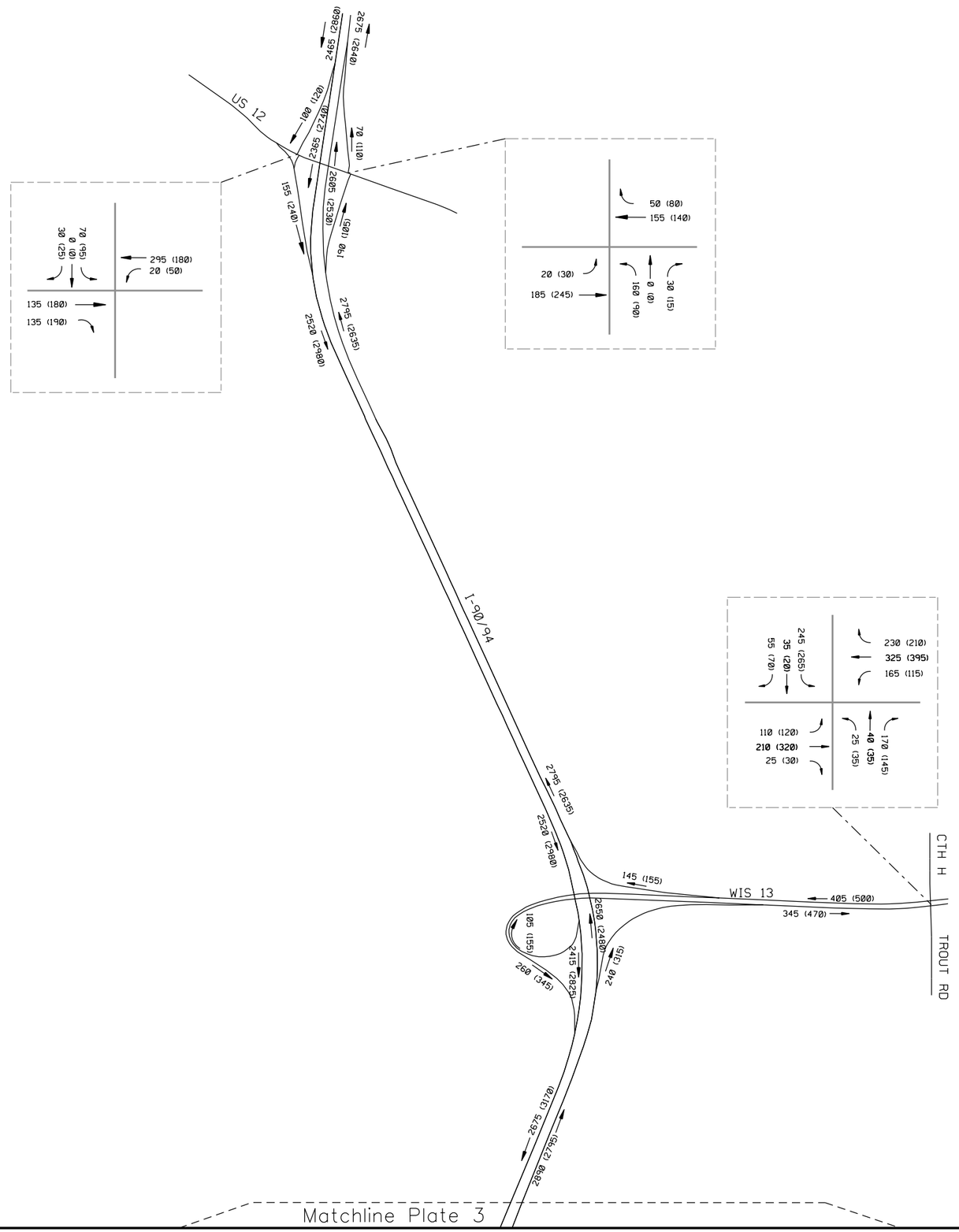
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 3 OF 5

OCTOBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

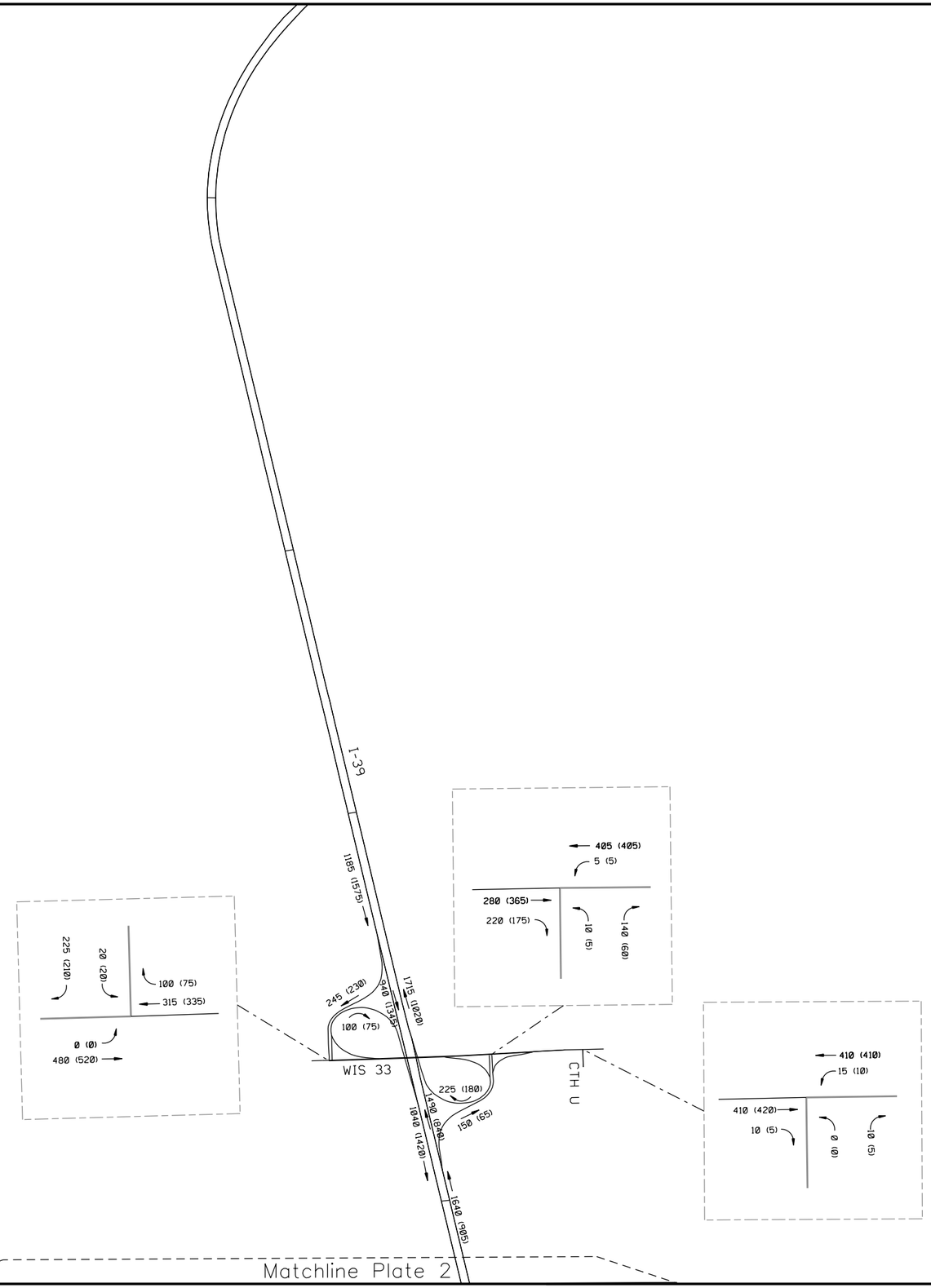
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 4 OF 5

OCTOBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

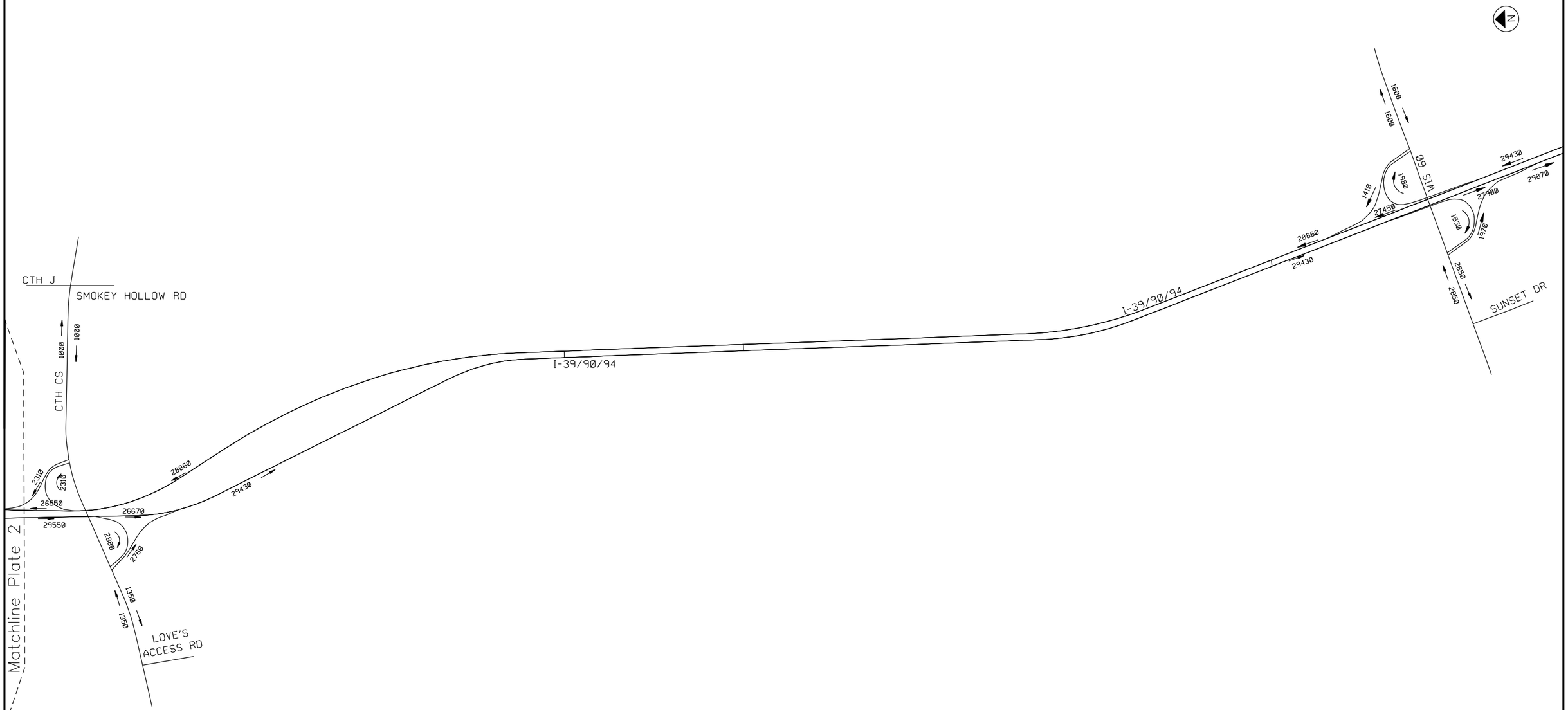
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 5 OF 5

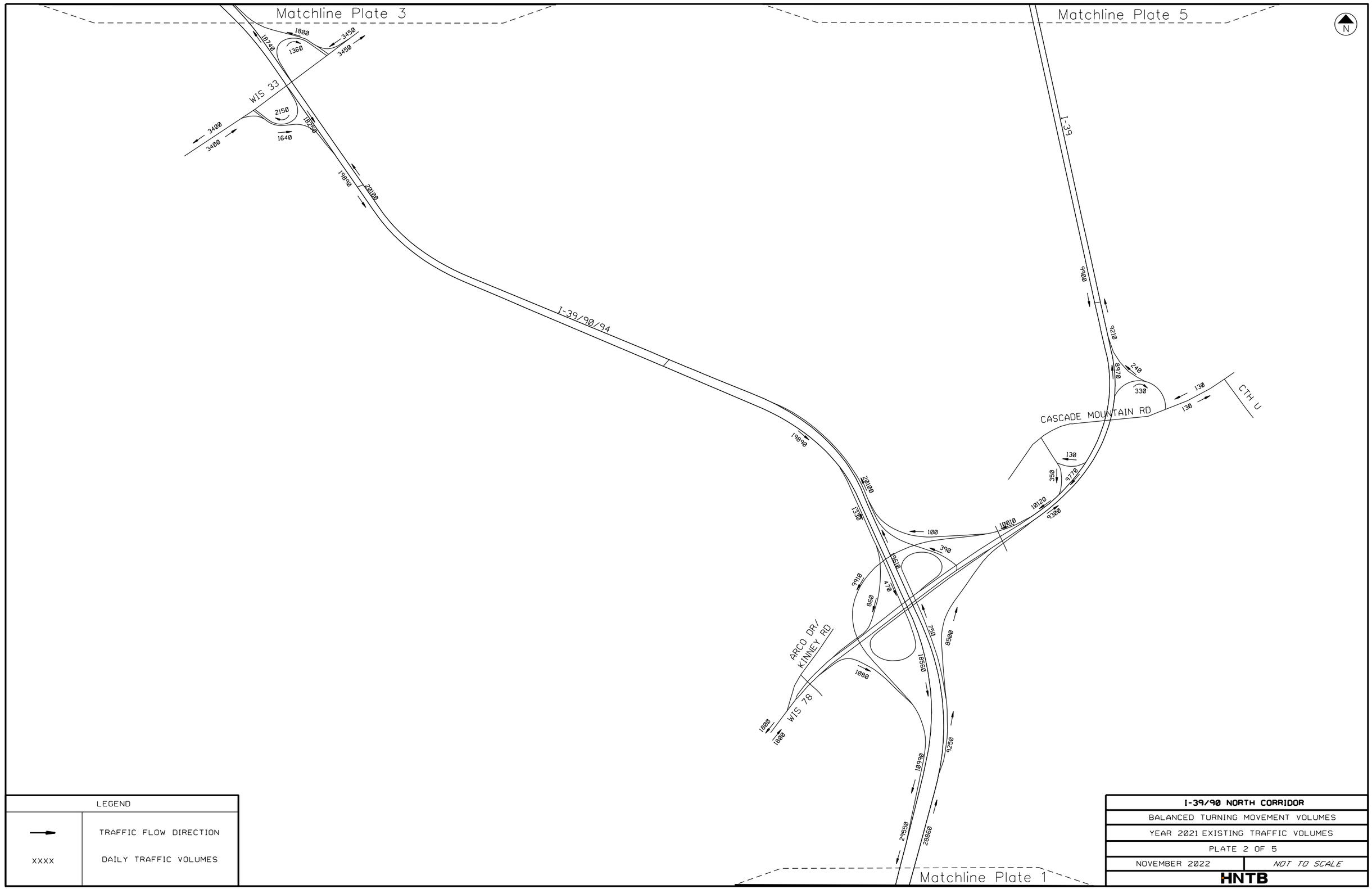
OCTOBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90 NORTH CORRIDOR | |
|---|---|
| BALANCED TURNING MOVEMENT VOLUMES | |
| YEAR 2021 EXISTING TRAFFIC VOLUMES | |
| PLATE 1 OF 5 | |
| NOVEMBER 2022 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90 NORTH CORRIDOR | |
|---|---|
| BALANCED TURNING MOVEMENT VOLUMES | |
| YEAR 2021 EXISTING TRAFFIC VOLUMES | |
| PLATE 2 OF 5 | |
| NOVEMBER 2022 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 4

N

US 12

WHITLOCK ST

WIS 23

CTH P

COMMERCE ST

22080
21840
2640
2600
19200
4700
4700
7800
7800
19480
2490
2550

MEADOWVIEW DR

GASSER RD

US 12

6000
6300
1650
2760
1330
3860
4080
20320
16870
19090
16460
20540
20400
4880
2220
1310
1000
3880
6010
7710
1750
2880
4260
4830

I-90/94
21750
21970
I-90/94

Matchline Plate 2

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

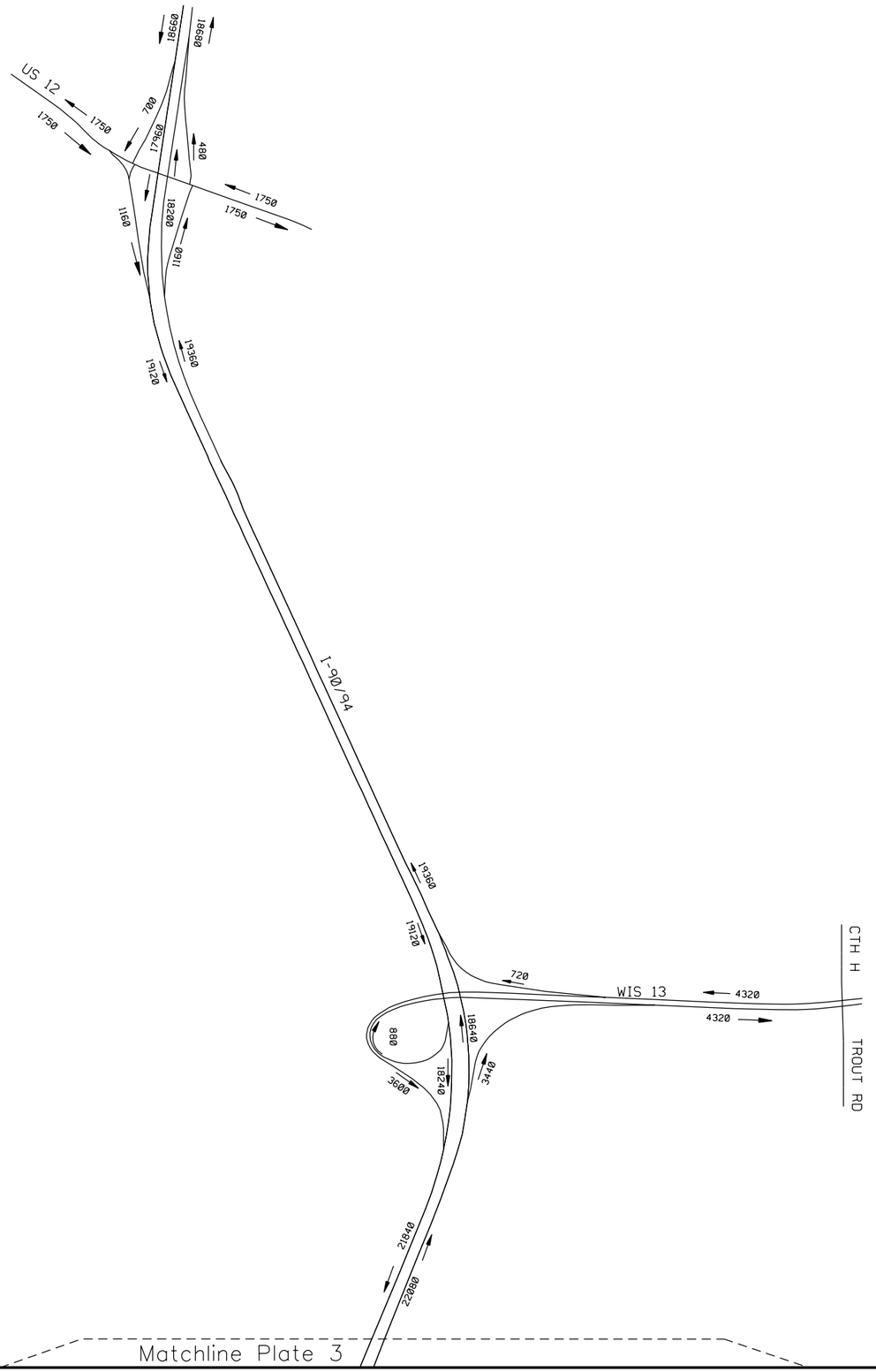
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 3 OF 5

NOVEMBER 2022 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

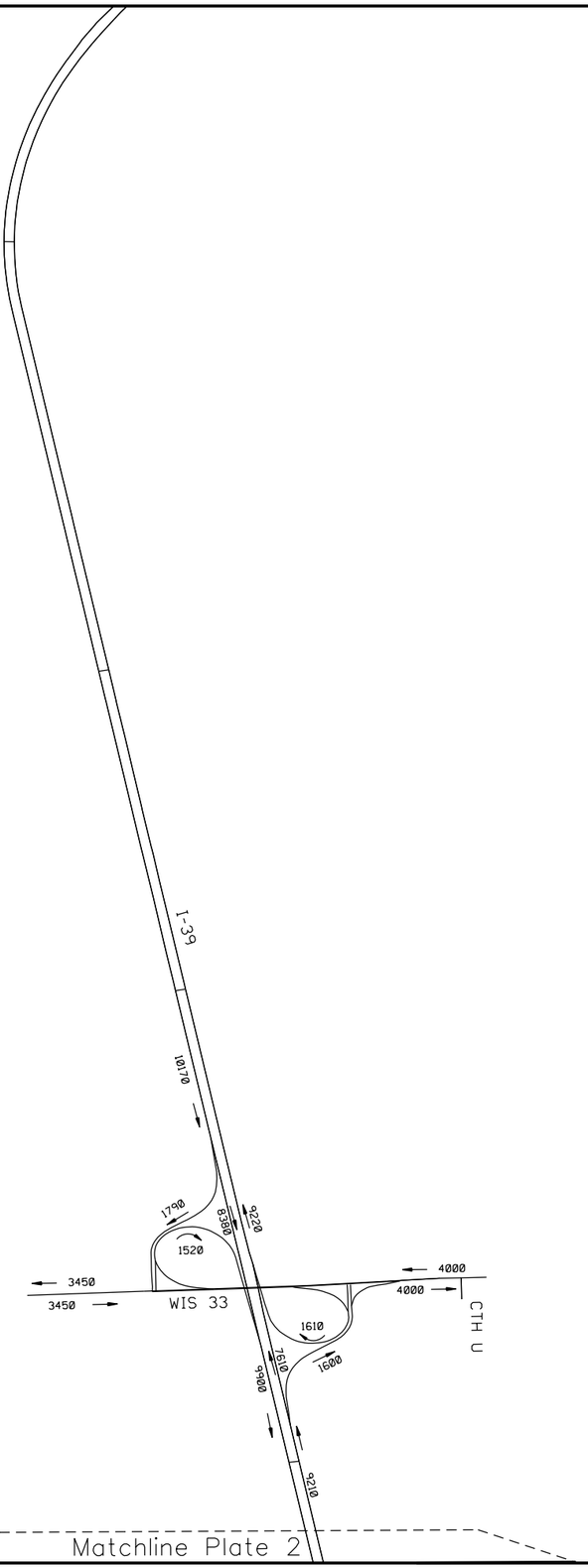
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 4 OF 5

NOVEMBER 2022 | *NOT TO SCALE*

HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

BALANCED TURNING MOVEMENT VOLUMES

YEAR 2021 EXISTING TRAFFIC VOLUMES

PLATE 5 OF 5

NOVEMBER 2022 | *NOT TO SCALE*

**HNTB**

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

BALANCED TURNING MOVEMENT VOLUMES

YEAR 2050 FUTURE E+C TRAFFIC VOLUMES

PLATE 1 OF 5

FEBRUARY 2023 | *NOT TO SCALE*

**HNTB**

Matchline Plate 3

Matchline Plate 5

N

WIS 33

I-39/90/94

I-39

CTH U

CASCADE MOUNTAIN RD

ARCO DR/
KINNEY RD

WIS 78

Matchline Plate 1

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90 NORTH CORRIDOR | |
|---|---|
| BALANCED TURNING MOVEMENT VOLUMES | |
| YEAR 2050 FUTURE E+C TRAFFIC VOLUMES | |
| PLATE 2 OF 5 | |
| FEBRUARY 2023 | *NOT TO SCALE* |
| HNTB | |

Matchline Plate 4

Matchline Plate 2

N

US 12

WHITLOCK ST

WIS 23

CTH P

COMMERCE ST

GASSER RD

MEADOWVIEW DR

I-90/94

3020 (3600)
3305 (3250)
430 (375)
490 (440)
2530 (3160)
2875 (2875)
230 (255)
240 (370)

295 (295) 10 (20) 580 (650)
615 (620)
445 (360)
5 (5)
260 (300)
385 (480)
10 (25)

5 (5) 95 (135) 160 (225)
250 (150)
155 (95)
550 (560)
10 (5)
105 (160)
45 (30)
45 (35) 125 (110) 555 (620)

335 (280) 0 (0) 155 (160)
620 (525)
100 (155)
680 (790)
140 (215)

180 (135)
560 (520)
250 (240)
585 (710)
160 (160) 0 (0) 70 (95)

200 (295) 365 (390) 170 (215)
130 (150)
145 (145)
255 (315)
190 (240)
135 (180)
330 (405)
375 (405) 595 (615) 250 (390)

680 (780)
450 (290)
620 (825)

95 (110)
1220 (1410)
270 (330)
600 (595)
450 (290)
785 (575)
1050 (875)
3105 (3130)
2770 (3530)
2835 (2800)
2050 (2225)
2210 (2700)
2525 (3000)
3100 (3100)
2720 (3280)
315 (300)
560 (830)
110 (170)
195 (280)
450 (660)

815 (770)
110 (170)
1295 (1230)

1490 (1510)
1265 (1430)
245 (280)
460 (360)
1020 (1150)
1030 (1150)

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

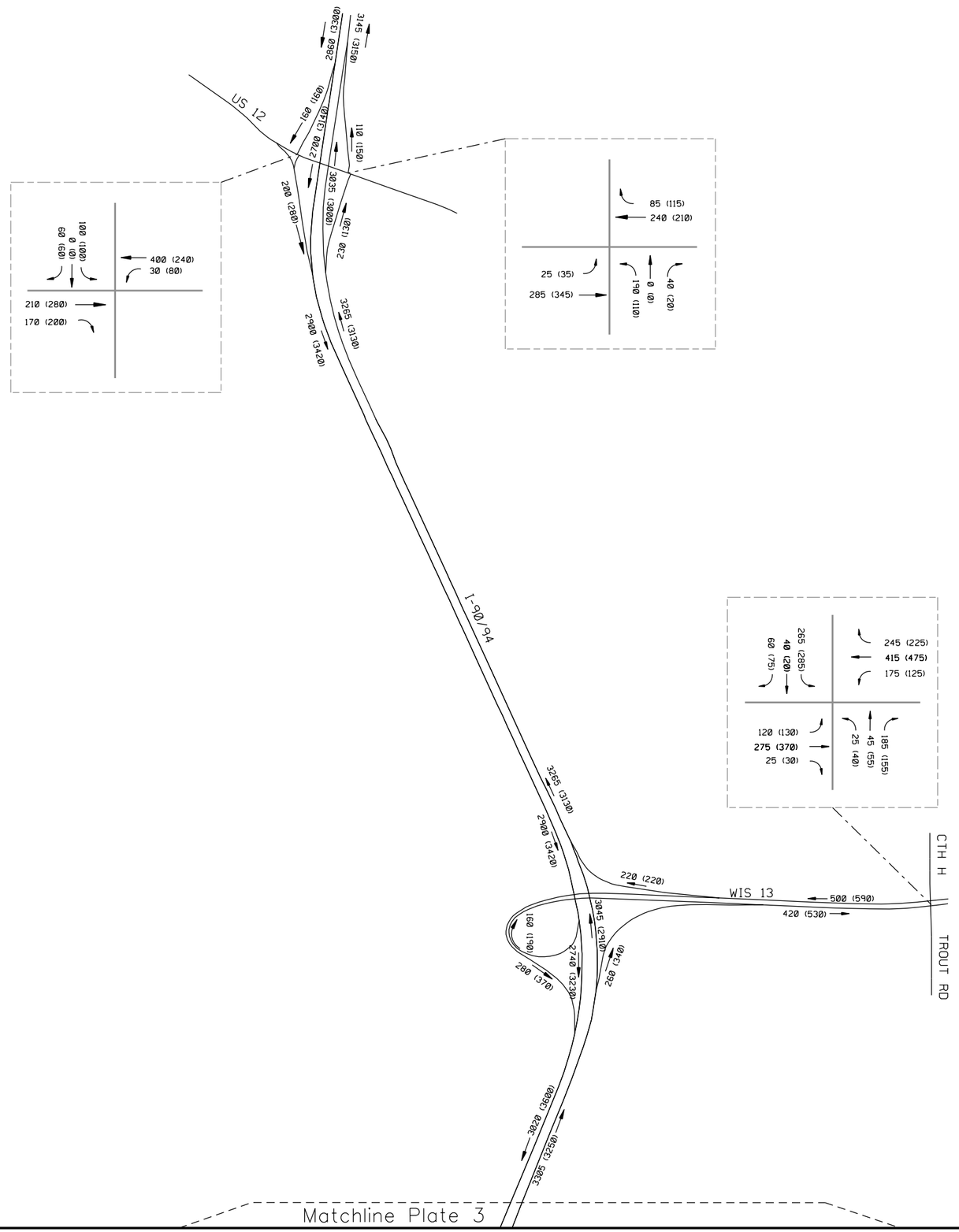
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2050 FUTURE E+C TRAFFIC VOLUMES

PLATE 3 OF 5

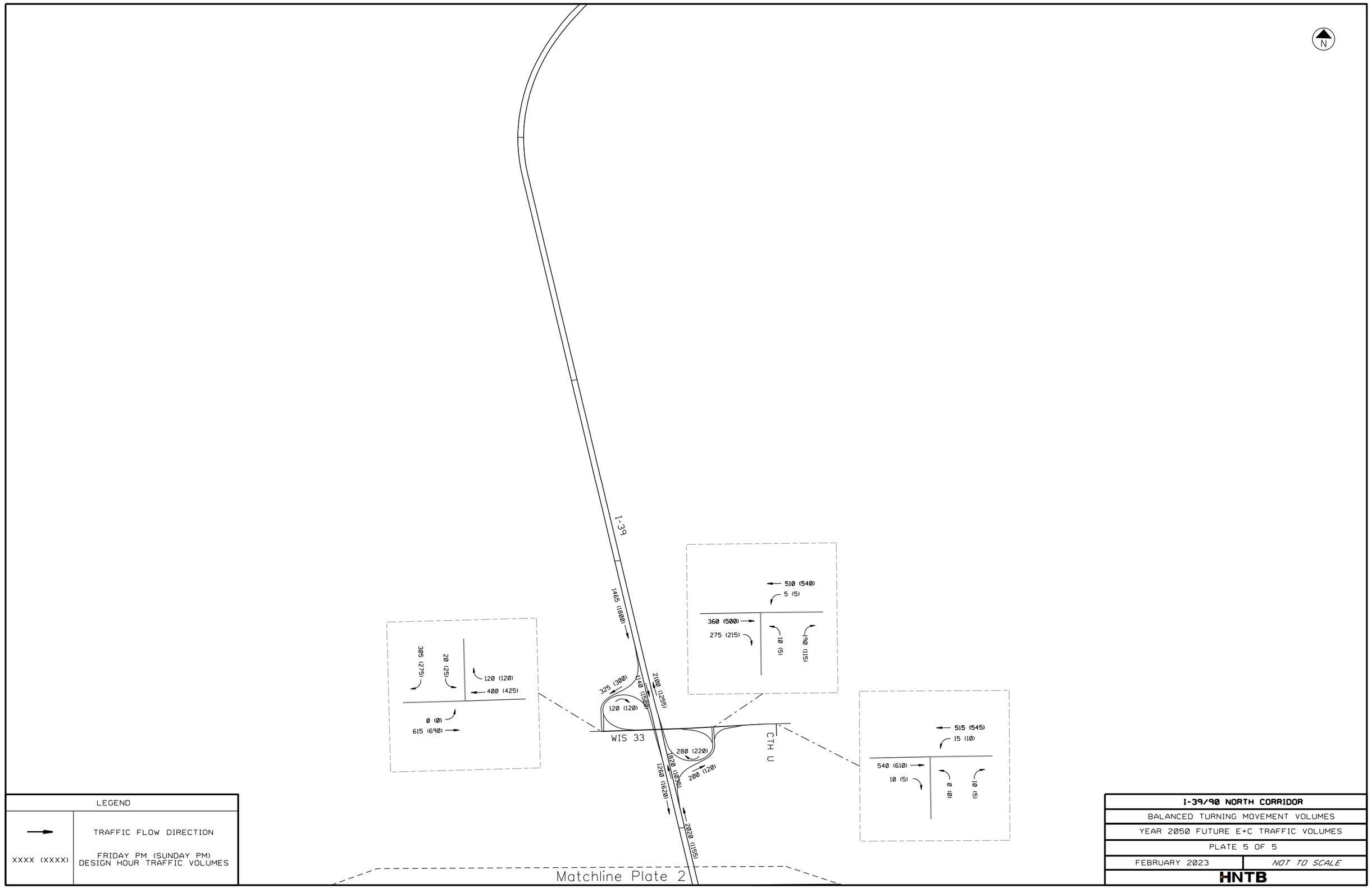
FEBRUARY 2023 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

| I-39/90 NORTH CORRIDOR | |
|---|---|
| BALANCED TURNING MOVEMENT VOLUMES | |
| YEAR 2050 FUTURE E+C TRAFFIC VOLUMES | |
| PLATE 4 OF 5 | |
| FEBRUARY 2023 | *NOT TO SCALE* |
| **HNTB** | |




| LEGEND | |
|---|---|
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| XXXX (XXXX) | FRIDAY PM (SUNDAY PM) DESIGN HOUR TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

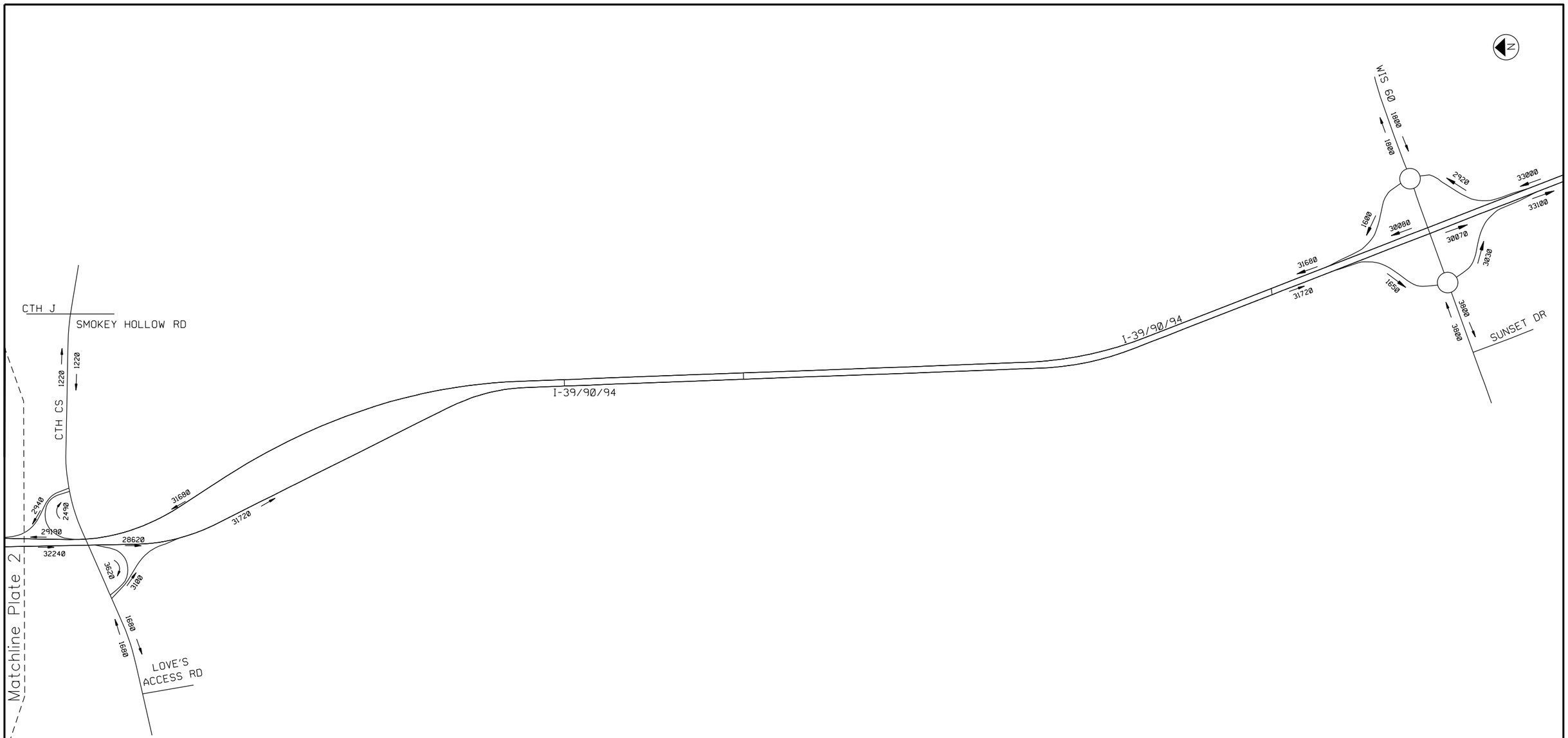
BALANCED TURNING MOVEMENT VOLUMES

YEAR 2050 FUTURE E+C TRAFFIC VOLUMES

PLATE 5 OF 5

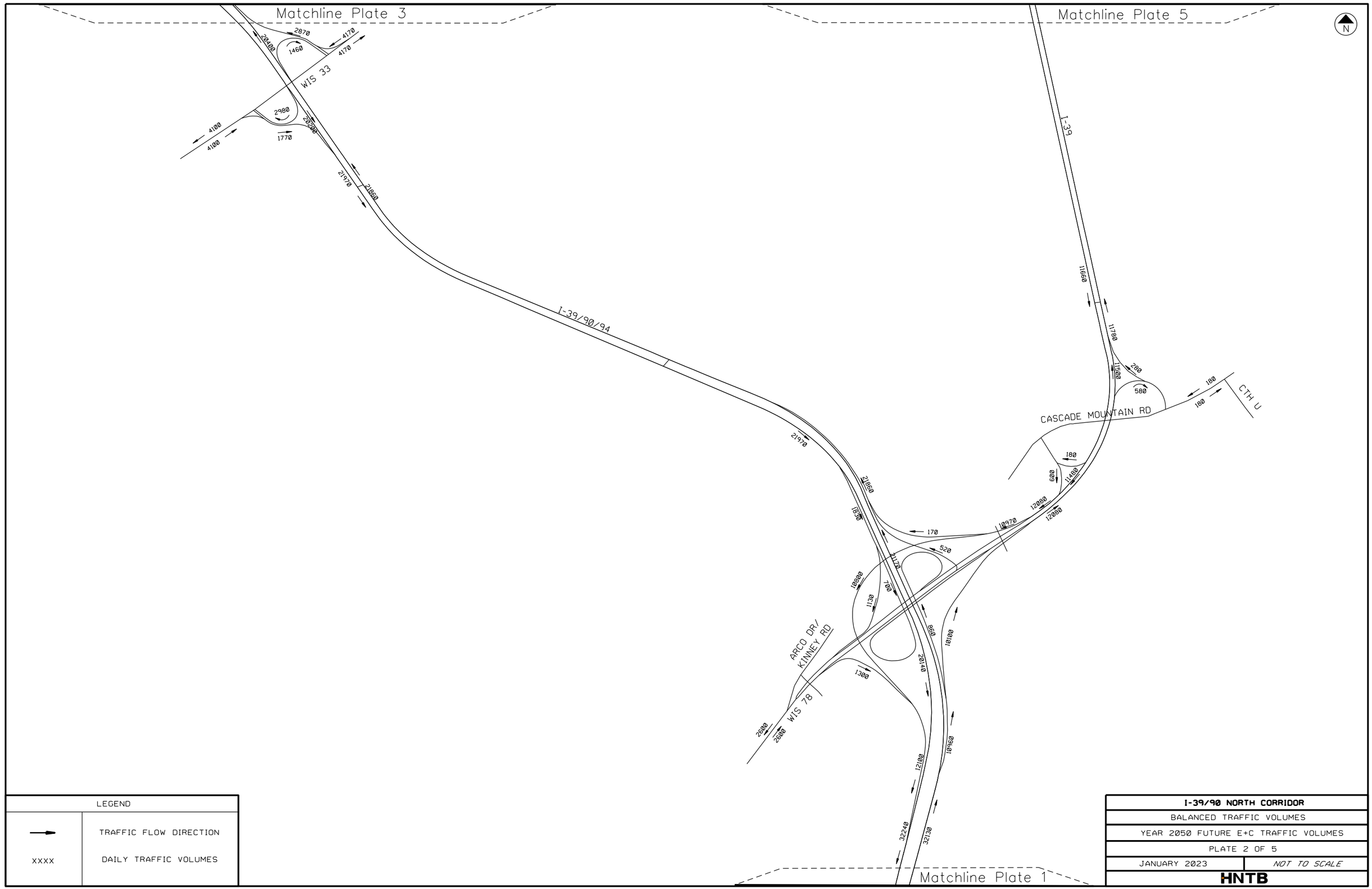
FEBRUARY 2023 | *NOT TO SCALE*

**HNTB**



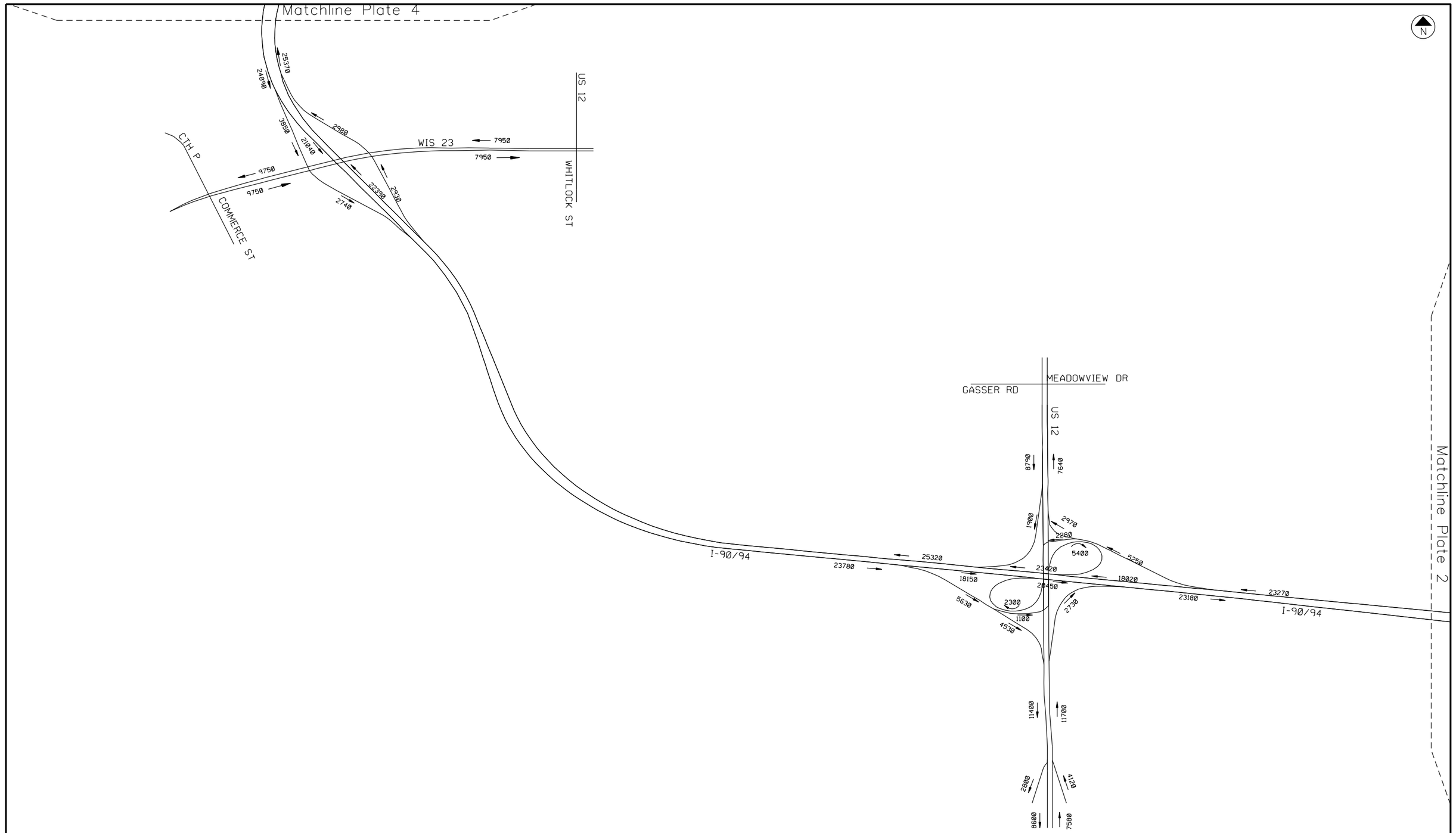

| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90 NORTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 FUTURE E+C TRAFFIC VOLUMES | |
| PLATE 1 OF 5 | |
| JANUARY 2023 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

| I-39/90 NORTH CORRIDOR | |
|---|---|
| BALANCED TRAFFIC VOLUMES | |
| YEAR 2050 FUTURE E+C TRAFFIC VOLUMES | |
| PLATE 2 OF 5 | |
| JANUARY 2023 | *NOT TO SCALE* |
| HNTB | |




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

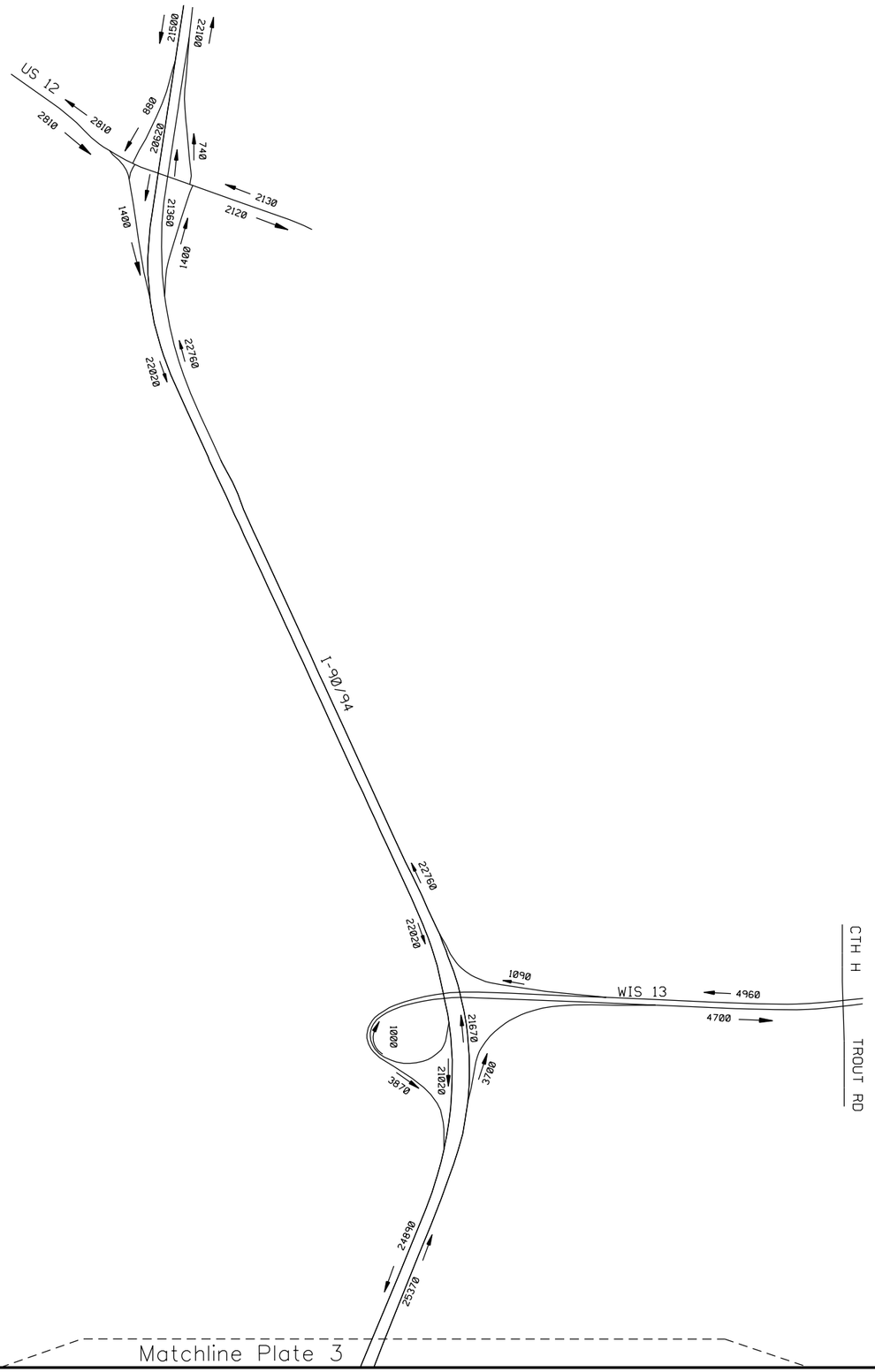
BALANCED TRAFFIC VOLUMES

YEAR 2050 FUTURE E+C TRAFFIC VOLUMES

PLATE 3 OF 5

JANUARY 2023 | *NOT TO SCALE*

**HNTB**




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

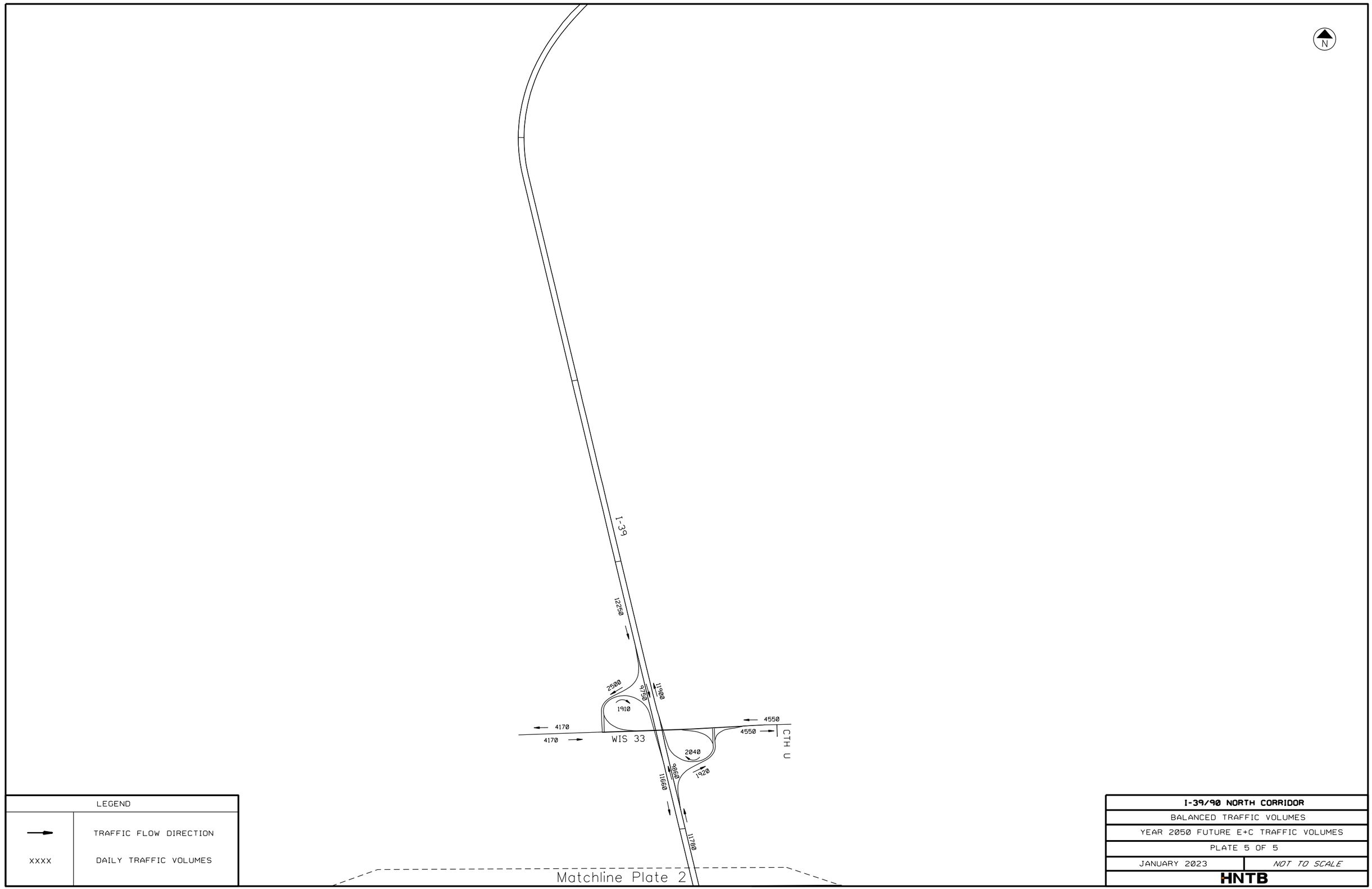
BALANCED TRAFFIC VOLUMES

YEAR 2050 FUTURE E+C TRAFFIC VOLUMES

PLATE 4 OF 5

JANUARY 2023 | *NOT TO SCALE*

HNTB




| LEGEND | |
|---|---|
| → | TRAFFIC FLOW DIRECTION |
| XXXX | DAILY TRAFFIC VOLUMES |

**I-39/90 NORTH CORRIDOR**

BALANCED TRAFFIC VOLUMES

YEAR 2050 FUTURE E+C TRAFFIC VOLUMES

PLATE 5 OF 5

JANUARY 2023 | *NOT TO SCALE*

**HNTB**

# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Neal Styka, PE, RSP1, PTOE | Date | 8/6/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | NB I-39/90/94 WIS 60 To WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 23 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 33.59 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 60 to CTH V | 34122 | 3 |
| 2 | Diverge | Diverge | STH 60 WB Off | 1500 | 3 |
| 3 | Basic | Basic | STH 60 Between off and On | 1192 | 3 |
| 4 | Merge | Merge | STH 60 WB On | 1500 | 3 |
| 5 | Basic | Basic | CTH CS to STH 60 | 17005 | 3 |
| 6 | Diverge | Diverge | CTH CS WB Off | 1500 | 3 |
| 7 | Basic | Basic | CTH CS Between off and on | 1097 | 3 |
| 8 | Merge | Merge | CTH CS WB On | 1500 | 3 |
| 9 | Basic | Basic | CTH CS To Rest Area | 6489 | 3 |
| 10 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 11 | Basic | Basic | Rest Area Between Off and On | 3554 | 3 |
| 12 | Merge | Merge | Rest Area On | 1500 | 3 |
| 13 | Basic | Basic | Rest Area to I-39 | 17074 | 3 |
| 14 | Diverge | Diverge | I-39 WB Off | 1500 | 3 |
| 15 | Basic | Basic | I-39 WB Off to I-39 WB On | 4769 | 3 |
| 16 | Merge | Basic | STH 78 NB/I-39 WB On | 1500 | 4 |
| 17 | Basic | Basic | STH 33 to I-39; 4 Lanes | 1375 | 4 |
| 18 | Basic | Basic | STH 33 to I-39; 3 Lanes | 825 | 3 |
| 19 | Basic | Basic | STH 33 to I-39; 2 Lanes | 6734 | 2 |
| 20 | Diverge | Diverge | STH 33 WB Off | 1500 | 2 |
| 21 | Basic | Basic | STH 33 Between off and on | 1130 | 2 |
| 22 | Merge | Merge | STH 33 WB On | 1500 | 2 |
| 23 | Basic | Basic | STH 33 to USH 12 | 66971 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.863 | 4701 | 6433 | 0.73 | 63.7 | 24.6 | C |
| 2 | 1.00 | 0.863 | 4373 | 6433 | 0.68 | 65.5 | 22.3 | C |
| 3 | 1.00 | 0.863 | 4582 | 6433 | 0.71 | 64.4 | 23.7 | C |
| 4 | 1.00 | 0.863 | 4582 | 6433 | 0.71 | 64.4 | 23.7 | C |
| 5 | 1.00 | 0.863 | 4917 | 6433 | 0.76 | 62.3 | 26.3 | D |
| 6 | 1.00 | 0.863 | 4574 | 6433 | 0.71 | 64.4 | 23.7 | C |
| 7 | 1.00 | 0.863 | 4793 | 6433 | 0.75 | 63.1 | 25.3 | C |
| 8 | 1.00 | 0.863 | 4791 | 6433 | 0.74 | 63.1 | 25.3 | C |
| 9 | 1.00 | 0.863 | 4935 | 6433 | 0.77 | 62.1 | 26.5 | D |
| 10 | 1.00 | 0.863 | 4590 | 6433 | 0.71 | 64.3 | 23.8 | C |
| 11 | 1.00 | 0.863 | 4810 | 6433 | 0.75 | 63.0 | 25.4 | C |
| 12 | 1.00 | 0.863 | 4809 | 6433 | 0.75 | 63.0 | 25.4 | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.863 | 0.911 | 4701 | 210 | 6331 | 1796 | 0.74 | 0.12 | 62.0 | 57.4 | 25.3 | 24.3 | C |
| 2 | 1.00 | 1.00 | 0.863 | 0.911 | 4373 | 214 | 6331 | 1796 | 0.69 | 0.12 | 62.0 | 57.3 | 23.5 | 22.8 | C |
| 3 | 1.00 | 1.00 | 0.863 | 0.911 | 4582 | 214 | 6331 | 1796 | 0.72 | 0.12 | 62.0 | 57.3 | 24.6 | 23.8 | C |
| 4 | 1.00 | 1.00 | 0.863 | 0.911 | 4582 | 285 | 6331 | 1796 | 0.72 | 0.16 | 61.9 | 57.2 | 24.7 | 23.9 | C |
| 5 | 1.00 | 1.00 | 0.863 | 0.911 | 4917 | 220 | 6331 | 1796 | 0.78 | 0.12 | 61.9 | 57.3 | 26.5 | 25.3 | C |
| 6 | 1.00 | 1.00 | 0.863 | 0.911 | 4574 | 224 | 6331 | 1796 | 0.72 | 0.12 | 62.0 | 57.3 | 24.6 | 23.8 | C |
| 7 | 1.00 | 1.00 | 0.863 | 0.911 | 4793 | 224 | 6331 | 1796 | 0.76 | 0.12 | 62.0 | 57.3 | 25.8 | 24.8 | C |
| 8 | 1.00 | 1.00 | 0.863 | 0.911 | 4791 | 299 | 6331 | 1796 | 0.76 | 0.17 | 61.8 | 57.1 | 25.8 | 24.8 | C |
| 9 | 1.00 | 1.00 | 0.863 | 0.911 | 4935 | 221 | 6331 | 1796 | 0.78 | 0.12 | 61.9 | 57.3 | 26.6 | 25.4 | C |
| 10 | 1.00 | 1.00 | 0.863 | 0.911 | 4590 | 225 | 6331 | 1796 | 0.72 | 0.13 | 62.0 | 57.3 | 24.7 | 23.9 | C |
| 11 | 1.00 | 1.00 | 0.863 | 0.911 | 4810 | 225 | 6331 | 1796 | 0.76 | 0.13 | 61.9 | 57.3 | 25.9 | 24.8 | C |
| 12 | 1.00 | 1.00 | 0.863 | 0.911 | 4809 | 300 | 6331 | 1796 | 0.76 | 0.17 | 61.8 | 57.1 | 25.9 | 24.9 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.861 | 4490 | 6404 | 0.70 | 64.2 | 23.3 | C |
| 2 | 1.00 | 0.861 | 4157 | 6404 | 0.65 | 65.7 | 21.1 | C |
| 3 | 1.00 | 0.861 | 4366 | 6404 | 0.68 | 64.8 | 22.5 | C |
| 4 | 1.00 | 0.861 | 4290 | 6404 | 0.67 | 65.1 | 22.0 | C |
| 5 | 1.00 | 0.861 | 4696 | 6404 | 0.73 | 63.1 | 24.8 | C |
| 6 | 1.00 | 0.861 | 4347 | 6404 | 0.68 | 64.9 | 22.3 | C |
| 7 | 1.00 | 0.861 | 4567 | 6404 | 0.71 | 63.8 | 23.9 | C |
| 8 | 1.00 | 0.861 | 4487 | 6404 | 0.70 | 64.2 | 23.3 | C |
| 9 | 1.00 | 0.861 | 4713 | 6404 | 0.74 | 62.9 | 25.0 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | | 0.861 | | 4362 | | 6404 | | 0.68 | | 64.8 | | 22.4 | C |
| 11 | 1.00 | | 0.861 | | 4583 | | 6404 | | 0.72 | | 63.7 | | 24.0 | C |
| 12 | 1.00 | | 0.861 | | 4503 | | 6404 | | 0.70 | | 64.1 | | 23.4 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.861 | 0.891 | 4725 | 235 | 6331 | 1886 | 0.75 | 0.12 | 62.1 | 60.9 | 25.4 | 20.9 | C |
| 2 | 1.00 | 1.00 | 0.861 | 0.891 | 4586 | 429 | 6331 | 1886 | 0.72 | 0.23 | 62.2 | 60.9 | 24.6 | 20.8 | C |
| 3 | 1.00 | 1.00 | 0.861 | 0.891 | 4823 | 457 | 6331 | 1886 | 0.76 | 0.24 | 61.8 | 60.5 | 26.0 | 22.0 | C |
| 4 | 1.00 | 1.00 | 0.861 | 0.891 | 4650 | 360 | 6331 | 1886 | 0.73 | 0.19 | 62.2 | 60.9 | 24.9 | 20.9 | C |
| 5 | 1.00 | 1.00 | 0.861 | 0.891 | 4941 | 245 | 6331 | 1886 | 0.78 | 0.13 | 61.8 | 60.6 | 26.7 | 22.0 | C |
| 6 | 1.00 | 1.00 | 0.861 | 0.891 | 4796 | 449 | 6331 | 1886 | 0.76 | 0.24 | 61.9 | 60.6 | 25.8 | 21.8 | C |
| 7 | 1.00 | 1.00 | 0.861 | 0.891 | 5045 | 478 | 6331 | 1886 | 0.80 | 0.25 | 61.5 | 60.2 | 27.3 | 23.1 | C |
| 8 | 1.00 | 1.00 | 0.861 | 0.891 | 4864 | 377 | 6331 | 1886 | 0.77 | 0.20 | 61.8 | 60.5 | 26.2 | 22.0 | C |
| 9 | 1.00 | 1.00 | 0.861 | 0.891 | 4959 | 246 | 6331 | 1886 | 0.78 | 0.13 | 61.7 | 60.5 | 26.8 | 22.1 | C |
| 10 | 1.00 | 1.00 | 0.861 | 0.891 | 4812 | 450 | 6331 | 1886 | 0.76 | 0.24 | 61.9 | 60.6 | 25.9 | 21.9 | C |
| 11 | 1.00 | 1.00 | 0.861 | 0.891 | 5062 | 479 | 6331 | 1886 | 0.80 | 0.25 | 61.5 | 60.1 | 27.4 | 23.2 | C |
| 12 | 1.00 | 1.00 | 0.861 | 0.891 | 4881 | 378 | 6331 | 1886 | 0.77 | 0.20 | 61.8 | 60.5 | 26.3 | 22.0 | C |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.863 | 4722 | 6377 | 0.74 | 62.3 | 25.3 | C |
| 2 | 1.00 | 0.863 | 4590 | 6377 | 0.72 | 63.0 | 24.3 | C |
| 3 | 1.00 | 0.863 | 4827 | 6377 | 0.76 | 61.7 | 26.1 | D |
| 4 | 1.00 | 0.863 | 4652 | 6377 | 0.73 | 62.7 | 24.7 | C |
| 5 | 1.00 | 0.863 | 4937 | 6377 | 0.77 | 60.9 | 27.0 | D |
| 6 | 1.00 | 0.863 | 4801 | 6377 | 0.75 | 61.8 | 25.9 | C |
| 7 | 1.00 | 0.863 | 5050 | 6377 | 0.79 | 60.2 | 28.0 | D |
| 8 | 1.00 | 0.863 | 4866 | 6377 | 0.76 | 61.4 | 26.4 | D |
| 9 | 1.00 | 0.863 | 4956 | 6377 | 0.78 | 60.8 | 27.2 | D |
| 10 | 1.00 | 0.863 | 4817 | 6377 | 0.76 | 61.7 | 26.0 | C |
| 11 | 1.00 | 0.863 | 5067 | 6377 | 0.79 | 60.0 | 28.2 | D |
| 12 | 1.00 | 0.863 | 4883 | 6377 | 0.77 | 61.3 | 26.6 | D |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.863 | 0.862 | 4722 | 309 | 6331 | 1886 | 0.75 | 0.16 | 63.0 | 58.7 | 25.0 | 28.5 | D |
| 2 | 1.00 | 1.00 | 0.863 | 0.862 | 4590 | 269 | 6331 | 1886 | 0.72 | 0.14 | 63.1 | 58.8 | 24.2 | 27.9 | C |
| 3 | 1.00 | 1.00 | 0.863 | 0.862 | 4827 | 266 | 6331 | 1886 | 0.76 | 0.14 | 63.0 | 58.8 | 25.5 | 28.9 | D |
| 4 | 1.00 | 1.00 | 0.863 | 0.862 | 4652 | 287 | 6331 | 1886 | 0.73 | 0.15 | 63.1 | 58.8 | 24.6 | 28.1 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 1.00 | 0.863 | 0.862 | 4937 | 324 | 6331 | 1886 | 0.78 | 0.17 | 63.0 | 58.7 | 26.1 | 29.5 | D |
| 6 | 1.00 | 1.00 | 0.863 | 0.862 | 4801 | 282 | 6331 | 1886 | 0.76 | 0.15 | 63.1 | 58.8 | 25.4 | 28.8 | D |
| 7 | 1.00 | 1.00 | 0.863 | 0.862 | 5050 | 278 | 6331 | 1886 | 0.80 | 0.15 | 63.0 | 58.8 | 26.7 | 29.9 | D |
| 8 | 1.00 | 1.00 | 0.863 | 0.862 | 4866 | 299 | 6331 | 1886 | 0.77 | 0.16 | 63.0 | 58.7 | 25.7 | 29.1 | D |
| 9 | 1.00 | 1.00 | 0.863 | 0.862 | 4956 | 325 | 6331 | 1886 | 0.78 | 0.17 | 62.9 | 58.7 | 26.3 | 29.5 | D |
| 10 | 1.00 | 1.00 | 0.863 | 0.862 | 4817 | 283 | 6331 | 1886 | 0.76 | 0.15 | 63.1 | 58.8 | 25.4 | 28.9 | D |
| 11 | 1.00 | 1.00 | 0.863 | 0.862 | 5067 | 280 | 6331 | 1886 | 0.80 | 0.15 | 63.0 | 58.8 | 26.8 | 30.0 | D |
| 12 | 1.00 | 1.00 | 0.863 | 0.862 | 4883 | 300 | 6331 | 1886 | 0.77 | 0.16 | 63.0 | 58.7 | 25.8 | 29.2 | D |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.863 | 4414 | 6377 | 0.69 | 63.9 | 23.0 | C |
| 2 | 1.00 | 0.863 | 4321 | 6377 | 0.68 | 64.3 | 22.4 | C |
| 3 | 1.00 | 0.863 | 4562 | 6377 | 0.72 | 63.2 | 24.1 | C |
| 4 | 1.00 | 0.863 | 4366 | 6377 | 0.68 | 64.1 | 22.7 | C |
| 5 | 1.00 | 0.863 | 4614 | 6377 | 0.72 | 62.9 | 24.5 | C |
| 6 | 1.00 | 0.863 | 4519 | 6377 | 0.71 | 63.4 | 23.8 | C |
| 7 | 1.00 | 0.863 | 4772 | 6377 | 0.75 | 62.0 | 25.7 | C |
| 8 | 1.00 | 0.863 | 4567 | 6377 | 0.72 | 63.2 | 24.1 | C |
| 9 | 1.00 | 0.863 | 4632 | 6377 | 0.73 | 62.8 | 24.6 | C |
| 10 | 1.00 | 0.863 | 4534 | 6377 | 0.71 | 63.3 | 23.9 | C |
| 11 | 1.00 | 0.863 | 4788 | 6377 | 0.75 | 61.9 | 25.8 | C |
| 12 | 1.00 | 0.863 | 4583 | 6377 | 0.72 | 63.1 | 24.2 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.863 | 0.807 | 4530 | 116 | 6331 | 1886 | 0.72 | 0.06 | 62.0 | 60.7 | 24.4 | 20.9 | C |
| 2 | 1.00 | 1.00 | 0.863 | 0.807 | 4426 | 105 | 6331 | 1886 | 0.70 | 0.06 | 62.2 | 60.8 | 23.7 | 20.4 | C |
| 3 | 1.00 | 1.00 | 0.863 | 0.807 | 4686 | 124 | 6331 | 1886 | 0.74 | 0.07 | 61.8 | 60.5 | 25.3 | 21.7 | C |
| 4 | 1.00 | 1.00 | 0.863 | 0.807 | 4495 | 129 | 6331 | 1886 | 0.71 | 0.07 | 62.1 | 60.7 | 24.1 | 20.8 | C |
| 5 | 1.00 | 1.00 | 0.863 | 0.807 | 4735 | 121 | 6331 | 1886 | 0.75 | 0.06 | 61.8 | 60.5 | 25.5 | 21.9 | C |
| 6 | 1.00 | 1.00 | 0.863 | 0.807 | 4629 | 110 | 6331 | 1886 | 0.73 | 0.06 | 61.9 | 60.6 | 24.9 | 21.4 | C |
| 7 | 1.00 | 1.00 | 0.863 | 0.807 | 4901 | 129 | 6331 | 1886 | 0.77 | 0.07 | 61.6 | 60.3 | 26.5 | 22.7 | C |
| 8 | 1.00 | 1.00 | 0.863 | 0.807 | 4702 | 135 | 6331 | 1886 | 0.74 | 0.07 | 61.8 | 60.5 | 25.4 | 21.8 | C |
| 9 | 1.00 | 1.00 | 0.863 | 0.807 | 4753 | 121 | 6331 | 1886 | 0.75 | 0.06 | 61.8 | 60.5 | 25.6 | 22.0 | C |
| 10 | 1.00 | 1.00 | 0.863 | 0.807 | 4644 | 110 | 6331 | 1886 | 0.73 | 0.06 | 61.9 | 60.6 | 25.0 | 21.5 | C |
| 11 | 1.00 | 1.00 | 0.863 | 0.807 | 4918 | 130 | 6331 | 1886 | 0.78 | 0.07 | 61.6 | 60.3 | 26.6 | 22.8 | C |
| 12 | 1.00 | 1.00 | 0.863 | 0.807 | 4718 | 135 | 6331 | 1886 | 0.75 | 0.07 | 61.8 | 60.5 | 25.4 | 21.9 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.862 | 4528 | 6431 | 0.70 | 64.6 | 23.4 | C |
| 2 | 1.00 | 0.862 | 4425 | 6431 | 0.69 | 65.2 | 22.6 | C |
| 3 | 1.00 | 0.862 | 4683 | 6431 | 0.73 | 63.7 | 24.5 | C |
| 4 | 1.00 | 0.862 | 4492 | 6431 | 0.70 | 64.8 | 23.1 | C |
| 5 | 1.00 | 0.862 | 4733 | 6431 | 0.74 | 63.4 | 24.9 | C |
| 6 | 1.00 | 0.862 | 4628 | 6431 | 0.72 | 64.0 | 24.1 | C |
| 7 | 1.00 | 0.862 | 4898 | 6431 | 0.76 | 62.3 | 26.2 | D |
| 8 | 1.00 | 0.862 | 4698 | 6431 | 0.73 | 63.6 | 24.6 | C |
| 9 | 1.00 | 0.862 | 4751 | 6431 | 0.74 | 63.3 | 25.0 | C |
| 10 | 1.00 | 0.862 | 4643 | 6431 | 0.72 | 64.0 | 24.2 | C |
| 11 | 1.00 | 0.862 | 4915 | 6431 | 0.76 | 62.2 | 26.3 | D |
| 12 | 1.00 | 0.862 | 4715 | 6431 | 0.73 | 63.5 | 24.8 | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.862 | 0.909 | 4528 | 84 | 6331 | 1796 | 0.72 | 0.05 | 61.1 | 56.1 | 24.7 | 24.4 | C |
| 2 | 1.00 | 1.00 | 0.862 | 0.909 | 4425 | 83 | 6331 | 1796 | 0.70 | 0.05 | 61.1 | 56.1 | 24.1 | 24.0 | C |
| 3 | 1.00 | 1.00 | 0.862 | 0.909 | 4683 | 87 | 6331 | 1796 | 0.74 | 0.05 | 61.1 | 56.1 | 25.5 | 25.1 | C |
| 4 | 1.00 | 1.00 | 0.862 | 0.909 | 4492 | 84 | 6331 | 1796 | 0.71 | 0.05 | 61.1 | 56.1 | 24.5 | 24.3 | C |
| 5 | 1.00 | 1.00 | 0.862 | 0.909 | 4733 | 88 | 6331 | 1796 | 0.75 | 0.05 | 61.1 | 56.1 | 25.8 | 25.4 | C |
| 6 | 1.00 | 1.00 | 0.862 | 0.909 | 4628 | 86 | 6331 | 1796 | 0.73 | 0.05 | 61.1 | 56.1 | 25.2 | 24.9 | C |
| 7 | 1.00 | 1.00 | 0.862 | 0.909 | 4898 | 91 | 6331 | 1796 | 0.77 | 0.05 | 61.1 | 56.1 | 26.7 | 26.1 | C |
| 8 | 1.00 | 1.00 | 0.862 | 0.909 | 4698 | 87 | 6331 | 1796 | 0.74 | 0.05 | 61.1 | 56.1 | 25.6 | 25.2 | C |
| 9 | 1.00 | 1.00 | 0.862 | 0.909 | 4751 | 88 | 6331 | 1796 | 0.75 | 0.05 | 61.1 | 56.1 | 25.9 | 25.4 | C |
| 10 | 1.00 | 1.00 | 0.862 | 0.909 | 4643 | 86 | 6331 | 1796 | 0.73 | 0.05 | 61.1 | 56.1 | 25.3 | 25.0 | C |
| 11 | 1.00 | 1.00 | 0.862 | 0.909 | 4915 | 91 | 6331 | 1796 | 0.78 | 0.05 | 61.1 | 56.1 | 26.8 | 26.2 | C |
| 12 | 1.00 | 1.00 | 0.862 | 0.909 | 4715 | 88 | 6331 | 1796 | 0.74 | 0.05 | 61.1 | 56.1 | 25.7 | 25.3 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.862 | 4440 | 6425 | 0.69 | 64.9 | 22.8 | C |
| 2 | 1.00 | 0.862 | 4338 | 6425 | 0.68 | 65.4 | 22.1 | C |
| 3 | 1.00 | 0.862 | 4592 | 6425 | 0.71 | 64.1 | 23.9 | C |
| 4 | 1.00 | 0.862 | 4404 | 6425 | 0.69 | 65.1 | 22.5 | C |
| 5 | 1.00 | 0.862 | 4640 | 6425 | 0.72 | 63.8 | 24.2 | C |
| 6 | 1.00 | 0.862 | 4537 | 6425 | 0.71 | 64.4 | 23.5 | C |
| 7 | 1.00 | 0.862 | 4802 | 6425 | 0.75 | 62.9 | 25.5 | C |
| 8 | 1.00 | 0.862 | 4607 | 6425 | 0.72 | 64.0 | 24.0 | C |
| 9 | 1.00 | 0.862 | 4658 | 6425 | 0.72 | 63.7 | 24.4 | C |
| 10 | 1.00 | 0.862 | 4552 | 6425 | 0.71 | 64.4 | 23.6 | C |
| 11 | 1.00 | 0.862 | 4819 | 6425 | 0.75 | 62.8 | 25.6 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.862 | | 4622 | | 6425 | | 0.72 | | 64.0 | | 24.1 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.862 | 0.909 | 4524 | 84 | 6331 | 1796 | 0.71 | 0.05 | 61.5 | 59.9 | 24.5 | 21.9 | C |
| 2 | 1.00 | 1.00 | 0.862 | 0.909 | 4421 | 83 | 6331 | 1796 | 0.70 | 0.05 | 61.7 | 60.0 | 23.9 | 21.4 | C |
| 3 | 1.00 | 1.00 | 0.862 | 0.909 | 4679 | 87 | 6331 | 1796 | 0.74 | 0.05 | 61.4 | 59.8 | 25.4 | 22.7 | C |
| 4 | 1.00 | 1.00 | 0.862 | 0.909 | 4488 | 84 | 6331 | 1796 | 0.71 | 0.05 | 61.6 | 60.0 | 24.3 | 21.8 | C |
| 5 | 1.00 | 1.00 | 0.862 | 0.909 | 4728 | 88 | 6331 | 1796 | 0.75 | 0.05 | 61.3 | 59.7 | 25.7 | 22.9 | C |
| 6 | 1.00 | 1.00 | 0.862 | 0.909 | 4623 | 86 | 6331 | 1796 | 0.73 | 0.05 | 61.4 | 59.8 | 25.1 | 22.4 | C |
| 7 | 1.00 | 1.00 | 0.862 | 0.909 | 4893 | 91 | 6331 | 1796 | 0.77 | 0.05 | 61.1 | 59.5 | 26.7 | 23.7 | C |
| 8 | 1.00 | 1.00 | 0.862 | 0.909 | 4694 | 87 | 6331 | 1796 | 0.74 | 0.05 | 61.4 | 59.8 | 25.5 | 22.7 | C |
| 9 | 1.00 | 1.00 | 0.862 | 0.909 | 4746 | 88 | 6331 | 1796 | 0.75 | 0.05 | 61.3 | 59.7 | 25.8 | 23.0 | C |
| 10 | 1.00 | 1.00 | 0.862 | 0.909 | 4638 | 86 | 6331 | 1796 | 0.73 | 0.05 | 61.4 | 59.8 | 25.2 | 22.5 | C |
| 11 | 1.00 | 1.00 | 0.862 | 0.909 | 4910 | 91 | 6331 | 1796 | 0.78 | 0.05 | 61.1 | 59.5 | 26.8 | 23.7 | C |
| 12 | 1.00 | 1.00 | 0.862 | 0.909 | 4710 | 88 | 6331 | 1796 | 0.74 | 0.05 | 61.3 | 59.7 | 25.6 | 22.8 | C |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.862 | 4528 | 6433 | 0.70 | 64.7 | 23.3 | C |
| 2 | 1.00 | 0.862 | 4425 | 6433 | 0.69 | 65.2 | 22.6 | C |
| 3 | 1.00 | 0.862 | 4683 | 6433 | 0.73 | 63.8 | 24.5 | C |
| 4 | 1.00 | 0.862 | 4492 | 6433 | 0.70 | 64.9 | 23.1 | C |
| 5 | 1.00 | 0.862 | 4733 | 6433 | 0.74 | 63.5 | 24.9 | C |
| 6 | 1.00 | 0.862 | 4628 | 6433 | 0.72 | 64.1 | 24.1 | C |
| 7 | 1.00 | 0.862 | 4898 | 6433 | 0.76 | 62.4 | 26.2 | D |
| 8 | 1.00 | 0.862 | 4698 | 6433 | 0.73 | 63.7 | 24.6 | C |
| 9 | 1.00 | 0.862 | 4751 | 6433 | 0.74 | 63.3 | 25.0 | C |
| 10 | 1.00 | 0.862 | 4643 | 6433 | 0.72 | 64.0 | 24.2 | C |
| 11 | 1.00 | 0.862 | 4915 | 6433 | 0.76 | 62.3 | 26.3 | D |
| 12 | 1.00 | 0.862 | 4715 | 6433 | 0.73 | 63.6 | 24.7 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.862 | 0.875 | 4528 | 1439 | 6331 | 3951 | 0.72 | 0.36 | 63.6 | 59.2 | 23.7 | 15.1 | B |
| 2 | 1.00 | 1.00 | 0.862 | 0.875 | 4425 | 1613 | 6331 | 3951 | 0.70 | 0.41 | 63.1 | 58.7 | 23.4 | 15.5 | B |
| 3 | 1.00 | 1.00 | 0.862 | 0.875 | 4683 | 1789 | 6331 | 3951 | 0.74 | 0.45 | 62.6 | 58.3 | 24.9 | 17.3 | B |
| 4 | 1.00 | 1.00 | 0.862 | 0.875 | 4492 | 1585 | 6331 | 3951 | 0.71 | 0.40 | 63.2 | 58.8 | 23.7 | 15.6 | B |
| 5 | 1.00 | 1.00 | 0.862 | 0.875 | 4733 | 1505 | 6331 | 3951 | 0.75 | 0.38 | 63.4 | 59.0 | 24.9 | 16.2 | B |
| 6 | 1.00 | 1.00 | 0.862 | 0.875 | 4628 | 1686 | 6331 | 3951 | 0.73 | 0.43 | 63.0 | 58.6 | 24.5 | 16.6 | B |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.862 | 0.875 | 4898 | 1871 | 6331 | 3951 | 0.77 | 0.47 | 62.4 | 58.1 | 26.2 | 18.6 | B |
| 8 | 1.00 | 1.00 | 0.862 | 0.875 | 4698 | 1658 | 6331 | 3951 | 0.74 | 0.42 | 63.0 | 58.6 | 24.9 | 16.8 | B |
| 9 | 1.00 | 1.00 | 0.862 | 0.875 | 4751 | 1511 | 6331 | 3951 | 0.75 | 0.38 | 63.4 | 59.0 | 25.0 | 16.3 | B |
| 10 | 1.00 | 1.00 | 0.862 | 0.875 | 4643 | 1693 | 6331 | 3951 | 0.73 | 0.43 | 62.9 | 58.5 | 24.6 | 16.7 | B |
| 11 | 1.00 | 1.00 | 0.862 | 0.875 | 4915 | 1878 | 6331 | 3951 | 0.78 | 0.48 | 62.4 | 58.1 | 26.3 | 18.7 | B |
| 12 | 1.00 | 1.00 | 0.862 | 0.875 | 4715 | 1664 | 6331 | 3951 | 0.74 | 0.42 | 63.0 | 58.6 | 24.9 | 16.9 | B |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.854 | 3096 | 6377 | 0.49 | 66.7 | 15.5 | B |
| 2 | 1.00 | 0.854 | 2814 | 6377 | 0.44 | 66.7 | 14.1 | B |
| 3 | 1.00 | 0.854 | 2895 | 6377 | 0.45 | 66.7 | 14.5 | B |
| 4 | 1.00 | 0.854 | 2910 | 6377 | 0.46 | 66.7 | 14.5 | B |
| 5 | 1.00 | 0.854 | 3235 | 6377 | 0.51 | 66.7 | 16.2 | B |
| 6 | 1.00 | 0.854 | 2944 | 6377 | 0.46 | 66.7 | 14.7 | B |
| 7 | 1.00 | 0.854 | 3027 | 6377 | 0.47 | 66.7 | 15.1 | B |
| 8 | 1.00 | 0.854 | 3043 | 6377 | 0.48 | 66.7 | 15.2 | B |
| 9 | 1.00 | 0.854 | 3247 | 6377 | 0.51 | 66.7 | 16.2 | B |
| 10 | 1.00 | 0.854 | 2952 | 6377 | 0.46 | 66.7 | 14.8 | B |
| 11 | 1.00 | 0.854 | 3037 | 6377 | 0.48 | 66.7 | 15.2 | B |
| 12 | 1.00 | 0.854 | 3054 | 6377 | 0.48 | 66.7 | 15.3 | B |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.854 | 0.745 | 3159 | 63 | 8578 | 1976 | 0.37 | 0.03 | 68.8 | 68.8 | 11.5 | 11.5 | B |
| 2 | 1.00 | 1.00 | 0.854 | 0.745 | 2835 | 21 | 8578 | 1976 | 0.33 | 0.01 | 68.8 | 68.8 | 10.3 | 10.3 | A |
| 3 | 1.00 | 1.00 | 0.854 | 0.745 | 2939 | 44 | 8578 | 1976 | 0.34 | 0.02 | 68.8 | 68.8 | 10.7 | 10.7 | A |
| 4 | 1.00 | 1.00 | 0.854 | 0.745 | 2961 | 51 | 8578 | 1976 | 0.35 | 0.03 | 68.8 | 68.8 | 10.8 | 10.8 | A |
| 5 | 1.00 | 1.00 | 0.854 | 0.745 | 3301 | 66 | 8578 | 1976 | 0.38 | 0.03 | 68.8 | 68.8 | 12.0 | 12.0 | B |
| 6 | 1.00 | 1.00 | 0.854 | 0.745 | 2967 | 23 | 8578 | 1976 | 0.35 | 0.01 | 68.8 | 68.8 | 10.8 | 10.8 | A |
| 7 | 1.00 | 1.00 | 0.854 | 0.745 | 3074 | 47 | 8578 | 1976 | 0.36 | 0.02 | 68.8 | 68.8 | 11.2 | 11.2 | B |
| 8 | 1.00 | 1.00 | 0.854 | 0.745 | 3097 | 54 | 8578 | 1976 | 0.36 | 0.03 | 68.8 | 68.8 | 11.3 | 11.3 | B |
| 9 | 1.00 | 1.00 | 0.854 | 0.745 | 3313 | 66 | 8578 | 1976 | 0.39 | 0.03 | 68.8 | 68.8 | 12.0 | 12.0 | B |
| 10 | 1.00 | 1.00 | 0.854 | 0.745 | 2975 | 23 | 8578 | 1976 | 0.35 | 0.01 | 68.8 | 68.8 | 10.8 | 10.8 | A |
| 11 | 1.00 | 1.00 | 0.854 | 0.745 | 3084 | 47 | 8578 | 1976 | 0.36 | 0.02 | 68.8 | 68.8 | 11.2 | 11.2 | B |
| 12 | 1.00 | 1.00 | 0.854 | 0.745 | 3108 | 54 | 8578 | 1976 | 0.36 | 0.03 | 68.8 | 68.8 | 11.3 | 11.3 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.853 | 3155 | 8578 | 0.37 | 68.8 | 11.5 | B |
| 2 | 1.00 | 0.853 | 2836 | 8578 | 0.33 | 68.8 | 10.3 | A |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.853 | 2937 | 8578 | 0.34 | 68.8 | 10.7 | A |
| 4 | 1.00 | 0.853 | 2958 | 8578 | 0.34 | 68.8 | 10.8 | A |
| 5 | 1.00 | 0.853 | 3297 | 8578 | 0.38 | 68.8 | 12.0 | B |
| 6 | 1.00 | 0.853 | 2967 | 8578 | 0.35 | 68.8 | 10.8 | A |
| 7 | 1.00 | 0.853 | 3072 | 8578 | 0.36 | 68.8 | 11.2 | B |
| 8 | 1.00 | 0.853 | 3094 | 8578 | 0.36 | 68.8 | 11.2 | B |
| 9 | 1.00 | 0.853 | 3308 | 8578 | 0.39 | 68.8 | 12.0 | B |
| 10 | 1.00 | 0.853 | 2975 | 8578 | 0.35 | 68.8 | 10.8 | A |
| 11 | 1.00 | 0.853 | 3082 | 8578 | 0.36 | 68.8 | 11.2 | B |
| 12 | 1.00 | 0.853 | 3104 | 8578 | 0.36 | 68.8 | 11.3 | B |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.853 | 3155 | 6377 | 0.49 | 66.7 | 15.8 | B |
| 2 | 1.00 | 0.853 | 2836 | 6377 | 0.44 | 66.7 | 14.2 | B |
| 3 | 1.00 | 0.853 | 2937 | 6377 | 0.46 | 66.7 | 14.7 | B |
| 4 | 1.00 | 0.853 | 2958 | 6377 | 0.46 | 66.7 | 14.8 | B |
| 5 | 1.00 | 0.853 | 3297 | 6377 | 0.52 | 66.7 | 16.5 | B |
| 6 | 1.00 | 0.853 | 2967 | 6377 | 0.47 | 66.7 | 14.8 | B |
| 7 | 1.00 | 0.853 | 3072 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 8 | 1.00 | 0.853 | 3094 | 6377 | 0.49 | 66.7 | 15.5 | B |
| 9 | 1.00 | 0.853 | 3308 | 6377 | 0.52 | 66.7 | 16.5 | B |
| 10 | 1.00 | 0.853 | 2975 | 6377 | 0.47 | 66.7 | 14.9 | B |
| 11 | 1.00 | 0.853 | 3082 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 12 | 1.00 | 0.853 | 3104 | 6377 | 0.49 | 66.7 | 15.5 | B |

## Segment 19: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.853 | 3155 | 4251 | 0.74 | 62.2 | 25.4 | C |
| 2 | 1.00 | 0.853 | 2836 | 4251 | 0.67 | 64.6 | 22.0 | C |
| 3 | 1.00 | 0.853 | 2937 | 4251 | 0.69 | 64.0 | 22.9 | C |
| 4 | 1.00 | 0.853 | 2958 | 4251 | 0.70 | 63.8 | 23.2 | C |
| 5 | 1.00 | 0.853 | 3297 | 4251 | 0.78 | 60.9 | 27.1 | D |
| 6 | 1.00 | 0.853 | 2967 | 4251 | 0.70 | 63.7 | 23.3 | C |
| 7 | 1.00 | 0.853 | 3072 | 4251 | 0.72 | 62.9 | 24.4 | C |
| 8 | 1.00 | 0.853 | 3094 | 4251 | 0.73 | 62.8 | 24.6 | C |
| 9 | 1.00 | 0.853 | 3308 | 4251 | 0.78 | 60.8 | 27.2 | D |
| 10 | 1.00 | 0.853 | 2975 | 4251 | 0.70 | 63.7 | 23.4 | C |
| 11 | 1.00 | 0.853 | 3082 | 4251 | 0.73 | 62.9 | 24.5 | C |
| 12 | 1.00 | 0.853 | 3104 | 4251 | 0.73 | 62.7 | 24.8 | C |

## Segment 20: Diverge

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | (pc/h) | | (pc/h) | | Ratio | | (mi/h) | | (pc/mi/ln) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.853 | 0.928 | 3155 | 144 | 4221 | 1886 | 0.75 | 0.08 | 59.1 | 59.1 | 26.7 | 28.1 | D |
| 2 | 1.00 | 1.00 | 0.853 | 0.928 | 2836 | 176 | 4221 | 1886 | 0.67 | 0.09 | 59.0 | 59.0 | 24.0 | 25.4 | C |
| 3 | 1.00 | 1.00 | 0.853 | 0.928 | 2937 | 181 | 4221 | 1886 | 0.70 | 0.10 | 59.0 | 59.0 | 24.9 | 26.3 | C |
| 4 | 1.00 | 1.00 | 0.853 | 0.928 | 2958 | 138 | 4221 | 1886 | 0.70 | 0.07 | 59.1 | 59.1 | 25.0 | 26.5 | C |
| 5 | 1.00 | 1.00 | 0.853 | 0.928 | 3297 | 151 | 4221 | 1886 | 0.78 | 0.08 | 59.1 | 59.1 | 27.9 | 29.4 | D |
| 6 | 1.00 | 1.00 | 0.853 | 0.928 | 2967 | 183 | 4221 | 1886 | 0.70 | 0.10 | 59.0 | 59.0 | 25.1 | 26.5 | C |
| 7 | 1.00 | 1.00 | 0.853 | 0.928 | 3072 | 190 | 4221 | 1886 | 0.73 | 0.10 | 59.0 | 59.0 | 26.0 | 27.4 | C |
| 8 | 1.00 | 1.00 | 0.853 | 0.928 | 3094 | 144 | 4221 | 1886 | 0.73 | 0.08 | 59.1 | 59.1 | 26.2 | 27.6 | C |
| 9 | 1.00 | 1.00 | 0.853 | 0.928 | 3308 | 152 | 4221 | 1886 | 0.78 | 0.08 | 59.1 | 59.1 | 28.0 | 29.5 | D |
| 10 | 1.00 | 1.00 | 0.853 | 0.928 | 2975 | 184 | 4221 | 1886 | 0.70 | 0.10 | 59.0 | 59.0 | 25.2 | 26.6 | C |
| 11 | 1.00 | 1.00 | 0.853 | 0.928 | 3082 | 190 | 4221 | 1886 | 0.73 | 0.10 | 59.0 | 59.0 | 26.1 | 27.5 | C |
| 12 | 1.00 | 1.00 | 0.853 | 0.928 | 3104 | 144 | 4221 | 1886 | 0.74 | 0.08 | 59.1 | 59.1 | 26.3 | 27.7 | C |

## Segment 21: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.848 | 3015 | 4260 | 0.71 | 63.7 | 23.7 | C |
| 2 | 1.00 | 0.848 | 2660 | 4260 | 0.62 | 65.9 | 20.2 | C |
| 3 | 1.00 | 0.848 | 2756 | 4260 | 0.65 | 65.4 | 21.1 | C |
| 4 | 1.00 | 0.848 | 2824 | 4260 | 0.66 | 65.0 | 21.7 | C |
| 5 | 1.00 | 0.848 | 3151 | 4260 | 0.74 | 62.6 | 25.2 | C |
| 6 | 1.00 | 0.848 | 2784 | 4260 | 0.65 | 65.3 | 21.3 | C |
| 7 | 1.00 | 0.848 | 2882 | 4260 | 0.68 | 64.7 | 22.3 | C |
| 8 | 1.00 | 0.848 | 2954 | 4260 | 0.69 | 64.2 | 23.0 | C |
| 9 | 1.00 | 0.848 | 3162 | 4260 | 0.74 | 62.5 | 25.3 | C |
| 10 | 1.00 | 0.848 | 2791 | 4260 | 0.66 | 65.2 | 21.4 | C |
| 11 | 1.00 | 0.848 | 2893 | 4260 | 0.68 | 64.6 | 22.4 | C |
| 12 | 1.00 | 0.848 | 2965 | 4260 | 0.70 | 64.1 | 23.1 | C |

## Segment 22: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.848 | 0.853 | 3305 | 290 | 4221 | 1886 | 0.78 | 0.15 | 59.6 | 59.6 | 27.7 | 24.9 | C |
| 2 | 1.00 | 1.00 | 0.848 | 0.853 | 2961 | 301 | 4221 | 1886 | 0.70 | 0.16 | 60.4 | 60.4 | 24.5 | 22.2 | C |
| 3 | 1.00 | 1.00 | 0.848 | 0.853 | 3014 | 258 | 4221 | 1886 | 0.71 | 0.14 | 60.3 | 60.3 | 25.0 | 22.7 | C |
| 4 | 1.00 | 1.00 | 0.848 | 0.853 | 3096 | 272 | 4221 | 1886 | 0.73 | 0.14 | 60.1 | 60.1 | 25.8 | 23.3 | C |
| 5 | 1.00 | 1.00 | 0.848 | 0.853 | 3453 | 302 | 4221 | 1886 | 0.82 | 0.16 | 59.1 | 59.1 | 29.2 | 26.1 | C |
| 6 | 1.00 | 1.00 | 0.848 | 0.853 | 3099 | 315 | 4221 | 1886 | 0.73 | 0.17 | 60.1 | 60.1 | 25.8 | 23.3 | C |
| 7 | 1.00 | 1.00 | 0.848 | 0.853 | 3152 | 270 | 4221 | 1886 | 0.75 | 0.14 | 60.0 | 60.0 | 26.3 | 23.7 | C |
| 8 | 1.00 | 1.00 | 0.848 | 0.853 | 3239 | 285 | 4221 | 1886 | 0.77 | 0.15 | 59.7 | 59.7 | 27.1 | 24.4 | C |
| 9 | 1.00 | 1.00 | 0.848 | 0.853 | 3466 | 304 | 4221 | 1886 | 0.82 | 0.16 | 59.0 | 59.0 | 29.4 | 26.2 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 1.00 | 0.848 | 0.853 | 3108 | 317 | 4221 | 1886 | 0.74 | 0.17 | 60.1 | 60.1 | 25.9 | 23.4 | C |
| 11 | 1.00 | 1.00 | 0.848 | 0.853 | 3164 | 271 | 4221 | 1886 | 0.75 | 0.14 | 59.9 | 59.9 | 26.4 | 23.8 | C |
| 12 | 1.00 | 1.00 | 0.848 | 0.853 | 3250 | 285 | 4221 | 1886 | 0.77 | 0.15 | 59.7 | 59.7 | 27.2 | 24.5 | C |

## Segment 23: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3303 | 4289 | 0.77 | 62.0 | 26.6 | D |
| 2 | 1.00 | 0.849 | 2960 | 4289 | 0.69 | 65.1 | 22.7 | C |
| 3 | 1.00 | 0.849 | 3012 | 4289 | 0.70 | 64.7 | 23.3 | C |
| 4 | 1.00 | 0.849 | 3094 | 4289 | 0.72 | 64.0 | 24.2 | C |
| 5 | 1.00 | 0.849 | 3451 | 4289 | 0.80 | 60.3 | 28.6 | D |
| 6 | 1.00 | 0.849 | 3098 | 4289 | 0.72 | 64.0 | 24.2 | C |
| 7 | 1.00 | 0.849 | 3150 | 4289 | 0.73 | 63.5 | 24.8 | C |
| 8 | 1.00 | 0.849 | 3237 | 4289 | 0.75 | 62.7 | 25.8 | C |
| 9 | 1.00 | 0.849 | 3463 | 4289 | 0.81 | 60.2 | 28.8 | D |
| 10 | 1.00 | 0.849 | 3106 | 4289 | 0.72 | 63.9 | 24.3 | C |
| 11 | 1.00 | 0.849 | 3161 | 4289 | 0.74 | 63.4 | 24.9 | C |
| 12 | 1.00 | 0.849 | 3247 | 4289 | 0.76 | 62.6 | 25.9 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 28571 | 28523 | 35.12 | 63.1 | 24.4 | 20.9 | 31.90 | D |
| 2 | 26658 | 26600 | 22.02 | 64.7 | 22.2 | 19.0 | 31.10 | D |
| 3 | 27737 | 27677 | 28.60 | 63.9 | 23.4 | 20.1 | 31.50 | D |
| 4 | 27566 | 27512 | 27.48 | 64.0 | 23.2 | 19.9 | 31.50 | D |
| 5 | 29867 | 29817 | 46.70 | 61.8 | 26.1 | 22.4 | 32.60 | D |
| 6 | 27887 | 27827 | 29.66 | 63.8 | 23.6 | 20.2 | 31.60 | D |
| 7 | 29010 | 28948 | 38.28 | 62.7 | 24.9 | 21.4 | 32.10 | D |
| 8 | 28833 | 28775 | 36.78 | 62.9 | 24.7 | 21.2 | 32.00 | D |
| 9 | 29975 | 29925 | 47.85 | 61.7 | 26.2 | 22.5 | 32.70 | D |
| 10 | 27974 | 27914 | 30.30 | 63.7 | 23.7 | 20.3 | 31.70 | D |
| 11 | 29114 | 29052 | 39.16 | 62.6 | 25.0 | 21.5 | 32.20 | D |
| 12 | 28932 | 28875 | 37.55 | 62.8 | 24.8 | 21.3 | 32.10 | D |

## Facility Overall Results

| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 63.1 | Density, veh/mi/ln | 20.9 |
| Average Travel Time, min | 31.90 | Density, pc/mi/ln | 24.4 |

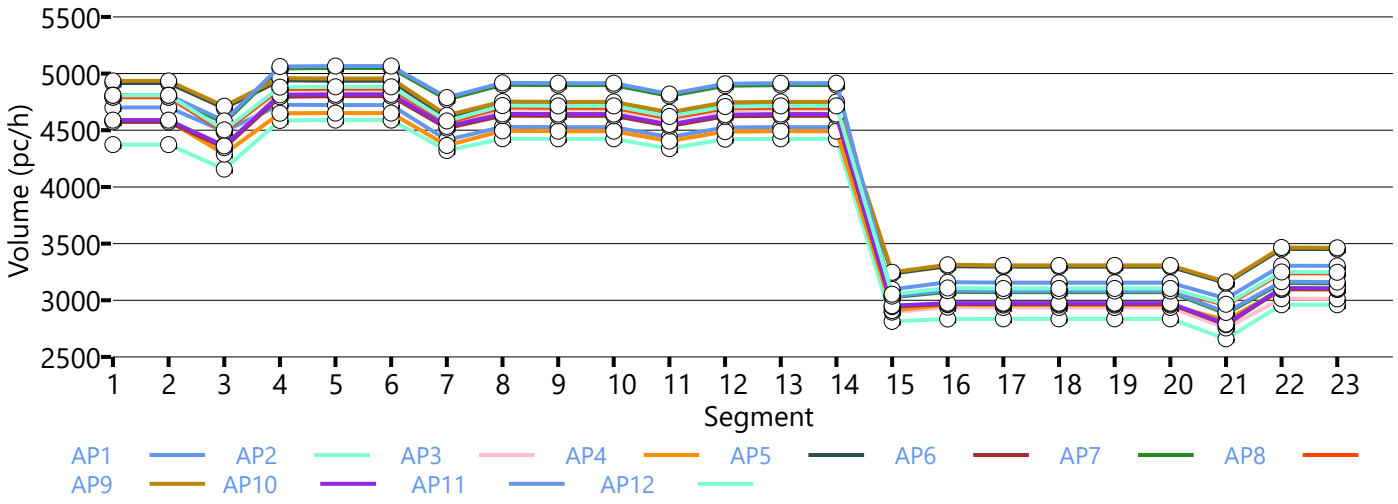
## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

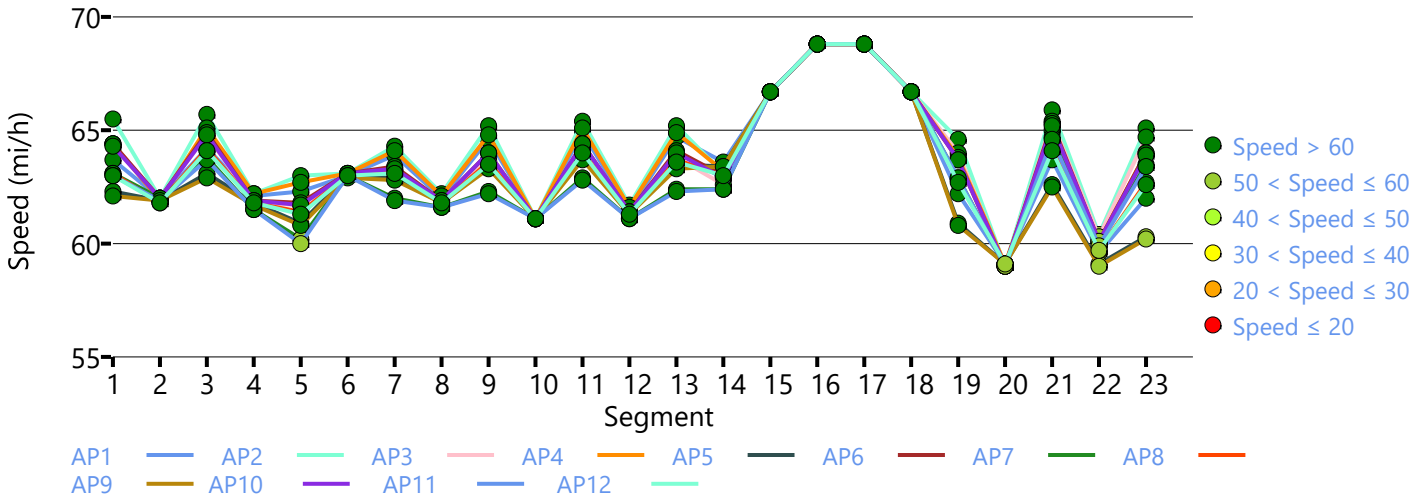
| | |
|---|---|
| WARNING 2 | FFS for segment 16 is out of range. For highway or C-D roadway merge/diverge/weaving segments, the FFS range should be between 45 - 60 mph. |

## Comments

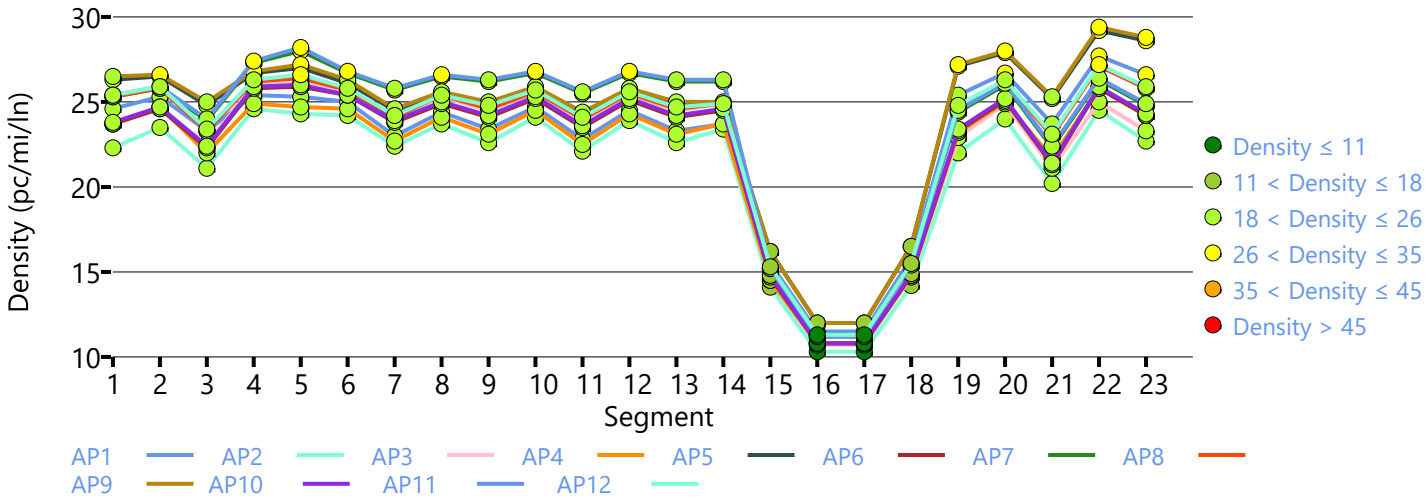
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 8/6/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | SB I-39/90/94 WIS 33 To WIS 60 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 17 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 19.90 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |
| 2 | Diverge | Diverge | I-39 EB Off | 1500 | 2 |
| 3 | Basic | Basic | I-39 EB Off to I-39 EB On | 5976 | 2 |
| 4 | Merge | Merge | I-39 EB On | 1500 | 3 |
| 5 | Basic | Basic | I-39 to Rest Area | 14012 | 3 |
| 6 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 7 | Basic | Basic | Rest Area Between Off and On | 3808 | 3 |
| 8 | Merge | Merge | Rest Area On | 1500 | 3 |
| 9 | Basic | Basic | Rest Area to CTH CS | 10077 | 3 |
| 10 | Diverge | Diverge | CTH CS EB Off | 1500 | 3 |
| 11 | Basic | Basic | CTH CS between on and off | 1093 | 3 |
| 12 | Merge | Merge | CTH CS EB On | 1500 | 3 |
| 13 | Basic | Basic | CTH CS to STH 60 | 16976 | 3 |
| 14 | Diverge | Diverge | STH 60 EB Off | 1500 | 3 |
| 15 | Basic | Basic | STH 60 Between off and On | 1076 | 3 |
| 16 | Merge | Merge | STH 60 EB On | 1500 | 3 |
| 17 | Basic | Basic | STH 60 to CTH V | 32877 | 3 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 2808 | 4269 | 0.66 | 65.5 | 21.4 | C |
| 2 | 1.00 | 0.858 | 2709 | 4269 | 0.63 | 66.0 | 20.5 | C |
| 3 | 1.00 | 0.858 | 2784 | 4269 | 0.65 | 65.6 | 21.2 | C |
| 4 | 1.00 | 0.858 | 2830 | 4269 | 0.66 | 65.3 | 21.7 | C |
| 5 | 1.00 | 0.858 | 3076 | 4269 | 0.72 | 63.5 | 24.2 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | | 0.858 | | 2885 | | 4269 | | 0.68 | | 65.0 | | 22.2 | | C |
| 7 | 1.00 | | 0.858 | | 2852 | | 4269 | | 0.67 | | 65.2 | | 21.9 | | C |
| 8 | 1.00 | | 0.858 | | 2979 | | 4269 | | 0.70 | | 64.3 | | 23.2 | | C |
| 9 | 1.00 | | 0.858 | | 2828 | | 4269 | | 0.66 | | 65.4 | | 21.6 | | C |
| 10 | 1.00 | | 0.858 | | 2656 | | 4269 | | 0.62 | | 66.3 | | 20.0 | | C |
| 11 | 1.00 | | 0.858 | | 2626 | | 4269 | | 0.62 | | 66.5 | | 19.7 | | C |
| 12 | 1.00 | | 0.858 | | 2742 | | 4269 | | 0.64 | | 65.9 | | 20.8 | | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.858 | 0.858 | 2808 | 133 | 4221 | 1886 | 0.67 | 0.07 | 60.7 | 60.7 | 23.1 | 16.4 | B |
| 2 | 1.00 | 1.00 | 0.858 | 0.858 | 2709 | 185 | 4221 | 1886 | 0.64 | 0.10 | 60.6 | 60.6 | 22.4 | 15.5 | B |
| 3 | 1.00 | 1.00 | 0.858 | 0.858 | 2784 | 245 | 4221 | 1886 | 0.66 | 0.13 | 60.4 | 60.4 | 23.0 | 16.2 | B |
| 4 | 1.00 | 1.00 | 0.858 | 0.858 | 2830 | 122 | 4221 | 1886 | 0.67 | 0.06 | 60.7 | 60.7 | 23.3 | 16.6 | B |
| 5 | 1.00 | 1.00 | 0.858 | 0.858 | 3076 | 140 | 4221 | 1886 | 0.73 | 0.07 | 60.7 | 60.7 | 25.3 | 18.7 | B |
| 6 | 1.00 | 1.00 | 0.858 | 0.858 | 2885 | 196 | 4221 | 1886 | 0.68 | 0.10 | 60.5 | 60.5 | 23.8 | 17.0 | B |
| 7 | 1.00 | 1.00 | 0.858 | 0.858 | 2852 | 259 | 4221 | 1886 | 0.68 | 0.14 | 60.4 | 60.4 | 23.6 | 16.8 | B |
| 8 | 1.00 | 1.00 | 0.858 | 0.858 | 2979 | 129 | 4221 | 1886 | 0.71 | 0.07 | 60.7 | 60.7 | 24.5 | 17.8 | B |
| 9 | 1.00 | 1.00 | 0.858 | 0.858 | 2828 | 136 | 4221 | 1886 | 0.67 | 0.07 | 60.7 | 60.7 | 23.3 | 16.5 | B |
| 10 | 1.00 | 1.00 | 0.858 | 0.858 | 2656 | 190 | 4221 | 1886 | 0.63 | 0.10 | 60.6 | 60.6 | 21.9 | 15.1 | B |
| 11 | 1.00 | 1.00 | 0.858 | 0.858 | 2626 | 251 | 4221 | 1886 | 0.62 | 0.13 | 60.4 | 60.4 | 21.7 | 14.8 | B |
| 12 | 1.00 | 1.00 | 0.858 | 0.858 | 2742 | 125 | 4221 | 1886 | 0.65 | 0.07 | 60.7 | 60.7 | 22.6 | 15.8 | B |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 2675 | 4269 | 0.63 | 66.2 | 20.2 | C |
| 2 | 1.00 | 0.858 | 2523 | 4269 | 0.59 | 66.9 | 18.9 | C |
| 3 | 1.00 | 0.858 | 2540 | 4269 | 0.59 | 66.8 | 19.0 | C |
| 4 | 1.00 | 0.858 | 2707 | 4269 | 0.63 | 66.0 | 20.5 | C |
| 5 | 1.00 | 0.858 | 2936 | 4269 | 0.69 | 64.6 | 22.7 | C |
| 6 | 1.00 | 0.858 | 2689 | 4269 | 0.63 | 66.2 | 20.3 | C |
| 7 | 1.00 | 0.858 | 2593 | 4269 | 0.61 | 66.6 | 19.5 | C |
| 8 | 1.00 | 0.858 | 2850 | 4269 | 0.67 | 65.2 | 21.9 | C |
| 9 | 1.00 | 0.858 | 2691 | 4269 | 0.63 | 66.1 | 20.4 | C |
| 10 | 1.00 | 0.858 | 2466 | 4269 | 0.58 | 67.1 | 18.4 | C |
| 11 | 1.00 | 0.858 | 2375 | 4269 | 0.56 | 67.3 | 17.7 | B |
| 12 | 1.00 | 0.858 | 2618 | 4269 | 0.61 | 66.5 | 19.7 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.858 | 0.850 | 3770 | 1095 | 6331 | 3951 | 0.60 | 0.28 | 63.9 | 62.8 | 19.7 | 16.1 | B |
| 2 | 1.00 | 1.00 | 0.858 | 0.850 | 3690 | 1167 | 6331 | 3951 | 0.58 | 0.30 | 63.9 | 62.8 | 19.2 | 16.0 | B |
| 3 | 1.00 | 1.00 | 0.858 | 0.850 | 3709 | 1169 | 6331 | 3951 | 0.59 | 0.30 | 63.9 | 62.8 | 19.3 | 16.0 | B |
| 4 | 1.00 | 1.00 | 0.858 | 0.850 | 3799 | 1092 | 6331 | 3951 | 0.60 | 0.28 | 63.9 | 62.8 | 19.8 | 16.2 | B |
| 5 | 1.00 | 1.00 | 0.858 | 0.850 | 4097 | 1161 | 6331 | 3951 | 0.65 | 0.29 | 63.5 | 62.4 | 21.5 | 17.8 | B |
| 6 | 1.00 | 1.00 | 0.858 | 0.850 | 3927 | 1238 | 6331 | 3951 | 0.62 | 0.31 | 63.7 | 62.6 | 20.5 | 17.2 | B |
| 7 | 1.00 | 1.00 | 0.858 | 0.850 | 3834 | 1241 | 6331 | 3951 | 0.61 | 0.31 | 63.7 | 62.6 | 20.1 | 16.8 | B |
| 8 | 1.00 | 1.00 | 0.858 | 0.850 | 4009 | 1159 | 6331 | 3951 | 0.63 | 0.29 | 63.6 | 62.5 | 21.0 | 17.4 | B |
| 9 | 1.00 | 1.00 | 0.858 | 0.850 | 3755 | 1064 | 6331 | 3951 | 0.59 | 0.27 | 63.9 | 62.8 | 19.6 | 15.9 | B |
| 10 | 1.00 | 1.00 | 0.858 | 0.850 | 3599 | 1133 | 6331 | 3951 | 0.57 | 0.29 | 64.0 | 62.9 | 18.7 | 15.4 | B |
| 11 | 1.00 | 1.00 | 0.858 | 0.850 | 3511 | 1136 | 6331 | 3951 | 0.55 | 0.29 | 64.1 | 63.0 | 18.3 | 15.1 | B |
| 12 | 1.00 | 1.00 | 0.858 | 0.850 | 3679 | 1061 | 6331 | 3951 | 0.58 | 0.27 | 64.0 | 62.9 | 19.2 | 15.6 | B |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 3760 | 6377 | 0.59 | 66.1 | 19.0 | C |
| 2 | 1.00 | 0.858 | 3679 | 6377 | 0.58 | 66.3 | 18.5 | C |
| 3 | 1.00 | 0.858 | 3698 | 6377 | 0.58 | 66.3 | 18.6 | C |
| 4 | 1.00 | 0.858 | 3789 | 6377 | 0.59 | 66.1 | 19.1 | C |
| 5 | 1.00 | 0.858 | 4086 | 6377 | 0.64 | 65.2 | 20.9 | C |
| 6 | 1.00 | 0.858 | 3915 | 6377 | 0.61 | 65.8 | 19.8 | C |
| 7 | 1.00 | 0.858 | 3823 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 8 | 1.00 | 0.858 | 3998 | 6377 | 0.63 | 65.5 | 20.4 | C |
| 9 | 1.00 | 0.858 | 3745 | 6377 | 0.59 | 66.2 | 18.9 | C |
| 10 | 1.00 | 0.858 | 3589 | 6377 | 0.56 | 66.4 | 18.0 | B |
| 11 | 1.00 | 0.858 | 3501 | 6377 | 0.55 | 66.5 | 17.5 | B |
| 12 | 1.00 | 0.858 | 3669 | 6377 | 0.58 | 66.3 | 18.4 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.858 | 0.909 | 3760 | 86 | 6331 | 1796 | 0.59 | 0.05 | 61.1 | 56.1 | 20.5 | 22.3 | C |
| 2 | 1.00 | 1.00 | 0.858 | 0.909 | 3679 | 83 | 6331 | 1796 | 0.58 | 0.05 | 61.1 | 56.1 | 20.1 | 21.9 | C |
| 3 | 1.00 | 1.00 | 0.858 | 0.909 | 3698 | 80 | 6331 | 1796 | 0.58 | 0.04 | 61.1 | 56.1 | 20.2 | 22.0 | C |
| 4 | 1.00 | 1.00 | 0.858 | 0.909 | 3789 | 85 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.7 | 22.4 | C |
| 5 | 1.00 | 1.00 | 0.858 | 0.909 | 4086 | 91 | 6331 | 1796 | 0.65 | 0.05 | 61.1 | 56.1 | 22.3 | 23.9 | C |
| 6 | 1.00 | 1.00 | 0.858 | 0.909 | 3915 | 87 | 6331 | 1796 | 0.62 | 0.05 | 61.1 | 56.1 | 21.4 | 23.1 | C |
| 7 | 1.00 | 1.00 | 0.858 | 0.909 | 3823 | 85 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.9 | 22.6 | C |
| 8 | 1.00 | 1.00 | 0.858 | 0.909 | 3998 | 89 | 6331 | 1796 | 0.63 | 0.05 | 61.1 | 56.1 | 21.8 | 23.5 | C |
| 9 | 1.00 | 1.00 | 0.858 | 0.909 | 3745 | 88 | 6331 | 1796 | 0.59 | 0.05 | 61.1 | 56.1 | 20.4 | 22.2 | C |
| 10 | 1.00 | 1.00 | 0.858 | 0.909 | 3589 | 85 | 6331 | 1796 | 0.57 | 0.05 | 61.1 | 56.1 | 19.6 | 21.5 | C |
| 11 | 1.00 | 1.00 | 0.858 | 0.909 | 3501 | 83 | 6331 | 1796 | 0.55 | 0.05 | 61.1 | 56.1 | 19.1 | 21.0 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | 1.00 | 0.858 | 0.909 | 3669 | 86 | 6331 | 1796 | 0.58 | 0.05 | 61.1 | 56.1 | 20.0 | 21.9 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.856 | 3678 | 6433 | 0.57 | 68.0 | 18.0 | B |
| 2 | 1.00 | 0.856 | 3600 | 6433 | 0.56 | 68.2 | 17.6 | B |
| 3 | 1.00 | 0.856 | 3621 | 6433 | 0.56 | 68.1 | 17.7 | B |
| 4 | 1.00 | 0.856 | 3708 | 6433 | 0.58 | 67.9 | 18.2 | C |
| 5 | 1.00 | 0.856 | 3999 | 6433 | 0.62 | 67.1 | 19.9 | C |
| 6 | 1.00 | 0.856 | 3832 | 6433 | 0.60 | 67.6 | 18.9 | C |
| 7 | 1.00 | 0.856 | 3742 | 6433 | 0.58 | 67.9 | 18.4 | C |
| 8 | 1.00 | 0.856 | 3912 | 6433 | 0.61 | 67.4 | 19.3 | C |
| 9 | 1.00 | 0.856 | 3660 | 6433 | 0.57 | 68.1 | 17.9 | B |
| 10 | 1.00 | 0.856 | 3507 | 6433 | 0.55 | 68.4 | 17.1 | B |
| 11 | 1.00 | 0.856 | 3422 | 6433 | 0.53 | 68.5 | 16.7 | B |
| 12 | 1.00 | 0.856 | 3586 | 6433 | 0.56 | 68.2 | 17.5 | B |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.856 | 0.909 | 3764 | 86 | 6331 | 1796 | 0.59 | 0.05 | 62.3 | 60.5 | 20.1 | 18.4 | B |
| 2 | 1.00 | 1.00 | 0.856 | 0.909 | 3683 | 83 | 6331 | 1796 | 0.58 | 0.05 | 62.4 | 60.6 | 19.7 | 18.0 | B |
| 3 | 1.00 | 1.00 | 0.856 | 0.909 | 3701 | 80 | 6331 | 1796 | 0.58 | 0.04 | 62.4 | 60.6 | 19.8 | 18.1 | B |
| 4 | 1.00 | 1.00 | 0.856 | 0.909 | 3793 | 85 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.3 | 18.5 | B |
| 5 | 1.00 | 1.00 | 0.856 | 0.909 | 4090 | 91 | 6331 | 1796 | 0.65 | 0.05 | 62.0 | 60.3 | 22.0 | 19.9 | B |
| 6 | 1.00 | 1.00 | 0.856 | 0.909 | 3919 | 87 | 6331 | 1796 | 0.62 | 0.05 | 62.2 | 60.4 | 21.0 | 19.1 | B |
| 7 | 1.00 | 1.00 | 0.856 | 0.909 | 3827 | 85 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.5 | 18.7 | B |
| 8 | 1.00 | 1.00 | 0.856 | 0.909 | 4001 | 89 | 6331 | 1796 | 0.63 | 0.05 | 62.1 | 60.4 | 21.5 | 19.5 | B |
| 9 | 1.00 | 1.00 | 0.856 | 0.909 | 3748 | 88 | 6331 | 1796 | 0.59 | 0.05 | 62.3 | 60.5 | 20.1 | 18.3 | B |
| 10 | 1.00 | 1.00 | 0.856 | 0.909 | 3592 | 85 | 6331 | 1796 | 0.57 | 0.05 | 62.4 | 60.6 | 19.2 | 17.6 | B |
| 11 | 1.00 | 1.00 | 0.856 | 0.909 | 3505 | 83 | 6331 | 1796 | 0.55 | 0.05 | 62.6 | 60.7 | 18.7 | 17.2 | B |
| 12 | 1.00 | 1.00 | 0.856 | 0.909 | 3672 | 86 | 6331 | 1796 | 0.58 | 0.05 | 62.4 | 60.6 | 19.6 | 17.9 | B |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.856 | 3769 | 6433 | 0.59 | 67.8 | 18.5 | C |
| 2 | 1.00 | 0.856 | 3688 | 6433 | 0.57 | 68.0 | 18.1 | C |
| 3 | 1.00 | 0.856 | 3707 | 6433 | 0.58 | 67.9 | 18.2 | C |
| 4 | 1.00 | 0.856 | 3798 | 6433 | 0.59 | 67.7 | 18.7 | C |
| 5 | 1.00 | 0.856 | 4096 | 6433 | 0.64 | 66.7 | 20.5 | C |
| 6 | 1.00 | 0.856 | 3924 | 6433 | 0.61 | 67.3 | 19.4 | C |
| 7 | 1.00 | 0.856 | 3832 | 6433 | 0.60 | 67.6 | 18.9 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | 0.856 | 4007 | 6433 | 0.62 | 67.0 | 19.9 | C |
| 9 | 1.00 | 0.856 | 3754 | 6433 | 0.58 | 67.8 | 18.5 | C |
| 10 | 1.00 | 0.856 | 3597 | 6433 | 0.56 | 68.2 | 17.6 | B |
| 11 | 1.00 | 0.856 | 3509 | 6433 | 0.55 | 68.4 | 17.1 | B |
| 12 | 1.00 | 0.856 | 3678 | 6433 | 0.57 | 68.0 | 18.0 | B |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.856 | 0.815 | 3769 | 266 | 6331 | 1886 | 0.60 | 0.14 | 63.1 | 58.8 | 19.9 | 24.0 | C |
| 2 | 1.00 | 1.00 | 0.856 | 0.815 | 3688 | 272 | 6331 | 1886 | 0.58 | 0.14 | 63.1 | 58.8 | 19.5 | 23.6 | C |
| 3 | 1.00 | 1.00 | 0.856 | 0.815 | 3707 | 302 | 6331 | 1886 | 0.59 | 0.16 | 63.0 | 58.7 | 19.6 | 23.7 | C |
| 4 | 1.00 | 1.00 | 0.856 | 0.815 | 3798 | 206 | 6331 | 1886 | 0.60 | 0.11 | 63.3 | 59.0 | 20.0 | 24.0 | C |
| 5 | 1.00 | 1.00 | 0.856 | 0.815 | 4096 | 281 | 6331 | 1886 | 0.65 | 0.15 | 63.1 | 58.8 | 21.6 | 25.6 | C |
| 6 | 1.00 | 1.00 | 0.856 | 0.815 | 3924 | 287 | 6331 | 1886 | 0.62 | 0.15 | 63.1 | 58.8 | 20.7 | 24.8 | C |
| 7 | 1.00 | 1.00 | 0.856 | 0.815 | 3832 | 319 | 6331 | 1886 | 0.61 | 0.17 | 63.0 | 58.7 | 20.3 | 24.4 | C |
| 8 | 1.00 | 1.00 | 0.856 | 0.815 | 4007 | 217 | 6331 | 1886 | 0.63 | 0.12 | 63.2 | 58.9 | 21.1 | 25.0 | C |
| 9 | 1.00 | 1.00 | 0.856 | 0.815 | 3754 | 272 | 6331 | 1886 | 0.59 | 0.14 | 63.1 | 58.8 | 19.8 | 23.9 | C |
| 10 | 1.00 | 1.00 | 0.856 | 0.815 | 3597 | 279 | 6331 | 1886 | 0.57 | 0.15 | 63.1 | 58.8 | 19.0 | 23.1 | C |
| 11 | 1.00 | 1.00 | 0.856 | 0.815 | 3509 | 309 | 6331 | 1886 | 0.55 | 0.16 | 63.0 | 58.7 | 18.6 | 22.8 | C |
| 12 | 1.00 | 1.00 | 0.856 | 0.815 | 3678 | 211 | 6331 | 1886 | 0.58 | 0.11 | 63.2 | 58.9 | 19.4 | 23.4 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.859 | 3503 | 6390 | 0.55 | 66.7 | 17.4 | B |
| 2 | 1.00 | 0.859 | 3417 | 6390 | 0.53 | 66.7 | 17.0 | B |
| 3 | 1.00 | 0.859 | 3407 | 6390 | 0.53 | 66.7 | 16.9 | B |
| 4 | 1.00 | 0.859 | 3589 | 6390 | 0.56 | 66.7 | 17.9 | B |
| 5 | 1.00 | 0.859 | 3815 | 6390 | 0.60 | 66.4 | 19.2 | C |
| 6 | 1.00 | 0.859 | 3638 | 6390 | 0.57 | 66.7 | 18.2 | C |
| 7 | 1.00 | 0.859 | 3516 | 6390 | 0.55 | 66.7 | 17.5 | B |
| 8 | 1.00 | 0.859 | 3787 | 6390 | 0.59 | 66.5 | 19.0 | C |
| 9 | 1.00 | 0.859 | 3482 | 6390 | 0.54 | 66.7 | 17.3 | B |
| 10 | 1.00 | 0.859 | 3320 | 6390 | 0.52 | 66.7 | 16.5 | B |
| 11 | 1.00 | 0.859 | 3204 | 6390 | 0.50 | 66.7 | 15.9 | B |
| 12 | 1.00 | 0.859 | 3464 | 6390 | 0.54 | 66.7 | 17.2 | B |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.859 | 0.770 | 3699 | 196 | 6331 | 1886 | 0.58 | 0.10 | 62.8 | 61.3 | 19.6 | 17.3 | B |
| 2 | 1.00 | 1.00 | 0.859 | 0.770 | 3546 | 129 | 6331 | 1886 | 0.56 | 0.07 | 63.1 | 61.5 | 18.7 | 16.4 | B |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 1.00 | 0.859 | 0.770 | 3543 | 136 | 6331 | 1886 | 0.56 | 0.07 | 63.1 | 61.5 | 18.7 | 16.4 | B |
| 4 | 1.00 | 1.00 | 0.859 | 0.770 | 3744 | 155 | 6331 | 1886 | 0.59 | 0.08 | 62.8 | 61.3 | 19.9 | 17.4 | B |
| 5 | 1.00 | 1.00 | 0.859 | 0.770 | 4021 | 206 | 6331 | 1886 | 0.64 | 0.11 | 62.6 | 61.1 | 21.4 | 18.8 | B |
| 6 | 1.00 | 1.00 | 0.859 | 0.770 | 3773 | 135 | 6331 | 1886 | 0.60 | 0.07 | 62.8 | 61.3 | 20.0 | 17.5 | B |
| 7 | 1.00 | 1.00 | 0.859 | 0.770 | 3660 | 144 | 6331 | 1886 | 0.58 | 0.08 | 62.9 | 61.4 | 19.4 | 17.0 | B |
| 8 | 1.00 | 1.00 | 0.859 | 0.770 | 3951 | 164 | 6331 | 1886 | 0.62 | 0.09 | 62.7 | 61.2 | 21.0 | 18.4 | B |
| 9 | 1.00 | 1.00 | 0.859 | 0.770 | 3682 | 200 | 6331 | 1886 | 0.58 | 0.11 | 62.9 | 61.3 | 19.5 | 17.2 | B |
| 10 | 1.00 | 1.00 | 0.859 | 0.770 | 3451 | 131 | 6331 | 1886 | 0.55 | 0.07 | 63.1 | 61.5 | 18.2 | 15.9 | B |
| 11 | 1.00 | 1.00 | 0.859 | 0.770 | 3344 | 140 | 6331 | 1886 | 0.53 | 0.07 | 63.2 | 61.6 | 17.6 | 15.5 | B |
| 12 | 1.00 | 1.00 | 0.859 | 0.770 | 3622 | 158 | 6331 | 1886 | 0.57 | 0.08 | 63.0 | 61.4 | 19.2 | 16.8 | B |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.855 | 3696 | 6377 | 0.58 | 66.3 | 18.6 | C |
| 2 | 1.00 | 0.855 | 3549 | 6377 | 0.56 | 66.5 | 17.8 | B |
| 3 | 1.00 | 0.855 | 3546 | 6377 | 0.56 | 66.5 | 17.8 | B |
| 4 | 1.00 | 0.855 | 3745 | 6377 | 0.59 | 66.2 | 18.9 | C |
| 5 | 1.00 | 0.855 | 4019 | 6377 | 0.63 | 65.5 | 20.5 | C |
| 6 | 1.00 | 0.855 | 3777 | 6377 | 0.59 | 66.1 | 19.0 | C |
| 7 | 1.00 | 0.855 | 3662 | 6377 | 0.57 | 66.3 | 18.4 | C |
| 8 | 1.00 | 0.855 | 3952 | 6377 | 0.62 | 65.7 | 20.0 | C |
| 9 | 1.00 | 0.855 | 3678 | 6377 | 0.58 | 66.3 | 18.5 | C |
| 10 | 1.00 | 0.855 | 3454 | 6377 | 0.54 | 66.6 | 17.3 | B |
| 11 | 1.00 | 0.855 | 3345 | 6377 | 0.52 | 66.7 | 16.7 | B |
| 12 | 1.00 | 0.855 | 3623 | 6377 | 0.57 | 66.4 | 18.2 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.855 | 0.866 | 3696 | 203 | 6331 | 1796 | 0.58 | 0.11 | 62.0 | 57.4 | 19.9 | 20.0 | B |
| 2 | 1.00 | 1.00 | 0.855 | 0.866 | 3549 | 150 | 6331 | 1796 | 0.56 | 0.08 | 62.1 | 57.5 | 19.0 | 19.2 | B |
| 3 | 1.00 | 1.00 | 0.855 | 0.866 | 3546 | 197 | 6331 | 1796 | 0.56 | 0.11 | 62.0 | 57.4 | 19.1 | 19.3 | B |
| 4 | 1.00 | 1.00 | 0.855 | 0.866 | 3745 | 215 | 6331 | 1796 | 0.59 | 0.12 | 62.0 | 57.3 | 20.1 | 20.3 | C |
| 5 | 1.00 | 1.00 | 0.855 | 0.866 | 4019 | 215 | 6331 | 1796 | 0.63 | 0.12 | 62.0 | 57.3 | 21.6 | 21.6 | C |
| 6 | 1.00 | 1.00 | 0.855 | 0.866 | 3777 | 158 | 6331 | 1796 | 0.60 | 0.09 | 62.1 | 57.5 | 20.3 | 20.3 | C |
| 7 | 1.00 | 1.00 | 0.855 | 0.866 | 3662 | 209 | 6331 | 1796 | 0.58 | 0.12 | 62.0 | 57.4 | 19.7 | 19.9 | B |
| 8 | 1.00 | 1.00 | 0.855 | 0.866 | 3952 | 226 | 6331 | 1796 | 0.62 | 0.13 | 62.0 | 57.3 | 21.2 | 21.3 | C |
| 9 | 1.00 | 1.00 | 0.855 | 0.866 | 3678 | 209 | 6331 | 1796 | 0.58 | 0.12 | 62.0 | 57.4 | 19.8 | 19.9 | B |
| 10 | 1.00 | 1.00 | 0.855 | 0.866 | 3454 | 154 | 6331 | 1796 | 0.55 | 0.09 | 62.1 | 57.5 | 18.5 | 18.7 | B |
| 11 | 1.00 | 1.00 | 0.855 | 0.866 | 3345 | 202 | 6331 | 1796 | 0.53 | 0.11 | 62.0 | 57.4 | 18.0 | 18.3 | B |
| 12 | 1.00 | 1.00 | 0.855 | 0.866 | 3623 | 219 | 6331 | 1796 | 0.57 | 0.12 | 61.9 | 57.3 | 19.5 | 19.7 | B |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.855 | 3490 | 6404 | 0.54 | 67.0 | 17.2 | B |
| 2 | 1.00 | 0.855 | 3396 | 6404 | 0.53 | 67.0 | 16.7 | B |
| 3 | 1.00 | 0.855 | 3346 | 6404 | 0.52 | 67.0 | 16.5 | B |
| 4 | 1.00 | 0.855 | 3527 | 6404 | 0.55 | 67.0 | 17.4 | B |
| 5 | 1.00 | 0.855 | 3801 | 6404 | 0.59 | 66.8 | 19.0 | C |
| 6 | 1.00 | 0.855 | 3616 | 6404 | 0.56 | 67.0 | 17.9 | B |
| 7 | 1.00 | 0.855 | 3450 | 6404 | 0.54 | 67.0 | 17.0 | B |
| 8 | 1.00 | 0.855 | 3723 | 6404 | 0.58 | 67.0 | 18.5 | C |
| 9 | 1.00 | 0.855 | 3467 | 6404 | 0.54 | 67.0 | 17.1 | B |
| 10 | 1.00 | 0.855 | 3298 | 6404 | 0.51 | 67.0 | 16.3 | B |
| 11 | 1.00 | 0.855 | 3140 | 6404 | 0.49 | 67.0 | 15.5 | B |
| 12 | 1.00 | 0.855 | 3401 | 6404 | 0.53 | 67.0 | 16.8 | B |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.855 | 0.913 | 3607 | 117 | 6331 | 1886 | 0.57 | 0.06 | 62.9 | 61.4 | 19.1 | 16.6 | B |
| 2 | 1.00 | 1.00 | 0.855 | 0.913 | 3484 | 88 | 6331 | 1886 | 0.55 | 0.05 | 63.1 | 61.5 | 18.4 | 16.0 | B |
| 3 | 1.00 | 1.00 | 0.855 | 0.913 | 3565 | 219 | 6331 | 1886 | 0.56 | 0.12 | 63.0 | 61.4 | 18.9 | 16.7 | B |
| 4 | 1.00 | 1.00 | 0.855 | 0.913 | 3643 | 116 | 6331 | 1886 | 0.58 | 0.06 | 62.9 | 61.4 | 19.3 | 16.8 | B |
| 5 | 1.00 | 1.00 | 0.855 | 0.913 | 3925 | 124 | 6331 | 1886 | 0.62 | 0.07 | 62.7 | 61.2 | 20.9 | 18.2 | B |
| 6 | 1.00 | 1.00 | 0.855 | 0.913 | 3708 | 92 | 6331 | 1886 | 0.59 | 0.05 | 62.9 | 61.4 | 19.7 | 17.0 | B |
| 7 | 1.00 | 1.00 | 0.855 | 0.913 | 3681 | 231 | 6331 | 1886 | 0.58 | 0.12 | 62.9 | 61.3 | 19.5 | 17.3 | B |
| 8 | 1.00 | 1.00 | 0.855 | 0.913 | 3846 | 123 | 6331 | 1886 | 0.61 | 0.07 | 62.8 | 61.3 | 20.4 | 17.8 | B |
| 9 | 1.00 | 1.00 | 0.855 | 0.913 | 3587 | 120 | 6331 | 1886 | 0.57 | 0.06 | 63.0 | 61.4 | 19.0 | 16.5 | B |
| 10 | 1.00 | 1.00 | 0.855 | 0.913 | 3388 | 90 | 6331 | 1886 | 0.54 | 0.05 | 63.2 | 61.6 | 17.9 | 15.5 | B |
| 11 | 1.00 | 1.00 | 0.855 | 0.913 | 3365 | 225 | 6331 | 1886 | 0.53 | 0.12 | 63.1 | 61.5 | 17.8 | 15.8 | B |
| 12 | 1.00 | 1.00 | 0.855 | 0.913 | 3519 | 118 | 6331 | 1886 | 0.56 | 0.06 | 63.1 | 61.5 | 18.6 | 16.2 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.857 | 3607 | 6433 | 0.56 | 68.2 | 17.6 | B |
| 2 | 1.00 | 0.857 | 3482 | 6433 | 0.54 | 68.4 | 17.0 | B |
| 3 | 1.00 | 0.857 | 3572 | 6433 | 0.56 | 68.2 | 17.5 | B |
| 4 | 1.00 | 0.857 | 3643 | 6433 | 0.57 | 68.1 | 17.8 | B |
| 5 | 1.00 | 0.857 | 3924 | 6433 | 0.61 | 67.3 | 19.4 | C |
| 6 | 1.00 | 0.857 | 3706 | 6433 | 0.58 | 67.9 | 18.2 | C |
| 7 | 1.00 | 0.857 | 3688 | 6433 | 0.57 | 68.0 | 18.1 | C |
| 8 | 1.00 | 0.857 | 3845 | 6433 | 0.60 | 67.6 | 19.0 | C |
| 9 | 1.00 | 0.857 | 3587 | 6433 | 0.56 | 68.2 | 17.5 | B |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 0.857 | 3386 | 6433 | 0.53 | 68.6 | 16.5 | B |
| 11 | 1.00 | 0.857 | 3372 | 6433 | 0.52 | 68.6 | 16.4 | B |
| 12 | 1.00 | 0.857 | 3519 | 6433 | 0.55 | 68.3 | 17.2 | B |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 15134 | 15043 | 4.85 | 66.6 | 18.6 | 16.0 | 17.90 | C |
| 2 | 14651 | 14561 | 3.99 | 66.8 | 18.0 | 15.4 | 17.90 | C |
| 3 | 14828 | 14730 | 4.39 | 66.7 | 18.3 | 15.7 | 17.90 | C |
| 4 | 15286 | 15197 | 5.17 | 66.5 | 18.9 | 16.2 | 18.00 | C |
| 5 | 16472 | 16376 | 8.62 | 65.7 | 20.6 | 17.6 | 18.20 | C |
| 6 | 15593 | 15498 | 5.95 | 66.3 | 19.3 | 16.5 | 18.00 | C |
| 7 | 15301 | 15198 | 5.28 | 66.5 | 18.9 | 16.2 | 18.00 | C |
| 8 | 16126 | 16032 | 7.35 | 66.0 | 20.1 | 17.2 | 18.10 | C |
| 9 | 15080 | 14990 | 4.81 | 66.6 | 18.6 | 15.9 | 17.90 | C |
| 10 | 14274 | 14186 | 3.42 | 66.9 | 17.5 | 15.0 | 17.80 | C |
| 11 | 14001 | 13905 | 3.12 | 67.0 | 17.1 | 14.7 | 17.80 | C |
| 12 | 14785 | 14699 | 4.25 | 66.7 | 18.2 | 15.6 | 17.90 | C |

## Facility Overall Results

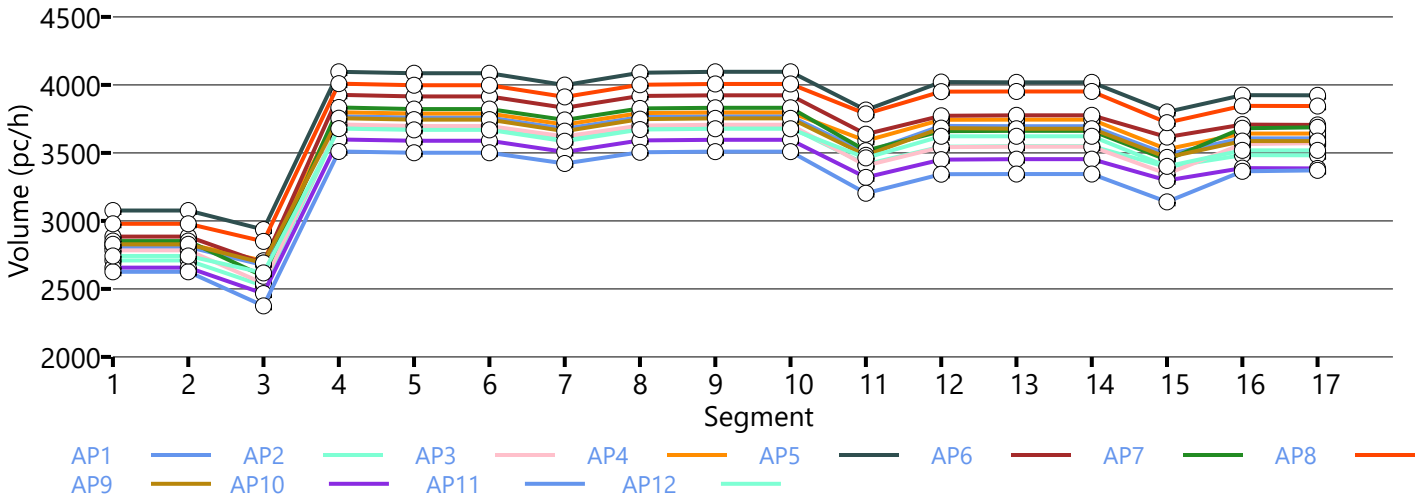
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 66.5 | Density, veh/mi/ln | 16.0 |
| Average Travel Time, min | 18.00 | Density, pc/mi/ln | 18.7 |

## Messages

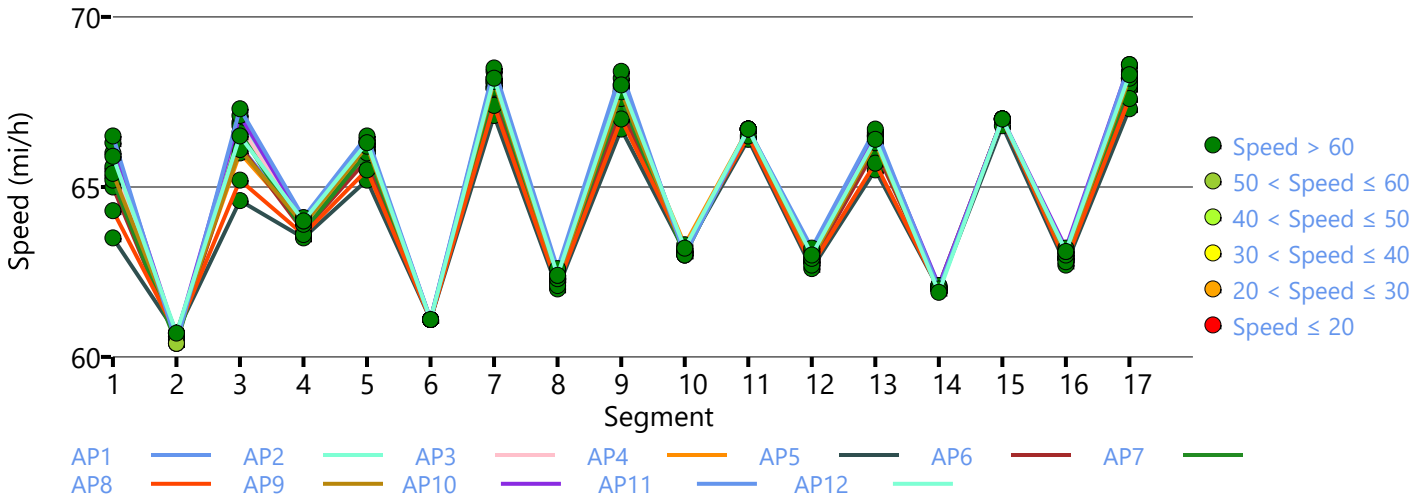
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

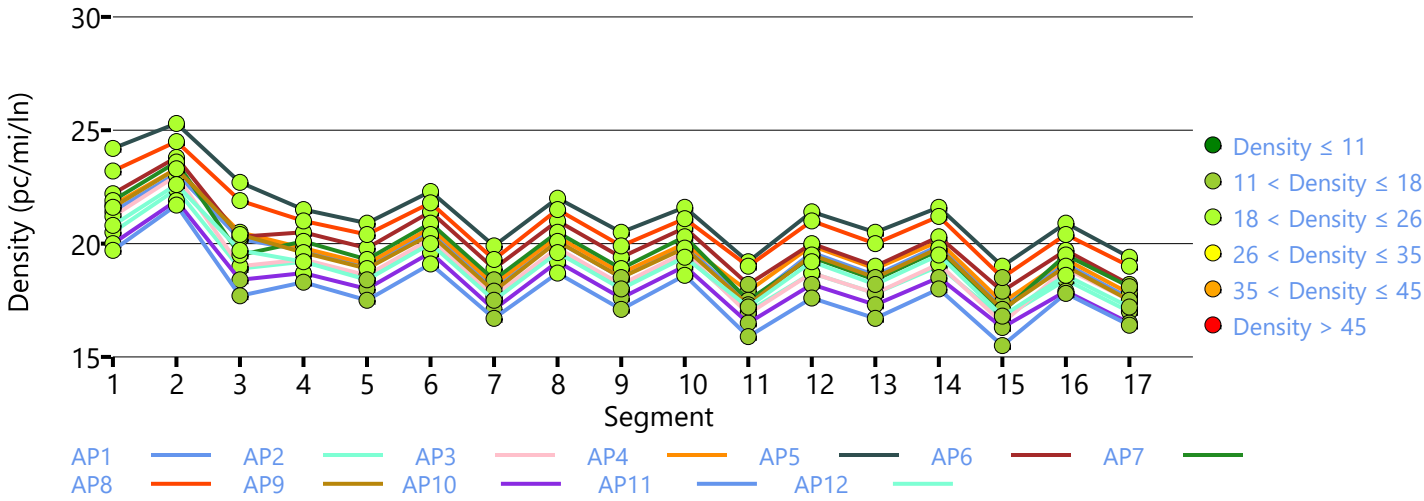
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 6/27/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | NB I-39/90/94 WIS 60 To WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 23 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 33.59 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 60 to CTH V | 34122 | 3 |
| 2 | Diverge | Diverge | STH 60 WB Off | 1500 | 3 |
| 3 | Basic | Basic | STH 60 Between off and On | 1192 | 3 |
| 4 | Merge | Merge | STH 60 WB On | 1500 | 3 |
| 5 | Basic | Basic | CTH CS to STH 60 | 17005 | 3 |
| 6 | Diverge | Diverge | CTH CS WB Off | 1500 | 3 |
| 7 | Basic | Basic | CTH CS Between off and on | 1097 | 3 |
| 8 | Merge | Merge | CTH CS WB On | 1500 | 3 |
| 9 | Basic | Basic | CTH CS to Rest Area | 6489 | 3 |
| 10 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 11 | Basic | Basic | Rest Area Between Off and On | 3554 | 3 |
| 12 | Merge | Merge | Rest Area On | 1500 | 3 |
| 13 | Basic | Basic | Rest Area On to I-39 WB Off | 17074 | 3 |
| 14 | Diverge | Diverge | I-39 WB Off | 1500 | 3 |
| 15 | Basic | Basic | I-39 WB Off to I-39 WB On | 4769 | 3 |
| 16 | Merge | Basic | STH 78 NB/I-39 WB On | 1500 | 4 |
| 17 | Basic | Basic | STH 33 to I-39; 4 Lanes | 1375 | 4 |
| 18 | Basic | Basic | STH 33 to I-39; 3 Lanes | 825 | 3 |
| 19 | Basic | Basic | STH 33 to I-39; 2 Lanes | 6734 | 2 |
| 20 | Diverge | Diverge | STH 33 WB Off | 1500 | 2 |
| 21 | Basic | Basic | STH 33 Between off and on | 1130 | 2 |
| 22 | Merge | Merge | STH 33 WB On | 1500 | 2 |
| 23 | Basic | Basic | STH 33 to USH 12 | 66971 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.903 | 3953 | 6433 | 0.61 | 67.2 | 19.6 | C |
| 2 | 1.00 | 0.903 | 3738 | 6433 | 0.58 | 67.9 | 18.4 | C |
| 3 | 1.00 | 0.903 | 3811 | 6433 | 0.59 | 67.7 | 18.8 | C |
| 4 | 1.00 | 0.903 | 3806 | 6433 | 0.59 | 67.7 | 18.7 | C |
| 5 | 1.00 | 0.903 | 3935 | 6433 | 0.61 | 67.3 | 19.5 | C |
| 6 | 1.00 | 0.903 | 3721 | 6433 | 0.58 | 67.9 | 18.3 | C |
| 7 | 1.00 | 0.903 | 3794 | 6433 | 0.59 | 67.7 | 18.7 | C |
| 8 | 1.00 | 0.903 | 3788 | 6433 | 0.59 | 67.7 | 18.7 | C |
| 9 | 1.00 | 0.903 | 3815 | 6433 | 0.59 | 67.6 | 18.8 | C |
| 10 | 1.00 | 0.903 | 3607 | 6433 | 0.56 | 68.2 | 17.6 | B |
| 11 | 1.00 | 0.903 | 3678 | 6433 | 0.57 | 68.0 | 18.0 | B |
| 12 | 1.00 | 0.903 | 3673 | 6433 | 0.57 | 68.0 | 18.0 | B |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.903 | 0.971 | 3953 | 141 | 6331 | 1796 | 0.62 | 0.08 | 62.2 | 57.5 | 21.2 | 20.8 | C |
| 2 | 1.00 | 1.00 | 0.903 | 0.971 | 3738 | 178 | 6331 | 1796 | 0.59 | 0.10 | 62.1 | 57.4 | 20.1 | 19.8 | B |
| 3 | 1.00 | 1.00 | 0.903 | 0.971 | 3811 | 175 | 6331 | 1796 | 0.60 | 0.10 | 62.1 | 57.4 | 20.5 | 20.1 | C |
| 4 | 1.00 | 1.00 | 0.903 | 0.971 | 3806 | 168 | 6331 | 1796 | 0.60 | 0.09 | 62.1 | 57.4 | 20.4 | 20.1 | C |
| 5 | 1.00 | 1.00 | 0.903 | 0.971 | 3935 | 140 | 6331 | 1796 | 0.62 | 0.08 | 62.2 | 57.5 | 21.1 | 20.7 | C |
| 6 | 1.00 | 1.00 | 0.903 | 0.971 | 3721 | 177 | 6331 | 1796 | 0.59 | 0.10 | 62.1 | 57.4 | 20.0 | 19.7 | B |
| 7 | 1.00 | 1.00 | 0.903 | 0.971 | 3794 | 175 | 6331 | 1796 | 0.60 | 0.10 | 62.1 | 57.4 | 20.4 | 20.0 | B |
| 8 | 1.00 | 1.00 | 0.903 | 0.971 | 3788 | 167 | 6331 | 1796 | 0.60 | 0.09 | 62.1 | 57.4 | 20.3 | 20.0 | B |
| 9 | 1.00 | 1.00 | 0.903 | 0.971 | 3815 | 136 | 6331 | 1796 | 0.60 | 0.08 | 62.2 | 57.5 | 20.4 | 20.1 | C |
| 10 | 1.00 | 1.00 | 0.903 | 0.971 | 3607 | 172 | 6331 | 1796 | 0.57 | 0.10 | 62.0 | 57.4 | 19.4 | 19.1 | B |
| 11 | 1.00 | 1.00 | 0.903 | 0.971 | 3678 | 169 | 6331 | 1796 | 0.58 | 0.09 | 62.1 | 57.4 | 19.7 | 19.4 | B |
| 12 | 1.00 | 1.00 | 0.903 | 0.971 | 3673 | 162 | 6331 | 1796 | 0.58 | 0.09 | 62.1 | 57.5 | 19.7 | 19.4 | B |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.900 | 3814 | 6404 | 0.60 | 66.8 | 19.0 | C |
| 2 | 1.00 | 0.900 | 3558 | 6404 | 0.56 | 67.1 | 17.6 | B |
| 3 | 1.00 | 0.900 | 3634 | 6404 | 0.57 | 67.1 | 18.0 | B |
| 4 | 1.00 | 0.900 | 3638 | 6404 | 0.57 | 67.1 | 18.1 | C |
| 5 | 1.00 | 0.900 | 3797 | 6404 | 0.59 | 66.8 | 19.0 | C |
| 6 | 1.00 | 0.900 | 3542 | 6404 | 0.55 | 67.1 | 17.5 | B |
| 7 | 1.00 | 0.900 | 3618 | 6404 | 0.56 | 67.1 | 17.9 | B |
| 8 | 1.00 | 0.900 | 3621 | 6404 | 0.57 | 67.1 | 18.0 | B |
| 9 | 1.00 | 0.900 | 3681 | 6404 | 0.57 | 67.1 | 18.3 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | | 0.900 | | 3433 | | 6404 | | 0.54 | | 67.1 | | 16.9 | | B |
| 11 | 1.00 | | 0.900 | | 3508 | | 6404 | | 0.55 | | 67.1 | | 17.3 | | B |
| 12 | 1.00 | | 0.900 | | 3511 | | 6404 | | 0.55 | | 67.1 | | 17.4 | | B |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.900 | 0.949 | 4029 | 215 | 6331 | 1886 | 0.64 | 0.11 | 62.9 | 61.6 | 21.4 | 17.6 | B |
| 2 | 1.00 | 1.00 | 0.900 | 0.949 | 3734 | 176 | 6331 | 1886 | 0.59 | 0.09 | 63.2 | 61.8 | 19.7 | 16.0 | B |
| 3 | 1.00 | 1.00 | 0.900 | 0.949 | 3847 | 213 | 6331 | 1886 | 0.61 | 0.11 | 63.0 | 61.7 | 20.4 | 16.7 | B |
| 4 | 1.00 | 1.00 | 0.900 | 0.949 | 3838 | 200 | 6331 | 1886 | 0.61 | 0.11 | 63.1 | 61.8 | 20.3 | 16.6 | B |
| 5 | 1.00 | 1.00 | 0.900 | 0.949 | 4011 | 214 | 6331 | 1886 | 0.63 | 0.11 | 62.9 | 61.6 | 21.3 | 17.5 | B |
| 6 | 1.00 | 1.00 | 0.900 | 0.949 | 3718 | 176 | 6331 | 1886 | 0.59 | 0.09 | 63.2 | 61.8 | 19.6 | 16.0 | B |
| 7 | 1.00 | 1.00 | 0.900 | 0.949 | 3830 | 212 | 6331 | 1886 | 0.60 | 0.11 | 63.1 | 61.8 | 20.2 | 16.6 | B |
| 8 | 1.00 | 1.00 | 0.900 | 0.949 | 3821 | 200 | 6331 | 1886 | 0.60 | 0.11 | 63.1 | 61.8 | 20.2 | 16.5 | B |
| 9 | 1.00 | 1.00 | 0.900 | 0.949 | 3889 | 208 | 6331 | 1886 | 0.61 | 0.11 | 63.0 | 61.7 | 20.6 | 16.9 | B |
| 10 | 1.00 | 1.00 | 0.900 | 0.949 | 3604 | 171 | 6331 | 1886 | 0.57 | 0.09 | 63.3 | 61.9 | 19.0 | 15.4 | B |
| 11 | 1.00 | 1.00 | 0.900 | 0.949 | 3713 | 205 | 6331 | 1886 | 0.59 | 0.11 | 63.2 | 61.8 | 19.6 | 16.0 | B |
| 12 | 1.00 | 1.00 | 0.900 | 0.949 | 3705 | 194 | 6331 | 1886 | 0.59 | 0.10 | 63.2 | 61.8 | 19.5 | 16.0 | B |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.903 | 4028 | 6377 | 0.63 | 65.4 | 20.5 | C |
| 2 | 1.00 | 0.903 | 3731 | 6377 | 0.59 | 66.2 | 18.8 | C |
| 3 | 1.00 | 0.903 | 3846 | 6377 | 0.60 | 65.9 | 19.5 | C |
| 4 | 1.00 | 0.903 | 3836 | 6377 | 0.60 | 66.0 | 19.4 | C |
| 5 | 1.00 | 0.903 | 4009 | 6377 | 0.63 | 65.5 | 20.4 | C |
| 6 | 1.00 | 0.903 | 3715 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 7 | 1.00 | 0.903 | 3828 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 8 | 1.00 | 0.903 | 3819 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 9 | 1.00 | 0.903 | 3887 | 6377 | 0.61 | 65.8 | 19.7 | C |
| 10 | 1.00 | 0.903 | 3601 | 6377 | 0.56 | 66.4 | 18.1 | C |
| 11 | 1.00 | 0.903 | 3712 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 12 | 1.00 | 0.903 | 3703 | 6377 | 0.58 | 66.2 | 18.6 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.903 | 0.884 | 4028 | 187 | 6331 | 1886 | 0.64 | 0.10 | 63.3 | 59.0 | 21.2 | 25.1 | C |
| 2 | 1.00 | 1.00 | 0.903 | 0.884 | 3731 | 179 | 6331 | 1886 | 0.59 | 0.09 | 63.3 | 59.0 | 19.6 | 23.7 | C |
| 3 | 1.00 | 1.00 | 0.903 | 0.884 | 3846 | 235 | 6331 | 1886 | 0.61 | 0.12 | 63.2 | 58.9 | 20.3 | 24.3 | C |
| 4 | 1.00 | 1.00 | 0.903 | 0.884 | 3836 | 127 | 6331 | 1886 | 0.61 | 0.07 | 63.5 | 59.2 | 20.1 | 24.1 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 1.00 | 0.903 | 0.884 | 4009 | 186 | 6331 | 1886 | 0.63 | 0.10 | 63.3 | 59.0 | 21.1 | 25.0 | C |
| 6 | 1.00 | 1.00 | 0.903 | 0.884 | 3715 | 179 | 6331 | 1886 | 0.59 | 0.09 | 63.3 | 59.0 | 19.6 | 23.6 | C |
| 7 | 1.00 | 1.00 | 0.903 | 0.884 | 3828 | 234 | 6331 | 1886 | 0.60 | 0.12 | 63.2 | 58.9 | 20.2 | 24.2 | C |
| 8 | 1.00 | 1.00 | 0.903 | 0.884 | 3819 | 126 | 6331 | 1886 | 0.60 | 0.07 | 63.5 | 59.2 | 20.0 | 24.0 | C |
| 9 | 1.00 | 1.00 | 0.903 | 0.884 | 3887 | 180 | 6331 | 1886 | 0.61 | 0.10 | 63.3 | 59.0 | 20.5 | 24.4 | C |
| 10 | 1.00 | 1.00 | 0.903 | 0.884 | 3601 | 173 | 6331 | 1886 | 0.57 | 0.09 | 63.3 | 59.0 | 19.0 | 23.0 | C |
| 11 | 1.00 | 1.00 | 0.903 | 0.884 | 3712 | 227 | 6331 | 1886 | 0.59 | 0.12 | 63.2 | 58.9 | 19.6 | 23.7 | C |
| 12 | 1.00 | 1.00 | 0.903 | 0.884 | 3703 | 122 | 6331 | 1886 | 0.58 | 0.06 | 63.5 | 59.2 | 19.4 | 23.5 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.904 | 3841 | 6377 | 0.60 | 66.0 | 19.4 | C |
| 2 | 1.00 | 0.904 | 3552 | 6377 | 0.56 | 66.3 | 17.8 | B |
| 3 | 1.00 | 0.904 | 3612 | 6377 | 0.57 | 66.3 | 18.1 | C |
| 4 | 1.00 | 0.904 | 3708 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 5 | 1.00 | 0.904 | 3823 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 6 | 1.00 | 0.904 | 3537 | 6377 | 0.55 | 66.3 | 17.7 | B |
| 7 | 1.00 | 0.904 | 3595 | 6377 | 0.56 | 66.3 | 18.0 | B |
| 8 | 1.00 | 0.904 | 3692 | 6377 | 0.58 | 66.3 | 18.6 | C |
| 9 | 1.00 | 0.904 | 3707 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 10 | 1.00 | 0.904 | 3428 | 6377 | 0.54 | 66.3 | 17.2 | B |
| 11 | 1.00 | 0.904 | 3486 | 6377 | 0.55 | 66.3 | 17.4 | B |
| 12 | 1.00 | 0.904 | 3580 | 6377 | 0.56 | 66.3 | 17.9 | B |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.904 | 0.797 | 4027 | 186 | 6331 | 1886 | 0.64 | 0.10 | 62.6 | 61.1 | 21.4 | 18.8 | B |
| 2 | 1.00 | 1.00 | 0.904 | 0.797 | 3824 | 272 | 6331 | 1886 | 0.60 | 0.14 | 62.7 | 61.2 | 20.3 | 18.0 | B |
| 3 | 1.00 | 1.00 | 0.904 | 0.797 | 3824 | 212 | 6331 | 1886 | 0.60 | 0.11 | 62.8 | 61.3 | 20.3 | 17.9 | B |
| 4 | 1.00 | 1.00 | 0.904 | 0.797 | 3895 | 187 | 6331 | 1886 | 0.62 | 0.10 | 62.7 | 61.2 | 20.7 | 18.1 | B |
| 5 | 1.00 | 1.00 | 0.904 | 0.797 | 4007 | 184 | 6331 | 1886 | 0.63 | 0.10 | 62.6 | 61.1 | 21.3 | 18.7 | B |
| 6 | 1.00 | 1.00 | 0.904 | 0.797 | 3808 | 271 | 6331 | 1886 | 0.60 | 0.14 | 62.7 | 61.2 | 20.2 | 17.9 | B |
| 7 | 1.00 | 1.00 | 0.904 | 0.797 | 3807 | 212 | 6331 | 1886 | 0.60 | 0.11 | 62.8 | 61.3 | 20.2 | 17.8 | B |
| 8 | 1.00 | 1.00 | 0.904 | 0.797 | 3879 | 187 | 6331 | 1886 | 0.61 | 0.10 | 62.7 | 61.2 | 20.6 | 18.0 | B |
| 9 | 1.00 | 1.00 | 0.904 | 0.797 | 3886 | 179 | 6331 | 1886 | 0.61 | 0.10 | 62.7 | 61.2 | 20.7 | 18.1 | B |
| 10 | 1.00 | 1.00 | 0.904 | 0.797 | 3690 | 262 | 6331 | 1886 | 0.58 | 0.14 | 62.8 | 61.3 | 19.6 | 17.4 | B |
| 11 | 1.00 | 1.00 | 0.904 | 0.797 | 3692 | 206 | 6331 | 1886 | 0.58 | 0.11 | 62.9 | 61.3 | 19.6 | 17.2 | B |
| 12 | 1.00 | 1.00 | 0.904 | 0.797 | 3761 | 181 | 6331 | 1886 | 0.59 | 0.10 | 62.8 | 61.3 | 20.0 | 17.5 | B |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 4031 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 2 | 1.00 | 0.898 | 3817 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 3 | 1.00 | 0.898 | 3824 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 4 | 1.00 | 0.898 | 3899 | 6377 | 0.61 | 65.8 | 19.8 | C |
| 5 | 1.00 | 0.898 | 4012 | 6377 | 0.63 | 65.5 | 20.4 | C |
| 6 | 1.00 | 0.898 | 3801 | 6377 | 0.60 | 66.0 | 19.2 | C |
| 7 | 1.00 | 0.898 | 3807 | 6377 | 0.60 | 66.0 | 19.2 | C |
| 8 | 1.00 | 0.898 | 3883 | 6377 | 0.61 | 65.8 | 19.7 | C |
| 9 | 1.00 | 0.898 | 3891 | 6377 | 0.61 | 65.8 | 19.7 | C |
| 10 | 1.00 | 0.898 | 3684 | 6377 | 0.58 | 66.3 | 18.5 | C |
| 11 | 1.00 | 0.898 | 3692 | 6377 | 0.58 | 66.3 | 18.6 | C |
| 12 | 1.00 | 0.898 | 3764 | 6377 | 0.59 | 66.1 | 19.0 | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.909 | 4031 | 91 | 6331 | 1796 | 0.64 | 0.05 | 61.1 | 56.1 | 22.0 | 23.6 | C |
| 2 | 1.00 | 1.00 | 0.898 | 0.909 | 3817 | 87 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.8 | 22.6 | C |
| 3 | 1.00 | 1.00 | 0.898 | 0.909 | 3824 | 87 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.9 | 22.6 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.909 | 3899 | 89 | 6331 | 1796 | 0.62 | 0.05 | 61.1 | 56.1 | 21.3 | 23.0 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.909 | 4012 | 91 | 6331 | 1796 | 0.63 | 0.05 | 61.1 | 56.1 | 21.9 | 23.6 | C |
| 6 | 1.00 | 1.00 | 0.898 | 0.909 | 3801 | 86 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.7 | 22.5 | C |
| 7 | 1.00 | 1.00 | 0.898 | 0.909 | 3807 | 87 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.8 | 22.5 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.909 | 3883 | 88 | 6331 | 1796 | 0.61 | 0.05 | 61.1 | 56.1 | 21.2 | 22.9 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.909 | 3891 | 88 | 6331 | 1796 | 0.61 | 0.05 | 61.1 | 56.1 | 21.2 | 23.0 | C |
| 10 | 1.00 | 1.00 | 0.898 | 0.909 | 3684 | 84 | 6331 | 1796 | 0.58 | 0.05 | 61.1 | 56.1 | 20.1 | 21.9 | C |
| 11 | 1.00 | 1.00 | 0.898 | 0.909 | 3692 | 84 | 6331 | 1796 | 0.58 | 0.05 | 61.1 | 56.1 | 20.1 | 22.0 | C |
| 12 | 1.00 | 1.00 | 0.898 | 0.909 | 3764 | 86 | 6331 | 1796 | 0.59 | 0.05 | 61.1 | 56.1 | 20.5 | 22.3 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 3939 | 6377 | 0.62 | 65.7 | 20.0 | C |
| 2 | 1.00 | 0.898 | 3729 | 6377 | 0.58 | 66.2 | 18.8 | C |
| 3 | 1.00 | 0.898 | 3736 | 6377 | 0.59 | 66.2 | 18.8 | C |
| 4 | 1.00 | 0.898 | 3808 | 6377 | 0.60 | 66.0 | 19.2 | C |
| 5 | 1.00 | 0.898 | 3920 | 6377 | 0.61 | 65.7 | 19.9 | C |
| 6 | 1.00 | 0.898 | 3714 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 7 | 1.00 | 0.898 | 3719 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 8 | 1.00 | 0.898 | 3794 | 6377 | 0.59 | 66.1 | 19.1 | C |
| 9 | 1.00 | 0.898 | 3802 | 6377 | 0.60 | 66.0 | 19.2 | C |
| 10 | 1.00 | 0.898 | 3599 | 6377 | 0.56 | 66.4 | 18.1 | C |
| 11 | 1.00 | 0.898 | 3607 | 6377 | 0.57 | 66.4 | 18.1 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.898 | | 3677 | | 6377 | | 0.58 | | 66.3 | | 18.5 | | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.909 | 4030 | 91 | 6331 | 1796 | 0.64 | 0.05 | 62.1 | 60.4 | 21.6 | 19.6 | B |
| 2 | 1.00 | 1.00 | 0.898 | 0.909 | 3816 | 87 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.4 | 18.6 | B |
| 3 | 1.00 | 1.00 | 0.898 | 0.909 | 3823 | 87 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.5 | 18.7 | B |
| 4 | 1.00 | 1.00 | 0.898 | 0.909 | 3897 | 89 | 6331 | 1796 | 0.62 | 0.05 | 62.2 | 60.4 | 20.9 | 19.0 | B |
| 5 | 1.00 | 1.00 | 0.898 | 0.909 | 4011 | 91 | 6331 | 1796 | 0.63 | 0.05 | 62.1 | 60.4 | 21.5 | 19.5 | B |
| 6 | 1.00 | 1.00 | 0.898 | 0.909 | 3800 | 86 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.3 | 18.5 | B |
| 7 | 1.00 | 1.00 | 0.898 | 0.909 | 3806 | 87 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.4 | 18.6 | B |
| 8 | 1.00 | 1.00 | 0.898 | 0.909 | 3882 | 88 | 6331 | 1796 | 0.61 | 0.05 | 62.2 | 60.5 | 20.8 | 18.9 | B |
| 9 | 1.00 | 1.00 | 0.898 | 0.909 | 3890 | 88 | 6331 | 1796 | 0.61 | 0.05 | 62.2 | 60.5 | 20.8 | 19.0 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.909 | 3683 | 84 | 6331 | 1796 | 0.58 | 0.05 | 62.4 | 60.6 | 19.7 | 18.0 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.909 | 3691 | 84 | 6331 | 1796 | 0.58 | 0.05 | 62.4 | 60.6 | 19.7 | 18.0 | B |
| 12 | 1.00 | 1.00 | 0.898 | 0.909 | 3763 | 86 | 6331 | 1796 | 0.59 | 0.05 | 62.3 | 60.5 | 20.1 | 18.4 | B |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 4031 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 2 | 1.00 | 0.898 | 3817 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 3 | 1.00 | 0.898 | 3824 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 4 | 1.00 | 0.898 | 3899 | 6377 | 0.61 | 65.8 | 19.8 | C |
| 5 | 1.00 | 0.898 | 4012 | 6377 | 0.63 | 65.5 | 20.4 | C |
| 6 | 1.00 | 0.898 | 3801 | 6377 | 0.60 | 66.0 | 19.2 | C |
| 7 | 1.00 | 0.898 | 3807 | 6377 | 0.60 | 66.0 | 19.2 | C |
| 8 | 1.00 | 0.898 | 3883 | 6377 | 0.61 | 65.8 | 19.7 | C |
| 9 | 1.00 | 0.898 | 3891 | 6377 | 0.61 | 65.8 | 19.7 | C |
| 10 | 1.00 | 0.898 | 3684 | 6377 | 0.58 | 66.3 | 18.5 | C |
| 11 | 1.00 | 0.898 | 3692 | 6377 | 0.58 | 66.3 | 18.6 | C |
| 12 | 1.00 | 0.898 | 3764 | 6377 | 0.59 | 66.1 | 19.0 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.900 | 4031 | 1008 | 6331 | 3951 | 0.64 | 0.26 | 64.9 | 60.2 | 20.7 | 11.1 | B |
| 2 | 1.00 | 1.00 | 0.898 | 0.900 | 3817 | 902 | 6331 | 3951 | 0.60 | 0.23 | 65.2 | 60.4 | 19.5 | 9.8 | A |
| 3 | 1.00 | 1.00 | 0.898 | 0.900 | 3824 | 948 | 6331 | 3951 | 0.60 | 0.24 | 65.0 | 60.3 | 19.6 | 10.0 | A |
| 4 | 1.00 | 1.00 | 0.898 | 0.900 | 3899 | 803 | 6331 | 3951 | 0.62 | 0.20 | 65.4 | 60.7 | 19.9 | 9.9 | A |
| 5 | 1.00 | 1.00 | 0.898 | 0.900 | 4012 | 1003 | 6331 | 3951 | 0.63 | 0.25 | 64.9 | 60.2 | 20.6 | 11.0 | B |
| 6 | 1.00 | 1.00 | 0.898 | 0.900 | 3801 | 898 | 6331 | 3951 | 0.60 | 0.23 | 65.2 | 60.5 | 19.4 | 9.7 | A |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.898 | 0.900 | 3807 | 944 | 6331 | 3951 | 0.60 | 0.24 | 65.1 | 60.4 | 19.5 | 9.9 | A |
| 8 | 1.00 | 1.00 | 0.898 | 0.900 | 3883 | 800 | 6331 | 3951 | 0.61 | 0.20 | 65.4 | 60.7 | 19.8 | 9.8 | A |
| 9 | 1.00 | 1.00 | 0.898 | 0.900 | 3891 | 972 | 6331 | 3951 | 0.61 | 0.25 | 65.0 | 60.3 | 20.0 | 10.4 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.900 | 3684 | 870 | 6331 | 3951 | 0.58 | 0.22 | 65.3 | 60.5 | 18.8 | 9.1 | A |
| 11 | 1.00 | 1.00 | 0.898 | 0.900 | 3692 | 916 | 6331 | 3951 | 0.58 | 0.23 | 65.2 | 60.4 | 18.9 | 9.4 | A |
| 12 | 1.00 | 1.00 | 0.898 | 0.900 | 3764 | 776 | 6331 | 3951 | 0.59 | 0.20 | 65.5 | 60.8 | 19.2 | 9.3 | A |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.897 | 3025 | 6377 | 0.47 | 66.7 | 15.1 | B |
| 2 | 1.00 | 0.897 | 2916 | 6377 | 0.46 | 66.7 | 14.6 | B |
| 3 | 1.00 | 0.897 | 2877 | 6377 | 0.45 | 66.7 | 14.4 | B |
| 4 | 1.00 | 0.897 | 3097 | 6377 | 0.49 | 66.7 | 15.5 | B |
| 5 | 1.00 | 0.897 | 3010 | 6377 | 0.47 | 66.7 | 15.0 | B |
| 6 | 1.00 | 0.897 | 2904 | 6377 | 0.46 | 66.7 | 14.5 | B |
| 7 | 1.00 | 0.897 | 2864 | 6377 | 0.45 | 66.7 | 14.3 | B |
| 8 | 1.00 | 0.897 | 3085 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 9 | 1.00 | 0.897 | 2920 | 6377 | 0.46 | 66.7 | 14.6 | B |
| 10 | 1.00 | 0.897 | 2815 | 6377 | 0.44 | 66.7 | 14.1 | B |
| 11 | 1.00 | 0.897 | 2777 | 6377 | 0.44 | 66.7 | 13.9 | B |
| 12 | 1.00 | 0.897 | 2990 | 6377 | 0.47 | 66.7 | 14.9 | B |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.897 | 0.748 | 3076 | 51 | 8578 | 1976 | 0.36 | 0.03 | 68.8 | 68.8 | 11.2 | 11.2 | B |
| 2 | 1.00 | 1.00 | 0.897 | 0.748 | 2965 | 49 | 8578 | 1976 | 0.35 | 0.02 | 68.8 | 68.8 | 10.8 | 10.8 | A |
| 3 | 1.00 | 1.00 | 0.897 | 0.748 | 2929 | 52 | 8578 | 1976 | 0.34 | 0.03 | 68.8 | 68.8 | 10.6 | 10.6 | A |
| 4 | 1.00 | 1.00 | 0.897 | 0.748 | 3160 | 63 | 8578 | 1976 | 0.37 | 0.03 | 68.8 | 68.8 | 11.5 | 11.5 | B |
| 5 | 1.00 | 1.00 | 0.897 | 0.748 | 3061 | 51 | 8578 | 1976 | 0.36 | 0.03 | 68.8 | 68.8 | 11.1 | 11.1 | B |
| 6 | 1.00 | 1.00 | 0.897 | 0.748 | 2952 | 48 | 8578 | 1976 | 0.34 | 0.02 | 68.8 | 68.8 | 10.7 | 10.7 | A |
| 7 | 1.00 | 1.00 | 0.897 | 0.748 | 2916 | 52 | 8578 | 1976 | 0.34 | 0.03 | 68.8 | 68.8 | 10.6 | 10.6 | A |
| 8 | 1.00 | 1.00 | 0.897 | 0.748 | 3148 | 63 | 8578 | 1976 | 0.37 | 0.03 | 68.8 | 68.8 | 11.4 | 11.4 | B |
| 9 | 1.00 | 1.00 | 0.897 | 0.748 | 2969 | 49 | 8578 | 1976 | 0.35 | 0.02 | 68.8 | 68.8 | 10.8 | 10.8 | A |
| 10 | 1.00 | 1.00 | 0.897 | 0.748 | 2862 | 47 | 8578 | 1976 | 0.33 | 0.02 | 68.8 | 68.8 | 10.4 | 10.4 | A |
| 11 | 1.00 | 1.00 | 0.897 | 0.748 | 2828 | 51 | 8578 | 1976 | 0.33 | 0.03 | 68.8 | 68.8 | 10.3 | 10.3 | A |
| 12 | 1.00 | 1.00 | 0.897 | 0.748 | 3050 | 60 | 8578 | 1976 | 0.36 | 0.03 | 68.8 | 68.8 | 11.1 | 11.1 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3074 | 8502 | 0.36 | 66.7 | 11.5 | B |
| 2 | 1.00 | 0.895 | 2964 | 8502 | 0.35 | 66.7 | 11.1 | B |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.895 | 2927 | 8502 | 0.34 | 66.7 | 11.0 | A |
| 4 | 1.00 | 0.895 | 3156 | 8502 | 0.37 | 66.7 | 11.8 | B |
| 5 | 1.00 | 0.895 | 3059 | 8502 | 0.36 | 66.7 | 11.5 | B |
| 6 | 1.00 | 0.895 | 2951 | 8502 | 0.35 | 66.7 | 11.1 | B |
| 7 | 1.00 | 0.895 | 2914 | 8502 | 0.34 | 66.7 | 10.9 | A |
| 8 | 1.00 | 0.895 | 3144 | 8502 | 0.37 | 66.7 | 11.8 | B |
| 9 | 1.00 | 0.895 | 2968 | 8502 | 0.35 | 66.7 | 11.1 | B |
| 10 | 1.00 | 0.895 | 2860 | 8502 | 0.34 | 66.7 | 10.7 | A |
| 11 | 1.00 | 0.895 | 2826 | 8502 | 0.33 | 66.7 | 10.6 | A |
| 12 | 1.00 | 0.895 | 3047 | 8502 | 0.36 | 66.7 | 11.4 | B |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3074 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 2 | 1.00 | 0.895 | 2964 | 6377 | 0.46 | 66.7 | 14.8 | B |
| 3 | 1.00 | 0.895 | 2927 | 6377 | 0.46 | 66.7 | 14.6 | B |
| 4 | 1.00 | 0.895 | 3156 | 6377 | 0.49 | 66.7 | 15.8 | B |
| 5 | 1.00 | 0.895 | 3059 | 6377 | 0.48 | 66.7 | 15.3 | B |
| 6 | 1.00 | 0.895 | 2951 | 6377 | 0.46 | 66.7 | 14.8 | B |
| 7 | 1.00 | 0.895 | 2914 | 6377 | 0.46 | 66.7 | 14.6 | B |
| 8 | 1.00 | 0.895 | 3144 | 6377 | 0.49 | 66.7 | 15.7 | B |
| 9 | 1.00 | 0.895 | 2968 | 6377 | 0.47 | 66.7 | 14.8 | B |
| 10 | 1.00 | 0.895 | 2860 | 6377 | 0.45 | 66.7 | 14.3 | B |
| 11 | 1.00 | 0.895 | 2826 | 6377 | 0.44 | 66.7 | 14.1 | B |
| 12 | 1.00 | 0.895 | 3047 | 6377 | 0.48 | 66.7 | 15.2 | B |

## Segment 19: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3074 | 4251 | 0.72 | 62.9 | 24.4 | C |
| 2 | 1.00 | 0.895 | 2964 | 4251 | 0.70 | 63.8 | 23.2 | C |
| 3 | 1.00 | 0.895 | 2927 | 4251 | 0.69 | 64.0 | 22.9 | C |
| 4 | 1.00 | 0.895 | 3156 | 4251 | 0.74 | 62.2 | 25.4 | C |
| 5 | 1.00 | 0.895 | 3059 | 4251 | 0.72 | 63.0 | 24.3 | C |
| 6 | 1.00 | 0.895 | 2951 | 4251 | 0.69 | 63.9 | 23.1 | C |
| 7 | 1.00 | 0.895 | 2914 | 4251 | 0.69 | 64.1 | 22.7 | C |
| 8 | 1.00 | 0.895 | 3144 | 4251 | 0.74 | 62.3 | 25.2 | C |
| 9 | 1.00 | 0.895 | 2968 | 4251 | 0.70 | 63.7 | 23.3 | C |
| 10 | 1.00 | 0.895 | 2860 | 4251 | 0.67 | 64.5 | 22.2 | C |
| 11 | 1.00 | 0.895 | 2826 | 4251 | 0.66 | 64.7 | 21.8 | C |
| 12 | 1.00 | 0.895 | 3047 | 4251 | 0.72 | 63.1 | 24.2 | C |

## Segment 20: Diverge

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | (pc/h) | | (pc/h) | | Ratio | | (mi/h) | | (pc/mi/ln) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.895 | 1.000 | 3074 | 195 | 4221 | 1886 | 0.73 | 0.10 | 59.0 | 59.0 | 26.1 | 27.4 | C |
| 2 | 1.00 | 1.00 | 0.895 | 1.000 | 2964 | 170 | 4221 | 1886 | 0.70 | 0.09 | 59.0 | 59.0 | 25.1 | 26.5 | C |
| 3 | 1.00 | 1.00 | 0.895 | 1.000 | 2927 | 185 | 4221 | 1886 | 0.69 | 0.10 | 59.0 | 59.0 | 24.8 | 26.2 | C |
| 4 | 1.00 | 1.00 | 0.895 | 1.000 | 3156 | 174 | 4221 | 1886 | 0.75 | 0.09 | 59.0 | 59.0 | 26.7 | 28.2 | D |
| 5 | 1.00 | 1.00 | 0.895 | 1.000 | 3059 | 194 | 4221 | 1886 | 0.72 | 0.10 | 59.0 | 59.0 | 25.9 | 27.3 | C |
| 6 | 1.00 | 1.00 | 0.895 | 1.000 | 2951 | 169 | 4221 | 1886 | 0.70 | 0.09 | 59.0 | 59.0 | 25.0 | 26.4 | C |
| 7 | 1.00 | 1.00 | 0.895 | 1.000 | 2914 | 184 | 4221 | 1886 | 0.69 | 0.10 | 59.0 | 59.0 | 24.7 | 26.1 | C |
| 8 | 1.00 | 1.00 | 0.895 | 1.000 | 3144 | 173 | 4221 | 1886 | 0.74 | 0.09 | 59.0 | 59.0 | 26.6 | 28.1 | D |
| 9 | 1.00 | 1.00 | 0.895 | 1.000 | 2968 | 188 | 4221 | 1886 | 0.70 | 0.10 | 59.0 | 59.0 | 25.2 | 26.5 | C |
| 10 | 1.00 | 1.00 | 0.895 | 1.000 | 2860 | 164 | 4221 | 1886 | 0.68 | 0.09 | 59.1 | 59.1 | 24.2 | 25.6 | C |
| 11 | 1.00 | 1.00 | 0.895 | 1.000 | 2826 | 178 | 4221 | 1886 | 0.67 | 0.09 | 59.0 | 59.0 | 23.9 | 25.3 | C |
| 12 | 1.00 | 1.00 | 0.895 | 1.000 | 3047 | 168 | 4221 | 1886 | 0.72 | 0.09 | 59.0 | 59.0 | 25.8 | 27.2 | C |

## Segment 21: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.888 | 2878 | 4260 | 0.68 | 64.7 | 22.2 | C |
| 2 | 1.00 | 0.888 | 2796 | 4260 | 0.66 | 65.2 | 21.4 | C |
| 3 | 1.00 | 0.888 | 2742 | 4260 | 0.64 | 65.5 | 20.9 | C |
| 4 | 1.00 | 0.888 | 2985 | 4260 | 0.70 | 63.9 | 23.3 | C |
| 5 | 1.00 | 0.888 | 2865 | 4260 | 0.67 | 64.8 | 22.1 | C |
| 6 | 1.00 | 0.888 | 2784 | 4260 | 0.65 | 65.3 | 21.3 | C |
| 7 | 1.00 | 0.888 | 2730 | 4260 | 0.64 | 65.6 | 20.8 | C |
| 8 | 1.00 | 0.888 | 2974 | 4260 | 0.70 | 64.0 | 23.2 | C |
| 9 | 1.00 | 0.888 | 2779 | 4260 | 0.65 | 65.3 | 21.3 | C |
| 10 | 1.00 | 0.888 | 2698 | 4260 | 0.63 | 65.7 | 20.5 | C |
| 11 | 1.00 | 0.888 | 2648 | 4260 | 0.62 | 66.0 | 20.1 | C |
| 12 | 1.00 | 0.888 | 2882 | 4260 | 0.68 | 64.7 | 22.3 | C |

## Segment 22: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.888 | 0.912 | 3139 | 261 | 4221 | 1886 | 0.74 | 0.14 | 60.0 | 60.0 | 26.2 | 23.6 | C |
| 2 | 1.00 | 1.00 | 0.888 | 0.912 | 3011 | 215 | 4221 | 1886 | 0.71 | 0.11 | 60.3 | 60.3 | 25.0 | 22.7 | C |
| 3 | 1.00 | 1.00 | 0.888 | 0.912 | 3033 | 291 | 4221 | 1886 | 0.72 | 0.15 | 60.2 | 60.2 | 25.2 | 22.8 | C |
| 4 | 1.00 | 1.00 | 0.888 | 0.912 | 3211 | 226 | 4221 | 1886 | 0.76 | 0.12 | 59.8 | 59.8 | 26.8 | 24.2 | C |
| 5 | 1.00 | 1.00 | 0.888 | 0.912 | 3125 | 260 | 4221 | 1886 | 0.74 | 0.14 | 60.0 | 60.0 | 26.0 | 23.5 | C |
| 6 | 1.00 | 1.00 | 0.888 | 0.912 | 2998 | 214 | 4221 | 1886 | 0.71 | 0.11 | 60.3 | 60.3 | 24.9 | 22.6 | C |
| 7 | 1.00 | 1.00 | 0.888 | 0.912 | 3019 | 289 | 4221 | 1886 | 0.72 | 0.15 | 60.3 | 60.3 | 25.0 | 22.7 | C |
| 8 | 1.00 | 1.00 | 0.888 | 0.912 | 3199 | 225 | 4221 | 1886 | 0.76 | 0.12 | 59.8 | 59.8 | 26.7 | 24.1 | C |
| 9 | 1.00 | 1.00 | 0.888 | 0.912 | 3031 | 252 | 4221 | 1886 | 0.72 | 0.13 | 60.2 | 60.2 | 25.2 | 22.8 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 1.00 | 0.888 | 0.912 | 2905 | 207 | 4221 | 1886 | 0.69 | 0.11 | 60.5 | 60.5 | 24.0 | 21.8 | C |
| 11 | 1.00 | 1.00 | 0.888 | 0.912 | 2929 | 281 | 4221 | 1886 | 0.69 | 0.15 | 60.4 | 60.4 | 24.2 | 22.0 | C |
| 12 | 1.00 | 1.00 | 0.888 | 0.912 | 3099 | 217 | 4221 | 1886 | 0.73 | 0.12 | 60.1 | 60.1 | 25.8 | 23.3 | C |

## Segment 23: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.890 | 3139 | 4289 | 0.73 | 63.6 | 24.7 | C |
| 2 | 1.00 | 0.890 | 3010 | 4289 | 0.70 | 64.7 | 23.3 | C |
| 3 | 1.00 | 0.890 | 3034 | 4289 | 0.71 | 64.5 | 23.5 | C |
| 4 | 1.00 | 0.890 | 3210 | 4289 | 0.75 | 62.9 | 25.5 | C |
| 5 | 1.00 | 0.890 | 3125 | 4289 | 0.73 | 63.8 | 24.5 | C |
| 6 | 1.00 | 0.890 | 2997 | 4289 | 0.70 | 64.9 | 23.1 | C |
| 7 | 1.00 | 0.890 | 3020 | 4289 | 0.70 | 64.7 | 23.3 | C |
| 8 | 1.00 | 0.890 | 3198 | 4289 | 0.75 | 63.1 | 25.3 | C |
| 9 | 1.00 | 0.890 | 3031 | 4289 | 0.71 | 64.6 | 23.5 | C |
| 10 | 1.00 | 0.890 | 2904 | 4289 | 0.68 | 65.6 | 22.1 | C |
| 11 | 1.00 | 0.890 | 2929 | 4289 | 0.68 | 65.4 | 22.4 | C |
| 12 | 1.00 | 0.890 | 3098 | 4289 | 0.72 | 64.0 | 24.2 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 26865 | 26814 | 19.11 | 64.9 | 21.3 | 19.1 | 31.10 | C |
| 2 | 25503 | 25452 | 13.72 | 65.6 | 20.1 | 18.0 | 30.70 | C |
| 3 | 25767 | 25712 | 14.65 | 65.5 | 20.3 | 18.2 | 30.80 | C |
| 4 | 26542 | 26493 | 19.44 | 64.8 | 21.1 | 18.9 | 31.10 | C |
| 5 | 26739 | 26688 | 18.27 | 65.0 | 21.2 | 19.0 | 31.00 | C |
| 6 | 25390 | 25340 | 13.23 | 65.7 | 19.9 | 17.9 | 30.70 | C |
| 7 | 25652 | 25598 | 14.08 | 65.6 | 20.1 | 18.0 | 30.70 | C |
| 8 | 26432 | 26384 | 18.87 | 64.9 | 21.0 | 18.8 | 31.10 | C |
| 9 | 25933 | 25884 | 14.97 | 65.5 | 20.4 | 18.3 | 30.80 | C |
| 10 | 24610 | 24561 | 10.58 | 66.1 | 19.2 | 17.2 | 30.50 | C |
| 11 | 24874 | 24821 | 11.37 | 66.0 | 19.4 | 17.4 | 30.50 | C |
| 12 | 25618 | 25571 | 15.33 | 65.4 | 20.2 | 18.1 | 30.80 | C |

## Facility Overall Results

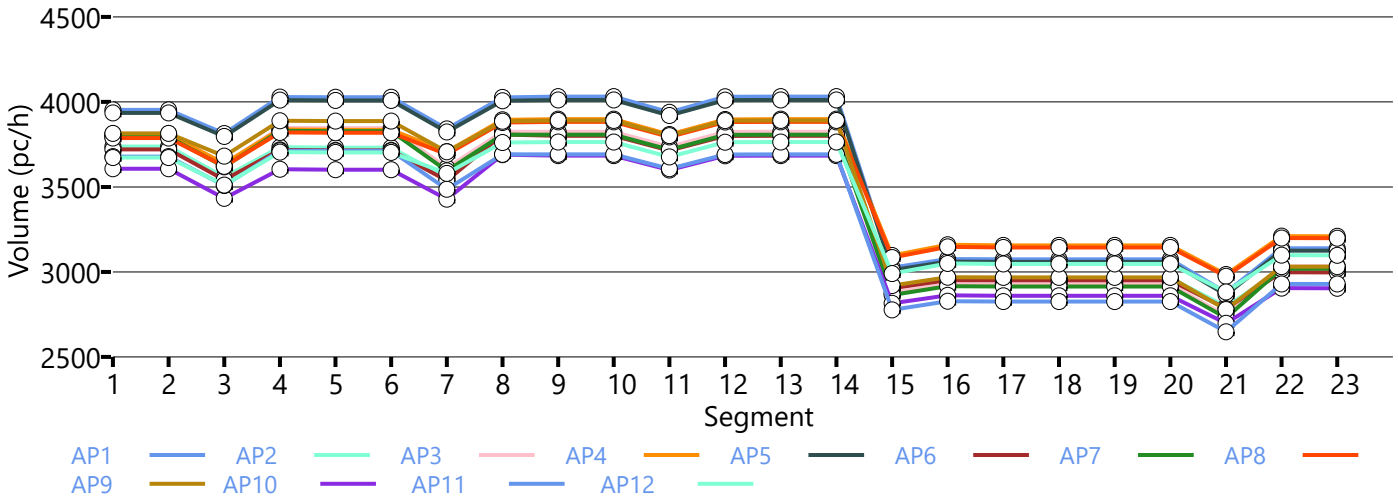
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 65.4 | Density, veh/mi/ln | 18.3 |
| Average Travel Time, min | 30.80 | Density, pc/mi/ln | 20.4 |

## Messages

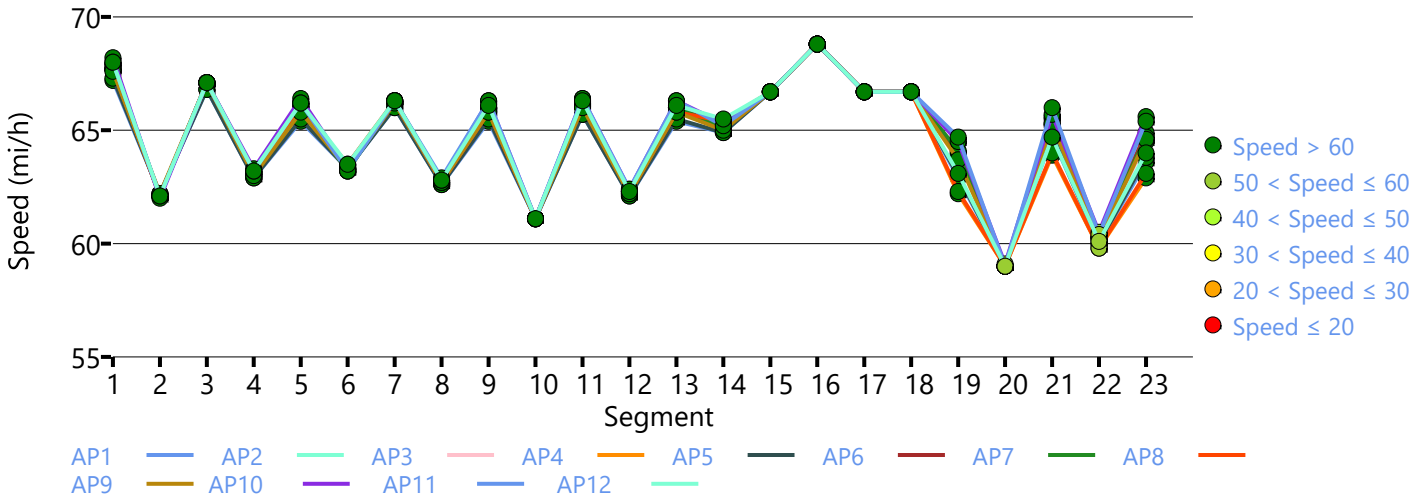
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

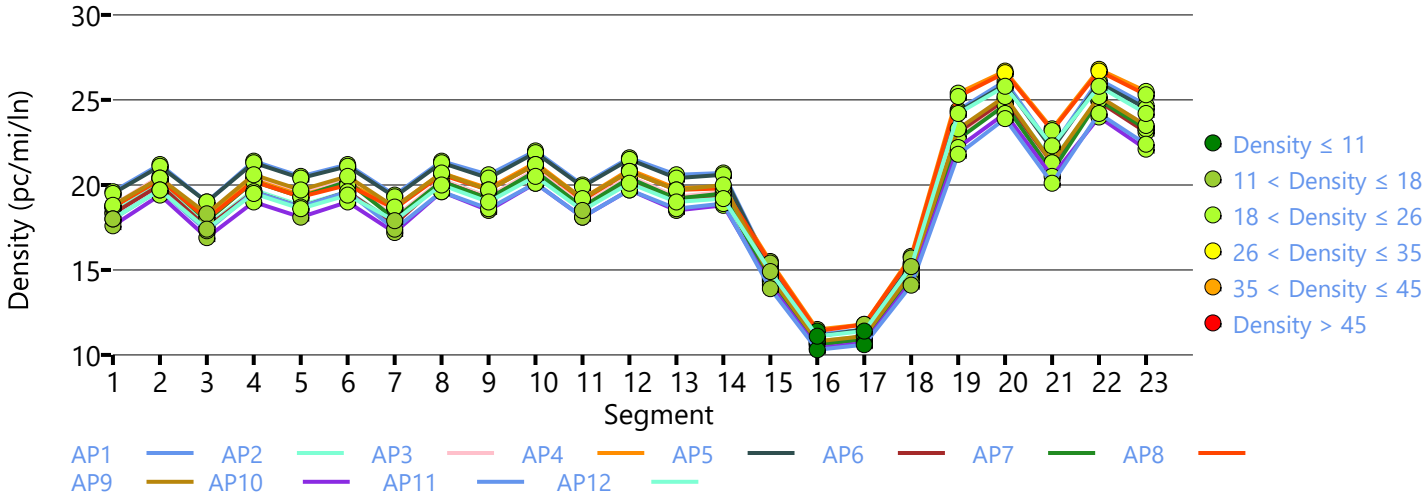
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 6/27/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | SB I-39/90/94 WIS 33 To WIS 60 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 17 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 19.90 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |
| 2 | Diverge | Diverge | I-39 EB Off | 1500 | 2 |
| 3 | Basic | Basic | I-39 EB Off to I-39 EB On | 5976 | 2 |
| 4 | Merge | Merge | I-39 EB On | 1500 | 3 |
| 5 | Basic | Basic | I-39 to Rest Area | 14012 | 3 |
| 6 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 7 | Basic | Basic | Rest Area Between Off and On | 3808 | 3 |
| 8 | Merge | Merge | Rest Area On | 1500 | 3 |
| 9 | Basic | Basic | I-39 to CTH CS | 10077 | 3 |
| 10 | Diverge | Diverge | CTH CS EB Off | 1500 | 3 |
| 11 | Basic | Basic | CTH CS between on and off | 1093 | 3 |
| 12 | Merge | Merge | CTH CS EB On | 1500 | 3 |
| 13 | Basic | Basic | CTH CS to STH 60 | 16976 | 3 |
| 14 | Diverge | Diverge | STH 60 EB Off | 1500 | 3 |
| 15 | Basic | Basic | STH 60 Between off and On | 1076 | 3 |
| 16 | Merge | Merge | STH 60 EB On | 1500 | 3 |
| 17 | Basic | Basic | STH 60 to CTH V | 32877 | 3 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 2930 | 4269 | 0.69 | 64.7 | 22.6 | C |
| 2 | 1.00 | 0.895 | 3132 | 4269 | 0.73 | 63.0 | 24.9 | C |
| 3 | 1.00 | 0.895 | 3313 | 4269 | 0.78 | 61.3 | 27.0 | D |
| 4 | 1.00 | 0.895 | 3342 | 4269 | 0.78 | 61.0 | 27.4 | D |
| 5 | 1.00 | 0.895 | 2993 | 4269 | 0.70 | 64.2 | 23.3 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 0.895 | 3249 | 4269 | 0.76 | 61.9 | 26.2 | D |
| 7 | 1.00 | 0.895 | 3437 | 4269 | 0.81 | 59.9 | 28.7 | D |
| 8 | 1.00 | 0.895 | 3483 | 4269 | 0.82 | 59.4 | 29.3 | D |
| 9 | 1.00 | 0.895 | 2916 | 4269 | 0.68 | 64.8 | 22.5 | C |
| 10 | 1.00 | 0.895 | 3122 | 4269 | 0.73 | 63.1 | 24.7 | C |
| 11 | 1.00 | 0.895 | 3298 | 4269 | 0.77 | 61.4 | 26.9 | D |
| 12 | 1.00 | 0.895 | 3327 | 4269 | 0.78 | 61.1 | 27.2 | D |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.895 | 0.854 | 2930 | 141 | 4221 | 1886 | 0.69 | 0.07 | 60.7 | 60.7 | 24.1 | 17.4 | B |
| 2 | 1.00 | 1.00 | 0.895 | 0.854 | 3132 | 242 | 4221 | 1886 | 0.74 | 0.13 | 60.4 | 60.4 | 25.9 | 19.2 | B |
| 3 | 1.00 | 1.00 | 0.895 | 0.854 | 3313 | 114 | 4221 | 1886 | 0.78 | 0.06 | 60.8 | 60.8 | 27.2 | 20.7 | C |
| 4 | 1.00 | 1.00 | 0.895 | 0.854 | 3342 | 132 | 4221 | 1886 | 0.79 | 0.07 | 60.7 | 60.7 | 27.5 | 21.0 | C |
| 5 | 1.00 | 1.00 | 0.895 | 0.854 | 2993 | 146 | 4221 | 1886 | 0.71 | 0.08 | 60.7 | 60.7 | 24.7 | 18.0 | B |
| 6 | 1.00 | 1.00 | 0.895 | 0.854 | 3249 | 253 | 4221 | 1886 | 0.77 | 0.13 | 60.4 | 60.4 | 26.9 | 20.2 | C |
| 7 | 1.00 | 1.00 | 0.895 | 0.854 | 3437 | 118 | 4221 | 1886 | 0.81 | 0.06 | 60.7 | 60.7 | 28.3 | 21.8 | C |
| 8 | 1.00 | 1.00 | 0.895 | 0.854 | 3483 | 138 | 4221 | 1886 | 0.83 | 0.07 | 60.7 | 60.7 | 28.7 | 22.2 | C |
| 9 | 1.00 | 1.00 | 0.895 | 0.854 | 2916 | 108 | 4221 | 1886 | 0.69 | 0.06 | 60.8 | 60.8 | 24.0 | 17.3 | B |
| 10 | 1.00 | 1.00 | 0.895 | 0.854 | 3122 | 186 | 4221 | 1886 | 0.74 | 0.10 | 60.6 | 60.6 | 25.8 | 19.1 | B |
| 11 | 1.00 | 1.00 | 0.895 | 0.854 | 3298 | 87 | 4221 | 1886 | 0.78 | 0.05 | 60.8 | 60.8 | 27.1 | 20.6 | C |
| 12 | 1.00 | 1.00 | 0.895 | 0.854 | 3327 | 102 | 4221 | 1886 | 0.79 | 0.05 | 60.8 | 60.8 | 27.4 | 20.8 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 2786 | 4269 | 0.65 | 65.6 | 21.2 | C |
| 2 | 1.00 | 0.898 | 2891 | 4269 | 0.68 | 64.9 | 22.3 | C |
| 3 | 1.00 | 0.898 | 3194 | 4269 | 0.75 | 62.5 | 25.6 | C |
| 4 | 1.00 | 0.898 | 3205 | 4269 | 0.75 | 62.4 | 25.7 | C |
| 5 | 1.00 | 0.898 | 2844 | 4269 | 0.67 | 65.2 | 21.8 | C |
| 6 | 1.00 | 0.898 | 2998 | 4269 | 0.70 | 64.2 | 23.3 | C |
| 7 | 1.00 | 0.898 | 3313 | 4269 | 0.78 | 61.3 | 27.0 | D |
| 8 | 1.00 | 0.898 | 3340 | 4269 | 0.78 | 61.0 | 27.4 | D |
| 9 | 1.00 | 0.898 | 2804 | 4269 | 0.66 | 65.5 | 21.4 | C |
| 10 | 1.00 | 0.898 | 2934 | 4269 | 0.69 | 64.6 | 22.7 | C |
| 11 | 1.00 | 0.898 | 3205 | 4269 | 0.75 | 62.4 | 25.7 | C |
| 12 | 1.00 | 0.898 | 3219 | 4269 | 0.75 | 62.2 | 25.9 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.898 | 0.903 | 4263 | 1477 | 6331 | 3951 | 0.67 | 0.37 | 63.1 | 62.0 | 22.5 | 19.4 | B |
| 2 | 1.00 | 1.00 | 0.898 | 0.903 | 4328 | 1437 | 6331 | 3951 | 0.68 | 0.36 | 63.0 | 61.9 | 22.9 | 19.6 | B |
| 3 | 1.00 | 1.00 | 0.898 | 0.903 | 4575 | 1381 | 6331 | 3951 | 0.72 | 0.35 | 62.8 | 61.6 | 24.3 | 20.5 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.903 | 4554 | 1349 | 6331 | 3951 | 0.72 | 0.34 | 62.9 | 61.7 | 24.1 | 20.3 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.903 | 4386 | 1542 | 6331 | 3951 | 0.69 | 0.39 | 63.0 | 61.8 | 23.2 | 20.1 | C |
| 6 | 1.00 | 1.00 | 0.898 | 0.903 | 4499 | 1501 | 6331 | 3951 | 0.71 | 0.38 | 62.8 | 61.6 | 23.9 | 20.5 | C |
| 7 | 1.00 | 1.00 | 0.898 | 0.903 | 4754 | 1441 | 6331 | 3951 | 0.75 | 0.36 | 62.5 | 61.3 | 25.4 | 21.5 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.903 | 4749 | 1409 | 6331 | 3951 | 0.75 | 0.36 | 62.5 | 61.3 | 25.3 | 21.4 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.903 | 3938 | 1134 | 6331 | 3951 | 0.62 | 0.29 | 63.7 | 62.6 | 20.6 | 17.0 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.903 | 4037 | 1103 | 6331 | 3951 | 0.64 | 0.28 | 63.6 | 62.6 | 21.2 | 17.3 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.903 | 4264 | 1059 | 6331 | 3951 | 0.67 | 0.27 | 63.4 | 62.3 | 22.4 | 18.2 | B |
| 12 | 1.00 | 1.00 | 0.898 | 0.903 | 4254 | 1035 | 6331 | 3951 | 0.67 | 0.26 | 63.4 | 62.4 | 22.4 | 18.1 | B |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.899 | 4267 | 6433 | 0.66 | 66.0 | 21.5 | C |
| 2 | 1.00 | 0.899 | 4331 | 6433 | 0.67 | 65.7 | 22.0 | C |
| 3 | 1.00 | 0.899 | 4577 | 6433 | 0.71 | 64.4 | 23.7 | C |
| 4 | 1.00 | 0.899 | 4556 | 6433 | 0.71 | 64.5 | 23.6 | C |
| 5 | 1.00 | 0.899 | 4389 | 6433 | 0.68 | 65.4 | 22.4 | C |
| 6 | 1.00 | 0.899 | 4502 | 6433 | 0.70 | 64.8 | 23.2 | C |
| 7 | 1.00 | 0.899 | 4756 | 6433 | 0.74 | 63.3 | 25.0 | C |
| 8 | 1.00 | 0.899 | 4751 | 6433 | 0.74 | 63.3 | 25.0 | C |
| 9 | 1.00 | 0.899 | 3940 | 6433 | 0.61 | 67.3 | 19.5 | C |
| 10 | 1.00 | 0.899 | 4039 | 6433 | 0.63 | 66.9 | 20.1 | C |
| 11 | 1.00 | 0.899 | 4265 | 6433 | 0.66 | 66.0 | 21.5 | C |
| 12 | 1.00 | 0.899 | 4256 | 6433 | 0.66 | 66.0 | 21.5 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.899 | 0.909 | 4267 | 80 | 6331 | 1796 | 0.67 | 0.04 | 61.1 | 56.1 | 23.3 | 24.7 | C |
| 2 | 1.00 | 1.00 | 0.899 | 0.909 | 4331 | 83 | 6331 | 1796 | 0.68 | 0.05 | 61.1 | 56.1 | 23.6 | 25.0 | C |
| 3 | 1.00 | 1.00 | 0.899 | 0.909 | 4577 | 87 | 6331 | 1796 | 0.72 | 0.05 | 61.1 | 56.1 | 25.0 | 26.2 | C |
| 4 | 1.00 | 1.00 | 0.899 | 0.909 | 4556 | 87 | 6331 | 1796 | 0.72 | 0.05 | 61.1 | 56.1 | 24.9 | 26.1 | C |
| 5 | 1.00 | 1.00 | 0.899 | 0.909 | 4389 | 84 | 6331 | 1796 | 0.69 | 0.05 | 61.1 | 56.1 | 23.9 | 25.3 | C |
| 6 | 1.00 | 1.00 | 0.899 | 0.909 | 4502 | 87 | 6331 | 1796 | 0.71 | 0.05 | 61.1 | 56.1 | 24.6 | 25.8 | C |
| 7 | 1.00 | 1.00 | 0.899 | 0.909 | 4756 | 91 | 6331 | 1796 | 0.75 | 0.05 | 61.1 | 56.1 | 25.9 | 27.0 | C |
| 8 | 1.00 | 1.00 | 0.899 | 0.909 | 4751 | 91 | 6331 | 1796 | 0.75 | 0.05 | 61.1 | 56.1 | 25.9 | 27.0 | C |
| 9 | 1.00 | 1.00 | 0.899 | 0.909 | 3940 | 62 | 6331 | 1796 | 0.62 | 0.03 | 61.1 | 56.1 | 21.5 | 23.2 | C |
| 10 | 1.00 | 1.00 | 0.899 | 0.909 | 4039 | 64 | 6331 | 1796 | 0.64 | 0.04 | 61.1 | 56.1 | 22.0 | 23.6 | C |
| 11 | 1.00 | 1.00 | 0.899 | 0.909 | 4265 | 67 | 6331 | 1796 | 0.67 | 0.04 | 61.1 | 56.1 | 23.3 | 24.7 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | 1.00 | 0.899 | 0.909 | 4256 | 67 | 6331 | 1796 | 0.67 | 0.04 | 61.1 | 56.1 | 23.2 | 24.7 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.899 | 4186 | 6433 | 0.65 | 66.3 | 21.0 | C |
| 2 | 1.00 | 0.899 | 4248 | 6433 | 0.66 | 66.1 | 21.4 | C |
| 3 | 1.00 | 0.899 | 4489 | 6433 | 0.70 | 64.9 | 23.1 | C |
| 4 | 1.00 | 0.899 | 4468 | 6433 | 0.69 | 65.0 | 22.9 | C |
| 5 | 1.00 | 0.899 | 4305 | 6433 | 0.67 | 65.8 | 21.8 | C |
| 6 | 1.00 | 0.899 | 4414 | 6433 | 0.69 | 65.3 | 22.5 | C |
| 7 | 1.00 | 0.899 | 4664 | 6433 | 0.73 | 63.9 | 24.3 | C |
| 8 | 1.00 | 0.899 | 4659 | 6433 | 0.72 | 63.9 | 24.3 | C |
| 9 | 1.00 | 0.899 | 3878 | 6433 | 0.60 | 67.5 | 19.2 | C |
| 10 | 1.00 | 0.899 | 3974 | 6433 | 0.62 | 67.1 | 19.7 | C |
| 11 | 1.00 | 0.899 | 4197 | 6433 | 0.65 | 66.3 | 21.1 | C |
| 12 | 1.00 | 0.899 | 4188 | 6433 | 0.65 | 66.3 | 21.1 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.899 | 0.909 | 4266 | 80 | 6331 | 1796 | 0.67 | 0.04 | 61.9 | 60.2 | 23.0 | 20.7 | C |
| 2 | 1.00 | 1.00 | 0.899 | 0.909 | 4331 | 83 | 6331 | 1796 | 0.68 | 0.05 | 61.8 | 60.1 | 23.4 | 21.0 | C |
| 3 | 1.00 | 1.00 | 0.899 | 0.909 | 4576 | 87 | 6331 | 1796 | 0.72 | 0.05 | 61.5 | 59.9 | 24.8 | 22.2 | C |
| 4 | 1.00 | 1.00 | 0.899 | 0.909 | 4555 | 87 | 6331 | 1796 | 0.72 | 0.05 | 61.5 | 59.9 | 24.7 | 22.1 | C |
| 5 | 1.00 | 1.00 | 0.899 | 0.909 | 4389 | 84 | 6331 | 1796 | 0.69 | 0.05 | 61.7 | 60.1 | 23.7 | 21.3 | C |
| 6 | 1.00 | 1.00 | 0.899 | 0.909 | 4501 | 87 | 6331 | 1796 | 0.71 | 0.05 | 61.6 | 60.0 | 24.4 | 21.8 | C |
| 7 | 1.00 | 1.00 | 0.899 | 0.909 | 4755 | 91 | 6331 | 1796 | 0.75 | 0.05 | 61.3 | 59.7 | 25.9 | 23.0 | C |
| 8 | 1.00 | 1.00 | 0.899 | 0.909 | 4750 | 91 | 6331 | 1796 | 0.75 | 0.05 | 61.3 | 59.7 | 25.8 | 23.0 | C |
| 9 | 1.00 | 1.00 | 0.899 | 0.909 | 3940 | 62 | 6331 | 1796 | 0.62 | 0.03 | 62.1 | 60.4 | 21.1 | 19.1 | B |
| 10 | 1.00 | 1.00 | 0.899 | 0.909 | 4038 | 64 | 6331 | 1796 | 0.64 | 0.04 | 62.1 | 60.4 | 21.7 | 19.6 | B |
| 11 | 1.00 | 1.00 | 0.899 | 0.909 | 4264 | 67 | 6331 | 1796 | 0.67 | 0.04 | 61.9 | 60.2 | 23.0 | 20.7 | C |
| 12 | 1.00 | 1.00 | 0.899 | 0.909 | 4255 | 67 | 6331 | 1796 | 0.67 | 0.04 | 61.9 | 60.2 | 22.9 | 20.6 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.899 | 4267 | 6377 | 0.67 | 64.6 | 22.0 | C |
| 2 | 1.00 | 0.899 | 4331 | 6377 | 0.68 | 64.3 | 22.5 | C |
| 3 | 1.00 | 0.899 | 4577 | 6377 | 0.72 | 63.1 | 24.2 | C |
| 4 | 1.00 | 0.899 | 4556 | 6377 | 0.71 | 63.2 | 24.0 | C |
| 5 | 1.00 | 0.899 | 4389 | 6377 | 0.69 | 64.0 | 22.9 | C |
| 6 | 1.00 | 0.899 | 4502 | 6377 | 0.71 | 63.5 | 23.6 | C |
| 7 | 1.00 | 0.899 | 4756 | 6377 | 0.75 | 62.1 | 25.5 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | 0.899 | 4751 | 6377 | 0.75 | 62.1 | 25.5 | C |
| 9 | 1.00 | 0.899 | 3940 | 6377 | 0.62 | 65.7 | 20.0 | C |
| 10 | 1.00 | 0.899 | 4039 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 11 | 1.00 | 0.899 | 4265 | 6377 | 0.67 | 64.6 | 22.0 | C |
| 12 | 1.00 | 0.899 | 4256 | 6377 | 0.67 | 64.6 | 22.0 | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.899 | 0.867 | 4267 | 260 | 6331 | 1886 | 0.67 | 0.14 | 63.1 | 58.8 | 22.5 | 26.3 | C |
| 2 | 1.00 | 1.00 | 0.899 | 0.867 | 4331 | 299 | 6331 | 1886 | 0.68 | 0.16 | 63.0 | 58.7 | 22.9 | 26.7 | C |
| 3 | 1.00 | 1.00 | 0.899 | 0.867 | 4577 | 291 | 6331 | 1886 | 0.72 | 0.15 | 63.1 | 58.8 | 24.2 | 27.8 | C |
| 4 | 1.00 | 1.00 | 0.899 | 0.867 | 4556 | 300 | 6331 | 1886 | 0.72 | 0.16 | 63.0 | 58.7 | 24.1 | 27.7 | C |
| 5 | 1.00 | 1.00 | 0.899 | 0.867 | 4389 | 271 | 6331 | 1886 | 0.69 | 0.14 | 63.1 | 58.8 | 23.2 | 26.9 | C |
| 6 | 1.00 | 1.00 | 0.899 | 0.867 | 4502 | 313 | 6331 | 1886 | 0.71 | 0.17 | 63.0 | 58.7 | 23.8 | 27.5 | C |
| 7 | 1.00 | 1.00 | 0.899 | 0.867 | 4756 | 303 | 6331 | 1886 | 0.75 | 0.16 | 63.0 | 58.7 | 25.2 | 28.6 | D |
| 8 | 1.00 | 1.00 | 0.899 | 0.867 | 4751 | 313 | 6331 | 1886 | 0.75 | 0.17 | 63.0 | 58.7 | 25.1 | 28.6 | D |
| 9 | 1.00 | 1.00 | 0.899 | 0.867 | 3940 | 198 | 6331 | 1886 | 0.62 | 0.11 | 63.3 | 59.0 | 20.7 | 24.7 | C |
| 10 | 1.00 | 1.00 | 0.899 | 0.867 | 4039 | 230 | 6331 | 1886 | 0.64 | 0.12 | 63.2 | 58.9 | 21.3 | 25.2 | C |
| 11 | 1.00 | 1.00 | 0.899 | 0.867 | 4265 | 224 | 6331 | 1886 | 0.67 | 0.12 | 63.2 | 58.9 | 22.5 | 26.3 | C |
| 12 | 1.00 | 1.00 | 0.899 | 0.867 | 4256 | 230 | 6331 | 1886 | 0.67 | 0.12 | 63.2 | 58.9 | 22.4 | 26.2 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.902 | 4003 | 6390 | 0.63 | 65.9 | 20.2 | C |
| 2 | 1.00 | 0.902 | 4030 | 6390 | 0.63 | 65.8 | 20.4 | C |
| 3 | 1.00 | 0.902 | 4283 | 6390 | 0.67 | 64.8 | 22.0 | C |
| 4 | 1.00 | 0.902 | 4253 | 6390 | 0.67 | 65.0 | 21.8 | C |
| 5 | 1.00 | 0.902 | 4114 | 6390 | 0.64 | 65.5 | 20.9 | C |
| 6 | 1.00 | 0.902 | 4186 | 6390 | 0.66 | 65.2 | 21.4 | C |
| 7 | 1.00 | 0.902 | 4449 | 6390 | 0.70 | 64.1 | 23.1 | C |
| 8 | 1.00 | 0.902 | 4435 | 6390 | 0.69 | 64.2 | 23.0 | C |
| 9 | 1.00 | 0.902 | 3736 | 6390 | 0.58 | 66.6 | 18.7 | C |
| 10 | 1.00 | 0.902 | 3805 | 6390 | 0.60 | 66.4 | 19.1 | C |
| 11 | 1.00 | 0.902 | 4035 | 6390 | 0.63 | 65.8 | 20.4 | C |
| 12 | 1.00 | 0.902 | 4021 | 6390 | 0.63 | 65.8 | 20.4 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.902 | 0.894 | 4171 | 168 | 6331 | 1886 | 0.66 | 0.09 | 62.4 | 61.0 | 22.3 | 19.4 | B |
| 2 | 1.00 | 1.00 | 0.902 | 0.894 | 4234 | 204 | 6331 | 1886 | 0.67 | 0.11 | 62.3 | 60.9 | 22.7 | 19.8 | B |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 1.00 | 0.902 | 0.894 | 4447 | 164 | 6331 | 1886 | 0.70 | 0.09 | 62.2 | 60.8 | 23.8 | 20.7 | C |
| 4 | 1.00 | 1.00 | 0.902 | 0.894 | 4424 | 171 | 6331 | 1886 | 0.70 | 0.09 | 62.2 | 60.8 | 23.7 | 20.6 | C |
| 5 | 1.00 | 1.00 | 0.902 | 0.894 | 4288 | 174 | 6331 | 1886 | 0.68 | 0.09 | 62.3 | 60.9 | 22.9 | 20.0 | B |
| 6 | 1.00 | 1.00 | 0.902 | 0.894 | 4399 | 213 | 6331 | 1886 | 0.69 | 0.11 | 62.2 | 60.8 | 23.6 | 20.6 | C |
| 7 | 1.00 | 1.00 | 0.902 | 0.894 | 4621 | 172 | 6331 | 1886 | 0.73 | 0.09 | 62.0 | 60.6 | 24.8 | 21.6 | C |
| 8 | 1.00 | 1.00 | 0.902 | 0.894 | 4614 | 179 | 6331 | 1886 | 0.73 | 0.09 | 61.9 | 60.6 | 24.8 | 21.6 | C |
| 9 | 1.00 | 1.00 | 0.902 | 0.894 | 3865 | 129 | 6331 | 1886 | 0.61 | 0.07 | 62.8 | 61.3 | 20.5 | 17.9 | B |
| 10 | 1.00 | 1.00 | 0.902 | 0.894 | 3962 | 157 | 6331 | 1886 | 0.63 | 0.08 | 62.7 | 61.2 | 21.1 | 18.4 | B |
| 11 | 1.00 | 1.00 | 0.902 | 0.894 | 4161 | 126 | 6331 | 1886 | 0.66 | 0.07 | 62.4 | 61.0 | 22.2 | 19.3 | B |
| 12 | 1.00 | 1.00 | 0.902 | 0.894 | 4153 | 132 | 6331 | 1886 | 0.66 | 0.07 | 62.4 | 61.0 | 22.2 | 19.3 | B |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.901 | 4174 | 6377 | 0.65 | 64.9 | 21.4 | C |
| 2 | 1.00 | 0.901 | 4236 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 3 | 1.00 | 0.901 | 4451 | 6377 | 0.70 | 63.7 | 23.3 | C |
| 4 | 1.00 | 0.901 | 4427 | 6377 | 0.69 | 63.9 | 23.1 | C |
| 5 | 1.00 | 0.901 | 4292 | 6377 | 0.67 | 64.5 | 22.2 | C |
| 6 | 1.00 | 0.901 | 4402 | 6377 | 0.69 | 64.0 | 22.9 | C |
| 7 | 1.00 | 0.901 | 4625 | 6377 | 0.73 | 62.8 | 24.6 | C |
| 8 | 1.00 | 0.901 | 4617 | 6377 | 0.72 | 62.9 | 24.5 | C |
| 9 | 1.00 | 0.901 | 3868 | 6377 | 0.61 | 65.9 | 19.6 | C |
| 10 | 1.00 | 0.901 | 3964 | 6377 | 0.62 | 65.6 | 20.1 | C |
| 11 | 1.00 | 0.901 | 4165 | 6377 | 0.65 | 65.0 | 21.4 | C |
| 12 | 1.00 | 0.901 | 4156 | 6377 | 0.65 | 65.0 | 21.3 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.901 | 0.949 | 4174 | 294 | 6331 | 1796 | 0.66 | 0.16 | 61.8 | 57.1 | 22.5 | 22.4 | C |
| 2 | 1.00 | 1.00 | 0.901 | 0.949 | 4236 | 271 | 6331 | 1796 | 0.67 | 0.15 | 61.9 | 57.2 | 22.8 | 22.7 | C |
| 3 | 1.00 | 1.00 | 0.901 | 0.949 | 4451 | 239 | 6331 | 1796 | 0.70 | 0.13 | 62.0 | 57.3 | 23.9 | 23.7 | C |
| 4 | 1.00 | 1.00 | 0.901 | 0.949 | 4427 | 205 | 6331 | 1796 | 0.70 | 0.11 | 62.0 | 57.4 | 23.8 | 23.5 | C |
| 5 | 1.00 | 1.00 | 0.901 | 0.949 | 4292 | 308 | 6331 | 1796 | 0.68 | 0.17 | 61.8 | 57.1 | 23.1 | 23.0 | C |
| 6 | 1.00 | 1.00 | 0.901 | 0.949 | 4402 | 282 | 6331 | 1796 | 0.70 | 0.16 | 61.9 | 57.2 | 23.7 | 23.5 | C |
| 7 | 1.00 | 1.00 | 0.901 | 0.949 | 4625 | 250 | 6331 | 1796 | 0.73 | 0.14 | 61.9 | 57.2 | 24.9 | 24.5 | C |
| 8 | 1.00 | 1.00 | 0.901 | 0.949 | 4617 | 214 | 6331 | 1796 | 0.73 | 0.12 | 62.0 | 57.3 | 24.8 | 24.4 | C |
| 9 | 1.00 | 1.00 | 0.901 | 0.949 | 3868 | 226 | 6331 | 1796 | 0.61 | 0.13 | 62.0 | 57.3 | 20.8 | 20.9 | C |
| 10 | 1.00 | 1.00 | 0.901 | 0.949 | 3964 | 208 | 6331 | 1796 | 0.63 | 0.12 | 62.1 | 57.4 | 21.3 | 21.3 | C |
| 11 | 1.00 | 1.00 | 0.901 | 0.949 | 4165 | 183 | 6331 | 1796 | 0.66 | 0.10 | 62.1 | 57.4 | 22.4 | 22.2 | C |
| 12 | 1.00 | 1.00 | 0.901 | 0.949 | 4156 | 157 | 6331 | 1796 | 0.66 | 0.09 | 62.2 | 57.5 | 22.3 | 22.2 | C |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.901 | 3865 | 6404 | 0.60 | 66.7 | 19.3 | C |
| 2 | 1.00 | 0.901 | 3951 | 6404 | 0.62 | 66.4 | 19.8 | C |
| 3 | 1.00 | 0.901 | 4199 | 6404 | 0.66 | 65.5 | 21.4 | C |
| 4 | 1.00 | 0.901 | 4211 | 6404 | 0.66 | 65.5 | 21.4 | C |
| 5 | 1.00 | 0.901 | 3968 | 6404 | 0.62 | 66.4 | 19.9 | C |
| 6 | 1.00 | 0.901 | 4104 | 6404 | 0.64 | 65.9 | 20.8 | C |
| 7 | 1.00 | 0.901 | 4362 | 6404 | 0.68 | 64.8 | 22.4 | C |
| 8 | 1.00 | 0.901 | 4392 | 6404 | 0.69 | 64.7 | 22.6 | C |
| 9 | 1.00 | 0.901 | 3630 | 6404 | 0.57 | 67.0 | 18.0 | B |
| 10 | 1.00 | 0.901 | 3746 | 6404 | 0.58 | 67.0 | 18.6 | C |
| 11 | 1.00 | 0.901 | 3972 | 6404 | 0.62 | 66.3 | 20.0 | C |
| 12 | 1.00 | 0.901 | 3991 | 6404 | 0.62 | 66.3 | 20.1 | C |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.941 | 4035 | 157 | 6331 | 1886 | 0.64 | 0.08 | 62.6 | 61.1 | 21.5 | 18.8 | B |
| 2 | 1.00 | 1.00 | 0.898 | 0.941 | 4166 | 202 | 6331 | 1886 | 0.66 | 0.11 | 62.5 | 61.1 | 22.2 | 19.1 | B |
| 3 | 1.00 | 1.00 | 0.898 | 0.941 | 4437 | 224 | 6331 | 1886 | 0.70 | 0.12 | 62.2 | 60.8 | 23.8 | 20.2 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.941 | 4435 | 210 | 6331 | 1886 | 0.70 | 0.11 | 62.2 | 60.9 | 23.8 | 20.2 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.941 | 4146 | 165 | 6331 | 1886 | 0.65 | 0.09 | 62.5 | 61.1 | 22.1 | 18.9 | B |
| 6 | 1.00 | 1.00 | 0.898 | 0.941 | 4328 | 210 | 6331 | 1886 | 0.68 | 0.11 | 62.3 | 60.9 | 23.2 | 19.8 | B |
| 7 | 1.00 | 1.00 | 0.898 | 0.941 | 4610 | 234 | 6331 | 1886 | 0.73 | 0.12 | 62.0 | 60.7 | 24.8 | 21.0 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.941 | 4625 | 219 | 6331 | 1886 | 0.73 | 0.12 | 62.0 | 60.7 | 24.9 | 21.0 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.941 | 3764 | 121 | 6331 | 1886 | 0.59 | 0.06 | 62.8 | 61.3 | 20.0 | 17.4 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.941 | 3913 | 155 | 6331 | 1886 | 0.62 | 0.08 | 62.7 | 61.2 | 20.8 | 18.2 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.941 | 4158 | 172 | 6331 | 1886 | 0.66 | 0.09 | 62.5 | 61.1 | 22.2 | 18.9 | B |
| 12 | 1.00 | 1.00 | 0.898 | 0.941 | 4166 | 162 | 6331 | 1886 | 0.66 | 0.09 | 62.5 | 61.1 | 22.2 | 19.0 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.900 | 4033 | 6433 | 0.63 | 66.9 | 20.1 | C |
| 2 | 1.00 | 0.900 | 4167 | 6433 | 0.65 | 66.4 | 20.9 | C |
| 3 | 1.00 | 0.900 | 4438 | 6433 | 0.69 | 65.1 | 22.7 | C |
| 4 | 1.00 | 0.900 | 4436 | 6433 | 0.69 | 65.1 | 22.7 | C |
| 5 | 1.00 | 0.900 | 4144 | 6433 | 0.64 | 66.5 | 20.8 | C |
| 6 | 1.00 | 0.900 | 4329 | 6433 | 0.67 | 65.7 | 22.0 | C |
| 7 | 1.00 | 0.900 | 4611 | 6433 | 0.72 | 64.2 | 23.9 | C |
| 8 | 1.00 | 0.900 | 4626 | 6433 | 0.72 | 64.1 | 24.1 | C |
| 9 | 1.00 | 0.900 | 3761 | 6433 | 0.58 | 67.8 | 18.5 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 0.900 | 3912 | 6433 | 0.61 | 67.4 | 19.3 | C |
| 11 | 1.00 | 0.900 | 4157 | 6433 | 0.65 | 66.4 | 20.9 | C |
| 12 | 1.00 | 0.900 | 4164 | 6433 | 0.65 | 66.4 | 20.9 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 17761 | 17641 | 10.69 | 65.4 | 21.2 | 19.1 | 18.30 | C |
| 2 | 18208 | 18085 | 12.69 | 65.0 | 21.9 | 19.7 | 18.40 | C |
| 3 | 19308 | 19190 | 18.76 | 63.9 | 23.6 | 21.2 | 18.70 | D |
| 4 | 19268 | 19152 | 18.54 | 63.9 | 23.6 | 21.2 | 18.70 | D |
| 5 | 18248 | 18122 | 12.76 | 65.0 | 22.0 | 19.7 | 18.40 | C |
| 6 | 18916 | 18788 | 16.28 | 64.3 | 23.0 | 20.7 | 18.60 | D |
| 7 | 20060 | 19936 | 23.93 | 63.0 | 24.9 | 22.4 | 19.00 | D |
| 8 | 20091 | 19970 | 24.26 | 62.9 | 25.0 | 22.5 | 19.00 | D |
| 9 | 16609 | 16516 | 6.84 | 66.2 | 19.6 | 17.7 | 18.00 | C |
| 10 | 17172 | 17078 | 8.75 | 65.8 | 20.4 | 18.3 | 18.10 | C |
| 11 | 18182 | 18091 | 12.97 | 64.9 | 21.9 | 19.7 | 18.40 | C |
| 12 | 18187 | 18098 | 13.10 | 64.9 | 21.9 | 19.7 | 18.40 | C |

## Facility Overall Results

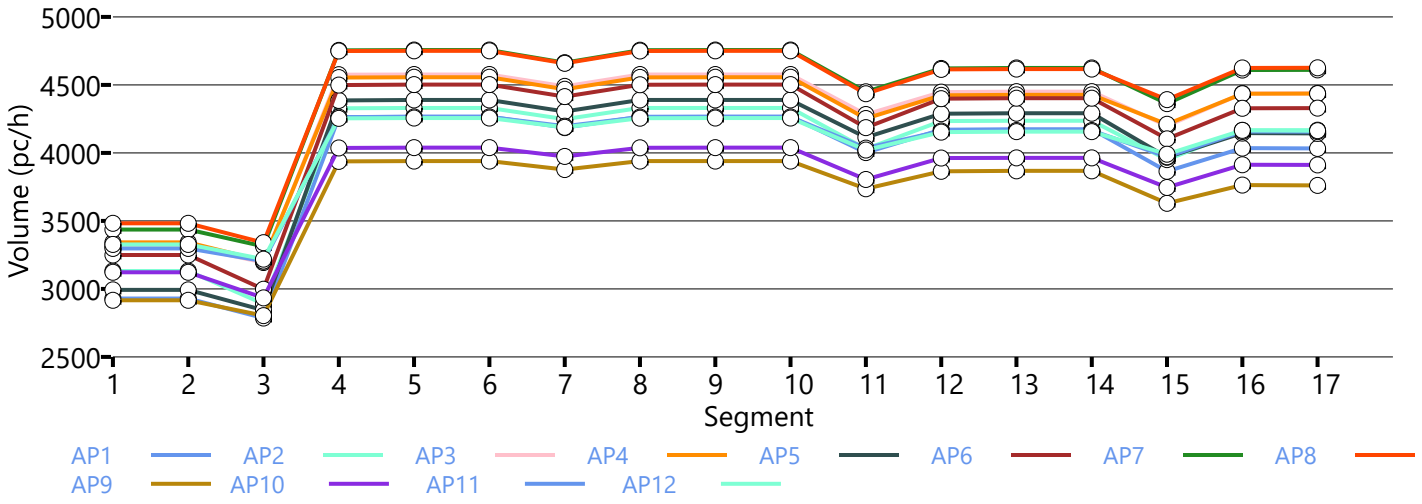
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 64.5 | Density, veh/mi/ln | 20.1 |
| Average Travel Time, min | 18.50 | Density, pc/mi/ln | 22.4 |

## Messages

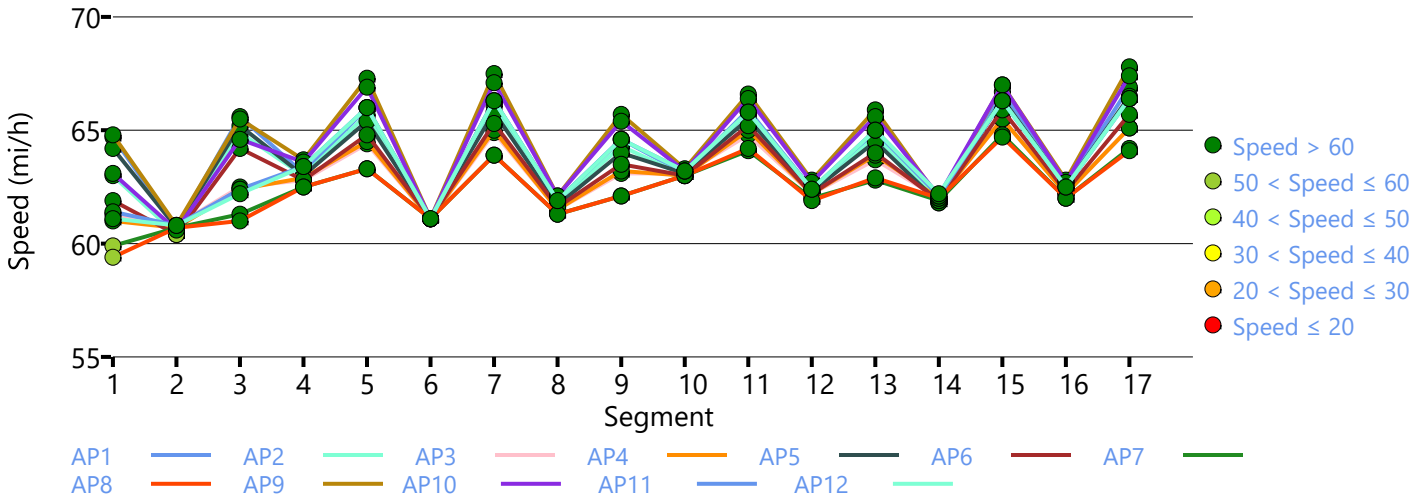
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

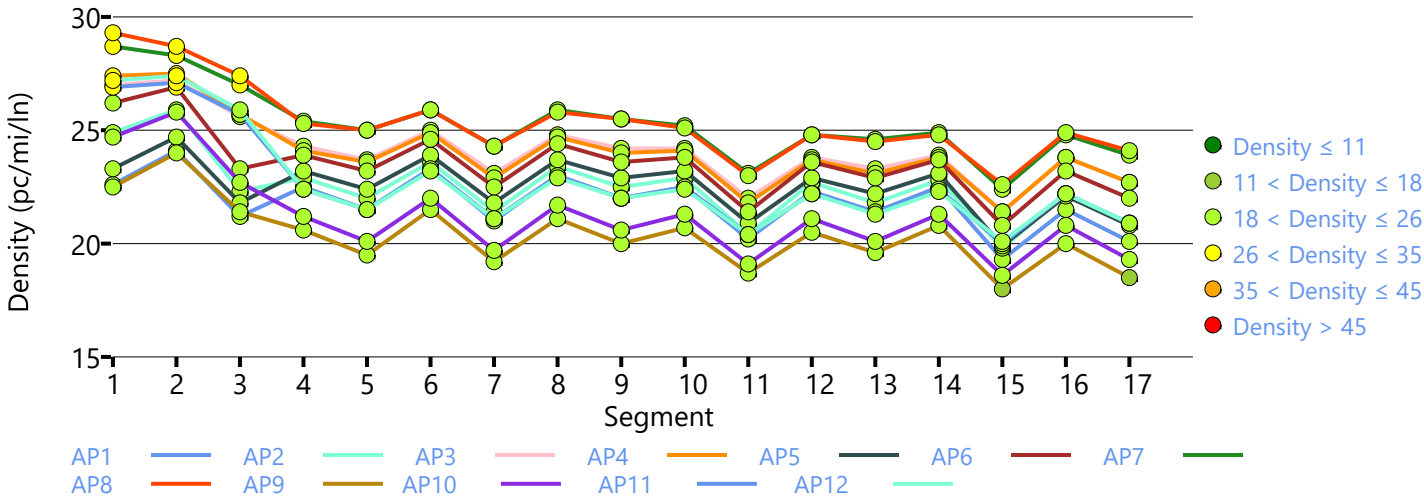
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 8/6/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | NB I-90/94 WIS 33 to US 12 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 18 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 26.35 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 33 to USH 12 | 66971 | 2 |
| 2 | Diverge | Diverge | USH 12 WB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12 between on and off | 1694 | 2 |
| 4 | Merge | Merge | USH 12 NB On | 831 | 2 |
| 5 | Merge | Merge | USH 12 WB On | 1500 | 2 |
| 6 | Basic | Basic | STH 23 to USH 12 | 6984 | 2 |
| 7 | Diverge | Diverge | STH 23 WB Off | 1500 | 2 |
| 8 | Basic | Basic | STH 23 between on and off | 3184 | 2 |
| 9 | Merge | Merge | STH 23 WB On | 1500 | 2 |
| 10 | Basic | Basic | STH 13 to STH 23 | 7816 | 2 |
| 11 | Diverge | Diverge | STH 13 WB Off | 1500 | 2 |
| 12 | Basic | Basic | STH 13 between on and off | 1620 | 2 |
| 13 | Merge | Merge | STH 13 WB On | 1500 | 2 |
| 14 | Basic | Basic | USH 12/STH 16 to STH 13 | 4727 | 2 |
| 15 | Diverge | Diverge | USH 12/STH 16 WB Off | 1500 | 2 |
| 16 | Basic | Basic | USH 12/STH 16 between on and off | 2705 | 2 |
| 17 | Merge | Merge | USH 12/STH 16 WB On | 1500 | 2 |
| 18 | Basic | Basic | CTH HH to USH 12/STH 16 | 30590 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3303 | 4289 | 0.77 | 62.0 | 26.6 | D |
| 2 | 1.00 | 0.849 | 2960 | 4289 | 0.69 | 65.1 | 22.7 | C |
| 3 | 1.00 | 0.849 | 3012 | 4289 | 0.70 | 64.7 | 23.3 | C |
| 4 | 1.00 | 0.849 | 3094 | 4289 | 0.72 | 64.0 | 24.2 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 0.849 | 3451 | 4289 | 0.80 | 60.3 | 28.6 | D |
| 6 | 1.00 | 0.849 | 3098 | 4289 | 0.72 | 64.0 | 24.2 | C |
| 7 | 1.00 | 0.849 | 3150 | 4289 | 0.73 | 63.5 | 24.8 | C |
| 8 | 1.00 | 0.849 | 3237 | 4289 | 0.75 | 62.7 | 25.8 | C |
| 9 | 1.00 | 0.849 | 3463 | 4289 | 0.81 | 60.2 | 28.8 | D |
| 10 | 1.00 | 0.849 | 3106 | 4289 | 0.72 | 63.9 | 24.3 | C |
| 11 | 1.00 | 0.849 | 3161 | 4289 | 0.74 | 63.4 | 24.9 | C |
| 12 | 1.00 | 0.849 | 3247 | 4289 | 0.76 | 62.6 | 25.9 | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.914 | 3303 | 911 | 4221 | 1886 | 0.78 | 0.48 | 58.8 | 58.8 | 28.1 | 28.1 | D |
| 2 | 1.00 | 1.00 | 0.849 | 0.914 | 2960 | 708 | 4221 | 1886 | 0.70 | 0.38 | 59.3 | 59.3 | 25.0 | 25.2 | C |
| 3 | 1.00 | 1.00 | 0.849 | 0.914 | 3012 | 887 | 4221 | 1886 | 0.71 | 0.47 | 58.9 | 58.9 | 25.6 | 25.6 | C |
| 4 | 1.00 | 1.00 | 0.849 | 0.914 | 3094 | 761 | 4221 | 1886 | 0.73 | 0.40 | 59.2 | 59.2 | 26.1 | 26.4 | C |
| 5 | 1.00 | 1.00 | 0.849 | 0.914 | 3451 | 995 | 4221 | 1886 | 0.82 | 0.53 | 58.6 | 58.6 | 29.4 | 29.4 | D |
| 6 | 1.00 | 1.00 | 0.849 | 0.914 | 3098 | 772 | 4221 | 1886 | 0.73 | 0.41 | 59.2 | 59.2 | 26.2 | 26.4 | C |
| 7 | 1.00 | 1.00 | 0.849 | 0.914 | 3150 | 968 | 4221 | 1886 | 0.75 | 0.51 | 58.7 | 58.7 | 26.8 | 26.8 | C |
| 8 | 1.00 | 1.00 | 0.849 | 0.914 | 3237 | 830 | 4221 | 1886 | 0.77 | 0.44 | 59.0 | 59.0 | 27.4 | 27.6 | C |
| 9 | 1.00 | 1.00 | 0.849 | 0.914 | 3463 | 950 | 4221 | 1886 | 0.82 | 0.50 | 58.7 | 58.7 | 29.5 | 29.5 | D |
| 10 | 1.00 | 1.00 | 0.849 | 0.914 | 3106 | 737 | 4221 | 1886 | 0.74 | 0.39 | 59.2 | 59.2 | 26.2 | 26.5 | C |
| 11 | 1.00 | 1.00 | 0.849 | 0.914 | 3161 | 925 | 4221 | 1886 | 0.75 | 0.49 | 58.8 | 58.8 | 26.9 | 26.9 | C |
| 12 | 1.00 | 1.00 | 0.849 | 0.914 | 3247 | 793 | 4221 | 1886 | 0.77 | 0.42 | 59.1 | 59.1 | 27.5 | 27.7 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.824 | 2392 | 4244 | 0.56 | 65.7 | 18.1 | C |
| 2 | 1.00 | 0.824 | 2265 | 4244 | 0.53 | 65.8 | 17.1 | B |
| 3 | 1.00 | 0.824 | 2119 | 4244 | 0.50 | 65.7 | 16.0 | B |
| 4 | 1.00 | 0.824 | 2343 | 4244 | 0.55 | 65.8 | 17.7 | B |
| 5 | 1.00 | 0.824 | 2453 | 4244 | 0.58 | 65.7 | 18.6 | C |
| 6 | 1.00 | 0.824 | 2335 | 4244 | 0.55 | 65.8 | 17.6 | B |
| 7 | 1.00 | 0.824 | 2171 | 4244 | 0.51 | 65.7 | 16.4 | B |
| 8 | 1.00 | 0.824 | 2414 | 4244 | 0.57 | 65.8 | 18.3 | C |
| 9 | 1.00 | 0.824 | 2515 | 4244 | 0.59 | 65.7 | 19.1 | C |
| 10 | 1.00 | 0.824 | 2382 | 4244 | 0.56 | 65.8 | 18.0 | B |
| 11 | 1.00 | 0.824 | 2232 | 4244 | 0.53 | 65.7 | 16.8 | B |
| 12 | 1.00 | 0.824 | 2466 | 4244 | 0.58 | 65.8 | 18.7 | C |

## Segment 4: Merge

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.824 | 0.901 | 2909 | 517 | 4221 | 1796 | 0.69 | 0.29 | 59.7 | 59.7 | 24.4 | 22.8 | C |
| 2 | 1.00 | 1.00 | 0.824 | 0.901 | 2883 | 618 | 4221 | 1796 | 0.68 | 0.34 | 59.7 | 59.7 | 24.1 | 22.5 | C |
| 3 | 1.00 | 1.00 | 0.824 | 0.901 | 2682 | 563 | 4221 | 1796 | 0.64 | 0.31 | 60.1 | 60.1 | 22.3 | 21.0 | C |
| 4 | 1.00 | 1.00 | 0.824 | 0.901 | 2962 | 619 | 4221 | 1796 | 0.70 | 0.34 | 59.6 | 59.6 | 24.8 | 23.2 | C |
| 5 | 1.00 | 1.00 | 0.824 | 0.901 | 3018 | 565 | 4221 | 1796 | 0.71 | 0.31 | 59.5 | 59.5 | 25.4 | 23.6 | C |
| 6 | 1.00 | 1.00 | 0.824 | 0.901 | 3010 | 675 | 4221 | 1796 | 0.71 | 0.38 | 59.5 | 59.5 | 25.3 | 23.5 | C |
| 7 | 1.00 | 1.00 | 0.824 | 0.901 | 2786 | 615 | 4221 | 1796 | 0.66 | 0.34 | 59.9 | 59.9 | 23.3 | 21.8 | C |
| 8 | 1.00 | 1.00 | 0.824 | 0.901 | 3090 | 676 | 4221 | 1796 | 0.73 | 0.38 | 59.3 | 59.3 | 26.1 | 24.1 | C |
| 9 | 1.00 | 1.00 | 0.824 | 0.901 | 3054 | 539 | 4221 | 1796 | 0.72 | 0.30 | 59.4 | 59.4 | 25.7 | 23.9 | C |
| 10 | 1.00 | 1.00 | 0.824 | 0.901 | 3027 | 645 | 4221 | 1796 | 0.72 | 0.36 | 59.5 | 59.5 | 25.4 | 23.7 | C |
| 11 | 1.00 | 1.00 | 0.824 | 0.901 | 2818 | 586 | 4221 | 1796 | 0.67 | 0.33 | 59.9 | 59.9 | 23.5 | 22.0 | C |
| 12 | 1.00 | 1.00 | 0.824 | 0.901 | 3111 | 645 | 4221 | 1796 | 0.74 | 0.36 | 59.3 | 59.3 | 26.2 | 24.3 | C |

## Segment 5: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.840 | 0.962 | 3144 | 243 | 4221 | 1886 | 0.74 | 0.13 | 59.9 | 59.9 | 26.2 | 23.8 | C |
| 2 | 1.00 | 1.00 | 0.840 | 0.962 | 3124 | 239 | 4221 | 1886 | 0.74 | 0.13 | 60.0 | 60.0 | 26.0 | 23.7 | C |
| 3 | 1.00 | 1.00 | 0.840 | 0.962 | 2898 | 216 | 4221 | 1886 | 0.69 | 0.11 | 60.5 | 60.5 | 24.0 | 21.9 | C |
| 4 | 1.00 | 1.00 | 0.840 | 0.962 | 3141 | 178 | 4221 | 1886 | 0.74 | 0.09 | 59.9 | 59.9 | 26.2 | 23.8 | C |
| 5 | 1.00 | 1.00 | 0.840 | 0.962 | 3277 | 265 | 4221 | 1886 | 0.78 | 0.14 | 59.6 | 59.6 | 27.5 | 24.8 | C |
| 6 | 1.00 | 1.00 | 0.840 | 0.962 | 3275 | 261 | 4221 | 1886 | 0.78 | 0.14 | 59.6 | 59.6 | 27.5 | 24.8 | C |
| 7 | 1.00 | 1.00 | 0.840 | 0.962 | 3025 | 236 | 4221 | 1886 | 0.72 | 0.13 | 60.2 | 60.2 | 25.1 | 22.9 | C |
| 8 | 1.00 | 1.00 | 0.840 | 0.962 | 3287 | 194 | 4221 | 1886 | 0.78 | 0.10 | 59.6 | 59.6 | 27.6 | 25.0 | C |
| 9 | 1.00 | 1.00 | 0.840 | 0.962 | 3299 | 254 | 4221 | 1886 | 0.78 | 0.13 | 59.5 | 59.5 | 27.7 | 25.0 | C |
| 10 | 1.00 | 1.00 | 0.840 | 0.962 | 3277 | 248 | 4221 | 1886 | 0.78 | 0.13 | 59.6 | 59.6 | 27.5 | 24.9 | C |
| 11 | 1.00 | 1.00 | 0.840 | 0.962 | 3044 | 226 | 4221 | 1886 | 0.72 | 0.12 | 60.2 | 60.2 | 25.3 | 23.0 | C |
| 12 | 1.00 | 1.00 | 0.840 | 0.962 | 3296 | 185 | 4221 | 1886 | 0.78 | 0.10 | 59.5 | 59.5 | 27.7 | 25.0 | C |

## Segment 6: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.850 | 3142 | 4244 | 0.74 | 62.1 | 25.3 | C |
| 2 | 1.00 | 0.850 | 3121 | 4244 | 0.74 | 62.3 | 25.0 | C |
| 3 | 1.00 | 0.850 | 2895 | 4244 | 0.68 | 64.0 | 22.6 | C |
| 4 | 1.00 | 0.850 | 3129 | 4244 | 0.74 | 62.2 | 25.1 | C |
| 5 | 1.00 | 0.850 | 3276 | 4244 | 0.77 | 60.9 | 26.9 | D |
| 6 | 1.00 | 0.850 | 3274 | 4244 | 0.77 | 60.9 | 26.9 | D |
| 7 | 1.00 | 0.850 | 3024 | 4244 | 0.71 | 63.1 | 24.0 | C |
| 8 | 1.00 | 0.850 | 3276 | 4244 | 0.77 | 60.9 | 26.9 | D |
| 9 | 1.00 | 0.850 | 3296 | 4244 | 0.78 | 60.7 | 27.1 | D |
| 10 | 1.00 | 0.850 | 3274 | 4244 | 0.77 | 60.9 | 26.9 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | | 0.850 | | 3040 | | 4244 | | 0.72 | | 62.9 | | 24.2 | | C |
| 12 | 1.00 | | 0.850 | | 3284 | | 4244 | | 0.77 | | 60.8 | | 27.0 | | D |

## Segment 7: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.850 | 0.930 | 3142 | 194 | 4221 | 1976 | 0.74 | 0.10 | 62.2 | 62.2 | 25.3 | 27.8 | C |
| 2 | 1.00 | 1.00 | 0.850 | 0.930 | 3121 | 177 | 4221 | 1976 | 0.74 | 0.09 | 62.2 | 62.2 | 25.1 | 27.6 | C |
| 3 | 1.00 | 1.00 | 0.850 | 0.930 | 2895 | 211 | 4221 | 1976 | 0.69 | 0.11 | 62.1 | 62.1 | 23.3 | 25.7 | C |
| 4 | 1.00 | 1.00 | 0.850 | 0.930 | 3129 | 167 | 4221 | 1976 | 0.74 | 0.08 | 62.2 | 62.2 | 25.2 | 27.7 | C |
| 5 | 1.00 | 1.00 | 0.850 | 0.930 | 3276 | 211 | 4221 | 1976 | 0.78 | 0.11 | 62.1 | 62.1 | 26.4 | 28.9 | D |
| 6 | 1.00 | 1.00 | 0.850 | 0.930 | 3274 | 194 | 4221 | 1976 | 0.78 | 0.10 | 62.2 | 62.2 | 26.3 | 28.9 | D |
| 7 | 1.00 | 1.00 | 0.850 | 0.930 | 3024 | 230 | 4221 | 1976 | 0.72 | 0.12 | 62.1 | 62.1 | 24.3 | 26.8 | C |
| 8 | 1.00 | 1.00 | 0.850 | 0.930 | 3276 | 183 | 4221 | 1976 | 0.78 | 0.09 | 62.2 | 62.2 | 26.3 | 28.9 | D |
| 9 | 1.00 | 1.00 | 0.850 | 0.930 | 3296 | 201 | 4221 | 1976 | 0.78 | 0.10 | 62.2 | 62.2 | 26.5 | 29.1 | D |
| 10 | 1.00 | 1.00 | 0.850 | 0.930 | 3274 | 185 | 4221 | 1976 | 0.78 | 0.09 | 62.2 | 62.2 | 26.3 | 28.9 | D |
| 11 | 1.00 | 1.00 | 0.850 | 0.930 | 3040 | 219 | 4221 | 1976 | 0.72 | 0.11 | 62.1 | 62.1 | 24.5 | 26.9 | C |
| 12 | 1.00 | 1.00 | 0.850 | 0.930 | 3284 | 174 | 4221 | 1976 | 0.78 | 0.09 | 62.2 | 62.2 | 26.4 | 29.0 | D |

## Segment 8: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.844 | 2951 | 4230 | 0.70 | 63.1 | 23.4 | C |
| 2 | 1.00 | 0.844 | 2948 | 4230 | 0.70 | 63.1 | 23.4 | C |
| 3 | 1.00 | 0.844 | 2684 | 4230 | 0.63 | 64.5 | 20.8 | C |
| 4 | 1.00 | 0.844 | 2968 | 4230 | 0.70 | 63.0 | 23.6 | C |
| 5 | 1.00 | 0.844 | 3068 | 4230 | 0.73 | 62.2 | 24.7 | C |
| 6 | 1.00 | 0.844 | 3084 | 4230 | 0.73 | 62.1 | 24.8 | C |
| 7 | 1.00 | 0.844 | 2791 | 4230 | 0.66 | 64.0 | 21.8 | C |
| 8 | 1.00 | 0.844 | 3098 | 4230 | 0.73 | 62.0 | 25.0 | C |
| 9 | 1.00 | 0.844 | 3098 | 4230 | 0.73 | 62.0 | 25.0 | C |
| 10 | 1.00 | 0.844 | 3094 | 4230 | 0.73 | 62.0 | 25.0 | C |
| 11 | 1.00 | 0.844 | 2820 | 4230 | 0.67 | 63.9 | 22.1 | C |
| 12 | 1.00 | 0.844 | 3115 | 4230 | 0.74 | 61.8 | 25.2 | C |

## Segment 9: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.844 | 0.932 | 3291 | 340 | 4221 | 1886 | 0.78 | 0.18 | 60.1 | 60.1 | 27.4 | 24.1 | C |
| 2 | 1.00 | 1.00 | 0.844 | 0.932 | 3292 | 344 | 4221 | 1886 | 0.78 | 0.18 | 60.1 | 60.1 | 27.4 | 24.1 | C |
| 3 | 1.00 | 1.00 | 0.844 | 0.932 | 3067 | 383 | 4221 | 1886 | 0.73 | 0.20 | 60.7 | 60.7 | 25.3 | 22.4 | C |
| 4 | 1.00 | 1.00 | 0.844 | 0.932 | 3296 | 328 | 4221 | 1886 | 0.78 | 0.17 | 60.1 | 60.1 | 27.4 | 24.2 | C |
| 5 | 1.00 | 1.00 | 0.844 | 0.932 | 3439 | 371 | 4221 | 1886 | 0.81 | 0.20 | 59.6 | 59.6 | 28.9 | 25.3 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 1.00 | 0.844 | 0.932 | 3460 | 376 | 4221 | 1886 | 0.82 | 0.20 | 59.6 | 59.6 | 29.0 | 25.4 | C |
| 7 | 1.00 | 1.00 | 0.844 | 0.932 | 3209 | 418 | 4221 | 1886 | 0.76 | 0.22 | 60.3 | 60.3 | 26.6 | 23.5 | C |
| 8 | 1.00 | 1.00 | 0.844 | 0.932 | 3456 | 358 | 4221 | 1886 | 0.82 | 0.19 | 59.6 | 59.6 | 29.0 | 25.4 | C |
| 9 | 1.00 | 1.00 | 0.844 | 0.932 | 3452 | 354 | 4221 | 1886 | 0.82 | 0.19 | 59.6 | 59.6 | 29.0 | 25.4 | C |
| 10 | 1.00 | 1.00 | 0.844 | 0.932 | 3452 | 358 | 4221 | 1886 | 0.82 | 0.19 | 59.6 | 59.6 | 29.0 | 25.4 | C |
| 11 | 1.00 | 1.00 | 0.844 | 0.932 | 3219 | 399 | 4221 | 1886 | 0.76 | 0.21 | 60.3 | 60.3 | 26.7 | 23.5 | C |
| 12 | 1.00 | 1.00 | 0.844 | 0.932 | 3457 | 342 | 4221 | 1886 | 0.82 | 0.18 | 59.6 | 59.6 | 29.0 | 25.4 | C |

## Segment 10: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.854 | 3288 | 4244 | 0.77 | 60.8 | 27.0 | D |
| 2 | 1.00 | 0.854 | 3289 | 4244 | 0.77 | 60.8 | 27.0 | D |
| 3 | 1.00 | 0.854 | 3070 | 4244 | 0.72 | 62.7 | 24.5 | C |
| 4 | 1.00 | 0.854 | 3292 | 4244 | 0.78 | 60.7 | 27.1 | D |
| 5 | 1.00 | 0.854 | 3437 | 4244 | 0.81 | 59.2 | 29.0 | D |
| 6 | 1.00 | 0.854 | 3458 | 4244 | 0.81 | 58.9 | 29.4 | D |
| 7 | 1.00 | 0.854 | 3215 | 4244 | 0.76 | 61.4 | 26.2 | D |
| 8 | 1.00 | 0.854 | 3453 | 4244 | 0.81 | 59.0 | 29.3 | D |
| 9 | 1.00 | 0.854 | 3448 | 4244 | 0.81 | 59.0 | 29.2 | D |
| 10 | 1.00 | 0.854 | 3448 | 4244 | 0.81 | 59.0 | 29.2 | D |
| 11 | 1.00 | 0.854 | 3222 | 4244 | 0.76 | 61.4 | 26.2 | D |
| 12 | 1.00 | 0.854 | 3452 | 4244 | 0.81 | 59.0 | 29.3 | D |

## Segment 11: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.854 | 0.972 | 3288 | 244 | 4221 | 1796 | 0.78 | 0.14 | 57.3 | 57.3 | 28.7 | 28.5 | D |
| 2 | 1.00 | 1.00 | 0.854 | 0.972 | 3289 | 211 | 4221 | 1796 | 0.78 | 0.12 | 57.4 | 57.4 | 28.6 | 28.5 | D |
| 3 | 1.00 | 1.00 | 0.854 | 0.972 | 3070 | 243 | 4221 | 1796 | 0.73 | 0.14 | 57.3 | 57.3 | 26.8 | 26.6 | C |
| 4 | 1.00 | 1.00 | 0.854 | 0.972 | 3292 | 207 | 4221 | 1796 | 0.78 | 0.12 | 57.4 | 57.4 | 28.7 | 28.5 | D |
| 5 | 1.00 | 1.00 | 0.854 | 0.972 | 3437 | 266 | 4221 | 1796 | 0.81 | 0.15 | 57.2 | 57.2 | 30.0 | 29.8 | D |
| 6 | 1.00 | 1.00 | 0.854 | 0.972 | 3458 | 230 | 4221 | 1796 | 0.82 | 0.13 | 57.3 | 57.3 | 30.2 | 30.0 | D |
| 7 | 1.00 | 1.00 | 0.854 | 0.972 | 3215 | 265 | 4221 | 1796 | 0.76 | 0.15 | 57.2 | 57.2 | 28.1 | 27.9 | C |
| 8 | 1.00 | 1.00 | 0.854 | 0.972 | 3453 | 225 | 4221 | 1796 | 0.82 | 0.13 | 57.3 | 57.3 | 30.1 | 29.9 | D |
| 9 | 1.00 | 1.00 | 0.854 | 0.972 | 3448 | 254 | 4221 | 1796 | 0.82 | 0.14 | 57.2 | 57.2 | 30.1 | 29.9 | D |
| 10 | 1.00 | 1.00 | 0.854 | 0.972 | 3448 | 220 | 4221 | 1796 | 0.82 | 0.12 | 57.3 | 57.3 | 30.1 | 29.9 | D |
| 11 | 1.00 | 1.00 | 0.854 | 0.972 | 3222 | 253 | 4221 | 1796 | 0.76 | 0.14 | 57.2 | 57.2 | 28.2 | 27.9 | C |
| 12 | 1.00 | 1.00 | 0.854 | 0.972 | 3452 | 215 | 4221 | 1796 | 0.82 | 0.12 | 57.3 | 57.3 | 30.1 | 29.9 | D |

## Segment 12: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.845 | 3043 | 4237 | 0.72 | 62.7 | 24.3 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.00 | 0.845 | 3082 | 4237 | 0.73 | 62.4 | 24.7 | C |
| 3 | 1.00 | 0.845 | 2824 | 4237 | 0.67 | 64.1 | 22.0 | C |
| 4 | 1.00 | 0.845 | 3089 | 4237 | 0.73 | 62.3 | 24.8 | C |
| 5 | 1.00 | 0.845 | 3167 | 4237 | 0.75 | 61.6 | 25.7 | C |
| 6 | 1.00 | 0.845 | 3230 | 4237 | 0.76 | 61.1 | 26.4 | D |
| 7 | 1.00 | 0.845 | 2944 | 4237 | 0.69 | 63.4 | 23.2 | C |
| 8 | 1.00 | 0.845 | 3231 | 4237 | 0.76 | 61.1 | 26.4 | D |
| 9 | 1.00 | 0.845 | 3193 | 4237 | 0.75 | 61.4 | 26.0 | C |
| 10 | 1.00 | 0.845 | 3232 | 4237 | 0.76 | 61.1 | 26.4 | D |
| 11 | 1.00 | 0.845 | 2966 | 4237 | 0.70 | 63.2 | 23.5 | C |
| 12 | 1.00 | 0.845 | 3241 | 4237 | 0.76 | 61.0 | 26.6 | D |

## Segment 13: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.845 | 0.934 | 3228 | 185 | 4221 | 1886 | 0.76 | 0.10 | 58.9 | 58.9 | 27.4 | 26.7 | C |
| 2 | 1.00 | 1.00 | 0.845 | 0.934 | 3253 | 171 | 4221 | 1886 | 0.77 | 0.09 | 58.9 | 58.9 | 27.6 | 26.9 | C |
| 3 | 1.00 | 1.00 | 0.845 | 0.934 | 2934 | 110 | 4221 | 1886 | 0.70 | 0.06 | 59.6 | 59.6 | 24.6 | 24.5 | C |
| 4 | 1.00 | 1.00 | 0.845 | 0.934 | 3192 | 103 | 4221 | 1886 | 0.76 | 0.05 | 59.0 | 59.0 | 27.1 | 26.5 | C |
| 5 | 1.00 | 1.00 | 0.845 | 0.934 | 3369 | 202 | 4221 | 1886 | 0.80 | 0.11 | 58.5 | 58.5 | 28.8 | 27.8 | C |
| 6 | 1.00 | 1.00 | 0.845 | 0.934 | 3416 | 186 | 4221 | 1886 | 0.81 | 0.10 | 58.4 | 58.4 | 29.2 | 28.2 | D |
| 7 | 1.00 | 1.00 | 0.845 | 0.934 | 3064 | 120 | 4221 | 1886 | 0.73 | 0.06 | 59.3 | 59.3 | 25.8 | 25.5 | C |
| 8 | 1.00 | 1.00 | 0.845 | 0.934 | 3342 | 111 | 4221 | 1886 | 0.79 | 0.06 | 58.6 | 58.6 | 28.5 | 27.6 | C |
| 9 | 1.00 | 1.00 | 0.845 | 0.934 | 3387 | 194 | 4221 | 1886 | 0.80 | 0.10 | 58.5 | 58.5 | 28.9 | 28.0 | C |
| 10 | 1.00 | 1.00 | 0.845 | 0.934 | 3410 | 178 | 4221 | 1886 | 0.81 | 0.09 | 58.4 | 58.4 | 29.2 | 28.1 | D |
| 11 | 1.00 | 1.00 | 0.845 | 0.934 | 3081 | 115 | 4221 | 1886 | 0.73 | 0.06 | 59.3 | 59.3 | 26.0 | 25.6 | C |
| 12 | 1.00 | 1.00 | 0.845 | 0.934 | 3348 | 107 | 4221 | 1886 | 0.79 | 0.06 | 58.6 | 58.6 | 28.6 | 27.7 | C |

## Segment 14: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3232 | 4244 | 0.76 | 61.3 | 26.4 | D |
| 2 | 1.00 | 0.849 | 3256 | 4244 | 0.77 | 61.1 | 26.6 | D |
| 3 | 1.00 | 0.849 | 2932 | 4244 | 0.69 | 63.7 | 23.0 | C |
| 4 | 1.00 | 0.849 | 3187 | 4244 | 0.75 | 61.7 | 25.8 | C |
| 5 | 1.00 | 0.849 | 3375 | 4244 | 0.80 | 59.8 | 28.2 | D |
| 6 | 1.00 | 0.849 | 3419 | 4244 | 0.81 | 59.4 | 28.8 | D |
| 7 | 1.00 | 0.849 | 3062 | 4244 | 0.72 | 62.8 | 24.4 | C |
| 8 | 1.00 | 0.849 | 3338 | 4244 | 0.79 | 60.2 | 27.7 | D |
| 9 | 1.00 | 0.849 | 3391 | 4244 | 0.80 | 59.7 | 28.4 | D |
| 10 | 1.00 | 0.849 | 3412 | 4244 | 0.80 | 59.5 | 28.7 | D |
| 11 | 1.00 | 0.849 | 3078 | 4244 | 0.73 | 62.6 | 24.6 | C |
| 12 | 1.00 | 0.849 | 3344 | 4244 | 0.79 | 60.2 | 27.8 | D |

## Segment 15: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.888 | 3232 | 182 | 4221 | 1976 | 0.77 | 0.09 | 62.2 | 62.2 | 26.0 | 26.2 | C |
| 2 | 1.00 | 1.00 | 0.849 | 0.888 | 3256 | 189 | 4221 | 1976 | 0.77 | 0.10 | 62.2 | 62.2 | 26.2 | 26.4 | C |
| 3 | 1.00 | 1.00 | 0.849 | 0.888 | 2932 | 185 | 4221 | 1976 | 0.69 | 0.09 | 62.2 | 62.2 | 23.6 | 23.6 | C |
| 4 | 1.00 | 1.00 | 0.849 | 0.888 | 3187 | 229 | 4221 | 1976 | 0.76 | 0.12 | 62.1 | 62.1 | 25.7 | 25.8 | C |
| 5 | 1.00 | 1.00 | 0.849 | 0.888 | 3375 | 199 | 4221 | 1976 | 0.80 | 0.10 | 62.2 | 62.2 | 27.1 | 27.4 | C |
| 6 | 1.00 | 1.00 | 0.849 | 0.888 | 3419 | 206 | 4221 | 1976 | 0.81 | 0.10 | 62.1 | 62.1 | 27.5 | 27.8 | C |
| 7 | 1.00 | 1.00 | 0.849 | 0.888 | 3062 | 200 | 4221 | 1976 | 0.73 | 0.10 | 62.2 | 62.2 | 24.6 | 24.7 | C |
| 8 | 1.00 | 1.00 | 0.849 | 0.888 | 3338 | 250 | 4221 | 1976 | 0.79 | 0.13 | 62.0 | 62.0 | 26.9 | 27.1 | C |
| 9 | 1.00 | 1.00 | 0.849 | 0.888 | 3391 | 190 | 4221 | 1976 | 0.80 | 0.10 | 62.2 | 62.2 | 27.3 | 27.6 | C |
| 10 | 1.00 | 1.00 | 0.849 | 0.888 | 3412 | 197 | 4221 | 1976 | 0.81 | 0.10 | 62.2 | 62.2 | 27.4 | 27.7 | C |
| 11 | 1.00 | 1.00 | 0.849 | 0.888 | 3078 | 191 | 4221 | 1976 | 0.73 | 0.10 | 62.2 | 62.2 | 24.7 | 24.9 | C |
| 12 | 1.00 | 1.00 | 0.849 | 0.888 | 3344 | 239 | 4221 | 1976 | 0.79 | 0.12 | 62.0 | 62.0 | 27.0 | 27.2 | C |

## Segment 16: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.846 | 3052 | 4251 | 0.72 | 63.1 | 24.2 | C |
| 2 | 1.00 | 0.846 | 3069 | 4251 | 0.72 | 63.0 | 24.3 | C |
| 3 | 1.00 | 0.846 | 2748 | 4251 | 0.65 | 65.1 | 21.1 | C |
| 4 | 1.00 | 0.846 | 2959 | 4251 | 0.70 | 63.8 | 23.2 | C |
| 5 | 1.00 | 0.846 | 3177 | 4251 | 0.75 | 62.0 | 25.6 | C |
| 6 | 1.00 | 0.846 | 3215 | 4251 | 0.76 | 61.7 | 26.1 | D |
| 7 | 1.00 | 0.846 | 2863 | 4251 | 0.67 | 64.4 | 22.2 | C |
| 8 | 1.00 | 0.846 | 3087 | 4251 | 0.73 | 62.8 | 24.6 | C |
| 9 | 1.00 | 0.846 | 3203 | 4251 | 0.75 | 61.8 | 25.9 | C |
| 10 | 1.00 | 0.846 | 3217 | 4251 | 0.76 | 61.7 | 26.1 | D |
| 11 | 1.00 | 0.846 | 2888 | 4251 | 0.68 | 64.3 | 22.5 | C |
| 12 | 1.00 | 0.846 | 3105 | 4251 | 0.73 | 62.7 | 24.8 | C |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.846 | 0.910 | 3117 | 65 | 4221 | 1976 | 0.74 | 0.03 | 60.7 | 60.7 | 25.7 | 23.2 | C |
| 2 | 1.00 | 1.00 | 0.846 | 0.910 | 3159 | 90 | 4221 | 1976 | 0.75 | 0.05 | 60.6 | 60.6 | 26.1 | 23.6 | C |
| 3 | 1.00 | 1.00 | 0.846 | 0.910 | 2813 | 65 | 4221 | 1976 | 0.67 | 0.03 | 61.3 | 61.3 | 22.9 | 20.9 | C |
| 4 | 1.00 | 1.00 | 0.846 | 0.910 | 3022 | 63 | 4221 | 1976 | 0.72 | 0.03 | 60.9 | 60.9 | 24.8 | 22.5 | C |
| 5 | 1.00 | 1.00 | 0.846 | 0.910 | 3247 | 70 | 4221 | 1976 | 0.77 | 0.04 | 60.3 | 60.3 | 26.9 | 24.3 | C |
| 6 | 1.00 | 1.00 | 0.846 | 0.910 | 3313 | 98 | 4221 | 1976 | 0.78 | 0.05 | 60.1 | 60.1 | 27.6 | 24.8 | C |
| 7 | 1.00 | 1.00 | 0.846 | 0.910 | 2934 | 71 | 4221 | 1976 | 0.70 | 0.04 | 61.1 | 61.1 | 24.0 | 21.8 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | 1.00 | 0.846 | 0.910 | 3155 | 68 | 4221 | 1976 | 0.75 | 0.03 | 60.6 | 60.6 | 26.0 | 23.5 | C |
| 9 | 1.00 | 1.00 | 0.846 | 0.910 | 3270 | 67 | 4221 | 1976 | 0.77 | 0.03 | 60.3 | 60.3 | 27.1 | 24.4 | C |
| 10 | 1.00 | 1.00 | 0.846 | 0.910 | 3310 | 93 | 4221 | 1976 | 0.78 | 0.05 | 60.2 | 60.2 | 27.5 | 24.7 | C |
| 11 | 1.00 | 1.00 | 0.846 | 0.910 | 2956 | 68 | 4221 | 1976 | 0.70 | 0.03 | 61.0 | 61.0 | 24.2 | 22.0 | C |
| 12 | 1.00 | 1.00 | 0.846 | 0.910 | 3170 | 65 | 4221 | 1976 | 0.75 | 0.03 | 60.5 | 60.5 | 26.2 | 23.7 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.848 | 3114 | 4278 | 0.73 | 63.5 | 24.5 | C |
| 2 | 1.00 | 0.848 | 3158 | 4278 | 0.74 | 63.1 | 25.0 | C |
| 3 | 1.00 | 0.848 | 2811 | 4278 | 0.66 | 65.8 | 21.4 | C |
| 4 | 1.00 | 0.848 | 3019 | 4278 | 0.71 | 64.3 | 23.5 | C |
| 5 | 1.00 | 0.848 | 3245 | 4278 | 0.76 | 62.3 | 26.0 | C |
| 6 | 1.00 | 0.848 | 3312 | 4278 | 0.77 | 61.6 | 26.9 | D |
| 7 | 1.00 | 0.848 | 2933 | 4278 | 0.69 | 65.0 | 22.6 | C |
| 8 | 1.00 | 0.848 | 3153 | 4278 | 0.74 | 63.2 | 24.9 | C |
| 9 | 1.00 | 0.848 | 3268 | 4278 | 0.76 | 62.0 | 26.4 | D |
| 10 | 1.00 | 0.848 | 3310 | 4278 | 0.77 | 61.6 | 26.9 | D |
| 11 | 1.00 | 0.848 | 2954 | 4278 | 0.69 | 64.8 | 22.8 | C |
| 12 | 1.00 | 0.848 | 3167 | 4278 | 0.74 | 63.0 | 25.1 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 17958 | 17891 | 25.61 | 62.1 | 25.9 | 21.9 | 25.50 | D |
| 2 | 17065 | 16994 | 18.40 | 63.5 | 24.0 | 20.4 | 24.90 | D |
| 3 | 16373 | 16308 | 14.34 | 64.3 | 22.8 | 19.3 | 24.60 | D |
| 4 | 17238 | 17178 | 19.47 | 63.3 | 24.4 | 20.7 | 25.00 | D |
| 5 | 18742 | 18669 | 33.57 | 60.7 | 27.6 | 23.4 | 26.00 | D |
| 6 | 17880 | 17803 | 24.70 | 62.3 | 25.7 | 21.8 | 25.40 | D |
| 7 | 17104 | 17034 | 19.01 | 63.3 | 24.2 | 20.5 | 25.00 | D |
| 8 | 18028 | 17963 | 25.70 | 62.1 | 26.0 | 22.0 | 25.50 | D |
| 9 | 18835 | 18766 | 34.47 | 60.6 | 27.8 | 23.6 | 26.10 | D |
| 10 | 17899 | 17826 | 24.86 | 62.2 | 25.7 | 21.8 | 25.40 | D |
| 11 | 17192 | 17124 | 19.58 | 63.2 | 24.3 | 20.6 | 25.00 | D |
| 12 | 18089 | 18026 | 26.26 | 62.0 | 26.1 | 22.1 | 25.50 | D |

## Facility Overall Results

| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 62.4 | Density, veh/mi/ln | 21.5 |
| Average Travel Time, min | 25.30 | Density, pc/mi/ln | 25.4 |

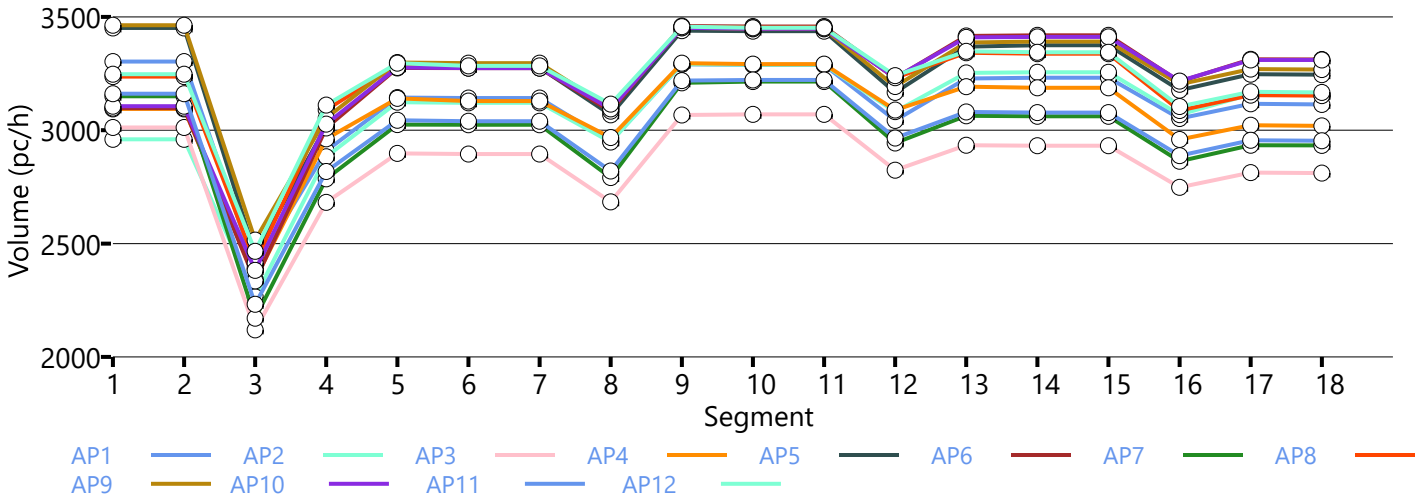
## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with |

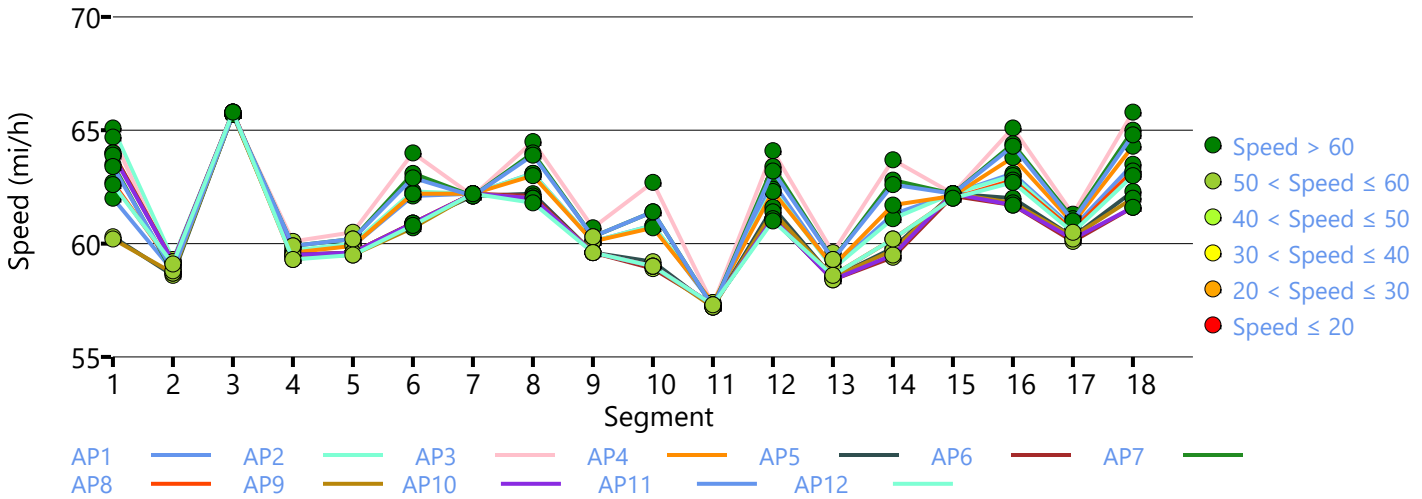
| | |
|---|---|
| | no queuing). |

| Comments |
|---|
| |

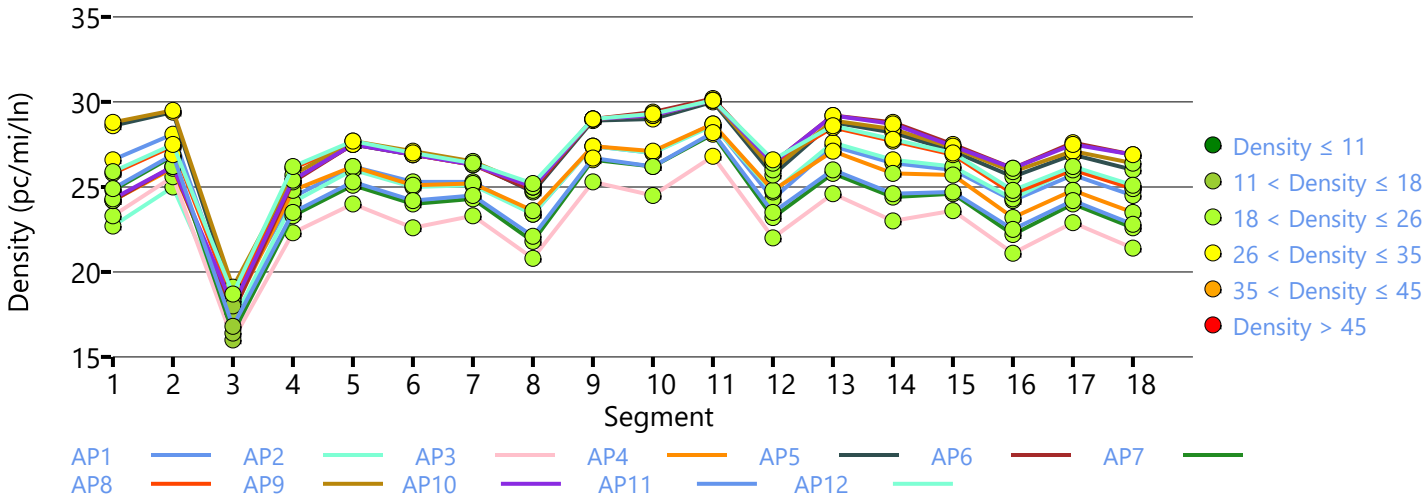
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 8/6/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | SB I-90/94 US 12 to WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 22 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 28.39 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | CTH HH to USH 12/STH 16 | 29955 | 2 |
| 2 | Diverge | Diverge | USH 12/STH 16 EB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12/STH 16 between on and off | 2202 | 2 |
| 4 | Merge | Merge | USH 12/STH 16 EB On | 1500 | 2 |
| 5 | Basic | Basic | USH 12/STH 16 to STH 13 | 5695 | 2 |
| 6 | Diverge | Diverge | STH 13 EB Off | 1500 | 2 |
| 7 | Basic | Basic | STH 13 between on and off | 1465 | 2 |
| 8 | Merge | Merge | STH 13 EB On | 1500 | 2 |
| 9 | Basic | Basic | STH 13 to STH 23 | 7583 | 2 |
| 10 | Diverge | Diverge | STH 23 EB Off | 1500 | 2 |
| 11 | Basic | Basic | STH 23 between on and off | 2771 | 2 |
| 12 | Merge | Merge | STH 23 EB On | 1500 | 2 |
| 13 | Basic | Basic | STH 23 to USH 12 | 6118 | 2 |
| 14 | Diverge | Diverge | USH 12 EB Off | 1500 | 2 |
| 15 | Basic | Basic | USH 12 between on and off | 1396 | 2 |
| 16 | Merge | Merge | USH 12 SB on | 1283 | 2 |
| 17 | Merge | Merge | USH 12 EB On | 1500 | 2 |
| 18 | Basic | Basic | USH 12 to STH 33 | 67891 | 2 |
| 19 | Diverge | Diverge | STH 33 EB Off | 1500 | 2 |
| 20 | Basic | Basic | STH 33 between on and off | 1344 | 2 |
| 21 | Merge | Merge | STH 33 EB On | 1500 | 2 |
| 22 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 2794 | 4278 | 0.65 | 65.9 | 21.2 | C |
| 2 | 1.00 | 0.849 | 2642 | 4278 | 0.62 | 66.7 | 19.8 | C |
| 3 | 1.00 | 0.849 | 2714 | 4278 | 0.63 | 66.4 | 20.4 | C |
| 4 | 1.00 | 0.849 | 2810 | 4278 | 0.66 | 65.8 | 21.4 | C |
| 5 | 1.00 | 0.849 | 2961 | 4278 | 0.69 | 64.8 | 22.8 | C |
| 6 | 1.00 | 0.849 | 2800 | 4278 | 0.65 | 65.9 | 21.2 | C |
| 7 | 1.00 | 0.849 | 2875 | 4278 | 0.67 | 65.4 | 22.0 | C |
| 8 | 1.00 | 0.849 | 2978 | 4278 | 0.70 | 64.6 | 23.0 | C |
| 9 | 1.00 | 0.849 | 2724 | 4278 | 0.64 | 66.3 | 20.5 | C |
| 10 | 1.00 | 0.849 | 2576 | 4278 | 0.60 | 67.1 | 19.2 | C |
| 11 | 1.00 | 0.849 | 2645 | 4278 | 0.62 | 66.7 | 19.8 | C |
| 12 | 1.00 | 0.849 | 2740 | 4278 | 0.64 | 66.2 | 20.7 | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.918 | 2794 | 107 | 4221 | 1976 | 0.66 | 0.05 | 62.4 | 62.4 | 22.4 | 20.6 | C |
| 2 | 1.00 | 1.00 | 0.849 | 0.918 | 2642 | 100 | 4221 | 1976 | 0.63 | 0.05 | 62.4 | 62.4 | 21.2 | 19.3 | B |
| 3 | 1.00 | 1.00 | 0.849 | 0.918 | 2714 | 102 | 4221 | 1976 | 0.64 | 0.05 | 62.4 | 62.4 | 21.7 | 19.9 | B |
| 4 | 1.00 | 1.00 | 0.849 | 0.918 | 2810 | 101 | 4221 | 1976 | 0.67 | 0.05 | 62.4 | 62.4 | 22.5 | 20.7 | C |
| 5 | 1.00 | 1.00 | 0.849 | 0.918 | 2961 | 113 | 4221 | 1976 | 0.70 | 0.06 | 62.3 | 62.3 | 23.8 | 22.0 | C |
| 6 | 1.00 | 1.00 | 0.849 | 0.918 | 2800 | 107 | 4221 | 1976 | 0.66 | 0.05 | 62.4 | 62.4 | 22.4 | 20.6 | C |
| 7 | 1.00 | 1.00 | 0.849 | 0.918 | 2875 | 108 | 4221 | 1976 | 0.68 | 0.05 | 62.4 | 62.4 | 23.0 | 21.3 | C |
| 8 | 1.00 | 1.00 | 0.849 | 0.918 | 2978 | 108 | 4221 | 1976 | 0.71 | 0.05 | 62.4 | 62.4 | 23.9 | 22.2 | C |
| 9 | 1.00 | 1.00 | 0.849 | 0.918 | 2724 | 105 | 4221 | 1976 | 0.65 | 0.05 | 62.4 | 62.4 | 21.8 | 20.0 | B |
| 10 | 1.00 | 1.00 | 0.849 | 0.918 | 2576 | 98 | 4221 | 1976 | 0.61 | 0.05 | 62.4 | 62.4 | 20.6 | 18.7 | B |
| 11 | 1.00 | 1.00 | 0.849 | 0.918 | 2645 | 99 | 4221 | 1976 | 0.63 | 0.05 | 62.4 | 62.4 | 21.2 | 19.3 | B |
| 12 | 1.00 | 1.00 | 0.849 | 0.918 | 2740 | 99 | 4221 | 1976 | 0.65 | 0.05 | 62.4 | 62.4 | 22.0 | 20.1 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.846 | 2688 | 4251 | 0.63 | 65.4 | 20.6 | C |
| 2 | 1.00 | 0.846 | 2543 | 4251 | 0.60 | 66.0 | 19.3 | C |
| 3 | 1.00 | 0.846 | 2612 | 4251 | 0.61 | 65.8 | 19.8 | C |
| 4 | 1.00 | 0.846 | 2710 | 4251 | 0.64 | 65.3 | 20.8 | C |
| 5 | 1.00 | 0.846 | 2849 | 4251 | 0.67 | 64.5 | 22.1 | C |
| 6 | 1.00 | 0.846 | 2694 | 4251 | 0.63 | 65.4 | 20.6 | C |
| 7 | 1.00 | 0.846 | 2768 | 4251 | 0.65 | 65.0 | 21.3 | C |
| 8 | 1.00 | 0.846 | 2871 | 4251 | 0.68 | 64.4 | 22.3 | C |
| 9 | 1.00 | 0.846 | 2621 | 4251 | 0.62 | 65.7 | 19.9 | C |
| 10 | 1.00 | 0.846 | 2479 | 4251 | 0.58 | 66.2 | 18.7 | C |
| 11 | 1.00 | 0.846 | 2547 | 4251 | 0.60 | 66.0 | 19.3 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.846 | | 2642 | | 4251 | | 0.62 | | 65.6 | | 20.1 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.846 | 0.935 | 2841 | 153 | 4221 | 1976 | 0.67 | 0.08 | 60.0 | 60.0 | 23.7 | 23.9 | C |
| 2 | 1.00 | 1.00 | 0.846 | 0.935 | 2704 | 161 | 4221 | 1976 | 0.64 | 0.08 | 60.3 | 60.3 | 22.4 | 22.8 | C |
| 3 | 1.00 | 1.00 | 0.846 | 0.935 | 2754 | 142 | 4221 | 1976 | 0.65 | 0.07 | 60.2 | 60.2 | 22.9 | 23.2 | C |
| 4 | 1.00 | 1.00 | 0.846 | 0.935 | 2879 | 169 | 4221 | 1976 | 0.68 | 0.09 | 60.0 | 60.0 | 24.0 | 24.2 | C |
| 5 | 1.00 | 1.00 | 0.846 | 0.935 | 3012 | 163 | 4221 | 1976 | 0.71 | 0.08 | 59.7 | 59.7 | 25.2 | 25.2 | C |
| 6 | 1.00 | 1.00 | 0.846 | 0.935 | 2866 | 172 | 4221 | 1976 | 0.68 | 0.09 | 60.0 | 60.0 | 23.9 | 24.1 | C |
| 7 | 1.00 | 1.00 | 0.846 | 0.935 | 2919 | 151 | 4221 | 1976 | 0.69 | 0.08 | 59.9 | 59.9 | 24.4 | 24.5 | C |
| 8 | 1.00 | 1.00 | 0.846 | 0.935 | 3050 | 179 | 4221 | 1976 | 0.72 | 0.09 | 59.6 | 59.6 | 25.6 | 25.5 | C |
| 9 | 1.00 | 1.00 | 0.846 | 0.935 | 2770 | 149 | 4221 | 1976 | 0.66 | 0.08 | 60.1 | 60.1 | 23.0 | 23.3 | C |
| 10 | 1.00 | 1.00 | 0.846 | 0.935 | 2637 | 158 | 4221 | 1976 | 0.62 | 0.08 | 60.4 | 60.4 | 21.8 | 22.3 | C |
| 11 | 1.00 | 1.00 | 0.846 | 0.935 | 2685 | 138 | 4221 | 1976 | 0.64 | 0.07 | 60.3 | 60.3 | 22.3 | 22.7 | C |
| 12 | 1.00 | 1.00 | 0.846 | 0.935 | 2807 | 165 | 4221 | 1976 | 0.67 | 0.08 | 60.1 | 60.1 | 23.4 | 23.6 | C |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.851 | 2840 | 4244 | 0.67 | 64.3 | 22.1 | C |
| 2 | 1.00 | 0.851 | 2705 | 4244 | 0.64 | 65.0 | 20.8 | C |
| 3 | 1.00 | 0.851 | 2753 | 4244 | 0.65 | 64.8 | 21.2 | C |
| 4 | 1.00 | 0.851 | 2880 | 4244 | 0.68 | 64.1 | 22.5 | C |
| 5 | 1.00 | 0.851 | 3011 | 4244 | 0.71 | 63.2 | 23.8 | C |
| 6 | 1.00 | 0.851 | 2867 | 4244 | 0.68 | 64.1 | 22.4 | C |
| 7 | 1.00 | 0.851 | 2918 | 4244 | 0.69 | 63.8 | 22.9 | C |
| 8 | 1.00 | 0.851 | 3051 | 4244 | 0.72 | 62.9 | 24.3 | C |
| 9 | 1.00 | 0.851 | 2769 | 4244 | 0.65 | 64.7 | 21.4 | C |
| 10 | 1.00 | 0.851 | 2638 | 4244 | 0.62 | 65.3 | 20.2 | C |
| 11 | 1.00 | 0.851 | 2684 | 4244 | 0.63 | 65.1 | 20.6 | C |
| 12 | 1.00 | 0.851 | 2807 | 4244 | 0.66 | 64.5 | 21.8 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.851 | 0.955 | 2840 | 83 | 4221 | 1706 | 0.67 | 0.05 | 54.5 | 54.5 | 26.1 | 22.3 | C |
| 2 | 1.00 | 1.00 | 0.851 | 0.955 | 2705 | 123 | 4221 | 1706 | 0.64 | 0.07 | 54.4 | 54.4 | 24.9 | 21.2 | C |
| 3 | 1.00 | 1.00 | 0.851 | 0.955 | 2753 | 96 | 4221 | 1706 | 0.65 | 0.06 | 54.5 | 54.5 | 25.3 | 21.6 | C |
| 4 | 1.00 | 1.00 | 0.851 | 0.955 | 2880 | 113 | 4221 | 1706 | 0.68 | 0.07 | 54.4 | 54.4 | 26.5 | 22.7 | C |
| 5 | 1.00 | 1.00 | 0.851 | 0.955 | 3011 | 87 | 4221 | 1706 | 0.71 | 0.05 | 54.5 | 54.5 | 27.6 | 23.8 | C |
| 6 | 1.00 | 1.00 | 0.851 | 0.955 | 2867 | 130 | 4221 | 1706 | 0.68 | 0.08 | 54.4 | 54.4 | 26.4 | 22.6 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.851 | 0.955 | 2918 | 103 | 4221 | 1706 | 0.69 | 0.06 | 54.4 | 54.4 | 26.8 | 23.0 | C |
| 8 | 1.00 | 1.00 | 0.851 | 0.955 | 3051 | 120 | 4221 | 1706 | 0.72 | 0.07 | 54.4 | 54.4 | 28.0 | 24.2 | C |
| 9 | 1.00 | 1.00 | 0.851 | 0.955 | 2769 | 81 | 4221 | 1706 | 0.66 | 0.05 | 54.5 | 54.5 | 25.4 | 21.7 | C |
| 10 | 1.00 | 1.00 | 0.851 | 0.955 | 2638 | 119 | 4221 | 1706 | 0.63 | 0.07 | 54.4 | 54.4 | 24.2 | 20.6 | C |
| 11 | 1.00 | 1.00 | 0.851 | 0.955 | 2684 | 94 | 4221 | 1706 | 0.64 | 0.06 | 54.5 | 54.5 | 24.6 | 21.0 | C |
| 12 | 1.00 | 1.00 | 0.851 | 0.955 | 2807 | 111 | 4221 | 1706 | 0.67 | 0.07 | 54.4 | 54.4 | 25.8 | 22.1 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.847 | 2760 | 4237 | 0.65 | 64.5 | 21.4 | C |
| 2 | 1.00 | 0.847 | 2580 | 4237 | 0.61 | 64.9 | 19.8 | C |
| 3 | 1.00 | 0.847 | 2658 | 4237 | 0.63 | 64.9 | 20.5 | C |
| 4 | 1.00 | 0.847 | 2766 | 4237 | 0.65 | 64.4 | 21.5 | C |
| 5 | 1.00 | 0.847 | 2927 | 4237 | 0.69 | 63.5 | 23.1 | C |
| 6 | 1.00 | 0.847 | 2734 | 4237 | 0.65 | 64.6 | 21.2 | C |
| 7 | 1.00 | 0.847 | 2816 | 4237 | 0.66 | 64.2 | 21.9 | C |
| 8 | 1.00 | 0.847 | 2929 | 4237 | 0.69 | 63.5 | 23.1 | C |
| 9 | 1.00 | 0.847 | 2691 | 4237 | 0.64 | 64.8 | 20.8 | C |
| 10 | 1.00 | 0.847 | 2516 | 4237 | 0.59 | 64.9 | 19.2 | C |
| 11 | 1.00 | 0.847 | 2590 | 4237 | 0.61 | 64.9 | 19.9 | C |
| 12 | 1.00 | 0.847 | 2695 | 4237 | 0.64 | 64.8 | 20.8 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.847 | 0.983 | 2998 | 238 | 4221 | 1886 | 0.71 | 0.13 | 60.5 | 60.5 | 24.8 | 21.9 | C |
| 2 | 1.00 | 1.00 | 0.847 | 0.983 | 2830 | 250 | 4221 | 1886 | 0.67 | 0.13 | 60.8 | 60.8 | 23.3 | 20.6 | C |
| 3 | 1.00 | 1.00 | 0.847 | 0.983 | 2908 | 250 | 4221 | 1886 | 0.69 | 0.13 | 60.7 | 60.7 | 24.0 | 21.2 | C |
| 4 | 1.00 | 1.00 | 0.847 | 0.983 | 3025 | 259 | 4221 | 1886 | 0.72 | 0.14 | 60.5 | 60.5 | 25.0 | 22.1 | C |
| 5 | 1.00 | 1.00 | 0.847 | 0.983 | 3179 | 252 | 4221 | 1886 | 0.75 | 0.13 | 60.1 | 60.1 | 26.4 | 23.3 | C |
| 6 | 1.00 | 1.00 | 0.847 | 0.983 | 3000 | 266 | 4221 | 1886 | 0.71 | 0.14 | 60.5 | 60.5 | 24.8 | 21.9 | C |
| 7 | 1.00 | 1.00 | 0.847 | 0.983 | 3082 | 266 | 4221 | 1886 | 0.73 | 0.14 | 60.3 | 60.3 | 25.6 | 22.6 | C |
| 8 | 1.00 | 1.00 | 0.847 | 0.983 | 3204 | 275 | 4221 | 1886 | 0.76 | 0.15 | 60.0 | 60.0 | 26.7 | 23.5 | C |
| 9 | 1.00 | 1.00 | 0.847 | 0.983 | 2923 | 232 | 4221 | 1886 | 0.69 | 0.12 | 60.7 | 60.7 | 24.1 | 21.3 | C |
| 10 | 1.00 | 1.00 | 0.847 | 0.983 | 2760 | 244 | 4221 | 1886 | 0.65 | 0.13 | 61.0 | 61.0 | 22.6 | 20.1 | C |
| 11 | 1.00 | 1.00 | 0.847 | 0.983 | 2834 | 244 | 4221 | 1886 | 0.67 | 0.13 | 60.8 | 60.8 | 23.3 | 20.6 | C |
| 12 | 1.00 | 1.00 | 0.847 | 0.983 | 2948 | 253 | 4221 | 1886 | 0.70 | 0.13 | 60.6 | 60.6 | 24.3 | 21.5 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 2998 | 4237 | 0.71 | 63.0 | 23.8 | C |
| 2 | 1.00 | 0.858 | 2833 | 4237 | 0.67 | 64.1 | 22.1 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.858 | 2910 | 4237 | 0.69 | 63.6 | 22.9 | C |
| 4 | 1.00 | 0.858 | 3028 | 4237 | 0.71 | 62.8 | 24.1 | C |
| 5 | 1.00 | 0.858 | 3178 | 4237 | 0.75 | 61.6 | 25.8 | C |
| 6 | 1.00 | 0.858 | 3003 | 4237 | 0.71 | 63.0 | 23.8 | C |
| 7 | 1.00 | 0.858 | 3084 | 4237 | 0.73 | 62.4 | 24.7 | C |
| 8 | 1.00 | 0.858 | 3206 | 4237 | 0.76 | 61.3 | 26.2 | D |
| 9 | 1.00 | 0.858 | 2922 | 4237 | 0.69 | 63.5 | 23.0 | C |
| 10 | 1.00 | 0.858 | 2763 | 4237 | 0.65 | 64.5 | 21.4 | C |
| 11 | 1.00 | 0.858 | 2837 | 4237 | 0.67 | 64.1 | 22.1 | C |
| 12 | 1.00 | 0.858 | 2951 | 4237 | 0.70 | 63.3 | 23.3 | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.858 | 0.956 | 2998 | 285 | 4221 | 1976 | 0.71 | 0.14 | 61.9 | 61.9 | 24.2 | 26.7 | C |
| 2 | 1.00 | 1.00 | 0.858 | 0.956 | 2833 | 322 | 4221 | 1976 | 0.67 | 0.16 | 61.9 | 61.9 | 22.9 | 25.3 | C |
| 3 | 1.00 | 1.00 | 0.858 | 0.956 | 2910 | 323 | 4221 | 1976 | 0.69 | 0.16 | 61.9 | 61.9 | 23.5 | 25.9 | C |
| 4 | 1.00 | 1.00 | 0.858 | 0.956 | 3028 | 354 | 4221 | 1976 | 0.72 | 0.18 | 61.8 | 61.8 | 24.5 | 26.9 | C |
| 5 | 1.00 | 1.00 | 0.858 | 0.956 | 3178 | 301 | 4221 | 1976 | 0.75 | 0.15 | 61.9 | 61.9 | 25.7 | 28.2 | D |
| 6 | 1.00 | 1.00 | 0.858 | 0.956 | 3003 | 341 | 4221 | 1976 | 0.71 | 0.17 | 61.8 | 61.8 | 24.3 | 26.7 | C |
| 7 | 1.00 | 1.00 | 0.858 | 0.956 | 3084 | 343 | 4221 | 1976 | 0.73 | 0.17 | 61.8 | 61.8 | 25.0 | 27.4 | C |
| 8 | 1.00 | 1.00 | 0.858 | 0.956 | 3206 | 376 | 4221 | 1976 | 0.76 | 0.19 | 61.7 | 61.7 | 26.0 | 28.5 | D |
| 9 | 1.00 | 1.00 | 0.858 | 0.956 | 2922 | 277 | 4221 | 1976 | 0.69 | 0.14 | 62.0 | 62.0 | 23.6 | 26.0 | C |
| 10 | 1.00 | 1.00 | 0.858 | 0.956 | 2763 | 314 | 4221 | 1976 | 0.65 | 0.16 | 61.9 | 61.9 | 22.3 | 24.7 | C |
| 11 | 1.00 | 1.00 | 0.858 | 0.956 | 2837 | 315 | 4221 | 1976 | 0.67 | 0.16 | 61.9 | 61.9 | 22.9 | 25.3 | C |
| 12 | 1.00 | 1.00 | 0.858 | 0.956 | 2951 | 345 | 4221 | 1976 | 0.70 | 0.17 | 61.8 | 61.8 | 23.9 | 26.3 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.846 | 2719 | 4230 | 0.64 | 64.4 | 21.1 | C |
| 2 | 1.00 | 0.846 | 2509 | 4230 | 0.59 | 65.1 | 19.3 | C |
| 3 | 1.00 | 0.846 | 2586 | 4230 | 0.61 | 64.9 | 19.9 | C |
| 4 | 1.00 | 0.846 | 2671 | 4230 | 0.63 | 64.6 | 20.7 | C |
| 5 | 1.00 | 0.846 | 2883 | 4230 | 0.68 | 63.5 | 22.7 | C |
| 6 | 1.00 | 0.846 | 2661 | 4230 | 0.63 | 64.6 | 20.6 | C |
| 7 | 1.00 | 0.846 | 2740 | 4230 | 0.65 | 64.3 | 21.3 | C |
| 8 | 1.00 | 0.846 | 2827 | 4230 | 0.67 | 63.8 | 22.2 | C |
| 9 | 1.00 | 0.846 | 2650 | 4230 | 0.63 | 64.7 | 20.5 | C |
| 10 | 1.00 | 0.846 | 2448 | 4230 | 0.58 | 65.3 | 18.7 | C |
| 11 | 1.00 | 0.846 | 2521 | 4230 | 0.60 | 65.1 | 19.4 | C |
| 12 | 1.00 | 0.846 | 2603 | 4230 | 0.62 | 64.8 | 20.1 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.846 | 0.951 | 2920 | 201 | 4221 | 1886 | 0.69 | 0.11 | 59.9 | 59.9 | 24.4 | 24.0 | C |
| 2 | 1.00 | 1.00 | 0.846 | 0.951 | 2755 | 246 | 4221 | 1886 | 0.65 | 0.13 | 60.2 | 60.2 | 22.9 | 22.7 | C |
| 3 | 1.00 | 1.00 | 0.846 | 0.951 | 2811 | 225 | 4221 | 1886 | 0.67 | 0.12 | 60.1 | 60.1 | 23.4 | 23.2 | C |
| 4 | 1.00 | 1.00 | 0.846 | 0.951 | 2873 | 202 | 4221 | 1886 | 0.68 | 0.11 | 60.0 | 60.0 | 23.9 | 23.7 | C |
| 5 | 1.00 | 1.00 | 0.846 | 0.951 | 3095 | 212 | 4221 | 1886 | 0.73 | 0.11 | 59.5 | 59.5 | 26.0 | 25.4 | C |
| 6 | 1.00 | 1.00 | 0.846 | 0.951 | 2921 | 260 | 4221 | 1886 | 0.69 | 0.14 | 59.9 | 59.9 | 24.4 | 24.0 | C |
| 7 | 1.00 | 1.00 | 0.846 | 0.951 | 2979 | 239 | 4221 | 1886 | 0.71 | 0.13 | 59.8 | 59.8 | 24.9 | 24.5 | C |
| 8 | 1.00 | 1.00 | 0.846 | 0.951 | 3040 | 213 | 4221 | 1886 | 0.72 | 0.11 | 59.6 | 59.6 | 25.5 | 25.0 | C |
| 9 | 1.00 | 1.00 | 0.846 | 0.951 | 2846 | 196 | 4221 | 1886 | 0.67 | 0.10 | 60.0 | 60.0 | 23.7 | 23.5 | C |
| 10 | 1.00 | 1.00 | 0.846 | 0.951 | 2688 | 240 | 4221 | 1886 | 0.64 | 0.13 | 60.3 | 60.3 | 22.3 | 22.2 | C |
| 11 | 1.00 | 1.00 | 0.846 | 0.951 | 2741 | 220 | 4221 | 1886 | 0.65 | 0.12 | 60.2 | 60.2 | 22.8 | 22.6 | C |
| 12 | 1.00 | 1.00 | 0.846 | 0.951 | 2800 | 197 | 4221 | 1886 | 0.66 | 0.10 | 60.1 | 60.1 | 23.3 | 23.1 | C |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.854 | 2917 | 4244 | 0.69 | 63.8 | 22.9 | C |
| 2 | 1.00 | 0.854 | 2760 | 4244 | 0.65 | 64.8 | 21.3 | C |
| 3 | 1.00 | 0.854 | 2813 | 4244 | 0.66 | 64.5 | 21.8 | C |
| 4 | 1.00 | 0.854 | 2871 | 4244 | 0.68 | 64.1 | 22.4 | C |
| 5 | 1.00 | 0.854 | 3093 | 4244 | 0.73 | 62.5 | 24.7 | C |
| 6 | 1.00 | 0.854 | 2925 | 4244 | 0.69 | 63.8 | 22.9 | C |
| 7 | 1.00 | 0.854 | 2980 | 4244 | 0.70 | 63.4 | 23.5 | C |
| 8 | 1.00 | 0.854 | 3039 | 4244 | 0.72 | 62.9 | 24.2 | C |
| 9 | 1.00 | 0.854 | 2843 | 4244 | 0.67 | 64.3 | 22.1 | C |
| 10 | 1.00 | 0.854 | 2692 | 4244 | 0.63 | 65.1 | 20.7 | C |
| 11 | 1.00 | 0.854 | 2742 | 4244 | 0.65 | 64.9 | 21.1 | C |
| 12 | 1.00 | 0.854 | 2797 | 4244 | 0.66 | 64.6 | 21.6 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.854 | 0.938 | 2917 | 542 | 4221 | 1886 | 0.69 | 0.29 | 59.7 | 59.7 | 24.4 | 25.5 | C |
| 2 | 1.00 | 1.00 | 0.854 | 0.938 | 2760 | 497 | 4221 | 1886 | 0.65 | 0.26 | 59.8 | 59.8 | 23.1 | 24.1 | C |
| 3 | 1.00 | 1.00 | 0.854 | 0.938 | 2813 | 468 | 4221 | 1886 | 0.67 | 0.25 | 59.9 | 59.9 | 23.5 | 24.6 | C |
| 4 | 1.00 | 1.00 | 0.854 | 0.938 | 2871 | 526 | 4221 | 1886 | 0.68 | 0.28 | 59.7 | 59.7 | 24.0 | 25.1 | C |
| 5 | 1.00 | 1.00 | 0.854 | 0.938 | 3093 | 574 | 4221 | 1886 | 0.73 | 0.30 | 59.6 | 59.6 | 25.9 | 27.0 | C |
| 6 | 1.00 | 1.00 | 0.854 | 0.938 | 2925 | 527 | 4221 | 1886 | 0.69 | 0.28 | 59.7 | 59.7 | 24.5 | 25.5 | C |
| 7 | 1.00 | 1.00 | 0.854 | 0.938 | 2980 | 497 | 4221 | 1886 | 0.71 | 0.26 | 59.8 | 59.8 | 24.9 | 26.0 | C |
| 8 | 1.00 | 1.00 | 0.854 | 0.938 | 3039 | 557 | 4221 | 1886 | 0.72 | 0.30 | 59.7 | 59.7 | 25.5 | 26.5 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1.00 | 1.00 | 0.854 | 0.938 | 2843 | 528 | 4221 | 1886 | 0.67 | 0.28 | 59.7 | 59.7 | 23.8 | 24.8 | C |
| 10 | 1.00 | 1.00 | 0.854 | 0.938 | 2692 | 484 | 4221 | 1886 | 0.64 | 0.26 | 59.8 | 59.8 | 22.5 | 23.5 | C |
| 11 | 1.00 | 1.00 | 0.854 | 0.938 | 2742 | 456 | 4221 | 1886 | 0.65 | 0.24 | 59.9 | 59.9 | 22.9 | 24.0 | C |
| 12 | 1.00 | 1.00 | 0.854 | 0.938 | 2797 | 513 | 4221 | 1886 | 0.66 | 0.27 | 59.8 | 59.8 | 23.4 | 24.4 | C |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.836 | 2372 | 4244 | 0.56 | 65.7 | 17.9 | B |
| 2 | 1.00 | 0.836 | 2262 | 4244 | 0.53 | 65.7 | 17.1 | B |
| 3 | 1.00 | 0.836 | 2348 | 4244 | 0.55 | 65.7 | 17.7 | B |
| 4 | 1.00 | 0.836 | 2343 | 4244 | 0.55 | 65.7 | 17.7 | B |
| 5 | 1.00 | 0.836 | 2516 | 4244 | 0.59 | 65.7 | 19.1 | C |
| 6 | 1.00 | 0.836 | 2397 | 4244 | 0.56 | 65.7 | 18.1 | C |
| 7 | 1.00 | 0.836 | 2487 | 4244 | 0.59 | 65.7 | 18.9 | C |
| 8 | 1.00 | 0.836 | 2480 | 4244 | 0.58 | 65.7 | 18.8 | C |
| 9 | 1.00 | 0.836 | 2312 | 4244 | 0.54 | 65.7 | 17.5 | B |
| 10 | 1.00 | 0.836 | 2207 | 4244 | 0.52 | 65.7 | 16.7 | B |
| 11 | 1.00 | 0.836 | 2289 | 4244 | 0.54 | 65.7 | 17.3 | B |
| 12 | 1.00 | 0.836 | 2282 | 4244 | 0.54 | 65.7 | 17.2 | B |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.836 | 0.983 | 2624 | 252 | 4221 | 1796 | 0.62 | 0.14 | 59.6 | 59.6 | 22.0 | 22.8 | C |
| 2 | 1.00 | 1.00 | 0.836 | 0.983 | 2532 | 270 | 4221 | 1796 | 0.60 | 0.15 | 59.7 | 59.7 | 21.2 | 22.0 | C |
| 3 | 1.00 | 1.00 | 0.836 | 0.983 | 2628 | 280 | 4221 | 1796 | 0.62 | 0.16 | 59.6 | 59.6 | 22.0 | 22.8 | C |
| 4 | 1.00 | 1.00 | 0.836 | 0.983 | 2654 | 311 | 4221 | 1796 | 0.63 | 0.17 | 59.6 | 59.6 | 22.3 | 23.0 | C |
| 5 | 1.00 | 1.00 | 0.836 | 0.983 | 2784 | 268 | 4221 | 1796 | 0.66 | 0.15 | 59.4 | 59.4 | 23.4 | 24.0 | C |
| 6 | 1.00 | 1.00 | 0.836 | 0.983 | 2683 | 286 | 4221 | 1796 | 0.64 | 0.16 | 59.5 | 59.5 | 22.5 | 23.2 | C |
| 7 | 1.00 | 1.00 | 0.836 | 0.983 | 2784 | 297 | 4221 | 1796 | 0.66 | 0.17 | 59.4 | 59.4 | 23.4 | 24.0 | C |
| 8 | 1.00 | 1.00 | 0.836 | 0.983 | 2810 | 330 | 4221 | 1796 | 0.67 | 0.18 | 59.3 | 59.3 | 23.7 | 24.2 | C |
| 9 | 1.00 | 1.00 | 0.836 | 0.983 | 2558 | 246 | 4221 | 1796 | 0.61 | 0.14 | 59.7 | 59.7 | 21.4 | 22.3 | C |
| 10 | 1.00 | 1.00 | 0.836 | 0.983 | 2470 | 263 | 4221 | 1796 | 0.59 | 0.15 | 59.8 | 59.8 | 20.7 | 21.6 | C |
| 11 | 1.00 | 1.00 | 0.836 | 0.983 | 2562 | 273 | 4221 | 1796 | 0.61 | 0.15 | 59.7 | 59.7 | 21.5 | 22.3 | C |
| 12 | 1.00 | 1.00 | 0.836 | 0.983 | 2585 | 303 | 4221 | 1796 | 0.61 | 0.17 | 59.7 | 59.7 | 21.6 | 22.4 | C |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.852 | 0.860 | 2739 | 120 | 4221 | 1796 | 0.65 | 0.07 | 59.6 | 59.6 | 23.0 | 23.2 | C |
| 2 | 1.00 | 1.00 | 0.852 | 0.860 | 2632 | 101 | 4221 | 1796 | 0.62 | 0.06 | 59.7 | 59.7 | 22.0 | 22.4 | C |
| 3 | 1.00 | 1.00 | 0.852 | 0.860 | 2703 | 76 | 4221 | 1796 | 0.64 | 0.04 | 59.6 | 59.6 | 22.7 | 22.9 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1.00 | 1.00 | 0.852 | 0.860 | 2756 | 98 | 4221 | 1796 | 0.65 | 0.05 | 59.6 | 59.6 | 23.1 | 23.4 | C |
| 5 | 1.00 | 1.00 | 0.852 | 0.860 | 2904 | 127 | 4221 | 1796 | 0.69 | 0.07 | 59.3 | 59.3 | 24.5 | 24.5 | C |
| 6 | 1.00 | 1.00 | 0.852 | 0.860 | 2789 | 107 | 4221 | 1796 | 0.66 | 0.06 | 59.5 | 59.5 | 23.4 | 23.6 | C |
| 7 | 1.00 | 1.00 | 0.852 | 0.860 | 2863 | 80 | 4221 | 1796 | 0.68 | 0.04 | 59.4 | 59.4 | 24.1 | 24.2 | C |
| 8 | 1.00 | 1.00 | 0.852 | 0.860 | 2916 | 103 | 4221 | 1796 | 0.69 | 0.06 | 59.3 | 59.3 | 24.6 | 24.6 | C |
| 9 | 1.00 | 1.00 | 0.852 | 0.860 | 2669 | 116 | 4221 | 1796 | 0.63 | 0.06 | 59.7 | 59.7 | 22.4 | 22.7 | C |
| 10 | 1.00 | 1.00 | 0.852 | 0.860 | 2568 | 99 | 4221 | 1796 | 0.61 | 0.06 | 59.8 | 59.8 | 21.5 | 21.9 | C |
| 11 | 1.00 | 1.00 | 0.852 | 0.860 | 2635 | 74 | 4221 | 1796 | 0.62 | 0.04 | 59.7 | 59.7 | 22.1 | 22.4 | C |
| 12 | 1.00 | 1.00 | 0.852 | 0.860 | 2684 | 95 | 4221 | 1796 | 0.64 | 0.05 | 59.7 | 59.7 | 22.5 | 22.8 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.852 | 2739 | 4289 | 0.64 | 66.6 | 20.6 | C |
| 2 | 1.00 | 0.852 | 2633 | 4289 | 0.61 | 67.2 | 19.6 | C |
| 3 | 1.00 | 0.852 | 2703 | 4289 | 0.63 | 66.8 | 20.2 | C |
| 4 | 1.00 | 0.852 | 2757 | 4289 | 0.64 | 66.5 | 20.7 | C |
| 5 | 1.00 | 0.852 | 2905 | 4289 | 0.68 | 65.6 | 22.1 | C |
| 6 | 1.00 | 0.852 | 2790 | 4289 | 0.65 | 66.3 | 21.0 | C |
| 7 | 1.00 | 0.852 | 2864 | 4289 | 0.67 | 65.8 | 21.8 | C |
| 8 | 1.00 | 0.852 | 2918 | 4289 | 0.68 | 65.5 | 22.3 | C |
| 9 | 1.00 | 0.852 | 2670 | 4289 | 0.62 | 67.0 | 19.9 | C |
| 10 | 1.00 | 0.852 | 2569 | 4289 | 0.60 | 67.5 | 19.0 | C |
| 11 | 1.00 | 0.852 | 2636 | 4289 | 0.61 | 67.2 | 19.6 | C |
| 12 | 1.00 | 0.852 | 2685 | 4289 | 0.63 | 67.0 | 20.0 | C |

## Segment 19: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.852 | 0.895 | 2739 | 202 | 4221 | 1886 | 0.65 | 0.11 | 59.0 | 59.0 | 23.2 | 24.6 | C |
| 2 | 1.00 | 1.00 | 0.852 | 0.895 | 2633 | 188 | 4221 | 1886 | 0.62 | 0.10 | 59.0 | 59.0 | 22.3 | 23.7 | C |
| 3 | 1.00 | 1.00 | 0.852 | 0.895 | 2703 | 197 | 4221 | 1886 | 0.64 | 0.10 | 59.0 | 59.0 | 22.9 | 24.3 | C |
| 4 | 1.00 | 1.00 | 0.852 | 0.895 | 2757 | 193 | 4221 | 1886 | 0.65 | 0.10 | 59.0 | 59.0 | 23.4 | 24.8 | C |
| 5 | 1.00 | 1.00 | 0.852 | 0.895 | 2905 | 164 | 4221 | 1886 | 0.69 | 0.09 | 59.1 | 59.1 | 24.6 | 26.0 | C |
| 6 | 1.00 | 1.00 | 0.852 | 0.895 | 2790 | 204 | 4221 | 1886 | 0.66 | 0.11 | 59.0 | 59.0 | 23.6 | 25.1 | C |
| 7 | 1.00 | 1.00 | 0.852 | 0.895 | 2864 | 249 | 4221 | 1886 | 0.68 | 0.13 | 58.9 | 58.9 | 24.3 | 25.7 | C |
| 8 | 1.00 | 1.00 | 0.852 | 0.895 | 2918 | 210 | 4221 | 1886 | 0.69 | 0.11 | 58.9 | 58.9 | 24.8 | 26.2 | C |
| 9 | 1.00 | 1.00 | 0.852 | 0.895 | 2670 | 151 | 4221 | 1886 | 0.63 | 0.08 | 59.1 | 59.1 | 22.6 | 24.0 | C |
| 10 | 1.00 | 1.00 | 0.852 | 0.895 | 2569 | 188 | 4221 | 1886 | 0.61 | 0.10 | 59.0 | 59.0 | 21.8 | 23.2 | C |
| 11 | 1.00 | 1.00 | 0.852 | 0.895 | 2636 | 229 | 4221 | 1886 | 0.62 | 0.12 | 58.9 | 58.9 | 22.4 | 23.7 | C |
| 12 | 1.00 | 1.00 | 0.852 | 0.895 | 2685 | 193 | 4221 | 1886 | 0.64 | 0.10 | 59.0 | 59.0 | 22.8 | 24.1 | C |

## Segment 20: Basic

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | (pc/h) | (pc/h) | Ratio | (mi/h) | (pc/mi/ln) | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 2536 | 4269 | 0.59 | 66.8 | 19.0 | C |
| 2 | 1.00 | 0.849 | 2444 | 4269 | 0.57 | 66.8 | 18.2 | C |
| 3 | 1.00 | 0.849 | 2505 | 4269 | 0.59 | 66.8 | 18.7 | C |
| 4 | 1.00 | 0.849 | 2563 | 4269 | 0.60 | 66.7 | 19.2 | C |
| 5 | 1.00 | 0.849 | 2742 | 4269 | 0.64 | 65.9 | 20.8 | C |
| 6 | 1.00 | 0.849 | 2584 | 4269 | 0.61 | 66.6 | 19.4 | C |
| 7 | 1.00 | 0.849 | 2611 | 4269 | 0.61 | 66.5 | 19.6 | C |
| 8 | 1.00 | 0.849 | 2707 | 4269 | 0.63 | 66.0 | 20.5 | C |
| 9 | 1.00 | 0.849 | 2521 | 4269 | 0.59 | 66.8 | 18.8 | C |
| 10 | 1.00 | 0.849 | 2380 | 4269 | 0.56 | 66.8 | 17.7 | B |
| 11 | 1.00 | 0.849 | 2404 | 4269 | 0.56 | 66.8 | 17.9 | B |
| 12 | 1.00 | 0.849 | 2491 | 4269 | 0.58 | 66.8 | 18.6 | C |

## Segment 21: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.943 | 2807 | 271 | 4221 | 1886 | 0.67 | 0.14 | 61.9 | 61.9 | 22.7 | 18.5 | B |
| 2 | 1.00 | 1.00 | 0.849 | 0.943 | 2708 | 264 | 4221 | 1886 | 0.64 | 0.14 | 62.0 | 62.0 | 21.8 | 17.8 | B |
| 3 | 1.00 | 1.00 | 0.849 | 0.943 | 2783 | 278 | 4221 | 1886 | 0.66 | 0.15 | 61.9 | 61.9 | 22.5 | 18.3 | B |
| 4 | 1.00 | 1.00 | 0.849 | 0.943 | 2830 | 267 | 4221 | 1886 | 0.67 | 0.14 | 61.9 | 61.9 | 22.9 | 18.7 | B |
| 5 | 1.00 | 1.00 | 0.849 | 0.943 | 3072 | 330 | 4221 | 1886 | 0.73 | 0.17 | 61.3 | 61.3 | 25.1 | 20.6 | C |
| 6 | 1.00 | 1.00 | 0.849 | 0.943 | 2882 | 298 | 4221 | 1886 | 0.68 | 0.16 | 61.8 | 61.8 | 23.3 | 19.1 | B |
| 7 | 1.00 | 1.00 | 0.849 | 0.943 | 2855 | 244 | 4221 | 1886 | 0.68 | 0.13 | 61.8 | 61.8 | 23.1 | 18.9 | B |
| 8 | 1.00 | 1.00 | 0.849 | 0.943 | 2981 | 274 | 4221 | 1886 | 0.71 | 0.15 | 61.6 | 61.6 | 24.2 | 19.9 | B |
| 9 | 1.00 | 1.00 | 0.849 | 0.943 | 2824 | 303 | 4221 | 1886 | 0.67 | 0.16 | 61.9 | 61.9 | 22.8 | 18.7 | B |
| 10 | 1.00 | 1.00 | 0.849 | 0.943 | 2654 | 274 | 4221 | 1886 | 0.63 | 0.15 | 62.1 | 62.1 | 21.4 | 17.3 | B |
| 11 | 1.00 | 1.00 | 0.849 | 0.943 | 2629 | 225 | 4221 | 1886 | 0.62 | 0.12 | 62.2 | 62.2 | 21.1 | 17.2 | B |
| 12 | 1.00 | 1.00 | 0.849 | 0.943 | 2743 | 252 | 4221 | 1886 | 0.65 | 0.13 | 62.0 | 62.0 | 22.1 | 18.0 | B |

## Segment 22: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 2808 | 4269 | 0.66 | 65.5 | 21.4 | C |
| 2 | 1.00 | 0.858 | 2709 | 4269 | 0.63 | 66.0 | 20.5 | C |
| 3 | 1.00 | 0.858 | 2784 | 4269 | 0.65 | 65.6 | 21.2 | C |
| 4 | 1.00 | 0.858 | 2830 | 4269 | 0.66 | 65.3 | 21.7 | C |
| 5 | 1.00 | 0.858 | 3076 | 4269 | 0.72 | 63.5 | 24.2 | C |
| 6 | 1.00 | 0.858 | 2885 | 4269 | 0.68 | 65.0 | 22.2 | C |
| 7 | 1.00 | 0.858 | 2852 | 4269 | 0.67 | 65.2 | 21.9 | C |
| 8 | 1.00 | 0.858 | 2979 | 4269 | 0.70 | 64.3 | 23.2 | C |
| 9 | 1.00 | 0.858 | 2828 | 4269 | 0.66 | 65.4 | 21.6 | C |
| 10 | 1.00 | 0.858 | 2656 | 4269 | 0.62 | 66.3 | 20.0 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | 0.858 | 2626 | 4269 | 0.62 | 66.5 | 19.7 | C |
| 12 | 1.00 | 0.858 | 2742 | 4269 | 0.64 | 65.9 | 20.8 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 16814 | 16742 | 11.40 | 65.1 | 21.4 | 18.2 | 26.20 | C |
| 2 | 16043 | 15968 | 8.58 | 65.7 | 20.2 | 17.2 | 25.90 | C |
| 3 | 16464 | 16391 | 9.99 | 65.4 | 20.8 | 17.7 | 26.00 | C |
| 4 | 16902 | 16826 | 11.78 | 65.0 | 21.5 | 18.3 | 26.20 | C |
| 5 | 17865 | 17786 | 16.38 | 64.1 | 23.0 | 19.6 | 26.60 | D |
| 6 | 17007 | 16926 | 12.19 | 64.9 | 21.6 | 18.4 | 26.20 | C |
| 7 | 17407 | 17333 | 14.08 | 64.6 | 22.3 | 19.0 | 26.40 | D |
| 8 | 17888 | 17808 | 16.63 | 64.1 | 23.1 | 19.7 | 26.60 | D |
| 9 | 16425 | 16353 | 9.85 | 65.4 | 20.8 | 17.7 | 26.00 | C |
| 10 | 15656 | 15581 | 7.35 | 66.0 | 19.6 | 16.7 | 25.80 | C |
| 11 | 16020 | 15952 | 8.43 | 65.8 | 20.1 | 17.2 | 25.90 | C |
| 12 | 16463 | 16389 | 9.89 | 65.4 | 20.8 | 17.7 | 26.00 | C |

## Facility Overall Results

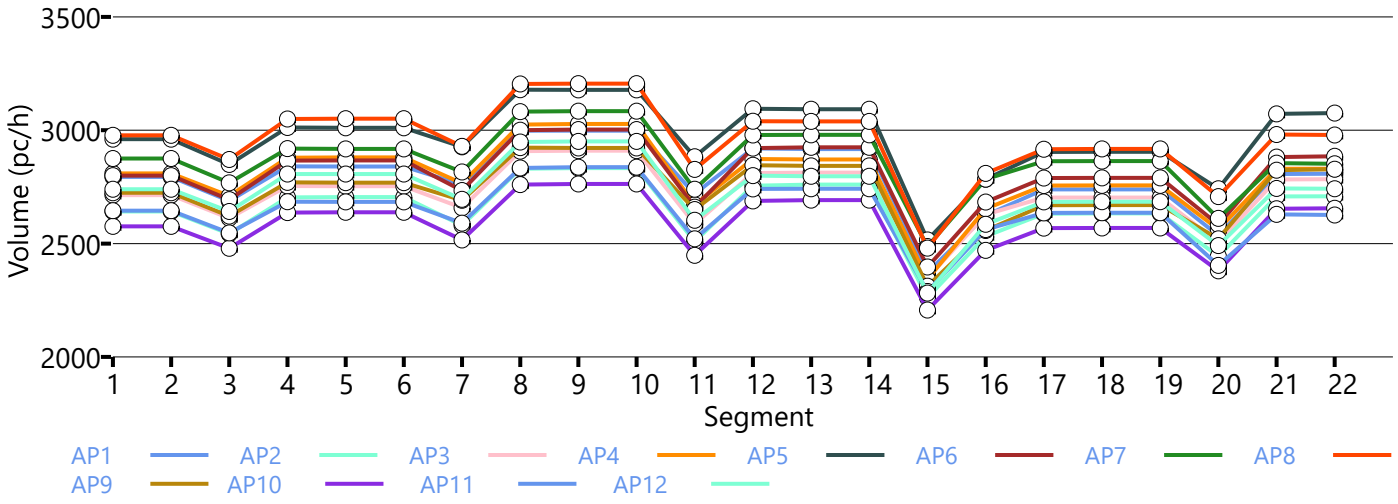
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 65.1 | Density, veh/mi/ln | 18.1 |
| Average Travel Time, min | 26.20 | Density, pc/mi/ln | 21.3 |

## Messages

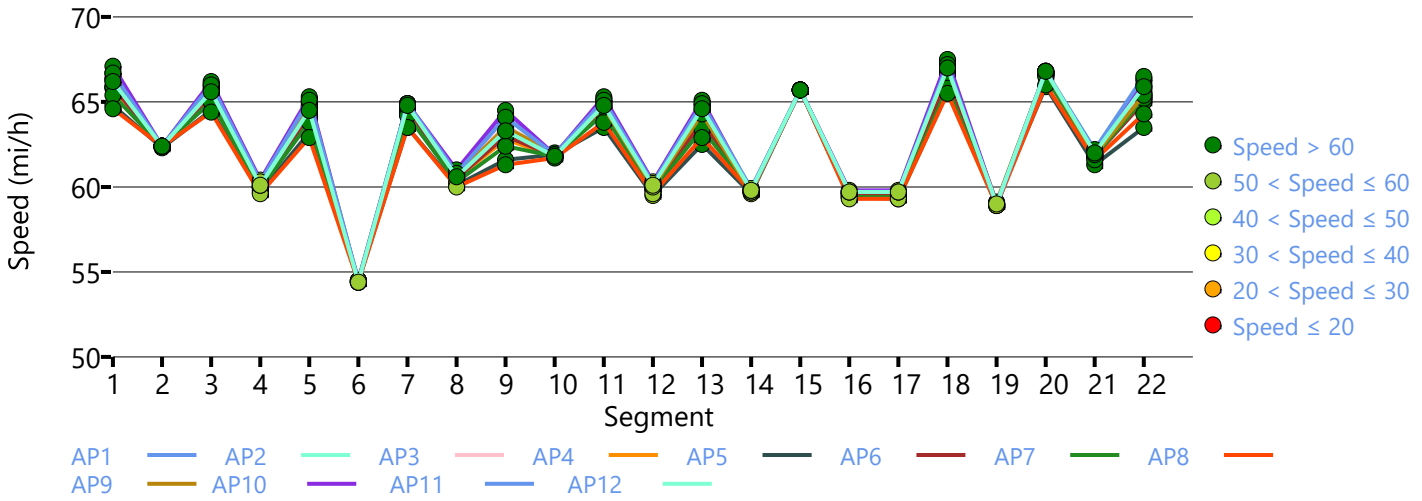
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

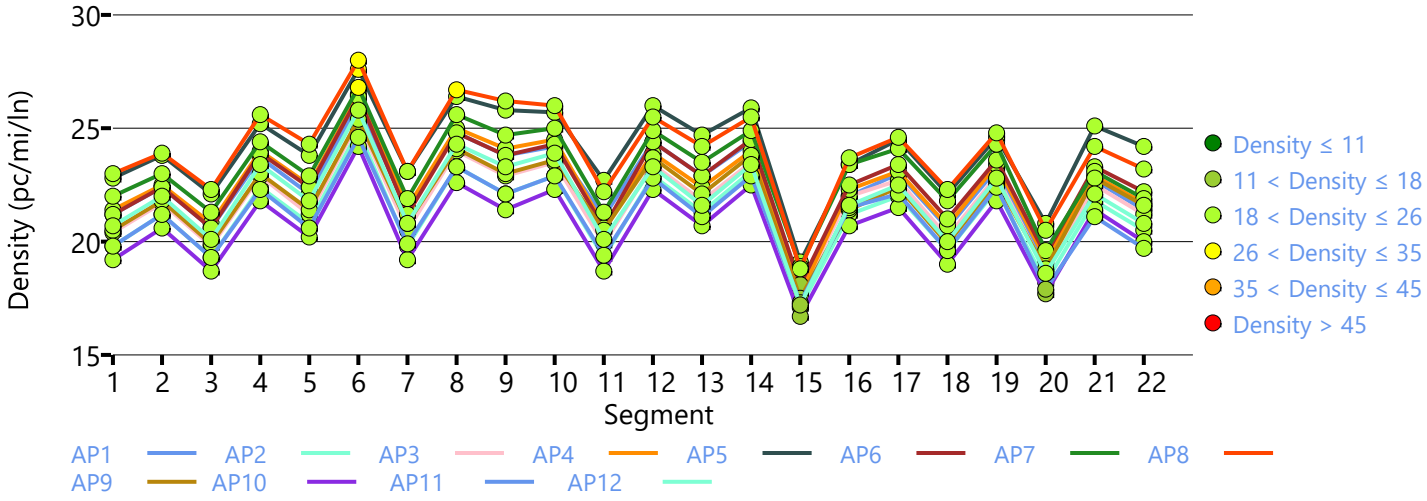
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 6/27/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | NB I-90/94 WIS 33 to US 12 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 18 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 26.35 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | USH 33 to STH 12 | 66971 | 2 |
| 2 | Diverge | Diverge | USH 12 WB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12 between on and off | 1694 | 2 |
| 4 | Merge | Merge | USH 12 NB On | 831 | 2 |
| 5 | Merge | Merge | USH 12 WB On | 1500 | 2 |
| 6 | Basic | Basic | STH 23 to USH 12 | 6984 | 2 |
| 7 | Diverge | Diverge | STH 23 WB Off | 1500 | 2 |
| 8 | Basic | Basic | STH 23 between on and off | 3184 | 2 |
| 9 | Merge | Merge | STH 23 WB On | 1500 | 2 |
| 10 | Basic | Basic | STH 13 to STH 23 | 7816 | 2 |
| 11 | Diverge | Diverge | STH 13 WB Off | 1500 | 2 |
| 12 | Basic | Basic | STH 13 between on and off | 1620 | 2 |
| 13 | Merge | Merge | STH 13 WB On | 1500 | 2 |
| 14 | Basic | Basic | USH 12/STH 16 to STH 13 | 4727 | 2 |
| 15 | Diverge | Diverge | USH 12/STH 16 WB Off | 1500 | 2 |
| 16 | Basic | Basic | USH 12/STH 16 between on and off | 2705 | 2 |
| 17 | Merge | Merge | USH 12/STH 16 WB On | 1500 | 2 |
| 18 | Basic | Basic | CTH HH to USH 12/STH 16 | 30590 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.890 | 3139 | 4289 | 0.73 | 63.6 | 24.7 | C |
| 2 | 1.00 | 0.890 | 3010 | 4289 | 0.70 | 64.7 | 23.3 | C |
| 3 | 1.00 | 0.890 | 3034 | 4289 | 0.71 | 64.5 | 23.5 | C |
| 4 | 1.00 | 0.890 | 3210 | 4289 | 0.75 | 62.9 | 25.5 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 0.890 | 3125 | 4289 | 0.73 | 63.8 | 24.5 | C |
| 6 | 1.00 | 0.890 | 2997 | 4289 | 0.70 | 64.9 | 23.1 | C |
| 7 | 1.00 | 0.890 | 3020 | 4289 | 0.70 | 64.7 | 23.3 | C |
| 8 | 1.00 | 0.890 | 3198 | 4289 | 0.75 | 63.1 | 25.3 | C |
| 9 | 1.00 | 0.890 | 3031 | 4289 | 0.71 | 64.6 | 23.5 | C |
| 10 | 1.00 | 0.890 | 2904 | 4289 | 0.68 | 65.6 | 22.1 | C |
| 11 | 1.00 | 0.890 | 2929 | 4289 | 0.68 | 65.4 | 22.4 | C |
| 12 | 1.00 | 0.890 | 3098 | 4289 | 0.72 | 64.0 | 24.2 | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.890 | 0.967 | 3139 | 744 | 4221 | 1886 | 0.74 | 0.39 | 59.2 | 59.2 | 26.5 | 26.7 | C |
| 2 | 1.00 | 1.00 | 0.890 | 0.967 | 3010 | 719 | 4221 | 1886 | 0.71 | 0.38 | 59.3 | 59.3 | 25.4 | 25.6 | C |
| 3 | 1.00 | 1.00 | 0.890 | 0.967 | 3034 | 721 | 4221 | 1886 | 0.72 | 0.38 | 59.3 | 59.3 | 25.6 | 25.8 | C |
| 4 | 1.00 | 1.00 | 0.890 | 0.967 | 3210 | 646 | 4221 | 1886 | 0.76 | 0.34 | 59.5 | 59.5 | 27.0 | 27.3 | C |
| 5 | 1.00 | 1.00 | 0.890 | 0.967 | 3125 | 761 | 4221 | 1886 | 0.74 | 0.40 | 59.2 | 59.2 | 26.4 | 26.6 | C |
| 6 | 1.00 | 1.00 | 0.890 | 0.967 | 2997 | 735 | 4221 | 1886 | 0.71 | 0.39 | 59.3 | 59.3 | 25.3 | 25.5 | C |
| 7 | 1.00 | 1.00 | 0.890 | 0.967 | 3020 | 737 | 4221 | 1886 | 0.72 | 0.39 | 59.2 | 59.2 | 25.5 | 25.7 | C |
| 8 | 1.00 | 1.00 | 0.890 | 0.967 | 3198 | 662 | 4221 | 1886 | 0.76 | 0.35 | 59.4 | 59.4 | 26.9 | 27.2 | C |
| 9 | 1.00 | 1.00 | 0.890 | 0.967 | 3031 | 726 | 4221 | 1886 | 0.72 | 0.38 | 59.3 | 59.3 | 25.6 | 25.8 | C |
| 10 | 1.00 | 1.00 | 0.890 | 0.967 | 2904 | 702 | 4221 | 1886 | 0.69 | 0.37 | 59.3 | 59.3 | 24.5 | 24.7 | C |
| 11 | 1.00 | 1.00 | 0.890 | 0.967 | 2929 | 703 | 4221 | 1886 | 0.69 | 0.37 | 59.3 | 59.3 | 24.7 | 24.9 | C |
| 12 | 1.00 | 1.00 | 0.890 | 0.967 | 3098 | 632 | 4221 | 1886 | 0.73 | 0.34 | 59.5 | 59.5 | 26.0 | 26.4 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.866 | 2396 | 4244 | 0.56 | 65.8 | 18.1 | C |
| 2 | 1.00 | 0.866 | 2291 | 4244 | 0.54 | 65.8 | 17.3 | B |
| 3 | 1.00 | 0.866 | 2313 | 4244 | 0.55 | 65.8 | 17.5 | B |
| 4 | 1.00 | 0.866 | 2577 | 4244 | 0.61 | 65.6 | 19.6 | C |
| 5 | 1.00 | 0.866 | 2361 | 4244 | 0.56 | 65.8 | 17.9 | B |
| 6 | 1.00 | 0.866 | 2259 | 4244 | 0.53 | 65.8 | 17.0 | B |
| 7 | 1.00 | 0.866 | 2281 | 4244 | 0.54 | 65.8 | 17.2 | B |
| 8 | 1.00 | 0.866 | 2547 | 4244 | 0.60 | 65.7 | 19.4 | C |
| 9 | 1.00 | 0.866 | 2305 | 4244 | 0.54 | 65.8 | 17.4 | B |
| 10 | 1.00 | 0.866 | 2201 | 4244 | 0.52 | 65.8 | 16.6 | B |
| 11 | 1.00 | 0.866 | 2225 | 4244 | 0.52 | 65.8 | 16.8 | B |
| 12 | 1.00 | 0.866 | 2478 | 4244 | 0.58 | 65.8 | 18.8 | C |

## Segment 4: Merge

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.866 | 0.925 | 2870 | 474 | 4221 | 1796 | 0.68 | 0.26 | 59.8 | 59.8 | 24.0 | 22.5 | C |
| 2 | 1.00 | 1.00 | 0.866 | 0.925 | 2745 | 454 | 4221 | 1796 | 0.65 | 0.25 | 60.0 | 60.0 | 22.9 | 21.5 | C |
| 3 | 1.00 | 1.00 | 0.866 | 0.925 | 2726 | 413 | 4221 | 1796 | 0.65 | 0.23 | 60.0 | 60.0 | 22.7 | 21.4 | C |
| 4 | 1.00 | 1.00 | 0.866 | 0.925 | 2948 | 371 | 4221 | 1796 | 0.70 | 0.21 | 59.6 | 59.6 | 24.7 | 23.2 | C |
| 5 | 1.00 | 1.00 | 0.866 | 0.925 | 2846 | 485 | 4221 | 1796 | 0.67 | 0.27 | 59.8 | 59.8 | 23.8 | 22.3 | C |
| 6 | 1.00 | 1.00 | 0.866 | 0.925 | 2724 | 465 | 4221 | 1796 | 0.65 | 0.26 | 60.0 | 60.0 | 22.7 | 21.4 | C |
| 7 | 1.00 | 1.00 | 0.866 | 0.925 | 2704 | 423 | 4221 | 1796 | 0.64 | 0.24 | 60.1 | 60.1 | 22.5 | 21.2 | C |
| 8 | 1.00 | 1.00 | 0.866 | 0.925 | 2926 | 379 | 4221 | 1796 | 0.69 | 0.21 | 59.7 | 59.7 | 24.5 | 23.0 | C |
| 9 | 1.00 | 1.00 | 0.866 | 0.925 | 2768 | 463 | 4221 | 1796 | 0.66 | 0.26 | 60.0 | 60.0 | 23.1 | 21.7 | C |
| 10 | 1.00 | 1.00 | 0.866 | 0.925 | 2644 | 443 | 4221 | 1796 | 0.63 | 0.25 | 60.1 | 60.1 | 22.0 | 20.8 | C |
| 11 | 1.00 | 1.00 | 0.866 | 0.925 | 2628 | 403 | 4221 | 1796 | 0.62 | 0.22 | 60.2 | 60.2 | 21.8 | 20.7 | C |
| 12 | 1.00 | 1.00 | 0.866 | 0.925 | 2840 | 362 | 4221 | 1796 | 0.67 | 0.20 | 59.8 | 59.8 | 23.7 | 22.3 | C |

## Segment 5: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.876 | 0.981 | 3160 | 291 | 4221 | 1886 | 0.75 | 0.15 | 59.9 | 59.9 | 26.4 | 23.9 | C |
| 2 | 1.00 | 1.00 | 0.876 | 0.981 | 3009 | 265 | 4221 | 1886 | 0.71 | 0.14 | 60.2 | 60.2 | 25.0 | 22.8 | C |
| 3 | 1.00 | 1.00 | 0.876 | 0.981 | 2964 | 241 | 4221 | 1886 | 0.70 | 0.13 | 60.3 | 60.3 | 24.6 | 22.4 | C |
| 4 | 1.00 | 1.00 | 0.876 | 0.981 | 3238 | 299 | 4221 | 1886 | 0.77 | 0.16 | 59.7 | 59.7 | 27.1 | 24.5 | C |
| 5 | 1.00 | 1.00 | 0.876 | 0.981 | 3145 | 298 | 4221 | 1886 | 0.75 | 0.16 | 59.9 | 59.9 | 26.3 | 23.8 | C |
| 6 | 1.00 | 1.00 | 0.876 | 0.981 | 2995 | 271 | 4221 | 1886 | 0.71 | 0.14 | 60.3 | 60.3 | 24.8 | 22.6 | C |
| 7 | 1.00 | 1.00 | 0.876 | 0.981 | 2948 | 247 | 4221 | 1886 | 0.70 | 0.13 | 60.4 | 60.4 | 24.4 | 22.3 | C |
| 8 | 1.00 | 1.00 | 0.876 | 0.981 | 3225 | 306 | 4221 | 1886 | 0.76 | 0.16 | 59.7 | 59.7 | 27.0 | 24.4 | C |
| 9 | 1.00 | 1.00 | 0.876 | 0.981 | 3050 | 283 | 4221 | 1886 | 0.72 | 0.15 | 60.1 | 60.1 | 25.4 | 23.1 | C |
| 10 | 1.00 | 1.00 | 0.876 | 0.981 | 2903 | 259 | 4221 | 1886 | 0.69 | 0.14 | 60.4 | 60.4 | 24.0 | 21.9 | C |
| 11 | 1.00 | 1.00 | 0.876 | 0.981 | 2861 | 235 | 4221 | 1886 | 0.68 | 0.12 | 60.5 | 60.5 | 23.6 | 21.6 | C |
| 12 | 1.00 | 1.00 | 0.876 | 0.981 | 3125 | 293 | 4221 | 1886 | 0.74 | 0.16 | 60.0 | 60.0 | 26.0 | 23.6 | C |

## Segment 6: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.885 | 3162 | 4244 | 0.75 | 61.9 | 25.5 | C |
| 2 | 1.00 | 0.885 | 3010 | 4244 | 0.71 | 63.2 | 23.8 | C |
| 3 | 1.00 | 0.885 | 2962 | 4244 | 0.70 | 63.5 | 23.3 | C |
| 4 | 1.00 | 0.885 | 3241 | 4244 | 0.76 | 61.2 | 26.5 | D |
| 5 | 1.00 | 0.885 | 3148 | 4244 | 0.74 | 62.1 | 25.3 | C |
| 6 | 1.00 | 0.885 | 2997 | 4244 | 0.71 | 63.3 | 23.7 | C |
| 7 | 1.00 | 0.885 | 2947 | 4244 | 0.69 | 63.6 | 23.2 | C |
| 8 | 1.00 | 0.885 | 3228 | 4244 | 0.76 | 61.3 | 26.3 | D |
| 9 | 1.00 | 0.885 | 3053 | 4244 | 0.72 | 62.9 | 24.3 | C |
| 10 | 1.00 | 0.885 | 2904 | 4244 | 0.68 | 63.9 | 22.7 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | | 0.885 | | 2860 | | 4244 | | 0.67 | | 64.2 | | 22.3 | C |
| 12 | 1.00 | | 0.885 | | 3128 | | 4244 | | 0.74 | | 62.2 | | 25.1 | C |

## Segment 7: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.885 | 0.953 | 3162 | 217 | 4221 | 1976 | 0.75 | 0.11 | 62.1 | 62.1 | 25.5 | 28.0 | C |
| 2 | 1.00 | 1.00 | 0.885 | 0.953 | 3010 | 215 | 4221 | 1976 | 0.71 | 0.11 | 62.1 | 62.1 | 24.2 | 26.7 | C |
| 3 | 1.00 | 1.00 | 0.885 | 0.953 | 2962 | 192 | 4221 | 1976 | 0.70 | 0.10 | 62.2 | 62.2 | 23.8 | 26.2 | C |
| 4 | 1.00 | 1.00 | 0.885 | 0.953 | 3241 | 216 | 4221 | 1976 | 0.77 | 0.11 | 62.1 | 62.1 | 26.1 | 28.6 | D |
| 5 | 1.00 | 1.00 | 0.885 | 0.953 | 3148 | 221 | 4221 | 1976 | 0.75 | 0.11 | 62.1 | 62.1 | 25.3 | 27.8 | C |
| 6 | 1.00 | 1.00 | 0.885 | 0.953 | 2997 | 220 | 4221 | 1976 | 0.71 | 0.11 | 62.1 | 62.1 | 24.1 | 26.5 | C |
| 7 | 1.00 | 1.00 | 0.885 | 0.953 | 2947 | 196 | 4221 | 1976 | 0.70 | 0.10 | 62.2 | 62.2 | 23.7 | 26.1 | C |
| 8 | 1.00 | 1.00 | 0.885 | 0.953 | 3228 | 221 | 4221 | 1976 | 0.76 | 0.11 | 62.1 | 62.1 | 26.0 | 28.5 | D |
| 9 | 1.00 | 1.00 | 0.885 | 0.953 | 3053 | 212 | 4221 | 1976 | 0.72 | 0.11 | 62.1 | 62.1 | 24.6 | 27.0 | C |
| 10 | 1.00 | 1.00 | 0.885 | 0.953 | 2904 | 211 | 4221 | 1976 | 0.69 | 0.11 | 62.1 | 62.1 | 23.4 | 25.7 | C |
| 11 | 1.00 | 1.00 | 0.885 | 0.953 | 2860 | 188 | 4221 | 1976 | 0.68 | 0.10 | 62.2 | 62.2 | 23.0 | 25.4 | C |
| 12 | 1.00 | 1.00 | 0.885 | 0.953 | 3128 | 211 | 4221 | 1976 | 0.74 | 0.11 | 62.1 | 62.1 | 25.2 | 27.7 | C |

## Segment 8: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.880 | 2944 | 4230 | 0.70 | 63.1 | 23.3 | C |
| 2 | 1.00 | 0.880 | 2794 | 4230 | 0.66 | 64.0 | 21.8 | C |
| 3 | 1.00 | 0.880 | 2770 | 4230 | 0.65 | 64.1 | 21.6 | C |
| 4 | 1.00 | 0.880 | 3025 | 4230 | 0.72 | 62.6 | 24.2 | C |
| 5 | 1.00 | 0.880 | 2926 | 4230 | 0.69 | 63.2 | 23.1 | C |
| 6 | 1.00 | 0.880 | 2775 | 4230 | 0.66 | 64.1 | 21.7 | C |
| 7 | 1.00 | 0.880 | 2751 | 4230 | 0.65 | 64.2 | 21.4 | C |
| 8 | 1.00 | 0.880 | 3007 | 4230 | 0.71 | 62.7 | 24.0 | C |
| 9 | 1.00 | 0.880 | 2841 | 4230 | 0.67 | 63.8 | 22.3 | C |
| 10 | 1.00 | 0.880 | 2692 | 4230 | 0.64 | 64.5 | 20.9 | C |
| 11 | 1.00 | 0.880 | 2673 | 4230 | 0.63 | 64.6 | 20.7 | C |
| 12 | 1.00 | 0.880 | 2917 | 4230 | 0.69 | 63.3 | 23.0 | C |

## Segment 9: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.880 | 0.960 | 3245 | 301 | 4221 | 1886 | 0.77 | 0.16 | 60.2 | 60.2 | 27.0 | 23.8 | C |
| 2 | 1.00 | 1.00 | 0.880 | 0.960 | 3055 | 261 | 4221 | 1886 | 0.72 | 0.14 | 60.7 | 60.7 | 25.2 | 22.3 | C |
| 3 | 1.00 | 1.00 | 0.880 | 0.960 | 3016 | 246 | 4221 | 1886 | 0.71 | 0.13 | 60.8 | 60.8 | 24.8 | 22.0 | C |
| 4 | 1.00 | 1.00 | 0.880 | 0.960 | 3336 | 311 | 4221 | 1886 | 0.79 | 0.17 | 60.0 | 60.0 | 27.8 | 24.5 | C |
| 5 | 1.00 | 1.00 | 0.880 | 0.960 | 3234 | 308 | 4221 | 1886 | 0.77 | 0.16 | 60.3 | 60.3 | 26.8 | 23.7 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 1.00 | 0.880 | 0.960 | 3043 | 268 | 4221 | 1886 | 0.72 | 0.14 | 60.7 | 60.7 | 25.1 | 22.2 | C |
| 7 | 1.00 | 1.00 | 0.880 | 0.960 | 3003 | 252 | 4221 | 1886 | 0.71 | 0.13 | 60.8 | 60.8 | 24.7 | 21.9 | C |
| 8 | 1.00 | 1.00 | 0.880 | 0.960 | 3326 | 319 | 4221 | 1886 | 0.79 | 0.17 | 60.0 | 60.0 | 27.7 | 24.4 | C |
| 9 | 1.00 | 1.00 | 0.880 | 0.960 | 3135 | 294 | 4221 | 1886 | 0.74 | 0.16 | 60.5 | 60.5 | 25.9 | 22.9 | C |
| 10 | 1.00 | 1.00 | 0.880 | 0.960 | 2947 | 255 | 4221 | 1886 | 0.70 | 0.14 | 60.9 | 60.9 | 24.2 | 21.5 | C |
| 11 | 1.00 | 1.00 | 0.880 | 0.960 | 2914 | 241 | 4221 | 1886 | 0.69 | 0.13 | 61.0 | 61.0 | 23.9 | 21.2 | C |
| 12 | 1.00 | 1.00 | 0.880 | 0.960 | 3221 | 304 | 4221 | 1886 | 0.76 | 0.16 | 60.3 | 60.3 | 26.7 | 23.6 | C |

## Segment 10: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.887 | 3247 | 4244 | 0.77 | 61.1 | 26.6 | D |
| 2 | 1.00 | 0.887 | 3055 | 4244 | 0.72 | 62.8 | 24.3 | C |
| 3 | 1.00 | 0.887 | 3015 | 4244 | 0.71 | 63.1 | 23.9 | C |
| 4 | 1.00 | 0.887 | 3338 | 4244 | 0.79 | 60.2 | 27.7 | D |
| 5 | 1.00 | 0.887 | 3237 | 4244 | 0.76 | 61.3 | 26.4 | D |
| 6 | 1.00 | 0.887 | 3043 | 4244 | 0.72 | 62.9 | 24.2 | C |
| 7 | 1.00 | 0.887 | 3002 | 4244 | 0.71 | 63.2 | 23.8 | C |
| 8 | 1.00 | 0.887 | 3328 | 4244 | 0.78 | 60.3 | 27.6 | D |
| 9 | 1.00 | 0.887 | 3136 | 4244 | 0.74 | 62.2 | 25.2 | C |
| 10 | 1.00 | 0.887 | 2947 | 4244 | 0.69 | 63.6 | 23.2 | C |
| 11 | 1.00 | 0.887 | 2912 | 4244 | 0.69 | 63.9 | 22.8 | C |
| 12 | 1.00 | 0.887 | 3223 | 4244 | 0.76 | 61.4 | 26.3 | D |

## Segment 11: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.887 | 0.982 | 3247 | 337 | 4221 | 1796 | 0.77 | 0.19 | 57.0 | 57.0 | 28.5 | 28.2 | D |
| 2 | 1.00 | 1.00 | 0.887 | 0.982 | 3055 | 281 | 4221 | 1796 | 0.72 | 0.16 | 57.2 | 57.2 | 26.7 | 26.5 | C |
| 3 | 1.00 | 1.00 | 0.887 | 0.982 | 3015 | 322 | 4221 | 1796 | 0.71 | 0.18 | 57.1 | 57.1 | 26.4 | 26.2 | C |
| 4 | 1.00 | 1.00 | 0.887 | 0.982 | 3338 | 313 | 4221 | 1796 | 0.79 | 0.17 | 57.1 | 57.1 | 29.2 | 28.9 | D |
| 5 | 1.00 | 1.00 | 0.887 | 0.982 | 3237 | 345 | 4221 | 1796 | 0.77 | 0.19 | 57.0 | 57.0 | 28.4 | 28.1 | D |
| 6 | 1.00 | 1.00 | 0.887 | 0.982 | 3043 | 288 | 4221 | 1796 | 0.72 | 0.16 | 57.2 | 57.2 | 26.6 | 26.4 | C |
| 7 | 1.00 | 1.00 | 0.887 | 0.982 | 3002 | 330 | 4221 | 1796 | 0.71 | 0.18 | 57.1 | 57.1 | 26.3 | 26.0 | C |
| 8 | 1.00 | 1.00 | 0.887 | 0.982 | 3328 | 321 | 4221 | 1796 | 0.79 | 0.18 | 57.1 | 57.1 | 29.1 | 28.8 | D |
| 9 | 1.00 | 1.00 | 0.887 | 0.982 | 3136 | 329 | 4221 | 1796 | 0.74 | 0.18 | 57.1 | 57.1 | 27.5 | 27.2 | C |
| 10 | 1.00 | 1.00 | 0.887 | 0.982 | 2947 | 275 | 4221 | 1796 | 0.70 | 0.15 | 57.2 | 57.2 | 25.8 | 25.6 | C |
| 11 | 1.00 | 1.00 | 0.887 | 0.982 | 2912 | 315 | 4221 | 1796 | 0.69 | 0.18 | 57.1 | 57.1 | 25.5 | 25.3 | C |
| 12 | 1.00 | 1.00 | 0.887 | 0.982 | 3223 | 305 | 4221 | 1796 | 0.76 | 0.17 | 57.1 | 57.1 | 28.2 | 27.9 | C |

## Segment 12: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.877 | 2906 | 4237 | 0.69 | 63.6 | 22.8 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.00 | 0.877 | 2775 | 4237 | 0.65 | 64.4 | 21.6 | C |
| 3 | 1.00 | 0.877 | 2689 | 4237 | 0.63 | 64.8 | 20.7 | C |
| 4 | 1.00 | 0.877 | 3026 | 4237 | 0.71 | 62.8 | 24.1 | C |
| 5 | 1.00 | 0.877 | 2887 | 4237 | 0.68 | 63.8 | 22.6 | C |
| 6 | 1.00 | 0.877 | 2755 | 4237 | 0.65 | 64.5 | 21.4 | C |
| 7 | 1.00 | 0.877 | 2667 | 4237 | 0.63 | 64.9 | 20.6 | C |
| 8 | 1.00 | 0.877 | 3007 | 4237 | 0.71 | 62.9 | 23.9 | C |
| 9 | 1.00 | 0.877 | 2804 | 4237 | 0.66 | 64.2 | 21.8 | C |
| 10 | 1.00 | 0.877 | 2673 | 4237 | 0.63 | 64.9 | 20.6 | C |
| 11 | 1.00 | 0.877 | 2593 | 4237 | 0.61 | 65.2 | 19.9 | C |
| 12 | 1.00 | 0.877 | 2918 | 4237 | 0.69 | 63.6 | 22.9 | C |

## Segment 13: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.877 | 0.902 | 3093 | 187 | 4221 | 1886 | 0.73 | 0.10 | 59.3 | 59.3 | 26.1 | 25.7 | C |
| 2 | 1.00 | 1.00 | 0.877 | 0.902 | 2940 | 165 | 4221 | 1886 | 0.70 | 0.09 | 59.6 | 59.6 | 24.7 | 24.5 | C |
| 3 | 1.00 | 1.00 | 0.877 | 0.902 | 2865 | 176 | 4221 | 1886 | 0.68 | 0.09 | 59.7 | 59.7 | 24.0 | 23.9 | C |
| 4 | 1.00 | 1.00 | 0.877 | 0.902 | 3168 | 142 | 4221 | 1886 | 0.75 | 0.08 | 59.1 | 59.1 | 26.8 | 26.3 | C |
| 5 | 1.00 | 1.00 | 0.877 | 0.902 | 3079 | 192 | 4221 | 1886 | 0.73 | 0.10 | 59.3 | 59.3 | 26.0 | 25.6 | C |
| 6 | 1.00 | 1.00 | 0.877 | 0.902 | 2925 | 170 | 4221 | 1886 | 0.69 | 0.09 | 59.6 | 59.6 | 24.5 | 24.4 | C |
| 7 | 1.00 | 1.00 | 0.877 | 0.902 | 2848 | 181 | 4221 | 1886 | 0.67 | 0.10 | 59.8 | 59.8 | 23.8 | 23.8 | C |
| 8 | 1.00 | 1.00 | 0.877 | 0.902 | 3152 | 145 | 4221 | 1886 | 0.75 | 0.08 | 59.1 | 59.1 | 26.7 | 26.1 | C |
| 9 | 1.00 | 1.00 | 0.877 | 0.902 | 2987 | 183 | 4221 | 1886 | 0.71 | 0.10 | 59.5 | 59.5 | 25.1 | 24.8 | C |
| 10 | 1.00 | 1.00 | 0.877 | 0.902 | 2835 | 162 | 4221 | 1886 | 0.67 | 0.09 | 59.8 | 59.8 | 23.7 | 23.7 | C |
| 11 | 1.00 | 1.00 | 0.877 | 0.902 | 2766 | 173 | 4221 | 1886 | 0.66 | 0.09 | 59.9 | 59.9 | 23.1 | 23.1 | C |
| 12 | 1.00 | 1.00 | 0.877 | 0.902 | 3057 | 139 | 4221 | 1886 | 0.72 | 0.07 | 59.3 | 59.3 | 25.8 | 25.4 | C |

## Segment 14: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 3096 | 4244 | 0.73 | 62.5 | 24.8 | C |
| 2 | 1.00 | 0.878 | 2942 | 4244 | 0.69 | 63.7 | 23.1 | C |
| 3 | 1.00 | 0.878 | 2867 | 4244 | 0.68 | 64.1 | 22.4 | C |
| 4 | 1.00 | 0.878 | 3169 | 4244 | 0.75 | 61.9 | 25.6 | C |
| 5 | 1.00 | 0.878 | 3081 | 4244 | 0.73 | 62.6 | 24.6 | C |
| 6 | 1.00 | 0.878 | 2926 | 4244 | 0.69 | 63.8 | 22.9 | C |
| 7 | 1.00 | 0.878 | 2850 | 4244 | 0.67 | 64.3 | 22.2 | C |
| 8 | 1.00 | 0.878 | 3153 | 4244 | 0.74 | 62.0 | 25.4 | C |
| 9 | 1.00 | 0.878 | 2989 | 4244 | 0.70 | 63.3 | 23.6 | C |
| 10 | 1.00 | 0.878 | 2836 | 4244 | 0.67 | 64.3 | 22.1 | C |
| 11 | 1.00 | 0.878 | 2768 | 4244 | 0.65 | 64.7 | 21.4 | C |
| 12 | 1.00 | 0.878 | 3057 | 4244 | 0.72 | 62.8 | 24.3 | C |

## Segment 15: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.878 | 0.946 | 3096 | 98 | 4221 | 1976 | 0.73 | 0.05 | 62.4 | 62.4 | 24.8 | 25.0 | C |
| 2 | 1.00 | 1.00 | 0.878 | 0.946 | 2942 | 96 | 4221 | 1976 | 0.70 | 0.05 | 62.4 | 62.4 | 23.6 | 23.7 | C |
| 3 | 1.00 | 1.00 | 0.878 | 0.946 | 2867 | 108 | 4221 | 1976 | 0.68 | 0.05 | 62.4 | 62.4 | 23.0 | 23.1 | C |
| 4 | 1.00 | 1.00 | 0.878 | 0.946 | 3169 | 132 | 4221 | 1976 | 0.75 | 0.07 | 62.3 | 62.3 | 25.4 | 25.7 | C |
| 5 | 1.00 | 1.00 | 0.878 | 0.946 | 3081 | 100 | 4221 | 1976 | 0.73 | 0.05 | 62.4 | 62.4 | 24.7 | 24.9 | C |
| 6 | 1.00 | 1.00 | 0.878 | 0.946 | 2926 | 98 | 4221 | 1976 | 0.69 | 0.05 | 62.4 | 62.4 | 23.4 | 23.6 | C |
| 7 | 1.00 | 1.00 | 0.878 | 0.946 | 2850 | 110 | 4221 | 1976 | 0.68 | 0.06 | 62.4 | 62.4 | 22.8 | 22.9 | C |
| 8 | 1.00 | 1.00 | 0.878 | 0.946 | 3153 | 135 | 4221 | 1976 | 0.75 | 0.07 | 62.3 | 62.3 | 25.3 | 25.5 | C |
| 9 | 1.00 | 1.00 | 0.878 | 0.946 | 2989 | 96 | 4221 | 1976 | 0.71 | 0.05 | 62.4 | 62.4 | 24.0 | 24.1 | C |
| 10 | 1.00 | 1.00 | 0.878 | 0.946 | 2836 | 94 | 4221 | 1976 | 0.67 | 0.05 | 62.4 | 62.4 | 22.7 | 22.8 | C |
| 11 | 1.00 | 1.00 | 0.878 | 0.946 | 2768 | 105 | 4221 | 1976 | 0.66 | 0.05 | 62.4 | 62.4 | 22.2 | 22.2 | C |
| 12 | 1.00 | 1.00 | 0.878 | 0.946 | 3057 | 129 | 4221 | 1976 | 0.72 | 0.07 | 62.3 | 62.3 | 24.5 | 24.7 | C |

## Segment 16: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.876 | 2997 | 4251 | 0.71 | 63.5 | 23.6 | C |
| 2 | 1.00 | 0.876 | 2845 | 4251 | 0.67 | 64.6 | 22.0 | C |
| 3 | 1.00 | 0.876 | 2757 | 4251 | 0.65 | 65.1 | 21.2 | C |
| 4 | 1.00 | 0.876 | 3033 | 4251 | 0.71 | 63.3 | 23.9 | C |
| 5 | 1.00 | 0.876 | 2979 | 4251 | 0.70 | 63.7 | 23.4 | C |
| 6 | 1.00 | 0.876 | 2826 | 4251 | 0.66 | 64.7 | 21.8 | C |
| 7 | 1.00 | 0.876 | 2737 | 4251 | 0.64 | 65.2 | 21.0 | C |
| 8 | 1.00 | 0.876 | 3014 | 4251 | 0.71 | 63.4 | 23.8 | C |
| 9 | 1.00 | 0.876 | 2892 | 4251 | 0.68 | 64.3 | 22.5 | C |
| 10 | 1.00 | 0.876 | 2741 | 4251 | 0.64 | 65.2 | 21.0 | C |
| 11 | 1.00 | 0.876 | 2661 | 4251 | 0.63 | 65.5 | 20.3 | C |
| 12 | 1.00 | 0.876 | 2925 | 4251 | 0.69 | 64.0 | 22.8 | C |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.876 | 0.939 | 3114 | 117 | 4221 | 1976 | 0.74 | 0.06 | 60.7 | 60.7 | 25.7 | 23.2 | C |
| 2 | 1.00 | 1.00 | 0.876 | 0.939 | 2956 | 111 | 4221 | 1976 | 0.70 | 0.06 | 61.0 | 61.0 | 24.2 | 22.0 | C |
| 3 | 1.00 | 1.00 | 0.876 | 0.939 | 2884 | 127 | 4221 | 1976 | 0.68 | 0.06 | 61.2 | 61.2 | 23.6 | 21.4 | C |
| 4 | 1.00 | 1.00 | 0.876 | 0.939 | 3136 | 103 | 4221 | 1976 | 0.74 | 0.05 | 60.6 | 60.6 | 25.9 | 23.4 | C |
| 5 | 1.00 | 1.00 | 0.876 | 0.939 | 3098 | 119 | 4221 | 1976 | 0.73 | 0.06 | 60.7 | 60.7 | 25.5 | 23.1 | C |
| 6 | 1.00 | 1.00 | 0.876 | 0.939 | 2940 | 114 | 4221 | 1976 | 0.70 | 0.06 | 61.1 | 61.1 | 24.1 | 21.8 | C |
| 7 | 1.00 | 1.00 | 0.876 | 0.939 | 2867 | 130 | 4221 | 1976 | 0.68 | 0.07 | 61.2 | 61.2 | 23.4 | 21.3 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | 1.00 | 0.876 | 0.939 | 3119 | 105 | 4221 | 1976 | 0.74 | 0.05 | 60.7 | 60.7 | 25.7 | 23.2 | C |
| 9 | 1.00 | 1.00 | 0.876 | 0.939 | 3006 | 114 | 4221 | 1976 | 0.71 | 0.06 | 60.9 | 60.9 | 24.7 | 22.4 | C |
| 10 | 1.00 | 1.00 | 0.876 | 0.939 | 2850 | 109 | 4221 | 1976 | 0.68 | 0.05 | 61.2 | 61.2 | 23.3 | 21.1 | C |
| 11 | 1.00 | 1.00 | 0.876 | 0.939 | 2785 | 124 | 4221 | 1976 | 0.66 | 0.06 | 61.3 | 61.3 | 22.7 | 20.6 | C |
| 12 | 1.00 | 1.00 | 0.876 | 0.939 | 3026 | 101 | 4221 | 1976 | 0.72 | 0.05 | 60.9 | 60.9 | 24.8 | 22.5 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 3115 | 4278 | 0.73 | 63.5 | 24.5 | C |
| 2 | 1.00 | 0.878 | 2957 | 4278 | 0.69 | 64.8 | 22.8 | C |
| 3 | 1.00 | 0.878 | 2886 | 4278 | 0.67 | 65.3 | 22.1 | C |
| 4 | 1.00 | 0.878 | 3137 | 4278 | 0.73 | 63.3 | 24.8 | C |
| 5 | 1.00 | 0.878 | 3100 | 4278 | 0.72 | 63.6 | 24.4 | C |
| 6 | 1.00 | 0.878 | 2942 | 4278 | 0.69 | 64.9 | 22.7 | C |
| 7 | 1.00 | 0.878 | 2870 | 4278 | 0.67 | 65.4 | 21.9 | C |
| 8 | 1.00 | 0.878 | 3120 | 4278 | 0.73 | 63.4 | 24.6 | C |
| 9 | 1.00 | 0.878 | 3007 | 4278 | 0.70 | 64.4 | 23.4 | C |
| 10 | 1.00 | 0.878 | 2851 | 4278 | 0.67 | 65.5 | 21.8 | C |
| 11 | 1.00 | 0.878 | 2787 | 4278 | 0.65 | 65.9 | 21.2 | C |
| 12 | 1.00 | 0.878 | 3026 | 4278 | 0.71 | 64.2 | 23.6 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 18188 | 18116 | 21.92 | 63.0 | 24.8 | 21.9 | 25.10 | D |
| 2 | 17347 | 17281 | 16.23 | 64.1 | 23.3 | 20.6 | 24.70 | D |
| 3 | 17240 | 17177 | 15.83 | 64.1 | 23.1 | 20.4 | 24.70 | D |
| 4 | 18557 | 18491 | 24.83 | 62.4 | 25.5 | 22.6 | 25.30 | D |
| 5 | 18102 | 18028 | 21.13 | 63.1 | 24.6 | 21.8 | 25.10 | D |
| 6 | 17263 | 17196 | 15.57 | 64.2 | 23.1 | 20.4 | 24.60 | D |
| 7 | 17153 | 17088 | 15.16 | 64.3 | 22.9 | 20.2 | 24.60 | D |
| 8 | 18475 | 18407 | 24.07 | 62.6 | 25.3 | 22.4 | 25.30 | D |
| 9 | 17560 | 17490 | 17.37 | 63.8 | 23.6 | 20.9 | 24.80 | D |
| 10 | 16732 | 16668 | 12.75 | 64.8 | 22.2 | 19.6 | 24.40 | D |
| 11 | 16646 | 16584 | 12.49 | 64.8 | 22.0 | 19.5 | 24.40 | D |
| 12 | 17906 | 17841 | 19.76 | 63.4 | 24.2 | 21.4 | 24.90 | D |

## Facility Overall Results

| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 63.7 | Density, veh/mi/ln | 21.0 |
| Average Travel Time, min | 24.80 | Density, pc/mi/ln | 23.7 |

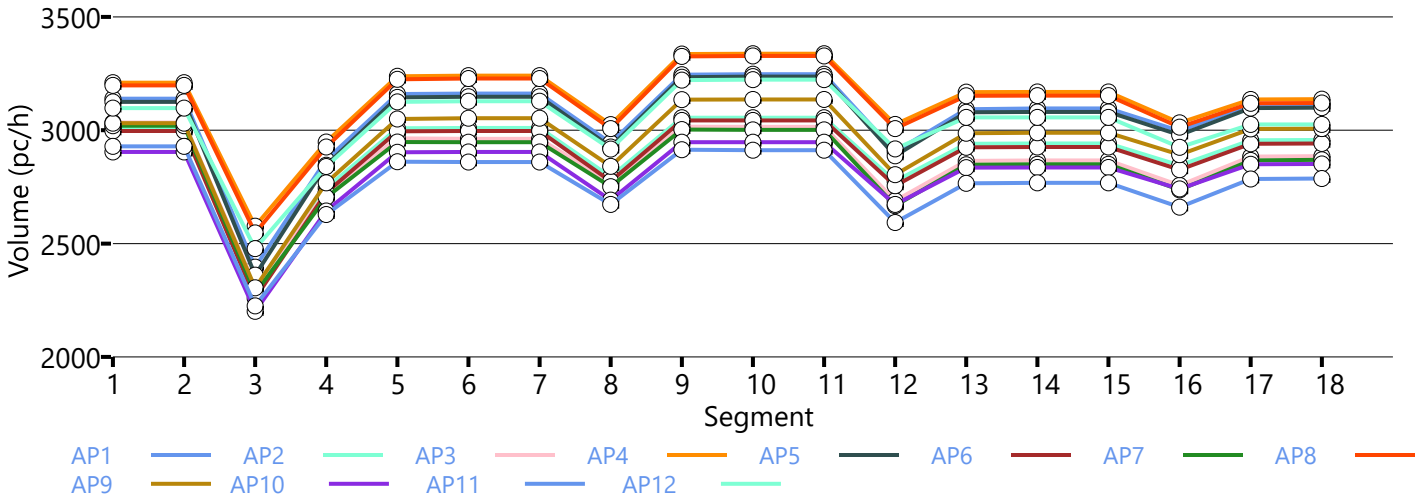
## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with |

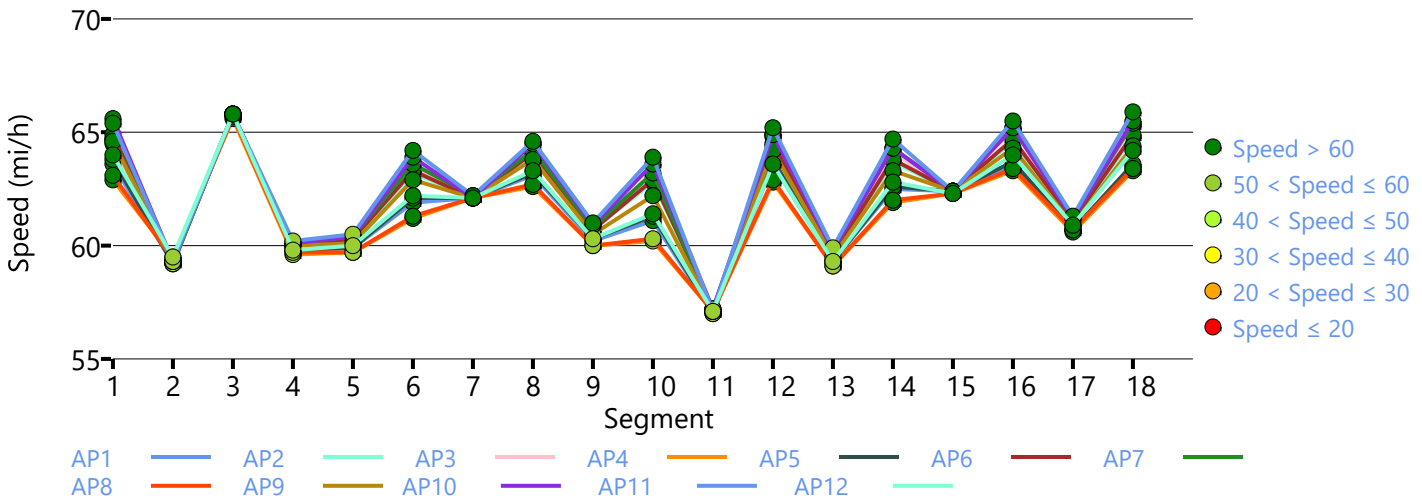
| | |
|---|---|
| | no queuing). |

| Comments |
|---|
| |

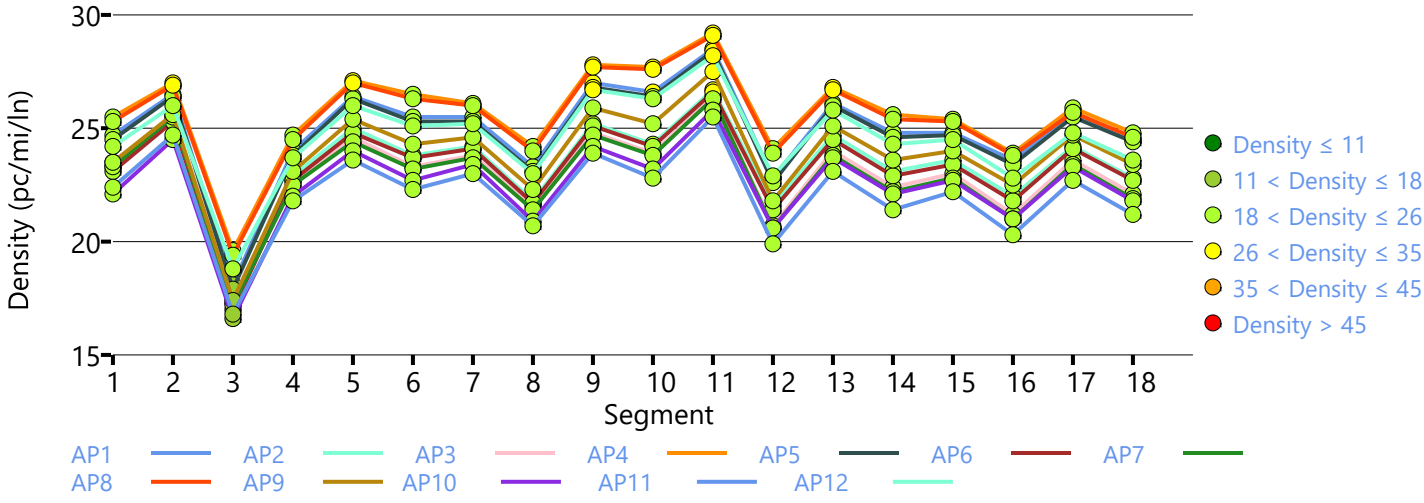
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Neal Styka, PE, RPS1, PTOE | Date | 6/27/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | SB I-90/94 US 12 to WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 22 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 28.39 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | CTH HH to USH 12/STH 16 | 29955 | 2 |
| 2 | Diverge | Diverge | USH 12/STH 16 EB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12/STH 16 between on and off | 2202 | 2 |
| 4 | Merge | Merge | USH 12/STH 16 EB On | 1500 | 2 |
| 5 | Basic | Basic | USH 12/STH 16 to STH 13 | 5695 | 2 |
| 6 | Diverge | Diverge | STH 13 EB Off | 1500 | 2 |
| 7 | Basic | Basic | STH 13 between on and off | 1465 | 2 |
| 8 | Merge | Merge | STH 13 EB On | 1500 | 2 |
| 9 | Basic | Basic | STH 13 to STH 23 | 7583 | 2 |
| 10 | Diverge | Diverge | STH 23 EB Off | 1500 | 2 |
| 11 | Basic | Basic | STH 23 between on and off | 2771 | 2 |
| 12 | Merge | Merge | STH 23 EB On | 1500 | 2 |
| 13 | Basic | Basic | STH 23 to USH 12 | 6118 | 2 |
| 14 | Diverge | Diverge | USH 12 EB Off | 1500 | 2 |
| 15 | Basic | Basic | USH 12 between on and off | 1396 | 2 |
| 16 | Merge | Merge | USH 12 SB on | 1283 | 2 |
| 17 | Merge | Merge | USH 12 EB On | 1500 | 2 |
| 18 | Basic | Basic | USH 12 to STH 33 | 67891 | 2 |
| 19 | Diverge | Diverge | STH 33 EB Off | 1500 | 2 |
| 20 | Basic | Basic | STH 33 between on and off | 1344 | 2 |
| 21 | Merge | Merge | STH 33 EB On | 1500 | 2 |
| 22 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.881 | 2940 | 4278 | 0.69 | 64.9 | 22.7 | C |
| 2 | 1.00 | 0.881 | 3012 | 4278 | 0.70 | 64.4 | 23.4 | C |
| 3 | 1.00 | 0.881 | 3322 | 4278 | 0.78 | 61.5 | 27.0 | D |
| 4 | 1.00 | 0.881 | 3269 | 4278 | 0.76 | 62.0 | 26.4 | D |
| 5 | 1.00 | 0.881 | 3043 | 4278 | 0.71 | 64.1 | 23.7 | C |
| 6 | 1.00 | 0.881 | 3119 | 4278 | 0.73 | 63.4 | 24.6 | C |
| 7 | 1.00 | 0.881 | 3439 | 4278 | 0.80 | 60.2 | 28.6 | D |
| 8 | 1.00 | 0.881 | 3384 | 4278 | 0.79 | 60.8 | 27.8 | D |
| 9 | 1.00 | 0.881 | 2928 | 4278 | 0.68 | 65.0 | 22.5 | C |
| 10 | 1.00 | 0.881 | 3001 | 4278 | 0.70 | 64.5 | 23.3 | C |
| 11 | 1.00 | 0.881 | 3309 | 4278 | 0.77 | 61.6 | 26.9 | D |
| 12 | 1.00 | 0.881 | 3257 | 4278 | 0.76 | 62.2 | 26.2 | D |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.881 | 0.954 | 2940 | 139 | 4221 | 1976 | 0.70 | 0.07 | 62.3 | 62.3 | 23.6 | 21.8 | C |
| 2 | 1.00 | 1.00 | 0.881 | 0.954 | 3012 | 130 | 4221 | 1976 | 0.71 | 0.07 | 62.3 | 62.3 | 24.2 | 22.5 | C |
| 3 | 1.00 | 1.00 | 0.881 | 0.954 | 3322 | 115 | 4221 | 1976 | 0.79 | 0.06 | 62.3 | 62.3 | 26.7 | 25.1 | C |
| 4 | 1.00 | 1.00 | 0.881 | 0.954 | 3269 | 101 | 4221 | 1976 | 0.77 | 0.05 | 62.4 | 62.4 | 26.2 | 24.7 | C |
| 5 | 1.00 | 1.00 | 0.881 | 0.954 | 3043 | 145 | 4221 | 1976 | 0.72 | 0.07 | 62.3 | 62.3 | 24.4 | 22.7 | C |
| 6 | 1.00 | 1.00 | 0.881 | 0.954 | 3119 | 134 | 4221 | 1976 | 0.74 | 0.07 | 62.3 | 62.3 | 25.0 | 23.4 | C |
| 7 | 1.00 | 1.00 | 0.881 | 0.954 | 3439 | 119 | 4221 | 1976 | 0.81 | 0.06 | 62.3 | 62.3 | 27.6 | 26.1 | C |
| 8 | 1.00 | 1.00 | 0.881 | 0.954 | 3384 | 105 | 4221 | 1976 | 0.80 | 0.05 | 62.4 | 62.4 | 27.1 | 25.7 | C |
| 9 | 1.00 | 1.00 | 0.881 | 0.954 | 2928 | 139 | 4221 | 1976 | 0.69 | 0.07 | 62.3 | 62.3 | 23.5 | 21.7 | C |
| 10 | 1.00 | 1.00 | 0.881 | 0.954 | 3001 | 129 | 4221 | 1976 | 0.71 | 0.07 | 62.3 | 62.3 | 24.1 | 22.4 | C |
| 11 | 1.00 | 1.00 | 0.881 | 0.954 | 3309 | 115 | 4221 | 1976 | 0.78 | 0.06 | 62.3 | 62.3 | 26.6 | 25.0 | C |
| 12 | 1.00 | 1.00 | 0.881 | 0.954 | 3257 | 101 | 4221 | 1976 | 0.77 | 0.05 | 62.4 | 62.4 | 26.1 | 24.6 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 2798 | 4251 | 0.66 | 64.8 | 21.6 | C |
| 2 | 1.00 | 0.878 | 2882 | 4251 | 0.68 | 64.3 | 22.4 | C |
| 3 | 1.00 | 0.878 | 3208 | 4251 | 0.75 | 61.8 | 26.0 | C |
| 4 | 1.00 | 0.878 | 3171 | 4251 | 0.75 | 62.1 | 25.5 | C |
| 5 | 1.00 | 0.878 | 2896 | 4251 | 0.68 | 64.2 | 22.6 | C |
| 6 | 1.00 | 0.878 | 2984 | 4251 | 0.70 | 63.6 | 23.5 | C |
| 7 | 1.00 | 0.878 | 3321 | 4251 | 0.78 | 60.7 | 27.3 | D |
| 8 | 1.00 | 0.878 | 3281 | 4251 | 0.77 | 61.1 | 26.8 | D |
| 9 | 1.00 | 0.878 | 2787 | 4251 | 0.66 | 64.9 | 21.5 | C |
| 10 | 1.00 | 0.878 | 2871 | 4251 | 0.68 | 64.4 | 22.3 | C |
| 11 | 1.00 | 0.878 | 3195 | 4251 | 0.75 | 61.9 | 25.8 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.878 | | 3158 | | 4251 | | 0.74 | | 62.2 | | 25.4 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.878 | 0.918 | 3088 | 290 | 4221 | 1976 | 0.73 | 0.15 | 59.5 | 59.5 | 25.9 | 25.7 | C |
| 2 | 1.00 | 1.00 | 0.878 | 0.918 | 3127 | 245 | 4221 | 1976 | 0.74 | 0.12 | 59.4 | 59.4 | 26.3 | 26.1 | C |
| 3 | 1.00 | 1.00 | 0.878 | 0.918 | 3459 | 251 | 4221 | 1976 | 0.82 | 0.13 | 58.5 | 58.5 | 29.6 | 28.7 | D |
| 4 | 1.00 | 1.00 | 0.878 | 0.918 | 3396 | 225 | 4221 | 1976 | 0.80 | 0.11 | 58.7 | 58.7 | 28.9 | 28.2 | D |
| 5 | 1.00 | 1.00 | 0.878 | 0.918 | 3196 | 300 | 4221 | 1976 | 0.76 | 0.15 | 59.3 | 59.3 | 26.9 | 26.6 | C |
| 6 | 1.00 | 1.00 | 0.878 | 0.918 | 3238 | 254 | 4221 | 1976 | 0.77 | 0.13 | 59.2 | 59.2 | 27.3 | 26.9 | C |
| 7 | 1.00 | 1.00 | 0.878 | 0.918 | 3580 | 259 | 4221 | 1976 | 0.85 | 0.13 | 58.1 | 58.1 | 30.8 | 29.6 | D |
| 8 | 1.00 | 1.00 | 0.878 | 0.918 | 3514 | 233 | 4221 | 1976 | 0.83 | 0.12 | 58.3 | 58.3 | 30.1 | 29.1 | D |
| 9 | 1.00 | 1.00 | 0.878 | 0.918 | 3076 | 289 | 4221 | 1976 | 0.73 | 0.15 | 59.6 | 59.6 | 25.8 | 25.6 | C |
| 10 | 1.00 | 1.00 | 0.878 | 0.918 | 3115 | 244 | 4221 | 1976 | 0.74 | 0.12 | 59.4 | 59.4 | 26.2 | 26.0 | C |
| 11 | 1.00 | 1.00 | 0.878 | 0.918 | 3444 | 249 | 4221 | 1976 | 0.82 | 0.13 | 58.5 | 58.5 | 29.4 | 28.5 | D |
| 12 | 1.00 | 1.00 | 0.878 | 0.918 | 3382 | 224 | 4221 | 1976 | 0.80 | 0.11 | 58.7 | 58.7 | 28.8 | 28.1 | D |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.882 | 3087 | 4244 | 0.73 | 62.6 | 24.7 | C |
| 2 | 1.00 | 0.882 | 3124 | 4244 | 0.74 | 62.3 | 25.1 | C |
| 3 | 1.00 | 0.882 | 3455 | 4244 | 0.81 | 59.0 | 29.3 | D |
| 4 | 1.00 | 0.882 | 3391 | 4244 | 0.80 | 59.7 | 28.4 | D |
| 5 | 1.00 | 0.882 | 3195 | 4244 | 0.75 | 61.6 | 25.9 | C |
| 6 | 1.00 | 0.882 | 3235 | 4244 | 0.76 | 61.3 | 26.4 | D |
| 7 | 1.00 | 0.882 | 3576 | 4244 | 0.84 | 57.5 | 31.1 | D |
| 8 | 1.00 | 0.882 | 3509 | 4244 | 0.83 | 58.3 | 30.1 | D |
| 9 | 1.00 | 0.882 | 3075 | 4244 | 0.72 | 62.7 | 24.5 | C |
| 10 | 1.00 | 0.882 | 3112 | 4244 | 0.73 | 62.4 | 24.9 | C |
| 11 | 1.00 | 0.882 | 3440 | 4244 | 0.81 | 59.1 | 29.1 | D |
| 12 | 1.00 | 0.882 | 3378 | 4244 | 0.80 | 59.8 | 28.2 | D |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.882 | 0.961 | 3087 | 139 | 4221 | 1706 | 0.73 | 0.08 | 54.4 | 54.4 | 28.4 | 24.5 | C |
| 2 | 1.00 | 1.00 | 0.882 | 0.961 | 3124 | 189 | 4221 | 1706 | 0.74 | 0.11 | 54.2 | 54.2 | 28.8 | 24.8 | C |
| 3 | 1.00 | 1.00 | 0.882 | 0.961 | 3455 | 165 | 4221 | 1706 | 0.82 | 0.10 | 54.3 | 54.3 | 31.8 | 27.6 | C |
| 4 | 1.00 | 1.00 | 0.882 | 0.961 | 3391 | 129 | 4221 | 1706 | 0.80 | 0.08 | 54.4 | 54.4 | 31.2 | 27.1 | C |
| 5 | 1.00 | 1.00 | 0.882 | 0.961 | 3195 | 145 | 4221 | 1706 | 0.76 | 0.08 | 54.3 | 54.3 | 29.4 | 25.4 | C |
| 6 | 1.00 | 1.00 | 0.882 | 0.961 | 3235 | 196 | 4221 | 1706 | 0.77 | 0.11 | 54.2 | 54.2 | 29.8 | 25.7 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.882 | 0.961 | 3576 | 171 | 4221 | 1706 | 0.85 | 0.10 | 54.3 | 54.3 | 32.9 | 28.7 | D |
| 8 | 1.00 | 1.00 | 0.882 | 0.961 | 3509 | 133 | 4221 | 1706 | 0.83 | 0.08 | 54.4 | 54.4 | 32.3 | 28.1 | D |
| 9 | 1.00 | 1.00 | 0.882 | 0.961 | 3075 | 139 | 4221 | 1706 | 0.73 | 0.08 | 54.4 | 54.4 | 28.3 | 24.4 | C |
| 10 | 1.00 | 1.00 | 0.882 | 0.961 | 3112 | 188 | 4221 | 1706 | 0.74 | 0.11 | 54.2 | 54.2 | 28.7 | 24.7 | C |
| 11 | 1.00 | 1.00 | 0.882 | 0.961 | 3440 | 164 | 4221 | 1706 | 0.82 | 0.10 | 54.3 | 54.3 | 31.7 | 27.5 | C |
| 12 | 1.00 | 1.00 | 0.882 | 0.961 | 3378 | 128 | 4221 | 1706 | 0.80 | 0.08 | 54.4 | 54.4 | 31.0 | 27.0 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 2949 | 4237 | 0.70 | 63.4 | 23.2 | C |
| 2 | 1.00 | 0.878 | 2931 | 4237 | 0.69 | 63.5 | 23.1 | C |
| 3 | 1.00 | 0.878 | 3289 | 4237 | 0.78 | 60.5 | 27.2 | D |
| 4 | 1.00 | 0.878 | 3265 | 4237 | 0.77 | 60.8 | 26.8 | D |
| 5 | 1.00 | 0.878 | 3051 | 4237 | 0.72 | 62.6 | 24.4 | C |
| 6 | 1.00 | 0.878 | 3035 | 4237 | 0.72 | 62.7 | 24.2 | C |
| 7 | 1.00 | 0.878 | 3405 | 4237 | 0.80 | 59.3 | 28.7 | D |
| 8 | 1.00 | 0.878 | 3379 | 4237 | 0.80 | 59.6 | 28.4 | D |
| 9 | 1.00 | 0.878 | 2936 | 4237 | 0.69 | 63.4 | 23.2 | C |
| 10 | 1.00 | 0.878 | 2920 | 4237 | 0.69 | 63.5 | 23.0 | C |
| 11 | 1.00 | 0.878 | 3276 | 4237 | 0.77 | 60.6 | 27.0 | D |
| 12 | 1.00 | 0.878 | 3253 | 4237 | 0.77 | 60.9 | 26.7 | D |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.878 | 0.984 | 3266 | 317 | 4221 | 1886 | 0.77 | 0.17 | 59.9 | 59.9 | 27.3 | 24.0 | C |
| 2 | 1.00 | 1.00 | 0.878 | 0.984 | 3330 | 399 | 4221 | 1886 | 0.79 | 0.21 | 59.7 | 59.7 | 27.9 | 24.4 | C |
| 3 | 1.00 | 1.00 | 0.878 | 0.984 | 3583 | 294 | 4221 | 1886 | 0.85 | 0.16 | 58.9 | 58.9 | 30.4 | 26.5 | C |
| 4 | 1.00 | 1.00 | 0.878 | 0.984 | 3610 | 345 | 4221 | 1886 | 0.86 | 0.18 | 58.8 | 58.8 | 30.7 | 26.6 | C |
| 5 | 1.00 | 1.00 | 0.878 | 0.984 | 3379 | 328 | 4221 | 1886 | 0.80 | 0.17 | 59.6 | 59.6 | 28.3 | 24.9 | C |
| 6 | 1.00 | 1.00 | 0.878 | 0.984 | 3448 | 413 | 4221 | 1886 | 0.82 | 0.22 | 59.3 | 59.3 | 29.1 | 25.4 | C |
| 7 | 1.00 | 1.00 | 0.878 | 0.984 | 3709 | 304 | 4221 | 1886 | 0.88 | 0.16 | 58.3 | 58.3 | 31.8 | 27.4 | C |
| 8 | 1.00 | 1.00 | 0.878 | 0.984 | 3736 | 357 | 4221 | 1886 | 0.89 | 0.19 | 58.2 | 58.2 | 32.1 | 27.6 | C |
| 9 | 1.00 | 1.00 | 0.878 | 0.984 | 3252 | 316 | 4221 | 1886 | 0.77 | 0.17 | 59.9 | 59.9 | 27.1 | 23.9 | C |
| 10 | 1.00 | 1.00 | 0.878 | 0.984 | 3317 | 397 | 4221 | 1886 | 0.79 | 0.21 | 59.7 | 59.7 | 27.8 | 24.3 | C |
| 11 | 1.00 | 1.00 | 0.878 | 0.984 | 3569 | 293 | 4221 | 1886 | 0.85 | 0.16 | 58.9 | 58.9 | 30.3 | 26.4 | C |
| 12 | 1.00 | 1.00 | 0.878 | 0.984 | 3596 | 343 | 4221 | 1886 | 0.85 | 0.18 | 58.8 | 58.8 | 30.6 | 26.5 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.888 | 3267 | 4237 | 0.77 | 60.7 | 26.9 | D |
| 2 | 1.00 | 0.888 | 3340 | 4237 | 0.79 | 60.0 | 27.8 | D |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.888 | 3578 | 4237 | 0.84 | 57.3 | 31.2 | D |
| 4 | 1.00 | 0.888 | 3610 | 4237 | 0.85 | 56.9 | 31.7 | D |
| 5 | 1.00 | 0.888 | 3381 | 4237 | 0.80 | 59.6 | 28.4 | D |
| 6 | 1.00 | 0.888 | 3458 | 4237 | 0.82 | 58.7 | 29.5 | D |
| 7 | 1.00 | 0.888 | 3704 | 4237 | 0.87 | 55.6 | 33.3 | D |
| 8 | 1.00 | 0.888 | 3736 | 4237 | 0.88 | 55.2 | 33.8 | D |
| 9 | 1.00 | 0.888 | 3253 | 4237 | 0.77 | 60.9 | 26.7 | D |
| 10 | 1.00 | 0.888 | 3328 | 4237 | 0.79 | 60.1 | 27.7 | D |
| 11 | 1.00 | 0.888 | 3563 | 4237 | 0.84 | 57.5 | 31.0 | D |
| 12 | 1.00 | 0.888 | 3597 | 4237 | 0.85 | 57.1 | 31.5 | D |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.888 | 0.962 | 3267 | 305 | 4221 | 1976 | 0.77 | 0.15 | 61.9 | 61.9 | 26.4 | 29.0 | D |
| 2 | 1.00 | 1.00 | 0.888 | 0.962 | 3340 | 264 | 4221 | 1976 | 0.79 | 0.13 | 62.0 | 62.0 | 26.9 | 29.6 | D |
| 3 | 1.00 | 1.00 | 0.888 | 0.962 | 3578 | 311 | 4221 | 1976 | 0.85 | 0.16 | 61.9 | 61.9 | 28.9 | 31.7 | D |
| 4 | 1.00 | 1.00 | 0.888 | 0.962 | 3610 | 266 | 4221 | 1976 | 0.86 | 0.13 | 62.0 | 62.0 | 29.1 | 32.0 | D |
| 5 | 1.00 | 1.00 | 0.888 | 0.962 | 3381 | 315 | 4221 | 1976 | 0.80 | 0.16 | 61.9 | 61.9 | 27.3 | 30.0 | D |
| 6 | 1.00 | 1.00 | 0.888 | 0.962 | 3458 | 273 | 4221 | 1976 | 0.82 | 0.14 | 62.0 | 62.0 | 27.9 | 30.6 | D |
| 7 | 1.00 | 1.00 | 0.888 | 0.962 | 3704 | 321 | 4221 | 1976 | 0.88 | 0.16 | 61.9 | 61.9 | 29.9 | 32.8 | D |
| 8 | 1.00 | 1.00 | 0.888 | 0.962 | 3736 | 275 | 4221 | 1976 | 0.89 | 0.14 | 62.0 | 62.0 | 30.1 | 33.0 | D |
| 9 | 1.00 | 1.00 | 0.888 | 0.962 | 3253 | 304 | 4221 | 1976 | 0.77 | 0.15 | 61.9 | 61.9 | 26.3 | 28.9 | D |
| 10 | 1.00 | 1.00 | 0.888 | 0.962 | 3328 | 263 | 4221 | 1976 | 0.79 | 0.13 | 62.0 | 62.0 | 26.8 | 29.5 | D |
| 11 | 1.00 | 1.00 | 0.888 | 0.962 | 3563 | 310 | 4221 | 1976 | 0.84 | 0.16 | 61.9 | 61.9 | 28.8 | 31.5 | D |
| 12 | 1.00 | 1.00 | 0.888 | 0.962 | 3597 | 265 | 4221 | 1976 | 0.85 | 0.13 | 62.0 | 62.0 | 29.0 | 31.8 | D |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.881 | 2960 | 4230 | 0.70 | 63.0 | 23.5 | C |
| 2 | 1.00 | 0.881 | 3078 | 4230 | 0.73 | 62.2 | 24.7 | C |
| 3 | 1.00 | 0.881 | 3267 | 4230 | 0.77 | 60.5 | 27.0 | D |
| 4 | 1.00 | 0.881 | 3348 | 4230 | 0.79 | 59.7 | 28.0 | D |
| 5 | 1.00 | 0.881 | 3064 | 4230 | 0.72 | 62.3 | 24.6 | C |
| 6 | 1.00 | 0.881 | 3187 | 4230 | 0.75 | 61.2 | 26.0 | C |
| 7 | 1.00 | 0.881 | 3383 | 4230 | 0.80 | 59.3 | 28.5 | D |
| 8 | 1.00 | 0.881 | 3465 | 4230 | 0.82 | 58.4 | 29.7 | D |
| 9 | 1.00 | 0.881 | 2948 | 4230 | 0.70 | 63.1 | 23.4 | C |
| 10 | 1.00 | 0.881 | 3067 | 4230 | 0.73 | 62.2 | 24.7 | C |
| 11 | 1.00 | 0.881 | 3253 | 4230 | 0.77 | 60.6 | 26.8 | D |
| 12 | 1.00 | 0.881 | 3336 | 4230 | 0.79 | 59.8 | 27.9 | D |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.881 | 0.960 | 3324 | 364 | 4221 | 1886 | 0.79 | 0.19 | 58.9 | 58.9 | 28.2 | 27.1 | C |
| 2 | 1.00 | 1.00 | 0.881 | 0.960 | 3406 | 328 | 4221 | 1886 | 0.81 | 0.17 | 58.7 | 58.7 | 29.0 | 27.8 | C |
| 3 | 1.00 | 1.00 | 0.881 | 0.960 | 3542 | 275 | 4221 | 1886 | 0.84 | 0.15 | 58.2 | 58.2 | 30.4 | 28.9 | D |
| 4 | 1.00 | 1.00 | 0.881 | 0.960 | 3750 | 402 | 4221 | 1886 | 0.89 | 0.21 | 57.4 | 57.4 | 32.7 | 30.4 | D |
| 5 | 1.00 | 1.00 | 0.881 | 0.960 | 3441 | 377 | 4221 | 1886 | 0.82 | 0.20 | 58.6 | 58.6 | 29.4 | 28.0 | C |
| 6 | 1.00 | 1.00 | 0.881 | 0.960 | 3527 | 340 | 4221 | 1886 | 0.84 | 0.18 | 58.3 | 58.3 | 30.2 | 28.7 | D |
| 7 | 1.00 | 1.00 | 0.881 | 0.960 | 3667 | 284 | 4221 | 1886 | 0.87 | 0.15 | 57.7 | 57.7 | 31.8 | 29.8 | D |
| 8 | 1.00 | 1.00 | 0.881 | 0.960 | 3881 | 416 | 4221 | 1886 | 0.92 | 0.22 | 56.8 | 56.8 | 34.2 | 31.4 | D |
| 9 | 1.00 | 1.00 | 0.881 | 0.960 | 3310 | 362 | 4221 | 1886 | 0.78 | 0.19 | 59.0 | 59.0 | 28.1 | 27.0 | C |
| 10 | 1.00 | 1.00 | 0.881 | 0.960 | 3394 | 327 | 4221 | 1886 | 0.80 | 0.17 | 58.7 | 58.7 | 28.9 | 27.7 | C |
| 11 | 1.00 | 1.00 | 0.881 | 0.960 | 3527 | 274 | 4221 | 1886 | 0.84 | 0.15 | 58.3 | 58.3 | 30.2 | 28.7 | D |
| 12 | 1.00 | 1.00 | 0.881 | 0.960 | 3736 | 400 | 4221 | 1886 | 0.89 | 0.21 | 57.4 | 57.4 | 32.5 | 30.3 | D |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.889 | 3326 | 4244 | 0.78 | 60.4 | 27.5 | D |
| 2 | 1.00 | 0.889 | 3405 | 4244 | 0.80 | 59.5 | 28.6 | D |
| 3 | 1.00 | 0.889 | 3534 | 4244 | 0.83 | 58.0 | 30.5 | D |
| 4 | 1.00 | 0.889 | 3753 | 4244 | 0.88 | 55.2 | 34.0 | D |
| 5 | 1.00 | 0.889 | 3443 | 4244 | 0.81 | 59.1 | 29.1 | D |
| 6 | 1.00 | 0.889 | 3525 | 4244 | 0.83 | 58.2 | 30.3 | D |
| 7 | 1.00 | 0.889 | 3659 | 4244 | 0.86 | 56.4 | 32.4 | D |
| 8 | 1.00 | 0.889 | 3883 | 4244 | 0.91 | 53.2 | 36.5 | E |
| 9 | 1.00 | 0.889 | 3313 | 4244 | 0.78 | 60.5 | 27.4 | D |
| 10 | 1.00 | 0.889 | 3393 | 4244 | 0.80 | 59.7 | 28.4 | D |
| 11 | 1.00 | 0.889 | 3520 | 4244 | 0.83 | 58.2 | 30.2 | D |
| 12 | 1.00 | 0.889 | 3738 | 4244 | 0.88 | 55.4 | 33.7 | D |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.889 | 0.942 | 3326 | 847 | 4221 | 1886 | 0.79 | 0.45 | 59.0 | 59.0 | 28.2 | 29.0 | D |
| 2 | 1.00 | 1.00 | 0.889 | 0.942 | 3405 | 652 | 4221 | 1886 | 0.81 | 0.35 | 59.4 | 59.4 | 28.7 | 29.7 | D |
| 3 | 1.00 | 1.00 | 0.889 | 0.942 | 3534 | 649 | 4221 | 1886 | 0.84 | 0.34 | 59.4 | 59.4 | 29.7 | 30.8 | D |
| 4 | 1.00 | 1.00 | 0.889 | 0.942 | 3753 | 806 | 4221 | 1886 | 0.89 | 0.43 | 59.1 | 59.1 | 31.8 | 32.7 | D |
| 5 | 1.00 | 1.00 | 0.889 | 0.942 | 3443 | 877 | 4221 | 1886 | 0.82 | 0.46 | 58.9 | 58.9 | 29.2 | 30.0 | D |
| 6 | 1.00 | 1.00 | 0.889 | 0.942 | 3525 | 674 | 4221 | 1886 | 0.84 | 0.36 | 59.4 | 59.4 | 29.7 | 30.7 | D |
| 7 | 1.00 | 1.00 | 0.889 | 0.942 | 3659 | 672 | 4221 | 1886 | 0.87 | 0.36 | 59.4 | 59.4 | 30.8 | 31.8 | D |
| 8 | 1.00 | 1.00 | 0.889 | 0.942 | 3883 | 834 | 4221 | 1886 | 0.92 | 0.44 | 59.0 | 59.0 | 32.9 | 33.8 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1.00 | 1.00 | 0.889 | 0.942 | 3313 | 844 | 4221 | 1886 | 0.78 | 0.45 | 59.0 | 59.0 | 28.1 | 28.9 | D |
| 10 | 1.00 | 1.00 | 0.889 | 0.942 | 3393 | 649 | 4221 | 1886 | 0.80 | 0.34 | 59.4 | 59.4 | 28.6 | 29.6 | D |
| 11 | 1.00 | 1.00 | 0.889 | 0.942 | 3520 | 646 | 4221 | 1886 | 0.83 | 0.34 | 59.5 | 59.5 | 29.6 | 30.7 | D |
| 12 | 1.00 | 1.00 | 0.889 | 0.942 | 3738 | 803 | 4221 | 1886 | 0.89 | 0.43 | 59.1 | 59.1 | 31.6 | 32.5 | D |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.875 | 2467 | 4244 | 0.58 | 65.6 | 18.7 | C |
| 2 | 1.00 | 0.875 | 2758 | 4244 | 0.65 | 64.8 | 21.3 | C |
| 3 | 1.00 | 0.875 | 2893 | 4244 | 0.68 | 64.0 | 22.6 | C |
| 4 | 1.00 | 0.875 | 2945 | 4244 | 0.69 | 63.7 | 23.1 | C |
| 5 | 1.00 | 0.875 | 2554 | 4244 | 0.60 | 65.6 | 19.4 | C |
| 6 | 1.00 | 0.875 | 2856 | 4244 | 0.67 | 64.2 | 22.2 | C |
| 7 | 1.00 | 0.875 | 2994 | 4244 | 0.71 | 63.3 | 23.6 | C |
| 8 | 1.00 | 0.875 | 3047 | 4244 | 0.72 | 62.9 | 24.2 | C |
| 9 | 1.00 | 0.875 | 2457 | 4244 | 0.58 | 65.6 | 18.6 | C |
| 10 | 1.00 | 0.875 | 2749 | 4244 | 0.65 | 64.8 | 21.2 | C |
| 11 | 1.00 | 0.875 | 2880 | 4244 | 0.68 | 64.1 | 22.5 | C |
| 12 | 1.00 | 0.875 | 2934 | 4244 | 0.69 | 63.7 | 23.0 | C |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.875 | 0.968 | 2773 | 306 | 4221 | 1796 | 0.66 | 0.17 | 59.4 | 59.4 | 23.3 | 23.9 | C |
| 2 | 1.00 | 1.00 | 0.875 | 0.968 | 3065 | 307 | 4221 | 1796 | 0.73 | 0.17 | 58.8 | 58.8 | 26.1 | 26.2 | C |
| 3 | 1.00 | 1.00 | 0.875 | 0.968 | 3148 | 255 | 4221 | 1796 | 0.75 | 0.14 | 58.6 | 58.6 | 26.9 | 26.8 | C |
| 4 | 1.00 | 1.00 | 0.875 | 0.968 | 3195 | 250 | 4221 | 1796 | 0.76 | 0.14 | 58.5 | 58.5 | 27.3 | 27.2 | C |
| 5 | 1.00 | 1.00 | 0.875 | 0.968 | 2870 | 316 | 4221 | 1796 | 0.68 | 0.18 | 59.2 | 59.2 | 24.2 | 24.7 | C |
| 6 | 1.00 | 1.00 | 0.875 | 0.968 | 3174 | 318 | 4221 | 1796 | 0.75 | 0.18 | 58.6 | 58.6 | 27.1 | 27.0 | C |
| 7 | 1.00 | 1.00 | 0.875 | 0.968 | 3258 | 264 | 4221 | 1796 | 0.77 | 0.15 | 58.3 | 58.3 | 27.9 | 27.7 | C |
| 8 | 1.00 | 1.00 | 0.875 | 0.968 | 3305 | 258 | 4221 | 1796 | 0.78 | 0.14 | 58.2 | 58.2 | 28.4 | 28.1 | D |
| 9 | 1.00 | 1.00 | 0.875 | 0.968 | 2761 | 304 | 4221 | 1796 | 0.65 | 0.17 | 59.4 | 59.4 | 23.2 | 23.8 | C |
| 10 | 1.00 | 1.00 | 0.875 | 0.968 | 3055 | 306 | 4221 | 1796 | 0.72 | 0.17 | 58.8 | 58.8 | 26.0 | 26.1 | C |
| 11 | 1.00 | 1.00 | 0.875 | 0.968 | 3134 | 254 | 4221 | 1796 | 0.74 | 0.14 | 58.6 | 58.6 | 26.7 | 26.7 | C |
| 12 | 1.00 | 1.00 | 0.875 | 0.968 | 3183 | 249 | 4221 | 1796 | 0.75 | 0.14 | 58.5 | 58.5 | 27.2 | 27.1 | C |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.883 | 0.948 | 2877 | 97 | 4221 | 1796 | 0.68 | 0.05 | 59.3 | 59.3 | 24.3 | 24.3 | C |
| 2 | 1.00 | 1.00 | 0.883 | 0.948 | 3183 | 114 | 4221 | 1796 | 0.75 | 0.06 | 58.7 | 58.7 | 27.1 | 26.7 | C |
| 3 | 1.00 | 1.00 | 0.883 | 0.948 | 3312 | 166 | 4221 | 1796 | 0.78 | 0.09 | 58.3 | 58.3 | 28.4 | 27.7 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1.00 | 1.00 | 0.883 | 0.948 | 3347 | 154 | 4221 | 1796 | 0.79 | 0.09 | 58.2 | 58.2 | 28.8 | 27.9 | C |
| 5 | 1.00 | 1.00 | 0.883 | 0.948 | 2978 | 100 | 4221 | 1796 | 0.71 | 0.06 | 59.2 | 59.2 | 25.2 | 25.1 | C |
| 6 | 1.00 | 1.00 | 0.883 | 0.948 | 3297 | 118 | 4221 | 1796 | 0.78 | 0.07 | 58.4 | 58.4 | 28.2 | 27.6 | C |
| 7 | 1.00 | 1.00 | 0.883 | 0.948 | 3428 | 171 | 4221 | 1796 | 0.81 | 0.10 | 58.0 | 58.0 | 29.6 | 28.6 | D |
| 8 | 1.00 | 1.00 | 0.883 | 0.948 | 3461 | 159 | 4221 | 1796 | 0.82 | 0.09 | 57.9 | 57.9 | 29.9 | 28.8 | D |
| 9 | 1.00 | 1.00 | 0.883 | 0.948 | 2864 | 96 | 4221 | 1796 | 0.68 | 0.05 | 59.4 | 59.4 | 24.1 | 24.2 | C |
| 10 | 1.00 | 1.00 | 0.883 | 0.948 | 3173 | 114 | 4221 | 1796 | 0.75 | 0.06 | 58.7 | 58.7 | 27.0 | 26.6 | C |
| 11 | 1.00 | 1.00 | 0.883 | 0.948 | 3298 | 165 | 4221 | 1796 | 0.78 | 0.09 | 58.4 | 58.4 | 28.2 | 27.5 | C |
| 12 | 1.00 | 1.00 | 0.883 | 0.948 | 3333 | 153 | 4221 | 1796 | 0.79 | 0.09 | 58.3 | 58.3 | 28.6 | 27.8 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.886 | 2875 | 4289 | 0.67 | 65.8 | 21.9 | C |
| 2 | 1.00 | 0.886 | 3181 | 4289 | 0.74 | 63.2 | 25.2 | C |
| 3 | 1.00 | 0.886 | 3313 | 4289 | 0.77 | 61.9 | 26.8 | D |
| 4 | 1.00 | 0.886 | 3347 | 4289 | 0.78 | 61.5 | 27.2 | D |
| 5 | 1.00 | 0.886 | 2975 | 4289 | 0.69 | 65.0 | 22.9 | C |
| 6 | 1.00 | 0.886 | 3295 | 4289 | 0.77 | 62.1 | 26.5 | D |
| 7 | 1.00 | 0.886 | 3429 | 4289 | 0.80 | 60.6 | 28.3 | D |
| 8 | 1.00 | 0.886 | 3462 | 4289 | 0.81 | 60.2 | 28.8 | D |
| 9 | 1.00 | 0.886 | 2861 | 4289 | 0.67 | 65.9 | 21.7 | C |
| 10 | 1.00 | 0.886 | 3170 | 4289 | 0.74 | 63.3 | 25.0 | C |
| 11 | 1.00 | 0.886 | 3298 | 4289 | 0.77 | 62.1 | 26.6 | D |
| 12 | 1.00 | 0.886 | 3333 | 4289 | 0.78 | 61.7 | 27.0 | D |

## Segment 19: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.886 | 0.878 | 2875 | 197 | 4221 | 1886 | 0.68 | 0.10 | 59.0 | 59.0 | 24.4 | 25.8 | C |
| 2 | 1.00 | 1.00 | 0.886 | 0.878 | 3181 | 248 | 4221 | 1886 | 0.75 | 0.13 | 58.9 | 58.9 | 27.0 | 28.4 | D |
| 3 | 1.00 | 1.00 | 0.886 | 0.878 | 3313 | 245 | 4221 | 1886 | 0.78 | 0.13 | 58.9 | 58.9 | 28.1 | 29.5 | D |
| 4 | 1.00 | 1.00 | 0.886 | 0.878 | 3347 | 233 | 4221 | 1886 | 0.79 | 0.12 | 58.9 | 58.9 | 28.4 | 29.8 | D |
| 5 | 1.00 | 1.00 | 0.886 | 0.878 | 2975 | 214 | 4221 | 1886 | 0.70 | 0.11 | 58.9 | 58.9 | 25.3 | 26.6 | C |
| 6 | 1.00 | 1.00 | 0.886 | 0.878 | 3295 | 261 | 4221 | 1886 | 0.78 | 0.14 | 58.8 | 58.8 | 28.0 | 29.4 | D |
| 7 | 1.00 | 1.00 | 0.886 | 0.878 | 3429 | 240 | 4221 | 1886 | 0.81 | 0.13 | 58.9 | 58.9 | 29.1 | 30.5 | D |
| 8 | 1.00 | 1.00 | 0.886 | 0.878 | 3462 | 241 | 4221 | 1886 | 0.82 | 0.13 | 58.9 | 58.9 | 29.4 | 30.8 | D |
| 9 | 1.00 | 1.00 | 0.886 | 0.878 | 2861 | 196 | 4221 | 1886 | 0.68 | 0.10 | 59.0 | 59.0 | 24.2 | 25.7 | C |
| 10 | 1.00 | 1.00 | 0.886 | 0.878 | 3170 | 248 | 4221 | 1886 | 0.75 | 0.13 | 58.9 | 58.9 | 26.9 | 28.3 | D |
| 11 | 1.00 | 1.00 | 0.886 | 0.878 | 3298 | 244 | 4221 | 1886 | 0.78 | 0.13 | 58.9 | 58.9 | 28.0 | 29.4 | D |
| 12 | 1.00 | 1.00 | 0.886 | 0.878 | 3333 | 233 | 4221 | 1886 | 0.79 | 0.12 | 58.9 | 58.9 | 28.3 | 29.7 | D |

## Segment 20: Basic

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | (pc/h) | (pc/h) | Ratio | (mi/h) | (pc/mi/ln) | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.887 | 2676 | 4269 | 0.63 | 66.2 | 20.2 | C |
| 2 | 1.00 | 0.887 | 2931 | 4269 | 0.69 | 64.6 | 22.7 | C |
| 3 | 1.00 | 0.887 | 3067 | 4269 | 0.72 | 63.6 | 24.1 | C |
| 4 | 1.00 | 0.887 | 3112 | 4269 | 0.73 | 63.2 | 24.6 | C |
| 5 | 1.00 | 0.887 | 2760 | 4269 | 0.65 | 65.8 | 21.0 | C |
| 6 | 1.00 | 0.887 | 3033 | 4269 | 0.71 | 63.9 | 23.7 | C |
| 7 | 1.00 | 0.887 | 3187 | 4269 | 0.75 | 62.5 | 25.5 | C |
| 8 | 1.00 | 0.887 | 3219 | 4269 | 0.75 | 62.2 | 25.9 | C |
| 9 | 1.00 | 0.887 | 2664 | 4269 | 0.62 | 66.3 | 20.1 | C |
| 10 | 1.00 | 0.887 | 2921 | 4269 | 0.68 | 64.7 | 22.6 | C |
| 11 | 1.00 | 0.887 | 3053 | 4269 | 0.72 | 63.7 | 24.0 | C |
| 12 | 1.00 | 0.887 | 3098 | 4269 | 0.73 | 63.3 | 24.5 | C |

## Segment 21: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.887 | 1.000 | 2924 | 248 | 4221 | 1886 | 0.69 | 0.13 | 61.7 | 61.7 | 23.7 | 19.5 | B |
| 2 | 1.00 | 1.00 | 0.887 | 1.000 | 3134 | 203 | 4221 | 1886 | 0.74 | 0.11 | 61.2 | 61.2 | 25.6 | 21.1 | C |
| 3 | 1.00 | 1.00 | 0.887 | 1.000 | 3312 | 245 | 4221 | 1886 | 0.78 | 0.13 | 60.8 | 60.8 | 27.2 | 22.5 | C |
| 4 | 1.00 | 1.00 | 0.887 | 1.000 | 3343 | 231 | 4221 | 1886 | 0.79 | 0.12 | 60.7 | 60.7 | 27.5 | 22.7 | C |
| 5 | 1.00 | 1.00 | 0.887 | 1.000 | 2991 | 231 | 4221 | 1886 | 0.71 | 0.12 | 61.5 | 61.5 | 24.3 | 20.0 | B |
| 6 | 1.00 | 1.00 | 0.887 | 1.000 | 3251 | 218 | 4221 | 1886 | 0.77 | 0.12 | 60.9 | 60.9 | 26.7 | 22.0 | C |
| 7 | 1.00 | 1.00 | 0.887 | 1.000 | 3436 | 249 | 4221 | 1886 | 0.81 | 0.13 | 60.4 | 60.4 | 28.4 | 23.5 | C |
| 8 | 1.00 | 1.00 | 0.887 | 1.000 | 3481 | 262 | 4221 | 1886 | 0.82 | 0.14 | 60.2 | 60.2 | 28.9 | 23.8 | C |
| 9 | 1.00 | 1.00 | 0.887 | 1.000 | 2911 | 247 | 4221 | 1886 | 0.69 | 0.13 | 61.7 | 61.7 | 23.6 | 19.4 | B |
| 10 | 1.00 | 1.00 | 0.887 | 1.000 | 3124 | 203 | 4221 | 1886 | 0.74 | 0.11 | 61.2 | 61.2 | 25.5 | 21.0 | C |
| 11 | 1.00 | 1.00 | 0.887 | 1.000 | 3297 | 244 | 4221 | 1886 | 0.78 | 0.13 | 60.8 | 60.8 | 27.1 | 22.4 | C |
| 12 | 1.00 | 1.00 | 0.887 | 1.000 | 3328 | 230 | 4221 | 1886 | 0.79 | 0.12 | 60.7 | 60.7 | 27.4 | 22.6 | C |

## Segment 22: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 2930 | 4269 | 0.69 | 64.7 | 22.6 | C |
| 2 | 1.00 | 0.895 | 3132 | 4269 | 0.73 | 63.0 | 24.9 | C |
| 3 | 1.00 | 0.895 | 3313 | 4269 | 0.78 | 61.3 | 27.0 | D |
| 4 | 1.00 | 0.895 | 3342 | 4269 | 0.78 | 61.0 | 27.4 | D |
| 5 | 1.00 | 0.895 | 2993 | 4269 | 0.70 | 64.2 | 23.3 | C |
| 6 | 1.00 | 0.895 | 3249 | 4269 | 0.76 | 61.9 | 26.2 | D |
| 7 | 1.00 | 0.895 | 3437 | 4269 | 0.81 | 59.9 | 28.7 | D |
| 8 | 1.00 | 0.895 | 3483 | 4269 | 0.82 | 59.4 | 29.3 | D |
| 9 | 1.00 | 0.895 | 2916 | 4269 | 0.68 | 64.8 | 22.5 | C |
| 10 | 1.00 | 0.895 | 3122 | 4269 | 0.73 | 63.1 | 24.7 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | 0.895 | 3298 | 4269 | 0.77 | 61.4 | 26.9 | D |
| 12 | 1.00 | 0.895 | 3327 | 4269 | 0.78 | 61.1 | 27.2 | D |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 18549 | 18451 | 17.30 | 64.0 | 23.1 | 20.4 | 26.60 | D |
| 2 | 19772 | 19675 | 25.58 | 62.6 | 25.2 | 22.3 | 27.20 | D |
| 3 | 21007 | 20917 | 36.52 | 60.9 | 27.5 | 24.3 | 28.00 | D |
| 4 | 21136 | 21038 | 38.29 | 60.6 | 27.8 | 24.6 | 28.10 | D |
| 5 | 19184 | 19083 | 21.41 | 63.3 | 24.1 | 21.4 | 26.90 | D |
| 6 | 20478 | 20378 | 31.65 | 61.6 | 26.4 | 23.4 | 27.60 | D |
| 7 | 21749 | 21656 | 45.10 | 59.7 | 29.0 | 25.7 | 28.50 | E |
| 8 | 21877 | 21774 | 47.13 | 59.4 | 29.3 | 26.0 | 28.70 | E |
| 9 | 18468 | 18370 | 16.80 | 64.1 | 22.9 | 20.3 | 26.60 | D |
| 10 | 19704 | 19607 | 25.04 | 62.7 | 25.0 | 22.2 | 27.20 | D |
| 11 | 20917 | 20827 | 35.54 | 61.0 | 27.3 | 24.2 | 27.90 | D |
| 12 | 21052 | 20954 | 37.21 | 60.8 | 27.6 | 24.4 | 28.00 | D |

## Facility Overall Results

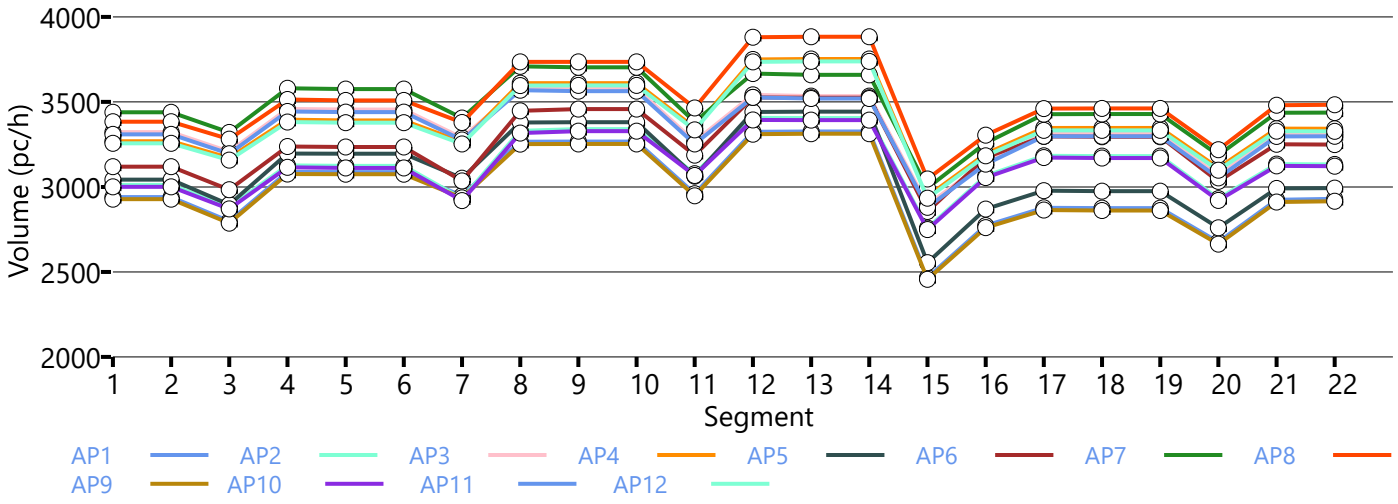
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 61.6 | Density, veh/mi/ln | 23.3 |
| Average Travel Time, min | 27.60 | Density, pc/mi/ln | 26.3 |

## Messages

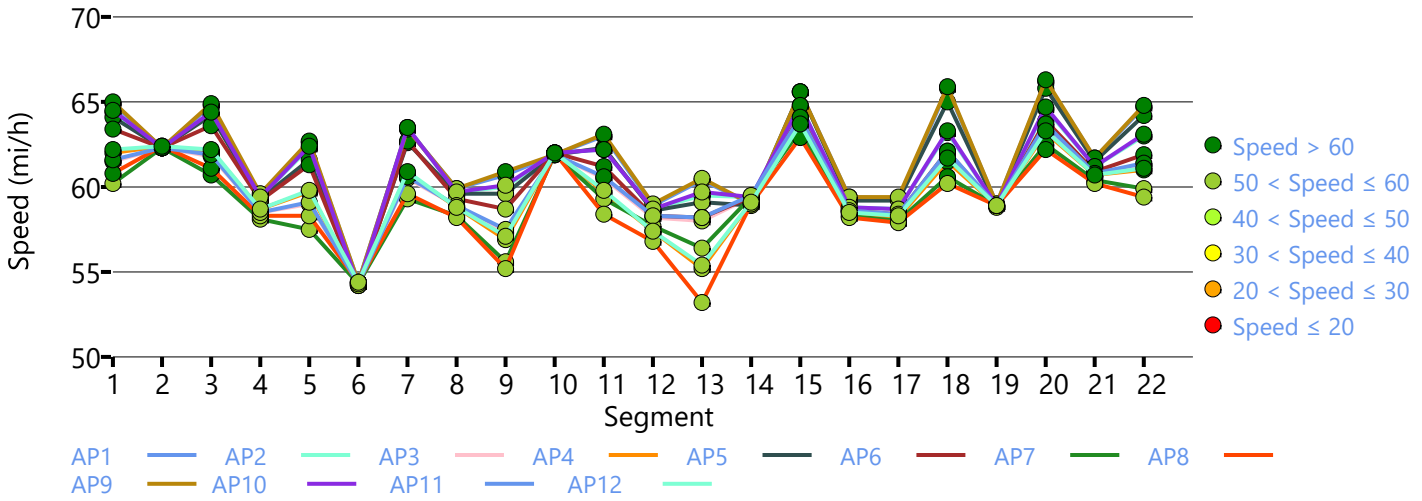
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

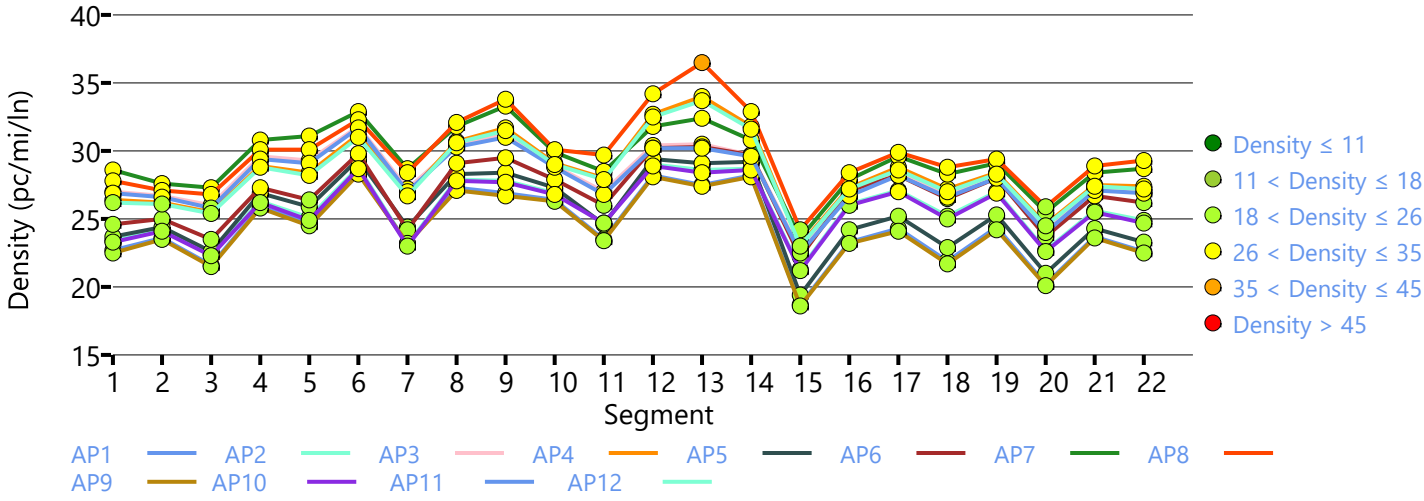
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS7 Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | 8/6/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | NB I-39/90/94 WIS 60 To WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 23 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 33.59 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 60 to CTH V | 34122 | 3 |
| 2 | Diverge | Diverge | STH 60 WB Off | 1500 | 3 |
| 3 | Basic | Basic | STH 60 Between off and On | 1192 | 3 |
| 4 | Merge | Merge | STH 60 WB On | 1500 | 3 |
| 5 | Basic | Basic | CTH CS to STH 60 | 17005 | 3 |
| 6 | Diverge | Diverge | CTH CS WB Off | 1500 | 3 |
| 7 | Basic | Basic | CTH CS Between off and on | 1097 | 3 |
| 8 | Merge | Merge | CTH CS WB On | 1500 | 3 |
| 9 | Basic | Basic | CTH CS To Rest Area | 6489 | 3 |
| 10 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 11 | Basic | Basic | Rest Area Between Off and On | 3554 | 3 |
| 12 | Merge | Merge | Rest Area On | 1500 | 3 |
| 13 | Basic | Basic | Rest Area to I-39 | 17074 | 3 |
| 14 | Diverge | Diverge | I-39 WB Off | 1500 | 3 |
| 15 | Basic | Basic | I-39 WB Off to I-39 WB On | 4769 | 3 |
| 16 | Merge | Basic | STH 78 NB/I-39 WB on | 1500 | 4 |
| 17 | Basic | Basic | STH 33 to I-39; 4 Lanes | 1375 | 4 |
| 18 | Basic | Basic | STH 33 to I-39; 3 Lanes | 825 | 3 |
| 19 | Basic | Basic | STH 33 to I-39; 2 Lanes | 6734 | 2 |
| 20 | Diverge | Diverge | STH 33 WB Off | 1500 | 2 |
| 21 | Basic | Basic | STH 33 Between off and on | 1130 | 2 |
| 22 | Merge | Merge | STH 33 WB On | 1500 | 2 |
| 23 | Basic | Basic | STH 33 to USH 12 | 66971 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.863 | 5267 | 6433 | 0.82 | 59.6 | 29.5 | D |
| 2 | 1.00 | 0.863 | 4899 | 6433 | 0.76 | 62.4 | 26.2 | D |
| 3 | 1.00 | 0.863 | 5133 | 6433 | 0.80 | 60.7 | 28.2 | D |
| 4 | 1.00 | 0.863 | 5132 | 6433 | 0.80 | 60.7 | 28.2 | D |
| 5 | 1.00 | 0.863 | 5508 | 6433 | 0.86 | 57.6 | 31.9 | D |
| 6 | 1.00 | 0.863 | 5123 | 6433 | 0.80 | 60.8 | 28.1 | D |
| 7 | 1.00 | 0.863 | 5368 | 6433 | 0.83 | 58.8 | 30.4 | D |
| 8 | 1.00 | 0.863 | 5367 | 6433 | 0.83 | 58.8 | 30.4 | D |
| 9 | 1.00 | 0.863 | 5528 | 6433 | 0.86 | 57.4 | 32.1 | D |
| 10 | 1.00 | 0.863 | 5143 | 6433 | 0.80 | 60.6 | 28.3 | D |
| 11 | 1.00 | 0.863 | 5388 | 6433 | 0.84 | 58.6 | 30.6 | D |
| 12 | 1.00 | 0.863 | 5387 | 6433 | 0.84 | 58.6 | 30.6 | D |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.863 | 0.911 | 5267 | 329 | 6331 | 1796 | 0.83 | 0.18 | 61.7 | 57.1 | 28.5 | 26.9 | C |
| 2 | 1.00 | 1.00 | 0.863 | 0.911 | 4899 | 336 | 6331 | 1796 | 0.77 | 0.19 | 61.7 | 57.0 | 26.5 | 25.4 | C |
| 3 | 1.00 | 1.00 | 0.863 | 0.911 | 5133 | 336 | 6331 | 1796 | 0.81 | 0.19 | 61.7 | 57.0 | 27.7 | 26.4 | C |
| 4 | 1.00 | 1.00 | 0.863 | 0.911 | 5132 | 448 | 6331 | 1796 | 0.81 | 0.25 | 61.5 | 56.8 | 27.8 | 26.5 | C |
| 5 | 1.00 | 1.00 | 0.863 | 0.911 | 5508 | 345 | 6331 | 1796 | 0.87 | 0.19 | 61.6 | 57.0 | 29.8 | 28.0 | C |
| 6 | 1.00 | 1.00 | 0.863 | 0.911 | 5123 | 351 | 6331 | 1796 | 0.81 | 0.20 | 61.6 | 57.0 | 27.7 | 26.4 | C |
| 7 | 1.00 | 1.00 | 0.863 | 0.911 | 5368 | 351 | 6331 | 1796 | 0.85 | 0.20 | 61.6 | 57.0 | 29.0 | 27.4 | C |
| 8 | 1.00 | 1.00 | 0.863 | 0.911 | 5367 | 469 | 6331 | 1796 | 0.85 | 0.26 | 61.4 | 56.7 | 29.1 | 27.6 | C |
| 9 | 1.00 | 1.00 | 0.863 | 0.911 | 5528 | 346 | 6331 | 1796 | 0.87 | 0.19 | 61.6 | 57.0 | 29.9 | 28.1 | D |
| 10 | 1.00 | 1.00 | 0.863 | 0.911 | 5143 | 352 | 6331 | 1796 | 0.81 | 0.20 | 61.7 | 57.0 | 27.8 | 26.4 | C |
| 11 | 1.00 | 1.00 | 0.863 | 0.911 | 5388 | 352 | 6331 | 1796 | 0.85 | 0.20 | 61.6 | 57.0 | 29.2 | 27.5 | C |
| 12 | 1.00 | 1.00 | 0.863 | 0.911 | 5387 | 470 | 6331 | 1796 | 0.85 | 0.26 | 61.4 | 56.7 | 29.2 | 27.7 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.861 | 4930 | 6404 | 0.77 | 61.6 | 26.7 | D |
| 2 | 1.00 | 0.861 | 4555 | 6404 | 0.71 | 63.9 | 23.8 | C |
| 3 | 1.00 | 0.861 | 4790 | 6404 | 0.75 | 62.5 | 25.6 | C |
| 4 | 1.00 | 0.861 | 4670 | 6404 | 0.73 | 63.2 | 24.6 | C |
| 5 | 1.00 | 0.861 | 5156 | 6404 | 0.81 | 59.9 | 28.7 | D |
| 6 | 1.00 | 0.861 | 4763 | 6404 | 0.74 | 62.6 | 25.4 | C |
| 7 | 1.00 | 0.861 | 5009 | 6404 | 0.78 | 61.0 | 27.4 | D |
| 8 | 1.00 | 0.861 | 4884 | 6404 | 0.76 | 61.9 | 26.3 | D |
| 9 | 1.00 | 0.861 | 5175 | 6404 | 0.81 | 59.8 | 28.8 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | | 0.861 | | 4782 | | 6404 | | 0.75 | | 62.5 | | 25.5 | | C |
| 11 | 1.00 | | 0.861 | | 5028 | | 6404 | | 0.79 | | 60.9 | | 27.5 | | D |
| 12 | 1.00 | | 0.861 | | 4902 | | 6404 | | 0.77 | | 61.7 | | 26.5 | | D |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.861 | 0.891 | 5178 | 248 | 6331 | 1886 | 0.82 | 0.13 | 61.4 | 60.2 | 28.1 | 23.1 | C |
| 2 | 1.00 | 1.00 | 0.861 | 0.891 | 5010 | 455 | 6331 | 1886 | 0.79 | 0.24 | 61.6 | 60.3 | 27.1 | 22.9 | C |
| 3 | 1.00 | 1.00 | 0.861 | 0.891 | 5274 | 484 | 6331 | 1886 | 0.83 | 0.26 | 61.1 | 59.7 | 28.8 | 24.2 | C |
| 4 | 1.00 | 1.00 | 0.861 | 0.891 | 5052 | 382 | 6331 | 1886 | 0.80 | 0.20 | 61.6 | 60.3 | 27.3 | 22.9 | C |
| 5 | 1.00 | 1.00 | 0.861 | 0.891 | 5415 | 259 | 6331 | 1886 | 0.86 | 0.14 | 61.0 | 59.7 | 29.6 | 24.3 | C |
| 6 | 1.00 | 1.00 | 0.861 | 0.891 | 5238 | 475 | 6331 | 1886 | 0.83 | 0.25 | 61.2 | 59.8 | 28.5 | 24.0 | C |
| 7 | 1.00 | 1.00 | 0.861 | 0.891 | 5514 | 505 | 6331 | 1886 | 0.87 | 0.27 | 60.7 | 59.2 | 30.3 | 25.4 | C |
| 8 | 1.00 | 1.00 | 0.861 | 0.891 | 5282 | 398 | 6331 | 1886 | 0.83 | 0.21 | 61.2 | 59.8 | 28.8 | 24.0 | C |
| 9 | 1.00 | 1.00 | 0.861 | 0.891 | 5435 | 260 | 6331 | 1886 | 0.86 | 0.14 | 61.0 | 59.7 | 29.7 | 24.4 | C |
| 10 | 1.00 | 1.00 | 0.861 | 0.891 | 5259 | 477 | 6331 | 1886 | 0.83 | 0.25 | 61.2 | 59.8 | 28.6 | 24.1 | C |
| 11 | 1.00 | 1.00 | 0.861 | 0.891 | 5535 | 507 | 6331 | 1886 | 0.87 | 0.27 | 60.7 | 59.2 | 30.4 | 25.5 | C |
| 12 | 1.00 | 1.00 | 0.861 | 0.891 | 5303 | 401 | 6331 | 1886 | 0.84 | 0.21 | 61.2 | 59.8 | 28.9 | 24.1 | C |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.863 | 5175 | 6377 | 0.81 | 59.2 | 29.1 | D |
| 2 | 1.00 | 0.863 | 5014 | 6377 | 0.79 | 60.4 | 27.7 | D |
| 3 | 1.00 | 0.863 | 5278 | 6377 | 0.83 | 58.4 | 30.1 | D |
| 4 | 1.00 | 0.863 | 5053 | 6377 | 0.79 | 60.1 | 28.0 | D |
| 5 | 1.00 | 0.863 | 5411 | 6377 | 0.85 | 57.3 | 31.5 | D |
| 6 | 1.00 | 0.863 | 5242 | 6377 | 0.82 | 58.7 | 29.8 | D |
| 7 | 1.00 | 0.863 | 5519 | 6377 | 0.87 | 56.4 | 32.6 | D |
| 8 | 1.00 | 0.863 | 5284 | 6377 | 0.83 | 58.4 | 30.2 | D |
| 9 | 1.00 | 0.863 | 5432 | 6377 | 0.85 | 57.1 | 31.7 | D |
| 10 | 1.00 | 0.863 | 5263 | 6377 | 0.83 | 58.6 | 29.9 | D |
| 11 | 1.00 | 0.863 | 5540 | 6377 | 0.87 | 56.2 | 32.9 | D |
| 12 | 1.00 | 0.863 | 5305 | 6377 | 0.83 | 58.2 | 30.4 | D |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.863 | 0.862 | 5175 | 340 | 6331 | 1886 | 0.82 | 0.18 | 62.8 | 58.6 | 27.5 | 30.5 | D |
| 2 | 1.00 | 1.00 | 0.863 | 0.862 | 5014 | 296 | 6331 | 1886 | 0.79 | 0.16 | 63.0 | 58.8 | 26.5 | 29.8 | D |
| 3 | 1.00 | 1.00 | 0.863 | 0.862 | 5278 | 292 | 6331 | 1886 | 0.83 | 0.16 | 63.0 | 58.8 | 27.9 | 30.9 | D |
| 4 | 1.00 | 1.00 | 0.863 | 0.862 | 5053 | 314 | 6331 | 1886 | 0.80 | 0.17 | 62.9 | 58.7 | 26.8 | 29.9 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 1.00 | 0.863 | 0.862 | 5411 | 355 | 6331 | 1886 | 0.85 | 0.19 | 62.8 | 58.6 | 28.7 | 31.5 | D |
| 6 | 1.00 | 1.00 | 0.863 | 0.862 | 5242 | 310 | 6331 | 1886 | 0.83 | 0.16 | 62.9 | 58.7 | 27.8 | 30.8 | D |
| 7 | 1.00 | 1.00 | 0.863 | 0.862 | 5519 | 305 | 6331 | 1886 | 0.87 | 0.16 | 62.8 | 58.7 | 29.3 | 31.9 | D |
| 8 | 1.00 | 1.00 | 0.863 | 0.862 | 5284 | 329 | 6331 | 1886 | 0.83 | 0.17 | 62.9 | 58.7 | 28.0 | 31.0 | D |
| 9 | 1.00 | 1.00 | 0.863 | 0.862 | 5432 | 356 | 6331 | 1886 | 0.86 | 0.19 | 62.8 | 58.6 | 28.8 | 31.6 | D |
| 10 | 1.00 | 1.00 | 0.863 | 0.862 | 5263 | 311 | 6331 | 1886 | 0.83 | 0.16 | 62.9 | 58.7 | 27.9 | 30.8 | D |
| 11 | 1.00 | 1.00 | 0.863 | 0.862 | 5540 | 306 | 6331 | 1886 | 0.88 | 0.16 | 62.9 | 58.7 | 29.4 | 32.0 | D |
| 12 | 1.00 | 1.00 | 0.863 | 0.862 | 5305 | 331 | 6331 | 1886 | 0.84 | 0.18 | 62.9 | 58.7 | 28.1 | 31.0 | D |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.863 | 4835 | 6377 | 0.76 | 61.6 | 26.2 | D |
| 2 | 1.00 | 0.863 | 4718 | 6377 | 0.74 | 62.3 | 25.2 | C |
| 3 | 1.00 | 0.863 | 4986 | 6377 | 0.78 | 60.6 | 27.4 | D |
| 4 | 1.00 | 0.863 | 4739 | 6377 | 0.74 | 62.2 | 25.4 | C |
| 5 | 1.00 | 0.863 | 5057 | 6377 | 0.79 | 60.1 | 28.1 | D |
| 6 | 1.00 | 0.863 | 4933 | 6377 | 0.77 | 61.0 | 27.0 | D |
| 7 | 1.00 | 0.863 | 5214 | 6377 | 0.82 | 58.9 | 29.5 | D |
| 8 | 1.00 | 0.863 | 4955 | 6377 | 0.78 | 60.8 | 27.2 | D |
| 9 | 1.00 | 0.863 | 5076 | 6377 | 0.80 | 60.0 | 28.2 | D |
| 10 | 1.00 | 0.863 | 4952 | 6377 | 0.78 | 60.8 | 27.2 | D |
| 11 | 1.00 | 0.863 | 5234 | 6377 | 0.82 | 58.8 | 29.7 | D |
| 12 | 1.00 | 0.863 | 4975 | 6377 | 0.78 | 60.7 | 27.3 | D |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.863 | 0.807 | 4997 | 162 | 6331 | 1886 | 0.79 | 0.09 | 61.4 | 60.1 | 27.1 | 23.3 | C |
| 2 | 1.00 | 1.00 | 0.863 | 0.807 | 4865 | 147 | 6331 | 1886 | 0.77 | 0.08 | 61.6 | 60.3 | 26.3 | 22.6 | C |
| 3 | 1.00 | 1.00 | 0.863 | 0.807 | 5159 | 173 | 6331 | 1886 | 0.81 | 0.09 | 61.2 | 59.9 | 28.1 | 24.1 | C |
| 4 | 1.00 | 1.00 | 0.863 | 0.807 | 4920 | 181 | 6331 | 1886 | 0.78 | 0.10 | 61.6 | 60.2 | 26.6 | 23.0 | C |
| 5 | 1.00 | 1.00 | 0.863 | 0.807 | 5227 | 170 | 6331 | 1886 | 0.83 | 0.09 | 61.1 | 59.8 | 28.5 | 24.4 | C |
| 6 | 1.00 | 1.00 | 0.863 | 0.807 | 5087 | 154 | 6331 | 1886 | 0.80 | 0.08 | 61.3 | 60.0 | 27.7 | 23.7 | C |
| 7 | 1.00 | 1.00 | 0.863 | 0.807 | 5395 | 181 | 6331 | 1886 | 0.85 | 0.10 | 60.9 | 59.5 | 29.5 | 25.2 | C |
| 8 | 1.00 | 1.00 | 0.863 | 0.807 | 5145 | 190 | 6331 | 1886 | 0.81 | 0.10 | 61.3 | 59.9 | 28.0 | 24.0 | C |
| 9 | 1.00 | 1.00 | 0.863 | 0.807 | 5247 | 171 | 6331 | 1886 | 0.83 | 0.09 | 61.1 | 59.7 | 28.6 | 24.5 | C |
| 10 | 1.00 | 1.00 | 0.863 | 0.807 | 5107 | 155 | 6331 | 1886 | 0.81 | 0.08 | 61.3 | 60.0 | 27.8 | 23.8 | C |
| 11 | 1.00 | 1.00 | 0.863 | 0.807 | 5416 | 182 | 6331 | 1886 | 0.86 | 0.10 | 60.8 | 59.4 | 29.7 | 25.3 | C |
| 12 | 1.00 | 1.00 | 0.863 | 0.807 | 5165 | 190 | 6331 | 1886 | 0.82 | 0.10 | 61.2 | 59.8 | 28.1 | 24.1 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.862 | 4993 | 6431 | 0.78 | 61.7 | 27.0 | D |
| 2 | 1.00 | 0.862 | 4862 | 6431 | 0.76 | 62.6 | 25.9 | C |
| 3 | 1.00 | 0.862 | 5154 | 6431 | 0.80 | 60.5 | 28.4 | D |
| 4 | 1.00 | 0.862 | 4914 | 6431 | 0.76 | 62.2 | 26.3 | D |
| 5 | 1.00 | 0.862 | 5222 | 6431 | 0.81 | 59.9 | 29.1 | D |
| 6 | 1.00 | 0.862 | 5082 | 6431 | 0.79 | 61.0 | 27.8 | D |
| 7 | 1.00 | 0.862 | 5390 | 6431 | 0.84 | 58.5 | 30.7 | D |
| 8 | 1.00 | 0.862 | 5138 | 6431 | 0.80 | 60.6 | 28.3 | D |
| 9 | 1.00 | 0.862 | 5242 | 6431 | 0.82 | 59.8 | 29.2 | D |
| 10 | 1.00 | 0.862 | 5103 | 6431 | 0.79 | 60.9 | 27.9 | D |
| 11 | 1.00 | 0.862 | 5411 | 6431 | 0.84 | 58.4 | 30.9 | D |
| 12 | 1.00 | 0.862 | 5158 | 6431 | 0.80 | 60.5 | 28.4 | D |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.862 | 0.909 | 4993 | 95 | 6331 | 1796 | 0.79 | 0.05 | 61.0 | 56.0 | 27.3 | 26.5 | C |
| 2 | 1.00 | 1.00 | 0.862 | 0.909 | 4862 | 92 | 6331 | 1796 | 0.77 | 0.05 | 61.1 | 56.1 | 26.5 | 25.9 | C |
| 3 | 1.00 | 1.00 | 0.862 | 0.909 | 5154 | 98 | 6331 | 1796 | 0.81 | 0.05 | 61.0 | 56.0 | 28.2 | 27.2 | C |
| 4 | 1.00 | 1.00 | 0.862 | 0.909 | 4914 | 94 | 6331 | 1796 | 0.78 | 0.05 | 61.1 | 56.1 | 26.8 | 26.2 | C |
| 5 | 1.00 | 1.00 | 0.862 | 0.909 | 5222 | 99 | 6331 | 1796 | 0.82 | 0.06 | 61.0 | 56.0 | 28.5 | 27.5 | C |
| 6 | 1.00 | 1.00 | 0.862 | 0.909 | 5082 | 97 | 6331 | 1796 | 0.80 | 0.05 | 61.0 | 56.0 | 27.8 | 26.9 | C |
| 7 | 1.00 | 1.00 | 0.862 | 0.909 | 5390 | 102 | 6331 | 1796 | 0.85 | 0.06 | 60.9 | 56.0 | 29.5 | 28.3 | D |
| 8 | 1.00 | 1.00 | 0.862 | 0.909 | 5138 | 98 | 6331 | 1796 | 0.81 | 0.05 | 61.0 | 56.0 | 28.1 | 27.2 | C |
| 9 | 1.00 | 1.00 | 0.862 | 0.909 | 5242 | 99 | 6331 | 1796 | 0.83 | 0.06 | 60.9 | 56.0 | 28.7 | 27.6 | C |
| 10 | 1.00 | 1.00 | 0.862 | 0.909 | 5103 | 97 | 6331 | 1796 | 0.81 | 0.05 | 61.0 | 56.0 | 27.9 | 27.0 | C |
| 11 | 1.00 | 1.00 | 0.862 | 0.909 | 5411 | 102 | 6331 | 1796 | 0.85 | 0.06 | 60.9 | 56.0 | 29.6 | 28.3 | D |
| 12 | 1.00 | 1.00 | 0.862 | 0.909 | 5158 | 99 | 6331 | 1796 | 0.81 | 0.06 | 61.0 | 56.0 | 28.2 | 27.2 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.862 | 4893 | 6425 | 0.76 | 62.3 | 26.2 | D |
| 2 | 1.00 | 0.862 | 4765 | 6425 | 0.74 | 63.1 | 25.2 | C |
| 3 | 1.00 | 0.862 | 5051 | 6425 | 0.79 | 61.1 | 27.6 | D |
| 4 | 1.00 | 0.862 | 4816 | 6425 | 0.75 | 62.8 | 25.6 | C |
| 5 | 1.00 | 0.862 | 5117 | 6425 | 0.80 | 60.6 | 28.2 | D |
| 6 | 1.00 | 0.862 | 4980 | 6425 | 0.78 | 61.7 | 26.9 | D |
| 7 | 1.00 | 0.862 | 5282 | 6425 | 0.82 | 59.3 | 29.7 | D |
| 8 | 1.00 | 0.862 | 5035 | 6425 | 0.78 | 61.3 | 27.4 | D |
| 9 | 1.00 | 0.862 | 5138 | 6425 | 0.80 | 60.5 | 28.3 | D |
| 10 | 1.00 | 0.862 | 5001 | 6425 | 0.78 | 61.5 | 27.1 | D |
| 11 | 1.00 | 0.862 | 5303 | 6425 | 0.83 | 59.2 | 29.9 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.862 | | 5053 | | 6425 | | 0.79 | | 61.1 | | 27.6 | | D |
| **Segment 12: Merge** | | | | | | | | | | | | | | | |
| **AP** | **PHF** | | **fHV** | | **Flow Rate (pc/h)** | | **Capacity (pc/h)** | | **d/c Ratio** | | **Speed (mi/h)** | | **Density (pc/mi/ln)** | | **LOS** |
| | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | **Freeway** | **Ramp** | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | |
| 1 | 1.00 | 1.00 | 0.862 | 0.909 | 4988 | 95 | 6331 | 1796 | 0.79 | 0.05 | 61.0 | 59.4 | 27.3 | 24.1 | C |
| 2 | 1.00 | 1.00 | 0.862 | 0.909 | 4857 | 92 | 6331 | 1796 | 0.77 | 0.05 | 61.1 | 59.6 | 26.5 | 23.5 | C |
| 3 | 1.00 | 1.00 | 0.862 | 0.909 | 5149 | 98 | 6331 | 1796 | 0.81 | 0.05 | 60.7 | 59.2 | 28.3 | 24.9 | C |
| 4 | 1.00 | 1.00 | 0.862 | 0.909 | 4910 | 94 | 6331 | 1796 | 0.78 | 0.05 | 61.1 | 59.5 | 26.8 | 23.8 | C |
| 5 | 1.00 | 1.00 | 0.862 | 0.909 | 5216 | 99 | 6331 | 1796 | 0.82 | 0.06 | 60.6 | 59.1 | 28.7 | 25.2 | C |
| 6 | 1.00 | 1.00 | 0.862 | 0.909 | 5077 | 97 | 6331 | 1796 | 0.80 | 0.05 | 60.8 | 59.3 | 27.8 | 24.5 | C |
| 7 | 1.00 | 1.00 | 0.862 | 0.909 | 5384 | 102 | 6331 | 1796 | 0.85 | 0.06 | 60.4 | 58.8 | 29.7 | 26.0 | C |
| 8 | 1.00 | 1.00 | 0.862 | 0.909 | 5133 | 98 | 6331 | 1796 | 0.81 | 0.05 | 60.7 | 59.2 | 28.2 | 24.8 | C |
| 9 | 1.00 | 1.00 | 0.862 | 0.909 | 5237 | 99 | 6331 | 1796 | 0.83 | 0.06 | 60.6 | 59.0 | 28.8 | 25.3 | C |
| 10 | 1.00 | 1.00 | 0.862 | 0.909 | 5098 | 97 | 6331 | 1796 | 0.81 | 0.05 | 60.8 | 59.3 | 27.9 | 24.7 | C |
| 11 | 1.00 | 1.00 | 0.862 | 0.909 | 5405 | 102 | 6331 | 1796 | 0.85 | 0.06 | 60.4 | 58.8 | 29.8 | 26.1 | C |
| 12 | 1.00 | 1.00 | 0.862 | 0.909 | 5152 | 99 | 6331 | 1796 | 0.81 | 0.06 | 60.7 | 59.2 | 28.3 | 24.9 | C |
| **Segment 13: Basic** | | | | | | | | | | | | | | | |
| **AP** | **PHF** | | **fHV** | | **Flow Rate (pc/h)** | | **Capacity (pc/h)** | | **d/c Ratio** | | **Speed (mi/h)** | | **Density (pc/mi/ln)** | | **LOS** |
| 1 | 1.00 | | 0.862 | | 4993 | | 6433 | | 0.78 | | 61.7 | | 27.0 | | D |
| 2 | 1.00 | | 0.862 | | 4862 | | 6433 | | 0.76 | | 62.6 | | 25.9 | | C |
| 3 | 1.00 | | 0.862 | | 5154 | | 6433 | | 0.80 | | 60.5 | | 28.4 | | D |
| 4 | 1.00 | | 0.862 | | 4914 | | 6433 | | 0.76 | | 62.3 | | 26.3 | | D |
| 5 | 1.00 | | 0.862 | | 5222 | | 6433 | | 0.81 | | 60.0 | | 29.0 | | D |
| 6 | 1.00 | | 0.862 | | 5082 | | 6433 | | 0.79 | | 61.1 | | 27.7 | | D |
| 7 | 1.00 | | 0.862 | | 5390 | | 6433 | | 0.84 | | 58.6 | | 30.7 | | D |
| 8 | 1.00 | | 0.862 | | 5138 | | 6433 | | 0.80 | | 60.6 | | 28.3 | | D |
| 9 | 1.00 | | 0.862 | | 5242 | | 6433 | | 0.81 | | 59.8 | | 29.2 | | D |
| 10 | 1.00 | | 0.862 | | 5103 | | 6433 | | 0.79 | | 60.9 | | 27.9 | | D |
| 11 | 1.00 | | 0.862 | | 5411 | | 6433 | | 0.84 | | 58.4 | | 30.9 | | D |
| 12 | 1.00 | | 0.862 | | 5158 | | 6433 | | 0.80 | | 60.5 | | 28.4 | | D |
| **Segment 14: Diverge** | | | | | | | | | | | | | | | |
| **AP** | **PHF** | | **fHV** | | **Flow Rate (pc/h)** | | **Capacity (pc/h)** | | **d/c Ratio** | | **Speed (mi/h)** | | **Density (pc/mi/ln)** | | **LOS** |
| | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | **Freeway** | **Ramp** | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | |
| 1 | 1.00 | 1.00 | 0.862 | 0.875 | 4993 | 1649 | 6331 | 3951 | 0.79 | 0.42 | 63.0 | 58.6 | 26.4 | 17.9 | B |
| 2 | 1.00 | 1.00 | 0.862 | 0.875 | 4862 | 1855 | 6331 | 3951 | 0.77 | 0.47 | 62.5 | 58.2 | 25.9 | 18.3 | B |
| 3 | 1.00 | 1.00 | 0.862 | 0.875 | 5154 | 2057 | 6331 | 3951 | 0.81 | 0.52 | 61.9 | 57.7 | 27.8 | 20.4 | C |
| 4 | 1.00 | 1.00 | 0.862 | 0.875 | 4914 | 1825 | 6331 | 3951 | 0.78 | 0.46 | 62.5 | 58.2 | 26.2 | 18.4 | B |
| 5 | 1.00 | 1.00 | 0.862 | 0.875 | 5222 | 1726 | 6331 | 3951 | 0.82 | 0.44 | 62.8 | 58.5 | 27.7 | 19.1 | B |
| 6 | 1.00 | 1.00 | 0.862 | 0.875 | 5082 | 1939 | 6331 | 3951 | 0.80 | 0.49 | 62.2 | 57.9 | 27.2 | 19.6 | B |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.862 | 0.875 | 5390 | 2151 | 6331 | 3951 | 0.85 | 0.54 | 61.6 | 57.4 | 29.2 | 21.8 | C |
| 8 | 1.00 | 1.00 | 0.862 | 0.875 | 5138 | 1910 | 6331 | 3951 | 0.81 | 0.48 | 62.3 | 58.0 | 27.5 | 19.7 | B |
| 9 | 1.00 | 1.00 | 0.862 | 0.875 | 5242 | 1731 | 6331 | 3951 | 0.83 | 0.44 | 62.8 | 58.5 | 27.8 | 19.2 | B |
| 10 | 1.00 | 1.00 | 0.862 | 0.875 | 5103 | 1947 | 6331 | 3951 | 0.81 | 0.49 | 62.2 | 57.9 | 27.3 | 19.7 | B |
| 11 | 1.00 | 1.00 | 0.862 | 0.875 | 5411 | 2159 | 6331 | 3951 | 0.85 | 0.55 | 61.6 | 57.4 | 29.3 | 21.9 | C |
| 12 | 1.00 | 1.00 | 0.862 | 0.875 | 5158 | 1917 | 6331 | 3951 | 0.81 | 0.49 | 62.3 | 58.0 | 27.6 | 19.8 | B |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.854 | 3350 | 6377 | 0.53 | 66.7 | 16.7 | B |
| 2 | 1.00 | 0.854 | 3007 | 6377 | 0.47 | 66.7 | 15.0 | B |
| 3 | 1.00 | 0.854 | 3095 | 6377 | 0.49 | 66.7 | 15.5 | B |
| 4 | 1.00 | 0.854 | 3090 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 5 | 1.00 | 0.854 | 3502 | 6377 | 0.55 | 66.5 | 17.5 | B |
| 6 | 1.00 | 0.854 | 3143 | 6377 | 0.49 | 66.7 | 15.7 | B |
| 7 | 1.00 | 0.854 | 3237 | 6377 | 0.51 | 66.7 | 16.2 | B |
| 8 | 1.00 | 0.854 | 3230 | 6377 | 0.51 | 66.7 | 16.1 | B |
| 9 | 1.00 | 0.854 | 3518 | 6377 | 0.55 | 66.5 | 17.6 | B |
| 10 | 1.00 | 0.854 | 3156 | 6377 | 0.49 | 66.7 | 15.8 | B |
| 11 | 1.00 | 0.854 | 3249 | 6377 | 0.51 | 66.7 | 16.2 | B |
| 12 | 1.00 | 0.854 | 3242 | 6377 | 0.51 | 66.7 | 16.2 | B |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.854 | 0.758 | 3433 | 83 | 8578 | 1976 | 0.40 | 0.04 | 68.8 | 68.8 | 12.5 | 12.5 | B |
| 2 | 1.00 | 1.00 | 0.854 | 0.758 | 3043 | 36 | 8578 | 1976 | 0.35 | 0.02 | 68.8 | 68.8 | 11.1 | 11.1 | B |
| 3 | 1.00 | 1.00 | 0.854 | 0.758 | 3158 | 63 | 8578 | 1976 | 0.37 | 0.03 | 68.8 | 68.8 | 11.5 | 11.5 | B |
| 4 | 1.00 | 1.00 | 0.854 | 0.758 | 3161 | 71 | 8578 | 1976 | 0.37 | 0.04 | 68.8 | 68.8 | 11.5 | 11.5 | B |
| 5 | 1.00 | 1.00 | 0.854 | 0.758 | 3589 | 87 | 8578 | 1976 | 0.42 | 0.04 | 68.8 | 68.8 | 13.0 | 13.0 | B |
| 6 | 1.00 | 1.00 | 0.854 | 0.758 | 3180 | 37 | 8578 | 1976 | 0.37 | 0.02 | 68.8 | 68.8 | 11.6 | 11.6 | B |
| 7 | 1.00 | 1.00 | 0.854 | 0.758 | 3303 | 66 | 8578 | 1976 | 0.39 | 0.03 | 68.8 | 68.8 | 12.0 | 12.0 | B |
| 8 | 1.00 | 1.00 | 0.854 | 0.758 | 3304 | 74 | 8578 | 1976 | 0.39 | 0.04 | 68.8 | 68.8 | 12.0 | 12.0 | B |
| 9 | 1.00 | 1.00 | 0.854 | 0.758 | 3606 | 88 | 8578 | 1976 | 0.42 | 0.04 | 68.8 | 68.8 | 13.1 | 13.1 | B |
| 10 | 1.00 | 1.00 | 0.854 | 0.758 | 3193 | 37 | 8578 | 1976 | 0.37 | 0.02 | 68.8 | 68.8 | 11.6 | 11.6 | B |
| 11 | 1.00 | 1.00 | 0.854 | 0.758 | 3315 | 66 | 8578 | 1976 | 0.39 | 0.03 | 68.8 | 68.8 | 12.0 | 12.0 | B |
| 12 | 1.00 | 1.00 | 0.854 | 0.758 | 3316 | 74 | 8578 | 1976 | 0.39 | 0.04 | 68.8 | 68.8 | 12.0 | 12.0 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.853 | 3428 | 8502 | 0.40 | 66.7 | 12.8 | B |
| 2 | 1.00 | 0.853 | 3042 | 8502 | 0.36 | 66.7 | 11.4 | B |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.853 | 3155 | 8502 | 0.37 | 66.7 | 11.8 | B |
| 4 | 1.00 | 0.853 | 3157 | 8502 | 0.37 | 66.7 | 11.8 | B |
| 5 | 1.00 | 0.853 | 3584 | 8502 | 0.42 | 66.7 | 13.4 | B |
| 6 | 1.00 | 0.853 | 3179 | 8502 | 0.37 | 66.7 | 11.9 | B |
| 7 | 1.00 | 0.853 | 3299 | 8502 | 0.39 | 66.7 | 12.4 | B |
| 8 | 1.00 | 0.853 | 3299 | 8502 | 0.39 | 66.7 | 12.4 | B |
| 9 | 1.00 | 0.853 | 3600 | 8502 | 0.42 | 66.7 | 13.5 | B |
| 10 | 1.00 | 0.853 | 3192 | 8502 | 0.38 | 66.7 | 12.0 | B |
| 11 | 1.00 | 0.853 | 3312 | 8502 | 0.39 | 66.7 | 12.4 | B |
| 12 | 1.00 | 0.853 | 3312 | 8502 | 0.39 | 66.7 | 12.4 | B |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.853 | 3428 | 6377 | 0.54 | 66.6 | 17.2 | B |
| 2 | 1.00 | 0.853 | 3042 | 6377 | 0.48 | 66.7 | 15.2 | B |
| 3 | 1.00 | 0.853 | 3155 | 6377 | 0.49 | 66.7 | 15.8 | B |
| 4 | 1.00 | 0.853 | 3157 | 6377 | 0.50 | 66.7 | 15.8 | B |
| 5 | 1.00 | 0.853 | 3584 | 6377 | 0.56 | 66.4 | 18.0 | B |
| 6 | 1.00 | 0.853 | 3179 | 6377 | 0.50 | 66.7 | 15.9 | B |
| 7 | 1.00 | 0.853 | 3299 | 6377 | 0.52 | 66.7 | 16.5 | B |
| 8 | 1.00 | 0.853 | 3299 | 6377 | 0.52 | 66.7 | 16.5 | B |
| 9 | 1.00 | 0.853 | 3600 | 6377 | 0.56 | 66.4 | 18.1 | C |
| 10 | 1.00 | 0.853 | 3192 | 6377 | 0.50 | 66.7 | 16.0 | B |
| 11 | 1.00 | 0.853 | 3312 | 6377 | 0.52 | 66.7 | 16.6 | B |
| 12 | 1.00 | 0.853 | 3312 | 6377 | 0.52 | 66.7 | 16.6 | B |

## Segment 19: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.853 | 3428 | 4251 | 0.81 | 59.5 | 28.8 | D |
| 2 | 1.00 | 0.853 | 3042 | 4251 | 0.72 | 63.2 | 24.1 | C |
| 3 | 1.00 | 0.853 | 3155 | 4251 | 0.74 | 62.2 | 25.4 | C |
| 4 | 1.00 | 0.853 | 3157 | 4251 | 0.74 | 62.2 | 25.4 | C |
| 5 | 1.00 | 0.853 | 3584 | 4251 | 0.84 | 57.6 | 31.1 | D |
| 6 | 1.00 | 0.853 | 3179 | 4251 | 0.75 | 62.0 | 25.6 | C |
| 7 | 1.00 | 0.853 | 3299 | 4251 | 0.78 | 60.9 | 27.1 | D |
| 8 | 1.00 | 0.853 | 3299 | 4251 | 0.78 | 60.9 | 27.1 | D |
| 9 | 1.00 | 0.853 | 3600 | 4251 | 0.85 | 57.4 | 31.4 | D |
| 10 | 1.00 | 0.853 | 3192 | 4251 | 0.75 | 61.9 | 25.8 | C |
| 11 | 1.00 | 0.853 | 3312 | 4251 | 0.78 | 60.7 | 27.3 | D |
| 12 | 1.00 | 0.853 | 3312 | 4251 | 0.78 | 60.7 | 27.3 | D |

## Segment 20: Diverge

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | (pc/h) | | (pc/h) | | Ratio | | (mi/h) | | (pc/mi/ln) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.853 | 0.928 | 3428 | 158 | 4221 | 1886 | 0.81 | 0.08 | 59.1 | 59.1 | 29.0 | 30.5 | D |
| 2 | 1.00 | 1.00 | 0.853 | 0.928 | 3042 | 193 | 4221 | 1886 | 0.72 | 0.10 | 59.0 | 59.0 | 25.8 | 27.2 | C |
| 3 | 1.00 | 1.00 | 0.853 | 0.928 | 3155 | 198 | 4221 | 1886 | 0.75 | 0.11 | 59.0 | 59.0 | 26.7 | 28.1 | D |
| 4 | 1.00 | 1.00 | 0.853 | 0.928 | 3157 | 151 | 4221 | 1886 | 0.75 | 0.08 | 59.1 | 59.1 | 26.7 | 28.2 | D |
| 5 | 1.00 | 1.00 | 0.853 | 0.928 | 3584 | 166 | 4221 | 1886 | 0.85 | 0.09 | 59.0 | 59.0 | 30.4 | 31.8 | D |
| 6 | 1.00 | 1.00 | 0.853 | 0.928 | 3179 | 202 | 4221 | 1886 | 0.75 | 0.11 | 59.0 | 59.0 | 26.9 | 28.4 | D |
| 7 | 1.00 | 1.00 | 0.853 | 0.928 | 3299 | 208 | 4221 | 1886 | 0.78 | 0.11 | 59.0 | 59.0 | 28.0 | 29.4 | D |
| 8 | 1.00 | 1.00 | 0.853 | 0.928 | 3299 | 158 | 4221 | 1886 | 0.78 | 0.08 | 59.1 | 59.1 | 27.9 | 29.4 | D |
| 9 | 1.00 | 1.00 | 0.853 | 0.928 | 3600 | 166 | 4221 | 1886 | 0.85 | 0.09 | 59.0 | 59.0 | 30.5 | 32.0 | D |
| 10 | 1.00 | 1.00 | 0.853 | 0.928 | 3192 | 203 | 4221 | 1886 | 0.76 | 0.11 | 59.0 | 59.0 | 27.1 | 28.5 | D |
| 11 | 1.00 | 1.00 | 0.853 | 0.928 | 3312 | 208 | 4221 | 1886 | 0.78 | 0.11 | 59.0 | 59.0 | 28.1 | 29.5 | D |
| 12 | 1.00 | 1.00 | 0.853 | 0.928 | 3312 | 158 | 4221 | 1886 | 0.78 | 0.08 | 59.1 | 59.1 | 28.0 | 29.5 | D |

## Segment 21: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.848 | 3275 | 4260 | 0.77 | 61.4 | 26.7 | D |
| 2 | 1.00 | 0.848 | 2849 | 4260 | 0.67 | 64.9 | 21.9 | C |
| 3 | 1.00 | 0.848 | 2956 | 4260 | 0.69 | 64.2 | 23.0 | C |
| 4 | 1.00 | 0.848 | 3011 | 4260 | 0.71 | 63.7 | 23.6 | C |
| 5 | 1.00 | 0.848 | 3423 | 4260 | 0.80 | 59.8 | 28.6 | D |
| 6 | 1.00 | 0.848 | 2978 | 4260 | 0.70 | 64.0 | 23.3 | C |
| 7 | 1.00 | 0.848 | 3091 | 4260 | 0.73 | 63.1 | 24.5 | C |
| 8 | 1.00 | 0.848 | 3145 | 4260 | 0.74 | 62.6 | 25.1 | C |
| 9 | 1.00 | 0.848 | 3440 | 4260 | 0.81 | 59.6 | 28.9 | D |
| 10 | 1.00 | 0.848 | 2989 | 4260 | 0.70 | 63.9 | 23.4 | C |
| 11 | 1.00 | 0.848 | 3104 | 4260 | 0.73 | 63.0 | 24.6 | C |
| 12 | 1.00 | 0.848 | 3158 | 4260 | 0.74 | 62.5 | 25.3 | C |

## Segment 22: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.848 | 0.853 | 3762 | 487 | 4221 | 1886 | 0.89 | 0.26 | 57.9 | 57.9 | 32.5 | 28.4 | D |
| 2 | 1.00 | 1.00 | 0.848 | 0.853 | 3355 | 506 | 4221 | 1886 | 0.79 | 0.27 | 59.4 | 59.4 | 28.2 | 25.2 | C |
| 3 | 1.00 | 1.00 | 0.848 | 0.853 | 3390 | 434 | 4221 | 1886 | 0.80 | 0.23 | 59.3 | 59.3 | 28.6 | 25.5 | C |
| 4 | 1.00 | 1.00 | 0.848 | 0.853 | 3468 | 457 | 4221 | 1886 | 0.82 | 0.24 | 59.0 | 59.0 | 29.4 | 26.1 | C |
| 5 | 1.00 | 1.00 | 0.848 | 0.853 | 3932 | 509 | 4221 | 1886 | 0.93 | 0.27 | 57.1 | 57.1 | 34.4 | 29.7 | D |
| 6 | 1.00 | 1.00 | 0.848 | 0.853 | 3508 | 530 | 4221 | 1886 | 0.83 | 0.28 | 58.9 | 58.9 | 29.8 | 26.4 | C |
| 7 | 1.00 | 1.00 | 0.848 | 0.853 | 3545 | 454 | 4221 | 1886 | 0.84 | 0.24 | 58.8 | 58.8 | 30.1 | 26.7 | C |
| 8 | 1.00 | 1.00 | 0.848 | 0.853 | 3623 | 478 | 4221 | 1886 | 0.86 | 0.25 | 58.5 | 58.5 | 31.0 | 27.3 | C |
| 9 | 1.00 | 1.00 | 0.848 | 0.853 | 3950 | 510 | 4221 | 1886 | 0.94 | 0.27 | 57.0 | 57.0 | 34.6 | 29.9 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 1.00 | 0.848 | 0.853 | 3521 | 532 | 4221 | 1886 | 0.83 | 0.28 | 58.9 | 58.9 | 29.9 | 26.5 | C |
| 11 | 1.00 | 1.00 | 0.848 | 0.853 | 3559 | 455 | 4221 | 1886 | 0.84 | 0.24 | 58.7 | 58.7 | 30.3 | 26.8 | C |
| 12 | 1.00 | 1.00 | 0.848 | 0.853 | 3637 | 479 | 4221 | 1886 | 0.86 | 0.25 | 58.4 | 58.4 | 31.1 | 27.4 | C |

## Segment 23: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3760 | 4289 | 0.88 | 56.3 | 33.4 | D |
| 2 | 1.00 | 0.849 | 3355 | 4289 | 0.78 | 61.4 | 27.3 | D |
| 3 | 1.00 | 0.849 | 3389 | 4289 | 0.79 | 61.1 | 27.7 | D |
| 4 | 1.00 | 0.849 | 3466 | 4289 | 0.81 | 60.2 | 28.8 | D |
| 5 | 1.00 | 0.849 | 3931 | 4289 | 0.92 | 53.8 | 36.5 | E |
| 6 | 1.00 | 0.849 | 3506 | 4289 | 0.82 | 59.7 | 29.4 | D |
| 7 | 1.00 | 0.849 | 3543 | 4289 | 0.83 | 59.2 | 29.9 | D |
| 8 | 1.00 | 0.849 | 3622 | 4289 | 0.84 | 58.2 | 31.1 | D |
| 9 | 1.00 | 0.849 | 3948 | 4289 | 0.92 | 53.5 | 36.9 | E |
| 10 | 1.00 | 0.849 | 3521 | 4289 | 0.82 | 59.5 | 29.6 | D |
| 11 | 1.00 | 0.849 | 3557 | 4289 | 0.83 | 59.1 | 30.1 | D |
| 12 | 1.00 | 0.849 | 3636 | 4289 | 0.85 | 58.0 | 31.3 | D |

## Facility Analysis Results

| AP | Speed, mi/h | Density, pc/mi/ln | Density, veh/mi/ln | Travel Time, min | LOS |
|---|---|---|---|---|---|
| 1 | 59.2 | 29.0 | 24.9 | 34.00 | E |
| 2 | 62.0 | 25.8 | 22.1 | 32.50 | D |
| 3 | 60.8 | 27.3 | 23.4 | 33.10 | D |
| 4 | 61.1 | 26.9 | 23.1 | 33.00 | D |
| 5 | 57.3 | 31.4 | 26.9 | 35.20 | E |
| 6 | 60.6 | 27.6 | 23.7 | 33.30 | D |
| 7 | 59.1 | 29.3 | 25.1 | 34.10 | E |
| 8 | 59.5 | 28.9 | 24.8 | 33.90 | D |
| 9 | 57.1 | 31.6 | 27.1 | 35.30 | E |
| 10 | 60.4 | 27.7 | 23.8 | 33.40 | D |
| 11 | 59.0 | 29.5 | 25.3 | 34.20 | E |
| 12 | 59.3 | 29.0 | 24.9 | 34.00 | E |

## Facility Overall Results

| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 59.5 | Density, veh/mi/ln | 24.6 |
| Average Travel Time, min | 33.90 | Density, pc/mi/ln | 28.7 |

## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

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| WARNING 2 | The Demand Adjustment Factor for segment 1 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 3 | The Demand Adjustment Factor for segment 2 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 4 | The Ramp Demand Adjustment factor for segment 2 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 5 | The Demand Adjustment Factor for segment 3 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 6 | The Demand Adjustment Factor for segment 4 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 7 | The Ramp Demand Adjustment factor for segment 4 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 8 | The Demand Adjustment Factor for segment 5 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 9 | The Demand Adjustment Factor for segment 6 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 10 | The Ramp Demand Adjustment factor for segment 6 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 11 | The Demand Adjustment Factor for segment 7 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 12 | The Demand Adjustment Factor for segment 8 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 13 | The Ramp Demand Adjustment factor for segment 8 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 14 | The Demand Adjustment Factor for segment 9 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 15 | The Demand Adjustment Factor for segment 14 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 16 | The Ramp Demand Adjustment factor for segment 14 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 17 | The Demand Adjustment Factor for segment 15 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 18 | The Demand Adjustment Factor for segment 16 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 19 | The Ramp Demand Adjustment factor for segment 16 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 20 | The Demand Adjustment Factor for segment 17 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 21 | The Demand Adjustment Factor for segment 19 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 22 | The Demand Adjustment Factor for segment 20 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 23 | The Ramp Demand Adjustment factor for segment 20 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 24 | The Demand Adjustment Factor for segment 21 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 25 | The Demand Adjustment Factor for segment 22 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 26 | The Ramp Demand Adjustment factor for segment 22 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 27 | The Demand Adjustment Factor for segment 23 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 28 | The Demand Adjustment Factor for segment 1 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 29 | The Demand Adjustment Factor for segment 2 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 30 | The Ramp Demand Adjustment factor for segment 2 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 31 | The Demand Adjustment Factor for segment 3 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 32 | The Demand Adjustment Factor for segment 4 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 33 | The Ramp Demand Adjustment factor for segment 4 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 34 | The Demand Adjustment Factor for segment 5 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 35 | The Demand Adjustment Factor for segment 6 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 36 | The Ramp Demand Adjustment factor for segment 6 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 37 | The Demand Adjustment Factor for segment 7 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 38 | The Demand Adjustment Factor for segment 8 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 39 | The Ramp Demand Adjustment factor for segment 8 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 40 | The Demand Adjustment Factor for segment 9 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 41 | The Demand Adjustment Factor for segment 14 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 42 | The Ramp Demand Adjustment factor for segment 14 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 43 | The Demand Adjustment Factor for segment 15 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 44 | The Demand Adjustment Factor for segment 16 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 45 | The Ramp Demand Adjustment factor for segment 16 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 46 | The Demand Adjustment Factor for segment 17 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 47 | The Demand Adjustment Factor for segment 19 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 48 | The Demand Adjustment Factor for segment 20 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 49 | The Ramp Demand Adjustment factor for segment 20 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 50 | The Demand Adjustment Factor for segment 21 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 51 | The Demand Adjustment Factor for segment 22 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 52 | The Ramp Demand Adjustment factor for segment 22 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 53 | The Demand Adjustment Factor for segment 23 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 54 | The Demand Adjustment Factor for segment 1 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 55 | The Demand Adjustment Factor for segment 2 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 56 | The Ramp Demand Adjustment factor for segment 2 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 57 | The Demand Adjustment Factor for segment 3 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 58 | The Demand Adjustment Factor for segment 4 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 59 | The Ramp Demand Adjustment factor for segment 4 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 60 | The Demand Adjustment Factor for segment 5 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 61 | The Demand Adjustment Factor for segment 6 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 62 | The Ramp Demand Adjustment factor for segment 6 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 63 | The Demand Adjustment Factor for segment 7 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 64 | The Demand Adjustment Factor for segment 8 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 65 | The Ramp Demand Adjustment factor for segment 8 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 66 | The Demand Adjustment Factor for segment 9 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 67 | The Demand Adjustment Factor for segment 14 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 68 | The Ramp Demand Adjustment factor for segment 14 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 69 | The Demand Adjustment Factor for segment 15 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 70 | The Demand Adjustment Factor for segment 16 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 71 | The Ramp Demand Adjustment factor for segment 16 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 72 | The Demand Adjustment Factor for segment 17 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 73 | The Demand Adjustment Factor for segment 19 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 74 | The Demand Adjustment Factor for segment 20 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 75 | The Ramp Demand Adjustment factor for segment 20 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 76 | The Demand Adjustment Factor for segment 21 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 77 | The Demand Adjustment Factor for segment 22 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 78 | The Ramp Demand Adjustment factor for segment 22 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 79 | The Demand Adjustment Factor for segment 23 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 80 | The Demand Adjustment Factor for segment 1 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 81 | The Demand Adjustment Factor for segment 2 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 82 | The Ramp Demand Adjustment factor for segment 2 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 83 | The Demand Adjustment Factor for segment 3 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 84 | The Demand Adjustment Factor for segment 4 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 85 | The Ramp Demand Adjustment factor for segment 4 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 86 | The Demand Adjustment Factor for segment 5 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 87 | The Demand Adjustment Factor for segment 6 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 88 | The Ramp Demand Adjustment factor for segment 6 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 89 | The Demand Adjustment Factor for segment 7 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 90 | The Demand Adjustment Factor for segment 8 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 91 | The Ramp Demand Adjustment factor for segment 8 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 92 | The Demand Adjustment Factor for segment 9 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 93 | The Demand Adjustment Factor for segment 14 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 94 | The Ramp Demand Adjustment factor for segment 14 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 95 | The Demand Adjustment Factor for segment 15 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 96 | The Demand Adjustment Factor for segment 16 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 97 | The Ramp Demand Adjustment factor for segment 16 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 98 | The Demand Adjustment Factor for segment 17 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 99 | The Demand Adjustment Factor for segment 19 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 100 | The Demand Adjustment Factor for segment 20 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 101 | The Ramp Demand Adjustment factor for segment 20 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 102 | The Demand Adjustment Factor for segment 21 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 103 | The Demand Adjustment Factor for segment 22 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 104 | The Ramp Demand Adjustment factor for segment 22 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 105 | The Demand Adjustment Factor for segment 23 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 106 | The Demand Adjustment Factor for segment 1 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 107 | The Demand Adjustment Factor for segment 2 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 108 | The Ramp Demand Adjustment factor for segment 2 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 109 | The Demand Adjustment Factor for segment 3 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 110 | The Demand Adjustment Factor for segment 4 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 111 | The Ramp Demand Adjustment factor for segment 4 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 112 | The Demand Adjustment Factor for segment 5 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 113 | The Demand Adjustment Factor for segment 6 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 114 | The Ramp Demand Adjustment factor for segment 6 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 115 | The Demand Adjustment Factor for segment 7 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 116 | The Demand Adjustment Factor for segment 8 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 117 | The Ramp Demand Adjustment factor for segment 8 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 118 | The Demand Adjustment Factor for segment 9 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 119 | The Demand Adjustment Factor for segment 14 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 120 | The Ramp Demand Adjustment factor for segment 14 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 121 | The Demand Adjustment Factor for segment 15 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 122 | The Demand Adjustment Factor for segment 16 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 123 | The Ramp Demand Adjustment factor for segment 16 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 124 | The Demand Adjustment Factor for segment 17 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 125 | The Demand Adjustment Factor for segment 19 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 126 | The Demand Adjustment Factor for segment 20 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 127 | The Ramp Demand Adjustment factor for segment 20 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 128 | The Demand Adjustment Factor for segment 21 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 129 | The Demand Adjustment Factor for segment 22 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 130 | The Ramp Demand Adjustment factor for segment 22 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 131 | The Demand Adjustment Factor for segment 23 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 132 | The Demand Adjustment Factor for segment 1 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 133 | The Demand Adjustment Factor for segment 2 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 134 | The Ramp Demand Adjustment factor for segment 2 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 135 | The Demand Adjustment Factor for segment 3 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 136 | The Demand Adjustment Factor for segment 4 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 137 | The Ramp Demand Adjustment factor for segment 4 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 138 | The Demand Adjustment Factor for segment 5 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 139 | The Demand Adjustment Factor for segment 6 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 140 | The Ramp Demand Adjustment factor for segment 6 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 141 | The Demand Adjustment Factor for segment 7 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 142 | The Demand Adjustment Factor for segment 8 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 143 | The Ramp Demand Adjustment factor for segment 8 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 144 | The Demand Adjustment Factor for segment 9 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 145 | The Demand Adjustment Factor for segment 14 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 146 | The Ramp Demand Adjustment factor for segment 14 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 147 | The Demand Adjustment Factor for segment 15 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 148 | The Demand Adjustment Factor for segment 16 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 149 | The Ramp Demand Adjustment factor for segment 16 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 150 | The Demand Adjustment Factor for segment 17 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 151 | The Demand Adjustment Factor for segment 19 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 152 | The Demand Adjustment Factor for segment 20 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 153 | The Ramp Demand Adjustment factor for segment 20 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 154 | The Demand Adjustment Factor for segment 21 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 155 | The Demand Adjustment Factor for segment 22 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 156 | The Ramp Demand Adjustment factor for segment 22 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 157 | The Demand Adjustment Factor for segment 23 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 158 | The Demand Adjustment Factor for segment 1 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 159 | The Demand Adjustment Factor for segment 2 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 160 | The Ramp Demand Adjustment factor for segment 2 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 161 | The Demand Adjustment Factor for segment 3 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 162 | The Demand Adjustment Factor for segment 4 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 163 | The Ramp Demand Adjustment factor for segment 4 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 164 | The Demand Adjustment Factor for segment 5 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 165 | The Demand Adjustment Factor for segment 6 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 166 | The Ramp Demand Adjustment factor for segment 6 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 167 | The Demand Adjustment Factor for segment 7 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 168 | The Demand Adjustment Factor for segment 8 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 169 | The Ramp Demand Adjustment factor for segment 8 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 170 | The Demand Adjustment Factor for segment 9 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 171 | The Demand Adjustment Factor for segment 14 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 172 | The Ramp Demand Adjustment factor for segment 14 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 173 | The Demand Adjustment Factor for segment 15 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 174 | The Demand Adjustment Factor for segment 16 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 175 | The Ramp Demand Adjustment factor for segment 16 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 176 | The Demand Adjustment Factor for segment 17 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 177 | The Demand Adjustment Factor for segment 19 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 178 | The Demand Adjustment Factor for segment 20 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 179 | The Ramp Demand Adjustment factor for segment 20 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 180 | The Demand Adjustment Factor for segment 21 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 181 | The Demand Adjustment Factor for segment 22 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 182 | The Ramp Demand Adjustment factor for segment 22 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 183 | The Demand Adjustment Factor for segment 23 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 184 | The Demand Adjustment Factor for segment 1 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 185 | The Demand Adjustment Factor for segment 2 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 186 | The Ramp Demand Adjustment factor for segment 2 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 187 | The Demand Adjustment Factor for segment 3 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 188 | The Demand Adjustment Factor for segment 4 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 189 | The Ramp Demand Adjustment factor for segment 4 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 190 | The Demand Adjustment Factor for segment 5 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 191 | The Demand Adjustment Factor for segment 6 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 192 | The Ramp Demand Adjustment factor for segment 6 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 193 | The Demand Adjustment Factor for segment 7 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 194 | The Demand Adjustment Factor for segment 8 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 195 | The Ramp Demand Adjustment factor for segment 8 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 196 | The Demand Adjustment Factor for segment 9 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 197 | The Demand Adjustment Factor for segment 14 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 198 | The Ramp Demand Adjustment factor for segment 14 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 199 | The Demand Adjustment Factor for segment 15 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 200 | The Demand Adjustment Factor for segment 16 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 201 | The Ramp Demand Adjustment factor for segment 16 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 202 | The Demand Adjustment Factor for segment 17 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 203 | The Demand Adjustment Factor for segment 19 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 204 | The Demand Adjustment Factor for segment 20 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 205 | The Ramp Demand Adjustment factor for segment 20 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 206 | The Demand Adjustment Factor for segment 21 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 207 | The Demand Adjustment Factor for segment 22 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 208 | The Ramp Demand Adjustment factor for segment 22 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 209 | The Demand Adjustment Factor for segment 23 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 210 | The Demand Adjustment Factor for segment 1 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 211 | The Demand Adjustment Factor for segment 2 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 212 | The Ramp Demand Adjustment factor for segment 2 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 213 | The Demand Adjustment Factor for segment 3 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 214 | The Demand Adjustment Factor for segment 4 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 215 | The Ramp Demand Adjustment factor for segment 4 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 216 | The Demand Adjustment Factor for segment 5 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 217 | The Demand Adjustment Factor for segment 6 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 218 | The Ramp Demand Adjustment factor for segment 6 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 219 | The Demand Adjustment Factor for segment 7 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 220 | The Demand Adjustment Factor for segment 8 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 221 | The Ramp Demand Adjustment factor for segment 8 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 222 | The Demand Adjustment Factor for segment 9 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 223 | The Demand Adjustment Factor for segment 14 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 224 | The Ramp Demand Adjustment factor for segment 14 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 225 | The Demand Adjustment Factor for segment 15 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 226 | The Demand Adjustment Factor for segment 16 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 227 | The Ramp Demand Adjustment factor for segment 16 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 228 | The Demand Adjustment Factor for segment 17 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 229 | The Demand Adjustment Factor for segment 19 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 230 | The Demand Adjustment Factor for segment 20 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 231 | The Ramp Demand Adjustment factor for segment 20 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 232 | The Demand Adjustment Factor for segment 21 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 233 | The Demand Adjustment Factor for segment 22 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 234 | The Ramp Demand Adjustment factor for segment 22 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 235 | The Demand Adjustment Factor for segment 23 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 236 | The Demand Adjustment Factor for segment 1 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 237 | The Demand Adjustment Factor for segment 2 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 238 | The Ramp Demand Adjustment factor for segment 2 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 239 | The Demand Adjustment Factor for segment 3 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 240 | The Demand Adjustment Factor for segment 4 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 241 | The Ramp Demand Adjustment factor for segment 4 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 242 | The Demand Adjustment Factor for segment 5 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 243 | The Demand Adjustment Factor for segment 6 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 244 | The Ramp Demand Adjustment factor for segment 6 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 245 | The Demand Adjustment Factor for segment 7 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 246 | The Demand Adjustment Factor for segment 8 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 247 | The Ramp Demand Adjustment factor for segment 8 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 248 | The Demand Adjustment Factor for segment 9 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 249 | The Demand Adjustment Factor for segment 14 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 250 | The Ramp Demand Adjustment factor for segment 14 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 251 | The Demand Adjustment Factor for segment 15 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 252 | The Demand Adjustment Factor for segment 16 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 253 | The Ramp Demand Adjustment factor for segment 16 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 254 | The Demand Adjustment Factor for segment 17 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 255 | The Demand Adjustment Factor for segment 19 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 262 | The Demand Adjustment Factor for segment 1 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 263 | The Demand Adjustment Factor for segment 2 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 264 | The Ramp Demand Adjustment factor for segment 2 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 265 | The Demand Adjustment Factor for segment 3 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 268 | The Demand Adjustment Factor for segment 5 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 269 | The Demand Adjustment Factor for segment 6 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 271 | The Demand Adjustment Factor for segment 7 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 273 | The Ramp Demand Adjustment factor for segment 8 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 279 | The Ramp Demand Adjustment factor for segment 16 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 280 | The Demand Adjustment Factor for segment 17 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 281 | The Demand Adjustment Factor for segment 19 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 286 | The Ramp Demand Adjustment factor for segment 22 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 287 | The Demand Adjustment Factor for segment 23 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 288 | The Demand Adjustment Factor for segment 1 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 289 | The Demand Adjustment Factor for segment 2 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 290 | The Ramp Demand Adjustment factor for segment 2 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 291 | The Demand Adjustment Factor for segment 3 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 292 | The Demand Adjustment Factor for segment 4 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 293 | The Ramp Demand Adjustment factor for segment 4 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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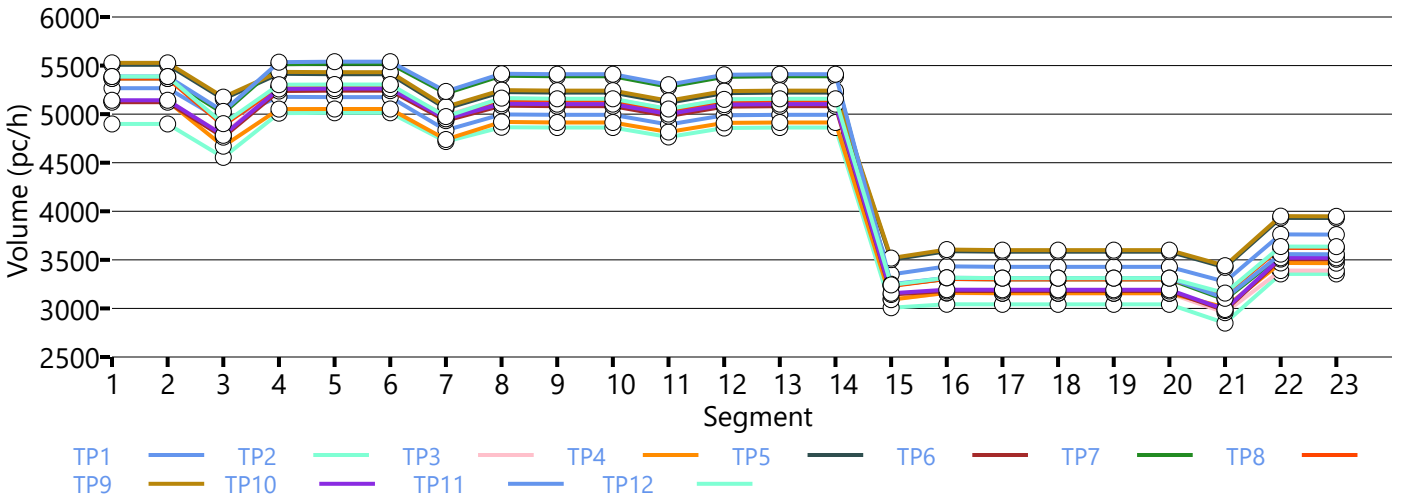
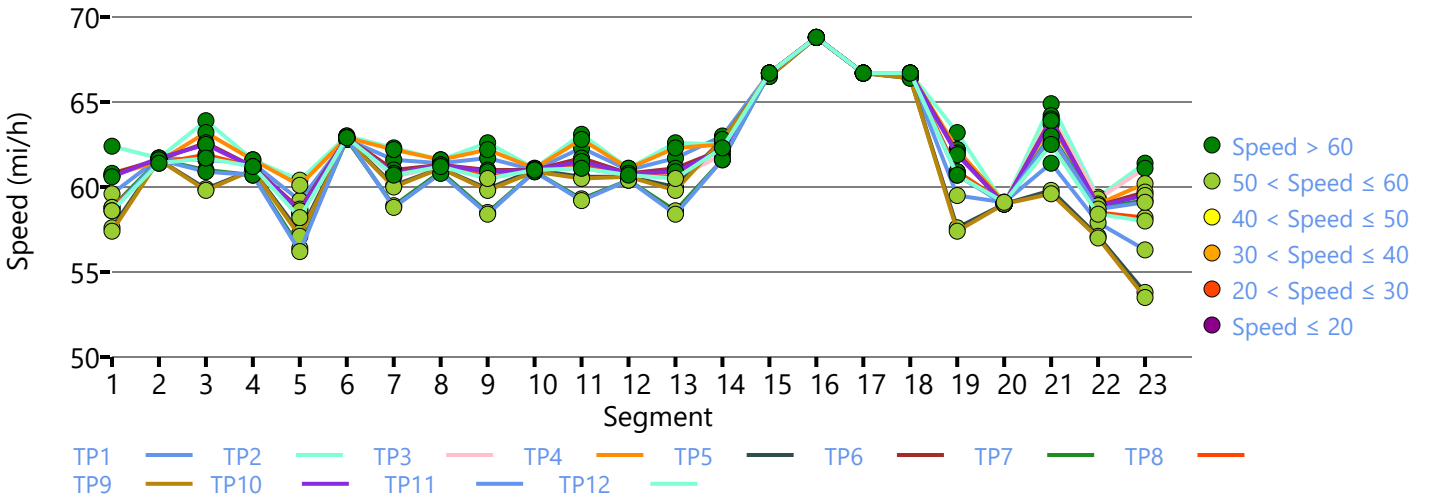
| WARNING 313 | The Demand Adjustment Factor for segment 23 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

## Comments

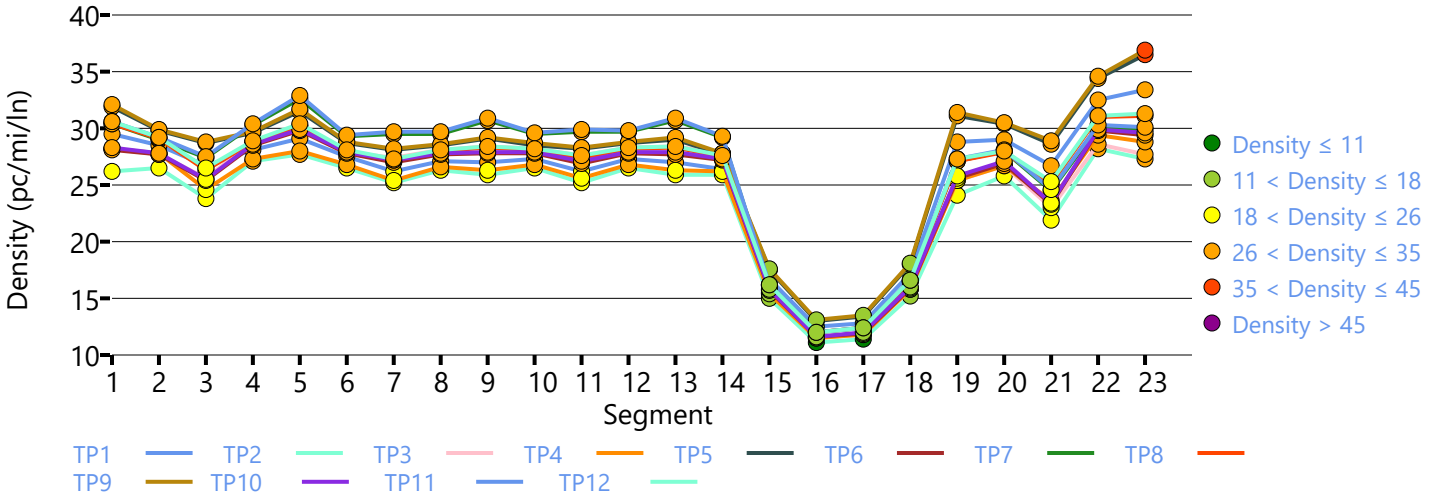
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | SB I-39/90/94 WIS 33 To WIS 60 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 17 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 19.90 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |
| 2 | Diverge | Diverge | I-39 EB Off | 1500 | 2 |
| 3 | Basic | Basic | I-39 EB Off to I-39 EB On | 5976 | 2 |
| 4 | Merge | Merge | I-39 EB On | 1500 | 3 |
| 5 | Basic | Basic | I-39 to Rest Area | 14012 | 3 |
| 6 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 7 | Basic | Basic | Rest Area Between Off and On | 3808 | 3 |
| 8 | Merge | Merge | Rest Area On | 1500 | 3 |
| 9 | Basic | Basic | Rest Area to CTH CS | 10077 | 3 |
| 10 | Diverge | Diverge | CTH CS EB Off | 1500 | 3 |
| 11 | Basic | Basic | CTH CS between on and off | 1093 | 3 |
| 12 | Merge | Merge | CTH CS EB On | 1500 | 3 |
| 13 | Basic | Basic | CTH CS to STH 60 | 16976 | 3 |
| 14 | Diverge | Diverge | STH 60 EB Off | 1500 | 3 |
| 15 | Basic | Basic | STH 60 Between off and On | 1076 | 3 |
| 16 | Merge | Merge | STH 60 EB On | 1500 | 3 |
| 17 | Basic | Basic | STH 60 to CTH V | 32877 | 3 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 3090 | 4269 | 0.72 | 63.4 | 24.4 | C |
| 2 | 1.00 | 0.858 | 2925 | 4269 | 0.69 | 64.7 | 22.6 | C |
| 3 | 1.00 | 0.858 | 2990 | 4269 | 0.70 | 64.2 | 23.3 | C |
| 4 | 1.00 | 0.858 | 3050 | 4269 | 0.71 | 63.7 | 23.9 | C |
| 5 | 1.00 | 0.858 | 3401 | 4269 | 0.80 | 60.3 | 28.2 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | | 0.858 | | 3114 | | 4269 | | 0.73 | | 63.2 | | 24.6 | | C |
| 7 | 1.00 | | 0.858 | | 3047 | | 4269 | | 0.71 | | 63.8 | | 23.9 | | C |
| 8 | 1.00 | | 0.858 | | 3213 | | 4269 | | 0.75 | | 62.3 | | 25.8 | | C |
| 9 | 1.00 | | 0.858 | | 3129 | | 4269 | | 0.73 | | 63.1 | | 24.8 | | C |
| 10 | 1.00 | | 0.858 | | 2865 | | 4269 | | 0.67 | | 65.1 | | 22.0 | | C |
| 11 | 1.00 | | 0.858 | | 2803 | | 4269 | | 0.66 | | 65.5 | | 21.4 | | C |
| 12 | 1.00 | | 0.858 | | 2958 | | 4269 | | 0.69 | | 64.5 | | 22.9 | | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.858 | 0.863 | 3090 | 160 | 4221 | 1886 | 0.73 | 0.08 | 60.6 | 60.6 | 25.5 | 18.8 | B |
| 2 | 1.00 | 1.00 | 0.858 | 0.863 | 2925 | 224 | 4221 | 1886 | 0.69 | 0.12 | 60.5 | 60.5 | 24.2 | 17.4 | B |
| 3 | 1.00 | 1.00 | 0.858 | 0.863 | 2990 | 300 | 4221 | 1886 | 0.71 | 0.16 | 60.3 | 60.3 | 24.8 | 17.9 | B |
| 4 | 1.00 | 1.00 | 0.858 | 0.863 | 3050 | 151 | 4221 | 1886 | 0.72 | 0.08 | 60.7 | 60.7 | 25.1 | 18.5 | B |
| 5 | 1.00 | 1.00 | 0.858 | 0.863 | 3401 | 169 | 4221 | 1886 | 0.81 | 0.09 | 60.6 | 60.6 | 28.1 | 21.5 | C |
| 6 | 1.00 | 1.00 | 0.858 | 0.863 | 3114 | 235 | 4221 | 1886 | 0.74 | 0.12 | 60.5 | 60.5 | 25.7 | 19.0 | B |
| 7 | 1.00 | 1.00 | 0.858 | 0.863 | 3047 | 317 | 4221 | 1886 | 0.72 | 0.17 | 60.3 | 60.3 | 25.3 | 18.4 | B |
| 8 | 1.00 | 1.00 | 0.858 | 0.863 | 3213 | 159 | 4221 | 1886 | 0.76 | 0.08 | 60.6 | 60.6 | 26.5 | 19.9 | B |
| 9 | 1.00 | 1.00 | 0.858 | 0.863 | 3129 | 163 | 4221 | 1886 | 0.74 | 0.09 | 60.6 | 60.6 | 25.8 | 19.1 | B |
| 10 | 1.00 | 1.00 | 0.858 | 0.863 | 2865 | 228 | 4221 | 1886 | 0.68 | 0.12 | 60.5 | 60.5 | 23.7 | 16.9 | B |
| 11 | 1.00 | 1.00 | 0.858 | 0.863 | 2803 | 307 | 4221 | 1886 | 0.66 | 0.16 | 60.3 | 60.3 | 23.2 | 16.3 | B |
| 12 | 1.00 | 1.00 | 0.858 | 0.863 | 2958 | 154 | 4221 | 1886 | 0.70 | 0.08 | 60.7 | 60.7 | 24.4 | 17.7 | B |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 2929 | 4269 | 0.69 | 64.7 | 22.6 | C |
| 2 | 1.00 | 0.858 | 2700 | 4269 | 0.63 | 66.1 | 20.4 | C |
| 3 | 1.00 | 0.858 | 2688 | 4269 | 0.63 | 66.2 | 20.3 | C |
| 4 | 1.00 | 0.858 | 2899 | 4269 | 0.68 | 64.9 | 22.3 | C |
| 5 | 1.00 | 0.858 | 3231 | 4269 | 0.76 | 62.1 | 26.0 | C |
| 6 | 1.00 | 0.858 | 2878 | 4269 | 0.67 | 65.0 | 22.1 | C |
| 7 | 1.00 | 0.858 | 2727 | 4269 | 0.64 | 65.9 | 20.7 | C |
| 8 | 1.00 | 0.858 | 3054 | 4269 | 0.72 | 63.7 | 24.0 | C |
| 9 | 1.00 | 0.858 | 2965 | 4269 | 0.69 | 64.4 | 23.0 | C |
| 10 | 1.00 | 0.858 | 2635 | 4269 | 0.62 | 66.4 | 19.8 | C |
| 11 | 1.00 | 0.858 | 2494 | 4269 | 0.58 | 67.0 | 18.6 | C |
| 12 | 1.00 | 0.858 | 2803 | 4269 | 0.66 | 65.5 | 21.4 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.858 | 0.850 | 4181 | 1252 | 6331 | 3951 | 0.66 | 0.32 | 63.4 | 62.3 | 22.0 | 18.4 | B |
| 2 | 1.00 | 1.00 | 0.858 | 0.850 | 4033 | 1333 | 6331 | 3951 | 0.64 | 0.34 | 63.5 | 62.4 | 21.2 | 18.0 | B |
| 3 | 1.00 | 1.00 | 0.858 | 0.850 | 4026 | 1338 | 6331 | 3951 | 0.64 | 0.34 | 63.5 | 62.4 | 21.1 | 17.9 | B |
| 4 | 1.00 | 1.00 | 0.858 | 0.850 | 4147 | 1248 | 6331 | 3951 | 0.65 | 0.32 | 63.4 | 62.3 | 21.8 | 18.2 | B |
| 5 | 1.00 | 1.00 | 0.858 | 0.850 | 4552 | 1321 | 6331 | 3951 | 0.72 | 0.33 | 62.9 | 61.8 | 24.1 | 20.2 | C |
| 6 | 1.00 | 1.00 | 0.858 | 0.850 | 4286 | 1408 | 6331 | 3951 | 0.68 | 0.36 | 63.2 | 62.0 | 22.6 | 19.3 | B |
| 7 | 1.00 | 1.00 | 0.858 | 0.850 | 4139 | 1412 | 6331 | 3951 | 0.65 | 0.36 | 63.3 | 62.2 | 21.8 | 18.7 | B |
| 8 | 1.00 | 1.00 | 0.858 | 0.850 | 4373 | 1319 | 6331 | 3951 | 0.69 | 0.33 | 63.1 | 62.0 | 23.1 | 19.4 | B |
| 9 | 1.00 | 1.00 | 0.858 | 0.850 | 4181 | 1216 | 6331 | 3951 | 0.66 | 0.31 | 63.4 | 62.3 | 22.0 | 18.3 | B |
| 10 | 1.00 | 1.00 | 0.858 | 0.850 | 3930 | 1295 | 6331 | 3951 | 0.62 | 0.33 | 63.6 | 62.5 | 20.6 | 17.4 | B |
| 11 | 1.00 | 1.00 | 0.858 | 0.850 | 3794 | 1300 | 6331 | 3951 | 0.60 | 0.33 | 63.7 | 62.6 | 19.9 | 16.8 | B |
| 12 | 1.00 | 1.00 | 0.858 | 0.850 | 4016 | 1213 | 6331 | 3951 | 0.63 | 0.31 | 63.6 | 62.5 | 21.0 | 17.5 | B |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.856 | 4179 | 6377 | 0.66 | 64.9 | 21.5 | C |
| 2 | 1.00 | 0.856 | 4030 | 6377 | 0.63 | 65.4 | 20.5 | C |
| 3 | 1.00 | 0.856 | 4022 | 6377 | 0.63 | 65.4 | 20.5 | C |
| 4 | 1.00 | 0.856 | 4145 | 6377 | 0.65 | 65.0 | 21.3 | C |
| 5 | 1.00 | 0.856 | 4550 | 6377 | 0.71 | 63.2 | 24.0 | C |
| 6 | 1.00 | 0.856 | 4283 | 6377 | 0.67 | 64.5 | 22.1 | C |
| 7 | 1.00 | 0.856 | 4136 | 6377 | 0.65 | 65.1 | 21.2 | C |
| 8 | 1.00 | 0.856 | 4370 | 6377 | 0.69 | 64.1 | 22.7 | C |
| 9 | 1.00 | 0.856 | 4180 | 6377 | 0.66 | 64.9 | 21.5 | C |
| 10 | 1.00 | 0.856 | 3928 | 6377 | 0.62 | 65.7 | 19.9 | C |
| 11 | 1.00 | 0.856 | 3791 | 6377 | 0.59 | 66.1 | 19.1 | C |
| 12 | 1.00 | 0.856 | 4014 | 6377 | 0.63 | 65.5 | 20.4 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.856 | 0.909 | 4179 | 97 | 6331 | 1796 | 0.66 | 0.05 | 61.0 | 56.0 | 22.8 | 24.3 | C |
| 2 | 1.00 | 1.00 | 0.856 | 0.909 | 4030 | 92 | 6331 | 1796 | 0.64 | 0.05 | 61.1 | 56.1 | 22.0 | 23.6 | C |
| 3 | 1.00 | 1.00 | 0.856 | 0.909 | 4022 | 90 | 6331 | 1796 | 0.64 | 0.05 | 61.1 | 56.1 | 21.9 | 23.6 | C |
| 4 | 1.00 | 1.00 | 0.856 | 0.909 | 4145 | 95 | 6331 | 1796 | 0.65 | 0.05 | 61.0 | 56.0 | 22.7 | 24.2 | C |
| 5 | 1.00 | 1.00 | 0.856 | 0.909 | 4550 | 102 | 6331 | 1796 | 0.72 | 0.06 | 61.0 | 56.0 | 24.9 | 26.1 | C |
| 6 | 1.00 | 1.00 | 0.856 | 0.909 | 4283 | 98 | 6331 | 1796 | 0.68 | 0.05 | 61.0 | 56.0 | 23.4 | 24.8 | C |
| 7 | 1.00 | 1.00 | 0.856 | 0.909 | 4136 | 96 | 6331 | 1796 | 0.65 | 0.05 | 61.0 | 56.0 | 22.6 | 24.1 | C |
| 8 | 1.00 | 1.00 | 0.856 | 0.909 | 4370 | 100 | 6331 | 1796 | 0.69 | 0.06 | 61.0 | 56.0 | 23.9 | 25.2 | C |
| 9 | 1.00 | 1.00 | 0.856 | 0.909 | 4180 | 99 | 6331 | 1796 | 0.66 | 0.06 | 61.0 | 56.0 | 22.8 | 24.4 | C |
| 10 | 1.00 | 1.00 | 0.856 | 0.909 | 3928 | 95 | 6331 | 1796 | 0.62 | 0.05 | 61.0 | 56.0 | 21.5 | 23.1 | C |
| 11 | 1.00 | 1.00 | 0.856 | 0.909 | 3791 | 92 | 6331 | 1796 | 0.60 | 0.05 | 61.1 | 56.1 | 20.7 | 22.5 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | 1.00 | 0.856 | 0.909 | 4014 | 97 | 6331 | 1796 | 0.63 | 0.05 | 61.0 | 56.0 | 21.9 | 23.6 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.856 | 4076 | 6433 | 0.63 | 66.8 | 20.3 | C |
| 2 | 1.00 | 0.856 | 3932 | 6433 | 0.61 | 67.3 | 19.5 | C |
| 3 | 1.00 | 0.856 | 3926 | 6433 | 0.61 | 67.3 | 19.5 | C |
| 4 | 1.00 | 0.856 | 4044 | 6433 | 0.63 | 66.9 | 20.1 | C |
| 5 | 1.00 | 0.856 | 4442 | 6433 | 0.69 | 65.1 | 22.7 | C |
| 6 | 1.00 | 0.856 | 4179 | 6433 | 0.65 | 66.4 | 21.0 | C |
| 7 | 1.00 | 0.856 | 4034 | 6433 | 0.63 | 66.9 | 20.1 | C |
| 8 | 1.00 | 0.856 | 4264 | 6433 | 0.66 | 66.0 | 21.5 | C |
| 9 | 1.00 | 0.856 | 4075 | 6433 | 0.63 | 66.8 | 20.3 | C |
| 10 | 1.00 | 0.856 | 3827 | 6433 | 0.59 | 67.6 | 18.9 | C |
| 11 | 1.00 | 0.856 | 3693 | 6433 | 0.57 | 68.0 | 18.1 | C |
| 12 | 1.00 | 0.856 | 3911 | 6433 | 0.61 | 67.4 | 19.3 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.856 | 0.909 | 4173 | 97 | 6331 | 1796 | 0.66 | 0.05 | 61.9 | 60.3 | 22.5 | 20.3 | C |
| 2 | 1.00 | 1.00 | 0.856 | 0.909 | 4024 | 92 | 6331 | 1796 | 0.64 | 0.05 | 62.1 | 60.4 | 21.6 | 19.6 | B |
| 3 | 1.00 | 1.00 | 0.856 | 0.909 | 4016 | 90 | 6331 | 1796 | 0.63 | 0.05 | 62.1 | 60.4 | 21.6 | 19.6 | B |
| 4 | 1.00 | 1.00 | 0.856 | 0.909 | 4139 | 95 | 6331 | 1796 | 0.65 | 0.05 | 62.0 | 60.3 | 22.3 | 20.2 | C |
| 5 | 1.00 | 1.00 | 0.856 | 0.909 | 4544 | 102 | 6331 | 1796 | 0.72 | 0.06 | 61.5 | 59.9 | 24.6 | 22.1 | C |
| 6 | 1.00 | 1.00 | 0.856 | 0.909 | 4277 | 98 | 6331 | 1796 | 0.68 | 0.05 | 61.8 | 60.1 | 23.1 | 20.8 | C |
| 7 | 1.00 | 1.00 | 0.856 | 0.909 | 4130 | 96 | 6331 | 1796 | 0.65 | 0.05 | 62.0 | 60.3 | 22.2 | 20.1 | C |
| 8 | 1.00 | 1.00 | 0.856 | 0.909 | 4364 | 100 | 6331 | 1796 | 0.69 | 0.06 | 61.7 | 60.1 | 23.6 | 21.2 | C |
| 9 | 1.00 | 1.00 | 0.856 | 0.909 | 4174 | 99 | 6331 | 1796 | 0.66 | 0.06 | 61.9 | 60.3 | 22.5 | 20.3 | C |
| 10 | 1.00 | 1.00 | 0.856 | 0.909 | 3922 | 95 | 6331 | 1796 | 0.62 | 0.05 | 62.2 | 60.4 | 21.0 | 19.1 | B |
| 11 | 1.00 | 1.00 | 0.856 | 0.909 | 3785 | 92 | 6331 | 1796 | 0.60 | 0.05 | 62.3 | 60.5 | 20.3 | 18.5 | B |
| 12 | 1.00 | 1.00 | 0.856 | 0.909 | 4008 | 97 | 6331 | 1796 | 0.63 | 0.05 | 62.1 | 60.4 | 21.5 | 19.6 | B |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.856 | 4179 | 6433 | 0.65 | 66.4 | 21.0 | C |
| 2 | 1.00 | 0.856 | 4030 | 6433 | 0.63 | 66.9 | 20.1 | C |
| 3 | 1.00 | 0.856 | 4022 | 6433 | 0.63 | 67.0 | 20.0 | C |
| 4 | 1.00 | 0.856 | 4145 | 6433 | 0.64 | 66.5 | 20.8 | C |
| 5 | 1.00 | 0.856 | 4550 | 6433 | 0.71 | 64.5 | 23.5 | C |
| 6 | 1.00 | 0.856 | 4283 | 6433 | 0.67 | 65.9 | 21.7 | C |
| 7 | 1.00 | 0.856 | 4136 | 6433 | 0.64 | 66.5 | 20.7 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | | 0.856 | | 4370 | | 6433 | | 0.68 | | 65.5 | | 22.2 | C |
| 9 | 1.00 | | 0.856 | | 4180 | | 6433 | | 0.65 | | 66.4 | | 21.0 | C |
| 10 | 1.00 | | 0.856 | | 3928 | | 6433 | | 0.61 | | 67.3 | | 19.5 | C |
| 11 | 1.00 | | 0.856 | | 3791 | | 6433 | | 0.59 | | 67.7 | | 18.7 | C |
| 12 | 1.00 | | 0.856 | | 4014 | | 6433 | | 0.62 | | 67.0 | | 20.0 | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.856 | 0.815 | 4179 | 355 | 6331 | 1886 | 0.66 | 0.19 | 62.9 | 58.6 | 22.1 | 26.1 | C |
| 2 | 1.00 | 1.00 | 0.856 | 0.815 | 4030 | 363 | 6331 | 1886 | 0.64 | 0.19 | 62.9 | 58.6 | 21.4 | 25.4 | C |
| 3 | 1.00 | 1.00 | 0.856 | 0.815 | 4022 | 402 | 6331 | 1886 | 0.64 | 0.21 | 62.8 | 58.5 | 21.3 | 25.4 | C |
| 4 | 1.00 | 1.00 | 0.856 | 0.815 | 4145 | 275 | 6331 | 1886 | 0.65 | 0.15 | 63.1 | 58.8 | 21.9 | 25.8 | C |
| 5 | 1.00 | 1.00 | 0.856 | 0.815 | 4550 | 374 | 6331 | 1886 | 0.72 | 0.20 | 62.9 | 58.6 | 24.1 | 27.8 | C |
| 6 | 1.00 | 1.00 | 0.856 | 0.815 | 4283 | 384 | 6331 | 1886 | 0.68 | 0.20 | 62.8 | 58.5 | 22.7 | 26.6 | C |
| 7 | 1.00 | 1.00 | 0.856 | 0.815 | 4136 | 425 | 6331 | 1886 | 0.65 | 0.23 | 62.7 | 58.4 | 22.0 | 26.0 | C |
| 8 | 1.00 | 1.00 | 0.856 | 0.815 | 4370 | 290 | 6331 | 1886 | 0.69 | 0.15 | 63.1 | 58.8 | 23.1 | 26.8 | C |
| 9 | 1.00 | 1.00 | 0.856 | 0.815 | 4180 | 363 | 6331 | 1886 | 0.66 | 0.19 | 62.9 | 58.6 | 22.2 | 26.1 | C |
| 10 | 1.00 | 1.00 | 0.856 | 0.815 | 3928 | 372 | 6331 | 1886 | 0.62 | 0.20 | 62.9 | 58.6 | 20.8 | 24.9 | C |
| 11 | 1.00 | 1.00 | 0.856 | 0.815 | 3791 | 412 | 6331 | 1886 | 0.60 | 0.22 | 62.8 | 58.5 | 20.1 | 24.3 | C |
| 12 | 1.00 | 1.00 | 0.856 | 0.815 | 4014 | 281 | 6331 | 1886 | 0.63 | 0.15 | 63.1 | 58.8 | 21.2 | 25.2 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.859 | 3828 | 6390 | 0.60 | 66.4 | 19.2 | C |
| 2 | 1.00 | 0.859 | 3672 | 6390 | 0.57 | 66.7 | 18.4 | C |
| 3 | 1.00 | 0.859 | 3626 | 6390 | 0.57 | 66.7 | 18.1 | C |
| 4 | 1.00 | 0.859 | 3870 | 6390 | 0.61 | 66.3 | 19.5 | C |
| 5 | 1.00 | 0.859 | 4179 | 6390 | 0.65 | 65.3 | 21.3 | C |
| 6 | 1.00 | 0.859 | 3903 | 6390 | 0.61 | 66.2 | 19.7 | C |
| 7 | 1.00 | 0.859 | 3718 | 6390 | 0.58 | 66.6 | 18.6 | C |
| 8 | 1.00 | 0.859 | 4080 | 6390 | 0.64 | 65.6 | 20.7 | C |
| 9 | 1.00 | 0.859 | 3821 | 6390 | 0.60 | 66.4 | 19.2 | C |
| 10 | 1.00 | 0.859 | 3561 | 6390 | 0.56 | 66.7 | 17.7 | B |
| 11 | 1.00 | 0.859 | 3386 | 6390 | 0.53 | 66.7 | 16.8 | B |
| 12 | 1.00 | 0.859 | 3733 | 6390 | 0.58 | 66.6 | 18.7 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.859 | 0.770 | 4047 | 219 | 6331 | 1886 | 0.64 | 0.12 | 62.6 | 61.1 | 21.5 | 19.0 | B |
| 2 | 1.00 | 1.00 | 0.859 | 0.770 | 3816 | 144 | 6331 | 1886 | 0.60 | 0.08 | 62.8 | 61.3 | 20.3 | 17.7 | B |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 1.00 | 0.859 | 0.770 | 3779 | 153 | 6331 | 1886 | 0.60 | 0.08 | 62.8 | 61.3 | 20.1 | 17.5 | B |
| 4 | 1.00 | 1.00 | 0.859 | 0.770 | 4043 | 173 | 6331 | 1886 | 0.64 | 0.09 | 62.5 | 61.1 | 21.6 | 18.8 | B |
| 5 | 1.00 | 1.00 | 0.859 | 0.770 | 4410 | 231 | 6331 | 1886 | 0.70 | 0.12 | 62.1 | 60.7 | 23.7 | 20.7 | C |
| 6 | 1.00 | 1.00 | 0.859 | 0.770 | 4055 | 152 | 6331 | 1886 | 0.64 | 0.08 | 62.6 | 61.1 | 21.6 | 18.8 | B |
| 7 | 1.00 | 1.00 | 0.859 | 0.770 | 3879 | 161 | 6331 | 1886 | 0.61 | 0.09 | 62.7 | 61.2 | 20.6 | 18.0 | B |
| 8 | 1.00 | 1.00 | 0.859 | 0.770 | 4263 | 183 | 6331 | 1886 | 0.67 | 0.10 | 62.3 | 60.9 | 22.8 | 19.9 | B |
| 9 | 1.00 | 1.00 | 0.859 | 0.770 | 4046 | 225 | 6331 | 1886 | 0.64 | 0.12 | 62.6 | 61.1 | 21.5 | 19.0 | B |
| 10 | 1.00 | 1.00 | 0.859 | 0.770 | 3708 | 147 | 6331 | 1886 | 0.59 | 0.08 | 62.8 | 61.3 | 19.7 | 17.2 | B |
| 11 | 1.00 | 1.00 | 0.859 | 0.770 | 3542 | 156 | 6331 | 1886 | 0.56 | 0.08 | 63.1 | 61.5 | 18.7 | 16.4 | B |
| 12 | 1.00 | 1.00 | 0.859 | 0.770 | 3910 | 177 | 6331 | 1886 | 0.62 | 0.09 | 62.7 | 61.2 | 20.8 | 18.2 | B |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.855 | 4043 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 2 | 1.00 | 0.855 | 3819 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 3 | 1.00 | 0.855 | 3781 | 6377 | 0.59 | 66.1 | 19.1 | C |
| 4 | 1.00 | 0.855 | 4043 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 5 | 1.00 | 0.855 | 4407 | 6377 | 0.69 | 64.0 | 23.0 | C |
| 6 | 1.00 | 0.855 | 4058 | 6377 | 0.64 | 65.3 | 20.7 | C |
| 7 | 1.00 | 0.855 | 3881 | 6377 | 0.61 | 65.8 | 19.7 | C |
| 8 | 1.00 | 0.855 | 4264 | 6377 | 0.67 | 64.6 | 22.0 | C |
| 9 | 1.00 | 0.855 | 4041 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 10 | 1.00 | 0.855 | 3710 | 6377 | 0.58 | 66.2 | 18.7 | C |
| 11 | 1.00 | 0.855 | 3543 | 6377 | 0.56 | 66.5 | 17.8 | B |
| 12 | 1.00 | 0.855 | 3910 | 6377 | 0.61 | 65.8 | 19.8 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.855 | 0.866 | 4043 | 221 | 6331 | 1796 | 0.64 | 0.12 | 62.0 | 57.3 | 21.7 | 21.7 | C |
| 2 | 1.00 | 1.00 | 0.855 | 0.866 | 3819 | 163 | 6331 | 1796 | 0.60 | 0.09 | 62.2 | 57.5 | 20.5 | 20.6 | C |
| 3 | 1.00 | 1.00 | 0.855 | 0.866 | 3781 | 215 | 6331 | 1796 | 0.60 | 0.12 | 62.0 | 57.3 | 20.3 | 20.5 | C |
| 4 | 1.00 | 1.00 | 0.855 | 0.866 | 4043 | 233 | 6331 | 1796 | 0.64 | 0.13 | 62.0 | 57.3 | 21.7 | 21.7 | C |
| 5 | 1.00 | 1.00 | 0.855 | 0.866 | 4407 | 233 | 6331 | 1796 | 0.70 | 0.13 | 62.0 | 57.3 | 23.7 | 23.4 | C |
| 6 | 1.00 | 1.00 | 0.855 | 0.866 | 4058 | 172 | 6331 | 1796 | 0.64 | 0.10 | 62.1 | 57.4 | 21.8 | 21.7 | C |
| 7 | 1.00 | 1.00 | 0.855 | 0.866 | 3881 | 226 | 6331 | 1796 | 0.61 | 0.13 | 62.0 | 57.3 | 20.9 | 21.0 | C |
| 8 | 1.00 | 1.00 | 0.855 | 0.866 | 4264 | 246 | 6331 | 1796 | 0.67 | 0.14 | 61.9 | 57.2 | 23.0 | 22.8 | C |
| 9 | 1.00 | 1.00 | 0.855 | 0.866 | 4041 | 226 | 6331 | 1796 | 0.64 | 0.13 | 62.0 | 57.3 | 21.7 | 21.7 | C |
| 10 | 1.00 | 1.00 | 0.855 | 0.866 | 3710 | 166 | 6331 | 1796 | 0.59 | 0.09 | 62.1 | 57.5 | 19.9 | 20.0 | B |
| 11 | 1.00 | 1.00 | 0.855 | 0.866 | 3543 | 219 | 6331 | 1796 | 0.56 | 0.12 | 62.0 | 57.3 | 19.0 | 19.3 | B |
| 12 | 1.00 | 1.00 | 0.855 | 0.866 | 3910 | 239 | 6331 | 1796 | 0.62 | 0.13 | 62.0 | 57.3 | 21.0 | 21.1 | C |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.855 | 3820 | 6404 | 0.60 | 66.8 | 19.1 | C |
| 2 | 1.00 | 0.855 | 3654 | 6404 | 0.57 | 67.0 | 18.1 | C |
| 3 | 1.00 | 0.855 | 3564 | 6404 | 0.56 | 67.0 | 17.7 | B |
| 4 | 1.00 | 0.855 | 3807 | 6404 | 0.59 | 66.8 | 19.0 | C |
| 5 | 1.00 | 0.855 | 4171 | 6404 | 0.65 | 65.6 | 21.2 | C |
| 6 | 1.00 | 0.855 | 3884 | 6404 | 0.61 | 66.6 | 19.4 | C |
| 7 | 1.00 | 0.855 | 3651 | 6404 | 0.57 | 67.0 | 18.1 | C |
| 8 | 1.00 | 0.855 | 4015 | 6404 | 0.63 | 66.2 | 20.2 | C |
| 9 | 1.00 | 0.855 | 3812 | 6404 | 0.60 | 66.8 | 19.0 | C |
| 10 | 1.00 | 0.855 | 3542 | 6404 | 0.55 | 67.0 | 17.5 | B |
| 11 | 1.00 | 0.855 | 3320 | 6404 | 0.52 | 67.0 | 16.4 | B |
| 12 | 1.00 | 0.855 | 3668 | 6404 | 0.57 | 67.0 | 18.2 | C |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.855 | 0.913 | 4046 | 226 | 6331 | 1886 | 0.64 | 0.12 | 62.6 | 61.1 | 21.5 | 19.0 | B |
| 2 | 1.00 | 1.00 | 0.855 | 0.913 | 3822 | 168 | 6331 | 1886 | 0.60 | 0.09 | 62.8 | 61.3 | 20.3 | 17.8 | B |
| 3 | 1.00 | 1.00 | 0.855 | 0.913 | 3986 | 422 | 6331 | 1886 | 0.63 | 0.22 | 62.5 | 61.0 | 21.3 | 19.2 | B |
| 4 | 1.00 | 1.00 | 0.855 | 0.913 | 4029 | 222 | 6331 | 1886 | 0.64 | 0.12 | 62.6 | 61.1 | 21.5 | 18.9 | B |
| 5 | 1.00 | 1.00 | 0.855 | 0.913 | 4409 | 238 | 6331 | 1886 | 0.70 | 0.13 | 62.2 | 60.8 | 23.6 | 20.2 | C |
| 6 | 1.00 | 1.00 | 0.855 | 0.913 | 4061 | 177 | 6331 | 1886 | 0.64 | 0.09 | 62.5 | 61.1 | 21.7 | 18.9 | B |
| 7 | 1.00 | 1.00 | 0.855 | 0.913 | 4096 | 445 | 6331 | 1886 | 0.65 | 0.24 | 62.4 | 60.9 | 21.9 | 19.8 | B |
| 8 | 1.00 | 1.00 | 0.855 | 0.913 | 4250 | 235 | 6331 | 1886 | 0.67 | 0.12 | 62.4 | 61.0 | 22.7 | 19.5 | B |
| 9 | 1.00 | 1.00 | 0.855 | 0.913 | 4043 | 231 | 6331 | 1886 | 0.64 | 0.12 | 62.6 | 61.1 | 21.5 | 19.0 | B |
| 10 | 1.00 | 1.00 | 0.855 | 0.913 | 3714 | 172 | 6331 | 1886 | 0.59 | 0.09 | 62.8 | 61.3 | 19.7 | 17.3 | B |
| 11 | 1.00 | 1.00 | 0.855 | 0.913 | 3752 | 432 | 6331 | 1886 | 0.59 | 0.23 | 62.8 | 61.2 | 19.9 | 18.1 | B |
| 12 | 1.00 | 1.00 | 0.855 | 0.913 | 3896 | 228 | 6331 | 1886 | 0.62 | 0.12 | 62.7 | 61.2 | 20.7 | 18.3 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.857 | 4051 | 6433 | 0.63 | 66.9 | 20.2 | C |
| 2 | 1.00 | 0.857 | 3824 | 6433 | 0.59 | 67.6 | 18.9 | C |
| 3 | 1.00 | 0.857 | 4005 | 6433 | 0.62 | 67.0 | 19.9 | C |
| 4 | 1.00 | 0.857 | 4035 | 6433 | 0.63 | 66.9 | 20.1 | C |
| 5 | 1.00 | 0.857 | 4414 | 6433 | 0.69 | 65.3 | 22.5 | C |
| 6 | 1.00 | 0.857 | 4064 | 6433 | 0.63 | 66.8 | 20.3 | C |
| 7 | 1.00 | 0.857 | 4117 | 6433 | 0.64 | 66.6 | 20.6 | C |
| 8 | 1.00 | 0.857 | 4257 | 6433 | 0.66 | 66.0 | 21.5 | C |
| 9 | 1.00 | 0.857 | 4049 | 6433 | 0.63 | 66.9 | 20.2 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 0.857 | 3716 | 6433 | 0.58 | 67.9 | 18.2 | C |
| 11 | 1.00 | 0.857 | 3772 | 6433 | 0.59 | 67.8 | 18.5 | C |
| 12 | 1.00 | 0.857 | 3902 | 6433 | 0.61 | 67.4 | 19.3 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 16787 | 16677 | 9.69 | 65.4 | 21.1 | 18.0 | 18.20 | C |
| 2 | 15957 | 15851 | 6.98 | 66.0 | 19.8 | 17.0 | 18.10 | C |
| 3 | 16180 | 16059 | 7.81 | 65.9 | 20.2 | 17.3 | 18.10 | C |
| 4 | 16697 | 16592 | 9.40 | 65.5 | 20.9 | 17.9 | 18.20 | C |
| 5 | 18311 | 18195 | 17.45 | 63.9 | 23.5 | 20.1 | 18.70 | D |
| 6 | 16962 | 16850 | 10.52 | 65.3 | 21.3 | 18.3 | 18.30 | C |
| 7 | 16610 | 16481 | 9.28 | 65.5 | 20.8 | 17.8 | 18.20 | C |
| 8 | 17608 | 17496 | 13.39 | 64.7 | 22.3 | 19.1 | 18.50 | D |
| 9 | 16805 | 16697 | 9.83 | 65.4 | 21.1 | 18.1 | 18.30 | C |
| 10 | 15530 | 15426 | 5.90 | 66.3 | 19.2 | 16.5 | 18.00 | C |
| 11 | 15211 | 15091 | 5.14 | 66.5 | 18.8 | 16.1 | 18.00 | C |
| 12 | 16156 | 16052 | 7.44 | 65.9 | 20.1 | 17.2 | 18.10 | C |

## Facility Overall Results

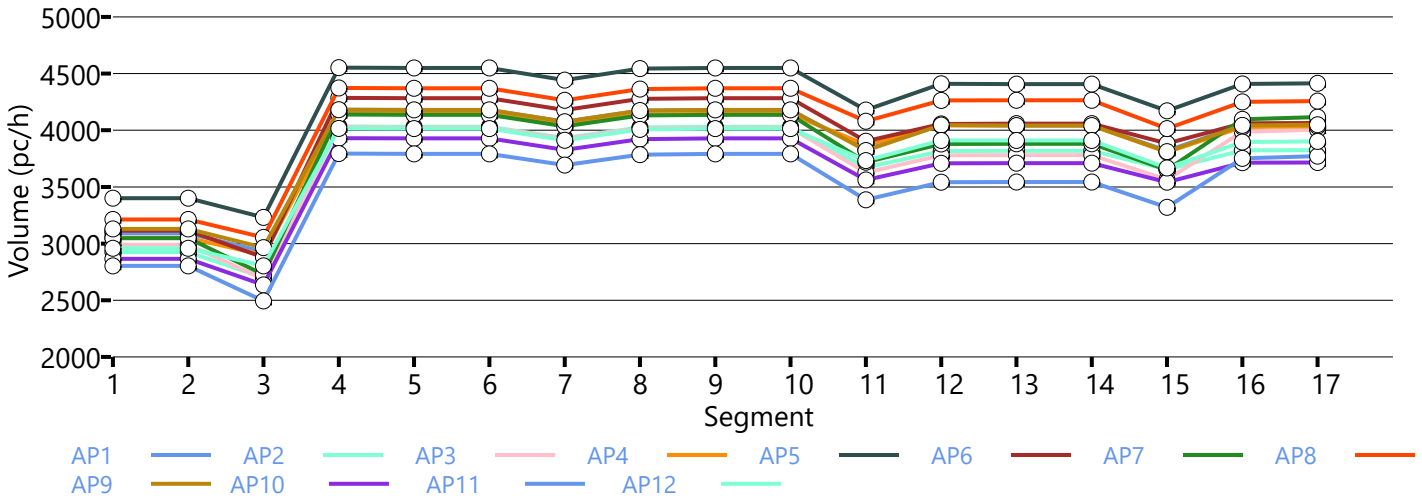
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 65.5 | Density, veh/mi/ln | 17.8 |
| Average Travel Time, min | 18.20 | Density, pc/mi/ln | 20.8 |

## Messages

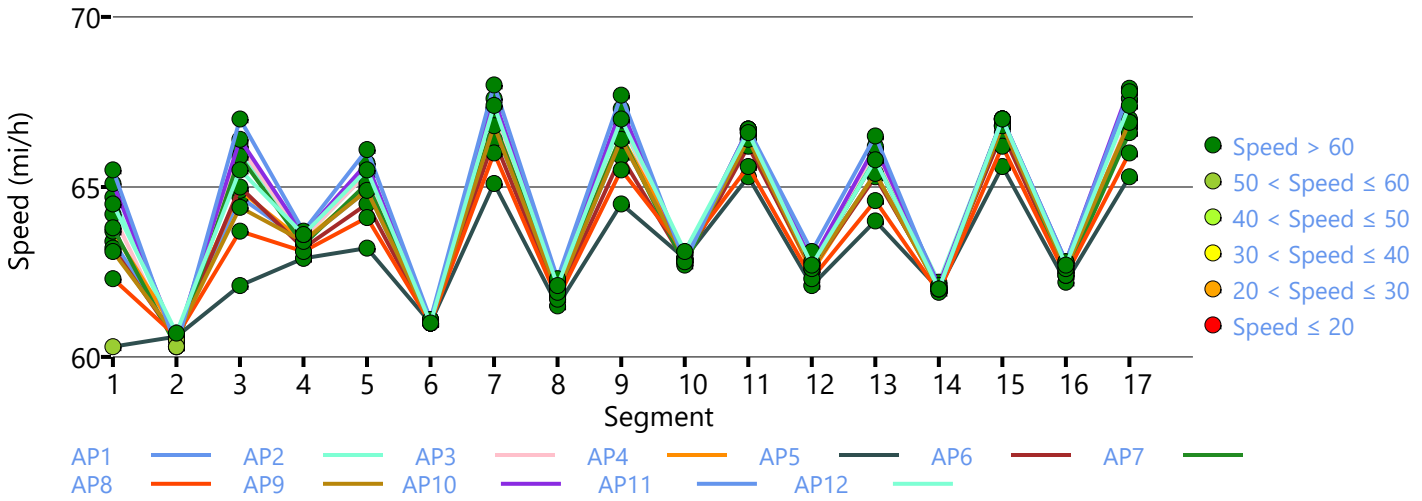
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

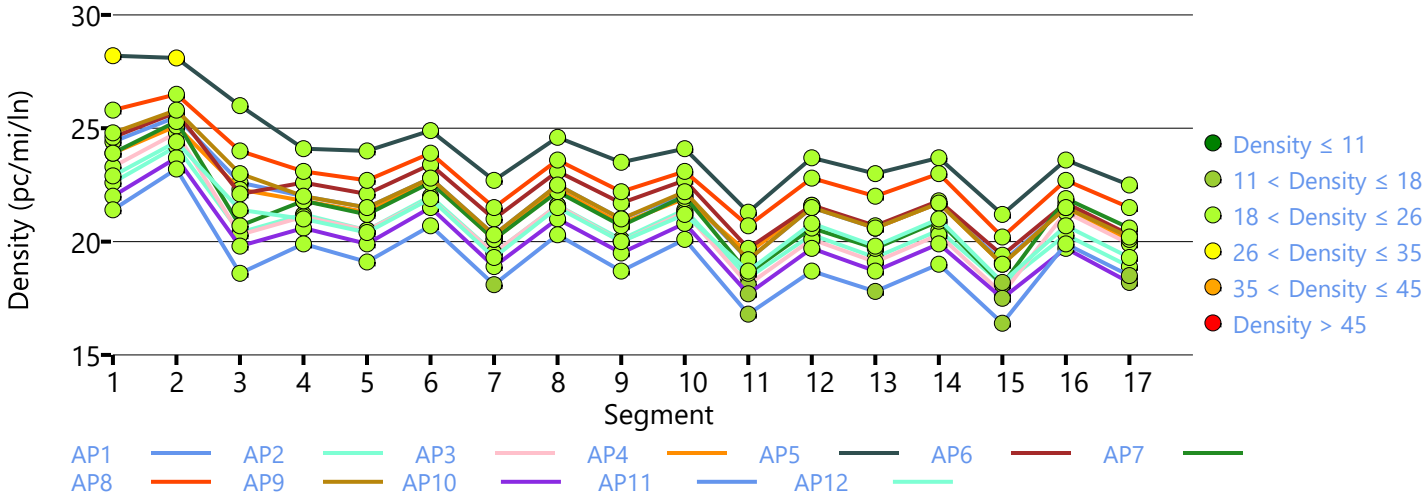
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | NB I-39/90/94 WIS 60 To WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 23 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 33.59 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 60 to CTH V | 34122 | 3 |
| 2 | Diverge | Diverge | STH 60 WB Off | 1500 | 3 |
| 3 | Basic | Basic | STH 60 Between off and On | 1192 | 3 |
| 4 | Merge | Merge | STH 60 WB On | 1500 | 3 |
| 5 | Basic | Basic | CTH CS to STH 60 | 17005 | 3 |
| 6 | Diverge | Diverge | CTH CS WB Off | 1500 | 3 |
| 7 | Basic | Basic | CTH CS Between off and on | 1097 | 3 |
| 8 | Merge | Merge | CTH CS WB On | 1500 | 3 |
| 9 | Basic | Basic | CTH CS to Rest Area | 6489 | 3 |
| 10 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 11 | Basic | Basic | Rest Area Between Off and On | 3554 | 3 |
| 12 | Merge | Merge | Rest Area On | 1500 | 3 |
| 13 | Basic | Basic | Rest Area to I-39 | 17074 | 3 |
| 14 | Diverge | Diverge | I-39 WB Off | 1500 | 3 |
| 15 | Basic | Basic | I-39 WB Off to I-39 WB On | 4769 | 3 |
| 16 | Merge | Basic | STH 78 NB/I-39 WB on | 1500 | 4 |
| 17 | Basic | Basic | STH 33 to I-39; 4 Lanes | 1375 | 4 |
| 18 | Basic | Basic | STH 33 to I-39; 3 Lanes | 825 | 3 |
| 19 | Basic | Basic | STH 33 to I-39; 2 Lanes | 6734 | 2 |
| 20 | Diverge | Diverge | STH 33 WB Off | 1500 | 2 |
| 21 | Basic | Basic | STH 33 Between off and on | 1130 | 2 |
| 22 | Merge | Merge | STH 33 WB On | 1500 | 2 |
| 23 | Basic | Basic | STH 33 to USH 12 | 66971 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.903 | 4436 | 6433 | 0.69 | 65.1 | 22.7 | C |
| 2 | 1.00 | 0.903 | 4194 | 6433 | 0.65 | 66.3 | 21.1 | C |
| 3 | 1.00 | 0.903 | 4277 | 6433 | 0.66 | 65.9 | 21.6 | C |
| 4 | 1.00 | 0.903 | 4271 | 6433 | 0.66 | 65.9 | 21.6 | C |
| 5 | 1.00 | 0.903 | 4415 | 6433 | 0.69 | 65.3 | 22.5 | C |
| 6 | 1.00 | 0.903 | 4175 | 6433 | 0.65 | 66.4 | 21.0 | C |
| 7 | 1.00 | 0.903 | 4257 | 6433 | 0.66 | 66.0 | 21.5 | C |
| 8 | 1.00 | 0.903 | 4251 | 6433 | 0.66 | 66.0 | 21.5 | C |
| 9 | 1.00 | 0.903 | 4281 | 6433 | 0.67 | 65.9 | 21.7 | C |
| 10 | 1.00 | 0.903 | 4048 | 6433 | 0.63 | 66.9 | 20.2 | C |
| 11 | 1.00 | 0.903 | 4127 | 6433 | 0.64 | 66.6 | 20.7 | C |
| 12 | 1.00 | 0.903 | 4122 | 6433 | 0.64 | 66.6 | 20.6 | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.903 | 0.971 | 4436 | 238 | 6331 | 1796 | 0.70 | 0.13 | 62.0 | 57.3 | 23.8 | 23.2 | C |
| 2 | 1.00 | 1.00 | 0.903 | 0.971 | 4194 | 301 | 6331 | 1796 | 0.66 | 0.17 | 61.8 | 57.1 | 22.6 | 22.1 | C |
| 3 | 1.00 | 1.00 | 0.903 | 0.971 | 4277 | 296 | 6331 | 1796 | 0.68 | 0.16 | 61.8 | 57.1 | 23.1 | 22.5 | C |
| 4 | 1.00 | 1.00 | 0.903 | 0.971 | 4271 | 283 | 6331 | 1796 | 0.67 | 0.16 | 61.9 | 57.2 | 23.0 | 22.5 | C |
| 5 | 1.00 | 1.00 | 0.903 | 0.971 | 4415 | 237 | 6331 | 1796 | 0.70 | 0.13 | 62.0 | 57.3 | 23.7 | 23.1 | C |
| 6 | 1.00 | 1.00 | 0.903 | 0.971 | 4175 | 300 | 6331 | 1796 | 0.66 | 0.17 | 61.8 | 57.1 | 22.5 | 22.1 | C |
| 7 | 1.00 | 1.00 | 0.903 | 0.971 | 4257 | 295 | 6331 | 1796 | 0.67 | 0.16 | 61.8 | 57.1 | 23.0 | 22.4 | C |
| 8 | 1.00 | 1.00 | 0.903 | 0.971 | 4251 | 281 | 6331 | 1796 | 0.67 | 0.16 | 61.9 | 57.2 | 22.9 | 22.4 | C |
| 9 | 1.00 | 1.00 | 0.903 | 0.971 | 4281 | 230 | 6331 | 1796 | 0.68 | 0.13 | 62.0 | 57.3 | 23.0 | 22.4 | C |
| 10 | 1.00 | 1.00 | 0.903 | 0.971 | 4048 | 290 | 6331 | 1796 | 0.64 | 0.16 | 61.8 | 57.1 | 21.8 | 21.4 | C |
| 11 | 1.00 | 1.00 | 0.903 | 0.971 | 4127 | 285 | 6331 | 1796 | 0.65 | 0.16 | 61.9 | 57.2 | 22.2 | 21.8 | C |
| 12 | 1.00 | 1.00 | 0.903 | 0.971 | 4122 | 273 | 6331 | 1796 | 0.65 | 0.15 | 61.9 | 57.2 | 22.2 | 21.7 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.900 | 4194 | 6404 | 0.65 | 65.5 | 21.3 | C |
| 2 | 1.00 | 0.900 | 3883 | 6404 | 0.61 | 66.6 | 19.4 | C |
| 3 | 1.00 | 0.900 | 3972 | 6404 | 0.62 | 66.3 | 20.0 | C |
| 4 | 1.00 | 0.900 | 3980 | 6404 | 0.62 | 66.3 | 20.0 | C |
| 5 | 1.00 | 0.900 | 4174 | 6404 | 0.65 | 65.6 | 21.2 | C |
| 6 | 1.00 | 0.900 | 3866 | 6404 | 0.60 | 66.7 | 19.3 | C |
| 7 | 1.00 | 0.900 | 3953 | 6404 | 0.62 | 66.4 | 19.8 | C |
| 8 | 1.00 | 0.900 | 3962 | 6404 | 0.62 | 66.4 | 19.9 | C |
| 9 | 1.00 | 0.900 | 4048 | 6404 | 0.63 | 66.1 | 20.4 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | | 0.900 | | 3748 | | 6404 | | 0.59 | | 67.0 | | 18.6 | | C |
| 11 | 1.00 | | 0.900 | | 3833 | | 6404 | | 0.60 | | 66.8 | | 19.1 | | C |
| 12 | 1.00 | | 0.900 | | 3841 | | 6404 | | 0.60 | | 66.7 | | 19.2 | | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.900 | 0.949 | 4432 | 238 | 6331 | 1886 | 0.70 | 0.13 | 62.4 | 61.2 | 23.7 | 19.5 | B |
| 2 | 1.00 | 1.00 | 0.900 | 0.949 | 4078 | 195 | 6331 | 1886 | 0.64 | 0.10 | 62.9 | 61.6 | 21.6 | 17.7 | B |
| 3 | 1.00 | 1.00 | 0.900 | 0.949 | 4207 | 235 | 6331 | 1886 | 0.66 | 0.12 | 62.7 | 61.4 | 22.4 | 18.5 | B |
| 4 | 1.00 | 1.00 | 0.900 | 0.949 | 4201 | 221 | 6331 | 1886 | 0.66 | 0.12 | 62.7 | 61.4 | 22.3 | 18.4 | B |
| 5 | 1.00 | 1.00 | 0.900 | 0.949 | 4410 | 236 | 6331 | 1886 | 0.70 | 0.13 | 62.5 | 61.2 | 23.5 | 19.4 | B |
| 6 | 1.00 | 1.00 | 0.900 | 0.949 | 4060 | 194 | 6331 | 1886 | 0.64 | 0.10 | 62.9 | 61.6 | 21.5 | 17.7 | B |
| 7 | 1.00 | 1.00 | 0.900 | 0.949 | 4187 | 234 | 6331 | 1886 | 0.66 | 0.12 | 62.8 | 61.5 | 22.2 | 18.4 | B |
| 8 | 1.00 | 1.00 | 0.900 | 0.949 | 4182 | 220 | 6331 | 1886 | 0.66 | 0.12 | 62.8 | 61.5 | 22.2 | 18.3 | B |
| 9 | 1.00 | 1.00 | 0.900 | 0.949 | 4278 | 230 | 6331 | 1886 | 0.68 | 0.12 | 62.6 | 61.3 | 22.8 | 18.8 | B |
| 10 | 1.00 | 1.00 | 0.900 | 0.949 | 3937 | 189 | 6331 | 1886 | 0.62 | 0.10 | 63.0 | 61.7 | 20.8 | 17.1 | B |
| 11 | 1.00 | 1.00 | 0.900 | 0.949 | 4060 | 227 | 6331 | 1886 | 0.64 | 0.12 | 62.9 | 61.6 | 21.5 | 17.7 | B |
| 12 | 1.00 | 1.00 | 0.900 | 0.949 | 4055 | 214 | 6331 | 1886 | 0.64 | 0.11 | 62.9 | 61.6 | 21.5 | 17.7 | B |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.903 | 4431 | 6377 | 0.69 | 63.8 | 23.2 | C |
| 2 | 1.00 | 0.903 | 4075 | 6377 | 0.64 | 65.3 | 20.8 | C |
| 3 | 1.00 | 0.903 | 4206 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 4 | 1.00 | 0.903 | 4199 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 5 | 1.00 | 0.903 | 4409 | 6377 | 0.69 | 63.9 | 23.0 | C |
| 6 | 1.00 | 0.903 | 4056 | 6377 | 0.64 | 65.3 | 20.7 | C |
| 7 | 1.00 | 0.903 | 4186 | 6377 | 0.66 | 64.9 | 21.5 | C |
| 8 | 1.00 | 0.903 | 4181 | 6377 | 0.66 | 64.9 | 21.5 | C |
| 9 | 1.00 | 0.903 | 4276 | 6377 | 0.67 | 64.5 | 22.1 | C |
| 10 | 1.00 | 0.903 | 3934 | 6377 | 0.62 | 65.7 | 20.0 | C |
| 11 | 1.00 | 0.903 | 4059 | 6377 | 0.64 | 65.3 | 20.7 | C |
| 12 | 1.00 | 0.903 | 4053 | 6377 | 0.64 | 65.3 | 20.7 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.903 | 0.884 | 4431 | 204 | 6331 | 1886 | 0.70 | 0.11 | 63.3 | 59.0 | 23.3 | 27.0 | C |
| 2 | 1.00 | 1.00 | 0.903 | 0.884 | 4075 | 196 | 6331 | 1886 | 0.64 | 0.10 | 63.3 | 59.0 | 21.5 | 25.4 | C |
| 3 | 1.00 | 1.00 | 0.903 | 0.884 | 4206 | 257 | 6331 | 1886 | 0.66 | 0.14 | 63.1 | 58.8 | 22.2 | 26.1 | C |
| 4 | 1.00 | 1.00 | 0.903 | 0.884 | 4199 | 138 | 6331 | 1886 | 0.66 | 0.07 | 63.4 | 59.1 | 22.1 | 25.9 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 1.00 | 0.903 | 0.884 | 4409 | 204 | 6331 | 1886 | 0.70 | 0.11 | 63.3 | 59.0 | 23.2 | 26.9 | C |
| 6 | 1.00 | 1.00 | 0.903 | 0.884 | 4056 | 195 | 6331 | 1886 | 0.64 | 0.10 | 63.3 | 59.0 | 21.4 | 25.3 | C |
| 7 | 1.00 | 1.00 | 0.903 | 0.884 | 4186 | 256 | 6331 | 1886 | 0.66 | 0.14 | 63.1 | 58.8 | 22.1 | 26.0 | C |
| 8 | 1.00 | 1.00 | 0.903 | 0.884 | 4181 | 138 | 6331 | 1886 | 0.66 | 0.07 | 63.4 | 59.1 | 22.0 | 25.8 | C |
| 9 | 1.00 | 1.00 | 0.903 | 0.884 | 4276 | 197 | 6331 | 1886 | 0.68 | 0.10 | 63.3 | 59.0 | 22.5 | 26.3 | C |
| 10 | 1.00 | 1.00 | 0.903 | 0.884 | 3934 | 189 | 6331 | 1886 | 0.62 | 0.10 | 63.3 | 59.0 | 20.7 | 24.7 | C |
| 11 | 1.00 | 1.00 | 0.903 | 0.884 | 4059 | 248 | 6331 | 1886 | 0.64 | 0.13 | 63.2 | 58.9 | 21.4 | 25.4 | C |
| 12 | 1.00 | 1.00 | 0.903 | 0.884 | 4053 | 133 | 6331 | 1886 | 0.64 | 0.07 | 63.4 | 59.1 | 21.3 | 25.2 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.904 | 4227 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 2 | 1.00 | 0.904 | 3879 | 6377 | 0.61 | 65.9 | 19.6 | C |
| 3 | 1.00 | 0.904 | 3950 | 6377 | 0.62 | 65.7 | 20.0 | C |
| 4 | 1.00 | 0.904 | 4060 | 6377 | 0.64 | 65.3 | 20.7 | C |
| 5 | 1.00 | 0.904 | 4205 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 6 | 1.00 | 0.904 | 3862 | 6377 | 0.61 | 65.9 | 19.5 | C |
| 7 | 1.00 | 0.904 | 3931 | 6377 | 0.62 | 65.7 | 19.9 | C |
| 8 | 1.00 | 0.904 | 4041 | 6377 | 0.63 | 65.4 | 20.6 | C |
| 9 | 1.00 | 0.904 | 4079 | 6377 | 0.64 | 65.3 | 20.8 | C |
| 10 | 1.00 | 0.904 | 3744 | 6377 | 0.59 | 66.2 | 18.9 | C |
| 11 | 1.00 | 0.904 | 3812 | 6377 | 0.60 | 66.0 | 19.3 | C |
| 12 | 1.00 | 0.904 | 3918 | 6377 | 0.61 | 65.8 | 19.8 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.904 | 0.797 | 4473 | 246 | 6331 | 1886 | 0.71 | 0.13 | 62.1 | 60.7 | 24.0 | 21.0 | C |
| 2 | 1.00 | 1.00 | 0.904 | 0.797 | 4239 | 360 | 6331 | 1886 | 0.67 | 0.19 | 62.3 | 60.8 | 22.7 | 20.2 | C |
| 3 | 1.00 | 1.00 | 0.904 | 0.797 | 4231 | 281 | 6331 | 1886 | 0.67 | 0.15 | 62.3 | 60.9 | 22.6 | 20.0 | B |
| 4 | 1.00 | 1.00 | 0.904 | 0.797 | 4307 | 247 | 6331 | 1886 | 0.68 | 0.13 | 62.2 | 60.8 | 23.1 | 20.2 | C |
| 5 | 1.00 | 1.00 | 0.904 | 0.797 | 4450 | 245 | 6331 | 1886 | 0.70 | 0.13 | 62.1 | 60.7 | 23.9 | 20.9 | C |
| 6 | 1.00 | 1.00 | 0.904 | 0.797 | 4220 | 358 | 6331 | 1886 | 0.67 | 0.19 | 62.4 | 60.9 | 22.5 | 20.1 | C |
| 7 | 1.00 | 1.00 | 0.904 | 0.797 | 4211 | 280 | 6331 | 1886 | 0.67 | 0.15 | 62.3 | 60.9 | 22.5 | 19.9 | B |
| 8 | 1.00 | 1.00 | 0.904 | 0.797 | 4288 | 247 | 6331 | 1886 | 0.68 | 0.13 | 62.3 | 60.9 | 22.9 | 20.1 | C |
| 9 | 1.00 | 1.00 | 0.904 | 0.797 | 4316 | 237 | 6331 | 1886 | 0.68 | 0.13 | 62.2 | 60.8 | 23.1 | 20.2 | C |
| 10 | 1.00 | 1.00 | 0.904 | 0.797 | 4092 | 348 | 6331 | 1886 | 0.65 | 0.18 | 62.5 | 61.0 | 21.8 | 19.5 | B |
| 11 | 1.00 | 1.00 | 0.904 | 0.797 | 4083 | 271 | 6331 | 1886 | 0.64 | 0.14 | 62.5 | 61.0 | 21.8 | 19.2 | B |
| 12 | 1.00 | 1.00 | 0.904 | 0.797 | 4158 | 240 | 6331 | 1886 | 0.66 | 0.13 | 62.4 | 61.0 | 22.2 | 19.5 | B |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 4473 | 6377 | 0.70 | 63.6 | 23.4 | C |
| 2 | 1.00 | 0.898 | 4225 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 3 | 1.00 | 0.898 | 4226 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 4 | 1.00 | 0.898 | 4306 | 6377 | 0.68 | 64.4 | 22.3 | C |
| 5 | 1.00 | 0.898 | 4450 | 6377 | 0.70 | 63.8 | 23.2 | C |
| 6 | 1.00 | 0.898 | 4205 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 7 | 1.00 | 0.898 | 4206 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 8 | 1.00 | 0.898 | 4287 | 6377 | 0.67 | 64.5 | 22.2 | C |
| 9 | 1.00 | 0.898 | 4316 | 6377 | 0.68 | 64.4 | 22.3 | C |
| 10 | 1.00 | 0.898 | 4078 | 6377 | 0.64 | 65.3 | 20.8 | C |
| 11 | 1.00 | 0.898 | 4078 | 6377 | 0.64 | 65.3 | 20.8 | C |
| 12 | 1.00 | 0.898 | 4157 | 6377 | 0.65 | 65.0 | 21.3 | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.909 | 4473 | 103 | 6331 | 1796 | 0.71 | 0.06 | 61.0 | 56.0 | 24.4 | 25.7 | C |
| 2 | 1.00 | 1.00 | 0.898 | 0.909 | 4225 | 98 | 6331 | 1796 | 0.67 | 0.05 | 61.0 | 56.0 | 23.1 | 24.6 | C |
| 3 | 1.00 | 1.00 | 0.898 | 0.909 | 4226 | 98 | 6331 | 1796 | 0.67 | 0.05 | 61.0 | 56.0 | 23.1 | 24.6 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.909 | 4306 | 100 | 6331 | 1796 | 0.68 | 0.06 | 61.0 | 56.0 | 23.5 | 24.9 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.909 | 4450 | 102 | 6331 | 1796 | 0.70 | 0.06 | 61.0 | 56.0 | 24.3 | 25.6 | C |
| 6 | 1.00 | 1.00 | 0.898 | 0.909 | 4205 | 97 | 6331 | 1796 | 0.66 | 0.05 | 61.0 | 56.0 | 23.0 | 24.4 | C |
| 7 | 1.00 | 1.00 | 0.898 | 0.909 | 4206 | 97 | 6331 | 1796 | 0.66 | 0.05 | 61.0 | 56.0 | 23.0 | 24.5 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.909 | 4287 | 99 | 6331 | 1796 | 0.68 | 0.06 | 61.0 | 56.0 | 23.4 | 24.8 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.909 | 4316 | 99 | 6331 | 1796 | 0.68 | 0.06 | 61.0 | 56.0 | 23.6 | 25.0 | C |
| 10 | 1.00 | 1.00 | 0.898 | 0.909 | 4078 | 95 | 6331 | 1796 | 0.64 | 0.05 | 61.0 | 56.0 | 22.3 | 23.9 | C |
| 11 | 1.00 | 1.00 | 0.898 | 0.909 | 4078 | 95 | 6331 | 1796 | 0.64 | 0.05 | 61.0 | 56.0 | 22.3 | 23.9 | C |
| 12 | 1.00 | 1.00 | 0.898 | 0.909 | 4157 | 96 | 6331 | 1796 | 0.66 | 0.05 | 61.0 | 56.0 | 22.7 | 24.3 | C |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 4369 | 6377 | 0.69 | 64.1 | 22.7 | C |
| 2 | 1.00 | 0.898 | 4126 | 6377 | 0.65 | 65.1 | 21.1 | C |
| 3 | 1.00 | 0.898 | 4127 | 6377 | 0.65 | 65.1 | 21.1 | C |
| 4 | 1.00 | 0.898 | 4205 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 5 | 1.00 | 0.898 | 4346 | 6377 | 0.68 | 64.2 | 22.6 | C |
| 6 | 1.00 | 0.898 | 4107 | 6377 | 0.64 | 65.2 | 21.0 | C |
| 7 | 1.00 | 0.898 | 4108 | 6377 | 0.64 | 65.2 | 21.0 | C |
| 8 | 1.00 | 0.898 | 4187 | 6377 | 0.66 | 64.9 | 21.5 | C |
| 9 | 1.00 | 0.898 | 4216 | 6377 | 0.66 | 64.8 | 21.7 | C |
| 10 | 1.00 | 0.898 | 3982 | 6377 | 0.62 | 65.6 | 20.2 | C |
| 11 | 1.00 | 0.898 | 3982 | 6377 | 0.62 | 65.6 | 20.2 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.898 | | 4060 | | 6377 | | 0.64 | | 65.3 | | 20.7 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.909 | 4472 | 103 | 6331 | 1796 | 0.71 | 0.06 | 61.6 | 60.0 | 24.2 | 21.7 | C |
| 2 | 1.00 | 1.00 | 0.898 | 0.909 | 4224 | 98 | 6331 | 1796 | 0.67 | 0.05 | 61.9 | 60.2 | 22.7 | 20.6 | C |
| 3 | 1.00 | 1.00 | 0.898 | 0.909 | 4225 | 98 | 6331 | 1796 | 0.67 | 0.05 | 61.9 | 60.2 | 22.8 | 20.6 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.909 | 4305 | 100 | 6331 | 1796 | 0.68 | 0.06 | 61.7 | 60.1 | 23.3 | 20.9 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.909 | 4448 | 102 | 6331 | 1796 | 0.70 | 0.06 | 61.6 | 60.0 | 24.1 | 21.6 | C |
| 6 | 1.00 | 1.00 | 0.898 | 0.909 | 4204 | 97 | 6331 | 1796 | 0.66 | 0.05 | 61.9 | 60.2 | 22.6 | 20.5 | C |
| 7 | 1.00 | 1.00 | 0.898 | 0.909 | 4205 | 97 | 6331 | 1796 | 0.66 | 0.05 | 61.9 | 60.2 | 22.6 | 20.5 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.909 | 4286 | 99 | 6331 | 1796 | 0.68 | 0.06 | 61.8 | 60.1 | 23.1 | 20.9 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.909 | 4315 | 99 | 6331 | 1796 | 0.68 | 0.06 | 61.7 | 60.1 | 23.3 | 21.0 | C |
| 10 | 1.00 | 1.00 | 0.898 | 0.909 | 4077 | 95 | 6331 | 1796 | 0.64 | 0.05 | 62.0 | 60.3 | 21.9 | 19.9 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.909 | 4077 | 95 | 6331 | 1796 | 0.64 | 0.05 | 62.0 | 60.3 | 21.9 | 19.9 | B |
| 12 | 1.00 | 1.00 | 0.898 | 0.909 | 4156 | 96 | 6331 | 1796 | 0.66 | 0.05 | 62.0 | 60.3 | 22.3 | 20.2 | C |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 4473 | 6377 | 0.70 | 63.6 | 23.4 | C |
| 2 | 1.00 | 0.898 | 4225 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 3 | 1.00 | 0.898 | 4226 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 4 | 1.00 | 0.898 | 4306 | 6377 | 0.68 | 64.4 | 22.3 | C |
| 5 | 1.00 | 0.898 | 4450 | 6377 | 0.70 | 63.8 | 23.2 | C |
| 6 | 1.00 | 0.898 | 4205 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 7 | 1.00 | 0.898 | 4206 | 6377 | 0.66 | 64.8 | 21.6 | C |
| 8 | 1.00 | 0.898 | 4287 | 6377 | 0.67 | 64.5 | 22.2 | C |
| 9 | 1.00 | 0.898 | 4316 | 6377 | 0.68 | 64.4 | 22.3 | C |
| 10 | 1.00 | 0.898 | 4078 | 6377 | 0.64 | 65.3 | 20.8 | C |
| 11 | 1.00 | 0.898 | 4078 | 6377 | 0.64 | 65.3 | 20.8 | C |
| 12 | 1.00 | 0.898 | 4157 | 6377 | 0.65 | 65.0 | 21.3 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.900 | 4473 | 1230 | 6331 | 3951 | 0.71 | 0.31 | 64.2 | 59.7 | 23.2 | 13.9 | B |
| 2 | 1.00 | 1.00 | 0.898 | 0.900 | 4225 | 1101 | 6331 | 3951 | 0.67 | 0.28 | 64.6 | 60.0 | 21.8 | 12.3 | B |
| 3 | 1.00 | 1.00 | 0.898 | 0.900 | 4226 | 1154 | 6331 | 3951 | 0.67 | 0.29 | 64.4 | 59.8 | 21.9 | 12.6 | B |
| 4 | 1.00 | 1.00 | 0.898 | 0.900 | 4306 | 980 | 6331 | 3951 | 0.68 | 0.25 | 64.8 | 60.3 | 22.2 | 12.1 | B |
| 5 | 1.00 | 1.00 | 0.898 | 0.900 | 4450 | 1224 | 6331 | 3951 | 0.70 | 0.31 | 64.2 | 59.7 | 23.1 | 13.8 | B |
| 6 | 1.00 | 1.00 | 0.898 | 0.900 | 4205 | 1096 | 6331 | 3951 | 0.66 | 0.28 | 64.6 | 60.0 | 21.7 | 12.2 | B |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.898 | 0.900 | 4206 | 1150 | 6331 | 3951 | 0.66 | 0.29 | 64.4 | 59.8 | 21.8 | 12.5 | B |
| 8 | 1.00 | 1.00 | 0.898 | 0.900 | 4287 | 976 | 6331 | 3951 | 0.68 | 0.25 | 64.9 | 60.3 | 22.0 | 12.0 | B |
| 9 | 1.00 | 1.00 | 0.898 | 0.900 | 4316 | 1187 | 6331 | 3951 | 0.68 | 0.30 | 64.4 | 59.8 | 22.3 | 13.1 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.900 | 4078 | 1062 | 6331 | 3951 | 0.64 | 0.27 | 64.7 | 60.1 | 21.0 | 11.6 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.900 | 4078 | 1114 | 6331 | 3951 | 0.64 | 0.28 | 64.5 | 59.9 | 21.1 | 11.8 | B |
| 12 | 1.00 | 1.00 | 0.898 | 0.900 | 4157 | 946 | 6331 | 3951 | 0.66 | 0.24 | 64.9 | 60.3 | 21.4 | 11.3 | B |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.897 | 3244 | 6377 | 0.51 | 66.7 | 16.2 | B |
| 2 | 1.00 | 0.897 | 3125 | 6377 | 0.49 | 66.7 | 15.6 | B |
| 3 | 1.00 | 0.897 | 3072 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 4 | 1.00 | 0.897 | 3328 | 6377 | 0.52 | 66.7 | 16.6 | B |
| 5 | 1.00 | 0.897 | 3226 | 6377 | 0.51 | 66.7 | 16.1 | B |
| 6 | 1.00 | 0.897 | 3110 | 6377 | 0.49 | 66.7 | 15.5 | B |
| 7 | 1.00 | 0.897 | 3057 | 6377 | 0.48 | 66.7 | 15.3 | B |
| 8 | 1.00 | 0.897 | 3313 | 6377 | 0.52 | 66.7 | 16.6 | B |
| 9 | 1.00 | 0.897 | 3130 | 6377 | 0.49 | 66.7 | 15.6 | B |
| 10 | 1.00 | 0.897 | 3017 | 6377 | 0.47 | 66.7 | 15.1 | B |
| 11 | 1.00 | 0.897 | 2964 | 6377 | 0.46 | 66.7 | 14.8 | B |
| 12 | 1.00 | 0.897 | 3213 | 6377 | 0.50 | 66.7 | 16.1 | B |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.897 | 0.770 | 3317 | 73 | 8578 | 1976 | 0.39 | 0.04 | 68.8 | 68.8 | 12.1 | 12.1 | B |
| 2 | 1.00 | 1.00 | 0.897 | 0.770 | 3199 | 74 | 8578 | 1976 | 0.37 | 0.04 | 68.8 | 68.8 | 11.6 | 11.6 | B |
| 3 | 1.00 | 1.00 | 0.897 | 0.770 | 3150 | 78 | 8578 | 1976 | 0.37 | 0.04 | 68.8 | 68.8 | 11.4 | 11.4 | B |
| 4 | 1.00 | 1.00 | 0.897 | 0.770 | 3416 | 88 | 8578 | 1976 | 0.40 | 0.04 | 68.8 | 68.8 | 12.4 | 12.4 | B |
| 5 | 1.00 | 1.00 | 0.897 | 0.770 | 3299 | 73 | 8578 | 1976 | 0.38 | 0.04 | 68.8 | 68.8 | 12.0 | 12.0 | B |
| 6 | 1.00 | 1.00 | 0.897 | 0.770 | 3184 | 74 | 8578 | 1976 | 0.37 | 0.04 | 68.8 | 68.8 | 11.6 | 11.6 | B |
| 7 | 1.00 | 1.00 | 0.897 | 0.770 | 3134 | 77 | 8578 | 1976 | 0.37 | 0.04 | 68.8 | 68.8 | 11.4 | 11.4 | B |
| 8 | 1.00 | 1.00 | 0.897 | 0.770 | 3401 | 88 | 8578 | 1976 | 0.40 | 0.04 | 68.8 | 68.8 | 12.4 | 12.4 | B |
| 9 | 1.00 | 1.00 | 0.897 | 0.770 | 3200 | 70 | 8578 | 1976 | 0.37 | 0.04 | 68.8 | 68.8 | 11.6 | 11.6 | B |
| 10 | 1.00 | 1.00 | 0.897 | 0.770 | 3088 | 71 | 8578 | 1976 | 0.36 | 0.04 | 68.8 | 68.8 | 11.2 | 11.2 | B |
| 11 | 1.00 | 1.00 | 0.897 | 0.770 | 3039 | 75 | 8578 | 1976 | 0.35 | 0.04 | 68.8 | 68.8 | 11.0 | 11.0 | A |
| 12 | 1.00 | 1.00 | 0.897 | 0.770 | 3299 | 86 | 8578 | 1976 | 0.38 | 0.04 | 68.8 | 68.8 | 12.0 | 12.0 | B |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3314 | 8502 | 0.39 | 66.7 | 12.4 | B |
| 2 | 1.00 | 0.895 | 3196 | 8502 | 0.38 | 66.7 | 12.0 | B |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.895 | 3146 | 8502 | 0.37 | 66.7 | 11.8 | B |
| 4 | 1.00 | 0.895 | 3411 | 8502 | 0.40 | 66.7 | 12.8 | B |
| 5 | 1.00 | 0.895 | 3296 | 8502 | 0.39 | 66.7 | 12.4 | B |
| 6 | 1.00 | 0.895 | 3181 | 8502 | 0.37 | 66.7 | 11.9 | B |
| 7 | 1.00 | 0.895 | 3130 | 8502 | 0.37 | 66.7 | 11.7 | B |
| 8 | 1.00 | 0.895 | 3397 | 8502 | 0.40 | 66.7 | 12.7 | B |
| 9 | 1.00 | 0.895 | 3198 | 8502 | 0.38 | 66.7 | 12.0 | B |
| 10 | 1.00 | 0.895 | 3085 | 8502 | 0.36 | 66.7 | 11.6 | B |
| 11 | 1.00 | 0.895 | 3036 | 8502 | 0.36 | 66.7 | 11.4 | B |
| 12 | 1.00 | 0.895 | 3294 | 8502 | 0.39 | 66.7 | 12.4 | B |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3314 | 6377 | 0.52 | 66.7 | 16.6 | B |
| 2 | 1.00 | 0.895 | 3196 | 6377 | 0.50 | 66.7 | 16.0 | B |
| 3 | 1.00 | 0.895 | 3146 | 6377 | 0.49 | 66.7 | 15.7 | B |
| 4 | 1.00 | 0.895 | 3411 | 6377 | 0.53 | 66.6 | 17.1 | B |
| 5 | 1.00 | 0.895 | 3296 | 6377 | 0.52 | 66.7 | 16.5 | B |
| 6 | 1.00 | 0.895 | 3181 | 6377 | 0.50 | 66.7 | 15.9 | B |
| 7 | 1.00 | 0.895 | 3130 | 6377 | 0.49 | 66.7 | 15.6 | B |
| 8 | 1.00 | 0.895 | 3397 | 6377 | 0.53 | 66.6 | 17.0 | B |
| 9 | 1.00 | 0.895 | 3198 | 6377 | 0.50 | 66.7 | 16.0 | B |
| 10 | 1.00 | 0.895 | 3085 | 6377 | 0.48 | 66.7 | 15.4 | B |
| 11 | 1.00 | 0.895 | 3036 | 6377 | 0.48 | 66.7 | 15.2 | B |
| 12 | 1.00 | 0.895 | 3294 | 6377 | 0.52 | 66.7 | 16.5 | B |

## Segment 19: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3314 | 4251 | 0.78 | 60.7 | 27.3 | D |
| 2 | 1.00 | 0.895 | 3196 | 4251 | 0.75 | 61.9 | 25.8 | C |
| 3 | 1.00 | 0.895 | 3146 | 4251 | 0.74 | 62.3 | 25.2 | C |
| 4 | 1.00 | 0.895 | 3411 | 4251 | 0.80 | 59.7 | 28.6 | D |
| 5 | 1.00 | 0.895 | 3296 | 4251 | 0.78 | 60.9 | 27.1 | D |
| 6 | 1.00 | 0.895 | 3181 | 4251 | 0.75 | 62.0 | 25.6 | C |
| 7 | 1.00 | 0.895 | 3130 | 4251 | 0.74 | 62.5 | 25.0 | C |
| 8 | 1.00 | 0.895 | 3397 | 4251 | 0.80 | 59.8 | 28.4 | D |
| 9 | 1.00 | 0.895 | 3198 | 4251 | 0.75 | 61.8 | 25.9 | C |
| 10 | 1.00 | 0.895 | 3085 | 4251 | 0.73 | 62.8 | 24.6 | C |
| 11 | 1.00 | 0.895 | 3036 | 4251 | 0.71 | 63.2 | 24.0 | C |
| 12 | 1.00 | 0.895 | 3294 | 4251 | 0.77 | 60.9 | 27.0 | D |

## Segment 20: Diverge

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | (pc/h) | | (pc/h) | | Ratio | | (mi/h) | | (pc/mi/ln) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.895 | 0.895 | 3314 | 236 | 4221 | 1886 | 0.79 | 0.13 | 58.9 | 58.9 | 28.1 | 29.5 | D |
| 2 | 1.00 | 1.00 | 0.895 | 0.895 | 3196 | 206 | 4221 | 1886 | 0.76 | 0.11 | 59.0 | 59.0 | 27.1 | 28.5 | D |
| 3 | 1.00 | 1.00 | 0.895 | 0.895 | 3146 | 223 | 4221 | 1886 | 0.75 | 0.12 | 58.9 | 58.9 | 26.7 | 28.1 | D |
| 4 | 1.00 | 1.00 | 0.895 | 0.895 | 3411 | 210 | 4221 | 1886 | 0.81 | 0.11 | 58.9 | 58.9 | 29.0 | 30.3 | D |
| 5 | 1.00 | 1.00 | 0.895 | 0.895 | 3296 | 235 | 4221 | 1886 | 0.78 | 0.12 | 58.9 | 58.9 | 28.0 | 29.4 | D |
| 6 | 1.00 | 1.00 | 0.895 | 0.895 | 3181 | 204 | 4221 | 1886 | 0.75 | 0.11 | 59.0 | 59.0 | 27.0 | 28.4 | D |
| 7 | 1.00 | 1.00 | 0.895 | 0.895 | 3130 | 222 | 4221 | 1886 | 0.74 | 0.12 | 58.9 | 58.9 | 26.6 | 27.9 | C |
| 8 | 1.00 | 1.00 | 0.895 | 0.895 | 3397 | 210 | 4221 | 1886 | 0.80 | 0.11 | 58.9 | 58.9 | 28.8 | 30.2 | D |
| 9 | 1.00 | 1.00 | 0.895 | 0.895 | 3198 | 228 | 4221 | 1886 | 0.76 | 0.12 | 58.9 | 58.9 | 27.1 | 28.5 | D |
| 10 | 1.00 | 1.00 | 0.895 | 0.895 | 3085 | 198 | 4221 | 1886 | 0.73 | 0.10 | 59.0 | 59.0 | 26.1 | 27.5 | C |
| 11 | 1.00 | 1.00 | 0.895 | 0.895 | 3036 | 216 | 4221 | 1886 | 0.72 | 0.11 | 58.9 | 58.9 | 25.8 | 27.1 | C |
| 12 | 1.00 | 1.00 | 0.895 | 0.895 | 3294 | 203 | 4221 | 1886 | 0.78 | 0.11 | 59.0 | 59.0 | 27.9 | 29.3 | D |

## Segment 21: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.888 | 3102 | 4260 | 0.73 | 63.0 | 24.6 | C |
| 2 | 1.00 | 0.888 | 3014 | 4260 | 0.71 | 63.7 | 23.7 | C |
| 3 | 1.00 | 0.888 | 2946 | 4260 | 0.69 | 64.2 | 22.9 | C |
| 4 | 1.00 | 0.888 | 3226 | 4260 | 0.76 | 61.9 | 26.1 | D |
| 5 | 1.00 | 0.888 | 3086 | 4260 | 0.72 | 63.1 | 24.5 | C |
| 6 | 1.00 | 0.888 | 3000 | 4260 | 0.70 | 63.8 | 23.5 | C |
| 7 | 1.00 | 0.888 | 2930 | 4260 | 0.69 | 64.3 | 22.8 | C |
| 8 | 1.00 | 0.888 | 3212 | 4260 | 0.75 | 62.0 | 25.9 | C |
| 9 | 1.00 | 0.888 | 2993 | 4260 | 0.70 | 63.9 | 23.4 | C |
| 10 | 1.00 | 0.888 | 2910 | 4260 | 0.68 | 64.5 | 22.6 | C |
| 11 | 1.00 | 0.888 | 2842 | 4260 | 0.67 | 64.9 | 21.9 | C |
| 12 | 1.00 | 0.888 | 3115 | 4260 | 0.73 | 62.9 | 24.8 | C |

## Segment 22: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.888 | 0.888 | 3560 | 458 | 4221 | 1886 | 0.84 | 0.24 | 58.7 | 58.7 | 30.3 | 26.8 | C |
| 2 | 1.00 | 1.00 | 0.888 | 0.888 | 3391 | 377 | 4221 | 1886 | 0.80 | 0.20 | 59.3 | 59.3 | 28.6 | 25.6 | C |
| 3 | 1.00 | 1.00 | 0.888 | 0.888 | 3456 | 510 | 4221 | 1886 | 0.82 | 0.27 | 59.1 | 59.1 | 29.2 | 26.0 | C |
| 4 | 1.00 | 1.00 | 0.888 | 0.888 | 3622 | 396 | 4221 | 1886 | 0.86 | 0.21 | 58.5 | 58.5 | 31.0 | 27.3 | C |
| 5 | 1.00 | 1.00 | 0.888 | 0.888 | 3542 | 456 | 4221 | 1886 | 0.84 | 0.24 | 58.8 | 58.8 | 30.1 | 26.7 | C |
| 6 | 1.00 | 1.00 | 0.888 | 0.888 | 3375 | 375 | 4221 | 1886 | 0.80 | 0.20 | 59.3 | 59.3 | 28.5 | 25.4 | C |
| 7 | 1.00 | 1.00 | 0.888 | 0.888 | 3438 | 508 | 4221 | 1886 | 0.81 | 0.27 | 59.2 | 59.2 | 29.0 | 25.9 | C |
| 8 | 1.00 | 1.00 | 0.888 | 0.888 | 3606 | 394 | 4221 | 1886 | 0.85 | 0.21 | 58.6 | 58.6 | 30.8 | 27.2 | C |
| 9 | 1.00 | 1.00 | 0.888 | 0.888 | 3436 | 443 | 4221 | 1886 | 0.81 | 0.23 | 59.2 | 59.2 | 29.0 | 25.9 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 1.00 | 0.888 | 0.888 | 3274 | 364 | 4221 | 1886 | 0.78 | 0.19 | 59.6 | 59.6 | 27.5 | 24.6 | C |
| 11 | 1.00 | 1.00 | 0.888 | 0.888 | 3335 | 493 | 4221 | 1886 | 0.79 | 0.26 | 59.5 | 59.5 | 28.0 | 25.1 | C |
| 12 | 1.00 | 1.00 | 0.888 | 0.888 | 3498 | 383 | 4221 | 1886 | 0.83 | 0.20 | 58.9 | 58.9 | 29.7 | 26.4 | C |

## Segment 23: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.890 | 3553 | 4289 | 0.83 | 59.1 | 30.1 | D |
| 2 | 1.00 | 0.890 | 3383 | 4289 | 0.79 | 61.1 | 27.7 | D |
| 3 | 1.00 | 0.890 | 3448 | 4289 | 0.80 | 60.4 | 28.5 | D |
| 4 | 1.00 | 0.890 | 3615 | 4289 | 0.84 | 58.3 | 31.0 | D |
| 5 | 1.00 | 0.890 | 3534 | 4289 | 0.82 | 59.4 | 29.7 | D |
| 6 | 1.00 | 0.890 | 3367 | 4289 | 0.79 | 61.3 | 27.5 | D |
| 7 | 1.00 | 0.890 | 3430 | 4289 | 0.80 | 60.6 | 28.3 | D |
| 8 | 1.00 | 0.890 | 3598 | 4289 | 0.84 | 58.5 | 30.8 | D |
| 9 | 1.00 | 0.890 | 3428 | 4289 | 0.80 | 60.6 | 28.3 | D |
| 10 | 1.00 | 0.890 | 3266 | 4289 | 0.76 | 62.4 | 26.2 | D |
| 11 | 1.00 | 0.890 | 3328 | 4289 | 0.78 | 61.7 | 27.0 | D |
| 12 | 1.00 | 0.890 | 3490 | 4289 | 0.81 | 59.9 | 29.1 | D |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 29974 | 29903 | 40.96 | 62.3 | 24.8 | 22.3 | 32.40 | D |
| 2 | 28343 | 28273 | 28.97 | 63.6 | 23.0 | 20.6 | 31.70 | D |
| 3 | 28739 | 28663 | 32.17 | 63.2 | 23.4 | 21.0 | 31.90 | D |
| 4 | 29522 | 29455 | 40.57 | 62.2 | 24.5 | 21.9 | 32.40 | D |
| 5 | 29820 | 29749 | 39.20 | 62.5 | 24.6 | 22.0 | 32.30 | D |
| 6 | 28212 | 28142 | 28.03 | 63.7 | 22.8 | 20.5 | 31.60 | D |
| 7 | 28598 | 28522 | 31.08 | 63.4 | 23.3 | 20.9 | 31.80 | D |
| 8 | 29388 | 29321 | 39.38 | 62.4 | 24.3 | 21.8 | 32.30 | D |
| 9 | 28924 | 28855 | 32.40 | 63.2 | 23.6 | 21.2 | 31.90 | D |
| 10 | 27360 | 27292 | 22.80 | 64.4 | 21.9 | 19.6 | 31.30 | C |
| 11 | 27734 | 27661 | 25.47 | 64.0 | 22.3 | 20.0 | 31.50 | D |
| 12 | 28498 | 28434 | 32.20 | 63.2 | 23.2 | 20.8 | 31.90 | D |

## Facility Overall Results

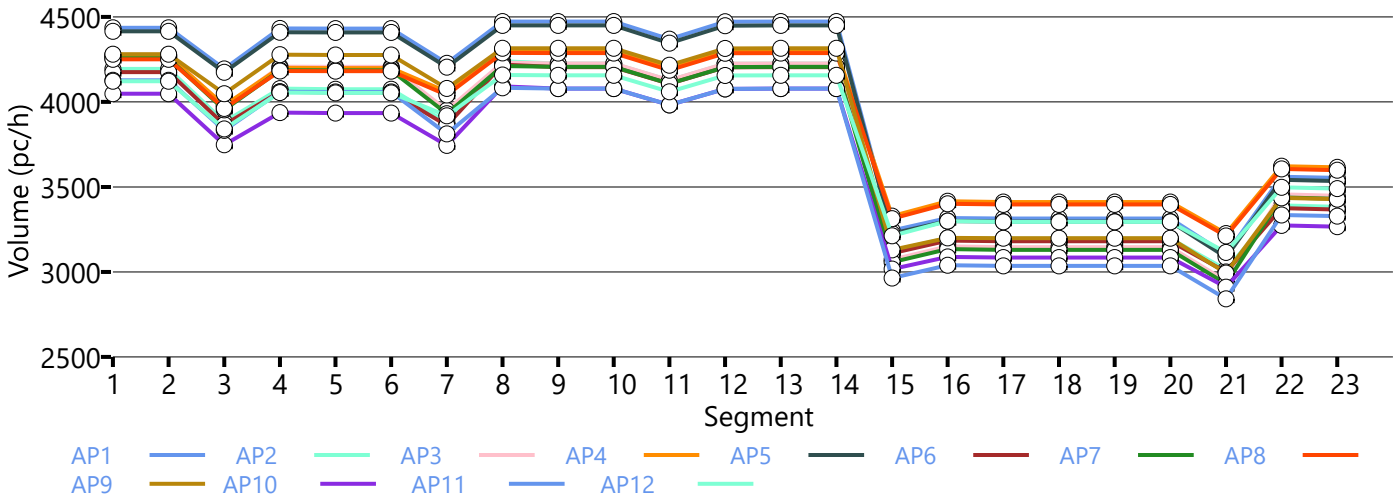
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 63.2 | Density, veh/mi/ln | 21.1 |
| Average Travel Time, min | 31.90 | Density, pc/mi/ln | 23.5 |

## Messages

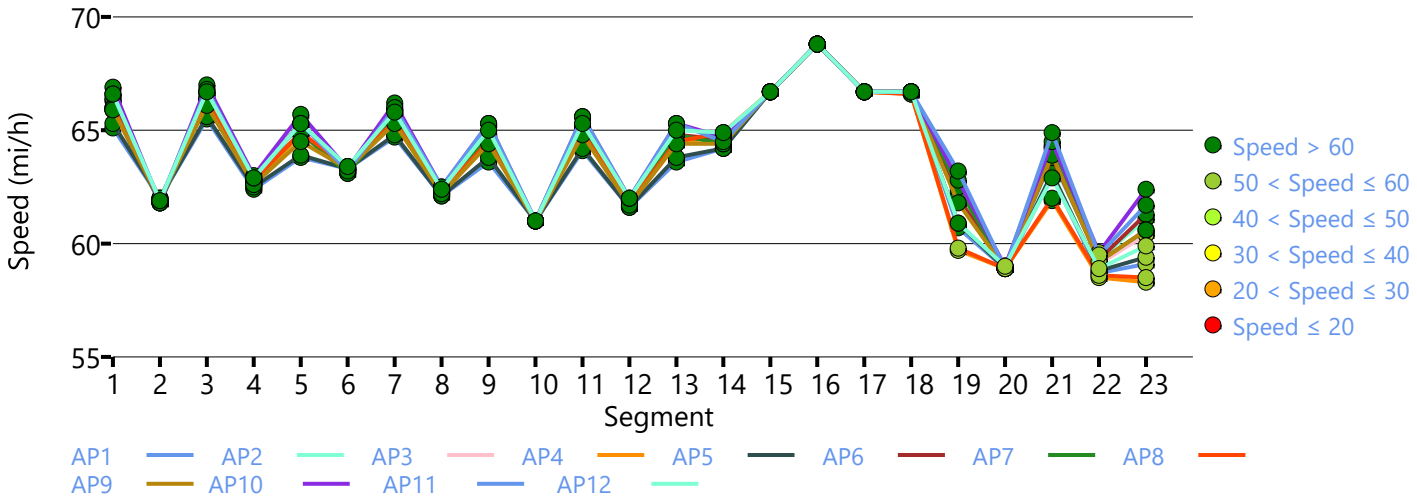
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

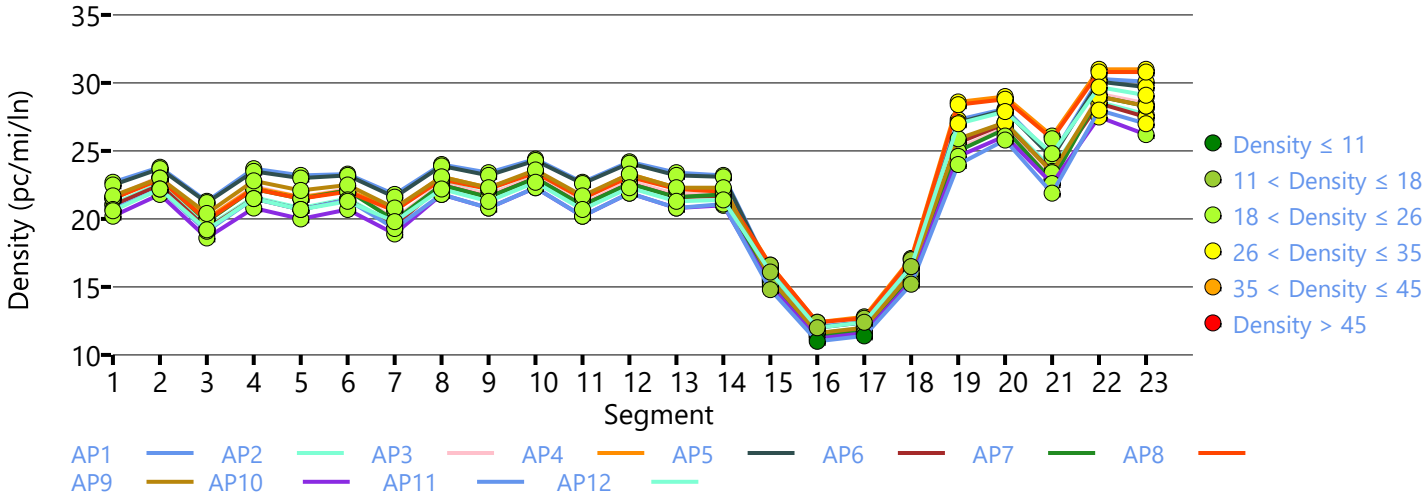
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Neal Styka, PE, RSP1, PTOE | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | SB I-39/90/94 WIS 33 To WIS 60 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 17 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 19.90 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |
| 2 | Diverge | Diverge | I-39 EB Off | 1500 | 2 |
| 3 | Basic | Basic | I-39 EB Off to I-39 EB On | 5976 | 2 |
| 4 | Merge | Merge | I-39 EB On | 1500 | 3 |
| 5 | Basic | Basic | I-39 to Rest Area | 14012 | 3 |
| 6 | Diverge | Diverge | Rest Area Off | 1500 | 3 |
| 7 | Basic | Basic | Rest Area Between Off and On | 3808 | 3 |
| 8 | Merge | Merge | Rest Area On | 1500 | 3 |
| 9 | Basic | Basic | I-39 to CTH CS | 10077 | 3 |
| 10 | Diverge | Diverge | CTH CS EB Off | 1500 | 3 |
| 11 | Basic | Basic | CTH CS between on and off | 1093 | 3 |
| 12 | Merge | Merge | CTH CS EB On | 1500 | 3 |
| 13 | Basic | Basic | CTH CS to STH 60 | 16976 | 3 |
| 14 | Diverge | Diverge | STH 60 EB Off | 1500 | 3 |
| 15 | Basic | Basic | STH 60 Between off and On | 1076 | 3 |
| 16 | Merge | Merge | STH 60 EB On | 1500 | 3 |
| 17 | Basic | Basic | STH 60 to CTH V | 32877 | 3 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3097 | 4269 | 0.73 | 63.4 | 24.4 | C |
| 2 | 1.00 | 0.895 | 3992 | 4269 | 0.94 | 52.2 | 38.2 | E |
| 3 | 1.00 | 0.895 | 3659 | 4269 | 0.86 | 57.2 | 32.0 | D |
| 4 | 1.00 | 0.895 | 3711 | 4269 | 0.87 | 56.5 | 32.8 | D |
| 5 | 1.00 | 0.895 | 3206 | 4269 | 0.75 | 62.4 | 25.7 | C |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 0.895 | 3509 | 4269 | 0.82 | 59.1 | 29.7 | D |
| 7 | 1.00 | 0.895 | 3789 | 4269 | 0.89 | 55.4 | 34.2 | D |
| 8 | 1.00 | 0.895 | 3841 | 4269 | 0.90 | 54.6 | 35.2 | E |
| 9 | 1.00 | 0.895 | 3086 | 4269 | 0.72 | 63.4 | 24.3 | C |
| 10 | 1.00 | 0.895 | 3375 | 4269 | 0.79 | 60.6 | 27.9 | D |
| 11 | 1.00 | 0.895 | 3647 | 4269 | 0.85 | 57.3 | 31.8 | D |
| 12 | 1.00 | 0.895 | 3695 | 4269 | 0.87 | 56.7 | 32.6 | D |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.895 | 0.854 | 3097 | 187 | 4221 | 1886 | 0.73 | 0.10 | 60.6 | 60.6 | 25.6 | 18.9 | B |
| 2 | 1.00 | 1.00 | 0.895 | 0.854 | 3992 | 331 | 4221 | 1886 | 0.95 | 0.18 | 60.2 | 60.2 | 33.2 | 26.6 | C |
| 3 | 1.00 | 1.00 | 0.895 | 0.854 | 3659 | 152 | 4221 | 1886 | 0.87 | 0.08 | 60.7 | 60.7 | 30.1 | 23.7 | C |
| 4 | 1.00 | 1.00 | 0.895 | 0.854 | 3711 | 181 | 4221 | 1886 | 0.88 | 0.10 | 60.6 | 60.6 | 30.6 | 24.1 | C |
| 5 | 1.00 | 1.00 | 0.895 | 0.854 | 3206 | 196 | 4221 | 1886 | 0.76 | 0.10 | 60.5 | 60.5 | 26.5 | 19.8 | B |
| 6 | 1.00 | 1.00 | 0.895 | 0.854 | 3509 | 347 | 4221 | 1886 | 0.83 | 0.18 | 60.2 | 60.2 | 29.1 | 22.4 | C |
| 7 | 1.00 | 1.00 | 0.895 | 0.854 | 3789 | 158 | 4221 | 1886 | 0.90 | 0.08 | 60.7 | 60.7 | 31.2 | 24.8 | C |
| 8 | 1.00 | 1.00 | 0.895 | 0.854 | 3841 | 190 | 4221 | 1886 | 0.91 | 0.10 | 60.6 | 60.6 | 31.7 | 25.3 | C |
| 9 | 1.00 | 1.00 | 0.895 | 0.854 | 3086 | 144 | 4221 | 1886 | 0.73 | 0.08 | 60.7 | 60.7 | 25.4 | 18.8 | B |
| 10 | 1.00 | 1.00 | 0.895 | 0.854 | 3375 | 254 | 4221 | 1886 | 0.80 | 0.13 | 60.4 | 60.4 | 27.9 | 21.3 | C |
| 11 | 1.00 | 1.00 | 0.895 | 0.854 | 3647 | 116 | 4221 | 1886 | 0.86 | 0.06 | 60.7 | 60.7 | 30.0 | 23.6 | C |
| 12 | 1.00 | 1.00 | 0.895 | 0.854 | 3695 | 139 | 4221 | 1886 | 0.88 | 0.07 | 60.7 | 60.7 | 30.4 | 24.0 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.898 | 2909 | 4269 | 0.68 | 64.8 | 22.4 | C |
| 2 | 1.00 | 0.898 | 3664 | 4269 | 0.86 | 57.1 | 32.1 | D |
| 3 | 1.00 | 0.898 | 3502 | 4269 | 0.82 | 59.2 | 29.6 | D |
| 4 | 1.00 | 0.898 | 3526 | 4269 | 0.83 | 58.9 | 29.9 | D |
| 5 | 1.00 | 0.898 | 3009 | 4269 | 0.70 | 64.1 | 23.5 | C |
| 6 | 1.00 | 0.898 | 3168 | 4269 | 0.74 | 62.7 | 25.3 | C |
| 7 | 1.00 | 0.898 | 3626 | 4269 | 0.85 | 57.6 | 31.5 | D |
| 8 | 1.00 | 0.898 | 3648 | 4269 | 0.85 | 57.3 | 31.8 | D |
| 9 | 1.00 | 0.898 | 2939 | 4269 | 0.69 | 64.6 | 22.8 | C |
| 10 | 1.00 | 0.898 | 3122 | 4269 | 0.73 | 63.1 | 24.7 | C |
| 11 | 1.00 | 0.898 | 3524 | 4269 | 0.83 | 58.9 | 29.9 | D |
| 12 | 1.00 | 0.898 | 3550 | 4269 | 0.83 | 58.6 | 30.3 | D |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.898 | 0.903 | 4565 | 1656 | 6331 | 3951 | 0.72 | 0.42 | 62.5 | 61.3 | 24.3 | 21.3 | C |
| 2 | 1.00 | 1.00 | 0.898 | 0.903 | 5274 | 1610 | 6331 | 3951 | 0.83 | 0.41 | 61.4 | 60.0 | 28.6 | 24.3 | C |
| 3 | 1.00 | 1.00 | 0.898 | 0.903 | 5049 | 1547 | 6331 | 3951 | 0.80 | 0.39 | 61.9 | 60.6 | 27.2 | 23.1 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.903 | 5038 | 1512 | 6331 | 3951 | 0.80 | 0.38 | 62.0 | 60.7 | 27.1 | 23.0 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.903 | 4737 | 1728 | 6331 | 3951 | 0.75 | 0.44 | 62.2 | 60.9 | 25.4 | 22.2 | C |
| 6 | 1.00 | 1.00 | 0.898 | 0.903 | 4849 | 1681 | 6331 | 3951 | 0.77 | 0.43 | 62.1 | 60.8 | 26.0 | 22.6 | C |
| 7 | 1.00 | 1.00 | 0.898 | 0.903 | 5241 | 1615 | 6331 | 3951 | 0.83 | 0.41 | 61.5 | 60.1 | 28.4 | 24.2 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.903 | 5226 | 1578 | 6331 | 3951 | 0.83 | 0.40 | 61.6 | 60.2 | 28.3 | 24.0 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.903 | 4209 | 1270 | 6331 | 3951 | 0.66 | 0.32 | 63.3 | 62.2 | 22.2 | 18.6 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.903 | 4357 | 1235 | 6331 | 3951 | 0.69 | 0.31 | 63.2 | 62.1 | 23.0 | 19.1 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.903 | 4710 | 1186 | 6331 | 3951 | 0.74 | 0.30 | 62.8 | 61.7 | 25.0 | 20.6 | C |
| 12 | 1.00 | 1.00 | 0.898 | 0.903 | 4709 | 1159 | 6331 | 3951 | 0.74 | 0.29 | 62.8 | 61.7 | 25.0 | 20.5 | C |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.899 | 4568 | 6433 | 0.71 | 64.4 | 23.6 | C |
| 2 | 1.00 | 0.899 | 5277 | 6433 | 0.82 | 59.5 | 29.6 | D |
| 3 | 1.00 | 0.899 | 5052 | 6433 | 0.79 | 61.3 | 27.5 | D |
| 4 | 1.00 | 0.899 | 5040 | 6433 | 0.78 | 61.4 | 27.4 | D |
| 5 | 1.00 | 0.899 | 4741 | 6433 | 0.74 | 63.4 | 24.9 | C |
| 6 | 1.00 | 0.899 | 4853 | 6433 | 0.75 | 62.7 | 25.8 | C |
| 7 | 1.00 | 0.899 | 5244 | 6433 | 0.82 | 59.8 | 29.2 | D |
| 8 | 1.00 | 0.899 | 5229 | 6433 | 0.81 | 59.9 | 29.1 | D |
| 9 | 1.00 | 0.899 | 4211 | 6433 | 0.65 | 66.2 | 21.2 | C |
| 10 | 1.00 | 0.899 | 4359 | 6433 | 0.68 | 65.5 | 22.2 | C |
| 11 | 1.00 | 0.899 | 4712 | 6433 | 0.73 | 63.6 | 24.7 | C |
| 12 | 1.00 | 0.899 | 4711 | 6433 | 0.73 | 63.6 | 24.7 | C |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.899 | 0.909 | 4568 | 90 | 6331 | 1796 | 0.72 | 0.05 | 61.1 | 56.1 | 24.9 | 26.2 | C |
| 2 | 1.00 | 1.00 | 0.899 | 0.909 | 5277 | 94 | 6331 | 1796 | 0.83 | 0.05 | 61.0 | 56.1 | 28.8 | 29.3 | D |
| 3 | 1.00 | 1.00 | 0.899 | 0.909 | 5052 | 98 | 6331 | 1796 | 0.80 | 0.05 | 61.0 | 56.0 | 27.6 | 28.3 | D |
| 4 | 1.00 | 1.00 | 0.899 | 0.909 | 5040 | 98 | 6331 | 1796 | 0.80 | 0.05 | 61.0 | 56.0 | 27.5 | 28.2 | D |
| 5 | 1.00 | 1.00 | 0.899 | 0.909 | 4741 | 95 | 6331 | 1796 | 0.75 | 0.05 | 61.0 | 56.0 | 25.9 | 26.9 | C |
| 6 | 1.00 | 1.00 | 0.899 | 0.909 | 4853 | 98 | 6331 | 1796 | 0.77 | 0.05 | 61.0 | 56.0 | 26.5 | 27.4 | C |
| 7 | 1.00 | 1.00 | 0.899 | 0.909 | 5244 | 102 | 6331 | 1796 | 0.83 | 0.06 | 60.9 | 56.0 | 28.7 | 29.1 | D |
| 8 | 1.00 | 1.00 | 0.899 | 0.909 | 5229 | 102 | 6331 | 1796 | 0.83 | 0.06 | 61.0 | 56.0 | 28.6 | 29.1 | D |
| 9 | 1.00 | 1.00 | 0.899 | 0.909 | 4211 | 69 | 6331 | 1796 | 0.67 | 0.04 | 61.1 | 56.1 | 23.0 | 24.5 | C |
| 10 | 1.00 | 1.00 | 0.899 | 0.909 | 4359 | 72 | 6331 | 1796 | 0.69 | 0.04 | 61.1 | 56.1 | 23.8 | 25.2 | C |
| 11 | 1.00 | 1.00 | 0.899 | 0.909 | 4712 | 75 | 6331 | 1796 | 0.74 | 0.04 | 61.1 | 56.1 | 25.7 | 26.8 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | 1.00 | 0.899 | 0.909 | 4711 | 75 | 6331 | 1796 | 0.74 | 0.04 | 61.1 | 56.1 | 25.7 | 26.8 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.899 | 4477 | 6433 | 0.70 | 64.9 | 23.0 | C |
| 2 | 1.00 | 0.899 | 5182 | 6433 | 0.81 | 60.3 | 28.6 | D |
| 3 | 1.00 | 0.899 | 4953 | 6433 | 0.77 | 62.0 | 26.6 | D |
| 4 | 1.00 | 0.899 | 4941 | 6433 | 0.77 | 62.1 | 26.5 | D |
| 5 | 1.00 | 0.899 | 4645 | 6433 | 0.72 | 64.0 | 24.2 | C |
| 6 | 1.00 | 0.899 | 4754 | 6433 | 0.74 | 63.3 | 25.0 | C |
| 7 | 1.00 | 0.899 | 5140 | 6433 | 0.80 | 60.6 | 28.3 | D |
| 8 | 1.00 | 0.899 | 5126 | 6433 | 0.80 | 60.7 | 28.2 | D |
| 9 | 1.00 | 0.899 | 4141 | 6433 | 0.64 | 66.5 | 20.8 | C |
| 10 | 1.00 | 0.899 | 4287 | 6433 | 0.67 | 65.9 | 21.7 | C |
| 11 | 1.00 | 0.899 | 4636 | 6433 | 0.72 | 64.1 | 24.1 | C |
| 12 | 1.00 | 0.899 | 4635 | 6433 | 0.72 | 64.1 | 24.1 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.899 | 0.909 | 4567 | 90 | 6331 | 1796 | 0.72 | 0.05 | 61.5 | 59.9 | 24.8 | 22.1 | C |
| 2 | 1.00 | 1.00 | 0.899 | 0.909 | 5276 | 94 | 6331 | 1796 | 0.83 | 0.05 | 60.5 | 59.0 | 29.1 | 25.5 | C |
| 3 | 1.00 | 1.00 | 0.899 | 0.909 | 5051 | 98 | 6331 | 1796 | 0.80 | 0.05 | 60.9 | 59.3 | 27.6 | 24.4 | C |
| 4 | 1.00 | 1.00 | 0.899 | 0.909 | 5039 | 98 | 6331 | 1796 | 0.80 | 0.05 | 60.9 | 59.3 | 27.6 | 24.4 | C |
| 5 | 1.00 | 1.00 | 0.899 | 0.909 | 4740 | 95 | 6331 | 1796 | 0.75 | 0.05 | 61.3 | 59.7 | 25.8 | 23.0 | C |
| 6 | 1.00 | 1.00 | 0.899 | 0.909 | 4852 | 98 | 6331 | 1796 | 0.77 | 0.05 | 61.2 | 59.6 | 26.4 | 23.5 | C |
| 7 | 1.00 | 1.00 | 0.899 | 0.909 | 5242 | 102 | 6331 | 1796 | 0.83 | 0.06 | 60.6 | 59.0 | 28.8 | 25.3 | C |
| 8 | 1.00 | 1.00 | 0.899 | 0.909 | 5228 | 102 | 6331 | 1796 | 0.83 | 0.06 | 60.6 | 59.1 | 28.8 | 25.3 | C |
| 9 | 1.00 | 1.00 | 0.899 | 0.909 | 4210 | 69 | 6331 | 1796 | 0.67 | 0.04 | 61.9 | 60.2 | 22.7 | 20.4 | C |
| 10 | 1.00 | 1.00 | 0.899 | 0.909 | 4359 | 72 | 6331 | 1796 | 0.69 | 0.04 | 61.7 | 60.1 | 23.5 | 21.1 | C |
| 11 | 1.00 | 1.00 | 0.899 | 0.909 | 4711 | 75 | 6331 | 1796 | 0.74 | 0.04 | 61.3 | 59.7 | 25.6 | 22.8 | C |
| 12 | 1.00 | 1.00 | 0.899 | 0.909 | 4710 | 75 | 6331 | 1796 | 0.74 | 0.04 | 61.3 | 59.7 | 25.6 | 22.8 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.899 | 4568 | 6377 | 0.72 | 63.2 | 24.1 | C |
| 2 | 1.00 | 0.899 | 5277 | 6377 | 0.83 | 58.4 | 30.1 | D |
| 3 | 1.00 | 0.899 | 5052 | 6377 | 0.79 | 60.1 | 28.0 | D |
| 4 | 1.00 | 0.899 | 5040 | 6377 | 0.79 | 60.2 | 27.9 | D |
| 5 | 1.00 | 0.899 | 4741 | 6377 | 0.74 | 62.2 | 25.4 | C |
| 6 | 1.00 | 0.899 | 4853 | 6377 | 0.76 | 61.5 | 26.3 | D |
| 7 | 1.00 | 0.899 | 5244 | 6377 | 0.82 | 58.7 | 29.8 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | | 0.899 | | 5229 | | 6377 | | 0.82 | | 58.8 | | 29.6 | | D |
| 9 | 1.00 | | 0.899 | | 4211 | | 6377 | | 0.66 | | 64.8 | | 21.7 | | C |
| 10 | 1.00 | | 0.899 | | 4359 | | 6377 | | 0.68 | | 64.2 | | 22.6 | | C |
| 11 | 1.00 | | 0.899 | | 4712 | | 6377 | | 0.74 | | 62.4 | | 25.2 | | C |
| 12 | 1.00 | | 0.899 | | 4711 | | 6377 | | 0.74 | | 62.4 | | 25.2 | | C |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.899 | 0.867 | 4568 | 334 | 6331 | 1886 | 0.72 | 0.18 | 62.9 | 58.6 | 24.2 | 27.8 | C |
| 2 | 1.00 | 1.00 | 0.899 | 0.867 | 5277 | 385 | 6331 | 1886 | 0.83 | 0.20 | 62.7 | 58.5 | 28.1 | 31.0 | D |
| 3 | 1.00 | 1.00 | 0.899 | 0.867 | 5052 | 375 | 6331 | 1886 | 0.80 | 0.20 | 62.9 | 58.6 | 26.8 | 30.0 | D |
| 4 | 1.00 | 1.00 | 0.899 | 0.867 | 5040 | 386 | 6331 | 1886 | 0.80 | 0.20 | 62.8 | 58.5 | 26.8 | 30.0 | D |
| 5 | 1.00 | 1.00 | 0.899 | 0.867 | 4741 | 348 | 6331 | 1886 | 0.75 | 0.18 | 62.9 | 58.6 | 25.1 | 28.6 | D |
| 6 | 1.00 | 1.00 | 0.899 | 0.867 | 4853 | 403 | 6331 | 1886 | 0.77 | 0.21 | 62.8 | 58.5 | 25.8 | 29.2 | D |
| 7 | 1.00 | 1.00 | 0.899 | 0.867 | 5244 | 391 | 6331 | 1886 | 0.83 | 0.21 | 62.7 | 58.5 | 27.9 | 30.9 | D |
| 8 | 1.00 | 1.00 | 0.899 | 0.867 | 5229 | 404 | 6331 | 1886 | 0.83 | 0.21 | 62.7 | 58.5 | 27.8 | 30.8 | D |
| 9 | 1.00 | 1.00 | 0.899 | 0.867 | 4211 | 256 | 6331 | 1886 | 0.67 | 0.14 | 63.1 | 58.8 | 22.2 | 26.1 | C |
| 10 | 1.00 | 1.00 | 0.899 | 0.867 | 4359 | 295 | 6331 | 1886 | 0.69 | 0.16 | 63.1 | 58.8 | 23.0 | 26.8 | C |
| 11 | 1.00 | 1.00 | 0.899 | 0.867 | 4712 | 288 | 6331 | 1886 | 0.74 | 0.15 | 63.1 | 58.8 | 24.9 | 28.4 | D |
| 12 | 1.00 | 1.00 | 0.899 | 0.867 | 4711 | 296 | 6331 | 1886 | 0.74 | 0.16 | 63.1 | 58.8 | 24.9 | 28.4 | D |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.902 | 4232 | 6390 | 0.66 | 65.0 | 21.7 | C |
| 2 | 1.00 | 0.902 | 4889 | 6390 | 0.77 | 61.5 | 26.5 | D |
| 3 | 1.00 | 0.902 | 4675 | 6390 | 0.73 | 62.9 | 24.8 | C |
| 4 | 1.00 | 0.902 | 4652 | 6390 | 0.73 | 63.0 | 24.6 | C |
| 5 | 1.00 | 0.902 | 4390 | 6390 | 0.69 | 64.4 | 22.7 | C |
| 6 | 1.00 | 0.902 | 4450 | 6390 | 0.70 | 64.1 | 23.1 | C |
| 7 | 1.00 | 0.902 | 4850 | 6390 | 0.76 | 61.8 | 26.2 | D |
| 8 | 1.00 | 0.902 | 4824 | 6390 | 0.75 | 62.0 | 25.9 | C |
| 9 | 1.00 | 0.902 | 3951 | 6390 | 0.62 | 66.0 | 20.0 | C |
| 10 | 1.00 | 0.902 | 4061 | 6390 | 0.64 | 65.7 | 20.6 | C |
| 11 | 1.00 | 0.902 | 4419 | 6390 | 0.69 | 64.2 | 22.9 | C |
| 12 | 1.00 | 0.902 | 4410 | 6390 | 0.69 | 64.3 | 22.9 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.902 | 0.894 | 4420 | 188 | 6331 | 1886 | 0.70 | 0.10 | 62.2 | 60.8 | 23.7 | 20.7 | C |
| 2 | 1.00 | 1.00 | 0.902 | 0.894 | 5118 | 229 | 6331 | 1886 | 0.81 | 0.12 | 61.2 | 59.8 | 27.9 | 24.1 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 1.00 | 0.902 | 0.894 | 4860 | 185 | 6331 | 1886 | 0.77 | 0.10 | 61.7 | 60.3 | 26.3 | 22.7 | C |
| 4 | 1.00 | 1.00 | 0.902 | 0.894 | 4844 | 192 | 6331 | 1886 | 0.77 | 0.10 | 61.6 | 60.3 | 26.2 | 22.7 | C |
| 5 | 1.00 | 1.00 | 0.902 | 0.894 | 4586 | 196 | 6331 | 1886 | 0.72 | 0.10 | 62.0 | 60.6 | 24.7 | 21.5 | C |
| 6 | 1.00 | 1.00 | 0.902 | 0.894 | 4688 | 238 | 6331 | 1886 | 0.74 | 0.13 | 61.8 | 60.4 | 25.3 | 22.1 | C |
| 7 | 1.00 | 1.00 | 0.902 | 0.894 | 5042 | 192 | 6331 | 1886 | 0.80 | 0.10 | 61.4 | 60.0 | 27.4 | 23.6 | C |
| 8 | 1.00 | 1.00 | 0.902 | 0.894 | 5024 | 200 | 6331 | 1886 | 0.79 | 0.11 | 61.4 | 60.0 | 27.3 | 23.5 | C |
| 9 | 1.00 | 1.00 | 0.902 | 0.894 | 4095 | 144 | 6331 | 1886 | 0.65 | 0.08 | 62.5 | 61.1 | 21.8 | 19.0 | B |
| 10 | 1.00 | 1.00 | 0.902 | 0.894 | 4237 | 176 | 6331 | 1886 | 0.67 | 0.09 | 62.3 | 60.9 | 22.7 | 19.8 | B |
| 11 | 1.00 | 1.00 | 0.902 | 0.894 | 4561 | 142 | 6331 | 1886 | 0.72 | 0.08 | 62.0 | 60.7 | 24.5 | 21.2 | C |
| 12 | 1.00 | 1.00 | 0.902 | 0.894 | 4558 | 148 | 6331 | 1886 | 0.72 | 0.08 | 62.0 | 60.7 | 24.5 | 21.2 | C |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.901 | 4423 | 6377 | 0.69 | 63.9 | 23.1 | C |
| 2 | 1.00 | 0.901 | 5122 | 6377 | 0.80 | 59.6 | 28.6 | D |
| 3 | 1.00 | 0.901 | 4863 | 6377 | 0.76 | 61.4 | 26.4 | D |
| 4 | 1.00 | 0.901 | 4848 | 6377 | 0.76 | 61.5 | 26.3 | D |
| 5 | 1.00 | 0.901 | 4589 | 6377 | 0.72 | 63.0 | 24.3 | C |
| 6 | 1.00 | 0.901 | 4691 | 6377 | 0.74 | 62.5 | 25.0 | C |
| 7 | 1.00 | 0.901 | 5047 | 6377 | 0.79 | 60.2 | 27.9 | D |
| 8 | 1.00 | 0.901 | 5028 | 6377 | 0.79 | 60.3 | 27.8 | D |
| 9 | 1.00 | 0.901 | 4099 | 6377 | 0.64 | 65.2 | 21.0 | C |
| 10 | 1.00 | 0.901 | 4240 | 6377 | 0.66 | 64.7 | 21.8 | C |
| 11 | 1.00 | 0.901 | 4565 | 6377 | 0.72 | 63.2 | 24.1 | C |
| 12 | 1.00 | 0.901 | 4562 | 6377 | 0.72 | 63.2 | 24.1 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.901 | 0.949 | 4423 | 323 | 6331 | 1796 | 0.70 | 0.18 | 61.8 | 57.1 | 23.9 | 23.7 | C |
| 2 | 1.00 | 1.00 | 0.901 | 0.949 | 5122 | 297 | 6331 | 1796 | 0.81 | 0.17 | 61.7 | 57.1 | 27.7 | 26.7 | C |
| 3 | 1.00 | 1.00 | 0.901 | 0.949 | 4863 | 263 | 6331 | 1796 | 0.77 | 0.15 | 61.9 | 57.2 | 26.2 | 25.5 | C |
| 4 | 1.00 | 1.00 | 0.901 | 0.949 | 4848 | 226 | 6331 | 1796 | 0.77 | 0.13 | 62.0 | 57.3 | 26.1 | 25.4 | C |
| 5 | 1.00 | 1.00 | 0.901 | 0.949 | 4589 | 338 | 6331 | 1796 | 0.72 | 0.19 | 61.7 | 57.0 | 24.8 | 24.4 | C |
| 6 | 1.00 | 1.00 | 0.901 | 0.949 | 4691 | 311 | 6331 | 1796 | 0.74 | 0.17 | 61.8 | 57.1 | 25.3 | 24.8 | C |
| 7 | 1.00 | 1.00 | 0.901 | 0.949 | 5047 | 275 | 6331 | 1796 | 0.80 | 0.15 | 61.8 | 57.2 | 27.2 | 26.3 | C |
| 8 | 1.00 | 1.00 | 0.901 | 0.949 | 5028 | 236 | 6331 | 1796 | 0.79 | 0.13 | 61.9 | 57.3 | 27.1 | 26.2 | C |
| 9 | 1.00 | 1.00 | 0.901 | 0.949 | 4099 | 249 | 6331 | 1796 | 0.65 | 0.14 | 61.9 | 57.2 | 22.1 | 22.0 | C |
| 10 | 1.00 | 1.00 | 0.901 | 0.949 | 4240 | 229 | 6331 | 1796 | 0.67 | 0.13 | 62.0 | 57.3 | 22.8 | 22.6 | C |
| 11 | 1.00 | 1.00 | 0.901 | 0.949 | 4565 | 202 | 6331 | 1796 | 0.72 | 0.11 | 62.0 | 57.4 | 24.5 | 24.1 | C |
| 12 | 1.00 | 1.00 | 0.901 | 0.949 | 4562 | 173 | 6331 | 1796 | 0.72 | 0.10 | 62.1 | 57.4 | 24.5 | 24.1 | C |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.901 | 4082 | 6404 | 0.64 | 66.0 | 20.6 | C |
| 2 | 1.00 | 0.901 | 4809 | 6404 | 0.75 | 62.4 | 25.7 | C |
| 3 | 1.00 | 0.901 | 4586 | 6404 | 0.72 | 63.7 | 24.0 | C |
| 4 | 1.00 | 0.901 | 4610 | 6404 | 0.72 | 63.5 | 24.2 | C |
| 5 | 1.00 | 0.901 | 4233 | 6404 | 0.66 | 65.4 | 21.6 | C |
| 6 | 1.00 | 0.901 | 4364 | 6404 | 0.68 | 64.8 | 22.5 | C |
| 7 | 1.00 | 0.901 | 4757 | 6404 | 0.74 | 62.7 | 25.3 | C |
| 8 | 1.00 | 0.901 | 4779 | 6404 | 0.75 | 62.5 | 25.5 | C |
| 9 | 1.00 | 0.901 | 3837 | 6404 | 0.60 | 66.7 | 19.2 | C |
| 10 | 1.00 | 0.901 | 3999 | 6404 | 0.62 | 66.3 | 20.1 | C |
| 11 | 1.00 | 0.901 | 4352 | 6404 | 0.68 | 64.9 | 22.4 | C |
| 12 | 1.00 | 0.901 | 4380 | 6404 | 0.68 | 64.7 | 22.6 | C |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.898 | 0.941 | 4367 | 271 | 6331 | 1886 | 0.69 | 0.14 | 62.2 | 60.9 | 23.4 | 20.1 | C |
| 2 | 1.00 | 1.00 | 0.898 | 0.941 | 5173 | 348 | 6331 | 1886 | 0.82 | 0.18 | 61.3 | 60.0 | 28.1 | 23.6 | C |
| 3 | 1.00 | 1.00 | 0.898 | 0.941 | 4986 | 385 | 6331 | 1886 | 0.79 | 0.20 | 61.5 | 60.2 | 27.0 | 23.0 | C |
| 4 | 1.00 | 1.00 | 0.898 | 0.941 | 4987 | 361 | 6331 | 1886 | 0.79 | 0.19 | 61.5 | 60.2 | 27.0 | 22.9 | C |
| 5 | 1.00 | 1.00 | 0.898 | 0.941 | 4530 | 283 | 6331 | 1886 | 0.72 | 0.15 | 62.0 | 60.7 | 24.4 | 20.8 | C |
| 6 | 1.00 | 1.00 | 0.898 | 0.941 | 4741 | 362 | 6331 | 1886 | 0.75 | 0.19 | 61.8 | 60.5 | 25.6 | 21.9 | C |
| 7 | 1.00 | 1.00 | 0.898 | 0.941 | 5175 | 402 | 6331 | 1886 | 0.82 | 0.21 | 61.2 | 59.9 | 28.2 | 23.8 | C |
| 8 | 1.00 | 1.00 | 0.898 | 0.941 | 5172 | 377 | 6331 | 1886 | 0.82 | 0.20 | 61.2 | 60.0 | 28.2 | 23.7 | C |
| 9 | 1.00 | 1.00 | 0.898 | 0.941 | 4058 | 208 | 6331 | 1886 | 0.64 | 0.11 | 62.5 | 61.1 | 21.6 | 19.0 | B |
| 10 | 1.00 | 1.00 | 0.898 | 0.941 | 4279 | 267 | 6331 | 1886 | 0.68 | 0.14 | 62.3 | 60.9 | 22.9 | 19.7 | B |
| 11 | 1.00 | 1.00 | 0.898 | 0.941 | 4661 | 295 | 6331 | 1886 | 0.74 | 0.16 | 61.9 | 60.6 | 25.1 | 21.4 | C |
| 12 | 1.00 | 1.00 | 0.898 | 0.941 | 4671 | 277 | 6331 | 1886 | 0.74 | 0.15 | 61.9 | 60.6 | 25.2 | 21.4 | C |

## Segment 17: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.900 | 4370 | 6433 | 0.68 | 65.5 | 22.2 | C |
| 2 | 1.00 | 0.900 | 5178 | 6433 | 0.80 | 60.3 | 28.6 | D |
| 3 | 1.00 | 0.900 | 4993 | 6433 | 0.78 | 61.7 | 27.0 | D |
| 4 | 1.00 | 0.900 | 4993 | 6433 | 0.78 | 61.7 | 27.0 | D |
| 5 | 1.00 | 0.900 | 4533 | 6433 | 0.70 | 64.6 | 23.4 | C |
| 6 | 1.00 | 0.900 | 4748 | 6433 | 0.74 | 63.4 | 25.0 | C |
| 7 | 1.00 | 0.900 | 5182 | 6433 | 0.81 | 60.3 | 28.6 | D |
| 8 | 1.00 | 0.900 | 5179 | 6433 | 0.81 | 60.3 | 28.6 | D |
| 9 | 1.00 | 0.900 | 4059 | 6433 | 0.63 | 66.8 | 20.3 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10 | 1.00 | 0.900 | 4282 | 6433 | 0.67 | 65.9 | 21.7 | C |
| 11 | 1.00 | 0.900 | 4666 | 6433 | 0.73 | 63.9 | 24.3 | C |
| 12 | 1.00 | 0.900 | 4674 | 6433 | 0.73 | 63.8 | 24.4 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 19012 | 18872 | 16.74 | 64.2 | 23.1 | 20.8 | 18.60 | D |
| 2 | 22399 | 22253 | 48.29 | 59.4 | 29.5 | 26.5 | 20.10 | E |
| 3 | 21399 | 21258 | 35.99 | 61.1 | 27.4 | 24.6 | 19.50 | D |
| 4 | 21393 | 21255 | 36.09 | 61.1 | 27.4 | 24.6 | 19.60 | D |
| 5 | 19721 | 19574 | 21.36 | 63.4 | 24.3 | 21.9 | 18.80 | D |
| 6 | 20445 | 20293 | 26.89 | 62.5 | 25.6 | 23.0 | 19.10 | D |
| 7 | 22203 | 22055 | 45.10 | 59.8 | 29.0 | 26.0 | 20.00 | D |
| 8 | 22186 | 22042 | 45.19 | 59.8 | 29.0 | 26.0 | 20.00 | D |
| 9 | 17748 | 17640 | 10.81 | 65.4 | 21.2 | 19.1 | 18.30 | C |
| 10 | 18574 | 18463 | 14.85 | 64.6 | 22.5 | 20.2 | 18.50 | D |
| 11 | 20156 | 20048 | 25.25 | 62.7 | 25.1 | 22.6 | 19.00 | D |
| 12 | 20190 | 20084 | 25.76 | 62.7 | 25.2 | 22.7 | 19.10 | D |

## Facility Overall Results

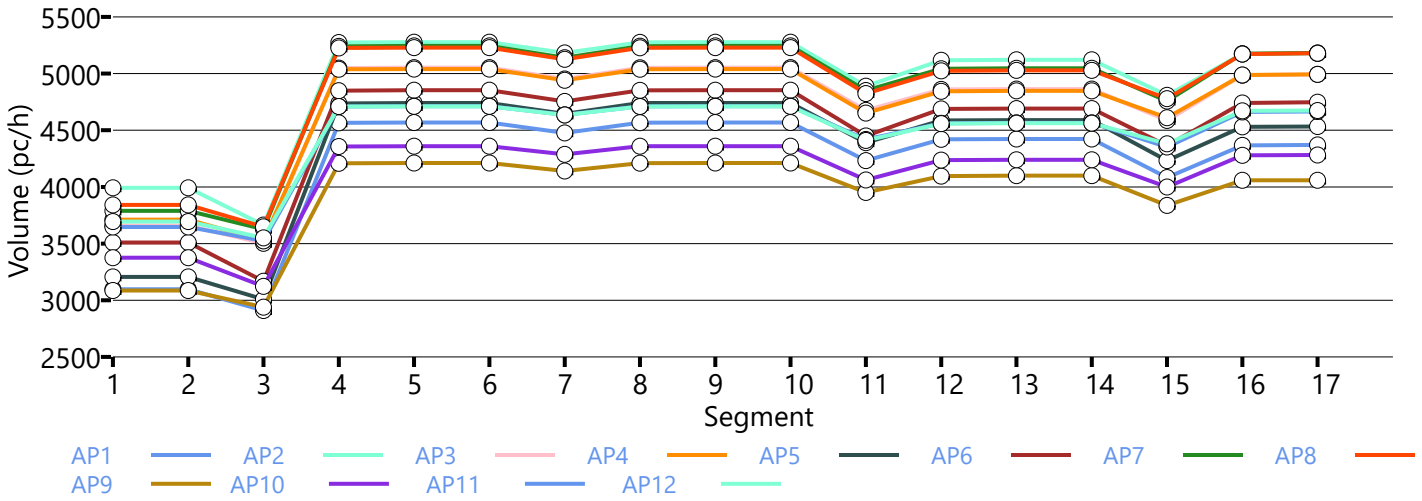
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 62.0 | Density, veh/mi/ln | 23.2 |
| Average Travel Time, min | 19.30 | Density, pc/mi/ln | 25.8 |

## Messages

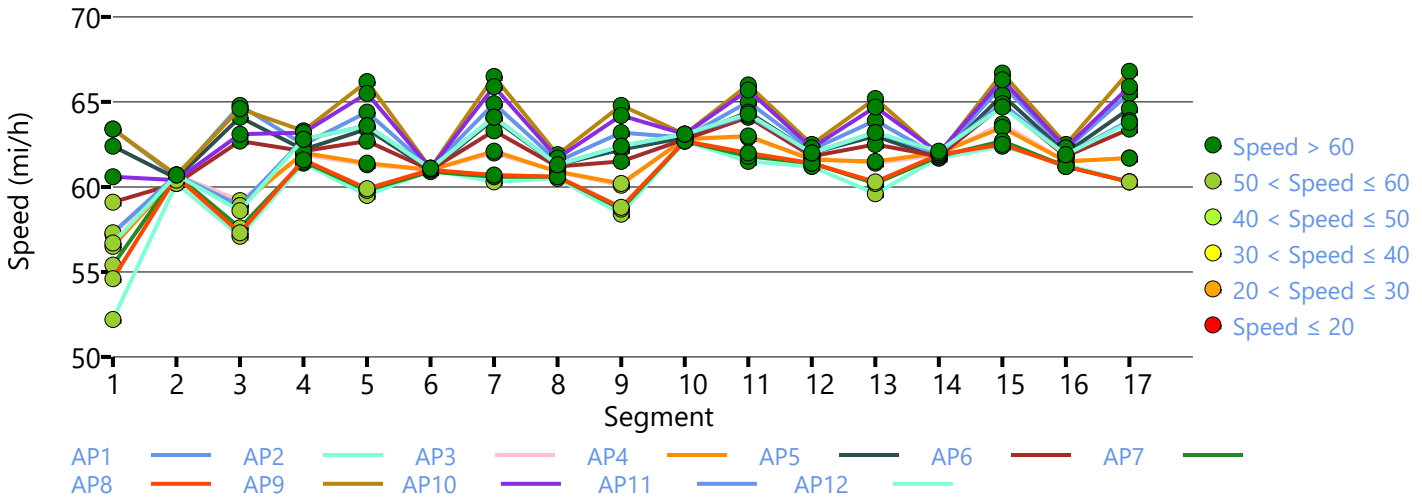
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

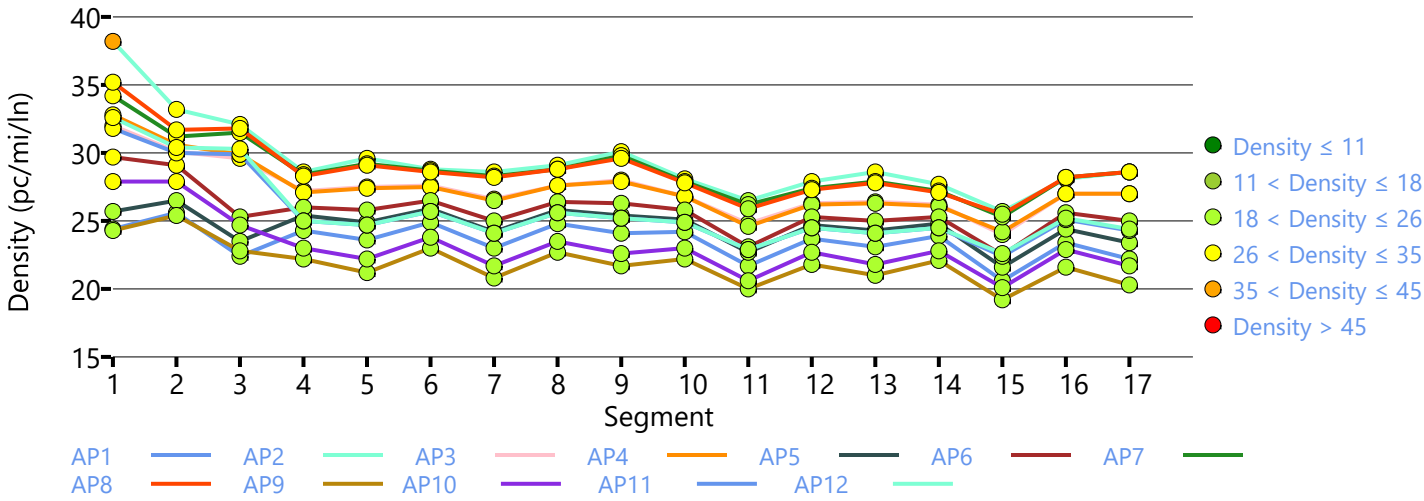
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | NB I-90/94 WIS 33 to US 12 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 18 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 26.35 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | STH 33 to USH 12 | 66971 | 2 |
| 2 | Diverge | Diverge | USH 12 WB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12 between on and off | 1694 | 2 |
| 4 | Merge | Merge | USH 12 NB On | 831 | 2 |
| 5 | Merge | Merge | USH 12 WB On | 1500 | 2 |
| 6 | Basic | Basic | STH 23 to USH 12 | 6984 | 2 |
| 7 | Diverge | Diverge | STH 23 WB Off | 1500 | 2 |
| 8 | Basic | Basic | STH 23 between on and off | 3184 | 2 |
| 9 | Merge | Merge | STH 23 WB On | 1500 | 2 |
| 10 | Basic | Basic | STH 13 to STH 23 | 7816 | 2 |
| 11 | Diverge | Diverge | STH 13 WB Off | 1500 | 2 |
| 12 | Basic | Basic | STH 13 between on and off | 1620 | 2 |
| 13 | Merge | Merge | STH 13 WB On | 1500 | 2 |
| 14 | Basic | Basic | USH 12/STH 16 to STH 13 | 4727 | 2 |
| 15 | Diverge | Diverge | USH 12/STH 16 WB Off | 1500 | 2 |
| 16 | Basic | Basic | USH 12/STH 16 between on and off | 2705 | 2 |
| 17 | Merge | Merge | USH 12/STH 16 WB On | 1500 | 2 |
| 18 | Basic | Basic | CTH HH to USH 12/STH 16 | 30590 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3760 | 4289 | 0.88 | 56.3 | 33.4 | D |
| 2 | 1.00 | 0.849 | 3355 | 4289 | 0.78 | 61.4 | 27.3 | D |
| 3 | 1.00 | 0.849 | 3389 | 4289 | 0.79 | 61.1 | 27.7 | D |
| 4 | 1.00 | 0.849 | 3466 | 4289 | 0.81 | 60.2 | 28.8 | D |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 0.849 | 3931 | 4289 | 0.92 | 53.8 | 36.5 | E |
| 6 | 1.00 | 0.849 | 3506 | 4289 | 0.82 | 59.7 | 29.4 | D |
| 7 | 1.00 | 0.849 | 3543 | 4289 | 0.83 | 59.2 | 29.9 | D |
| 8 | 1.00 | 0.849 | 3622 | 4289 | 0.84 | 58.2 | 31.1 | D |
| 9 | 1.00 | 0.849 | 3948 | 4289 | 0.92 | 53.5 | 36.9 | E |
| 10 | 1.00 | 0.849 | 3521 | 4289 | 0.82 | 59.5 | 29.6 | D |
| 11 | 1.00 | 0.849 | 3557 | 4289 | 0.83 | 59.1 | 30.1 | D |
| 12 | 1.00 | 0.849 | 3636 | 4289 | 0.85 | 58.0 | 31.3 | D |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.914 | 3760 | 1165 | 4221 | 1886 | 0.89 | 0.62 | 58.2 | 58.2 | 32.3 | 32.1 | D |
| 2 | 1.00 | 1.00 | 0.849 | 0.914 | 3355 | 937 | 4221 | 1886 | 0.79 | 0.50 | 58.8 | 58.8 | 28.5 | 28.6 | D |
| 3 | 1.00 | 1.00 | 0.849 | 0.914 | 3389 | 1126 | 4221 | 1886 | 0.80 | 0.60 | 58.3 | 58.3 | 29.1 | 28.9 | D |
| 4 | 1.00 | 1.00 | 0.849 | 0.914 | 3466 | 982 | 4221 | 1886 | 0.82 | 0.52 | 58.6 | 58.6 | 29.6 | 29.6 | D |
| 5 | 1.00 | 1.00 | 0.849 | 0.914 | 3931 | 1271 | 4221 | 1886 | 0.93 | 0.67 | 57.9 | 57.9 | 33.9 | 33.5 | D |
| 6 | 1.00 | 1.00 | 0.849 | 0.914 | 3506 | 1022 | 4221 | 1886 | 0.83 | 0.54 | 58.6 | 58.6 | 29.9 | 29.9 | D |
| 7 | 1.00 | 1.00 | 0.849 | 0.914 | 3543 | 1229 | 4221 | 1886 | 0.84 | 0.65 | 58.1 | 58.1 | 30.5 | 30.2 | D |
| 8 | 1.00 | 1.00 | 0.849 | 0.914 | 3622 | 1072 | 4221 | 1886 | 0.86 | 0.57 | 58.4 | 58.4 | 31.0 | 30.9 | D |
| 9 | 1.00 | 1.00 | 0.849 | 0.914 | 3948 | 1213 | 4221 | 1886 | 0.94 | 0.64 | 58.1 | 58.1 | 34.0 | 33.7 | D |
| 10 | 1.00 | 1.00 | 0.849 | 0.914 | 3521 | 975 | 4221 | 1886 | 0.83 | 0.52 | 58.7 | 58.7 | 30.0 | 30.0 | D |
| 11 | 1.00 | 1.00 | 0.849 | 0.914 | 3557 | 1173 | 4221 | 1886 | 0.84 | 0.62 | 58.2 | 58.2 | 30.6 | 30.3 | D |
| 12 | 1.00 | 1.00 | 0.849 | 0.914 | 3636 | 1024 | 4221 | 1886 | 0.86 | 0.54 | 58.6 | 58.6 | 31.0 | 31.0 | D |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.824 | 2581 | 4244 | 0.61 | 65.6 | 19.7 | C |
| 2 | 1.00 | 0.824 | 2417 | 4244 | 0.57 | 65.7 | 18.3 | C |
| 3 | 1.00 | 0.824 | 2243 | 4244 | 0.53 | 65.7 | 16.9 | B |
| 4 | 1.00 | 0.824 | 2482 | 4244 | 0.58 | 65.7 | 18.8 | C |
| 5 | 1.00 | 0.824 | 2640 | 4244 | 0.62 | 65.3 | 20.2 | C |
| 6 | 1.00 | 0.824 | 2479 | 4244 | 0.58 | 65.7 | 18.8 | C |
| 7 | 1.00 | 0.824 | 2288 | 4244 | 0.54 | 65.7 | 17.3 | B |
| 8 | 1.00 | 0.824 | 2542 | 4244 | 0.60 | 65.7 | 19.3 | C |
| 9 | 1.00 | 0.824 | 2722 | 4244 | 0.64 | 65.0 | 20.9 | C |
| 10 | 1.00 | 0.824 | 2546 | 4244 | 0.60 | 65.7 | 19.4 | C |
| 11 | 1.00 | 0.824 | 2364 | 4244 | 0.56 | 65.7 | 17.9 | B |
| 12 | 1.00 | 0.824 | 2610 | 4244 | 0.61 | 65.5 | 19.9 | C |

## Segment 4: Merge

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.824 | 0.894 | 3299 | 718 | 4221 | 1796 | 0.78 | 0.40 | 58.8 | 58.8 | 28.1 | 25.7 | C |
| 2 | 1.00 | 1.00 | 0.824 | 0.894 | 3276 | 859 | 4221 | 1796 | 0.78 | 0.48 | 58.9 | 58.9 | 27.8 | 25.5 | C |
| 3 | 1.00 | 1.00 | 0.824 | 0.894 | 3025 | 782 | 4221 | 1796 | 0.72 | 0.44 | 59.5 | 59.5 | 25.4 | 23.6 | C |
| 4 | 1.00 | 1.00 | 0.824 | 0.894 | 3341 | 859 | 4221 | 1796 | 0.79 | 0.48 | 58.7 | 58.7 | 28.5 | 26.0 | C |
| 5 | 1.00 | 1.00 | 0.824 | 0.894 | 3424 | 784 | 4221 | 1796 | 0.81 | 0.44 | 58.4 | 58.4 | 29.3 | 26.7 | C |
| 6 | 1.00 | 1.00 | 0.824 | 0.894 | 3416 | 937 | 4221 | 1796 | 0.81 | 0.52 | 58.4 | 58.4 | 29.2 | 26.6 | C |
| 7 | 1.00 | 1.00 | 0.824 | 0.894 | 3141 | 853 | 4221 | 1796 | 0.74 | 0.48 | 59.2 | 59.2 | 26.5 | 24.4 | C |
| 8 | 1.00 | 1.00 | 0.824 | 0.894 | 3480 | 938 | 4221 | 1796 | 0.82 | 0.52 | 58.2 | 58.2 | 29.9 | 27.0 | C |
| 9 | 1.00 | 1.00 | 0.824 | 0.894 | 3470 | 748 | 4221 | 1796 | 0.82 | 0.42 | 58.3 | 58.3 | 29.8 | 27.1 | C |
| 10 | 1.00 | 1.00 | 0.824 | 0.894 | 3441 | 895 | 4221 | 1796 | 0.82 | 0.50 | 58.3 | 58.3 | 29.5 | 26.8 | C |
| 11 | 1.00 | 1.00 | 0.824 | 0.894 | 3178 | 814 | 4221 | 1796 | 0.75 | 0.45 | 59.1 | 59.1 | 26.9 | 24.8 | C |
| 12 | 1.00 | 1.00 | 0.824 | 0.894 | 3505 | 895 | 4221 | 1796 | 0.83 | 0.50 | 58.1 | 58.1 | 30.2 | 27.3 | C |

## Segment 5: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.840 | 0.962 | 3582 | 286 | 4221 | 1886 | 0.85 | 0.15 | 58.6 | 58.6 | 30.6 | 27.2 | C |
| 2 | 1.00 | 1.00 | 0.840 | 0.962 | 3566 | 280 | 4221 | 1886 | 0.84 | 0.15 | 58.7 | 58.7 | 30.4 | 27.1 | C |
| 3 | 1.00 | 1.00 | 0.840 | 0.962 | 3287 | 255 | 4221 | 1886 | 0.78 | 0.14 | 59.6 | 59.6 | 27.6 | 24.9 | C |
| 4 | 1.00 | 1.00 | 0.840 | 0.962 | 3558 | 209 | 4221 | 1886 | 0.84 | 0.11 | 58.7 | 58.7 | 30.3 | 27.1 | C |
| 5 | 1.00 | 1.00 | 0.840 | 0.962 | 3736 | 312 | 4221 | 1886 | 0.89 | 0.17 | 58.0 | 58.0 | 32.2 | 28.4 | D |
| 6 | 1.00 | 1.00 | 0.840 | 0.962 | 3736 | 306 | 4221 | 1886 | 0.89 | 0.16 | 58.0 | 58.0 | 32.2 | 28.4 | D |
| 7 | 1.00 | 1.00 | 0.840 | 0.962 | 3430 | 278 | 4221 | 1886 | 0.81 | 0.15 | 59.1 | 59.1 | 29.0 | 26.0 | C |
| 8 | 1.00 | 1.00 | 0.840 | 0.962 | 3721 | 228 | 4221 | 1886 | 0.88 | 0.12 | 58.0 | 58.0 | 32.1 | 28.3 | D |
| 9 | 1.00 | 1.00 | 0.840 | 0.962 | 3764 | 297 | 4221 | 1886 | 0.89 | 0.16 | 57.8 | 57.8 | 32.6 | 28.6 | D |
| 10 | 1.00 | 1.00 | 0.840 | 0.962 | 3742 | 292 | 4221 | 1886 | 0.89 | 0.15 | 57.9 | 57.9 | 32.3 | 28.5 | D |
| 11 | 1.00 | 1.00 | 0.840 | 0.962 | 3451 | 265 | 4221 | 1886 | 0.82 | 0.14 | 59.0 | 59.0 | 29.2 | 26.2 | C |
| 12 | 1.00 | 1.00 | 0.840 | 0.962 | 3730 | 217 | 4221 | 1886 | 0.88 | 0.12 | 58.0 | 58.0 | 32.2 | 28.4 | D |

## Segment 6: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.850 | 3581 | 4244 | 0.84 | 57.5 | 31.1 | D |
| 2 | 1.00 | 0.850 | 3564 | 4244 | 0.84 | 57.7 | 30.9 | D |
| 3 | 1.00 | 0.850 | 3285 | 4244 | 0.77 | 60.8 | 27.0 | D |
| 4 | 1.00 | 0.850 | 3546 | 4244 | 0.84 | 57.9 | 30.6 | D |
| 5 | 1.00 | 0.850 | 3736 | 4244 | 0.88 | 55.4 | 33.7 | D |
| 6 | 1.00 | 0.850 | 3735 | 4244 | 0.88 | 55.4 | 33.7 | D |
| 7 | 1.00 | 0.850 | 3429 | 4244 | 0.81 | 59.3 | 28.9 | D |
| 8 | 1.00 | 0.850 | 3709 | 4244 | 0.87 | 55.8 | 33.2 | D |
| 9 | 1.00 | 0.850 | 3762 | 4244 | 0.89 | 55.0 | 34.2 | D |
| 10 | 1.00 | 0.850 | 3740 | 4244 | 0.88 | 55.3 | 33.8 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | | 0.850 | | 3448 | | 4244 | | 0.81 | | 59.0 | | 29.2 | | D |
| 12 | 1.00 | | 0.850 | | 3718 | | 4244 | | 0.88 | | 55.6 | | 33.4 | | D |

## Segment 7: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.850 | 0.930 | 3581 | 234 | 4221 | 1976 | 0.85 | 0.12 | 62.1 | 62.1 | 28.8 | 31.6 | D |
| 2 | 1.00 | 1.00 | 0.850 | 0.930 | 3564 | 215 | 4221 | 1976 | 0.84 | 0.11 | 62.1 | 62.1 | 28.7 | 31.4 | D |
| 3 | 1.00 | 1.00 | 0.850 | 0.930 | 3285 | 255 | 4221 | 1976 | 0.78 | 0.13 | 62.0 | 62.0 | 26.5 | 29.0 | D |
| 4 | 1.00 | 1.00 | 0.850 | 0.930 | 3546 | 202 | 4221 | 1976 | 0.84 | 0.10 | 62.1 | 62.1 | 28.6 | 31.3 | D |
| 5 | 1.00 | 1.00 | 0.850 | 0.930 | 3736 | 256 | 4221 | 1976 | 0.89 | 0.13 | 62.0 | 62.0 | 30.1 | 32.9 | D |
| 6 | 1.00 | 1.00 | 0.850 | 0.930 | 3735 | 234 | 4221 | 1976 | 0.89 | 0.12 | 62.1 | 62.1 | 30.1 | 32.9 | D |
| 7 | 1.00 | 1.00 | 0.850 | 0.930 | 3429 | 278 | 4221 | 1976 | 0.81 | 0.14 | 62.0 | 62.0 | 27.7 | 30.3 | D |
| 8 | 1.00 | 1.00 | 0.850 | 0.930 | 3709 | 220 | 4221 | 1976 | 0.88 | 0.11 | 62.1 | 62.1 | 29.9 | 32.7 | D |
| 9 | 1.00 | 1.00 | 0.850 | 0.930 | 3762 | 244 | 4221 | 1976 | 0.89 | 0.12 | 62.0 | 62.0 | 30.3 | 33.1 | D |
| 10 | 1.00 | 1.00 | 0.850 | 0.930 | 3740 | 224 | 4221 | 1976 | 0.89 | 0.11 | 62.1 | 62.1 | 30.1 | 32.9 | D |
| 11 | 1.00 | 1.00 | 0.850 | 0.930 | 3448 | 266 | 4221 | 1976 | 0.82 | 0.13 | 62.0 | 62.0 | 27.8 | 30.4 | D |
| 12 | 1.00 | 1.00 | 0.850 | 0.930 | 3718 | 211 | 4221 | 1976 | 0.88 | 0.11 | 62.1 | 62.1 | 29.9 | 32.7 | D |

## Segment 8: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.844 | 3348 | 4230 | 0.79 | 59.7 | 28.0 | D |
| 2 | 1.00 | 0.844 | 3352 | 4230 | 0.79 | 59.7 | 28.1 | D |
| 3 | 1.00 | 0.844 | 3027 | 4230 | 0.72 | 62.5 | 24.2 | C |
| 4 | 1.00 | 0.844 | 3348 | 4230 | 0.79 | 59.7 | 28.0 | D |
| 5 | 1.00 | 0.844 | 3481 | 4230 | 0.82 | 58.3 | 29.8 | D |
| 6 | 1.00 | 0.844 | 3504 | 4230 | 0.83 | 58.0 | 30.2 | D |
| 7 | 1.00 | 0.844 | 3147 | 4230 | 0.74 | 61.6 | 25.6 | C |
| 8 | 1.00 | 0.844 | 3493 | 4230 | 0.83 | 58.1 | 30.1 | D |
| 9 | 1.00 | 0.844 | 3520 | 4230 | 0.83 | 57.8 | 30.4 | D |
| 10 | 1.00 | 0.844 | 3520 | 4230 | 0.83 | 57.8 | 30.4 | D |
| 11 | 1.00 | 0.844 | 3180 | 4230 | 0.75 | 61.3 | 25.9 | C |
| 12 | 1.00 | 0.844 | 3512 | 4230 | 0.83 | 57.9 | 30.3 | D |

## Segment 9: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.844 | 0.932 | 3760 | 412 | 4221 | 1886 | 0.89 | 0.22 | 58.4 | 58.4 | 32.2 | 27.8 | C |
| 2 | 1.00 | 1.00 | 0.844 | 0.932 | 3768 | 416 | 4221 | 1886 | 0.89 | 0.22 | 58.4 | 58.4 | 32.3 | 27.8 | C |
| 3 | 1.00 | 1.00 | 0.844 | 0.932 | 3491 | 464 | 4221 | 1886 | 0.83 | 0.25 | 59.5 | 59.5 | 29.3 | 25.6 | C |
| 4 | 1.00 | 1.00 | 0.844 | 0.932 | 3746 | 398 | 4221 | 1886 | 0.89 | 0.21 | 58.5 | 58.5 | 32.0 | 27.7 | C |
| 5 | 1.00 | 1.00 | 0.844 | 0.932 | 3931 | 450 | 4221 | 1886 | 0.93 | 0.24 | 57.6 | 57.6 | 34.1 | 29.1 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 1.00 | 0.844 | 0.932 | 3959 | 455 | 4221 | 1886 | 0.94 | 0.24 | 57.4 | 57.4 | 34.5 | 29.3 | D |
| 7 | 1.00 | 1.00 | 0.844 | 0.932 | 3653 | 506 | 4221 | 1886 | 0.87 | 0.27 | 58.9 | 58.9 | 31.0 | 26.9 | C |
| 8 | 1.00 | 1.00 | 0.844 | 0.932 | 3928 | 435 | 4221 | 1886 | 0.93 | 0.23 | 57.6 | 57.6 | 34.1 | 29.1 | D |
| 9 | 1.00 | 1.00 | 0.844 | 0.932 | 3949 | 429 | 4221 | 1886 | 0.94 | 0.23 | 57.5 | 57.5 | 34.3 | 29.2 | D |
| 10 | 1.00 | 1.00 | 0.844 | 0.932 | 3955 | 435 | 4221 | 1886 | 0.94 | 0.23 | 57.4 | 57.4 | 34.5 | 29.3 | D |
| 11 | 1.00 | 1.00 | 0.844 | 0.932 | 3663 | 483 | 4221 | 1886 | 0.87 | 0.26 | 58.8 | 58.8 | 31.1 | 27.0 | C |
| 12 | 1.00 | 1.00 | 0.844 | 0.932 | 3927 | 415 | 4221 | 1886 | 0.93 | 0.22 | 57.6 | 57.6 | 34.1 | 29.1 | D |

## Segment 10: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.854 | 3759 | 4244 | 0.89 | 55.1 | 34.1 | D |
| 2 | 1.00 | 0.854 | 3767 | 4244 | 0.89 | 54.9 | 34.3 | D |
| 3 | 1.00 | 0.854 | 3498 | 4244 | 0.82 | 58.5 | 29.9 | D |
| 4 | 1.00 | 0.854 | 3744 | 4244 | 0.88 | 55.3 | 33.9 | D |
| 5 | 1.00 | 0.854 | 3931 | 4244 | 0.93 | 52.5 | 37.4 | E |
| 6 | 1.00 | 0.854 | 3959 | 4244 | 0.93 | 52.0 | 38.1 | E |
| 7 | 1.00 | 0.854 | 3663 | 4244 | 0.86 | 56.4 | 32.5 | D |
| 8 | 1.00 | 0.854 | 3926 | 4244 | 0.93 | 52.6 | 37.3 | E |
| 9 | 1.00 | 0.854 | 3947 | 4244 | 0.93 | 52.2 | 37.8 | E |
| 10 | 1.00 | 0.854 | 3953 | 4244 | 0.93 | 52.2 | 37.9 | E |
| 11 | 1.00 | 0.854 | 3670 | 4244 | 0.86 | 56.3 | 32.6 | D |
| 12 | 1.00 | 0.854 | 3924 | 4244 | 0.92 | 52.6 | 37.3 | E |

## Segment 11: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.854 | 0.972 | 3759 | 264 | 4221 | 1796 | 0.89 | 0.15 | 57.2 | 57.2 | 32.9 | 32.6 | D |
| 2 | 1.00 | 1.00 | 0.854 | 0.972 | 3767 | 229 | 4221 | 1796 | 0.89 | 0.13 | 57.3 | 57.3 | 32.9 | 32.6 | D |
| 3 | 1.00 | 1.00 | 0.854 | 0.972 | 3498 | 263 | 4221 | 1796 | 0.83 | 0.15 | 57.2 | 57.2 | 30.6 | 30.3 | D |
| 4 | 1.00 | 1.00 | 0.854 | 0.972 | 3744 | 223 | 4221 | 1796 | 0.89 | 0.12 | 57.3 | 57.3 | 32.7 | 32.4 | D |
| 5 | 1.00 | 1.00 | 0.854 | 0.972 | 3931 | 289 | 4221 | 1796 | 0.93 | 0.16 | 57.1 | 57.1 | 34.4 | 34.0 | D |
| 6 | 1.00 | 1.00 | 0.854 | 0.972 | 3959 | 250 | 4221 | 1796 | 0.94 | 0.14 | 57.2 | 57.2 | 34.6 | 34.3 | D |
| 7 | 1.00 | 1.00 | 0.854 | 0.972 | 3663 | 287 | 4221 | 1796 | 0.87 | 0.16 | 57.2 | 57.2 | 32.0 | 31.7 | D |
| 8 | 1.00 | 1.00 | 0.854 | 0.972 | 3926 | 244 | 4221 | 1796 | 0.93 | 0.14 | 57.3 | 57.3 | 34.3 | 34.0 | D |
| 9 | 1.00 | 1.00 | 0.854 | 0.972 | 3947 | 276 | 4221 | 1796 | 0.94 | 0.15 | 57.2 | 57.2 | 34.5 | 34.2 | D |
| 10 | 1.00 | 1.00 | 0.854 | 0.972 | 3953 | 239 | 4221 | 1796 | 0.94 | 0.13 | 57.3 | 57.3 | 34.5 | 34.2 | D |
| 11 | 1.00 | 1.00 | 0.854 | 0.972 | 3670 | 274 | 4221 | 1796 | 0.87 | 0.15 | 57.2 | 57.2 | 32.1 | 31.8 | D |
| 12 | 1.00 | 1.00 | 0.854 | 0.972 | 3924 | 233 | 4221 | 1796 | 0.93 | 0.13 | 57.3 | 57.3 | 34.2 | 34.0 | D |

## Segment 12: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.845 | 3495 | 4237 | 0.82 | 58.3 | 30.0 | D |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.00 | 0.845 | 3543 | 4237 | 0.84 | 57.7 | 30.7 | D |
| 3 | 1.00 | 0.845 | 3232 | 4237 | 0.76 | 61.1 | 26.4 | D |
| 4 | 1.00 | 0.845 | 3527 | 4237 | 0.83 | 57.9 | 30.5 | D |
| 5 | 1.00 | 0.845 | 3640 | 4237 | 0.86 | 56.5 | 32.2 | D |
| 6 | 1.00 | 0.845 | 3714 | 4237 | 0.88 | 55.5 | 33.5 | D |
| 7 | 1.00 | 0.845 | 3372 | 4237 | 0.80 | 59.7 | 28.2 | D |
| 8 | 1.00 | 0.845 | 3688 | 4237 | 0.87 | 55.9 | 33.0 | D |
| 9 | 1.00 | 0.845 | 3672 | 4237 | 0.87 | 56.1 | 32.7 | D |
| 10 | 1.00 | 0.845 | 3721 | 4237 | 0.88 | 55.4 | 33.6 | D |
| 11 | 1.00 | 0.845 | 3394 | 4237 | 0.80 | 59.4 | 28.6 | D |
| 12 | 1.00 | 0.845 | 3698 | 4237 | 0.87 | 55.7 | 33.2 | D |

## Segment 13: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.845 | 0.934 | 3777 | 282 | 4221 | 1886 | 0.89 | 0.15 | 57.0 | 57.0 | 33.1 | 31.0 | D |
| 2 | 1.00 | 1.00 | 0.845 | 0.934 | 3802 | 259 | 4221 | 1886 | 0.90 | 0.14 | 56.9 | 56.9 | 33.4 | 31.2 | D |
| 3 | 1.00 | 1.00 | 0.845 | 0.934 | 3399 | 167 | 4221 | 1886 | 0.81 | 0.09 | 58.5 | 58.5 | 29.1 | 28.1 | D |
| 4 | 1.00 | 1.00 | 0.845 | 0.934 | 3682 | 155 | 4221 | 1886 | 0.87 | 0.08 | 57.4 | 57.4 | 32.1 | 30.3 | D |
| 5 | 1.00 | 1.00 | 0.845 | 0.934 | 3947 | 307 | 4221 | 1886 | 0.94 | 0.16 | 56.2 | 56.2 | 35.1 | 32.3 | D |
| 6 | 1.00 | 1.00 | 0.845 | 0.934 | 3997 | 283 | 4221 | 1886 | 0.95 | 0.15 | 55.9 | 55.9 | 35.8 | 32.7 | D |
| 7 | 1.00 | 1.00 | 0.845 | 0.934 | 3554 | 182 | 4221 | 1886 | 0.84 | 0.10 | 57.9 | 57.9 | 30.7 | 29.3 | D |
| 8 | 1.00 | 1.00 | 0.845 | 0.934 | 3857 | 169 | 4221 | 1886 | 0.91 | 0.09 | 56.6 | 56.6 | 34.1 | 31.6 | D |
| 9 | 1.00 | 1.00 | 0.845 | 0.934 | 3965 | 293 | 4221 | 1886 | 0.94 | 0.16 | 56.1 | 56.1 | 35.3 | 32.4 | D |
| 10 | 1.00 | 1.00 | 0.845 | 0.934 | 3991 | 270 | 4221 | 1886 | 0.95 | 0.14 | 55.9 | 55.9 | 35.7 | 32.6 | D |
| 11 | 1.00 | 1.00 | 0.845 | 0.934 | 3567 | 173 | 4221 | 1886 | 0.85 | 0.09 | 57.9 | 57.9 | 30.8 | 29.4 | D |
| 12 | 1.00 | 1.00 | 0.845 | 0.934 | 3860 | 162 | 4221 | 1886 | 0.91 | 0.09 | 56.6 | 56.6 | 34.1 | 31.7 | D |

## Segment 14: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3788 | 4244 | 0.89 | 54.7 | 34.6 | D |
| 2 | 1.00 | 0.849 | 3812 | 4244 | 0.90 | 54.3 | 35.1 | E |
| 3 | 1.00 | 0.849 | 3400 | 4244 | 0.80 | 59.6 | 28.5 | D |
| 4 | 1.00 | 0.849 | 3681 | 4244 | 0.87 | 56.2 | 32.7 | D |
| 5 | 1.00 | 0.849 | 3961 | 4244 | 0.93 | 52.0 | 38.1 | E |
| 6 | 1.00 | 0.849 | 4007 | 4244 | 0.94 | 51.3 | 39.1 | E |
| 7 | 1.00 | 0.849 | 3556 | 4244 | 0.84 | 57.8 | 30.8 | D |
| 8 | 1.00 | 0.849 | 3856 | 4244 | 0.91 | 53.7 | 35.9 | E |
| 9 | 1.00 | 0.849 | 3978 | 4244 | 0.94 | 51.8 | 38.4 | E |
| 10 | 1.00 | 0.849 | 4000 | 4244 | 0.94 | 51.4 | 38.9 | E |
| 11 | 1.00 | 0.849 | 3569 | 4244 | 0.84 | 57.6 | 31.0 | D |
| 12 | 1.00 | 0.849 | 3859 | 4244 | 0.91 | 53.6 | 36.0 | E |

## Segment 15: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.888 | 3788 | 221 | 4221 | 1976 | 0.90 | 0.11 | 62.1 | 62.1 | 30.5 | 31.0 | D |
| 2 | 1.00 | 1.00 | 0.849 | 0.888 | 3812 | 229 | 4221 | 1976 | 0.90 | 0.12 | 62.1 | 62.1 | 30.7 | 31.2 | D |
| 3 | 1.00 | 1.00 | 0.849 | 0.888 | 3400 | 223 | 4221 | 1976 | 0.81 | 0.11 | 62.1 | 62.1 | 27.4 | 27.6 | C |
| 4 | 1.00 | 1.00 | 0.849 | 0.888 | 3681 | 277 | 4221 | 1976 | 0.87 | 0.14 | 62.0 | 62.0 | 29.7 | 30.1 | D |
| 5 | 1.00 | 1.00 | 0.849 | 0.888 | 3961 | 241 | 4221 | 1976 | 0.94 | 0.12 | 62.0 | 62.0 | 31.9 | 32.5 | D |
| 6 | 1.00 | 1.00 | 0.849 | 0.888 | 4007 | 250 | 4221 | 1976 | 0.95 | 0.13 | 62.0 | 62.0 | 32.3 | 32.9 | D |
| 7 | 1.00 | 1.00 | 0.849 | 0.888 | 3556 | 243 | 4221 | 1976 | 0.84 | 0.12 | 62.0 | 62.0 | 28.7 | 29.0 | D |
| 8 | 1.00 | 1.00 | 0.849 | 0.888 | 3856 | 302 | 4221 | 1976 | 0.91 | 0.15 | 61.9 | 61.9 | 31.1 | 31.6 | D |
| 9 | 1.00 | 1.00 | 0.849 | 0.888 | 3978 | 230 | 4221 | 1976 | 0.94 | 0.12 | 62.1 | 62.1 | 32.0 | 32.6 | D |
| 10 | 1.00 | 1.00 | 0.849 | 0.888 | 4000 | 238 | 4221 | 1976 | 0.95 | 0.12 | 62.0 | 62.0 | 32.3 | 32.8 | D |
| 11 | 1.00 | 1.00 | 0.849 | 0.888 | 3569 | 232 | 4221 | 1976 | 0.85 | 0.12 | 62.1 | 62.1 | 28.7 | 29.1 | D |
| 12 | 1.00 | 1.00 | 0.849 | 0.888 | 3859 | 288 | 4221 | 1976 | 0.91 | 0.15 | 61.9 | 61.9 | 31.2 | 31.6 | D |

## Segment 16: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.846 | 3570 | 4251 | 0.84 | 57.8 | 30.9 | D |
| 2 | 1.00 | 0.846 | 3585 | 4251 | 0.84 | 57.6 | 31.1 | D |
| 3 | 1.00 | 0.846 | 3178 | 4251 | 0.75 | 62.0 | 25.6 | C |
| 4 | 1.00 | 0.846 | 3403 | 4251 | 0.80 | 59.8 | 28.5 | D |
| 5 | 1.00 | 0.846 | 3722 | 4251 | 0.88 | 55.8 | 33.4 | D |
| 6 | 1.00 | 0.846 | 3759 | 4251 | 0.88 | 55.3 | 34.0 | D |
| 7 | 1.00 | 0.846 | 3313 | 4251 | 0.78 | 60.7 | 27.3 | D |
| 8 | 1.00 | 0.846 | 3553 | 4251 | 0.84 | 58.0 | 30.6 | D |
| 9 | 1.00 | 0.846 | 3751 | 4251 | 0.88 | 55.4 | 33.9 | D |
| 10 | 1.00 | 0.846 | 3765 | 4251 | 0.89 | 55.2 | 34.1 | D |
| 11 | 1.00 | 0.846 | 3338 | 4251 | 0.79 | 60.5 | 27.6 | D |
| 12 | 1.00 | 0.846 | 3570 | 4251 | 0.84 | 57.8 | 30.9 | D |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.846 | 0.910 | 3671 | 101 | 4221 | 1976 | 0.87 | 0.05 | 58.9 | 58.9 | 31.2 | 27.6 | C |
| 2 | 1.00 | 1.00 | 0.846 | 0.910 | 3727 | 142 | 4221 | 1976 | 0.88 | 0.07 | 58.7 | 58.7 | 31.7 | 28.0 | C |
| 3 | 1.00 | 1.00 | 0.846 | 0.910 | 3280 | 102 | 4221 | 1976 | 0.78 | 0.05 | 60.3 | 60.3 | 27.2 | 24.5 | C |
| 4 | 1.00 | 1.00 | 0.846 | 0.910 | 3501 | 98 | 4221 | 1976 | 0.83 | 0.05 | 59.6 | 59.6 | 29.4 | 26.2 | C |
| 5 | 1.00 | 1.00 | 0.846 | 0.910 | 3833 | 111 | 4221 | 1976 | 0.91 | 0.06 | 58.2 | 58.2 | 32.9 | 28.8 | D |
| 6 | 1.00 | 1.00 | 0.846 | 0.910 | 3914 | 155 | 4221 | 1976 | 0.93 | 0.08 | 57.8 | 57.8 | 33.9 | 29.4 | D |
| 7 | 1.00 | 1.00 | 0.846 | 0.910 | 3425 | 112 | 4221 | 1976 | 0.81 | 0.06 | 59.8 | 59.8 | 28.6 | 25.6 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | 1.00 | 0.846 | 0.910 | 3660 | 107 | 4221 | 1976 | 0.87 | 0.05 | 59.0 | 59.0 | 31.0 | 27.5 | C |
| 9 | 1.00 | 1.00 | 0.846 | 0.910 | 3856 | 105 | 4221 | 1976 | 0.91 | 0.05 | 58.1 | 58.1 | 33.2 | 29.0 | D |
| 10 | 1.00 | 1.00 | 0.846 | 0.910 | 3912 | 147 | 4221 | 1976 | 0.93 | 0.07 | 57.8 | 57.8 | 33.8 | 29.4 | D |
| 11 | 1.00 | 1.00 | 0.846 | 0.910 | 3445 | 107 | 4221 | 1976 | 0.82 | 0.05 | 59.7 | 59.7 | 28.9 | 25.8 | C |
| 12 | 1.00 | 1.00 | 0.846 | 0.910 | 3672 | 102 | 4221 | 1976 | 0.87 | 0.05 | 58.9 | 58.9 | 31.2 | 27.6 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.848 | 3670 | 4278 | 0.86 | 57.3 | 32.0 | D |
| 2 | 1.00 | 0.848 | 3729 | 4278 | 0.87 | 56.5 | 33.0 | D |
| 3 | 1.00 | 0.848 | 3281 | 4278 | 0.77 | 61.9 | 26.5 | D |
| 4 | 1.00 | 0.848 | 3500 | 4278 | 0.82 | 59.5 | 29.4 | D |
| 5 | 1.00 | 0.848 | 3833 | 4278 | 0.90 | 55.0 | 34.8 | D |
| 6 | 1.00 | 0.848 | 3916 | 4278 | 0.92 | 53.7 | 36.5 | E |
| 7 | 1.00 | 0.848 | 3426 | 4278 | 0.80 | 60.3 | 28.4 | D |
| 8 | 1.00 | 0.848 | 3659 | 4278 | 0.86 | 57.4 | 31.9 | D |
| 9 | 1.00 | 0.848 | 3855 | 4278 | 0.90 | 54.6 | 35.3 | E |
| 10 | 1.00 | 0.848 | 3914 | 4278 | 0.91 | 53.7 | 36.4 | E |
| 11 | 1.00 | 0.848 | 3445 | 4278 | 0.81 | 60.1 | 28.7 | D |
| 12 | 1.00 | 0.848 | 3671 | 4278 | 0.86 | 57.3 | 32.0 | D |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 20646 | 20558 | 60.08 | 56.9 | 32.5 | 27.6 | 27.80 | E |
| 2 | 19604 | 19511 | 44.68 | 59.0 | 29.7 | 25.3 | 26.80 | E |
| 3 | 18639 | 18554 | 32.11 | 61.0 | 27.3 | 23.2 | 25.90 | D |
| 4 | 19546 | 19467 | 42.36 | 59.4 | 29.5 | 25.0 | 26.60 | E |
| 5 | 21567 | 21471 | 78.30 | 54.6 | 35.3 | 29.9 | 28.90 | E |
| 6 | 20535 | 20433 | 59.48 | 56.9 | 32.3 | 27.5 | 27.80 | E |
| 7 | 19474 | 19382 | 42.32 | 59.4 | 29.3 | 24.9 | 26.60 | E |
| 8 | 20433 | 20346 | 55.85 | 57.4 | 31.8 | 27.0 | 27.50 | E |
| 9 | 21685 | 21593 | 80.94 | 54.3 | 35.7 | 30.3 | 29.10 | E |
| 10 | 20577 | 20479 | 60.04 | 56.8 | 32.4 | 27.5 | 27.80 | E |
| 11 | 19567 | 19479 | 43.26 | 59.2 | 29.6 | 25.1 | 26.70 | E |
| 12 | 20500 | 20417 | 56.90 | 57.3 | 32.0 | 27.1 | 27.60 | E |

## Facility Overall Results

| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 57.5 | Density, veh/mi/ln | 26.7 |
| Average Travel Time, min | 27.50 | Density, pc/mi/ln | 31.5 |

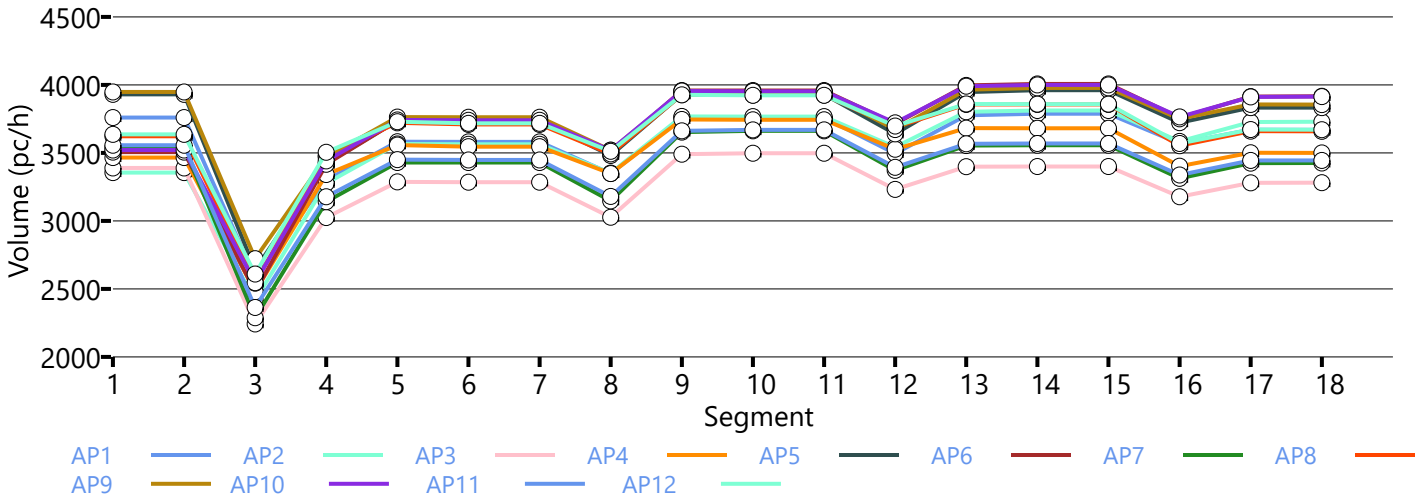
## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with |

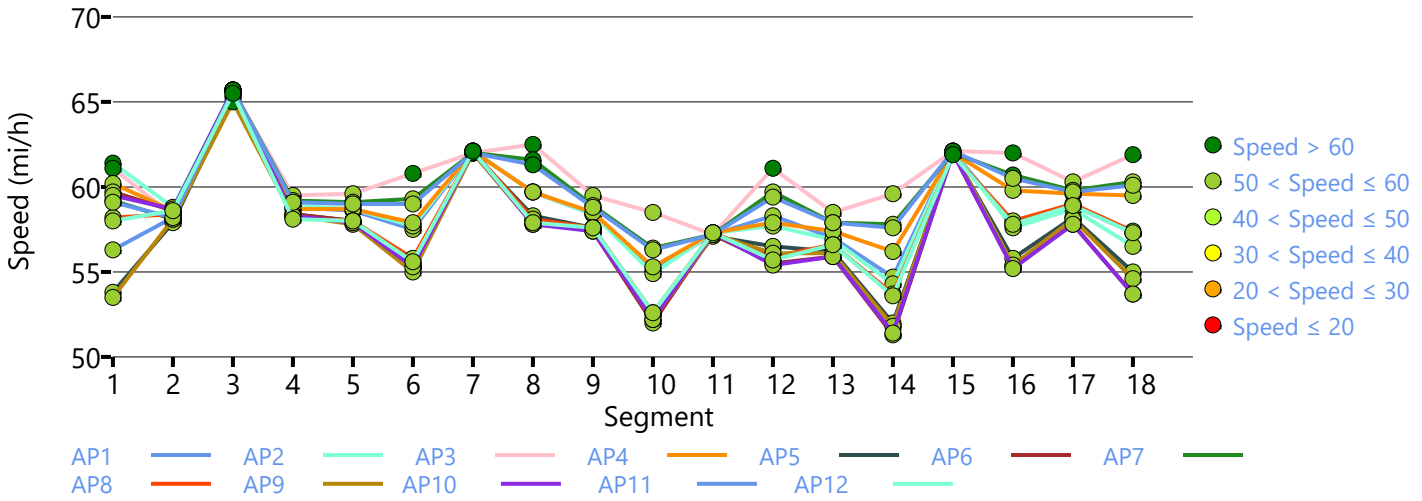
| | |
|---|---|
| | no queuing). |

| Comments |
|---|
| |

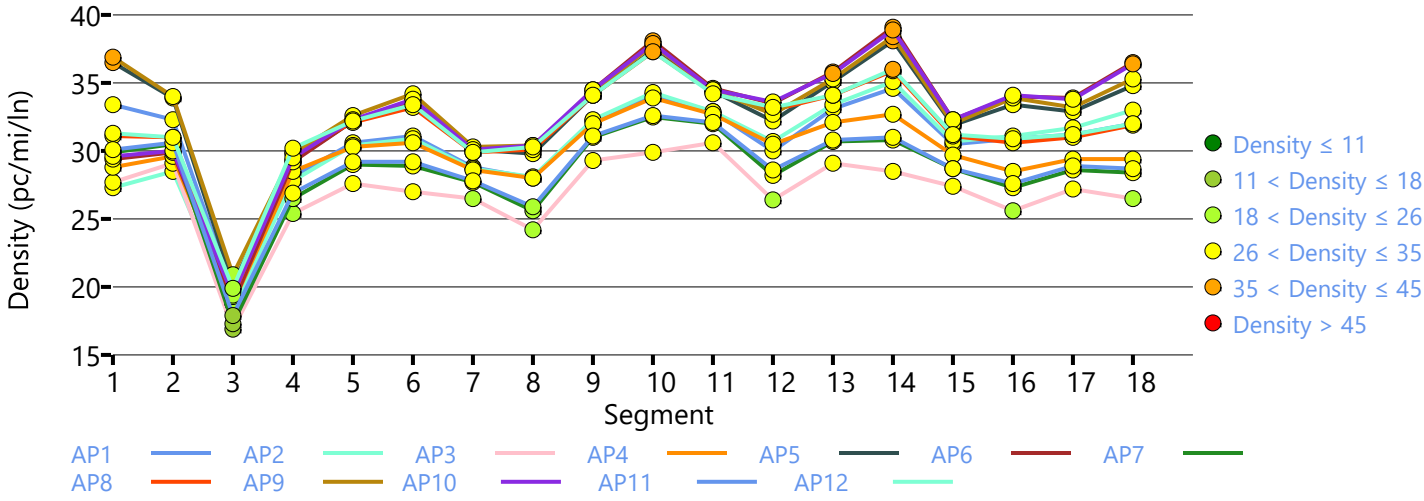
## Volume Distribution




## Speed Distribution




## Density Distribution

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Friday Afternoon Peak |
| Project Description | SB I-90/94 WIS 33 to US 12 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 22 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 28.39 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | CTH HH to USH 12/STH 16 | 29955 | 2 |
| 2 | Diverge | Diverge | USH 12/STH 16 EB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12/STH 16 between on and off | 2202 | 2 |
| 4 | Merge | Merge | USH 12/STH 16 EB On | 1500 | 2 |
| 5 | Basic | Basic | USH 12/STH 16 to STH 13 | 5695 | 2 |
| 6 | Diverge | Diverge | STH 13 EB Off | 1500 | 2 |
| 7 | Basic | Basic | STH 13 between on and off | 1465 | 2 |
| 8 | Merge | Merge | STH 13 EB On | 1500 | 2 |
| 9 | Basic | Basic | STH 13 to STH 23 | 7583 | 2 |
| 10 | Diverge | Diverge | STH 23 EB Off | 1500 | 2 |
| 11 | Basic | Basic | STH 23 between on and off | 2771 | 2 |
| 12 | Merge | Merge | STH 23 EB On | 1500 | 2 |
| 13 | Basic | Basic | STH 23 to USH 12 | 6118 | 2 |
| 14 | Diverge | Diverge | USH 12 EB Off | 1500 | 2 |
| 15 | Basic | Basic | USH 12 between on and off | 1396 | 2 |
| 16 | Merge | Merge | USH 12 SB on | 1283 | 2 |
| 17 | Merge | Merge | USH 12 EB On | 1500 | 2 |
| 18 | Basic | Basic | USH 12 to STH 33 | 67891 | 2 |
| 19 | Diverge | Diverge | STH 33 EB Off | 1500 | 2 |
| 20 | Basic | Basic | STH 33 between on and off | 1344 | 2 |
| 21 | Merge | Merge | STH 33 EB On | 1500 | 2 |
| 22 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 3243 | 4278 | 0.76 | 62.3 | 26.0 | C |
| 2 | 1.00 | 0.849 | 3066 | 4278 | 0.72 | 63.9 | 24.0 | C |
| 3 | 1.00 | 0.849 | 3148 | 4278 | 0.74 | 63.2 | 24.9 | C |
| 4 | 1.00 | 0.849 | 3260 | 4278 | 0.76 | 62.1 | 26.2 | D |
| 5 | 1.00 | 0.849 | 3436 | 4278 | 0.80 | 60.2 | 28.5 | D |
| 6 | 1.00 | 0.849 | 3249 | 4278 | 0.76 | 62.2 | 26.1 | D |
| 7 | 1.00 | 0.849 | 3336 | 4278 | 0.78 | 61.3 | 27.2 | D |
| 8 | 1.00 | 0.849 | 3455 | 4278 | 0.81 | 60.0 | 28.8 | D |
| 9 | 1.00 | 0.849 | 3161 | 4278 | 0.74 | 63.1 | 25.0 | C |
| 10 | 1.00 | 0.849 | 2988 | 4278 | 0.70 | 64.5 | 23.2 | C |
| 11 | 1.00 | 0.849 | 3069 | 4278 | 0.72 | 63.9 | 24.0 | C |
| 12 | 1.00 | 0.849 | 3179 | 4278 | 0.74 | 62.9 | 25.3 | C |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.918 | 3243 | 171 | 4221 | 1976 | 0.77 | 0.09 | 62.2 | 62.2 | 26.1 | 24.4 | C |
| 2 | 1.00 | 1.00 | 0.849 | 0.918 | 3066 | 160 | 4221 | 1976 | 0.73 | 0.08 | 62.2 | 62.2 | 24.6 | 22.9 | C |
| 3 | 1.00 | 1.00 | 0.849 | 0.918 | 3148 | 163 | 4221 | 1976 | 0.75 | 0.08 | 62.2 | 62.2 | 25.3 | 23.6 | C |
| 4 | 1.00 | 1.00 | 0.849 | 0.918 | 3260 | 162 | 4221 | 1976 | 0.77 | 0.08 | 62.2 | 62.2 | 26.2 | 24.6 | C |
| 5 | 1.00 | 1.00 | 0.849 | 0.918 | 3436 | 182 | 4221 | 1976 | 0.81 | 0.09 | 62.2 | 62.2 | 27.6 | 26.1 | C |
| 6 | 1.00 | 1.00 | 0.849 | 0.918 | 3249 | 170 | 4221 | 1976 | 0.77 | 0.09 | 62.2 | 62.2 | 26.1 | 24.5 | C |
| 7 | 1.00 | 1.00 | 0.849 | 0.918 | 3336 | 173 | 4221 | 1976 | 0.79 | 0.09 | 62.2 | 62.2 | 26.8 | 25.2 | C |
| 8 | 1.00 | 1.00 | 0.849 | 0.918 | 3455 | 172 | 4221 | 1976 | 0.82 | 0.09 | 62.2 | 62.2 | 27.8 | 26.3 | C |
| 9 | 1.00 | 1.00 | 0.849 | 0.918 | 3161 | 167 | 4221 | 1976 | 0.75 | 0.08 | 62.2 | 62.2 | 25.4 | 23.7 | C |
| 10 | 1.00 | 1.00 | 0.849 | 0.918 | 2988 | 157 | 4221 | 1976 | 0.71 | 0.08 | 62.2 | 62.2 | 24.0 | 22.2 | C |
| 11 | 1.00 | 1.00 | 0.849 | 0.918 | 3069 | 159 | 4221 | 1976 | 0.73 | 0.08 | 62.2 | 62.2 | 24.7 | 22.9 | C |
| 12 | 1.00 | 1.00 | 0.849 | 0.918 | 3179 | 159 | 4221 | 1976 | 0.75 | 0.08 | 62.2 | 62.2 | 25.6 | 23.9 | C |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.846 | 3069 | 4251 | 0.72 | 63.0 | 24.3 | C |
| 2 | 1.00 | 0.846 | 2903 | 4251 | 0.68 | 64.2 | 22.6 | C |
| 3 | 1.00 | 0.846 | 2982 | 4251 | 0.70 | 63.6 | 23.4 | C |
| 4 | 1.00 | 0.846 | 3096 | 4251 | 0.73 | 62.7 | 24.7 | C |
| 5 | 1.00 | 0.846 | 3251 | 4251 | 0.76 | 61.3 | 26.5 | D |
| 6 | 1.00 | 0.846 | 3076 | 4251 | 0.72 | 62.9 | 24.5 | C |
| 7 | 1.00 | 0.846 | 3160 | 4251 | 0.74 | 62.2 | 25.4 | C |
| 8 | 1.00 | 0.846 | 3280 | 4251 | 0.77 | 61.1 | 26.8 | D |
| 9 | 1.00 | 0.846 | 2992 | 4251 | 0.70 | 63.6 | 23.5 | C |
| 10 | 1.00 | 0.846 | 2829 | 4251 | 0.67 | 64.7 | 21.9 | C |
| 11 | 1.00 | 0.846 | 2908 | 4251 | 0.68 | 64.2 | 22.6 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.846 | | 3018 | | 4251 | | 0.71 | | 63.4 | | 23.8 | C |

## Segment 4: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.846 | 0.935 | 3267 | 198 | 4221 | 1976 | 0.77 | 0.10 | 59.1 | 59.1 | 27.6 | 27.2 | C |
| 2 | 1.00 | 1.00 | 0.846 | 0.935 | 3112 | 209 | 4221 | 1976 | 0.74 | 0.11 | 59.5 | 59.5 | 26.2 | 26.0 | C |
| 3 | 1.00 | 1.00 | 0.846 | 0.935 | 3165 | 183 | 4221 | 1976 | 0.75 | 0.09 | 59.3 | 59.3 | 26.7 | 26.4 | C |
| 4 | 1.00 | 1.00 | 0.846 | 0.935 | 3314 | 218 | 4221 | 1976 | 0.79 | 0.11 | 58.9 | 58.9 | 28.1 | 27.5 | C |
| 5 | 1.00 | 1.00 | 0.846 | 0.935 | 3461 | 210 | 4221 | 1976 | 0.82 | 0.11 | 58.5 | 58.5 | 29.6 | 28.7 | D |
| 6 | 1.00 | 1.00 | 0.846 | 0.935 | 3297 | 221 | 4221 | 1976 | 0.78 | 0.11 | 59.0 | 59.0 | 27.9 | 27.4 | C |
| 7 | 1.00 | 1.00 | 0.846 | 0.935 | 3355 | 195 | 4221 | 1976 | 0.79 | 0.10 | 58.8 | 58.8 | 28.5 | 27.9 | C |
| 8 | 1.00 | 1.00 | 0.846 | 0.935 | 3511 | 231 | 4221 | 1976 | 0.83 | 0.12 | 58.3 | 58.3 | 30.1 | 29.1 | D |
| 9 | 1.00 | 1.00 | 0.846 | 0.935 | 3185 | 193 | 4221 | 1976 | 0.75 | 0.10 | 59.3 | 59.3 | 26.9 | 26.5 | C |
| 10 | 1.00 | 1.00 | 0.846 | 0.935 | 3033 | 204 | 4221 | 1976 | 0.72 | 0.10 | 59.6 | 59.6 | 25.4 | 25.3 | C |
| 11 | 1.00 | 1.00 | 0.846 | 0.935 | 3087 | 179 | 4221 | 1976 | 0.73 | 0.09 | 59.5 | 59.5 | 25.9 | 25.8 | C |
| 12 | 1.00 | 1.00 | 0.846 | 0.935 | 3231 | 213 | 4221 | 1976 | 0.77 | 0.11 | 59.2 | 59.2 | 27.3 | 26.9 | C |

## Segment 5: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.851 | 3268 | 4244 | 0.77 | 61.0 | 26.8 | D |
| 2 | 1.00 | 0.851 | 3115 | 4244 | 0.73 | 62.3 | 25.0 | C |
| 3 | 1.00 | 0.851 | 3166 | 4244 | 0.75 | 61.9 | 25.6 | C |
| 4 | 1.00 | 0.851 | 3317 | 4244 | 0.78 | 60.5 | 27.4 | D |
| 5 | 1.00 | 0.851 | 3462 | 4244 | 0.82 | 58.9 | 29.4 | D |
| 6 | 1.00 | 0.851 | 3301 | 4244 | 0.78 | 60.6 | 27.2 | D |
| 7 | 1.00 | 0.851 | 3355 | 4244 | 0.79 | 60.1 | 27.9 | D |
| 8 | 1.00 | 0.851 | 3515 | 4244 | 0.83 | 58.3 | 30.2 | D |
| 9 | 1.00 | 0.851 | 3186 | 4244 | 0.75 | 61.7 | 25.8 | C |
| 10 | 1.00 | 0.851 | 3036 | 4244 | 0.72 | 63.0 | 24.1 | C |
| 11 | 1.00 | 0.851 | 3087 | 4244 | 0.73 | 62.6 | 24.7 | C |
| 12 | 1.00 | 0.851 | 3234 | 4244 | 0.76 | 61.3 | 26.4 | D |

## Segment 6: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.851 | 0.955 | 3268 | 126 | 4221 | 1706 | 0.77 | 0.07 | 54.4 | 54.4 | 30.0 | 26.0 | C |
| 2 | 1.00 | 1.00 | 0.851 | 0.955 | 3115 | 187 | 4221 | 1706 | 0.74 | 0.11 | 54.2 | 54.2 | 28.7 | 24.7 | C |
| 3 | 1.00 | 1.00 | 0.851 | 0.955 | 3166 | 147 | 4221 | 1706 | 0.75 | 0.09 | 54.3 | 54.3 | 29.2 | 25.2 | C |
| 4 | 1.00 | 1.00 | 0.851 | 0.955 | 3317 | 173 | 4221 | 1706 | 0.79 | 0.10 | 54.3 | 54.3 | 30.5 | 26.5 | C |
| 5 | 1.00 | 1.00 | 0.851 | 0.955 | 3462 | 133 | 4221 | 1706 | 0.82 | 0.08 | 54.4 | 54.4 | 31.8 | 27.7 | C |
| 6 | 1.00 | 1.00 | 0.851 | 0.955 | 3301 | 198 | 4221 | 1706 | 0.78 | 0.12 | 54.2 | 54.2 | 30.5 | 26.3 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.851 | 0.955 | 3355 | 156 | 4221 | 1706 | 0.79 | 0.09 | 54.3 | 54.3 | 30.9 | 26.8 | C |
| 8 | 1.00 | 1.00 | 0.851 | 0.955 | 3515 | 183 | 4221 | 1706 | 0.83 | 0.11 | 54.2 | 54.2 | 32.4 | 28.2 | D |
| 9 | 1.00 | 1.00 | 0.851 | 0.955 | 3186 | 123 | 4221 | 1706 | 0.75 | 0.07 | 54.4 | 54.4 | 29.3 | 25.3 | C |
| 10 | 1.00 | 1.00 | 0.851 | 0.955 | 3036 | 182 | 4221 | 1706 | 0.72 | 0.11 | 54.2 | 54.2 | 28.0 | 24.0 | C |
| 11 | 1.00 | 1.00 | 0.851 | 0.955 | 3087 | 143 | 4221 | 1706 | 0.73 | 0.08 | 54.3 | 54.3 | 28.4 | 24.5 | C |
| 12 | 1.00 | 1.00 | 0.851 | 0.955 | 3234 | 169 | 4221 | 1706 | 0.77 | 0.10 | 54.3 | 54.3 | 29.8 | 25.7 | C |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.847 | 3142 | 4237 | 0.74 | 61.9 | 25.4 | C |
| 2 | 1.00 | 0.847 | 2919 | 4237 | 0.69 | 63.5 | 23.0 | C |
| 3 | 1.00 | 0.847 | 3015 | 4237 | 0.71 | 62.9 | 24.0 | C |
| 4 | 1.00 | 0.847 | 3138 | 4237 | 0.74 | 61.9 | 25.3 | C |
| 5 | 1.00 | 0.847 | 3328 | 4237 | 0.79 | 60.1 | 27.7 | D |
| 6 | 1.00 | 0.847 | 3093 | 4237 | 0.73 | 62.3 | 24.8 | C |
| 7 | 1.00 | 0.847 | 3195 | 4237 | 0.75 | 61.4 | 26.0 | C |
| 8 | 1.00 | 0.847 | 3325 | 4237 | 0.78 | 60.2 | 27.6 | D |
| 9 | 1.00 | 0.847 | 3063 | 4237 | 0.72 | 62.5 | 24.5 | C |
| 10 | 1.00 | 0.847 | 2845 | 4237 | 0.67 | 64.0 | 22.2 | C |
| 11 | 1.00 | 0.847 | 2940 | 4237 | 0.69 | 63.4 | 23.2 | C |
| 12 | 1.00 | 0.847 | 3059 | 4237 | 0.72 | 62.5 | 24.5 | C |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.847 | 0.983 | 3398 | 256 | 4221 | 1886 | 0.81 | 0.14 | 59.5 | 59.5 | 28.6 | 25.0 | C |
| 2 | 1.00 | 1.00 | 0.847 | 0.983 | 3189 | 270 | 4221 | 1886 | 0.76 | 0.14 | 60.1 | 60.1 | 26.5 | 23.4 | C |
| 3 | 1.00 | 1.00 | 0.847 | 0.983 | 3285 | 270 | 4221 | 1886 | 0.78 | 0.14 | 59.8 | 59.8 | 27.5 | 24.1 | C |
| 4 | 1.00 | 1.00 | 0.847 | 0.983 | 3418 | 280 | 4221 | 1886 | 0.81 | 0.15 | 59.4 | 59.4 | 28.8 | 25.2 | C |
| 5 | 1.00 | 1.00 | 0.847 | 0.983 | 3600 | 272 | 4221 | 1886 | 0.85 | 0.14 | 58.8 | 58.8 | 30.6 | 26.6 | C |
| 6 | 1.00 | 1.00 | 0.847 | 0.983 | 3379 | 286 | 4221 | 1886 | 0.80 | 0.15 | 59.6 | 59.6 | 28.3 | 24.9 | C |
| 7 | 1.00 | 1.00 | 0.847 | 0.983 | 3481 | 286 | 4221 | 1886 | 0.82 | 0.15 | 59.2 | 59.2 | 29.4 | 25.7 | C |
| 8 | 1.00 | 1.00 | 0.847 | 0.983 | 3621 | 296 | 4221 | 1886 | 0.86 | 0.16 | 58.7 | 58.7 | 30.8 | 26.8 | C |
| 9 | 1.00 | 1.00 | 0.847 | 0.983 | 3313 | 250 | 4221 | 1886 | 0.78 | 0.13 | 59.7 | 59.7 | 27.7 | 24.4 | C |
| 10 | 1.00 | 1.00 | 0.847 | 0.983 | 3107 | 262 | 4221 | 1886 | 0.74 | 0.14 | 60.3 | 60.3 | 25.8 | 22.8 | C |
| 11 | 1.00 | 1.00 | 0.847 | 0.983 | 3203 | 263 | 4221 | 1886 | 0.76 | 0.14 | 60.0 | 60.0 | 26.7 | 23.5 | C |
| 12 | 1.00 | 1.00 | 0.847 | 0.983 | 3332 | 273 | 4221 | 1886 | 0.79 | 0.14 | 59.7 | 59.7 | 27.9 | 24.5 | C |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 3395 | 4237 | 0.80 | 59.4 | 28.6 | D |
| 2 | 1.00 | 0.858 | 3190 | 4237 | 0.75 | 61.5 | 25.9 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.858 | 3286 | 4237 | 0.78 | 60.5 | 27.2 | D |
| 4 | 1.00 | 0.858 | 3418 | 4237 | 0.81 | 59.2 | 28.9 | D |
| 5 | 1.00 | 0.858 | 3597 | 4237 | 0.85 | 57.1 | 31.5 | D |
| 6 | 1.00 | 0.858 | 3381 | 4237 | 0.80 | 59.6 | 28.4 | D |
| 7 | 1.00 | 0.858 | 3481 | 4237 | 0.82 | 58.5 | 29.7 | D |
| 8 | 1.00 | 0.858 | 3621 | 4237 | 0.85 | 56.7 | 31.9 | D |
| 9 | 1.00 | 0.858 | 3310 | 4237 | 0.78 | 60.3 | 27.4 | D |
| 10 | 1.00 | 0.858 | 3110 | 4237 | 0.73 | 62.1 | 25.0 | C |
| 11 | 1.00 | 0.858 | 3204 | 4237 | 0.76 | 61.3 | 26.1 | D |
| 12 | 1.00 | 0.858 | 3332 | 4237 | 0.79 | 60.1 | 27.7 | D |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.858 | 0.956 | 3395 | 429 | 4221 | 1976 | 0.80 | 0.22 | 61.6 | 61.6 | 27.6 | 30.1 | D |
| 2 | 1.00 | 1.00 | 0.858 | 0.956 | 3190 | 485 | 4221 | 1976 | 0.76 | 0.25 | 61.5 | 61.5 | 25.9 | 28.3 | D |
| 3 | 1.00 | 1.00 | 0.858 | 0.956 | 3286 | 487 | 4221 | 1976 | 0.78 | 0.25 | 61.5 | 61.5 | 26.7 | 29.2 | D |
| 4 | 1.00 | 1.00 | 0.858 | 0.956 | 3418 | 533 | 4221 | 1976 | 0.81 | 0.27 | 61.3 | 61.3 | 27.9 | 30.3 | D |
| 5 | 1.00 | 1.00 | 0.858 | 0.956 | 3597 | 454 | 4221 | 1976 | 0.85 | 0.23 | 61.5 | 61.5 | 29.2 | 31.8 | D |
| 6 | 1.00 | 1.00 | 0.858 | 0.956 | 3381 | 515 | 4221 | 1976 | 0.80 | 0.26 | 61.4 | 61.4 | 27.5 | 30.0 | D |
| 7 | 1.00 | 1.00 | 0.858 | 0.956 | 3481 | 517 | 4221 | 1976 | 0.82 | 0.26 | 61.4 | 61.4 | 28.3 | 30.8 | D |
| 8 | 1.00 | 1.00 | 0.858 | 0.956 | 3621 | 566 | 4221 | 1976 | 0.86 | 0.29 | 61.3 | 61.3 | 29.5 | 32.0 | D |
| 9 | 1.00 | 1.00 | 0.858 | 0.956 | 3310 | 417 | 4221 | 1976 | 0.78 | 0.21 | 61.6 | 61.6 | 26.9 | 29.4 | D |
| 10 | 1.00 | 1.00 | 0.858 | 0.956 | 3110 | 473 | 4221 | 1976 | 0.74 | 0.24 | 61.5 | 61.5 | 25.3 | 27.6 | C |
| 11 | 1.00 | 1.00 | 0.858 | 0.956 | 3204 | 475 | 4221 | 1976 | 0.76 | 0.24 | 61.5 | 61.5 | 26.0 | 28.5 | D |
| 12 | 1.00 | 1.00 | 0.858 | 0.956 | 3332 | 520 | 4221 | 1976 | 0.79 | 0.26 | 61.4 | 61.4 | 27.1 | 29.6 | D |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.846 | 2959 | 4230 | 0.70 | 63.0 | 23.5 | C |
| 2 | 1.00 | 0.846 | 2687 | 4230 | 0.64 | 64.5 | 20.8 | C |
| 3 | 1.00 | 0.846 | 2781 | 4230 | 0.66 | 64.1 | 21.7 | C |
| 4 | 1.00 | 0.846 | 2864 | 4230 | 0.68 | 63.6 | 22.5 | C |
| 5 | 1.00 | 0.846 | 3135 | 4230 | 0.74 | 61.7 | 25.4 | C |
| 6 | 1.00 | 0.846 | 2848 | 4230 | 0.67 | 63.7 | 22.4 | C |
| 7 | 1.00 | 0.846 | 2947 | 4230 | 0.70 | 63.1 | 23.4 | C |
| 8 | 1.00 | 0.846 | 3033 | 4230 | 0.72 | 62.5 | 24.3 | C |
| 9 | 1.00 | 0.846 | 2885 | 4230 | 0.68 | 63.5 | 22.7 | C |
| 10 | 1.00 | 0.846 | 2619 | 4230 | 0.62 | 64.8 | 20.2 | C |
| 11 | 1.00 | 0.846 | 2713 | 4230 | 0.64 | 64.4 | 21.1 | C |
| 12 | 1.00 | 0.846 | 2792 | 4230 | 0.66 | 64.0 | 21.8 | C |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.846 | 0.951 | 3178 | 219 | 4221 | 1886 | 0.75 | 0.12 | 59.3 | 59.3 | 26.8 | 26.1 | C |
| 2 | 1.00 | 1.00 | 0.846 | 0.951 | 2955 | 268 | 4221 | 1886 | 0.70 | 0.14 | 59.8 | 59.8 | 24.7 | 24.3 | C |
| 3 | 1.00 | 1.00 | 0.846 | 0.951 | 3027 | 246 | 4221 | 1886 | 0.72 | 0.13 | 59.7 | 59.7 | 25.4 | 24.9 | C |
| 4 | 1.00 | 1.00 | 0.846 | 0.951 | 3084 | 220 | 4221 | 1886 | 0.73 | 0.12 | 59.6 | 59.6 | 25.9 | 25.3 | C |
| 5 | 1.00 | 1.00 | 0.846 | 0.951 | 3367 | 232 | 4221 | 1886 | 0.80 | 0.12 | 58.8 | 58.8 | 28.6 | 27.5 | C |
| 6 | 1.00 | 1.00 | 0.846 | 0.951 | 3132 | 284 | 4221 | 1886 | 0.74 | 0.15 | 59.4 | 59.4 | 26.4 | 25.7 | C |
| 7 | 1.00 | 1.00 | 0.846 | 0.951 | 3208 | 261 | 4221 | 1886 | 0.76 | 0.14 | 59.2 | 59.2 | 27.1 | 26.3 | C |
| 8 | 1.00 | 1.00 | 0.846 | 0.951 | 3266 | 233 | 4221 | 1886 | 0.77 | 0.12 | 59.1 | 59.1 | 27.6 | 26.7 | C |
| 9 | 1.00 | 1.00 | 0.846 | 0.951 | 3098 | 213 | 4221 | 1886 | 0.73 | 0.11 | 59.5 | 59.5 | 26.0 | 25.4 | C |
| 10 | 1.00 | 1.00 | 0.846 | 0.951 | 2880 | 261 | 4221 | 1886 | 0.68 | 0.14 | 60.0 | 60.0 | 24.0 | 23.7 | C |
| 11 | 1.00 | 1.00 | 0.846 | 0.951 | 2953 | 240 | 4221 | 1886 | 0.70 | 0.13 | 59.8 | 59.8 | 24.7 | 24.3 | C |
| 12 | 1.00 | 1.00 | 0.846 | 0.951 | 3007 | 215 | 4221 | 1886 | 0.71 | 0.11 | 59.7 | 59.7 | 25.2 | 24.7 | C |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.854 | 3174 | 4244 | 0.75 | 61.8 | 25.7 | C |
| 2 | 1.00 | 0.854 | 2960 | 4244 | 0.70 | 63.5 | 23.3 | C |
| 3 | 1.00 | 0.854 | 3029 | 4244 | 0.71 | 63.0 | 24.0 | C |
| 4 | 1.00 | 0.854 | 3082 | 4244 | 0.73 | 62.6 | 24.6 | C |
| 5 | 1.00 | 0.854 | 3364 | 4244 | 0.79 | 60.0 | 28.0 | D |
| 6 | 1.00 | 0.854 | 3137 | 4244 | 0.74 | 62.2 | 25.2 | C |
| 7 | 1.00 | 0.854 | 3210 | 4244 | 0.76 | 61.5 | 26.1 | D |
| 8 | 1.00 | 0.854 | 3265 | 4244 | 0.77 | 61.0 | 26.8 | D |
| 9 | 1.00 | 0.854 | 3096 | 4244 | 0.73 | 62.5 | 24.8 | C |
| 10 | 1.00 | 0.854 | 2885 | 4244 | 0.68 | 64.0 | 22.5 | C |
| 11 | 1.00 | 0.854 | 2954 | 4244 | 0.70 | 63.6 | 23.2 | C |
| 12 | 1.00 | 0.854 | 3005 | 4244 | 0.71 | 63.2 | 23.8 | C |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.854 | 0.938 | 3174 | 600 | 4221 | 1886 | 0.75 | 0.32 | 59.6 | 59.6 | 26.6 | 27.7 | C |
| 2 | 1.00 | 1.00 | 0.854 | 0.938 | 2960 | 551 | 4221 | 1886 | 0.70 | 0.29 | 59.7 | 59.7 | 24.8 | 25.8 | C |
| 3 | 1.00 | 1.00 | 0.854 | 0.938 | 3029 | 519 | 4221 | 1886 | 0.72 | 0.28 | 59.8 | 59.8 | 25.3 | 26.4 | C |
| 4 | 1.00 | 1.00 | 0.854 | 0.938 | 3082 | 583 | 4221 | 1886 | 0.73 | 0.31 | 59.6 | 59.6 | 25.9 | 26.9 | C |
| 5 | 1.00 | 1.00 | 0.854 | 0.938 | 3364 | 636 | 4221 | 1886 | 0.80 | 0.34 | 59.5 | 59.5 | 28.3 | 29.3 | D |
| 6 | 1.00 | 1.00 | 0.854 | 0.938 | 3137 | 583 | 4221 | 1886 | 0.74 | 0.31 | 59.6 | 59.6 | 26.3 | 27.4 | C |
| 7 | 1.00 | 1.00 | 0.854 | 0.938 | 3210 | 550 | 4221 | 1886 | 0.76 | 0.29 | 59.7 | 59.7 | 26.9 | 28.0 | C |
| 8 | 1.00 | 1.00 | 0.854 | 0.938 | 3265 | 618 | 4221 | 1886 | 0.77 | 0.33 | 59.5 | 59.5 | 27.4 | 28.5 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1.00 | 1.00 | 0.854 | 0.938 | 3096 | 585 | 4221 | 1886 | 0.73 | 0.31 | 59.6 | 59.6 | 26.0 | 27.0 | C |
| 10 | 1.00 | 1.00 | 0.854 | 0.938 | 2885 | 537 | 4221 | 1886 | 0.68 | 0.28 | 59.7 | 59.7 | 24.2 | 25.2 | C |
| 11 | 1.00 | 1.00 | 0.854 | 0.938 | 2954 | 506 | 4221 | 1886 | 0.70 | 0.27 | 59.8 | 59.8 | 24.7 | 25.8 | C |
| 12 | 1.00 | 1.00 | 0.854 | 0.938 | 3005 | 568 | 4221 | 1886 | 0.71 | 0.30 | 59.7 | 59.7 | 25.2 | 26.2 | C |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.836 | 2569 | 4244 | 0.61 | 65.6 | 19.6 | C |
| 2 | 1.00 | 0.836 | 2406 | 4244 | 0.57 | 65.7 | 18.2 | C |
| 3 | 1.00 | 0.836 | 2512 | 4244 | 0.59 | 65.7 | 19.1 | C |
| 4 | 1.00 | 0.836 | 2494 | 4244 | 0.59 | 65.7 | 19.0 | C |
| 5 | 1.00 | 0.836 | 2722 | 4244 | 0.64 | 65.0 | 20.9 | C |
| 6 | 1.00 | 0.836 | 2550 | 4244 | 0.60 | 65.7 | 19.4 | C |
| 7 | 1.00 | 0.836 | 2661 | 4244 | 0.63 | 65.2 | 20.4 | C |
| 8 | 1.00 | 0.836 | 2641 | 4244 | 0.62 | 65.3 | 20.2 | C |
| 9 | 1.00 | 0.836 | 2506 | 4244 | 0.59 | 65.7 | 19.0 | C |
| 10 | 1.00 | 0.836 | 2344 | 4244 | 0.55 | 65.7 | 17.7 | B |
| 11 | 1.00 | 0.836 | 2450 | 4244 | 0.58 | 65.7 | 18.6 | C |
| 12 | 1.00 | 0.836 | 2432 | 4244 | 0.57 | 65.7 | 18.4 | C |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.836 | 0.983 | 2844 | 275 | 4221 | 1796 | 0.67 | 0.15 | 59.3 | 59.3 | 24.0 | 24.5 | C |
| 2 | 1.00 | 1.00 | 0.836 | 0.983 | 2699 | 293 | 4221 | 1796 | 0.64 | 0.16 | 59.5 | 59.5 | 22.7 | 23.3 | C |
| 3 | 1.00 | 1.00 | 0.836 | 0.983 | 2816 | 304 | 4221 | 1796 | 0.67 | 0.17 | 59.3 | 59.3 | 23.7 | 24.2 | C |
| 4 | 1.00 | 1.00 | 0.836 | 0.983 | 2832 | 338 | 4221 | 1796 | 0.67 | 0.19 | 59.3 | 59.3 | 23.9 | 24.3 | C |
| 5 | 1.00 | 1.00 | 0.836 | 0.983 | 3013 | 291 | 4221 | 1796 | 0.71 | 0.16 | 58.9 | 58.9 | 25.6 | 25.8 | C |
| 6 | 1.00 | 1.00 | 0.836 | 0.983 | 2860 | 310 | 4221 | 1796 | 0.68 | 0.17 | 59.2 | 59.2 | 24.2 | 24.6 | C |
| 7 | 1.00 | 1.00 | 0.836 | 0.983 | 2983 | 322 | 4221 | 1796 | 0.71 | 0.18 | 59.0 | 59.0 | 25.3 | 25.5 | C |
| 8 | 1.00 | 1.00 | 0.836 | 0.983 | 2999 | 358 | 4221 | 1796 | 0.71 | 0.20 | 59.0 | 59.0 | 25.4 | 25.6 | C |
| 9 | 1.00 | 1.00 | 0.836 | 0.983 | 2774 | 268 | 4221 | 1796 | 0.66 | 0.15 | 59.4 | 59.4 | 23.4 | 23.9 | C |
| 10 | 1.00 | 1.00 | 0.836 | 0.983 | 2630 | 286 | 4221 | 1796 | 0.62 | 0.16 | 59.6 | 59.6 | 22.1 | 22.8 | C |
| 11 | 1.00 | 1.00 | 0.836 | 0.983 | 2746 | 296 | 4221 | 1796 | 0.65 | 0.16 | 59.4 | 59.4 | 23.1 | 23.7 | C |
| 12 | 1.00 | 1.00 | 0.836 | 0.983 | 2762 | 330 | 4221 | 1796 | 0.65 | 0.18 | 59.4 | 59.4 | 23.2 | 23.8 | C |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.852 | 0.860 | 3097 | 259 | 4221 | 1796 | 0.73 | 0.14 | 58.9 | 58.9 | 26.3 | 25.9 | C |
| 2 | 1.00 | 1.00 | 0.852 | 0.860 | 2918 | 220 | 4221 | 1796 | 0.69 | 0.12 | 59.3 | 59.3 | 24.6 | 24.6 | C |
| 3 | 1.00 | 1.00 | 0.852 | 0.860 | 2981 | 165 | 4221 | 1796 | 0.71 | 0.09 | 59.1 | 59.1 | 25.2 | 25.1 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1.00 | 1.00 | 0.852 | 0.860 | 3049 | 212 | 4221 | 1796 | 0.72 | 0.12 | 59.0 | 59.0 | 25.8 | 25.6 | C |
| 5 | 1.00 | 1.00 | 0.852 | 0.860 | 3281 | 274 | 4221 | 1796 | 0.78 | 0.15 | 58.4 | 58.4 | 28.1 | 27.4 | C |
| 6 | 1.00 | 1.00 | 0.852 | 0.860 | 3093 | 233 | 4221 | 1796 | 0.73 | 0.13 | 58.9 | 58.9 | 26.3 | 25.9 | C |
| 7 | 1.00 | 1.00 | 0.852 | 0.860 | 3158 | 174 | 4221 | 1796 | 0.75 | 0.10 | 58.8 | 58.8 | 26.9 | 26.5 | C |
| 8 | 1.00 | 1.00 | 0.852 | 0.860 | 3229 | 224 | 4221 | 1796 | 0.76 | 0.12 | 58.6 | 58.6 | 27.6 | 27.0 | C |
| 9 | 1.00 | 1.00 | 0.852 | 0.860 | 3020 | 252 | 4221 | 1796 | 0.72 | 0.14 | 59.0 | 59.0 | 25.6 | 25.3 | C |
| 10 | 1.00 | 1.00 | 0.852 | 0.860 | 2844 | 214 | 4221 | 1796 | 0.67 | 0.12 | 59.4 | 59.4 | 23.9 | 24.0 | C |
| 11 | 1.00 | 1.00 | 0.852 | 0.860 | 2905 | 160 | 4221 | 1796 | 0.69 | 0.09 | 59.3 | 59.3 | 24.5 | 24.5 | C |
| 12 | 1.00 | 1.00 | 0.852 | 0.860 | 2973 | 207 | 4221 | 1796 | 0.70 | 0.12 | 59.2 | 59.2 | 25.1 | 25.0 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.852 | 3100 | 4289 | 0.72 | 64.0 | 24.2 | C |
| 2 | 1.00 | 0.852 | 2920 | 4289 | 0.68 | 65.4 | 22.3 | C |
| 3 | 1.00 | 0.852 | 2982 | 4289 | 0.70 | 65.0 | 22.9 | C |
| 4 | 1.00 | 0.852 | 3050 | 4289 | 0.71 | 64.4 | 23.7 | C |
| 5 | 1.00 | 0.852 | 3284 | 4289 | 0.77 | 62.2 | 26.4 | D |
| 6 | 1.00 | 0.852 | 3095 | 4289 | 0.72 | 64.0 | 24.2 | C |
| 7 | 1.00 | 0.852 | 3160 | 4289 | 0.74 | 63.4 | 24.9 | C |
| 8 | 1.00 | 0.852 | 3231 | 4289 | 0.75 | 62.7 | 25.8 | C |
| 9 | 1.00 | 0.852 | 3022 | 4289 | 0.70 | 64.6 | 23.4 | C |
| 10 | 1.00 | 0.852 | 2846 | 4289 | 0.66 | 66.0 | 21.6 | C |
| 11 | 1.00 | 0.852 | 2907 | 4289 | 0.68 | 65.5 | 22.2 | C |
| 12 | 1.00 | 0.852 | 2975 | 4289 | 0.69 | 65.0 | 22.9 | C |

## Segment 19: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.852 | 0.895 | 3100 | 296 | 4221 | 1886 | 0.73 | 0.16 | 58.8 | 58.8 | 26.4 | 27.7 | C |
| 2 | 1.00 | 1.00 | 0.852 | 0.895 | 2920 | 274 | 4221 | 1886 | 0.69 | 0.15 | 58.8 | 58.8 | 24.8 | 26.2 | C |
| 3 | 1.00 | 1.00 | 0.852 | 0.895 | 2982 | 287 | 4221 | 1886 | 0.71 | 0.15 | 58.8 | 58.8 | 25.4 | 26.7 | C |
| 4 | 1.00 | 1.00 | 0.852 | 0.895 | 3050 | 283 | 4221 | 1886 | 0.72 | 0.15 | 58.8 | 58.8 | 25.9 | 27.3 | C |
| 5 | 1.00 | 1.00 | 0.852 | 0.895 | 3284 | 239 | 4221 | 1886 | 0.78 | 0.13 | 58.9 | 58.9 | 27.9 | 29.3 | D |
| 6 | 1.00 | 1.00 | 0.852 | 0.895 | 3095 | 298 | 4221 | 1886 | 0.73 | 0.16 | 58.7 | 58.7 | 26.4 | 27.7 | C |
| 7 | 1.00 | 1.00 | 0.852 | 0.895 | 3160 | 363 | 4221 | 1886 | 0.75 | 0.19 | 58.6 | 58.6 | 27.0 | 28.2 | D |
| 8 | 1.00 | 1.00 | 0.852 | 0.895 | 3231 | 306 | 4221 | 1886 | 0.77 | 0.16 | 58.7 | 58.7 | 27.5 | 28.8 | D |
| 9 | 1.00 | 1.00 | 0.852 | 0.895 | 3022 | 220 | 4221 | 1886 | 0.72 | 0.12 | 58.9 | 58.9 | 25.7 | 27.0 | C |
| 10 | 1.00 | 1.00 | 0.852 | 0.895 | 2846 | 274 | 4221 | 1886 | 0.67 | 0.15 | 58.8 | 58.8 | 24.2 | 25.5 | C |
| 11 | 1.00 | 1.00 | 0.852 | 0.895 | 2907 | 334 | 4221 | 1886 | 0.69 | 0.18 | 58.6 | 58.6 | 24.8 | 26.1 | C |
| 12 | 1.00 | 1.00 | 0.852 | 0.895 | 2975 | 282 | 4221 | 1886 | 0.70 | 0.15 | 58.8 | 58.8 | 25.3 | 26.6 | C |

## Segment 20: Basic

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | (pc/h) | (pc/h) | Ratio | (mi/h) | (pc/mi/ln) | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.849 | 2799 | 4269 | 0.66 | 65.5 | 21.4 | C |
| 2 | 1.00 | 0.849 | 2642 | 4269 | 0.62 | 66.4 | 19.9 | C |
| 3 | 1.00 | 0.849 | 2690 | 4269 | 0.63 | 66.1 | 20.3 | C |
| 4 | 1.00 | 0.849 | 2763 | 4269 | 0.65 | 65.7 | 21.0 | C |
| 5 | 1.00 | 0.849 | 3044 | 4269 | 0.71 | 63.8 | 23.9 | C |
| 6 | 1.00 | 0.849 | 2792 | 4269 | 0.65 | 65.6 | 21.3 | C |
| 7 | 1.00 | 0.849 | 2788 | 4269 | 0.65 | 65.6 | 21.3 | C |
| 8 | 1.00 | 0.849 | 2920 | 4269 | 0.68 | 64.7 | 22.6 | C |
| 9 | 1.00 | 0.849 | 2801 | 4269 | 0.66 | 65.5 | 21.4 | C |
| 10 | 1.00 | 0.849 | 2568 | 4269 | 0.60 | 66.7 | 19.3 | C |
| 11 | 1.00 | 0.849 | 2565 | 4269 | 0.60 | 66.7 | 19.2 | C |
| 12 | 1.00 | 0.849 | 2689 | 4269 | 0.63 | 66.2 | 20.3 | C |

## Segment 21: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.849 | 0.943 | 3091 | 292 | 4221 | 1886 | 0.73 | 0.15 | 61.3 | 61.3 | 25.2 | 20.7 | C |
| 2 | 1.00 | 1.00 | 0.849 | 0.943 | 2925 | 283 | 4221 | 1886 | 0.69 | 0.15 | 61.7 | 61.7 | 23.7 | 19.5 | B |
| 3 | 1.00 | 1.00 | 0.849 | 0.943 | 2988 | 298 | 4221 | 1886 | 0.71 | 0.16 | 61.5 | 61.5 | 24.3 | 19.9 | B |
| 4 | 1.00 | 1.00 | 0.849 | 0.943 | 3050 | 287 | 4221 | 1886 | 0.72 | 0.15 | 61.4 | 61.4 | 24.8 | 20.4 | C |
| 5 | 1.00 | 1.00 | 0.849 | 0.943 | 3398 | 354 | 4221 | 1886 | 0.80 | 0.19 | 60.5 | 60.5 | 28.1 | 23.1 | C |
| 6 | 1.00 | 1.00 | 0.849 | 0.943 | 3112 | 320 | 4221 | 1886 | 0.74 | 0.17 | 61.3 | 61.3 | 25.4 | 20.9 | C |
| 7 | 1.00 | 1.00 | 0.849 | 0.943 | 3050 | 262 | 4221 | 1886 | 0.72 | 0.14 | 61.4 | 61.4 | 24.8 | 20.4 | C |
| 8 | 1.00 | 1.00 | 0.849 | 0.943 | 3215 | 295 | 4221 | 1886 | 0.76 | 0.16 | 61.0 | 61.0 | 26.4 | 21.7 | C |
| 9 | 1.00 | 1.00 | 0.849 | 0.943 | 3127 | 326 | 4221 | 1886 | 0.74 | 0.17 | 61.2 | 61.2 | 25.5 | 21.0 | C |
| 10 | 1.00 | 1.00 | 0.849 | 0.943 | 2863 | 295 | 4221 | 1886 | 0.68 | 0.16 | 61.8 | 61.8 | 23.2 | 19.0 | B |
| 11 | 1.00 | 1.00 | 0.849 | 0.943 | 2806 | 241 | 4221 | 1886 | 0.66 | 0.13 | 61.9 | 61.9 | 22.7 | 18.5 | B |
| 12 | 1.00 | 1.00 | 0.849 | 0.943 | 2959 | 270 | 4221 | 1886 | 0.70 | 0.14 | 61.6 | 61.6 | 24.0 | 19.7 | B |

## Segment 22: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.858 | 3090 | 4269 | 0.72 | 63.4 | 24.4 | C |
| 2 | 1.00 | 0.858 | 2925 | 4269 | 0.69 | 64.7 | 22.6 | C |
| 3 | 1.00 | 0.858 | 2990 | 4269 | 0.70 | 64.2 | 23.3 | C |
| 4 | 1.00 | 0.858 | 3050 | 4269 | 0.71 | 63.7 | 23.9 | C |
| 5 | 1.00 | 0.858 | 3401 | 4269 | 0.80 | 60.3 | 28.2 | D |
| 6 | 1.00 | 0.858 | 3114 | 4269 | 0.73 | 63.2 | 24.6 | C |
| 7 | 1.00 | 0.858 | 3047 | 4269 | 0.71 | 63.8 | 23.9 | C |
| 8 | 1.00 | 0.858 | 3213 | 4269 | 0.75 | 62.3 | 25.8 | C |
| 9 | 1.00 | 0.858 | 3129 | 4269 | 0.73 | 63.1 | 24.8 | C |
| 10 | 1.00 | 0.858 | 2865 | 4269 | 0.67 | 65.1 | 22.0 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | 0.858 | 2803 | 4269 | 0.66 | 65.5 | 21.4 | C |
| 12 | 1.00 | 0.858 | 2958 | 4269 | 0.69 | 64.5 | 22.9 | C |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 19046 | 18958 | 24.69 | 62.6 | 25.2 | 21.4 | 27.20 | D |
| 2 | 17947 | 17857 | 17.32 | 63.9 | 23.2 | 19.8 | 26.70 | D |
| 3 | 18374 | 18288 | 19.86 | 63.4 | 24.0 | 20.4 | 26.90 | D |
| 4 | 18891 | 18801 | 23.85 | 62.7 | 24.9 | 21.2 | 27.20 | D |
| 5 | 20228 | 20132 | 35.65 | 60.8 | 27.5 | 23.4 | 28.00 | D |
| 6 | 19024 | 18927 | 24.72 | 62.6 | 25.2 | 21.4 | 27.20 | D |
| 7 | 19421 | 19334 | 28.14 | 62.0 | 25.9 | 22.1 | 27.50 | D |
| 8 | 20006 | 19910 | 33.87 | 61.1 | 27.1 | 23.1 | 27.90 | D |
| 9 | 18615 | 18527 | 21.53 | 63.1 | 24.4 | 20.8 | 27.00 | D |
| 10 | 17497 | 17408 | 14.72 | 64.4 | 22.5 | 19.2 | 26.40 | D |
| 11 | 17871 | 17791 | 16.90 | 64.0 | 23.1 | 19.7 | 26.60 | D |
| 12 | 18416 | 18328 | 20.40 | 63.3 | 24.1 | 20.5 | 26.90 | D |

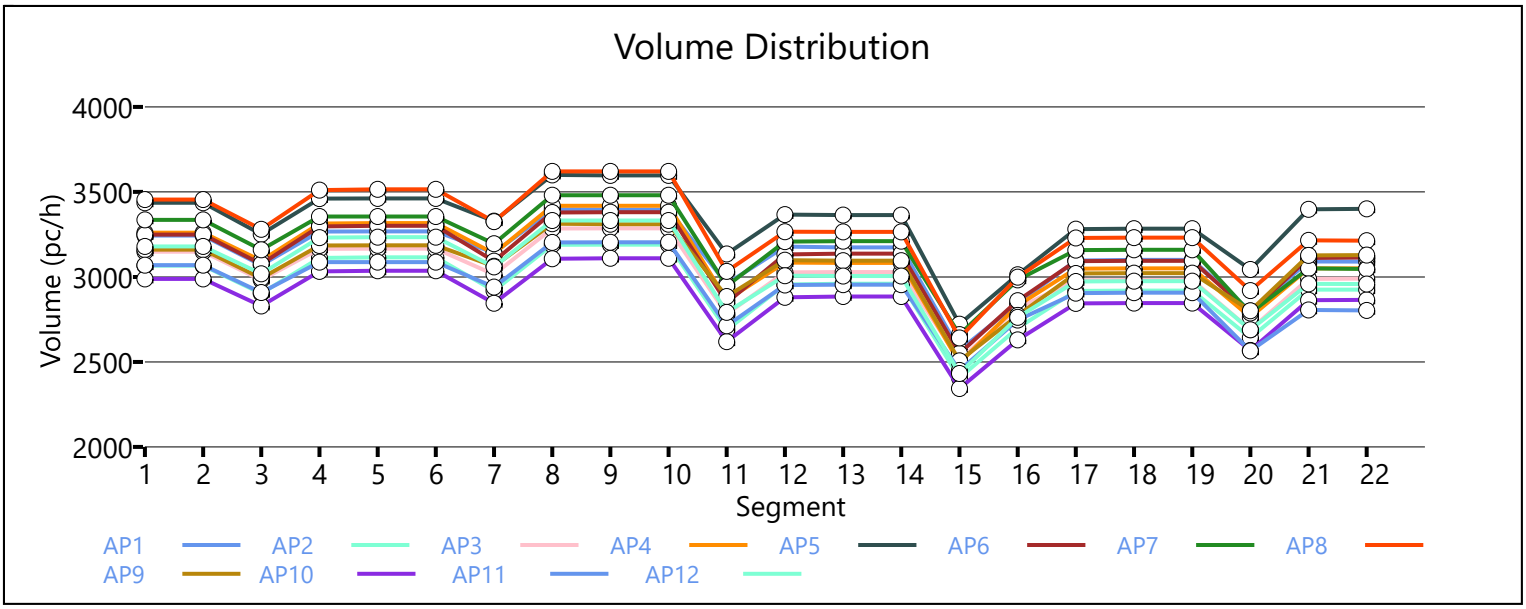
## Facility Overall Results

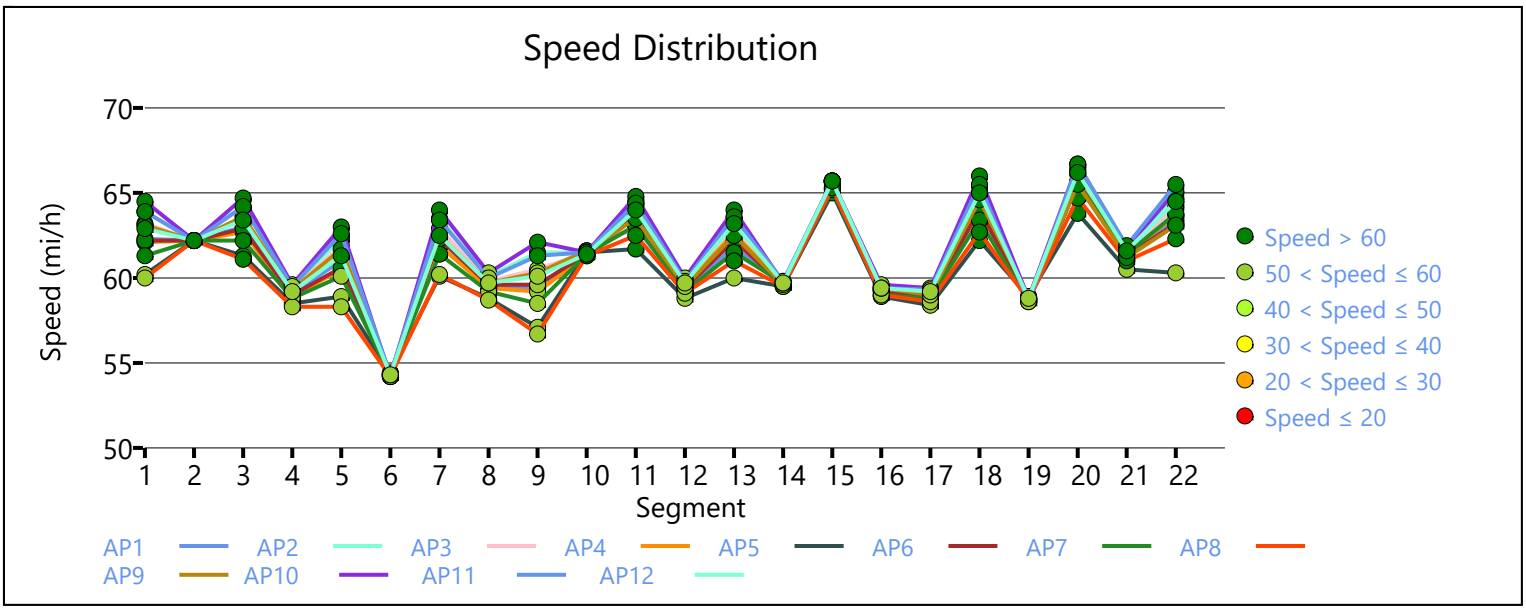
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 62.8 | Density, veh/mi/ln | 21.1 |
| Average Travel Time, min | 27.10 | Density, pc/mi/ln | 24.8 |

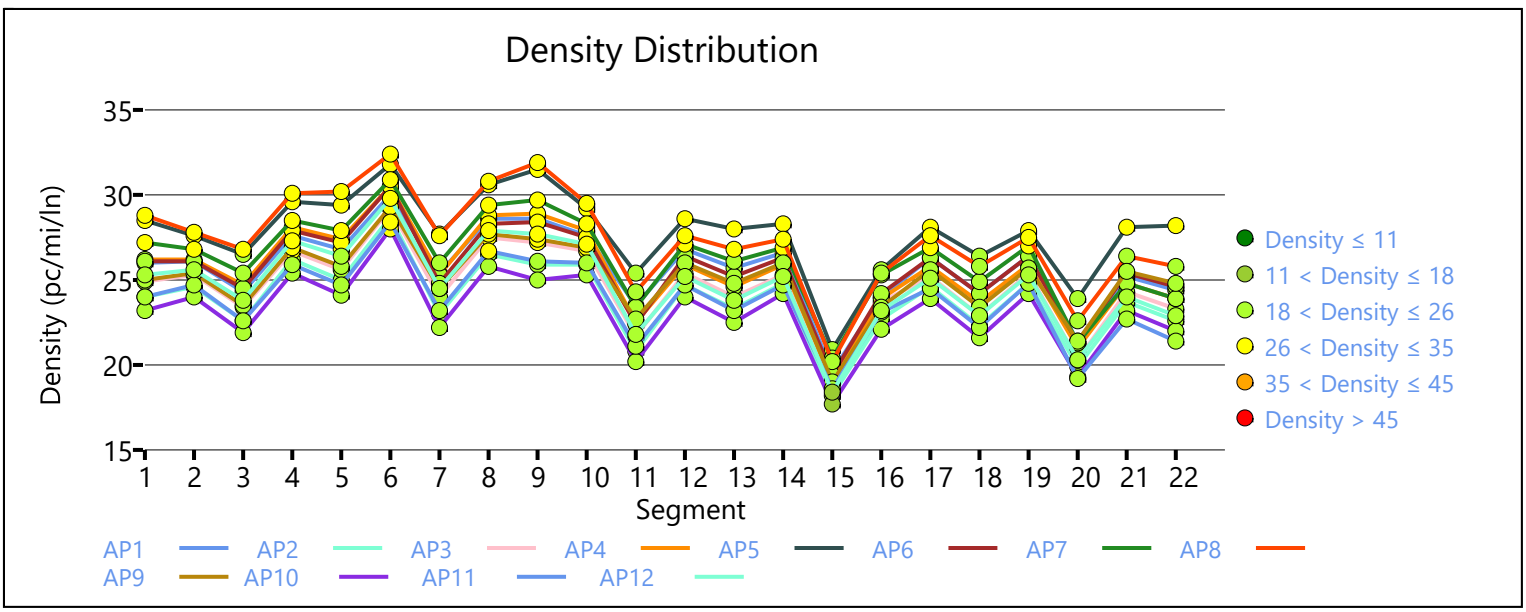
## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |

## Comments

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# HCS Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | NB I-90/94 WIS 33 to US 12 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 18 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 26.35 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | USH 33 to STH 12 | 66971 | 2 |
| 2 | Diverge | Diverge | USH 12 WB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12 between on and off | 1694 | 2 |
| 4 | Merge | Merge | USH 12 NB On | 831 | 2 |
| 5 | Merge | Merge | USH 12 WB On | 1500 | 2 |
| 6 | Basic | Basic | STH 23 to USH 12 | 6984 | 2 |
| 7 | Diverge | Diverge | STH 23 WB Off | 1500 | 2 |
| 8 | Basic | Basic | STH 23 between on and off | 3184 | 2 |
| 9 | Merge | Merge | STH 23 WB On | 1500 | 2 |
| 10 | Basic | Basic | STH 13 to STH 23 | 7816 | 2 |
| 11 | Diverge | Diverge | STH 13 WB Off | 1500 | 2 |
| 12 | Basic | Basic | STH 13 between on and off | 1620 | 2 |
| 13 | Merge | Merge | STH 13 WB On | 1500 | 2 |
| 14 | Basic | Basic | USH 12/STH 16 to STH 13 | 4727 | 2 |
| 15 | Diverge | Diverge | USH 12/STH 16 WB Off | 1500 | 2 |
| 16 | Basic | Basic | USH 12/STH 16 between on and off | 2705 | 2 |
| 17 | Merge | Merge | USH 12/STH 16 WB On | 1500 | 2 |
| 18 | Basic | Basic | CTH HH to USH 12/STH 16 | 30590 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.890 | 3553 | 4289 | 0.83 | 59.1 | 30.1 | D |
| 2 | 1.00 | 0.890 | 3383 | 4289 | 0.79 | 61.1 | 27.7 | D |
| 3 | 1.00 | 0.890 | 3448 | 4289 | 0.80 | 60.4 | 28.5 | D |
| 4 | 1.00 | 0.890 | 3615 | 4289 | 0.84 | 58.3 | 31.0 | D |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 1.00 | 0.890 | 3534 | 4289 | 0.82 | 59.4 | 29.7 | D |
| 6 | 1.00 | 0.890 | 3367 | 4289 | 0.79 | 61.3 | 27.5 | D |
| 7 | 1.00 | 0.890 | 3430 | 4289 | 0.80 | 60.6 | 28.3 | D |
| 8 | 1.00 | 0.890 | 3598 | 4289 | 0.84 | 58.5 | 30.8 | D |
| 9 | 1.00 | 0.890 | 3428 | 4289 | 0.80 | 60.6 | 28.3 | D |
| 10 | 1.00 | 0.890 | 3266 | 4289 | 0.76 | 62.4 | 26.2 | D |
| 11 | 1.00 | 0.890 | 3328 | 4289 | 0.78 | 61.7 | 27.0 | D |
| 12 | 1.00 | 0.890 | 3490 | 4289 | 0.81 | 59.9 | 29.1 | D |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.890 | 0.959 | 3553 | 946 | 4221 | 1886 | 0.84 | 0.50 | 58.8 | 58.8 | 30.2 | 30.3 | D |
| 2 | 1.00 | 1.00 | 0.890 | 0.959 | 3383 | 910 | 4221 | 1886 | 0.80 | 0.48 | 58.8 | 58.8 | 28.8 | 28.8 | D |
| 3 | 1.00 | 1.00 | 0.890 | 0.959 | 3448 | 911 | 4221 | 1886 | 0.82 | 0.48 | 58.8 | 58.8 | 29.3 | 29.4 | D |
| 4 | 1.00 | 1.00 | 0.890 | 0.959 | 3615 | 799 | 4221 | 1886 | 0.86 | 0.42 | 59.1 | 59.1 | 30.6 | 30.8 | D |
| 5 | 1.00 | 1.00 | 0.890 | 0.959 | 3534 | 968 | 4221 | 1886 | 0.84 | 0.51 | 58.7 | 58.7 | 30.1 | 30.1 | D |
| 6 | 1.00 | 1.00 | 0.890 | 0.959 | 3367 | 932 | 4221 | 1886 | 0.80 | 0.49 | 58.8 | 58.8 | 28.6 | 28.7 | D |
| 7 | 1.00 | 1.00 | 0.890 | 0.959 | 3430 | 933 | 4221 | 1886 | 0.81 | 0.49 | 58.8 | 58.8 | 29.2 | 29.2 | D |
| 8 | 1.00 | 1.00 | 0.890 | 0.959 | 3598 | 818 | 4221 | 1886 | 0.85 | 0.43 | 59.0 | 59.0 | 30.5 | 30.7 | D |
| 9 | 1.00 | 1.00 | 0.890 | 0.959 | 3428 | 923 | 4221 | 1886 | 0.81 | 0.49 | 58.8 | 58.8 | 29.1 | 29.2 | D |
| 10 | 1.00 | 1.00 | 0.890 | 0.959 | 3266 | 889 | 4221 | 1886 | 0.77 | 0.47 | 58.9 | 58.9 | 27.7 | 27.8 | C |
| 11 | 1.00 | 1.00 | 0.890 | 0.959 | 3328 | 891 | 4221 | 1886 | 0.79 | 0.47 | 58.9 | 58.9 | 28.3 | 28.4 | D |
| 12 | 1.00 | 1.00 | 0.890 | 0.959 | 3490 | 780 | 4221 | 1886 | 0.83 | 0.41 | 59.2 | 59.2 | 29.5 | 29.8 | D |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.866 | 2604 | 4244 | 0.61 | 65.5 | 19.9 | C |
| 2 | 1.00 | 0.866 | 2469 | 4244 | 0.58 | 65.7 | 18.7 | C |
| 3 | 1.00 | 0.866 | 2535 | 4244 | 0.60 | 65.7 | 19.3 | C |
| 4 | 1.00 | 0.866 | 2830 | 4244 | 0.67 | 64.4 | 22.0 | C |
| 5 | 1.00 | 0.866 | 2560 | 4244 | 0.60 | 65.6 | 19.5 | C |
| 6 | 1.00 | 0.866 | 2428 | 4244 | 0.57 | 65.7 | 18.4 | C |
| 7 | 1.00 | 0.866 | 2492 | 4244 | 0.59 | 65.7 | 18.9 | C |
| 8 | 1.00 | 0.866 | 2792 | 4244 | 0.66 | 64.6 | 21.6 | C |
| 9 | 1.00 | 0.866 | 2501 | 4244 | 0.59 | 65.7 | 19.0 | C |
| 10 | 1.00 | 0.866 | 2372 | 4244 | 0.56 | 65.7 | 17.9 | B |
| 11 | 1.00 | 0.866 | 2434 | 4244 | 0.57 | 65.7 | 18.4 | C |
| 12 | 1.00 | 0.866 | 2723 | 4244 | 0.64 | 64.9 | 21.0 | C |

## Segment 4: Merge

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 0.866 | 0.925 | 3276 | 672 | 4221 | 1796 | 0.78 | 0.37 | 58.9 | 58.9 | 27.8 | 25.6 | C |
| 2 | 1.00 | 1.00 | 0.866 | 0.925 | 3114 | 645 | 4221 | 1796 | 0.74 | 0.36 | 59.3 | 59.3 | 26.3 | 24.3 | C |
| 3 | 1.00 | 1.00 | 0.866 | 0.925 | 3121 | 586 | 4221 | 1796 | 0.74 | 0.33 | 59.3 | 59.3 | 26.3 | 24.4 | C |
| 4 | 1.00 | 1.00 | 0.866 | 0.925 | 3356 | 526 | 4221 | 1796 | 0.80 | 0.29 | 58.6 | 58.6 | 28.6 | 26.3 | C |
| 5 | 1.00 | 1.00 | 0.866 | 0.925 | 3249 | 689 | 4221 | 1796 | 0.77 | 0.38 | 58.9 | 58.9 | 27.6 | 25.4 | C |
| 6 | 1.00 | 1.00 | 0.866 | 0.925 | 3089 | 661 | 4221 | 1796 | 0.73 | 0.37 | 59.3 | 59.3 | 26.0 | 24.1 | C |
| 7 | 1.00 | 1.00 | 0.866 | 0.925 | 3091 | 599 | 4221 | 1796 | 0.73 | 0.33 | 59.3 | 59.3 | 26.1 | 24.2 | C |
| 8 | 1.00 | 1.00 | 0.866 | 0.925 | 3330 | 538 | 4221 | 1796 | 0.79 | 0.30 | 58.7 | 58.7 | 28.4 | 26.1 | C |
| 9 | 1.00 | 1.00 | 0.866 | 0.925 | 3158 | 657 | 4221 | 1796 | 0.75 | 0.37 | 59.2 | 59.2 | 26.7 | 24.7 | C |
| 10 | 1.00 | 1.00 | 0.866 | 0.925 | 3002 | 630 | 4221 | 1796 | 0.71 | 0.35 | 59.5 | 59.5 | 25.2 | 23.5 | C |
| 11 | 1.00 | 1.00 | 0.866 | 0.925 | 3006 | 572 | 4221 | 1796 | 0.71 | 0.32 | 59.5 | 59.5 | 25.3 | 23.5 | C |
| 12 | 1.00 | 1.00 | 0.866 | 0.925 | 3237 | 514 | 4221 | 1796 | 0.77 | 0.29 | 59.0 | 59.0 | 27.4 | 25.3 | C |

## Segment 5: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.876 | 0.981 | 3633 | 349 | 4221 | 1886 | 0.86 | 0.18 | 58.4 | 58.4 | 31.1 | 27.6 | C |
| 2 | 1.00 | 1.00 | 0.876 | 0.981 | 3440 | 318 | 4221 | 1886 | 0.82 | 0.17 | 59.1 | 59.1 | 29.1 | 26.1 | C |
| 3 | 1.00 | 1.00 | 0.876 | 0.981 | 3414 | 290 | 4221 | 1886 | 0.81 | 0.15 | 59.2 | 59.2 | 28.8 | 25.9 | C |
| 4 | 1.00 | 1.00 | 0.876 | 0.981 | 3713 | 359 | 4221 | 1886 | 0.88 | 0.19 | 58.1 | 58.1 | 32.0 | 28.2 | D |
| 5 | 1.00 | 1.00 | 0.876 | 0.981 | 3615 | 357 | 4221 | 1886 | 0.86 | 0.19 | 58.5 | 58.5 | 30.9 | 27.4 | C |
| 6 | 1.00 | 1.00 | 0.876 | 0.981 | 3423 | 325 | 4221 | 1886 | 0.81 | 0.17 | 59.2 | 59.2 | 28.9 | 26.0 | C |
| 7 | 1.00 | 1.00 | 0.876 | 0.981 | 3392 | 296 | 4221 | 1886 | 0.80 | 0.16 | 59.3 | 59.3 | 28.6 | 25.7 | C |
| 8 | 1.00 | 1.00 | 0.876 | 0.981 | 3696 | 367 | 4221 | 1886 | 0.88 | 0.19 | 58.1 | 58.1 | 31.8 | 28.1 | D |
| 9 | 1.00 | 1.00 | 0.876 | 0.981 | 3507 | 340 | 4221 | 1886 | 0.83 | 0.18 | 58.9 | 58.9 | 29.8 | 26.6 | C |
| 10 | 1.00 | 1.00 | 0.876 | 0.981 | 3321 | 311 | 4221 | 1886 | 0.79 | 0.16 | 59.4 | 59.4 | 28.0 | 25.2 | C |
| 11 | 1.00 | 1.00 | 0.876 | 0.981 | 3292 | 282 | 4221 | 1886 | 0.78 | 0.15 | 59.6 | 59.6 | 27.6 | 25.0 | C |
| 12 | 1.00 | 1.00 | 0.876 | 0.981 | 3585 | 351 | 4221 | 1886 | 0.85 | 0.19 | 58.6 | 58.6 | 30.6 | 27.2 | C |

## Segment 6: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.885 | 3637 | 4244 | 0.86 | 56.7 | 32.1 | D |
| 2 | 1.00 | 0.885 | 3443 | 4244 | 0.81 | 59.1 | 29.1 | D |
| 3 | 1.00 | 0.885 | 3414 | 4244 | 0.80 | 59.4 | 28.7 | D |
| 4 | 1.00 | 0.885 | 3718 | 4244 | 0.88 | 55.6 | 33.4 | D |
| 5 | 1.00 | 0.885 | 3620 | 4244 | 0.85 | 57.0 | 31.8 | D |
| 6 | 1.00 | 0.885 | 3427 | 4244 | 0.81 | 59.3 | 28.9 | D |
| 7 | 1.00 | 0.885 | 3392 | 4244 | 0.80 | 59.7 | 28.4 | D |
| 8 | 1.00 | 0.885 | 3702 | 4244 | 0.87 | 55.9 | 33.1 | D |
| 9 | 1.00 | 0.885 | 3512 | 4244 | 0.83 | 58.3 | 30.1 | D |
| 10 | 1.00 | 0.885 | 3324 | 4244 | 0.78 | 60.4 | 27.5 | D |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | | 0.885 | | 3293 | | 4244 | | 0.78 | | 60.7 | | 27.1 | | D |
| 12 | 1.00 | | 0.885 | | 3590 | | 4244 | | 0.85 | | 57.3 | | 31.3 | | D |

## Segment 7: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.885 | 0.953 | 3637 | 270 | 4221 | 1976 | 0.86 | 0.14 | 62.0 | 62.0 | 29.3 | 32.0 | D |
| 2 | 1.00 | 1.00 | 0.885 | 0.953 | 3443 | 268 | 4221 | 1976 | 0.82 | 0.14 | 62.0 | 62.0 | 27.8 | 30.4 | D |
| 3 | 1.00 | 1.00 | 0.885 | 0.953 | 3414 | 239 | 4221 | 1976 | 0.81 | 0.12 | 62.0 | 62.0 | 27.5 | 30.1 | D |
| 4 | 1.00 | 1.00 | 0.885 | 0.953 | 3718 | 270 | 4221 | 1976 | 0.88 | 0.14 | 62.0 | 62.0 | 30.0 | 32.7 | D |
| 5 | 1.00 | 1.00 | 0.885 | 0.953 | 3620 | 276 | 4221 | 1976 | 0.86 | 0.14 | 62.0 | 62.0 | 29.2 | 31.9 | D |
| 6 | 1.00 | 1.00 | 0.885 | 0.953 | 3427 | 274 | 4221 | 1976 | 0.81 | 0.14 | 62.0 | 62.0 | 27.6 | 30.2 | D |
| 7 | 1.00 | 1.00 | 0.885 | 0.953 | 3392 | 244 | 4221 | 1976 | 0.80 | 0.12 | 62.0 | 62.0 | 27.4 | 29.9 | D |
| 8 | 1.00 | 1.00 | 0.885 | 0.953 | 3702 | 276 | 4221 | 1976 | 0.88 | 0.14 | 62.0 | 62.0 | 29.9 | 32.6 | D |
| 9 | 1.00 | 1.00 | 0.885 | 0.953 | 3512 | 263 | 4221 | 1976 | 0.83 | 0.13 | 62.0 | 62.0 | 28.3 | 31.0 | D |
| 10 | 1.00 | 1.00 | 0.885 | 0.953 | 3324 | 262 | 4221 | 1976 | 0.79 | 0.13 | 62.0 | 62.0 | 26.8 | 29.4 | D |
| 11 | 1.00 | 1.00 | 0.885 | 0.953 | 3293 | 233 | 4221 | 1976 | 0.78 | 0.12 | 62.1 | 62.1 | 26.5 | 29.1 | D |
| 12 | 1.00 | 1.00 | 0.885 | 0.953 | 3590 | 263 | 4221 | 1976 | 0.85 | 0.13 | 62.0 | 62.0 | 29.0 | 31.6 | D |

## Segment 8: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.880 | 3366 | 4230 | 0.80 | 59.5 | 28.3 | D |
| 2 | 1.00 | 0.880 | 3173 | 4230 | 0.75 | 61.4 | 25.8 | C |
| 3 | 1.00 | 0.880 | 3174 | 4230 | 0.75 | 61.4 | 25.8 | C |
| 4 | 1.00 | 0.880 | 3447 | 4230 | 0.81 | 58.6 | 29.4 | D |
| 5 | 1.00 | 0.880 | 3342 | 4230 | 0.79 | 59.8 | 27.9 | D |
| 6 | 1.00 | 0.880 | 3150 | 4230 | 0.74 | 61.6 | 25.6 | C |
| 7 | 1.00 | 0.880 | 3147 | 4230 | 0.74 | 61.6 | 25.6 | C |
| 8 | 1.00 | 0.880 | 3424 | 4230 | 0.81 | 58.9 | 29.1 | D |
| 9 | 1.00 | 0.880 | 3247 | 4230 | 0.77 | 60.7 | 26.8 | D |
| 10 | 1.00 | 0.880 | 3059 | 4230 | 0.72 | 62.3 | 24.6 | C |
| 11 | 1.00 | 0.880 | 3059 | 4230 | 0.72 | 62.3 | 24.6 | C |
| 12 | 1.00 | 0.880 | 3325 | 4230 | 0.79 | 59.9 | 27.7 | D |

## Segment 9: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.880 | 0.960 | 3776 | 410 | 4221 | 1886 | 0.89 | 0.22 | 58.3 | 58.3 | 32.4 | 27.9 | C |
| 2 | 1.00 | 1.00 | 0.880 | 0.960 | 3529 | 356 | 4221 | 1886 | 0.84 | 0.19 | 59.3 | 59.3 | 29.8 | 26.0 | C |
| 3 | 1.00 | 1.00 | 0.880 | 0.960 | 3509 | 335 | 4221 | 1886 | 0.83 | 0.18 | 59.4 | 59.4 | 29.5 | 25.8 | C |
| 4 | 1.00 | 1.00 | 0.880 | 0.960 | 3871 | 424 | 4221 | 1886 | 0.92 | 0.22 | 57.9 | 57.9 | 33.4 | 28.6 | D |
| 5 | 1.00 | 1.00 | 0.880 | 0.960 | 3763 | 421 | 4221 | 1886 | 0.89 | 0.22 | 58.4 | 58.4 | 32.2 | 27.8 | C |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 1.00 | 0.880 | 0.960 | 3515 | 365 | 4221 | 1886 | 0.83 | 0.19 | 59.4 | 59.4 | 29.6 | 25.9 | C |
| 7 | 1.00 | 1.00 | 0.880 | 0.960 | 3491 | 344 | 4221 | 1886 | 0.83 | 0.18 | 59.5 | 59.5 | 29.3 | 25.7 | C |
| 8 | 1.00 | 1.00 | 0.880 | 0.960 | 3858 | 434 | 4221 | 1886 | 0.91 | 0.23 | 57.9 | 57.9 | 33.3 | 28.5 | D |
| 9 | 1.00 | 1.00 | 0.880 | 0.960 | 3648 | 401 | 4221 | 1886 | 0.86 | 0.21 | 58.9 | 58.9 | 31.0 | 26.9 | C |
| 10 | 1.00 | 1.00 | 0.880 | 0.960 | 3407 | 348 | 4221 | 1886 | 0.81 | 0.18 | 59.7 | 59.7 | 28.5 | 25.0 | C |
| 11 | 1.00 | 1.00 | 0.880 | 0.960 | 3387 | 328 | 4221 | 1886 | 0.80 | 0.17 | 59.8 | 59.8 | 28.3 | 24.9 | C |
| 12 | 1.00 | 1.00 | 0.880 | 0.960 | 3740 | 415 | 4221 | 1886 | 0.89 | 0.22 | 58.5 | 58.5 | 32.0 | 27.6 | C |

## Segment 10: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.887 | 3784 | 4244 | 0.89 | 54.7 | 34.6 | D |
| 2 | 1.00 | 0.887 | 3533 | 4244 | 0.83 | 58.1 | 30.4 | D |
| 3 | 1.00 | 0.887 | 3512 | 4244 | 0.83 | 58.3 | 30.1 | D |
| 4 | 1.00 | 0.887 | 3878 | 4244 | 0.91 | 53.3 | 36.4 | E |
| 5 | 1.00 | 0.887 | 3771 | 4244 | 0.89 | 54.9 | 34.4 | D |
| 6 | 1.00 | 0.887 | 3520 | 4244 | 0.83 | 58.2 | 30.2 | D |
| 7 | 1.00 | 0.887 | 3494 | 4244 | 0.82 | 58.5 | 29.9 | D |
| 8 | 1.00 | 0.887 | 3867 | 4244 | 0.91 | 53.5 | 36.1 | E |
| 9 | 1.00 | 0.887 | 3655 | 4244 | 0.86 | 56.5 | 32.4 | D |
| 10 | 1.00 | 0.887 | 3411 | 4244 | 0.80 | 59.5 | 28.7 | D |
| 11 | 1.00 | 0.887 | 3390 | 4244 | 0.80 | 59.7 | 28.4 | D |
| 12 | 1.00 | 0.887 | 3747 | 4244 | 0.88 | 55.2 | 33.9 | D |

## Segment 11: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.887 | 0.982 | 3784 | 364 | 4221 | 1796 | 0.90 | 0.20 | 57.0 | 57.0 | 33.2 | 32.8 | D |
| 2 | 1.00 | 1.00 | 0.887 | 0.982 | 3533 | 303 | 4221 | 1796 | 0.84 | 0.17 | 57.1 | 57.1 | 30.9 | 30.6 | D |
| 3 | 1.00 | 1.00 | 0.887 | 0.982 | 3512 | 348 | 4221 | 1796 | 0.83 | 0.19 | 57.0 | 57.0 | 30.8 | 30.4 | D |
| 4 | 1.00 | 1.00 | 0.887 | 0.982 | 3878 | 338 | 4221 | 1796 | 0.92 | 0.19 | 57.0 | 57.0 | 34.0 | 33.6 | D |
| 5 | 1.00 | 1.00 | 0.887 | 0.982 | 3771 | 372 | 4221 | 1796 | 0.89 | 0.21 | 57.0 | 57.0 | 33.1 | 32.7 | D |
| 6 | 1.00 | 1.00 | 0.887 | 0.982 | 3520 | 311 | 4221 | 1796 | 0.83 | 0.17 | 57.1 | 57.1 | 30.8 | 30.5 | D |
| 7 | 1.00 | 1.00 | 0.887 | 0.982 | 3494 | 356 | 4221 | 1796 | 0.83 | 0.20 | 57.0 | 57.0 | 30.6 | 30.3 | D |
| 8 | 1.00 | 1.00 | 0.887 | 0.982 | 3867 | 346 | 4221 | 1796 | 0.92 | 0.19 | 57.0 | 57.0 | 33.9 | 33.5 | D |
| 9 | 1.00 | 1.00 | 0.887 | 0.982 | 3655 | 355 | 4221 | 1796 | 0.87 | 0.20 | 57.0 | 57.0 | 32.1 | 31.7 | D |
| 10 | 1.00 | 1.00 | 0.887 | 0.982 | 3411 | 296 | 4221 | 1796 | 0.81 | 0.16 | 57.1 | 57.1 | 29.9 | 29.6 | D |
| 11 | 1.00 | 1.00 | 0.887 | 0.982 | 3390 | 340 | 4221 | 1796 | 0.80 | 0.19 | 57.0 | 57.0 | 29.7 | 29.4 | D |
| 12 | 1.00 | 1.00 | 0.887 | 0.982 | 3747 | 330 | 4221 | 1796 | 0.89 | 0.18 | 57.1 | 57.1 | 32.8 | 32.5 | D |

## Segment 12: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.877 | 3420 | 4237 | 0.81 | 59.1 | 28.9 | D |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.00 | 0.877 | 3234 | 4237 | 0.76 | 61.0 | 26.5 | D |
| 3 | 1.00 | 0.877 | 3162 | 4237 | 0.75 | 61.7 | 25.6 | C |
| 4 | 1.00 | 0.877 | 3544 | 4237 | 0.84 | 57.7 | 30.7 | D |
| 5 | 1.00 | 0.877 | 3398 | 4237 | 0.80 | 59.4 | 28.6 | D |
| 6 | 1.00 | 0.877 | 3212 | 4237 | 0.76 | 61.3 | 26.2 | D |
| 7 | 1.00 | 0.877 | 3135 | 4237 | 0.74 | 61.9 | 25.3 | C |
| 8 | 1.00 | 0.877 | 3523 | 4237 | 0.83 | 57.9 | 30.4 | D |
| 9 | 1.00 | 0.877 | 3299 | 4237 | 0.78 | 60.4 | 27.3 | D |
| 10 | 1.00 | 0.877 | 3119 | 4237 | 0.74 | 62.1 | 25.1 | C |
| 11 | 1.00 | 0.877 | 3048 | 4237 | 0.72 | 62.6 | 24.3 | C |
| 12 | 1.00 | 0.877 | 3421 | 4237 | 0.81 | 59.1 | 28.9 | D |

## Segment 13: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.877 | 0.902 | 3686 | 266 | 4221 | 1886 | 0.87 | 0.14 | 57.4 | 57.4 | 32.1 | 30.3 | D |
| 2 | 1.00 | 1.00 | 0.877 | 0.902 | 3469 | 235 | 4221 | 1886 | 0.82 | 0.12 | 58.2 | 58.2 | 29.8 | 28.6 | D |
| 3 | 1.00 | 1.00 | 0.877 | 0.902 | 3413 | 251 | 4221 | 1886 | 0.81 | 0.13 | 58.4 | 58.4 | 29.2 | 28.1 | D |
| 4 | 1.00 | 1.00 | 0.877 | 0.902 | 3746 | 202 | 4221 | 1886 | 0.89 | 0.11 | 57.1 | 57.1 | 32.8 | 30.8 | D |
| 5 | 1.00 | 1.00 | 0.877 | 0.902 | 3671 | 273 | 4221 | 1886 | 0.87 | 0.14 | 57.5 | 57.5 | 31.9 | 30.1 | D |
| 6 | 1.00 | 1.00 | 0.877 | 0.902 | 3451 | 239 | 4221 | 1886 | 0.82 | 0.13 | 58.3 | 58.3 | 29.6 | 28.4 | D |
| 7 | 1.00 | 1.00 | 0.877 | 0.902 | 3391 | 256 | 4221 | 1886 | 0.80 | 0.14 | 58.5 | 58.5 | 29.0 | 28.0 | C |
| 8 | 1.00 | 1.00 | 0.877 | 0.902 | 3729 | 206 | 4221 | 1886 | 0.88 | 0.11 | 57.2 | 57.2 | 32.6 | 30.6 | D |
| 9 | 1.00 | 1.00 | 0.877 | 0.902 | 3560 | 261 | 4221 | 1886 | 0.84 | 0.14 | 57.9 | 57.9 | 30.7 | 29.3 | D |
| 10 | 1.00 | 1.00 | 0.877 | 0.902 | 3348 | 229 | 4221 | 1886 | 0.79 | 0.12 | 58.6 | 58.6 | 28.6 | 27.6 | C |
| 11 | 1.00 | 1.00 | 0.877 | 0.902 | 3293 | 245 | 4221 | 1886 | 0.78 | 0.13 | 58.8 | 58.8 | 28.0 | 27.2 | C |
| 12 | 1.00 | 1.00 | 0.877 | 0.902 | 3618 | 197 | 4221 | 1886 | 0.86 | 0.10 | 57.7 | 57.7 | 31.4 | 29.8 | D |

## Segment 14: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 3689 | 4244 | 0.87 | 56.1 | 32.9 | D |
| 2 | 1.00 | 0.878 | 3472 | 4244 | 0.82 | 58.8 | 29.5 | D |
| 3 | 1.00 | 0.878 | 3416 | 4244 | 0.80 | 59.4 | 28.8 | D |
| 4 | 1.00 | 0.878 | 3747 | 4244 | 0.88 | 55.2 | 33.9 | D |
| 5 | 1.00 | 0.878 | 3674 | 4244 | 0.87 | 56.2 | 32.7 | D |
| 6 | 1.00 | 0.878 | 3454 | 4244 | 0.81 | 59.0 | 29.3 | D |
| 7 | 1.00 | 0.878 | 3394 | 4244 | 0.80 | 59.6 | 28.5 | D |
| 8 | 1.00 | 0.878 | 3731 | 4244 | 0.88 | 55.5 | 33.6 | D |
| 9 | 1.00 | 0.878 | 3563 | 4244 | 0.84 | 57.7 | 30.9 | D |
| 10 | 1.00 | 0.878 | 3351 | 4244 | 0.79 | 60.1 | 27.9 | D |
| 11 | 1.00 | 0.878 | 3296 | 4244 | 0.78 | 60.7 | 27.1 | D |
| 12 | 1.00 | 0.878 | 3620 | 4244 | 0.85 | 57.0 | 31.8 | D |

## Segment 15: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.878 | 0.946 | 3689 | 122 | 4221 | 1976 | 0.87 | 0.06 | 62.3 | 62.3 | 29.6 | 30.1 | D |
| 2 | 1.00 | 1.00 | 0.878 | 0.946 | 3472 | 118 | 4221 | 1976 | 0.82 | 0.06 | 62.3 | 62.3 | 27.9 | 28.3 | D |
| 3 | 1.00 | 1.00 | 0.878 | 0.946 | 3416 | 133 | 4221 | 1976 | 0.81 | 0.07 | 62.3 | 62.3 | 27.4 | 27.8 | C |
| 4 | 1.00 | 1.00 | 0.878 | 0.946 | 3747 | 163 | 4221 | 1976 | 0.89 | 0.08 | 62.2 | 62.2 | 30.1 | 30.6 | D |
| 5 | 1.00 | 1.00 | 0.878 | 0.946 | 3674 | 125 | 4221 | 1976 | 0.87 | 0.06 | 62.3 | 62.3 | 29.5 | 30.0 | D |
| 6 | 1.00 | 1.00 | 0.878 | 0.946 | 3454 | 122 | 4221 | 1976 | 0.82 | 0.06 | 62.3 | 62.3 | 27.7 | 28.1 | D |
| 7 | 1.00 | 1.00 | 0.878 | 0.946 | 3394 | 136 | 4221 | 1976 | 0.80 | 0.07 | 62.3 | 62.3 | 27.2 | 27.6 | C |
| 8 | 1.00 | 1.00 | 0.878 | 0.946 | 3731 | 167 | 4221 | 1976 | 0.88 | 0.08 | 62.2 | 62.2 | 30.0 | 30.5 | D |
| 9 | 1.00 | 1.00 | 0.878 | 0.946 | 3563 | 119 | 4221 | 1976 | 0.84 | 0.06 | 62.3 | 62.3 | 28.6 | 29.0 | D |
| 10 | 1.00 | 1.00 | 0.878 | 0.946 | 3351 | 116 | 4221 | 1976 | 0.79 | 0.06 | 62.3 | 62.3 | 26.9 | 27.2 | C |
| 11 | 1.00 | 1.00 | 0.878 | 0.946 | 3296 | 130 | 4221 | 1976 | 0.78 | 0.07 | 62.3 | 62.3 | 26.5 | 26.7 | C |
| 12 | 1.00 | 1.00 | 0.878 | 0.946 | 3620 | 160 | 4221 | 1976 | 0.86 | 0.08 | 62.2 | 62.2 | 29.1 | 29.5 | D |

## Segment 16: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.876 | 3566 | 4251 | 0.84 | 57.9 | 30.8 | D |
| 2 | 1.00 | 0.876 | 3352 | 4251 | 0.79 | 60.3 | 27.8 | D |
| 3 | 1.00 | 0.876 | 3280 | 4251 | 0.77 | 61.1 | 26.8 | D |
| 4 | 1.00 | 0.876 | 3580 | 4251 | 0.84 | 57.7 | 31.0 | D |
| 5 | 1.00 | 0.876 | 3548 | 4251 | 0.83 | 58.1 | 30.5 | D |
| 6 | 1.00 | 0.876 | 3331 | 4251 | 0.78 | 60.5 | 27.5 | D |
| 7 | 1.00 | 0.876 | 3255 | 4251 | 0.77 | 61.3 | 26.6 | D |
| 8 | 1.00 | 0.876 | 3559 | 4251 | 0.84 | 57.9 | 30.7 | D |
| 9 | 1.00 | 0.876 | 3442 | 4251 | 0.81 | 59.3 | 29.0 | D |
| 10 | 1.00 | 0.876 | 3233 | 4251 | 0.76 | 61.5 | 26.3 | D |
| 11 | 1.00 | 0.876 | 3163 | 4251 | 0.74 | 62.2 | 25.4 | C |
| 12 | 1.00 | 0.876 | 3455 | 4251 | 0.81 | 59.2 | 29.2 | D |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R Infl. | F | R Infl. | |
| 1 | 1.00 | 1.00 | 0.876 | 0.939 | 3726 | 160 | 4221 | 1976 | 0.88 | 0.08 | 58.7 | 58.7 | 31.7 | 28.0 | C |
| 2 | 1.00 | 1.00 | 0.876 | 0.939 | 3503 | 151 | 4221 | 1976 | 0.83 | 0.08 | 59.6 | 59.6 | 29.4 | 26.2 | C |
| 3 | 1.00 | 1.00 | 0.876 | 0.939 | 3453 | 173 | 4221 | 1976 | 0.82 | 0.09 | 59.7 | 59.7 | 28.9 | 25.8 | C |
| 4 | 1.00 | 1.00 | 0.876 | 0.939 | 3721 | 141 | 4221 | 1976 | 0.88 | 0.07 | 58.7 | 58.7 | 31.7 | 27.9 | C |
| 5 | 1.00 | 1.00 | 0.876 | 0.939 | 3711 | 163 | 4221 | 1976 | 0.88 | 0.08 | 58.8 | 58.8 | 31.6 | 27.8 | C |
| 6 | 1.00 | 1.00 | 0.876 | 0.939 | 3485 | 154 | 4221 | 1976 | 0.83 | 0.08 | 59.6 | 59.6 | 29.2 | 26.1 | C |
| 7 | 1.00 | 1.00 | 0.876 | 0.939 | 3432 | 177 | 4221 | 1976 | 0.81 | 0.09 | 59.8 | 59.8 | 28.7 | 25.7 | C |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.00 | 1.00 | 0.876 | 0.939 | 3703 | 144 | 4221 | 1976 | 0.88 | 0.07 | 58.8 | 58.8 | 31.5 | 27.8 | C |
| 9 | 1.00 | 1.00 | 0.876 | 0.939 | 3597 | 155 | 4221 | 1976 | 0.85 | 0.08 | 59.2 | 59.2 | 30.4 | 26.9 | C |
| 10 | 1.00 | 1.00 | 0.876 | 0.939 | 3381 | 148 | 4221 | 1976 | 0.80 | 0.07 | 60.0 | 60.0 | 28.2 | 25.3 | C |
| 11 | 1.00 | 1.00 | 0.876 | 0.939 | 3331 | 168 | 4221 | 1976 | 0.79 | 0.09 | 60.1 | 60.1 | 27.7 | 24.9 | C |
| 12 | 1.00 | 1.00 | 0.876 | 0.939 | 3592 | 137 | 4221 | 1976 | 0.85 | 0.07 | 59.2 | 59.2 | 30.3 | 26.9 | C |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 3729 | 4278 | 0.87 | 56.5 | 33.0 | D |
| 2 | 1.00 | 0.878 | 3506 | 4278 | 0.82 | 59.4 | 29.5 | D |
| 3 | 1.00 | 0.878 | 3457 | 4278 | 0.81 | 60.0 | 28.8 | D |
| 4 | 1.00 | 0.878 | 3722 | 4278 | 0.87 | 56.6 | 32.9 | D |
| 5 | 1.00 | 0.878 | 3714 | 4278 | 0.87 | 56.7 | 32.8 | D |
| 6 | 1.00 | 0.878 | 3489 | 4278 | 0.82 | 59.6 | 29.3 | D |
| 7 | 1.00 | 0.878 | 3436 | 4278 | 0.80 | 60.2 | 28.5 | D |
| 8 | 1.00 | 0.878 | 3705 | 4278 | 0.87 | 56.8 | 32.6 | D |
| 9 | 1.00 | 0.878 | 3600 | 4278 | 0.84 | 58.2 | 30.9 | D |
| 10 | 1.00 | 0.878 | 3384 | 4278 | 0.79 | 60.8 | 27.8 | D |
| 11 | 1.00 | 0.878 | 3336 | 4278 | 0.78 | 61.3 | 27.2 | D |
| 12 | 1.00 | 0.878 | 3595 | 4278 | 0.84 | 58.3 | 30.8 | D |

## Facility Analysis Results

| AP | VMT veh-mi/p | VMT-Demand veh-mi/p | VHD veh-h/p | Speed mi/h | Density pc/mi/ln | Density veh/mi/ln | TT min | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 21014 | 20917 | 53.73 | 58.0 | 31.1 | 27.5 | 27.20 | E |
| 2 | 19886 | 19797 | 38.32 | 60.2 | 28.3 | 25.1 | 26.30 | D |
| 3 | 19961 | 19875 | 39.12 | 60.1 | 28.5 | 25.2 | 26.30 | D |
| 4 | 21318 | 21230 | 58.22 | 57.4 | 31.9 | 28.2 | 27.50 | E |
| 5 | 20911 | 20812 | 52.03 | 58.3 | 30.8 | 27.2 | 27.10 | E |
| 6 | 19789 | 19698 | 37.17 | 60.4 | 28.1 | 24.9 | 26.20 | D |
| 7 | 19845 | 19758 | 37.86 | 60.3 | 28.2 | 25.0 | 26.20 | D |
| 8 | 21219 | 21129 | 56.71 | 57.6 | 31.6 | 28.0 | 27.40 | E |
| 9 | 20282 | 20188 | 43.37 | 59.5 | 29.3 | 25.9 | 26.60 | E |
| 10 | 19195 | 19109 | 30.75 | 61.4 | 26.8 | 23.7 | 25.70 | D |
| 11 | 19262 | 19178 | 31.59 | 61.3 | 27.0 | 23.9 | 25.80 | D |
| 12 | 20584 | 20498 | 46.97 | 59.0 | 29.9 | 26.5 | 26.80 | E |

## Facility Overall Results

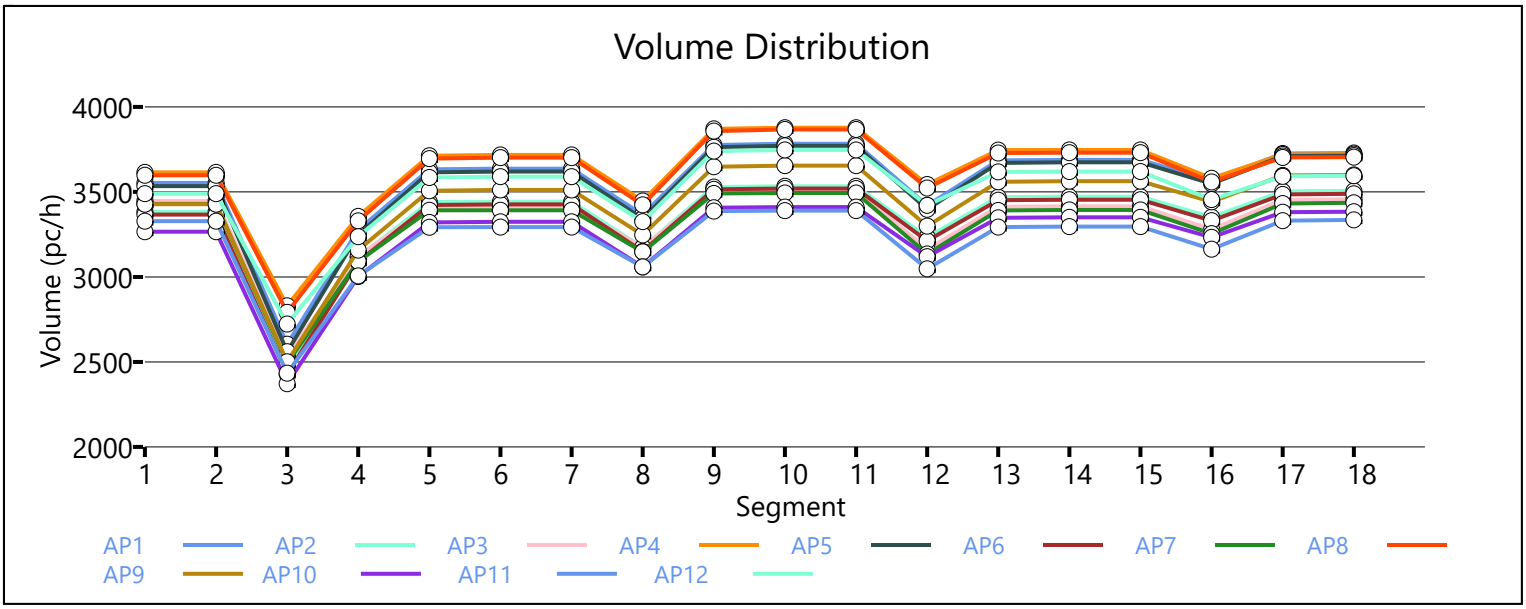
| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 59.4 | Density, veh/mi/ln | 25.9 |
| Average Travel Time, min | 26.60 | Density, pc/mi/ln | 29.3 |

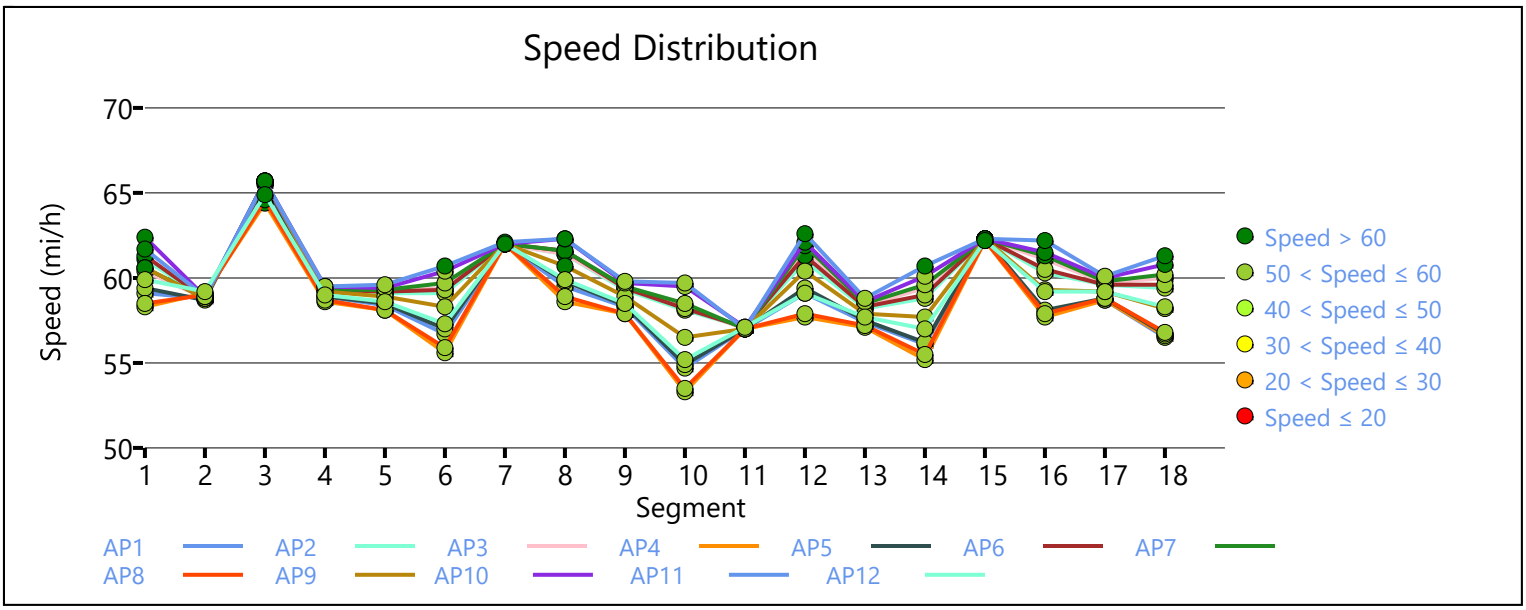
## Messages

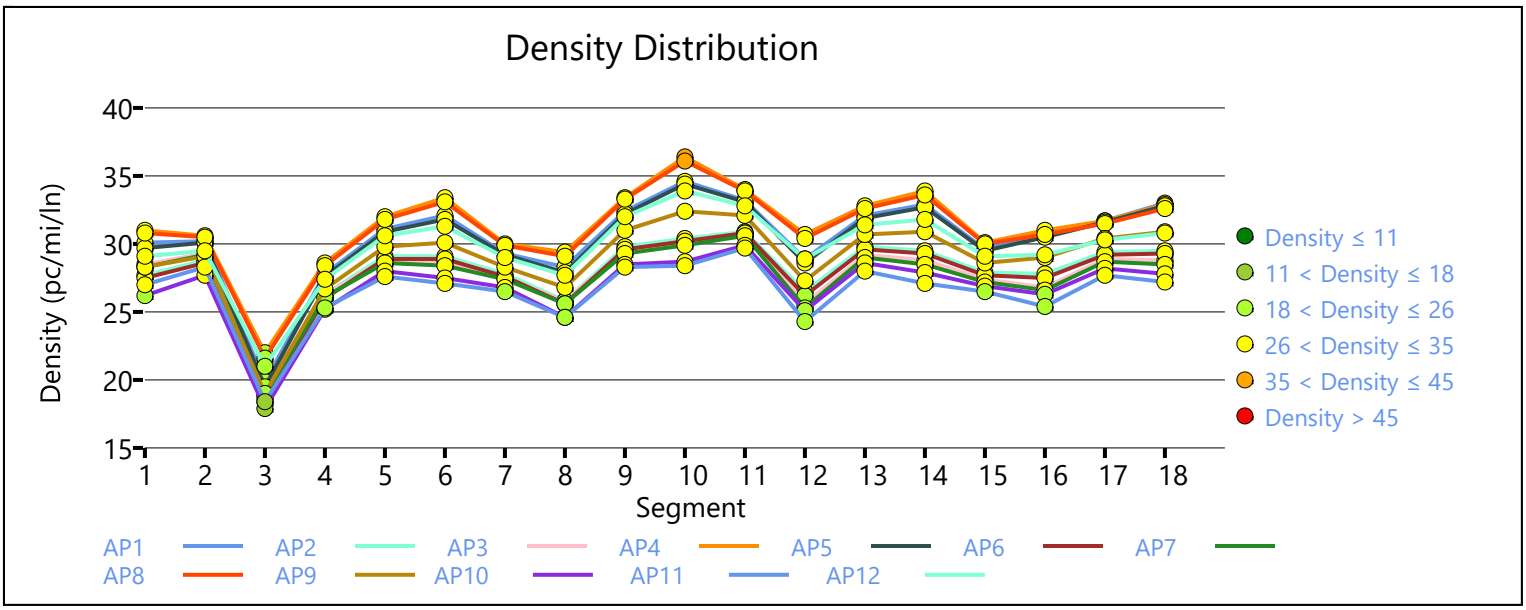
| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with |

| | |
|---|---|
| | no queuing). |

| Comments |
|---|
| |

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# HCS7 Freeway Facilities Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | | Date | |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | Sunday Afternoon Peak |
| Project Description | SB I-90/94 US 12 to WIS 33 | Units | U.S. Customary |

## Facility Global Input

| | | | |
|---|---|---|---|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 22 |
| Total Analysis Periods | 12 | Analysis Period Duration, min | 15 |
| Facility Length, mi | 28.39 | | |

## Facility Segment Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|---|---|---|---|---|---|
| 1 | Basic | Basic | CTH HH to USH 12/STH 16 | 29955 | 2 |
| 2 | Diverge | Diverge | USH 12/STH 16 EB Off | 1500 | 2 |
| 3 | Basic | Basic | USH 12/STH 16 between on and off | 2202 | 2 |
| 4 | Merge | Merge | USH 12/STH 16 EB On | 1500 | 2 |
| 5 | Basic | Basic | USH 12/STH 16 to STH 13 | 5695 | 2 |
| 6 | Diverge | Diverge | STH 13 EB Off | 1500 | 2 |
| 7 | Basic | Basic | STH 13 between on and off | 1465 | 2 |
| 8 | Merge | Merge | STH 13 EB On | 1500 | 2 |
| 9 | Basic | Basic | STH 13 to STH 23 | 7583 | 2 |
| 10 | Diverge | Diverge | STH 23 EB Off | 1500 | 2 |
| 11 | Basic | Basic | STH 23 between on and off | 2771 | 2 |
| 12 | Merge | Merge | STH 23 EB On | 1500 | 2 |
| 13 | Basic | Basic | STH 23 to USH 12 | 6118 | 2 |
| 14 | Diverge | Diverge | USH 12 EB Off | 1500 | 2 |
| 15 | Basic | Basic | USH 12 between on and off | 1396 | 2 |
| 16 | Merge | Merge | USH 12 SB on | 1283 | 2 |
| 17 | Merge | Merge | USH 12 EB On | 1500 | 2 |
| 18 | Basic | Basic | USH 12 to STH 33 | 67891 | 2 |
| 19 | Diverge | Diverge | STH 33 EB Off | 1500 | 2 |
| 20 | Basic | Basic | STH 33 between on and off | 1344 | 2 |
| 21 | Merge | Merge | STH 33 EB On | 1500 | 2 |
| 22 | Basic | Basic | STH 33 to I-39 | 7200 | 2 |

## Facility Segment Data

### Segment 1: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.881 | 3393 | 4278 | 0.79 | 60.7 | 27.9 | D |
| 2 | 1.00 | 0.881 | 4089 | 4278 | 0.96 | 50.9 | 40.2 | E |
| 3 | 1.00 | 0.881 | 3627 | 4278 | 0.90 | 57.9 | 31.3 | D |
| 4 | 1.00 | 0.881 | 3734 | 4278 | 0.88 | 56.4 | 33.1 | D |
| 5 | 1.00 | 0.881 | 3673 | 4278 | 0.82 | 57.2 | 32.1 | D |
| 6 | 1.00 | 0.881 | 3511 | 4278 | 0.84 | 59.3 | 29.6 | D |
| 7 | 1.00 | 0.881 | 3341 | 4278 | 0.93 | 33.5 | 49.8 | F |
| 8 | 1.00 | 0.881 | 3840 | 4278 | 0.91 | 36.4 | 52.7 | F |
| 9 | 1.00 | 0.881 | 3626 | 4278 | 0.79 | 57.9 | 31.3 | D |
| 10 | 1.00 | 0.881 | 3671 | 4278 | 0.81 | 57.3 | 32.0 | D |
| 11 | 1.00 | 0.881 | 3281 | 4278 | 0.89 | 33.3 | 49.3 | F |
| 12 | 1.00 | 0.881 | 3886 | 4278 | 0.88 | 38.2 | 50.8 | F |

## Segment 2: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.881 | 0.954 | 3393 | 187 | 4221 | 1976 | 0.80 | 0.09 | 62.2 | 62.2 | 27.3 | 25.7 | C |
| 2 | 1.00 | 1.00 | 0.881 | 0.954 | 4078 | 173 | 4221 | 1976 | 0.97 | 0.09 | 62.2 | 62.2 | 32.8 | 31.6 | D |
| 3 | 1.00 | 1.00 | 0.881 | 0.954 | 3639 | 154 | 4221 | 1976 | 0.86 | 0.08 | 62.3 | 62.3 | 29.2 | 27.8 | C |
| 4 | 1.00 | 1.00 | 0.881 | 0.954 | 3734 | 135 | 4221 | 1976 | 0.88 | 0.07 | 62.3 | 62.3 | 30.0 | 28.7 | D |
| 5 | 1.00 | 1.00 | 0.881 | 0.954 | 3613 | 193 | 4221 | 1976 | 0.86 | 0.10 | 62.2 | 62.2 | 29.0 | 27.6 | C |
| 6 | 1.00 | 1.00 | 0.881 | 0.954 | 3570 | 179 | 4221 | 1976 | 0.85 | 0.09 | 62.2 | 62.2 | 28.7 | 27.2 | C |
| 7 | 1.00 | 1.00 | 0.881 | 0.954 | 3312 | 159 | 4221 | 1976 | 0.94 | 0.08 | 30.8 | 62.2 | 53.7 | 30.7 | F |
| 8 | 1.00 | 1.00 | 0.881 | 0.954 | 3759 | 139 | 4221 | 1976 | 0.93 | 0.07 | 31.7 | 62.3 | 59.3 | 30.1 | F |
| 9 | 1.00 | 1.00 | 0.881 | 0.954 | 3657 | 186 | 4221 | 1976 | 0.80 | 0.09 | 33.2 | 62.2 | 55.1 | 25.6 | F |
| 10 | 1.00 | 1.00 | 0.881 | 0.954 | 3635 | 172 | 4221 | 1976 | 0.82 | 0.09 | 32.0 | 62.2 | 56.9 | 26.3 | F |
| 11 | 1.00 | 1.00 | 0.881 | 0.954 | 3397 | 153 | 4221 | 1976 | 0.80 | 0.08 | 62.3 | 62.3 | 27.3 | 25.8 | C |
| 12 | 1.00 | 1.00 | 0.881 | 0.954 | 3821 | 134 | 4221 | 1976 | 0.89 | 0.07 | 34.0 | 62.3 | 56.3 | 28.9 | F |

## Segment 3: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 3202 | 4251 | 0.75 | 61.8 | 25.9 | C |
| 2 | 1.00 | 0.878 | 3783 | 4251 | 0.92 | 54.9 | 34.5 | D |
| 3 | 1.00 | 0.878 | 3535 | 4251 | 0.87 | 36.8 | 48.1 | F |
| 4 | 1.00 | 0.878 | 3539 | 4251 | 0.86 | 36.6 | 48.3 | F |
| 5 | 1.00 | 0.878 | 3440 | 4251 | 0.78 | 27.8 | 61.9 | F |
| 6 | 1.00 | 0.878 | 3394 | 4251 | 0.80 | 26.0 | 65.2 | F |
| 7 | 1.00 | 0.878 | 3183 | 4251 | 0.90 | 22.6 | 70.5 | F |
| 8 | 1.00 | 0.878 | 3668 | 4251 | 0.89 | 28.3 | 64.9 | F |
| 9 | 1.00 | 0.878 | 3431 | 4251 | 0.75 | 26.3 | 65.3 | F |
| 10 | 1.00 | 0.878 | 3505 | 4251 | 0.77 | 27.2 | 64.5 | F |
| 11 | 1.00 | 0.878 | 3191 | 4251 | 0.86 | 22.5 | 70.8 | F |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | | 0.878 | | 3664 | | 4251 | | 0.85 | | 28.2 | | 65.0 | | F |
| **Segment 4: Merge** | | | | | | | | | | | | | | | |
| **AP** | **PHF** | | **fHV** | | **Flow Rate (pc/h)** | | **Capacity (pc/h)** | | **d/c Ratio** | | **Speed (mi/h)** | | **Density (pc/mi/ln)** | | **LOS** |
| | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | **Freeway** | **Ramp** | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | |
| 1 | 1.00 | 1.00 | 0.878 | 0.918 | 3540 | 338 | 4221 | 1976 | 0.84 | 0.17 | 58.2 | 58.2 | 30.4 | 29.2 | D |
| 2 | 1.00 | 1.00 | 0.878 | 0.918 | 4012 | 285 | 4221 | 1976 | 1.00 | 0.14 | 43.2 | 54.8 | 46.4 | 34.4 | F |
| 3 | 1.00 | 1.00 | 0.878 | 0.918 | 3829 | 292 | 4221 | 1976 | 0.94 | 0.15 | 38.8 | 56.3 | 49.3 | 32.6 | F |
| 4 | 1.00 | 1.00 | 0.878 | 0.918 | 3794 | 263 | 4221 | 1976 | 0.92 | 0.13 | 36.2 | 56.6 | 52.4 | 32.1 | F |
| 5 | 1.00 | 1.00 | 0.878 | 0.918 | 3782 | 350 | 4221 | 1976 | 0.87 | 0.18 | 36.3 | 57.7 | 52.1 | 30.2 | F |
| 6 | 1.00 | 1.00 | 0.878 | 0.918 | 3685 | 295 | 4221 | 1976 | 0.87 | 0.15 | 57.7 | 57.7 | 31.9 | 30.4 | D |
| 7 | 1.00 | 1.00 | 0.878 | 0.918 | 3557 | 302 | 4221 | 1976 | 0.84 | 0.15 | 58.2 | 58.2 | 30.6 | 29.4 | D |
| 8 | 1.00 | 1.00 | 0.878 | 0.918 | 3914 | 272 | 4221 | 1976 | 0.93 | 0.14 | 56.6 | 56.6 | 34.6 | 32.2 | D |
| 9 | 1.00 | 1.00 | 0.878 | 0.918 | 3794 | 337 | 4221 | 1976 | 0.90 | 0.17 | 57.2 | 57.2 | 33.2 | 31.2 | D |
| 10 | 1.00 | 1.00 | 0.878 | 0.918 | 3751 | 284 | 4221 | 1976 | 0.89 | 0.14 | 57.4 | 57.4 | 32.7 | 30.9 | D |
| 11 | 1.00 | 1.00 | 0.878 | 0.918 | 3520 | 291 | 4221 | 1976 | 0.83 | 0.15 | 58.3 | 58.3 | 30.2 | 29.1 | D |
| 12 | 1.00 | 1.00 | 0.878 | 0.918 | 3925 | 261 | 4221 | 1976 | 0.93 | 0.13 | 56.5 | 56.5 | 34.7 | 32.3 | D |
| **Segment 5: Basic** | | | | | | | | | | | | | | | |
| **AP** | **PHF** | | **fHV** | | **Flow Rate (pc/h)** | | **Capacity (pc/h)** | | **d/c Ratio** | | **Speed (mi/h)** | | **Density (pc/mi/ln)** | | **LOS** |
| 1 | 1.00 | | 0.882 | | 3539 | | 4244 | | 0.83 | | 58.0 | | 30.5 | | D |
| 2 | 1.00 | | 0.882 | | 3840 | | 4244 | | 0.99 | | 35.1 | | 54.7 | | F |
| 3 | 1.00 | | 0.882 | | 3817 | | 4244 | | 0.93 | | 34.5 | | 55.3 | | F |
| 4 | 1.00 | | 0.882 | | 3760 | | 4244 | | 0.92 | | 32.0 | | 58.8 | | F |
| 5 | 1.00 | | 0.882 | | 3739 | | 4244 | | 0.86 | | 32.7 | | 57.1 | | F |
| 6 | 1.00 | | 0.882 | | 3672 | | 4244 | | 0.87 | | 31.3 | | 58.6 | | F |
| 7 | 1.00 | | 0.882 | | 3797 | | 4244 | | 0.97 | | 35.0 | | 54.2 | | F |
| 8 | 1.00 | | 0.882 | | 3751 | | 4244 | | 0.95 | | 35.4 | | 53.0 | | F |
| 9 | 1.00 | | 0.882 | | 3765 | | 4244 | | 0.83 | | 39.3 | | 47.9 | | F |
| 10 | 1.00 | | 0.882 | | 3689 | | 4244 | | 0.84 | | 33.8 | | 54.6 | | F |
| 11 | 1.00 | | 0.882 | | 3808 | | 4244 | | 0.93 | | 54.4 | | 35.0 | | D |
| 12 | 1.00 | | 0.882 | | 3771 | | 4244 | | 0.91 | | 54.9 | | 34.3 | | D |
| **Segment 6: Diverge** | | | | | | | | | | | | | | | |
| **AP** | **PHF** | | **fHV** | | **Flow Rate (pc/h)** | | **Capacity (pc/h)** | | **d/c Ratio** | | **Speed (mi/h)** | | **Density (pc/mi/ln)** | | **LOS** |
| | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | **Freeway** | **Ramp** | **F** | **R** | **F** | **R** | **Freeway** | **Ramp** | |
| 1 | 1.00 | 1.00 | 0.882 | 0.961 | 3539 | 172 | 4221 | 1706 | 0.84 | 0.10 | 54.3 | 54.3 | 32.6 | 28.4 | D |
| 2 | 1.00 | 1.00 | 0.882 | 0.961 | 3786 | 232 | 4221 | 1706 | 0.99 | 0.14 | 32.8 | 54.1 | 57.7 | 34.0 | F |
| 3 | 1.00 | 1.00 | 0.882 | 0.961 | 3821 | 203 | 4221 | 1706 | 0.94 | 0.12 | 32.7 | 54.2 | 58.3 | 32.0 | F |
| 4 | 1.00 | 1.00 | 0.882 | 0.961 | 3753 | 158 | 4221 | 1706 | 0.92 | 0.09 | 30.9 | 54.3 | 60.8 | 31.4 | F |
| 5 | 1.00 | 1.00 | 0.882 | 0.961 | 3733 | 178 | 4221 | 1706 | 0.87 | 0.10 | 31.0 | 54.2 | 60.2 | 29.4 | F |
| 6 | 1.00 | 1.00 | 0.882 | 0.961 | 3668 | 240 | 4221 | 1706 | 0.88 | 0.14 | 28.8 | 54.1 | 63.7 | 29.8 | F |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.00 | 1.00 | 0.882 | 0.961 | 3820 | 210 | 4221 | 1706 | 0.97 | 0.12 | 41.5 | 54.2 | 46.1 | 33.2 | F |
| 8 | 1.00 | 1.00 | 0.882 | 0.961 | 3740 | 163 | 4221 | 1706 | 0.96 | 0.10 | 30.6 | 54.3 | 61.2 | 32.6 | F |
| 9 | 1.00 | 1.00 | 0.882 | 0.961 | 3755 | 171 | 4221 | 1706 | 0.84 | 0.10 | 32.4 | 54.3 | 58.0 | 28.2 | F |
| 10 | 1.00 | 1.00 | 0.882 | 0.961 | 3685 | 231 | 4221 | 1706 | 0.85 | 0.14 | 29.2 | 54.1 | 63.1 | 28.6 | F |
| 11 | 1.00 | 1.00 | 0.882 | 0.961 | 3835 | 202 | 4221 | 1706 | 0.91 | 0.12 | 54.2 | 54.2 | 35.4 | 30.9 | D |
| 12 | 1.00 | 1.00 | 0.882 | 0.961 | 3755 | 157 | 4221 | 1706 | 0.92 | 0.09 | 30.9 | 54.3 | 60.7 | 31.3 | F |

## Segment 7: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.878 | 3367 | 4237 | 0.79 | 59.7 | 28.2 | D |
| 2 | 1.00 | 0.878 | 3502 | 4237 | 0.93 | 25.8 | 67.8 | F |
| 3 | 1.00 | 0.878 | 3610 | 4237 | 0.89 | 27.2 | 66.4 | F |
| 4 | 1.00 | 0.878 | 3555 | 4237 | 0.88 | 26.0 | 68.3 | F |
| 5 | 1.00 | 0.878 | 3573 | 4237 | 0.82 | 26.4 | 67.6 | F |
| 6 | 1.00 | 0.878 | 3482 | 4237 | 0.82 | 24.6 | 70.8 | F |
| 7 | 1.00 | 0.878 | 3599 | 4237 | 0.92 | 29.3 | 61.5 | F |
| 8 | 1.00 | 0.878 | 3543 | 4237 | 0.91 | 25.8 | 68.7 | F |
| 9 | 1.00 | 0.878 | 3587 | 4237 | 0.79 | 26.8 | 66.9 | F |
| 10 | 1.00 | 0.878 | 3499 | 4237 | 0.79 | 24.9 | 70.2 | F |
| 11 | 1.00 | 0.878 | 3611 | 4237 | 0.88 | 28.9 | 62.5 | F |
| 12 | 1.00 | 0.878 | 3557 | 4237 | 0.88 | 26.1 | 68.2 | F |

## Segment 8: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.878 | 0.984 | 3707 | 340 | 4221 | 1886 | 0.88 | 0.18 | 58.4 | 58.4 | 31.7 | 27.4 | C |
| 2 | 1.00 | 1.00 | 0.878 | 0.984 | 3930 | 428 | 4221 | 1886 | 0.93 | 0.23 | 57.3 | 57.3 | 34.3 | 29.1 | F |
| 3 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 315 | 4221 | 1886 | 0.93 | 0.17 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 4 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 370 | 4221 | 1886 | 0.93 | 0.20 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 5 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 352 | 4221 | 1886 | 0.93 | 0.19 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 6 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 443 | 4221 | 1886 | 0.93 | 0.23 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 7 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 326 | 4221 | 1886 | 0.93 | 0.17 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 8 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 382 | 4221 | 1886 | 0.93 | 0.20 | 57.3 | 57.3 | 34.2 | 29.1 | F |
| 9 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 338 | 4221 | 1886 | 0.93 | 0.18 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 10 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 426 | 4221 | 1886 | 0.93 | 0.23 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 11 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 314 | 4221 | 1886 | 0.93 | 0.17 | 57.3 | 57.3 | 34.2 | 29.1 | D |
| 12 | 1.00 | 1.00 | 0.878 | 0.984 | 3925 | 368 | 4221 | 1886 | 0.93 | 0.20 | 57.3 | 57.3 | 34.2 | 29.1 | D |

## Segment 9: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.888 | 3706 | 4237 | 0.87 | 55.6 | 33.3 | D |
| 2 | 1.00 | 0.888 | 3930 | 4237 | 1.04 | 52.3 | 37.6 | F |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 0.888 | 3925 | 4237 | 0.96 | 52.4 | 37.5 | E |
| 4 | 1.00 | 0.888 | 3925 | 4237 | 0.97 | 52.4 | 37.5 | E |
| 5 | 1.00 | 0.888 | 3925 | 4237 | 0.91 | 52.4 | 37.5 | E |
| 6 | 1.00 | 0.888 | 3925 | 4237 | 0.92 | 52.4 | 37.5 | E |
| 7 | 1.00 | 0.888 | 3925 | 4237 | 0.99 | 52.4 | 37.5 | E |
| 8 | 1.00 | 0.888 | 3925 | 4237 | 1.00 | 52.4 | 37.5 | F |
| 9 | 1.00 | 0.888 | 3925 | 4237 | 0.87 | 52.4 | 37.5 | E |
| 10 | 1.00 | 0.888 | 3925 | 4237 | 0.89 | 52.4 | 37.5 | E |
| 11 | 1.00 | 0.888 | 3925 | 4237 | 0.96 | 52.4 | 37.5 | E |
| 12 | 1.00 | 0.888 | 3925 | 4237 | 0.97 | 52.4 | 37.5 | E |

## Segment 10: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.888 | 0.962 | 3706 | 470 | 4221 | 1976 | 0.88 | 0.24 | 61.5 | 61.5 | 30.1 | 32.8 | D |
| 2 | 1.00 | 1.00 | 0.888 | 0.962 | 3930 | 407 | 4221 | 1976 | 0.93 | 0.21 | 61.6 | 61.6 | 31.9 | 34.7 | F |
| 3 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 479 | 4221 | 1976 | 0.93 | 0.24 | 61.5 | 61.5 | 31.9 | 34.7 | D |
| 4 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 411 | 4221 | 1976 | 0.93 | 0.21 | 61.6 | 61.6 | 31.9 | 34.7 | D |
| 5 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 486 | 4221 | 1976 | 0.93 | 0.25 | 61.5 | 61.5 | 31.9 | 34.7 | D |
| 6 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 421 | 4221 | 1976 | 0.93 | 0.21 | 61.6 | 61.6 | 31.9 | 34.7 | D |
| 7 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 496 | 4221 | 1976 | 0.93 | 0.25 | 61.4 | 61.4 | 32.0 | 34.7 | D |
| 8 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 425 | 4221 | 1976 | 0.93 | 0.22 | 61.6 | 61.6 | 31.9 | 34.7 | F |
| 9 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 468 | 4221 | 1976 | 0.93 | 0.24 | 61.5 | 61.5 | 31.9 | 34.7 | D |
| 10 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 405 | 4221 | 1976 | 0.93 | 0.21 | 61.6 | 61.6 | 31.9 | 34.7 | D |
| 11 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 477 | 4221 | 1976 | 0.93 | 0.24 | 61.5 | 61.5 | 31.9 | 34.7 | D |
| 12 | 1.00 | 1.00 | 0.888 | 0.962 | 3925 | 410 | 4221 | 1976 | 0.93 | 0.21 | 61.6 | 61.6 | 31.9 | 34.7 | D |

## Segment 11: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.881 | 3222 | 4230 | 0.76 | 60.9 | 26.5 | D |
| 2 | 1.00 | 0.881 | 3566 | 4230 | 0.94 | 57.2 | 31.2 | D |
| 3 | 1.00 | 0.881 | 3561 | 4230 | 0.85 | 57.3 | 31.1 | D |
| 4 | 1.00 | 0.881 | 3463 | 4230 | 0.87 | 58.4 | 29.6 | D |
| 5 | 1.00 | 0.881 | 3532 | 4230 | 0.79 | 57.6 | 30.7 | D |
| 6 | 1.00 | 0.881 | 3428 | 4230 | 0.82 | 58.8 | 29.1 | D |
| 7 | 1.00 | 0.881 | 3503 | 4230 | 0.88 | 58.0 | 30.2 | D |
| 8 | 1.00 | 0.881 | 3463 | 4230 | 0.90 | 58.4 | 29.6 | D |
| 9 | 1.00 | 0.881 | 3533 | 4230 | 0.76 | 57.6 | 30.7 | D |
| 10 | 1.00 | 0.881 | 3427 | 4230 | 0.79 | 58.9 | 29.1 | D |
| 11 | 1.00 | 0.881 | 3503 | 4230 | 0.84 | 58.0 | 30.2 | D |
| 12 | 1.00 | 0.881 | 3463 | 4230 | 0.87 | 58.4 | 29.6 | D |

## Segment 12: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.881 | 0.960 | 3618 | 396 | 4221 | 1886 | 0.86 | 0.21 | 57.9 | 57.9 | 31.2 | 29.4 | D |
| 2 | 1.00 | 1.00 | 0.881 | 0.960 | 3923 | 357 | 4221 | 1886 | 0.93 | 0.19 | 56.6 | 56.6 | 34.7 | 31.8 | F |
| 3 | 1.00 | 1.00 | 0.881 | 0.960 | 3860 | 299 | 4221 | 1886 | 0.91 | 0.16 | 56.9 | 56.9 | 33.9 | 31.3 | D |
| 4 | 1.00 | 1.00 | 0.881 | 0.960 | 3901 | 438 | 4221 | 1886 | 0.92 | 0.23 | 56.7 | 56.7 | 34.4 | 31.6 | D |
| 5 | 1.00 | 1.00 | 0.881 | 0.960 | 3941 | 409 | 4221 | 1886 | 0.93 | 0.22 | 56.4 | 56.4 | 34.9 | 31.9 | D |
| 6 | 1.00 | 1.00 | 0.881 | 0.960 | 3798 | 370 | 4221 | 1886 | 0.90 | 0.20 | 57.2 | 57.2 | 33.2 | 30.8 | D |
| 7 | 1.00 | 1.00 | 0.881 | 0.960 | 3812 | 309 | 4221 | 1886 | 0.90 | 0.16 | 57.1 | 57.1 | 33.4 | 31.0 | D |
| 8 | 1.00 | 1.00 | 0.881 | 0.960 | 3915 | 452 | 4221 | 1886 | 0.93 | 0.24 | 56.6 | 56.6 | 34.6 | 31.7 | F |
| 9 | 1.00 | 1.00 | 0.881 | 0.960 | 3928 | 395 | 4221 | 1886 | 0.93 | 0.21 | 56.5 | 56.5 | 34.8 | 31.8 | D |
| 10 | 1.00 | 1.00 | 0.881 | 0.960 | 3783 | 356 | 4221 | 1886 | 0.90 | 0.19 | 57.2 | 57.2 | 33.1 | 30.7 | D |
| 11 | 1.00 | 1.00 | 0.881 | 0.960 | 3801 | 298 | 4221 | 1886 | 0.90 | 0.16 | 57.1 | 57.1 | 33.3 | 30.9 | D |
| 12 | 1.00 | 1.00 | 0.881 | 0.960 | 3898 | 435 | 4221 | 1886 | 0.92 | 0.23 | 56.7 | 56.7 | 34.4 | 31.6 | D |

## Segment 13: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.889 | 3621 | 4244 | 0.85 | 57.0 | 31.8 | D |
| 2 | 1.00 | 0.889 | 3923 | 4244 | 1.02 | 52.6 | 37.3 | F |
| 3 | 1.00 | 0.889 | 3860 | 4244 | 0.91 | 53.6 | 36.0 | E |
| 4 | 1.00 | 0.889 | 3901 | 4244 | 0.97 | 53.0 | 36.8 | E |
| 5 | 1.00 | 0.889 | 3941 | 4244 | 0.88 | 52.3 | 37.7 | E |
| 6 | 1.00 | 0.889 | 3798 | 4244 | 0.91 | 54.5 | 34.8 | D |
| 7 | 1.00 | 0.889 | 3812 | 4244 | 0.94 | 54.3 | 35.1 | E |
| 8 | 1.00 | 0.889 | 3915 | 4244 | 1.01 | 52.8 | 37.1 | F |
| 9 | 1.00 | 0.889 | 3928 | 4244 | 0.85 | 52.6 | 37.3 | E |
| 10 | 1.00 | 0.889 | 3783 | 4244 | 0.87 | 54.7 | 34.6 | D |
| 11 | 1.00 | 0.889 | 3801 | 4244 | 0.91 | 54.5 | 34.9 | D |
| 12 | 1.00 | 0.889 | 3898 | 4244 | 0.97 | 53.0 | 36.8 | E |

## Segment 14: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.889 | 0.941 | 3621 | 976 | 4221 | 1886 | 0.86 | 0.52 | 58.7 | 58.7 | 30.8 | 31.5 | D |
| 2 | 1.00 | 1.00 | 0.889 | 0.941 | 3923 | 752 | 4221 | 1886 | 0.93 | 0.40 | 59.2 | 59.2 | 33.1 | 34.1 | F |
| 3 | 1.00 | 1.00 | 0.889 | 0.941 | 3860 | 750 | 4221 | 1886 | 0.91 | 0.40 | 59.2 | 59.2 | 32.6 | 33.6 | D |
| 4 | 1.00 | 1.00 | 0.889 | 0.941 | 3901 | 931 | 4221 | 1886 | 0.92 | 0.49 | 58.8 | 58.8 | 33.2 | 33.9 | D |
| 5 | 1.00 | 1.00 | 0.889 | 0.941 | 3941 | 1010 | 4221 | 1886 | 0.93 | 0.54 | 58.6 | 58.6 | 33.6 | 34.3 | D |
| 6 | 1.00 | 1.00 | 0.889 | 0.941 | 3798 | 778 | 4221 | 1886 | 0.90 | 0.41 | 59.2 | 59.2 | 32.1 | 33.0 | D |
| 7 | 1.00 | 1.00 | 0.889 | 0.941 | 3812 | 777 | 4221 | 1886 | 0.90 | 0.41 | 59.2 | 59.2 | 32.2 | 33.2 | D |
| 8 | 1.00 | 1.00 | 0.889 | 0.941 | 3915 | 964 | 4221 | 1886 | 0.93 | 0.51 | 58.7 | 58.7 | 33.3 | 34.1 | F |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1.00 | 1.00 | 0.889 | 0.941 | 3928 | 971 | 4221 | 1886 | 0.93 | 0.52 | 58.7 | 58.7 | 33.5 | 34.2 | D |
| 10 | 1.00 | 1.00 | 0.889 | 0.941 | 3783 | 749 | 4221 | 1886 | 0.90 | 0.40 | 59.2 | 59.2 | 32.0 | 32.9 | D |
| 11 | 1.00 | 1.00 | 0.889 | 0.941 | 3801 | 747 | 4221 | 1886 | 0.90 | 0.40 | 59.2 | 59.2 | 32.1 | 33.1 | D |
| 12 | 1.00 | 1.00 | 0.889 | 0.941 | 3898 | 928 | 4221 | 1886 | 0.92 | 0.49 | 58.8 | 58.8 | 33.1 | 33.9 | D |

## Segment 15: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.875 | 2630 | 4244 | 0.62 | 65.4 | 20.1 | C |
| 2 | 1.00 | 0.875 | 3241 | 4244 | 0.85 | 61.2 | 26.5 | D |
| 3 | 1.00 | 0.875 | 3189 | 4244 | 0.74 | 61.7 | 25.8 | C |
| 4 | 1.00 | 0.875 | 3145 | 4244 | 0.75 | 62.1 | 25.3 | C |
| 5 | 1.00 | 0.875 | 3053 | 4244 | 0.64 | 62.8 | 24.3 | C |
| 6 | 1.00 | 0.875 | 2774 | 4244 | 0.73 | 64.7 | 21.4 | C |
| 7 | 1.00 | 0.875 | 3042 | 4244 | 0.76 | 62.9 | 24.2 | C |
| 8 | 1.00 | 0.875 | 3155 | 4244 | 0.78 | 62.0 | 25.4 | C |
| 9 | 1.00 | 0.875 | 3042 | 4244 | 0.62 | 62.9 | 24.2 | C |
| 10 | 1.00 | 0.875 | 2765 | 4244 | 0.70 | 64.7 | 21.4 | C |
| 11 | 1.00 | 0.875 | 3033 | 4244 | 0.73 | 63.0 | 24.1 | C |
| 12 | 1.00 | 0.875 | 3143 | 4244 | 0.75 | 62.1 | 25.3 | C |

## Segment 16: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.875 | 0.968 | 2957 | 327 | 4221 | 1796 | 0.70 | 0.18 | 59.0 | 59.0 | 25.1 | 25.3 | C |
| 2 | 1.00 | 1.00 | 0.875 | 0.968 | 3571 | 330 | 4221 | 1796 | 0.85 | 0.18 | 57.3 | 57.3 | 31.2 | 30.1 | D |
| 3 | 1.00 | 1.00 | 0.875 | 0.968 | 3463 | 274 | 4221 | 1796 | 0.82 | 0.15 | 57.7 | 57.7 | 30.0 | 29.3 | D |
| 4 | 1.00 | 1.00 | 0.875 | 0.968 | 3413 | 268 | 4221 | 1796 | 0.81 | 0.15 | 57.9 | 57.9 | 29.5 | 28.9 | D |
| 5 | 1.00 | 1.00 | 0.875 | 0.968 | 3392 | 339 | 4221 | 1796 | 0.80 | 0.19 | 57.9 | 57.9 | 29.3 | 28.7 | D |
| 6 | 1.00 | 1.00 | 0.875 | 0.968 | 3115 | 341 | 4221 | 1796 | 0.74 | 0.19 | 58.7 | 58.7 | 26.5 | 26.6 | C |
| 7 | 1.00 | 1.00 | 0.875 | 0.968 | 3325 | 283 | 4221 | 1796 | 0.79 | 0.16 | 58.2 | 58.2 | 28.6 | 28.2 | D |
| 8 | 1.00 | 1.00 | 0.875 | 0.968 | 3432 | 277 | 4221 | 1796 | 0.81 | 0.15 | 57.8 | 57.8 | 29.7 | 29.1 | D |
| 9 | 1.00 | 1.00 | 0.875 | 0.968 | 3368 | 326 | 4221 | 1796 | 0.80 | 0.18 | 58.0 | 58.0 | 29.0 | 28.5 | D |
| 10 | 1.00 | 1.00 | 0.875 | 0.968 | 3092 | 327 | 4221 | 1796 | 0.73 | 0.18 | 58.8 | 58.8 | 26.3 | 26.4 | C |
| 11 | 1.00 | 1.00 | 0.875 | 0.968 | 3306 | 273 | 4221 | 1796 | 0.78 | 0.15 | 58.2 | 58.2 | 28.4 | 28.1 | D |
| 12 | 1.00 | 1.00 | 0.875 | 0.968 | 3410 | 267 | 4221 | 1796 | 0.81 | 0.15 | 57.9 | 57.9 | 29.4 | 28.9 | D |

## Segment 17: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.883 | 0.948 | 3174 | 209 | 4221 | 1796 | 0.75 | 0.12 | 58.7 | 58.7 | 27.0 | 26.6 | C |
| 2 | 1.00 | 1.00 | 0.883 | 0.948 | 3817 | 246 | 4221 | 1796 | 0.90 | 0.14 | 56.4 | 56.4 | 33.8 | 31.6 | D |
| 3 | 1.00 | 1.00 | 0.883 | 0.948 | 3818 | 355 | 4221 | 1796 | 0.90 | 0.20 | 56.4 | 56.4 | 33.8 | 31.5 | D |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1.00 | 1.00 | 0.883 | 0.948 | 3744 | 331 | 4221 | 1796 | 0.89 | 0.18 | 56.8 | 56.8 | 33.0 | 30.9 | D |
| 5 | 1.00 | 1.00 | 0.883 | 0.948 | 3608 | 216 | 4221 | 1796 | 0.85 | 0.12 | 57.3 | 57.3 | 31.5 | 29.9 | D |
| 6 | 1.00 | 1.00 | 0.883 | 0.948 | 3369 | 254 | 4221 | 1796 | 0.80 | 0.14 | 58.2 | 58.2 | 28.9 | 28.1 | D |
| 7 | 1.00 | 1.00 | 0.883 | 0.948 | 3693 | 368 | 4221 | 1796 | 0.87 | 0.20 | 57.0 | 57.0 | 32.4 | 30.5 | D |
| 8 | 1.00 | 1.00 | 0.883 | 0.948 | 3775 | 343 | 4221 | 1796 | 0.89 | 0.19 | 56.6 | 56.6 | 33.3 | 31.2 | D |
| 9 | 1.00 | 1.00 | 0.883 | 0.948 | 3576 | 208 | 4221 | 1796 | 0.85 | 0.12 | 57.5 | 57.5 | 31.1 | 29.7 | D |
| 10 | 1.00 | 1.00 | 0.883 | 0.948 | 3337 | 245 | 4221 | 1796 | 0.79 | 0.14 | 58.3 | 58.3 | 28.6 | 27.8 | C |
| 11 | 1.00 | 1.00 | 0.883 | 0.948 | 3660 | 354 | 4221 | 1796 | 0.87 | 0.20 | 57.1 | 57.1 | 32.0 | 30.3 | D |
| 12 | 1.00 | 1.00 | 0.883 | 0.948 | 3740 | 330 | 4221 | 1796 | 0.89 | 0.18 | 56.8 | 56.8 | 32.9 | 30.9 | D |

## Segment 18: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.886 | 3178 | 4289 | 0.74 | 63.3 | 25.1 | C |
| 2 | 1.00 | 0.886 | 3817 | 4289 | 0.97 | 55.5 | 34.4 | D |
| 3 | 1.00 | 0.886 | 3818 | 4289 | 0.88 | 55.5 | 34.4 | D |
| 4 | 1.00 | 0.886 | 3744 | 4289 | 0.89 | 56.6 | 33.1 | D |
| 5 | 1.00 | 0.886 | 3608 | 4289 | 0.77 | 58.4 | 30.9 | D |
| 6 | 1.00 | 0.886 | 3369 | 4289 | 0.86 | 61.3 | 27.5 | D |
| 7 | 1.00 | 0.886 | 3693 | 4289 | 0.91 | 57.3 | 32.2 | D |
| 8 | 1.00 | 0.886 | 3775 | 4289 | 0.92 | 56.1 | 33.6 | D |
| 9 | 1.00 | 0.886 | 3576 | 4289 | 0.74 | 58.8 | 30.4 | D |
| 10 | 1.00 | 0.886 | 3337 | 4289 | 0.83 | 61.6 | 27.1 | D |
| 11 | 1.00 | 0.886 | 3660 | 4289 | 0.87 | 57.7 | 31.7 | D |
| 12 | 1.00 | 0.886 | 3740 | 4289 | 0.88 | 56.6 | 33.0 | D |

## Segment 19: Diverge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.886 | 0.878 | 3178 | 325 | 4221 | 1886 | 0.75 | 0.17 | 58.7 | 58.7 | 27.1 | 28.4 | D |
| 2 | 1.00 | 1.00 | 0.886 | 0.878 | 3817 | 396 | 4221 | 1886 | 0.90 | 0.21 | 58.5 | 58.5 | 32.6 | 33.9 | D |
| 3 | 1.00 | 1.00 | 0.886 | 0.878 | 3818 | 364 | 4221 | 1886 | 0.90 | 0.19 | 58.6 | 58.6 | 32.6 | 33.9 | D |
| 4 | 1.00 | 1.00 | 0.886 | 0.878 | 3744 | 367 | 4221 | 1886 | 0.89 | 0.19 | 58.6 | 58.6 | 31.9 | 33.3 | D |
| 5 | 1.00 | 1.00 | 0.886 | 0.878 | 3608 | 336 | 4221 | 1886 | 0.85 | 0.18 | 58.6 | 58.6 | 30.8 | 32.1 | D |
| 6 | 1.00 | 1.00 | 0.886 | 0.878 | 3369 | 410 | 4221 | 1886 | 0.80 | 0.22 | 58.5 | 58.5 | 28.8 | 30.0 | D |
| 7 | 1.00 | 1.00 | 0.886 | 0.878 | 3693 | 377 | 4221 | 1886 | 0.87 | 0.20 | 58.5 | 58.5 | 31.6 | 32.8 | D |
| 8 | 1.00 | 1.00 | 0.886 | 0.878 | 3775 | 379 | 4221 | 1886 | 0.89 | 0.20 | 58.5 | 58.5 | 32.3 | 33.5 | D |
| 9 | 1.00 | 1.00 | 0.886 | 0.878 | 3576 | 323 | 4221 | 1886 | 0.85 | 0.17 | 58.7 | 58.7 | 30.5 | 31.8 | D |
| 10 | 1.00 | 1.00 | 0.886 | 0.878 | 3337 | 395 | 4221 | 1886 | 0.79 | 0.21 | 58.5 | 58.5 | 28.5 | 29.8 | D |
| 11 | 1.00 | 1.00 | 0.886 | 0.878 | 3660 | 363 | 4221 | 1886 | 0.87 | 0.19 | 58.6 | 58.6 | 31.2 | 32.5 | D |
| 12 | 1.00 | 1.00 | 0.886 | 0.878 | 3740 | 366 | 4221 | 1886 | 0.89 | 0.19 | 58.6 | 58.6 | 31.9 | 33.2 | D |

## Segment 20: Basic

| AP | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|---|---|---|---|---|---|---|---|---|

| | | | (pc/h) | (pc/h) | Ratio | (mi/h) | (pc/mi/ln) | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.887 | 2853 | 4269 | 0.67 | 65.2 | 21.9 | C |
| 2 | 1.00 | 0.887 | 3454 | 4269 | 0.88 | 59.7 | 28.9 | D |
| 3 | 1.00 | 0.887 | 3456 | 4269 | 0.80 | 59.7 | 28.9 | D |
| 4 | 1.00 | 0.887 | 3382 | 4269 | 0.80 | 60.5 | 28.0 | D |
| 5 | 1.00 | 0.887 | 3260 | 4269 | 0.69 | 61.8 | 26.4 | D |
| 6 | 1.00 | 0.887 | 3025 | 4269 | 0.77 | 63.9 | 23.7 | C |
| 7 | 1.00 | 0.887 | 3282 | 4269 | 0.82 | 61.6 | 26.6 | D |
| 8 | 1.00 | 0.887 | 3410 | 4269 | 0.83 | 60.2 | 28.3 | D |
| 9 | 1.00 | 0.887 | 3232 | 4269 | 0.67 | 62.1 | 26.0 | D |
| 10 | 1.00 | 0.887 | 2997 | 4269 | 0.74 | 64.2 | 23.3 | C |
| 11 | 1.00 | 0.887 | 3252 | 4269 | 0.79 | 61.9 | 26.3 | D |
| 12 | 1.00 | 0.887 | 3378 | 4269 | 0.80 | 60.6 | 27.9 | D |

## Segment 21: Merge

| AP | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.887 | 1.000 | 3094 | 241 | 4221 | 1886 | 0.73 | 0.13 | 61.3 | 61.3 | 25.2 | 20.8 | C |
| 2 | 1.00 | 1.00 | 0.887 | 1.000 | 3683 | 229 | 4221 | 1886 | 0.87 | 0.12 | 59.5 | 59.5 | 30.9 | 25.4 | C |
| 3 | 1.00 | 1.00 | 0.887 | 1.000 | 3716 | 260 | 4221 | 1886 | 0.88 | 0.14 | 59.3 | 59.3 | 31.3 | 25.6 | C |
| 4 | 1.00 | 1.00 | 0.887 | 1.000 | 3656 | 274 | 4221 | 1886 | 0.87 | 0.15 | 59.6 | 59.6 | 30.7 | 25.2 | C |
| 5 | 1.00 | 1.00 | 0.887 | 1.000 | 3510 | 250 | 4221 | 1886 | 0.83 | 0.13 | 60.1 | 60.1 | 29.2 | 24.0 | C |
| 6 | 1.00 | 1.00 | 0.887 | 1.000 | 3262 | 237 | 4221 | 1886 | 0.77 | 0.13 | 60.9 | 60.9 | 26.8 | 22.1 | C |
| 7 | 1.00 | 1.00 | 0.887 | 1.000 | 3552 | 270 | 4221 | 1886 | 0.84 | 0.14 | 60.0 | 60.0 | 29.6 | 24.4 | C |
| 8 | 1.00 | 1.00 | 0.887 | 1.000 | 3694 | 284 | 4221 | 1886 | 0.88 | 0.15 | 59.4 | 59.4 | 31.1 | 25.5 | C |
| 9 | 1.00 | 1.00 | 0.887 | 1.000 | 3472 | 240 | 4221 | 1886 | 0.82 | 0.13 | 60.3 | 60.3 | 28.8 | 23.7 | C |
| 10 | 1.00 | 1.00 | 0.887 | 1.000 | 3225 | 228 | 4221 | 1886 | 0.76 | 0.12 | 61.0 | 61.0 | 26.4 | 21.8 | C |
| 11 | 1.00 | 1.00 | 0.887 | 1.000 | 3511 | 259 | 4221 | 1886 | 0.83 | 0.14 | 60.1 | 60.1 | 29.2 | 24.0 | C |
| 12 | 1.00 | 1.00 | 0.887 | 1.000 | 3651 | 273 | 4221 | 1886 | 0.87 | 0.14 | 59.6 | 59.6 | 30.6 | 25.1 | C |

## Segment 22: Basic

| AP | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.895 | 3097 | 4269 | 0.73 | 63.4 | 24.4 | C |
| 2 | 1.00 | 0.895 | 3683 | 4269 | 0.94 | 56.8 | 32.4 | D |
| 3 | 1.00 | 0.895 | 3716 | 4269 | 0.86 | 56.4 | 32.9 | D |
| 4 | 1.00 | 0.895 | 3656 | 4269 | 0.87 | 57.2 | 32.0 | D |
| 5 | 1.00 | 0.895 | 3510 | 4269 | 0.75 | 59.1 | 29.7 | D |
| 6 | 1.00 | 0.895 | 3262 | 4269 | 0.82 | 61.8 | 26.4 | D |
| 7 | 1.00 | 0.895 | 3552 | 4269 | 0.89 | 58.6 | 30.3 | D |
| 8 | 1.00 | 0.895 | 3694 | 4269 | 0.90 | 56.7 | 32.6 | D |
| 9 | 1.00 | 0.895 | 3472 | 4269 | 0.72 | 59.5 | 29.2 | D |
| 10 | 1.00 | 0.895 | 3225 | 4269 | 0.79 | 62.2 | 25.9 | C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 1.00 | 0.895 | 3511 | 4269 | 0.85 | 59.1 | 29.7 | D |
| 12 | 1.00 | 0.895 | 3651 | 4269 | 0.87 | 57.3 | 31.9 | D |

## Facility Analysis Results

| AP | Speed, mi/h | Density, pc/mi/ln | Density, veh/mi/ln | Travel Time, min | LOS |
|---|---|---|---|---|---|
| 1 | 61.2 | 26.9 | 23.8 | 27.80 | D |
| 2 | 52.4 | 36.9 | 32.6 | 32.50 | F |
| 3 | 53.3 | 35.3 | 31.2 | 31.90 | E |
| 4 | 53.2 | 35.2 | 31.1 | 32.00 | E |
| 5 | 53.8 | 34.0 | 30.0 | 31.70 | E |
| 6 | 55.2 | 31.4 | 27.8 | 30.80 | E |
| 7 | 47.8 | 37.9 | 33.5 | 35.70 | E |
| 8 | 47.9 | 39.5 | 35.0 | 35.60 | F |
| 9 | 54.5 | 33.3 | 29.4 | 31.30 | E |
| 10 | 54.9 | 31.8 | 28.1 | 31.10 | E |
| 11 | 49.3 | 36.4 | 32.2 | 34.60 | E |
| 12 | 49.6 | 38.1 | 33.7 | 34.40 | E |

## Facility Overall Results

| | | | |
|---|---|---|---|
| Space Mean Speed, mi/h | 52.4 | Density, veh/mi/ln | 30.7 |
| Average Travel Time, min | 32.50 | Density, pc/mi/ln | 34.7 |

## Messages

| | |
|---|---|
| WARNING 1 | Facility Length is too long and may result in unreliable calculations. A vehicle traveling at the average speed should be able to traverse the entire facility in under 15 minutes. Consider breaking the segment into multiple facilities at appropriate break points (i.e. at undersaturated segments with no queuing). |
| WARNING 2 | The Demand Adjustment Factor for segment 1 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 3 | The Demand Adjustment Factor for segment 2 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 6 | The Demand Adjustment Factor for segment 4 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 7 | The Ramp Demand Adjustment factor for segment 4 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 8 | The Demand Adjustment Factor for segment 5 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 9 | The Demand Adjustment Factor for segment 6 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 10 | The Ramp Demand Adjustment factor for segment 6 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 11 | The Demand Adjustment Factor for segment 7 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 12 | The Demand Adjustment Factor for segment 8 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 14 | The Demand Adjustment Factor for segment 9 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 20 | The Demand Adjustment Factor for segment 13 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 21 | The Demand Adjustment Factor for segment 14 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 22 | The Ramp Demand Adjustment factor for segment 14 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 23 | The Demand Adjustment Factor for segment 15 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 24 | The Demand Adjustment Factor for segment 16 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 25 | The Ramp Demand Adjustment factor for segment 16 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 26 | The Demand Adjustment Factor for segment 17 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 27 | The Ramp Demand Adjustment factor for segment 17 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 29 | The Demand Adjustment Factor for segment 19 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 34 | The Demand Adjustment Factor for segment 22 in analysis period 1 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 35 | The Demand Adjustment Factor for segment 1 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 36 | The Demand Adjustment Factor for segment 2 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 37 | The Ramp Demand Adjustment factor for segment 2 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 38 | The Demand Adjustment Factor for segment 3 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 46 | The Ramp Demand Adjustment factor for segment 8 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 47 | The Demand Adjustment Factor for segment 9 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 48 | The Demand Adjustment Factor for segment 10 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 57 | The Demand Adjustment Factor for segment 16 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 58 | The Ramp Demand Adjustment factor for segment 16 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 67 | The Demand Adjustment Factor for segment 22 in analysis period 2 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 68 | The Demand Adjustment Factor for segment 1 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 69 | The Demand Adjustment Factor for segment 2 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 70 | The Ramp Demand Adjustment factor for segment 2 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 71 | The Demand Adjustment Factor for segment 3 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 72 | The Demand Adjustment Factor for segment 4 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 76 | The Ramp Demand Adjustment factor for segment 6 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 86 | The Demand Adjustment Factor for segment 13 in analysis period 3 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 101 | The Demand Adjustment Factor for segment 1 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 102 | The Demand Adjustment Factor for segment 2 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 105 | The Demand Adjustment Factor for segment 4 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 124 | The Ramp Demand Adjustment factor for segment 16 in analysis period 4 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 134 | The Demand Adjustment Factor for segment 1 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 135 | The Demand Adjustment Factor for segment 2 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 136 | The Ramp Demand Adjustment factor for segment 2 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 137 | The Demand Adjustment Factor for segment 3 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 138 | The Demand Adjustment Factor for segment 4 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 139 | The Ramp Demand Adjustment factor for segment 4 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 140 | The Demand Adjustment Factor for segment 5 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 141 | The Demand Adjustment Factor for segment 6 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 142 | The Ramp Demand Adjustment factor for segment 6 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 143 | The Demand Adjustment Factor for segment 7 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 144 | The Demand Adjustment Factor for segment 8 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 145 | The Ramp Demand Adjustment factor for segment 8 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 146 | The Demand Adjustment Factor for segment 9 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 147 | The Demand Adjustment Factor for segment 10 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 148 | The Ramp Demand Adjustment factor for segment 10 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 149 | The Demand Adjustment Factor for segment 11 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 150 | The Demand Adjustment Factor for segment 12 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 151 | The Ramp Demand Adjustment factor for segment 12 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 152 | The Demand Adjustment Factor for segment 13 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 153 | The Demand Adjustment Factor for segment 14 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 154 | The Ramp Demand Adjustment factor for segment 14 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 155 | The Demand Adjustment Factor for segment 15 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 156 | The Demand Adjustment Factor for segment 16 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 157 | The Ramp Demand Adjustment factor for segment 16 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 158 | The Demand Adjustment Factor for segment 17 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 159 | The Ramp Demand Adjustment factor for segment 17 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 160 | The Demand Adjustment Factor for segment 18 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 161 | The Demand Adjustment Factor for segment 19 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 162 | The Ramp Demand Adjustment factor for segment 19 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 163 | The Demand Adjustment Factor for segment 20 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 164 | The Demand Adjustment Factor for segment 21 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 165 | The Ramp Demand Adjustment factor for segment 21 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 166 | The Demand Adjustment Factor for segment 22 in analysis period 5 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 167 | The Demand Adjustment Factor for segment 1 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 168 | The Demand Adjustment Factor for segment 2 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 169 | The Ramp Demand Adjustment factor for segment 2 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 170 | The Demand Adjustment Factor for segment 3 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 171 | The Demand Adjustment Factor for segment 4 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 172 | The Ramp Demand Adjustment factor for segment 4 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 173 | The Demand Adjustment Factor for segment 5 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 174 | The Demand Adjustment Factor for segment 6 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 175 | The Ramp Demand Adjustment factor for segment 6 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 176 | The Demand Adjustment Factor for segment 7 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 177 | The Demand Adjustment Factor for segment 8 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 178 | The Ramp Demand Adjustment factor for segment 8 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 179 | The Demand Adjustment Factor for segment 9 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 180 | The Demand Adjustment Factor for segment 10 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 181 | The Ramp Demand Adjustment factor for segment 10 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 182 | The Demand Adjustment Factor for segment 11 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 183 | The Demand Adjustment Factor for segment 12 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 184 | The Ramp Demand Adjustment factor for segment 12 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 185 | The Demand Adjustment Factor for segment 13 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 186 | The Demand Adjustment Factor for segment 14 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 187 | The Ramp Demand Adjustment factor for segment 14 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 188 | The Demand Adjustment Factor for segment 15 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 189 | The Demand Adjustment Factor for segment 16 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 190 | The Ramp Demand Adjustment factor for segment 16 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 191 | The Demand Adjustment Factor for segment 17 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 192 | The Ramp Demand Adjustment factor for segment 17 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 193 | The Demand Adjustment Factor for segment 18 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 194 | The Demand Adjustment Factor for segment 19 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 195 | The Ramp Demand Adjustment factor for segment 19 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 196 | The Demand Adjustment Factor for segment 20 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 197 | The Demand Adjustment Factor for segment 21 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 198 | The Ramp Demand Adjustment factor for segment 21 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 199 | The Demand Adjustment Factor for segment 22 in analysis period 6 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 200 | The Demand Adjustment Factor for segment 1 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 201 | The Demand Adjustment Factor for segment 2 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 202 | The Ramp Demand Adjustment factor for segment 2 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 203 | The Demand Adjustment Factor for segment 3 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 204 | The Demand Adjustment Factor for segment 4 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 205 | The Ramp Demand Adjustment factor for segment 4 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 206 | The Demand Adjustment Factor for segment 5 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 207 | The Demand Adjustment Factor for segment 6 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 208 | The Ramp Demand Adjustment factor for segment 6 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 209 | The Demand Adjustment Factor for segment 7 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 210 | The Demand Adjustment Factor for segment 8 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 211 | The Ramp Demand Adjustment factor for segment 8 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 212 | The Demand Adjustment Factor for segment 9 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 213 | The Demand Adjustment Factor for segment 10 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 214 | The Ramp Demand Adjustment factor for segment 10 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 215 | The Demand Adjustment Factor for segment 11 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 216 | The Demand Adjustment Factor for segment 12 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 217 | The Ramp Demand Adjustment factor for segment 12 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 218 | The Demand Adjustment Factor for segment 13 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 219 | The Demand Adjustment Factor for segment 14 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 220 | The Ramp Demand Adjustment factor for segment 14 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 221 | The Demand Adjustment Factor for segment 15 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 222 | The Demand Adjustment Factor for segment 16 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 223 | The Ramp Demand Adjustment factor for segment 16 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 224 | The Demand Adjustment Factor for segment 17 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 225 | The Ramp Demand Adjustment factor for segment 17 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 226 | The Demand Adjustment Factor for segment 18 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 227 | The Demand Adjustment Factor for segment 19 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 228 | The Ramp Demand Adjustment factor for segment 19 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 229 | The Demand Adjustment Factor for segment 20 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 230 | The Demand Adjustment Factor for segment 21 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 231 | The Ramp Demand Adjustment factor for segment 21 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 232 | The Demand Adjustment Factor for segment 22 in analysis period 7 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 233 | The Demand Adjustment Factor for segment 1 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 234 | The Demand Adjustment Factor for segment 2 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 235 | The Ramp Demand Adjustment factor for segment 2 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 236 | The Demand Adjustment Factor for segment 3 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 237 | The Demand Adjustment Factor for segment 4 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 238 | The Ramp Demand Adjustment factor for segment 4 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 239 | The Demand Adjustment Factor for segment 5 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 240 | The Demand Adjustment Factor for segment 6 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 241 | The Ramp Demand Adjustment factor for segment 6 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 242 | The Demand Adjustment Factor for segment 7 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 243 | The Demand Adjustment Factor for segment 8 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 244 | The Ramp Demand Adjustment factor for segment 8 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 245 | The Demand Adjustment Factor for segment 9 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 246 | The Demand Adjustment Factor for segment 10 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 247 | The Ramp Demand Adjustment factor for segment 10 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 248 | The Demand Adjustment Factor for segment 11 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 249 | The Demand Adjustment Factor for segment 12 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 250 | The Ramp Demand Adjustment factor for segment 12 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 251 | The Demand Adjustment Factor for segment 13 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 252 | The Demand Adjustment Factor for segment 14 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 253 | The Ramp Demand Adjustment factor for segment 14 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 254 | The Demand Adjustment Factor for segment 15 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 255 | The Demand Adjustment Factor for segment 16 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 256 | The Ramp Demand Adjustment factor for segment 16 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 257 | The Demand Adjustment Factor for segment 17 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 258 | The Ramp Demand Adjustment factor for segment 17 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 259 | The Demand Adjustment Factor for segment 18 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 260 | The Demand Adjustment Factor for segment 19 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 261 | The Ramp Demand Adjustment factor for segment 19 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 262 | The Demand Adjustment Factor for segment 20 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 263 | The Demand Adjustment Factor for segment 21 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 264 | The Ramp Demand Adjustment factor for segment 21 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 265 | The Demand Adjustment Factor for segment 22 in analysis period 8 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 266 | The Demand Adjustment Factor for segment 1 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 267 | The Demand Adjustment Factor for segment 2 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 268 | The Ramp Demand Adjustment factor for segment 2 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 269 | The Demand Adjustment Factor for segment 3 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 270 | The Demand Adjustment Factor for segment 4 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 271 | The Ramp Demand Adjustment factor for segment 4 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 272 | The Demand Adjustment Factor for segment 5 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 273 | The Demand Adjustment Factor for segment 6 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 274 | The Ramp Demand Adjustment factor for segment 6 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 275 | The Demand Adjustment Factor for segment 7 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 276 | The Demand Adjustment Factor for segment 8 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 277 | The Ramp Demand Adjustment factor for segment 8 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 278 | The Demand Adjustment Factor for segment 9 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 279 | The Demand Adjustment Factor for segment 10 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 280 | The Ramp Demand Adjustment factor for segment 10 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 281 | The Demand Adjustment Factor for segment 11 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 282 | The Demand Adjustment Factor for segment 12 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 283 | The Ramp Demand Adjustment factor for segment 12 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 284 | The Demand Adjustment Factor for segment 13 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 285 | The Demand Adjustment Factor for segment 14 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 286 | The Ramp Demand Adjustment factor for segment 14 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 287 | The Demand Adjustment Factor for segment 15 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 288 | The Demand Adjustment Factor for segment 16 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 289 | The Ramp Demand Adjustment factor for segment 16 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 290 | The Demand Adjustment Factor for segment 17 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 291 | The Ramp Demand Adjustment factor for segment 17 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 292 | The Demand Adjustment Factor for segment 18 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 293 | The Demand Adjustment Factor for segment 19 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 294 | The Ramp Demand Adjustment factor for segment 19 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |

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| WARNING 295 | The Demand Adjustment Factor for segment 20 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 296 | The Demand Adjustment Factor for segment 21 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 298 | The Demand Adjustment Factor for segment 22 in analysis period 9 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 299 | The Demand Adjustment Factor for segment 1 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 300 | The Demand Adjustment Factor for segment 2 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 314 | The Demand Adjustment Factor for segment 11 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 315 | The Demand Adjustment Factor for segment 12 in analysis period 10 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 333 | The Demand Adjustment Factor for segment 2 in analysis period 11 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 365 | The Demand Adjustment Factor for segment 1 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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| WARNING 371 | The Demand Adjustment Factor for segment 5 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
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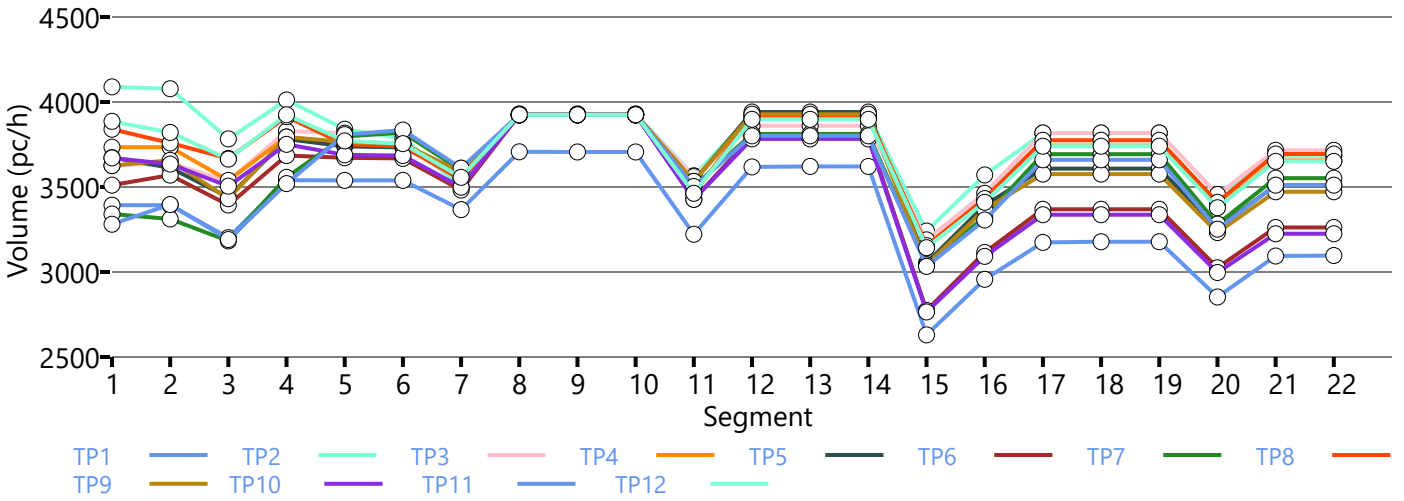
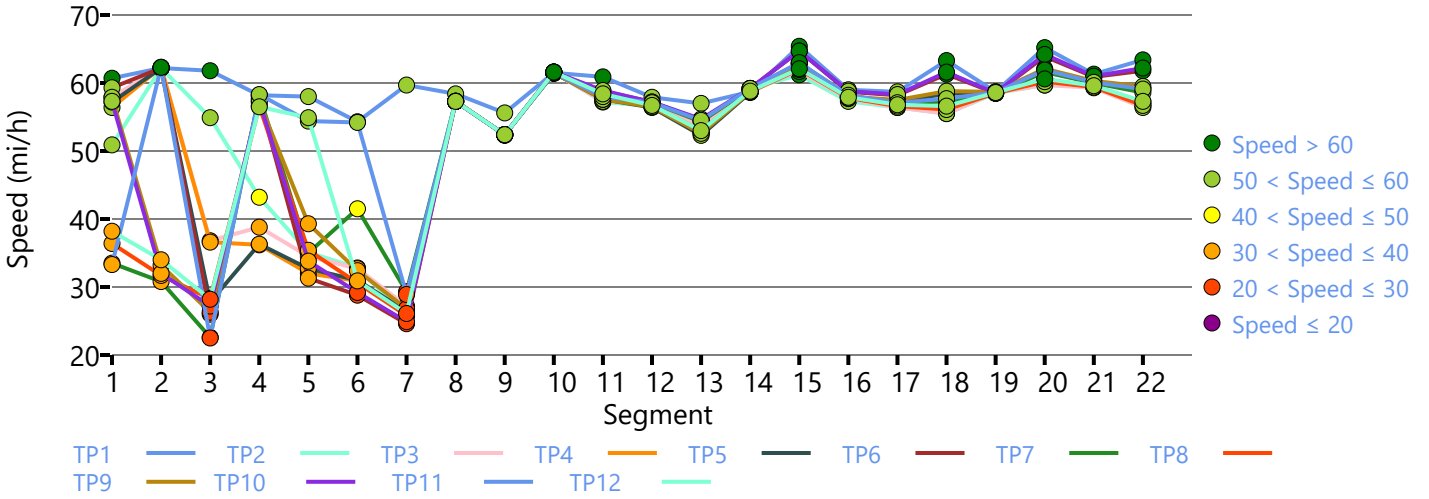
| WARNING 397 | The Demand Adjustment Factor for segment 22 in analysis period 12 has been overwritten. To reset the value to the HCM default, delete the content of the input box and click anywhere else on the page. |
| WARNING 398 | Queue extends past the beginning of the facility on analysis period 7.  Consider expanding the length of the facility to account for these vehicles performance and affect on upstream segments. |

## Comments

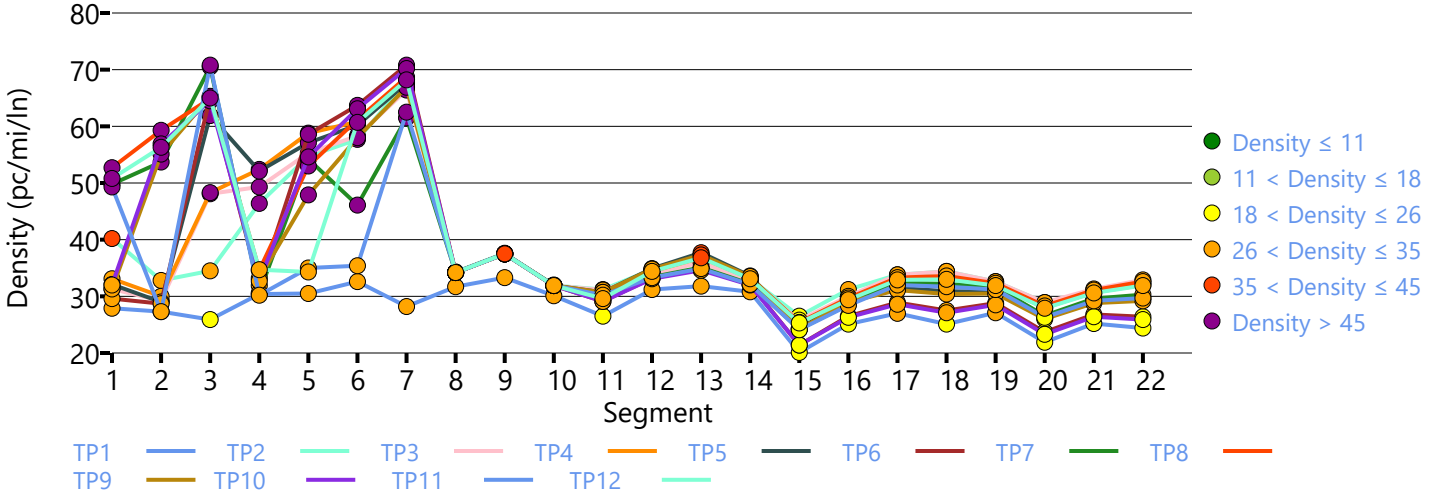
## Volume Distribution




## Speed Distribution




## Density Distribution

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