DMC TRANSPORTATION & INFRASTRUCTURE PROGRAM

INTEGRATED TRANSIT STUDIES

Street Operations Study Report

Prepared for:

Destination Medical Center Corporation

City of Rochester, Minnesota

DMC Transportation & Infrastructure Program

DMC
A Global Destination for Health & Healing

CITY OF ROCHESTER MINNESOTA

DMC TRANSPORTATION INFRASTRUCTURE PROGRAM MANAGEMENT

Prepared by:

Kimley»Horn

SRF

June 20, 2018

City Project No. J8623

This report is one of five Integrated Transit Studies (ITS) Reports and an Executive Summary that were prepared for the Destination Medical Center Corporation (DMCC) and the City of Rochester, Minnesota. The ITS reports were accepted by the DMCC on June 28, 2018 (Resolution No. 69-2018) and by the City of Rochester on July 2, 2018 (Resolution 237-18).

The Integrated Transit Studies are comprised of the following reports:

- Executive Summary
- Transit Circulator Study Report
- Parking & Transportation Management Authority (TMA) Study Report
- City Loop Study Report
- Street Use & Complete Streets Study Report
- Street Operations Study Report

Summary of Traffic Analysis Technical Memoranda

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
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From: JoNette Kuhnau
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Date: March 2, 2018

Subject: J8623 – Street Use
Street Use Technical Memoranda Summary

Cc:

Introduction

Through the course of the Integrated Transit Studies, a number of technical memoranda have been produced to inform the development and evaluation of the Integrated Transit scenarios. The purpose of this memorandum is to document and summarize the technical memoranda that have been produced, which will serve as a reference by the technical teams and project partners. The following sections are organized by analysis area, and list the technical memoranda and a brief overview of the assumptions and findings.

Traffic Analysis

The following memoranda related to traffic operations analysis were produced. These are listed in chronological order.

TH 14/TH 52 and Parking Location 1 – Traffic Analysis, October 4, 2017

This memorandum summarizes the preliminary traffic analysis completed for the TH 14/TH 52 interchange and the proposed Parking Location 1 in the northwest quadrant of TH 14/TH 52. The purpose of the analysis was to inform the first draft of interchange and parking access layouts. The analysis reflected the geometric layouts as of August 2017. Significant additional refinements to the geometric layouts have occurred since this analysis was done and the layouts continue to be refined in 2018. Future traffic analysis will be needed to reflect the updated geometrics.

Key findings and assumptions were as follows:

- Analysis was completed based on forecasted 2040 volumes provided by SRF Consulting Group.

- The majority of demand for the proposed parking ramp near TH 14/52 is expected to originate from TH 52 to the north.
- Parking ramp access utilizing collector-distributor roads north and south of TH 14 can be used to manage merge, diverge, and weaving maneuvers off mainline TH 14 at acceptable levels of service (C or better).
- Additional geometric design work is needed to refine the layouts to meet MnDOT design standards.

Portal Capacity Methodology, Revised February 14, 2018

The purpose of the portal capacity analysis was to determine the total volume of vehicles that can enter and exit downtown Rochester during peak periods. The existing and future portal capacity play a significant factor in determining where and by what mode new employees and visitors will access the DMC District. The results of the portal capacity analysis were used to inform the alternatives and strategies developed in the Parking/TMA Study and Transit Study. The existing portal capacity was analyzed in January 2017 and the 2040 No Build analysis was added in February 2018

Key findings and assumptions were as follows:

- Analysis was based on 2016 traffic volumes collected by WSB Associates in October-November 2016.
- There is less capacity available than previously estimated in the DMC Development Plan.
- The portals from TH 52 (Civic Center Drive, 2nd Street SW, and 6th Street SW) have very little remaining capacity in the existing AM and PM peak periods. This means that limited new commuter traffic can travel through these portals in the future.
- The analysis shows that there is no remaining capacity available at the portals that connect to TH 52.
- Most of the portals with available capacity in the existing and 2040 No Build conditions are on local streets (Silver Lake Drive, 4th Street SE, 3rd Avenue SE) that do not provide direct access to TH 14 or TH 52.

Parking Analysis

The following memoranda related to parking analysis were produced. These are listed in chronological order.

Peripheral Parking Analysis, May 16, 2017

The purpose of the peripheral parking analysis was to evaluate the potential peripheral parking locations from a portal capacity and intersection operations perspective. The results of this analysis were used by the Integrated Transit Studies teams in the development of the DMC scenarios. The analysis summarized in this memorandum represents a high-level screening, and additional detailed operational analysis of the traffic forecasts and operations were conducted in October-December 2017 after the transit and parking scenarios had been defined.

Key findings and assumptions were as follows:

- Parking at 7 potential sites was evaluated from a portal capacity and transportation network perspective. The number of parking spaces under various transportation improvement scenarios were identified.
- Construction of parking structures at locations 2 (NE Quadrant TH 14/TH 52), 3 (Civic Center Drive), 4 (Fullerton), and 7 (Miracle Mile), which are inside the portals, would not provide new parking capacity. Parking at these locations would need to consist of relocated existing employee parking from the downtown core to the periphery, in order to avoid additional traffic impacts to the portals.

Parking Supply Calculations, Revised August 14, 2017

This memorandum documents the assumptions and calculations used to develop parking supply concepts for the Integrates Transit Study scenarios. The analysis of the transit scenarios occurred in June-August 2017, prior to development of the Hybrid Scenario. In addition, there have been a number of alignment modifications produced since the time of this analysis. The transit alignment and parking locations shown in the scenario graphics included in the memorandum were current as of May/June 2017 when the analysis was conducted.

Key findings and assumptions were as follows:

- Parking supply calculations were completed for the Traffic Concept (no new development-built parking in DMC District) and Development Concept (development-built parking in DMC District, as estimated by Parking Team as part of that portion of the project).
- Based on 2009-2013 US Census data (American Community Survey) and the 2040 forecast model for the DMC, 30 percent of 2040 employee traffic will be generated from districts that primarily use the unconstrained portals to/from their employment in downtown Rochester. The remaining 70 percent of downtown employee traffic is generated from the districts that are further from downtown and therefore will use the regional highway network and travel through the constrained portals into downtown Rochester:
    - Civic Center Drive at TH 52
    - 2nd Street SW at TH 52
    - 6th Street SW at TH 52
    - S Broadway Avenue at 6th Street SW
- After accounting for 10 percent reserve capacity at the portals, the remaining capacity at the three portals from TH 52 is only 100-200 vehicles in the existing peak hours.
- Estimated parking capacities were developed at each location based on different levels of infrastructure improvements:
    - Location 1 (NW Quadrant TH 14/TH 52): <1,000-7,500 spaces
    - Location 2 (NE Quadrant TH 14/TH 52): 1,000-3,000 spaces
    - Location 3 (Civic Center Drive between 8th Avenue and 4th Avenue): <500-3,000 spaces
    - Location 4 (Fullerton Lot): 1,750-4,750 spaces (includes 750 existing spaces)
    - Location 5 (K-Mart Site): 1,000-2,500 spaces
    - Location 6 (Olmsted County Fairgrounds): 1,000-4,500 spaces

    - Location 7 (Miracle Mile): 500-3,500 spaces
- Commuters traveling on the regional highway network can more easily be captured outside the portals. Therefore, park-and-ride and remote parking sites (Location 1 and Location 6) should consist primarily of commuters that would otherwise travel through the constrained portals.
- It will be more difficult to direct local residents that live close to the DMC District to the remote parking and park-and-ride sites, because this may result in a reverse commute. In addition, local residents that live closer to the DMC District are more likely to travel through the unconstrained portals. Therefore, parking for employees that live within Rochester should be located in the periphery sites or remote sites that are closer to downtown (Locations 3, 4, and 5).
- Commuter parking constructed inside the portals as part of individual developments in the downtown core will reduce or eliminate the number of employee spaces that can be constructed at peripheral parking locations (Locations 2, 3, 4, and 5), specifically for employees that travel through the constrained portals.
- Commuter parking at Locations 3 (Civic Center Drive between 8th Avenue and 4th Avenue) and 4 (Fullerton Lot) could likely be retained for commuters that travel through unconstrained portals, even if individual developments use all the remaining capacity of the constrained portals.

Parking Supply Calculations – Mayo Uses, October 4, 2017

The purpose of this memorandum was analysis of a specific parking supply concept based on the assumption of no new Mayo-related employee parking. This memo was used in the creation of the parking supply concept for the Hybrid Scenario.

Key findings and assumptions were as follows:

- If the demand for additional patient and visitor parking is met through construction of all new facilities by Mayo, City of Rochester, or others, only 250 net new employee spaces can be created in the DMC District due to portal capacity constraints.
    - The portals on Civic Center Drive, 2nd Street SW, and 6th Street SW would continue to be at or over capacity.
- Existing Mayo employee parking spaces that can be reallocated for patient/visitor use would allow additional net new Employee-Other (non-Mayo) parking to be constructed with individual developments or redevelopments.

Parking Recommendations Summary, December 28, 2017

The purpose of this memorandum was to summarize the previous traffic analysis and other considerations used to make recommendations about parking facilities at seven evaluated locations.

Key findings and assumptions were as follows:

- The following parking sites were recommended to be incorporated into the Integrated Transit scenarios:
  - Location 1 (Northwest Quadrant TH 14/TH 52) – DMC Modified, Scenario A, Scenario D, and Hybrid Scenario -
  - Location 3 (Civic Center Drive between 8th Avenue and 4th Avenue) – DMC Modified
  - Location 4 (Fullerton Lot) – DMC Modified, Scenario A, and Scenario D
  - Location 5 (K-Mart Site) – Scenario A and Hybrid Scenario
  - Location 6 (Olmsted County Fairgrounds) – Future facility beyond 2040
- The following parking sites were recommended to not be incorporated into the Integrated Transit scenarios:
  - Location 2 (Northeast Quadrant TH 14/TH 52) – Location is inside the portals and therefore is subject to constrained peak period portal capacity. Access points to the parking compete for capacity with the primary east/west traffic on Civic Center Drive.
  - Location 7 (Miracle Mile) – Location is inside the portals and therefore is subject to constrained peak period portal capacity. Local street access provides limited ability for parking (less than 500 spaces), and direct freeway access to TH 52 is not feasible.

Transit Analysis

The following memoranda related to transit alignment analysis were produced. These are listed in chronological order.

2nd Street SW Transit Lane Analysis, May 16, 2017

The purpose of this analysis was to assess the traffic impacts of converting two vehicle lanes on 2nd Street SW to transit only lanes through the DMC area. The results of the analysis were intended to be used by the Integrated Transit Studies teams in the development and screening of the transit scenarios.

The analysis summarized in the memorandum represents a high-level screening, and additional detailed operational analysis that included parking locations was conducted in late 2017.

Key findings and assumptions were as follows:

- Analysis was completed using 2040 No Build volumes that were produced in early 2017, as these were the best forecasts available at the time of the initial analysis in April-May 2017.[1]

[1] Updated 2040 traffic volume forecasts for each scenario were produced in October 2017 and used in later evaluations of the transit scenarios.

- Transit-only lanes on 2nd Street SW between 14th Avenue SW and 16th Avenue SW resulted in significant traffic operational issues, due to the large volume of traffic accessing St. Mary's parking facilities via 14th Avenue SW.
- Additional capacity on Civic Center Drive would be needed to absorb vehicle traffic diverted from 2nd Street SW, as a result of the transit exclusive lanes and the reduction in vehicle capacity from four lanes to two lanes.

Transit Travel Time Analysis, Revised October 23, 2017

Traffic simulation was used to provide a high-level evaluation and comparison of the travel times on each of the transit alignments. The results of the travel time analysis were intended to be used by the Integrated Transit Studies teams in the development of the preferred transit alignment for each scenario. The analysis of the DMC Modified Scenario, Scenario A, and Scenario D alignments occurred in June 2017 and the Hybrid Scenario analysis was completed in October 2017. There have been a number of alignment modifications and updated 2040 traffic volume forecasts produced since the time of this analysis. The transit alignment and parking locations shown in the graphics for the DMC Modified, A, and D scenarios included in the memorandum were current as of May/June 2017 when the original analysis was conducted. Analysis of the Hybrid scenario was added in October 2017.

Key findings and assumptions were as follows:

- Analysis was completed using 2040 No Build volumes that were produced in early 2017, as these were the best forecasts available at the time of the initial analysis in June 2017.
- The transit alignment in Scenario A was consistently the fastest, due to the shorter overall length.
- The transit alignment in Scenario D was consistently the slowest due to the slightly longer length and interactions with the greatest number of traffic signals, especially at the congested end of 2nd Street SW near TH 52.
- Hybrid Scenario Bus Loop A (since renamed to Route 1) and B (since renamed to Route 2) have similar travel times to the two major employment destinations (St. Mary's Hospital and Mayo Gonda Building) as Scenario A. The Hybrid alignments have been modified significantly since this analysis.
- Exclusive transit lanes on 2nd Street SW, created by removal of two vehicle traffic lanes, do not provide significant travel time savings, but would be expected to provide more reliable transit operations. Existing coordination along 2nd Street SW combined with transit signal priority provides good progression of transit vehicles with or without exclusive lanes.
- Exclusive transit lanes on 3rd Avenue and 4th Avenue, as a result of the removal of one vehicle traffic lane on each street, cause the greatest traffic congestion, particularly at 2nd Street SW. Transit lanes on 3rd Avenue and 4th Avenue shared with vehicle traffic do not have any significant operational issues.

Transit Scenario Traffic Operations Analysis, Revised December 14, 2017

The purpose of the analysis was to identify traffic operations issues in each of the transit scenarios, which will aid in the decision-making process to select a transit scenario. Key findings and assumptions were as follows:

- Analysis was completed for Existing, 2040 No Build, 2040 DMC Modified, 2040 Scenario A, 2040 Scenario D, and 2040 Hybrid Scenario. The analysis was based on PM peak, due to the overall higher traffic volumes during that period.
- All of the 2040 scenarios suggest that a six-lane Civic Center Drive would be needed to accommodate the forecast volumes between 16th Avenue NW and N Broadway Avenue.
- Congestion will increase on 2nd Street SW with exclusive transit lanes (removal of vehicle traffic lanes). Some segments may operate over capacity, especially where there are heavy left turn movements onto or off 2nd Street SW. This issue was analyzed in greater detail and is summarized in the Transit Scenario Traffic Analysis Mitigation Summary memorandum.
    - Removal of vehicle lanes west of 14th Avenue SW causes significant operational issues, particularly for traffic entering and exiting St. Mary's campus.
- Traffic volumes on 11th Avenue NW require more than one approach lane at Civic Center Drive. This limits transit station placement near the intersection or requires additional right-of-way to accommodate exclusive transit lanes and provide adequate traffic capacity.
- Exclusive transit lanes on 3rd Avenue and 4th Avenue (removal of vehicle traffic lanes) cause over capacity operations from 4th Street SW to Center Street due to the vehicle volumes and exclusive transit phases. Shared transit lanes on 3rd Avenue and 4th Avenue do not have any significant operational issues.
- For all street segments with exclusive transit lanes, turn lanes for vehicle movements across the transit lanes will minimize the need for exclusive vehicle and transit phasing and lessen the overall intersection operations impacts.

Transit Scenario Traffic Analysis Mitigation Summary, Revised January 19, 2018

The purpose of the mitigation analysis was to identify potential mitigation measures that would produce acceptable traffic operations. The mitigation measures were intended to inform the scenario evaluation and cost estimating. Key findings and assumptions were as follows:

- The analysis was based on 2040 PM peak, due to the overall higher traffic volumes during that period.
- The following feasible mitigation measures have been identified for each of the anticipated over-capacity areas (based on the 2040 analysis):
    - 6th Street SW/14th Avenue SW – Install traffic signal or construct roundabout. This mitigation applies to all scenarios.
    - Civic Center Drive/Silver Lake Drive – Install traffic signal or construct roundabout. This mitigation applies to all scenarios.
    - Civic Center Drive between TH 52 and Broadway Avenue – Construct 6-lane roadway section. This mitigation applies to all scenarios except the Hybrid Scenario, which already includes a six-lane section on Civic Center Drive. The 6-lane scenario

was already assumed to be part of the Hybrid Scenario, based on the geometric layouts and the forecast modeling for that scenario.

- 11th Avenue NW/Civic Center Drive
  - Convert the southbound approach to a left-turn lane, a through lane, and a right-turn lane.
  - Convert the northbound approach to a left-turn lane, a through lane, and a shared through/right-turn lane.

  These mitigations apply to Scenario A and the Hybrid Scenario. The mitigations have already been added to the Hybrid Scenario geometric layouts dated December 12, 2017. The mitigations have not been incorporated into the Scenario A geometric layouts dated October 11, 2017. All other scenarios already included four lanes on 2nd Street SW between 14th Avenue SW and TH 52.

- 2nd Street SW
  - Provide eastbound (into parking lot) and westbound left-turn lanes at 2nd Street SW/9th Avenue SW. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario transit geometric layouts dated December 12, 2017.
  - Provide left-turn lanes on all approaches at 2nd Street SW/11th Avenue SW. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario transit geometric layouts dated December 12, 2017.
  - Maintain four through lanes on 2nd Street SW between 14th Avenue SW and TH 52. This mitigation applies to the DMC Modified scenario, but has not been incorporated into the transit geometric layouts dated October 11, 2017.
- 3rd Avenue NW/SW and 4th Avenue NW/SW – Provide two vehicle lanes. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario transit geometric layouts dated December 12, 2017.
- 6th Street SW – Provide left-turn lanes on 6th Street SW at signalized intersections or operate transit in shared lanes. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario transit geometric layouts dated December 12, 2017.
- 3rd Avenue SE – Provide left-turn lanes on 3rd Avenue SE at signalized intersections or operate transit in shared lanes. This mitigation applies to Scenario A, but has not been incorporated into the transit geometric layouts dated October 11, 2017.

- Additional traffic analysis should be conducted to further scope these improvements, once a preferred transit scenario has been identified.

City Loop Analysis

The following memoranda related to city loop analysis were produced. These are listed in chronological order.

City Loop – Traffic Evaluation, October 2, 2017

This memorandum documents the evaluation of several City Loop Concepts and other potential pedestrian and bicycle scenarios suggested or proposed by other stakeholders in the DMC district. The purpose of the traffic evaluation was to inform the City Loop team and others on the potential implications of these scenarios.

Key findings and assumptions were as follows:

- The City Loop alignment for Scenario A runs on Civic Center Drive between W Silver Lake Drive and 2nd Street SE. It would be feasible from a traffic volume perspective to remove one traffic lane on Civic Center Drive between W Silver Lake Rd and 2nd Street SW. Either a three-lane or four-lane roadway section would be recommended on Civic Center Drive to accommodate forecast volumes.
- The Heart of the City project has proposed that 2nd Avenue SW be closed to vehicle traffic from 2nd Street SW to 6th Street SW to extend the plaza north of 2nd Street SW and enhance the pedestrian environment. The closure of 2nd Avenue SW appears feasible from a traffic volume perspective if it was a standalone change. However, the removal of lanes on 3rd Avenue SW and 4th Avenue or the conversion of 1st Avenue SW to a shared street could impact this feasibility.
- Stakeholders have suggested that 1st Avenue NW/SW from 2nd Street NW to 6th Street SW be converted to a shared street. 1st Avenue NW/SW between 2nd Street NW to 6th Street SW carries a relatively high traffic volume to be considered for conversion to a shared street. There are several access, parking, and operations issues and impacts that require additional analysis.

Summary

A total of 11 technical memoranda have been produced by Kimley-Horn traffic team as part of the Street Use study. The following lists these memoranda, organized by topic and date of the more recent version of each document:

- Traffic Analysis
  - TH 14/TH 52 and Parking Location 1 – Traffic Analysis, October 4, 2017
  - Portal Capacity Methodology, Revised February 14, 2018

- Parking Analysis
  - Peripheral Parking Analysis, May 16, 2017
  - Parking Supply Calculations, Revised August 14, 2017
  - Parking Supply Calculations – Mayo Uses, October 4, 2017
  - Parking Recommendations Summary, December 28, 2017

- Transit Analysis
  - 2nd Street SW Transit Lane Analysis, May 16, 2017
  - Transit Travel Time Analysis, Revised October 23, 2017
  - Transit Scenario Traffic Operations Analysis, Revised December 14, 2017

  - Transit Scenario Traffic Analysis Mitigation Summary, Revised January 19, 2018

- City Loop Analysis
  - City Loop – Traffic Evaluation, October 2, 2017

Next Steps

Additional, more detailed traffic analysis will be needed going forward to support the project design and implementation:

- TH 14/TH 52 and Parking Location 1 freeway operations analysis, to inform geometric layouts
- Transit and pedestrian analysis along the transit alignment, particularly near stations

Attachments

1. TH 14/TH 52 and Parking Location 1 – Traffic Analysis, October 4, 2017
2. Portal Capacity Methodology, Revised February 14, 2018
3. Peripheral Parking Analysis, May 16, 2017
4. Parking Supply Calculations, Revised August 14, 2017
5. Parking Supply Calculations – Mayo Uses, October 4, 2017
6. Parking Recommendations Summary, December 28, 2017
7. 2nd Street SW Transit Lane Analysis, May 16, 2017
8. Transit Travel Time Analysis, Revised October 23, 2017
9. Transit Scenario Traffic Operations Analysis, Revised December 14, 2017
10. Transit Scenario Traffic Analysis Mitigation Summary, Revised January 19, 2018
11. City Loop – Traffic Evaluation, October 2, 2017

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Technical Memorandum 1

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
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JoNette.Kuhnau@kimley-horn.com
651-643-0464

Date: October 4, 2017

Subject: TH 14/TH 52 and Parking Location 1 – Traffic Analysis

Cc:

Introduction

This memorandum summarizes the preliminary traffic analysis completed for the TH 14/TH 52 interchange and the proposed Parking Location 1. The purpose of the analysis was to inform the interchange and parking access layouts.

Assumptions

The assumptions used in the analysis are summarized in the following bullets:

- Analysis completed in Highway Capacity Software (HCS).
- The parking ramp is assumed to include 4,000 employee spaces[1], and is assumed to be at capacity in 2040. The ramp is expected to generate approximately 1,600 trips into the ramp during the AM peak and 1,600 trips out of the ramp during the PM peak.
- The 2040 directional distribution of parking-generated traffic, provided by SRF, is shown in **Table 1**.

[1] *Parking Supply Calculations Technical Memorandum*, August 14, 2017

Table 1. Parking Location 1 Directional Distribution

Direction	Percentage of Ramp Traffic	Peak Hour Trip Generation
TH 52 - North	64%	1,020
TH 52 - South	9%	140
TH 14 - West	19%	300
TH 14 - East	9%	140

Source: SRF Consulting Group

- Layouts of the interchange modifications and parking access (Option B and Option C) were provided by SRF on September 25, 2017.
    - Additional assumptions were made regarding access to the parking to/from WB TH 14 and from the parking to SB TH 52, because this was not depicted on the layout.
- The exit from the parking ramp to EB TH 14 cannot cross the ramp from EB TH 14 to SB TH 52 at grade.
- Initial analysis was used to refine the geometrics of Option B and Option C. Mark-ups of the layouts are provided as attachments to this memorandum, for reference.
    - All options are similar for the TH 14/52 interchange.
    - All options are similar for WB TH 14 exit and entrance ramps. The following movements are proposed to be combined onto a collector-distributor (C-D) road on the north side of WB TH 14:
        - SB TH 52 to WB TH 14 (including traffic from SB TH 52 to parking ramp)
        - WB TH 14 to parking ramp (including traffic from NB TH 52)
        - Parking ramp to WB TH 14
    - Option B1 does not allow access from the parking ramp to SB TH 52.
    - Option B2 combines the following movements onto a C-D road on the south side of EB TH 14:
        - EB TH 14 to SB TH 52
        - Parking ramp to EB TH 14 (including traffic to NB TH 52)
        - Parking ramp to TH 52 (north or south)
    - Option C has a similar EB C-D road as Option B2, however the merge from the parking ramp is on the left side of the C-D road to minimize weaving. The majority of

traffic exiting the parking ramp is expected to use NB TH 52. The merge on the left side places this traffic in the left lane of the C-D road so that fewer lane changing and weaving will be needed.

- It was noted that the exit ramps from EB TH 14 to the parking ramp and to SB TH 52 could be combined into a single exit ramp.

Analysis Results

- The HCS analysis showed that 2 lanes are needed for a portion of the EB and WB collector-distributor roads, based on forecast peak hour volumes of 1,600-1,900 vehicles in the peak direction (WB in AM, EB in PM).

- The fly-over ramps to TH 52, eliminating the existing at-grade left-turn movements, would improve the safety and operations of the TH 14/TH 52 interchange.

- With the geometrics as proposed in the attached marked-up layouts, the HCS results showed that all merge, diverge, and weave areas would operate at LOS C or better in the 2040 peak hours.

Findings and Recommendations

The findings of the interchange and parking ramp analysis are as follows:

- The majority of demand for the proposed parking ramp near TH 14/52 originates from TH 52 to the north.

- Parking ramp access utilizing collector-distributor roads north and south of TH 14 can be used to manage merge, diverge, and weaving maneuvers off the mainline facility at acceptable levels of service (C or better).

- The fly-over ramps to TH 52, eliminating the existing at-grade left-turn movements, would improve the safety and operations of the TH 14/TH 52 interchange.

- Additional geometric design work is needed to refine the layouts to meet MnDOT design standards.

    - Additional design and coordination is needed to determine if the overhead power on the north side of TH 14 can be relocated or avoided.

    - The alignment and configuration of the existing frontage road on the north side of TH 14 needs to be further investigated. At-grade access from the parking ramp to the frontage road could be considered.

    - Axillary lanes should be considered on both directions of TH 14 through the TH 52 interchange.

- A left-side merge from the parking ramp to the C-D road on the south side of TH 14 should be considered based on the travel patterns out of the ramp towards NB TH 52. Merging traffic on the left side is not typical and may violate driver expectations, but would minimize the necessary lane-changing and weaving maneuvers and therefore may operate more efficiently and safely than a right-side merge.

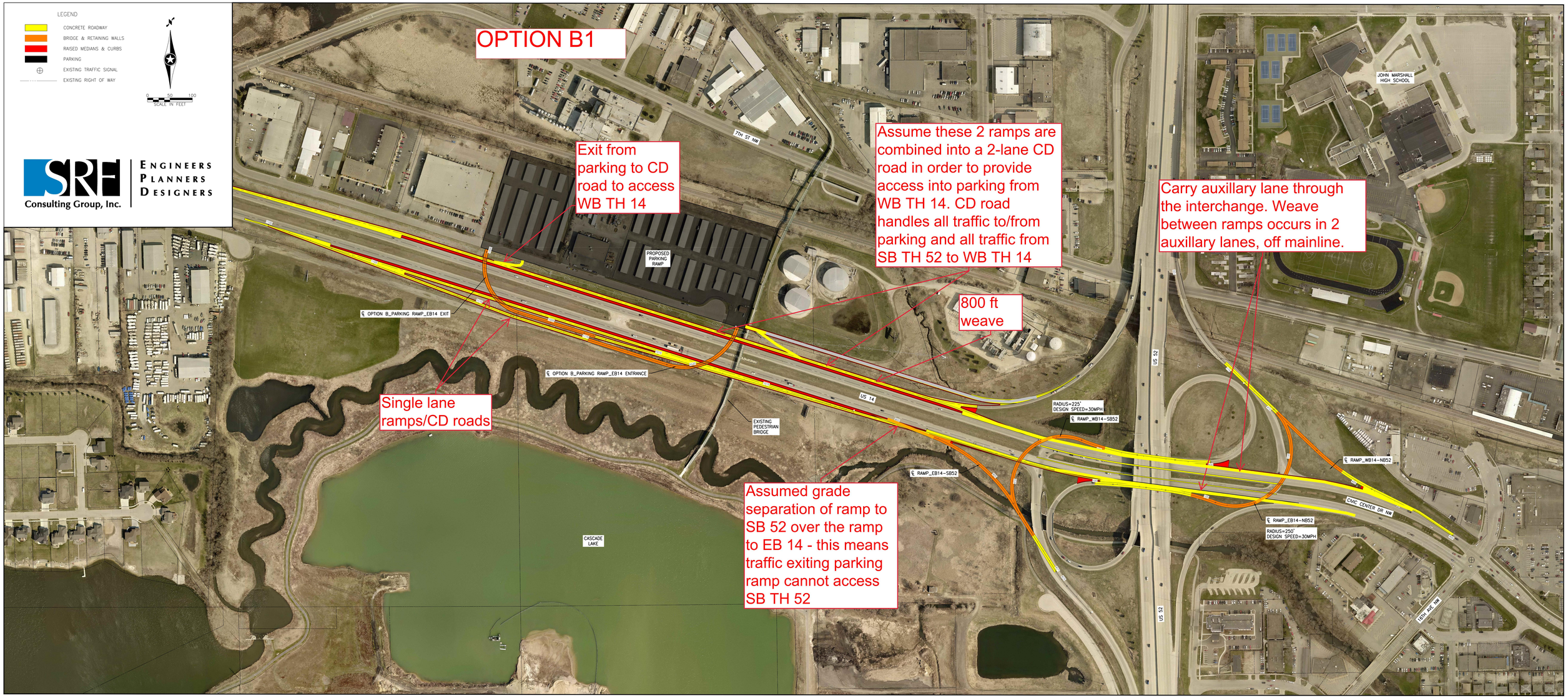
- Exit ramps from EB TH 14 to the parking ramp and to SB TH 52 may need to be combined into a single ramp based on necessary ramp spacing.

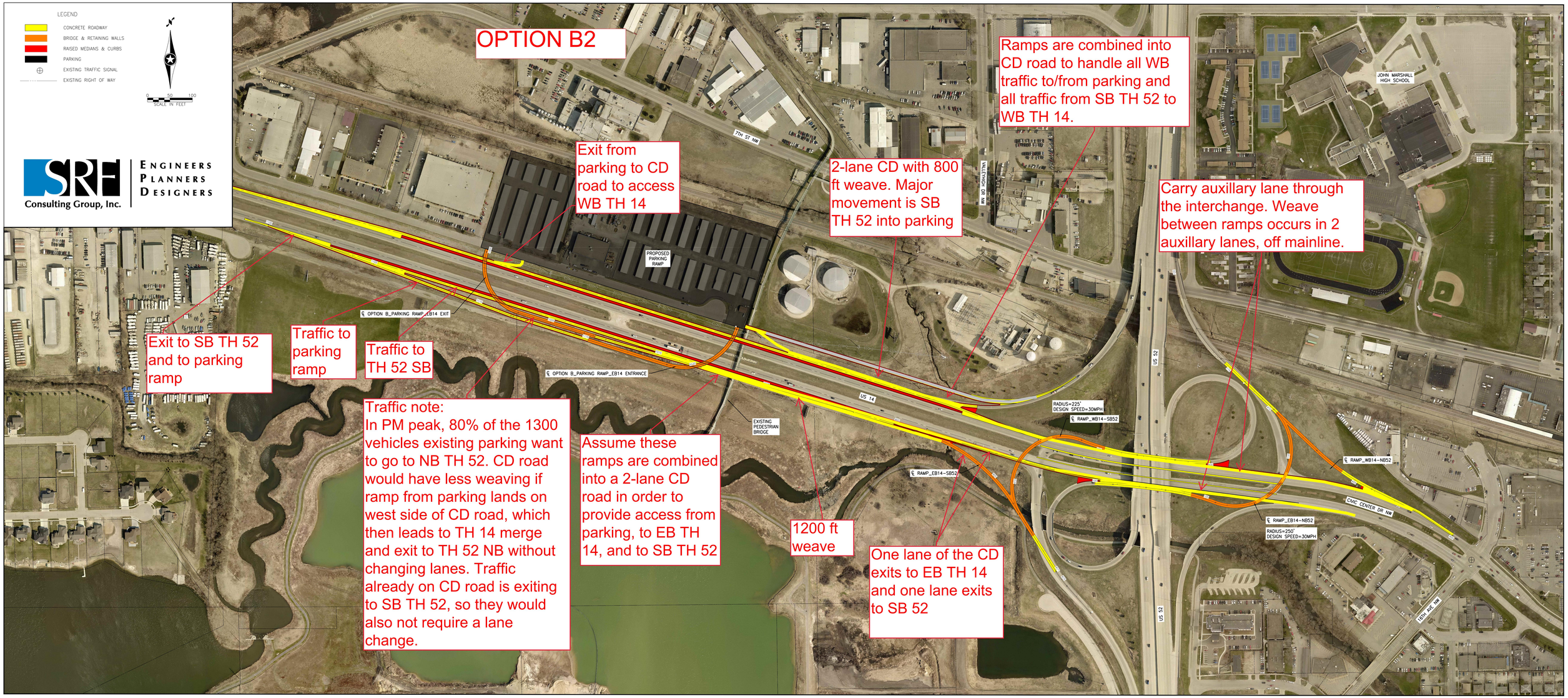
Attachments

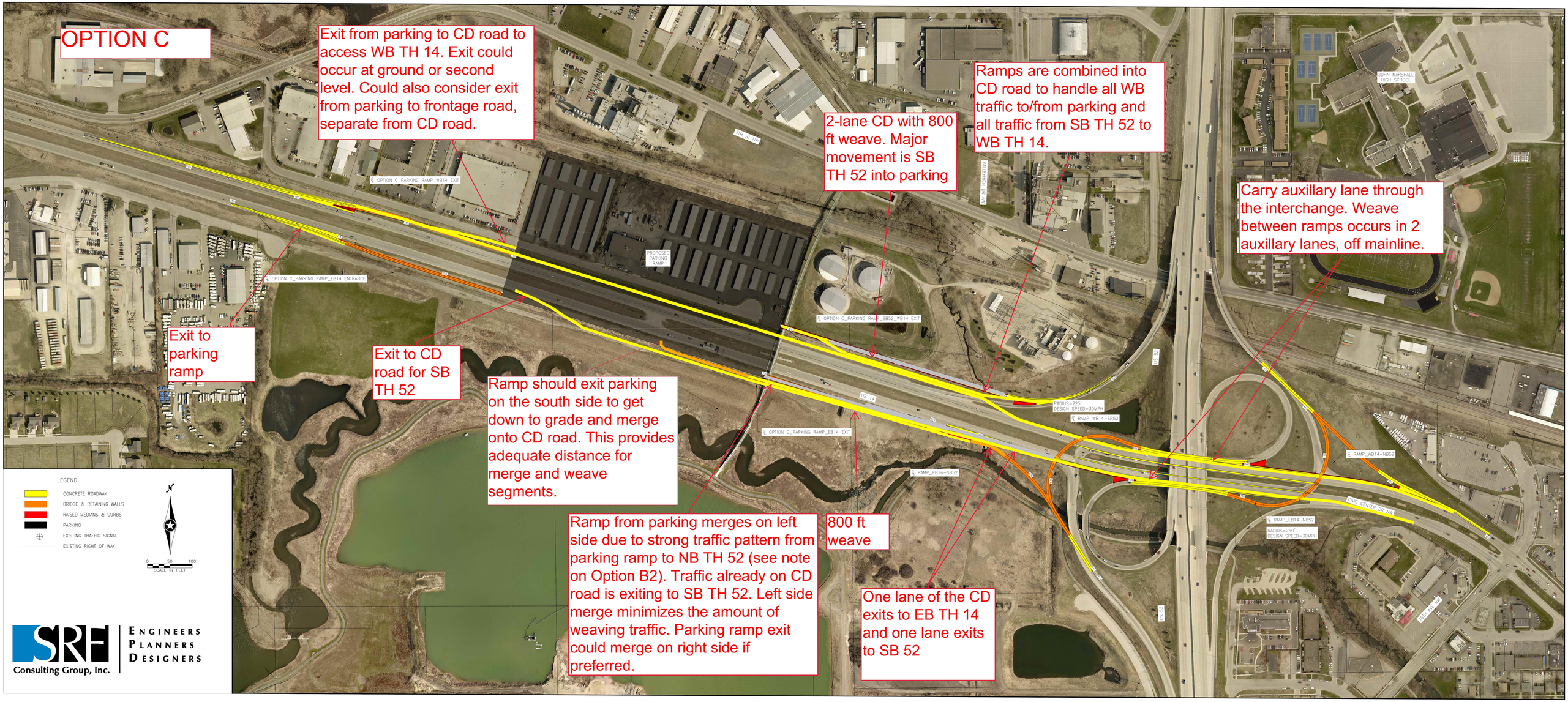
Option B1 Layout with Kimley-Horn Mark-Up

Option B2 Layout with Kimley-Horn Mark-Up

Option C Layout with Kimley-Horn Mark-Up


LEGEND
CONCRETE ROADWAY
BRIDGE & RETAINING WALLS
RAISED MEDIANS & CURBS
PARKING
EXISTING TRAFFIC SIGNAL
EXISTING RIGHT OF WAY
0 50 100
SCALE IN FEET
SRF Consulting Group, Inc.
ENGINEERS
PLANNERS
DESIGNERS
OPTION B1
Exit from parking to CD road to access WB TH 14
Assume these 2 ramps are combined into a 2-lane CD road in order to provide access into parking from WB TH 14. CD road handles all traffic to/from parking and all traffic from SB TH 52 to WB TH 14
Carry auxillary lane through the interchange. Weave between ramps occurs in 2 auxillary lanes, off mainline.
800 ft weave
Single lane ramps/CD roads
Assumed grade separation of ramp to SB 52 over the ramp to EB 14 - this means traffic exiting parking ramp cannot access SB TH 52
7TH ST NW
PROPOSED PARKING RAMP
OPTION B_PARKING RAMP_EB14 EXIT
OPTION B_PARKING RAMP_EB14 ENTRANCE
US 14
EXISTING PEDESTRIAN BRIDGE
CASCADE LAKE
RADIUS=225'
DESIGN SPEED=30MPH
RAMP_WB14-SB52
RAMP_EB14-SB52
US 52
JOHN MARSHALL HIGH SCHOOL
RAMP_WB14-NB52
CIVIC CENTER DR NW
RAMP_EB14-NB52
RADIUS=250'
DESIGN SPEED=30MPH
16TH AVE NW


LEGEND
CONCRETE ROADWAY
BRIDGE & RETAINING WALLS
RAISED MEDIANS & CURBS
PARKING
EXISTING TRAFFIC SIGNAL
EXISTING RIGHT OF WAY
0 50 100
SCALE IN FEET
SRF Consulting Group, Inc.
ENGINEERS
PLANNERS
DESIGNERS
OPTION B2
Exit from parking to CD road to access WB TH 14
2-lane CD with 800 ft weave. Major movement is SB TH 52 into parking
Ramps are combined into CD road to handle all WB traffic to/from parking and all traffic from SB TH 52 to WB TH 14.
Carry auxillary lane through the interchange. Weave between ramps occurs in 2 auxillary lanes, off mainline.
Exit to SB TH 52 and to parking ramp
Traffic to parking ramp
Traffic to TH 52 SB
Traffic note:
In PM peak, 80% of the 1300 vehicles existing parking want to go to NB TH 52. CD road would have less weaving if ramp from parking lands on west side of CD road, which then leads to TH 14 merge and exit to TH 52 NB without changing lanes. Traffic already on CD road is exiting to SB TH 52, so they would also not require a lane change.
Assume these ramps are combined into a 2-lane CD road in order to provide access from parking, to EB TH 14, and to SB TH 52
1200 ft weave
One lane of the CD exits to EB TH 14 and one lane exits to SB 52
7TH ST NW
PROPOSED PARKING RAMP
OPTION B_PARKING RAMP_EB14 EXIT
OPTION B_PARKING RAMP_EB14 ENTRANCE
EXISTING PEDESTRIAN BRIDGE
US 14
US 52
RADIUS=225' DESIGN SPEED=30MPH
RAMP_WB14-SB52
RAMP_EB14-SB52
RAMP_WB14-NB52
RAMP_EB14-NB52
RADIUS=250' DESIGN SPEED=30MPH
CIVIC CENTER DR NW
16TH AVE NW
JOHN MARSHALL HIGH SCHOOL


OPTION C
Exit from parking to CD road to access WB TH 14. Exit could occur at ground or second level. Could also consider exit from parking to frontage road, separate from CD road.
2-lane CD with 800 ft weave. Major movement is SB TH 52 into parking
Ramps are combined into CD road to handle all WB traffic to/from parking and all traffic from SB TH 52 to WB TH 14.
Carry auxillary lane through the interchange. Weave between ramps occurs in 2 auxillary lanes, off mainline.
Exit to parking ramp
Exit to CD road for SB TH 52
Ramp should exit parking on the south side to get down to grade and merge onto CD road. This provides adequate distance for merge and weave segments.
Ramp from parking merges on left side due to strong traffic pattern from parking ramp to NB TH 52 (see note on Option B2). Traffic already on CD road is exiting to SB TH 52. Left side merge minimizes the amount of weaving traffic. Parking ramp exit could merge on right side if preferred.
800 ft weave
One lane of the CD exits to EB TH 14 and one lane exits to SB 52
OPTION C_PARKING RAMP_WB14 EXIT
OPTION C_PARKING RAMP_EB14 ENTRANCE
OPTION C_PARKING RAMP_SB52_WB14 EXIT
OPTION C_PARKING RAMP_EB14 EXIT
RAMP_WB14-SB52
RAMP_EB14-SB52
RAMP_WB14-NB52
RAMP_EB14-NB52
RADIUS=225'
DESIGN SPEED=30MPH
RADIUS=250'
DESIGN SPEED=30MPH
PROPOSED PARKING RAMP
7TH ST NW
MAIN ST NW
US 14
CIVIC CENTER DR NW
JOHN MARSHALL HIGH SCHOOL
LEGEND
CONCRETE ROADWAY
BRIDGE & RETAINING WALLS
RAISED MEDIANS & CURBS
PARKING
EXISTING TRAFFIC SIGNAL
EXISTING RIGHT OF WAY
0 50 100
SCALE IN FEET
SRF Consulting Group, Inc.
ENGINEERS
PLANNERS
DESIGNERS

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Technical Memorandum 2

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
Kimley-Horn and Associates
JoNette.Kuhnau@kimley-horn.com
651-643-0464

Date: January 18, 2017 - **REVISED February 14, 2018**

Subject: Portal Capacity Methodology

Cc:

Introduction

The purpose of the portal capacity analysis is to determine the volume of vehicles that can enter and exit downtown Rochester. The existing and future portal capacity play a significant factor in determining where and by what mode new employees and visitors will access the Destination Medical Center (DMC). The results of the portal capacity analysis will be used to identify necessary mode split of future traffic and will inform the alternatives and strategies developed in the Parking/TMA Study and Transit Study.

Portal Capacity Analysis

Existing Conditions

The Street Use Study conducted a portal capacity analysis as an update of the analysis in the DMC Development Plan. The updated analysis was completed to:

- Update the traffic volumes to 2016
- Evaluate the portal capacity in 15-minute increments throughout the peak period
- Incorporate signal timings and field observations to more accurately capture intersection capacity
- Expand the analysis period from the peak hour to 90 minutes to evaluate the shoulders of the peak

The same 11 portal locations were analyzed, but both AM and PM peaks were analyzed separately and were evaluated over a 90-minute period rather than the peak hour only.[1] Capacity in the predominant commuting direction only was analyzed – inbound to downtown in the AM peak and outbound from downtown in the PM peak.

First, updated weekday intersection counts were collected in October 2016 at each of the following locations:

- 6th Street SW and 14th Avenue SW
- 2nd Street SW and 17th Avenue SW
- Civic Center Drive NW and 16th Avenue NW
- 6th Avenue NW and Civic Center Drive NW
- 4th Avenue NW and Civic Center Drive NW
- N Broadway and Civic Center Drive NW
- W Silver Lake Drive NW and Civic Center Drive NW/NE
- E Center Street and Civic Center Drive SE
- 3rd Avenue SE and 4th Street SE
- S Broadway and 6th Street SW
- Memorial Parkway and 14th Avenue SW

Existing signal timings for each intersection were provided by the City of Rochester. Based on the existing counts and signal timing, the capacity of each portal was determined based on the methods laid out in Chapter 19 of the Highway Capacity Manual 6th Edition. For the peak direction at each portal, the capacity in vehicles per hour per lane was calculated based on an ideal vehicular flow rate of 1,800 vehicles per hour per lane and the movement effective green time. Next, the hourly capacity of the portal was calculated by multiplying by the number of lanes by the per-lane capacity, adjusting for lane utilization and other observed operating characteristics.

The percent of existing available capacity for each portal was calculated by dividing the observed peak hour vehicle volume by the calculated hourly capacity at each location. This was completed for each 15-minute period, for the peak hour, and for the 90-minute peak period to assess how the demand/capacity ratio varies over time. The remaining capacity was calculated by subtracting the existing peak hour vehicle volume from the calculated hourly capacity.

[1] The DMC Development plan used daily traffic volumes and assumed peak hour factors to develop the peak hour capacity available, resulting in the same capacity calculated for the AM and PM peak hours.

2040 No Build Conditions

No Build (2040) analysis was based on forecast volumes from the ROCOG model, produced by SRF in spring 2017. The No Build scenario reflects DMC development but does not include parking, transit, or other measures to accommodate the increased growth.

Optimized signal timings were estimated for the future year conditions. The analysis methodology for the 2040 No Build used the same methodology as the Existing Conditions. The same 11 portal locations were analyzed, with AM and PM peak hours analyzed separately. The capacity was evaluated over a 90-minute period rather than the peak hour only.

Findings

The results of the existing portal capacity analysis in percent capacity available are summarized in **Figure 1** (AM peak hour) and **Figure 2** (PM peak hour). Based on the total capacity of each portal, this was translated to the approximate number of additional vehicles per peak hour, which are displayed in **Figure 3** and **Figure 4**.

More detailed existing conditions results for each portal intersection are provided in Appendix A (AM Peak hour) and Appendix B (PM peak hour). The updated analysis showed that overall there is approximately 42 percent available capacity in the AM peak hour (see Table A1 in Appendix A) and 44 percent available capacity in the PM peak hour (see Table B1 in Appendix B). Approximately two-thirds of the available capacity is on arterial (four-lane) roadways. The DMC Development Plan identified approximately 53 percent available portal capacity.[2] In addition, the analysis shows that the portals from TH 52 (Civic Center Drive, 2nd Street SW, and 6th Street SW) have very little remaining capacity. There is less capacity available than previously estimated, and the need for mode shift into the DMC Development District is even more critical.

The results of the 2040 No Build portal capacity are summarized in **Figure 5** (AM peak hour) and **Figure 6** (PM peak hour). The analysis shows that there is no remaining capacity available at the portals that connect to TH 52.

Next Steps

The next step in the analysis will be to compare these available capacities to the anticipated future residential growth areas, as this will influence the location and direction of future travel demand into downtown Rochester. The findings of the portal capacity analysis will also be used by the

[2] Figure 7.4-8 – Existing Functional Capacity by Facility, *Destination Medical Center Development Plan.*

Parking/TMA Study to identify potential parking locations and the Transit Study to identify potential transit routes.

Attachments:

Appendix A: AM Peak Hour Portal Capacity Analysis

Appendix B: PM Peak Hour Portal Capacity Analysis

Appendix A: AM Portal Capacity Analysis

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Figure A14.

Street Use Study

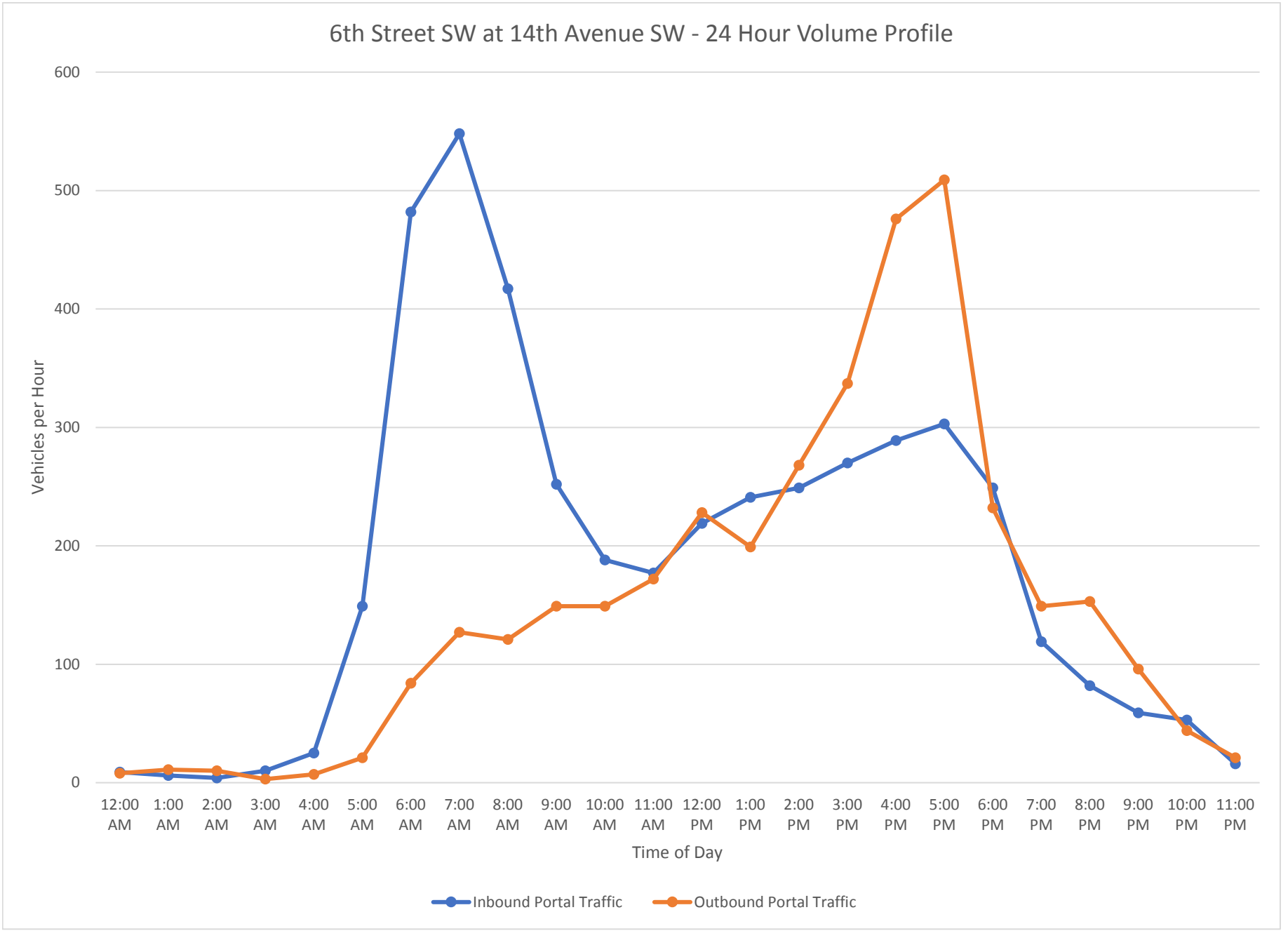

Figure A15.

Street Use Study

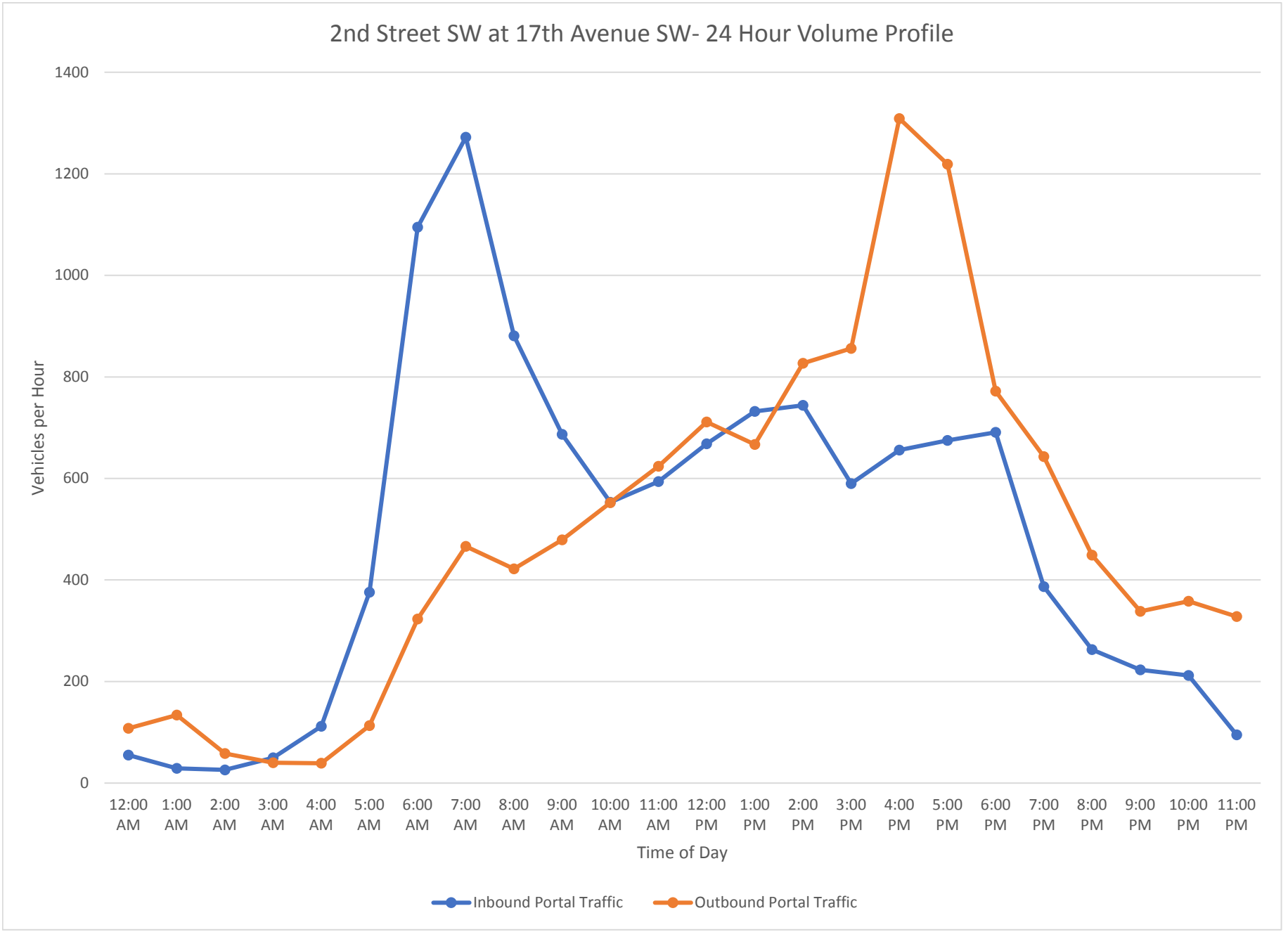

Figure A16.

Street Use Study

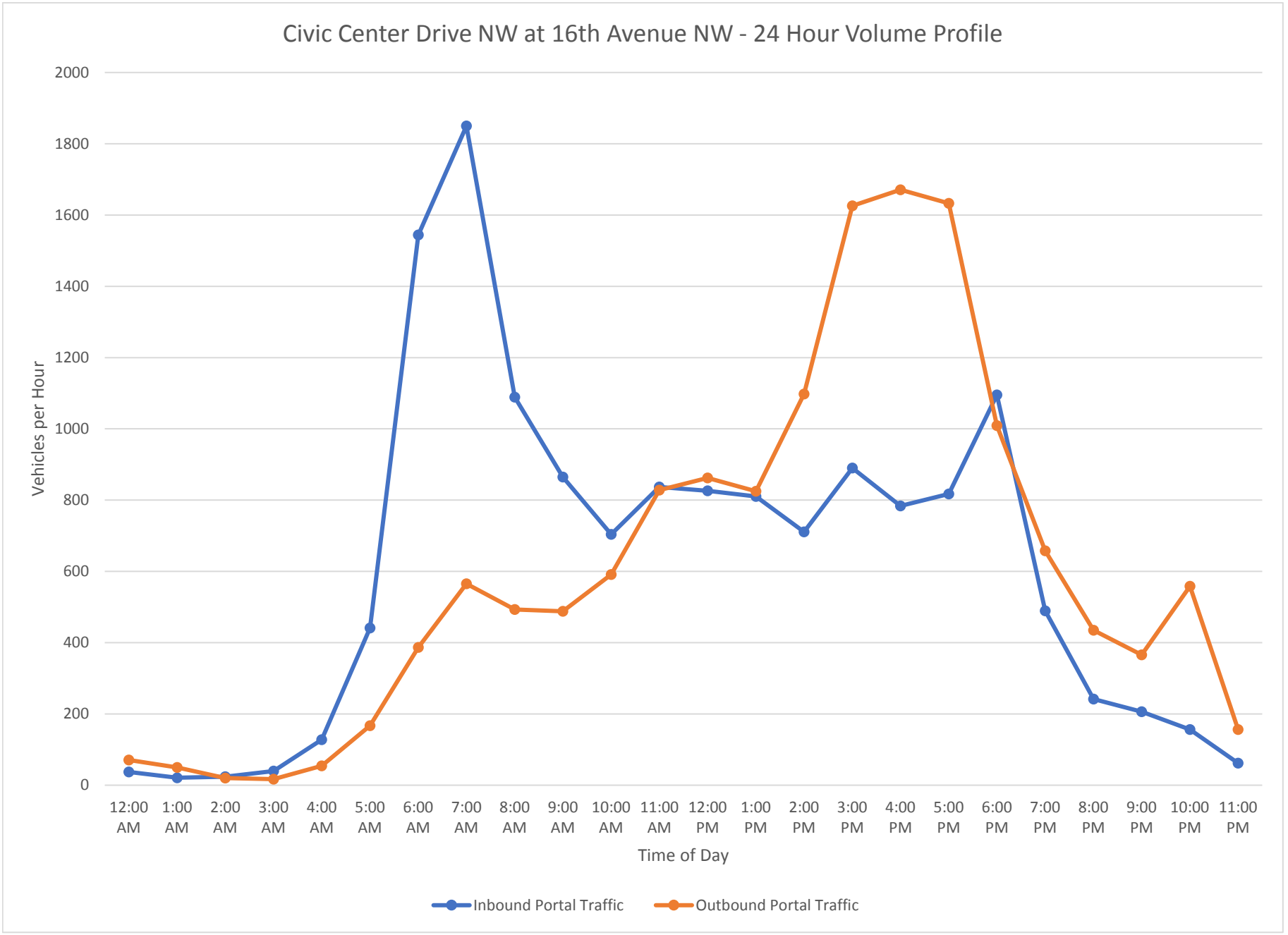

Figure A17.

Street Use Study

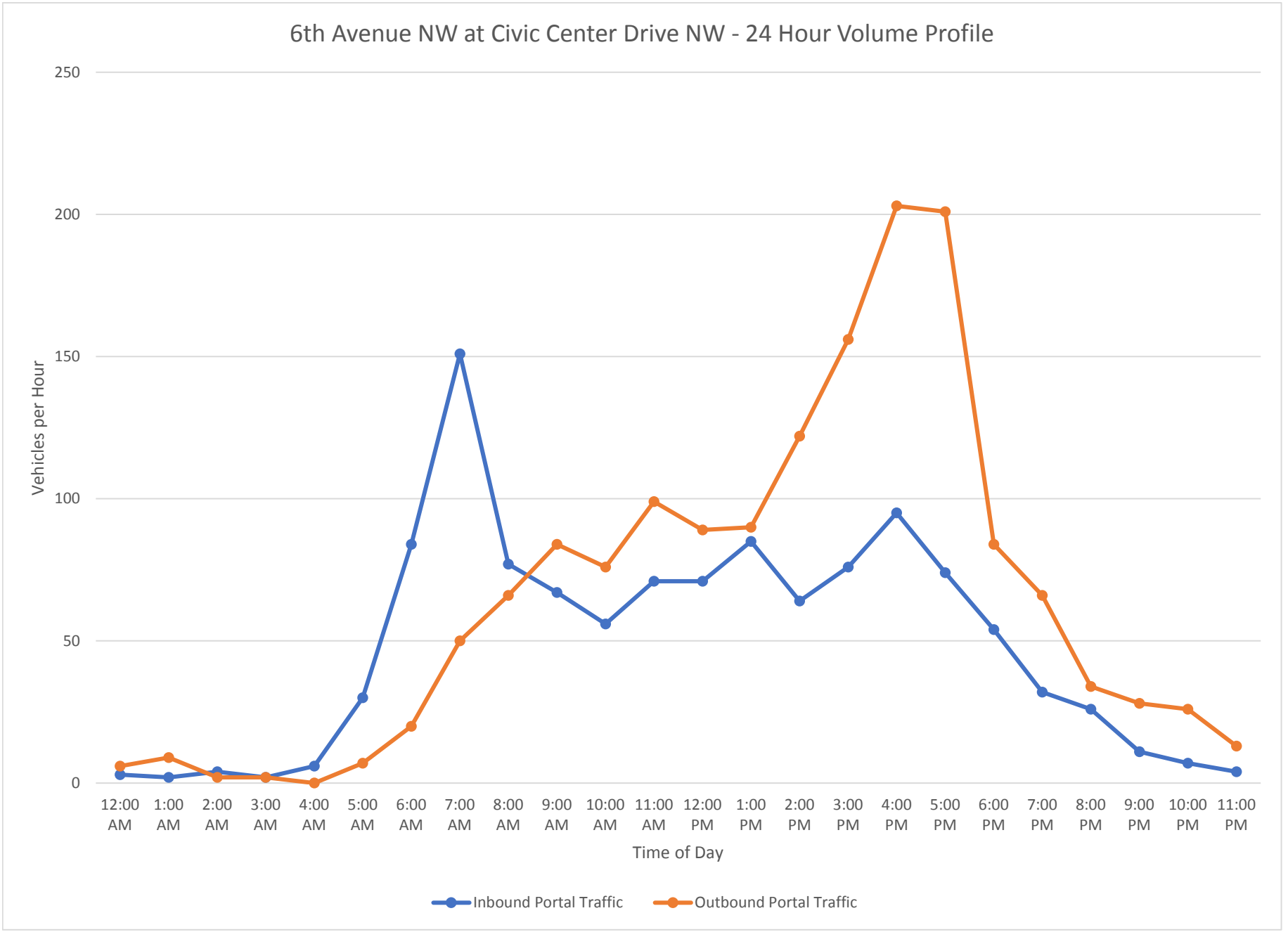

Figure A18.

Street Use Study

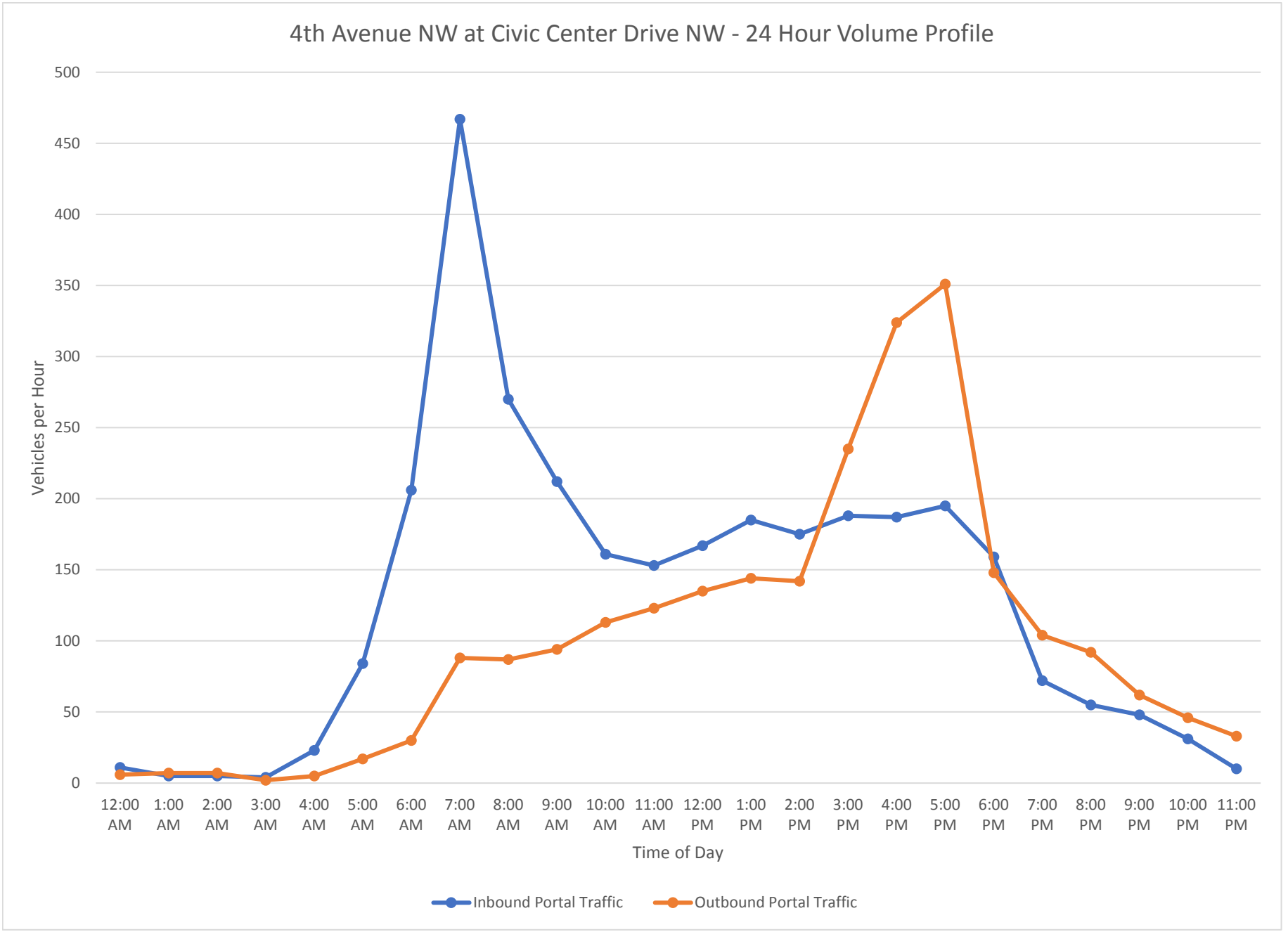

Figure A19.

Street Use Study

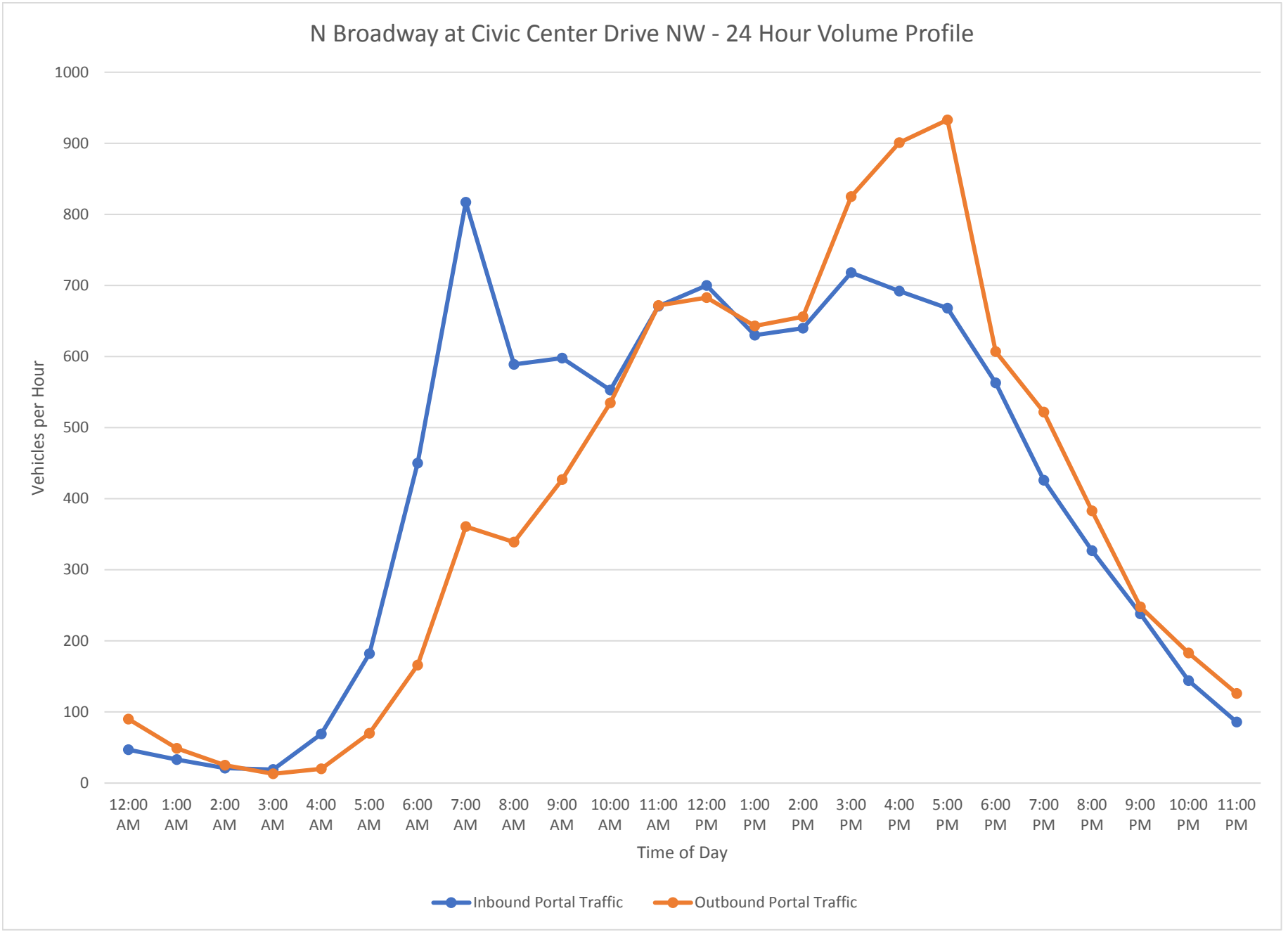

Figure A20.

Street Use Study

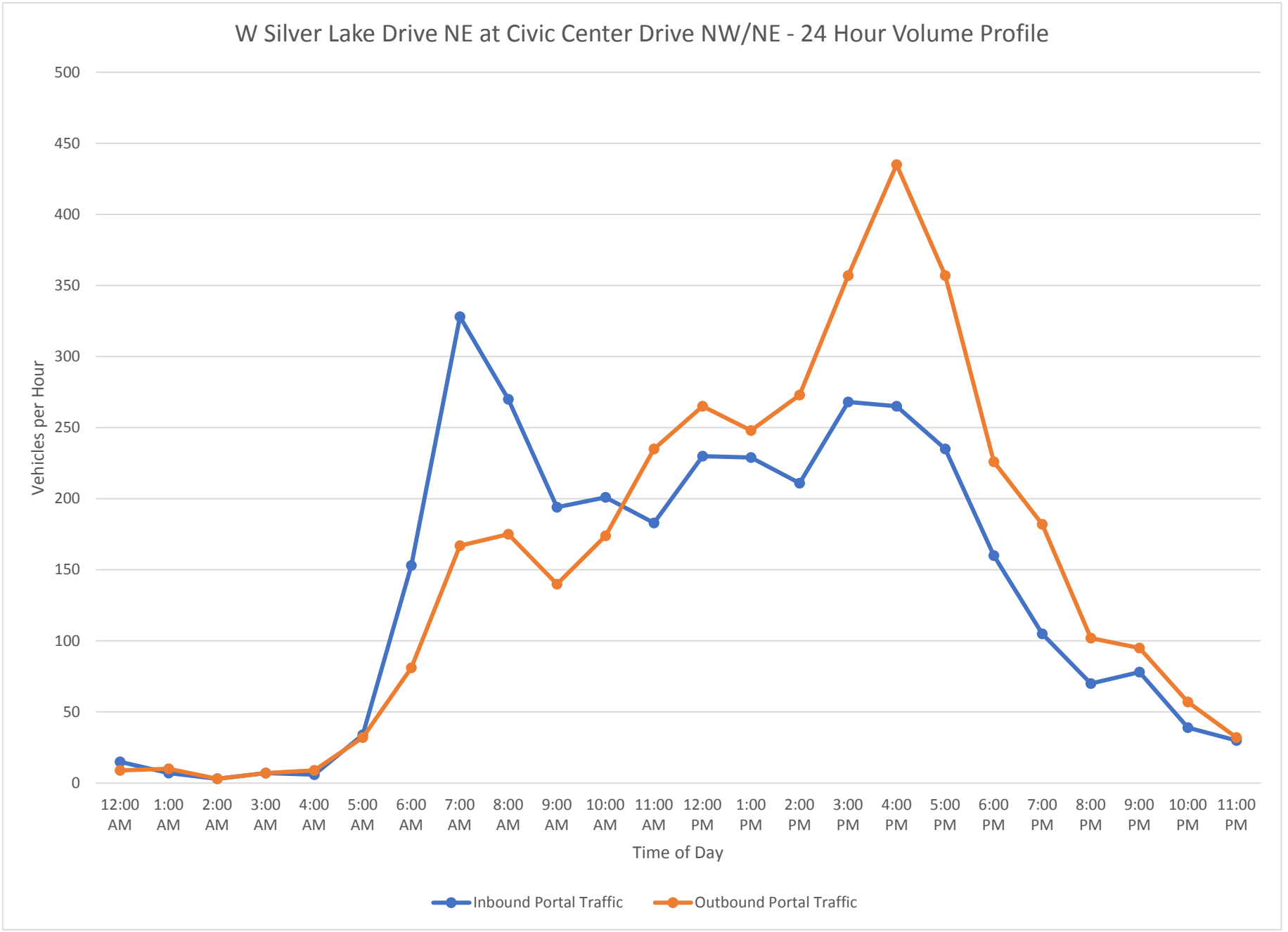

Figure A21.

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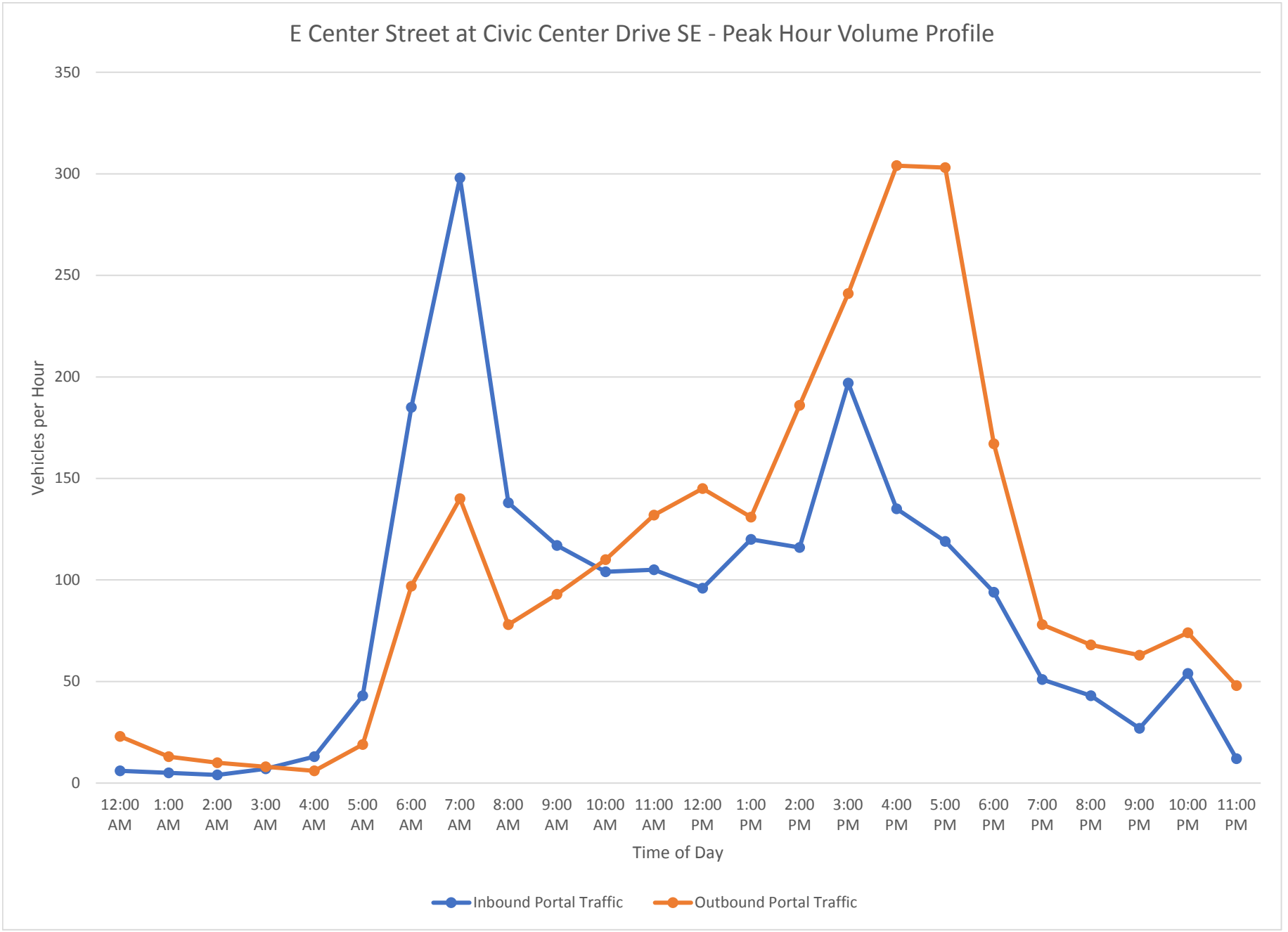

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Street Use Study

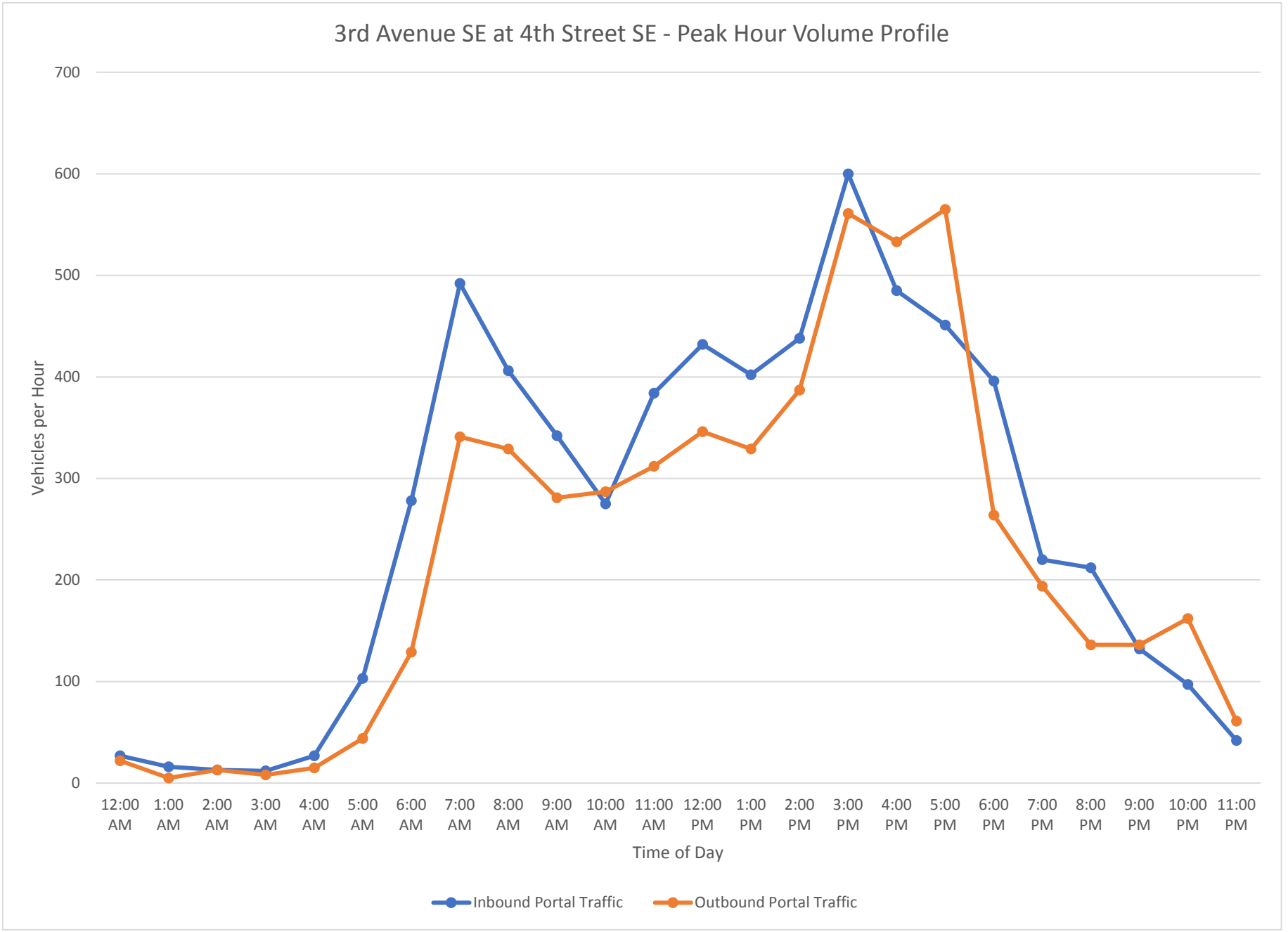

Figure A23.

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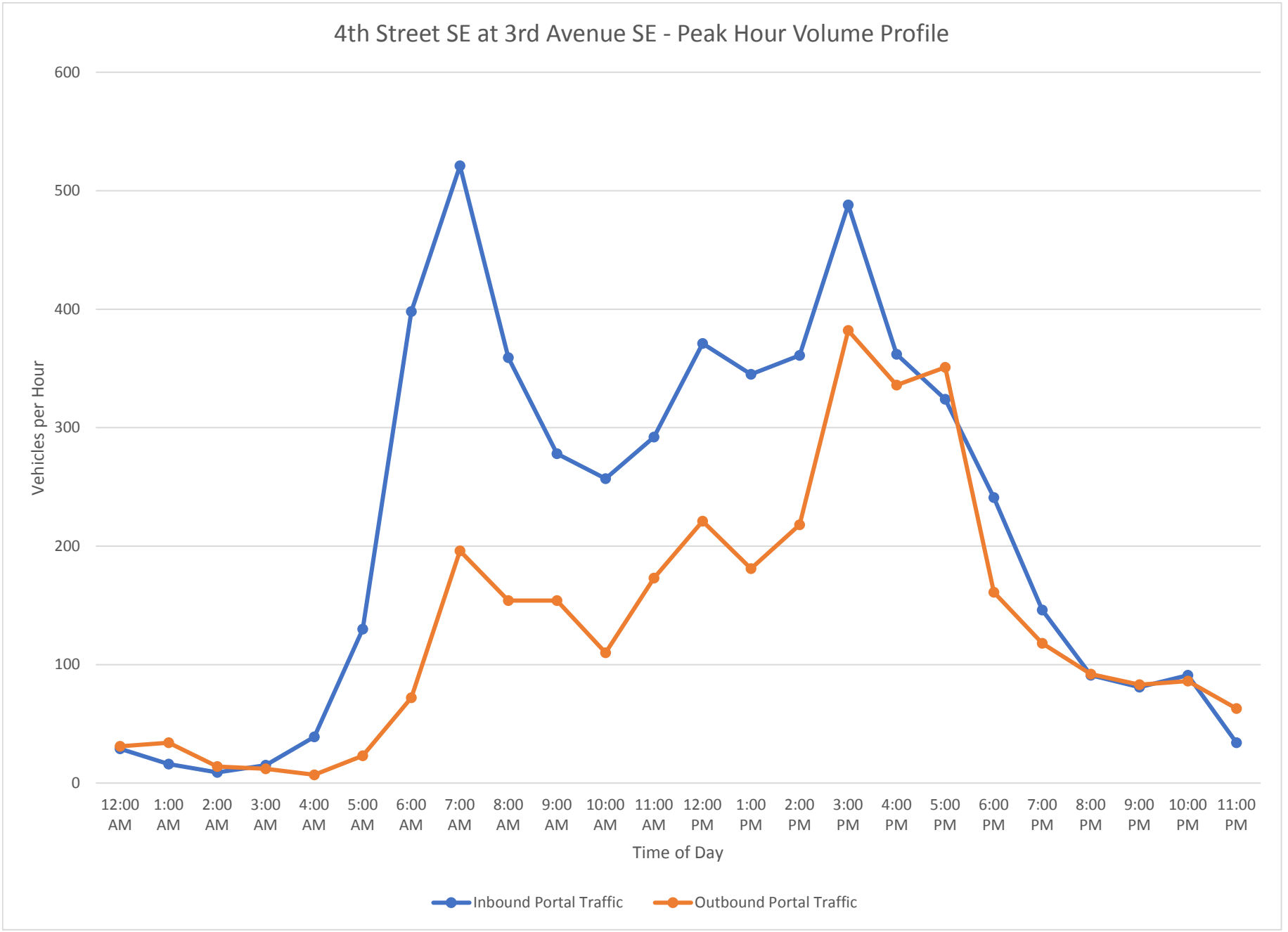


Figure A24.

Street Use Study

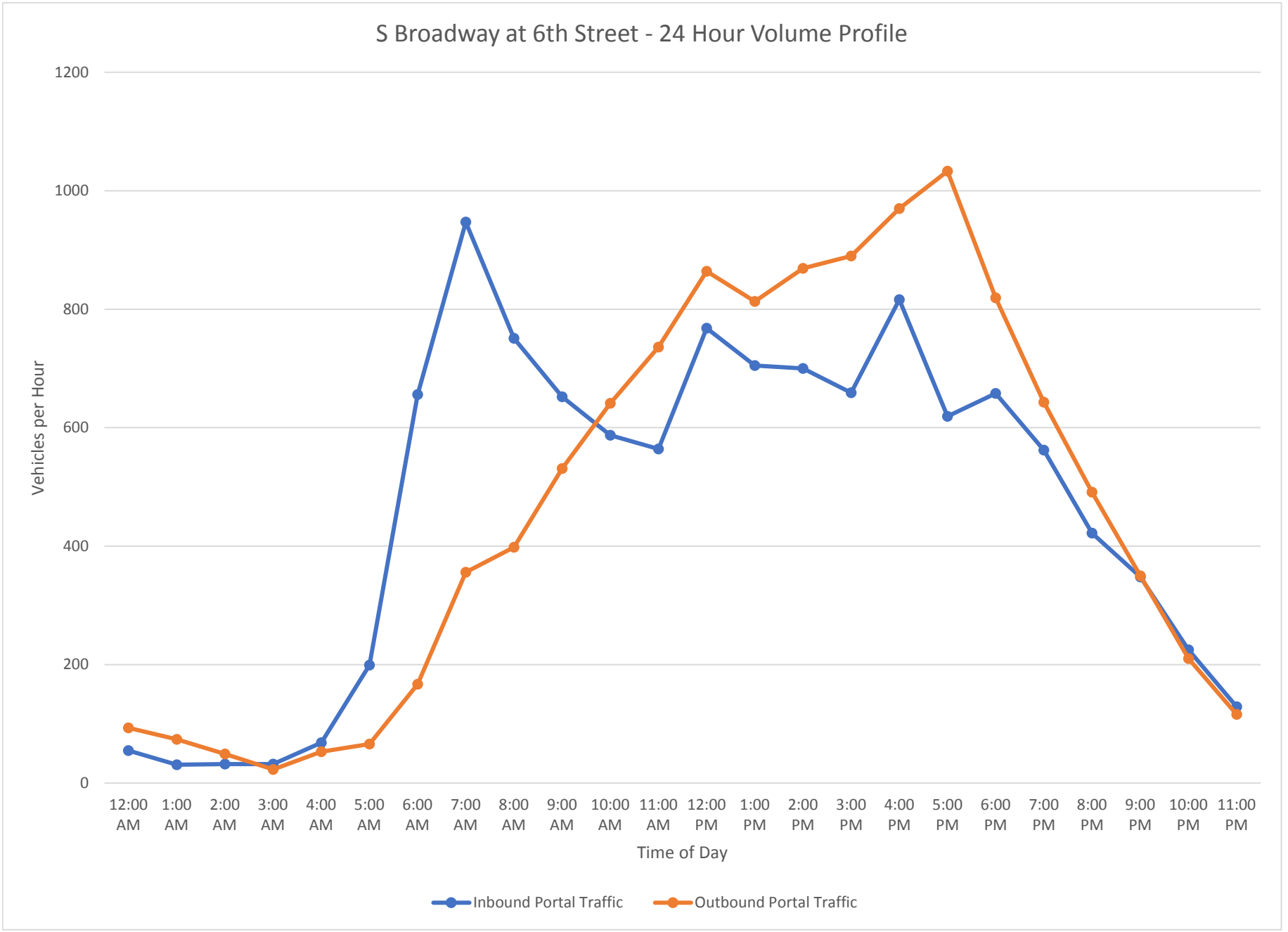
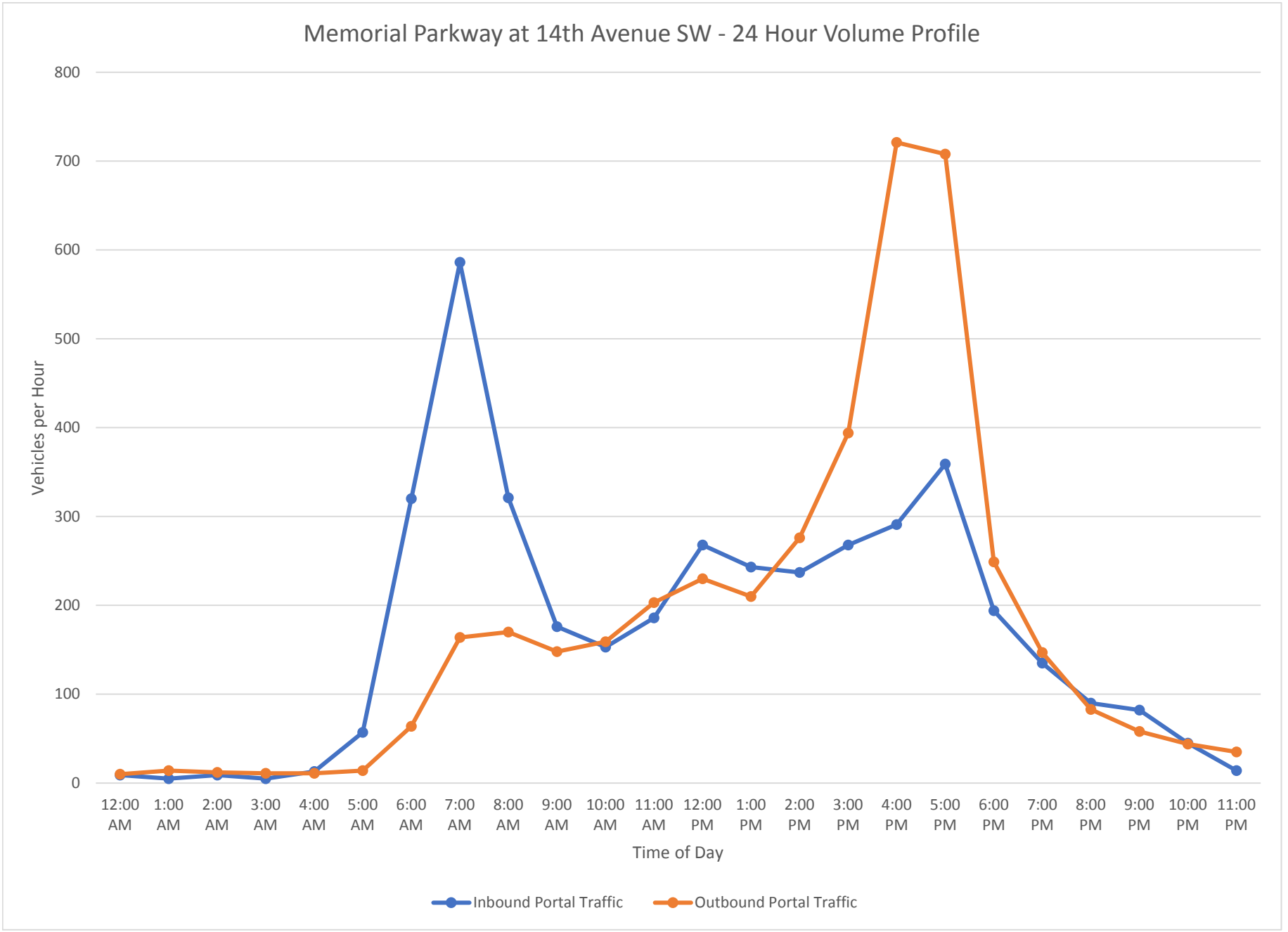


Figure A25.

Street Use Study



DMC TRANSPORTATION INFRASTRUCTURE PROGRAM MANAGEMENT

Appendix B: PM Portal Capacity Analysis

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Table A1.

Street Use Study

AM Peak Period

City Portal	Existing Peak Hour Remaining Capacity (vehicles)	Existing 90-Minute Remaining Capacity (vehicles)	Existing Peak Hour Capacity Used (vehicles)	Existing 90-Minute Capacity Used (vehicles)
EB 6th Street SW at 14th Ave SW	100	200	600	800
EB 2nd St SW at 17th Ave SW	300	600	1200	1700
EB Civic Center Dr NW at 16th Ave NW	100	300	1800	2500
SB 6th Ave NW at Civic Center Dr NW	300	500	200	200
SB 4th Ave NW at Civic Center Dr NW	300	600	500	600
SB Broadway at Civic Center Dr NW	700	1200	800	1100
SB W Silver Lake Dr NE at Civic Center Dr NW/NE	600	1000	400	500
WB Center St at Civic Center Dr SE	200	300	300	400
NB 3rd Ave SE at 4th St SE	900	1400	500	700
WB 4th St SE at 3rd Ave SE	600	1000	500	700
NB Broadway at 6th St SW	1500	2300	900	1400
NB Memorial Pkwy at 14th Ave SW	400	700	600	700
Portal Total	**6000**	**10100**	8300	11300

AM Peak Period Major (4-Lane) Roadway Remaining Capacity

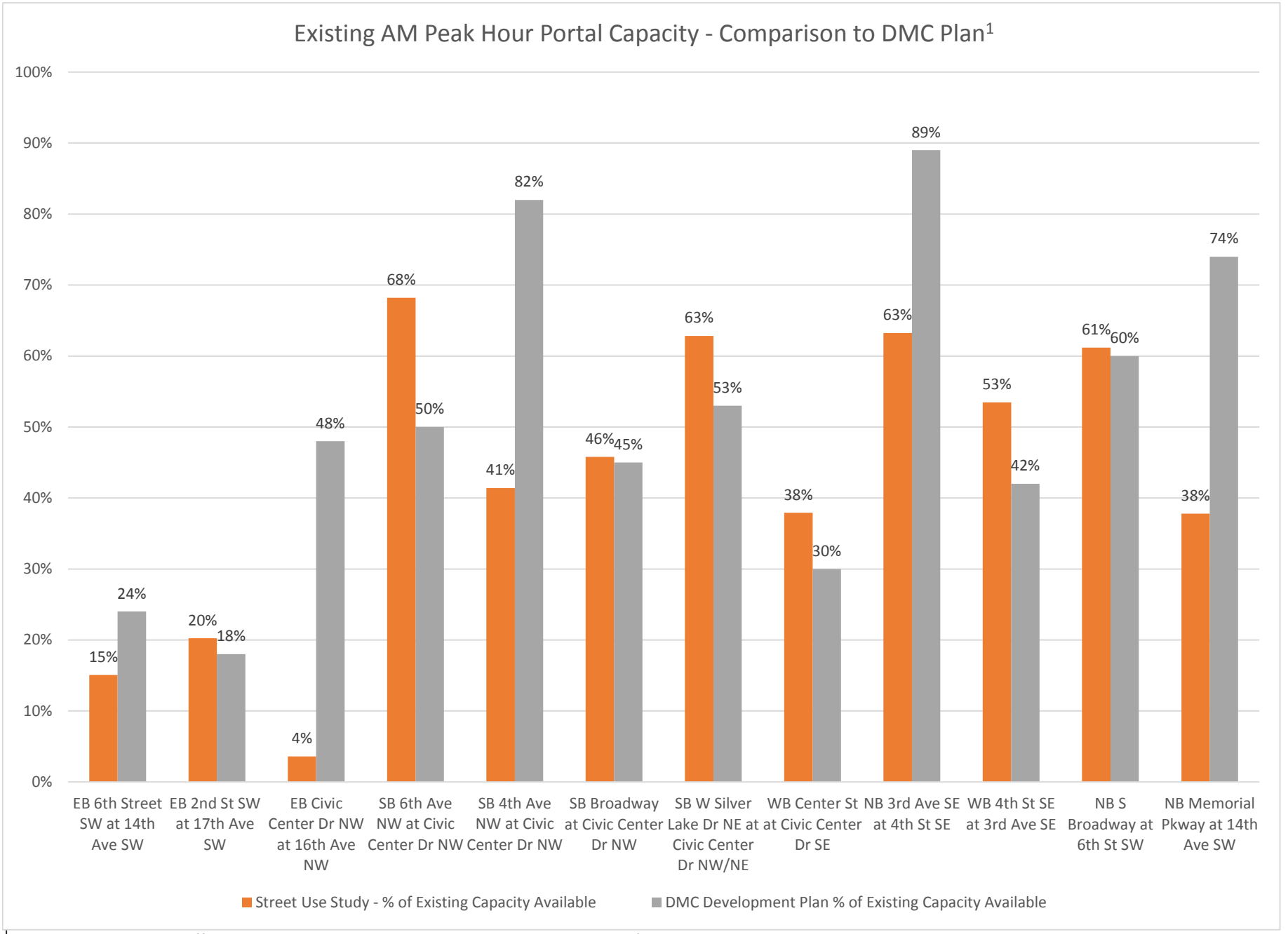
City Portal	Existing Peak Hour Remaining Capacity (vehicles)	Existing 90-Minute Remaining Capacity (vehicles)	Existing Peak Hour Capacity Used (vehicles)	Existing 90-Minute Capacity Used (vehicles)
EB 2nd St SW at 17th Ave SW	300	600	1200	1700
EB Civic Center Dr NW at 16th Ave NW	100	300	1800	2500
SB Broadway at Civic Center Dr NW	700	1200	800	1100
NB 3rd Ave SE at 4th St SE	900	1400	500	700
WB 4th St SE at 3rd Ave SE	600	1000	500	700
NB Broadway at 6th St SW	1500	2300	900	1400
Portal Total	**4100**	**6800**	5700	8100

AM Peak Period Minor (2-Lane) Roadway Remaining Capacity

City Portal	Existing Peak Hour Remaining Capacity (vehicles)	Existing 90-Minute Remaining Capacity (vehicles)	Existing Peak Hour Capacity Used (vehicles)	Existing 90-Minute Capacity Used (vehicles)
EB 6th Street SW at 14th Ave SW	100	200	600	800
SB 6th Ave NW at Civic Center Dr NW	300	500	200	200
SB 4th Ave NW at Civic Center Dr NW	300	600	500	600
SB W Silver Lake Dr NE at Civic Center Dr NW/NE	600	1000	400	500
WB Center St at Civic Center Dr SE	200	300	300	400
NB Memorial Pkwy at 14th Ave SW	400	700	600	700
Portal Total	**1900**	**3300**	2600	3200

Figure A1.

Street Use Study



[1] DMC Plan used daily traffic volumes and an assumed peak hour percentage, therefore the AM and PM capacity available values are the same.

Figure A2.

Street Use Study

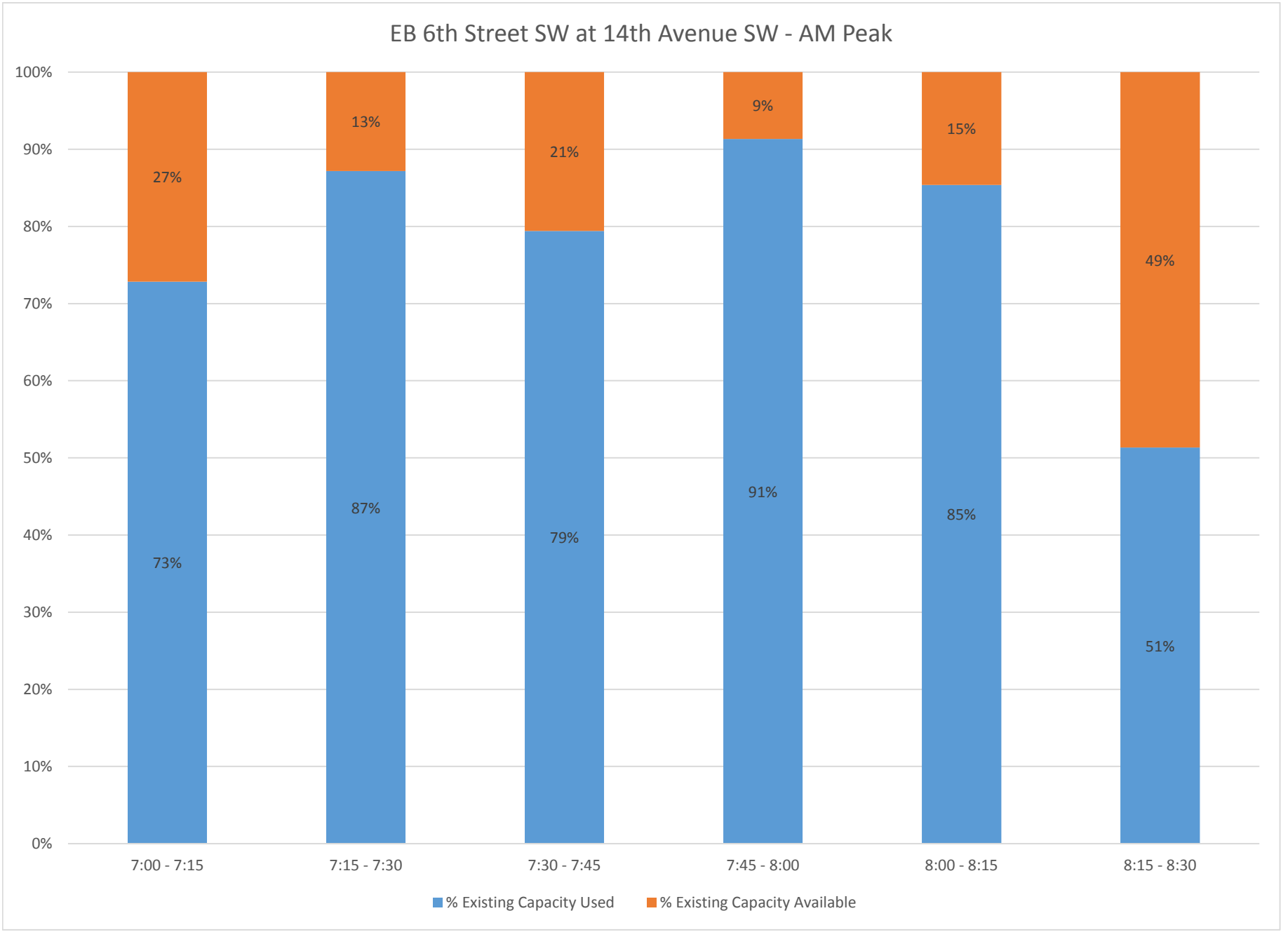


Figure A3.

Street Use Study

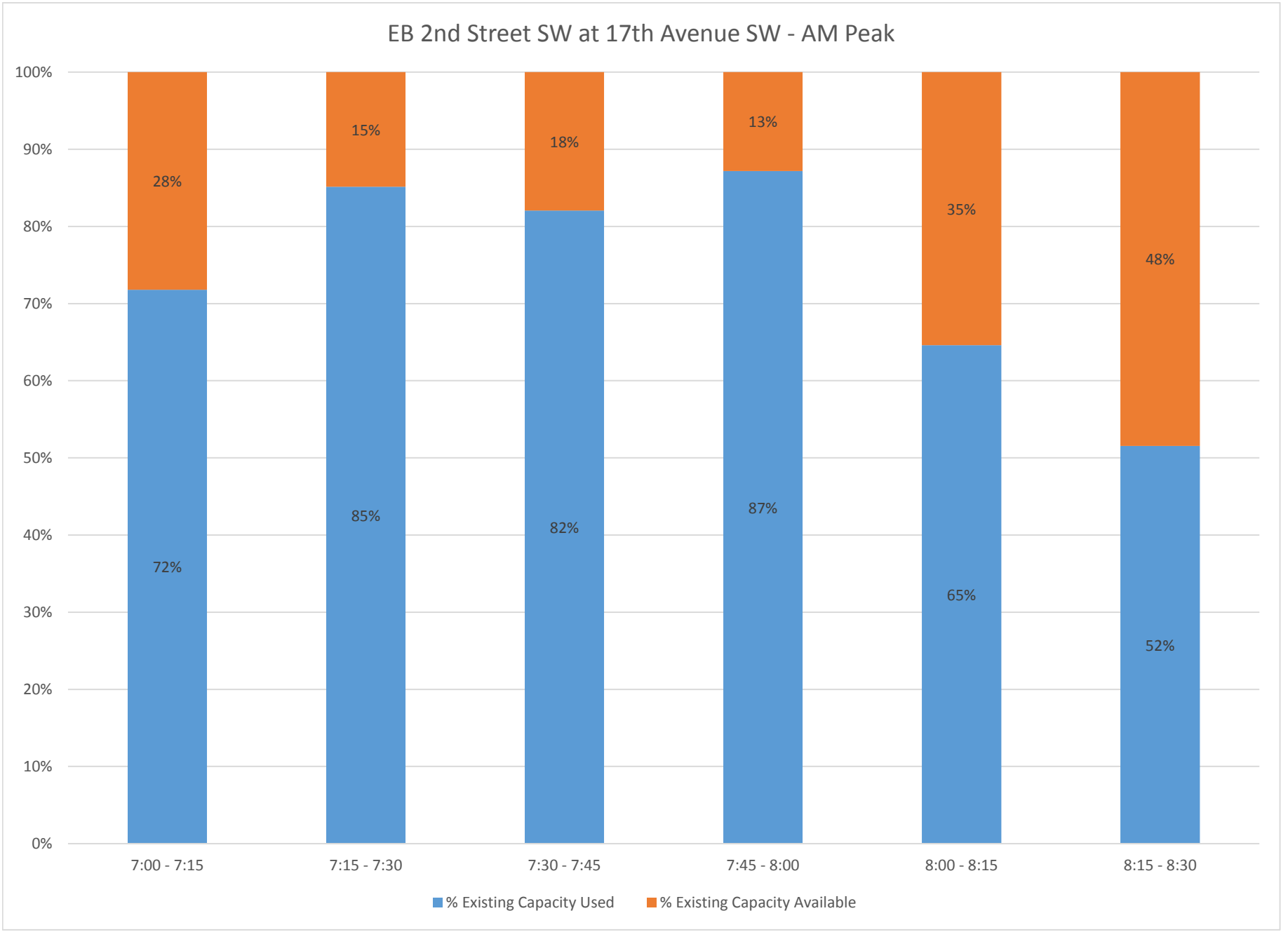


Figure A4.

Street Use Study

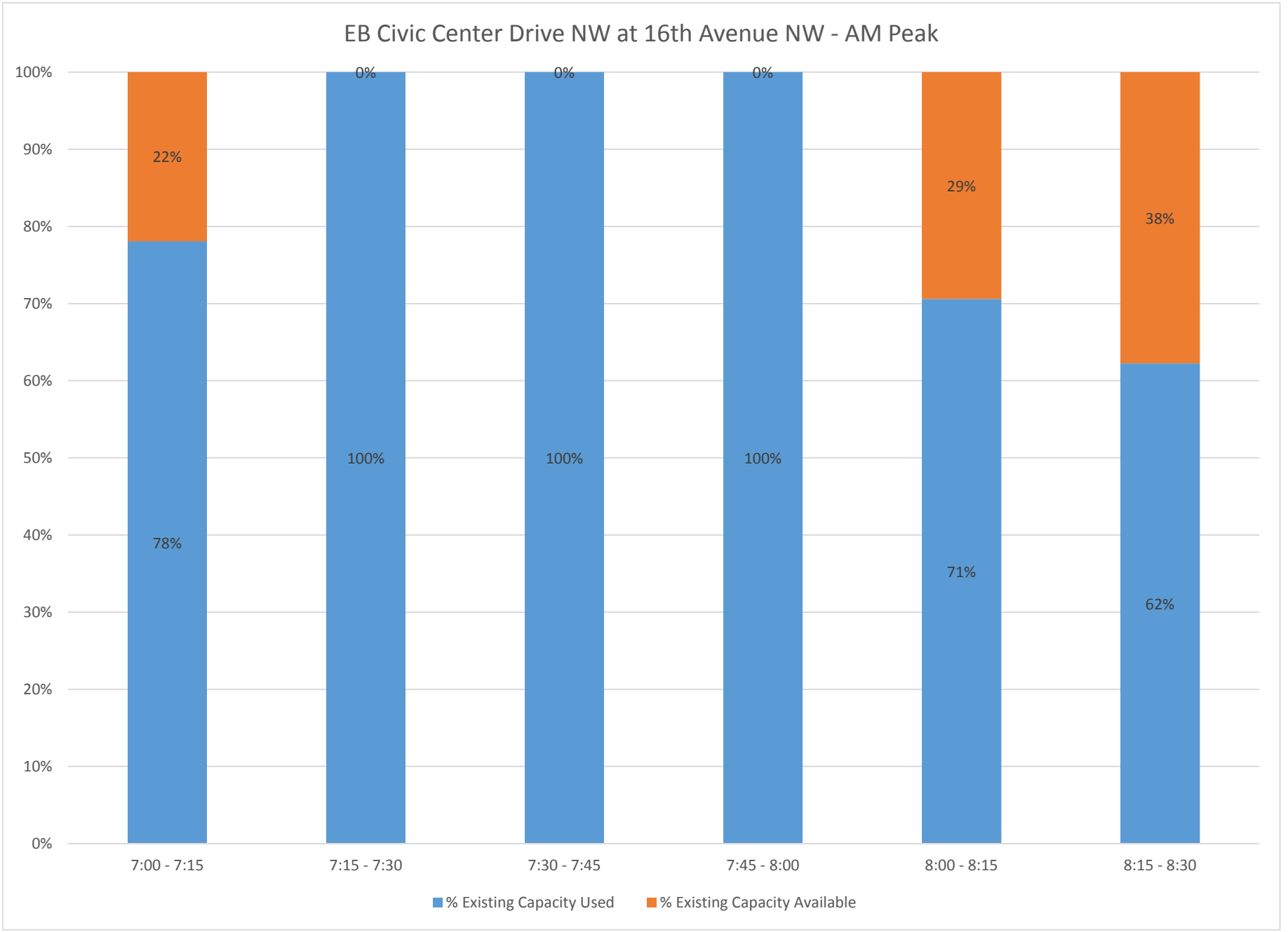


Figure A5.

Street Use Study

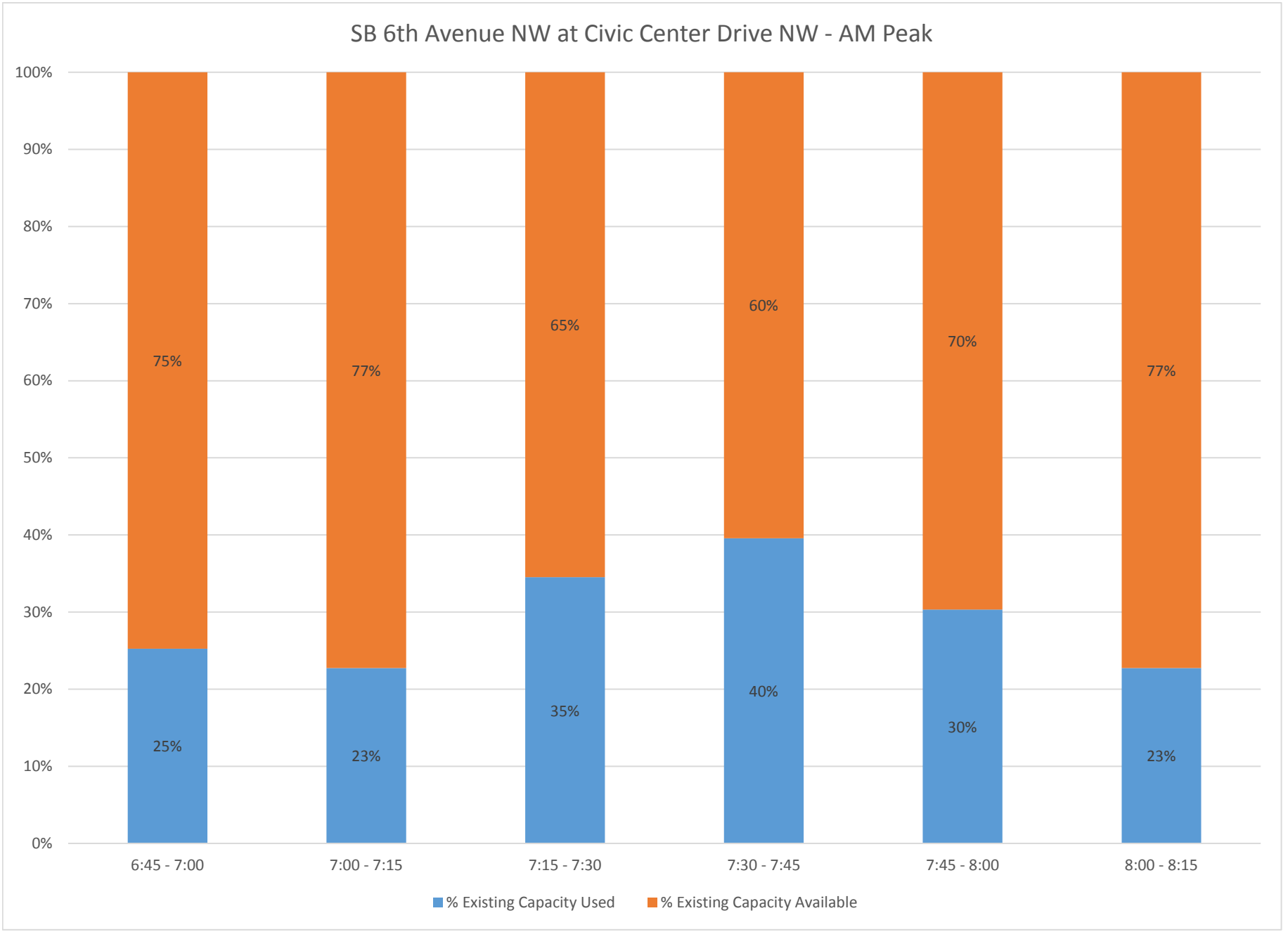


Figure A6.

Street Use Study

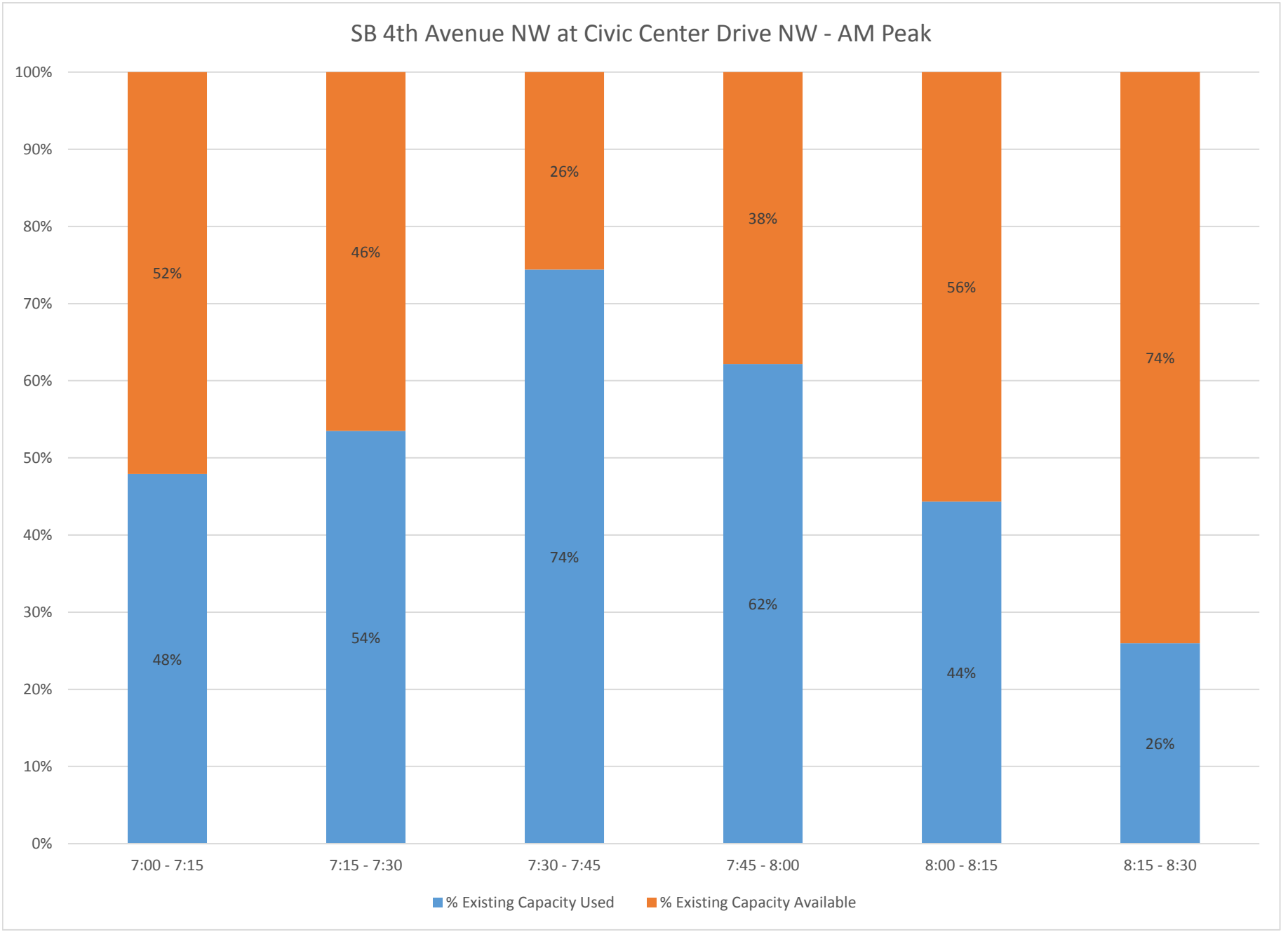


Figure A7.

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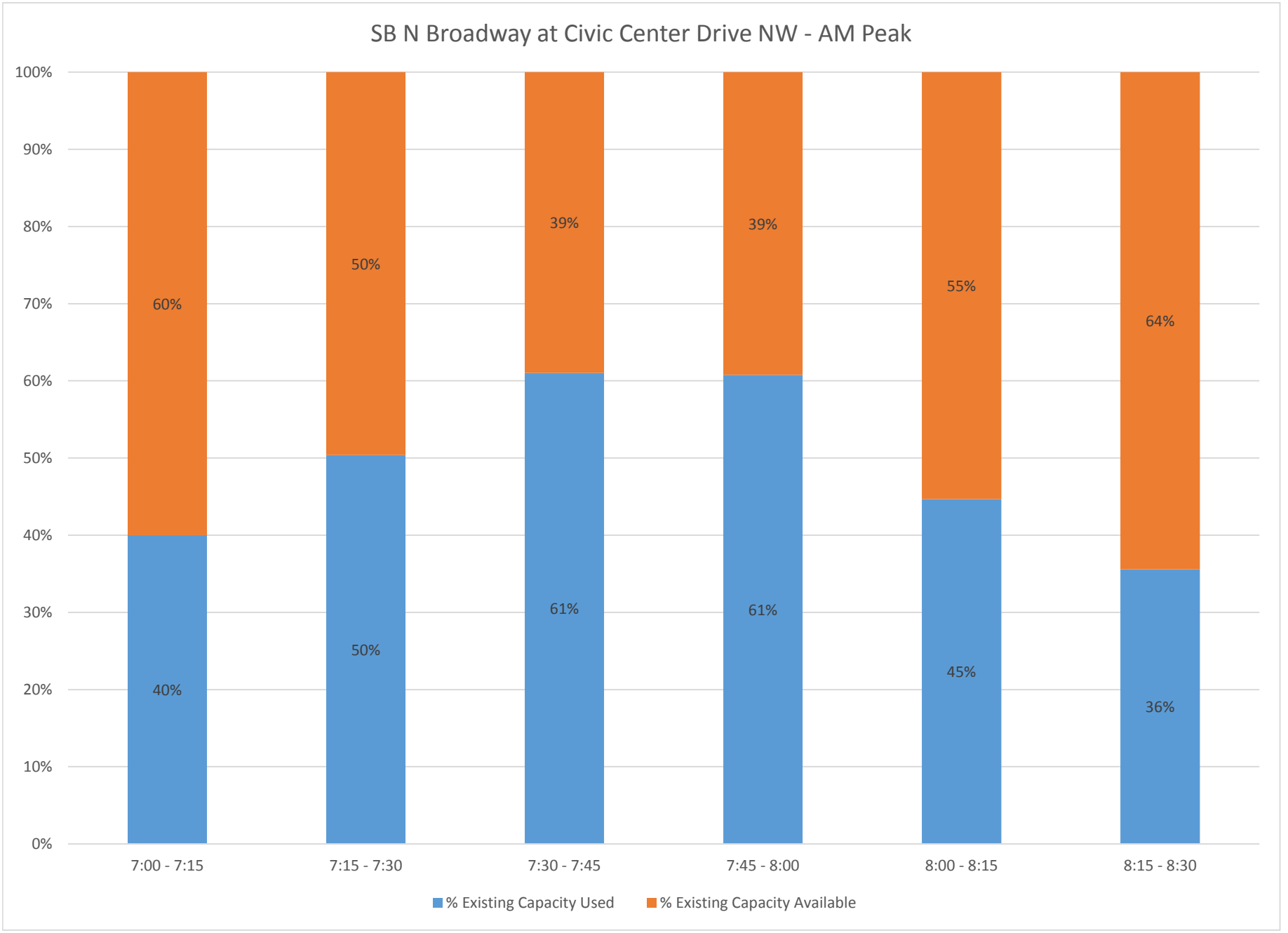

FIgure A8.

Street Use Study

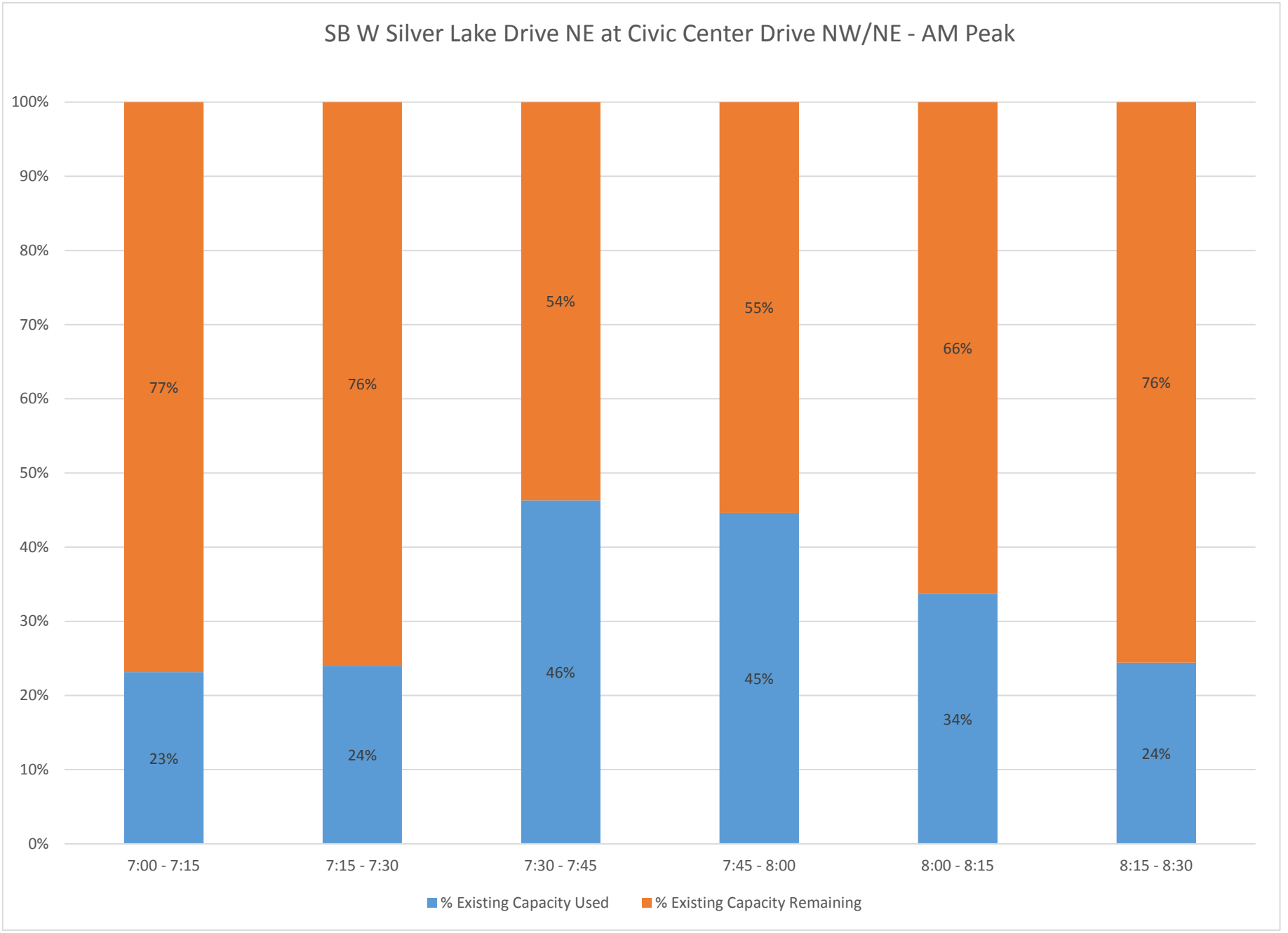

Figure A9.

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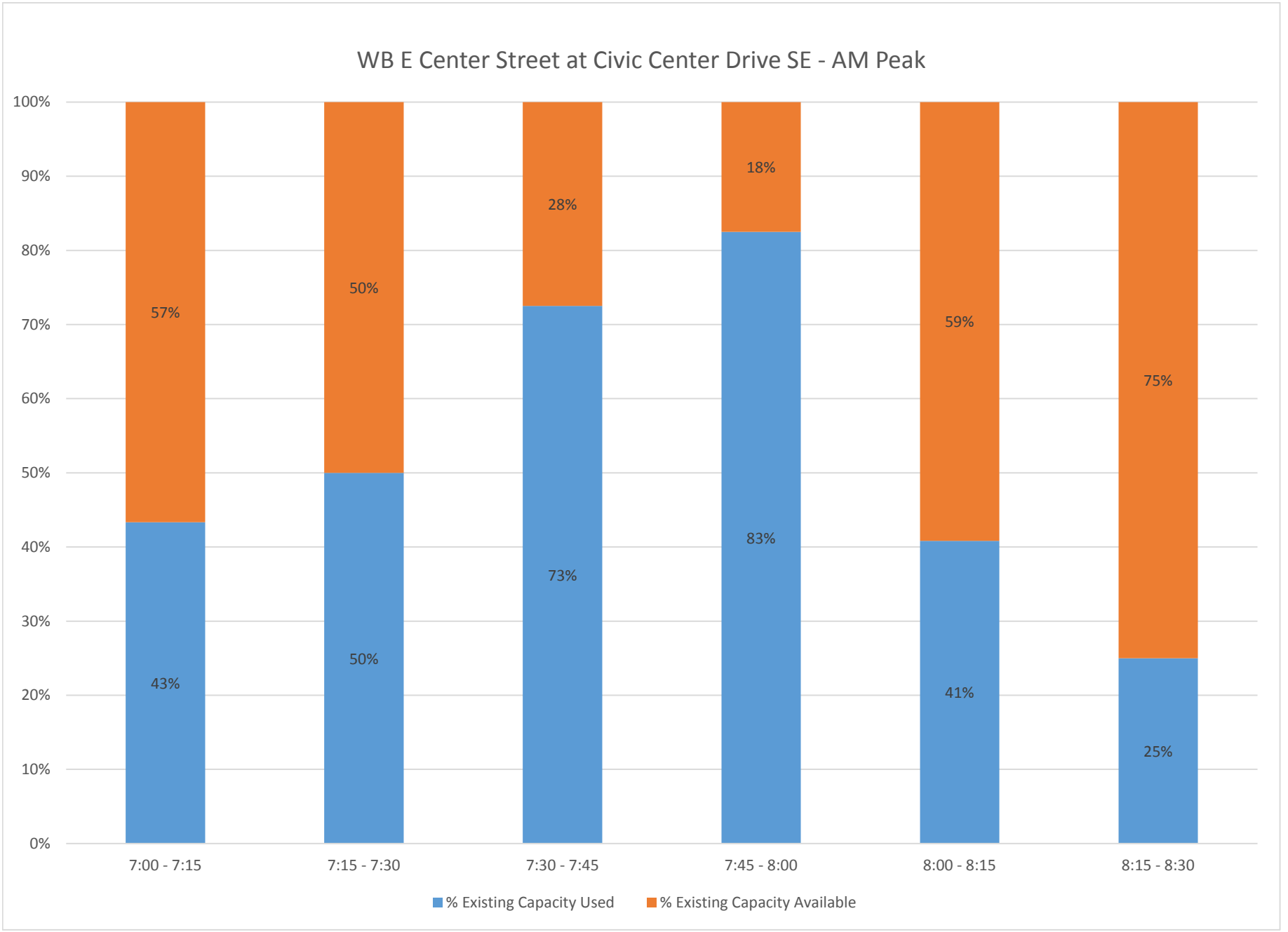

Figure A10.

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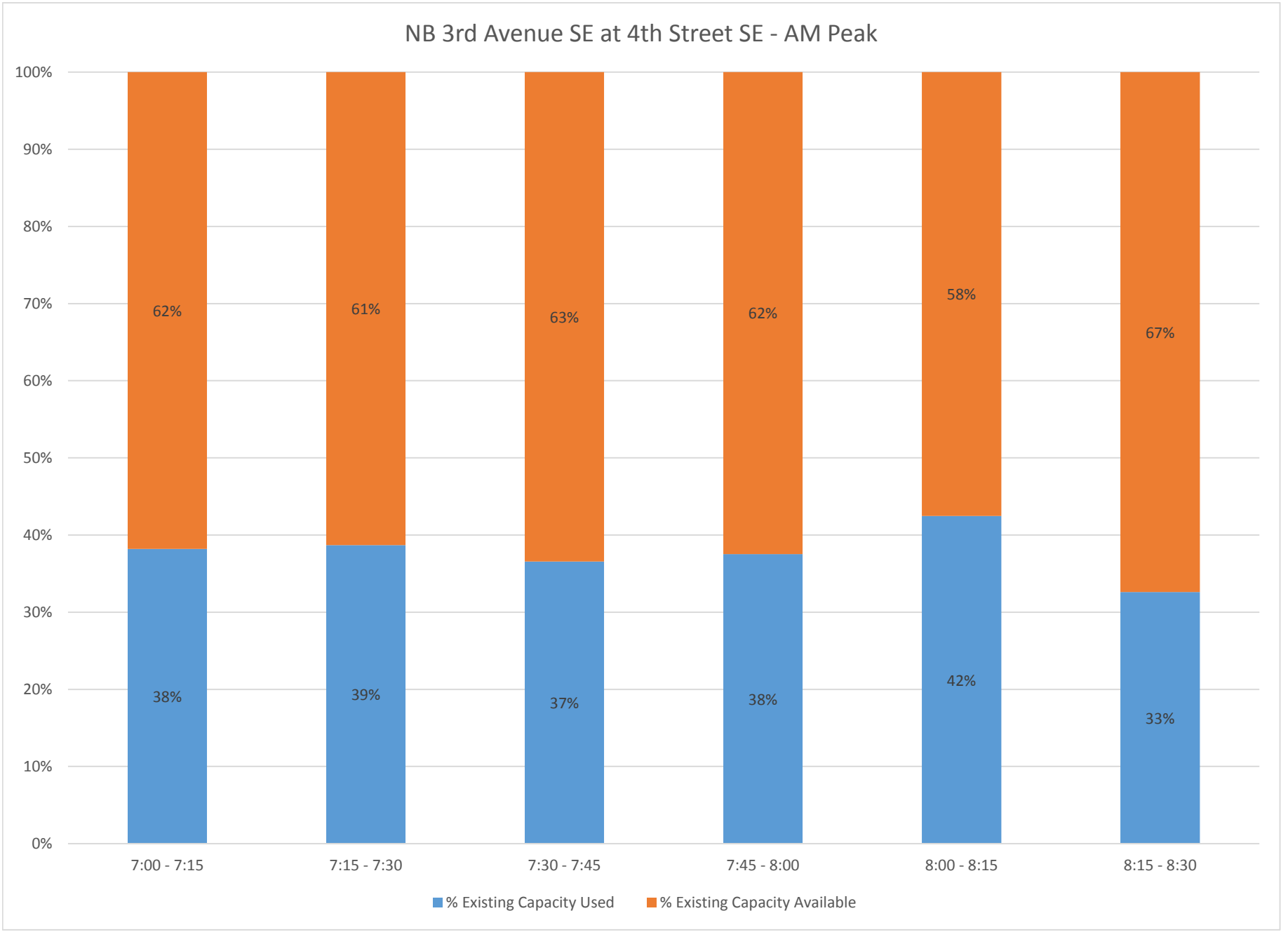

Figure A11.

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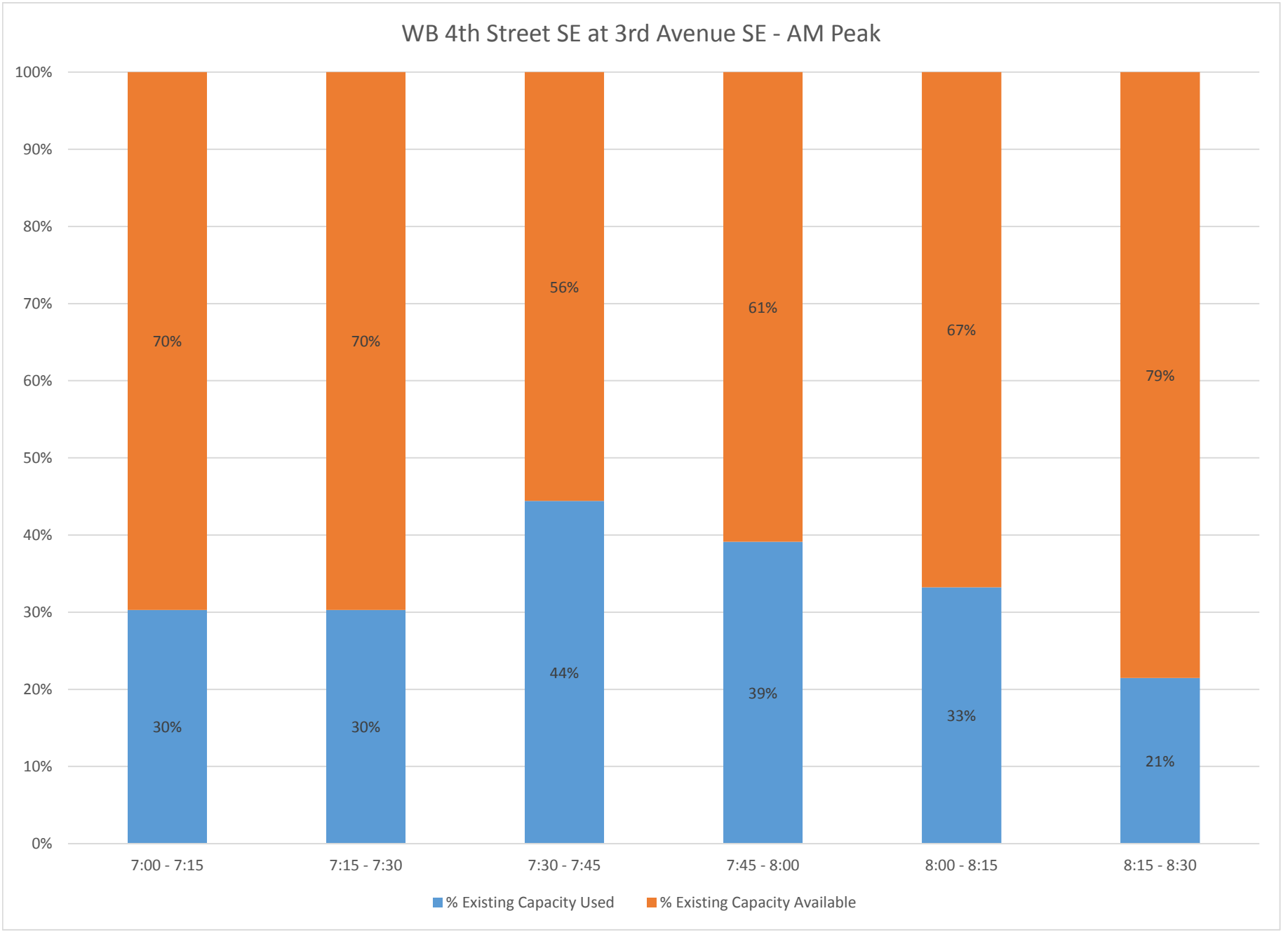

Figure A12.

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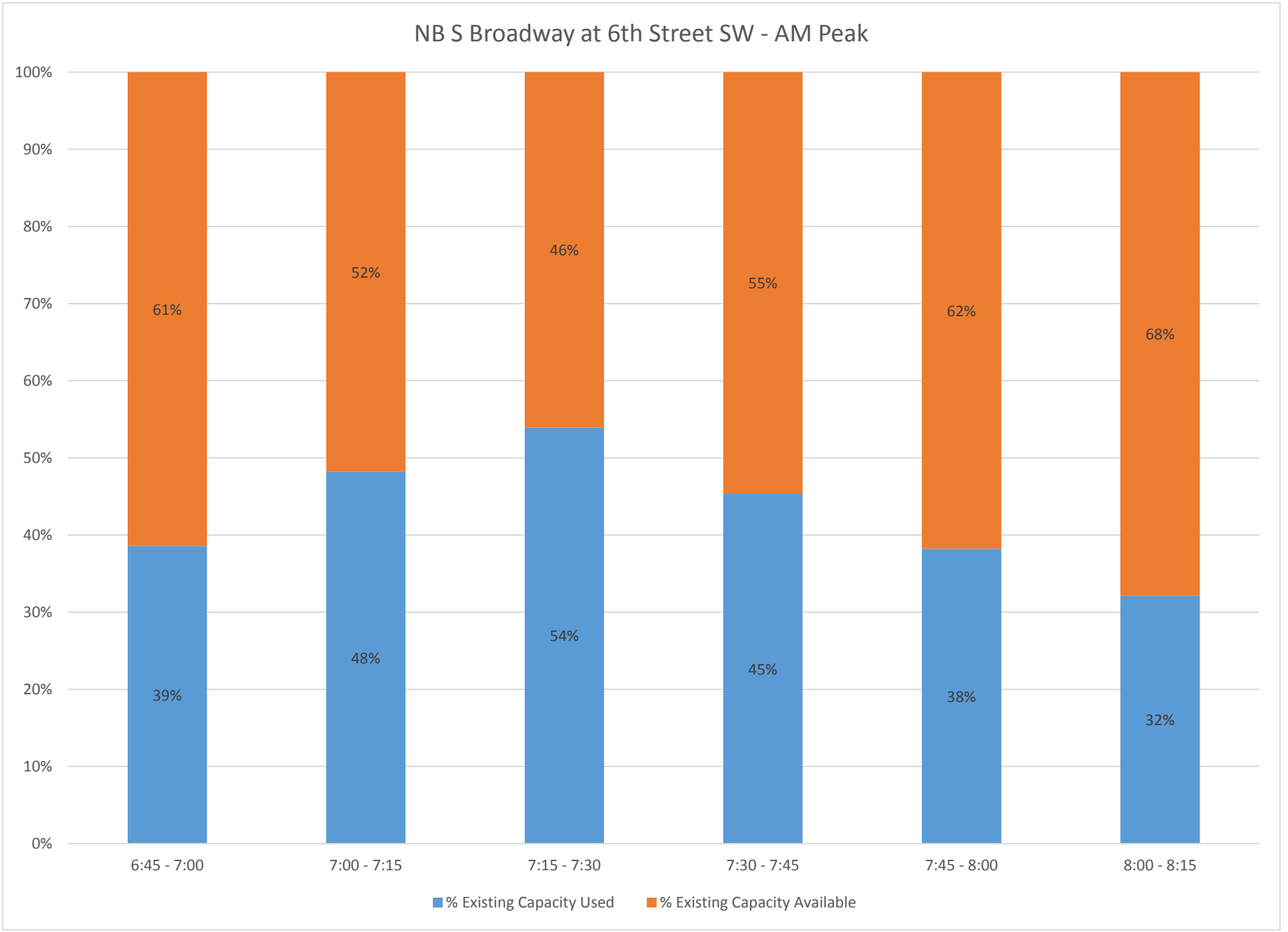

Figure A13.

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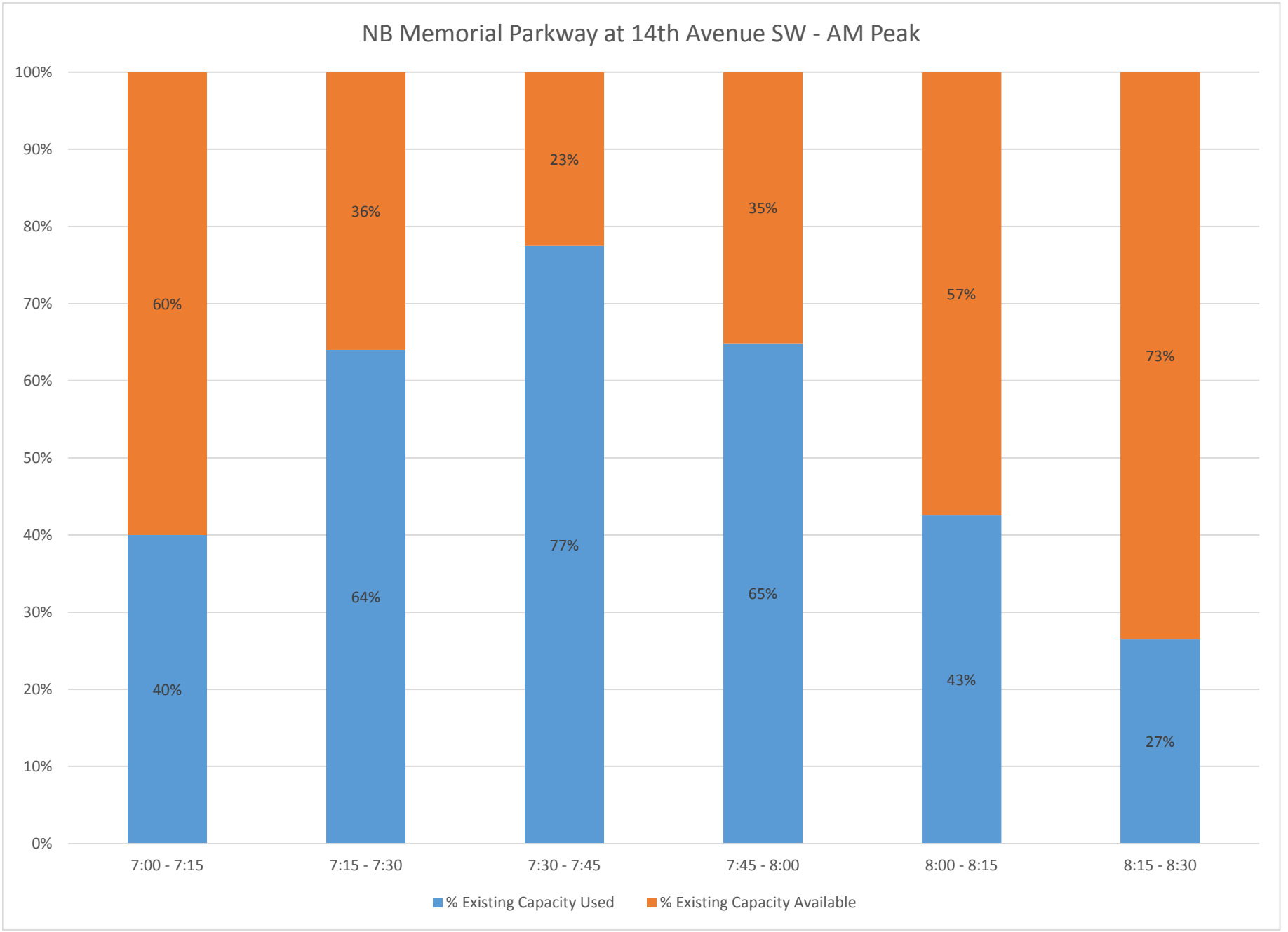
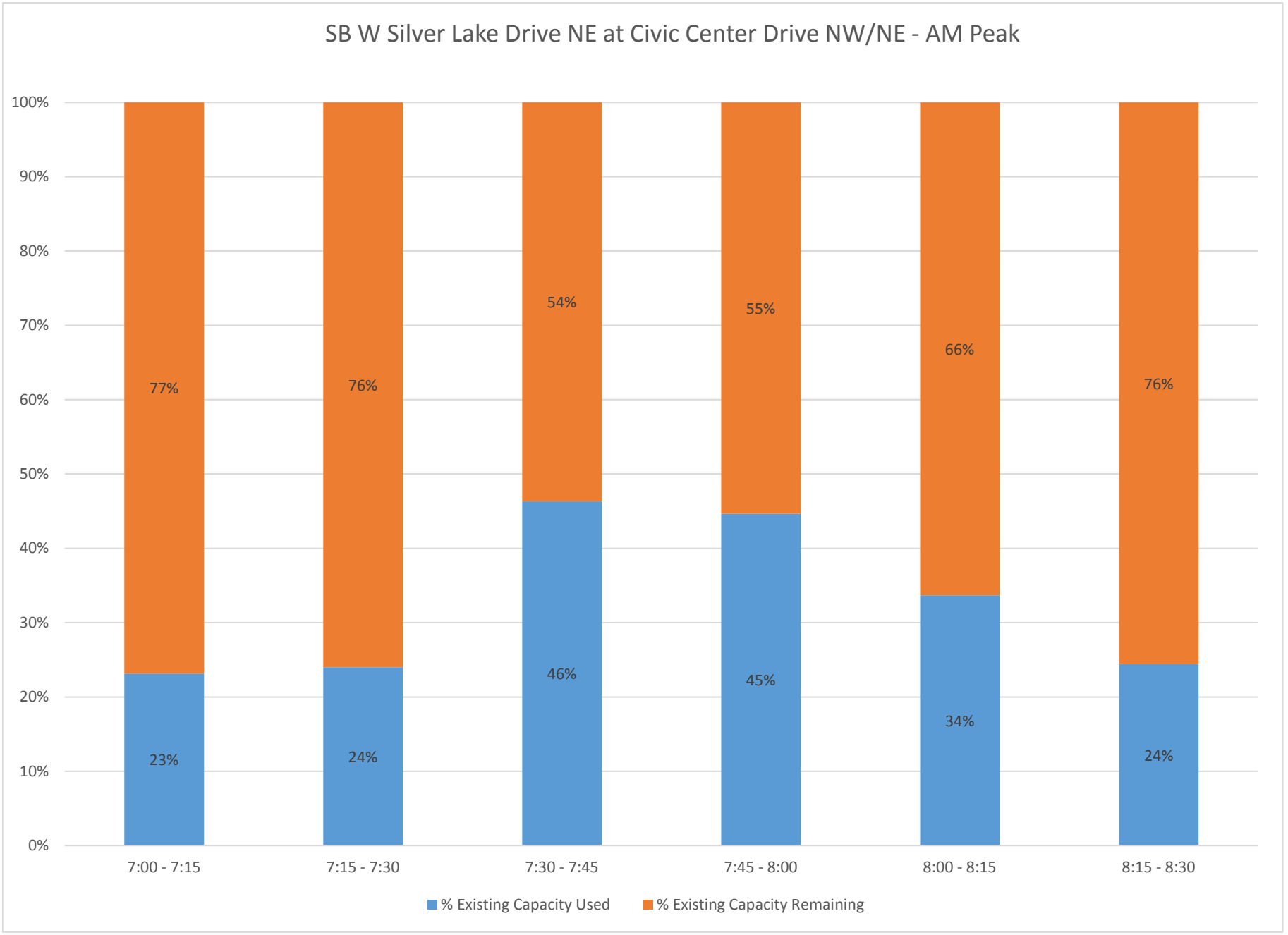


FIgure A8.

Street Use Study



Concatenate	Unique Value	Intersection
MinorMinorNoNo	11	WB 6th Street SW at 14th Ave SW
MajorMajorNoYes	4	WB 2nd St SW at 17th Ave SW
MajorMinorYesNo	6	WB Civic Center Dr NW at 16th Ave NW
MajorMinorNoNo	7	NB 6th Ave NW at Civic Center Dr NW
MajorMinorNoYes	8	NB 4th Ave NW at Civic Center Dr NW
MajorMajorYesYes	1	NB Broadway at Civic Center Dr NW
MinorMajorNoNo	15	NB W Silver Lake Dr NE at Civic Center Dr NW/NE
MajorMajorYesYes	1	EB Center St at Civic Center Dr SE
MajorMajorYesYes	1	SB 3rd Ave SE at 4th St SE
MajorMajorYesYes	1	EB 4th St SE at 3rd Ave SE
MajorMinorNoNo	7	SB Broadway at 6th St SW
MajorMajorNoNo	3	SB Memorial Pkway at 14th Ave SW
	#N/A	Intesection 13

Timings In
Volumes In
Both Timings and Volumes in

Road 1	Road 2	Road 1 LT	Road 2 LT	Analysis Road	Cycle Length	Split	Yellow	Red	Lost Time
Minor	Minor	No	No	Road 1	All-Way Stop Control				
Major	Major	No	Yes	Road 2	130	47	3.5	1.5	4
Major	Minor	Yes	No	Road 1	110	61	4	2.5	4
Major	Minor	No	No	Road 2	110	57	3.5	3	4
Major	Minor	No	Yes	Road 2	110	49	3.5	3.5	4
Major	Major	Yes	Yes	Road 2	110	51	3.5	2.5	4
Minor	Major	No	No	Road 2	Two-Way Stop Contro				
Major	Major	Yes	Yes	Road 2	90	28	3.5	2	4
Major	Major	Yes	Yes	Road 1	90	38	3.5	1.5	4
Major	Major	Yes	Yes	Road 2	90	32	3.5	1.5	4
Major	Minor	No	No	Road 1	100	57	4	1.5	4
Major	Major	No	No	Road 1	90	50	3.5	1.5	4
						#N/A	3.5	2	4

Effective Green	Headway	Capacity per lane per hour	Number of Lanes	Through+Right Capacity per Hour	Peak
	2	580	1	580	543
43	2	595	2.5	1487.5	1306
57	2	935	2	1870	1732
53	2	865	1	865	210
45	2	735	1	735	392
47	2	770	2	1540	853
lled		950	2	1900	466
24	2	480	1	480	358
34	2	680	2	1360	606
28	2	560	2	1120	373
53	2	955	2	1910	970
46	2	920	2	1840	752
#N/A	2	#N/A	2	#N/A	450

% Used Peak	% Available Peak Hour	0 - 15 Min	% Used 0 - 15	% Available 0 - 15	15 - 30 Min	% Used 15 - 30
94%	6%	102	70%	30%	140	97%
88%	12%	326	88%	12%	343	92%
93%	7%	413	88%	12%	416	89%
24%	76%	50	23%	77%	47	22%
53%	47%	79	43%	57%	93	51%
55%	45%	186	48%	52%	201	52%
25%	75%	85	18%	82%	108	23%
75%	25%	83	69%	31%	78	65%
45%	55%	132	38.8%	61.2%	134	39.4%
33%	67%	80	29%	71%	89	32%
51%	49%	235	49%	51%	212	44%
41%	59%	161	35.0%	65.0%	177	38.5%
#N/A	#N/A	100	#N/A	#N/A	120	#N/A

	'B 6th Street SW at 14th Ave S		WB 2nd St SW at 17th Ave SW		Civic Center Dr I
	% Used	% Available	% Used	% Available	% Used
Peak	94%	6%	88%	12%	93%
0-15 Min	70%	30%	88%	12%	88%
15-30 Min	97%	3%	92%	8%	89%
30-45 Min	99%	1%	84%	16%	92%
45-60 Min	95%	5%	85%	15%	97%
60-75 Min	83%	17%	90%	10%	92%
75-90 Min	73%	27%	87%	13%	69%

	EB 4th St SE at 3rd Ave SE		SB Broadway at 6th St SW		Memorial Pkwa
	% Used	% Available	% Used	% Available	% Used
Peak	33%	67%	51%	49%	41%
0-15 Min	29%	71%	49%	51%	35%
15-30 Min	32%	68%	44%	56%	38%
30-45 Min	30%	70%	52%	48%	34%
45-60 Min	34%	66%	57%	43%	55%
60-75 Min	37%	63%	58%	42%	36%
75-90 Min	34%	66%	54%	46%	29%

% Available 15 - 30	30 - 45 Min	% Used 30 - 45	% Available 30 - 45 Min	45 - 60 Min	% Used 45 - 60	% Available 45 - 60 Min	60 - 75 Min
3%	144	99%	1%	138	95%	5%	121
8%	313	84%	16%	316	85%	15%	334
11%	432	92%	8%	453	97%	3%	431
78%	55	25%	75%	48	22%	78%	60
49%	80	44%	56%	80	44%	56%	139
48%	205	53%	47%	233	61%	39%	214
77%	123	26%	74%	119	25%	75%	116
35%	81	68%	33%	86	72%	28%	113
60.6%	139	40.9%	59.1%	170	50.0%	50.0%	163
68%	84	30%	70%	96	34%	66%	104
56%	249	52%	48%	274	57%	43%	278
61.5%	156	33.9%	66.1%	253	55.0%	45.0%	166
#N/A	60	#N/A	#N/A	300	#N/A	#N/A	250

NW at 16th Ave	h Ave NW at Civic Center D	h Ave NW at Civic Center D	Broadway at Civic Center Dr N	Lake Dr NE			
% Available	% Used	% Available	% Used	% Available	% Used	% Available	% Used
7%	24%	76%	53%	47%	55%	45%	25%
12%	23%	77%	43%	57%	48%	52%	18%
11%	22%	78%	51%	49%	52%	48%	23%
8%	25%	75%	44%	56%	53%	47%	26%
3%	22%	78%	44%	56%	61%	39%	25%
8%	28%	72%	76%	24%	56%	44%	24%
31%	25%	75%	44%	56%	57%	43%	21%

ay at 14th Ave S	Intesection 13	
% Available	% Used	% Available
59%	#N/A	#N/A
65%	#N/A	#N/A
62%	#N/A	#N/A
66%	#N/A	#N/A
45%	#N/A	#N/A
64%	#N/A	#N/A
71%	#N/A	#N/A

% Used 60 - 75	% Available 60 - 75 Min	75 - 90 Min	% Used 75 - 90	% Available 75 - 90 Min
83%	17%	106	73%	27%
90%	10%	322	87%	13%
92%	8%	322	69%	31%
28%	72%	55	25%	75%
76%	24%	81	44%	56%
56%	44%	219	57%	43%
24%	76%	98	21%	79%
94%	6%	52	43%	57%
47.9%	52.1%	132	39%	61.2%
37%	63%	94	34%	66%
58%	42%	260	54%	46%
36.1%	63.9%	133	29%	71.1%
#N/A	#N/A	400	#N/A	#N/A

at Civic Center	B Center St at Civic Center Dr S		SB 3rd Ave SE at 4th St SE	
% Available	% Used	% Available	% Used	% Available
75%	75%	25%	45%	55%
82%	69%	31%	39%	61%
77%	65%	35%	39%	61%
74%	68%	33%	41%	59%
75%	72%	28%	50%	50%
76%	94%	6%	48%	52%
79%	43%	57%	39%	61%

Intersection	Previous % Available	Previous % Used	0-15
WB 6th Sreet SW at 14th Ave SW	24%	76%	4:30 - 4:45
WB 2nd St SW at 17th Ave SW	18%	82%	4:15 - 4:30
WB Civic Center Dr NW at 16th Ave NW	48%	52%	4:30 - 4:45
NB 6th Ave NW at Civic Center Dr NW	50%	50%	4:15 - 4:30
NB 4th Ave NW at Civic Center Dr NW	82%	18%	4:15 - 4:30
NB N Broadway at Civic Center Dr NW	45%	55%	3:00 - 3:15
NB W Silver Lake Dr NE at Civic Center Dr NW/NE	53%	47%	4:00 - 4:15
EB E Center St at Civic Center Dr SE	30%	70%	4:15 - 4:30
SB 3rd Ave SE at 4th St SE	89%	11%	4:15 - 4:30
EB 4th St SE at 3rd Ave SE	42%	58%	4:15 - 4:30
SB S Broadway at 6th St SW	60%	40%	4:00 - 4:15
SB memorial Parkway at 14th Ave SW	74%	26%	4:30 - 4:45

15-30	30-45	45-60	60-75	75-90
4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45	5:45 - 6:00
4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45
4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45	5:45 - 6:00
4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45
4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45
3:15 - 3:30	3:30- 3:45	3:45 - 4:00	4:00 - 4:15	4:15 - 4:30
4:15 - 4:30	4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30
4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45
4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45
4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45
4:15 - 4:30	4:30 - 4:45	4:45 - 5:00	5:00 - 5:15	5:15 - 5:30
4:45 - 5:00	5:00 - 5:15	5:15 - 5:30	5:30 - 5:45	5:45 - 6:00

Table B1.

Street Use Study

PM Peak Period

City Portal	Existing Peak Hour Remaining Capacity (vehicles)	Existing 90-Minute Remaining Capacity (vehicles)	Existing Peak Hour Capacity Used (vehicles)	Existing 90-Minute Capacity Used (vehicles)
WB 6th Street SW at 14th Ave SW	0	100	500	800
WB 2nd St SW at 17th Ave SW	200	300	1300	2000
WB Civic Center Dr NW at 16th Ave NW	100	300	1700	2500
NB 6th Ave NW at Civic Center Dr NW	700	1000	200	300
NB 4th Ave NW at Civic Center Dr NW	300	600	400	600
NB Broadway at Civic Center Dr NW	700	1100	900	1300
NB W Silver Lake Dr NE at Civic Center Dr NW/NE	1400	2200	500	600
EB Center St at Civic Center Dr SE	100	200	400	500
SB 3rd Ave SE at 4th St SE	800	1200	600	900
EB 4th St SE at 3rd Ave SE	700	1100	400	500
SB Broadway at 6th St SW	900	1400	1000	1500
SB Memorial Pkway at 14th Ave SW	1100	1700	800	1000
Portal Total	**7000**	**11200**	8700	12500

AM Peak Period Major (4-Lane) Roadway Remaining Capacity

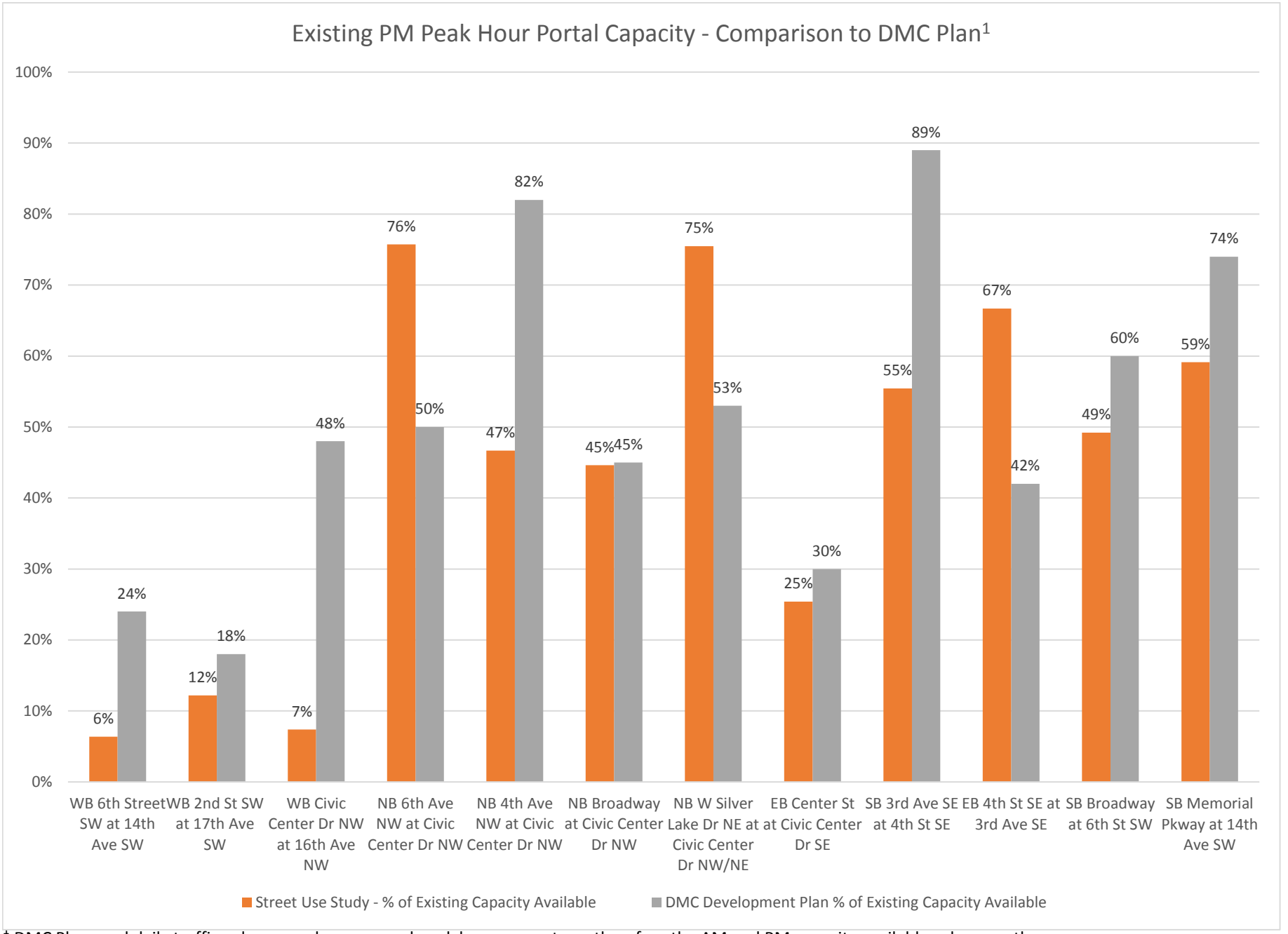
City Portal	Existing Peak Hour Remaining Capacity (vehicles)	Existing 90-Minute Remaining Capacity (vehicles)	Existing Peak Hour Capacity Used (vehicles)	Existing 90-Minute Capacity Used (vehicles)
WB 2nd St SW at 17th Ave SW	200	300	1300	2000
WB Civic Center Dr NW at 16th Ave NW	100	300	1700	2500
NB Broadway at Civic Center Dr NW	700	1100	900	1300
SB 3rd Ave SE at 4th St SE	800	1200	600	900
EB 4th St SE at 3rd Ave SE	700	1100	400	500
SB Broadway at 6th St SW	900	1400	1000	1500
Portal Total	**3400**	**5400**	5900	8700

AM Peak Period Minor (2-Lane) Roadway Remaining Capacity

City Portal	Existing Peak Hour Remaining Capacity (vehicles)	Existing 90-Minute Remaining Capacity (vehicles)	Existing Peak Hour Capacity Used (vehicles)	Existing 90-Minute Capacity Used (vehicles)
WB 6th Street SW at 14th Ave SW	0	100	500	800
NB 6th Ave NW at Civic Center Dr NW	700	1000	200	300
NB 4th Ave NW at Civic Center Dr NW	300	600	400	600
NB W Silver Lake Dr NE at Civic Center Dr NW/NE	1400	2200	500	600
EB Center St at Civic Center Dr SE	100	200	400	500
SB Memorial Pkway at 14th Ave SW	1100	1700	800	1000
Portal Total	**3600**	**5800**	2800	3800

Figure B1.

Street Use Study



[1] DMC Plan used daily traffic volumes and an assumed peak hour percentage, therefore the AM and PM capacity available values are the same.

Figure B2.

Street Use Study

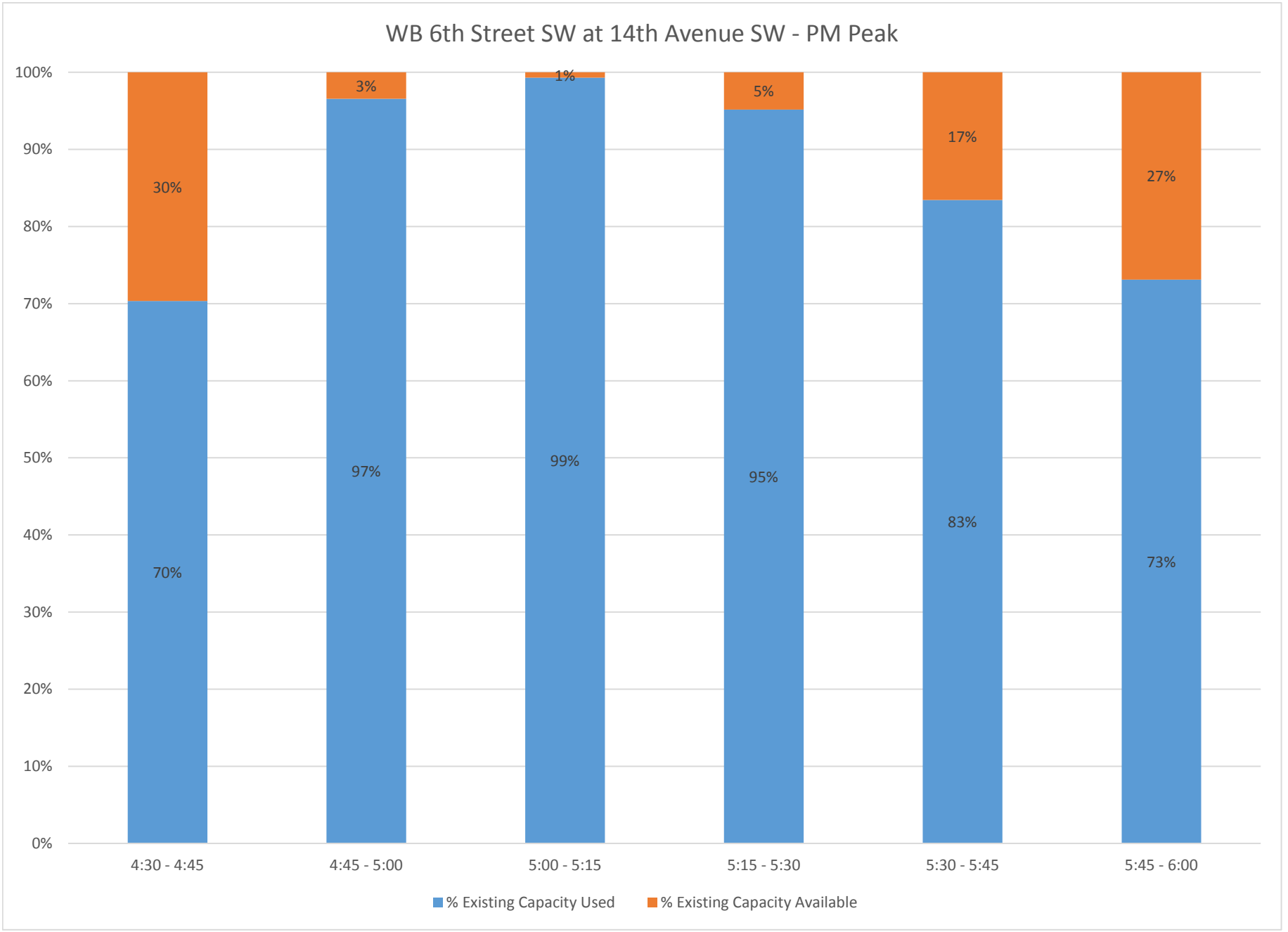


Figure B3.

Street Use Study

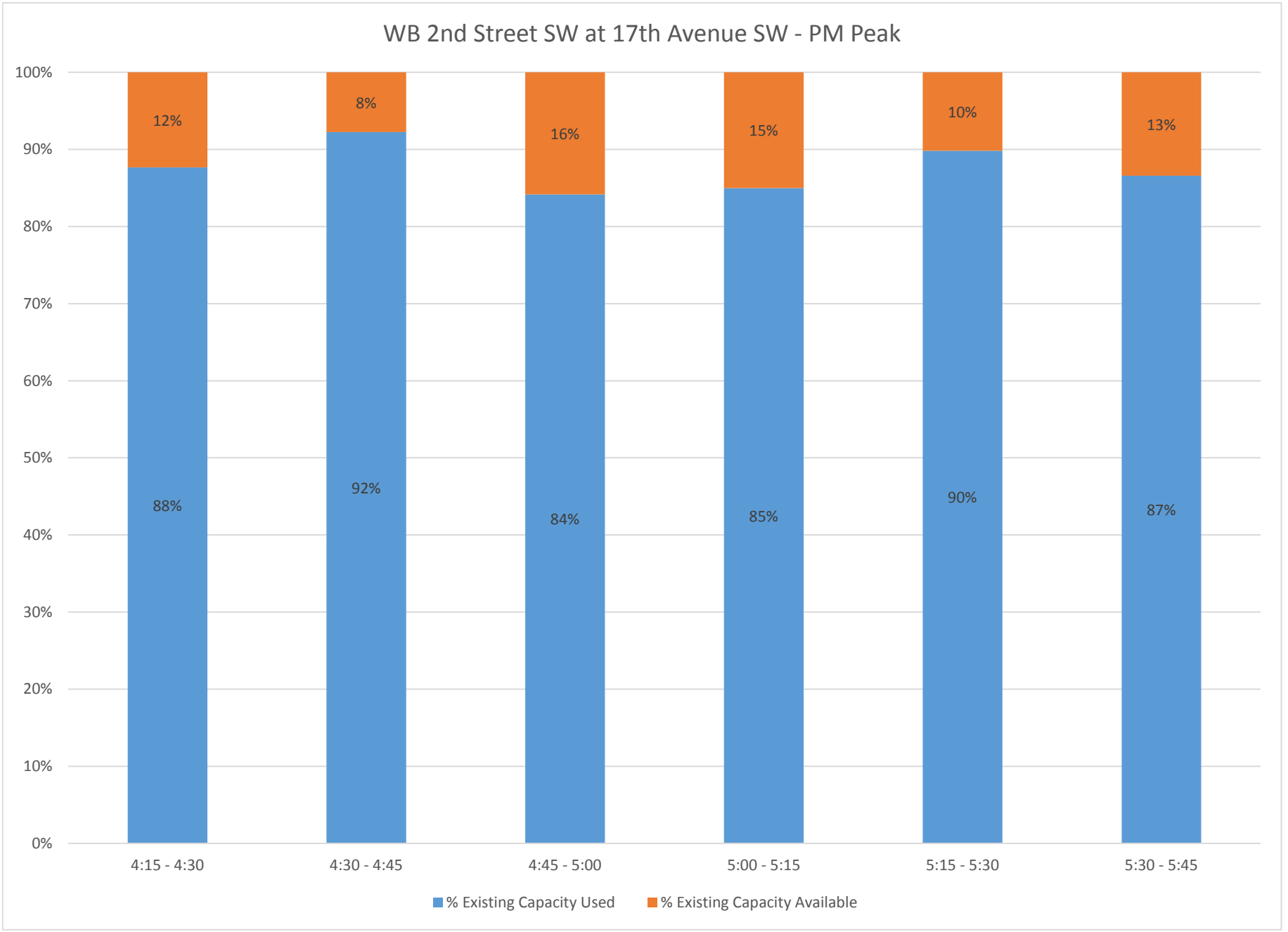


Figure B4.

Street Use Study

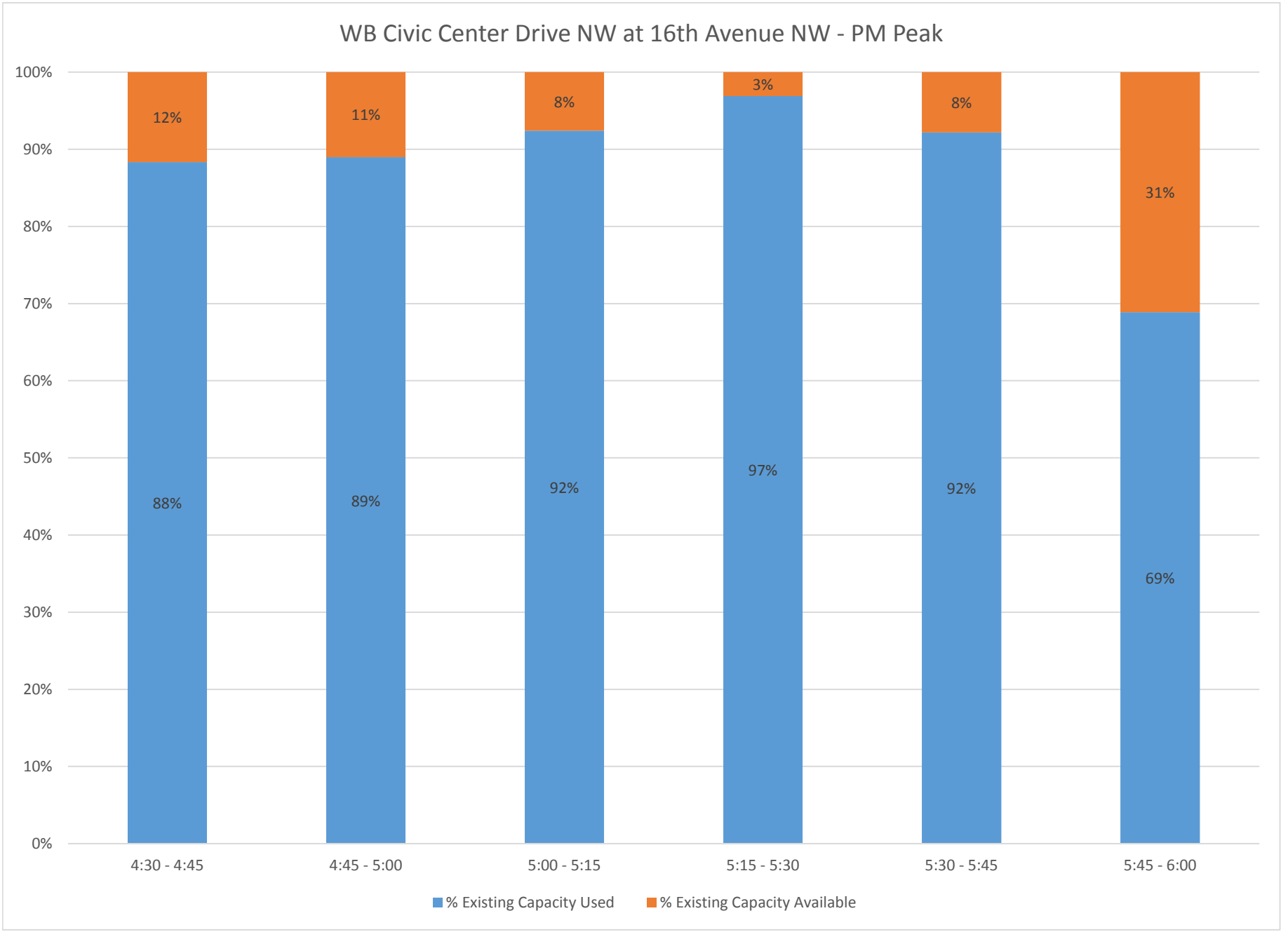


Figure B5.

Street Use Study

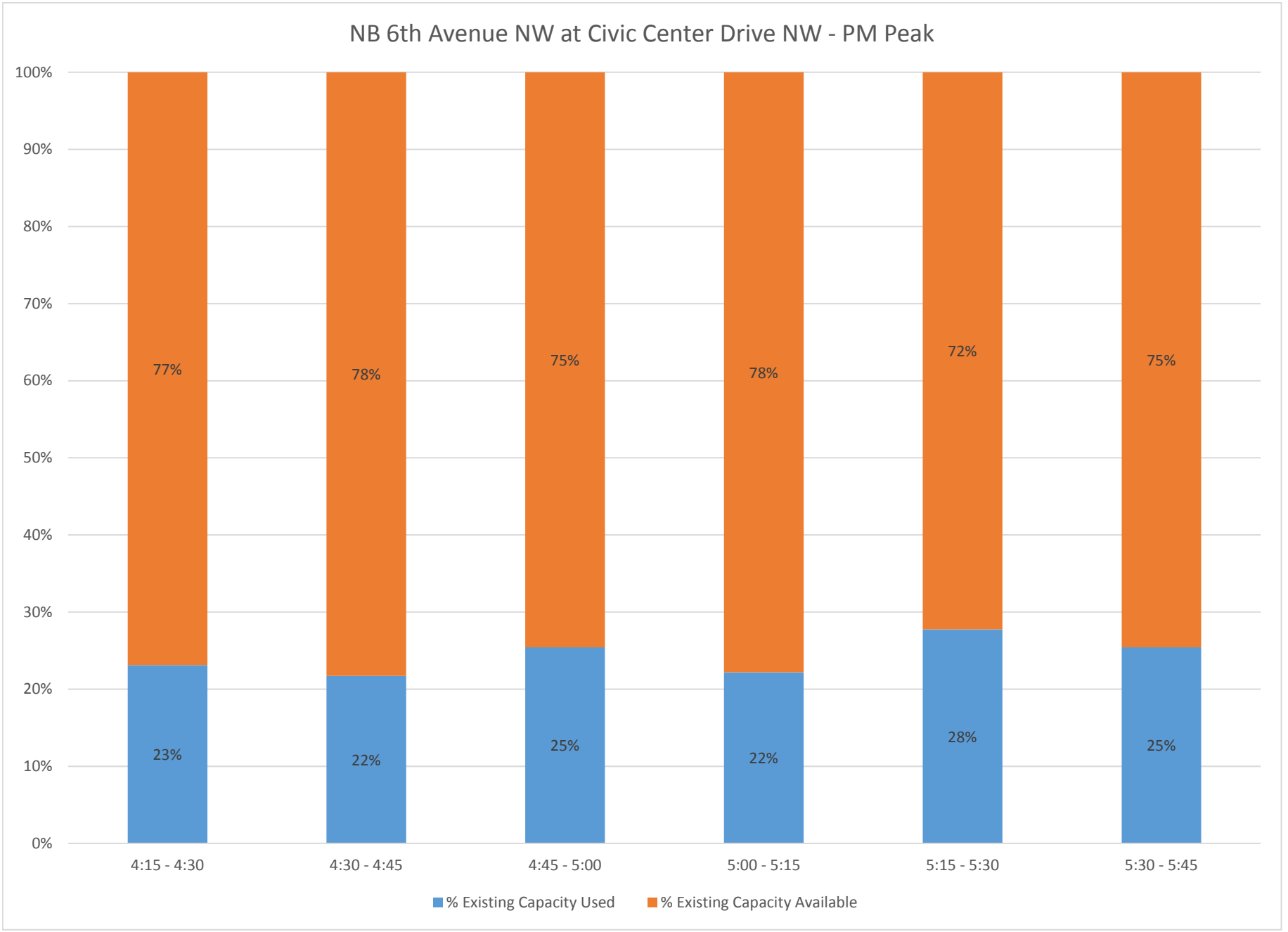


Figure B6.

Street Use Study

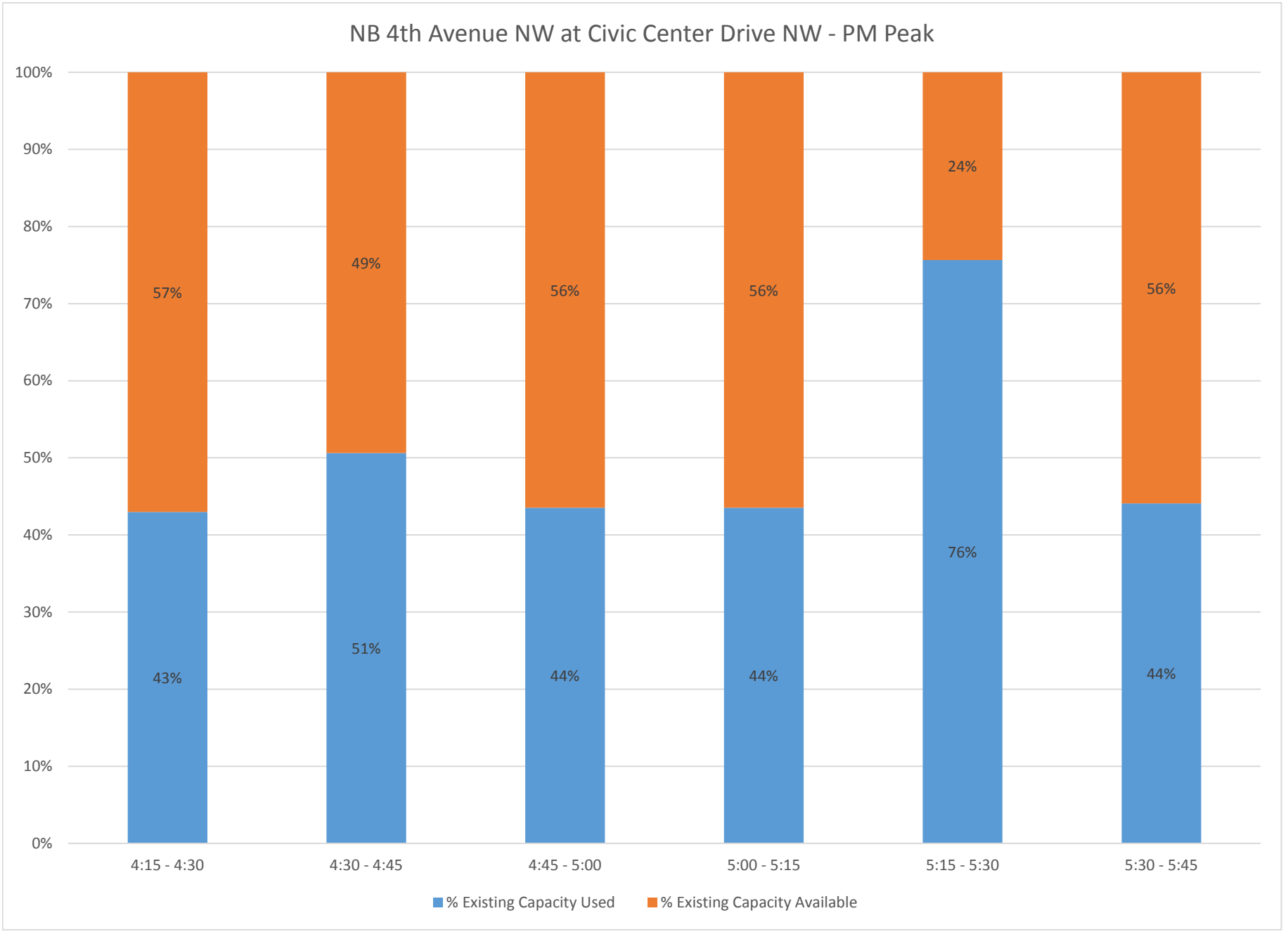


Figure B7.

Street Use Study

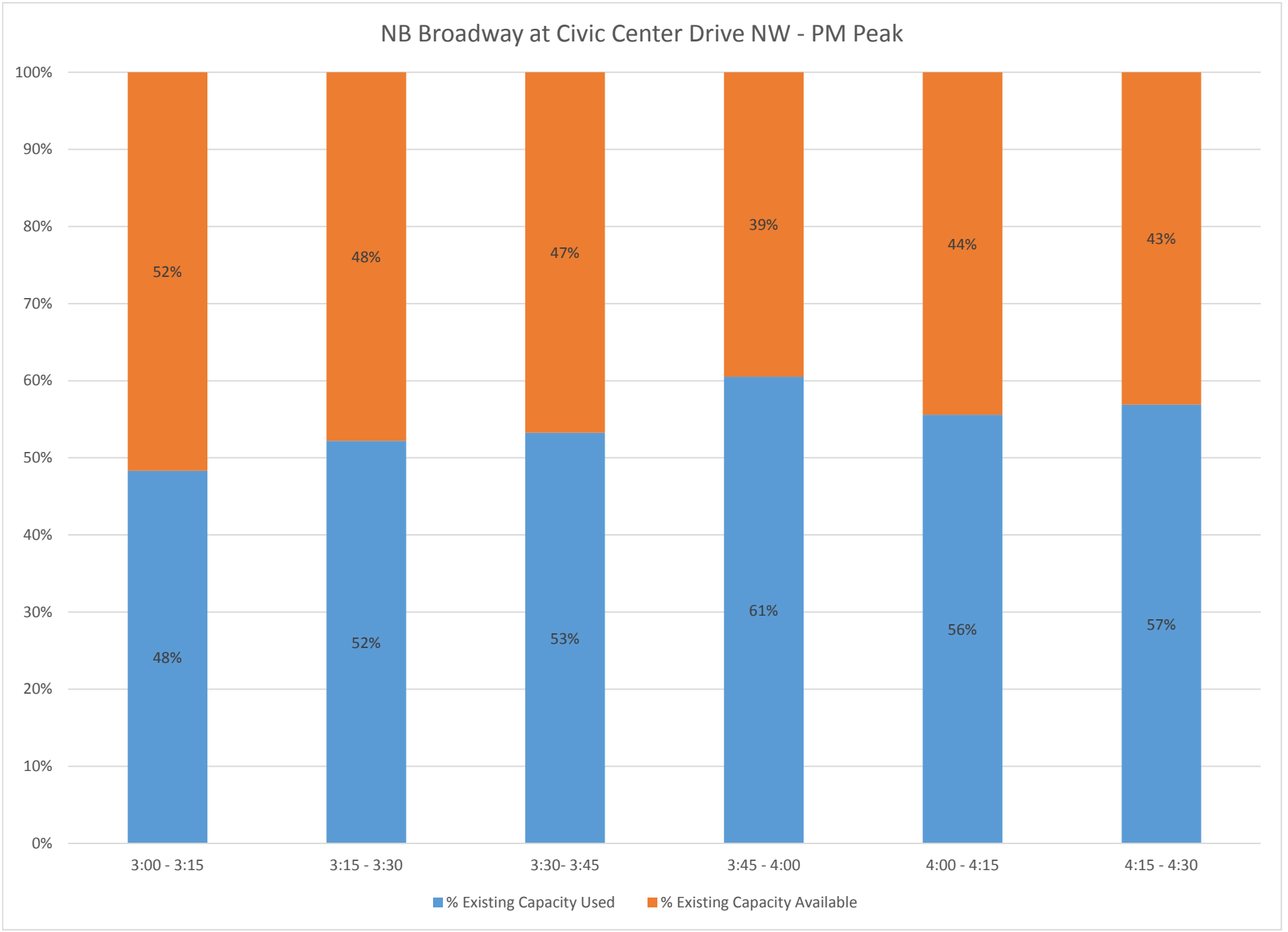


Figure B8.

Street Use Study

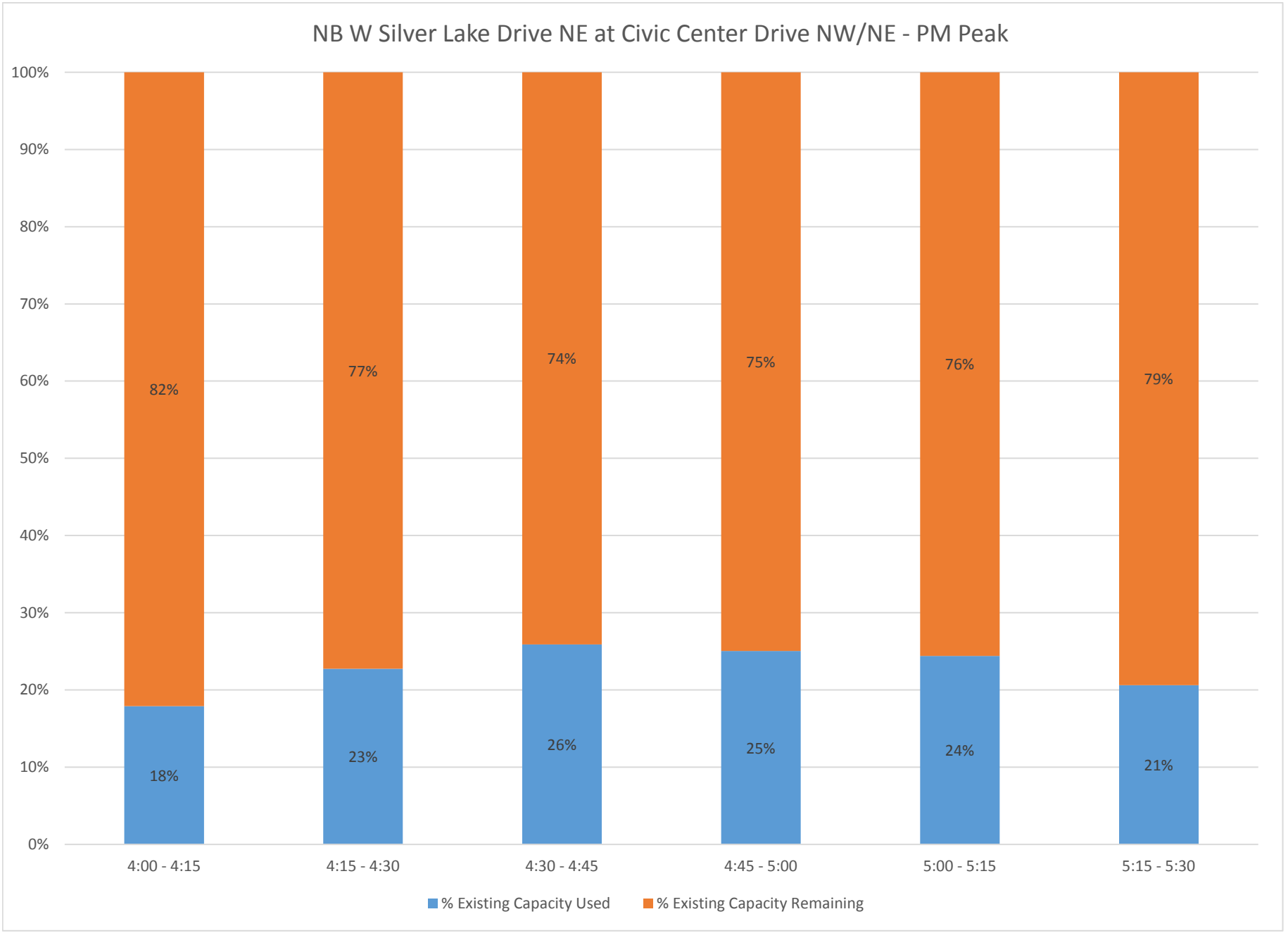


Figure B9.

Street Use Study

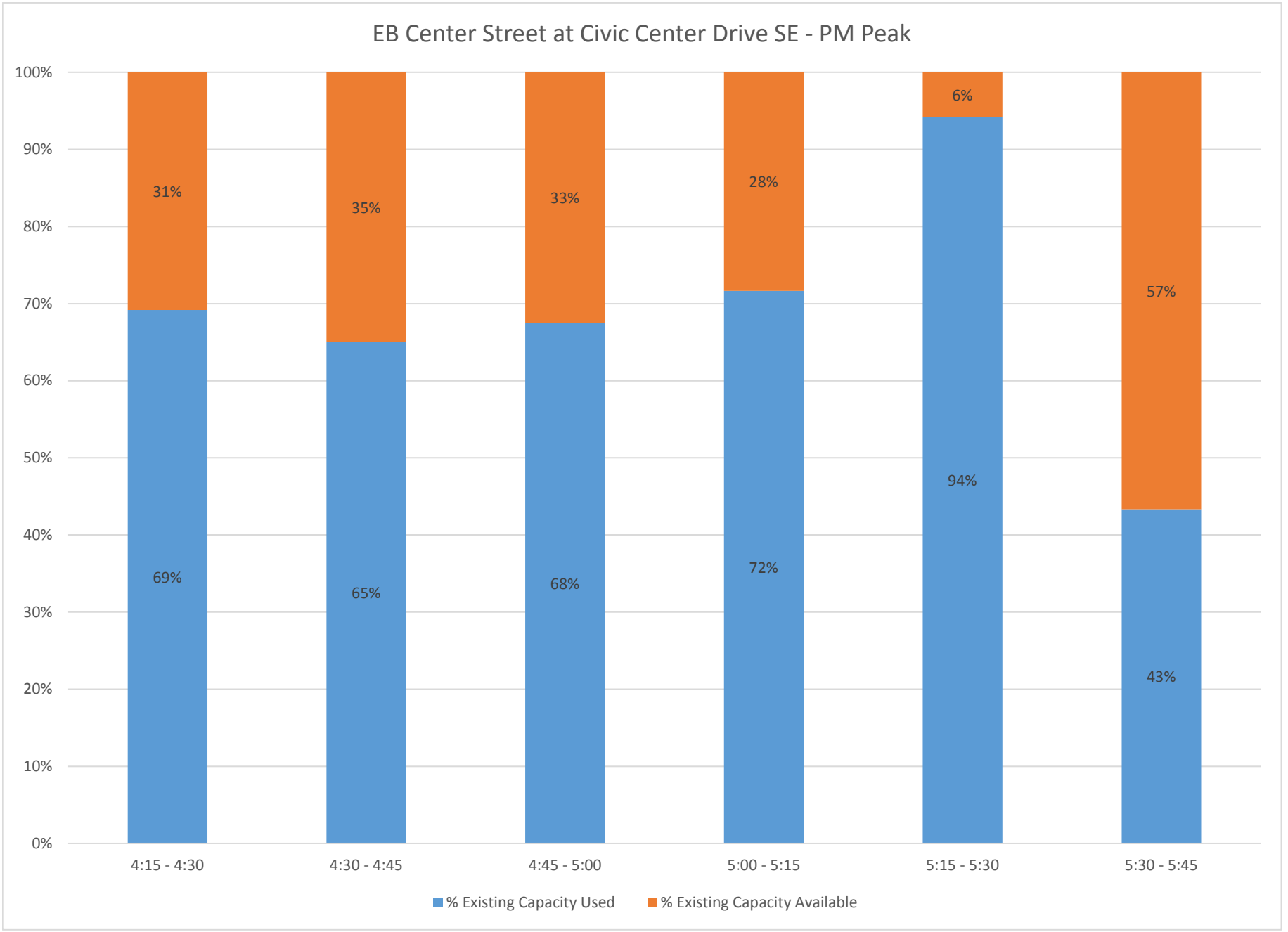


Figure B10.

Street Use Study

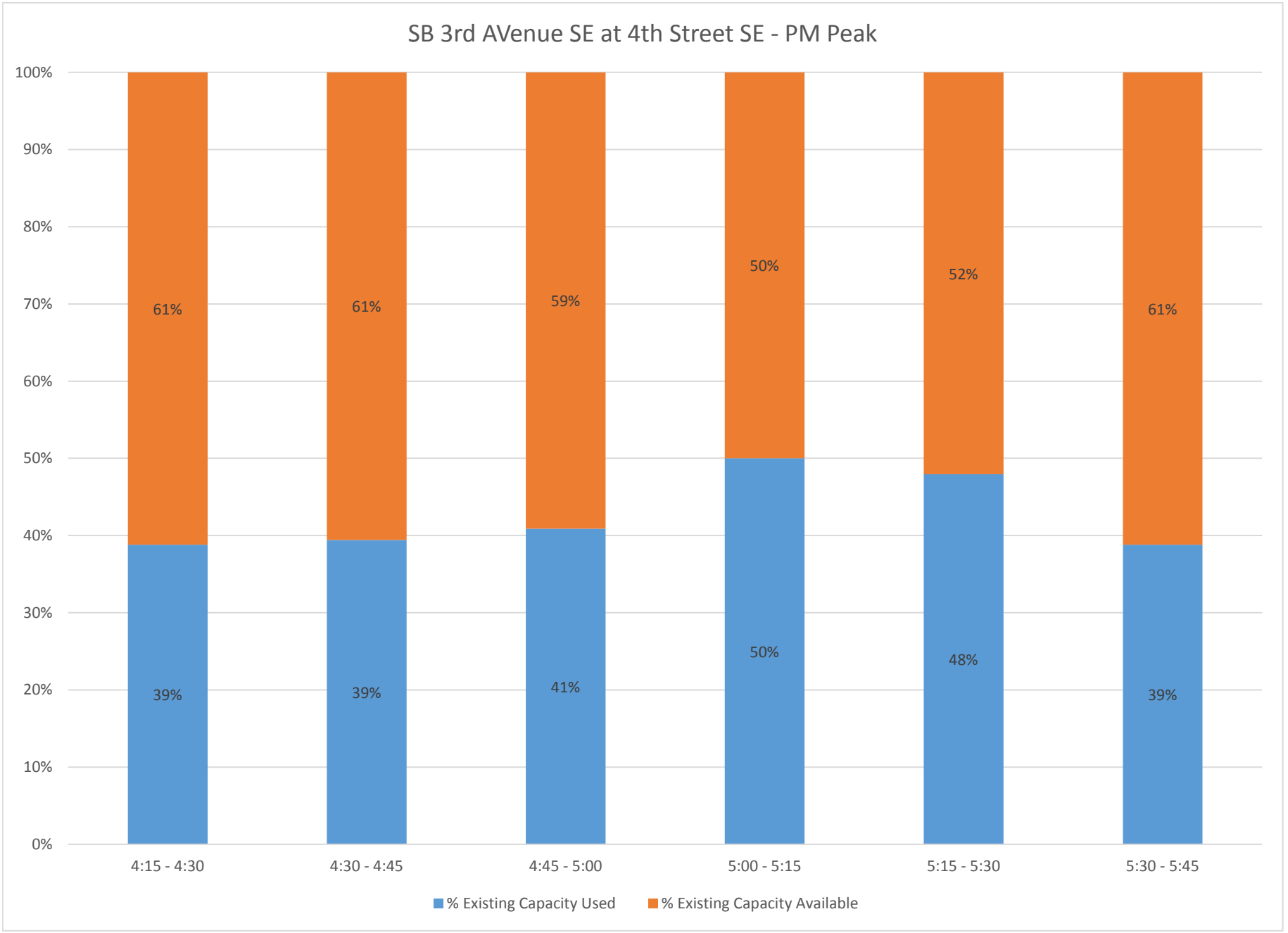


Figure B11.

Street Use Study

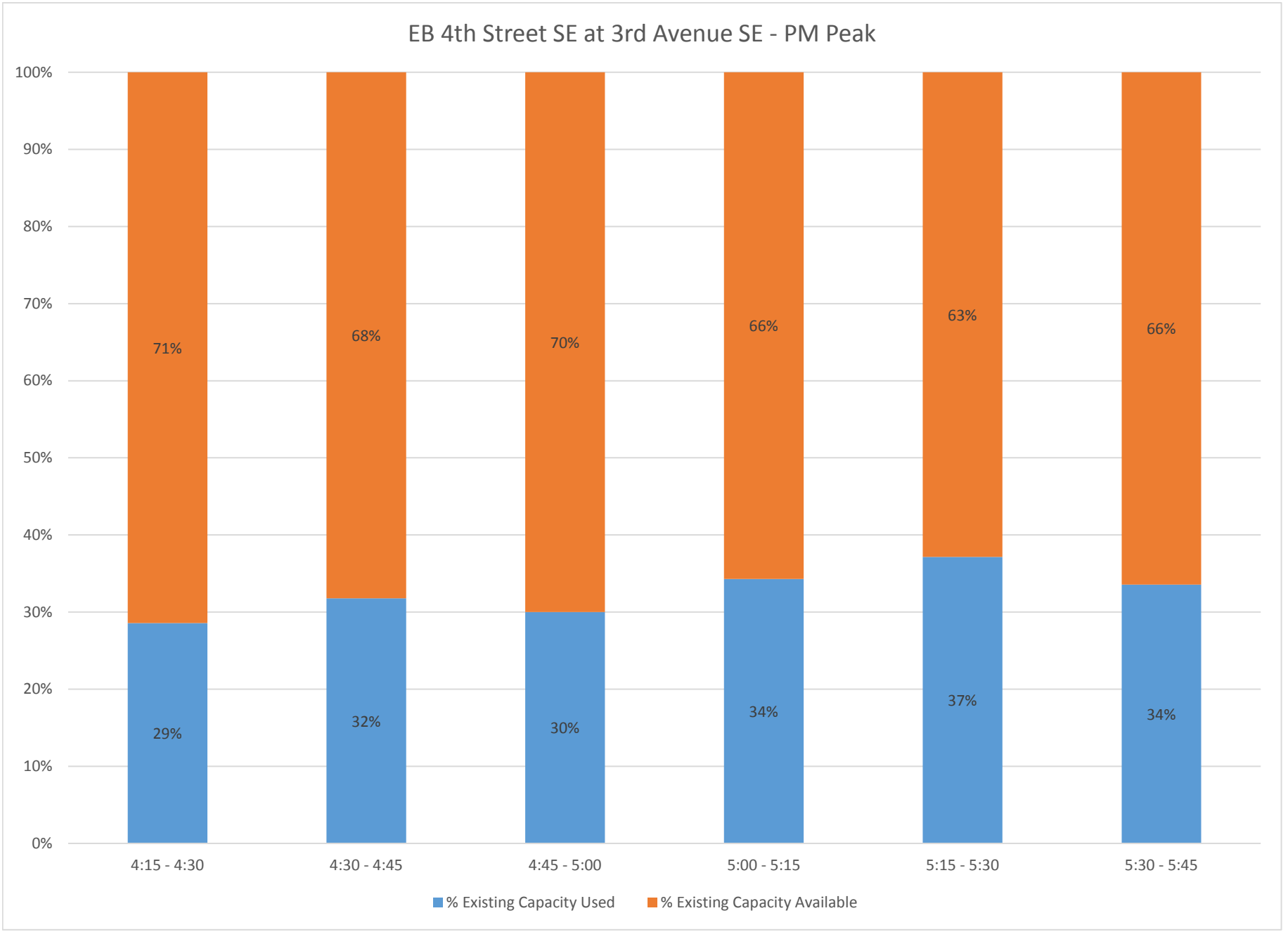


Figure B12.

Street Use Study

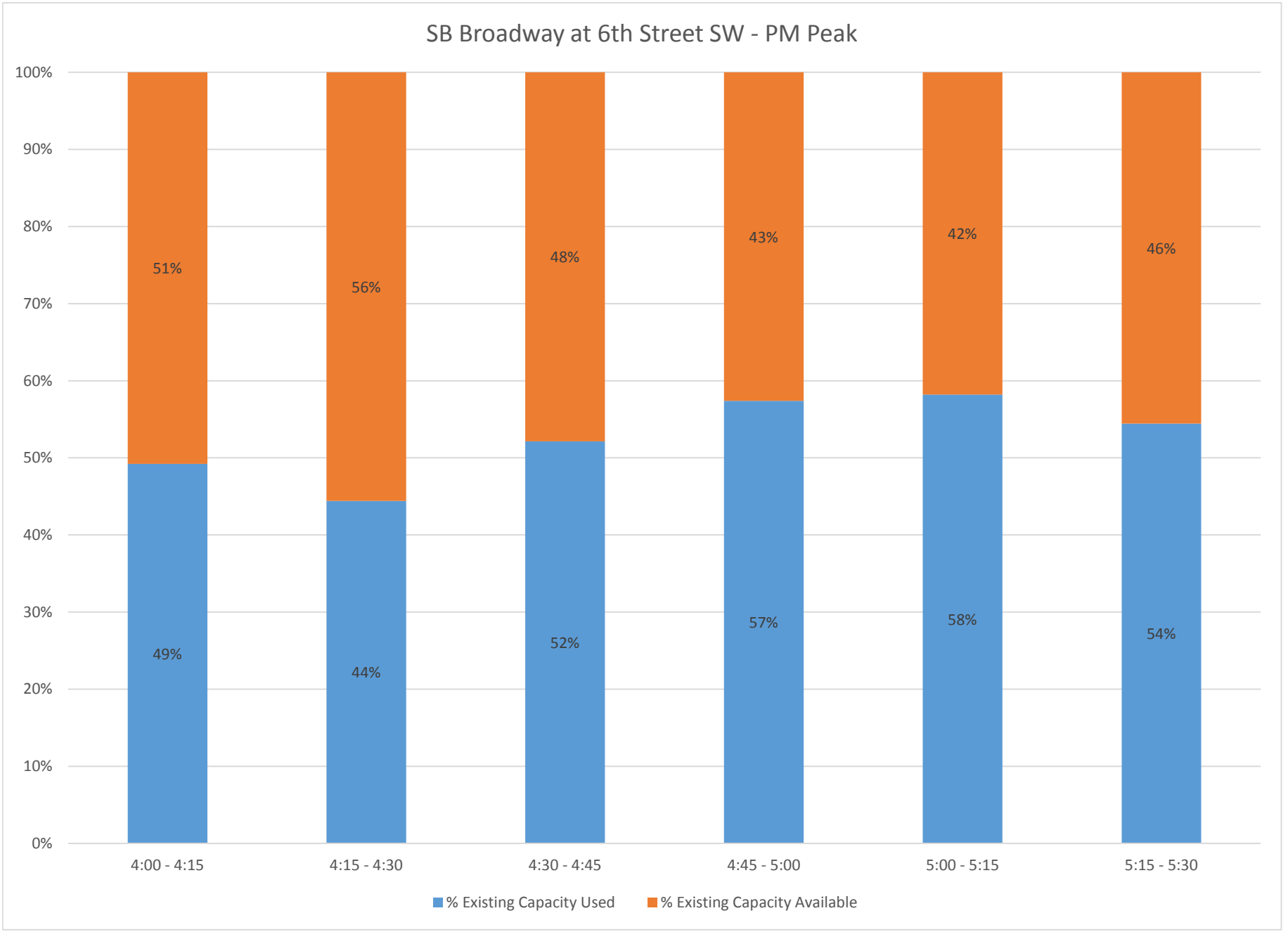
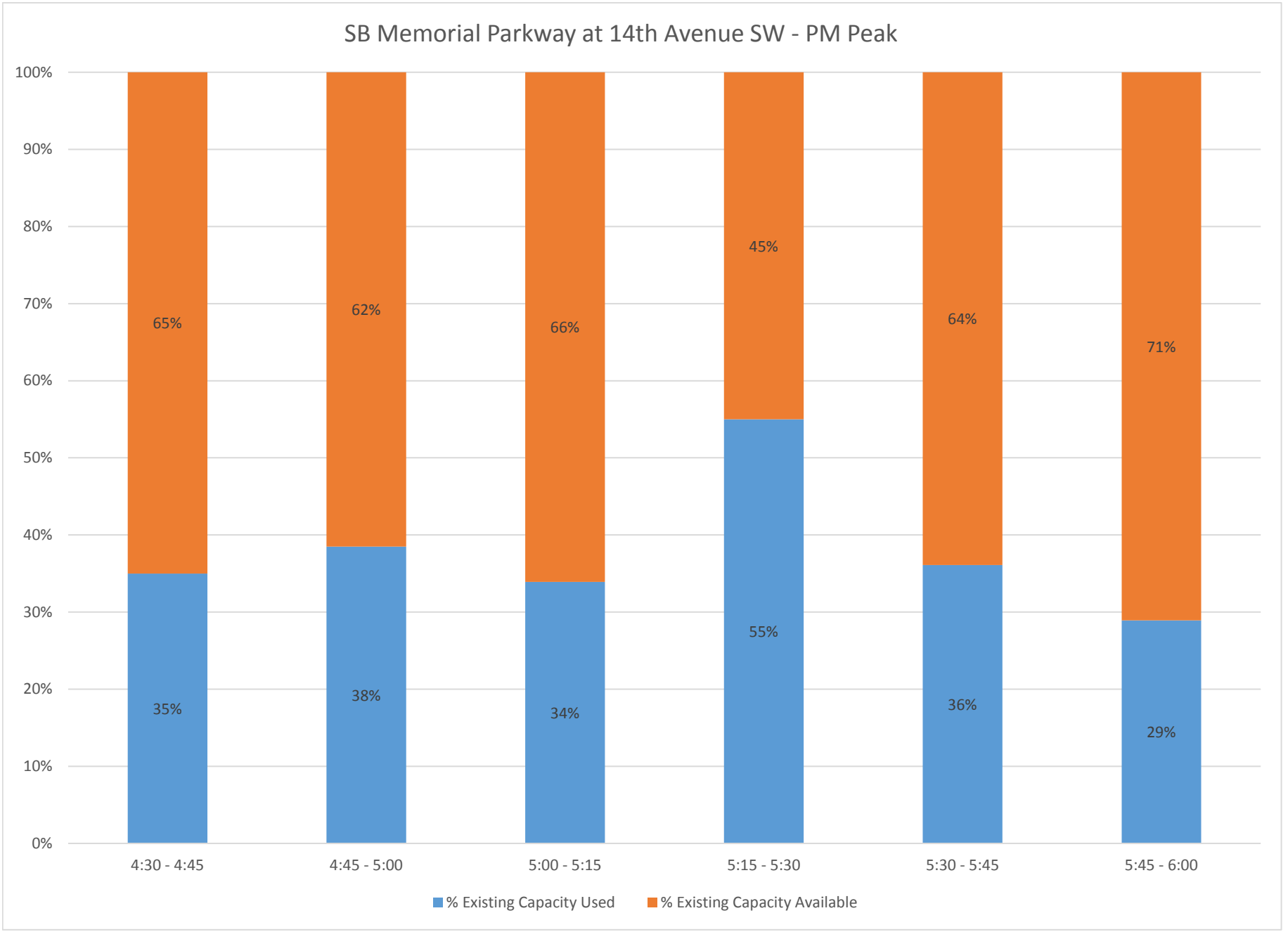


Figure B13.

Street Use Study



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Technical Memorandum 3

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
Kimley-Horn and Associates
JoNette.Kuhnau@kimley-horn.com
651-643-0464

Date: May 16, 2017

Subject: Peripheral Parking Analysis

Cc:

Introduction

The purpose of the peripheral parking analysis is to evaluate the potential peripheral parking locations (**Figure 1**) from a portal capacity and intersection operations perspective. The results of this analysis are intended to be used by the Integrated Transit Studies teams in the development and screening of the DMC scenarios. The analysis summarized in this memorandum represents a high-level screening, and additional detailed operational analysis of the parking will be conducted once the comprehensive DMC scenarios have been defined.

Analysis Methodology

Each parking location was analyzed based on 2040 No Build traffic forecasts, as provided by the ROCOG travel demand model developed for the DMC project. The No Build scenario assumes the population and employment growth identified in the DMC plan, but does not include infrastructure improvements to accommodate this growth. The key analysis assumptions are summarized in the following bullets:

- Each parking location was analyzed independently. The capacity of a given parking location may be less when combined with other parking locations, especially if they use the same portal into the DMC.
- Background traffic growth rate of 15% outside the portals, based on the ROCOG 2040 No Build model.
- 40% of employees arrive in the AM peak hour and depart in the PM peak hour, based on 2010 US Census Journey to Work (JTW) data. This is equivalent to a trip rate of 0.4 trips per parking stall during the AM and PM peaks.

- The directional distribution to and from the DMC was based on the output of the 2040 ROCOG (see **Figure 1**).
    - To/from west – 20%
    - To/from northwest – 19%
    - To/from northeast – 22%
    - To/from south – 19%
    - To/from east – 20%

- Estimated parking facility capacities are based only on employee parking.

- Estimated parking facility capacities are based on traffic capacity of the surrounding intersections and roadway network. Physical configuration of parking on the site, and the capacity of the internal site, have not been analyzed.

- Analysis was conducted in Synchro/SimTraffic using similar methodology as the portal capacity analysis. [1]

- For some parking locations, it was assumed that employees could be assigned to the structure based on their home address. The purpose of this assignment was maximizing parking capacity by limiting the potential for vehicles to make capacity-constrained movements in and out of the parking facility. For example, at location one, the parking stalls would be assigned to employees who only live to the west of the parking structure to eliminate the need for left-turn movements during the PM peak.

- The 2040 No Build travel demand model projects nearly a 200% increase in home-work trips that start and end downtown (i.e., an increase in people living and working in the DMC area). This reduces the percentage of new jobs in the DMC area that will result in a vehicle trip through the portals.

Each parking location was first analyzed to determine the potential parking capacity assuming no infrastructure improvements. Parking capacity was then analyzed with infrastructure improvements to address roadway and intersection constraints to the parking location.

Analysis Results

Table 1 below summarizes the results of the capacity analysis of each parking location, as well as the relevant recommendations.

[1] *Portal Capacity Methodology,* Kimley-Horn and Associates, December 15, 2016.

Table 1. Peripheral Parking Capacity

Parking Location	Impact on Portal	Peak Period Constraint	No Build Scenario		Improvement Scenario 1		Improvement Scenario 2		Improvement Scenario 3		Improvement Scenario 4	
			Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes
Location 1: NW quadrant TH 52/ TH 14	Parking located outside the portal. Frees up capacity at portals during peak periods.	PM	<1,000	No access improvements.	2,000	Traffic signals added at parking ramp access/TH 14 and TH 14/TH 52 NB. Dual left turn out of the parking access.	3,000	All traffic using the parking facility travels to/from the west, limiting or eliminating left-turn movements in the PM peak. Dual left-turn lane from TH 14 to parking facility. Free flow right-turn auxiliary lane from parking facility to WB TH 14.	4,000	Dual left-turn lane from TH 14 to parking facility. Dual left-turn lane from parking facility to TH 14. Additional WB lane on TH 14 through TH 52 interchange. New traffic signal at TH 14/TH 52 NB with dual left-turn lane. New signal at TH 14/TH 52 SB.[2]	7,500	Fly-over ramp from EB TH 14 into the parking facility. Dual left-turn lane from parking facility to TH 14. Free flow right-turn auxiliary lane from parking facility to WB TH 14. Slip ramp from SB 52 exit ramp into the site. Fly-over ramp from parking facility to EB TH 14. Bridge from the parking facility to 7th Street for local traffic. [3]
Location 2: NE quadrant TH 52/ TH 14	Relocates employee parking within portals, does not reduce peak period demand at portals. May be an opportunity to increase visitor parking in downtown core.	PM	1,000	No access improvements.	2,000	Traffic using the parking facility exits to the west.	3,000	Traffic using the parking facility exits to the west and Civic Center Drive widened to 6 lanes.	N/A	N/A	N/A	N/A
Location 3: Civic Center Drive between 8th Ave and 4th Ave	Relocates employee parking within portals, does not reduce peak period demand at portals. May be an opportunity to increase visitor parking in downtown core.	PM	<500	No access improvements. Parking ramp assumed to bridge over 6th Ave.	3,000	Traffic signal at Civic Center Drive/8th Ave NW for primary parking access.	N/A	N/A	N/A	N/A	N/A	N/A

[2] Analysis assumed assigned employee parking to make up the following distribution: 20% to/from northwest or northeast, 10% to/from east, 40% to/from west, and 30% to/from south.
[3] Analysis assumed assigned employee parking to make up the following distribution: 15% local, 25% to/from northwest or northeast, 5% to/from east, 40% to/from west, and 15% to/from south.
.

Table 1 (continued). Peripheral Parking Capacity

Parking Location	Impact on Portal	Peak Period Constraint	No Build Scenario		Improvement Scenario 1		Improvement Scenario 2		Improvement Scenario 3		Improvement Scenario 4	
			Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes
Location 4: Fullerton Lot	Relocates employee parking within portals, does not reduce peak period demand at portals. May be an opportunity to increase visitor parking in downtown core.	PM	1,750	No improvements (parking capacity includes the existing 750 stalls)	3,250	New signal at parking access on 3rd Avenue SE. (parking capacity includes the existing 750 stalls)	3,750	New signal at 3rd Avenue SE/6th Street SE with a stop controlled access on 3rd Avenue SE. (parking capacity includes the existing 750 stalls)	4,750	New signal at 3rd Avenue SE/6th Street SE with a stop controlled access on 3rd Avenue SE. 6th Street SE bridge over Zumbro River. Dual left-turn lanes from 6th St SE onto S Broadway Ave. (parking capacity includes the existing 750 stalls)	N/A	N/A
Location 5: K-Mart Site	Parking located outside the portal. Frees up capacity at portals during peak periods.	PM	1,000	No improvements.	2,000	Intersection improvements at TH 14/ S Broadway Ave to remove existing capacity constraints. Dual left-turn lanes on 9th St SE at S Broadway Ave.	2,500	Intersection improvements at TH 14/ S Broadway Ave to remove existing capacity constraints. Dual left-turn lanes on 9th St SE at S Broadway Ave. New signals at parking accesses on 9th Street SE and 3rd Avenue SE.	2,500	Intersection improvements at TH 14/ S Broadway Ave to remove existing capacity constraints. Dual left-turn lanes on 9th St SE at S Broadway Ave. New signals at parking accesses on 9th Street SE and 3rd Avenue SE. Third SB through lane on S Broadway Ave from Zumbro River to 16th Street SE.[4]	N/A	N/A

[4] *Broadway Corridor Study, SEH and* WSB & Associates, November 30, 2015.

Table 1 (continued). Peripheral Parking Capacity

Parking Location	Impact on Portal	Peak Period Constraint	No Build Scenario		Improvement Scenario 1		Improvement Scenario 2		Improvement Scenario 3		Improvement Scenario 4	
			Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumptions and Notes	Parking Capacity	Assumption and Notes
Location 6: Olmstead County Fairgrounds	Parking located outside the portal. Frees up capacity at portals during peak periods.	PM	1,000	No improvements.	3,500	Intersection improvements at 12th St SE and S Broadway Ave to remove existing capacity constraints. Dual left-turn lanes on S Broadway Ave at 14th St SW. Left-turn lane on 14th St SW at S Broadway Ave.	4,500	Intersection improvements at 12th St SE and S Broadway Ave to remove existing capacity constraints. Dual left-turn lanes on S Broadway Ave at 14th St SW. Left-turn lane on 14th St SW at S Broadway Ave. Third SB through lane on S Broadway Ave from Zumbro River to 16th Street SE.[5]	N/A	N/A	N/A	N/A
Location 7: Miracle Mile	Relocates employee parking within portals, does not reduce peak period demand at portals. Fly-overs would increase portal capacity. May be an opportunity to increase visitor parking in downtown core.	PM	500	No improvements	2,500	Direct fly-over ramp access to and from TH 52 to the north.	3,500	Direct fly-over ramp access to and from TH 52 to the north. Traffic using the parking facility only enters and exits to the north.	N/A	N/A	N/A	N/A

Source: Kimley-Horn and Associates, Inc.

[5] *Broadway Corridor Study, SEH and* WSB & Associates, November 30, 2015.

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Roundabout Analysis

At several of the analyzed parking locations, significant left turning volumes were added to intersections surrounding the parking site. Roundabouts were analyzed at a high level to determine intersections where a roundabout would be feasible relative to geometrics and operations. Each location was analyzed as a multi-lane roundabout, with two circulating lanes. Based on the feasibility of the geometric footprint, the following intersections were then analyzed for operations using the current HCS software (HCS 7).

- TH 52 SB Ramp and TH 14
- TH 52 NB Ramp and TH 14
- S Broadway Avenue and 9th Street SE
- 9th Street SE and Location 5 Access
- S Broadway Avenue and 14th Street SE

The forecast peak hour volumes were analyzed based on the maximum number of parking spaces shown in **Table 1**. Each of the five locations had at least one approach that was anticipated to operate at LOS F in 2040. Based on the results, multi-lane roundabouts were not considered to be the preferred roadway improvement at any of the sites. Roundabouts could be evaluated in more detail when the future year transit and parking alternatives have been further defined.

Summary

The key findings and conclusions of the analysis are:

- Several of the portals are near capacity in the existing peak period conditions:
    - Civic Center Drive (96% full during AM peak hour)
    - 2nd Street SW (88% full during PM peak hour)
    - 6th Street SW (94% full during PM peak hour)

  Construction of parking structures at locations 2, 3, 4, and 6, which are inside the portals, would not provide new parking capacity. Parking at these locations would represent relocation of existing employee parking from the downtown core to the periphery. If new employee spaces are built at these locations, their utility will be negatively impacted by portal congestion and an inability to travel into/out of the portals during peak periods.

- Parking locations 3 and 7 have the potential to also accommodate commuter bus parking during the day. To accommodate the buses, the first level of the parking structure would need to be built approximately 18 feet clear (i.e., from bottom of structural beam to floor), which will impact the overall height of the structure. Parking structure height and the compatibility with adjacent land uses will need to be further explored as scenarios are developed and evaluated.

- Factors that affect the analysis results and could result in a different number of spaces being feasible are:
    - The cost and feasibility of local street improvements to access the parking facility.
    - The capacity of the transit circulator selected to serve the parking facility.
    - The combination of parking locations selected for implementation.
    - Use of the parking by non-employees (patients, visitors, and customers).
    - Distribution or assignment of employees to the parking areas.
    - Design of the parking facilities and their ability to accommodate the entering/exiting traffic.

Technical Memorandum 4

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
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651-643-0464

Date: **REVISED –** August 14, 2017

Subject: Parking Supply Calculations

Cc:

Introduction

This memorandum documents the assumptions and calculations used to develop parking supply values for the Integrates Transit Study scenarios.

Assumptions

The assumptions used in the analysis are summarized in the following bullets:

- Future transit mode share is the same as existing.
- Through vehicle traffic through portals (i.e., traffic without destinations in downtown Rochester) will not grow from existing.
- The percentage of people living and working downtown is expected to increase, but the parking demand per employee has not been adjusted.
- Future parking demand by user group is shown in **Table 1**.

Table 1. Future Parking Demand [1]

	New Spaces Needed
Employee	8,804
Patient/Visitor	3,866
Student	385
Residential	3,233
Total	**16,288**

- Total remaining peak hour capacity = 6,000 vehicles in AM peak hour and 7,000 vehicles in PM peak hour, as shown in **Table 2**. Portals that connect to the regional highway network, which are the most constrained portals, are highlighted in grey.

Table 2. Existing Peak Hour Remaining Portal Capacity

	AM Peak Hour Remaining Capacity (Vehicles)	PM Peak Hour Remaining Capacity (Vehicles)
6th St SW	100	0
2nd St SW	300	200
Civic Center Dr NW	100	100
6th Ave NW	300	700
4th Ave NW	300	300
Broadway Ave N	700	700
Silver Lake Dr NE	600	1,400
Center St	200	100
3rd Ave SE	900	800
4th St SE	600	700
Broadway Ave S	1,500	900
NB Memorial Pkwy	400	1,100
Total	**6,000**	**7,000**
Total Capacity through Constrained Portals	**2,000**	**1,200**

Source: *Portal Capacity Methodology Technical Memorandum*, January 18, 2017

- Based on 2009-2013 US Census data (American Community Survey) and the 2040 No Build forecast model for the DMC, 30 percent of employee traffic will be generated from Districts 3, 4, 5, 8, 9, 10, and 11 (**see Figure 1)** and are assumed to primarily use the unconstrained portals to/from their employment in downtown Rochester. The remaining 70 percent of downtown

[1] Existing and Future Peak Parking Demand by User Type, DMC Park+ model, July 7, 2017.

employee traffic is generated from the Districts that are further from downtown and therefore will use the regional highway network and travel through the constrained portals into downtown Rochester. Traffic through both the constrained and unconstrained portals, which is generated by the parking demand, are shown in **Table 3**, with peak hour percentages based on census and patient survey data provided by Olmstead County.

- Residents in Districts 1 and 2 that work in downtown are assumed to generate no vehicle traffic through the portals in the peak hour in the peak direction (inbound in AM and outbound in PM).

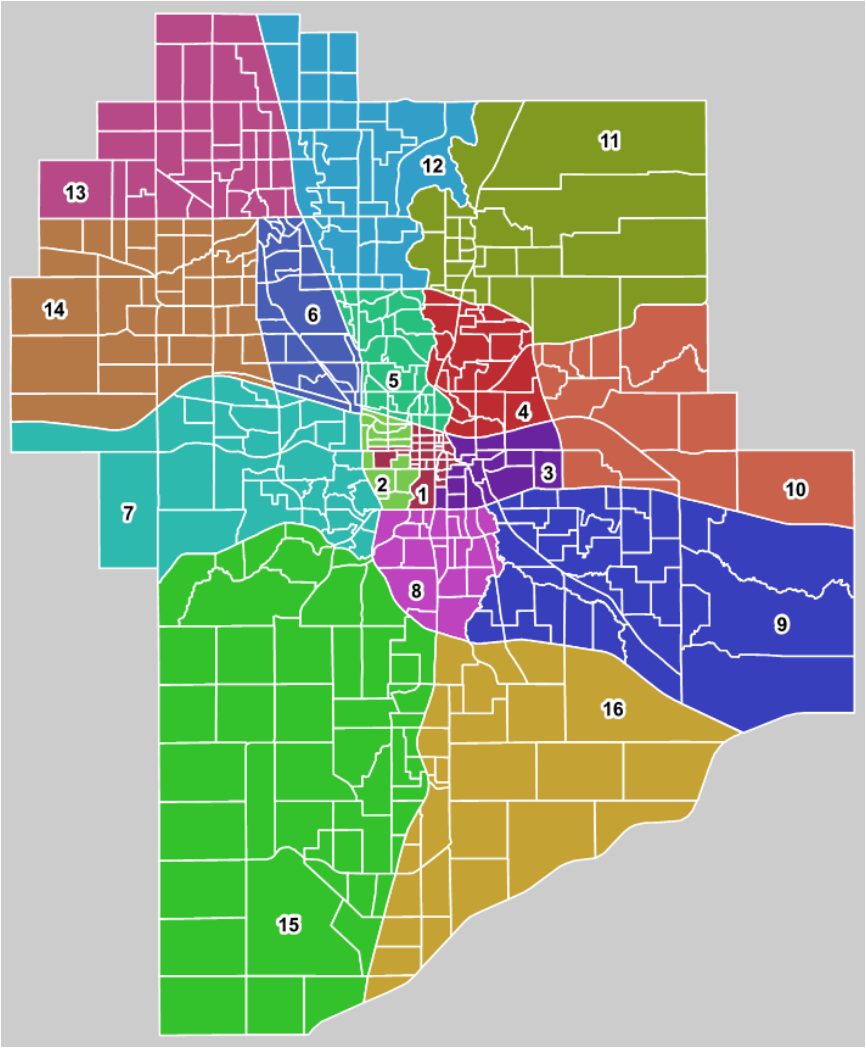

Figure 1. DMC Forecast Districts

Table 3. Future Parking Demand through Constrained and Unconstrained Portals

	New Spaces Needed		Peak Hour Vehicle Trip Generation (trips/space) *	Peak Hour Trips Generated	
	Travel Through Constrained Portals	Travel Through Unconstrained Portals		Travel Through Constrained Portals	Travel Through Unconstrained Portals
Employee	6,163	2,641	0.40 [2]	2,465	1,057
Patient/Visitor	3,866	0	0.23 AM/ 0.16 PM [3]	889 AM/ 619 PM	0
Student	385	0	0.25	96	0
Residential	0	3,233	0	0	0
Total	**9,254**	**7,034**		**3,450 AM/ 3,180 PM**	**1,057**

* NOTE: Trip generation rate per parking space accounts for distribution of work arrival times between 5 AM and 12PM, as well as transit usage, space turn-over, and patient/visitor arrival and departure patterns. This rate means that every parking space generates trips, or fractions of trips, in both peak and off-peak periods. For example, each employee space will generate at least 0.6 additional arrival trips, on top of what is shown in the table for the peak 1 hour.

- Commuters traveling on the regional highway network can more easily be captured outside the portals. Therefore, park-and-ride and remote parking sites (Location 1 and Location 6) should consist primarily of commuters that would otherwise travel through the constrained portals.

- It will be more difficult to direct local residents that live close to the DMC District to the remote parking and park-and-ride sites, because this may result in a reverse commute. In addition, local residents that live closer to the DMC District are more likely to travel through the unconstrained portals. Therefore, parking for employees that live in Districts 3-5 and 8-11 should be located in the periphery sites or remote sites that are closer to downtown (Locations 3, 4, and 5).

- Location 2 is not considered viable for commuters because it is inside the Civic Center Driver portal that is already at capacity.

- In the future, it is desired to hold 10 percent of portal capacity in reserve.

- Patient and visitor parking should be located in the downtown core, if possible. Employee and student parking can be located in the core, peripheral parking areas, remote parking areas, or park-and-ride facilities.

[2] Journey to Work data, 2010 Census Transportation Planning Package, provided by ROCOG, February 2017.
[3] Each parking space generates 0.25 spaces in the AM peak hour, with 93% entering, and 0.19 trips in the PM peak, with 85% exiting. Traffic Impact Report for Mayo Clinic Graham Parking Ramp Expansion, June 2008.

Calculations

- Remaining available capacity, assuming 10 percent reserve portal capacity, is shown in **Table 4**. Portals that connect to the regional highway network, which are the constrained portals, are highlighted in grey.

Table 4. Remaining Portal Capacity with 10% Reserve Capacity

	AM Peak Hour Remaining Capacity (Vehicles)	PM Peak Hour Remaining Capacity (Vehicles)
6th St SW	0	0
2nd St SW	200	100
Civic Center Dr NW	0	0
6th Ave NW	300	600
4th Ave NW	200	200
Broadway Ave N	600	500
Silver Lake Dr NE	500	1,200
Center St	200	100
3rd Ave SE	800	700
4th St SE	500	600
Broadway Ave S	1,300	700
NB Memorial Pkwy	300	900
Total	**4,600**	**5,400**
Total Portal Capacity through Constrained Portals	**1,500**	**800**
Total Portal Capacity through Unconstrained Portals	**3,100**	**4,600**

- Commuters through Constrained Portals
    - Demand = 6,163 parking spaces (Table 3)
    - Supply
        - Capacity through constrained portals = 800 vehicles/hour (PM Peak, Table 4) on roadways to regional highway network ÷ 40 percent of commuter traffic arriving in peak hour = **maximum of 2,000 spaces inside portal for commuters traveling through constrained portals.** This calculation assumes no existing employee spaces relocated outside the portals.
        - New employee parking spaces inside portals need to be located near or on Broadway Ave S based on available portal capacity.
        - Spaces outside portals = 6,163 total spaces – maximum 2,000 spaces inside portals = **minimum of 4,163 spaces outside portals.**
- Commuters through Unconstrained Portals

- Demand = 2,641 parking spaces (Table 3)
- Capacity of unconstrained portals = 3,100 vehicles (AM Peak, Table 4).
- Available capacity of unconstrained portals is adequate to absorb all peak hour traffic (1,057 vehicles) associated with 2,641 parking spaces for commuters that travel through the unconstrained portals.
- New parking spaces inside portals should be located near Broadway Ave N or east of Broadway Ave, where the parking spaces will not be attractive for access via TH 52 since those portals are at capacity.
- New parking spaces should be assigned to limit new vehicle traffic generated on Civic Center Drive or 2nd Street SW.

- Patients/Visitors
  - Demand = 3,866 new parking spaces (Table 1)
    - Distribution of trips through the constrained versus unconstrained portals is not known. However, it is anticipated that most patients and visitors will want to use the unconstrained portals.
    - Given the lack of available portal capacity to/from TH 52, it is recommended that new patient and visitor parking in the core be created by relocating existing employee parking to locations outside the portals.
    - Based on peak hour demand, traffic generated by 1 relocated employee parking space = AM traffic generated by 1.7 patient/visitor spaces or PM traffic generated by 2.5 patient/visitor spaces.
    - From a traffic perspective, 2,274 employee spaces would need to be relocated outside the portal to provide 3,866 additional patient/visitor spaces and maintain a net zero change in peak hour trips into the downtown core.
  - Supply
    - If all available portal capacity was dedicated to patients/visitors rather than employees, new patient/visitor parking inside portals = 800 vehicles/hour PM peak portal capacity through constrained portals (Table 4) ÷ 16 percent of patient/visitor traffic arriving in peak hour = **maximum of 5,000 patient/visitor spaces inside portal.**
    - New parking spaces inside portals should be located near or on Broadway Ave S based on available portal capacity. However, this will still likely impact portals on TH 52 due to regional traffic patterns with vehicle traffic coming primarily from the north, northwest, and west.
    - Any new spaces built inside the portals for patients/visitors that are not associated with moving employees out of the downtown area will need to result in a reduction of new employee parking in the core or in peripheral parking areas, in order to avoid exceeding the capacity of the constrained portals.
    - The range of potential strategies to meet the total patient/visitor demand are shown in **Table 5**.

Table 5. Patient/Visitor Parking Supply Options

		Option 1 – All New Spaces	Option 2 – Relocated + New Spaces	Option 3 – All Relocated Spaces
Newly Constructed Spaces		4,000	1,500	0
Employee Spaces Reassigned to Patient/Visitor Spaces		0	2,500	4,000
Total Spaces		**4,000**	**4,000**	**4,000**
Net Change in Portal Traffic (vehicles/peak hour)	AM	**+920**	**-80**	**-680**
	PM	**+640**	**-360**	**-960**
Maximum Number of New Employee Spaces in Downtown Core		500	4,100	6,300

- Students
    - Demand = 385 new parking spaces.
        - Distribution of trips through constrained versus unconstrained portals is not known.
        - Time-of-day patterns of student parking demand is not known, but is assumed to be 25 percent in AM and PM peak hours.
    - New parking spaces inside portals need to be located near or on Broadway Ave S based on available portal capacity. However, this will still likely have some impact of the portals that connect to TH 52 due to regional traffic patterns.
    - Any new spaces built inside the portals for students will slightly reduce the potential new spaces inside the portals for patients/visitors and employees. However, the demand for student parking spaces and the traffic generated by this use is minimal.
- Park-and-Ride
    - Cycle time (round trip) = approximately 30 minutes (2 trips per peak hour)
    - Bus capacity = 60 passengers/bus
    - Number of new buses needed = Employee park-and-ride spaces x 0.40 demand in peak hour ÷ 60 passengers/bus ÷ 2 buses/hour + Student park-and-ride spaces x 0.25 demand in peak hour ÷ 60 passengers/bus ÷ 2 buses/hour

Recommended Parking Supply Concepts

Based on the assumptions and calculations documented in this memo, the scheme of parking supply and designated users shown in **Table 6** is proposed for the four analysis scenarios and also shown on **Figure 2 – Figure 5**. Residential parking is not shown in the table because these spaces can be located where development occurs and are not expected to impact portal capacity. The resulting new peak hour traffic demand, relative to the portals, is shown in **Table 7.**

Table 6. Parking Supply Scenarios – Traffic Concept

	Scenario DMC Modified	**Scenario A**	**Scenario D**	**Transit Alternative Phase #1**
Location 1 – NW Quadrant TH 14/TH 52 (Remote)	• 3,000 Employee (new) • 1,000 Employee (relocated)	• 4,000 Employee (new)	• 4,000 Employee (new)	n/a
Location 2 – NE Quadrant TH 14/TH 52 (Remote)	0	0	0	n/a
Location 3 – Central Station (Peripheral)	• 1,500 Employee (new, through unconstrained portals only) • 700 Employee (relocated from downtown core to create Patient/Visitor Spaces)	n/a	n/a	n/a
Location 4 – Fullerton Lot (Peripheral)	• 1,500 Employee (new) • 1,000 Employee (new, through unconstrained portals only) • 400 Student (new)	• 500 Employee (new) • 2,500 Employee (new, through unconstrained portals only)	• 2,500 Employee (new, through unconstrained portals only) • 400 Student (new)	n/a
Location 5 – K-Mart Site (Remote)	n/a	• 2,000 Employee (relocated) • 400 Student (new)	n/a	n/a
Location 6 – Fairgrounds Site (Remote)	n/a	0	n/a	n/a
Downtown Core (no site(s) identified)	• 1,500 Patient/Visitor (new)	• 1,500 Patient/Visitor (new)	• 1,500 Patient/Visitor (new)	• 1,500 Patient/Visitor (new)

	Scenario DMC Modified	Scenario A	Scenario D	Transit Alternative Phase #1
Park-and-Rides	• 2,000 Employee (new) – no site(s) identified • 800 Employee (relocated from downtown core to create Patient/Visitor Spaces) – no site(s) identified	• 500 Employee (relocated) – no site(s) identified • 2,000 Employee (new) – no site(s) identified	• 2,500 Employee (new) – no site(s) identified • 2,500 Employee (relocated) – no site(s) identified	• 9,000 Employee (new) • 2,500 Employee (relocated) • 400 Student (new)
Total DMC Spaces	• 2,500 reassigned spaces • 13,400 new spaces (excluding residential)			
Downtown Core	• 2,500 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 1,500 new spaces (Patient/Visitor)	• 2,500 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 1,500 new spaces (Patient/Visitor)	• 2,500 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 1,500 new spaces (Patient/Visitor)	• 2,500 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 1,500 new spaces (Patient/Visitor)
Peripheral	• 5,100 new spaces (Employee + Student)	• 3,000 new spaces (Employee)	• 2,900 new spaces (Employee + Student)	0
Remote	• 4,000 new spaces (Employee)	• 6,400 new spaces (Employee + Student)	• 4,000 new spaces (Employee)	0
Park-and-Rides	• 2,800 new spaces (Employee) • At least 10 new buses	• 2,500 new spaces (Employee) • At least 9 new buses	• 5,000 new spaces (Employee) • At least 17 new buses	• 11,900 new spaces (Employee + Student) • At least 40 new buses

n/a = Parking not proposed at this site in this scenario.

Table 7. Portal Capacity with 10% Reserve Capacity – Traffic Concept

	AM Peak Hour Remaining Capacity (Vehicles)	AM Peak Hour New Parking-Generated Constrained Portal Demand (Vehicles)*	PM Peak Hour Remaining Capacity (Vehicles)	PM Peak Hour New Parking-Generated Portal Demand (Vehicles)*
Travel Through Constrained Portals	**1,500**	**+1,100**	**800**	**+800**
Travel Through Unconstrained Portals	**3,100**	**+800**	**4,600**	**+800**

* Yellow shading indicates new demand is within 10% of the reserve capacity.

A secondary review of parking supply was conducted based on block-level anticipated developments and the associated parking supply constructed as part of the development, as provided by the City of Rochester and the parking team. The anticipated developments create significant amounts of new on-site parking in the downtown core, as summarized in **Table 8** below. The resulting proposed parking supply and designated users are shown in **Table 9** and on **Figure 6 – Figure 9**. The resulting new peak hour traffic demand, relative to the portals, is shown in **Table 10.** If individual developments are allowed to build the parking supply at their front door, additional commuter parking would need to be moved to remote (not peripheral) locations in order to avoid overloading the constrained portals. As a result, in this concept the proposed parking supply at the peripheral parking locations should be limited to commuters traveling through the unconstrained portals only.

Table 8. Future Parking Supply – Development-Constructed Spaces[4]

	Net New Spaces Provided Inside Portals
Employee	3,600 (assumed 2,500 through constrained portals and 1,100 through unconstrained portals)
Patient/Visitor	2,400
Student	0
Residential	2,000
Total	**8,000**

[4] DMC District Block Level Parking Market Breakdown spreadsheet, City of Rochester, August 2, 2017. Note that spaces have been rounded to the nearest 100.

Table 9. Parking Supply Scenarios – Development Concept

	Scenario DMC Modified	Scenario A	Scenario D	Transit Alternative Phase #1
Location 1 – NW Quadrant TH 14/TH 52 (Remote)	• 4,000 Employee (new)	• 4,000 Employee (new)	• 4,000 Employee (new)	n/a
Location 2 – NE Quadrant TH 14/TH 52 (Remote)	0	0	0	n/a
Location 3 – Central Station (Peripheral)	• 500 Employee (new, through unconstrained portals only)	n/a	n/a	n/a
Location 4 – Fullerton Lot (Peripheral)	• 900 Employee (new, through unconstrained portals only) • 400 Student (new)	• 1,400 Employee (new, through unconstrained portals only) • 400 Student (new)	• 1,400 Employee (new, through unconstrained portals only) • 400 Student (new)	n/a
Location 5 – K-Mart Site (Remote)	n/a	• 1,600 Employee (relocated)	n/a	n/a
Location 6 – Fairgrounds Site (Remote)	n/a	0	n/a	n/a
Downtown Core	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 2,400 Patient/Visitor (new) • 2,500 Employee (new) • 1,100 Employee (new, through unconstrained portals only)	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 2,400 Patient/Visitor (new) • 2,500 Employee (new) • 1,100 Employee (new, through unconstrained portals only)	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 2,400 Patient/Visitor (new) • 2,500 Employee (new) • 1,100 Employee (new, through unconstrained portals only)	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 2,400 Patient/Visitor (new) • 2,500 Employee (new) • 1,100 Employee (new, through unconstrained portals only)
Park-and-Rides	• 1,600 Employee (relocated) – no site(s) identified	0	• 1,600 Employee (relocated) – no site(s) identified	• 5,400 Employee (new) • 1,600 Employee (relocated) • 400 Student (new)
Total DMC Spaces	• 1,600 reassigned spaces • 13,400 new spaces (excluding residential)			

	Scenario DMC Modified	Scenario A	Scenario D	Transit Alternative Phase #1
Downtown Core	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 6,000 new spaces (Patient/Visitor + Employee)	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 6,000 new spaces (Patient/Visitor + Employee)	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 6,000 new spaces (Patient/Visitor + Employee)	• 1,600 Employee spaces relocated out of core and spaces reassigned to Patient/Visitor • 6,000 new spaces (Patient/Visitor + Employee)
Peripheral	• 1,800 new spaces (Employee + Student)	• 1,800 new spaces (Employee + Student)	• 1,800 new spaces (Employee + Student)	0
Remote	• 4,000 new spaces (Employee)	• 5,600 new spaces (Employee)	• 4,000 new spaces (Employee)	0
Park-and-Rides	• 1,600 new spaces (Employee) • At least 6 new buses	0	• 1,600 new spaces (Employee) • At least 6 new buses	• 7,400 new spaces (Employee + Student) • At least 25 new buses

n/a = Parking not proposed at this site in this scenario.

Table 10. Portal Capacity with 10% Reserve Capacity – Development Concept

	AM Peak Hour Remaining Capacity (Vehicles)	AM Peak Hour New Parking-Generated Constrained Portal Demand (Vehicles)*	PM Peak Hour Remaining Capacity (Vehicles)	PM Peak Hour New Parking-Generated Portal Demand (Vehicles)*
Travel Through Constrained Portals	**1,500**	**+1,500**	**800**	**+1,200**
Travel Through Unconstrained Portals	**3,100**	**+800**	**4,600**	**+800**

* Yellow shading indicates new demand is within 10% of the reserve capacity and red shading indicates that the new demand exceeds the reserve capacity.

Summary

The findings and factors that would modify the recommended or feasible parking supply scenarios are as follows:

- The unconstrained portals represent only about 30% of commuters. The remaining 70% of commuters travel on the reginal highway network and into the DMC District via portals that have very little remaining capacity.

- To optimize available portal capacity, commuter parking should be assigned based on employees' home location and direction of travel to the DMC District.

- Commuter parking constructed inside the portals as part of individual developments in the downtown core will reduce or eliminate the number of employee spaces that can be constructed at peripheral parking locations, specifically for employees that travel through the constrained portals.

- Commuter parking at Locations 3 and 4 could likely be retained for commuters that travel through unconstrained portals, even if individual developments use all the remaining capacity of the constrained portals.

- Changes to forecasted or actual land uses will result in changes to the total parking demand.

- Moderate street network improvements have been assumed (i.e., traffic signals and turn lanes, but not flyovers or additional through lanes). Additional roadway improvements would increase the maximum number of spaces that could be provided at Locations 1, 4, and 5, but these improvements would be expected to carry relatively high costs.

- The previous traffic analysis[5] considered parking sites independently. The combination and size of proposed parking sites in these scenarios need to be analyzed together to ensure that they are still feasible relative to peak hour traffic capacity and operations.

- Type and size of transit vehicles, and their headways, could impact the number of remote parking spaces that can be provided due to the number of employees that would need to be transported during peak hours.

- Cost effectiveness of new transit service to Locations 3, 4, and 5 would need to be assessed based on potential parking spaces to determine the minimum number of parking spaces needed to warrant a new transit alignment.

- Additional parking spaces, over the forecasted demand, will need to be provided due to parking inefficiencies and latent demand. This has been estimated to represent an additional 15 percent increase in parking supply.

[5] *Peripheral Parking Analysis Technical Memorandum*, Kimley-Horn and Associates, Inc, May 16, 2017.

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Technical Memorandum 5

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
Kimley-Horn and Associates
JoNette.Kuhnau@kimley-horn.com
651-643-0464

Date: October 4, 2017

Subject: Parking Supply Calculations – Mayo Uses

Cc: Craig Vaughn, Parking Coordinator

Introduction

This memorandum builds on the previous parking supply analysis and focuses on a specific supply concept based on assumptions regarding Mayo-related employee and patient/visitor parking.

Assumptions

In addition to the assumptions previously documented in the Parking Supply Technical Memorandum[1], the new assumptions used in this analysis are summarized in the following bullets:

- Breakdown of future parking demand by user group is shown in **Table 1**.

[1] *Parking Supply Calculations Technical Memorandum*, August 14, 2017

Table 1. Future Parking Demand [2]

	New Spaces Needed
Employee - Mayo	6,535
Employee - Other	2,268
Patient/Visitor - Mayo	1,616
Visitor - Other	2,251
Student	385
Residential	3,233
Total	**16,288**

- Mayo will add zero net new employee parking spaces in the DMC district.
- The City of Rochester will manage the demand for new Visitor-Other (non-Mayo) parking, to the extent possible, by reducing contract parking in city parking facilities and repurposing those spaces for visitor use.
- The City of Rochester will use Travel Demand Management (TDM) strategies to limit the amount of net new Employee-Other (non-Mayo) parking constructed as part of new developments or redevelopments.

Calculations

- Remaining available capacity, assuming 10 percent reserve portal capacity, is shown in **Table 2**. Portals that connect to the regional highway network, which are the constrained portals, are highlighted in grey.
- A proposed parking supply concept based on the above assumptions, and the limited available portal capacity, is summarized in **Table 3.** The values in Table 3 assume the patient/visitor demand is met through all newly constructed parking in the DMC district. Parking in the district allocated to the Employee-Other category was based on reaching the maximum of 800 additional vehicles through the Constrained Portals in the PM peak.
- **Table 4** summarizes the number and location of remote parking spaces for employees.

[2] Existing and Future Peak Parking Demand by User Type, DMC Park+ model, July 7, 2017.

Table 2. Remaining Portal Capacity with 10% Reserve Capacity

	AM Peak Hour Remaining Capacity (Vehicles)	PM Peak Hour Remaining Capacity (Vehicles)
6th St SW	0	0
2nd St SW	200	100
Civic Center Dr NW	0	0
6th Ave NW	300	600
4th Ave NW	200	200
Broadway Ave N	600	500
Silver Lake Dr NE	500	1,200
Center St	200	100
3rd Ave SE	800	700
4th St SE	500	600
Broadway Ave S	1,300	700
NB Memorial Pkwy	300	900
Total	**4,600**	**5,400**
Total Portal Capacity through Constrained Portals	**1,500**	**800**
Total Portal Capacity through Unconstrained Portals	**3,100**	**4,600**

Table 3. Parking Supply Summary and Portal Capacity Impacts

User Group	New Parking Demand (spaces)[3]	Location of Parking	Constrained Portal Impacts (vehicles in peak hours)
Employee - Mayo	6,600	Remote	0
Employee - Other	2,300	250 spaces – DMC district, at development sites [4]	70 trips AM/PM
		2,050 spaces - remote	0
Patient/Visitor - Mayo	1,600	DMC district	370 trips AM/ 260 trips PM
Visitor - Other	2,300	DMC district	530 trips AM/ 370 trips PM
Student	400	DMC district	100 trips AM/PM
Residential	3,300	DMC district	0
Total	**16,500**	**7,850 spaces – DMC district 8,650 spaces – remote**	**1,070 trips AM/ 800 trips PM**

[3] Rounded values from Table 1.
[4] Calculated based on remaining PM peak portal capacity and assuming 70/30 distribution through constrained/unconstrained portals.

Table 4. New Remote Employee Parking Spaces

New Parking Demand – Remote (spaces)	Number of New Parking Spaces			
	Location 1 – TH 14/52	Location 5 – K-Mart Site	Park-and Ride	Total
Employee - Mayo	4,000	2,000 [5]	2,650	6,600
Employee - Other				2,050
Total	**4,000**	**2,000**	**2,650**	**8,650**

Summary

The findings of this parking supply concept are as follows:

- If the demand for additional patient and visitor parking is met through construction of all new facilities, only 250 net new employee spaces can be created in the DMC district due to portal capacity constraints.
    - In this scenario, 8,650 remote employee spaces would be needed.
    - Using all the availability portal capacity of the constrained portals requires new peak hour traffic to travel through the portal on Broadway Avenue S. The portals on Civic Center Drive, 2nd Street SW, and 6th Street SW would continue to be at or over capacity.
- Existing Mayo employee parking spaces that can be reallocated for patient/visitor use would allow additional net new Employee-Other (non-Mayo) parking to be constructed with individual developments or redevelopments.

[5] *Peripheral Parking Location Analysis Technical Memorandum,* May 16, 2017.

Technical Memorandum 6

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
Kimley-Horn and Associates
JoNette.Kuhnau@kimley-horn.com
651-643-0464

Date: December 28, 2017

Subject: Parking Recommendations Summary

Cc: Mona Elabbady, Transit Coordinator
Craig Vaughn, Parking Coordinator

Introduction

This memorandum summarizes the feasibility of each of the potential parking locations, building upon the previously completed peripheral parking analysis[1]. The purpose of this memorandum is to summarize the traffic analysis and other considerations used to make recommendations about parking facilities at each location. The recommendations were used in the development of the Integrated Transit scenarios.

Analysis Summary

The capacity analysis of each parking location was previously completed based on the access points to the property and the local roadway network at each of the seven parking locations, shown in **Figure 1**. Based on the capacity analysis, the potential numbers of parking stalls were identified at each location for the existing conditions, and for various levels of roadway network improvements. Following that analysis, additional discussions with the Transit and Parking teams identified other factors that ultimately led to the identification of recommended parking locations for each scenario.

Parking Location 1 – Northwest Quadrant TH 14/TH 52

This parking location was recommended to move forward for further study in the Integrated Transit scenarios based on the following considerations:

- Location outside the portals allows employee parkers to be captured before entering the portal.

[1] Peripheral Parking Location Analysis, Kimley-Horn and Associates, May 16, 2017

- The location is close enough to provide convenient transit service to downtown Rochester, and the Mayo and St. Mary's campuses.
- The analysis indicates the potential to build a significant parking structure at this location (4,000 parking spaces), with convenient access to the regional highway network (TH 14 and TH 52).

Parking Location 1 was incorporated into the DMC Modified, Scenario A, Scenario D, and Hybrid alternatives.

Parking Location 2 – Northeast Quadrant TH 14/TH 52

This parking location was not recommended to move forward for further study in the Integrated Transit scenarios based on the following considerations:

- Location inside the portal does not meet the goal of moving employee trips outside the portals, to maintain peak period street capacity for patient and visitor vehicle traffic.
- Access to the parking location from the Civic Center Drive/16th Avenue NW intersection may reduce Civic Center Drive peak period portal capacity because traffic to/from the parking would compete for intersection capacity with the primary east/west traffic through the portal on Civic Center Drive.
- Parking Location 1 was the preferred location adjacent to TH 14/TH 52. Two parking locations adjacent to the interchange were not recommended based on interchange capacity concerns.

Parking Location 2 was not included in any of the Integrated Transit scenarios for these reasons.

Parking Location 3 – Civic Center Drive between 8th Avenue and 4th Avenue

This parking location was recommended to move forward for further study in the Integrated Transit scenarios based on the following considerations:

- Location is adjacent to the DMC District, allowing for some employees to walk between parking and employment.
- The location is close enough to provide convenient transit service to downtown Rochester, and the Mayo and St. Mary's campuses.
- Location is well-suited to potentially serve as a layover or loading point for commuter buses, based on its proximity to downtown.
- The analysis indicates the potential to build a significant parking structure at this location (3,000 spaces) with moderate improvements to the transportation network.

Due to the parking location inside the portals, it was recommended that Parking Location 3 be identified only for replacement of existing employee parking that was lost within the DMC District or for employees traveling through unconstrained portals (local traffic).

Parking Location 3 was incorporated into the DMC Modified alternative.

Parking Location 4 – Fullerton Lot

This parking location was recommended to move forward for further study in the Integrated Transit scenarios based on the following considerations:

- Location is adjacent to the DMC District, allowing for some employees to walk between parking and employment.
- The location is close enough to provide convenient transit service to downtown Rochester, and the Mayo and St. Mary's campuses.
- Location is well-suited to serve Discovery Square and University of Minnesota parking needs.
- The analysis indicates the potential to build significant additional parking at this location (3,000 new spaces) with moderate improvements to the transportation network.

Due to the parking location inside the portals, it was recommended that Parking Location 4 be identified only for replacement of existing employee parking that was lost within the DMC District or for employees traveling through unconstrained portals (local traffic).

Parking Location 4 was incorporated into the DMC Modified, Scenario A, and Scenario D alternatives.

Parking Location 5 – K-Mart Site

This parking location was recommended to move forward for further study in the Integrated Transit scenarios based on the following considerations:

- Location outside the portals allows employee parkers to be captured before entering the portal.
- Parking is located near S Broadway Ave, which currently has available peak period portal capacity.
- The location is close enough to provide convenient transit service to downtown Rochester, and the Mayo and St. Mary's campuses.
- The analysis indicates the potential to build significant additional parking at this location (2,500 new spaces) with moderate improvements to the transportation network.

Parking Location 5 was incorporated into the Scenario A and Hybrid alternatives.

Parking Location 6 – Olmsted County Fairgrounds

This parking location was evaluated, but recommended for consideration beyond the 2040 timeframe of the DMC plan. This recommendation was made based on the following considerations:

- Location outside the portals allows employee parkers to be captured before entering the portal.
- Parking is located near S Broadway Ave, which currently has available peak period portal capacity.

- The analysis indicates the potential to build significant additional parking at this location (4,500 new spaces) with moderate improvements to the transportation network.
- The location is a logical extension of transit service to Parking Locations 4 and/or 5.
- The location is further away from the employment destinations, which would require more significant transit capital and operating costs to serve.

Parking Location 6 was incorporated as a future facility (beyond 2040) in the Scenario A and Hybrid alternatives.

Parking Location 7 – Miracle Mile

This parking location was not recommended to move forward for further study in the Integrated Transit scenarios based on the following considerations:

- Location inside the portal does not meet the goal of moving employee trips outside the portals, to maintain peak period street capacity for patient and visitor vehicle traffic.
- Access to the parking includes travel through the two most constrained portals during peak periods – Civic Center Drive and 2nd Street SW.
- With parking access from the existing local roadway network, the capacity for parking at this site was relatively small (500 new spaces).
- Direct access to/from TH 52 and this parking location is not feasible based on the existing interchange spacing, which is already less than standard. Adding additional access points with heavy peak period traffic flows to this already congested segment of highway would be expected to cause operational and safety issues on TH 52.

Parking Location 7 was not included in any of the Integrated Transit scenarios for these reasons.

Summary

The capacity analysis of each parking location was previously completed based on the access points to the property and the portal capacity. The results of the traffic analysis, as well as parking and transit considerations, led to the following parking sites moving forward into the Integrated Transit scenarios:

- Location 1 (Northwest Quadrant TH 14/TH 52) – DMC Modified, Scenario A, Scenario D, and Hybrid
- Location 3 (Civic Center Drive between 8th Avenue and 4th Avenue) – DMC Modified
- Location 4 (Fullerton Lot) – DMC Modified, Scenario A, and Scenario D
- Location 5 (K-Mart Site) – Scenario A and Hybrid
- Location 6 (Olmsted County Fairgrounds) – Future facility beyond 2040

The following parking sites were not recommended to move forward:

- Location 2 (Northeast Quadrant TH 14/TH 52) – Location is inside the portals and therefore is subject to constrained peak period portal capacity. Access points to the parking compete for capacity with the primary east/west traffic on Civic Center Drive.
- Location 7 (Miracle Mile) – Location is inside the portals and therefore is subject to constrained peak period portal capacity. Local street access provides limited ability for parking (less than 500 spaces), and direct freeway access is not feasible.

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Technical Memorandum 7

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
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Date: May 16, 2017

Subject: 2nd Street SW Transit Lane Analysis

Cc:

Introduction

The purpose of this technical memorandum is to summarize the traffic impacts of converting two vehicle lanes on 2nd Street SW to transit only lanes through the DMC area. The results of this analysis are intended to be used by the Integrated Transit Studies teams in the development and screening of the DMC scenarios. The analysis summarized in this memorandum represents a high-level screening, and additional detailed operational analysis of the parking will be conducted once the comprehensive DMC scenarios have been defined.

Analysis Methodology

The 2nd Street SW analysis was based on 2040 No Build traffic forecasts, as provided by the ROCOG travel demand model developed for the DMC project. The No Build scenario assumes the population and employment growth identified in the DMC plan, but does not include infrastructure improvements to accommodate this growth. The key analysis assumptions are summarized in the following bullets:

- The exclusive transit lanes will extend from S Broadway Avenue to either 14th Avenue SW or 16th Avenue SW.
- The 2nd Street SW analysis was conducted independently of the peripheral parking analysis. The 2nd Street SW analysis does not assume any new peripheral or remote parking.
- Analysis was conducted in Synchro/SimTraffic and represents a screening level of analysis.

- Existing signal phasing was assumed. The location of the transit lanes (curb lane or median), transit mode may necessitate changes in signal phasing. This would be evaluated as part of the future detailed scenario analysis.

- Existing geometrics were assumed at all intersections along 2nd Street SW, except for modifications made to accommodate the start and end points of the transit lanes.

Analysis Results

Diverted Traffic

In the AM peak, eastbound traffic is primarily impacted by the conversion of 2nd Street SW to 2 vehicle lanes and 2 exclusive transit lanes.

The AM peak hour analysis with the transit lanes extended to 16th Avenue SW showed that the existing volume exceeds the 1-lane eastbound capacity by approximately 500 vehicles per hour (vph), or 40% of the existing (2016) volume. Based on the 2040 No Build forecasts, the capacity of the single eastbound lane would be exceeded by approximately 700 vph, or about 45% to 50%.

The same analysis was completed assuming the transit lanes extend to 14th Avenue SW. With one eastbound lane, the existing volume is approximately equal to one lane of capacity and little diversion (<50 vph) would be expected. Based on the 2040 No Build forecasts, the capacity of the single eastbound lane would be exceeded by approximately 150 vph, or about 15%. This is due to the heavy right-turn movement from eastbound 2nd Street SW onto southbound 14th Avenue to access the large parking structure at St. Mary's Hospital.

In the PM, westbound traffic is the direction most impacted by the conversion of 2 lanes to transit-only lanes.

The PM peak hour analysis with the transit lanes extended to 16th Avenue SW showed that the existing volume exceeds the 1-lane westbound capacity by approximately 50 vph, or 5% of the existing (2016) volume. Based on the 2040 No Build forecasts, the capacity of the single westbound lane would be exceeded by approximately 200 vph, or about 15% to 20%%. In addition to the westbound through traffic exceeding capacity, if the transit lane is extended to 16th Avenue the current dual northbound left turn at 14th Avenue SW would need to be converted to a single northbound left turn. The existing volume would exceed the single left turn lane capacity by approximately 50 vph, or 10% of the existing (2016) volume. Based on the 2040 No Build forecasts, the capacity of the single northbound left turn lane would be exceeded by approximately 120 vph, or about 20% to 25%%. Extending the transit lane to 16th Avenue SW has a minimal effect on the westbound through capacity, however the capacity of the side streets along 2nd Street SW have significantly more queueing and delay. The additional queueing and delay is primarily centered around the Saint Mary's hospital location.

The results of the Synchro/SimTraffic analysis of the 2nd Street SW analysis are summarized in **Table 1.**

Table 1. 2nd Street SW Transit Lane Analysis: Peak Hours

Year/Peak Period	Transit Lane Extents	Peak Hour Traffic Remaining on 2nd St SW	Peak Hour Diverted Traffic	Peak Hour % Diverted Traffic
Existing AM	16th Ave SW to S Broadway Ave	750 vph eastbound*	500 vph eastbound	40%
2040 AM			700 vph eastbound	45% - 50%
Existing AM	14th Ave SW to S Broadway Ave	950 vph eastbound*	<50 vph eastbound	<5%
2040 AM			150 vph eastbound	15%
Existing PM	16th Ave SW to S Broadway Ave	850 vph westbound*	50 vph westbound	5%
2040 PM			200 vph westbound	15% - 20%
Existing PM	14th Ave SW to S Broadway Ave	850 vph westbound*	50 vph westbound	10%
2040 PM			200 vph westbound	20% - 25%

* Considered to be at capacity for 1 traffic lane

Source: Kimley-Horn and Associates

In addition to the Synchro/SimTraffic analysis, the travel demand model was also used to estimate the daily traffic volume expected to be diverted from 2nd St SW if transit-only lanes are implemented. The results from the travel demand model are summarized in **Table 2** and the raw model outputs are included in Attachment 1 and Attachment 2. The travel demand model results are consistent with the operations (Synchro/SimTraffic results).

Table 2. 2nd Street SW Transit Lane Analysis: Daily Volume – 2040 No Build

Transit Lane Extents	Maximum 2040 Daily Diverted Traffic		Diverted 2040 Traffic Between 16th Ave SW and 14th Ave SW
16th Ave SW to S Broadway Ave	4,100 vehicles eastbound 4,100 vehicles westbound	7th Ave SW to 9th Ave SW	-700 vehicles eastbound -300 vehicles westbound
14th Ave SW to S Broadway Ave	4,000 vehicles eastbound 4,000 vehicles westbound	7th Ave SW to 9th Ave SW	-100 vehicles eastbound -100 vehicles westbound

Source: SRF Consulting Group

Civic Center Drive Capacity

In the 2040 No Build infrastructure scenario, the travel demand model showed that the diverted traffic would primarily use local streets parallel to 2nd Street SW, including 4th St SW, 1st Street SW, Center St, 1st Street NW, and 2nd Street NW. Each of the local streets had a traffic increase of approximately 1,000 vehicles per day. This is due to the portals on the parallel routes of 6th Street SW and Civic Center Drive already being at or near capacity under existing volumes.

As a result, a second 2040 scenario was run in the travel demand model, with transit-only lanes on 2nd Street SW from S Broadway Avenue to 16th Avenue SW and Civic Center Drive expanded from 4 lanes to 6 lanes. The travel demand model showed that with the added capacity on Civic Center Drive, approximately 3,300 vehicles per day eastbound and 3,200 vehicles per day westbound (nearly 70% of the diverted traffic) would use Civic Center Drive instead of 2nd Street SW or the local streets. Diversion onto local streets was primarily on 1st Street SW and 4th Street SW. The results of this travel demand model run are provided in Attachment 3.

The expansion of Civic Center Drive will mitigate the reduced vehicle capacity on 2nd Street SW. Based on the forecast 2040 eastbound volumes on Civic Center Drive, it is recommended that the 6-lane section on Civic Center Drive be continued to N Broadway Avenue based on the 2040 AM peak hour eastbound volume of 1,400 vph. Finally, it should be noted that the additional peak hour capacity on Civic Center Drive is expected to be consumed by the background traffic growth plus the traffic diverted from 2nd Street SW.

Summary of Findings

The following bullets summarizing the findings regarding conversion of two lanes on 2nd Street SW from vehicle lanes to transit-only lanes:

- The extent of the transit-only lanes to 16th Avenue SW versus 14th Avenue SW makes a significant difference in the results, due to the large volume of traffic accessing St. Mary's via 14th Avenue SW.

- The type of transit guideway and its operation could increase or decrease the total amount of traffic diverted from 2nd Street SW.

- Additional capacity on Civic Center Drive would be needed to absorb the traffic volumes diverted from 2nd Street SW. The 6-lane section on Civic Center Drive is recommended to extend to Broadway Avenue.

- If additional capacity is not provided on Civic Center Drive, traffic is expected to use local streets.

- The volume of traffic that would be diverted from 2nd Street SW by the transit-only lanes would be less if employee parking was relocated from the downtown core to the periphery, because the background volume of traffic would be less.

Attachments

1. 2040 No Build Travel Demand Model Output – ADT
2. 2040 No Build Travel Demand Model Output – ADT with 2nd Street SW Transit Lanes to 16th Avenue SW
3. 2040 No Build Travel Demand Model Output – Peak Hour Volume with 2nd Street SW Transit Lanes to 16th Avenue SW
4. 2040 No Build Travel Demand Model Output – Diversion with 2nd Street SW Transit Lanes to 16th Avenue SW
5. 2040 No Build Travel Demand Model Output – Diversion with 2nd Street SW Transit Lanes to 14th Avenue SW versus 16th Avenue SW
6. 2040 No Build Travel Demand Model Output – Diversion with 2nd Street SW Transit Lanes to 16th Avenue SW + Civic Center Drive Expanded to 6 Lanes

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Technical Memorandum 8

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
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From: JoNette Kuhnau
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Date: July 12, 2017 – **REVISED October 23, 2017**

Subject: Transit Travel Time Analysis

Cc: Mona Elabbady, Transit Coordinator

Introduction

The purpose of this technical memorandum is to summarize the analysis of the transit alignments shown in the DMC Modified, A, and D scenarios[1], which are attached for reference at the end of this document. The Hybrid "A" and "B" bus routes have also been added. The results of the travel time analysis are intended to be used by the Integrated Transit Studies teams in the development of the preferred transit alignment for each scenario.

Analysis Methodology

The travel time analysis utilized 2040 No Build forecast volumes, which was the best information available at the time of the analysis. The No Build scenario assumes the population and employment growth identified in the DMC plan, but does not include infrastructure improvements to accommodate this growth. The key analysis assumptions are summarized in the following bullets:

- Existing geometrics were assumed at all intersections except for the westbound approach at 2nd Street SW/TH 52 Northbound ramp. The existing westbound approach consists of four through lanes and a right turn lane. The analysis assumed three through lanes, a shared through/right lane and an exclusive right turn lane.

[1] J8614 Downtown Rochester Integrated Transit Studies, scenario graphics dated 5/30/2017.

- The PM peak period was determined to be the worst peak period for transit travel time runs, therefore the PM peak period was the only period analyzed. The most-congested period was analyzed because this would be expected to show the greatest potential benefits of exclusive or grade-separated transit alignments.
- All transit stations were assumed to have a 40 second dwell time.
- Transit signal priority was assumed at all signalized intersections, for both mixed traffic and exclusive transit lane options.
- Transit vehicles were assumed to travel at 35 miles per hour when in dedicated lanes and at the posted speed limit when in mixed traffic.
- The extents of the VISSIM model include the downtown core. Travel time segments outside this area were estimated using the estimated free-flow link travel time (distance divided by speed) plus the intersection delay analyzed in Synchro/SimTraffic.
- Several additional assumptions were utilized for exclusive transit lanes
    - Turn movements across the exclusive transit lane were assumed to be prohibited at unsignalized intersections. These turn movements were rerouted to the nearest signalized intersection.
    - Turn movements across the exclusive transit lane were assumed to operate on a protected-only phase at signalized intersections.
- Vehicle diversion from 2nd St SW to other routes was assumed for the analysis of exclusive transit lanes on 2nd St SW.[2]
- The average travel time for grade-separated transit alignments was determined by dividing the alignment length by the assumed operating speed of 35 mph, then adding 40 seconds per station to the free flow travel time.

[2] *2nd Street SW Transit Lane Analysis Technical Memorandum*, Kimley-Horn and Associates, May 16, 2017.

Results

Transit in Mixed Traffic

Table 1 below summarizes the results for each transit alignment in mixed traffic operations, as well as the time savings if the Civic Center Drive crossing was grade separated.

Table 1: Mixed Traffic Transit Travel Time Summary

Alignment/ Scenario	One-Way Length of Corridor (Miles)	Shared Transit Lane			
		Average One-Way Peak Hour Travel Time (Minutes)	One-Way Peak Hour Travel Time Range (Minutes)	Average Roundtrip Peak Hour Travel Time, without Station Dwell (Minutes)	Average One-Way Travel Time with Grade Separation at Civic Center Drive (Minutes)
2nd St SW/ DMC Modified	2.8	16	11-18	24	15
2nd St SW/ Scenario A	2.5	13	10-14	20	12
2nd St SW/ Scenario D	3.0	20	15-22	31	19
3rd Ave NW/ DMC Modified	1.2	10	9-12	18	n/a
4th Ave NW/ DMC Modified	1.2	13	12-15	18	n/a
Hybrid/ Bus Loop "A"	3.0	15	11-17	23	15
Hybrid/ Bus Loop "B"	2.8	17	13-19	25	16

Table 2 below summarizes travel times from parking locations to St. Mary's Hospital and the Mayo Gonda Building.

Table 2: Transit Travel Time Summary to Key Destinations

Alignment/ Scenario	One-Way Length of Corridor (Miles))	Shared Transit Lane			
		Average One-Way Peak Hour Travel Time (Minutes)			
		Parking Location 1 to St. Mary's Hospital	Parking Location 1 to Mayo Gonda Building	Parking Location 5 (K-Mart) to St. Mary's Hospital	Parking Location 5 (K-Mart) to Mayo Gonda Building
Scenario A	2.5	5	7.5	8.5	6
Hybrid/ Bus Loop A	3.0	6.5	9	N/A*	5
Hybrid/ Bus Loop B	2.8	N/A*	10	8.5	6

*Would require travel to the other parking facility and layover time.

Exclusive Transit Lanes

Table 3 below summarizes the results for each transit alignment in exclusive lane operations, as well as the time savings if the Civic Center Drive crossing was grade separated.

Table 3: Exclusive Transit Lane Travel Time Summary

Alignment/ Scenario	One-Way Length of Corridor (Miles)	Exclusive Transit Lane			
		Average One-Way Peak Hour Travel Time (Minutes)	One-Way Peak Hour Travel Time Range (Minutes)	Average Roundtrip Peak Hour Travel Time, without Station Dwell (Minutes)	Average One-Way Travel Time With Grade Separation at Civic Center Drive (Minutes)
2nd St SW/ DMC Modified	2.8	15	11-17	23	14
2nd St SW/ Scenario A	2.5	12	10-14	19	11
2nd St SW/ Scenario D	3.0	18	14-22	28	17
3rd Ave NW/ DMC Modified	1.2	8	8-10	12	n/a
4th Ave NW/ DMC Modified	1.2	9	8-11	12	n/a
Hybrid/ Bus Loop "A"	3.0	14	11-16	20	13
Hybrid/ Bus Loop "B"	2.8	14	10-16	20	13

Table 4 below summarizes travel times from parking locations to St. Mary's Hospital and the Mayo Gonda Building.

Table 4: Transit Travel Time Summary to Key Destinations

Alignment/ Scenario	One-Way Length of Corridor (Miles)	Exclusive Transit Lane			
		Average One-Way Peak Hour Travel Time (Minutes)			
		Parking Location 1 to St. Mary's Hospital	Parking Location 1 to Mayo Gonda Building	Parking Location 5 (K-Mart) to St. Mary's Hospital	Parking Location 5 (K-Mart) to Mayo Gonda Building
Scenario A	2.5	5	7	5.5	5.5
Hybrid/ Bus Loop A	3.0	6	8.5	N/A*	4.5
Hybrid/ Bus Loop B	2.8	N/A*	8	5.5	5.5

*Would require travel to the other parking facility and layover time.

Based on the mixed traffic and exclusive lane analysis, exclusive transit lanes on 2nd St SW do not appear to provide significant travel time savings. Existing coordination along 2nd Street SW combined with transit signal priority provides good progression of transit vehicles with or without exclusive lanes.

Exclusive transit lanes along 3rd Ave and 4th Ave provide greater travel time savings and increased reliability, however the travel time savings are still less than 5 minutes (one way). The greatest benefit from the exclusive transit lanes are gained at the intersections with Center St W and 2nd St SW. However, the exclusive transit lanes on 3rd Ave and 4th Ave also caused the greatest vehicle congestion.

The following intersections caused the greatest delays to the transit vehicle under both options:

- Along 2nd St SW:
  - 14th Ave SW
  - 6th Ave SW
  - 1st Ave SW
  - Broadway Ave S
- Along 3rd Ave and 4th Ave:
  - 2nd Street NW (Mixed traffic options only)
  - 2nd St SW (3rd Ave intersection only)

Under both the mixed traffic and exclusive transit lane options, Scenario D consistently had the longest travel time and Scenario A consistently had the shortest travel time. Scenario D had the longest travel time because it has a slightly longer length and because it travels through the most traffic signals, particularly the congested intersections on 2nd St SW near TH 52. Scenario A had the shortest travel because it is slightly shorter, and it contains the longest segment of operations in the railroad corridor north of Civic Center Drive. There are no signalized intersections in this segment and it was assumed the transit vehicle could travel at 35 mph, which is faster than the posted speed on city streets in downtown. The Hybrid bus loops had similar travel times as scenario A (generally within 1 to 2 minutes). The segment of bus loop B on 4th Ave caused the one-way travel time to be greater than Scenario A by 4 minutes in the shared lane option.

Summary of Findings

The following bullets summarize the findings of the analyzed alternatives.

- The transit alignment in Scenario A was consistently the fastest, due to the shorter overall length and the longer segment in the railroad corridor where there are no signalized intersections.
- The transit alignment in Scenario D was consistently the slowest due to the slightly longer length and interactions with the greatest number of traffic signals, especially at the congested end of 2nd St SW near TH 52.
- Hybrid Bus Loop A and B have similar travel times to the two major employment destinations (St. Mary's Hospital and Mayo Gonda Building) as Scenario A.
- Exclusive transit lanes on 2nd St SW do not provide significant travel time savings. Existing coordination along 2nd Street SW combined with transit signal priority provides good progression of transit vehicles with or without exclusive lanes.
- Exclusive transit lanes along 3rd Ave and 4th Ave provide greater travel time savings and increased reliability, however the travel time savings are still less than 5 minutes (one way). The greatest benefit from the exclusive transit lanes are gained at the intersections with Center St W and 2nd St SW. Exclusive transit lanes on 3rd Ave and 4th Ave also cause the greatest traffic congestion, particularly at 2nd St SW.

Attachments

1. Integrated Transit Studies scenario graphics dated 5/30/2017.
2. Hybrid bus loop alternative description dated 10/18/2017.

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Technical Memorandum 9

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
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From: JoNette Kuhnau
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Date: November 9, 2017 **– REVISED December 14, 2017**

Subject: Transit Scenario Traffic Operations Analysis

Cc:

Introduction

This memorandum summarizes the traffic operations analysis completed for each transit scenario. The purpose of the analysis was to identify traffic operations issues, which will aid in the decision-making process to select a transit scenario.

Assumptions

The assumptions used in the analysis are summarized in the following bullets:

- Analysis was completed in Synchro using Highway Capacity (HCM) methodologies relating volume to capacity (v/c) for roadway segments.
- Analysis was completed for PM peak operations.
- Existing analysis was based on existing traffic volumes collected in 2016 and 2017.
- No Build (2040) analysis was based on forecast volumes from the ROCOG model, produced by SRF in spring 2017. The No Build scenario reflects DMC development but does not include parking, transit, or other measures to accommodate the increased growth.
- 2040 analysis for the DMC Modified, A, and D scenarios was based on forecast volumes from the ROCOG model, developed by SRF in October 2017.
    - The traffic forecasts are based on the Development Concept parking supply.
- 2040 analysis for the Hybrid scenario was based on forecast volumes from the ROCOG model, developed by SRF in December 2017.
    - The traffic forecasts are based on no new Mayo employee parking within the DMC district.

- The vehicle and transit lane geometrics for the DMC Modified, A, and D scenarios were based on the geometrics layouts dated October 11, 2017.
- The vehicle and transit lane geometrics for the Hybrid scenario was based on the geometric layouts dated December 12, 2017.
- Scenarios with reductions in vehicle lanes, compared to existing, are summarized in **Figure 1**.
- On the maps, green roadway segments should be interpreted as under capacity (acceptable operations, yellow and orange segments are nearing capacity, and red segments identify are over capacity and have poor operations.

Analysis Results

The analysis results are shown in **Figure 2-7**. A summary of key findings for each scenario are provided in the following sections.

Existing PM Peak

The operations analysis for the Existing PM Peak is shown in **Figure 2.**

- Operations on Civic Center Drive are over capacity in the peak direction.
- Operations on 2nd Street SW are nearing capacity west of 14th Avenue SW due to heavy traffic volumes and unbalanced lane use at the TH 52 interchange.
- Northbound 14th Avenue SW is at capacity due to a high left turn volume from St. Mary's to TH 52.
- 6th Street SW is over capacity at 14th Avenue SW, due to the high traffic volumes, single lane approaches, and all-way stop control.
- Operations on 1st Avenue SW are nearing capacity from 4th Street SW to Center Street. As the only two-way north-south street between Broadway Avenue and 6th Avenue, 1st Avenue carries significant circulating traffic in the downtown core.
- Portions of 3rd Avenue SW and 4th Avenue SW carry significant volumes to and from parking areas in downtown and are nearing capacity.

Under Existing conditions, there is limited additional capacity to/from the DMC District via 2nd Street or 6th Street. There is no additional capacity to/from the DMC District via Civic Center Drive.

No Build 2040 PM Peak

The operations analysis for the No Build 2040 PM Peak is shown in **Figure 3.**

- Operations on Civic Center Drive are over capacity in the peak direction.
- Operations on 2nd Street SW are at capacity at 16th Avenue SW, and are worse than in the Existing conditions. The worsening congestion at the intersection also causes 16th Avenue SW to operate over capacity.
- Northbound 14th Avenue SW is at capacity due to a high left turn volume from St. Mary's to TH 52.
- 6th Street SW is over capacity at 14th Avenue SW, due to the high traffic volumes, single lane approaches, and all-way stop control. The operations are significantly worse than in the Existing conditions.
- Operations on 1st Avenue SW, 3rd Avenue SW, and 4th Avenue SW in the downtown area are close to capacity between Center Street W and 4th Street SW, and are notably worse than in the Existing conditions. This is primarily due to the increased downtown employment in the No Build scenario.
- Poor operations on Civic Center Drive between Silver Lake Drive and N Broadway Avenue are due to the stop control at Silver Lake Drive in the eastbound direction, and due to the high volumes and signal operations at the Broadway Avenue/Civic Center Drive intersection.
- Under existing conditions, there is limited additional capacity to/from the DMC District via 2nd Street or 6th Street. There is no additional capacity to/from the DMC District via Civic Center Drive.

Under 2040 No Build conditions, 2nd Street, 6th Street, and Civic Center Drive are all over capacity due to the increased downtown employment without corresponding roadway or transit improvements. In addition, circulation within the DMC District is congested due to all the vehicle traffic within the district.

DMC Modified 2040 PM Peak

The operations analysis for the DMC Modified 2040 PM Peak is shown in **Figure 4.**

- Operations on Civic Center Drive are over capacity in the peak direction. Volumes do not differ significantly from the No Build scenario, but operations are worse than No Build due to the transit alignment diagonally through the Civic Center Drive/16th Avenue NW intersection.
- Operations on 2nd Street SW are nearing or at capacity due to exclusive transit lanes. Several of the cross streets also show over capacity operations due to the congestion on 2nd Street SW.
    - West of the 14th Avenue SW intersection, 2nd Street SW is significantly over capacity due to the large volume of traffic from St. Mary's to TH 52 and due to the diagonal transit alignment at 2nd Street SW/16th Avenue SW.
- 6th Street SW is over capacity at 14th Avenue SW, due to the high traffic volumes, single lane approaches, and all-way stop control. The operations are similar to the No Build conditions.

- Operations on 1st Avenue SW, 3rd Avenue SW, and 4th Avenue SW in the downtown area are nearing capacity between Center Street W and 4th Street SW, but are better than in the No Build conditions based on employee parking located out of the downtown core.
    - The shared transit lanes on 3rd Avenue SW and 4th Avenue SW do not have significant impacts on traffic operations.
- Poor operations on Civic Center Drive between Silver Lake Drive and N Broadway Avenue are due to the stop control at Silver Lake Drive in the eastbound direction, and due to the high volumes and signal operations at the Broadway Avenue/Civic Center Drive intersection. The operations are similar to the No Build conditions.
- Operations on 6th Street SW between S Broadway Avenue and 4th Avenue SW are over capacity due to the exclusive transit lanes, particularly at the capacity constrained intersection with S Broadway Avenue.

Under 2040 DMC Modified conditions, Civic Center Drive and 2nd Street SW west of 14th Avenue SW are over capacity. In addition to the vehicle volumes and roadway capacity, the operations are negatively impacted by the diagonal transit alignment through the Civic Center Drive/16th Avenue SW and 2nd Street SW/16th Avenue SW intersections. The shared transit lanes on 3rd Avenue and 4th Avenue do not have significant operations impacts.

Scenario A 2040 PM Peak

The operations analysis for the Scenario A 2040 PM Peak is shown in **Figure 5.**

- Operations on Civic Center Drive are over capacity in the peak direction. Volumes do not differ significantly from No Build. Operations at 11th Avenue NW are severely impacted by the transit alignment, vehicle lanes on 11th Avenue NW, and the volumes on 11th Avenue NW.
    - Lane reductions on 11th Avenue NW have significant operational impacts because 11th Avenue NW carries 7,400 to 13,700 vehicles per day and requires more than a single northbound lane at the Civic Center Drive intersection. This limits transit station placement near the intersection and/or requires additional right-of-way to accommodate exclusive transit lanes and provide adequate traffic capacity.
- Operations on 2nd Street SW are nearing or at capacity due to the reduction in vehicle lanes. Several of the cross streets also show over capacity operations due to the congestion on 2nd Street SW.
    - The street segment west of 14th Avenue SW intersection operates significantly better than in the DMC Modified scenario because there are four vehicle lanes west of 11th Avenue SW.
    - The southbound approach on 11th Avenue SW operates better than in the DMC Modified scenario because it is compatible with the transit movement and therefore benefits from additional green time at the signal.
- 6th Street SW is over capacity at 14th Avenue SW, due to the high traffic volumes, single lane approaches, and all-way stop control. The operations are similar to the No Build conditions.

- Operations on 1st Avenue SW, 3rd Avenue SW, and 4th Avenue SW in the downtown area are nearing capacity between Center Street W and 4th Street SW, but are better than in the No Build conditions based on employee parking located out of the downtown core.
    - The shared transit lanes on 3rd Avenue SW and 4th Avenue SW do not have significant impacts on traffic operations.
- Poor operations on Civic Center Drive between Silver Lake Drive and N Broadway Avenue are due to the stop control at Silver Lake Drive in the eastbound direction, and due to the high volumes and signal operations at the Broadway Avenue/Civic Center Drive intersection. The operations are similar to the No Build conditions.
- Operations on 3rd Avenue SE at 6th Street SE are over capacity due to the signal phasing needed to accommodate exclusive transit lanes and phasing.

Under 2040 Scenario A conditions, Civic Center Drive is over capacity. The intersection of Civic Center Drive/11th Avenue NW has poor operations due to the exclusive transit lanes and reduced vehicle lane capacity on 11th Avenue NW. The shared transit lanes on 3rd Avenue and 4th Avenue do not have significant operations impacts.

Scenario D 2040 PM Peak

The operations analysis for the Scenario D 2040 PM Peak is shown in **Figure 6.**

- Operations on Civic Center Drive are over capacity in the peak direction. Volumes do not differ significantly from No Build and have similar operational issues.
- Operations on 2nd Street SW are similar to the Existing conditions because there are no reductions in vehicle lanes.
- 6th Street SW is over capacity at 14th Avenue SW, due to the high traffic volumes, single lane approaches, and all-way stop control. The operations are similar to the No Build conditions.
- Operations on 1st Avenue SW, 3rd Avenue SW, and 4th Avenue SW in the downtown area are nearing capacity between Center Street W and 4th Street SW, but are better than in the No Build conditions based on employee parking located out of the downtown core.
- Poor operations on Civic Center Drive between Silver Lake Drive and N Broadway Avenue are due to the stop control at Silver Lake Drive in the eastbound direction, and due to the high volumes and signal operations at the Broadway Avenue/Civic Center Drive intersection. The operations are similar to the No Build conditions.

Under 2040 Scenario D conditions, Civic Center Drive is over capacity. Operations on 2nd Street are similar to Existing conditions because transit is elevated above the street, with no reduction in vehicle lanes.

Hybrid 2040 PM Peak

The operations analysis for the Hybrid 2040 PM Peak is shown in **Figure 7.**

- Operations on Civic Center Drive are under capacity in the peak direction. Volumes do not differ significantly from No Build, but are better accommodated on the six-lane roadway. The

transit alignment on Civil Center Drive east of 11th Avenue results in better operations than the other 2040 scenarios due to the added capacity of the 6-lane section.

- Operations on 2nd Street SW are nearing capacity in a few segments due to the reduction in vehicle lanes. The provision of left-turn lanes allow for the most efficient operations of through traffic on 2nd Street SW.
- 6th Street SW is over capacity at 14th Avenue SW, due to the high traffic volumes, single lane approaches, and all-way stop control. The operations are similar to the No Build conditions.
- Operations on 1st Avenue SW in the downtown area are nearing capacity between Center Street W and 4th Street SW, but are better than in the No Build conditions based on employee parking located out of the downtown core.
- The shared transit lanes on 3rd Avenue SW and 4th Avenue SW do not have significant impacts on traffic operations.
- Poor operations on Civic Center Drive between Silver Lake Drive and N Broadway Avenue are due to the stop control at Silver Lake Drive in the eastbound direction, and due to the high volumes and signal operations at the Broadway Avenue/Civic Center Drive intersection. The operations are similar to the No Build conditions.
- Operations on 6th Street SW between S Broadway Avenue and 4th Avenue SW are nearing or over capacity due to the exclusive transit lanes, particularly at the capacity constrained intersection with S Broadway Avenue.

Under 2040 Hybrid conditions, Civic Center Drive does not operate over capacity. Operations on 2nd Street SW are nearing capacity, but are generally acceptable based on provision of turn lanes for left turns across the exclusive transit lanes. The shared transit lanes on 3rd Avenue and 4th Avenue do not have significant operations impacts.

Findings and Recommendations

The findings of the traffic operations analysis are as follows:

- All of the 2040 scenarios suggest that a six-lane Civic Center Drive would be needed to accommodate the forecast volumes between 16th Avenue NW and N Broadway.
- Congestion will increase on 2nd Street SW with exclusive transit lanes. Some segments may operate over capacity, especially where there are heavy left turn movements onto or off 2nd Street SW.
    - Removal of vehicle lanes west of 14th Avenue SW causes significant operational issues, particularly for traffic entering and exiting the St. Mary's campus.
- Traffic volumes on 11th Avenue NW require more than one approach lane at Civic Center Drive. This limits transit station placement near the intersection and/or requires additional right-of-way to accommodate exclusive transit lanes and provide adequate traffic capacity.
- Exclusive transit lanes on 3rd Avenue and 4th Avenue cause over capacity operations from 4th Street SW to Center Street due to the vehicle volumes and exclusive transit phases. Shared transit lanes on 3rd Avenue and 4th Avenue do not have any significant operational issues.

- For all street segments with exclusive transit lanes, turn lanes for vehicle movements across the transit lanes will minimize the need for exclusive phasing and lessen the overall intersection operations impacts.

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Technical Memorandum 10

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
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From: JoNette Kuhnau
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Date: December 6, 2017 – **REVISED January 19, 2018**

Subject: Transit Scenario Traffic Analysis Mitigation Summary

Cc:

Introduction

This memorandum summarizes the traffic analysis completed to identify potential mitigations to the 2040 traffic operations resulting from each of the transit scenarios. Areas in need of mitigation were considered to be red links as shown in the maps attached to the Transit Scenario Traffic Operations Analysis memorandum[1]. The purpose of the mitigation analysis is to identify potential mitigation measures to inform the scenario evaluation and cost estimating.

Assumptions

The assumptions used in the analysis are summarized in the following bullets:

- Analysis was completed in Synchro for signalized and unsignalized intersections.
- Analysis was completed in Rodel for roundabouts.
- Analysis was completed for 2040 PM peak operations,
- If multiple scenarios had a similar operational issue, the scenario with the highest volumes was analyzed to identify the potential mitigation.

Analysis Results

Eight areas were identified as having traffic operations issues in 2040 in one or more scenarios:

- 6th Street SW at 14th Avenue SW
- Civic Center Drive at Silver Lake Drive
- Civic Center Drive from 16th Avenue NW to N Broadway Avenue

[1] *Transit Scenario Traffic Operations Analysis*, December 14, 2017

- 11th Avenue NW at Civic Center Drive
- 2nd Street SW from TH 52 to Civic Center Drive
- 3rd Avenue NW/SW and 4th Avenue NW/SW from 6th Street SW to Civic Center Drive
- 6th Street SW from 4th Avenue SW to 3rd Avenue SE
- 3rd Avenue SE from 2nd Street SW to 6th Street SW

6th Street SW at 14th Avenue SW

Under all scenarios, the existing all-way stop controlled intersection operates over capacity during peak hours and the stop control does not efficiently handle large directional traffic volumes. Two mitigation treatments were tested at this intersection:

- Convert the intersection to a signalized intersection (no turn lanes).
- Convert the intersection to a single lane roundabout.

Under both mitigation options the intersection would operate at an acceptable level of service (LOS) and address the over-capacity operations. The roundabout would have right-of-way impacts on adjacent residential properties.

Civic Center Drive at Silver Lake Drive

Under all scenarios, the existing side-street stop on Civic Center Drive operates inefficiently during peak hours when significant traffic volumes are entering/exiting the downtown area. Two mitigation treatments were analyzed at this intersection:

- Convert the intersection to a coordinated signalized intersection with an eastbound free flow right turn lane.
- Convert the intersection to a roundabout. It was determined that a multilane roundabout would be needed based on lane continuity and traffic volumes.

Under both mitigation options, the intersection would operate at an acceptable LOS and would address the over-capacity operations. The roundabout would have right-of-way impacts on adjacent parking lots.

Civic Center Drive between 16th Avenue NW and Broadway Avenue

Under all scenarios except for the Hybrid Scenario, Civic Center Drive is anticipated to operate over-capacity for multiple segments. The Hybrid Scenario already includes a six-lane section. Based on the forecast volumes, a six-lane section on Civic Center Drive between TH 52 and 4th Avenue NW would address the over-capacity operations. The 6-lane section should be considered to extend to Broadway Avenue for continuity.

11th Avenue NW at Civic Center Drive

Under all scenarios, 11th Avenue NW at Civic Center Drive is anticipated to operate over capacity. Two levels of mitigation were analyzed at this intersection.

Expand Civic Center Drive to a 6-Lane Cross Section

Under the DMC Modified Scenario and Scenario D (transit alignments that do not travel through the 11th Avenue NW/Civic Center Drive intersection), the identified mitigation on Civic Center Drive (six-lane section) would also improve the 11th Avenue NW intersection to an acceptable LOS.

Expand Civic Center Drive to a 6-Lane Cross Section and Modify Intersection Geometry

Under Scenario A and the Hybrid Scenario (transit alignments that travel through the 11th Avenue NW/Civic Center Drive intersection), the identified mitigation on Civic Center Drive (six-lane cross section) would be needed as well as the following geometric modifications to improve the intersection to an acceptable LOS:

- Modify the southbound approach to a left-turn lane, a through lane, and a right-turn lane.
- Modify the northbound approach to a left-turn lane, a through lane, and a shared through/right-turn lane.

These mitigations have already been added to the Hybrid Scenario geometric layouts dated December 12, 2017. The mitigations have not been been incorporated into the Scenario A transit geometric layouts dated October 11, 2017.

2nd Street SW

Under all scenarios, except for Scenario D, 2nd Street SW is anticipated to operate over-capacity for one or more segments due to the exclusive transit lanes. Three key areas were the focus for mitigation.

2nd Street SW/9th Avenue SW

Eastbound (into parking lot)/westbound left-turn lanes eliminate the need for split phased operation, and eliminate the over-capacity operations. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario geometric layouts dated December 12, 2017.

2nd Street SW/11th Avenue SW

At the intersection of 11th Avenue SW and 2nd Street SW, it was determined that left-turn lanes would be needed on each approach to operate at an acceptable LOS. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario geometric layouts dated December 12, 2017.

The concept of a modified rotary between 9th Avenue SW and 11th Avenue SW, as shown in the DMC Development Plan, is feasible but would be expected to require additional right-of-way.

2nd Street SW between 14th Avenue SW and TH 52

Maintaining four through vehicle lanes on 2nd Street SW between 14th Avenue SW and TH 52, in addition to the transit lanes, will maintain an acceptable LOS. This will require the purchase of additional right-of-way to provide four vehicle lanes and exclusive transit lanes. This mitigation applies to the DMC Modified scenario, but has not been incorporated into the transit geometric layouts dated October 11, 2017.

3rd Avenue NW/SW and 4th Avenue NW/SW

Under the DMC Modified scenario, which includes a single vehicle lane and an exclusive transit lane on 3rd Avenue NW and 4th Avenue NW, both streets are anticipated to operate over capacity due to overall vehicle volumes and turning vehicles. Mitigation would be maintaining two lanes for vehicle traffic. This mitigation has already been incorporated into the DMC Modified geometric layouts dated October 11, 2017.

6th Street SW

Under the DMC Modified scenario, 6th Street SW operated over-capacity with a single vehicle lane and exclusive transit lanes between 3rd Avenue SW and S Broadway. Mitigation for the operations could include the following options:

- Provide left-turn lanes at all signalized intersections, which allows the signal to operate more efficiently by eliminating the need for split phase signal operations.
- Operate the transit in shared lanes.

This mitigation applies to the DMC Modified scenario, but has not been incorporated into the transit geometric layouts dated October 11, 2017.

3rd Avenue SE

The intersections of 3rd Avenue SE/6th Street SE and 3rd Avenue SE/9th Street SE are anticipated to operate over-capacity in scenario A, which includes exclusive transit lanes on 3rd Avenue SE. Mitigation for the operations could include the following options:

- Provide left-turn lanes at all signalized intersections, which allows the signal to operate more efficiently by eliminating the need for split phase signal operations across the transit lanes.
- Operate the transit in shared lanes.

This mitigation applies to Scenario A, but has not been incorporated into the transit geometric layouts dated October 11, 2017.

Summary and Next Steps

The following feasible mitigation measures have been identified for each of the anticipated over-capacity areas (based on the 2040 analysis). Updated traffic operations heat maps, with the mitigation measures incorporated are shown in **Figures 1-4**. Mitigations that were not implemented into the analysis, based on the current transit geometric layouts, are noted below.

- 6th Street SW/14th Avenue SW – Install traffic signal or construct roundabout. This mitigation applies to all scenarios.
- Civic Center Drive/Silver Lake Drive – Install traffic signal or construct roundabout. This mitigation applies to all scenarios.
- Civic Center Drive between TH 52 and Broadway Avenue – Construct 6-lane roadway section. This mitigation applies to all scenarios except the Hybrid Scenario, which already includes a six-lane section on Civic Center Drive.
- 11th Avenue NW at Civic Center Drive
  These mitigations apply to Scenario A and the Hybrid Scenario. The mitigations have already been added to the Hybrid Scenario geometric layouts dated December 12, 2017. The mitigations have not been implemented into the Scenario A transit geometric layouts dated October 11, 2017.
    - Covert the southbound approach to a left-turn lane, a through lane, and a right-turn lane.
    - Convert the northbound approach to a left-turn lane, a through lane, and a shared through/right lane.
- 2nd Street SW
    - Provide eastbound (into parking lot) and westbound left-turn lanes at 2nd Street SW/9th Avenue SW. This mitigation applies to all scenarios except Scenario D. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario transit geometric layouts dated December 12, 2017.
    - Provide left-turn lanes on all approaches at 2nd Street SW/11th Avenue SW. This mitigation applies to all scenarios except Scenario D. The turn lanes have already been added to the DMC Modified and Scenario A geometric layouts dated October 11, 2017 and to the Hybrid Scenario transit geometric layouts dated December 12, 2017.
    - The concept of a modified rotary between 9th Avenue SW and 11th Avenue SW, as shown in the DMC Development Plan, is feasible but would be expected to require additional right-of-way.
    - Maintain four through vehicle lanes on 2nd Street SW between 14th Avenue SW and TH 52, in addition to the transit lanes. This mitigation applies to the DMC Modified scenario, but has not been implemented into the transit geometric layouts dated October 11, 2017.
- 3rd Avenue NW/SW and 4th Avenue NW/SW – Provide two vehicle lanes. This mitigation applies to the DMC Modified Scenario and has already been implemented into the transit geometric layouts dated October 11, 2017.
- 6th Street SW – Provide left-turn lanes at signalized intersections or operate transit in shared lanes. This mitigation applies to the DMC Modified Scenario, but has not been implemented into the transit geometric layouts dated October 11, 2017.
- 3rd Avenue SE – Provide left-turn lanes at signalized intersections or operate transit in shared lanes. This mitigation applied to Scenario A, but has not been implemented into the transit geometric layouts dated October 11, 2017.

The identified mitigations should be considered in the future development and refinement of the scenarios and any mitigation measures should be included in the cost estimates. Additional refined traffic analysis should be completed once a preferred transit scenario has been identified.

Technical Memorandum 11

DMC Project No. J8623

To: Pat Corkle, Street Use Coordinator
SRF Consulting Group

From: JoNette Kuhnau
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Date: October 2, 2017

Subject: City Loop – Traffic Evaluation

Cc: Joni Giese, City Loop Coordinator

Introduction

This memorandum documents the evaluation of several City Loop Concepts and other potential pedestrian and bicycle scenarios suggested or proposed by other stakeholders in the DMC district. The purpose of the traffic evaluation is to inform the City Loop team and others on the potential implications of these scenarios.

Assumptions

The evaluation was based on existing peak hour and daily volumes. Forecast volumes for the four Integrated Transit Scenarios were not available at the time of the evaluation. Detailed microsimulation was not conducted at this time.

Evaluation

City Loop on Civic Center Drive

The City Loop alignment for Scenario A runs on Civic Center Drive between W Silver Lake Drive and 2nd Street SE. Constructing the City Loop would require removing one travel lane from this segment of roadway, which currently has 5 lanes (two lanes in each direction and a center left-turn lane that extends the entire segment).

The approach of W Silver Lake Drive at Civic Center Drive was previously evaluated as part of the portal capacity analysis.[1] The portal capacity analysis was adjusted for this evaluation to address the volumes and capacity south of Civil Center Drive, which is summarized in **Table 1** below.

Table 1. Civic Center Drive Portal Capacity

Peak Hour	Portal Capacity (vehicles)	Existing Volume (vehicles)	Remaining Capacity (vehicles)
AM (southbound)	1,900	800	1,100
PM (northbound)	1,900	875	1,025

The portal does not directly connect to the regional network, therefore for the purposes of this evaluation a maximum rate of future traffic growth of 15 to 20 percent was estimated by 2040. With 20 percent growth, there would still be approximately 45 to 50 percent of the portal capacity available in the peak hours. This indicates that one lane could be removed without impacting portal capacity.

The operations of the intersections along this segment were also evaluated, as follows:

- W Silver Lake Drive/Civic Center Drive
    - Designated or de-facto northbound left-turn lane needed due to very high left-turn volume in PM peak (existing volume of approximately 400 vehicles)
- Civic Center Drive/Center Street
    - Southbound left-turn phase or lane needed due to high left-turn volume in AM and PM peak (existing volume of approximately 250 vehicles in each peak)

Due to the total approach volumes of 700 to 850 vehicles per hour in each direction between W Silver Lake Drive and Center Street during the peaks, either a three-lane or four-lane roadway section would be recommended. If this City Loop alignment is chosen, additional detailed simulation analysis should be conducted to determine the appropriate roadway geometry.

Street Closure on 2nd Avenue SW

The Heart of the City project has proposed that 2nd Avenue SW be closed to vehicle traffic from 2nd Street SW to 6th Street SW to extend the plaza north of 2nd Street SW and enhance the pedestrian environment.

[1] *Portal Capacity Methodology Technical Memorandum*, Kimley-Horn and Associates, January 18, 2017

An existing traffic count was conducted at 2nd Avenue SW/2nd Street SW in October 2016. No other data was collected on 2nd Avenue SW as part of this study. The 2nd Avenue SW count is summarized in **Table 2**.

Table 2. 2nd Avenue SW Existing Traffic

Peak Hour	Existing Volume (vehicles)		
	Northbound	Southbound	Total
AM	40	70	110
PM	150	80	230
Daily (estimated based on 13-hour count)	830	850	1,680

The existing volume on 2nd Avenue SW is not significant, but there are several access and circulation considerations in closing this street:

- Closing 2nd Avenue SW would disrupt the street grid, which currently allows for good access and local circulation and allows traffic to be relatively balanced among the local street network.

- Rochester City Lines commuter buses currently use 2nd Avenue SW between 2nd Street SW and 3rd Street SW for loading in the afternoon. If 2nd Avenue SW were closed, these buses would need to be relocated to another street or to a mobility hub.

- Existing surface parking lots between 4th Street SW and 6th Street SW, totaling approximately 400 spaces, currently have driveway access on 2nd Avenue SW.

- 3rd Avenue SW/4th Avenue SW
    - Closure of 2nd Avenue SW would likely result in increased traffic on 3rd Avenue SW and 4th Avenue SW
    - Existing traffic volume on 3rd Avenue SW is approximately 2,500 vehicles per day and traffic on 4th Avenue SW is approximately 3,500 vehicles per day
    - A 700-900 space parking ramp is planned to be constructed between 4th Street SW and 5th Street SW as part of Discovery Square, with its access assumed to be only on 3rd Avenue SW[2]
    - The combination of existing traffic, the closure of 2nd Avenue SW, and the construction of the Discovery Square parking ramp would be expected to cause traffic on 3rd Avenue SW to more than double, to approximately 5,500 to 6,000 vehicles per

[2] *Discovery Square Traffic Impact Report*, August 2017.

day. Traffic on 4th Avenue SW would be expected to increase to approximately 4,500 to 5,000 vehicles per day.

- The increased traffic on 3rd Avenue SW and 4th Avenue SW are proposed to be accommodated in two vehicle lanes in all of the Integrated Transit Study scenarios, however one of the lanes is shared with a tram in the DMC Modified scenario.
- Scenario A and Scenario D include the City Loop alignment on 4th Avenue SW. The increased traffic combined with space for the City Loop could affect the traffic lanes or parking available.

The closure of 2nd Avenue SW appears feasible from a traffic volume perspective, but needs to be considered in the larger context of local access, downtown circulation, and the combined traffic impacts on other adjacent streets. If the closure of 2nd Avenue SW is pursued further, detailed simulation should be done in conjunction with all other street closures and modifications, including potential exclusive transit lanes on 2nd Street SW, 3rd Avenue SE, and 6th Street SE, a shared street on 1st Avenue NW/SW, and any other lane changes, to evaluate the comprehensive impacts on the downtown street network.

Shared Street on 1st Avenue NW/SW

Stakeholders have suggested that 1st Avenue NW/SW from 2nd Street NW to 6th Street SW be converted to a shared street. A shared street would have all modes sharing the same space with no curbs. All modes, including vehicles, would be expected to travel slowly and it has been assumed there would be no on-street parking.

Existing traffic counts were conducted on 1st Avenue NW/SW at 2nd Street NW, Center Street, 2nd Street SW, 4th Street SW, and 6th Street SW in October and November 2016. The counts at Center Street and 4th Street SW are summarized in **Table 3**.

Table 3. 1st Avenue NW/SW Existing Traffic

Location	Peak Hour	Existing Volume (vehicles)		
		Northbound	Southbound	Total
1st Avenue NW/SW /Center Street	AM	170	220	390
	PM	270	210	480
	Daily (estimated based on 13-hour count)	2,400	2,600	5,000
1st Avenue SW/ 4th Street SW	AM	220	90	310
	PM	180	340	520
	Daily (estimated based on 13-hour count)	2,300	2,750	5,050

The existing traffic volumes are high for a shared street and these volumes are influenced by the existing on-street parking, access to large parking ramp facilities near 2nd Street NW and 3rd Street

SW, access to surface parking near 5th Street SW, drive-through drop-off access to hotel and Mayo buildings, and the numerous store fronts and businesses on 1st Avenue NW/SW.

If 1st Avenue NW/SW were to be converted to a shared street, some of the existing traffic would likely divert to other streets. South of 2nd Street SW, 2nd Avenue SW is also a two-way street and would be able to absorb this additional traffic. However, if 2nd Avenue SW is closed to all traffic then vehicles would need to divert to either Broadway Avenue S or 3rd Avenue SW/4th Avenue SW. In addition, if transit exclusive lanes are designated on 2nd Street SW and 6th Street SW, there could be difficulty in traffic circulating to Broadway Avenue S or 3rd Avenue SW/4th Avenue SW. North of 2nd Street SW, the traffic would need to either use Broadway Avenue or the one-way pair of 3rd Avenue/4th Avenue. Adding another 1,000-2,000 vehicles per day to these streets impacts the function and character of these streets as well, impacts pedestrian conflicts and crossings, and would put significant traffic pressure on these streets to carry virtually all the north/south circulation traffic in this part of the DMC district in addition to pedestrians/bicyclists on the City Loop (all scenarios) and a tram (DMC Modified).

It is also assumed that a shared street would result in the loss of most of the existing on-street spaces, a total of approximately 220 spaces currently used by customers and visitors. If removed, additional structured parking would need to be constructed elsewhere and added to the total 3,900 net new parking spaces needed for patients and visitors within the DMC district.[3]

Summary

The evaluation of the City Loop and other potential pedestrian and bicycle scenarios are as follows:

- It would be feasible from a traffic volume perspective to remove one traffic lane on Civic Center Drive between W Silver Lake Rd and 2nd Street SW. Either a three-lane or four-lane roadway section would be recommended on Civic Center Drive to accommodate forecast volumes.
    - If this City Loop alignment is chosen, additional detailed simulation analysis should be conducted to determine the appropriate roadway geometry.
- The closure of 2nd Avenue SW appears feasible from a traffic volume perspective if it was a standalone change. However, if pursued the following issues and impacts would need to be further analyzed:
    - Rochester City Lines commuter buses would need to be relocated to another street or mobility hub.
    - Access to existing surface parking lots between 4th Street SW and 6th Street SW, totaling approximately 400 spaces, would need to be configured.

[3] Existing and Future Peak Parking Demand by User Type, DMC Park+ model, July 7, 2017.

  - Closure of 2nd Avenue SW combined with construction of the Discovery Square development would cause traffic on 3rd Avenue SW to more than double, to approximately 5,500 to 6,000 vehicles per day. Traffic on 4th Avenue SW would be expected to increase to approximately 4,500 to 5,000 vehicles per day.
  - Additional detailed simulation analysis should be conducted that includes all proposed roadway closures and modifications to determine the comprehensive impacts on access and circulation in the downtown network.

- 1st Avenue NW/SW between 2nd Street NW to 6th Street SW carries a relatively high traffic volume to be considered for conversion to a shared street. If pursued, the following issues and impacts would need to be further analyzed:

  - Diversion of a portion of the existing 5,000 vehicles per day to adjacent street.
  - If 2nd Avenue SW is also closed to traffic, this would create significant traffic pressure on Broadway Avenue S and 3rd Avenue/4th Avenue as the only north/south circulation streets in this part of the DMC district.
  - All or a portion of the existing 220 on-street parking spaces would be removed and would need to be replaced elsewhere to meet the total net new demand of 3,900 spaces for patients/visitors in the DMC district.
  - Additional detailed simulation analysis should be conducted that includes all proposed roadway closures and modifications to determine the comprehensive impacts on access and circulation in the downtown network.

- Changes to forecasted or actual land uses, or construction of additional new parking facilities along 1st Avenue NW/SW or 2nd Avenue SW would result in additional traffic impacts in these scenarios.