US 169/I-70 North Loop
Planning & Environmental Linkages Study

Traffic and Transportation Report of Findings

Draft – April 13th, 2018

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List of Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
AC	Access Consolidation
ADT	Average Daily Traffic
AM	Morning Peak Hour
AWSC	All-Way Stop Controlled
CBD	Central Business District
CF	Compressed Footprint
DOT	Department of Transportation
E	Existing
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
ITE	Institute of Transportation Engineers
LOS	Level of Service
NB	No-Build
O-D	Origin – Destination
PHF	Peak Hour Factor
PM	Evening Peak Hour
RR	Remove and Reclassify
v/c	Volume to Capacity Ratio

1. Introduction and Overview

The overall goal of the US 169/I-70 North Loop Planning and Environmental Linkages (PEL) Study is to position the Mid America Regional Council (MARC) and its partners for future work to finalize National Environmental Policy Act (NEPA) documentation for segments of independent utility within the defined study area. The area of influence referred to as the study area is generally defined by the US-169/Route 9 interchange to the north, I-670 to the south, the I-70/670 interchange in Wyandotte County, Kansas to the west, and the I-70/I-670 interchange in Jackson County, Missouri, to the east.

1.1 Study Area Description

The EMME model limits include four Missouri counties and four Kansas counties in the Kansas City metropolitan area. Missouri counties include: Platte, Clay, Jackson, and Cass. Kansas counties include: Leavenworth, Wyandotte, Johnson, and Miami. The DTA model is centered within the EMME model limits and is defined as being within the borders of I-435 to the east, I-435 to the west, I-29/I-35 to the north, and Shawnee Mission Parkway/Volker Boulevard to the south.

The area of influence, referred to as the study area, is generally defined as being bordered by the US-169/ Route 9 interchange to the north, I-670 to the south, the I-70/670 interchange in Wyandotte County, Kansas to the west, and the I-70/I-670 interchange in Jackson County, Missouri, to the east. The PEL Study focuses on development of a master plan that identifies and evaluates reasonable strategies for the US-169 corridor, including access connections to Downtown. Figure 1-1 shows the EMME model study area and Figure 1-2 shows the DTA model limits and VISSIM area of influence.

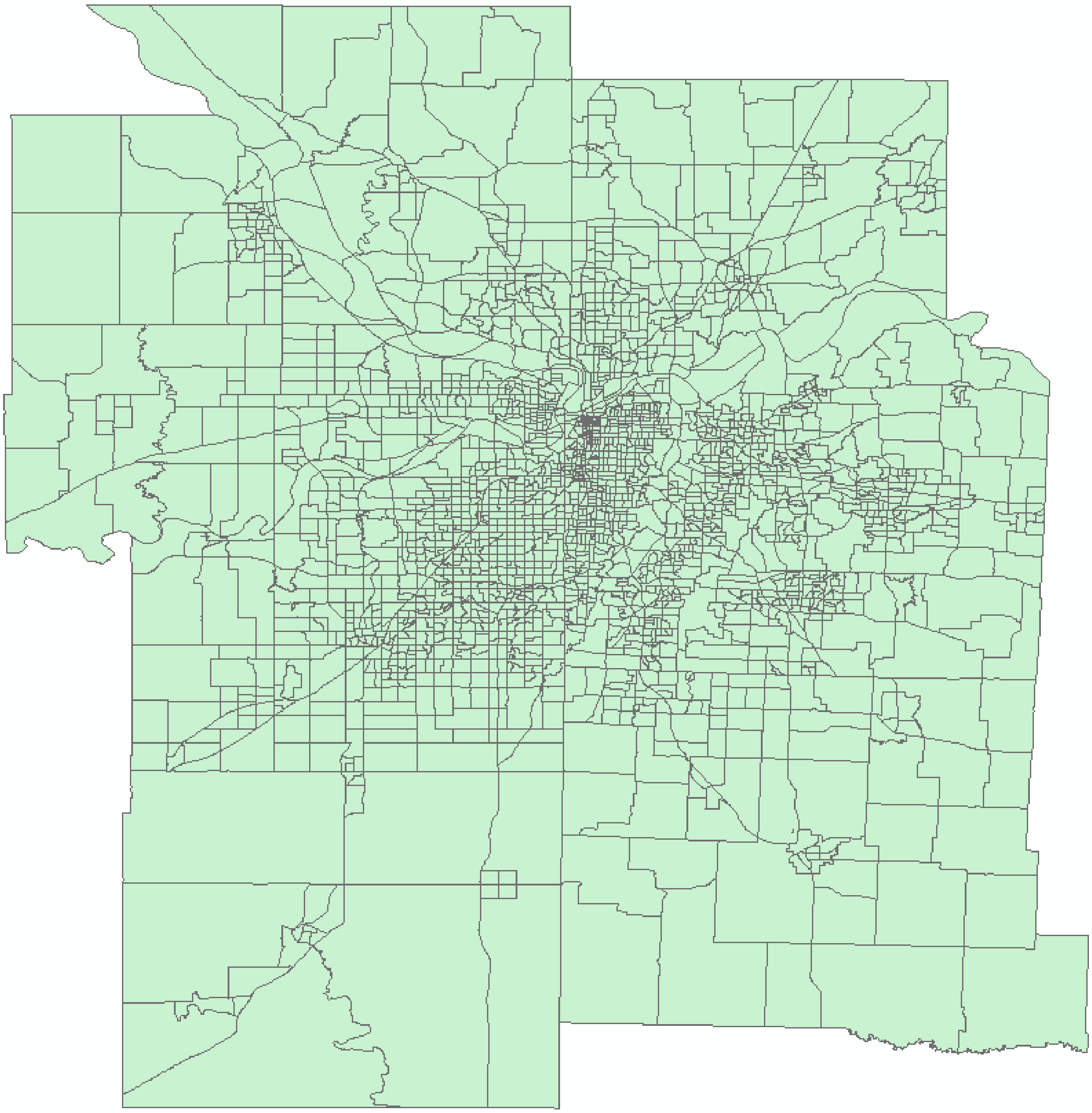


Figure 1-1: EMME Model Study Area

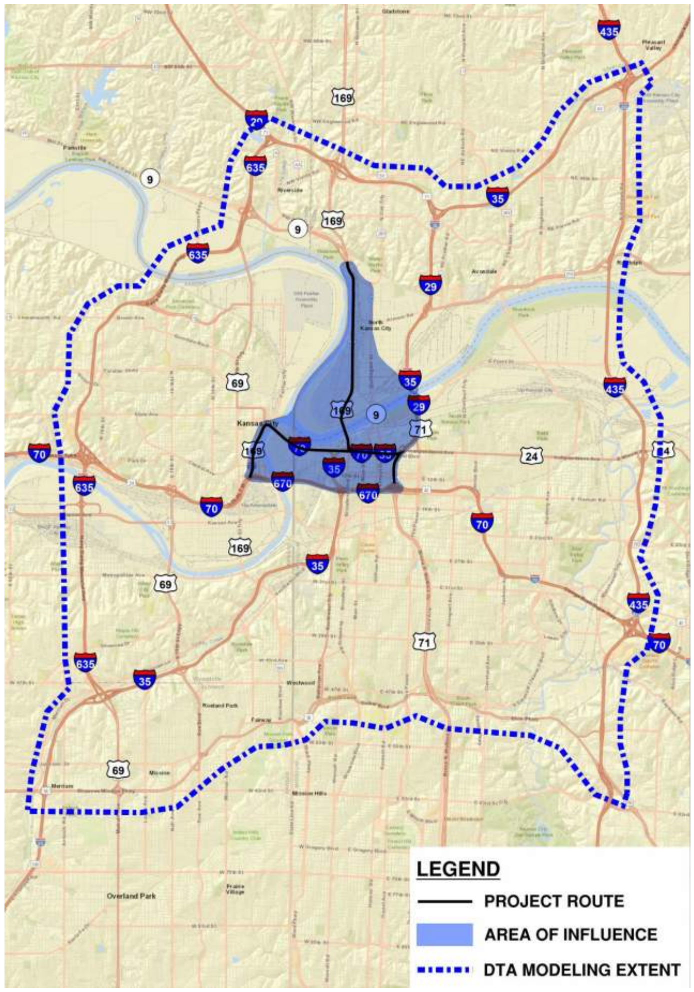


Figure 1-2: DTA Model Limits (Dashed) and VISSIM Influence Subarea (Solid)

1.2 Relevant Existing Studies and Existing Traffic Models

To avoid reevaluating ground that was covered previously, the previously developed studies, such as HNTB's April 2005, Downtown Loop Master Plan – I-29 Paseo Bridge EIS, were reviewed.

The project included efforts using an existing travel demand model for traffic projections, building dynamic traffic assignment (DTA) models, VISSIM micro-simulation models and capacity analysis using Highway Capacity Manual methodologies. These efforts followed an overall traffic modeling framework using multi-resolution modeling approaches that allowed each level of traffic analysis to learn from the higher-tier models and seed the lower-tier/more detailed models.

MARC's calibrated EMME model was the largest scale of model used on the project and generated current year (2016) and future year (2040) traffic conditions under the No-Build scenario. Field data and trip information gained from the EMME model and existing data collection sources was applied to develop and calibrate a detailed current and future conditions DTA models in the Dynameq software platform. The EMME model is a daily trip generation model and was used to generate daily trip totals for the following scenarios:

1. 2040 No-Build
2. 2040 Access Consolidation
3. 2040 Compressed Footprint
4. 2040 Remove and Reclassify I-70
5. Existing No WB Lewis & Clark
6. Existing No US-169 Across the Missouri River

The concept is that the DTA model will be predictive of changes to traffic patterns in the relatively immediate vicinity of the Downtown Loop, say within 5-miles of the Loop. The geographic extent of the DTA model is shown on the PEL Study Area Map and is generally described as I-435 to the east, Swope Parkway/Volker Boulevard/Ward Parkway/Shawnee Mission Parkway to the south, I-35 and I-635 to the west, and I-29 and I-35 to the north.

The calibrated DTA model formulated the basis for the evaluation of transportation network strategies under various scenario planning schemes through simulated Measures of Effectiveness (MOE). The simulated MOEs that have been reported from the DTA model are:

- Roadway Volumes – broken into total vehicles accommodated and classification of roadway: freeway, ramp and arterial.
- Route Travel Times
- Spot Travel Speeds

The MOE's were measured for the DTA models for the following transportation network scenarios:

- Existing 2016
- Access Consolidation
- Compressed Footprint
- Remove and Reclassify I-70

These metrics were reported for the entire DTA model to assess total system impacts and for selected corridors, sub-regions or select roadway segments of interest. The metrics were also stratified by time to indicate how these metrics change throughput during the time periods analyzed.

Microsimulation of traffic operations and HCM analysis were performed at critical locations within the Study Area using PTV VISSIM and Highway Capacity Software (HCS). These "mini-models" were developed to provide an in-depth analysis of these specific critical areas of the study:

- Broadway Boulevard/I-70 interchange
- Route 9/I-70 interchange
- I-670/I-70 interchange

Various geometries were tested, and successful results of these mini-models were then fed back into the DTA models.

2. Baseline Data Collection

A variety of types of existing traffic data from a variety of sources were collected throughout the study area to determine expected traffic operations.

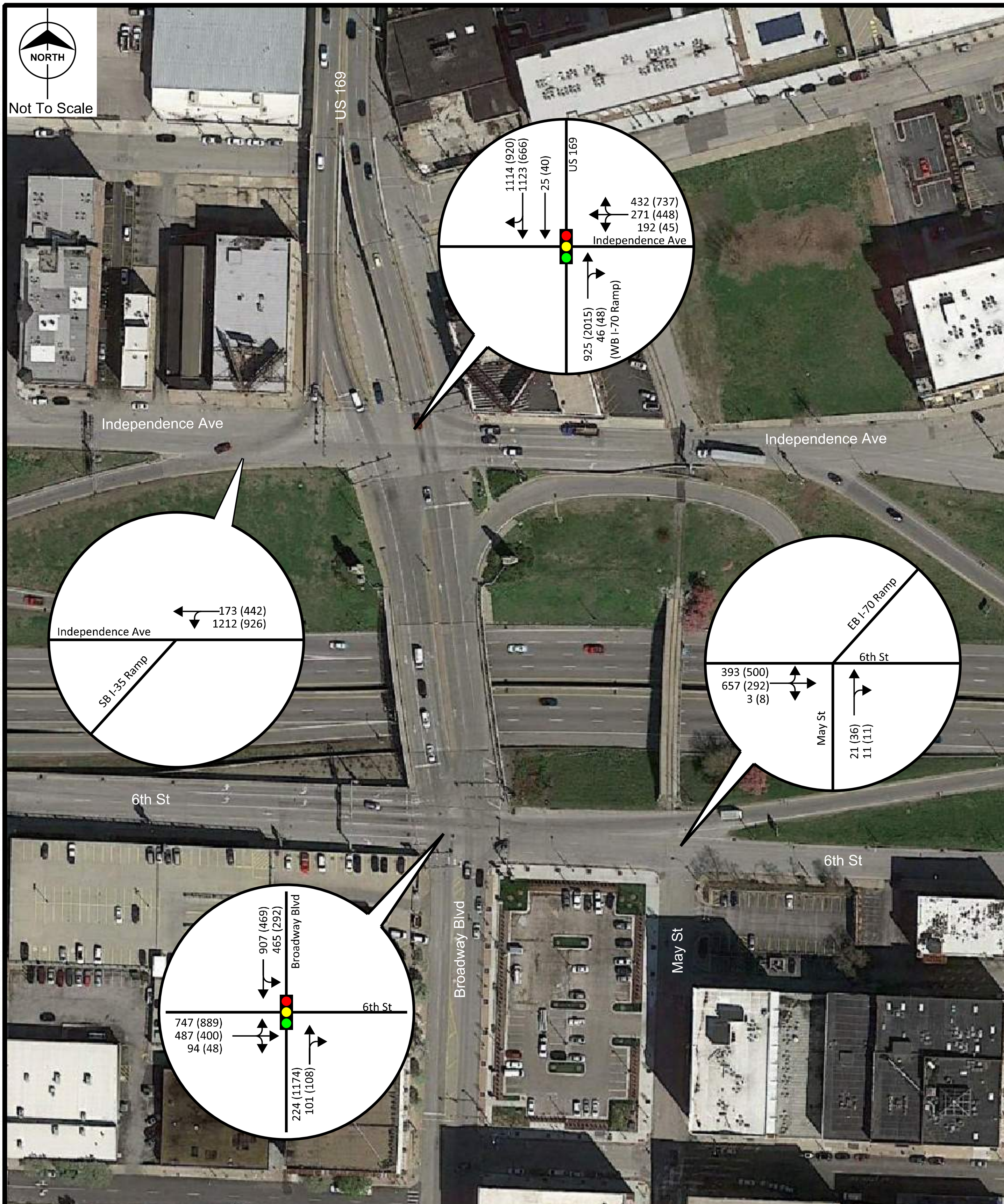
2.1 Existing Data Collection

Data types collected include:

- Traffic Volumes
- Vehicle Speeds
- Vehicle Routes
- Vehicle Travel Times

2.1.1 Traffic Volumes

Traffic volumes were collected and compared through multiple data sources to determine a balance of expected traffic volumes through the downtown loop freeways and ramps. Additionally, traffic counts were performed at the intersections of 5th Street & Broadway Boulevard and 6th Street & Broadway, due to the intersections' importance to the roadway network as well as through the Kansas City, Missouri downtown airport roadways. Morning and evening peak hour traffic counts performed in May of 2017 are shown in
Figure 2-1.



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date June 2017

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Jackson County, MO
Broadway Bridge
Traffic Impact Study
Figure 2-1
2017 Traffic Counts
Peak Hour Volumes

LEGEND

X	Study Intersection
	Signalized
STOP	Stop Controlled
	Roundabout
XX (XX)	AM (PM) Peak Hour Volumes

Major system input traffic volumes were collected from KC Scout's portal. A data query of multiple days was used to determine an acceptable range of anticipated traffic volumes for each major system approach and system on/off-ramps. More information pertaining to the Skycomp data collection methodology can be found in Appendix A.

Two of the downtown loop major freeway approaches did not have readily available KC Scout traffic counts. To compensate for the missing information, Skycomp manual traffic counts were collected for Route 9 north of the Loop and for I-70 in the northeast corner of the Loop. The Broadway Boulevard corridor, 5th Street and 6th Street segments of the downtown network were compiled using a composition of Kansas City, Missouri's KC OpenData intersections reports and city-wide Synchro model.

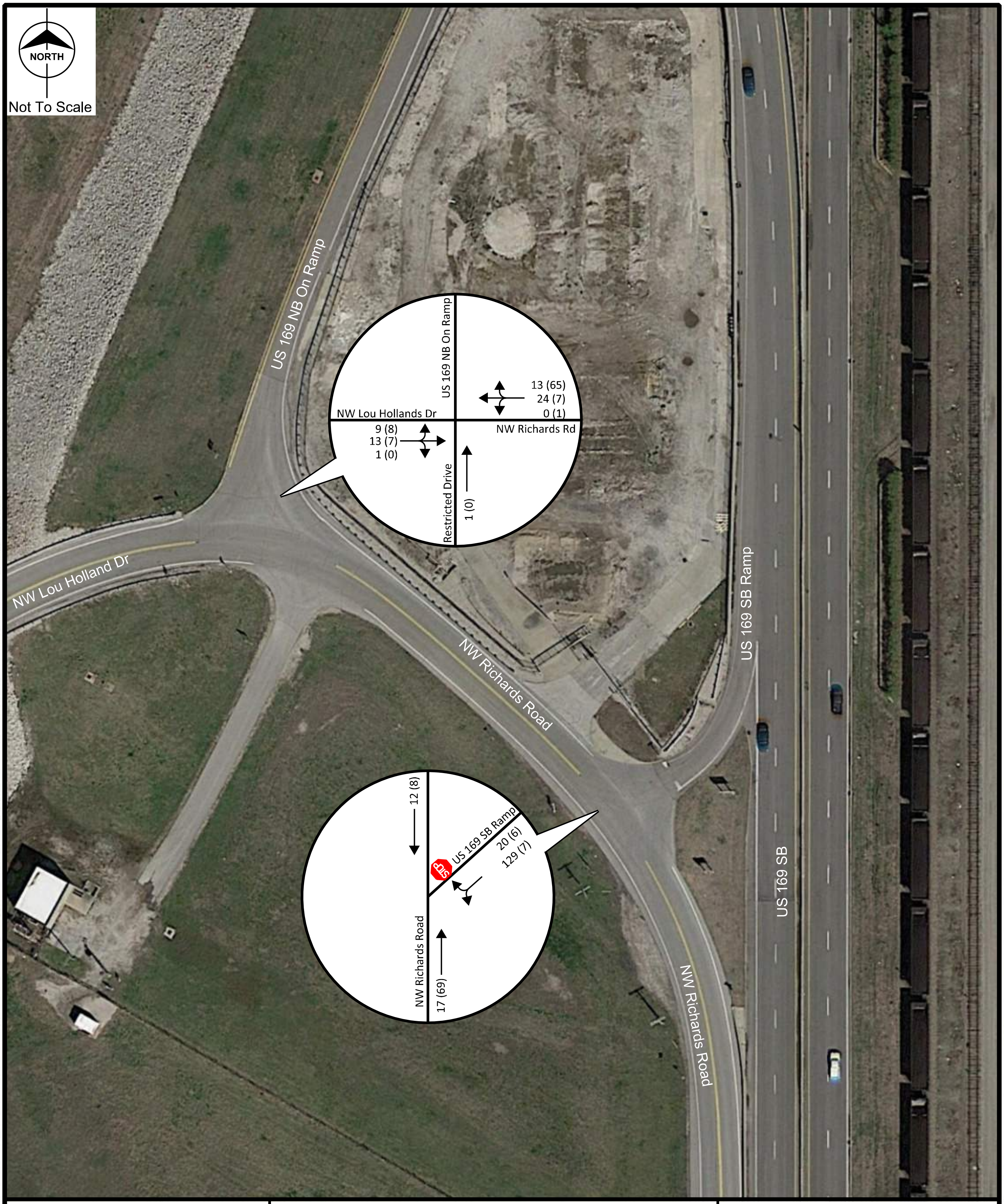
Additionally, minor roadway connections and on/off-ramps were assessed directly from the Skycomp matrices. Aside from the freeway system, the SB I-70 on-ramp from 10th Street on the east side of the Loop was not collected during the Skycomp analysis period, due to a ramp closure during the a.m. count, and was not readily available within the KC Scout database. For the purposes of simulating a typical condition, traffic volumes for this ramp were collected through a separate project, "KC ICON", in which the south VISSIM model extents included the SB I-70 on-ramp from 10th Street.

Traffic counts were also performed at six locations along the Kansas City, Missouri downtown airport roadways to assist in understanding how traffic utilizes NW Richards Road and Hwy 169 access points during morning and evening peak hours. Locations where traffic counts were collected include:

1. Hwy 169 NB On-Ramp & NW Lou Holland Drive/NW Richards Road
2. Hwy 169 SB Off-Ramp & NW Richards Road
3. Hwy 169 On/Off-Ramps & Richards Road
4. Parking Entrance & Richards Road/Hwy 169 NB On-Ramp
5. Richards Road Roundabout

Based on an inspection of the traffic counts collected, an unequal flow of traffic enters Richards Road from Hwy 169 in the morning peak hour versus exits to NB US-169 from Richards Road in the evening peak hour. The vehicular imbalance possibly indicates that a significant number of vehicles are utilizing Richards Road from various access points to "skip over" delays along SB US-169 during the morning peak hour. In total, 331 vehicles are counted to enter Richards Road from SB US-169 to the north while 238 vehicles are counted to enter SB US-169 at the south end of Richards Road during the morning peak hour. This compares to 72 vehicles entering NB Richards Road from NB Hwy 169 to the south while 100 vehicles were counted to exit NB Richards Road to NB US-169 to the north during the evening peak hour. All other movements were found to be relatively small volumes and no other major diversion was experienced. Figure 2-2 below shows alternative Richards Road route for SB US-169 and Figure 2-3 through Figure 2-7 show intersection turning movement counts for the downtown airport roadway network.

Figure 2-2: Observed Alternative Routes for SB US-169



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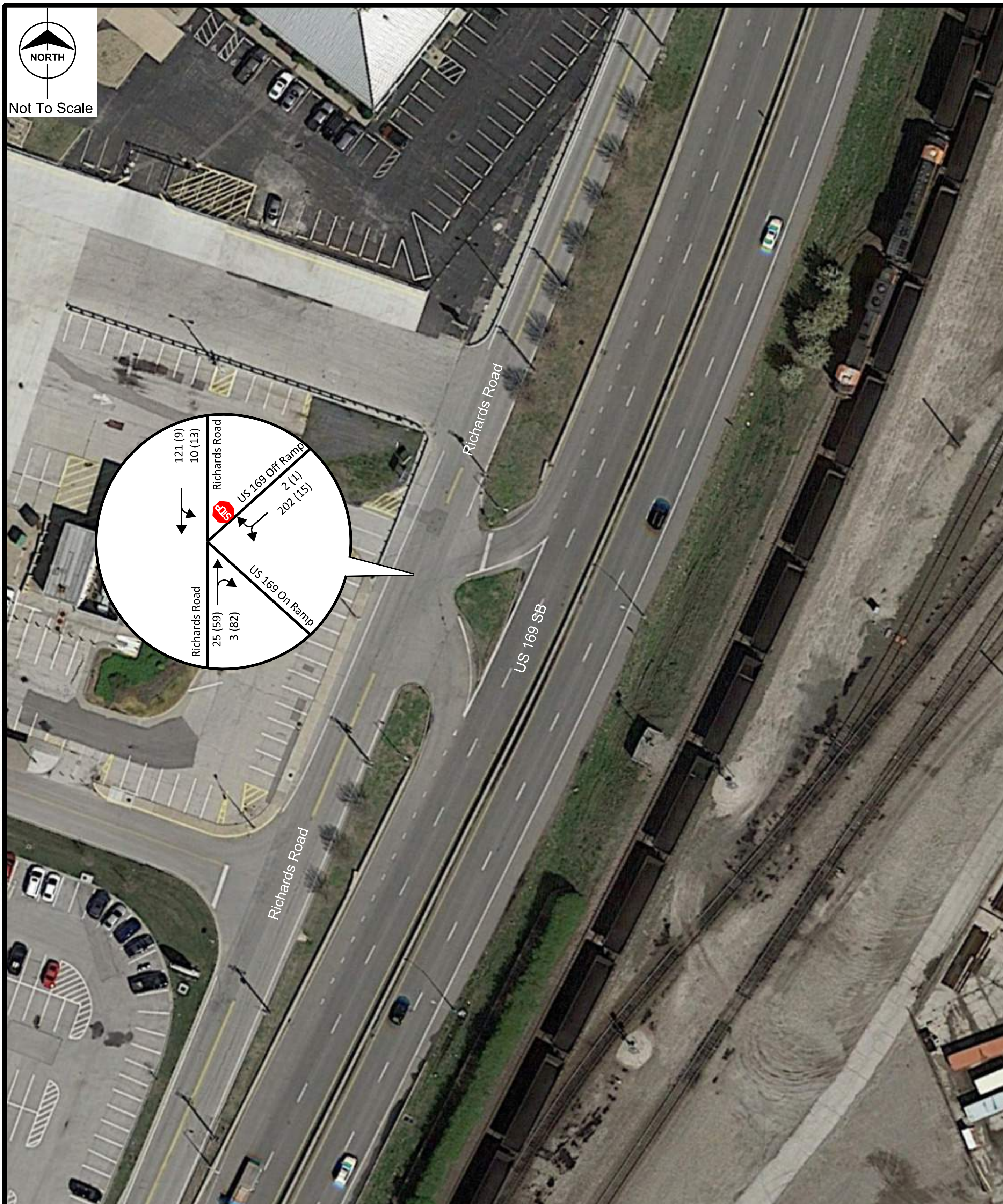
Jackson County, MO
NW Richards Road
Traffic Impact Study
Figure 2-3
2017 Traffic Counts
Peak Hour Volumes

LEGEND

X	Study Intersection
	Signalized
STOP	Stop Controlled
	Roundabout
XX (XX)	AM (PM) Peak Hour Volumes



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Jackson County, MO
400 Richards Road
Traffic Impact Study
Figure 2-4
2017 Traffic Counts
Peak Hour Volumes

LEGEND

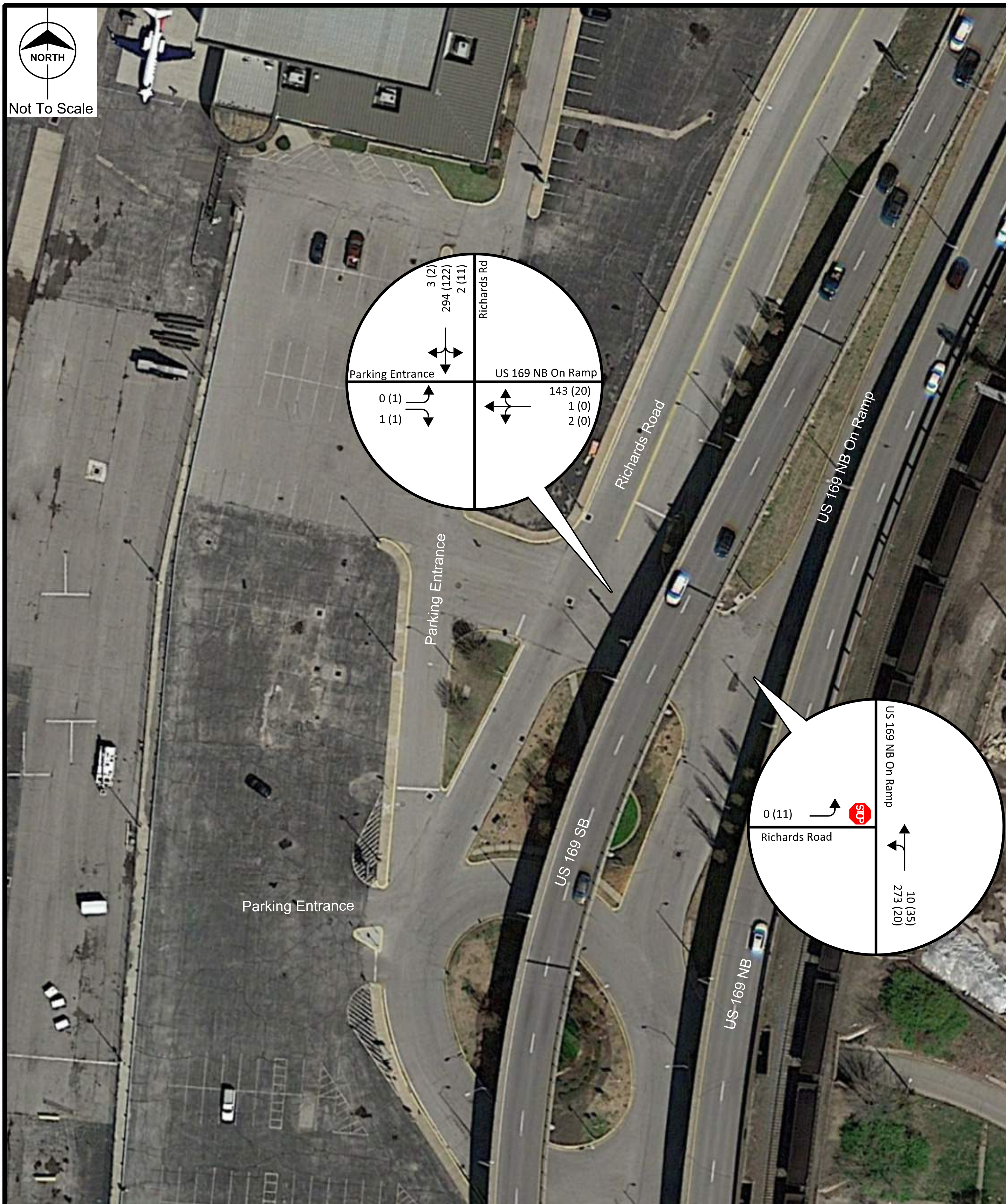
Study Intersection

Signalized

Stop Controlled

Roundabout

XX (XX) AM (PM) Peak Hour Volumes



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Jackson County, MO
Richards Road N. of Roundabout
Traffic Impact Study
Figure 2-5
2017 Traffic Counts
Peak Hour Volumes

LEGEND

X Study Intersection

Signalized

STOP Stop Controlled

Roundabout

XX (XX) AM (PM) Peak Hour Volumes

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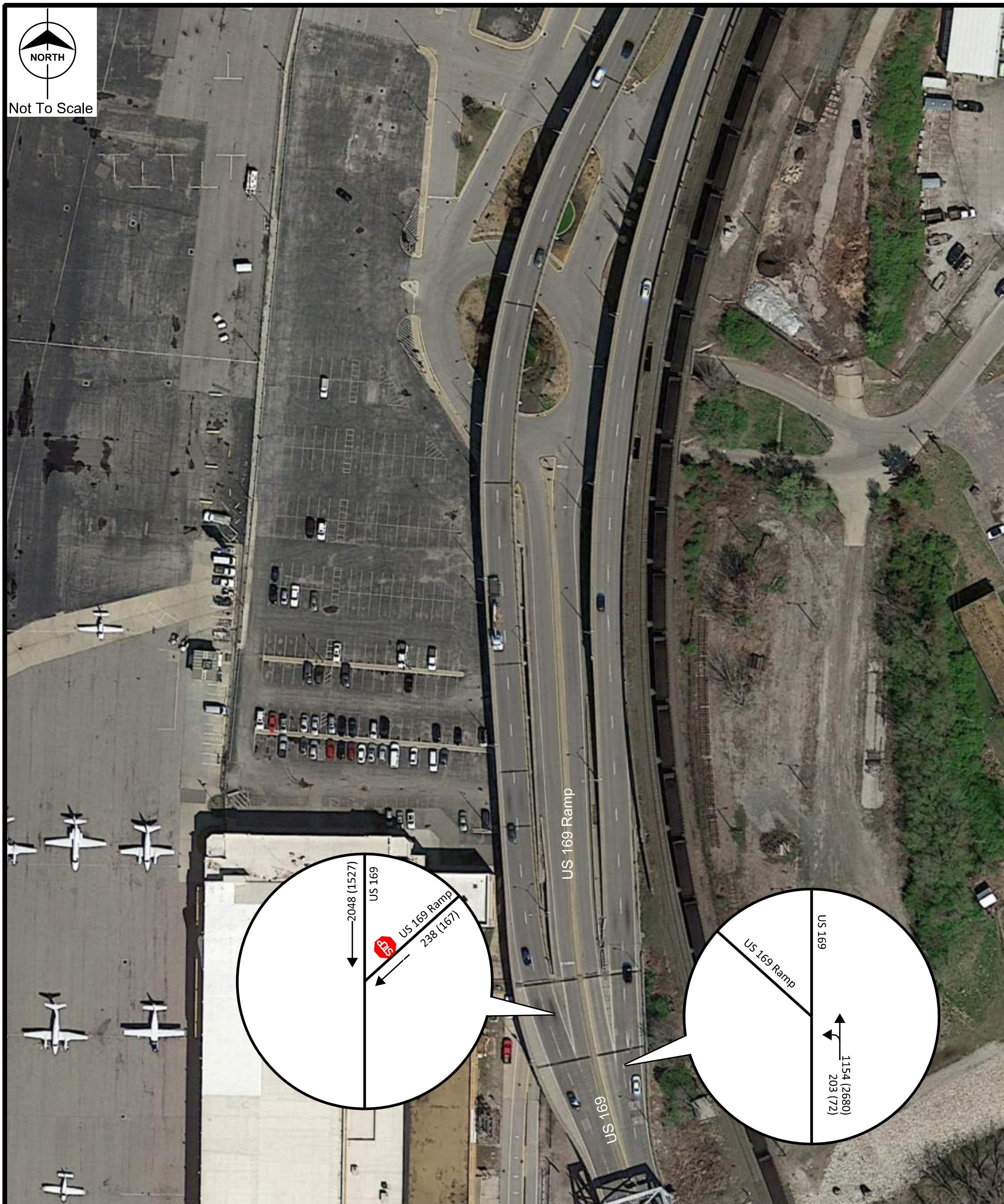
Jackson County, MO
US 169 Roundabout
Traffic Impact Study
Figure 2-6
2017 Traffic Counts
Peak Hour Volumes

LEGEND

X	Study Intersection
	Signalized
STOP	Stop Controlled
	Roundabout
XX (XX)	AM (PM) Peak Hour Volumes



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Jackson County, MO
US 169 Roundabout Ramps
Traffic Impact Study
Figure 2-7
2017 Traffic Counts
Peak Hour Volumes

LEGEND

X	Study Intersection
	Signalized
STOP	Stop Controlled
○	Roundabout
XX (XX)	AM (PM) Peak Hour Volumes

2.1.2 Travel Speeds and Queue Lengths

Average travel speeds throughout the downtown freeway system are collected daily by KC Scout. Samples of these travel speeds were harvested from the KC Scout database and compared to travel speeds collected from the DTA model. Travel speeds and traffic queues are effectively synonymous, in that poor travel speeds result from the presence of traffic queues, and vice-versa. During regular weekdays, chronic traffic queues can be found at the same locations and same times day after day. For the morning peak hour, an approximately 0.5 to 1.0-mile queue regularly accumulates north of I-70 on the SB Hwy 169 approach to Downtown. Traffic congestion is also regularly seen on SB I-35/I-70 on the east side of the Loop during the morning peak hour. EB I-670 routinely generates traffic queues extending from approximately the I-670/I-35 interchange to the Wyoming Street/Genessee Street/I-670 interchange. Figure 2-8 shows typical weekday GoogleMaps peak hour travel speeds.

Since 2002, the American Transportation Research Institute (ATRI) has collected and processed truck GPS data in support of the Federal Highway Administration's Freight Performance Measures (FPM) initiative, a program that maintains and monitors a series of performance measures related to the nation's truck-based freight transportation system.

Kansas City ranked 74th on the ATRI's Bottleneck List:

Congestion Ranking	Location Description	State	Average Speed	Peak Average Speed	Non-Peak Average Speed	Peak Average Speed Percent Change 2017-2018
74	Kansas City, MO: I-70 at I-670 at US 71	MO	49.1	45.0	50.7	-3.12%

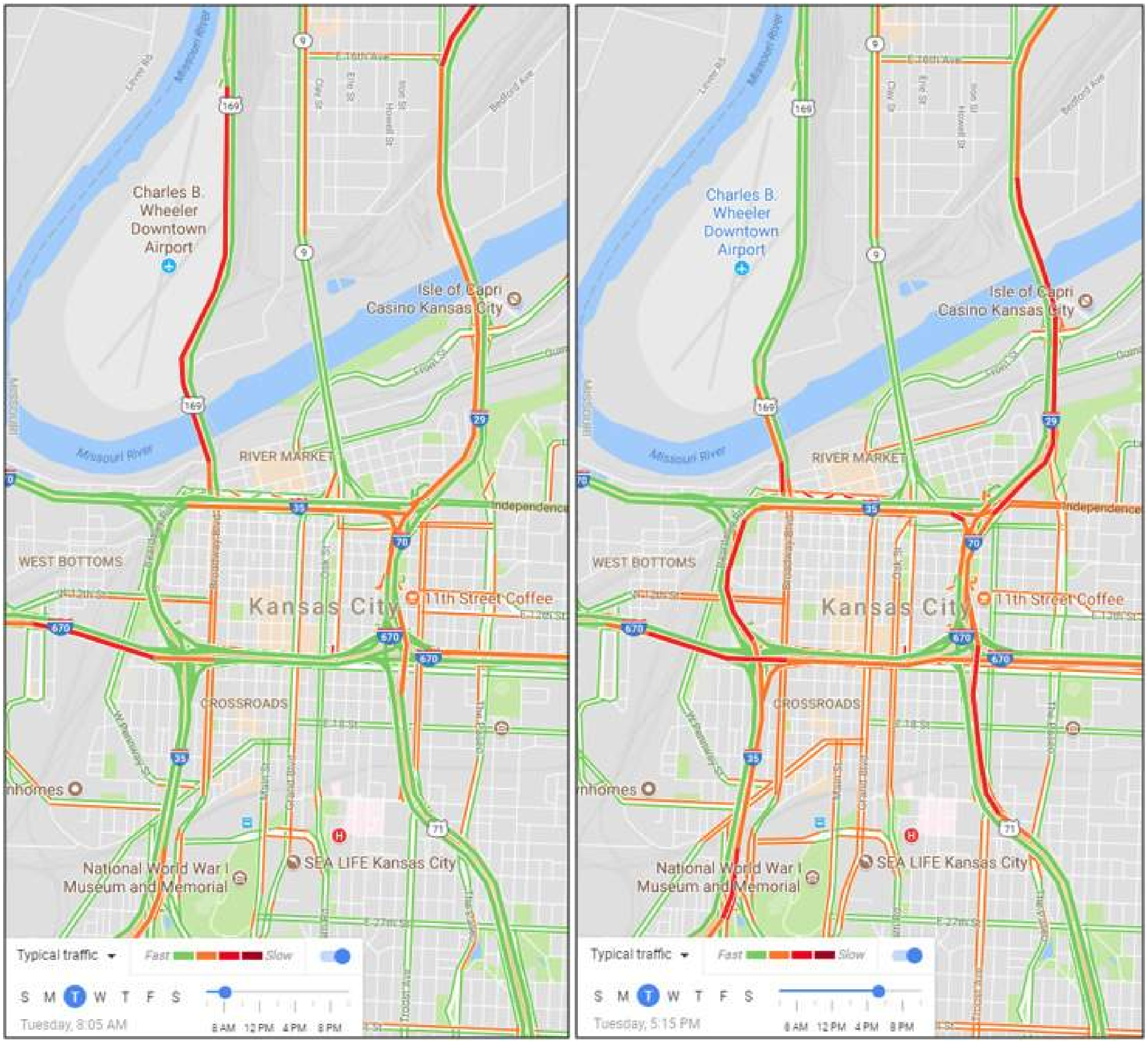


Figure 2-8: Typical Weekday GoogleMaps Peak Hour Travel Speeds (A.M.-Left, P.M.-Right)

2.1.3 Travel Times

During Skycomp's vehicle routing data collection process in October and November 2016, selected routes in the survey area were designated for the tracking of vehicles, in order to accurately measure travel times. Using the existing aligned imagery, vehicle paths were traced using Skycomp's SkyTracker program.

Survey Dates:
Tuesday, October 18, 2016 (4:00-6:00 p.m.)
Tuesday, November 15, 2016 (7:00-9:00 p.m.)

Figure 2-9: Skycomp (Green) and GoogleMaps (Orange) Travel Time Collection O-D Pairs

Skycomp travel time results are shown in Table 2-1 below.

Table 2-1: Skycomp Measured Travel Time Results

Collection Path	A.M. Peak Hour	P.M. Peak Hour
Point 1 to 2	6:49	-
Point 1 to 3	6:48	-
Point 2 to 1	-	1:58
Point 3 to 1	-	6:22

For comparison purposes, expected path travel times were also compiled from GoogleMaps. Data collection of GoogleMaps travel times encompassed performing a point-to-point estimated travel time for a typical weekday during morning and evening peak hours for all major movements. Skycomp and GoogleMaps travel time collection origin and destination (O-D) pairs are shown in Figure 2-9.

GoogleMaps typically outputs a range of anticipated travel times for a selected path. Travel time ranges for major routes in the downtown network are shown in Table 2-2 for the morning peak hour and in Table 2-3 for the evening peak hour.

Later in this report travel times will be measured and compared using the DTA traffic models.

Table 2-2: GoogleMaps Travel Time Range for Major Routes During the A.M. Peak Hour (Minutes)

Destination

	A.M. Peak Hour	WB I-70 NW Corner	NB US 169	NB MO 9	NB I-29 NE Corner	EB I-70 SE Corner	SB US-71 SE Corner	SB I-35 SW Corner	WB I-670 SW Corner
Origin	EB I-70 NW Corner	X	4-7	4	4	4-7	4-7	3	5-8
	SB US 169	9-18	X	10-20	10-20	10-22	10-22	10-18	12-22
	SB Route 9	3	4-7	X	3	3-6	3-6	5	4-7
	SB I-29 NE Corner	4	5-8	5	X	3	3	4-6	4
	WB I-70 SE Corner	4	5-9	3-6	2	X	3	3	3
	NB US-71 SE Corner	4	5-9	3-6	3	4	X	3	3
	NB I-35 SW Corner	3	5-8	4	4	3	3	X	2
	EB I-670 SW Corner	5-7	6-10	5-8	4	3	3	2	X

Table 2-3: GoogleMaps Travel Time Range for Major Routes During the P.M. Peak Hour (Minutes)

Destination

	P.M. Peak Hour	WB I-70 NW Corner	NB US 169	NB MO 9	NB I-29 NE Corner	EB I-70 SE Corner	SB US-71 SE Corner	SB I-35 SW Corner	WB I-670 SW Corner
Origin	EB I-70 NW Corner	X	4-10	4	4-9	4-9	4-8	3	5-9
	SB US 169	4-7	X	5-12	6-14	6-14	6-14	5-8	7-14
	SB Route 9	3	5-9	X	3-6	3-6	4	4	4-7
	SB I-29 NE Corner	3	5-9	5	X	3	3	5	4
	WB I-70 SE Corner	4-8	6-20	3-7	4	X	3	3	3
	NB US-71 SE Corner	4-9	7-20	4-8	3	4	X	4	3
	NB I-35 SW Corner	3-9	8-20	5-12	5-9	3-6	3-6	X	2
	EB I-670 SW Corner	5-9	8-16	5-10	4-9	3-7	3	2	X

2.1.4 Origin-Destination Data

Vehicular routing decisions were developed through Skycomp vehicle tracking. Skycomp provided morning and evening peak hour origin and destination matrices detailing percentage-based routing decisions by vehicle origin. Additional information pertaining to Skycomp methodologies is included in Appendix A. Vehicle routes for roadway segments not assessed in the Skycomp routing matrices were developed through determining O-D pairs in conjunction with connection points to the Skycomp matrices and KC OpenData intersection studies. Volume balancing and peak hour factor (PHF) adjustments were performed for each O-D pair.

O-D pairs were also assessed for regions outside of the local VISSIM study area. These areas include the Fairfax region in Kansas City, Kansas and the West Bottoms area located west of Downtown Kansas City, Missouri. These O-D pairs were collected through Skycomp INRIX analyses for the purposes of assessing commercial truck traffic routes. INRIX is a database that is comprised of GPS tracking of commercial vehicles and the individual trips made by that vehicle. The information can give an accurate trip map and routes being used. Additional information pertaining to Skycomp methodologies is included in Appendix A. Fairfax is a heavy industrial area with a significant volume of truck traffic. The two major access points to Fairfax include Hwy 5 to the northwest, providing access to I-635, and the I-70 interchanges to the south. Figure 2-10 shows the regional location of Fairfax of Kansas City, Kansas, and the I-70 interchange area in proximity to Downtown Kansas City, Missouri.

Figure 2-10: Regional Location of Fairfax in Kansas City, Kansas

The I-70 interchange south of Fairfax includes three O-D pairs of interest including:

- Hwy 24 – Fairfax Trafficway
- James St Bridge – Fairfax Trafficway
- I-70 – Fairfax Trafficway

Heavy and medium truck volumes and routings were collected for each vehicle path of interest from 9:00 a.m. to 3:00 p.m. on Tuesday, Wednesday, and Thursday of March of 2016. Figure 2-11 depicts the origin-destination routes of interest across the I-70 interchange area.

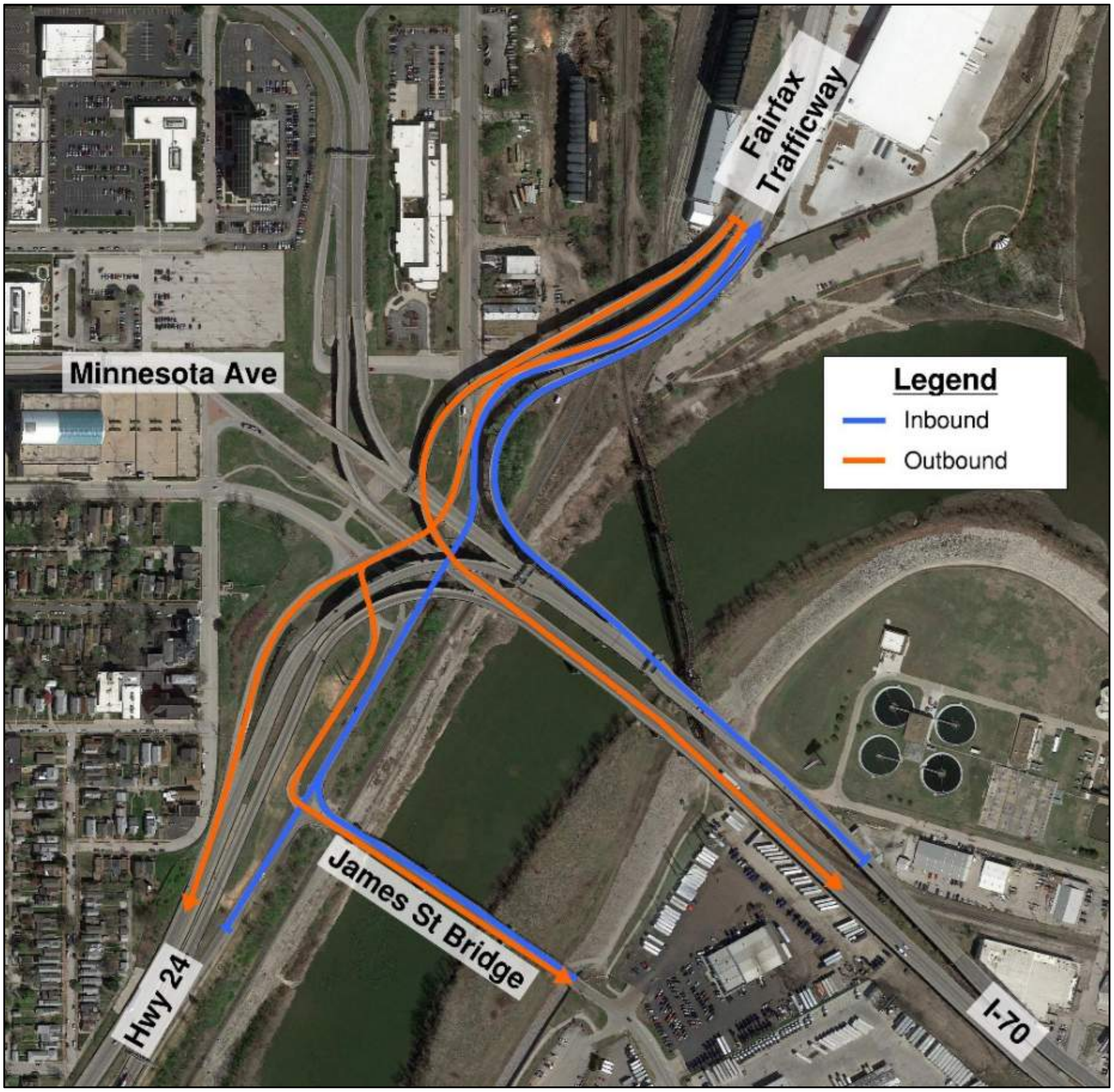


Figure 2-11: O-D Routes of Interest

Table 2-4 shows Fairfax inbound vehicular volume and routing split results and

Table 2–5 shows Fairfax outbound vehicular volume and routing split results across the 9:00 a.m. – 3:00 p.m. study period.

Table 2-4: Fairfax Inbound Vehicular Volumes and Routing Splits

Fairfax Inbound Direction				
Vehicle Type	Total	NB US 24	WB I-70	James St Bridge
Heavy Vehicles	2477	288	1861	328
Heavy Vehicle Splits	100%	12%	75%	13%
Medium Vehicles	669	150	270	249
Medium Vehicle Splits	100%	22%	40%	37%

Table 2-5: Fairfax Outbound Vehicular Volumes and Routing Splits

Fairfax Outbound Direction				
Vehicle Type	Total	SB US 24	EB I-70	James St Bridge
Heavy Vehicles	2606	495	2023	88
Heavy Vehicle Splits	100%	19%	78%	3%
Medium Vehicles	575	126	412	37
Medium Vehicle Splits	100%	22%	72%	6%

Similar to the Fairfax regional truck traffic assessment, the West Bottoms region immediately west of Downtown Kansas City, Missouri was analyzed to determine peak truck traffic trends. The West Bottoms is a heavy industrial area that experiences increased levels of truck traffic. The West Bottoms is located just west of Downtown Kansas City, Missouri and is surrounded by the Kansas River and the Missouri River, I-670, and I-35. Figure 2-11 shows the regional location of the West Bottoms of Kansas City.

Figure 2-12: Regional Location of the West Bottoms in Kansas City

The West Bottoms has the following six points of access:

- Genessee/Wyoming Street
- Central Ave Bridge
- James St Bridge
- Woodswether Road
- W 12th Street
- Forrester Road

Heavy and medium vehicular volumes and routing were collected for each vehicle path of interest from 9:00 a.m. to 3:00 p.m. on Tuesday, Wednesday, and Thursday of March 2016. Figure 2-13 depicts the origin-destination routes of interest across the West Bottoms area.

Figure 2-13: West Bottoms Origin and Destination Routes of Interest

Table 2-6 shows West Bottoms inbound vehicular volume and routing split results and Table 2-7 shows West Bottoms outbound vehicular volume and routing split results across the 9:00 a.m. – 3:00 p.m. study period.

Table 2-6: West Bottoms Inbound Vehicular Volumes and Routing Splits

INBOUND DIRECTION							
Vehicle Type	Total	Genesee St / Wyoming St	Central Ave Bridge	James St Bridge	Woodswether Rd	W 12th St	Forrester Rd
Heavy Vehicles	1529	388	279	450	39	107	266
Heavy Vehicle Splits	100%	25%	18%	29%	3%	7%	17%
Medium Vehicles	776	211	142	144	76	92	111
Medium Vehicle Splits	100%	27%	18%	19%	10%	12%	14%

Table 2-7: West Bottoms Outbound Vehicular Volumes and Routing Splits

OUTBOUND DIRECTION							
Vehicle Type	Total	Genesee St / Wyoming St	Central Ave Bridge	James St Bridge	Woodswether Rd	W 12th St	Forrester Rd
Heavy Vehicles	1802	444	358	572	41	70	318
Heavy Vehicle Splits	100%	25%	20%	32%	2%	4%	18%
Medium Vehicles	736	180	193	177	35	56	95
Medium Vehicle Splits	100%	24%	26%	24%	5%	8%	13%

3. Existing Conditions

3.1 Weaving Areas

Kansas City, Missouri's, Downtown Loop, and both directions of the North Loop in particular, have a series of very short weaving segments, with multiple weaving segments layered upon each other. The weaving sections are so short, in fact, that some weaving lengths are significantly shorter than HCS's minimum analysis length of 300 feet. Since the weaving segments are so short, lane utilization cannot be reflected in HCS calculations.

HCM Chapter 12 page 23:

"When a series of closely spaced merge and diverge areas creates overlapping weaving movements (between different merge-diverge pairs) that share the same segment of a roadway, a multiple weaving segment is created. In earlier editions of the HCM, a specific application of the weaving methodology for two-segment multiple weaving segments was included. While it was a logical extension of the methodology, it did not address cases in which three or more sets of weaving movements overlapped, nor was it well-supported by field data. Multiple weaving segments should be segregated into separate merge, diverge, and simple weaving segments, with each segment appropriately analyzed by using this chapter's methodology or that of chapter 13, Freeway Merge and Diverge Segments. Chapter 11, Basic Freeway Segments, contains information relative to the process of identifying appropriate segments for analysis."

HCM Chapter 13 page 5:

"Requirements for freeway mainline analysis information on lane widths, lateral clearances, number of lanes, and total ramp density is required. The methodology can be applied to facilities with any FFS. Its use with multilane highways or C-D roadways must be considered approximate, however, since it was not calibrated with data from these types of facilities."

4. Baseline Conditions

This document describes the methodology and general results of the findings of the traffic analysis for the US 169/I-70 North Loop Planning and Environmental Linkages Study. The basic results and findings will be used to develop the messaging of the relative impacts of the No-Build and various Build strategies through the upcoming public engagement activities. The data is focused on the incremental impacts and effects of the three basic strategies developed for the North Loop area of I-70 in comparison with base year (2016) and future year (2040) No-Build conditions. Generally, overall the findings are:

- The results from the various traffic models seem consistent and reasonable
- Specifically, there is good correlation between DTA and VISSIM models
- Based on the analysis, a 4-Lane Buck O'Neil Bridge is needed
- Comparable speeds between scenarios seen on the freeways and a marginal speed reduction between scenarios on arterials
- Increased traffic demand on I-670 resulting from a much more efficient I-35/US-169 connection proposed in the Build scenarios
- Diversion of traffic from the downtown area to I-29/I-35 results from the Remove and Reclassify scenario.
- At-grade Route 9 and Independence Avenue and Route 9 and 6th Street results in traffic diversion from Route 9 predominantly to US-169.

4.1 Strategy Definitions Applied for DTA Modeling

The analysis of traffic operations was supported from a variety of modeling techniques and data sources. The Mid America Regional Council (MARC) regional travel demand model, which is run on the EMME platform, was applied to establish the base trip generation and trip distribution parameters. The analysis of base no-build conditions was evaluated under the 2016 base year and the future year 2040 for both respective model networks and land use demographics. The 2040 EMME model was ultimately calibrated by MARC in the summer of 2017.

A dynamic traffic assignment (DTA) model in the Dynameq platform was developed to test the regional and local effects of the strategies on traffic operations under morning and evening peak period conditions. The DTA model network lies within and overlays the network and trip distribution framework of the EMME model (Figure 4-1). The DTA model is highly effective in that it applies link level traffic operational parameters, similarly to the more detailed VISSIM model, so a much more reliable traffic assignment and set of output metrics are attained in comparison with EMME. The DTA model network extents include the area bounded to the north at the I-29/I-35 split, to the west along I-435, to the west by I-635, and to the south by Shawnee Mission Parkway. As part of the model development, the initial EMME model network was updated and further detailed to reflect 2016 geometric conditions, and some roadways that were not present in the EMME model network but relevant to the study, and to incorporate traffic signals timing and phasing details. The calibration of the base year DTA model was supported by a variety of traffic data including volume and speed data from MoDOT, KC Scout, KDOT, and KCMO. Additional origin/destination data was derived from INRIX and a project specific study to reconcile trip patterns in the downtown loop area by time lapse aerial photography methods. Based on these data sources, the base year DTA model was calibrated to acceptable levels of accuracy as reviewed and accepted by MARC and MoDOT staff.

To achieve a more detailed evaluation of traffic operations specific to the downtown loop and US 169, a VISSIM model network was developed and calibrated closely against observed baseline data. Additionally, VISSIM spot analysis were also developed for the major interchange areas of the loop to test and improve proposed geometry. The mini-models were also used to test the validity of the DTA results around the loop, to provide detailed local interchange operations and to analyze conceptual scenarios to mitigate potential congestion resulting from traffic diversion directly related to the strategies.

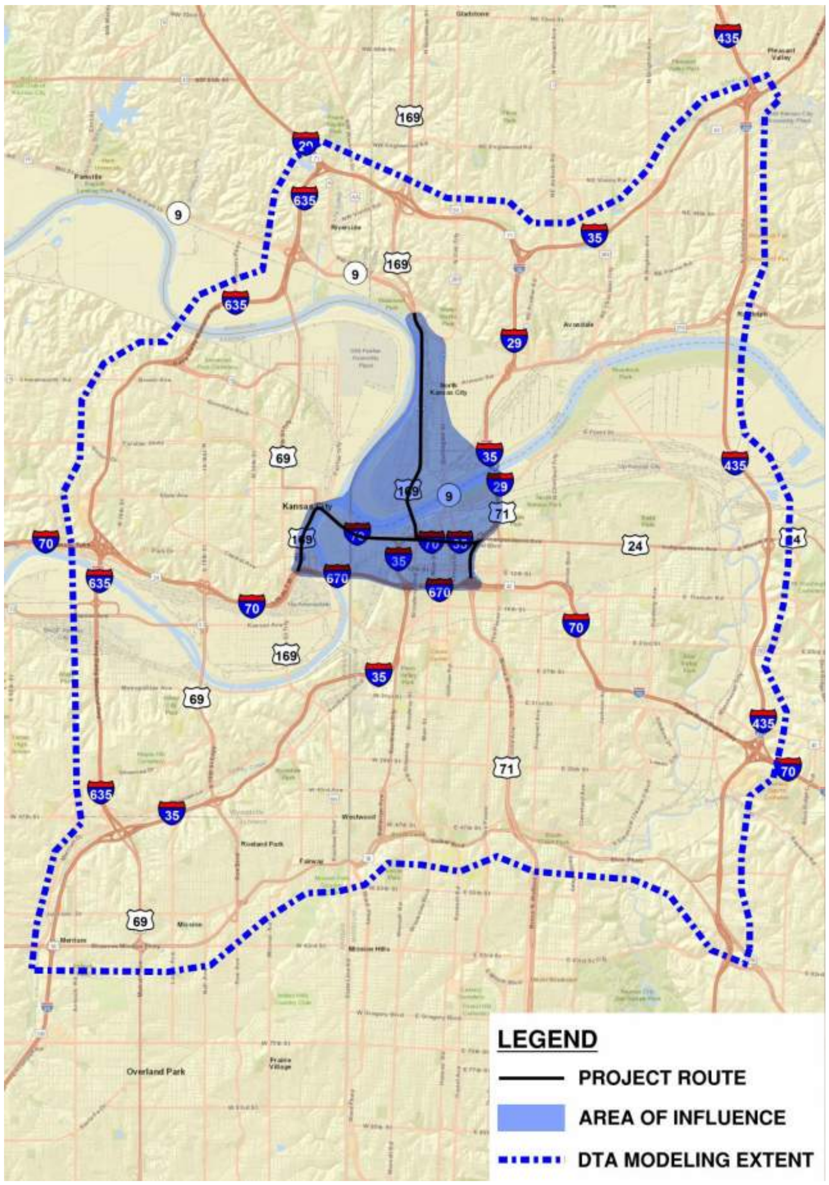


Figure 4-1: DTA Model Extents

4.2 Proposed Build Strategies

In this section the three Build scenarios are described from a traffic operations and traffic congestion point of view. In total, three overall Downtown North Loop strategies were analyzed. North Loop Strategies include:

- Access Consolidation (AC)
- Compressed Footprint (CF)
- Remove and Reclassify I-70 (RR)

All strategies involve a realignment of the Buck O'Neil Bridge to be positioned more directly with I-35. Added connections between I-35 and US-169 significantly improve travel time for I-35/US-169 traffic due to vehicles no longer being required to traverse 5th Street and 6th Street signalized intersections. Traffic is also anticipated to divert from Route 9 to US-169. Furthermore, travelers will be encouraged to use I-670 to get from/to origins/destinations to the east of downtown through each strategy. Existing Downtown North Loop roadway configurations are shown in

Figure 4-2 below. All proposed strategies are encompassed by the area shown in

Figure 4-2.

Figure 4-2: Existing Conditions

For the Access Consolidation (AC) strategy, access points outside of Broadway Boulevard are eliminated along the North Loop while access ramps on the east side of Broadway Boulevard are maintained. Route 9 and Independence Avenue and Route 9 and 6th Street are reconfigured as at-grade intersections. Access to the north of Downtown remains similar to the existing conditions with exception to reduced congestion through removal of I-35 and US-169 interactions. The AC strategy maintains one-way Independence Avenue and 6th Street configurations with Independence Avenue set at two-way east of Route 9. Figure 4-3 details the AC strategy roadway configuration.

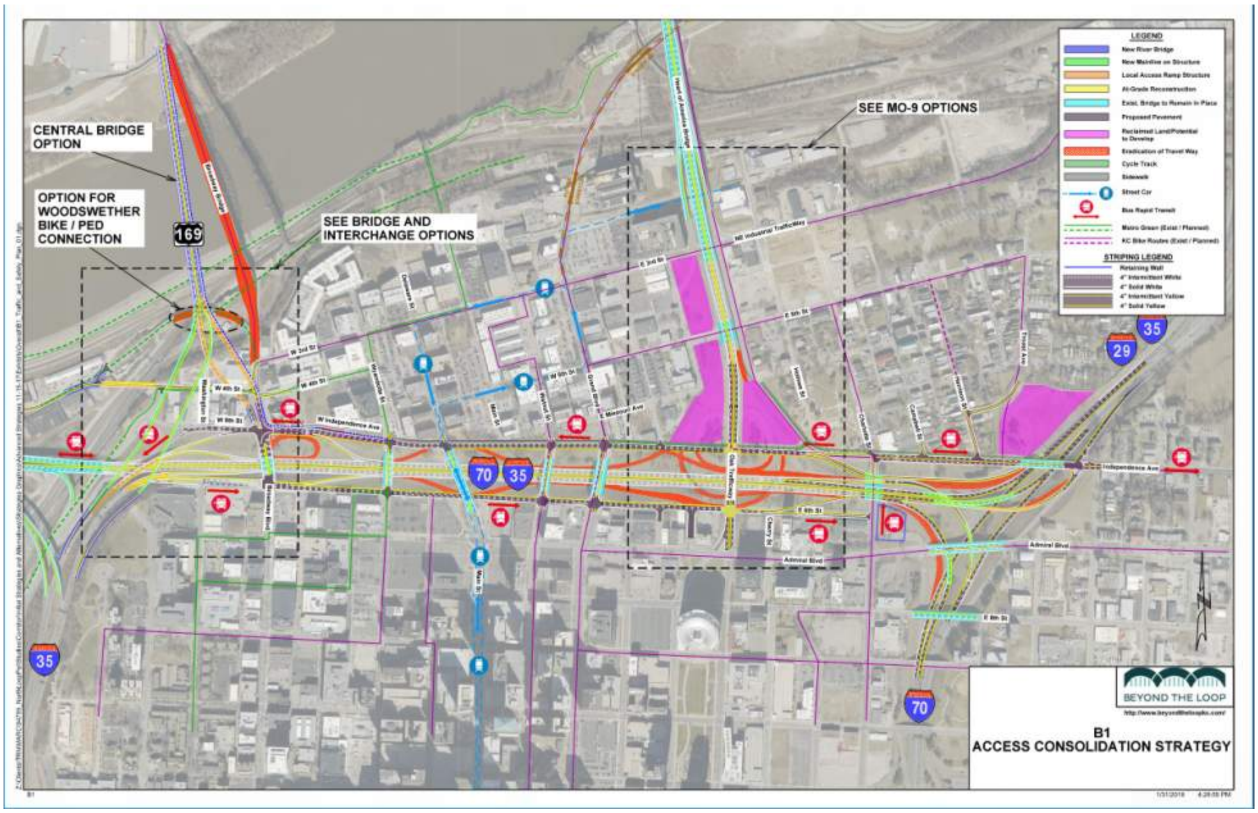


Figure 4-3: Access Consolidation (AC) Strategy

There are three variations of the Compressed Footprint (CF) strategy; north, centered, and south. From a traffic operations perspective, all CF strategies represent similar characteristics. The CF strategy involves removal of I-70 on and off ramps through the North Loop with access remaining on the eastern and western ends of the Downtown North Loop. Route 9 and Independence Avenue and Route 9 and 6th Street are reconfigured as at-grade intersections. Access to the north of Downtown remains similar to the existing conditions with exception to reduced congestion through removal of I-35 and US-169 interactions. The CF strategy identifies both Independence Avenue and 6th Street as two-way from Broadway Boulevard to Charlotte Street. Independence Avenue east of Charlotte Street remains as a two-way designation. Figure 4-4 details CF strategy roadway configurations under the centered variation.

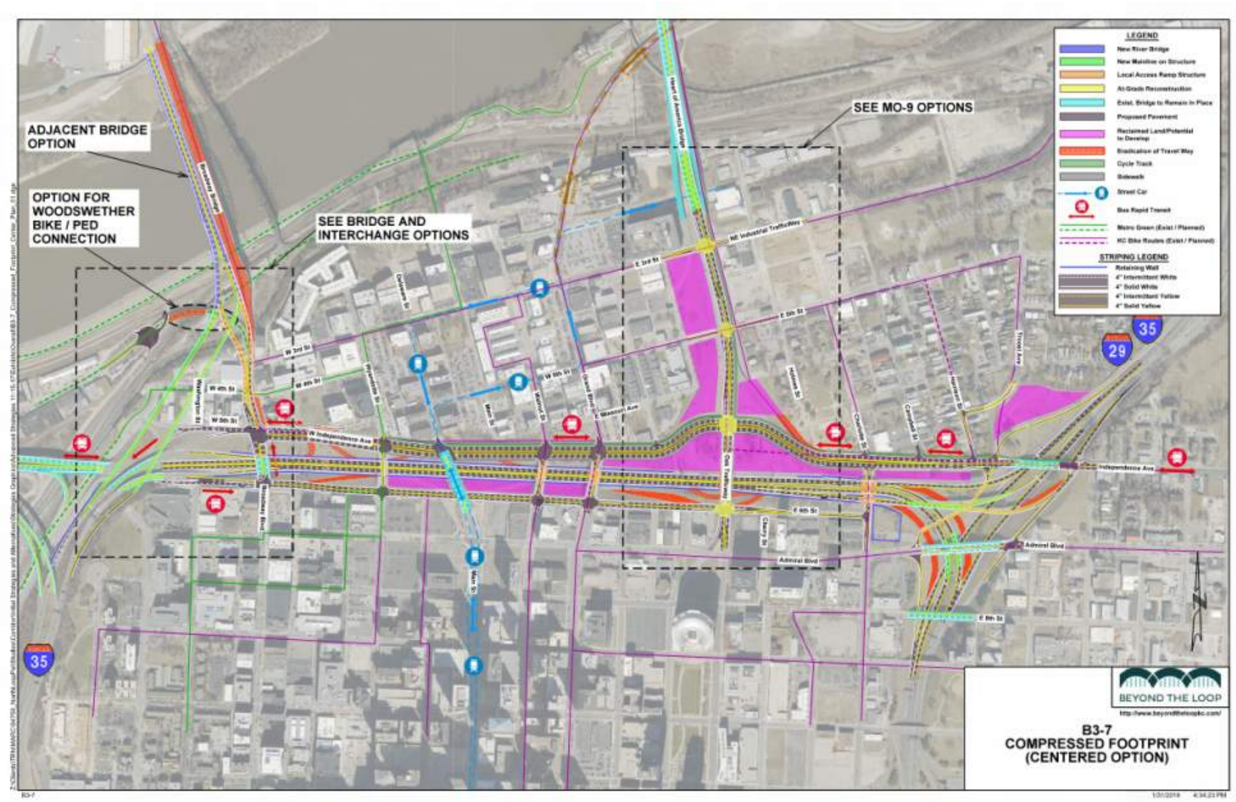


Figure 4-4: Compressed Footprint (CF) Strategy

The Remove and Reclassify I-70 (RR) strategy involves a complete elimination of I-70 from the Downtown North Loop. Route 9 and Independence Avenue and Route 9 and 6th Street are reconfigured as at-grade intersections. Access to the north of Downtown remains similar to the existing conditions with exception to reduced congestion through removal of I-35 and US-169 intersections. Similar to the CF strategy, the RR strategy identifies both Independence Avenue and 6th Street as two-way from Broadway Boulevard to Charlotte Street. Independence Avenue east of Charlotte Street remains as a two-way designation. Figure 4-5 details the RR strategy roadway configurations.

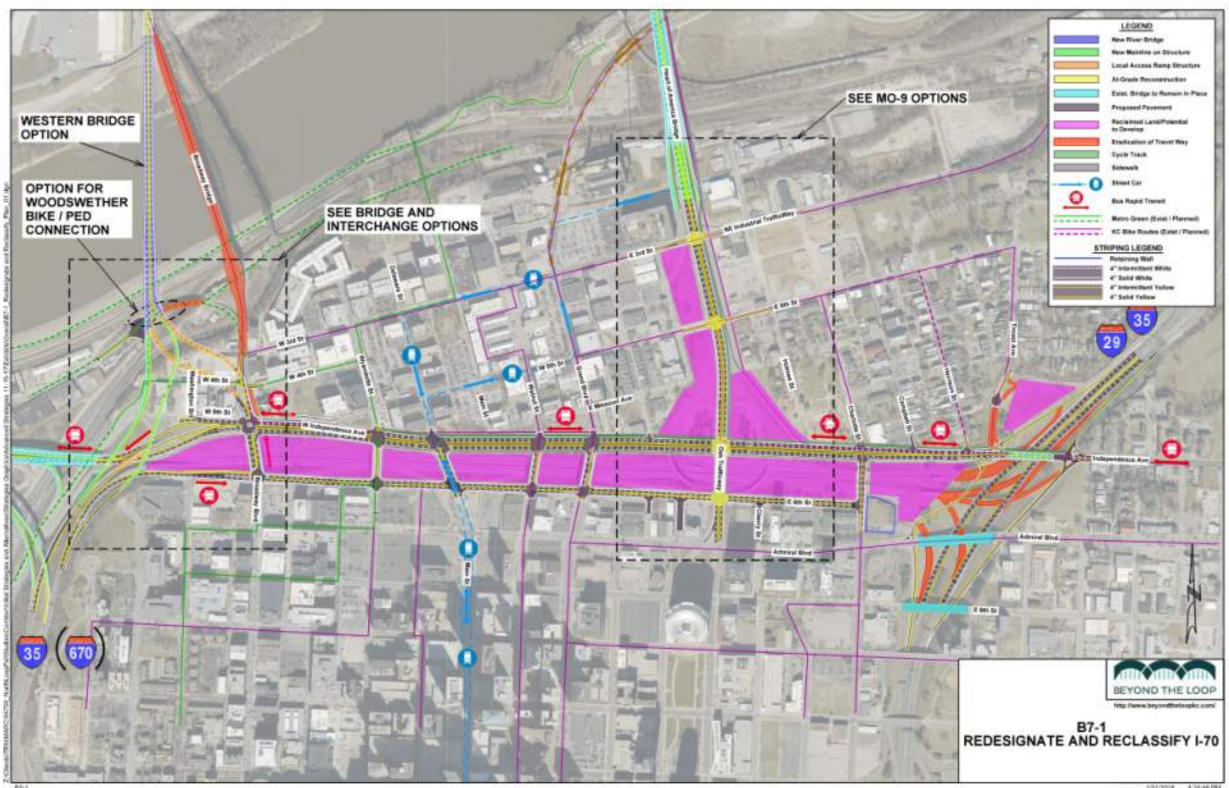


Figure 4-5: Remove and Reclassify I-70 (RR) Strategy

4.3 DTA Network Metrics

Measures of effectiveness (MOE's) were collected from the Baseline DTA models and have been organized as follows:

1. Morning and evening conditions
2. Freeways, ramps, arterials, and all roadways combined
3. Baseline conditions and the three Build DTA scenario models

Specifically, the following information was collected:

- Vehicle Miles Traveled (VMT)
- Vehicle Hours Traveled (VHT)
- Vehicle Hours of Delay (VHD)

The VMT metric is particularly good to identify if traffic is rerouting to longer, but faster, alternative routes to avoid congestion in the Downtown area. The VHT and VHD metrics are good indicators of overall network performance.

4.3.1 A.M. Peak

As discussed in the previous section, results for VMT, VHT, and VHD were collected to serve as comparison metrics between each analysis strategy. This section details morning peak period results for each analysis strategy by roadway segment type. Table 4-1 lists morning peak period VMT results across each strategy.

Table 4-1: A.M. Peak Period DTA Vehicle Miles Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions	1,381,960	128,822	574,171	2,084,952
Access Consolidation	1,375,121	132,880	575,239	2,083,240
Compressed Footprint	1,376,785	131,618	577,174	2,085,577
Remove and Reclassify I-70	1,373,208	133,307	579,247	2,085,762
Change vs Existing Conditions				
Access Consolidation	-0.5%	3.2%	0.2%	-0.1%
Compressed Footprint	-0.4%	2.2%	0.5%	0.0%
Remove and Reclassify I-70	-0.6%	3.5%	0.9%	0.0%

As shown in Table 4-1, each strategy is expected to result in marginal impacts to total system VMT. Freeways and expressways are projected to experience a decrease in VMT, ramps are anticipated to experience an increase in VMT, while change measured for the overall system total VMT remains close to 0% across each strategy in the morning peak period. Table 4-2 lists morning peak period VHT results across each strategy.

Table 4-2: A.M. Peak Period DTA Vehicle Hours Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions	25,537	4,101	25,987	55,625
Access Consolidation	25,341	4,221	26,316	55,878
Compressed Footprint	25,396	4,245	26,486	56,127
Remove and Reclassify I-70	25,529	4,248	26,620	56,397
Change vs Existing Conditions				
Access Consolidation	-0.8%	2.9%	1.3%	0.5%
Compressed Footprint	-0.6%	3.5%	1.9%	0.9%
Remove and Reclassify I-70	0.0%	3.6%	2.4%	1.4%

As shown in Table 4-2, the AC and CF strategies are anticipated to experience a decrease in VHT across freeways and expressways while it is projected that the AC and CF strategies will result in an increase in VHT across ramps and arterials. System total VHT comparisons to existing conditions show a slight increase in VHT for both the AC and CF strategies. The RR strategy is projected to experience no change in freeways and expressways VHT while experiencing an increase in VHT across ramps, arterials, and the overall system. Table 4-3 lists morning peak period VHD results across each strategy.

Table 4-3: A.M. Peak Period DTA Vehicle Hours of Delay Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions	1,867	567	7,838	10,273
Access Consolidation	1,799	628	8,115	10,542
Compressed Footprint	1,836	673	8,216	10,725
Remove and Reclassify I-70	2,044	627	8,288	10,959
Change vs Existing Conditions				
Access Consolidation	-3.6%	10.8%	3.5%	2.6%
Compressed Footprint	-1.7%	18.7%	4.8%	4.4%
Remove and Reclassify I-70	9.5%	10.6%	5.7%	6.7%

As shown in Table 4-3, the AC and CF strategies are anticipated to experience a decrease in VHD across freeways and expressways while it is projected that the AC and CF strategies will result in an increase in VHT across ramps and arterials. The RR strategy is projected to experience an increase in VHD all segment types. The AC strategy is anticipated to result in the most significant improvement to freeway and expressway delay. The CF strategy is projected to result in the most significant increase in VHD across ramps while the RR strategy is expected to result in the most significant increase in VHD across freeways and expressways, arterials, and overall system total.

4.3.2 P.M. Peak

This section details evening peak period results for each analysis strategy by roadway segment type. Table 4-4 lists evening peak period VMT results across each strategy.

Table 4-4: P.M. Peak Period DTA Vehicle Miles Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions	1,950,179	190,480	983,511	3,124,170
Access Consolidation	1,940,550	194,061	986,554	3,121,165
Compressed Footprint	1,941,163	192,273	990,992	3,124,427
Remove and Reclassify I-70	1,934,141	193,445	999,378	3,126,964
Change vs Existing Conditions				
Access Consolidation	-0.5%	1.9%	0.3%	-0.1%
Compressed Footprint	-0.5%	0.9%	0.8%	0.0%
Remove and Reclassify I-70	-0.8%	1.6%	1.6%	0.1%

As shown in Table 4-4, each strategy is expected to result in marginal impacts to total system VMT. Freeways and expressways are projected to experience a decrease in VMT, ramps are anticipated to experience an increase in VMT, while change measured for the overall system total VMT remains close to 0% across each strategy in the morning peak period. Table 4-5 lists evening peak period VHT results across each strategy.

Table 4-5: P.M. Peak Period DTA Vehicle Hours Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions	37,398	6,349	53,611	97,357
Access Consolidation	37,264	6,423	53,485	97,173
Compressed Footprint	37,479	6,446	53,311	97,236
Remove and Reclassify I-70	37,835	6,671	54,237	98,743
Change vs Existing Conditions				
Access Consolidation	-0.4%	1.2%	-0.2%	-0.2%
Compressed Footprint	0.2%	1.5%	-0.6%	-0.1%
Remove and Reclassify I-70	1.2%	5.1%	1.2%	1.4%

As shown in Table 4-5, the AC and CF strategies are anticipated to experience a decrease in VHT across arterials while it is projected that the AC and CF strategies will result in an increase in VHT across ramps. System total VHT comparisons to existing conditions show a slight decrease in VHT for both the AC and CF strategies. The AC strategy freeways and expressways are anticipated to experience a slight improvement of VHT over the existing conditions while the CF strategy is projected to see a slight increase in VHT for freeway and expressway segments. The RR strategy is expected to experience the most significant increase in VHT across all segment types in comparison to the existing conditions. Table 4-6 lists evening peak period VHD results across each strategy.

Table 4-6: P.M. Peak Period DTA Vehicle Hours of Delay Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions	3,993	1,099	22,223	27,314
Access Consolidation	4,014	1,128	22,005	27,147
Compressed Footprint	4,254	1,189	21,670	27,113
Remove and Reclassify I-70	4,786	1,381	22,322	28,490
Change vs Existing Conditions				
Access Consolidation	0.5%	2.6%	-1.0%	-0.6%
Compressed Footprint	6.5%	8.2%	-2.5%	-0.7%
Remove and Reclassify I-70	19.9%	25.7%	0.4%	4.3%

As shown in Table 4-6, the AC strategy is expected to experience the least amount of increase of VHD over existing conditions for freeways and expressways and ramps. The AC strategy is also projected to experience a decrease in VHD across arterial segments and the system total. The CF strategy is anticipated to result in an increase in VHD across freeways, expressways, and ramps while experiencing a decrease of VHD across arterials and the system total. The RR strategy is expected to result in the most significant increases of VHD across all segment types.

4.3.3 Strategy Comparison Graphics

Strategy comparison graphics were produced to aid in visualizing strategy impacts over existing conditions (E) link volumes and speeds. In the volume figures, orange bars indicate a net volume increase from existing conditions (E) to each respective strategy and blue bars indicate a net volume decrease from E to each respective strategy. Comparison bar thickness represents the amount of change difference with thicker bars indicating more significant change and thinner bars indicating less significant to no measured change. Figure 4-6 shows net volume change measured for the AC strategy from E during the morning peak period. All comparison figures detail the overall DTA network (left) and the downtown region (right).

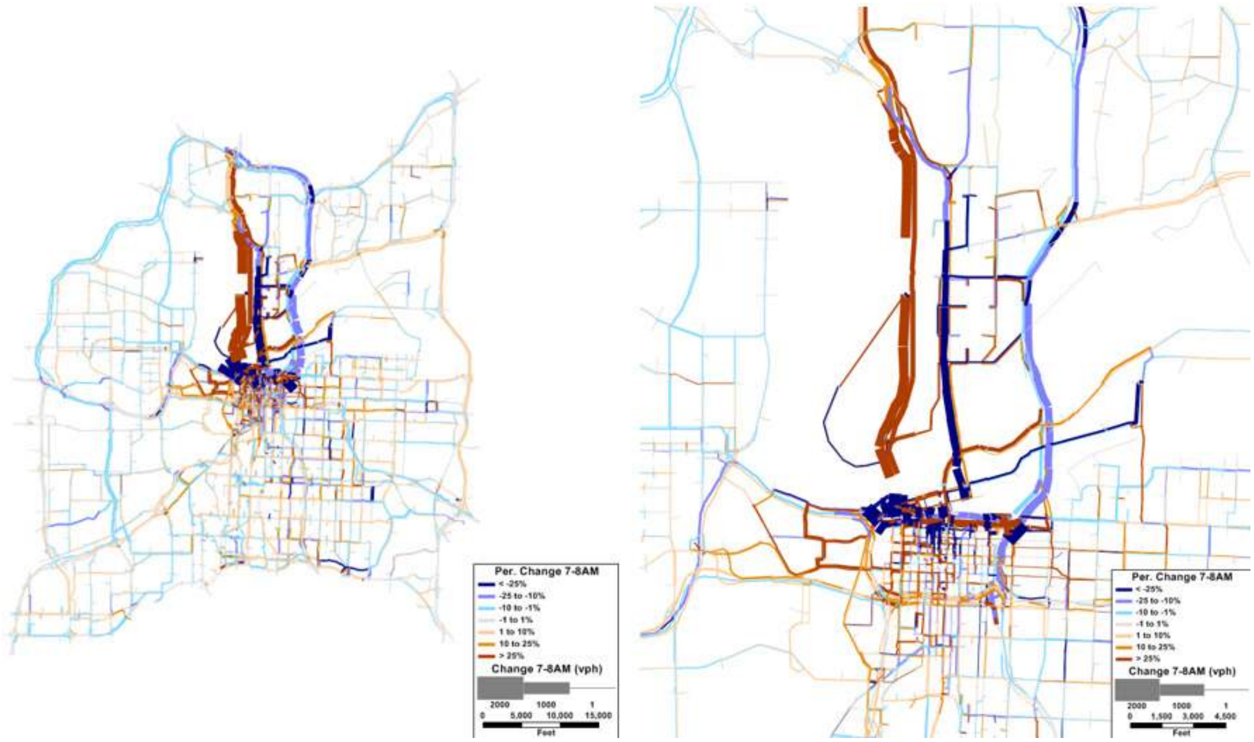


Figure 4-6: E vs AC A.M. Peak Period Link Volume Change

Figure 4-7 shows net volume change measured for the AC strategy from E during the evening peak period.

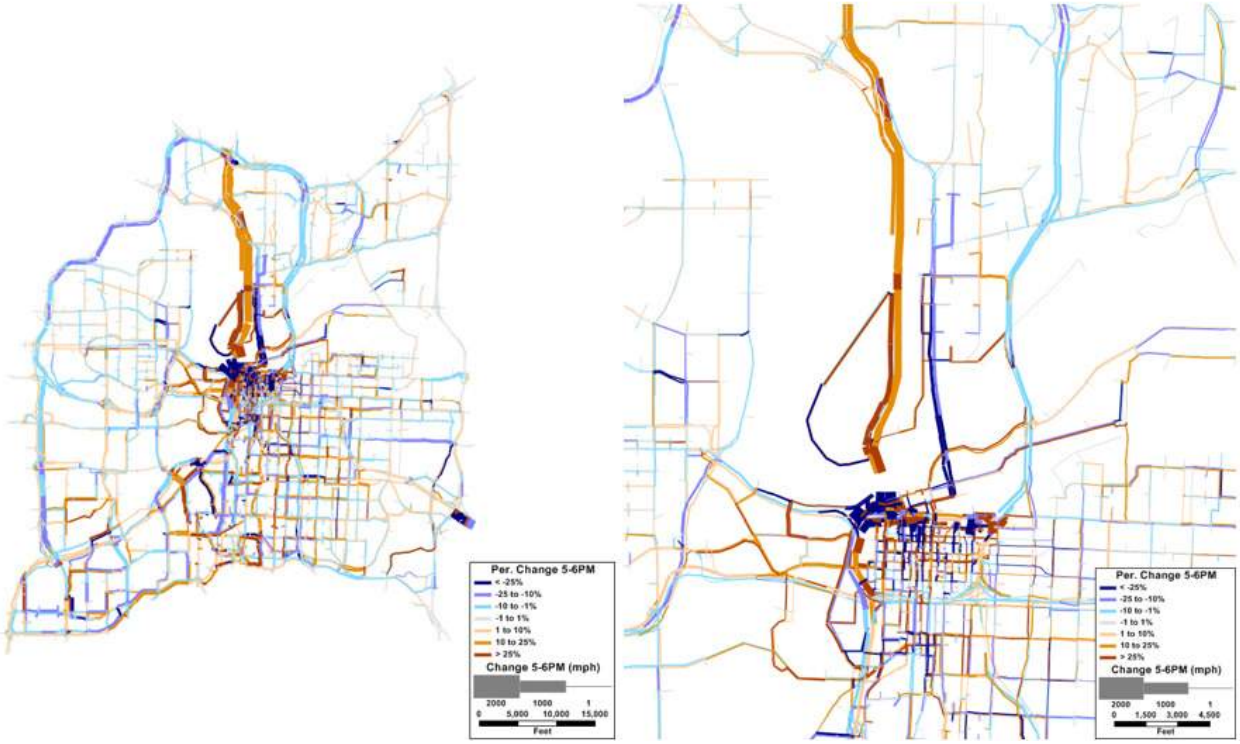


Figure 4-7: E vs AC PM Peak Period Link Volume Change

Figure 4-8 shows net volume change measured for the CF strategy from E during the morning peak period.

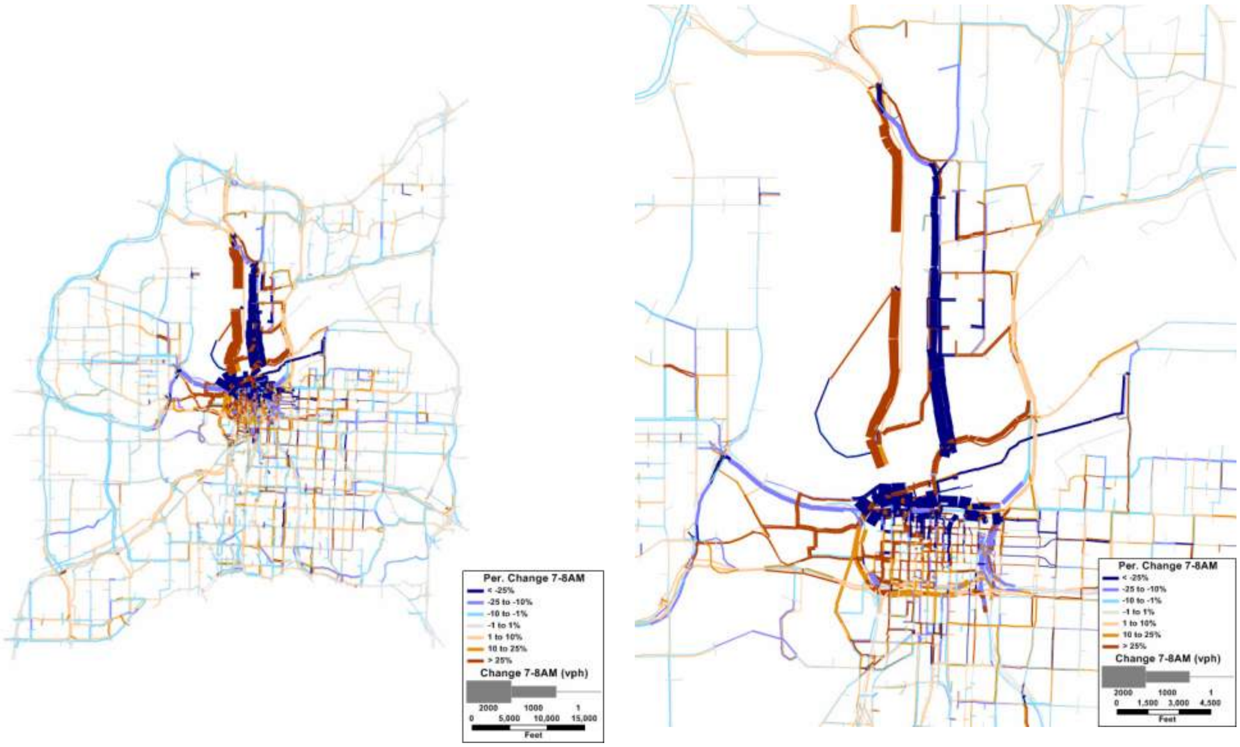


Figure 4-8: E vs CF A.M. Peak Period Link Volume Change

Figure 4-9 shows net volume change measured for the CF strategy from E during the evening peak period.

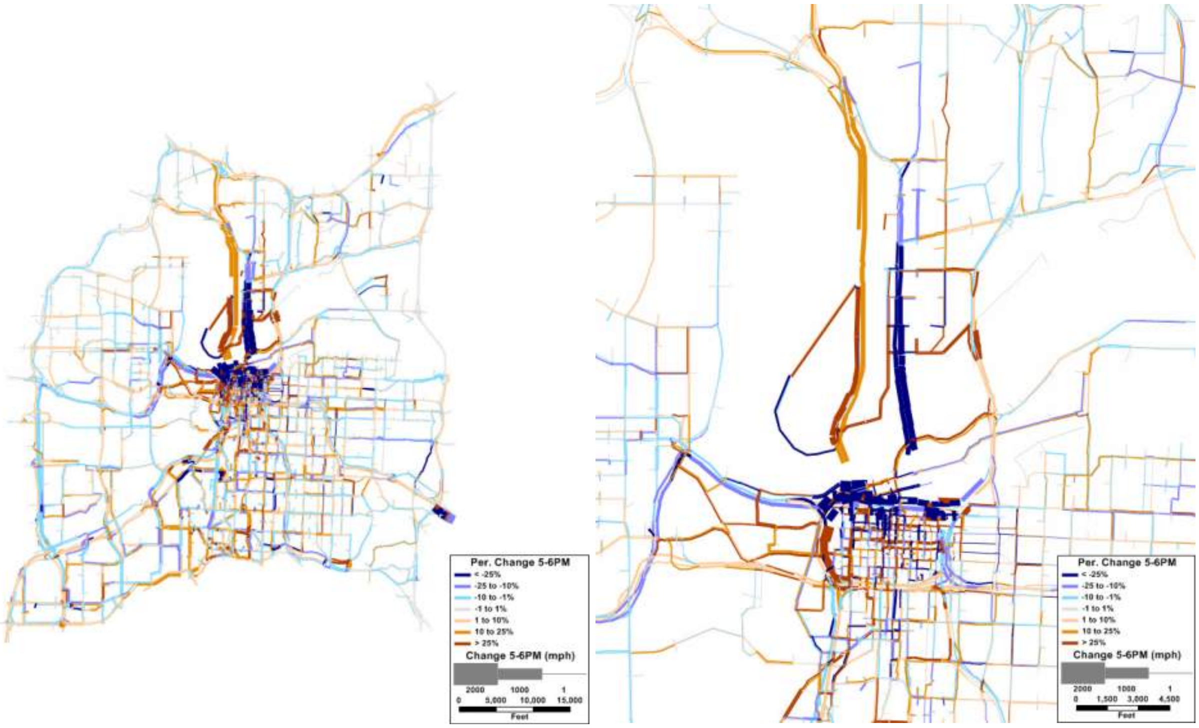


Figure 4-9: E vs CF P.M. Peak Period Link Volume Change

Figure 4-10 shows net volume change measured for the RR strategy from E during the morning peak period.

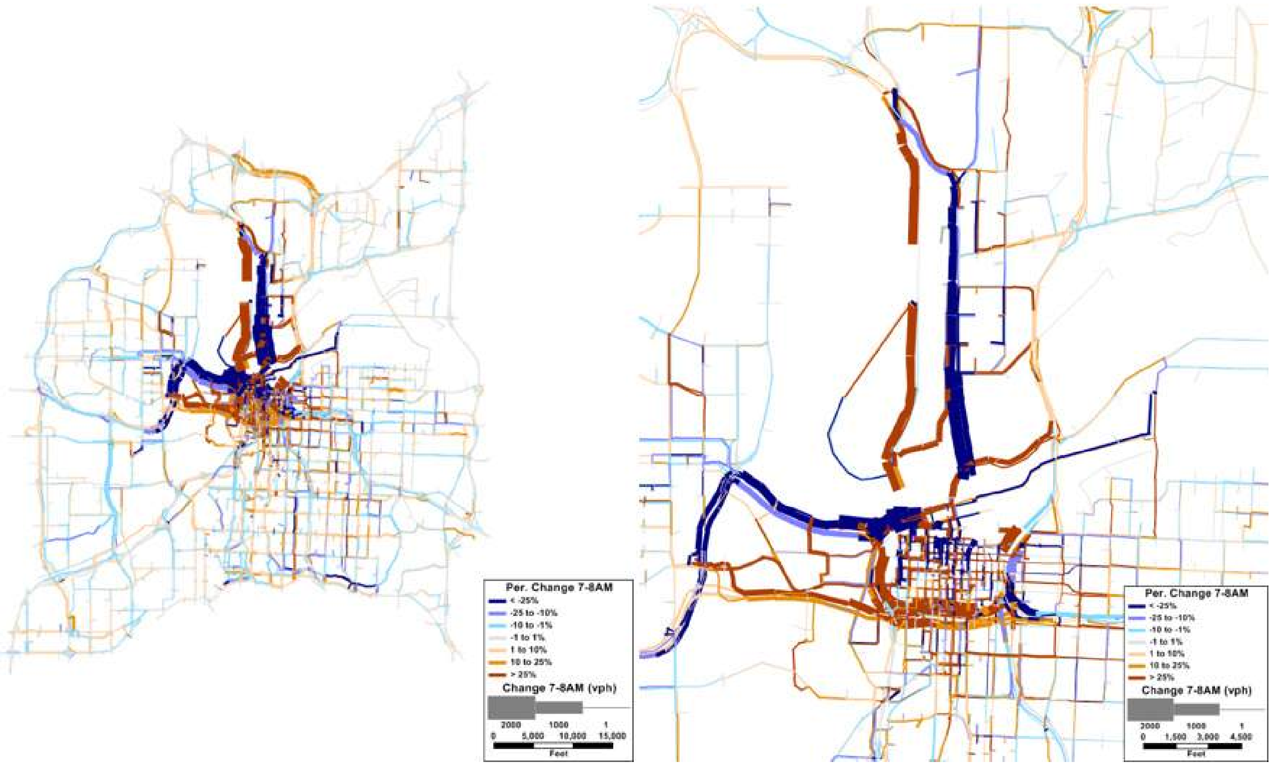


Figure 4-10: E vs RR A.M. Peak Period Link Volume Change

Figure 4-11 shows net volume change measured for the RR strategy from E during the evening peak period.

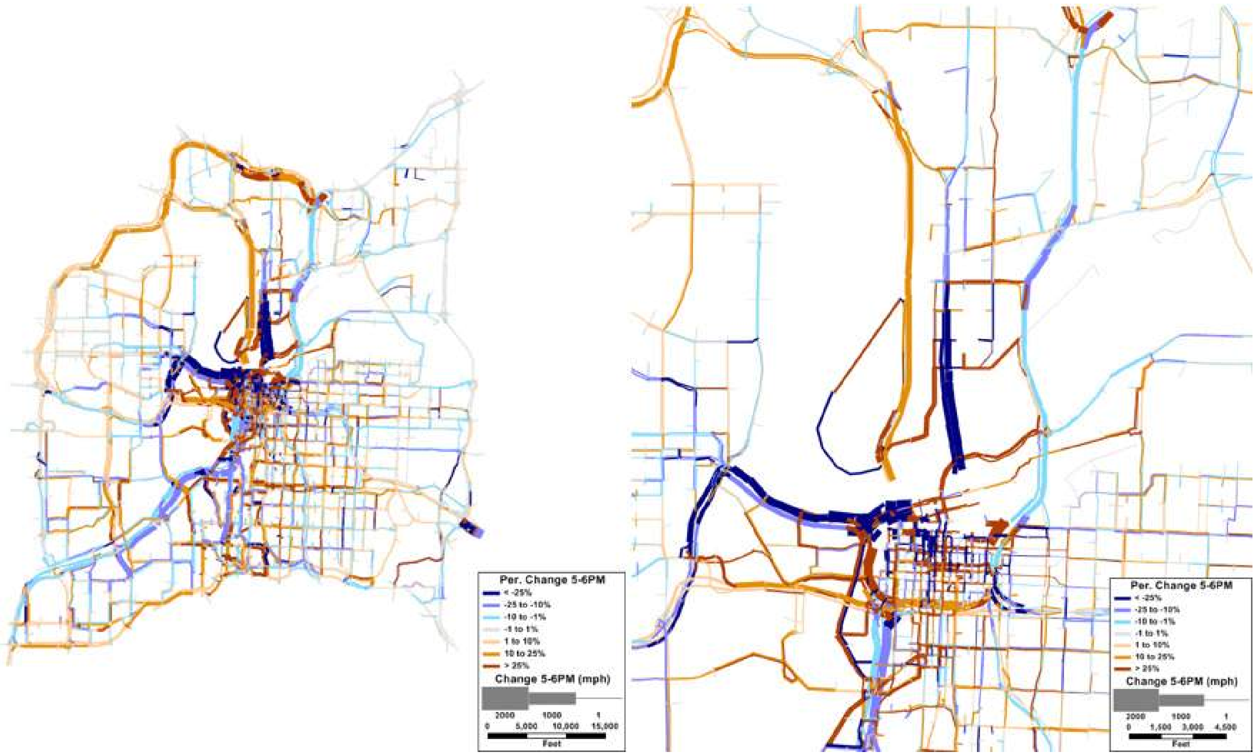


Figure 4-11: E vs RR P.M. Peak Period Link Volume Change

Speed comparison graphics detail net change in link segment average speed results for each strategy from E. Figure 4-12 shows net speed change measured for the AC strategy from E during the morning peak period.

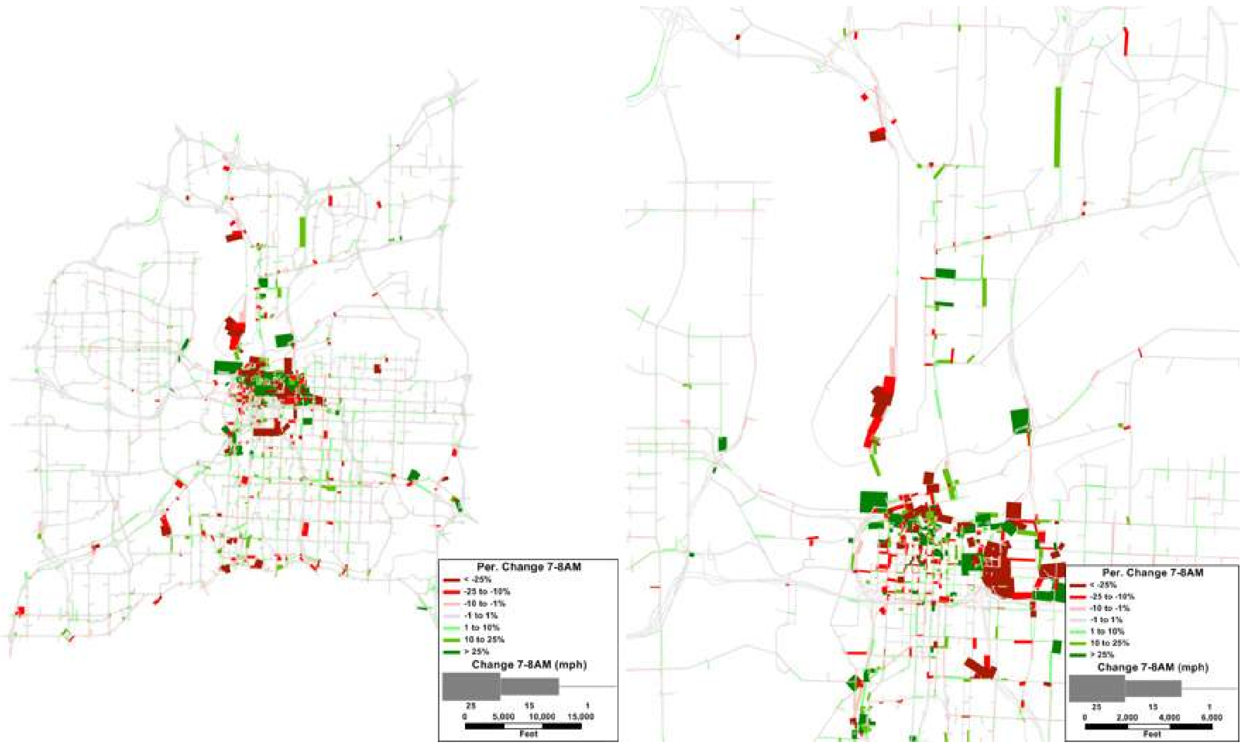


Figure 4-12: E vs AC A.M. Peak Period Link Speed Change

Figure 4-13 shows net speed change measured for the AC strategy from E during the evening peak period.

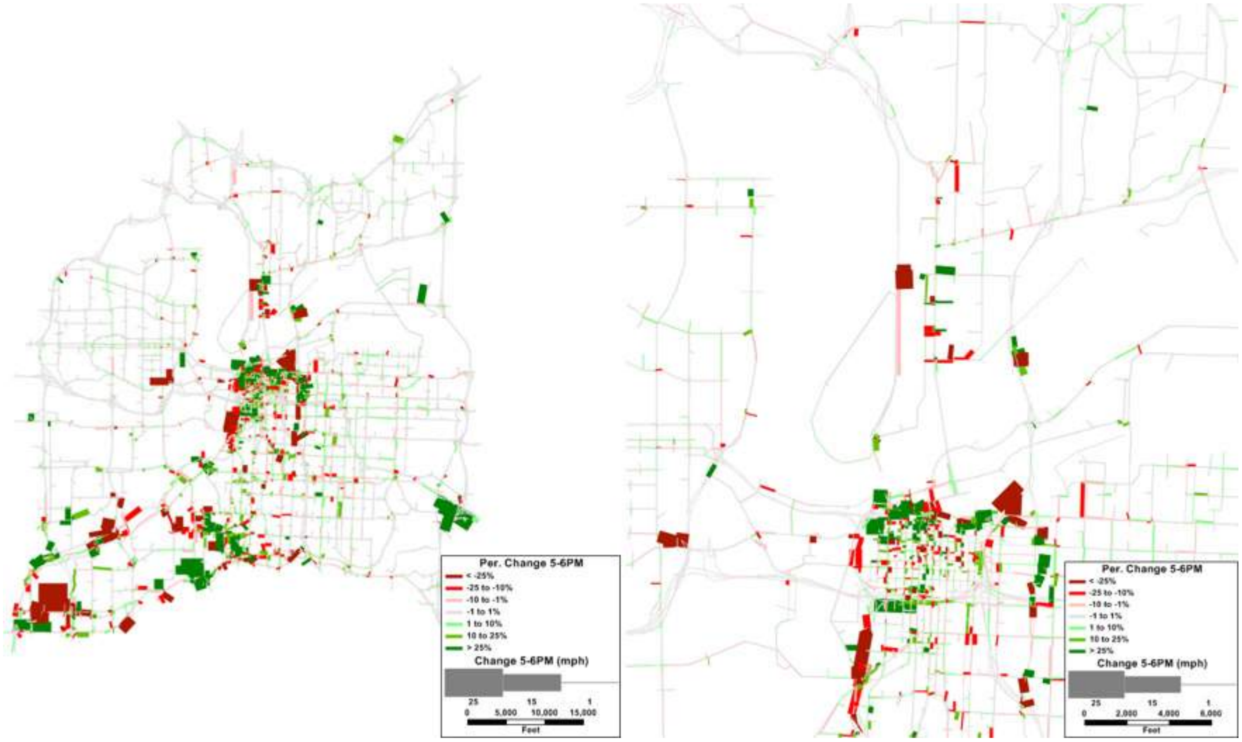


Figure 4-13: E vs AC P.M. Peak Period Link Speed Change

Figure 4-14 shows net speed change measured for the CF strategy from E during the morning peak period.

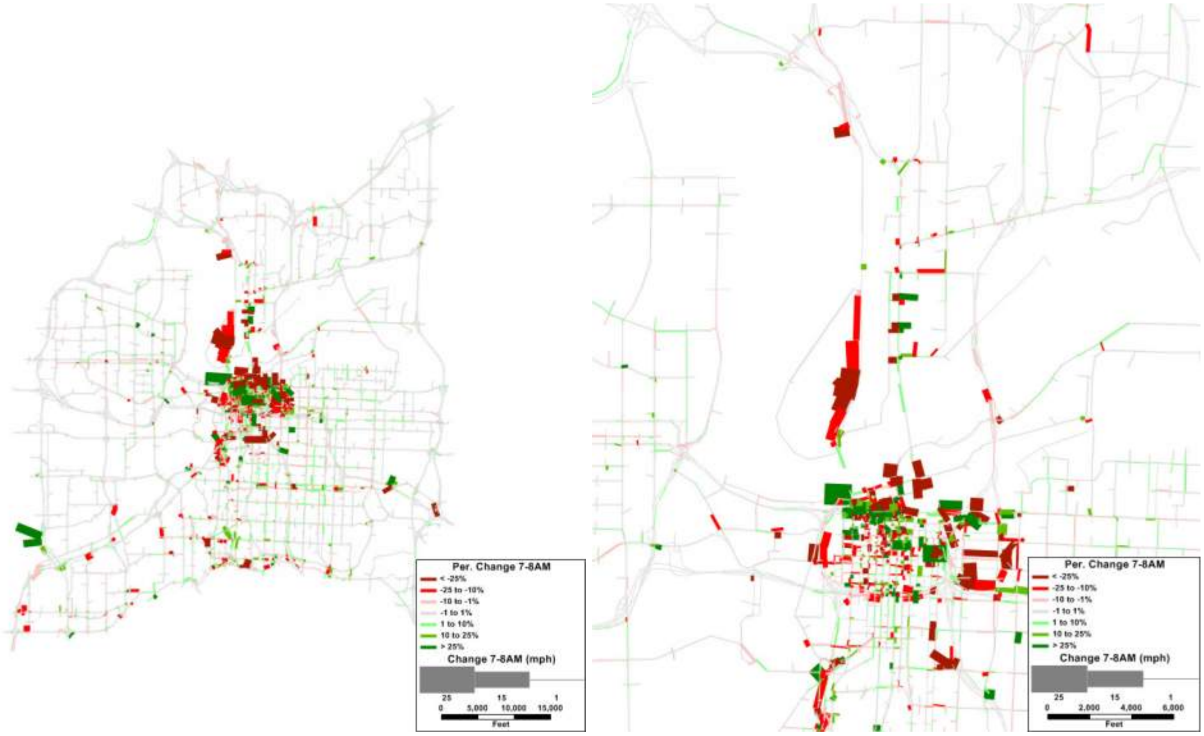


Figure 4-14: E vs CF A.M. Peak Period Link Speed Change

Figure 4-15 shows net speed change measured for the CF strategy from E during the evening peak period.

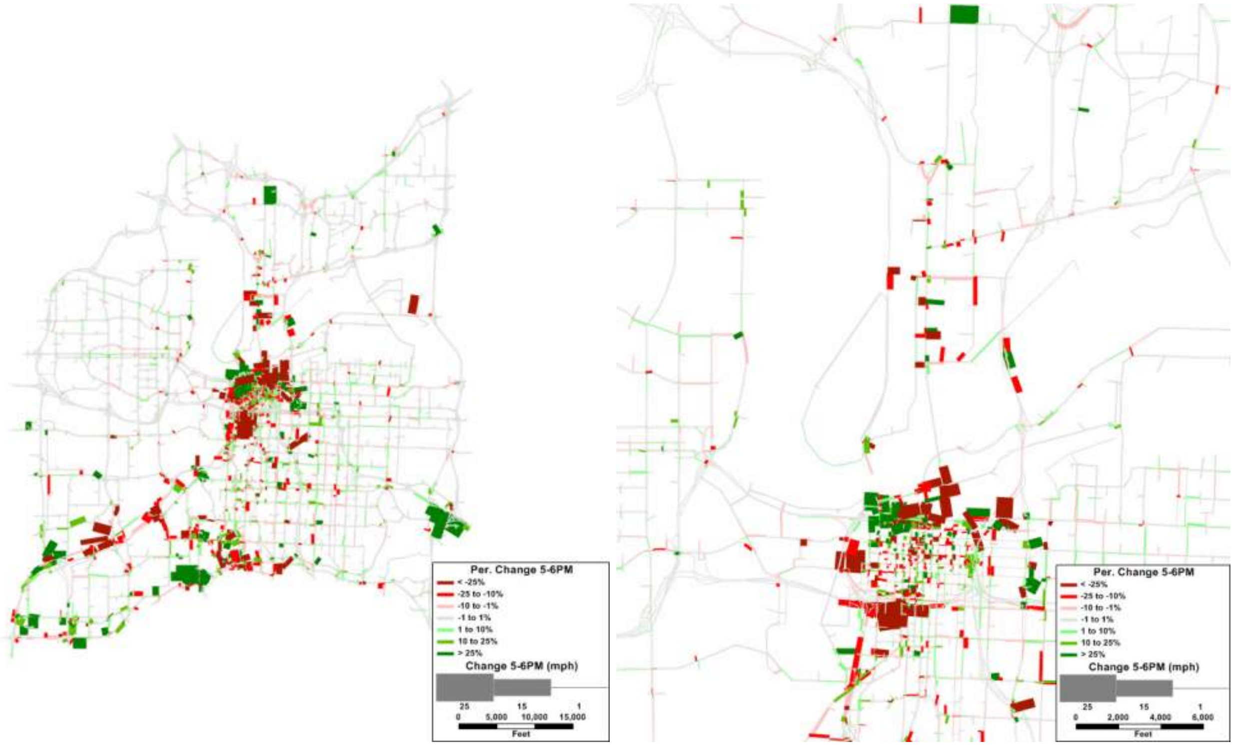


Figure 4-15: E vs CF P.M. Peak Period Link Speed Change

Figure 4-16 shows net speed change measured for the RR strategy from E during the morning peak period.

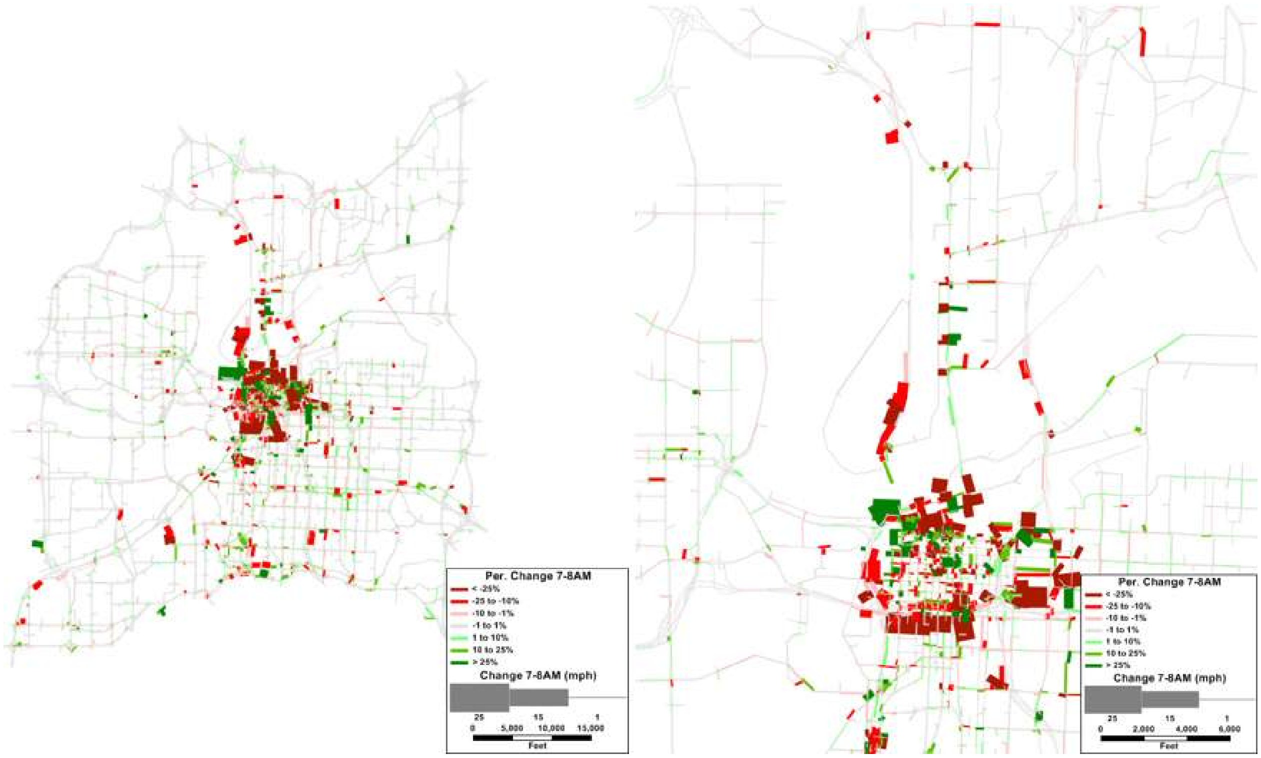


Figure 4-16: E vs RR A.M. Peak Period Link Speed Change

Figure 4-17 shows net speed change measured for the RR strategy from E during the evening peak period.

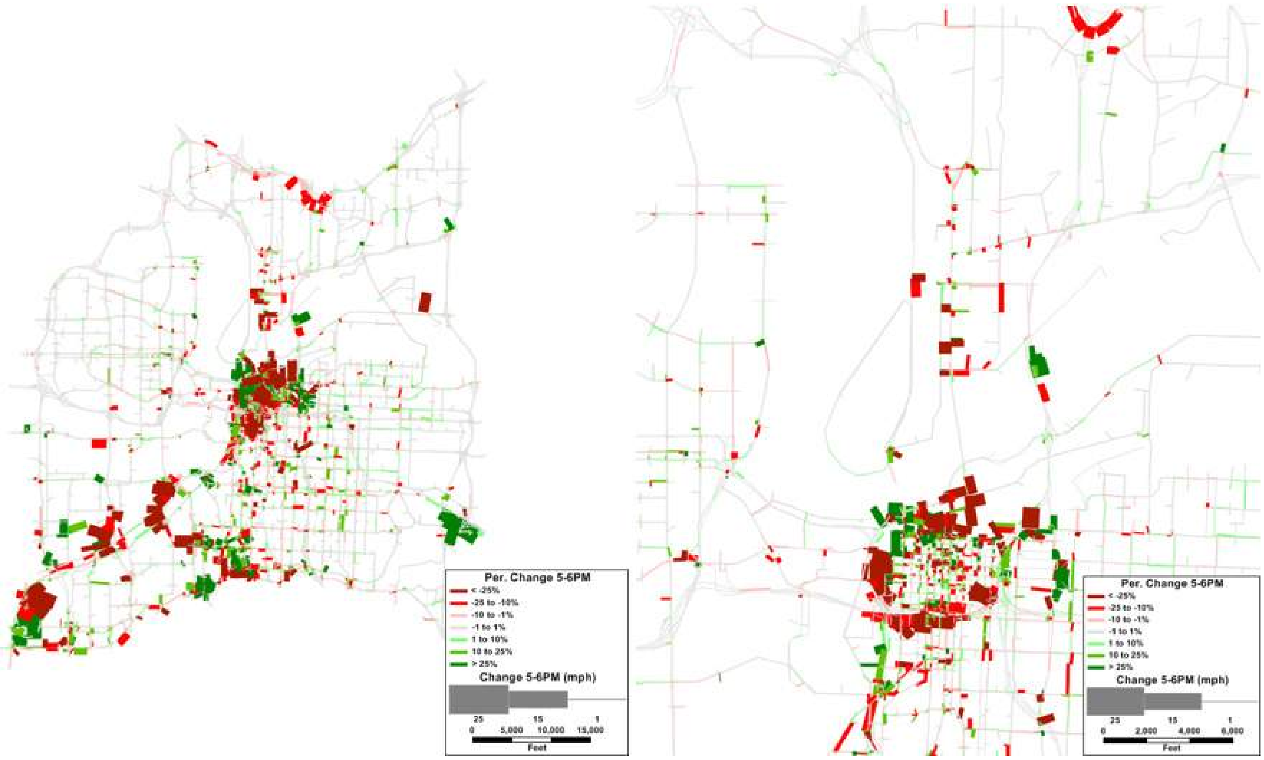
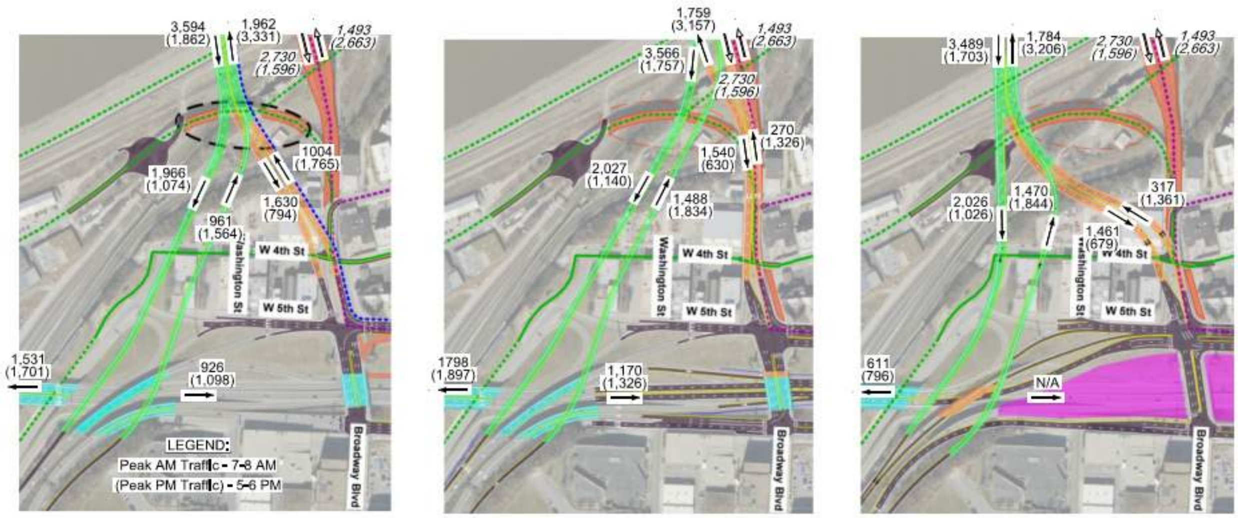


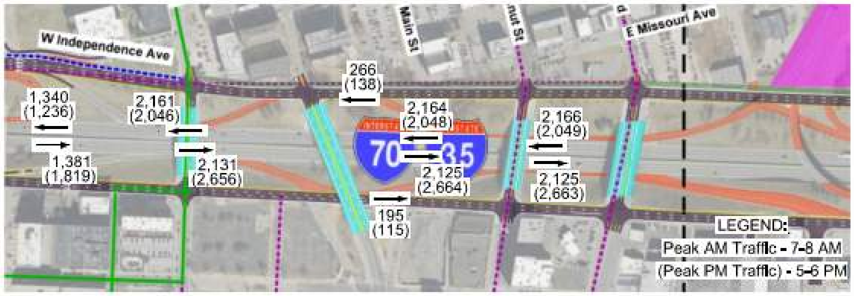
Figure 4-17: E vs RR P.M. Peak Period Link Speed Change

As discussed in the previous section, sections not detailed by DTA "volume change" and "speed change" comparison figures represent areas involving new roadway segments at which comparison to existing roadway cannot be performed. The following figures show total peak hour volumes and speeds for locations where DTA strategy comparison data is not available.

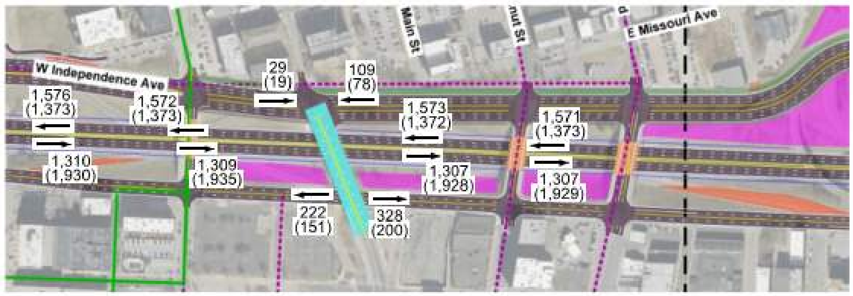


Access Consolidation Strategy | Compressed Footprint (Centered Option) | Remove and Reclassify

Figure 4-18: West Area Volumes



Access Consolidation Strategy



Compressed Footprint (Centered Option)

Remove and Reclassify

Figure 4-19: Central Area Volumes

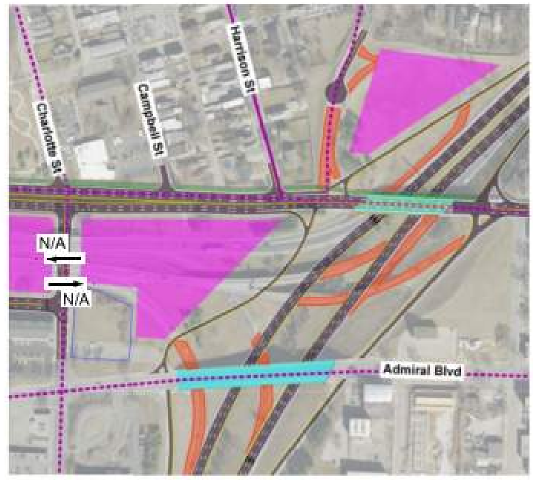
Access Consolidation Strategy

Compressed Footprint
(Centered Option)

Remove and Reclassify

Figure 4-20: Route 9 Area Volumes

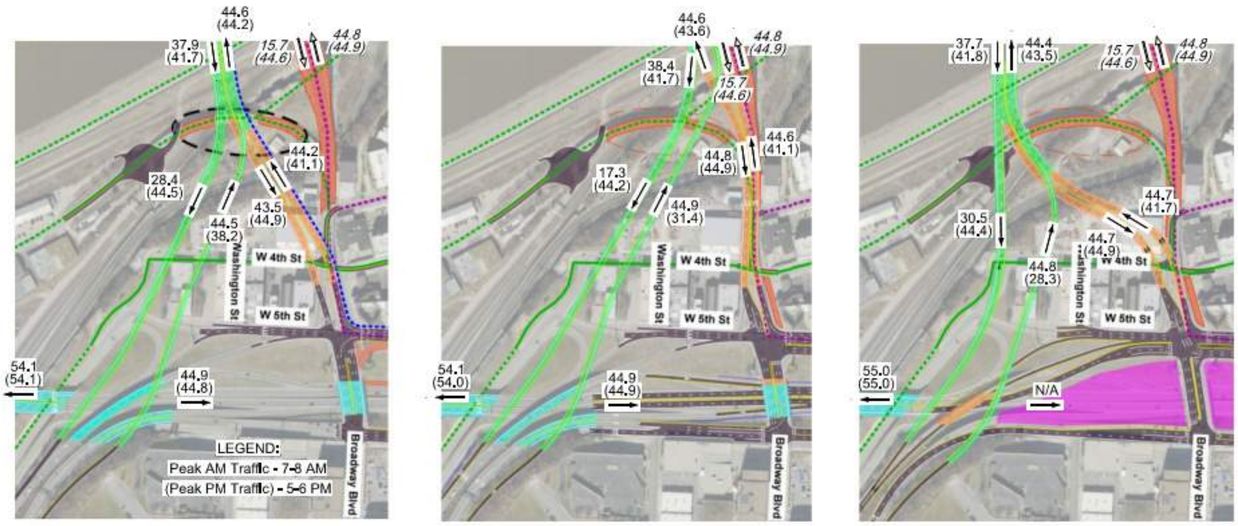
Access Consolidation Strategy



Remove and Reclassify

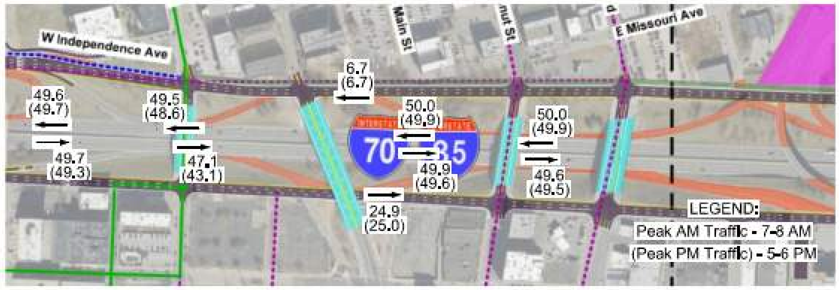
Compressed Footprint (Centered Option)

Figure 4-21: East Area Volumes



Access Consolidation Strategy | Compressed Footprint (Centered Option) | Remove and Reclassify

Figure 4-22: West Area Speeds



Access Consolidation Strategy

Compressed Footprint (Centered Option)

Remove and Reclassify

Figure 4-23: Central Area Speeds

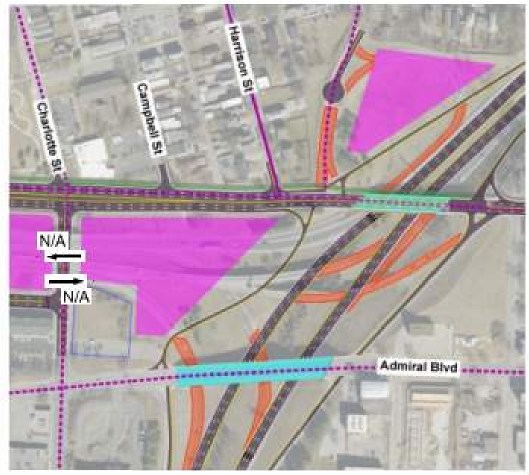
Access Consolidation Strategy

Compressed Footprint
(Centered Option)

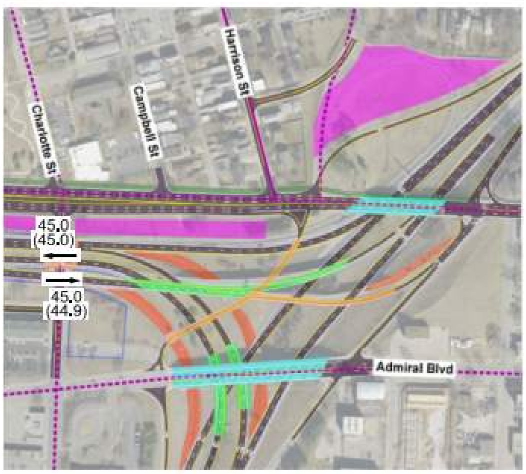
Remove and Reclassify

Figure 4-24: Route 9 Area Speeds

Access Consolidation Strategy



Remove and Reclassify



Compressed Footprint (Centered Option)

Figure 4-25: East Area Speeds

4.4 Downtown Loop Area Point Speed Matrix by Strategy

Point location speeds were assessed for comparison purposes across each configuration strategy. Table 4-7 and Figure 4-26 lists comparison locations measured base on existing KC Scout data collection points as well as details the posted speed, existing measured speed via KC Scout, and projected speeds via DTA results for each comparison location. A highlighted red-green scale shows the amplitude of projected speed impacts when compared to DTA existing scenario resulting speeds.

Location	Direction		Posted Speed	Speed (MPH) Existing AM	Existing PM	DTA - Base AM	DTA - Base PM	DTA - AC AM	DTA - AC PM	DTA - CF AM	DTA - CF PM	DTA - RR AM	DTA - RR PM
Location 1	WB	L&C	55	53.0	***59.0***	54.7	54.5	54.1	54.1	54.1	54.0	55.0	55.0
Location 2	EB		45	***52.0***	***51.0***	44.9	44.8	44.9	44.8	44.9	44.9	NA	NA
Location 3.1	WB (btwn merge and diverge)	North Loop	45	***47.0***	43.0	41.9	36.0	***49.5***	***48.6***	***50.0***	***50.0***	NA	NA
Location 3.2	WB W of diverge		45	***47.0***	43.0	***49.1***	***49.2***	***49.6***	***49.7***	***49.8***	***49.9***	NA	NA
Location 4.1	EB (btwn merge and diverge)		45	43.0	***53.0***	40.1	***45.4***	***47.1***	43.1	***50.0***	***50.0***	NA	NA
Location 4.2	EB W of Merge		45	43.0	***53.0***	***45.8***	***48.6***	***49.7***	***49.3***	***49.8***	***49.7***	NA	NA
Location 5.1	WB (btwn merge and diverge)		45	***51.0***	***50.0***	43.1	***46.7***	***50.0***	***49.9***	***50.0***	***50.0***	NA	NA
Location 5.2	WB W of diverge		45	***51.0***	***50.0***	***49.5***	***47.0***	***50.0***	***49.9***	***50.0***	***50.0***	NA	NA
Location 6.1	EB (btwn merge and diverge)		45	***54.0***	42.0	44.6	43.5	***49.6***	***49.5***	***50.0***	***50.0***	NA	NA
Location 6.2	EB W of Merge		45	***54.0***	42.0	***49.1***	***47.8***	***49.9***	***49.6***	***49.9***	***49.9***	NA	NA
Location 7	WB		45	***54.0***	***57.0***	***47.0***	***49.2***	***49.5***	***49.4***	***49.9***	***49.9***	NA	NA
Location 8	EB		45	39.0	39.0	***49.7***	***48.2***	***49.2***	***47.4***	***49.6***	***48.8***	NA	NA
Location 9	WB		45	***51.0***	***55.0***	45.0	45.0	45.0	45.0	45.0	45.0	NA	NA
Location 10	EB		45			44.7	35.4	34.9	34.9	45.0	44.9	NA	NA
Location 11	NB (north of merge)	East Loop	45			45.0	41.0	22.1	39.7	***47.0***	40.7	***48.1***	43.6
Location 12	SB (north of merge)		45			23.7	39.5	43.2	***47.6***	***46.8***	***47.6***	25.8	42.8
Location 13	EB	South Loop	45	40.0	34.0	***49.2***	37.2	***48.6***	***49.2***	***46.3***	***49.4***	30.7	25.4
Location 14	WB		45	34.0	37.0	43.8	41.7	42.6	40.6	42.3	40.8	39.2	38.9
Location 15	SB	West Loop	45			***49.3***	***49.9***	***49.4***	***49.9***	***49.5***	***49.8***	***48.7***	***49.5***
Location 16	NB		45			***48.1***	***48.1***	***47.5***	42.1	36.2	23.7	37.1	26.9
Location 17	WB	Arterial	25			19.9	18.2	19.6	17.2	19.2	17.5	19.2	17.4
Location 18	EB		25			12.9	10.1	10.9	11.0	9.2	8.4	8.7	8.9
Location 19	SB		35			13.1	15.0	12.9	14.5	12.0	14.7	12.2	14.9
Location 20	NB		35			28.2	29.4	25.1	29.9	24.7	28.6	24.7	28.6
Location 21	SB Broadway Bridge	Broadway Blvd	45			15.7	44.6	37.9	41.7	38.4	41.7	37.7	41.8
Location 22	NB Broadway Bridge		45			44.8	44.9	44.6	44.2	44.6	43.6	44.4	43.5
Location 23	SB Hwy 9	Hwy 9	45			36.8	43.4	42.4	44.9	14.0	17.9	15.4	19.8
Location 24	NB Hwy 9		45			44.8	44.3	44.6	44.2	30.0	29.9	30.0	29.7
Location 25	EB I-670 (under Broadway)	South Loop	45			***49.2***	37.2	***48.6***	***49.2***	***46.3***	49.4	30.7	25.4
Location 26	WB I-670 (under Broadway)		45			44.9	44.7	44.7	44.6	44.8	44.6	44.6	44.4
Location 27	EB I-670 (under Summit St)		45			40.2	41.9	40.7	42.0	41.2	43.0	36.6	32.7
Location 28	WB I-670 (under Summit St)		45			***54.9***	***54.9***	***54.8***	***54.8***	***54.9***	***54.8***	***54.6***	***54.6***
Location 29	SB Hwy 169 to SB I-35	Broadway Blvd/I-35 Connection	45			NA	NA	28.4	44.5	17.3	44.2	30.5	44.4
Location 30	NB I-35 to NB Hwy 169		45			NA	NA	44.5	38.2	44.9	31.4	44.8	28.3
Location 31	SB Hwy 169 to SB Broadway		45			13.6	32.3	43.5	44.9	44.8	44.9	44.7	44.9
Location 32	NB Broadway to NB Hwy 169		45			44.7	44.9	44.2	41.1	44.6	41.1	44.7	41.7

LEGEND
- DTA Build model speed increase (> 5.0mph) versus DTA Base model
- DTA Build model speed increase (2.0mph to 5.0mph) versus DTA Base model
- DTA Build model speed increase (0.5mph to 2.0mph) versus DTA Base model
- DTA Build model speed increase/decrease (< 0.5mph) versus DTA Base model
- DTA Build model speed decrease (-0.5 to -2.0mph) versus DTA Base model
- DTA Build model speed decrease (-2.0mph to -5.0mph) versus DTA Base model
- DTA Build model speed decrease (> -5.0mph) versus DTA Base model
- Existing Speed Information Not Available

Note: No color for Build model speed indicates that the Build versus Base speeds were basically the same (less than a 0.5 mph change).
Italics and Bold Indicates that Resulting DTA Speed is Greater than Posted Speed

Table 4-7: Point Location Speed Comparisons

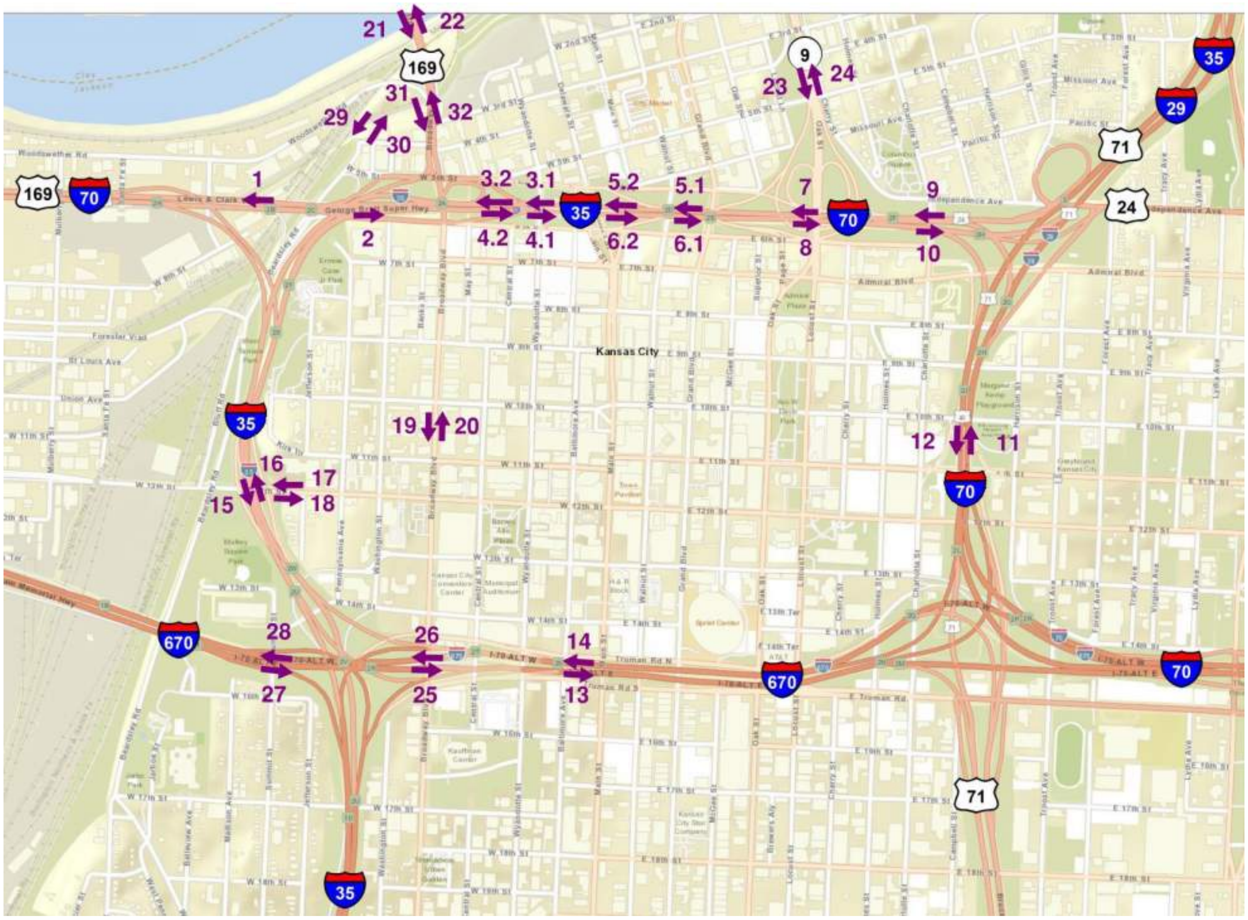


Figure 4-26: Point Location Speed Comparisons

Within Figure 4-26, cells highlighted in green indicate point location DTA strategy projected vehicle speeds that are greater than DTA base condition projected speeds. Cells highlighted in red indicate point location DTA strategy projected vehicle speeds that are greater than DTA base condition projected speeds. Text notated by bolded and italicized text indicates speed projections that are above the posted speed limit.

Observations of Figure 4-26 above show several locations where projected vehicular speeds are greater than posted speed limits. While most of these comparison locations are attributed to speed increases between scenarios, some cases of anticipated speed reduction between scenario comparison remain above posted speed limits. In general, speeds along the north side of the Downtown Loop are projected to increase through the AC and CF strategies. The projected increase in speeds is speculated to be due to a removal of driver interaction turbulence effects between existing on and off ramps. Projected speeds for eastbound I-670 at the south side of the Downtown Loop are expected to decrease during the morning peak hour and increase during the evening peak hour for AC and CF strategies while eastbound I-670 speeds are projected to decrease most significantly during both the morning and evening peak hours under the RR strategy. Projected speeds for westbound I-670 at the south side of the Downtown Loop are expected to reduce in both the morning and evening peak hours under all strategy conditions with the RR strategy showing the most significant impact. The southbound travel direction of I-35 along the west side of the Downtown Loop is anticipated maintain similar to existing average speeds for both morning and evening peak hours across each strategy. The northbound travel direction of I-35 along the west side of the Downtown Loop is projected to experience a reduction in average travel speed for both morning and evening peak hours across all strategies. Projected travel speeds for southbound I-70 along the east side of the Loop are projected to increase across all strategies for both the morning and evening peak hours while the northbound travel direction is anticipated to experience a decrease in travel speeds under AC strategy conditions and an increase in travel speeds under all other strategy conditions.

4.5 Travel Times

DTA travel time measurements were collected for all interstate-to-interstate movements across the influence area. Figure 4-27 shows the influence area considered for all interstate-to-interstate movement travel times.

Figure 4-27: DTA Travel Time Collection Locations

Resulting interstate-to-interstate travel times are listed in

Table 4-8.

Table 4-8: Baseline Conditions DTA Strategy Travel Time Results

Movement	2016 Base		Access Consolidated		Compressed Footprint		Remove & Reclassify	
	A.M. Travel Time	P.M. Travel Time	A.M. Travel Time	P.M. Travel Time	A.M. Travel Time	P.M. Travel Time	A.M. Travel Time	P.M. Travel Time
I35_North to I35_South	04:38	04:42	04:48	05:56	04:49	05:23	05:05	05:21
I35_South to I35_North	04:17	04:55	04:34	04:53	04:24	05:09	04:44	05:52
I70_East to LC Viaduct	04:35	04:08	05:12	04:05	04:19	04:01	05:48	04:43
LC Viaduct to I70_East	04:12	04:10	04:07	04:06	04:04	04:04	04:47	05:46
I670_West to I70_East	02:38	03:39	02:38	03:25	02:43	03:28	03:24	04:37
I70_East to I670_West	03:07	02:32	03:17	02:33	03:24	02:33	04:04	02:43
I-70 WB to US 169 NB	06:36	06:47	07:43	07:59	07:29	09:25	08:27	11:11
US 169 SB to I-70 EB	07:49	06:43	09:13	08:05	09:50	09:09	10:46	11:10
I35_North to I70_East	03:39	03:41	03:47	04:00	03:47	03:59	06:00	06:36
I70_East to I35_North	03:32	03:33	03:31	03:33	03:33	03:34	05:48	06:48
US169 to I35_South	07:02	05:57	06:13	06:10	07:01	05:13	06:13	05:14
I35_South to US 169	07:11	07:21	05:23	05:36	05:29	06:01	05:29	06:07

Table 4-8 depicts the travel time results for all the DTA strategy scenarios for the morning and evening peaks for the existing condition.

5. Traffic Report - 2040

This document describes the methodology and general results of the findings of the traffic analysis for the US 169/I-70 North Loop Planning and Environmental Linkages Study. The basic results and findings will be used to develop the messaging of the relative impacts of the No-Build and various Build strategies through the upcoming public engagement activities. The data is focused on the incremental impacts and effects of the three basic strategies developed for the North Loop area of I-70 in comparison with base year (2016) and future year (2040) No-Build conditions. Generally, overall the findings are:

- Baseline 2016 to 2040 No-Build comparisons show a projected 62.6% increase in Vehicle Hours Delay in the morning peak period and a 77.2% increase in Vehicle Hours Delay in the evening peak period across DTA study area freeways and expressways.
- The most significant vehicle speed and volume impacts through each strategy are experienced on the edges of the DTA model limits. Therefore, DTA model data for the area of the Downtown Loop only, DTA model with a cordon line, will be developed to create additional insight.
- Access Consolidation (AC) appears to improve conditions all around, especially north/south across the river. Compressed Footprint (CF) appears to also improve conditions in many areas, especially north/south across the river, but does have some challenges. Remove and Reclassify (RR) appears to also improve conditions north/south across the river but diverts traffic to I-670. I-670 issues are not due to capacity, but rather an interchange and weaving issue.
- Three mitigations were analyzed and added to improve performance.
- Congested conditions and delays are limited to peak hours located on the west side of the Loop and I-670.
- Forecasts for the RR conditions within the Downtown Loop area are equivalent to the 2040 No-Build conditions outside the Downtown Loop area.
- Traffic volume diversions and speed reductions due to congestion outside the Downtown Loop area significantly complicate the analysis.
- CV/AV considerations result in an increase VMT and a decrease in VHD, which means drivers are willing to drive out of their way to get to CV/AV freeways.

5.1 2040 DTA Model Modification

On typical weekday afternoons, one source of southbound I-35 congestion begins south of Shawnee Mission Parkway, around 75th Street, and queues back to just north of Mission Road (Figure 5-1). This condition also occurs during typical weekday mornings, but the extent of the congestion and queues are much more reduced as compared to the afternoon conditions.

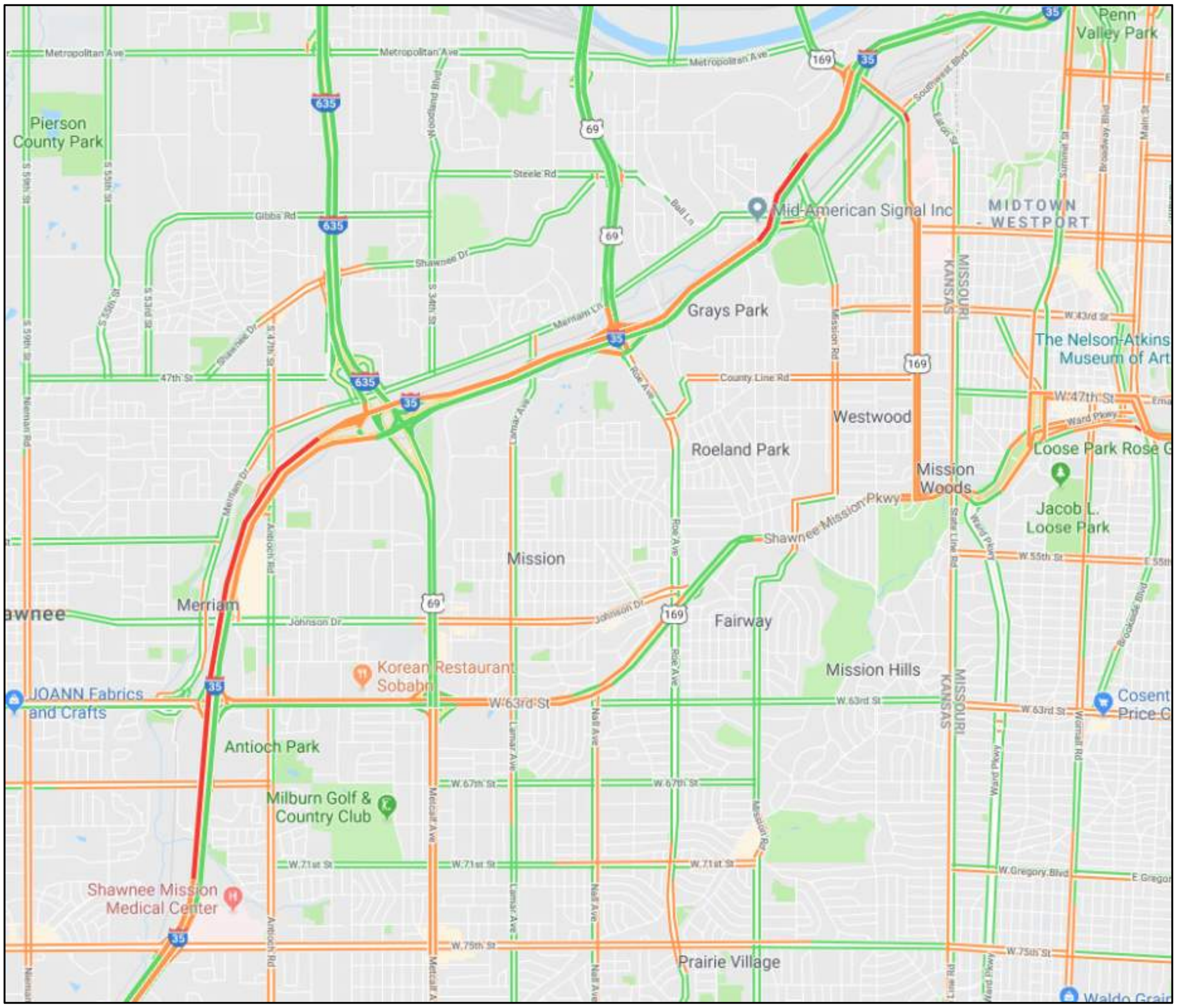


Figure 5-1: Typical Weekday PM Peak Hour Conditions on SB I-35

Since DTA model limits are Shawnee Mission Parkway, the source of the congestion is not included in the DTA base conditions model. Without the congestion, SB I-35 is, for the most part, free-flow. Therefore, to replicate existing conditions in the DTA model, specifically the SB queue on I-35, factors were included to reduce the saturation flow rates of the exit link of I-35 at the southern DTA model limits during hours where the existing queues were observed. The constraints were calibrated until the SB I-35 volume (throughput) and queues were sufficiently represented in the Baseline DTA model.

Unfortunately, the constraints used to calibrate the Baseline conditions resulted in an excessively long queue in the 2040 DTA model even when combined with all known programmed projects. The queues extended back to almost reach the Downtown Loop. The concern with the queue was that traffic would avoid I-35 altogether, and perhaps avoid the Downtown area. Three general approaches to addressing the long 2040 queue were considered:

1. Use the DTA model as-is and have the long queue influence traffic assignments and metrics of the various Build scenarios.

2. Adjust the EMME model and traffic projections along I-35. This approach would suggest that growth to the south along the I-35 corridor would be stunted due to the excessive delays resulting from the queue.

3. Add capacity improvements to the I-35 corridor that would result from recommended, but not yet programmed projects, to allow the forecasted growth on I-35 to still be achieved.

The third approach was selected, and projects recommended in the I-35, Moving Forward study, June 2013, were considered. Hard Shoulder Running (HSR) was recommended in the report for both directions of I-35 from just outside the Downtown Loop to well south of the southern DTA limits. A segment from the I-35 Study Executive Summary states;

> *"Hard Shoulder Running (HSR) — Sixty-nine percent of respondents said they would support expansion of bus on shoulder to address congestion. Fifty-four percent of respondents said they would support restricted vehicles (e.g., transit, high occupancy vehicle (HOV) lanes, high occupancy toll (HOT) lanes using the shoulders during peak periods and incidents. Twenty-three percent felt that all traffic should use the shoulders to manage congestion and incidents during the peak periods."*

To conservatively account for HSR the equivalent of 80% of a lane was deducted from the SB I-35 "constraint", or, in other words, 0.80 of a lane was added to SB I-35 just south of Shawnee Mission Parkway through the existing 3 lane bottleneck locations. The 80% was determined through a review of literature on the capacity impacts of hard shoulder running and is well summarized in the February 2016 USDOT report "Use of Freeway Shoulders for Travel". The value assumes as a well-designed shoulder with sufficient offsets from barriers or bridge abutments that allows for the safe use of the shoulder during peak periods but provides is conservative in the assumption of the HSR lane provides less benefits than a full additional lane of capacity, which has been observed in some initial implementations of HSR lanes in the U.S. (e.g. I-66 in Virginia).

No capacity improvements were included anywhere else on SB I-35 in the DTA model and no improvements were assigned to northbound I-35 within the DTA model, as the DTA model assumes that the traffic as already past this bottleneck south of Shawnee Mission Parkway. This reduction in the constraint resulted in the 2040 No Build SB I-35 queue to be relatively similar to the length of the queue on I-35 today.

5.2 Baseline 2016 versus 2040 No-Build

Measures of effectiveness (MOE's) similar to the methods used for baseline conditions analyses were collected from the 2040 DTA models and have been organized as follows:

1. Morning and evening conditions
2. Freeways, ramps, arterials and all roadways combined
3. No-Build conditions and the three Build DTA scenario models

Specifically, the following information was collected:

- Vehicle Miles Traveled (VMT)
- Vehicle Hours Traveled (VHT)
- Vehicle Hours of Delay (VHD)

The VMT metric is a particularly telling metric to identify if traffic is rerouting to longer but faster, alternative routes to avoid congestion in the Downtown area. The VHT and VHD metrics are good indicators of overall network performance.

These measures of effectiveness, MOE's are used to measure strategy comparisons between Baseline 2016 conditions and No-Build 2040 conditions, both the morning and evening peak periods. These comparisons are both tabular and graphic comparisons of the systemwide MOE's. It is important to note that several of the MOE's reported in this section appear to report relatively significant degradation of the freeway system within the DTA model area. It is important note that while the tables are reporting large delays across the system, the delta figures show that significant speed deterioration and volume increases generally are happening along the perimeter of the DTA model: I-435/I-70, I-29/I-35, I-635/I-29, I-35/I-635. This suggests the issues identified in the comparison of the Baseline 2016 conditions and the No-Build 2040 conditions are located outside the study area, outside the Downtown Loop. The DTA model analysis of the study area, with cordon lines, should identify provide better resolution of the comparison of Baseline 2016 conditions and 2040 conditions.

5.2.1 A.M. Peak

As discussed in the previous section, results for VMT, VHT, and VHD were collected to serve as comparison metrics between 2040 No-Build and Baseline conditions. This section details morning peak period results for each analysis strategy by roadway segment type. Table 5-1 lists morning peak period VMT results for the 2016 existing and 2040 No-Build conditions.

Table 5-1: A.M. Peak Period DTA Vehicle Miles Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,381,960	128,822	574,171	2,084,952
No Build 2040	1,580,254	138,616	601,108	2,319,979
Change vs Existing Conditions				
No Build 2040	14.3%	7.6%	4.7%	11.3%

As shown in Table 5-1, the future No-Build condition is projected to result in a system total increase of VMT by approximately 11% while freeways and expressways are projected to experience an increase of VMT by approximately 14%.

Table 5‑2 lists morning peak period VHT results for the 2016 existing and 2040 No-Build conditions.

Table 5-2: A.M. Peak Period DTA Vehicle Hours Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	25,537	4,101	25,987	55,625
No Build 2040	30,042	4,424	30,387	64,853
Change vs Existing Conditions				
No Build 2040	17.6%	7.9%	16.9%	16.6%

As shown in

Table 5‑2, the future No-Build condition is projected to result in a system to increase of VHT system by approximately 17% while freeways and expressways are projected to result in an increase of VHT by approximately 18%. Table 5-3 lists morning peak period VHD results for the 2016 existing and 2040 no-build conditions.

Table 5-3: A.M. Peak Period DTA Vehicle Hours of Delay Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,867	567	7,838	10,273
No Build 2040	3,035	652	11,418	15,105
Change vs Existing Conditions				
No Build 2040	62.6%	15.0%	45.7%	47.0%

As shown in Table 5-3, the No-Build condition is expected to experience the most significant change in VHD by 63%.

Table 5-4: A.M. Peak Period DTA Average Harmonic Speed Results

A.M. Peak Period (6-9 A.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	54	31	22	37
No Build 2040	53	31	20	36
Change vs Existing Conditions				
No Build 2040	-2.8%	-0.3%	-10.5%	-4.6%

As shown in Table 5-4, average harmonic speeds do not change significantly but do show an overall decrease in AHS in all roadway segments.

5.2.2 P.M. Peak

This section details evening peak period results for existing and No-Build conditions by roadway segment type. Table 5-5, lists evening peak period VMT results for the 2016 existing and 2040 no-build conditions.

Table 5-5: P.M. Peak Period DTA Vehicle Miles Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,950,179	190,480	983,511	3,124,170
No Build 2040	2,247,398	205,661	1,041,454	3,494,513
Change vs Existing Conditions				
No Build 2040	15.2%	8.0%	5.9%	11.9%

As shown in Table 5-5, the No-Build condition is expected to experience the most significant change in VMT by 15 percent in the freeways and expressways. Table 5-6 lists evening peak period VHT results for the 2016 existing and 2040 no-build conditions.

Table 5-6: P.M. Peak Period DTA Vehicle Hours Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	37,398	6,349	53,611	97,357
No Build 2040	45,429	7,160	63,342	115,931
Change vs Existing Conditions				
No Build 2040	21.5%	12.8%	18.2%	19.1%

As shown in Table 5-6, the No-Build condition is expected to experience significant increases in the arterials, freeways and expressways by 19 and 21 percent respectively in the VHT results.

Table **5-7** lists evening peak period VHD results for the 2016 existing and 2040 No-Build conditions.

Table 5-7: P.M. Peak Period DTA Vehicle Hours of Delay Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	3,993	1,099	22,223	27,314
No Build 2040	7,076	1,528	30,149	38,753
Change vs Existing Conditions				
No Build 2040	77.2%	39.0%	35.7%	41.9%

As shown in

Table 5-7, the No-Build condition is expected to have significant changes in the entire system, however, the freeways and expressways experience the most with a 77% change and a system change of 42%.

Table 5-8: P.M. Peak Period DTA Average Harmonic Speed Results

P.M. Peak Period (3-7 P.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	52	30	18	32
No Build 2040	49	29	16	30
Change vs Existing Conditions				
No Build 2040	-5.1%	-4.3%	-10.4%	-6.1%

As shown in Table 5-8, average harmonic speeds do not change significantly but do show an overall decrease in AHS in all roadway segments.

5.2.3 Baseline 2016 to 2040 No-Build Comparison Graphics

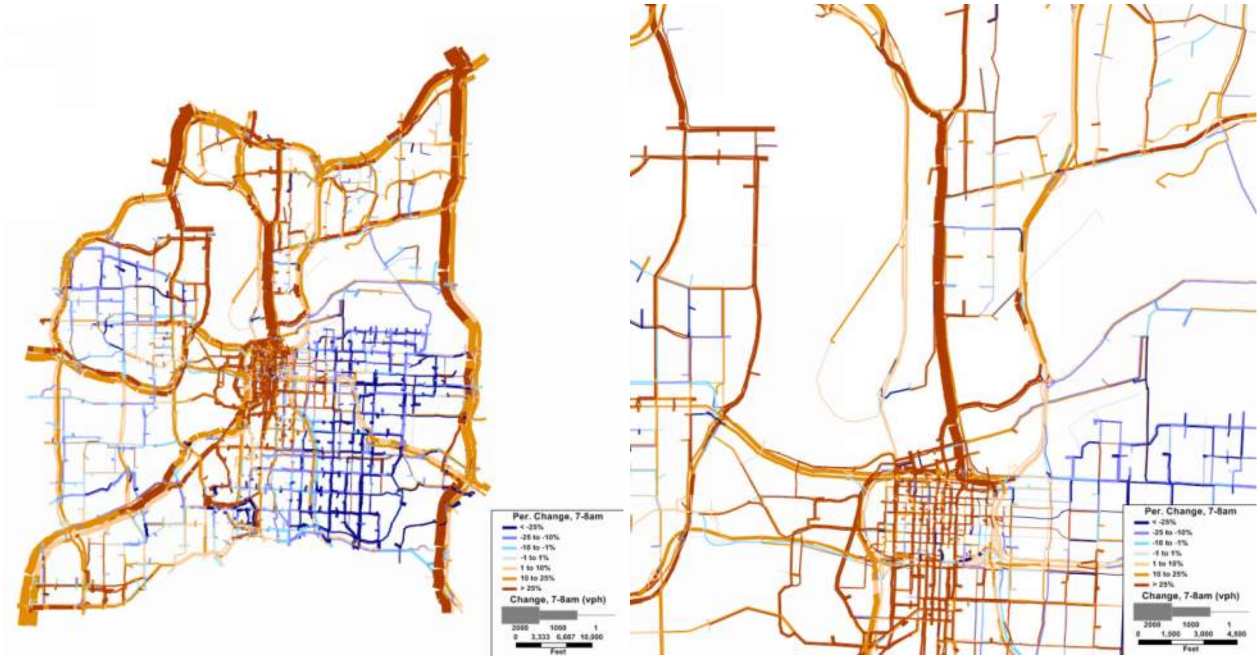


Figure 5-2: A.M. No-Build 2016 vs. 2040 Volume Maps

Figure 5-3: P.M. No-Build 2016 vs. 2040 Volume Maps

Figure 5-4: A.M. No-Build 2016 vs. 2040 Speed Maps

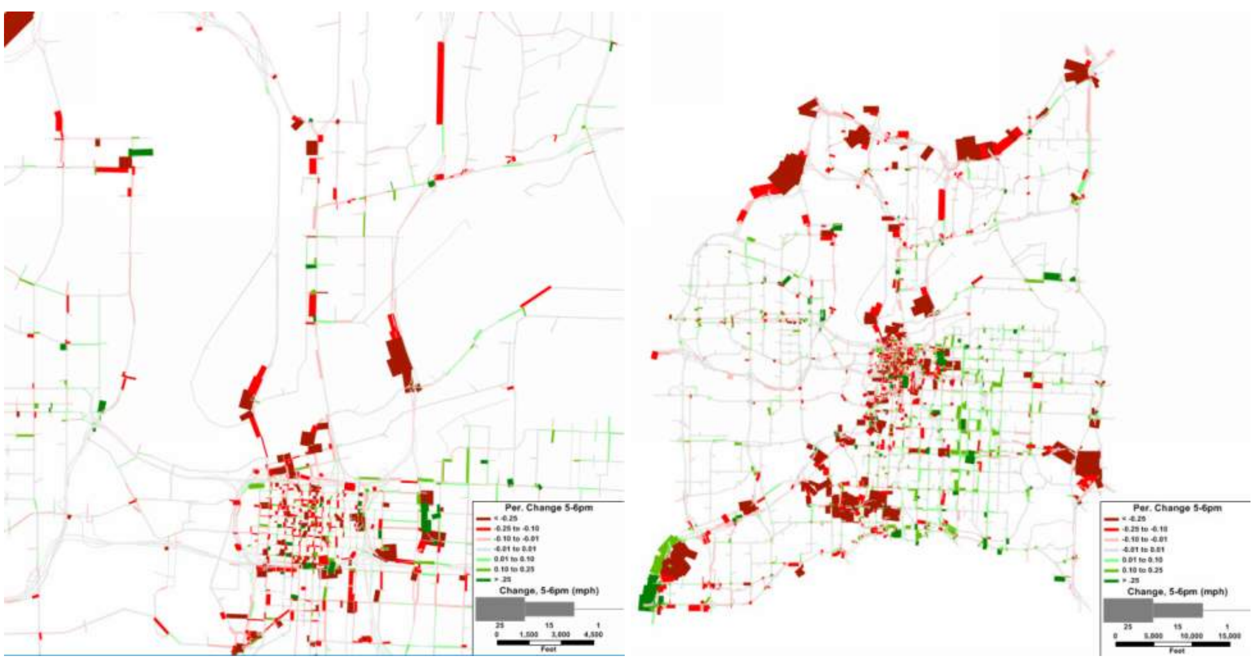


Figure 5-5: P.M. No-Build 2016 vs. 2040 Speed Maps

Figure 5-2 thru Figure 5-5 shows the change in speeds and volumes across the No-Build scenarios from 2016 to 2040. The outer system is affected more significantly than the inner Downtown Loop area, causing significant increases in volume, and thus decreasing the speeds.

5.3 2040 DTA Network Metrics

Measures of effectiveness, MOE's discussed in the previous section were used to measure strategy comparisons between 2016 Baseline and the No-Build 2040 conditions in both the morning and evening peak periods. This section reports the regional DTA model MOE's in tabular format. It is important to note that several of the MOE's reported in this section appear to report a rather gloomy forecast for the Build scenarios, particularly the Remove and Reclassify I-70 scenario. However, review of the delta figures shows that significant speed deterioration and volume increases happen along the perimeter of the DTA model: I-435/I-70, I-29/I-35, I-635/I-29, I-35/I-635. This suggests the issues identified in the 2040 DTA models is occurring outside the study area, outside the Downtown Loop. The DTA model analysis of the study area, with cordon lines, should identify provide better resolution of the Build scenario impacts on 2040 conditions.

5.3.1 A.M. Peak Strategy Comparisons

As discussed in the previous section, results for VMT, VHT, and VHD were collected to serve as comparison metrics between each analysis strategy under 2040 projections. This section details morning peak period results for each analysis strategy by roadway segment type.

Table 5-9 lists morning peak period VMT results across each strategy.

Table 5-9: A.M. Peak Period 2040 DTA Vehicle Miles Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
No-Build Conditions	1,580,254	138,616	601,108	2,319,979
Access Consolidation	1,570,785	141,950	604,650	2,317,385
Compressed Footprint	1,572,327	140,765	606,517	2,319,608
Remove and Reclassify I-70	1,562,785	142,268	610,067	2,315,121
Change vs Existing Conditions				
Access Consolidation	-0.6%	2.4%	0.6%	-0.1%
Compressed Footprint	-0.5%	1.6%	0.9%	0.0%
Remove and Reclassify I-70	-1.1%	2.6%	1.5%	-0.2%

As shown in

Table 5-9, each strategy is expected to result in marginal impacts to total system VMT. VMT comparison differentials remain similar to VMT differentials reported in the baseline conditions portion of the report. Therefore, each condition is projected to show similar traffic diversion characteristics to the baseline conditions.

Table 5-10 lists morning peak period VHT results across each strategy.

Table 5-10: A.M. Peak Period 2040 DTA Vehicle Hours Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
No-Build Conditions	30,042	4,424	30,387	64,853
Access Consolidation	29,999	4,545	30,985	65,529
Compressed Footprint	30,056	4,530	31,435	66,021
Remove and Reclassify I-70	30,478	4,559	32,339	67,376
Change vs Existing Conditions				
Access Consolidation	-0.1%	2.7%	2.0%	1.0%
Compressed Footprint	0.0%	2.4%	3.4%	1.8%
Remove and Reclassify I-70	1.5%	3.1%	6.4%	3.9%

As shown in Table 5-10, the AC and CF strategies are anticipated to maintain constant VHT across freeways and expressways while it is projected that the AC and CF strategies will result in an increase in VHT across ramps, arterials, and the system total. The RR strategy is projected to experience the most significant increase in VHT across all segment types. The projected increase in VHT for the RR strategy is projected to be significantly higher in comparison to baseline comparisons discussed previously. Table 5-11 lists morning peak period VHD results across each strategy.

Table 5-11: A.M. Peak Period 2040 DTA Vehicle Hours of Delay Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
No-Build Conditions	3,035	652	11,418	15,105
Access Consolidation	3,171	737	11,875	15,783
Compressed Footprint	3,213	741	12,252	16,206
Remove and Reclassify I-70	3,830	728	13,040	17,599
Change vs Existing Conditions				
Access Consolidation	4.5%	13.0%	4.0%	4.5%
Compressed Footprint	5.9%	13.7%	7.3%	7.3%
Remove and Reclassify I-70	26.2%	11.7%	14.2%	16.5%

As shown in Table 5-11, the AC strategy is projected to experience the least significant overall increase in VHD while the CF strategy is expected to result in an overall VHD increase greater than the AC strategy.

The RR strategy is projected to result in the most significant increase in overall VHD with freeway and expressway segments experiencing the most significant change.

Table 5-12: A.M. Peak Period 2040 DTA Average Harmonic Speed Results

A.M. Peak Period (6-9 A.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions Final	53	31	20	36
Access Consolidation	52	31	20	35
Compressed Footprint	52	31	19	35
Remove and Reclassify I-70	51	31	19	34
Change vs Existing Conditions				
Access Consolidation	-0.5%	-0.3%	-1.4%	-1.1%
Compressed Footprint	-0.5%	-0.8%	-2.5%	-1.8%
Remove and Reclassify I-70	-2.5%	-0.4%	-4.6%	-3.9%

As shown in Table 5-12, the RR strategy is projected to experience the most significant decrease in AHS. However, the largest speed decrease for the RR strategy is 2 mph for the freeway and expressway road segments.

5.3.2 P.M. Peak Strategy Comparisons

This section details evening peak period results for each analysis strategy by roadway segment type. Table 5-13 lists evening peak period VMT results across each strategy.

Table 5-13: P.M. Peak Period 2040 DTA Vehicle Miles Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
No-Build Conditions	2,247,398	205,661	1,041,454	3,494,513
Access Consolidation	2,237,981	209,158	1,041,711	3,488,849
Compressed Footprint	2,248,332	209,362	1,044,745	3,502,439
Remove and Reclassify I-70	2,224,092	207,377	1,063,695	3,495,165
Change vs Existing Conditions				
Access Consolidation	-0.4%	1.7%	0.0%	-0.2%
Compressed Footprint	0.0%	1.8%	0.3%	0.2%
Remove and Reclassify I-70	-1.0%	0.8%	2.1%	0.0%

As shown in Table 5-13, each strategy is expected to result in marginal impacts to total system VMT. VMT comparison differentials remain similar to VMT differentials reported in the baseline conditions portion of the report. Therefore, each condition is projected to show similar traffic diversion characteristics to the baseline conditions. Table 5-14 lists evening peak period VHT results across each strategy.

Table 5-14: P.M. Peak Period 2040 DTA Vehicle Hours Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
No-Build Conditions	45,429	7,160	63,342	115,931
Access Consolidation	45,061	7,050	65,717	117,828
Compressed Footprint	46,796	7,281	63,369	117,446
Remove and Reclassify I-70	46,838	7,797	68,862	123,497
Change vs Existing Conditions				
Access Consolidation	-0.8%	-1.5%	3.7%	1.6%
Compressed Footprint	3.0%	1.7%	0.0%	1.3%
Remove and Reclassify I-70	3.1%	8.9%	8.7%	6.5%

As shown in Table 5-14, the AC and CF strategies result in similar system total VTR results. The AC strategy shows an increase in VTR across arterials while the CF strategy shows in increase of VTR across freeways, expressways and ramps. The RR strategy is projected to experience the most significant increase in VTR across all segment types. Table 5-15 lists evening peak period VHD results across each strategy.

Table 5-15: P.M. Peak Period 2040 DTA Vehicle Hours of Delay Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
No-Build Conditions	7,076	1,528	30,149	38,753
Access Consolidation	6,855	1,381	32,508	40,745
Compressed Footprint	8,450	1,596	30,010	40,056
Remove and Reclassify I-70	9,001	2,154	34,904	46,059
Change vs Existing Conditions				
Access Consolidation	-3.1%	-9.6%	7.8%	5.1%
Compressed Footprint	19.4%	4.5%	-0.5%	3.4%
Remove and Reclassify I-70	27.2%	41.0%	15.8%	18.9%

As shown in Table 5-15, the AC strategy is anticipated to experience a reduction in VHD across freeways, expressways, and ramps while the CF strategy is projected to experience a significant increase in VHD across freeways and expressways. The RR strategy is expected to result in the most significant increases in VHD across freeways, expressways, and ramps.

Table 5-16: P.M. Peak Period 2040 DTA Average Harmonic Speed Results

P.M. Peak Period (3-7 P.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing Conditions Final	49	29	16	30
Access Consolidation	50	30	16	30
Compressed Footprint	48	29	16	30
Remove and Reclassify I-70	47	27	15	28
Change vs Existing Conditions				
Access Consolidation	0.4%	3.3%	-3.6%	-1.8%
Compressed Footprint	-2.9%	0.1%	0.3%	-1.1%
Remove and Reclassify I-70	-4.0%	-7.4%	-6.1%	-6.1%

As shown in Table 5-16, the RR strategy is projected to experience the most significant decrease in AHS. However, the largest speed decrease for the RR strategy is 2 mph for the freeway and expressway, and ramp road segments.

5.4 2040 Comparison Graphics

Strategy comparison graphics were produced to aid in visualizing strategy impacts over no-build conditions (NB) link volumes and speeds. In the volume figures, orange bars indicate a net volume increase from NB to each respective strategy and blue bars indicate a net volume decrease from NB to each respective strategy. Comparison bar thickness represents the amount of change difference with thicker bars indicating more significant change and thinner bars indicating less significant to no measured change.

In the previous section, measures of effectiveness, MOE's, were presented in a tabular format, while this section presents volume and speed delta figures information graphically by location within the DTA model. It is important to note that several of the MOE's reported in the earlier section appear to report a rather gloomy forecast for the Build scenarios, particularly the Remove and Reclassify I-70 scenario. However, review of the delta figures shows that significant speed deterioration and volume increases happen along the perimeter of the DTA model: I-435/I-70, I-29/I-35, I-635/I-29, I-35/I-635. This suggests the issues identified in the 2040 DTA models is occurring outside the study area, outside the Downtown Loop. The DTA model analysis of the study area, with cordon lines, should identify provide better resolution of the Build scenario impacts on 2040 conditions.

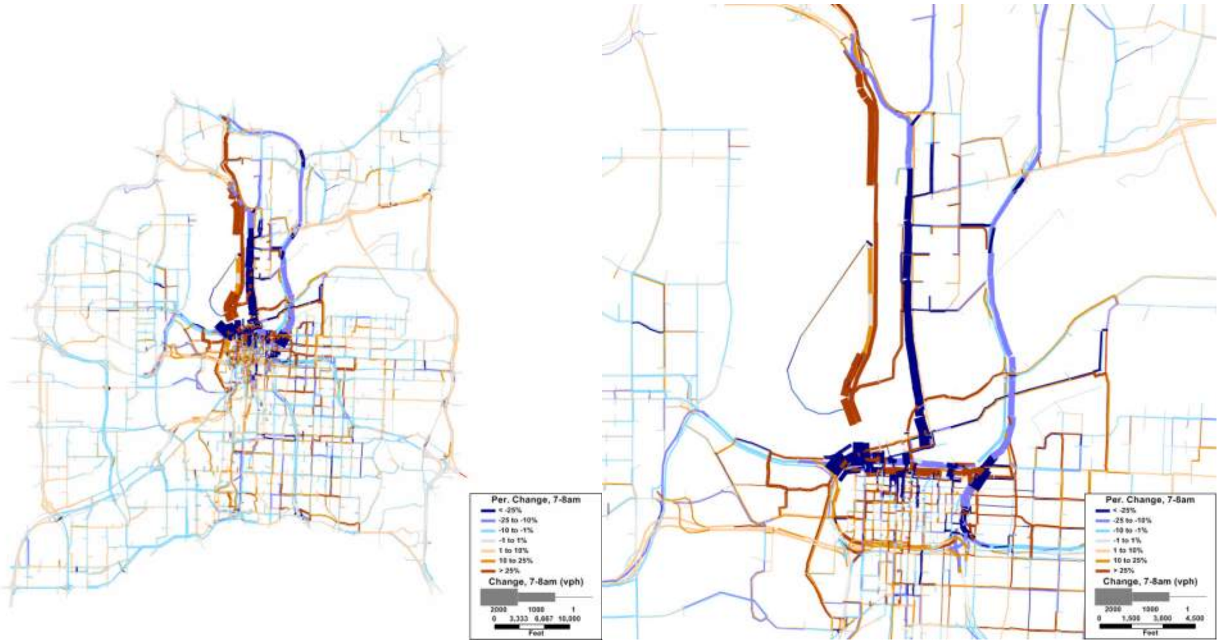


Figure 5-6: NB vs. AC A.M. Peak Period Link Volume Change

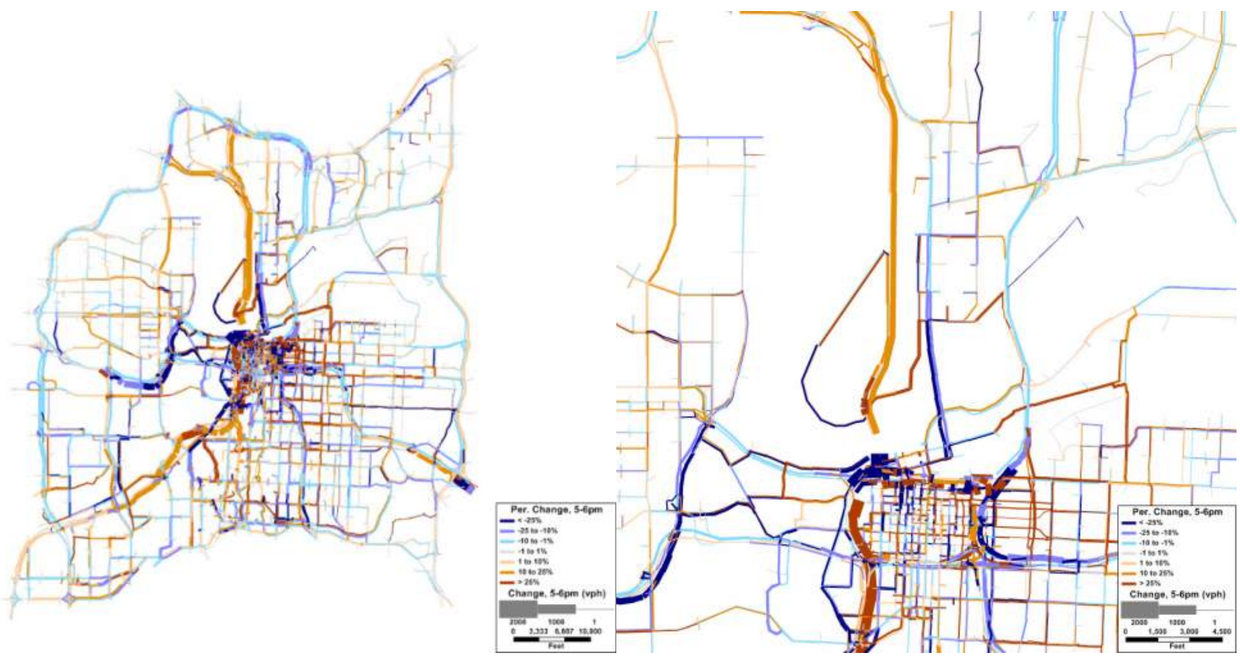


Figure 5-7: NB vs. AC P.M. Peak Period Link Volume Change

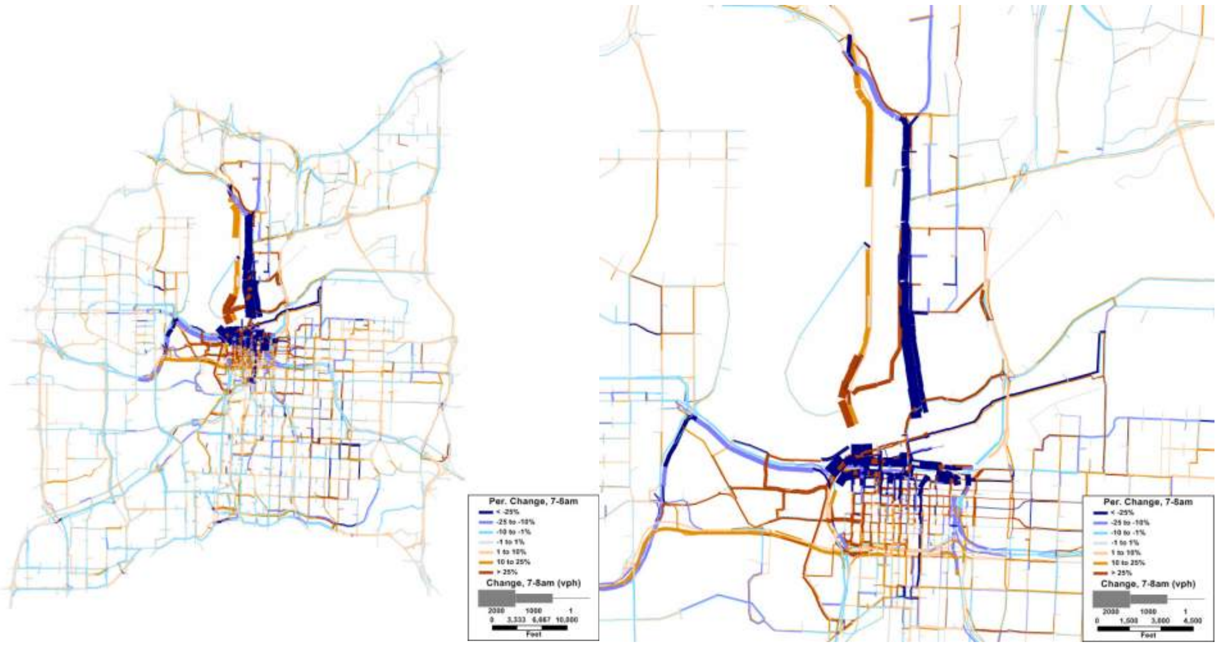


Figure 5-8: NB vs. CF A.M. Peak Period Link Volume Change

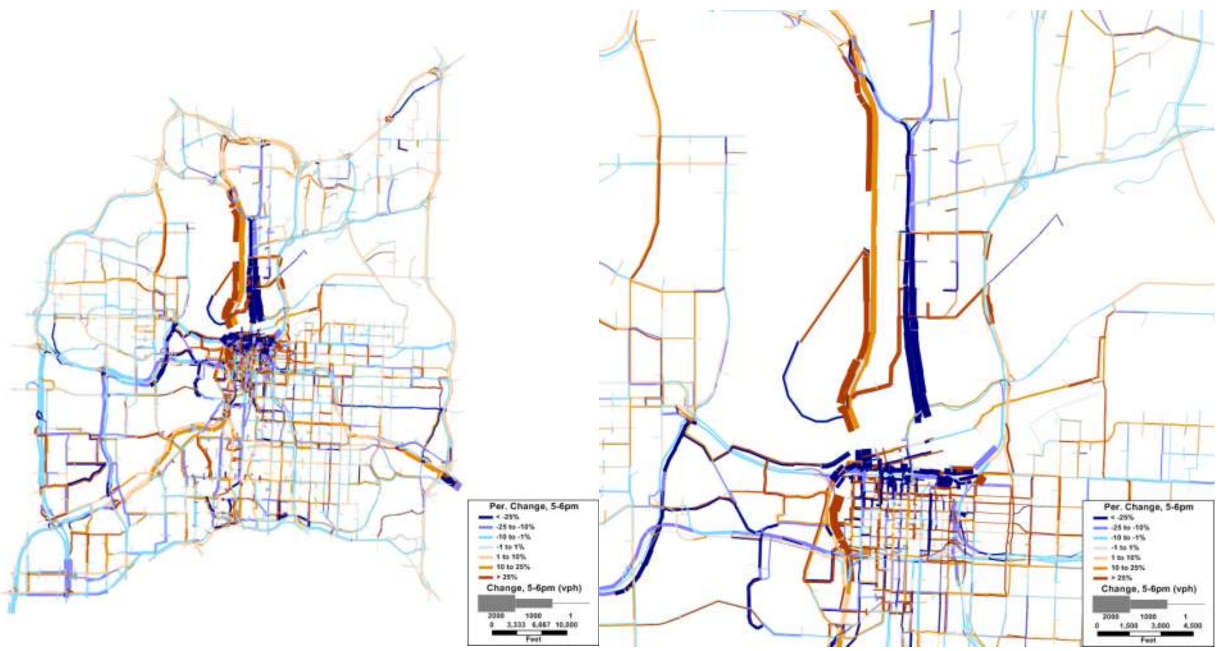


Figure 5-9: NB vs. CF P.M. Peak Period Link Volume Change

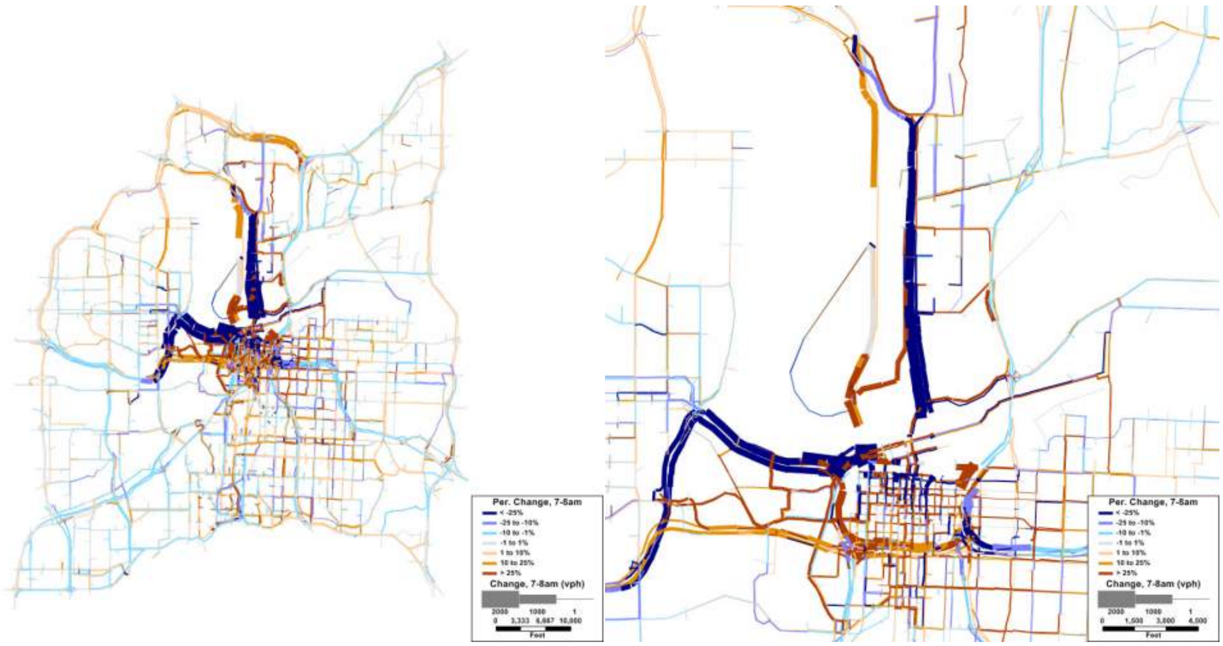


Figure 5-10: NB vs. RR A.M. Peak Period Link Volume Change

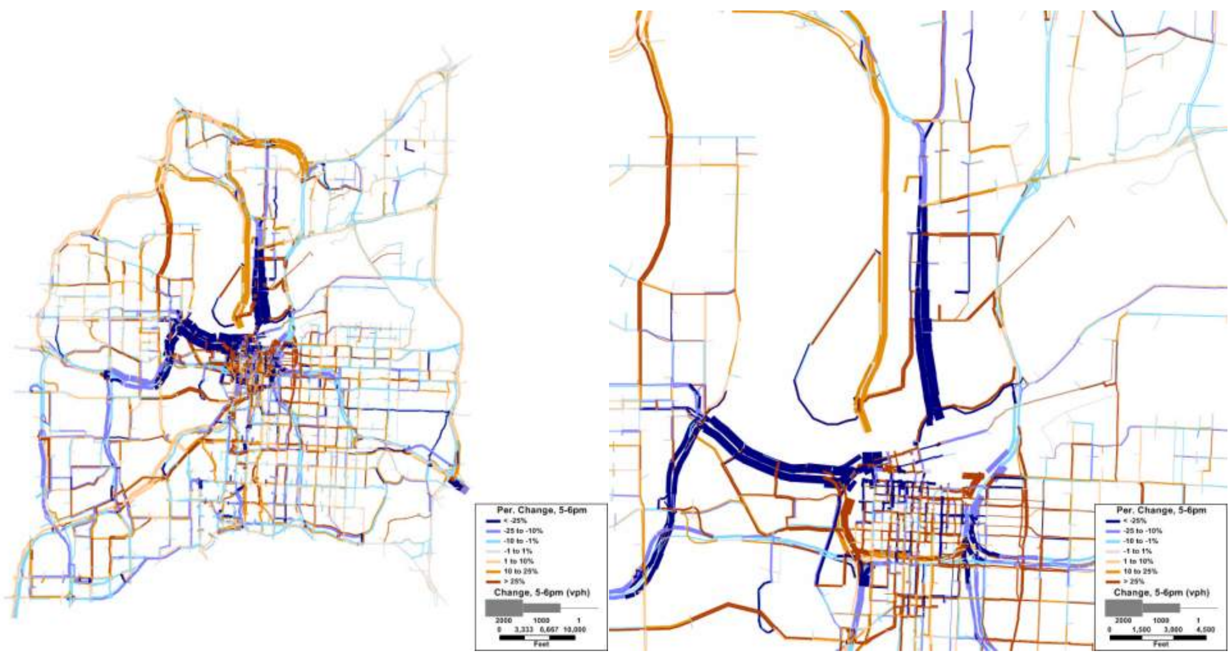


Figure 5-11: NB vs. RR P.M. Peak Period Link Volume Change

Figure 5-12: NB vs. AC A.M. Peak Period Link Speed Change

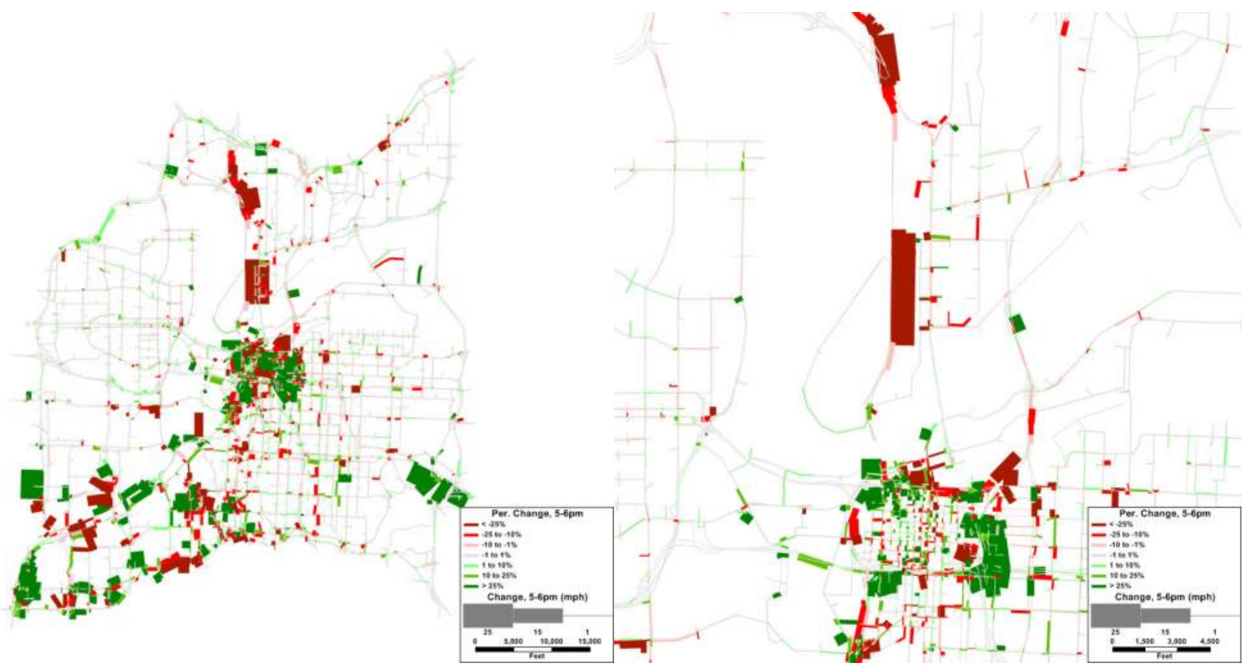


Figure 5-13: NB vs. AC P.M. Peak Period Link Speed Change

Figure 5-14: NB vs. CF A.M. Peak Period Link Speed Change

Figure 5-15: NB vs. CF P.M. Peak Period Link Speed Change

Figure 5-16: NB vs. RR A.M. Peak Period Link Speed Change

Figure 5-17: NB vs. RR P.M. Peak Period Link Speed Change

5.5 2040 Downtown Loop Area Point Speed Matrix by Strategy

Point location speeds were assessed for comparison purposes across each configuration strategy in year 2040 projections.

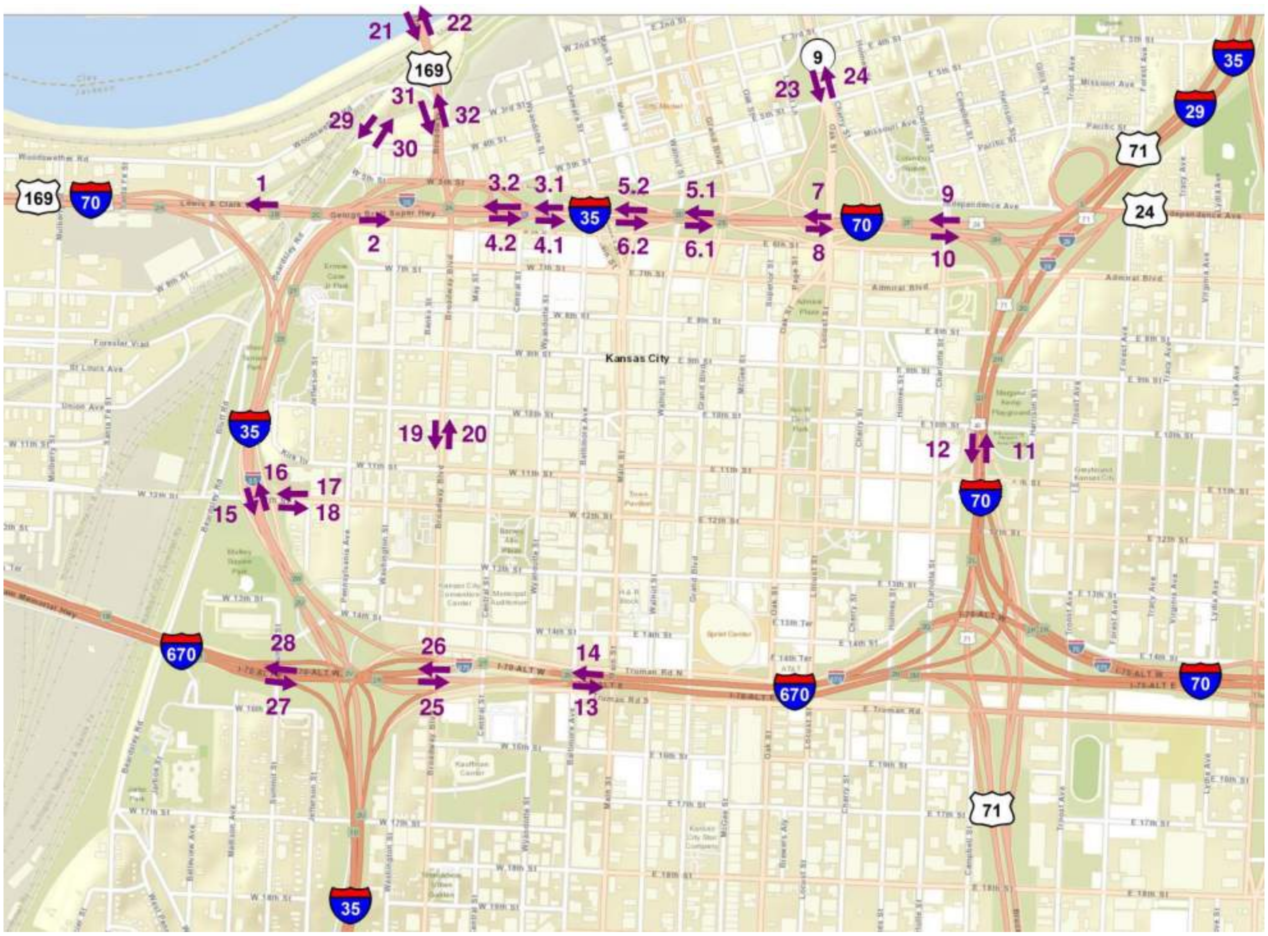


Figure 5-18 lists comparison locations measured base on existing KC Scout data collection points as well as details the posted speed, existing measured speed via KC Scout, and projected speeds via DTA results for each comparison location. A highlighted red-green scale shows the amplitude of projected speed impacts when compared to DTA existing scenario resulting speeds.

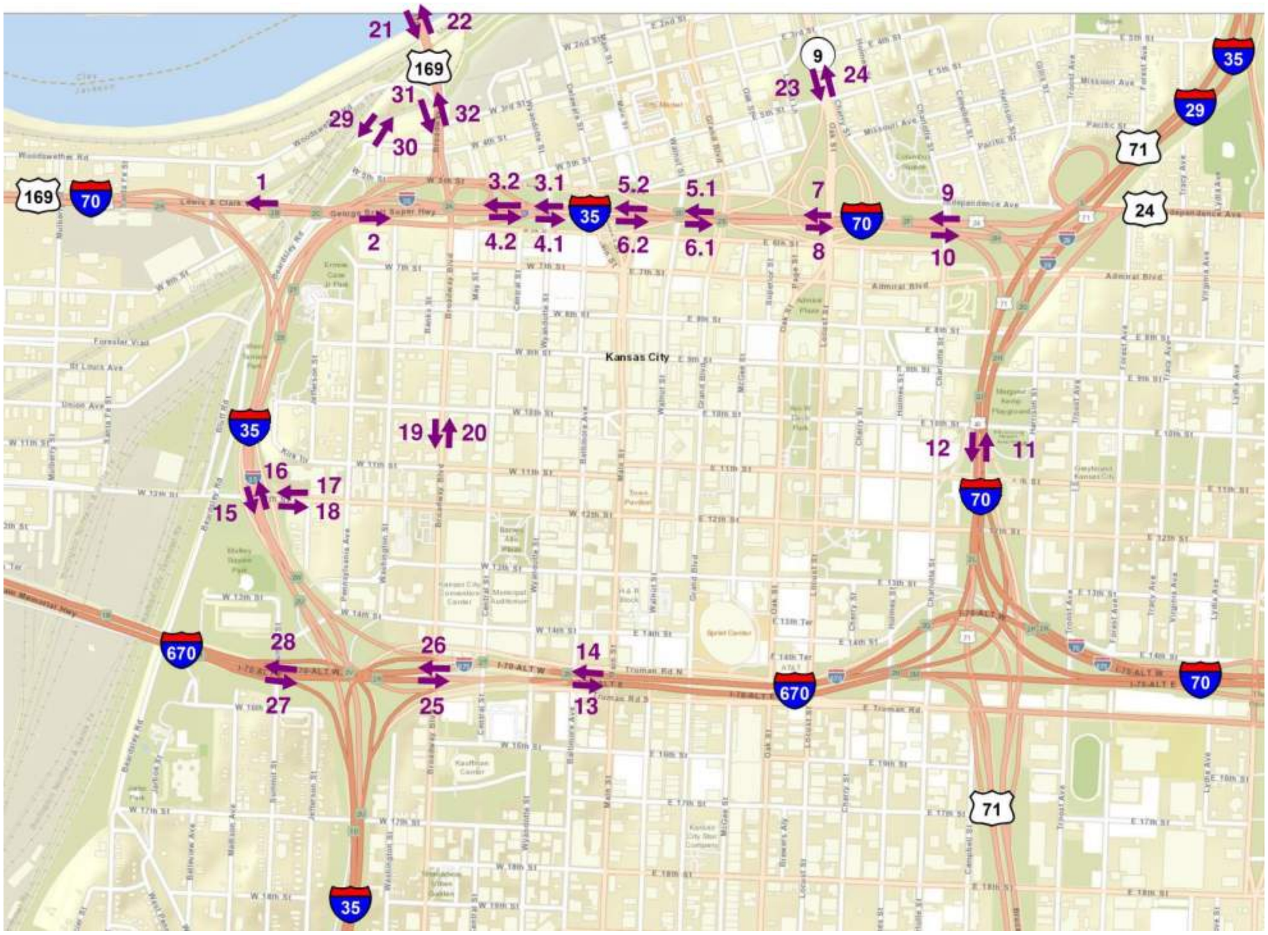


Figure 5-18: Point Location Speed Comparisons

Within Table 5-17, cells highlighted in green indicate point location DTA strategy projected vehicle speeds that are greater than DTA base condition projected speeds. Cells highlighted in red indicate point location

DTA strategy projected vehicle speeds that are greater than DTA base condition projected speeds. Text notated by bolded and italicized text indicates speed projections that are above the posted speed limit.

Table 5-17: Point Location Speed Comparisons

Location	Direction		Posted Speed	Speed (MPH) Existing AM	Existing PM	2040 DTA -NB AM	2040 DTA -NB PM	2040 DTA - AC AM	2040 DTA - AC PM	2040 DTA - CF AM	2040 DTA - CF PM	2040 DTA - RR AM	2040 DTA - RR PM
Location 1	WB	L&C	55	53.0	***59.0***	54.4	54.3	53.6	53.7	53.4	53.4	55.0	55.0
Location 2	EB		45	***52.0***	***51.0***	44.8	44.5	44.9	44.6	***55.0***	***54.9***	NA	NA
Location 3.1	WB (btwn merge and diverge	North Loop	45	***47.0***	43.0	40.2	36.2	***49.5***	38.4	***50.0***	***50.0***	NA	NA
Location 3.2	WB W of diverge		45	***47.0***	43.0	***48.2***	***48.6***	***49.1***	***49.8***	***49.5***	***49.9***	NA	NA
Location 4.1	EB (btwn merge and diverge)		45	43.0	***53.0***	41.1	44.4	43.8	43.3	***50.0***	***50.0***	NA	NA
Location 4.2	EB W of Merge		45	43.0	***53.0***	***46.4***	***49.3***	***49.5***	***49.3***	***49.7***	***49.6***	NA	NA
Location 5.1	WB (btwn merge and diverge		45	***51.0***	***50.0***	41.6	***45.5***	***50.0***	***48.0***	***50.0***	***50.0***	NA	NA
Location 5.2	WB W of diverge		45	***51.0***	***50.0***	***47.5***	***49.7***	***49.9***	42.5	***50.0***	***50.0***	NA	NA
Location 6.1	EB (btwn merge and diverge)		45	***54.0***	42.0	44.1	42.7	***50.0***	***46.4***	***50.0***	***50.0***	NA	NA
Location 6.2	EB W of Merge		45	***54.0***	42.0	***48.7***	***48.1***	***49.7***	***49.3***	***49.8***	***49.9***	NA	NA
Location 7	WB		45	***54.0***	***57.0***	44.9	***49.1***	***49.3***	***49.7***	***49.7***	***50.0***	NA	NA
Location 8	EB		45	39.0	39.0	***49.4***	***48.5***	***48.5***	38.9	***49.2***	***49.0***	NA	NA
Location 9	WB		45	***51.0***	***55.0***	45.0	45.0	45.0	45.0	45.0	45.0	NA	NA
Location 10	EB		45			44.1	43.5	45.0	45.0	43.4	43.2	NA	NA
Location 11	NB (north of merge)	East Loop	45			43.9	17.6	19.2	43.3	42.6	18.3	***46.6***	***45.1***
Location 12	SB (north of merge)		45			13.6	29.3	33.0	44.0	42.8	***48.7***	10.8	41.5
Location 13	EB	South Loop	45	40.0	34.0	42.4	10.6	44.3	10.2	39.3	10.0	19.9	9.5
Location 14	WB		45	34.0	37.0	41.5	40.2	39.2	41.2	40.6	42.3	34.5	33.2
Location 15	SB	West Loop	45			***49.0***	***49.8***	***49.2***	***49.9***	***49.4***	***49.7***	32.4	38.9
Location 16	NB		45			***47.4***	***49.2***	41.6	39.3	36.0	13.0	28.2	11.1
Location 17	WB	Arterial	25			18.9	17.0	19.0	17.1	19.0	16.5	18.4	16.8
Location 18	EB		25			11.9	5.4	9.4	5.1	10.8	5.3	12.1	5.6
Location 19	SB		35			12.1	13.0	12.7	12.5	11.9	11.8	13.2	11.6
Location 20	NB		35			27.2	27.2	23.6	28.0	25.8	25.9	23.5	26.3
Location 21	SB Broadway Bridge	Broadway Blvd	45			13.7	23.5	38.1	41.1	38.1	39.8	37.1	41.3
Location 22	NB Broadway Bridge		45			44.7	44.9	44.2	43.3	44.4	43.3	44.4	43.1
Location 23	SB Hwy 9	Hwy 9	45			33.8	42.9	40.6	43.7	6.2	7.8	8.4	9.0
Location 24	NB Hwy 9		45			44.7	40.6	44.5	36.8	30.0	29.2	30.0	29.1
Location 25	EB I-670 (under Broadway)	South Loop	45			43.5	12.1	***45.6***	15.2	44.1	13.6	18.2	10.8
Location 26	WB I-670 (under Broadway)		45			44.9	44.9	44.6	44.6	44.7	44.6	44.4	44.5
Location 27	EB I-670 (under Summit St)		45			38.2	16.1	36.5	17.3	38.9	19.2	14.7	10.1
Location 28	WB I-670 (under Summit St)		45			***54.8***	***54.8***	***54.8***	***54.8***	***54.8***	***54.9***	***54.7***	***54.7***
Location 29	SB Hwy 169 to SB I-35	Broadway Blvd/I-35 Connection	45			NA	NA	15.2	44.4	17.1	44.0	23.3	44.4
Location 30	NB I-35 to NB Hwy 169		45			NA	NA	44.3	32.8	44.7	25.8	44.7	24.1
Location 31	SB Hwy 169 to SB Broadway		45			13.7	23.5	43.4	44.0	44.6	44.2	44.8	45.0
Location 32	NB Broadway to NB Hwy 169		45			44.7	44.9	44.2	39.9	44.3	39.3	44.5	40.5

LEGEND

- DTA Build model speed increase (> 5.0mph) versus DTA Base model
- DTA Build model speed increase (2.0mph to 5.0mph) versus DTA Base model
- DTA Build model speed increase (0.5mph to 2.0mph) versus DTA Base model
- DTA Build model speed increase/decrease (< 0.5mph) versus DTA Base model
- DTA Build model speed decrease (-0.5 to -2.0mph) versus DTA Base model
- DTA Build model speed decrease (-2.0mph to -5.0mph) versus DTA Base model
- DTA Build model speed decrease (> -5.0mph) versus DTA Base model
- Existing Speed Information Not Available

Note: No color for Build model speed indicates that the Build versus Base speeds were basically the same (less than a 0.5 mph change).

Italics and Bold Indicates that Resulting DTA Speed is Greater than Posted Speed

Through observations of Figure 5-18, point speed collections throughout the downtown loop are found to not replicate trends observed through the DTA network wide analysis results. This indicates that the most significant impacts result outside of the influence area and indicates that roadway links entering and exiting the Downtown region are at or near capacity.

5.6 2040 Travel Times

Travel times through the focus area were collected for each gate-to-gate movement within the study area. Figure 5-19 shows the travel time collection locations used to DTA measurements.

Figure 5-19: Travel Time Collection Border

Travel times were collected for each analysis strategy. RR mitigation strategies were assessed through VISSIM spot analysis models and measured travel time impacts were included into the DTA measured travel times for the RR with mitigation strategy. Table 5-18 lists DTA and DTA with VISSIM adjustment travel time results across each analysis strategy.

Table 5-18: 2040 DTA Travel Time Results

Movement	2040 Base		Access Consolidated		Compressed Footprint		Remove & Reclassify		Remove & Reclassify - Mitigated	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
SB I35_North to SB I35_South	04:58	06:17	05:07	06:43	05:11	06:15	06:12	07:33		
NB I35_South to NB I35_North	04:25	08:05	04:45	06:21	04:32	08:37	05:12	15:11		
WB I70_East to WB LC Viaduct	04:35	04:15	05:42	04:12	04:22	04:05	06:22	05:42		5:41 ***
EB LC Viaduct to EB I70_East	04:22	04:46	04:12	04:30	04:06	04:51	05:20	09:53		7:51 **
EB I670_West to EB I70_East	02:49	06:14	02:43	09:04	02:56	06:36	04:52	10:06	4:24 *	7:17 **
WB I70_East to WB I670_West	03:20	02:35	03:41	02:38	03:43	02:33	04:30	02:45		
NB I35_South to EB I70_East	03:20	07:02	03:29	06:04	03:25	06:16	03:32	12:25		9:41 **
WB I70_East to US169 NB	06:37	07:05	07:43	07:59	07:29	09:25	08:27	11:11		
SB US169 to EB I70_East	07:49	08:53	09:13	08:05	09:50	09:09	10:46	11:10		
SB I35_North to WB LC Viaduct	03:43	03:38	03:49	04:11	03:52	03:53	07:00	09:11		
EB LC Viaduct to NB I35_North	03:34	03:33	03:32	03:41	03:33	03:52	06:21	10:08		
SB US169 to SB I35_South	07:52	06:06	08:52	05:36	08:46	07:51	09:09	08:33		
NB I35_South to NB US 169	06:59	08:26	05:34	06:40	05:31	08:41	05:37	11:03		

* Mitigation for EB I-670 (Under Bartle Hall)
** Mitigation for EB I-670 (SE Corner)
*** Mitigation for NB I-35 (NW Corner)

5.7 Additional Capacity Enhancements to Support RR

Assessment of DTA resulting hot spots showed some excessive queuing developing through the RR strategy. Three areas are which further mitigation is feasible includes eastbound I-670 directly underneath Bartle Hall, northbound I-35 just north of 12th Street, and eastbound I-670 at the southeast corner of the Downtown Loop.

Eastbound I-670 underneath Bartle Hall involves a segment at which I-670 is reduced to a single lane. This location is projected to experience a significant increase in traffic demand under RR strategy conditions. Adding a lane to the existing single lane segment allows for higher vehicular volume to be serviced and improves performance. Figure 5-20 shows the mitigation area for eastbound I-670 with the added mitigation lane detailed in green.

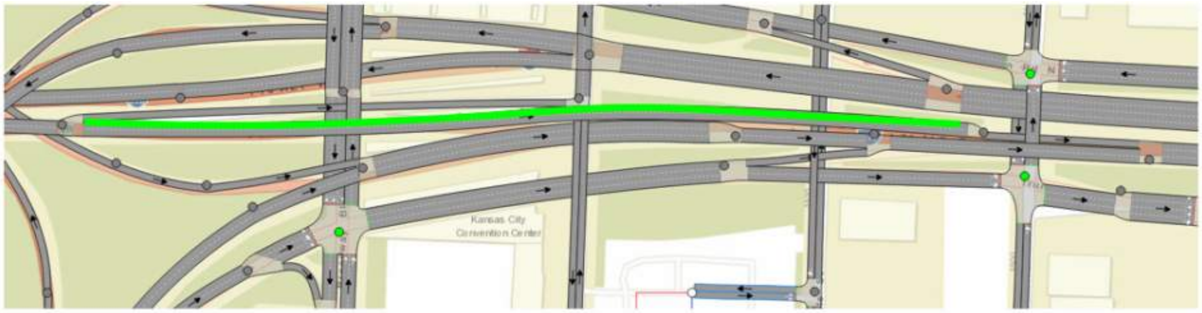


Figure 5-20: Eastbound I-670 (Under Bartle Hall) RR Mitigation

Northbound I-35 north of 12th Street involves a two-lane segment with a 12th Street on ramp acceleration lane of approximately 250 feet. Both the 12th Street on ramp and northbound segment of I-35 are projected to experience a significant increase in traffic volumes under RR strategy conditions. An extension of the 12th Street acceleration lane to connect to the northbound I-35 to US-169 ramp would provide added performance and capacity benefits. Figure 5-21 shows the mitigation area for northbound I-35 with the extended acceleration lane detailed in green.

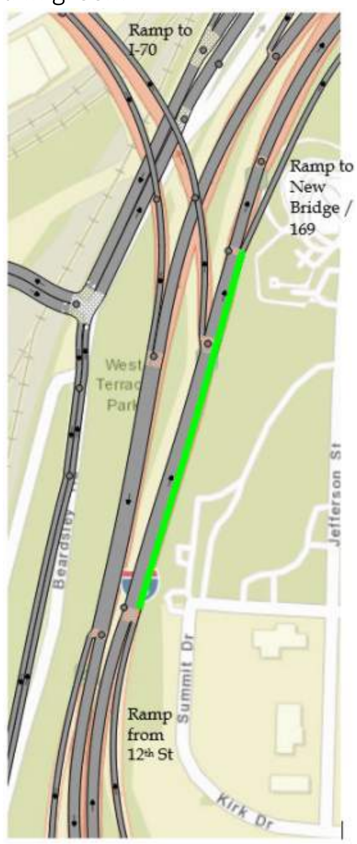


Figure 5-21: Northbound I-35 RR Mitigation

Eastbound I-670 at the southeast corner of the Downtown Loop involves a weaving segment that provides access to northbound I-70/I-35, eastbound I-70, and southbound US-71. Traffic projections indicate that an increase level of vehicles will be destined to the northbound I-70/I-35 system-to-system ramp and mitigations of movements will be required. Mitigation strategies explored include the addition of a merging lane along the northbound I-70/I-35 ramp and converting the existing dedicated southbound US-71 ramp approach lane to be a decision lane for eastbound I-70. Figure 5-22 shows the eastbound I-670 mitigation area with the added lane segment highlighted in green.

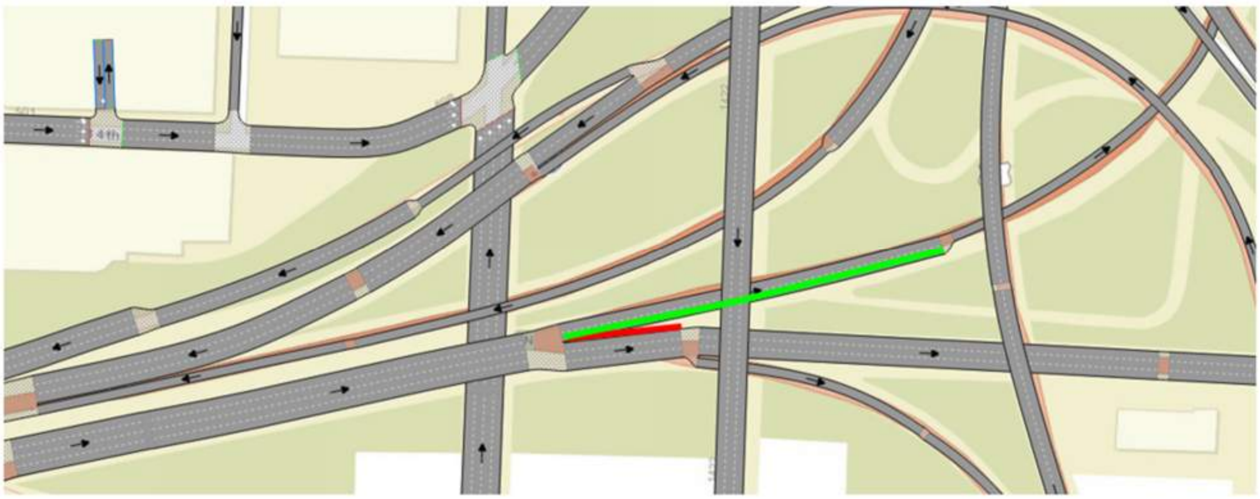


Figure 5-22: Eastbound I-670 (Southeast Corner) RR Mitigation

5.8 VISSIM Spot Analysis

VISSIM microsimulation was utilized to determine localized improvements provided by the mitigation strategies previously described. The basis for the VISSIM spot analysis models originated from the existing day calibrated VISSIM model that included the entire influence area. Volume and routing adjustments specific to the localized area of influence per each mitigation approach were accounted for through the assessment of resulting DTA traffic volumes through the most significant strategy. Figure 5-23 shows VISSIM spot analysis locations with mitigation locations. While five total VISSIM spot analysis locations are shown, only spot analysis locations at which mitigation strategies were applied are assessed in this report.

Figure 5-23: VISSIM Spot Analysis Locations

5.8.1 I-670 SW Quadrant (Under Bartle Hall)

The VISSIM I-670 SW Quadrant spot analysis model was assessed to determine potential traffic improvements due to the eastbound I-670 mitigation approach. The mitigation scenario of provides an additional eastbound I-670 lane was assessed for the RR strategy. Figure 5-24 shows existing conditions queuing during the worst-case morning peak hour.

Figure 5-24: Existing Condition Traffic Queuing during the A.M. Peak Hour (VISSIM Model)

DTA traffic projections for the RR strategy show the most significant increase in traffic volumes to be during the morning peak period. Figure 5-25 shows RR strategy traffic queuing during the evening peak hour without any mitigation.

Figure 5-25: RR Strategy Traffic Queuing during the A.M. Peak Hour (VISSIM Model)

Figure 5-26 shows RR strategy with mitigation traffic queues during the morning peak hour. The added capacity by providing an extending two-lane segment underneath Bartle Hall provides significant traffic performance improvement.

Figure 5-26: RR Mitigation Traffic Queuing during the A.M. Peak Hour (VISSIM Model)

5.8.2 US-169 Buck O'Neil Bridge

The VISSIM US-169 Buck O'Neil Bridge spot models were assessed to determine potential traffic improvements due to the northbound I-670 mitigation approach. As discussed previously, the mitigation scenario of providing an additional northbound I-670 lane was studied for the RR strategy. Figure 5-27 shows RR baseline conditions queuing during the worst-case evening peak hour.

Figure 5-27: RR Strategy Traffic Queuing during the P.M. Peak Hour (VISSIM Model)

Figure 5-28 shows RR strategy with mitigation traffic queues during the evening peak hour. The added capacity by providing a full travel lane from the 12th St on ramp to the US-169 ramp results in a significant reduction in traffic queuing.

Figure 5-28: RR Mitigation Traffic Queuing during the P.M. Peak Hour (VISSIM Model)

5.8.3 EB I-670 (SE Corner)

The VISSIM I-670 (SE Quadrant) spot analysis model was assessed to determine potential traffic improvements due to the eastbound I-670 mitigation approach. Figure 5-29 shows VISSIM spot analysis model 2040 NB traffic conditions during the evening peak hour.

Figure 5-29: 2040 NB Traffic Queuing during the P.M. Peak Hour (VISSIM Model)

DTA traffic projections show further degradation through the 2040 RR scenario. Figure 5-30 shows 2040 RR traffic queuing during the evening peak hour.

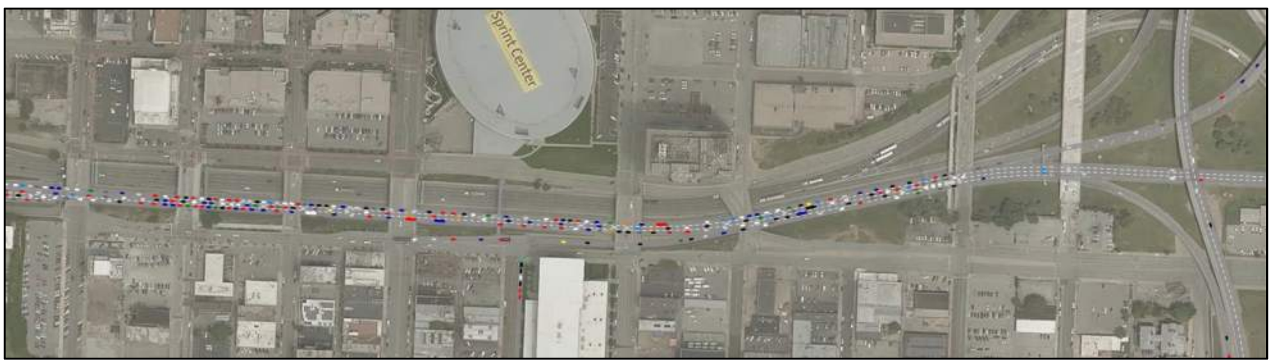


Figure 5-30: 2040 RR Strategy Traffic Queuing during the P.M. Peak Hour (VISSIM Model)

Mitigation strategies were assessed for the most significant traffic projection. Figure 5-31 shows traffic queuing under 2040 RR projected traffic volumes with mitigation strategies implemented.

Figure 5-31: 2040 RR Mitigation Traffic Queuing during the A.M. Peak Hour (VISSIM Model)

5.9 CV/AV Considerations

Connected and autonomous vehicles (CV/AV) have the potential to have a great impact on traffic operations in terms of congestion and safety. Two primary impacts CV/AV's will have on roadway system performance are thought to be alterations of vehicular behaviors in traffic demand and roadway capacity. Traffic demand is defined as the number of travelers that want to use a particular segment of roadway at a given time and by the type of mode of transportation. Roadway capacity is defined as the maximum hourly limit of the number of vehicles able to traverse a specific roadway segment. This report focuses on long-term impacts of full implementation of CV/AV technologies and does not consider operational impacts of mixed vehicular activities.

5.9.1 Potential Impact to Traffic Demand

Travel demand includes three basic components that influence how many travelers intend to use a specific segment of roadway. The three components include: where people live, where people go, and what mode of transportation is used.

Autonomous Vehicles (AV) are anticipated to encourage people to travel further distances, on a daily basis, and accept longer typical commute times. In the example of an urban setting, this behavior shift is not expected to significantly impact Central Business District (CBD) traffic volumes. However, if AV eliminate the need for parking mitigation, a further densification of urban areas could result and therefore increase traffic demands. Additionally, with AV vehicles, the possibility of zero-occupant vehicle miles traveled may also be seen on roadways as vehicles reposition themselves to a location where parking is available for privately owned AV vehicles, or to service other passengers under a mobility-as-a-service model.

5.9.2 Potential Impact to Roadway Capacity

Roadway capacity is anticipated to experience the greatest short-term impact upon implementation of CV/AV technologies. Traffic related benefits are anticipated for both recurring and event-based situations. Aspects that CV/AV implementation could bring to recurring traffic scenarios include: variable speed limits, alternative routing, the broadcasting of traffic signal phasing and timing, and decreased headways between vehicles. Each of these implementations would result in added traffic mobility, more effective traffic distribution, and reduced intersection queues. Highway related CV/AV research has consistently shown increases in per lane through put by dampening the shockwaves from stop and go traffic and increasing the stability of traffic flow. However, future lane change and weaving interactions between human driven vehicles and autonomous vehicles is currently unknown as it is not clear what degree of safety factor vehicle manufacturers will choose to program AVs to follow and what distances will be upheld during lane change maneuvers.

Traffic operations during event-based situations such as traffic incidents or inclement weather can also be mitigated through CV/AV technologies. CV/AV technologies have potential to reduce the number of crashes that occur, thus removing a cause for non-recurring traffic congestion. For incidents or events that still do occur from a traffic incident or adverse roadway conditions, warning transmissions can be dispersed to vehicles and in turn reduce travel speeds or reroute travelers to an alternative route. These interactions would result in reduced secondary crashes and an increased resiliency in the transportation network.

5.9.3 CV/AV Approach

While the future rate of CV/AV implementation and vehicle market adaptation is currently unknown, traffic operation and safety benefits are expected upon implementation. Implementation of CV/AV technologies will likely start slowly with minimal system-wide improvements until higher levels of market penetration is experienced. Upon full implementation, an elimination of distracted driving, optimization of vehicular routing decisions, and harmonization of traffic operations will result in a level of safety not experienced to date.

The following changes to traffic operations are expected to result:

- Increased vehicle miles traveled
- Changes to trip distributions
- Improved overall operations of connected vehicles
- Increased saturation flow rates, i.e. capacity, due to reduced following distances (headways)

As a conservative approach to accounting for CV/AV technology in this study, the saturation flow rate, or capacity, was increased by 20%. Future year impacts of CV/AV advancements were taken into consideration in addition to the 2040 NB and 2040 RR analyses. CV/AV advancements considered include an increase adjustment of saturation flow rate by 20%. Saturation flow rates were only adjusted along freeway segments and matches methodologies used for an analysis performed for the city of Los Angeles, California. It should be noted that the potential changes to demands from CV/AV deployments were not considered in this analysis.

Similar to the methodologies used to assess strategy comparison metrics, comparison metrics of VMT, VHT, and VHD were collected across the 2016 E, 2040 NB, and 2040 NB with CV/AV for morning and evening peak periods. Table 5-19 lists morning peak period VMT results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-19: A.M. Peak Period NB CV/AV Vehicle Miles Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,381,960	128,822	574,171	2,084,952
No Build 2040	1,580,254	138,616	601,108	2,319,979
No Build 2040 with CV/AV	1,597,264	139,686	588,375	2,325,326
Change vs Existing Conditions				
No Build 2040	14.3%	7.6%	4.7%	11.3%
No Build 2040 with CV/AV	15.6%	8.4%	2.5%	11.5%

As shown in Table 5-19, 2040 NB scenarios with and without CV/AV considerations result in similar VMT behaviors during the morning peak period. Some vehicle driving shifts are observed away from arterial streets and to freeways, expressways, and ramps in the CV/AV scenario. This is primarily due to an incentive for drivers to utilize freeways and expressways from CV/AV capabilities. Table 5-20 lists morning peak period VHT results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-20: A.M. Peak Period NB CV/AV Vehicle Hours Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	25,537	4,101	25,987	55,625
No Build 2040	30,042	4,424	30,387	64,853
No Build 2040 with CV/AV	28,618	4,404	28,056	61,079
Change vs Existing Conditions				
No Build 2040	17.6%	7.9%	16.9%	16.6%
No Build 2040 with CV/AV	12.1%	7.4%	8.0%	9.8%

As shown in Table 5-20, a significant reduction in VHT can be expected from CV/AV when comparing the 2040 NB scenarios with and without CV/AV. Freeways, expressways, and ramps are projected to experience a reduction of VHT directly due to CV/AV implementation while a reduction in VHT along arterials is indirectly expected due to vehicles being incentivized to freeways and expressways by CV/AV capabilities.

Table 5-21 lists morning peak period VHD results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-21: A.M. Peak Period NB CV/AV Vehicle Hours of Delay Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,867	567	7,838	10,273
No Build 2040	3,035	652	11,418	15,105
No Build 2040 with CV/AV	1,316	603	9,449	11,368
Change vs Existing Conditions				
No Build 2040	62.6%	15.0%	45.7%	47.0%
No Build 2040 with CV/AV	-29.5%	6.3%	20.6%	10.7%

As shown in

Table 5-21, CV/AV implementation is projected to have a significant impact on VHD. Comparisons of 2040 NB to 2040 NB with CV/AV show significant VHD improvement s across all segment types for the morning peak period scenarios. Table 5-22 lists AHS results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-22: A.M. Peak Period NB CV/AV Average Harmonic Speed Results

A.M. Peak Period (6-9 A.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	54	31	22	37
No Build 2040	53	31	20	36
No Build 2040 with CV/AV	56	32	21	38
Change vs Existing Conditions				
No Build 2040	-2.8%	-0.3%	-10.5%	-4.6%
No Build 2040 with CV/AV	3.1%	1.0%	-5.1%	1.6%

As shown in Table 5-22, CV/AV implementation results in an increase in AHS for the 2040 NB with CV/AV scenario in comparison to the 2040 NB scenario without CV/AV across all segment types. Freeway, expressway, and ramp segments are also projected to experience an increase in AHS over the 2016 E conditions. Table 5-23 lists evening peak period VMT results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-23: P.M. Peak Period NB CV/AV Vehicle Miles Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,950,179	190,480	983,511	3,124,170
No Build 2040	2,247,398	205,661	1,041,454	3,494,513
No Build 2040 with CV/AV	2,291,318	209,415	1,000,371	3,501,104
Change vs Existing Conditions				
No Build 2040	15.2%	8.0%	5.9%	11.9%
No Build 2040 with CV/AV	17.5%	9.9%	1.7%	12.1%

As shown in Table 5-23, similar comparison trends observed for the morning peak period are anticipated for VMT in the evening peak period. Comparison trends show that the implementation of CV/AV will add additional traffic to freeway and expressway segments due to CV/AV capabilities. Table 5-24 lists evening peak period VHD results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-24: P.M. Peak Period NB CV/AV Vehicle Hours Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	37,398	6,349	53,611	97,357
No Build 2040	45,429	7,160	63,342	115,931
No Build 2040 with CV/AV	40,958	6,817	60,332	108,107
Change vs Existing Conditions				
No Build 2040	21.5%	12.8%	18.2%	19.1%
No Build 2040 with CV/AV	9.5%	7.4%	12.5%	11.0%

As shown in Table 5-24, similarly to the morning peak period, a significant reduction in VHT can be expected from CV/AV when comparing the 2040 NB scenarios with and without CV/AV. Freeways, expressways, and ramps are projected to experience a reduction of VHT directly due to CV/AV implementation while a reduction in VHT along arterials is indirectly expected due to vehicles being incentivized to freeways and expressways by CV/AV capabilities. Table 5-25 lists evening peak period VHD results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-25: P.M. Peak Period NB CV/AV Vehicle Hours of Delay Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	3,993	1,099	22,223	27,314
No Build 2040	7,076	1,528	30,149	38,753
No Build 2040 with CV/AV	1,809	1,086	28,400	31,294
Change vs Existing Conditions				
No Build 2040	77.2%	39.0%	35.7%	41.9%
No Build 2040 with CV/AV	-54.7%	-1.2%	27.8%	14.6%

As shown in Table 5-25, CV/AV implementation is projected to have a significant impact on VHD. Comparisons of 2040 NB to 2040 NB with CV/AV show significant VHD improvement s across all segment types for the morning peak period scenarios. Evening peak period comparisons show that freeway and expressway VHD is anticipated to experience a reduction from even the 2016 E conditions through the 2040 NB with CV/AV scenario. Table 5-26 lists AHS results across the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-26: P.M. Peak Period NB CV/AV Average Harmonic Speed Results

P.M. Peak Period (3-7 P.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	52	30	18	32
No Build 2040	49	29	16	30
No Build 2040 with CV/AV	56	31	17	32
Change vs Existing Conditions				
No Build 2040	-5.1%	-4.3%	-10.4%	-6.1%
No Build 2040 with CV/AV	7.3%	2.4%	-9.6%	0.9%

As shown in Table 5-26, CV/AV implementation results in an increase in AHS for the 2040 NB with CV/AV scenario in comparison to the 2040 NB scenario without CV/AV across all segment types. Freeway, expressway, and ramp segments are also projected to experience an increase in AHS over the 2016 E conditions.

A similar CV/AV consideration analysis scenario was performed for the RR strategy. Table 5-27 lists evening peak period VMT results across the 2016 E, 2040 RR, and 2040 RR with CV/AV scenarios.

Table 5-27: P.M. Peak Period RR CV/AV Vehicle Miles Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Miles Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	302,005	41,250	101,582	444,837
RR Build 2040	269,481	41,189	107,965	418,635
RR Build 2040 with CV/AV	284,213	45,074	103,038	432,326
Change vs Existing Conditions				
RR Build 2040	-10.8%	-0.1%	6.3%	-5.9%
RR Build 2040 with CV/AV	-5.9%	9.3%	1.4%	-2.8%

As shown in Table 5-27, comparison trends show that the implementation of CV/AV will add additional traffic to freeway and expressway segments due to CV/AV added capacity. Table 5-28 lists evening peak period VHT results across the 2016 E, 2040 RR, and 2040 RR with CV/AV scenarios.

Table 5-28: P.M. Peak Period RR CV/AV Vehicle Hours Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours Travelled			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	7,075	1,544	7,848	16,467
RR Build 2040	7,240	1,947	10,676	19,863
RR Build 2040 with CV/AV	6,537	1,758	8,518	16,814
Change vs Existing Conditions				
RR Build 2040	2.3%	26.1%	36.0%	20.6%
RR Build 2040 with CV/AV	-7.6%	13.9%	8.5%	2.1%

As shown in Table 5-28, a significant reduction in VHT can be expected from CV/AV when comparing the 2040 NB scenarios with and without CV/AV. Freeways, expressways, and ramps are projected to experience a reduction of VHT directly due to CV/AV implementation while a reduction in VHT along arterials is indirectly expected due to vehicles being incentivized to freeways and expressways by CV/AV capabilities. Freeway and expressway segment VHT results show an improvement in the 2040 RR with CV/AV scenario even over the 2016 E scenario. Table 5-29 lists evening peak period VHD results across the 2016 E, 2040 RR, and 2040 RR with CV/AV scenarios.

Table 5-29: P.M. Peak Period RR CV/AV Vehicle Hours of Delay Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours of Delay			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	1,129	370	4,189	5,689
RR Build 2040	1,949	805	676	9,521
RR Build 2040 with CV/AV	989	526	4,787	6,302
Change vs Existing Conditions				
RR Build 2040	72.6%	117.6%	-83.9%	67.4%
RR Build 2040 with CV/AV	-12.4%	42.2%	14.3%	10.8%

As shown in Table 5-29, CV/AV implementation is projected to have a significant impact on VHD. Comparisons of 2040 RR to 2040 RR with CV/AV show significant VHD improvement s across all segment types for the morning peak period scenarios. Evening peak period comparisons show that freeway and expressway VHD is anticipated to experience a reduction from even the 2016 E conditions through the 2040 RR with CV/AV scenario. Table 5-30 lists evening peak period AHS results across the 2016 E, 2040 RR, and 2040 RR with CV/AV scenarios.

Table 5-30: P.M. Peak Period RR CV/AV Average Harmonic Speed Results

P.M. Peak Period (3-7 P.M.)	Average Harmonic Speed			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	43	27	13	27
RR Build 2040	37	21	10	21
RR Build 2040 with CV/AV	43	26	12	26
Change vs Existing Conditions				
RR Build 2040	-12.8%	-20.8%	-21.9%	-22.0%
RR Build 2040 with CV/AV	1.9%	-4.0%	-6.5%	-4.8%

As shown in Table 5-30, CV/AV implementation results in an increase in AHS for the 2040 RR with CV/AV scenario in comparison to the 2040 RR scenario without CV/AV across all segment types. Freeway, expressway, and ramp segments are also projected to experience an increase in AHS over the 2016 existing conditions. In general, CV/AV is projected to result in similar AHS in the RR Build with CV/AV to the 2016 E conditions.

5.10 Cordon Line Analysis

The goal of the cordon line analysis was to eliminate the influences of traffic conditions on the perimeter of the DTA model and to focus on the changes within the immediate study area. The analysis area of the cordon line focus area is shown in Figure 5-32.

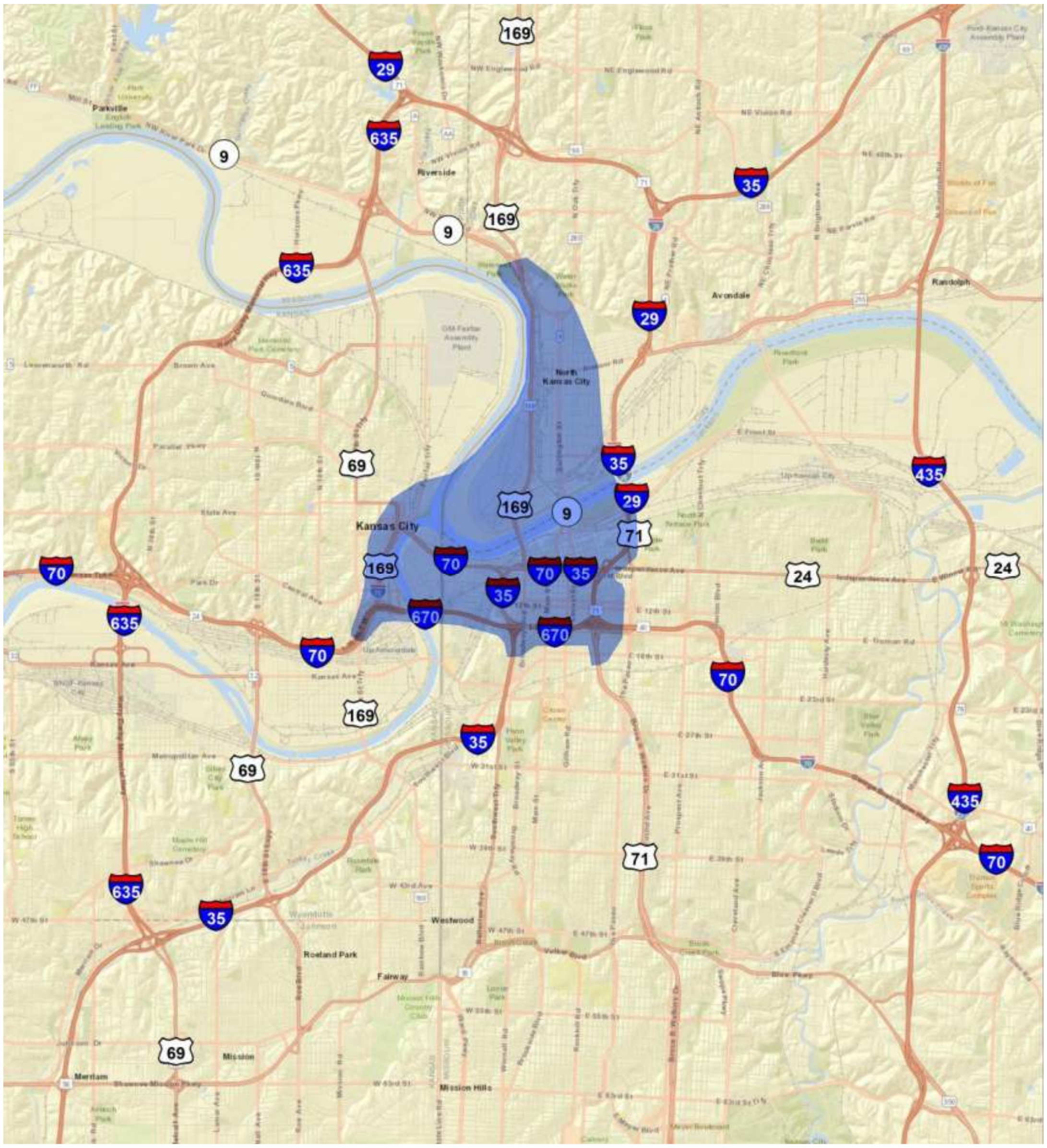


Figure 5-32: Cordon Line Analysis Focus Area

The cordon line statistics tend to match the overall trends that were seen with the previous full DTA, but scales of the changes are amplified. With the cordon statistics, the VMT may be changing as vehicles avoid a potentially more congested downtown, so looking at the speeds is needed in addition to the VHT and VHD numbers, as those metrics are scaled by the number of vehicles.

Table 5-31 lists morning peak period cordon line analysis VMT results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-31: A.M. Peak Period NB Cordon Line Vehicle Miles Travelled Results

A.M. Peak Period (6-9 A.M.)	Vehicle Miles Travelled - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	196,779	28,763	49,691	275,233
No Build 2040	219,657	30,846	62,639	313,142
Access Consolidated 2040	220,811	33,785	64,966	319,562
Compressed Footprint 2040	214,185	32,281	66,679	313,145
Remove and Reclassify 2040	202,937	33,803	67,760	304,500
No Build 2040 wCV/AV	223,219	31,874	59,203	314,296
Change vs Existing Conditions				
No Build 2040	11.6%	7.2%	26.1%	13.8%
Access Consolidated vs NB 2040	0.5%	9.5%	3.7%	2.1%
Compressed Footprint vs NB 2040	-2.5%	4.7%	6.4%	0.0%
Remove and Reclassify vs NB 2040	-7.6%	9.6%	8.2%	-2.8%
No Build 2040 wCV/AV	13.4%	10.8%	19.1%	14.2%

As shown in

Table **5-31**, 2040 NB and 2040 NB with CV/AV scenarios show similar VMT results with similar trends identified in the NB scenario analysis. CV/AV implementation results in added freeway and expressway traffic volumes and a reduction of traffic along arterial segments. This interaction is primarily due to the added incentive of freeway and expressway travel with CV/AV operations. Table 5-32 lists morning peak period cordon line analysis VHT results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-32: A.M. Peak Period NB Cordon Line Vehicle Hours Travelled

A.M. Peak Period (6-9 A.M.)	Vehicle Hours Travelled - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	4,301	900	2,535	7,736
No Build 2040	5,150	971	3,930	10,051
Access Consolidated 2040	5,279	1,107	4,824	11,210
Compressed Footprint 2040	5,062	1,054	5,243	11,359
Remove and Reclassify 2040	5,234	1,091	5,452	11,777
No Build 2040 wCV/AV	4,870	996	3,295	9,161
Change vs Existing Conditions				
No Build 2040	19.7%	7.9%	55.0%	29.9%
Access Consolidated vs NB 2040	2.5%	14.0%	22.7%	11.5%
Compressed Footprint vs NB 2040	-1.7%	8.5%	33.4%	13.0%
Remove and Reclassify vs NB 2040	1.6%	12.4%	38.7%	17.2%
No Build 2040 wCV/AV	13.2%	10.7%	30.0%	18.4%

As shown in Table 5-32, significant improvements of VHT are anticipated with CV/AV implementation over the 2040 NB scenario across all segment types.

Table 5-33 lists morning peak period cordon line analysis VHD results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-33: A.M. Peak Period NB Cordon Line Hours of Delay Results

A.M. Peak Period (6-9 A.M.)	Vehicle Hours of Delay - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	431	90	714	1,235
No Build 2040	816	99	1,661	2,575
Access Consolidated 2040	942	202	2,455	3,600
Compressed Footprint 2040	852	184	2,806	3,842
Remove and Reclassify 2040	1,245	176	2,974	4,395
No Build 2040 wCV/AV	477	98	1,120	1,696
Change vs Existing Conditions				
No Build 2040	89.3%	10.0%	132.6%	108.5%
Access Consolidated vs NB 2040	15.4%	104.0%	47.8%	39.8%
Compressed Footprint vs NB 2040	4.4%	85.9%	68.9%	49.2%
Remove and Reclassify vs NB 2040	52.6%	77.8%	79.0%	70.7%

No Build 2040 wCV/AV	10.7%	8.9%	56.9%	37.3%

As shown in

Table **5-33**, significant VHD improvements are anticipated with CV/AV implementation across all segment types. Overall system shows approximately a 37% increase in VHD for the 2040 NB with CV/AV scenario over the 2016 E scenario while the 2040 NB scenario shows over a 100% increase in VHD over the 2016 E scenario.

Table 5-34 lists morning peak period cordon line analysis AHS results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-34: A.M. Peak Period NB Cordon Line Average Harmonic Speed Results

A.M. Peak Period (6-9 A.M.)	Average Harmonic Speed - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	46	32	20	36
No Build 2040	43	32	16	31
Access Consolidated 2040	42	31	13	29
Compressed Footprint 2040	42	31	13	28
Remove and Reclassify 2040	39	31	12	26
No Build 2040 wCV/AV	46	32	18	34
Change vs Existing Conditions				
No Build 2040	-6.8%	-0.6%	-18.7%	-12.4%
Access Consolidated vs NB 2040	-1.5%	-2.4%	-18.4%	-6.9%
Compressed Footprint vs NB 2040	-1.5%	-2.4%	-18.4%	-10.1%
Remove and Reclassify vs NB 2040	-8.6%	-2.4%	-24.7%	-16.5%
No Build 2040 wCV/AV	0.2%	0.1%	-8.3%	-3.6%

As shown in Table 5-34, upon CV/AV implementation,2040 NB with CV/AV results closely replicate 2016 E conditions and shows significant improvements in AHS over the 2040 NB scenario.

Table 5-35 lists evening peak period cordon line analysis VMT results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-35: P.M. Peak Period NB Cordon Line Vehicle Miles Travelled Results

P.M. Peak Period (3-7 P.M.)	Vehicle Miles Travelled - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	268,077	38,025	69,938	376,039
No Build 2040	302,005	41,250	101,582	444,837
Access Consolidated 2040	310,250	44,964	100,521	455,734
Compressed Footprint 2040	301,170	43,874	102,156	447,200
Remove and Reclassify 2040	270,593	41,323	108,002	419,918
No Build 2040 wCV/AV	309,477	43,107	94,071	446,656
Change vs Existing Conditions				
No Build 2040	12.7%	8.5%	45.2%	18.3%
Access Consolidated vs NB 2040	2.7%	9.0%	-1.0%	2.4%
Compressed Footprint vs NB 2040	-0.3%	6.4%	0.6%	0.5%
Remove and Reclassify vs NB 2040	-10.4%	0.2%	6.3%	-5.6%
No Build 2040 wCV/AV	15.4%	13.4%	34.5%	18.8%

As shown in

Table 5-35, evening peak period results show that 2040 NB and 2040 NB with CV/AV scenarios show similar VMT results with similar trends identified in the NB scenario analysis. CV/AV implementation results in added freeway and expressway traffic volumes and a reduction of traffic along arterial segments. This interaction is primarily due to the added incentive of freeway and expressway travel with CV/AV operations. Table 5-36 lists evening peak period cordon line analysis VHT results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-36: P.M. Peak Period NB Cordon Line Vehicle Hours Travelled

P.M. Peak Period (3-7 P.M.)	Vehicle Hours Travelled - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	5,700	1,170	3,790	10,660
No Build 2040	7,075	1,544	7,848	16,467
Access Consolidated 2040	7,412	1,423	8,336	17,171
Compressed Footprint 2040	7,345	1,619	8,497	17,461
Remove and Reclassify 2040	7,125	1,913	10,515	19,553
No Build 2040 wCV/AV	6,517	1,382	7,991	15,891
Change vs Existing Conditions				
No Build 2040	24.1%	32.0%	107.1%	54.5%
Access Consolidated vs NB 2040	4.8%	-7.8%	6.2%	4.3%
Compressed Footprint vs NB 2040	3.8%	4.9%	8.3%	6.0%
Remove and Reclassify vs NB 2040	0.7%	23.9%	34.0%	18.7%
No Build 2040 wCV/AV	14.3%	18.1%	110.8%	49.1%

As shown in Table 5-36, significant improvements of VHT are anticipated with CV/AV implementation in comparison to the 2040 NB scenario across freeway and expressway segments. Arterial segment types are projected to experience an approximately 3% increase over the 2040 NB scenario within the focus area for the evening peak period. Table 5-37 lists evening peak period cordon line analysis VHD results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-37: P.M. Peak Period NB Cordon Line Hours of Delay Results

P.M. Peak Period (3-7 P.M.)	Vehicle Hours of Delay - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	426	101	1,231	1,758
No Build 2040	1,129	370	4,189	5,689
Access Consolidated 2040	1,314	204	4,691	6,209
Compressed Footprint 2040	1,429	429	4,779	6,636
Remove and Reclassify 2040	1,811	768	6,595	9,174
No Build 2040 wCV/AV	424	166	4,567	5,156
Change vs Existing Conditions				
No Build 2040	165.0%	266.3%	240.3%	223.6%
Access Consolidated vs NB 2040	16.4%	-44.9%	12.0%	9.1%
Compressed Footprint vs NB 2040	26.6%	15.9%	14.1%	16.6%
Remove and Reclassify vs NB 2040	60.4%	107.6%	57.4%	61.3%
No Build 2040 wCV/AV	-0.5%	64.4%	271.0%	193.3%

As shown in Table 5-37, a significant improvement in VHD is anticipated along freeways, expressways, and ramps with CV/AV implementation. The overall system total does not experience the same level of improvement, but this is primarily due to CV/AV interactions only being applied to freeway and expressway segments. Table 5-38 lists evening peak period cordon line analysis AHS results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

Table 5-38: P.M. Peak Period NB Cordon Line Average Harmonic Speed Results

P.M. Peak Period (3-7 P.M.)	Average Harmonic Speed - Focus Area Only			
	Freeway & Expressway	All Ramps	Arterials	System Total
Existing 2016	47	33	18	35
No Build 2040	43	27	13	27
Access Consolidated 2040	42	32	12	27
Compressed Footprint 2040	41	27	12	26
Remove and Reclassify 2040	38	22	10	21
No Build 2040 wCV/AV	47	31	12	28
Change vs Existing Conditions				
No Build 2040	-9.2%	-17.8%	-29.9%	-23.4%
Access Consolidated vs NB 2040	-1.6%	19.8%	-7.3%	-0.1%
Compressed Footprint vs NB 2040	-4.0%	1.1%	-7.3%	-3.8%
Remove and Reclassify vs NB 2040	-11.0%	-17.7%	-22.7%	-22.3%
No Build 2040 wCV/AV	1.0%	-4.0%	-36.2%	-20.3%

As shown in Table 5-38, upon CV/AV implementation,2040 NB with CV/AV results closely replicate 2016 E conditions and shows significant improvements in AHS over the 2040 NB scenario across freeways, expressways, and ramps. System total results for the 2040 NB with CV/AV scenario do not as closely replicate the 2016 E scenario primarily due to the CV/AV interactions only being applied to the freeway and expressway segments.

Table 5-35 lists evening peak period cordon line analysis VMT results for the 2016 E, 2040 NB, and 2040 NB with CV/AV scenarios.

5.11 Environmental Impacts

Environmental impacts were assessed through each strategy for the 2040 analysis year. Note that this assessment is not an EPA-compliant analysis but provides a quick assessment of relative emissions between strategies. Measurements were pulled directly from the DTA model by performing a link by link tabulation of all VMTs by 5mph increments and then applying generalized emission rates for each speed grouping to convert VMT in to pollutant emissions for the entire morning and evening peak periods across each strategy. Emission rates used were generalized rates for light duty gas vehicles for 2040 as estimated by California's EMFAC2014 model for a 2040 future year. The following pollutants were assessed for each comparison:

- ROG: Reactive Organic Gases
- TOG: Total Organic Gases
- CO: Carbon Monoxide
- NOx: Nitrogen Oxides
- CO2: Carbon Dioxide
- PM10: Particulate Matter less than 10 microns
- PM2.5: Particulate Matter less than 2.5 microns

Table 5-39 through Table 5-41 show total percentage gram comparisons per each strategy. All emission impacts are considered to be negligible.

Table 5-39: Full DTA Model – Change from No Build

	Peak VMT		Change in Key Pollutants (combined A.M. and P.M. Peaks)						
2040 Strategy	A.M. 6-9 VMT	P.M. 3-7 VMT	ROG	TOG	CO	Nox	CO2	PM10	PM2.5
Access Consolidated	-0.1%	0.2%	-0.3%	-0.3%	-0.1%	-0.1%	-0.1%	-0.3%	-0.3%
Compressed Footprint	0.1%	0.1%	0.6%	0.6%	0.3%	0.2%	0.4%	0.7%	0.7%
Remove and Reclassify	-0.2%	0.2%	1.6%	1.6%	0.7%	0.4%	0.9%	1.9%	1.9%

Table 5-40: Focus Area Only – Change from No Build

	Peak VMT		Change in Key Pollutants (combined A.M. and P.M. Peaks)						
2040 Strategy	A.M. 6-9 VMT	P.M. 3-7 VMT	ROG	TOG	CO	Nox	CO2	PM10	PM2.5
Access Consolidated	2.1%	2.6%	2.5%	2.5%	3.1%	2.7%	2.6%	2.5%	2.5%
Compressed Footprint	-2.0%	-1.9%	0.7%	0.7%	-1.2%	-1.4%	-0.4%	1.0%	1.0%
Remove and Reclassify	-2.8%	-6.1%	2.4%	2.4%	-2.3%	-2.9%	-0.7%	3.2%	3.2%

Table 5-41: Loop Area Only – Change from No Build

	Peak VMT		Change in Key Pollutants (combined A.M. and P.M. Peaks)						
2040 Strategy	A.M. 6-9 VMT	P.M. 3-7 VMT	ROG	TOG	CO	Nox	CO2	PM10	PM2.5
Access Consolidated	2.8%	4.2%	3.6%	3.6%	4.4%	3.8%	3.7%	3.6%	3.6%
Compressed Footprint	-1.7%	-1.8%	1.0%	1.0%	-0.9%	-1.1%	-0.1%	1.4%	1.4%
Remove and Reclassify	-3.0%	-7.2%	4.0%	4.0%	-2.5%	-3.1%	0.0%	5.2%	5.2%

APPENDIX A- SKYCOMP DATA COLLECTION METHODOLOGY

SURVEY METHODOLOGY SUMMARY

Downtown Kansas City Freeway Loop
Origin-Destination, Route and Travel Time Patterns
Kansas City, Missouri

Surveys conducted in October / November 2016

Skycomp

Prepared by Skycomp
in association with Burns & McDonnell

INTRODUCTION

The scope of services for the survey conducted by Skycomp in Kansas City, Missouri included the use of time-lapse aerial photography (TLAP) and INRIX data in order to obtain traffic flow parameters for transportation planning activities.

The TLAP assignments were to record and extract second-by-second traffic movements on vehicles that used the downtown Kansas City Loop. The primary task was to produce peak period morning and evening origin-destination (O-D) tables. An additional task was volume counts at designated locations in the survey area. Skycomp's TLAP work was divided into two tasks: *Task 1* related to acquisition and alignment of the TLAP imagery; *Task 2* related to post-flight data extraction.

Four weeks of INRIX *Trip Records* data were analyzed in order to produce 24-hour origin-destination tables for the EMME model area. Additionally, two areas (West Bottoms and Fairfax) were selected for medium/heavy vehicle analysis from 9:00 AM to 3:00 PM. *Task 3* related to creating O-D tables for the EMME model area; *Task 4* related to the medium/heavy vehicle analysis of selected regions.

TLAP TASK ONE – SURVEY EXECUTION AND PHOTO ALIGNMENT

Using a hovering helicopter in a fixed position approximately one mile above the ground, Skycomp executed two 2-hour survey flights to acquire continuous photographic coverage of the study area. These surveys were conducted on the following dates:

Tuesday, October 18, 2016 (4:00-6:00 p.m.)
Tuesday, November 15, 2016 (7:00-9:00 a.m.)

SURVEY AREA

The assigned survey area is shown on the next page in *Figure 1*. This survey area was imaged using a three-camera wide-area video "WAV" system. Images were recorded at a rate of one frame per second. Resolution was set so that it would be possible later to trace individual vehicles between origins and destinations across the survey area, and to obtain queue profiles at designated intersections.

AERIAL CAMERAS

Skycomp prepared a camera coverage plan such that the entire survey area could be viewed by one of three high-resolution digital cameras mounted aboard one helicopter hovering about one mile above the ground. This "wide-area video" (WAV) camera systems captured all visible vehicle flows continuously at a one-second frame rate, for approximately 120-minute periods. The aerial camera plan is shown in *Figure 2*.

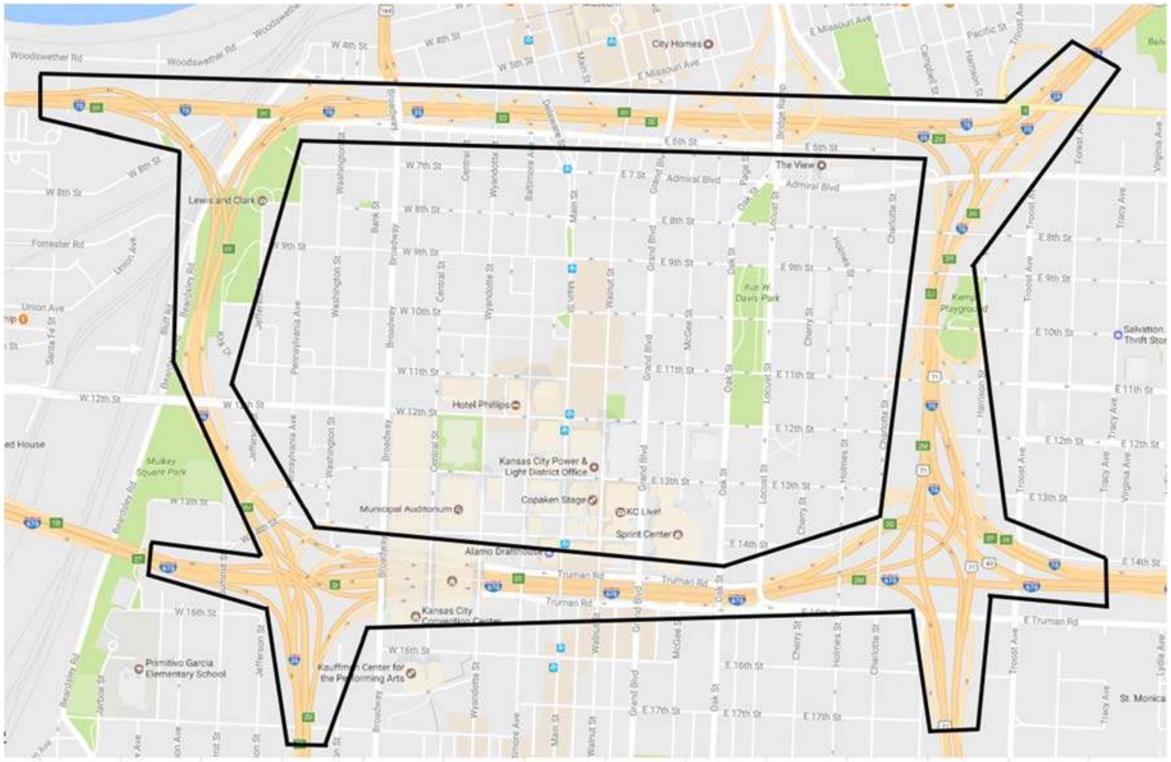


Figure 1: The survey area is outlined in black above; tracing was done along the primary highways comprising the loop to determine vehicle routes and overall traffic O-D percentages between specified locations.

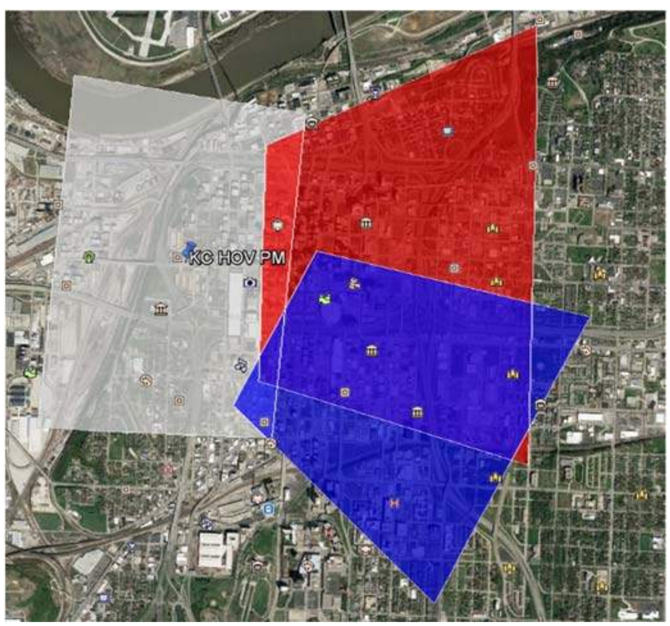


Figure 2: One helicopter with a three-camera cluster was used to image the study area during the evening period (shown above). Each colored polygon is the approximate field-of-view of one high-resolution digital camera. The hover point of the helicopter is depicted by a by a yellow pin left of center. A fourth camera was added to the cluster for the morning survey to enhance resolution in certain locations of the survey area.

SURVEY METHODOLOGIES

Aerial Survey – As described above, Skycomp deployed one helicopter to record all visible highway traffic flow within the aerial survey area. Using one Skycomp “Wide-Area Video” (WAV) digital imaging systems in the multi-camera configurations described above, the surveyors produced image archives suitable for the extraction of the metrics described below. Digital images were captured at one-second intervals.

Aerial Photo alignment –First, all associated imagery sets were tightly-aligned by camera to compose a permanent photographic record of highway traffic conditions. One image taken at the same instant by each of the survey cameras were then pasted onto a single digital "photoboard"; one such photoboard was produced for each second of each survey period. Tight alignment was maintained of all pasted images so that the background would not move when a user advanced from one board to the next. A transparent overlay was then created and applied over each photoboard; the overlay contains codes and colored lines to control recording of the data. These aligned photoboards were then used for the extraction of data.

Figure 3: This is a sample photoboard from the evening survey. Each of the three photographs were acquired at the same instant, combined onto a single image (photoboard) that shows the entire survey area at once.

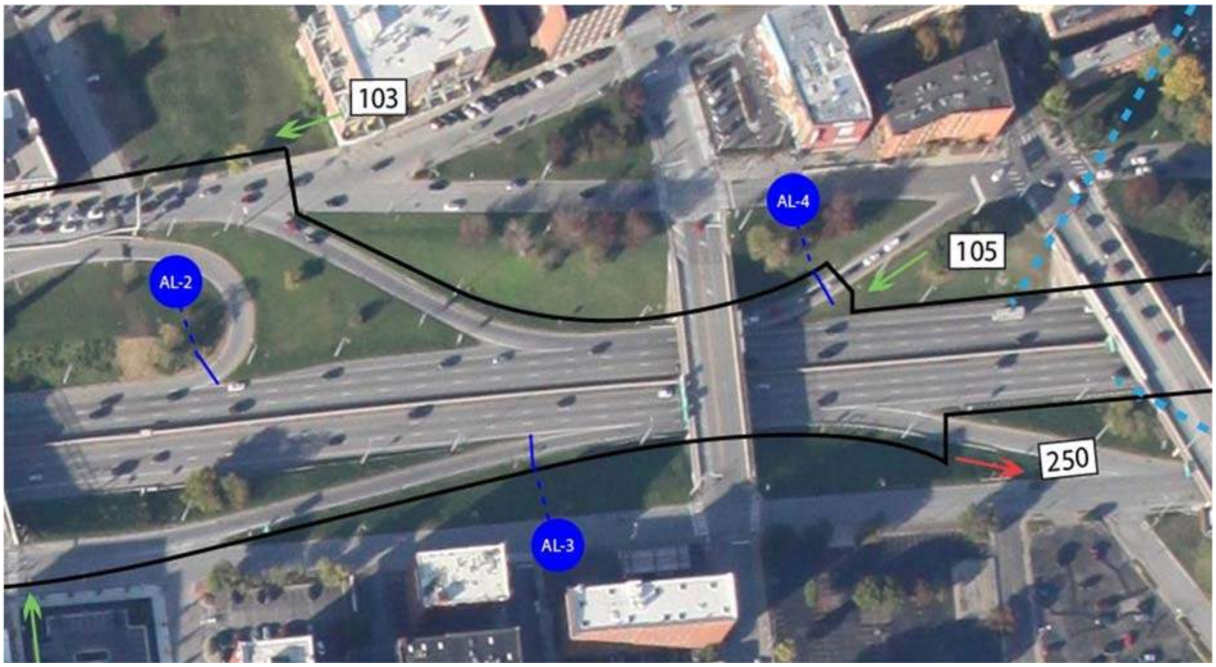


Figure 4: This full-resolution image was cropped from the evening photoboard, and shows the data reduction codes. The blue dots indicate where sampled vehicles were selected for tracing; the numbers (103, 105, 250) serve as origin and destination codes.

TLAP TASK TWO – DATA EXTRACTION, COMPILATION AND DELIVERY

Origin-Destination Data **–** Virtual *assignment lines* (AL's) were used to define where vehicles would be selected for tracing. A sampled number of vehicles that crossed each AL were traced backward to their origins and forward to their destinations. AL's were drawn as close to the designated origins as possible. In some cases, obstructions in the aerial imagery (overpasses) required that assignment lines be moved to where vehicles could most effectively be traced; volume counts were obtained to supplement O-D compilation in these instances. Vehicles were traced as needed until leaving the survey area across a black boundary line. For this survey, 10% of the vehicles crossing each AL for the 90-minute loading period were selected for tracing; for the high volume AL's, a maximum of 300 vehicles were selected. At some of the low volume AL's (freeway ramps), more than 10% of traffic flow was sampled. Due to a traffic incident later in the evening survey period (potentially impacting O-D behavior), only 60 minutes were sampled at some of the assignment lines. Additionally, at some locations where the origin and destination were known, volume counts were used in lieu of traced samples.

LIST OF ASSIGNMENT LINES

AL-1	Mainline – SB US 169
AL-2	Ramp - NB Broadway Blvd to WB I-70
AL-3	Ramp - EB W 6th St / Broadway Blvd to EB I-70
AL-4	Ramp - WB W Independence Ave / Delaware St to WB I-70
AL-5	Ramp - EB E 6th St / Deleware St to EB I-70
AL-6	Ramp - SB SR 9 to EB / WB I-70
AL-7	Ramp - NB SR 9 to WB I-70
AL-8	Ramp - EB / WB Independence Ave to WB I-70
AL-9	Mainline - SB I-29
AL-10	Ramp - EB / WB Admiral Blvd to SB I-70

AL-12A	Ramp - WB 10th St to NB I-70
AL-12B	Ramp - WB 11th St to NB I-70
AL-14/15	Mainline - WB I-70
AL-16	Mainline - NB US 71
AL-18	Ramp - E Truman Rd to EB I-670
AL-19	Mainline - NB I-35
AL-20A	Ramp - EB I-670 to SB I-35
AL-20B	Mainline - EB I-670
AL-22	Ramp - EB / WB W 12th St to SB I-35
AL-23	Ramp - EB / WB W 12th St to NB I-35
AL-24A	Mainline - EB I-70
AL-24B	Ramp - EB I-70 to SB I-35

<u>Vehicle tracing O-D master database creation</u> - Based on the sampling rate, vehicles were selected for tracing as they crossed each AL, and then traced backwards and forward until crossing a boundary of the survey area (black lines in the overlay graphic, as shown in Figures 4). Tags were applied manually to these selected vehicles as they moved between origins and destinations using a computerized imagery tagging tool; that tool accumulated the tagging information into a master vehicle trajectory database for each survey period. This included fields for time-stamped crossing of AL's and origin and destination boundary lines. This master database is comprised of two types of files: the "A" files which contain one record for each traced vehicle to include the origin, destination, class (car, truck, tractor-trailer or bus), travel time and the time that the trace began. The "B" files contain one record for each tag applied to each traced vehicle. Each such record contains a unique vehicle ID number to correlate it to the "A" file, the precise time that each tag was applied, and the pixel (x,y) location of the vehicle's tag on the photoboard (this provides trajectory information to be extracted later if needed).

'ID'	Type	Total Time (sec)	Symbol	Origin	Destination	Notes
101	Car	65	1	200	120	71608 B
102	Bus	112	2	200	120	71654 W BUS
103	Car	119	3	200	300	71714 B CAR
104	Car	175	4	200	340	71757 B CAR
105	Car	56	5	200	120	71904 G CAR UI
106	Car	149	6	200	120	71949 W CAR
107	Car	175	7	200	125	72036 B CAR UI
108	Car	71	8	200	205	72130 G CAR
109	Truck	90	9	200	120	72235 W TRUCI
110	Car	163	10	200	310	72344 W CAR

Figure 5: This is a sample from the "A" file from the morning period. Each record represents one traced vehicle.

'ID'	Origin	Destinatic	Lane	Photo	X	Y	Field 1	Field 2
921	200			r_02a_20160921-081758.ecw	12092	3991		
921	200			r_02a_20160921-081800.ecw	12036	4000		
921	200			r_02a_20160921-081802.ecw	11986	3999	AL-1	
921	200			r_02a_20160921-081806.ecw	11896	3956		
921	200			r_02a_20160921-081810.ecw	11837	3875		
921	200			r_02a_20160921-081812.ecw	11834	3820		
921	200			r_02a_20160921-081816.ecw	11856	3720		
921	200			r_02a_20160921-081820.ecw	11914	3666		
921	200			r_02a_20160921-081824.ecw	11977	3663		
921	200			r_02a_20160921-081828.ecw	12026	3670		
921	200			r_02a_20160921-081832.ecw	12067	3699		
921	200			r_02a_20160921-081837.ecw	12063	3795		
921	200			r_02a_20160921-081841.ecw	12051	3899		
921	200			r_02a_20160921-081842.ecw	12045	3929		
921	200			r_02a_20160921-081843.ecw	12041	3960		
921	200			r_02a_20160921-081910.ecw	11992	4189		
921	200			r_02a_20160921-081911.ecw	11989	4205		
921	200			r_02a_20160921-081914.ecw	11970	4287		
921	200			r_02a_20160921-081918.ecw	11947	4417		
921	200			r_02a_20160921-081922.ecw	11928	4530		
921	200	120		r_02a_20160921-081928.ecw	11880	4646		

Figure 6 (above): This is a sample from the "B" file from the morning period, for Vehicle ID 921. Each record represents one vehicle tag placed on succeeding photoboards; the x,y fields track the movement of each vehicle across the photoboard. The filename includes the time to the nearest second, allowing the exporting of detailed travel times using the route markers in Field 1.

Next, O-D data was compiled into summary tables by survey period. Hourly volumes were applied to the raw tallies of the tracing results in order to create balanced tables. Each "Table 1" displays these balanced tables; each "Table 2" displays the data from Table 1 converted to percentages.

TABLE 1: Origin-Destination Table with Applied Hourly Volumes										
	Hourly	**Destinations**								
Origins	**Balanced Volume**	**100**	**104**	**105**	**107**	**110**	**111**	**120**	**125**	**130**
100	**1385**	0	78	16	47	10	0	8	0	0
101	**20**	0	0	0	0	0	0	0	0	0
103	**1**	0	0	0	0	0	0	0	0	0
105	**490**	10	0	0	0	0	0	0	0	0
110	**726**	0	0	7	0	0	0	13	26	0
112	**66**	0	0	0	0	0	0	0	0	0
113	**33**	0	0	0	0	0	0	0	0	0
115	**211**	7	0	13	0	7	0	0	0	0
120	**3588**	0	0	70	0	35	26	0	0	0
135	**130**	0	0	3	0	0	0	80	0	6
137	**118**	4	0	0	0	0	0	97	0	11
150	**331**	19	0	28	0	9	0	132	9	9
155	**3340**	68	0	107	0	27	10	358	10	87
170	**3451**	110	0	50	0	35	0	1509	0	120

Figure 7: Partial Table 1, evening survey period.

TABLE 2: Origin-Destination Overall Percentages Table (Based on Table 1)										
	Total	**Destinations**								
Origins	**Origin Percentages**	**100**	**104**	**105**	**107**	**110**	**111**	**120**	**125**	**130**
100	**5.4%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
101	**0.1%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
103	**0.0%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
105	**1.9%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
110	**2.8%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
112	**0.3%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
113	**0.1%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
115	**0.8%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
120	**14.0%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
135	**0.5%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
137	**0.5%**	0%	0%	0%	0%	0%	0%	0%	0%	0%
150	**1.3%**	0%	0%	0%	0%	0%	0%	1%	0%	0%
155	**13.0%**	0%	0%	0%	0%	0%	0%	1%	0%	0%
170	**13.4%**	0%	0%	0%	0%	0%	0%	6%	0%	0%

Figure 8: Partial Table 2, evening survey period.

Travel Times - The client designated 4 routes where travel times were to be obtained using the aerial imagery. AM routes were southbound from 1 to 2 and 1 to 3. PM routes were northbound from 2 to 1 and 3 to 1 (see *Figure 9* below).

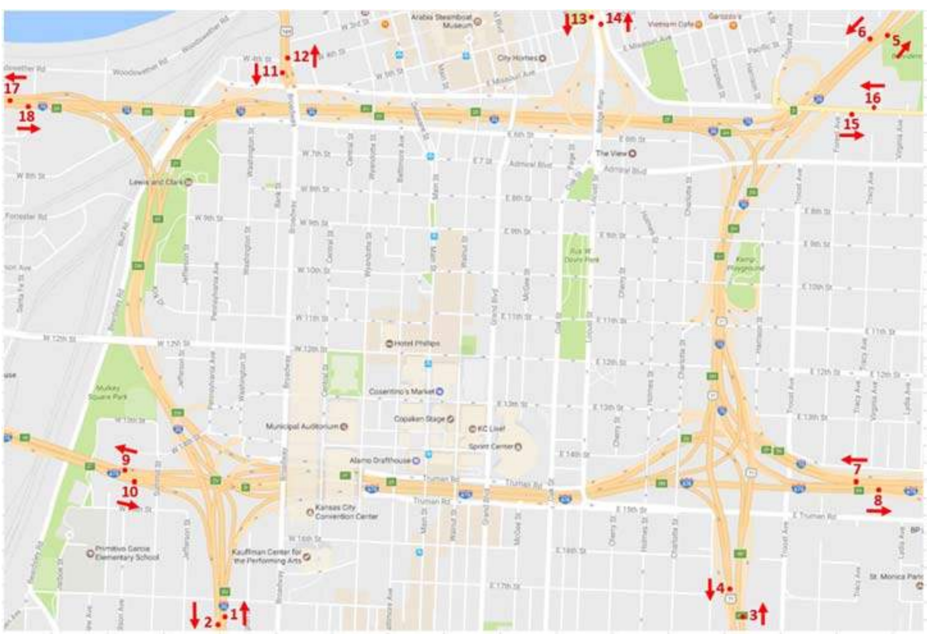
Figure 9: Travel time routes (AM: 1-2, 1-3; PM: 2-1, 3-1)

Travel time results were provided in excel workbooks (see *Figure 10* below).

Date:		Tuesday, November 15, 2016		
Route:		(1) vicinity of airport interchange to (3) I-35 / 12th St Interchange		
Direction:		Southbound		
Distance (miles):		1.9		
Sample	Time (PM)	Travel Time (seconds)	Travel Time (mins:secs)	Speed (mph)
1	700-715	334	5:34	20
2	700-715	347	5:47	20
3	715-730	430	7:10	16
4	715-730	391	6:31	17
5	715-730	442	7:22	15
6	730-745	356	5:56	19
7	730-745	415	6:55	16
8	745-800	485	8:05	14

Figure 10: Partial travel time table

Volume Counts - The client specified 18 mainline locations for 2-hour volume counts (for each time period). See map and list of count locations in *Figure 11* below. Volume counts were provided in 15-minute sets; in these tables, vehicles were also classified as trucks, tractor-trailers, buses or autos/other small vehicles (pick-up trucks, vans, etc.). See sample table in *Figure 10* below.



Volume #	Location
1	Northbound I-35
2	Southbound I-35
3	Northbound US-71
4	Southbound US-71
5	Northbound I-29
6	Southbound I-29
7	Westbound I-70
8	Eastbound I-70
9	Westbound I-670
10	Eastbound I-670
11	Southbound US-169
12	Northbound US-169
13	Southbound SR-9
14	Northbound SR-9
15	Westbound Independence Ave
16	Eastbound Independence Ave
17	Westbound I-70
18	Eastbound I-70

Figure 11: Volume count locations are depicted above.

Project:	Downtown Kansas City Freeway Loop
Assignment:	1
Location:	Northbound I-35
Date:	Tuesday, November 15, 2016
Time:	7:00-9:00 AM

VOLUME COUNT SUMMARY

TIME PERIOD	VEHICLE CLASS.	NB
7:00 AM	Total Vehicles	1166
	Passenger Car	1141
	Truck	8
	Tractor-Trailer	9
7:15 AM	Bus	8
7:15 AM	Total Vehicles	1475
	Passenger Car	1441
	Truck	16
	Tractor-Trailer	13
7:30 AM	Bus	5
7:30 AM	Total Vehicles	1595
	Passenger Car	1567
	Truck	11
	Tractor-Trailer	5
7:45 AM	Bus	12
7:45 AM	Total Vehicles	1744
	Passenger Car	1705

Figure 10: The partial table above depicts AM volume counts for northbound I-35 approaching the downtown Kansas City loop.

<u>TLAP Deliverables -</u> Skycomp has produced the following deliverables:

1. Summary of the survey methodologies in a written report;
2. Origin-destination tables (Tables 1 and 2 per above);
3. Travel times on designated routes;
4. Volume counts.

INRIX TASK THREE – DATA EXTRACTION, COMPILATION AND DELIVERY

The INRIX Trips database is comprised of GPS "ping" trails (lat/longs) of individual trips; each trip has a unique Trip ID number. Furthermore, each trip is associated with a specific device, so that if a vehicle makes multiple trips in one day, it is possible to understand that the trips are related. Several other fields are provided including the time that each trip began and ended; the coordinates of its beginning and ending points (origins and destinations); and the coordinates of all route pings which are contained in the database, with precise time stamps. The ping rates vary widely from one trip to the next, ranging from one ping per second to around five minutes per ping (latter is rare). Most vehicles ping at a rate between 30 seconds and two minutes.

To perform this study, INRIX provided Skycomp with a database that included all trips aggregated by INRIX for the month of March 2016 for which at least one ping was generated within the study area.

The general processing steps were as follows:
1. Because the INRIX Trips database contains three types of vehicle classification (light, medium and heavy vehicles), all vehicle records were segregated and retained for analysis.

2. The next step was to create subsets of the trips database, each of which contained only the trips within a specific time period. The analysis periods are listed below. Trips from typical, non-holiday, Tuesday-Thursdays were included.

AM Peak – 6:00 AM to 9:00 AM
Midday - 9:00 AM to 3:00 PM
PM Peak – 3:00 PM to 7:00 PM
Overnight - 7:00 PM to 6:00 AM

3. The lat/long coordinates of each start and end point for each trip is part of the trip's information. These points were plotted against the traffic analysis zone (TAZ) map provided by the client, so that the origin and destination codes in the database could be appended with the client's TAZ code names.

3. The origins and destinations of the vehicles were then compiled into O-D Counts tables by vehicle class (light, medium, heavy) and time period. O-D Percentages tables were then created based on the O-D Counts tables. These O-D matrices were then provided to the client.

INRIX TASK FOUR – DATA EXTRACTION, COMPILATION AND DELIVERY

Using the INRIX Tripstats data from *Task Three*, Skycomp performed analyses on two industrial sites; West Bottoms, Kansas City, MO; and Fairfax, Kansas City, KS. For each of these studies, vehicles classified as heavy or medium were analyzed from 9:00 am to 3:00 pm. Trips from typical, non-holiday, Tuesday-Thursdays were included.

The general processing steps for the INRIX OD analysis of medium/heavy vehicles in the West Bottoms and Fairfax areas differ from the *Task Three* steps in that points had to be plotted against customized polygons rather than the TAZ map provided.

Questions - If there are any questions about the methodologies described above, please direct them to Billie Barnett at Skycomp, at *barnett@skycomp.com*.

BEYOND THE LOOP

APPENDIX B- GARVER US-169 BROADWAY CAPACITY ANALYSIS REPORT

US 169 Broadway Blvd

Capacity Analysis for the Proposed Alternative Strategies

DRAFT

December 2017

GARVER

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US 169 – Broadway PEL Capacity analysis

1. Introduction

The purpose of this report is to document the findings of the capacity analysis for the conceptual strategies. These strategies were developed to seek the most effective approach to improving the transportation facilities in the study area which is northwest of downtown Kansas City, MO. The study area includes US-169/MO Route 9, I-670 and I-70, and is generally limited by the US-169/MO Route 9 interchange to the north, I-670 to the south, the I-70/670 interchange in Wyandotte county, Kansas to the west, and the I-70/I-670 interchange in Jackson county, Missouri, to the east, including the US-169 Buck O' Neil Bridge over the Missouri River. In the current study, the US 169 north of the Broadway Bridge has been analyzed for any potential issues for Harlem interchange and the North interchange improvements. The right in and right out geometric improvements just north of main airport terminal is also analyzed. The two driveways at the airport terminal has been checked to make sure the proposed alternative strategies will not impact the capacity.

The US-169 interchange with Harlem Road features left side on and off ramps, no acceleration lane for the southbound US 169 on-ramp, and a complex nine-legged roundabout that serves the interchange, Richards Road, Lou Holland Drive, and Harlem Road. The left-side on-ramp in the southbound direction is of particular concern due to confusion relating with signing and lack of acceleration lane. The southbound on ramp has a stop sign for the on ramp traffic with a very poor sight distance and this is of a major safety issue because of the fast moving traffic on US 169 mainline southbound.

At a minimum, access provisions to US-169 for airport patrons and on-site business will be maintained at current levels; one northbound off ramp, two southbound on-ramps, and two southbound off-ramps. Conceptual improvements have also been developed to address safety concerns at the southbound off-ramp to the north side of the airport property and the southbound right-in/right-out located on the east side of the airport.

2. Description of the conceptual strategies

The following three strategies have been developed to improve the Harlem interchange:

(i) Strategy C1: Half Diamond Interchange with Existing Harlem Road Access

Strategy C1 represents a half diamond interchange, with the exit and entrance ramps on the right side for the northbound traffic. Harlem Road eastbound and westbound traffic would maintain the existing access (separated with individual railroad under crossings) and connect to Richards Road, which is relocated slightly west as shown in the **Figure 1**.

(ii) Strategy C4: Half Diamond Interchange with Split Lou Holland Undercrossing

Strategy C4 represents a half diamond interchange, with the exit and entrance ramps on the right side of US-169. Harlem eastbound and westbound traffic would maintain the existing access (separated with individual railroad under crossings) and connect to Richards Road, which is locally relocated to the west. Northbound Lou Holland drive splits near the levee retaining wall and provides direct connection to northbound US169 and Richards Road via a weaving movement. **Figure 2** shows the layout of Strategy C4.

(iii) Strategy C5: Half Diamond Interchange with New Single Harlem Road Railroad Crossing

Strategy C5 represents a half diamond interchange, with the exit and entrance ramps on the right-hand side similarly to Strategy C1, with the exception that Harlem Road to the east is served by a new railroad structure. **Figure 3** shows the layout of Strategy C5.

In addition to the above three alternatives, two additional supplemental strategies are proposed that would be implemented with any of the three Harlem interchange options.

(iv) Strategy C7: Right-In/Right-Out At-Grade Access Improvements

Strategy C7 reconfigures the existing at-grade intersection just north of the main airport access to provide dedicated southbound acceleration and deceleration lanes. The lanes would function similarly to diamond interchange ramps, removing the traffic they serve from the adjacent mainline lanes under current layout. **Figure 4** shows the layout of Strategy C7.

(v) Strategy C8: Interchange Improvements at Richards Road (North)

Strategy C8 constructs a new southbound folded diamond interchange at the north end of Richards Road by reconstructing the southbound off-ramp from US 169 and constructing a new southbound on-ramp loop. The new loop ramp restores the second southbound access to US 169 as the left-side on-ramp ramp at the existing Harlem Road interchange is removed in the three Harlem improvement concepts. **Figure 5** shows the layout of Strategy C8.

Figure 1: Strategy C1 – Half Diamond Interchange with Existing Harlem Road Access

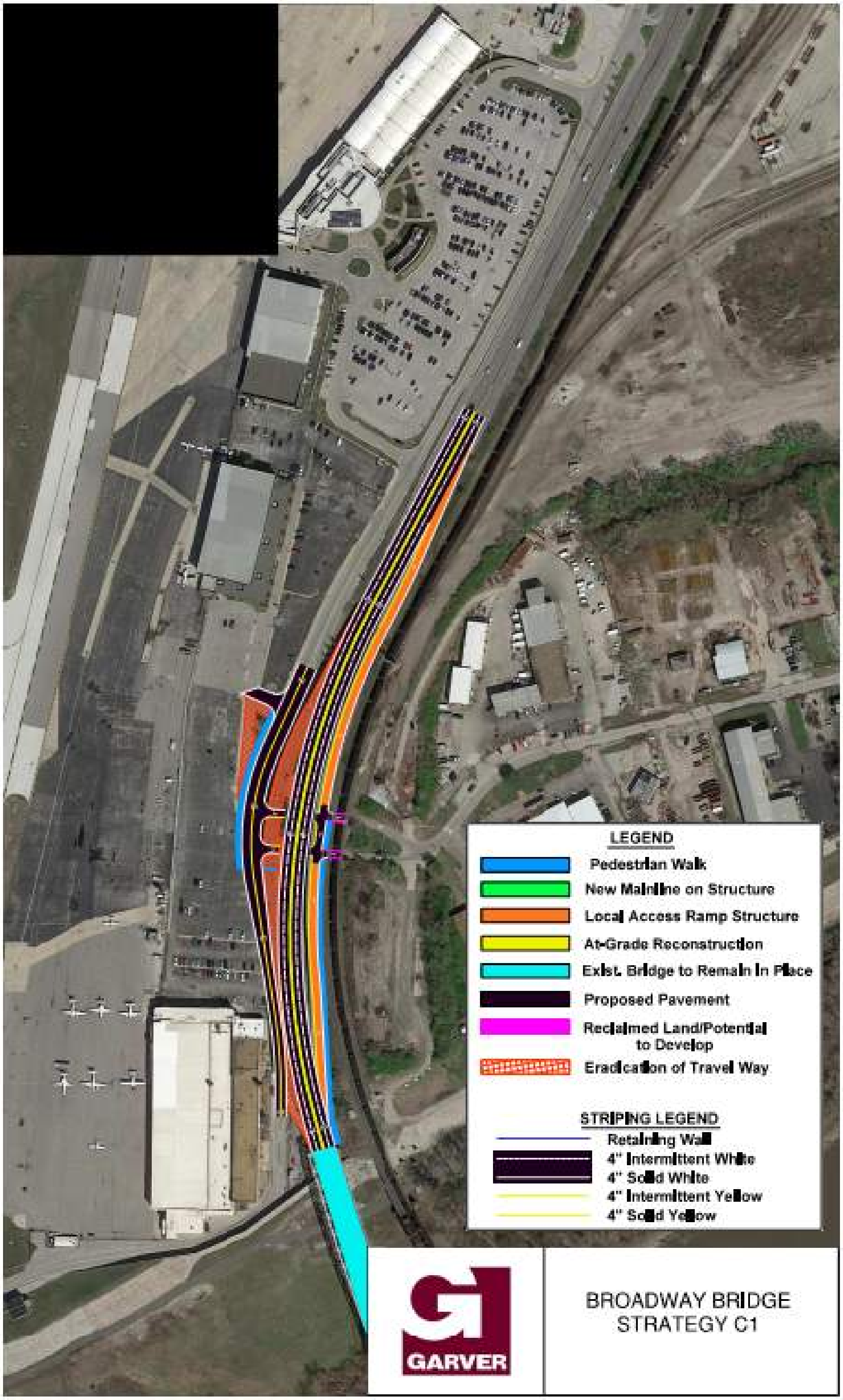


Figure 2: Strategy C4 – Half Diamond Interchange with Split Lou Holland Undercrossing

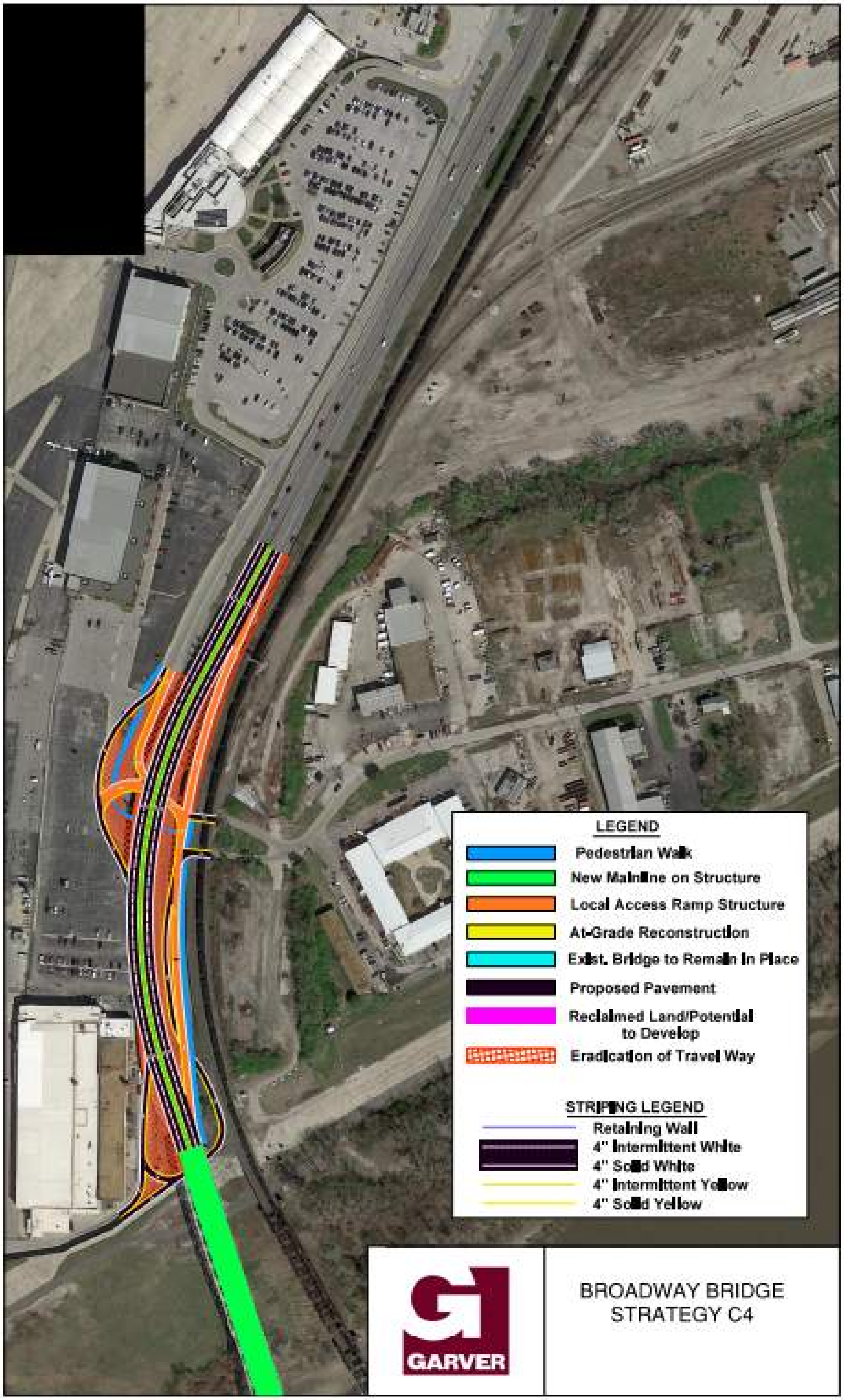


Figure 3: Strategy C5 – Half Diamond Interchange with Single Harlem Road Railroad Crossing

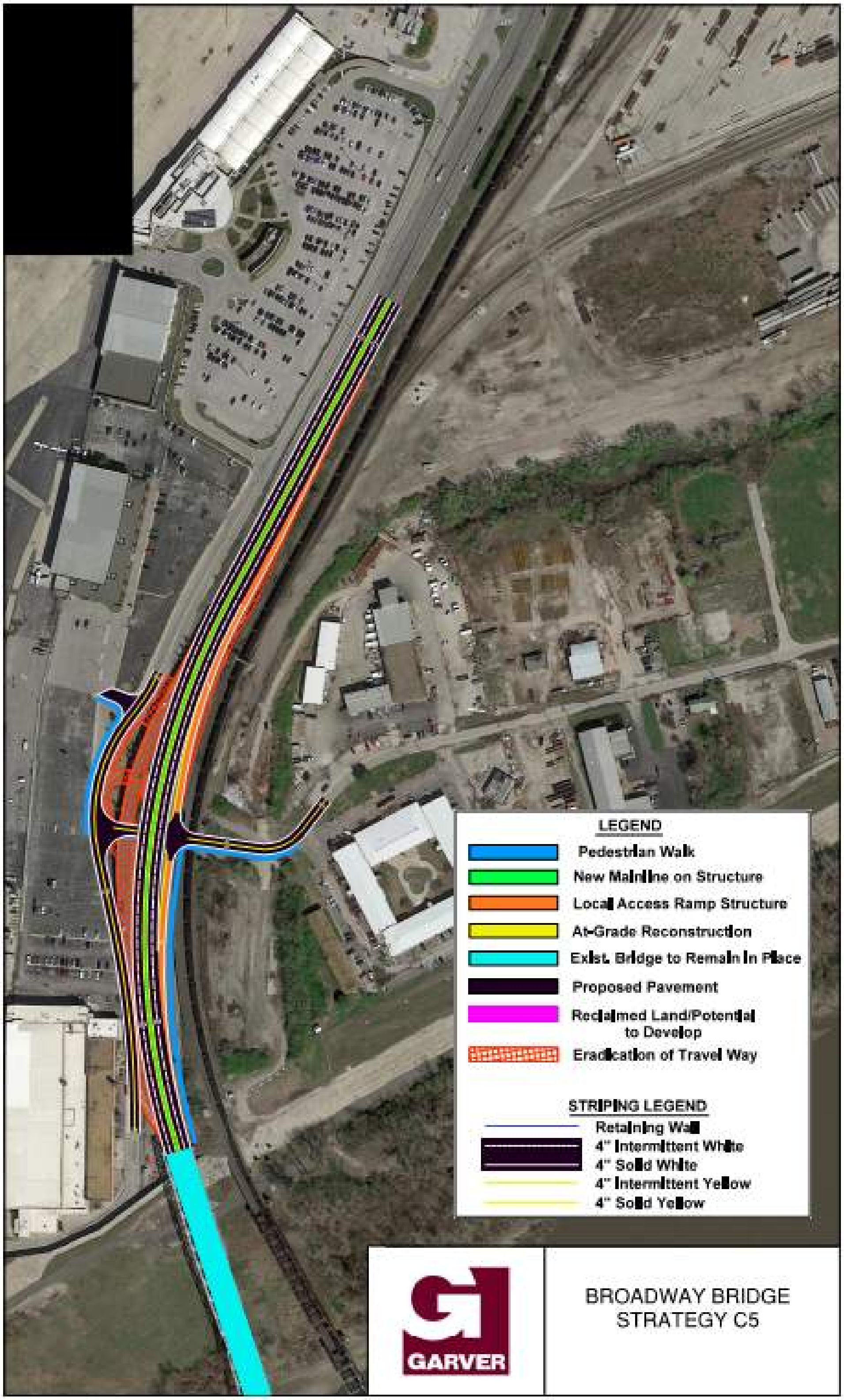
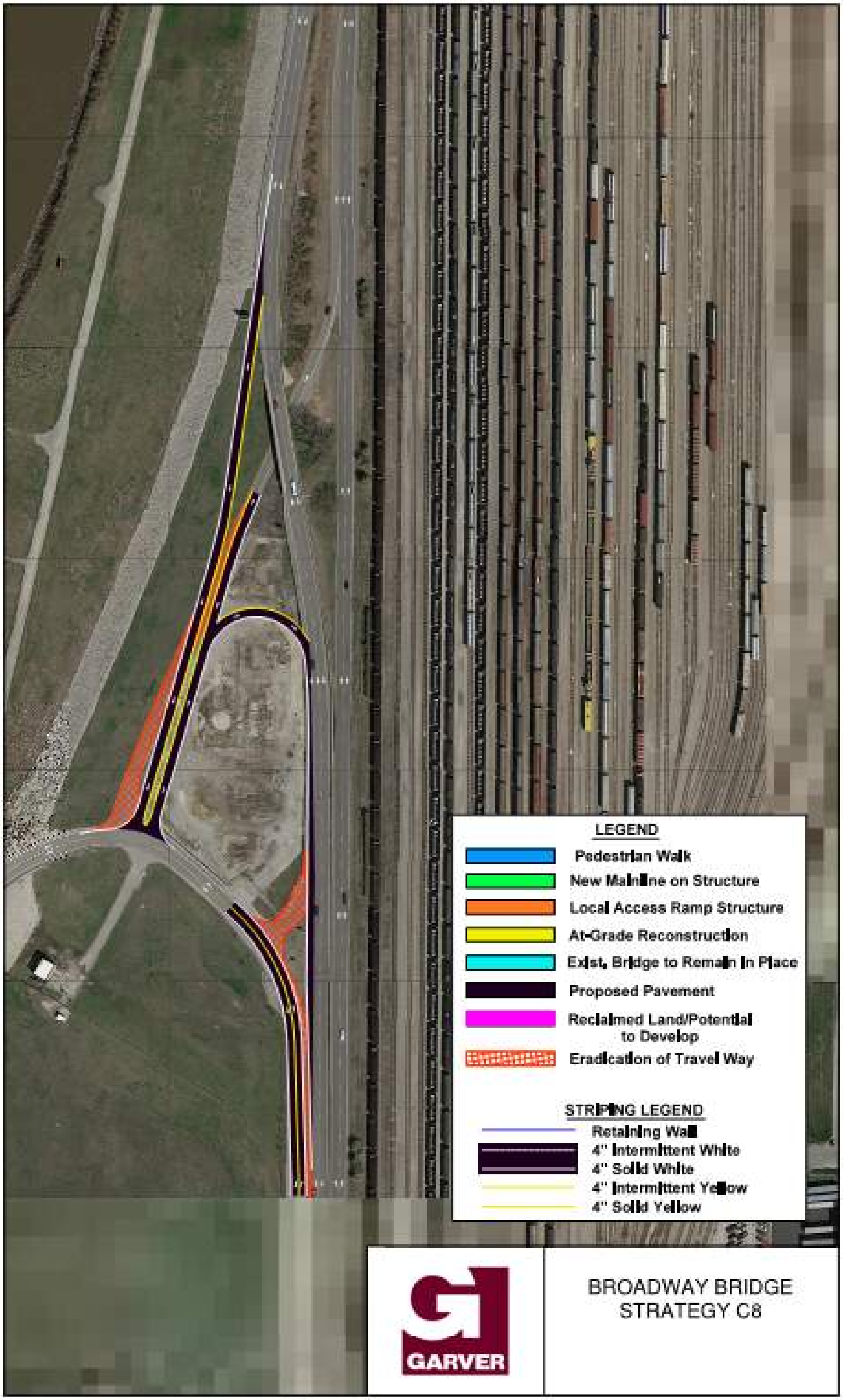


Figure 4: Strategy C7 – Right-In/Right-Out At-Grade Access Improvements

Figure 5: Strategy C8 – Interchange Improvements at Richards Road (North)



3. Methodology and Capacity Analysis Assumptions

3.1 Methodology

There are several merge and diverge ramps along US 169 and unsignalized or stop controlled intersections included with the proposed alternative strategies. Highway capacity software (HCS) was used to analyze the performance of the merge and diverge ramps and Synchro was used to analyze the performance of the unsignalized intersections in the current study. The complex 9-legged roundabout at the Harlem interchange in the existing condition was analyzed using SIDRA 7, which is the best tool to analyze complex roundabouts.

3.2 Assumptions

The following assumptions were taken into consideration:

- For the purpose of traffic analysis, three study years have been taken into consideration current year 2017, opening year 2023, and future year 2040. For the year 2017, existing conditions with existing geometrics and proposed conditions with the geometrics in the above proposed alternative strategies were analyzed. For the years 2023 and 2040, the proposed conditions with geometrics in the above proposed alternative strategies were analyzed.

- Proposed alternative strategies C7 and C8 will be in place for all the proposed alternative strategies C1, C4 and C5 developed for Harlem interchange improvements.

- Actual speed limits with assumptions for unposted speed limits on some roads are shown in **Figure 6**.

- Since there is no information on the truck percentage, the current study assumed five percent trucks.

- Based on the information obtained from the regional EMME model, it is assumed that there will be annual growth rate of 1% for US 169 mainline and an annual growth rate of 0.63% for the airport access traffic and Harlem access traffic.

- Peak hour factor (PHF) is assumed to be 0.94.

Because all the merge and diverge ramps have the same traffic volumes for all the proposed strategies for each of the study years, these ramps were analyzed for each of the study years for all the proposed alternatives together as shown in section 5.

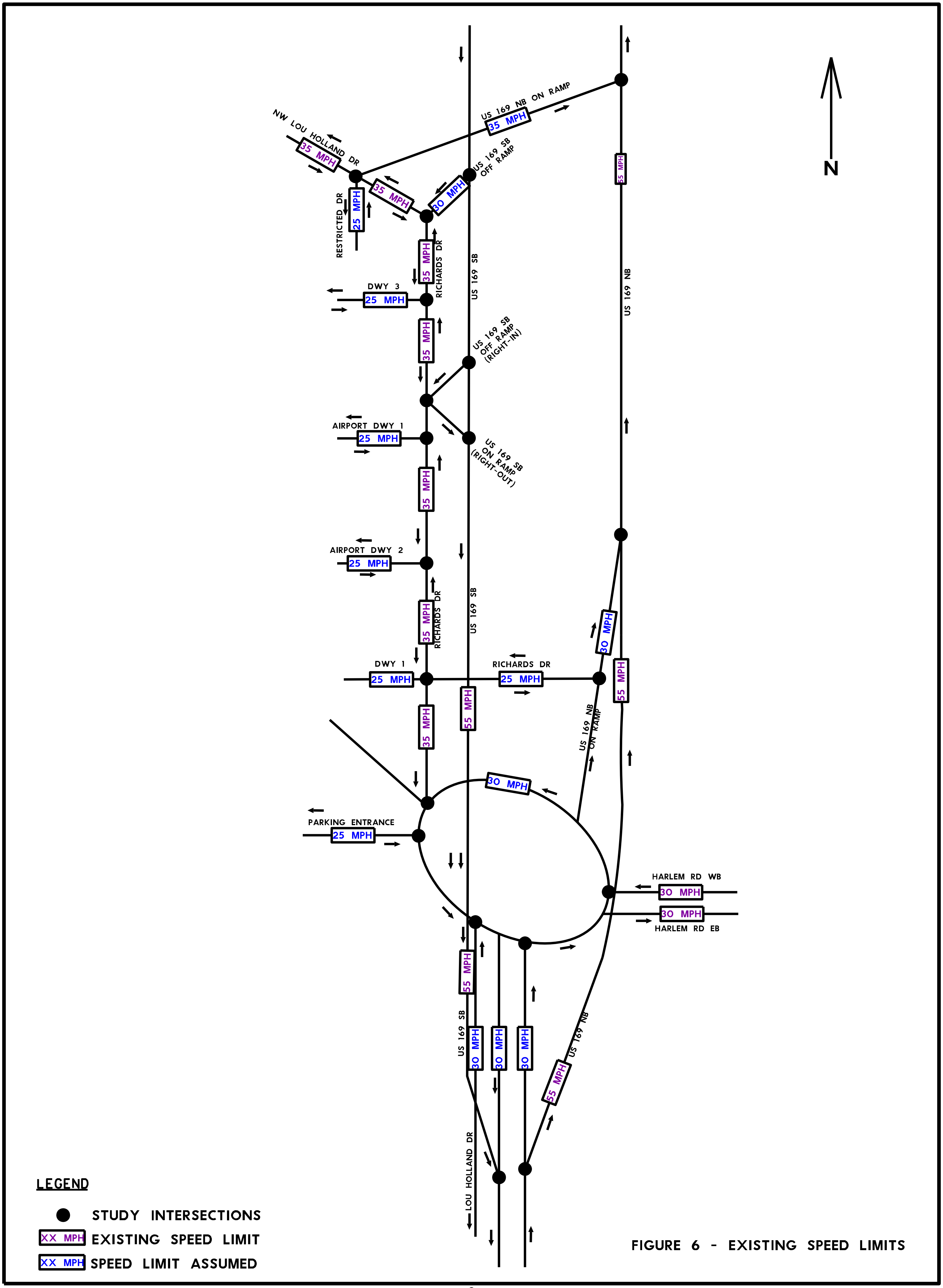


FIGURE 6 - EXISTING SPEED LIMITS

4. Existing Conditions

4.1 Geometric conditions

Lane configuration for the existing condition is shown in **Figure 7**. There are two driveways adjacent to the airport parking just south of the right-in, right-out intersection along Richard's Road which are called out as Airport Driveway 1 and Airport Driveway 2. Additionally, the driveway to the airport parking lot just north of Harlem interchange roundabout is called as Driveway 1 and the airport parking lot entrance on the west of the existing Harlem interchange roundabout is called as "Parking Entrance" in the current analysis. Driveway 3 just south of Richard's road interchange is taken into consideration in the current analysis for the purpose of volume balancing.

The peak hour volumes were provided at the following locations:

- Roundabout at Harlem Road
- The US 169 NB off ramp, north of Broadway bridge
- The US 169 SB on ramp, north of Broadway bridge
- Richards Road at Parking entrance/US 169 NB on ramp
- Richards Road at US 169 NB on ramp
- Richards Road at US 169 SB off ramp/US 169 SB on ramp just north of airport main terminal
- NW Lou Holland Drive at US 169 NB on ramp
- NW Richards Road at US 169 SB off ramp

There is no information available for the peak hour volumes at the two driveways (Airport Driveway 1 and Airport Driveway 2) at the main airport terminal along Richards Road. Based on the given volumes, it is assumed that some of the traffic along Richards Road will be entering and exiting the airport driveways. These assumptions were taken into consideration for balancing the volumes between the intersections where the volumes are provided. **Figure 8** shows the existing volumes for the year 2017 with these assumptions.

4.2 Capacity analysis

In the existing condition, the roundabout at the Harlem interchange is analyzed using Sidra 7 software. The freeway ramps and the study intersections were analyzed using the HCM procedures. Known constraints such as traffic spilling back from the signals south of the bridge was not modelled nor was a detailed microsimulation performed.

4.2.1 Roundabout analysis

Based on the existing roundabout analysis using Sidra 7, it is observed that the existing roundabout operates at an acceptable Level of service with queues within the available storage length for both the AM and PM peak hours. **Table 1** shows the roundabout analysis results from Sidra 7 software for the existing roundabout at Harlem interchange in the year 2017.

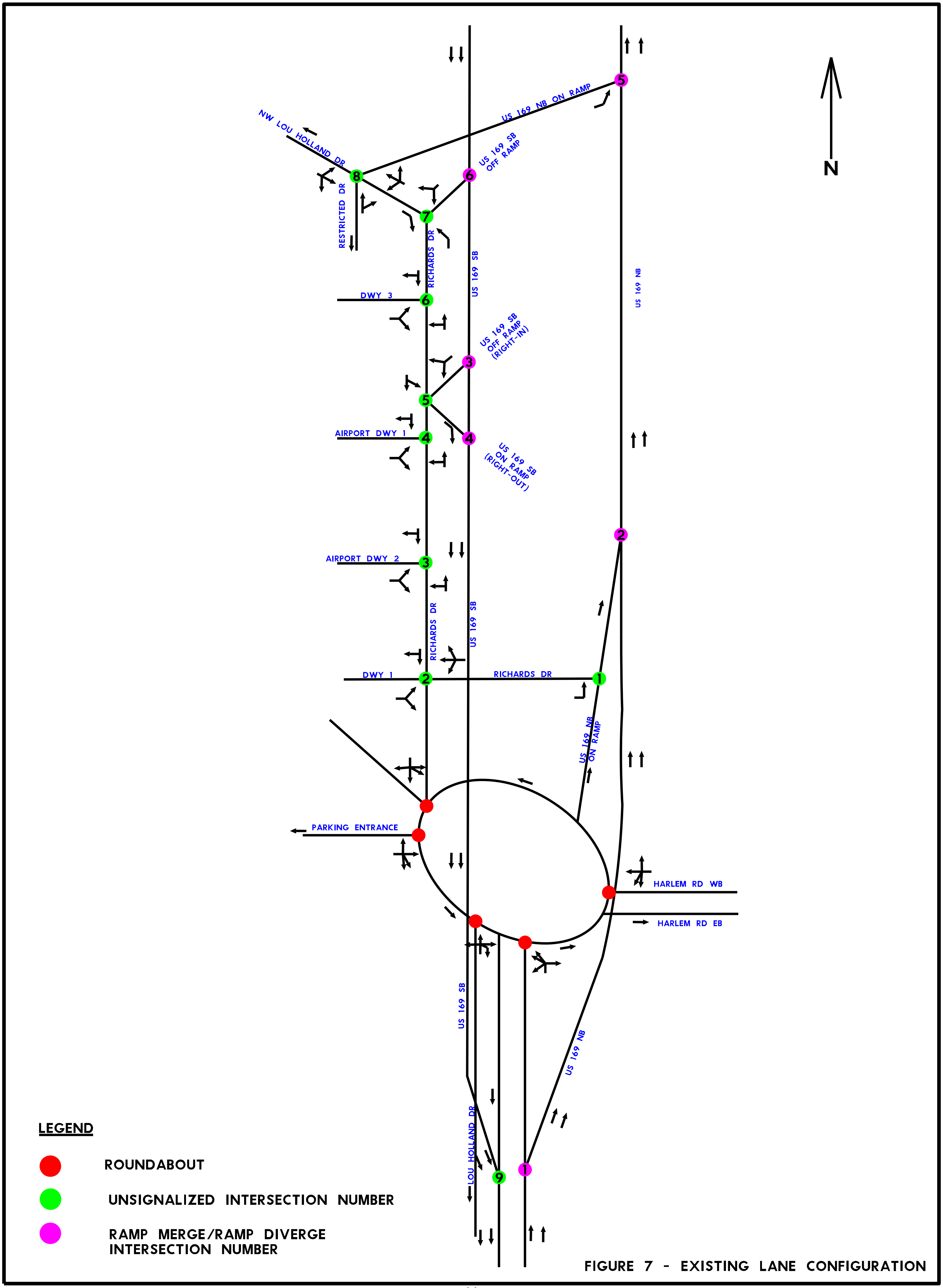


FIGURE 7 - EXISTING LANE CONFIGURATION

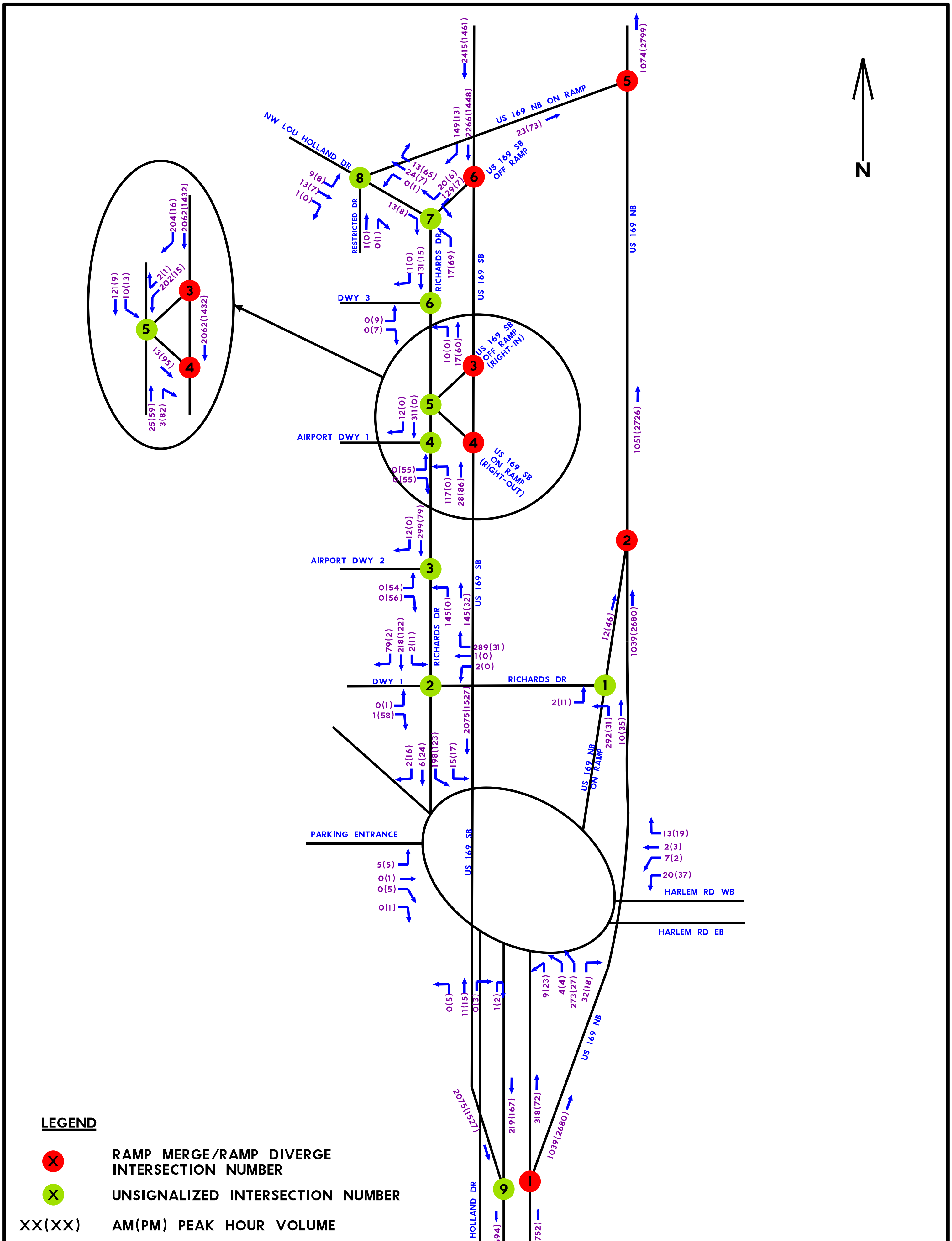


FIGURE 8 - EXISTING CONDITION PEAK HOUR VOLUMES YEAR 2017

Table 1 - Roundabout analysis – Existing condition Year 2017

Year 2017 - Existing configuration	SIDRA 7 - Roundabout analysis - Level of service (LOS) and 95% queue length (ft.)						
	Roundabout at Harlem Rd	AM			PM		
		Delay	LOS	95% Queue (ft.)	Delay	LOS	95% Queue (ft.)
Approach	Lou Holland Dr	3.8	A	2	3.6	A	3
	NB off ramp	5.2	A	37	3.4	A	7
	Harlem Rd	4.3	A	5	3.4	A	6
	NB on ramp	4.5	A	24	4.4	A	19
	Parking lot	3.8	A	1	3.7	A	1
Intersection		4.8	A	---	3.9	A	---

4.2.2 Freeway Ramp Analysis

Six ramp locations as shown in **Figure 7** were analyzed using HCS software which includes both the merge and diverge ramps. Based on this analysis, the merge and diverge ramps in the existing condition show that they operate at an acceptable Level of service in both AM and PM peak hour conditions as shown in **Table 2**. The southbound on ramp just north of the bridge was not analyzed as a part of ramp analysis because this ramp operates with a stop control and is analyzed as part of intersection analysis.

Table 2 - Freeway ramp analysis – Existing condition Year 2017

HCS 7 analysis for merge and diverge ramps - Level of Service (LOS)				
No.	Location	Type of ramp	Existing configuration	
			YR 2017	
			AM	PM
1	NB off ramp S of Harlem Rd	Diverge	B	D
2	NB on ramp N of Harlem Rd	Merge	B	D
3	SB off ramp at right in right out	Diverge	B	B
4	SB on ramp at right in right out	Merge	C	B
5	NB on ramp at North interchange	Merge	B	C
6	SB off ramp at North interchange	Diverge	C	B
7	SB on ramp at North interchange	Merge	---	---

4.2.3 Intersection analysis

Nine unsignalized/stop controlled intersections as shown in **Table 3 and Table 4** were analyzed using Synchro 10 to check for the measures of effectiveness. The southbound on ramp (north of Broadway Bridge) currently operates with a stop control for the on ramp and hence analyzed in Synchro as an unsignalized intersection.

Table 3 - Intersection analysis – Existing condition Year 2017 – AM Peak

Node No.	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB on ramp at Richards Dr	13.4/B	-	-	-	-	-	0.0/A	0.0/A	-	-	-	-	0.1/A
2	Richards Rd at Dwy 1	9.8/A	9.8/A	9.8/A	0.0/A	0.0/A	0.0/A	-	-	-	0.0/A	0.0/A	0.0/A	0.0/A
3	Richards Rd at Airport Dwy 2	0.0/A	-	0.0/A	-	-	-	8.4/A	0.0/A	-	-	0.0/A	0.0/A	2.0/A
4	Richards Rd at Airport Dwy 1	0.0/A	-	0.0/A	-	-	-	8.4/A	0.0/A	-	-	0.0/A	0.0/A	2.1/A
5	Richards Rd at Right-in Right-out	-	-	-	11.3/B	-	11.3/B	-	0.0/A	0.0/A	7.3/A	0.0/A	-	6.6/A
6	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
7	Richards Rd at SB off ramp	-	-	-	9.4/A	-	9.4/A	-	0.0/A	-	-	0.0/A	-	7.8/A
8	NW Lou Holland Dr/NW Richards Dr at NB on ramp	2.9/A	2.9/A	2.9/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	-	-	-	1.1/A
9	SB on ramp S of Harlem Road	-	-	-	-	-	297.7/F	-	0.0/A	-	-	0.0/A	-	25.9/D
		95% Queue length (ft.)												
1	NB on ramp at Richards Dr	0	-	-	-	-	-	-	-	-	-	-	-	-
2	Richards Rd at Dwy 1	0	0	0	0	0	0	-	-	-	0	0	0	-
3	Richards Rd at Airport Dwy 2	0	-	0	-	-	-	13	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 1	0	-	0	-	-	-	10	0	-	-	0	0	-
5	Richards Rd at Right-in Right-out	-	-	-	28	-	28	-	0	0	0	0	-	-
6	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at SB off ramp	-	-	-	15	-	15	-	0	-	-	0	-	-
8	NW Lou Holland Dr/NW Richards Dr at NB on ramp	0	0	0	0	0	0	0	0	0	-	-	-	-
9	SB on ramp S of Harlem Road	-	-	-	-	-	385	-	0	-	-	0	-	-

Based on the results shown in **Table 3**, all the intersections operate at an acceptable Level of service in the AM peak hour except US 169 SB on ramp south of the roundabout at Harlem Road which fails with LOS ‘F’. This ramp reaches close to its capacity in the AM peak hour and also there is a sight distance issue for the ramp traffic to enter onto the mainline with the fast moving traffic. The SB on ramp traffic is unable to find gap to enter US 169 mainline, which results in excessive delay for the ramp traffic, however the queue length is within the available storage. Presently, as traffic at the signal south of the bridge backs up, gaps become available for Harlem road traffic at the expense of the mainline.

Table 4 - Intersection analysis – Existing condition Year 2017 – PM Peak

Node No.	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB on ramp at Richards Dr	9.1/A	-	-	-	-	-	0.0/A	0.0/A	-	-	-	-	1.3/A
2	Richards Rd at Dwy 1	9.3/A	9.3/A	9.3/A	0.0/A	0.0/A	0.0/A	-	-	-	0.0/A	0.0/A	0.0/A	2.8/A
3	Richards Rd at Airport Dwy 2	9.5/A	-	9.5/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.7/A
4	Richards Rd at Airport Dwy 1	9.3/A	-	9.3/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.7/A
5	Richards Rd at Right-in Right-out	-	-	-	9.4/A	-	9.4/A	-	0.0/A	0.0/A	7.6/A	0.0/A	-	1.4/A
6	Richards Rd at Dwy 3	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.5/A
7	Richards Rd at SB off ramp	-	-	-	8.9/A	-	8.9/A	-	0.0/A	-	-	0.0/A	-	1.3/A
8	NW Lou Holland Dr/NW Richards Dr at NB on ramp	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	-	-	-	0.9/A
9	SB on ramp S of Harlem Road	-	-	-	-	-	32.4/D	-	0.0/A	-	-	0.0/A	-	1.2/A
		95% Queue length (ft.)												
1	NB on ramp at Richards Dr	0	-	-	-	-	-	-	-	-	-	-	-	-
2	Richards Rd at Dwy 1	5	5	5	0	0	0	-	-	-	0	0	0	-
3	Richards Rd at Airport Dwy 2	10	-	10	-	-	-	0	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 1	10	-	10	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
6	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at SB off ramp	-	-	-	0	-	0	-	0	-	-	0	-	-
8	NW Lou Holland Dr/NW Richards Dr at NB on ramp	0	0	0	0	0	0	0	0	0	-	-	-	-
9	SB on ramp S of Harlem Road	-	-	-	-	-	88	-	0	-	-	0	-	-

Based on the results shown in **Table 4**, all the intersections operate at an acceptable Level of service in the PM peak hour with the queue length not exceeding the available storage.

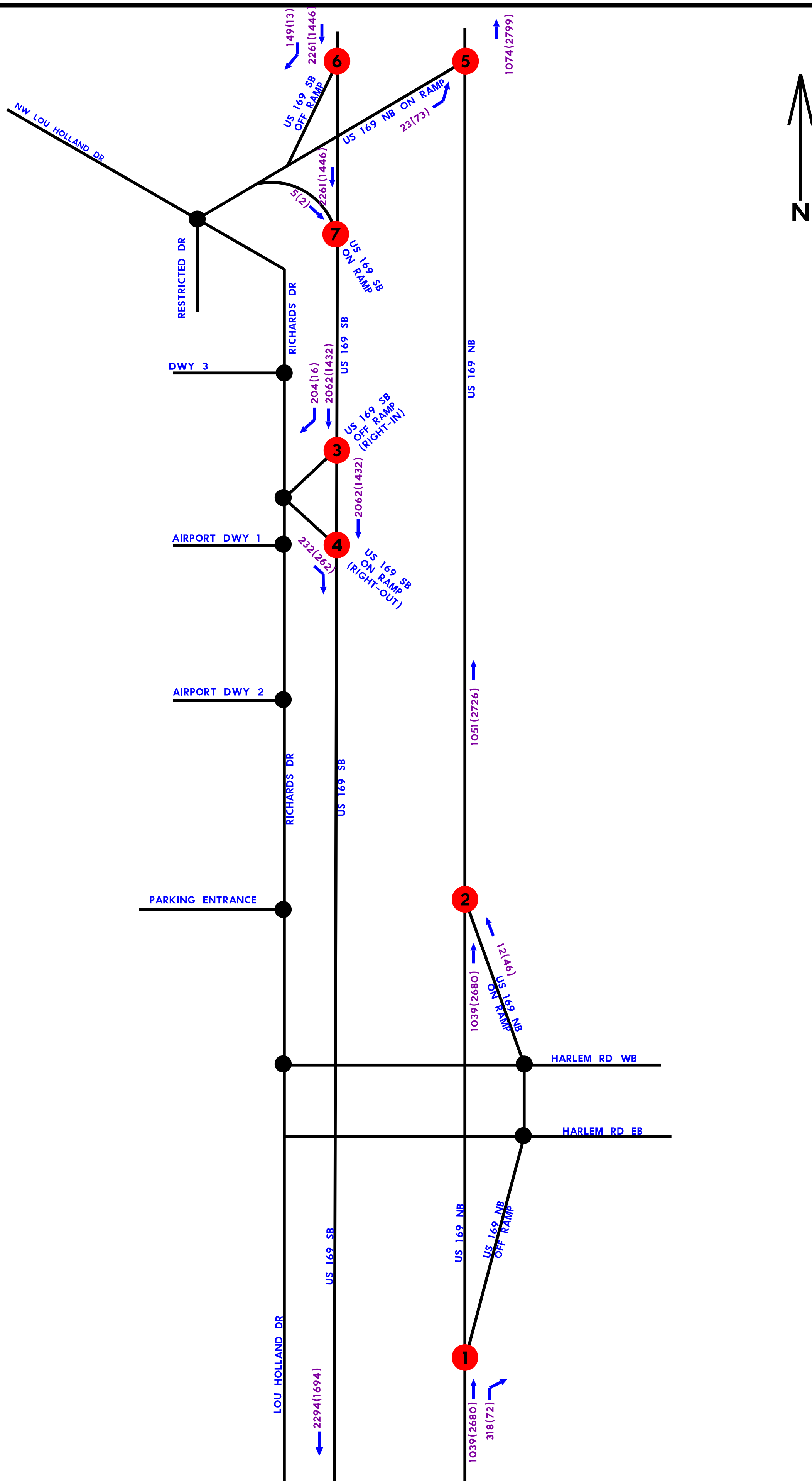
5. Freeway Ramp Analysis for the Proposed Alternatives

The proposed strategies C1, C4, C5, C7 and C8 will have same traffic volumes for all the merge and diverge ramps for each of the study years. Hence, this section summarizes the results of the ramp analysis for all the strategies together.

The existing southbound on ramp, north of the bridge will be closed in the proposed alternatives. This traffic will be re-routed to the southbound on ramp just north of the airport main terminal. Because of this shift in traffic to the southbound on ramp traffic (north of the airport) will have an increase in the traffic volume as shown in **Figure 9** for node number 4 compared to the traffic volume shown in **Figure 8** for node number 4.

The traffic volumes at the proposed southbound on ramp (node # 7 in **Figure 9**) at the north interchange were assumed based on the conditions surrounding area. From the existing volumes provided at this interchange, it is observed that most of the southbound off ramp traffic is going south on Richards Road past the right-in/right-out intersection. Based on the observation from the google maps, there are no major traffic generation driveways or cross streets between right-in/right-out intersection and the southbound off ramp at the north interchange along Richards Road. Also, the restricted drive and the NW Lou Holland Dr at the north interchange show lower volumes. The traffic shifted from the existing southbound on ramp, north of the bridge will tend to use the southbound on ramp at the right-in/right-out intersection rather than going further north to the north interchange. Hence, the volumes for the proposed southbound on ramp were assumed to be low.

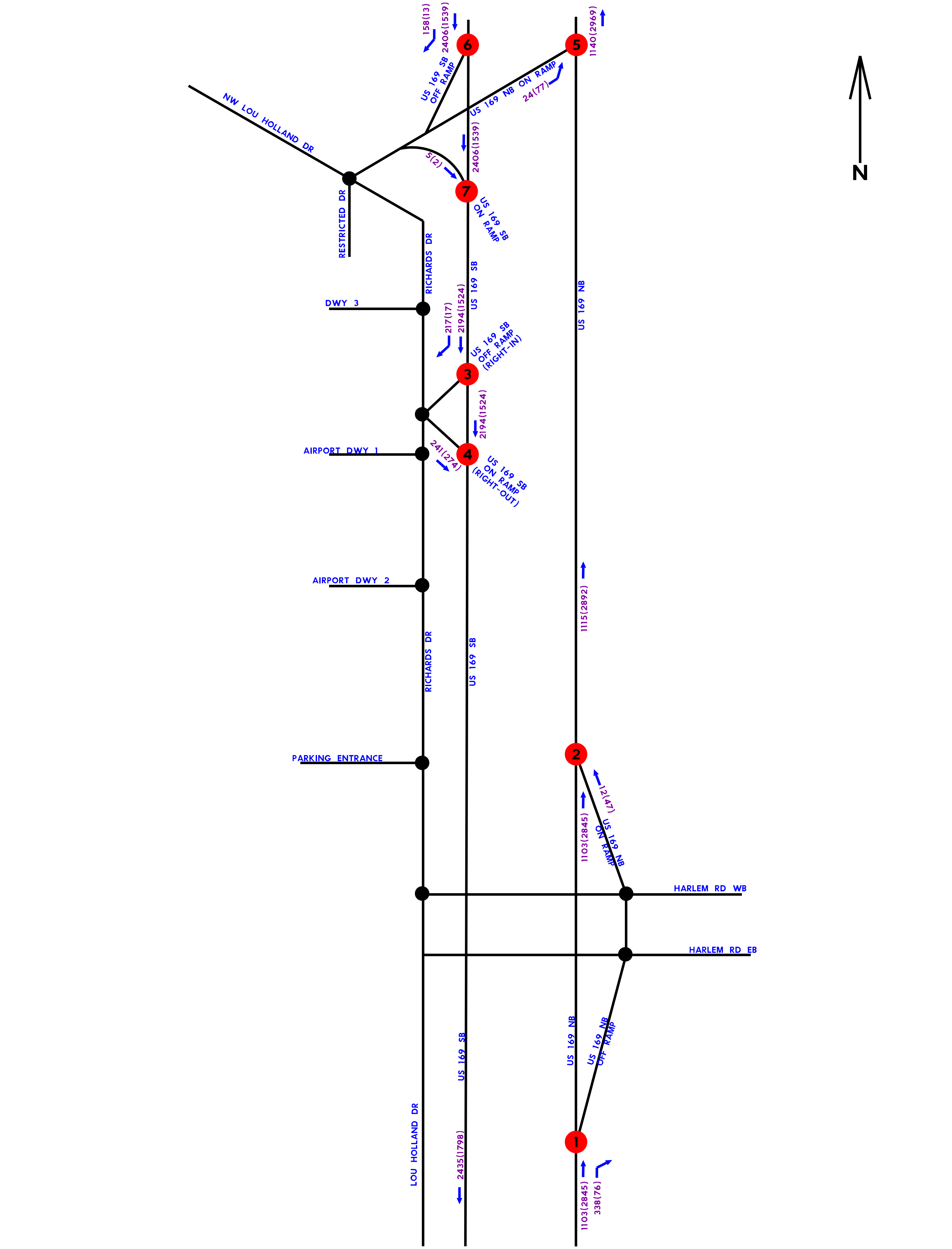
The traffic volumes for the merge and diverge ramps for each of the study years is shown in **Figures 9** through **11**.



LEGEND

X RAMP MERGE/RAMP DIVERGE RAMP LOCATIONS WITH NODE NUMBERS

FIGURE 9 - RAMP VOLUMES FOR STRATEGIES C1, C4, C5, C7 AND C8 - YEAR 2017



LEGEND

X RAMP MERGE/RAMP DIVERGE RAMP LOCATIONS WITH NODE NUMBERS

FIGURE 10 - RAMP VOLUMES FOR STRATEGIES C1, C4, C5, C7 AND C8 - YEAR 2023

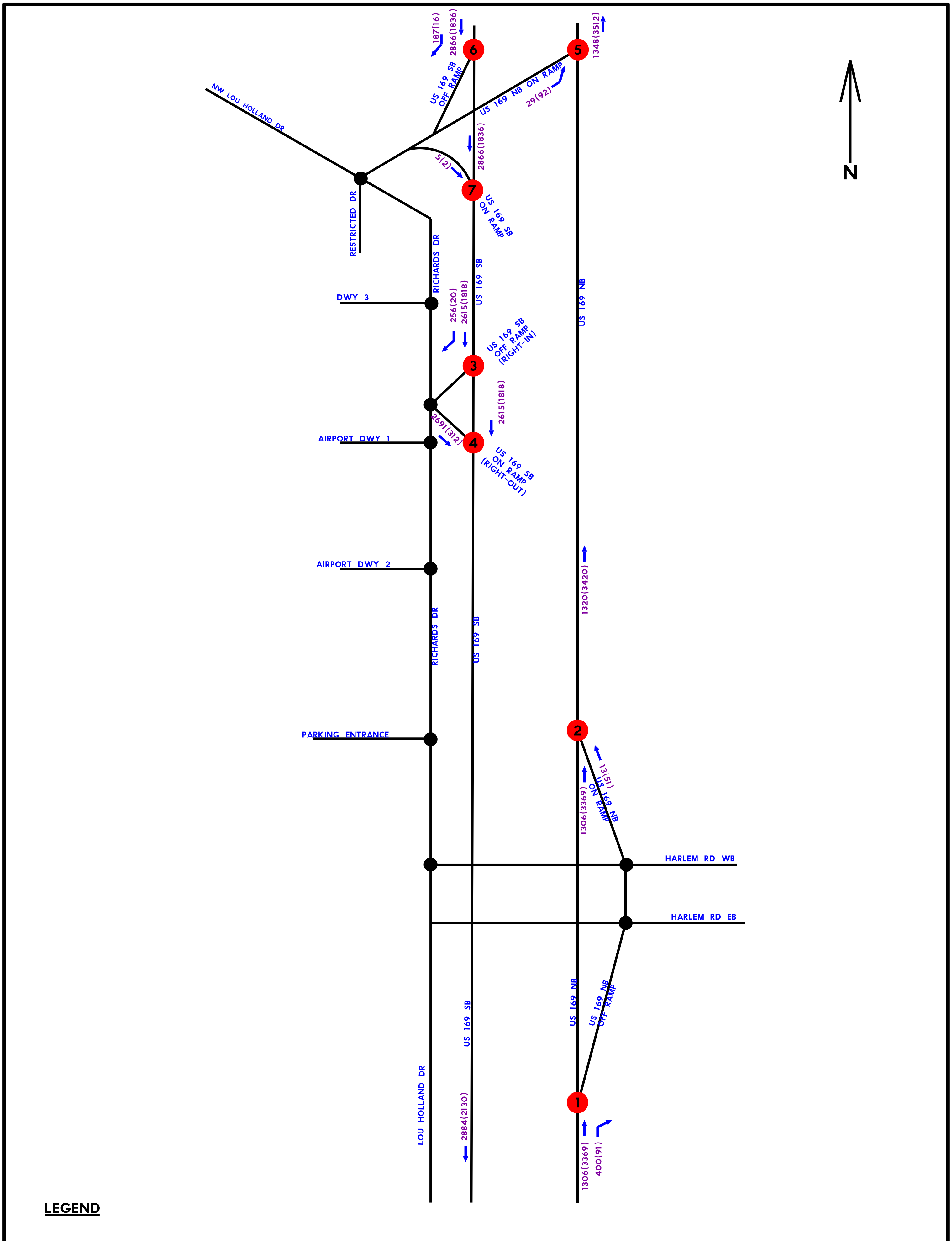


FIGURE 11 - RAMP VOLUMES FOR STRATEGIES C1, C4, C5, C7 AND C8 - YEAR 2040

Tables 5 through **Table 7** show the results of HCS analysis for each of the ramps for all the strategies together for the study years 2017, 2023 and 2040.

Table 5 – Freeway Ramp Analysis – Current Year 2017

HCS 7 analysis for merge and diverge ramps - Level of Service (LOS)				
No.	Location	Type of ramp	Strategies C1, C4, C5, C7 and C8	
			YR 2017	
			AM	PM
1	NB off ramp S of Harlem Rd	Diverge	B	D
2	NB on ramp N of Harlem Rd	Merge	B	D
3	SB off ramp at Right-in Right-out	Diverge	B	B
4	SB on ramp at Right-in Right-out	Merge	C	B
5	NB on ramp at North interchange	Merge	B	C
6	SB off ramp at North interchange	Diverge	C	B
7	SB on ramp at North interchange	Merge	B	B

Table 6 – Freeway Ramp Analysis – Build Year 2023

HCS 7 analysis for merge and diverge ramps - Level of Service (LOS)				
No.	Location	Type of ramp	Strategies C1, C4, C5, C7 and C8	
			YR 2023	
			AM	PM
1	NB off ramp S of Harlem Rd	Diverge	B	D
2	NB on ramp N of Harlem Rd	Merge	B	D
3	SB off ramp at Right-in Right-out	Diverge	B	B
4	SB on ramp at Right-in Right-out	Merge	C	B
5	NB on ramp at North interchange	Merge	B	D
6	SB off ramp at North interchange	Diverge	C	B
7	SB on ramp at North interchange	Merge	C	B

Table 7 – Freeway Ramp Analysis – Future Year 2040

HCS 7 analysis for merge and diverge ramps - Level of Service (LOS)				
No.	Location	Type of ramp	Strategies C1, C4, C5, C7 and C8	
			YR 2040	
			AM	PM
1	NB off ramp S of Harlem Rd	Diverge	B	E
2	NB on ramp N of Harlem Rd	Merge	B	E
3	SB off ramp at Right-in Right-out	Diverge	C	B
4	SB on ramp at Right-in Right-out	Merge	C	C
5	NB on ramp at North interchange	Merge	B	D
6	SB off ramp at North interchange	Diverge	D	C
7	SB on ramp at North interchange	Merge	C	B

From **Table 5** and **Table 6**, all the merge and diverge ramps operate at acceptable LOS for the years 2017 and 2023 for the proposed strategies. In the year 2040, all the ramps operate at acceptable LOS except for the NB merge ramp and NB diverge ramp at Harlem road which fails to operate at acceptable LOS as shown in **Table 7**. This is because of the increase in the northbound mainline traffic and lack of acceleration and deceleration lanes for the northbound on ramp and off ramp traffic. By providing acceleration and deceleration lanes, these two ramp locations will operate at an acceptable LOS.

6. Strategy C1 (with Strategy C7 and Strategy C8) – Intersection Analysis

6.1 Geometric conditions

The following are the qualitative benefits with this proposed alternative:

- The southbound on ramp south of Harlem Road will be eliminated which will resolve the safety issues pertaining to the on ramp traffic.
- The complex nine legged roundabout will be replaced with a half diamond interchange which will avoid any confusion and complexity for the drivers.
- The non-typical left side on ramp and off ramp that are just north and south of Harlem road will be replaced with the more typical right side ramps.

The lane configuration for the proposed strategy C1 with strategies C7 and C8 is shown in **Figure 12**. **Figure 13** through **Figure 15** show the traffic volumes for strategy C1 with strategy C7 and C8 for the study years 2017, 2023 and 2040. With the shift in the existing SB on ramp traffic (north of bridge) to the SB on ramp just north of the airport, the traffic volume will increase at the SB on ramp (north of the airport) as shown in **Figures 13** through **15**. However, with the improved right-in/right-out geometry, the SB on ramp still operates at acceptable LOS.

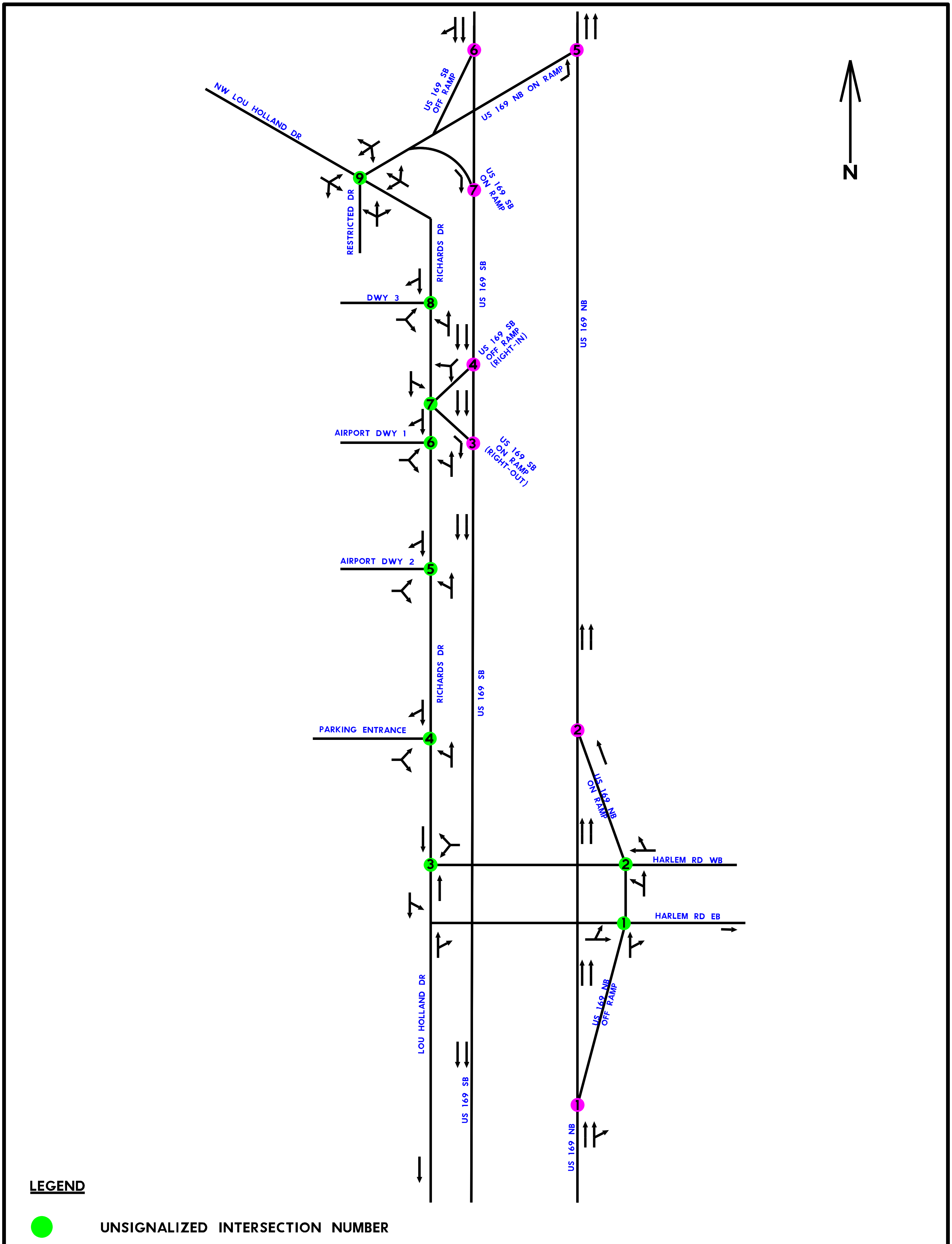


FIGURE 12 - STRATEGIES C1, C7 AND C8 LANE CONFIGURATION

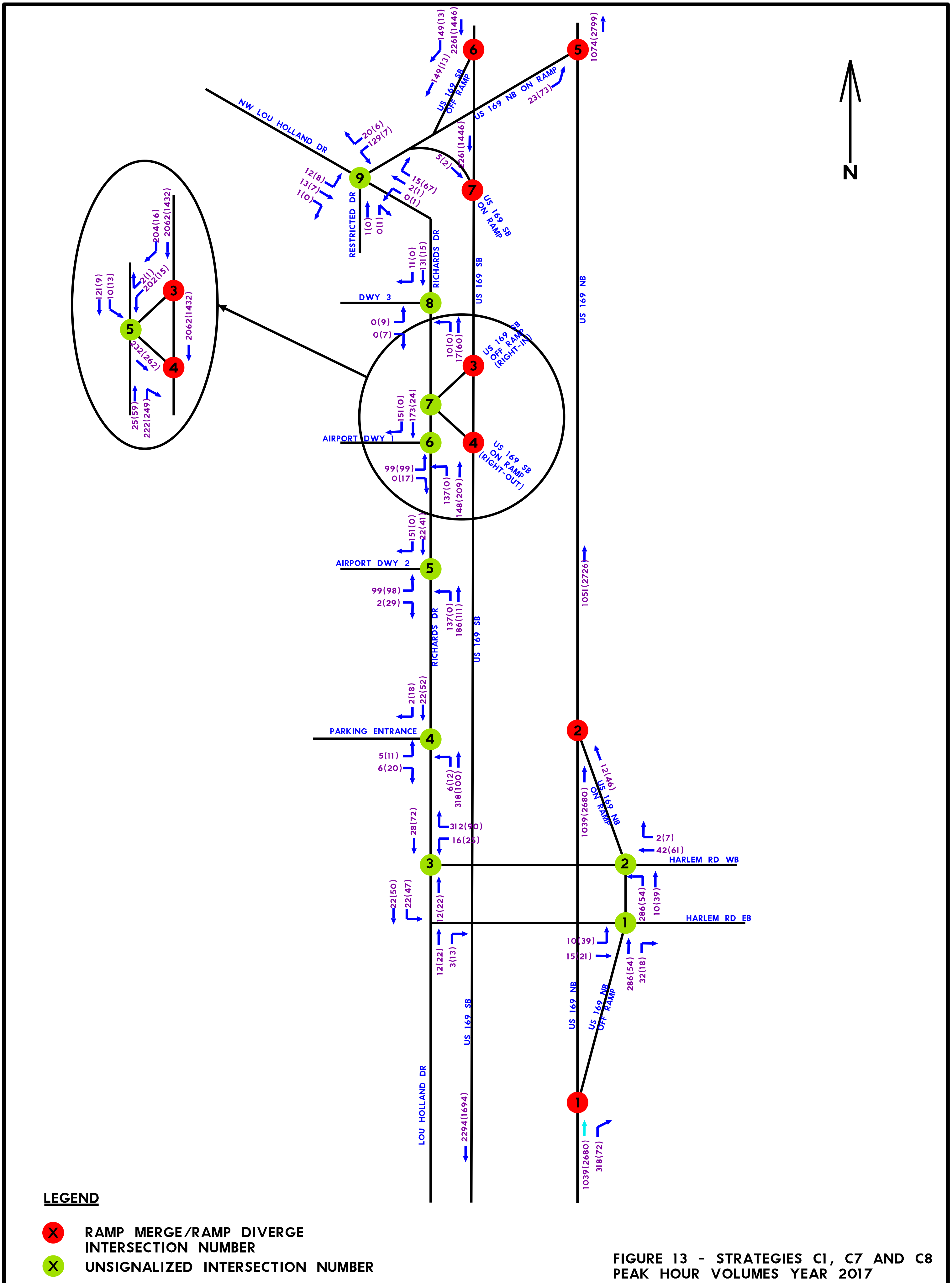
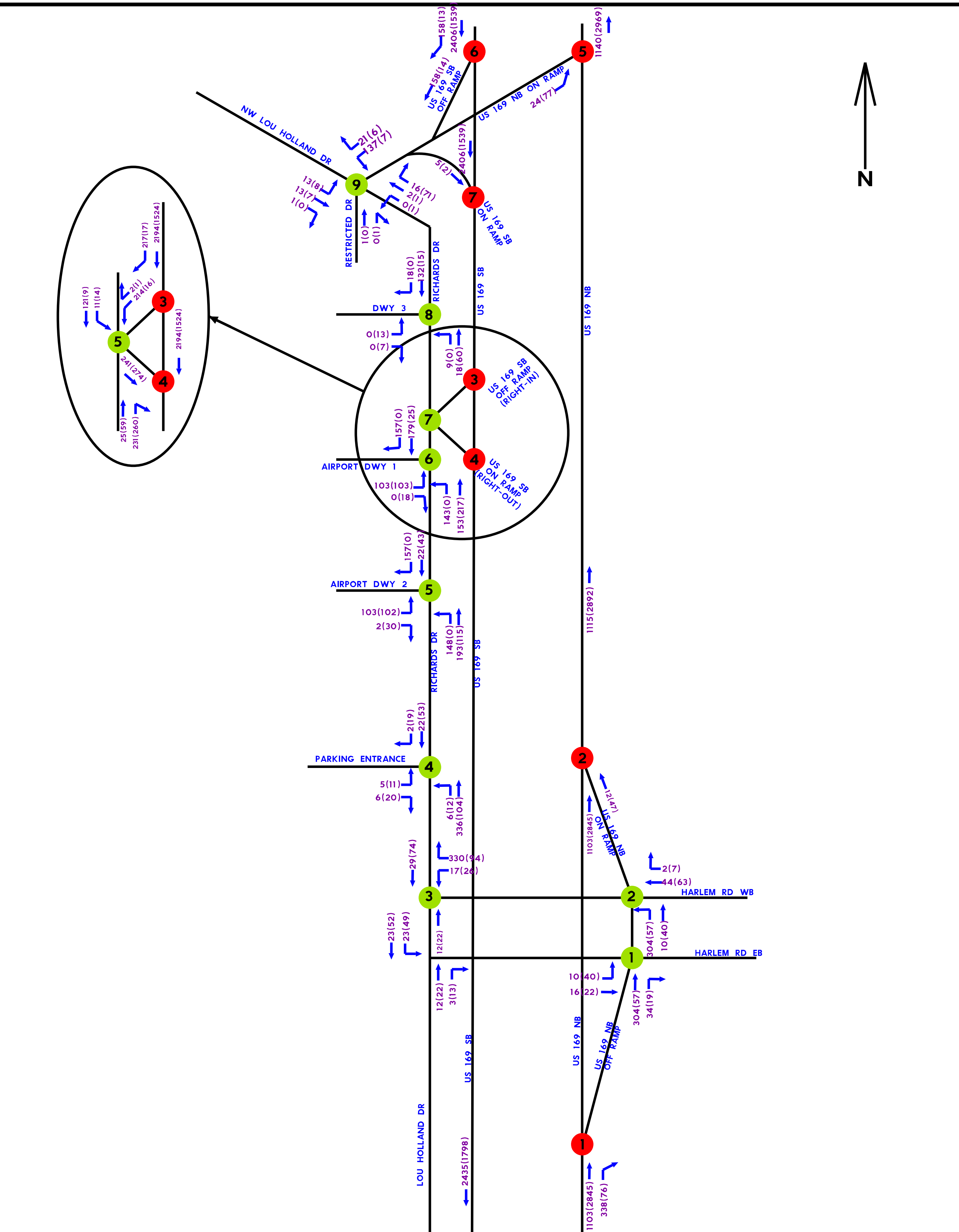


FIGURE 13 - STRATEGIES C1, C7 AND C8
PEAK HOUR VOLUMES YEAR 2017

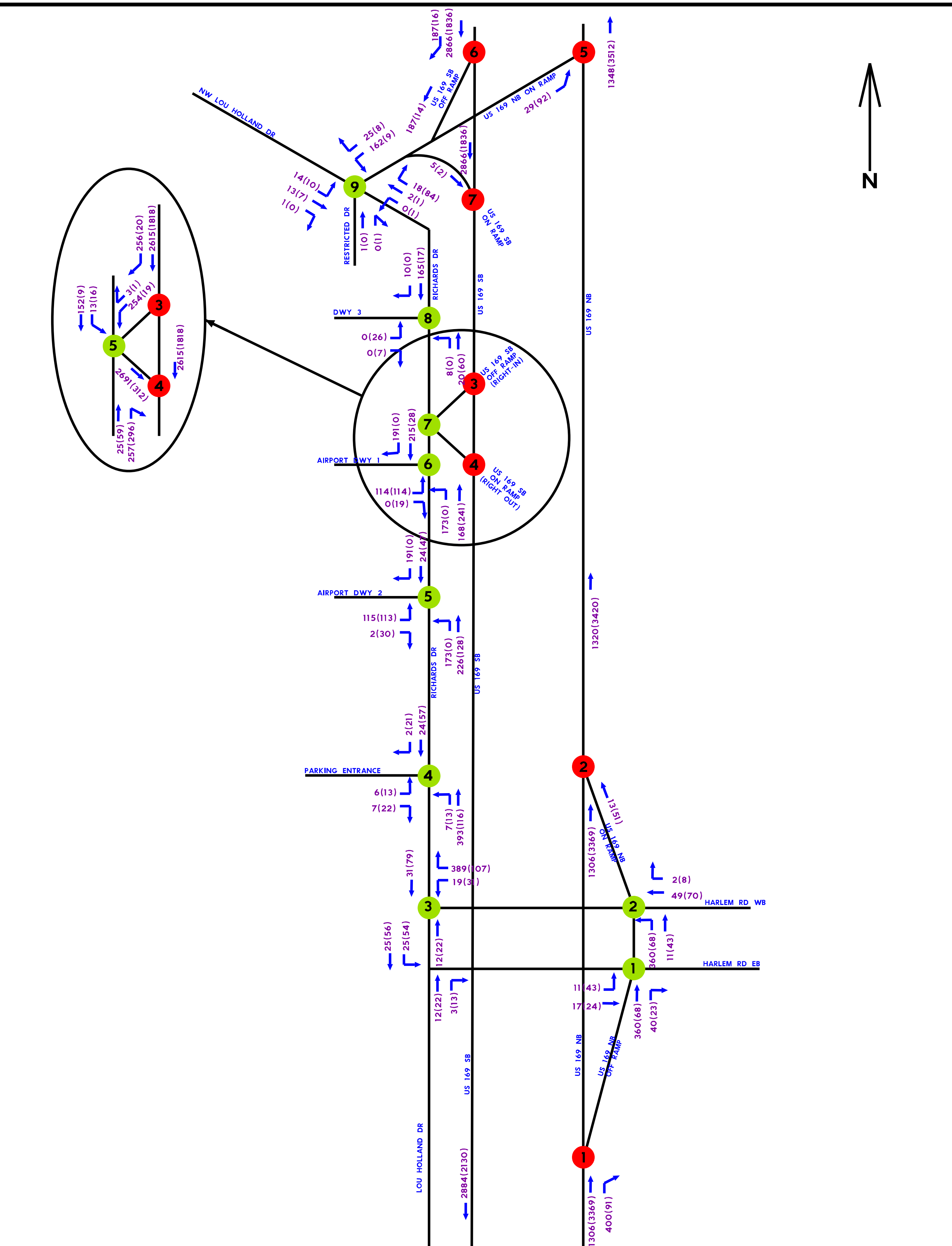


LEGEND

RAMP MERGE/RAMP DIVERGE INTERSECTION NUMBER

UNSIGNALIZED INTERSECTION NUMBER

FIGURE 14 - STRATEGIES C1, C7 AND C8
PEAK HOUR VOLUMES YEAR 2023



LEGEND

RAMP MERGE/RAMP DIVERGE INTERSECTION NUMBER

UNSIGNALIZED INTERSECTION NUMBER

FIGURE 15 - STRATEGIES C1, C7 AND C8
PEAK HOUR VOLUMES YEAR 2040

6.2 Intersection analysis – Strategy C1

Nine unsignalized/stop controlled intersections were analyzed as shown in **Table 8** through **Table 13** were analyzed using Synchro 10 to check for the measures of effectiveness of strategy C1 with strategy C7 and strategy C8 for the years 2017, 2023 and 2040 in both the AM and PM peak hours. **Figure 12** shows the nine unsignalized intersections.

Table 8 - Synchro analysis – Strategy C1 with Strategy C7 and C8 - Year 2017 – AM Peak

Node	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd EB	10.7/B	10.7/B	-	-	-	-	-	0.0/A	0.0/A	-	-	-	0.8/A
2	NB on ramp at Harlem Rd WB	-	-	-	-	8.6/A	8.6/A	0.0/A	0.0/A	-	-	-	-	1.1/A
3	Richards Rd at Harlem Rd WB	-	-	-	10.2/B	-	10.2/B	-	0.0/A	-	-	0.0/A	-	9.1/A
4	Richards Rd at Parking entrance	9.6/A	-	9.6/A	-	-	-	7.3/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
5	Richards Rd at Airport Dwy 2	17.2/C	-	17.2/C	-	-	-	8.0/A	0.0/A	-	-	0.0/A	0.0/A	4.7/A
6	Richards Rd at Airport Dwy 1	20.9/C	-	20.9/C	-	-	-	8.5/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
7	Richards Rd at Right-in Right-out	-	-	-	12.9/B	-	12.9/B	-	0.0/A	0.0/A	7.8/A	0.0/A	-	4.7/A
8	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
9	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.4/A	9.4/A	9.4/A	9.6/A	9.6/A	9.6/A	7.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd EB	3	3	-	-	-	-	-	0	0	-	-	-	-
2	NB on ramp at Harlem Rd WB	-	-	-	-	3	3	0	0	-	-	-	-	-
3	Richards Rd at Harlem Rd WB	-	-	-	38	-	38	-	0	-	-	0	-	-
4	Richards Rd at Parking entrance	0	-	0	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 2	28	-	28	-	-	-	10	0	-	-	0	0	-
6	Richards Rd at Airport Dwy 1	35	-	35	-	-	-	10	-	-	-	0	0	-
7	Richards Rd at Right-in Right-out	-	-	-	35	-	35	-	0	0	0	0	-	-
8	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
9	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	15	15	15	-

Table 9 - Synchro analysis – Strategy C1 with Strategy C7 and C8 - Year 2017 – PM Peak

Node	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd EB	9.2/A	9.2/A	-	-	-	-	-	0.0/A	0.0/A	-	-	-	4.2/A
2	NB on ramp at Harlem Rd WB	-	-	-	-	8.8/A	8.8/A	0.0/A	0.0/A	-	-	-	-	3.7/A
3	Richards Rd at Harlem Rd WB	-	-	-	9.1/A	-	9.1/A	-	0.0/A	-	-	0.0/A	-	5.0/A
4	Richards Rd at Parking entrance	9.2/A	-	9.2/A	-	-	-	7.4/A	0.0/A	-	-	0.0/A	0.0/A	1.8/A
5	Richards Rd at Airport Dwy 2	10.0/A	-	10.0/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
6	Richards Rd at Airport Dwy 1	10.7/B	-	10.7/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.6/A
7	Richards Rd at Right-in Right-out	-	-	-	10.0/A	-	10.0/A	-	0.0/A	0.0/A	8.0/A	0.0/A	-	0.8/A
8	Richards Rd at Dwy 3	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.5/A
9	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.8/A	8.8/A	8.8/A	1.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd EB	5	5	-	-	-	-	-	0	0	-	-	-	-
2	NB on ramp at Harlem Rd WB	-	-	-	-	5	5	0	0	-	-	-	-	-
3	Richards Rd at Harlem Rd WB	-	-	-	10	-	10	-	0	-	-	0	-	-
4	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 2	15	-	15	-	-	-	0	0	-	-	0	0	-
6	Richards Rd at Airport Dwy 1	15	-	15	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
8	Richards Rd at Dwy 3	3	-	3	-	-	-	0	0	-	-	0	0	-
9	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	0	0	0	-

Table 10 - Synchro analysis – Strategy C1 with Strategy C7 and C8 - Year 2023 – AM Peak

Nod e	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd EB	10.9/B	10.9/B	-	-	-	-	-	0.0/A	0/A	-	-	-	0.8/A
2	NB on ramp at Harlem Rd WB	-	-	-	-	8.6/A	8.6/A	0.0/A	0.0/A	-	-	-	-	1.1/A
3	Richards Rd at Harlem Rd WB	-	-	-	10.3/B	-	10.3/B	-	0.0/A	-	-	0.0/A	-	9.2/A
4	Richards Rd at Parking entrance	9.7/A	-	9.7/A	-	-	-	7.3/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
5	Richards Rd at Airport Dwy 2	18.5/C	-	18.5/C	-	-	-	8.0/A	0.0/A	-	-	0.0/A	0.0/A	5.0/A
6	Richards Rd at Airport Dwy 1	22.4/C	-	22.4/C	-	-	-	8.5/A	0.0/A	-	-	0.0/A	0.0/A	4.8/A
7	Richards Rd at Right-in Right-out	-	-	-	13.2/B	-	13.2/B	-	0.0/A	0.0/A	7.9/A	0.0/A	-	4.9/A
8	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
9	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.4/A	9.4/A	9.4/A	9.6/A	9.6/A	9.6/A	7.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd EB	3	3	-	-	-	-	-	0	0	-	-	-	-
2	NB on ramp at Harlem Rd WB	-	-	-	-	3	3	0	0	-	-	-	-	-
3	Richards Rd at Harlem Rd WB	-	-	-	40	-	40	-	0	-	-	0	-	-
4	Richards Rd at Parking entrance	0	-	0	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 2	30	-	30	-	-	-	10	0	-	-	0	0	-
6	Richards Rd at Airport Dwy 1	38	-	38	-	-	-	13	0	-	-	0	0	-
7	Richards Rd at Right-in Right-out	-	-	-	40	-	40	-	0	0	0	0	-	-
8	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
9	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	18	18	18	-

Table 11 - Synchro analysis – Strategy C1 with Strategy C7 and C8 - Year 2023 – PM Peak

Nod e	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd EB	9.2/A	9.2/A	-	-	-	-	-	0.0/A	0/A	-	-	-	4.1/A
2	NB on ramp at Harlem Rd WB	-	-	-	-	8.8/A	8.8/A	0.0/A	0.0/A	-	-	-	-	3.7/A
3	Richards Rd at Harlem Rd WB	-	-	-	9.1/A	-	9.1/A	-	0.0/A	-	-	0.0/A	-	5.1/A
4	Richards Rd at Parking entrance	9.2/A	-	9.2/A	-	-	-	7.4/A	0.0/A	-	-	0.0/A	0.0/A	1.7/A
5	Richards Rd at Airport Dwy 2	10.1/B	-	10.1/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
6	Richards Rd at Airport Dwy 1	10.8/B	-	10.8/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.6/A
7	Richards Rd at Right-in Right-out	-	-	-	10.1/B	-	10.1/B	-	0.0/A	0.0/A	8.1/A	0.0/A	-	0.8/A
8	Richards Rd at Dwy 3	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.9/A
9	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.8/A	8.8/A	8.8/A	1.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd EB	5	5	-	-	-	-	-	0	0	-	-	-	-
2	NB on ramp at Harlem Rd WB	-	-	-	-	5	5	0	0	-	-	-	-	-
3	Richards Rd at Harlem Rd WB	-	-	-	10	-	10	-	0	-	-	0	-	-
4	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 2	15	-	15	-	-	-	0	0	-	-	0	0	-
6	Richards Rd at Airport Dwy 1	15	-	15	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
8	Richards Rd at Dwy 3	3	-	3	-	-	-	0	0	-	-	0	0	-
9	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	0	0	0	-

Table 12 - Synchro analysis – Strategy C1 with Strategy C7 and C8 - Year 2040 – AM Peak

Nod	Intersections	Delay (sec.)/LOS												
e		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd EB	11.4/B	11.4/B	-	-	-	-	-	0.0/A	0.0/A	-	-	-	0.7/A
2	NB on ramp at Harlem Rd WB	-	-	-	-	8.6/A	8.6/A	0.0/A	0.0/A	-	-	-	-	1.0/A
3	Richards Rd at Harlem Rd WB	-	-	-	10.9/B	-	10.9/B	-	0.0/A	-	-	0.0/A	-	9.9/A
4	Richards Rd at Parking entrance	10.0/A	-	10.0/A	-	-	-	7.3/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
5	Richards Rd at Airport Dwy 2	23.9/C	-	23.9/C	-	-	-	8.2/A	0.0/A	-	-	0.0/A	0.0/A	5.8/A
6	Richards Rd at Airport Dwy 1	33.0/D	-	33.0/D	-	-	-	8.9/A	0.0/A	-	-	0.0/A	0.0/A	6.2/A
7	Richards Rd at Right-in Right-out	-	-	-	15.3/C	-	15.3/C	-	0.0/A	0.0/A	7.9/A	0.0/A	-	5.7/A
8	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.7/A	0.0/A	-	-	0.0/A	0.0/A	0.3/A
9	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.5/A	9.5/A	9.5/A	9.9/A	9.9/A	9.9/A	8.3/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd EB	5	5	-	-	-	-	-	0	0	-	-	-	-
2	NB on ramp at Harlem Rd WB	-	-	-	-	5	5	0	0	-	-	-	-	-
3	Richards Rd at Harlem Rd WB	-	-	-	53	-	53	-	0	-	-	0	-	-
4	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 2	48	-	48	-	-	-	13	0	-	-	0	0	-
6	Richards Rd at Airport Dwy 1	65	-	65	-	-	-	15	0	-	-	0	0	-
7	Richards Rd at Right-in Right-out	-	-	-	58	-	58	-	0	0	0	0	-	-
8	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
9	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	20	20	20	-

Table 13 - Synchro analysis – Strategy C1 with Strategy C7 and C8 - Year 2040 – PM Peak

Nod	Intersections	Delay (sec.)/LOS												
e		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd EB	9.3/A	9.3/A	-	-	-	-	-	0.0/A	0.0/A	-	-	-	3.9/A
2	NB on ramp at Harlem Rd WB	-	-	-	-	8.9/A	8.9/A	0.0/A	0.0/A	-	-	-	-	3.7/A
3	Richards Rd at Harlem Rd WB	-	-	-	9.2/A	-	9.2/A	-	0.0/A	-	-	0.0/A	-	5.3/A
4	Richards Rd at Parking entrance	9.3/A	-	9.3/A	-	-	-	7.4/A	0.0/A	-	-	0.0/A	0.0/A	1.7/A
5	Richards Rd at Airport Dwy 2	10.3/B	-	10.3/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
6	Richards Rd at Airport Dwy 1	11.2/B	-	11.2/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.7/A
7	Richards Rd at Right-in Right-out	-	-	-	10.2/B	-	10.2/B	-	0.0/A	0.0/A	8.2/A	0.0/A	-	0.8/A
8	Richards Rd at Dwy 3	9.0/A	-	9.0/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	2.7/A
9	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.9/A	8.9/A	8.9/A	2.0/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd EB	8	8	-	-	-	-	-	0	0	-	-	-	-
2	NB on ramp at Harlem Rd WB	-	-	-	-	8	8	0	0	-	-	-	-	-
3	Richards Rd at Harlem Rd WB	-	-	-	13	-	13	-	0	-	-	0	-	-
4	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 2	18	-	18	-	-	-	0	0	-	-	0	0	-
6	Richards Rd at Airport Dwy 1	18	-	18	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
8	Richards Rd at Dwy 3	3	-	3	-	-	-	0	0	-	-	0	0	-
9	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	3	3	3	-

Based on the results shown in **Table 8** through **Table 13**, all the intersections operate at an acceptable level of service for all the movements and for the overall intersection in both the AM and PM peak hours with the queues not exceeding the available storage.

7. Strategy C4 (with Strategy C7 and Strategy C8) – Intersection Analysis

7.1 Geometric conditions

The following are the qualitative benefits with this proposed alternative:

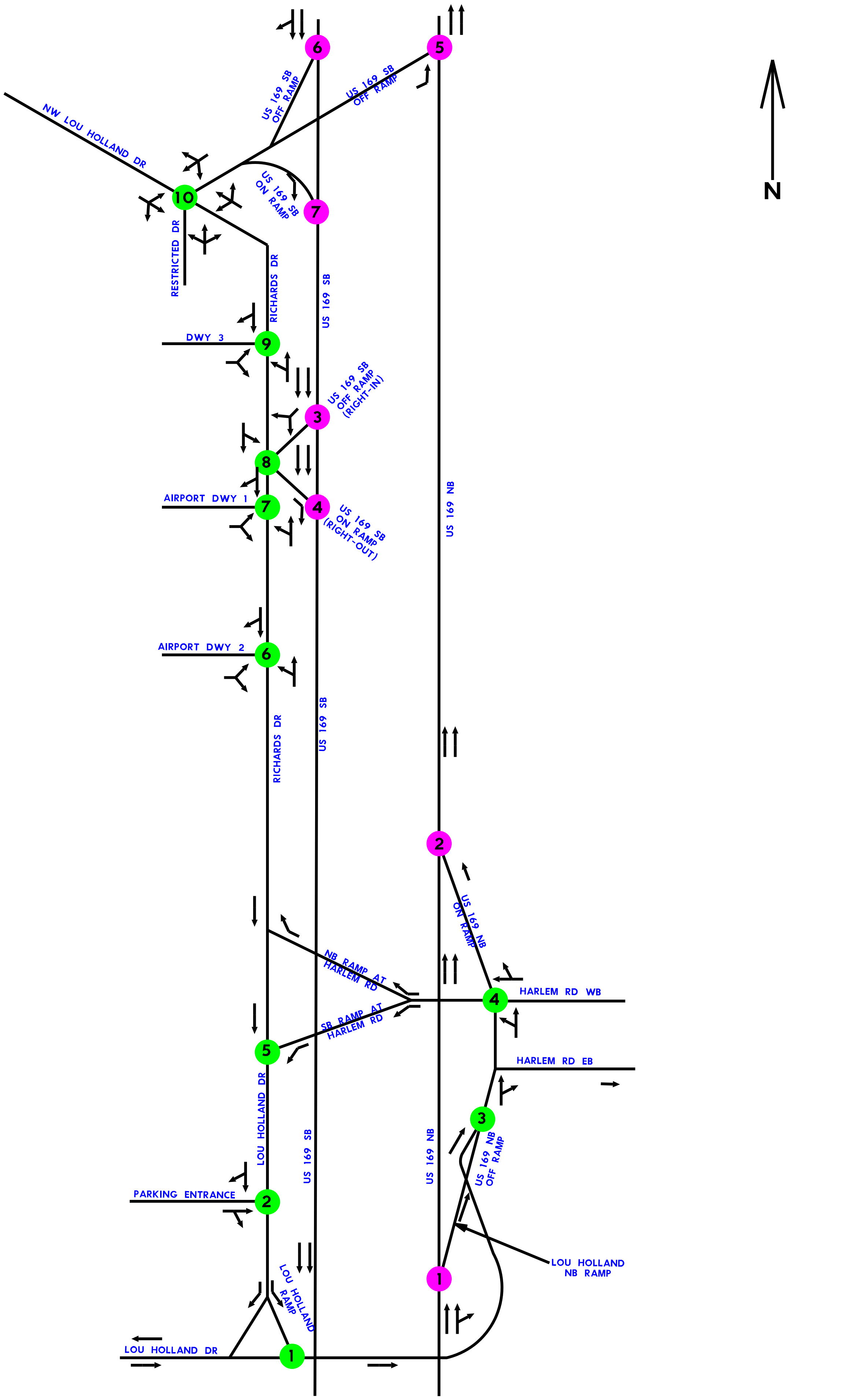
- The southbound on ramp south of Harlem Road will be eliminated which will resolve the safety issues pertaining to the on ramp traffic.
- The complex nine legged roundabout will be replaced with a half diamond interchange which will avoid any confusion and complexity for the drivers.
- The non-typical left side on ramp and off ramp that are just north and south of Harlem road will be replaced with the more typical right side ramps

The lane configuration for the proposed strategy C4 with strategies C7 and C8 is shown in **Figure 16**.

7.2 Intersection analysis

Ten unsignalized/stop controlled intersections were analyzed as shown in **Table 14** through **Table 19** using Synchro 10 to check for the measures of effectiveness of strategy C4 with strategy C7 and strategy C8 for the years 2017, 2023 and 2040. **Figure 16** shows the ten unsignalized intersections. **Figure 17** through **Figure 19** show the traffic volumes for strategy C4 with strategy C7 and C8 for the study years 2017, 2023 and 2040.

With the shift in the existing SB on ramp traffic (north of bridge) to the SB on ramp just north of the airport, the traffic volume will increase at the SB on ramp (north of the airport) as shown in **Figures 17** through **19**. However, with the improved right-in/right-out geometry, the SB on ramp still operates at acceptable LOS.

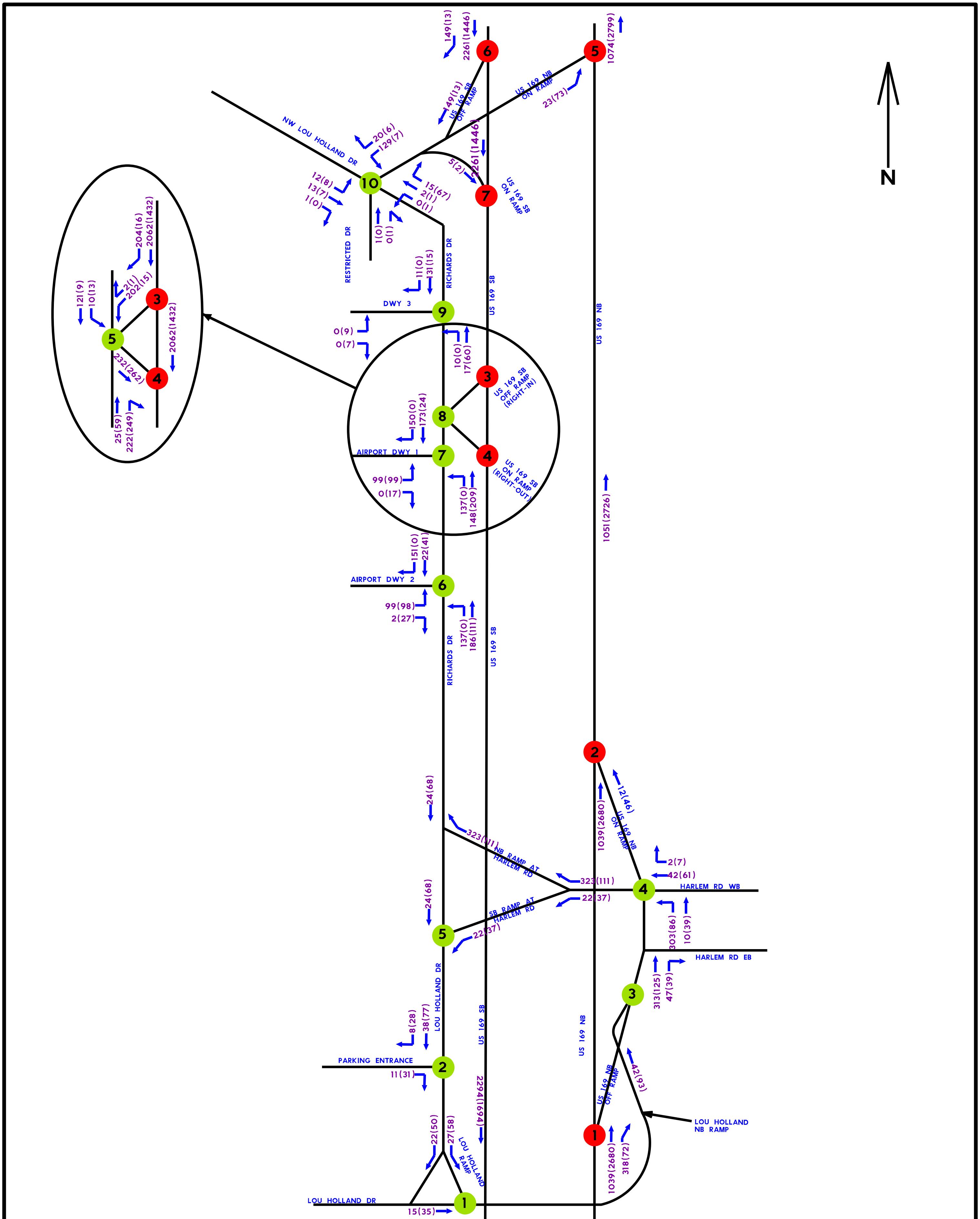


LEGEND

UNSIGNALIZED INTERSECTION NUMBER

RAMP MERGE/RAMP DIVERGE INTERSECTION NUMBER

FIGURE 16 - STRATEGIES C4, C7 AND C8 LANE CONFIGURATION

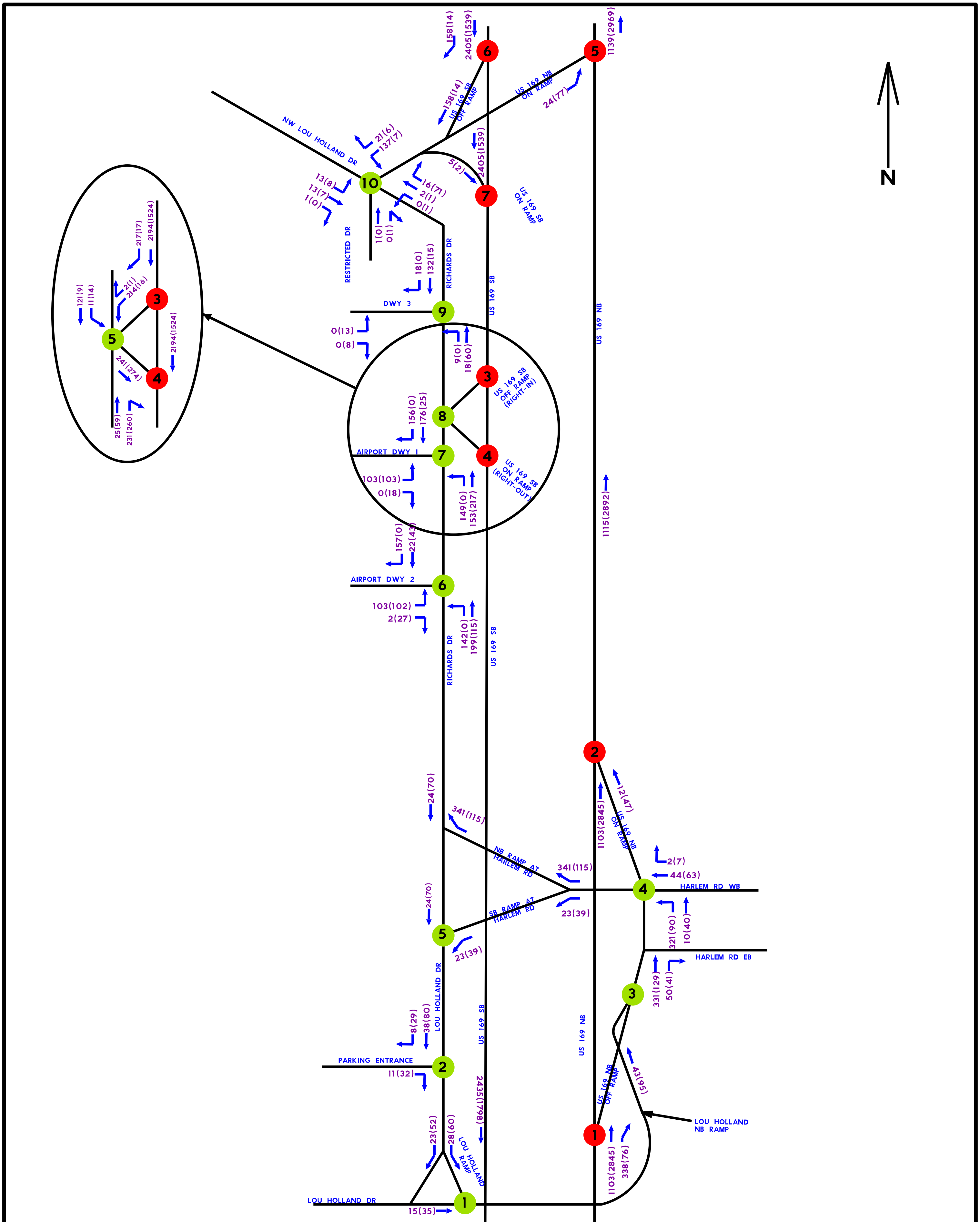


LEGEND

RAMP MERGE/RAMP DIVERGE INTERSECTION NUMBER

UNSIGNALIZED INTERSECTION NUMBER

FIGURE 17 - STRATEGIES C4, C7 AND C8 PEAK HOUR VOLUMES YEAR 2017



LEGEND

RAMP MERGE/RAMP DIVERGE INTERSECTION NUMBER

UNSIGNALIZED INTERSECTION NUMBER

FIGURE 18 - STRATEGIES C4, C7 AND C8 PEAK HOUR VOLUMES YEAR 2023

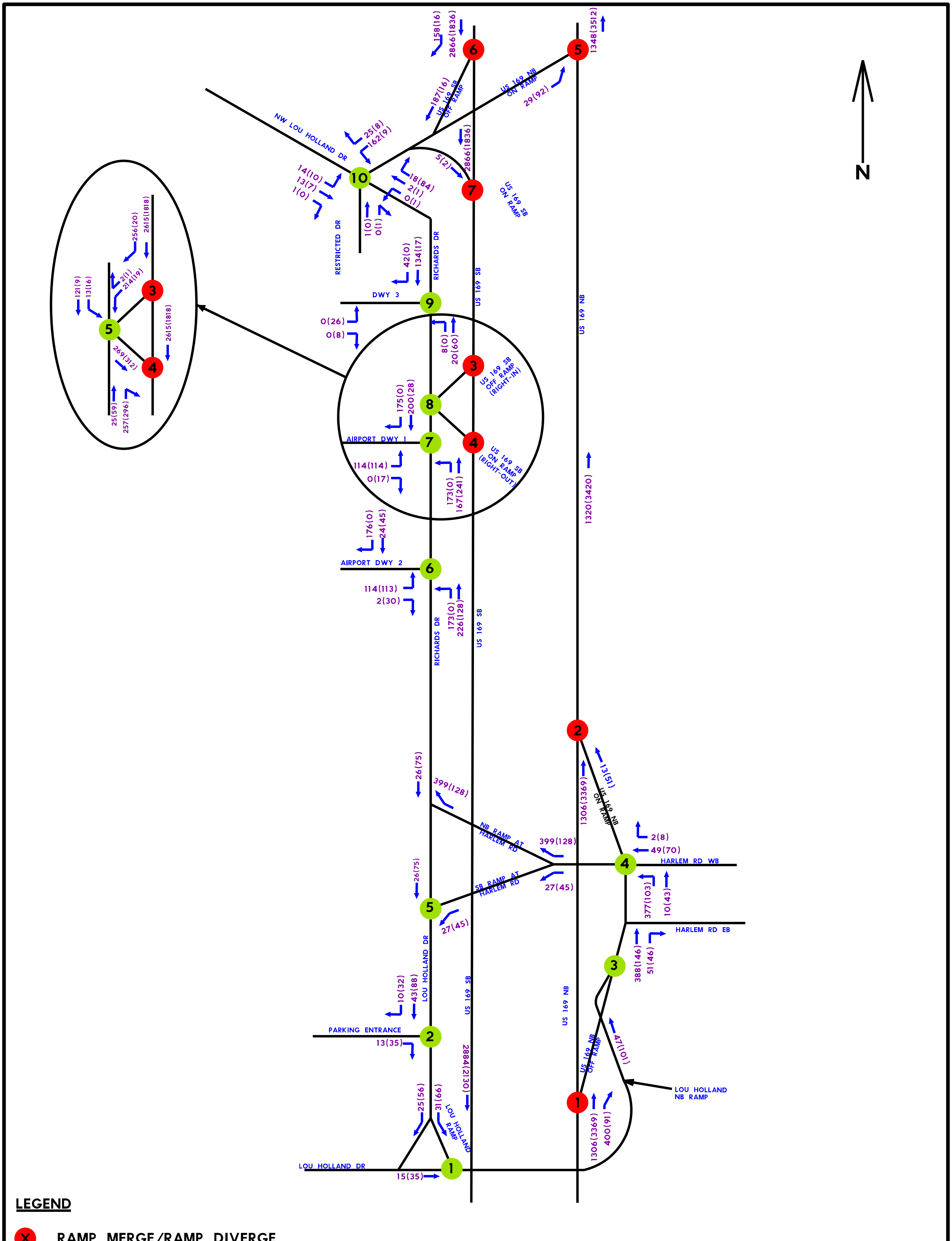


FIGURE 19 - STRATEGY C4, C7 AND C8
PEAK HOUR VOLUMES YEAR 2040

Table 14 - Synchro analysis – Strategy C4 with Strategy C7 and C8 - Year 2017 – AM Peak

Node	Intersections	Delay (sec.)/LOS												
No.		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	Lou Holland Ramp at Lou Holland Dr	-	0.0/A	-	-	-	-	-	-	-	8.7/A	-	-	5.6/A
2	Parking Entrance at Lou Holland Dr	-	-	8.6/A	-	-	-	-	-	-	-	0.0/A	0.0/A	1.7/A
3	Lou Holland Ramp at US 169 NB off ramp	11.0/B	-	-	-	-	-	-	0.0/A	-	-	-	-	1.3/A
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8.6/A	8.6/A	0.0/A	0.0/A	-	-	-	-	1.1/A
5	Harlem Rd SB ramp at Richards Rd	-	-	-	8.8/A	-	-	-	-	-	-	0.0/A	-	4.2/A
6	Richards Rd at Airport Dwy 2	17.2/C	-	17.2/C	-	-	-	8.0/A	0.0/A	-	-	0.0/A	0.0/A	4.7/A
7	Richards Rd at Airport Dwy 1	20.9/C	-	20.9/C	-	-	-	8.5/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
8	Richards Rd at Right-in Right-out	-	-	-	12.9/B	-	12.9/B	-	0.0/A	0.0/A	7.8/A	0.0/A	-	4.7/A
9	Dwy 3 at Richards Rd	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
10	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.4/A	9.4/A	9.4/A	9.6/A	9.6/A	9.6/A	7.9/A
		95% Queue length (ft.)												
1	Lou Holland Ramp at Lou Holland Dr	-	0	-	-	-	-	-	-	-	3	-	-	-
2	Parking Entrance at Lou Holland Dr	-	-	0	-	-	-	-	-	-	-	0	0	-
3	Lou Holland Ramp at US 169 NB off ramp	5	-	-	-	-	-	-	0	-	-	-	-	-
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	3	3	0	0	-	-	-	-	-
5	Harlem Rd SB ramp at Richards Rd	-	-	-	3	-	-	-	-	-	-	0	-	-
6	Richards Rd at Airport Dwy 2	28	-	28	-	-	-	10	0	-	-	0	0	-
7	Richards Rd at Airport Dwy 1	35	-	35	-	-	-	10	0	-	-	0	0	-
8	Richards Rd at Right-in Right-out	-	-	-	35	-	35	-	0	0	0	0	-	-
9	Dwy 3 at Richards Rd	0	-	0	-	-	-	0	0	-	-	0	0	-
10	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	15	15	15	-

Table 15 - Synchro analysis – Strategy C4 with Strategy C7 and C8 - Year 2017 – PM Peak

Node	Intersections	Delay (sec.)/LOS												
No.		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	Lou Holland Ramp at Lou Holland Dr	-	0.0/A	-	-	-	-	-	-	-	9.0/A	-	-	5.6/A
2	Parking Entrance at Lou Holland Dr	-	-	8.9/A	-	-	-	-	-	-	-	0.0/A	0.0/A	2.0/A
3	Lou Holland Ramp at US 169 NB off ramp	9.4/A	-	-	-	-	-	-	0.0/A	-	-	-	-	5.3/A
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8.8/A	8.8/A	0.0/A	0.0/A	-	-	-	-	3.1/A
5	Harlem Rd SB ramp at Richards Rd	-	-	-	9.1/A	-	-	-	-	-	-	0.0/A	-	3.2/A
6	Richards Rd at Airport Dwy 2	10.0/B	-	10.0/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.5/A
7	Richards Rd at Airport Dwy 1	10.7/B	-	10.7/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.6/A
8	Richards Rd at Right-in Right-out	-	-	-	10.0/B	-	10.0/B	-	0.0/A	0.0/A	8.0/A	0.0/A	-	0.8/A
9	Dwy 3 at Richards Rd	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.5/A
10	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.8/A	8.8/A	8.8/A	1.9/A
		95% Queue length (ft.)												
1	Lou Holland Ramp at Lou Holland Dr	-	0	-	-	-	-	-	-	-	5	-	-	-
2	Parking Entrance at Lou Holland Dr	-	-	3	-	-	-	-	-	-	-	0	0	-
3	Lou Holland Ramp at US 169 NB off ramp	10	-	-	-	-	-	-	0	-	-	-	-	-
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	5	5	0	0	-	-	-	-	-
5	Harlem Rd SB ramp at Richards Rd	-	-	-	3	-	-	-	-	-	-	0	-	-
6	Richards Rd at Airport Dwy 2	15	-	15	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at Airport Dwy 1	15	-	15	-	-	-	0	0	-	-	0	0	-
8	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
9	Dwy 3 at Richards Rd	3	-	3	-	-	-	0	0	-	-	0	0	-
10	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	0	0	0	-

Table 16 - Synchro analysis – Strategy C4 with Strategy C7 and C8 - Year 2023 – AM Peak

Node	Intersections	Delay (sec.)/LOS												
No.		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	Lou Holland Ramp at Lou Holland Dr	-	0.0/A	-	-	-	-	-	-	-	8.7/A	-	-	5.7/A
2	Parking Entrance at Lou Holland Dr	-	-	8.6/A	-	-	-	-	-	-	-	0.0/A	0.0/A	1.7/A
3	Lou Holland Ramp at US 169 NB off ramp	11.2/B	-	-	-	-	-	-	0.0/A	-	-	-	-	1.3/A
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8.6/A	8.6/A	0.0/A	0.0/A	-	-	-	-	1.0/A
5	Harlem Rd SB ramp at Richards Rd	-	-	-	8.8/A	-	-	-	-	-	-	0.0/A	-	4.3/A
6	Richards Rd at Airport Dwy 2	18.2/C	-	18.2/C	-	-	-	8.0/A	0.0/A	-	-	0.0/A	0.0/A	4.9/A
7	Richards Rd at Airport Dwy 1	23.0/C	-	23.0/C	-	-	-	8.5/A	0.0/A	-	-	0.0/A	0.0/A	4.9/A
8	Richards Rd at Right-in Right-out	-	-	-	13.2/B	-	13.2/B	-	0.0/A	0.0/A	7.9/A	0.0/A	-	4.9/A
9	Dwy 3 at Richards Rd	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
10	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.4/A	9.4/A	9.4/A	9.6/A	9.6/A	9.6/A	7.9/A
		95% Queue length (ft.)												
1	Lou Holland Ramp at Lou Holland Dr	-	0	-	-	-	-	-	-	-	3	-	-	-
2	Parking Entrance at Lou Holland Dr	-	-	0	-	-	-	-	-	-	-	0	0	-
3	Lou Holland Ramp at US 169 NB off ramp	5	-	-	-	-	-	-	0	-	-	-	-	-
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	3	3	0	0	-	-	-	-	-
5	Harlem Rd SB ramp at Richards Rd	-	-	-	3	-	-	-	-	-	-	0	-	-
6	Richards Rd at Airport Dwy 2	30	-	30	-	-	-	10	0	-	-	0	0	-
7	Richards Rd at Airport Dwy 1	40	-	40	-	-	-	13	0	-	-	0	0	-
8	Richards Rd at Right-in Right-out	-	-	-	40	-	40	-	0	0	0	0	-	-
9	Dwy 3 at Richards Rd	0	-	0	-	-	-	0	0	-	-	0	0	-
10	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	18	18	18	-

Table 17 - Synchro analysis – Strategy C4 with Strategy C7 and C8 - Year 2023 – PM Peak

Node	Intersections	Delay (sec.)/LOS												
No.		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	Lou Holland Ramp at Lou Holland Dr	-	0.0/A	-	-	-	-	-	-	-	9.0/A	-	-	5.7/A
2	Parking Entrance at Lou Holland Dr	-	-	9.0/A	-	-	-	-	-	-	-	0.0/A	0.0/A	2.0/A
3	Lou Holland Ramp at US 169 NB off ramp	9.5/A	-	-	-	-	-	-	0.0/A	-	-	-	-	5.3/A
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8.8/A	8.8/A	0.0/A	0.0/A	-	-	-	-	3.1/A
5	Harlem Rd SB ramp at Richards Rd	-	-	-	9.1/A	-	-	-	-	-	-	0.0/A	-	3.3/A
6	Richards Rd at Airport Dwy 2	10.1/B	-	10.1/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.5/A
7	Richards Rd at Airport Dwy 1	10.8/B	-	10.8/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.6/A
8	Richards Rd at Right-in Right-out	-	-	-	10.1/B	-	10.1/B	-	0.0/A	0.0/A	8.1/A	0.0/A	-	0.8/A
9	Dwy 3 at Richards Rd	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.9/A
10	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.8/A	8.8/A	8.8/A	1.9/A
		95% Queue length (ft.)												
1	Lou Holland Ramp at Lou Holland Dr	-	0	-	-	-	-	-	-	-	5	-	-	-
2	Parking Entrance at Lou Holland Dr	-	-	3	-	-	-	-	-	-	-	0	0	-
3	Lou Holland Ramp at US 169 NB off ramp	10	-	-	-	-	-	-	0	-	-	-	-	-
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	5	5	0	0	-	-	-	-	-
5	Harlem Rd SB ramp at Richards Rd	-	-	-	3	-	-	-	-	-	-	0	-	-
6	Richards Rd at Airport Dwy 2	15	-	15	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at Airport Dwy 1	15	-	15	-	-	-	0	0	-	-	0	0	-
8	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
9	Dwy 3 at Richards Rd	3	-	3	-	-	-	0	0	-	-	0	0	-
10	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	0	0	0	-

Table 18 - Synchro analysis – Strategy C4 with Strategy C7 and C8 - Year 2040 – AM Peak

Node No.	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	Lou Holland Ramp at Lou Holland Dr	-	0.0/A	-	-	-	-	-	-	-	8.7/A	-	-	5.9/A
2	Parking Entrance at Lou Holland Dr	-	-	8.6/A	-	-	-	-	-	-	-	0.0/A	0.0/A	1.7/A
3	Lou Holland Ramp at US 169 NB off ramp	11.9/B	-	-	-	-	-	-	0.0/A	-	-	-	-	1.3/A
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8.6/A	8.6/A	0.0/A	0.0/A	-	-	-	-	1.0/A
5	Harlem Rd SB ramp at Richards Rd	-	-	-	8.8/A	-	-	-	-	-	-	0.0/A	-	4.5/A
6	Richards Rd at Airport Dwy 2	23.4/C	-	23.4/C	-	-	-	8.1/A	0.0/A	-	-	0.0/A	0.0/A	5.7/A
7	Richards Rd at Airport Dwy 1	31.0/D	-	31.0/D	-	-	-	8.8/A	0.0/A	-	-	0.0/A	0.0/A	6.1/A
8	Richards Rd at Right-in Right-out	-	-	-	14.5/B	-	14.5/B	-	0.0/A	0/A	7.9/A	0.0/A	-	5.7/A
9	Dwy 3 at Richards Rd	0.0/A	-	0.0/A	-	-	-	7.7/A	0.0/A	-	-	0.0/A	0.0/A	0.3/A
10	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.5/A	9.5/A	9.5/A	9.9/A	9.9/A	9.9/A	8.3/A
		95% Queue length (ft.)												
1	Lou Holland Ramp at Lou Holland Dr	-	0	-	-	-	-	-	-	-	3	-	-	-
2	Parking Entrance at Lou Holland Dr	-	-	0	-	-	-	-	-	-	-	0	0	-
3	Lou Holland Ramp at US 169 NB off ramp	8	-	-	-	-	-	-	0	-	-	-	-	-
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	5	5	0	0	-	-	-	-	-
5	Harlem Rd SB ramp at Richards Rd	-	-	-	3	-	-	-	-	-	-	0	-	-
6	Richards Rd at Airport Dwy 2	45	-	45	-	-	-	13	0	-	-	0	0	-
7	Richards Rd at Airport Dwy 1	60	-	60	-	-	-	15	0	-	-	0	0	-
8	Richards Rd at Right-in Right-out	-	-	-	53	-	53	-	0	0	0	0	-	-
9	Dwy 3 at Richards Rd	0	-	0	-	-	-	0	0	-	-	0	0	-
10	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	20	20	20	-

Table 19 - Synchro analysis – Strategy C4 with Strategy C7 and C8 - Year 2040 – PM Peak

Node No.	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	Lou Holland Ramp at Lou Holland Dr	-	0.0/A	-	-	-	-	-	-	-	9.0/A	-	-	5.9/A
2	Parking Entrance at Lou Holland Dr	-	-	9.0/A	-	-	-	-	-	-	-	0.0/A	0.0/A	2.0/A
3	Lou Holland Ramp at US 169 NB off ramp	9.6/A	-	-	-	-	-	-	0.0/A	-	-	-	-	5.1/A
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8.9/A	8.9/A	0.0/A	0.0/A	-	-	-	-	3.1/A
5	Harlem Rd SB ramp at Richards Rd	-	-	-	9.2/A	-	-	-	-	-	-	0.0/A	-	3.5/A
6	Richards Rd at Airport Dwy 2	10.3/B	-	10.3/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.7/A
7	Richards Rd at Airport Dwy 1	11.2/B	-	11.2/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.7/A
8	Richards Rd at Right-in Right-out	-	-	-	10.2/B	-	10.2/B	-	0.0/A	0.0/A	8.2/A	0.0/A	-	0.8/A
9	Dwy 3 at Richards Rd	9.0/A	-	9.0/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	2.8/A
10	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.9/A	8.9/A	8.9/A	2.0/A
		95% Queue length (ft.)												
1	Lou Holland Ramp at Lou Holland Dr	-	0	-	-	-	-	-	-	-	5	-	-	-
2	Parking Entrance at Lou Holland Dr	-	-	3	-	-	-	-	-	-	-	0	0	-
3	Lou Holland Ramp at US 169 NB off ramp	10	-	-	-	-	-	-	0	-	-	-	-	-
4	Harlem Rd WB at US 169 NB on ramp	-	-	-	-	8	8	0	0	-	-	-	-	-
5	Harlem Rd SB ramp at Richards Rd	-	-	-	5	-	-	-	-	-	-	0	-	-
6	Richards Rd at Airport Dwy 2	18	-	18	-	-	-	0	0	-	-	0	0	-
7	Richards Rd at Airport Dwy 1	18	-	18	-	-	-	0	0	-	-	0	0	-
8	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
9	Dwy 3 at Richards Rd	3	-	3	-	-	-	0	0	-	-	0	0	-
10	Restricted Dr/NW Lou Holland	0	0	0	0	0	0	0	0	0	3	3	3	-

Based on the results shown in **Table 14** through **Table 19**, all the intersections operate at an acceptable level of service for all the movements and for the overall intersection in both the AM and PM peak hours with the queues not exceeding the available storage.

8. Strategy C5 (with Strategy C7 and Strategy C8) – Intersection Analysis

8.1 Geometric conditions

This strategy is similar to strategy C1 except that Harlem road and Richards road will be connection for eastbound and westbound directions without any offset between each direction. This strategy will have the same qualitative benefits as strategy C1.

The lane configuration for the proposed strategy C1 with strategies C7 and C8 is shown in **Figure 20**.

8.2 Intersection analysis

Eight unsignalized/stop controlled intersections were analyzed as shown in **Table 20** through **Table 25** using Synchro 10 to check for the measures of effectiveness of strategy C5 with strategy C7 and strategy C8 for the years 2017, 2023 and 2040. **Figure 20** shows the eight unsignalized intersections. **Figure 21** through **Figure 23** show the traffic volumes for strategy C5 with strategy C7 and C8 for the study years 2017, 2023 and 2040.

The shift in the traffic from the existing SB on ramp (south of Harlem Road) to the SB on ramp (north of airport) will not impact the performance of the SB on ramp north of airport or any other intersections.

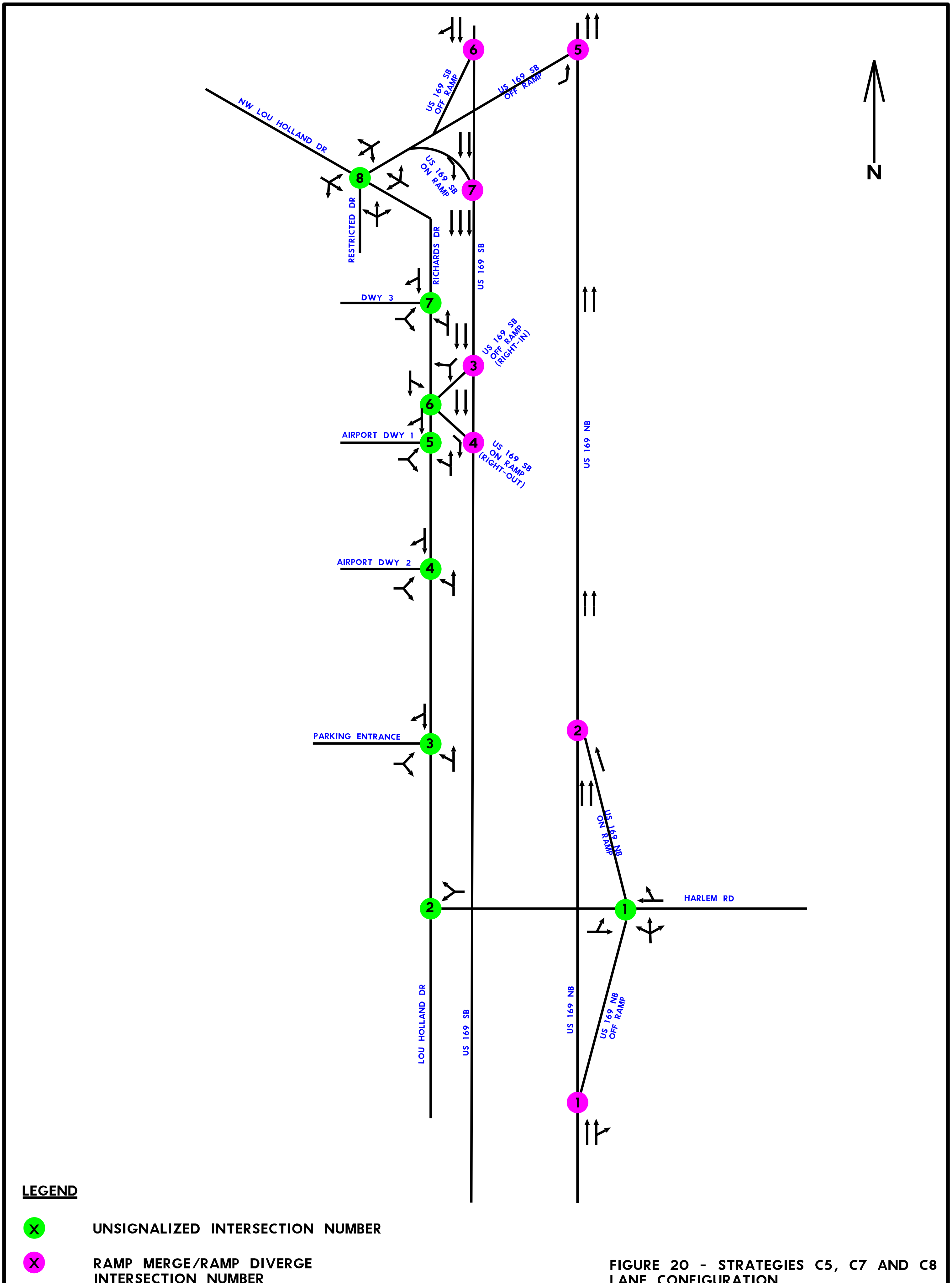


FIGURE 20 - STRATEGIES C5, C7 AND C8 LANE CONFIGURATION

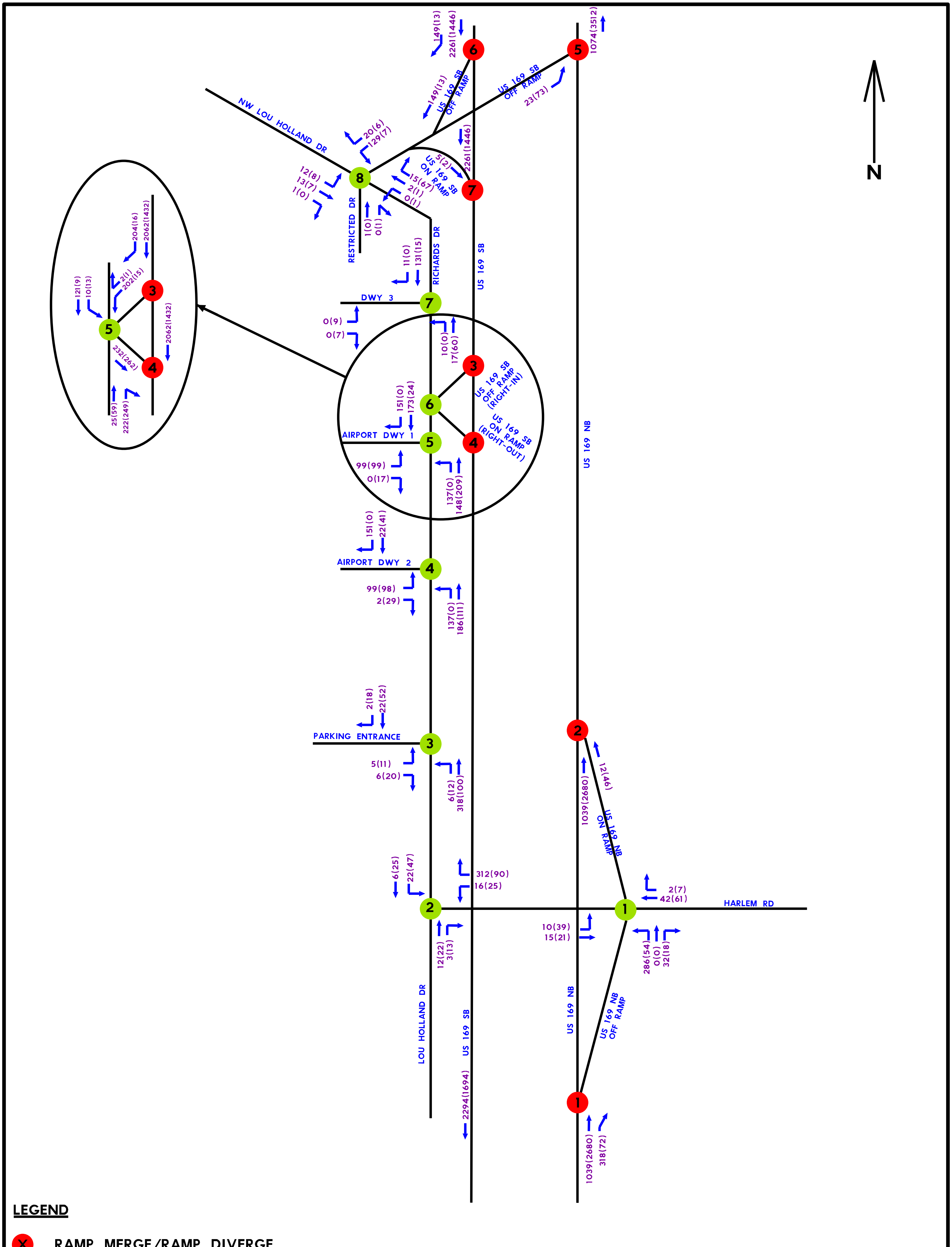
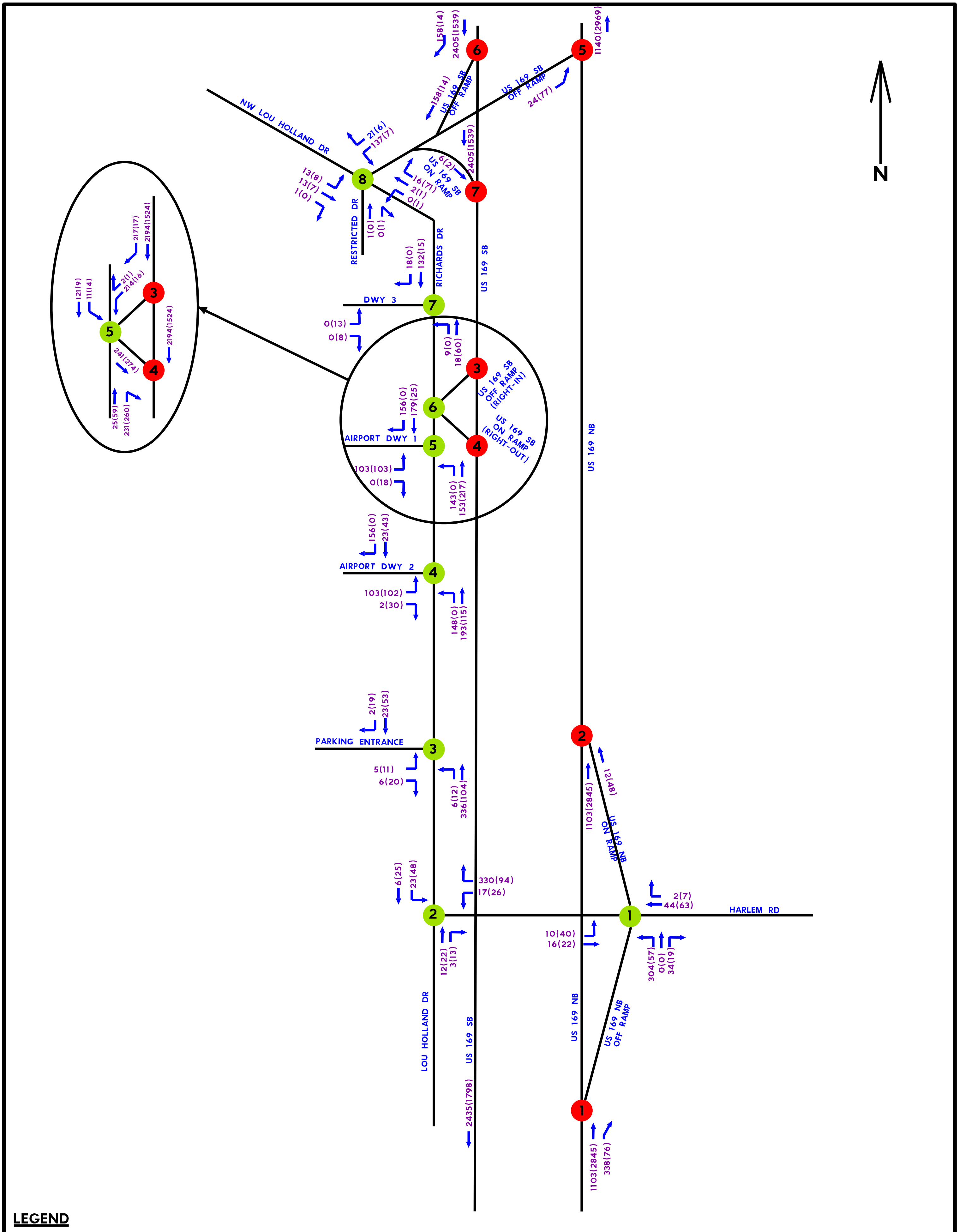


FIGURE 21 - STRATEGIES C5, C7 AND C8
PEAK HOUR VOLUMES YEAR 2017



LEGEND

RAMP MERGE/RAMP DIVERGE INTERSECTION NUMBER

UNSIGNALIZED INTERSECTION NUMBER

FIGURE 22 - STRATEGIES C5, C7 AND C8 PEAK HOUR VOLUMES YEAR 2023

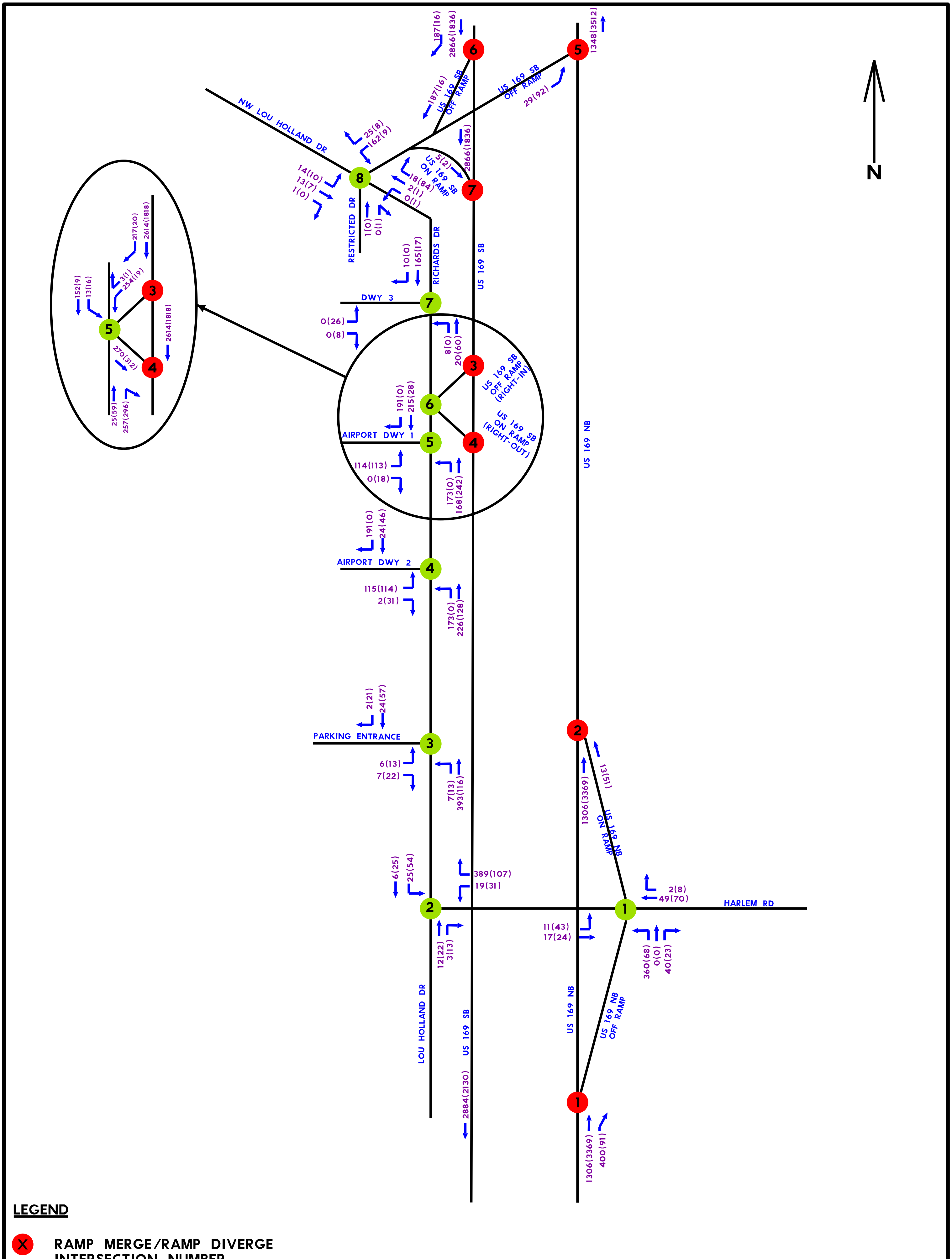


FIGURE 23 - STRATEGIES C5, C7 AND C8
PEAK HOUR VOLUMES YEAR 2040

Table 20 - Synchro analysis – Strategy C5 with Strategy C7 and C8 - Year 2017 – AM Peak

Alternative 5 AM Peak - Year 2017														
Node	**Intersections**	**Delay (sec.)/LOS**												
		EBL	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
1	NB off ramp at Harlem Rd	15.8/C	15.8/C	-	-	15.2/C	15.2/C	0.0/A	0.0/A	0.0/A	-	-	-	2.7/A
2	Lou Holland Dr at Harlem Rd	-	-	-	10.2/B	-	10.2/B	-	0.0/A	0.0/A	7.3/A	0.0/A	-	9.4/A
3	Richards Rd at Parking entrance	9.6/A	-	9.6/A	-	-	-	7.3/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
4	Richards Rd at Airport Dwy 2	17.2/C	-	17.2/C	-	-	-	8.0/A	0.0/A	-	-	0.0/A	0.0/A	4.7/A
5	Richards Rd at Airport Dwy 1	20.9/C	-	20.9/C	-	-	-	8.5/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
6	Richards Rd at Right-in Right-out	-	-	-	12.9/B	-	12.9/B	-	0.0/A	0.0/A	7.8/A	0.0/A	-	4.7/A
7	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
8	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.4/A	9.4/A	9.4/A	9.6/A	9.6/A	9.6/A	7.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd	5	5	-	-	10	10	0	0	0	-	-	-	-
2	Lou Holland Dr at Harlem Rd	-	-	-	38	-	38	-	0	0	0	0	-	-
3	Richards Dr at Parking entrance	0	-	0	-	-	-	0	0	-	-	0	0	-
4	Richards Dr at Airport Dwy 2	28	-	28	-	-	-	10	0	-	-	0	0	-
5	Richards Dr at Airport Dwy 1	35	-	35	-	-	-	10	0	-	-	0	0	-
6	Richards Dr at Right in Right out	-	-	-	35	-	35	-	0	-	0	0	-	-
7	Richards Dr at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
8	Restricted Dr/NW Lou Holland	-	-	-	-	-	-	-	-	-	15	15	15	-

Table 21 - Synchro analysis – Strategy C5 with Strategy C7 and C8 - Year 2017 – PM Peak

Node	**Intersections**	**Delay (sec.)/LOS**												
		EBL	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
1	NB off ramp at Harlem Rd	10.4/B	10.4/B	-	-	10.1/B	10.1/B	0.0/A	0.0/A	0.0/A	-	-	-	6.6/A
2	Lou Holland Dr at Harlem Rd	-	-	-	9.3/A	-	9.3/A	-	0.0/A	0.0/A	7.4/A	0.0/A	-	6.4/A
3	Richards Rd at Parking entrance	9.2/A	-	9.2/A	-	-	-	7.4/A	0.0/A	-	-	0.0/A	0.0/A	1.8/A
4	Richards Rd at Airport Dwy 2	10.0/B	-	10.0/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
5	Richards Rd at Airport Dwy 1	10.7/B	-	10.7/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.6/A
6	Richards Rd at Right-in Right-out	-	-	-	10.0/B	-	10.0/B	-	0.0/A	0.0/A	8.0/A	0.0/A	-	0.8/A
7	Richards Rd at Dwy 3	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.5/A
8	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.8/A	8.8/A	8.8/A	1.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd	8	8	-	-	8	8	0	0	0	-	-	-	-
2	Lou Holland Dr at Harlem Rd	-	-	-	10	-	10	-	0	0	3	0	-	-
3	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 2	15	-	15	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 1	15	-	15	-	-	-	0	0	-	-	0	0	-
6	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
7	Richards Rd at Dwy 3	3	-	3	-	-	-	0	0	-	-	0	0	-
8	Restricted Dr/NW Lou Holland	-	-	-	-	-	-	-	-	-	0	0	0	-

Table 22 - Synchro analysis – Strategy C5 with Strategy C7 and C8 - Year 2023 – AM Peak

Nod	Intersections	Delay (sec.)/LOS												
e		**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
1	NB off ramp at Harlem Rd	16.5/C	16.5/C	-	-	15.9/C	15.9/C	0.0/A	0.0/A	0.0/A	-	-	-	2.8/A
2	Lou Holland Dr at Harlem Rd	-	-	-	10.4/B	-	10.4/B	-	0.0/A	0.0/A	7.3/A	0.0/A	-	9.7/A
3	Richards Rd at Parking entrance	9.7/A	-	9.7/A	-	-	-	7.3/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
4	Richards Rd at Airport Dwy 2	18.5/C	-	18.5/C	-	-	-	8.0/A	0.0/A	-	-	0.0/A	0.0/A	5.0/A
5	Richards Rd at Airport Dwy 1	22.4/C	-	22.4/C	-	-	-	8.5/A	0.0/A	-	-	0.0/A	0.0/A	4.8/A
6	Richards Rd at Right-in Right-out	-	-	-	13.2/B	-	13.2/B	-	0.0/A	0.0/A	7.9/A	0.0/A	-	4.9/A
7	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.6/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
8	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.4/A	9.4/A	9.4/A	9.6/A	9.6/A	9.6/A	7.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd	8	8	-	-	10	10	0	0	0	-	-	-	-
2	Lou Holland Dr at Harlem Rd	-	-	-	43	-	43	-	0	0	0	0	-	-
3	Richards Rd at Parking entrance	0	-	0	-	-	-	0	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 2	30	-	30	-	-	-	10	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 1	38	-	38	-	-	-	13	0	-	-	0	0	-
6	Richards Rd at Right-in Right-out	-	-	-	40	-	40	-	0	-	0	0	-	-
7	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
8	Restricted Dr/NW Lou Holland	-	-	-	-	-	-	-	-	-	18	18	18	-

Table 23 - Synchro analysis – Strategy C5 with Strategy C7 and C8 - Year 2023 – PM Peak

Nod	Intersections	Delay (sec.)/LOS												
e		**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
1	NB off ramp at Harlem Rd	10.4/B	10.4/B	-	-	10.2/B	10.2/B	0.0/A	0.0/A	0.0/A	-	-	-	6.5/A
2	Lou Holland Dr at Harlem Rd	-	-	-	9.3/A	-	9.3/A	-	0.0/A	0.0/A	7.4/A	0.0/A	-	6.5/A
3	Richards Rd at Parking entrance	9.2/A	-	9.2/A	-	-	-	7.4/A	0.0/A	-	-	0.0/A	0.0/A	1.7/A
4	Richards Rd at Airport Dwy 2	10.0/B	-	10.0/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
5	Richards Rd at Airport Dwy 1	10.8/B	-	10.8/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.6/A
6	Richards Rd at Right-in Right-out	-	-	-	10.1/B	-	10.1/B	-	0.0/A	0.0/A	8.1/A	0.0/A	-	0.8/A
7	Richards Rd at Dwy 3	8.8/A	-	8.8/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	1.9/A
8	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.8/A	8.8/A	8.8/A	1.9/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd	8	8	-	-	8	8	0	0	0	-	-	-	-
2	Lou Holland Dr at Harlem Rd	-	-	-	13	-	13	-	0	0	3	0	-	-
3	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 2	15	-	15	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 1	15	-	15	-	-	-	0	0	-	-	0	0	-
6	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
7	Richards Rd at Dwy 3	3	-	3	-	-	-	0	0	-	-	0	0	-
8	Restricted Dr/NW Lou Holland	-	-	-	-	-	-	-	-	-	0	0	0	-

Table 24 - Synchro analysis – Strategy C5 with Strategy C7 and C8 - Year 2040 – AM Peak

Node	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd	19.5/C	19.5/C	-	-	18.5/C	18.5/C	0.0/A	0.0/A	0.0/A	-	-	-	3.1/A
2	Lou Holland Dr at Harlem Rd	-	-	-	10.9/B	-	10.9/B	-	0.0/A	0.0/A	7.3/A	0.0/A	-	10.2/B
3	Richards Rd at Parking entrance	10.0/B	-	10.0/B	-	-	-	7.3/A	0.0/A	-	-	0.0/A	0.0/A	0.4/A
4	Richards Rd at Airport Dwy 2	23.9/C	-	23.9/C	-	-	-	8.2/A	0.0/A	-	-	0.0/A	0.0/A	5.8/A
5	Richards Rd at Airport Dwy 1	33.0/D	-	33.0/D	-	-	-	8.9/A	0.0/A	-	-	0.0/A	0.0/A	6.2/A
6	Richards Rd at Right-in Right-out	-	-	-	15.3/C	-	15.3/C	-	0.0/A	0.0/A	7.9/A	0.0/A	-	5.7/A
7	Richards Rd at Dwy 3	0.0/A	-	0.0/A	-	-	-	7.7/A	0.0/A	-	-	0.0/A	0.0/A	0.3/A
8	Restricted Dr/NW Lou Holland	7.3/A	0.0/A	0.0/A	0.0/A	0.0/A	0.0/A	9.5/A	9.5/A	9.5/A	9.9/A	9.9/A	9.9/A	8.3/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd	10	10	-	-	15	15	0	0	0	-	-	-	-
2	Lou Holland Dr at Harlem Rd	-	-	-	53	-	53	-	0	0	3	0	-	-
3	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 2	48	-	48	-	-	-	13	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 1	65	-	65	-	-	-	15	0	-	-	0	0	-
6	Richards Rd at Right-in Right-out	-	-	-	58	-	58	-	0	-	0	0	-	-
7	Richards Rd at Dwy 3	0	-	0	-	-	-	0	0	-	-	0	0	-
8	Restricted Dr/NW Lou Holland	-	-	-	-	-	-	-	-	-	20	20	20	-

Table 25 - Synchro analysis – Strategy C5 with Strategy C7 and C8 - Year 2040 – PM Peak

Node	Intersections	Delay (sec.)/LOS												
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
1	NB off ramp at Harlem Rd	10.8/B	10.8/B	-	-	10.4/B	10.4/B	0.0/A	0.0/A	0.0/A	-	-	-	6.5/A
2	Lou Holland Dr at Harlem Rd	-	-	-	9.4/A	-	9.4/A	-	0.0/A	0.0/A	7.4/A	0.0/A	-	6.7/A
3	Richards Rd at Parking entrance	9.3/A	-	9.3/A	-	-	-	7.4/A	0.0/A	-	-	0.0/A	0.0/A	1.7/A
4	Richards Rd at Airport Dwy 2	10.3/B	-	10.3/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	4.6/A
5	Richards Rd at Airport Dwy 1	11.2/B	-	11.2/B	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	3.7/A
6	Richards Rd at Right-in Right-out	-	-	-	10.2/B	-	10.2/B	-	0.0/A	0.0/A	8.2/A	0.0/A	-	0.8/A
7	Richards Rd at Dwy 3	9.0/A	-	9.0/A	-	-	-	0.0/A	0.0/A	-	-	0.0/A	0.0/A	2.7/A
8	Restricted Dr/NW Lou Holland	7.4/A	0.0/A	0.0/A	7.3/A	0.0/A	0.0/A	8.4/A	8.4/A	8.4/A	8.9/A	8.9/A	8.9/A	2.0/A
		95% Queue length (ft.)												
1	NB off ramp at Harlem Rd	10	10	-	-	10	10	0	0	0	-	-	-	-
2	Lou Holland Dr at Harlem Rd	-	-	-	15	-	15	-	0	0	3	0	-	-
3	Richards Rd at Parking entrance	3	-	3	-	-	-	0	0	-	-	0	0	-
4	Richards Rd at Airport Dwy 2	18	-	18	-	-	-	0	0	-	-	0	0	-
5	Richards Rd at Airport Dwy 1	18	-	18	-	-	-	0	0	-	-	0	0	-
6	Richards Rd at Right-in Right-out	-	-	-	3	-	3	-	0	0	0	0	-	-
7	Richards Rd at Dwy 3	3	-	3	-	-	-	0	0	-	-	0	0	-
8	Restricted Dr/NW Lou Holland	-	-	-	-	-	-	-	-	-	3	3	3	-

Based on the results shown in **Table 20** through **Table 25**, all the intersections operate at an acceptable level of service for all the movements and for the overall intersection in both the AM and PM peak hours with the queues not exceeding the available storage.

9. Conclusion

From the Synchro analysis results, the intersections operate at an acceptable LOS for the existing configuration and the proposed strategies in the current year 2017, build year 2023 and future year 2040 as shown in **Tables 1 through Table 25** except for the SB on ramp south of Harlem Road fails to operate at an acceptable LOS in the existing condition in the year 2017 for AM peak as shown in **Table 3**. The queue length is observed to be within the available storage length. The roundabout at Harlem road operates at an acceptable LOS per the results obtained from Sidra intersection as shown in **Table 1**. Based on the HCS analysis for merge and diverge ramps along US 169, the ramps operate at acceptable LOS for the existing condition and proposed strategies for all the study years except for the US 169 NB on ramp and US 169 NB off ramp at Harlem Road, which fails to operate at an acceptable LOS in the year 2040 as shown in **Table 7**. The performance of these two ramps can be improved by adding an acceleration and a deceleration lanes at the merge and diverge ramp locations.

Overall the proposed alternatives have the following benefits:

- Eliminate the sight distance issues associated with the existing southbound on ramp traffic (south of Harlem road) and improve the delays by shifting this traffic to the southbound on ramp (north of airport).
- The geometric improvements at the right-in/right-out location, will help to handle the shifted traffic due to the closure of the existing southbound on ramp that is south of Harlem road.
- The proposed southbound off ramp at the north interchange, will now have more storage to accommodate any spills.
- The replacement of the complex roundabout with a half diamond interchange will avoid confusion for the drivers.
- The non-typical left side ramps will be replaced with the more typical right side ramps which will help the drivers avoid confusion.

Appendix A

Existing Configuration

Ramp analysis

(Highway Capacity Software)

Year 2017

AM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1039	318
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1161	355
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.28	0.18

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	14.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.460
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1161	Ramp Junction Speed (S), mi/h	49.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.8
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1039	12
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1161	13
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.28	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	14.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.334
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1161	Ramp Junction Speed (S), mi/h	50.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1174	Average Density (D), pc/mi/ln	11.6
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB off ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2062	204
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2304	228
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.55	0.11

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.449
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2304	Ramp Junction Speed (S), mi/h	49.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	23.4
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2062	13
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2304	15
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.55	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	20.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.328
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2304	Ramp Junction Speed (S), mi/h	50.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2319	Average Density (D), pc/mi/ln	22.9
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1051	23
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1174	26
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.29	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.300
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1174	Ramp Junction Speed (S), mi/h	51.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1200	Average Density (D), pc/mi/ln	11.7
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB off ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2266	149
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2532	167
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.60	0.08

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	26.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.378
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2532	Ramp Junction Speed (S), mi/h	50.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	25.3
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - S of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Left

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2075	219
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2319	245
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.61	0.12

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	25.4
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.372
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2319	Ramp Junction Speed (S), mi/h	50.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2564	Average Density (D), pc/mi/ln	25.5
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Left

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1527	167
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1706	187
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.45	0.09

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	20.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.347
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1706	Ramp Junction Speed (S), mi/h	50.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1893	Average Density (D), pc/mi/ln	18.7
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2680	72
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2995	80
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.71	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	30.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.435
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2995	Ramp Junction Speed (S), mi/h	49.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	30.4
Level of Service (LOS)	D		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2680	46
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2995	51
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.73	0.03

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	29.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.403
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	49.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2995	Ramp Junction Speed (S), mi/h	49.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3046	Average Density (D), pc/mi/ln	30.6
Level of Service (LOS)	D		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1432	16
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1600	18
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.38	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.430
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1600	Ramp Junction Speed (S), mi/h	49.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.2
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1432	95
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1600	106
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.41	0.05

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	15.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.310
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1600	Ramp Junction Speed (S), mi/h	51.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1706	Average Density (D), pc/mi/ln	16.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2726	73
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3046	82
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.74	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.376
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3046	Ramp Junction Speed (S), mi/h	50.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3128	Average Density (D), pc/mi/ln	31.2
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB off ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1448	13
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1618	15
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.39	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.364
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1618	Ramp Junction Speed (S), mi/h	50.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.1
Level of Service (LOS)	B		

PM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2680	72
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2995	80
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.71	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	30.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.435
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2995	Ramp Junction Speed (S), mi/h	49.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	30.4
Level of Service (LOS)	D		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2680	46
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2995	51
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.73	0.03

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	29.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.403
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	49.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2995	Ramp Junction Speed (S), mi/h	49.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3046	Average Density (D), pc/mi/ln	30.6
Level of Service (LOS)	D		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1432	16
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1600	18
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.38	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.430
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1600	Ramp Junction Speed (S), mi/h	49.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.2
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1432	95
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1600	106
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.41	0.05

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	15.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.310
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1600	Ramp Junction Speed (S), mi/h	51.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1706	Average Density (D), pc/mi/ln	16.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2726	73
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3046	82
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.74	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.376
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3046	Ramp Junction Speed (S), mi/h	50.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3128	Average Density (D), pc/mi/ln	31.2
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB off ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1448	13
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1618	15
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.39	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_s)	0.364
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1618	Ramp Junction Speed (S), mi/h	50.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.1
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Existing configuration		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Left

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1527	167
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1706	187
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.45	0.09

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	20.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.347
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1706	Ramp Junction Speed (S), mi/h	50.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1893	Average Density (D), pc/mi/ln	18.7
Level of Service (LOS)	C		

Appendix B

Existing Configuration

Roundabout analysis

(SIDRA)

Year 2017

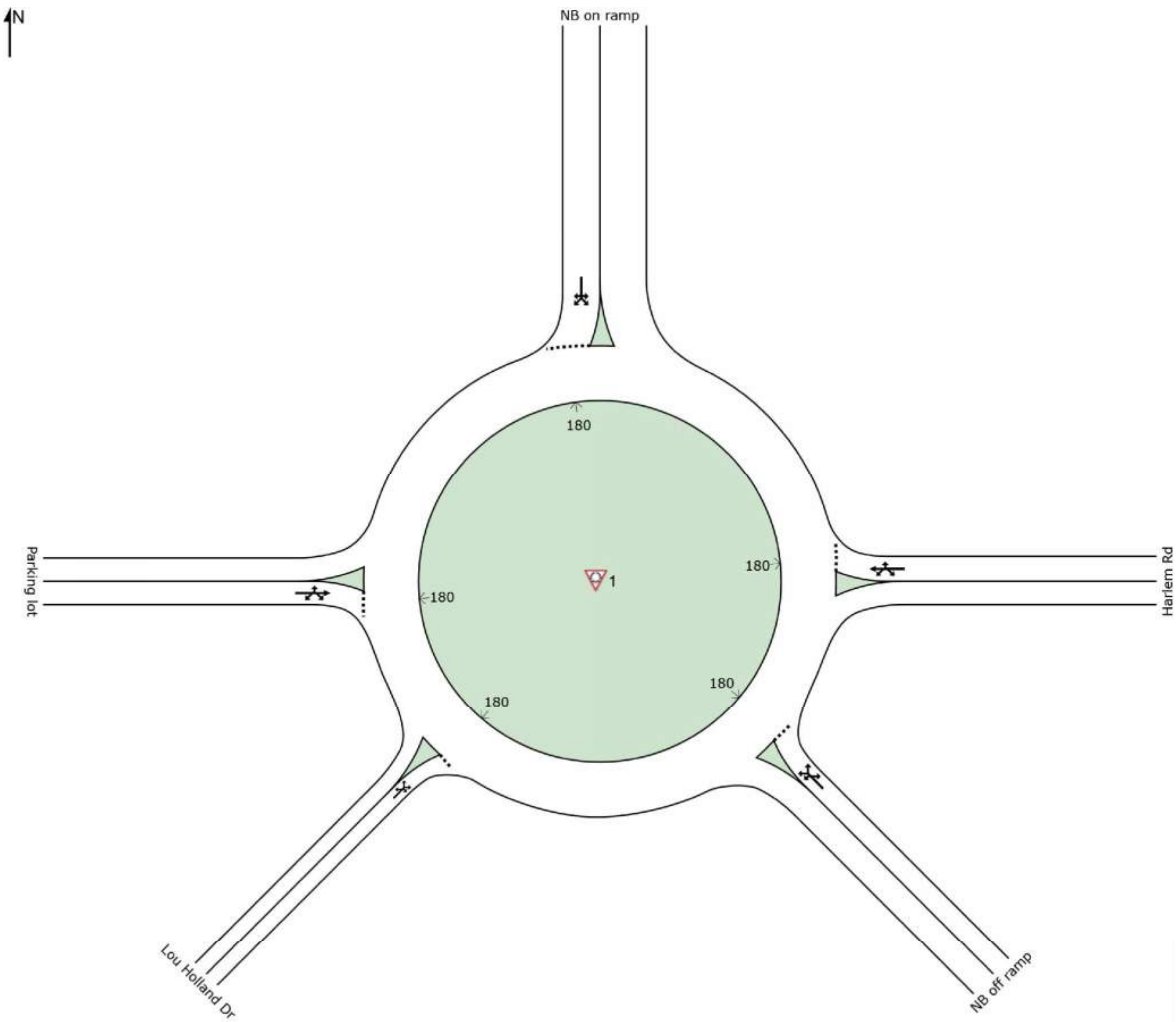
AM Peak

SITE LAYOUT

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



INPUT VOLUMES

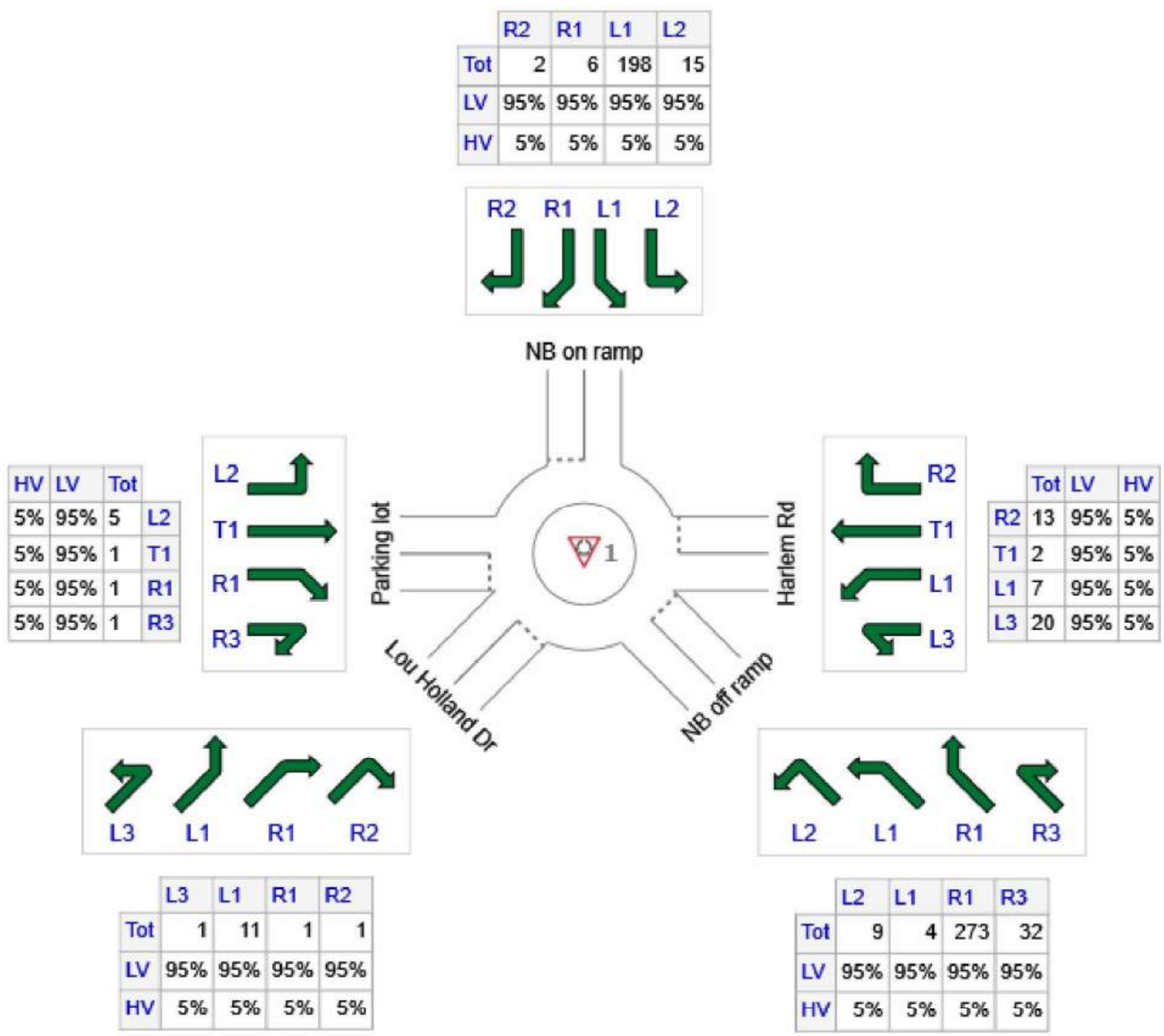
Vehicles and pedestrians per 60 minutes

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
SE: NB off ramp	318	302	16
E: Harlem Rd	42	40	2
N: NB on ramp	221	210	11
W: Parking lot	8	8	0
SW: Lou Holland Dr	14	13	1
Total	603	573	30

LANE FLOWS

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Approach Lane Flows (veh/h)

SouthEast: NB off ramp

Mov. From SE To Exit:	L2 SW	L1 W	R1 N	R3 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	4	290	34	338	5.0	1263	0.268	100	NA	NA
Approach	10	4	290	34	338	5.0		0.268			

East: Harlem Rd

Mov. From E To Exit:	L3 SE	L1 SW	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	22	8	2	14	46	5.0	930	0.049	100	NA	NA
Approach	22	8	2	14	46	5.0		0.049			

North: NB on ramp

Mov. From N To Exit:	L2 E	L1 SE	R1 SW	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	215	7	2	240	5.0	1251	0.192	100	NA	NA
Approach	16	215	7	2	240	5.0		0.192			

West: Parking lot

Mov. From W To Exit:	L2 N	T1 E	R1 SE	R3 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	1	1	1	9	5.0	977	0.009	100	NA	NA
Approach	5	1	1	1	9	5.0		0.009			

SouthWest: Lou Holland Dr

Mov. From SW To Exit:	L3 W	L1 N	R1 E	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	12	1	1	15	5.0	994	0.015	100	NA	NA
Approach	1	12	1	1	15	5.0		0.015			

	Total	%HV	Deg.Satn (v/c)
Intersection	648	5.0	0.268

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

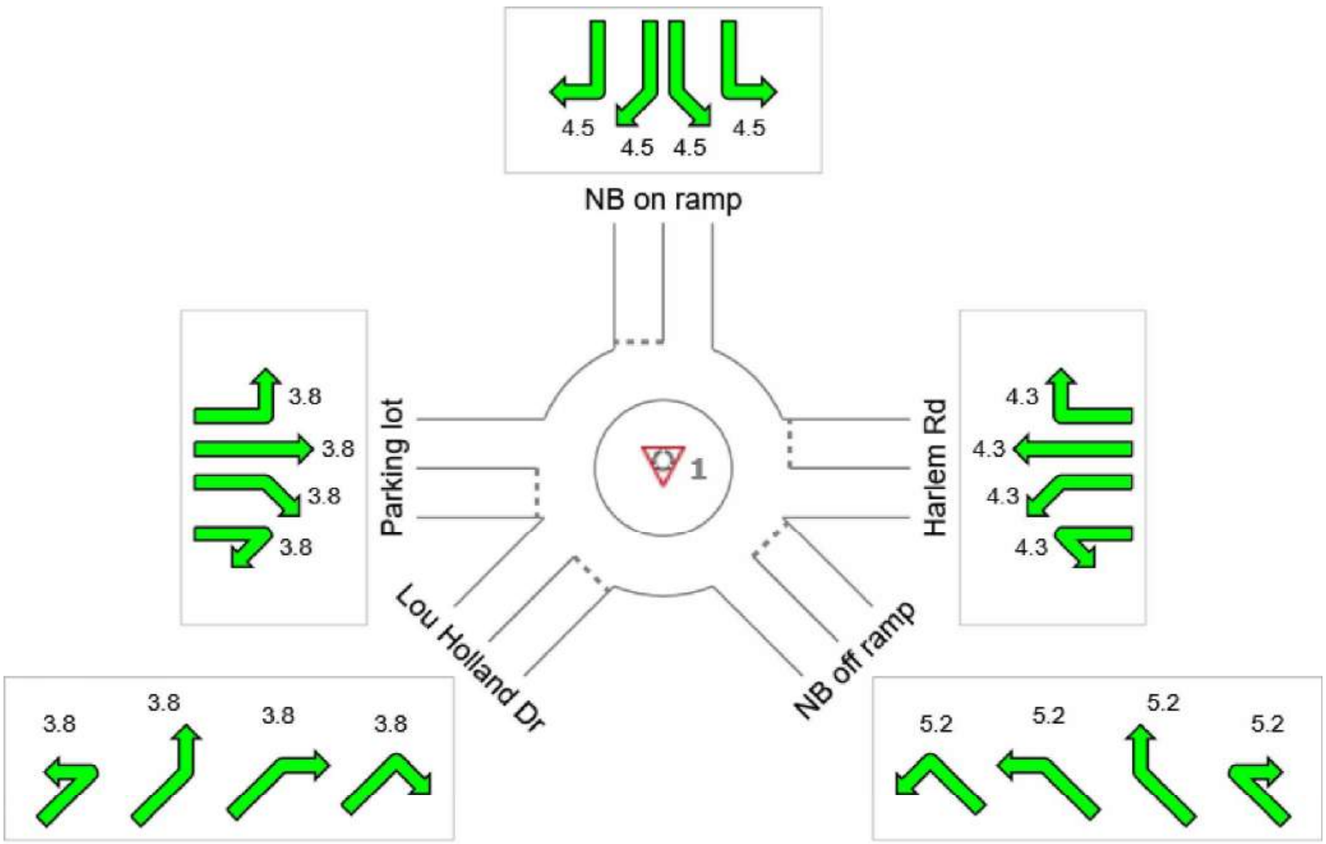
Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
Delay (Control)	5.2	4.3	4.5	3.8	3.8	4.8
LOS	A	A	A	A	A	A



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

LANE LEVEL OF SERVICE

Lane Level of Service

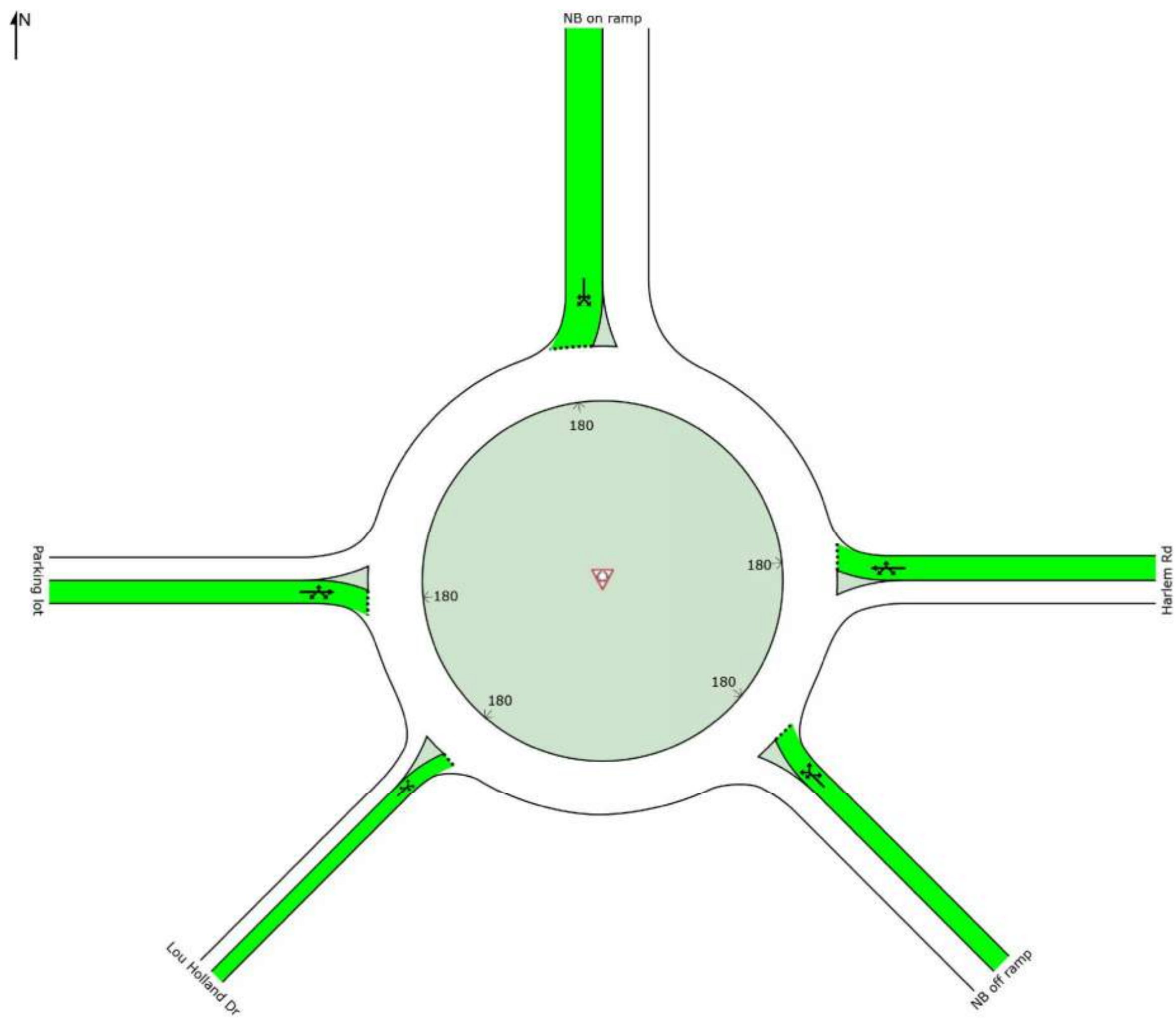
Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
LOS	A	A	A	A	A	A



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

QUEUE DISTANCE (%ILE)

95% Back of Queue Distance per lane (feet)

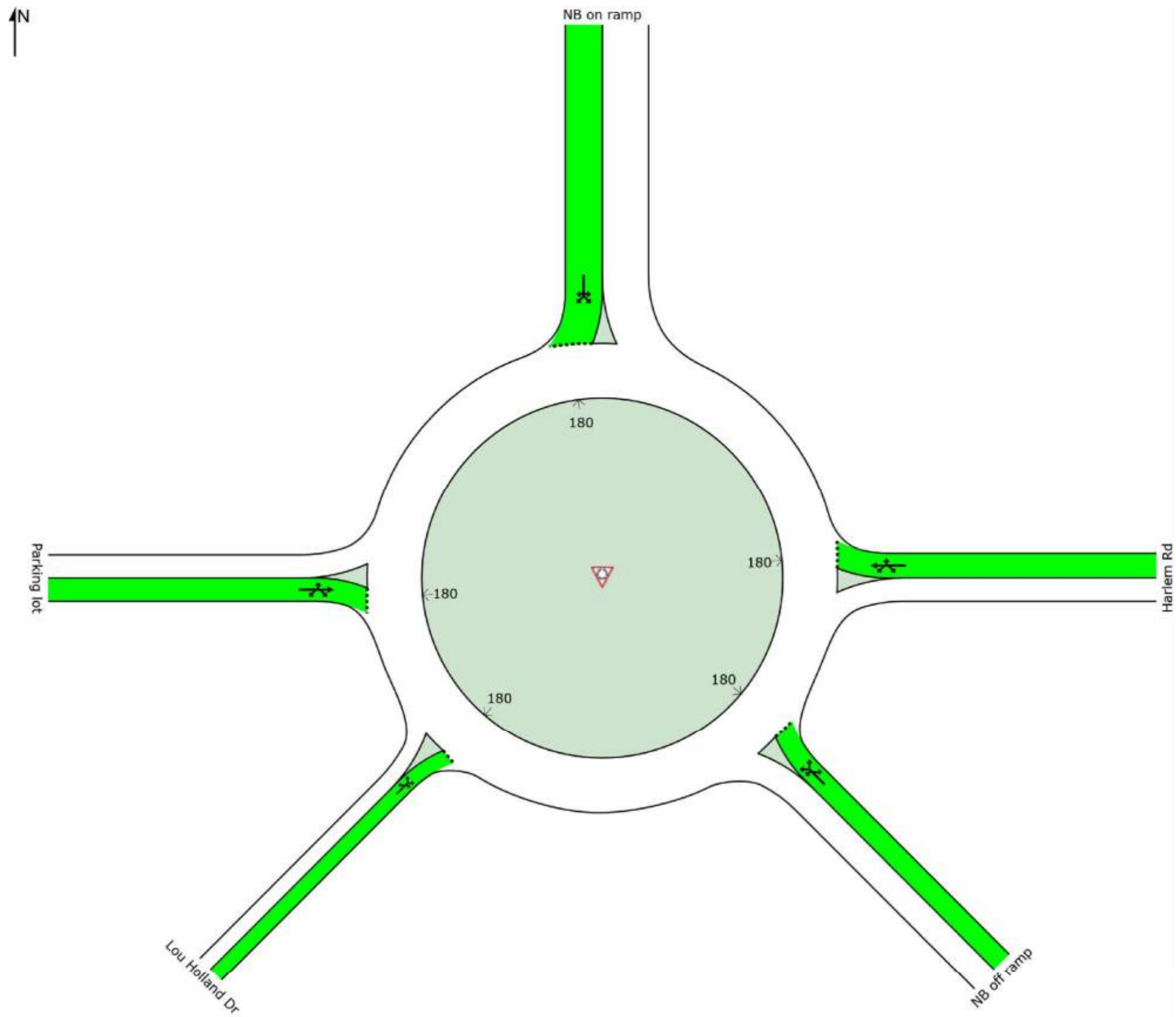
Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
Vehicle Queue (%ile)	37	5	24	1	2	37



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

LANE SUMMARY

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Lane Use and Performance														
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: NB off ramp													
Lane 1[d]	338	5.0	1263	0.268	100	5.2	LOS A	1.4	36.7	Full	1600	0.0	0.0
Approach	338	5.0		0.268		5.2	LOS A	1.4	36.7				
East: Harlem Rd													
Lane 1[d]	46	5.0	930	0.049	100	4.3	LOS A	0.2	5.0	Full	1600	0.0	0.0
Approach	46	5.0		0.049		4.3	LOS A	0.2	5.0				
North: NB on ramp													
Lane 1[d]	240	5.0	1251	0.192	100	4.5	LOS A	0.9	24.0	Full	1600	0.0	0.0
Approach	240	5.0		0.192		4.5	LOS A	0.9	24.0				
West: Parking lot													
Lane 1[d]	9	5.0	977	0.009	100	3.8	LOS A	0.0	0.9	Full	1600	0.0	0.0
Approach	9	5.0		0.009		3.8	LOS A	0.0	0.9				
SouthWest: Lou Holland Dr													
Lane 1[d]	15	5.0	994	0.015	100	3.8	LOS A	0.1	1.5	Full	1600	0.0	0.0
Approach	15	5.0		0.015		3.8	LOS A	0.1	1.5				
Intersection	648	5.0		0.268		4.8	LOS A	1.4	36.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

MOVEMENT SUMMARY

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
SouthEast: NB off ramp											
3x	L2	10	5.0	0.268	5.2	LOS A	1.4	36.7	0.17	0.06	34.7
3ax	L1	4	5.0	0.268	5.2	LOS A	1.4	36.7	0.17	0.06	33.9
18ax	R1	290	5.0	0.268	5.2	LOS A	1.4	36.7	0.17	0.06	33.2
18bx	R3	34	5.0	0.268	5.2	LOS A	1.4	36.7	0.17	0.06	31.7
Approach		338	5.0	0.268	5.2	LOS A	1.4	36.7	0.17	0.06	33.1
East: Harlem Rd											
1b	L3	22	5.0	0.049	4.3	LOS A	0.2	5.0	0.43	0.30	35.5
1a	L1	8	5.0	0.049	4.3	LOS A	0.2	5.0	0.43	0.30	34.7
6	T1	2	5.0	0.049	4.3	LOS A	0.2	5.0	0.43	0.30	34.8
16	R2	14	5.0	0.049	4.3	LOS A	0.2	5.0	0.43	0.30	33.3
Approach		46	5.0	0.049	4.3	LOS A	0.2	5.0	0.43	0.30	34.6
North: NB on ramp											
7	L2	16	5.0	0.192	4.5	LOS A	0.9	24.0	0.18	0.07	35.0
7a	L1	215	5.0	0.192	4.5	LOS A	0.9	24.0	0.18	0.07	34.3
14a	R1	7	5.0	0.192	4.5	LOS A	0.9	24.0	0.18	0.07	33.9
14	R2	2	5.0	0.192	4.5	LOS A	0.9	24.0	0.18	0.07	32.9
Approach		240	5.0	0.192	4.5	LOS A	0.9	24.0	0.18	0.07	34.3
West: Parking lot											
5	L2	5	5.0	0.009	3.8	LOS A	0.0	0.9	0.39	0.22	36.0
2	T1	1	5.0	0.009	3.8	LOS A	0.0	0.9	0.39	0.22	35.3
12a	R1	1	5.0	0.009	3.8	LOS A	0.0	0.9	0.39	0.22	34.8
12b	R3	1	5.0	0.009	3.8	LOS A	0.0	0.9	0.39	0.22	33.3
Approach		9	5.0	0.009	3.8	LOS A	0.0	0.9	0.39	0.22	35.4
SouthWest: Lou Holland Dr											
5bx	L3	1	5.0	0.015	3.8	LOS A	0.1	1.5	0.38	0.22	35.8
5ax	L1	12	5.0	0.015	3.8	LOS A	0.1	1.5	0.38	0.22	34.9
12ax	R1	1	5.0	0.015	3.8	LOS A	0.1	1.5	0.38	0.22	34.5
12x	R2	1	5.0	0.015	3.8	LOS A	0.1	1.5	0.38	0.22	33.5
Approach		15	5.0	0.015	3.8	LOS A	0.1	1.5	0.38	0.22	34.9
All Vehicles		648	5.0	0.268	4.8	LOS A	1.4	36.7	0.20	0.09	33.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	33.7 mph	33.7 mph
Travel Distance (Total)	422.5 veh-mi/h	507.0 pers-mi/h
Travel Time (Total)	12.5 veh-h/h	15.0 pers-h/h
Demand Flows (Total)	648 veh/h	777 pers/h
Percent Heavy Vehicles (Demand)	5.0 %	
Degree of Saturation	0.268	
Practical Spare Capacity	217.5 %	
Effective Intersection Capacity	2420 veh/h	
Control Delay (Total)	0.87 veh-h/h	1.05 pers-h/h
Control Delay (Average)	4.8 sec	4.8 sec
Control Delay (Worst Lane)	5.2 sec	
Control Delay (Worst Movement)	5.2 sec	5.2 sec
Geometric Delay (Average)	0.0 sec	
Stop-Line Delay (Average)	4.8 sec	
Idling Time (Average)	3.7 sec	
Intersection Level of Service (LOS)	LOS A	
95% Back of Queue - Vehicles (Worst Lane)	1.4 veh	
95% Back of Queue - Distance (Worst Lane)	36.7 ft	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	55 veh/h	66 pers/h
Effective Stop Rate	0.09 per veh	0.09 per pers
Proportion Queued	0.20	0.20
Performance Index	20.9	20.9
Cost (Total)	176.89 $/h	176.89 $/h
Fuel Consumption (Total)	16.9 gal/h	
Carbon Dioxide (Total)	152.2 kg/h	
Hydrocarbons (Total)	0.012 kg/h	
Carbon Monoxide (Total)	0.163 kg/h	
NOx (Total)	0.310 kg/h	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values		
Performance Measure	**Vehicles**	**Persons**
Demand Flows (Total)	310,990 veh/y	373,188 pers/y
Delay	419 veh-h/y	503 pers-h/y
Effective Stops	26,528 veh/y	31,833 pers/y
Travel Distance	202,809 veh-mi/y	243,371 pers-mi/y
Travel Time	6,018 veh-h/y	7,221 pers-h/y
Cost	84,906 $/y	84,906 $/y
Fuel Consumption	8,108 gal/y	
Carbon Dioxide	73,032 kg/y	
Hydrocarbons	6 kg/y	
Carbon Monoxide	78 kg/y	

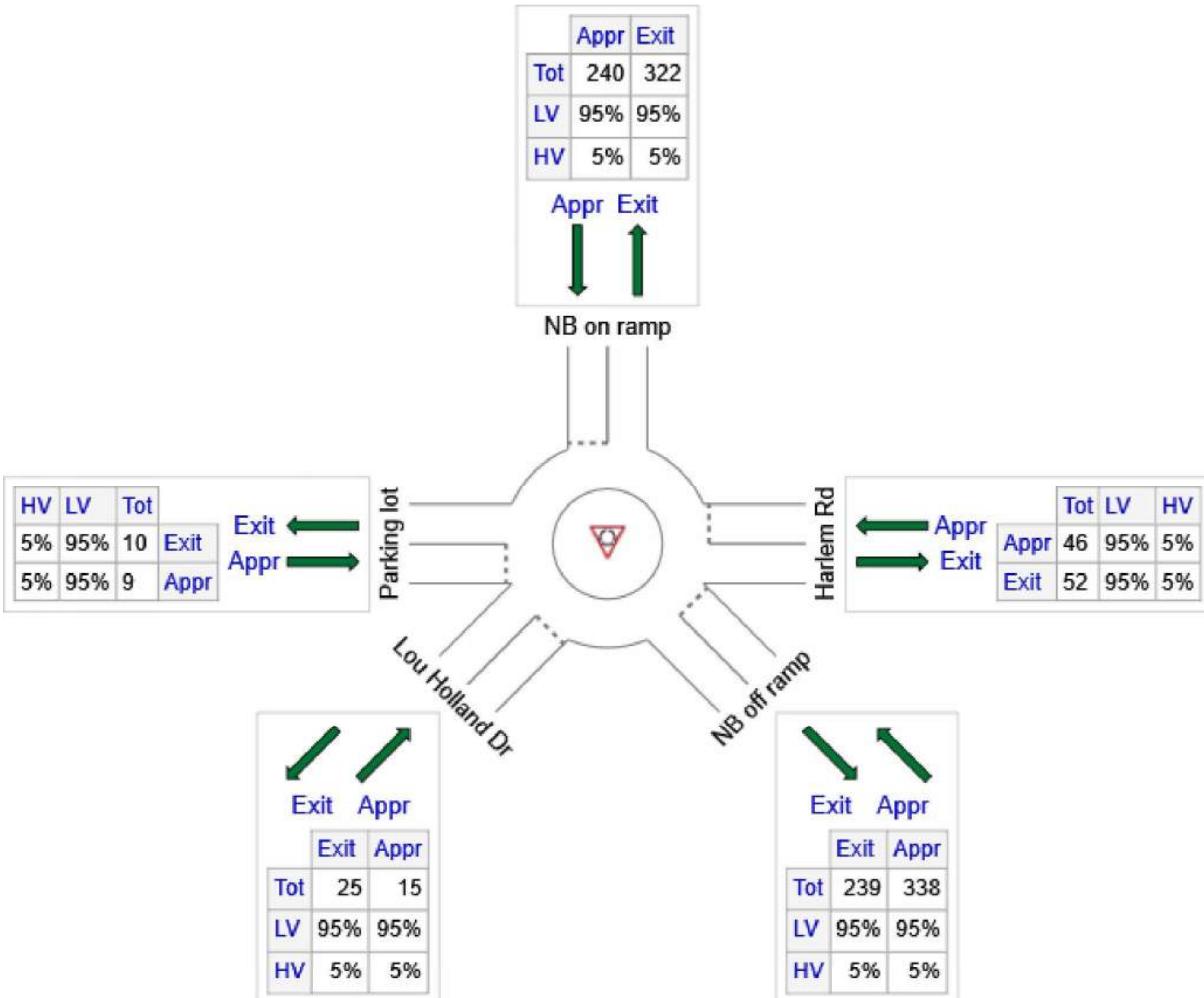
APPROACH AND EXIT FLOWS

Total Values for All Movement Classes Based on Site Demand Flow Rates (veh/h)

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



NB on ramp:

	Appr	Exit
Tot	240	322
LV	95%	95%
HV	5%	5%

Parking lot:

HV	LV	Tot	
5%	95%	10	Exit
5%	95%	9	Appr

Harlem Rd:

	Tot	LV	HV
Appr	46	95%	5%
Exit	52	95%	5%

Lou Holland Dr:

	Exit	Appr
Tot	25	15
LV	95%	95%
HV	5%	5%

NB off ramp:

	Exit	Appr
Tot	239	338
LV	95%	95%
HV	5%	5%

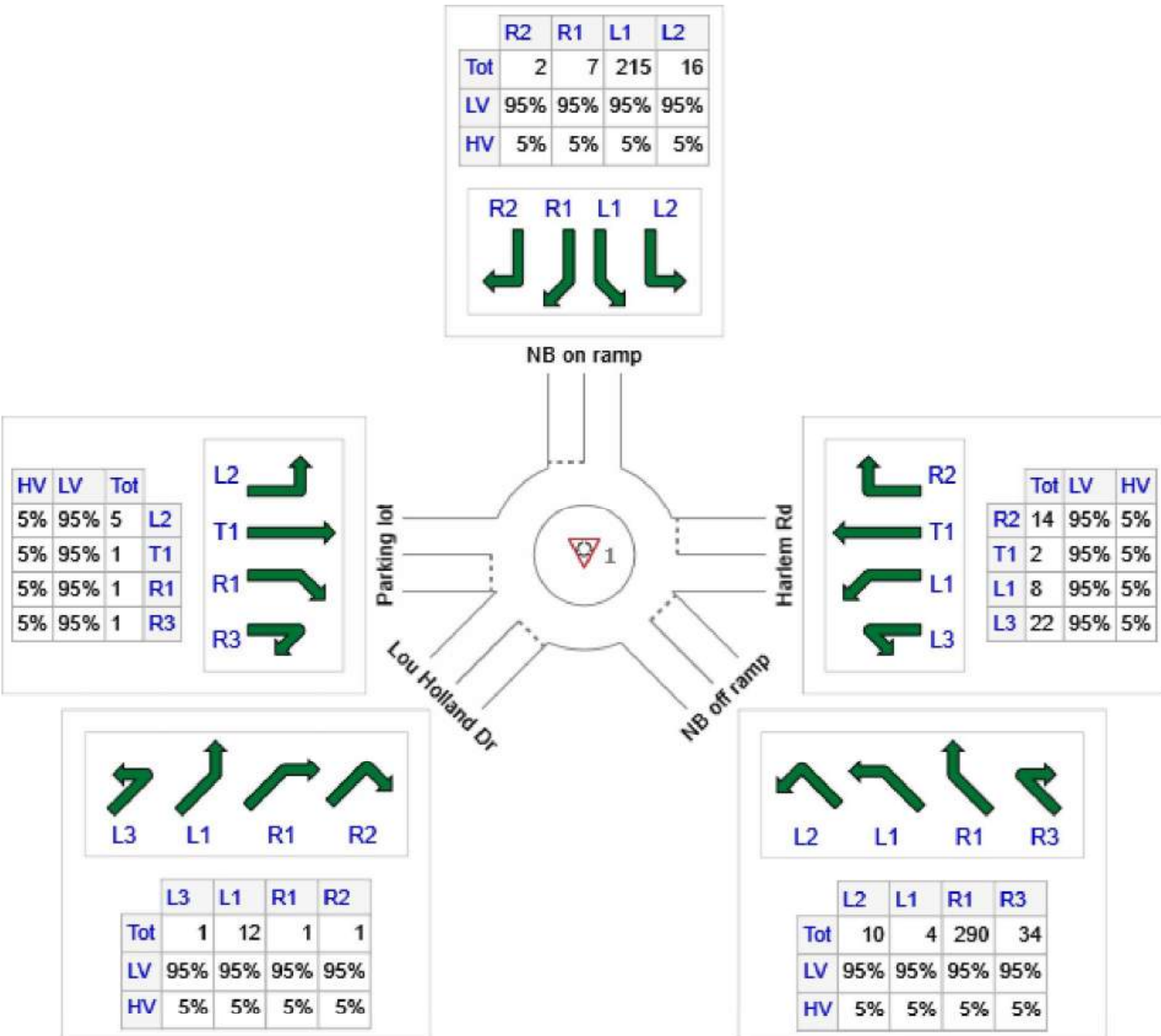
OD MOVEMENT DEMAND FLOWS

Site Origin - Destination Movement Demand Flow Rates (veh/h) and Pedestrian Flow Rates (ped/h)

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
SE: NB off ramp	338	321	17
E: Harlem Rd	46	43	2
N: NB on ramp	240	228	12
W: Parking lot	9	8	0
SW: Lou Holland Dr	15	14	1
Total	648	616	32

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LANE LEVEL OF SERVICE

Lane Level of Service

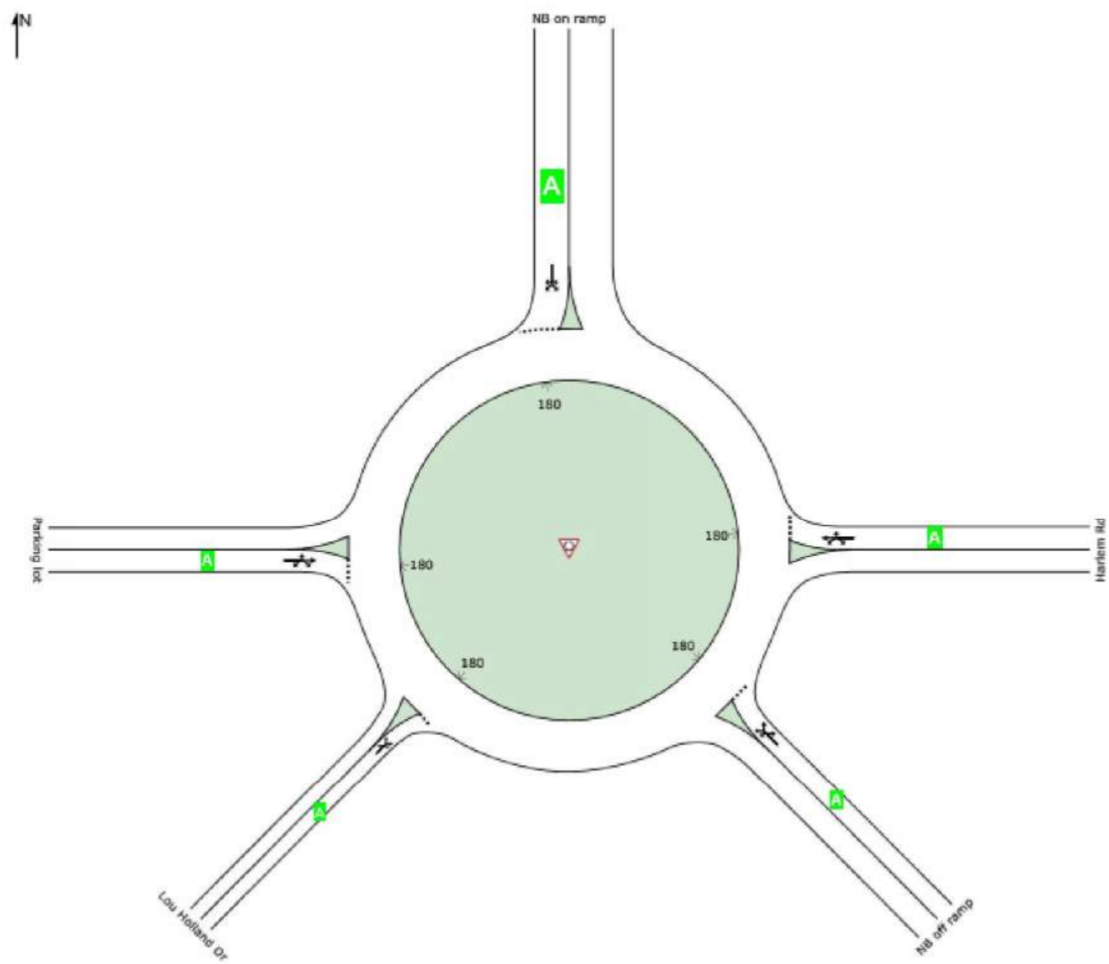
Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
LOS	A	A	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

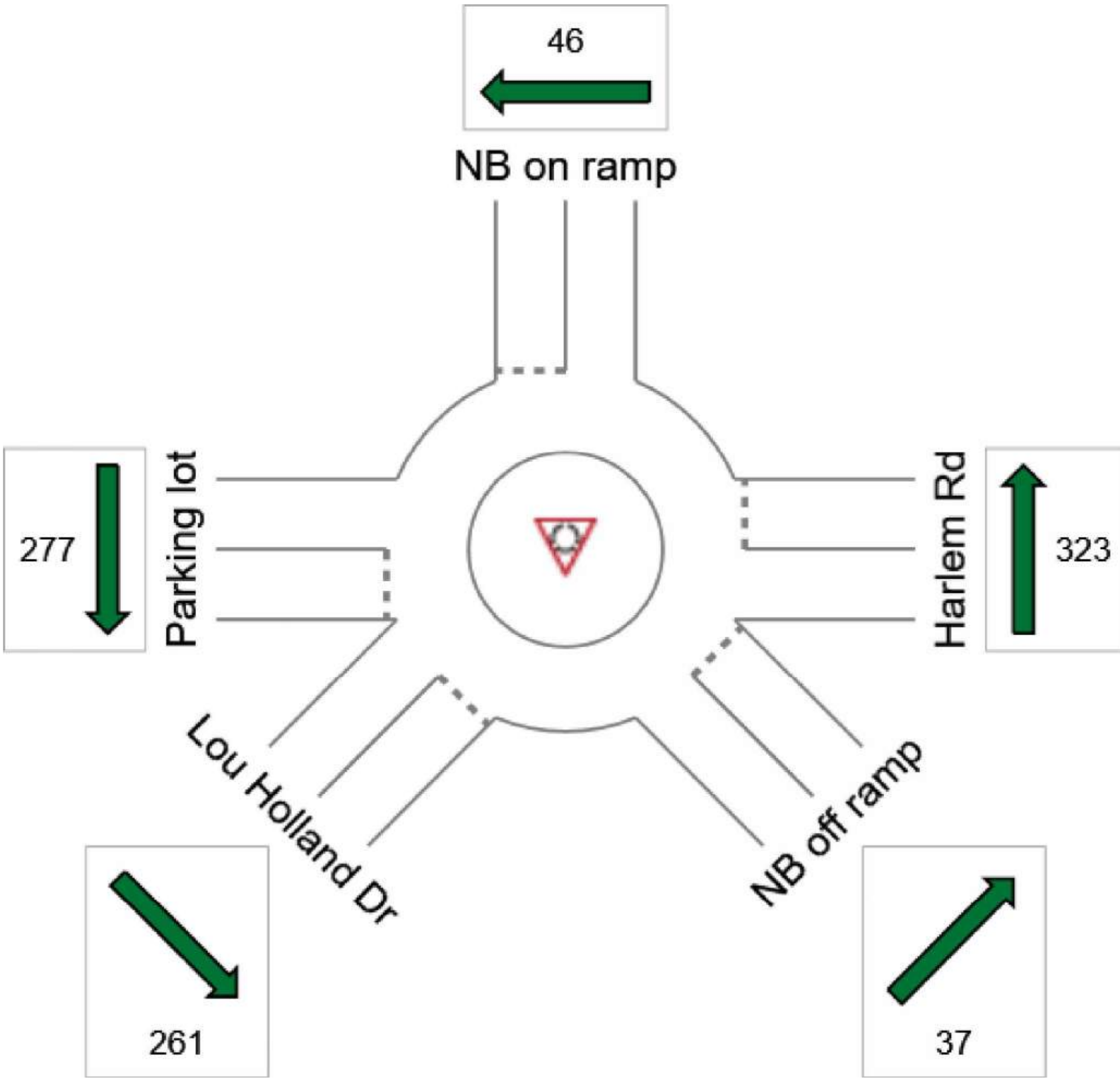
ROUNDABOUT CIRCULATING FLOWS

Total Values for All Movement Classes Based on Site Arrival Flow Rates including Capacity Constraint Effects (veh/h)

Site: 1 [US 169 - Roundabout analysis AM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



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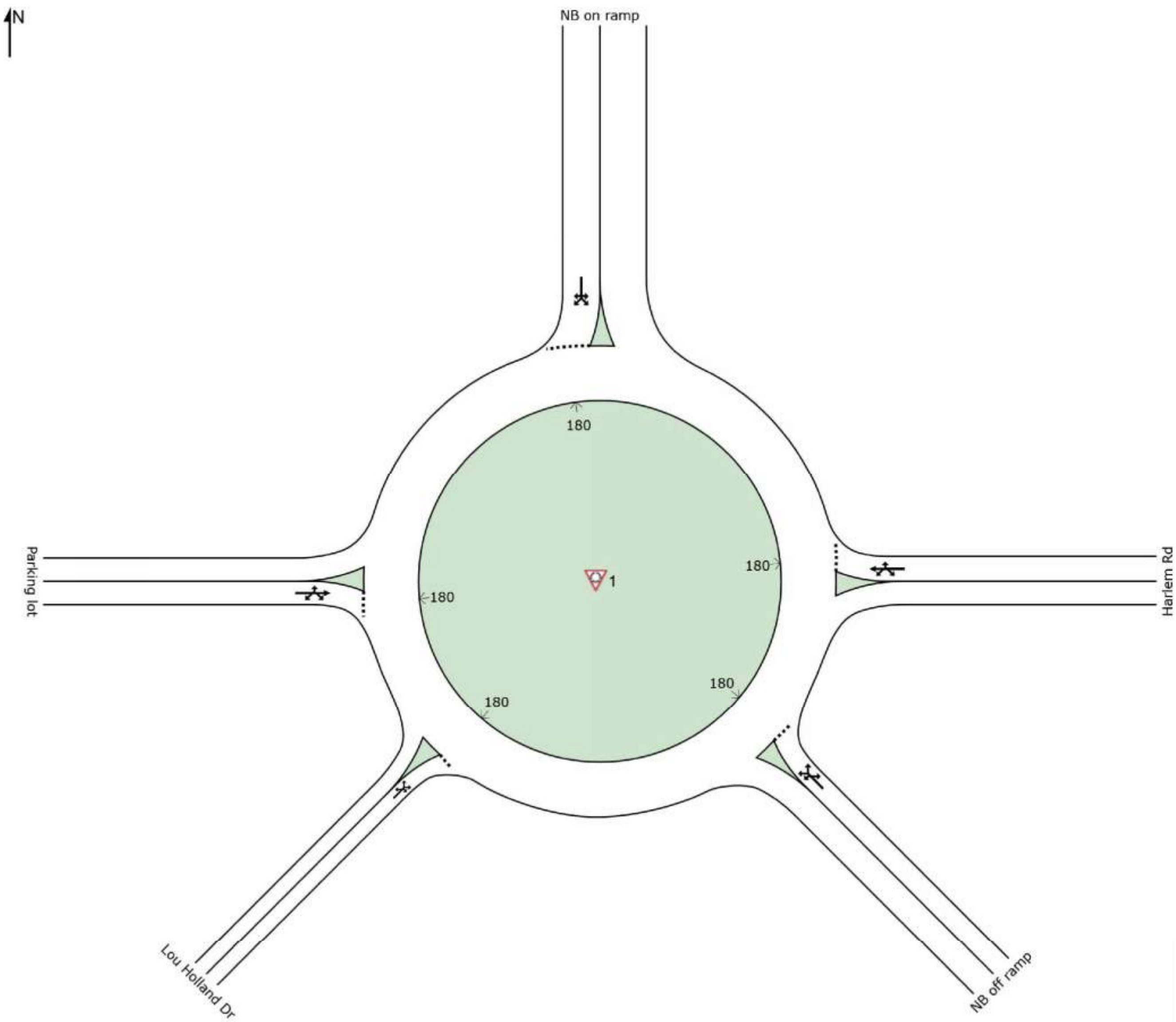
PM Peak

SITE LAYOUT

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



INPUT VOLUMES

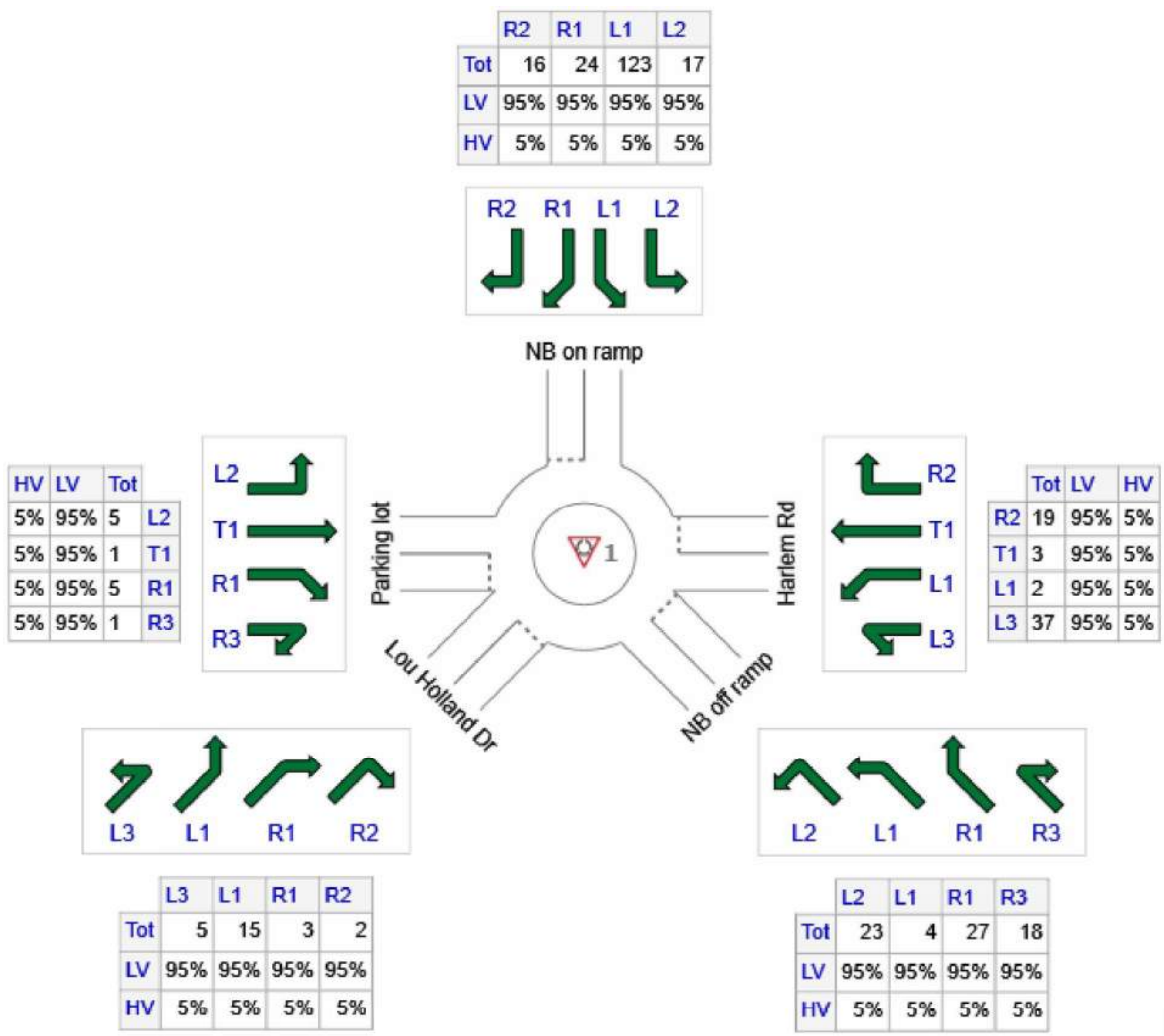
Vehicles and pedestrians per 60 minutes

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
SE: NB off ramp	72	68	4
E: Harlem Rd	61	58	3
N: NB on ramp	180	171	9
W: Parking lot	12	11	1
SW: Lou Holland Dr	25	24	1
Total	350	333	18

LANE FLOWS

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Approach Lane Flows (veh/h)

SouthEast: NB off ramp

Mov. From SE To Exit:	L2 SW	L1 W	R1 N	R3 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	24	4	29	19	77	5.0	1246	0.061	100	NA	NA
Approach	24	4	29	19	77	5.0		0.061			

East: Harlem Rd

Mov. From E To Exit:	L3 SE	L1 SW	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	40	2	3	21	66	5.0	1201	0.055	100	NA	NA
Approach	40	2	3	21	66	5.0		0.055			

North: NB on ramp

Mov. From N To Exit:	L2 E	L1 SE	R1 SW	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	18	134	26	17	196	5.0	1207	0.162	100	NA	NA
Approach	18	134	26	17	196	5.0		0.162			

West: Parking lot

Mov. From W To Exit:	L2 N	T1 E	R1 SE	R3 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	1	5	1	13	5.0	1011	0.013	100	NA	NA
Approach	5	1	5	1	13	5.0		0.013			

SouthWest: Lou Holland Dr

Mov. From SW To Exit:	L3 W	L1 N	R1 E	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	16	3	2	27	5.0	1056	0.026	100	NA	NA
Approach	5	16	3	2	27	5.0		0.026			

	Total	%HV	Deg.Satn (v/c)
Intersection	378	5.0	0.162

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

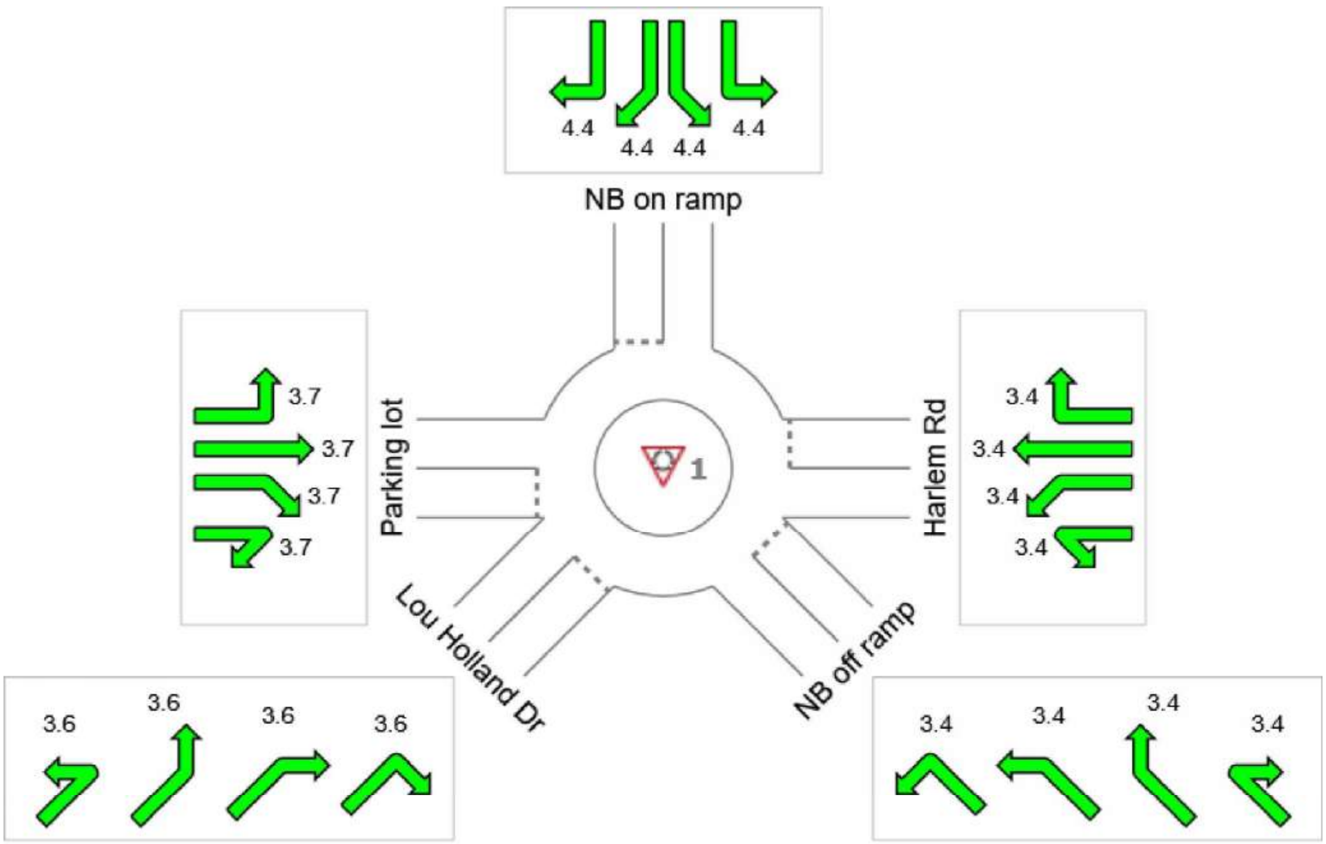
Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
Delay (Control)	3.4	3.4	4.4	3.7	3.6	3.9
LOS	A	A	A	A	A	A



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

LANE LEVEL OF SERVICE

Lane Level of Service

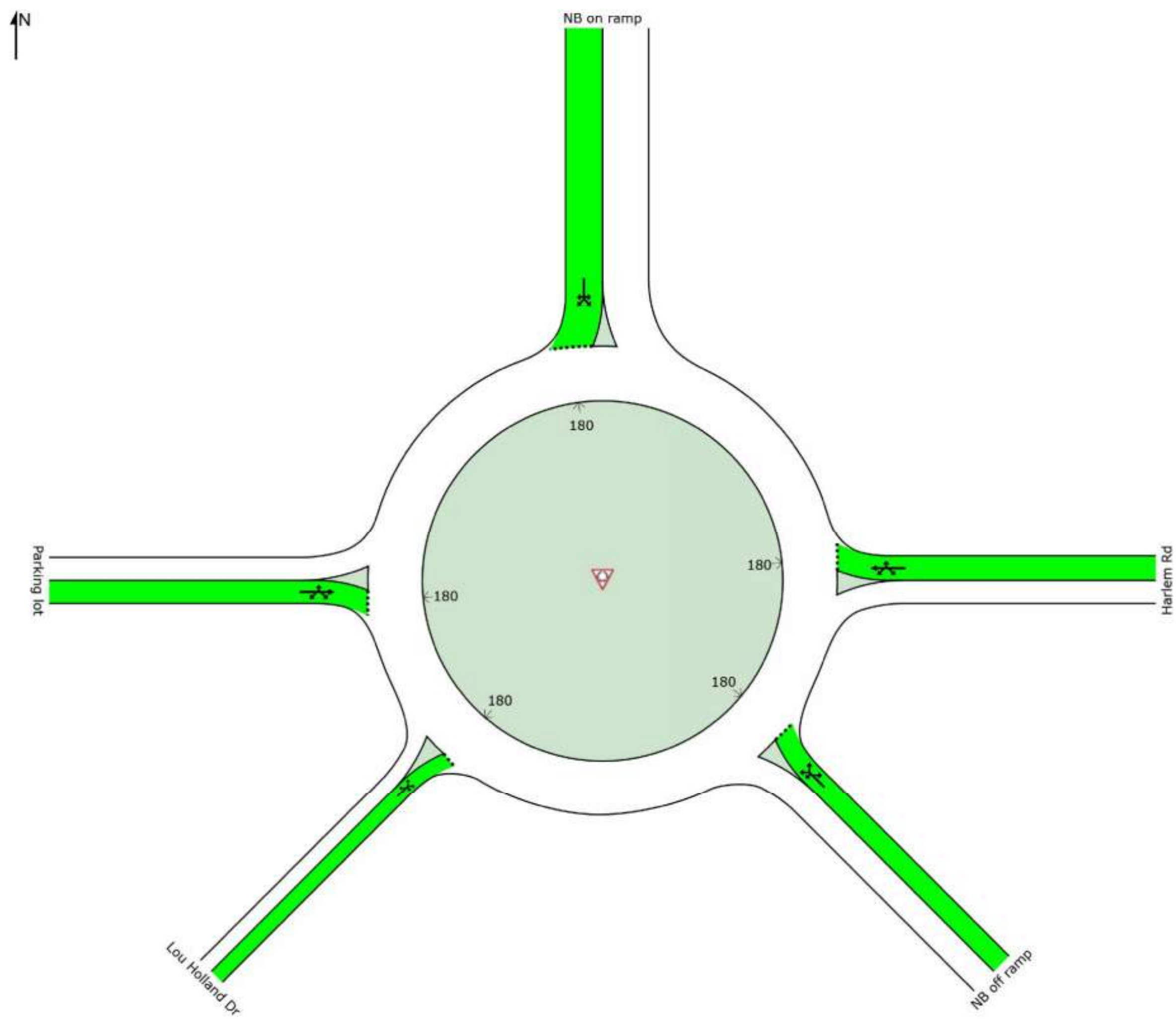
Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
LOS	A	A	A	A	A	A



Colour code based on Level of Service

LOS A   LOS B   LOS C   LOS D   LOS E   LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

QUEUE DISTANCE (%ILE)

95% Back of Queue Distance per lane (feet)

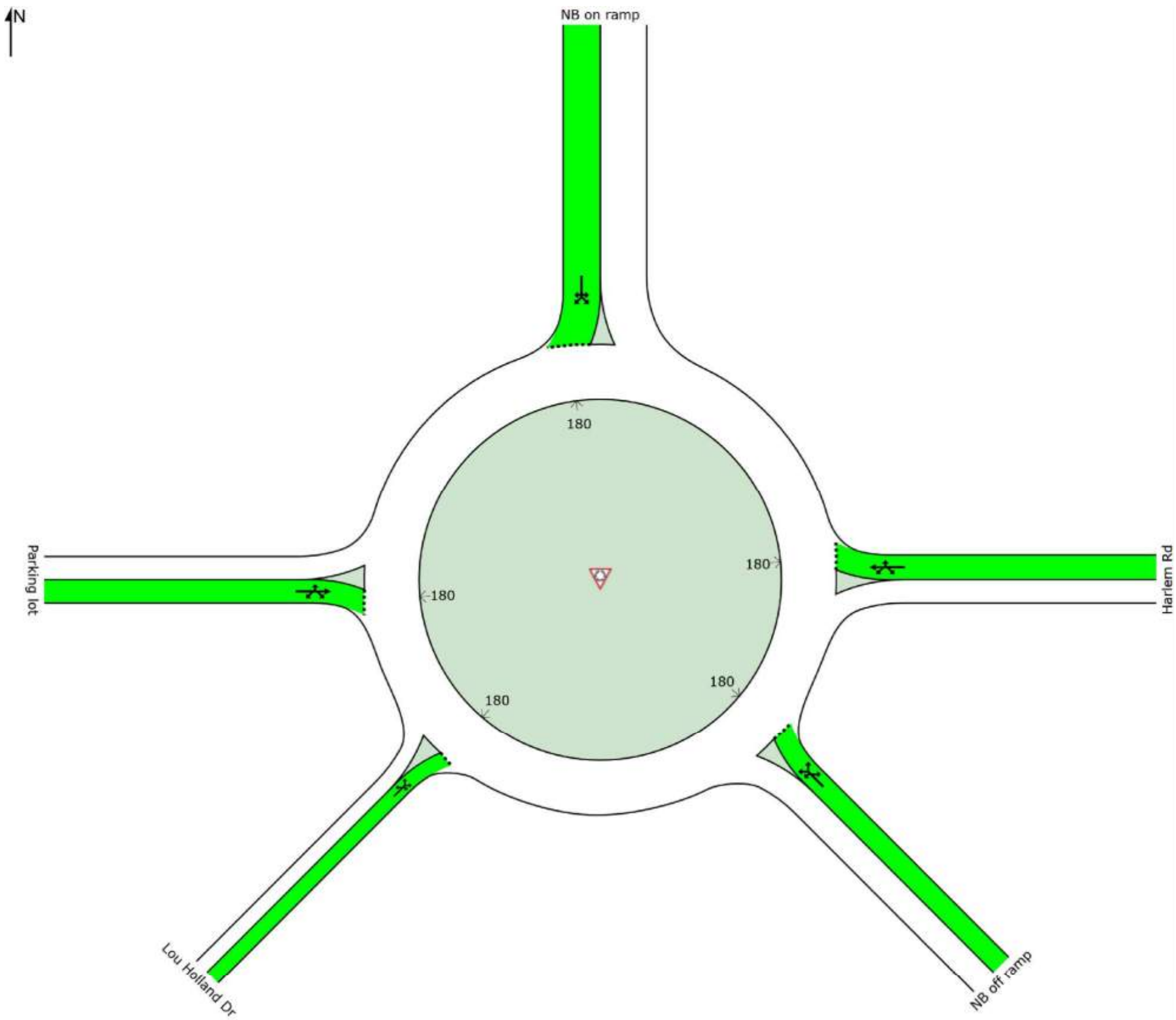
Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
Vehicle Queue (%ile)	7	6	19	1	3	19



Colour code based on Queue Storage Ratio

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

LANE SUMMARY

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: NB off ramp													
Lane 1[d]	77	5.0	1246	0.061	100	3.4	LOS A	0.3	6.7	Full	1600	0.0	0.0
Approach	77	5.0		0.061		3.4	LOS A	0.3	6.7				
East: Harlem Rd													
Lane 1[d]	66	5.0	1201	0.055	100	3.4	LOS A	0.2	6.0	Full	1600	0.0	0.0
Approach	66	5.0		0.055		3.4	LOS A	0.2	6.0				
North: NB on ramp													
Lane 1[d]	196	5.0	1207	0.162	100	4.4	LOS A	0.7	19.4	Full	1600	0.0	0.0
Approach	196	5.0		0.162		4.4	LOS A	0.7	19.4				
West: Parking lot													
Lane 1[d]	13	5.0	1011	0.013	100	3.7	LOS A	0.0	1.3	Full	1600	0.0	0.0
Approach	13	5.0		0.013		3.7	LOS A	0.0	1.3				
SouthWest: Lou Holland Dr													
Lane 1[d]	27	5.0	1056	0.026	100	3.6	LOS A	0.1	2.6	Full	1600	0.0	0.0
Approach	27	5.0		0.026		3.6	LOS A	0.1	2.6				
Intersection	378	5.0		0.162		3.9	LOS A	0.7	19.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

MOVEMENT SUMMARY

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
SouthEast: NB off ramp											
3x	L2	24	5.0	0.061	3.4	LOS A	0.3	6.7	0.16	0.06	34.3
3ax	L1	4	5.0	0.061	3.4	LOS A	0.3	6.7	0.16	0.06	33.6
18ax	R1	29	5.0	0.061	3.4	LOS A	0.3	6.7	0.16	0.06	32.8
18bx	R3	19	5.0	0.061	3.4	LOS A	0.3	6.7	0.16	0.06	31.4
Approach		77	5.0	0.061	3.4	LOS A	0.3	6.7	0.16	0.06	33.0
East: Harlem Rd											
1b	L3	40	5.0	0.055	3.4	LOS A	0.2	6.0	0.22	0.09	35.8
1a	L1	2	5.0	0.055	3.4	LOS A	0.2	6.0	0.22	0.09	35.0
6	T1	3	5.0	0.055	3.4	LOS A	0.2	6.0	0.22	0.09	35.0
16	R2	21	5.0	0.055	3.4	LOS A	0.2	6.0	0.22	0.09	33.6
Approach		66	5.0	0.055	3.4	LOS A	0.2	6.0	0.22	0.09	35.0
North: NB on ramp											
7	L2	18	5.0	0.162	4.4	LOS A	0.7	19.4	0.23	0.11	35.6
7a	L1	134	5.0	0.162	4.4	LOS A	0.7	19.4	0.23	0.11	34.9
14a	R1	26	5.0	0.162	4.4	LOS A	0.7	19.4	0.23	0.11	34.4
14	R2	17	5.0	0.162	4.4	LOS A	0.7	19.4	0.23	0.11	33.4
Approach		196	5.0	0.162	4.4	LOS A	0.7	19.4	0.23	0.11	34.7
West: Parking lot											
5	L2	5	5.0	0.013	3.7	LOS A	0.0	1.3	0.37	0.20	37.0
2	T1	1	5.0	0.013	3.7	LOS A	0.0	1.3	0.37	0.20	36.3
12a	R1	5	5.0	0.013	3.7	LOS A	0.0	1.3	0.37	0.20	35.7
12b	R3	1	5.0	0.013	3.7	LOS A	0.0	1.3	0.37	0.20	34.1
Approach		13	5.0	0.013	3.7	LOS A	0.0	1.3	0.37	0.20	36.1
SouthWest: Lou Holland Dr											
5bx	L3	5	5.0	0.026	3.6	LOS A	0.1	2.6	0.34	0.19	35.9
5ax	L1	16	5.0	0.026	3.6	LOS A	0.1	2.6	0.34	0.19	35.0
12ax	R1	3	5.0	0.026	3.6	LOS A	0.1	2.6	0.34	0.19	34.5
12x	R2	2	5.0	0.026	3.6	LOS A	0.1	2.6	0.34	0.19	33.6
Approach		27	5.0	0.026	3.6	LOS A	0.1	2.6	0.34	0.19	35.0
All Vehicles		378	5.0	0.162	3.9	LOS A	0.7	19.4	0.23	0.10	34.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

Intersection Performance - Hourly Values

Performance Measure	Vehicles		Persons	
Travel Speed (Average)	34.5	mph	34.5	mph
Travel Distance (Total)	249.9	veh-mi/h	299.9	pers-mi/h
Travel Time (Total)	7.2	veh-h/h	8.7	pers-h/h
Demand Flows (Total)	378	veh/h	454	pers/h
Percent Heavy Vehicles (Demand)	5.0	%		
Degree of Saturation	0.162			
Practical Spare Capacity	424.2	%		
Effective Intersection Capacity	2334	veh/h		
Control Delay (Total)	0.41	veh-h/h	0.50	pers-h/h
Control Delay (Average)	3.9	sec	3.9	sec
Control Delay (Worst Lane)	4.4	sec		
Control Delay (Worst Movement)	4.4	sec	4.4	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	3.9	sec		
Idling Time (Average)	2.8	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	0.7	veh		
95% Back of Queue - Distance (Worst Lane)	19.4	ft		
Queue Storage Ratio (Worst Lane)	0.00			
Total Effective Stops	39	veh/h	47	pers/h
Effective Stop Rate	0.10	per veh	0.10	per pers
Proportion Queued	0.23		0.23	
Performance Index	11.5		11.5	
Cost (Total)	111.41	$/h	111.41	$/h
Fuel Consumption (Total)	10.8	gal/h		
Carbon Dioxide (Total)	97.0	kg/h		
Hydrocarbons (Total)	0.008	kg/h		
Carbon Monoxide (Total)	0.108	kg/h		
NOx (Total)	0.206	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values

Performance Measure	Vehicles		Persons	
Demand Flows (Total)	181,676	veh/y	218,012	pers/y
Delay	198	veh-h/y	238	pers-h/y
Effective Stops	18,655	veh/y	22,386	pers/y
Travel Distance	119,966	veh-mi/y	143,959	pers-mi/y
Travel Time	3,479	veh-h/y	4,174	pers-h/y
Cost	53,478	$/y	53,478	$/y
Fuel Consumption	5,170	gal/y		
Carbon Dioxide	46,542	kg/y		
Hydrocarbons	4	kg/y		
Carbon Monoxide	52	kg/y		

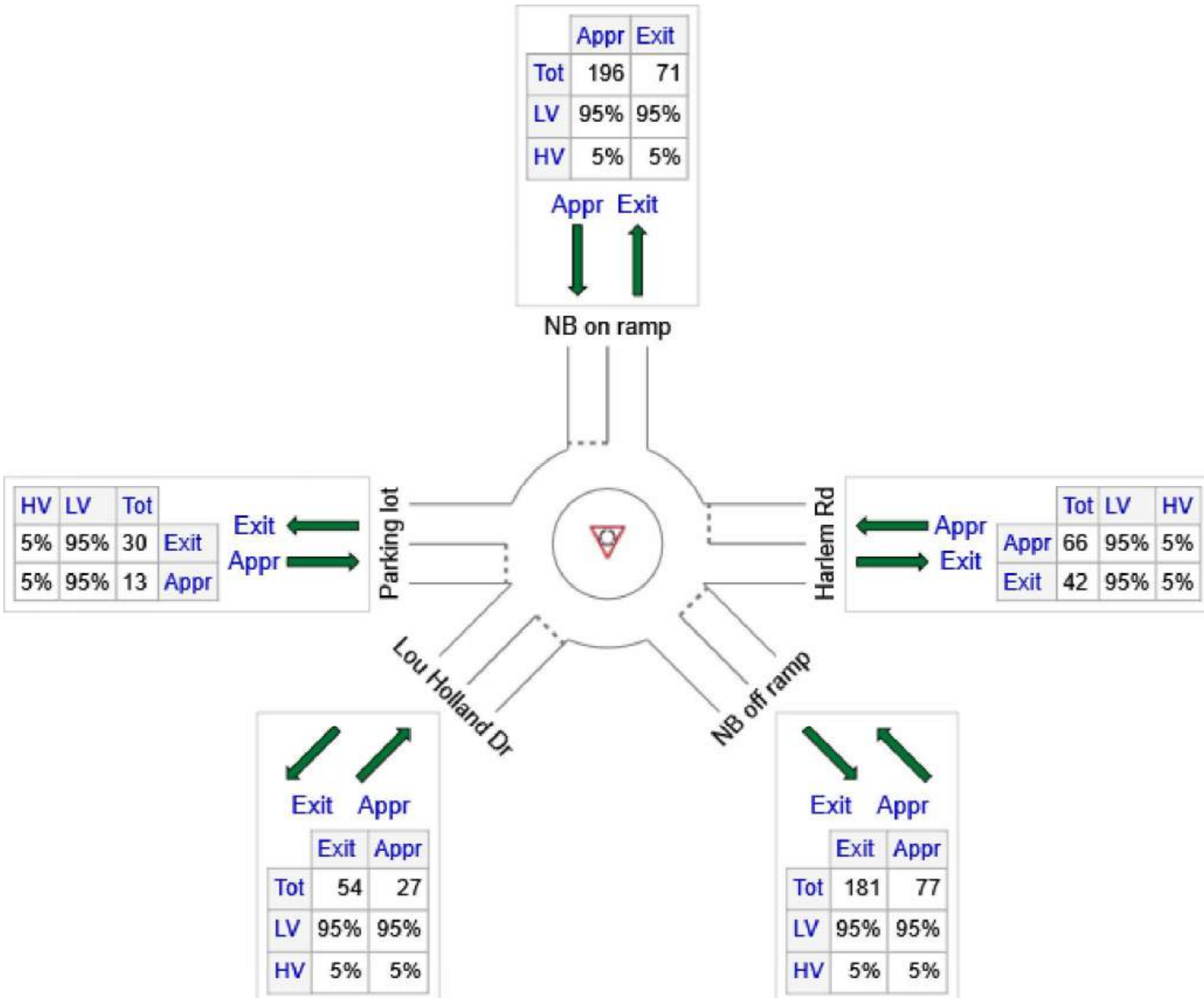
APPROACH AND EXIT FLOWS

Total Values for All Movement Classes Based on Site Demand Flow Rates (veh/h)

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



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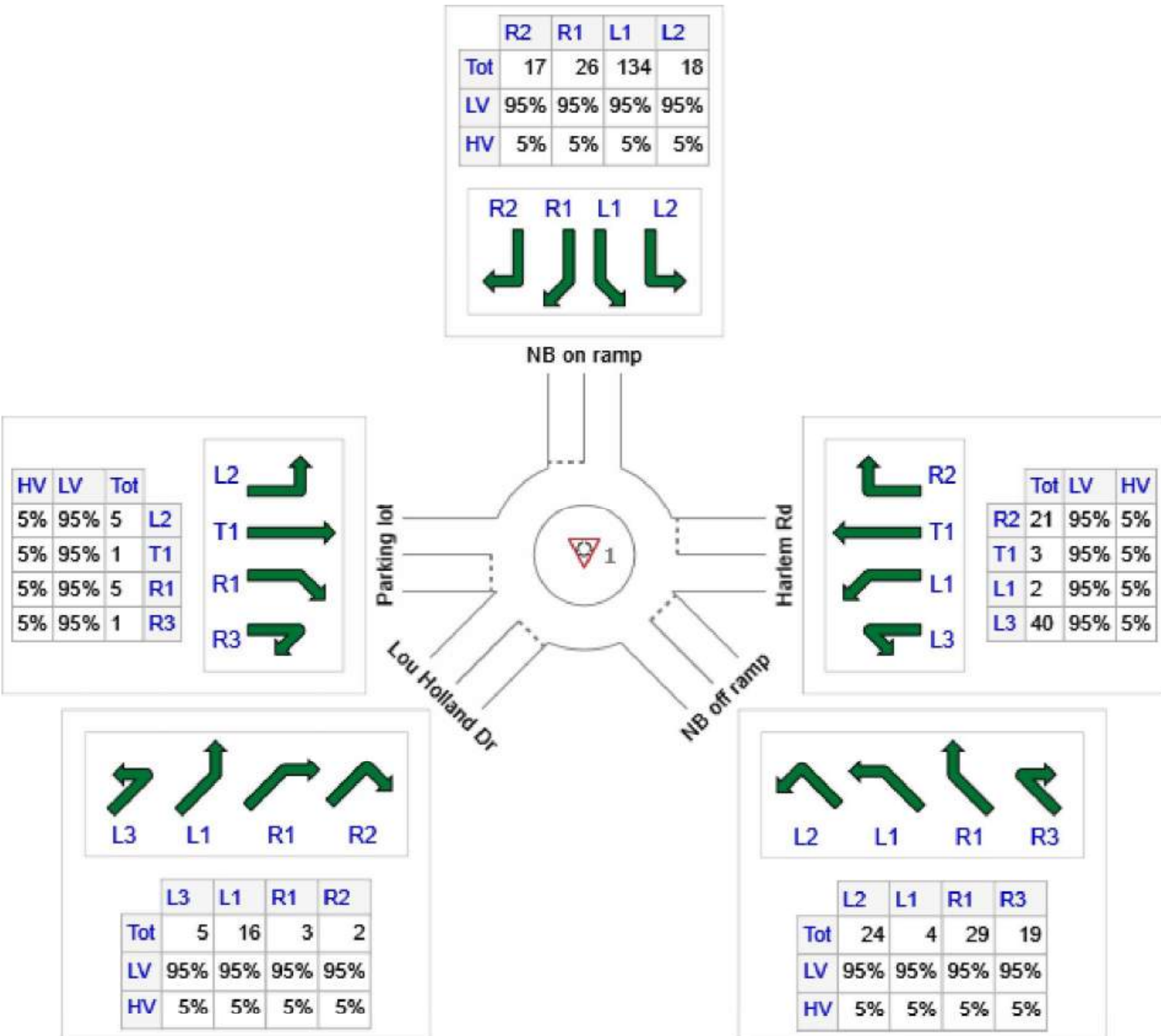
OD MOVEMENT DEMAND FLOWS

Site Origin - Destination Movement Demand Flow Rates (veh/h) and Pedestrian Flow Rates (ped/h)

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
SE: NB off ramp	77	73	4
E: Harlem Rd	66	63	3
N: NB on ramp	196	186	10
W: Parking lot	13	12	1
SW: Lou Holland Dr	27	26	1
Total	378	360	19

LANE LEVEL OF SERVICE

Lane Level of Service

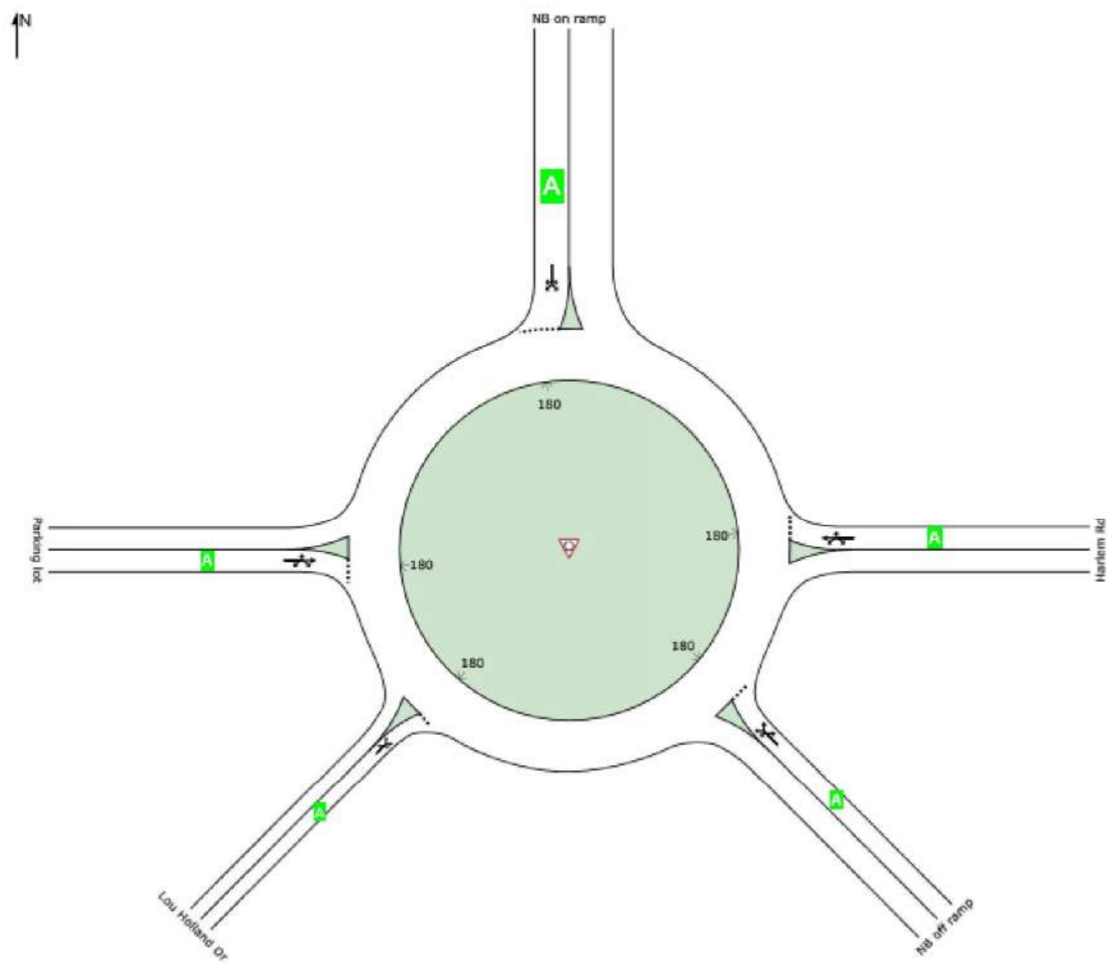
Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout

All Movement Classes

	Southeast	East	North	West	Southwest	Intersection
LOS	A	A	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

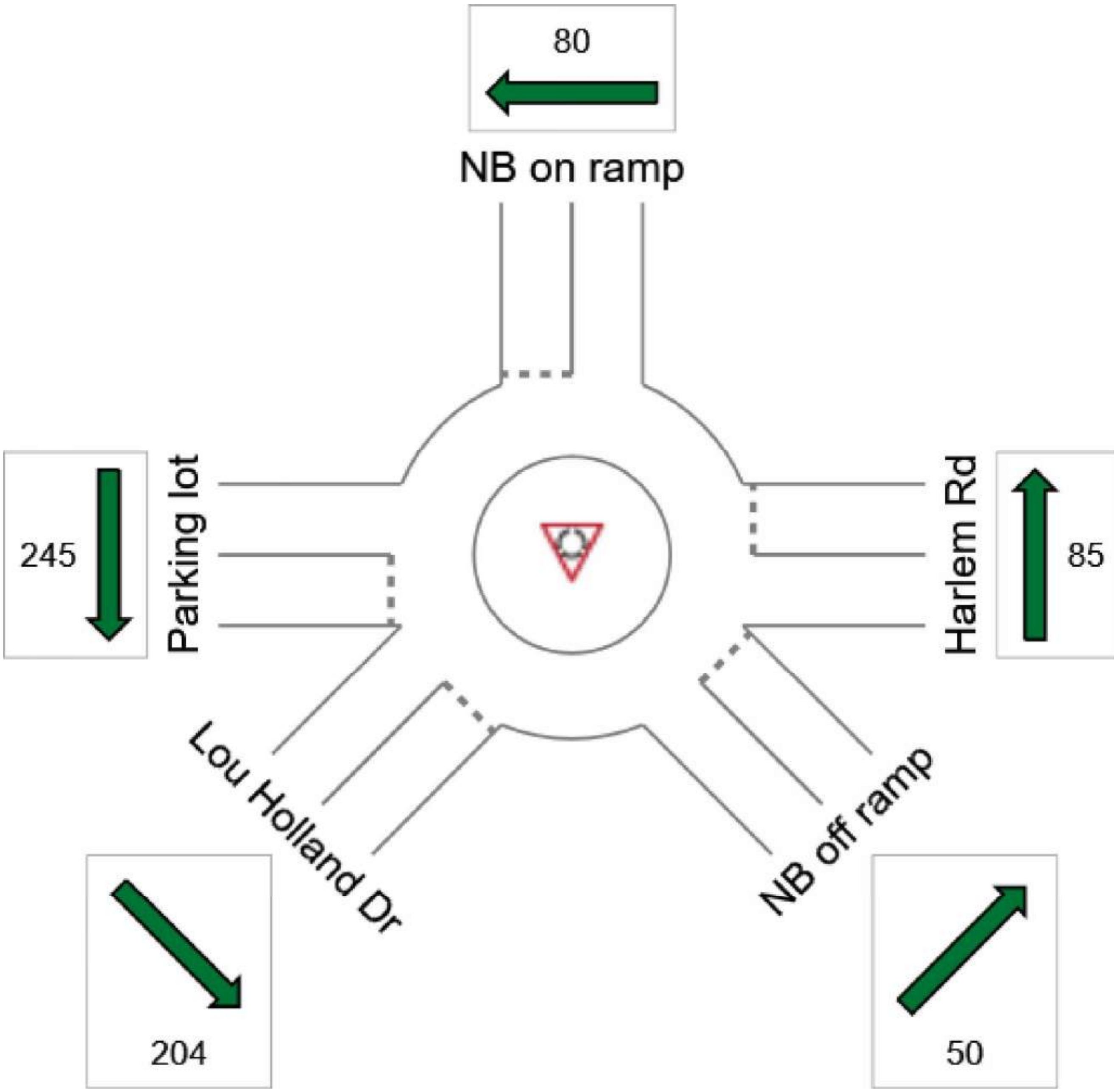
ROUNDABOUT CIRCULATING FLOWS

Total Values for All Movement Classes Based on Site Arrival Flow Rates including Capacity Constraint Effects (veh/h)

Site: 1 [US 169 - Roundabout analysis PM Peak - YR 2017]

Roundabout with 5 legs, and 1-lane approaches and circulating road

Roundabout



Appendix C

Existing Configuration

Synchro analysis

Year 2017

AM Peak

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	0	292	10	0	0
Future Vol, veh/h	2	0	292	10	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	16965	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	2	0	317	11	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	645	-	0	0
Stage 1	0	-	-	-
Stage 2	645	-	-	-
Critical Hdwy	6.45	-	4.15	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-
Follow-up Hdwy	3.545	-	2.245	-
Pot Cap-1 Maneuver	432	0	-	-
Stage 1	-	0	-	-
Stage 2	517	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	432	-	-	-
Mov Cap-2 Maneuver	432	-	-	-
Stage 1	-	-	-	-
Stage 2	517	-	-	-

Approach	EB	NB
HCM Control Delay, s	13.4	
HCM LOS	B	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	-	-	432
HCM Lane V/C Ratio	-	-	0.005
HCM Control Delay (s)	-	-	13.4
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	2	1	289	0	0	0	2	218	79
Future Vol, veh/h	0	0	1	2	1	289	0	0	0	2	218	79
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	2	1	314	0	0	0	2	237	86

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	285	284	280	285	327	-				0	0	0
Stage 1	284	284	-	0	0	-				-	-	-
Stage 2	1	0	-	285	327	-				-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	-				4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.15	5.55	-				-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	-				2.245	-	-
Pot Cap-1 Maneuver	661	620	752	661	587	0				-	-	-
Stage 1	717	671	-	-	-	0				-	-	-
Stage 2	-	-	-	716	642	0				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	660	620	752	660	587	-				-	-	-
Mov Cap-2 Maneuver	660	620	-	660	587	-				-	-	-
Stage 1	717	671	-	-	-	-				-	-	-
Stage 2	-	-	-	715	642	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	9.8		
HCM LOS	A	-	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	752	-	-	-	-
HCM Lane V/C Ratio	0.001	-	-	-	-
HCM Control Delay (s)	9.8	-	-	-	-
HCM Lane LOS	A	-	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	145	145	299	12
Future Vol, veh/h	0	0	145	145	299	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	158	158	325	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	806	332	338	0	-	0
Stage 1	332	-	-	-	-	-
Stage 2	474	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	347	703	1205	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	297	703	1205	-	-	-
Mov Cap-2 Maneuver	297	-	-	-	-	-
Stage 1	616	-	-	-	-	-
Stage 2	620	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	4.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1205	-	-	-	-
HCM Lane V/C Ratio	0.131	-	-	-	-
HCM Control Delay (s)	8.4	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	117	28	311	12
Future Vol, veh/h	0	0	117	28	311	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	127	30	338	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	629	345	351	0	-	0
Stage 1	345	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	441	691	1191	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	757	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	393	691	1191	-	-	-
Mov Cap-2 Maneuver	393	-	-	-	-	-
Stage 1	633	-	-	-	-	-
Stage 2	757	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	6.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1191	-	-	-	-
HCM Lane V/C Ratio	0.107	-	-	-	-
HCM Control Delay (s)	8.4	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-	-

Intersection	
Int Delay, s/veh	6.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	202	2	25	3	10	121
Future Vol, veh/h	202	2	25	3	10	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	220	2	27	3	11	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	183	29	0	0	30	0
Stage 1	29	-	-	-	-	-
Stage 2	154	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	800	1037	-	-	1564	-
Stage 1	986	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	794	1037	-	-	1564	-
Mov Cap-2 Maneuver	794	-	-	-	-	-
Stage 1	978	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.3	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	796	1564	-
HCM Lane V/C Ratio	-	-	0.279	0.007	-
HCM Control Delay (s)	-	-	11.3	7.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	10	17	131	11
Future Vol, veh/h	0	0	10	17	131	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	11	18	142	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	188	148	154	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	794	891	1408	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	788	891	1408	-	-	-
Mov Cap-2 Maneuver	788	-	-	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1408	-	-	-	-
HCM Lane V/C Ratio	0.008	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	7.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	129	20	17	0	0	13
Future Vol, veh/h	129	20	17	0	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	140	22	18	0	0	14

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	32	18	0	-	-	-
Stage 1	18	-	-	-	-	-
Stage 2	14	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	974	1052	-	0	0	-
Stage 1	997	-	-	0	0	-
Stage 2	1001	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	974	1052	-	-	-	-
Mov Cap-2 Maneuver	974	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	984	-
HCM Lane V/C Ratio	-	0.165	-
HCM Control Delay (s)	-	9.4	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.6	-

Intersection												
Int Delay, s/veh	1.1											
Movement	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**SEL**	**SET**	**SER**	**NWL**	**NWT**	**NWR**
Lane Configurations												
Traffic Vol, veh/h	0	1	0	0	0	0	9	13	1	0	24	13
Future Vol, veh/h	0	1	0	0	0	0	9	13	1	0	24	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	0	0	0	10	14	1	0	26	14

Major/Minor	Minor1						Major1			Major2		
Conflicting Flow All	-	75	-				40	0	0	15	0	0
Stage 1	-	35	-				-	-	-	-	-	-
Stage 2	-	40	-				-	-	-	-	-	-
Critical Hdwy	-	6.55	-				4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-				-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.55	-				-	-	-	-	-	-
Follow-up Hdwy	-	4.045	-				2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	0	810	0				1550	-	-	1583	-	-
Stage 1	0	860	0				-	-	-	-	-	-
Stage 2	0	856	0				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	0	-				1550	-	-	1583	-	-
Mov Cap-2 Maneuver	-	0	-				-	-	-	-	-	-
Stage 1	-	0	-				-	-	-	-	-	-
Stage 2	-	0	-				-	-	-	-	-	-

Approach	NB	SE	NW
HCM Control Delay, s		2.9	0
HCM LOS	-		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	-	1583	-	-	1550	-	-
HCM Lane V/C Ratio	-	-	-	-	0.006	-	-
HCM Control Delay (s)	-	0	-	-	7.3	0	-
HCM Lane LOS	-	A	-	-	A	A	-
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-

Intersection	
Int Delay, s/veh	25.9

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	0	0	2294	0	0	219
Future Vol, veh/h	0	0	2294	0	0	219
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	2493	0	0	238

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1247
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.35
Pot Cap-1 Maneuver	0	-	-	0	0	~ 161
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	~ 161
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	NB	SB	SE
HCM Control Delay, s	0	0	297.7
HCM LOS			F

Minor Lane/Major Mvmt	NBT	SELn1	SBT
Capacity (veh/h)	-	161	-
HCM Lane V/C Ratio	-	1.479	-
HCM Control Delay (s)	-	297.7	-
HCM Lane LOS	-	F	-
HCM 95th %tile Q(veh)	-	15.4	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

PM Peak

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	0	31	35	0	0
Future Vol, veh/h	11	0	31	35	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	16965	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	12	0	34	38	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	106	-	0	0
Stage 1	0	-	-	-
Stage 2	106	-	-	-
Critical Hdwy	6.45	-	4.15	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-
Follow-up Hdwy	3.545	-	2.245	-
Pot Cap-1 Maneuver	884	0	-	-
Stage 1	-	0	-	-
Stage 2	911	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	884	-	-	-
Mov Cap-2 Maneuver	884	-	-	-
Stage 1	-	-	-	-
Stage 2	911	-	-	-

Approach	EB	NB
HCM Control Delay, s	9.1	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	-	-	884
HCM Lane V/C Ratio	-	-	0.014
HCM Control Delay (s)	-	-	9.1
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	58	0	0	31	0	0	0	11	122	2
Future Vol, veh/h	1	0	58	0	0	31	0	0	0	11	122	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	1	0	63	0	0	34	0	0	0	12	133	2

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	158	158	134	190	159	-				0	0	0
Stage 1	158	158	-	0	0	-				-	-	-
Stage 2	0	0	-	190	159	-				-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	-				4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.15	5.55	-				-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	-				2.245	-	-
Pot Cap-1 Maneuver	801	729	907	763	728	0				-	-	-
Stage 1	837	761	-	-	-	0				-	-	-
Stage 2	-	-	-	805	761	0				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	801	729	907	710	728	-				-	-	-
Mov Cap-2 Maneuver	801	729	-	710	728	-				-	-	-
Stage 1	837	761	-	-	-	-				-	-	-
Stage 2	-	-	-	749	761	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	9.3	0	
HCM LOS	A	A	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	905	-	-	-	-
HCM Lane V/C Ratio	0.071	-	-	-	-
HCM Control Delay (s)	9.3	0	-	-	-
HCM Lane LOS	A	A	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	54	56	0	32	79	0
Future Vol, veh/h	54	56	0	32	79	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	59	61	0	35	86	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	121	86	86	0	-	0
Stage 1	86	-	-	-	-	-
Stage 2	35	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	867	964	1492	-	-	-
Stage 1	930	-	-	-	-	-
Stage 2	980	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	867	964	1492	-	-	-
Mov Cap-2 Maneuver	867	-	-	-	-	-
Stage 1	930	-	-	-	-	-
Stage 2	980	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1492	-	914	-	-
HCM Lane V/C Ratio	-	-	0.131	-	-
HCM Control Delay (s)	0	-	9.5	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	55	55	0	86	24	0
Future Vol, veh/h	55	55	0	86	24	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	60	60	0	93	26	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	119	26	26	0	-	0
Stage 1	26	-	-	-	-	-
Stage 2	93	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	870	1041	1569	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	923	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	870	1041	1569	-	-	-
Mov Cap-2 Maneuver	870	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	923	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	948	-	-
HCM Lane V/C Ratio	-	-	0.126	-	-
HCM Control Delay (s)	0	-	9.3	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	1	59	82	13	9
Future Vol, veh/h	15	1	59	82	13	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	16	1	64	89	14	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	147	109	0	0	153	0
Stage 1	109	-	-	-	-	-
Stage 2	38	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	838	937	-	-	1409	-
Stage 1	908	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	830	937	-	-	1409	-
Mov Cap-2 Maneuver	830	-	-	-	-	-
Stage 1	899	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	4.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	836	1409	-
HCM Lane V/C Ratio	-	-	0.021	0.01	-
HCM Control Delay (s)	-	-	9.4	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	7	0	60	15	0
Future Vol, veh/h	9	7	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	10	8	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	971	-	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	6	69	0	0	8
Future Vol, veh/h	7	6	69	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	8	7	75	0	0	9

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	84	75	0	-	-	-
Stage 1	75	-	-	-	-	-
Stage 2	9	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	910	978	-	0	0	-
Stage 1	940	-	-	0	0	-
Stage 2	1006	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	910	978	-	-	-	-
Mov Cap-2 Maneuver	910	-	-	-	-	-
Stage 1	940	-	-	-	-	-
Stage 2	1006	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	940	-
HCM Lane V/C Ratio	-	0.015	-
HCM Control Delay (s)	-	8.9	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	0	0	0	8	7	0	1	7	65
Future Vol, veh/h	0	0	1	0	0	0	8	7	0	1	7	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	17747	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	0	0	0	9	8	0	1	8	71

Major/Minor	Minor1						Major1			Major2		
Conflicting Flow All	72	107	8				79	0	0	8	0	0
Stage 1	26	26	-				-	-	-	-	-	-
Stage 2	46	81	-				-	-	-	-	-	-
Critical Hdwy	6.45	6.55	6.25				4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	5.45	5.55	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-				-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345				2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	925	777	1065				1500	-	-	1593	-	-
Stage 1	989	868	-				-	-	-	-	-	-
Stage 2	969	822	-				-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	919	0	1065				1500	-	-	1593	-	-
Mov Cap-2 Maneuver	919	0	-				-	-	-	-	-	-
Stage 1	982	0	-				-	-	-	-	-	-
Stage 2	969	0	-				-	-	-	-	-	-

Approach	NB	SE	NW
HCM Control Delay, s	8.4	4	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	1065	1593	-	-	1500	-	-
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-
HCM Lane LOS	A	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	0	2752	1527	0	0	167
Future Vol, veh/h	0	2752	1527	0	0	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	2991	1660	0	0	182

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	830
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.35
Pot Cap-1 Maneuver	0	-	-	0	0	307
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	307
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	NB	SB	SE
HCM Control Delay, s	0	0	32.4
HCM LOS			D

Minor Lane/Major Mvmt	NBT	SELn1	SBT
Capacity (veh/h)	-	307	-
HCM Lane V/C Ratio	-	0.591	-
HCM Control Delay (s)	-	32.4	-
HCM Lane LOS	-	D	-
HCM 95th %tile Q(veh)	-	3.5	-

Appendix D

Strategies C1, C4, C5, C7 and C8

Ramp analysis

(Highway Capacity Software)

Year 2017

AM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1039	318
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1161	355
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.28	0.18

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	14.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.460
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1161	Ramp Junction Speed (S), mi/h	49.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.8
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1039	12
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1161	13
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.28	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	14.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.334
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1161	Ramp Junction Speed (S), mi/h	50.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1174	Average Density (D), pc/mi/ln	11.6
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2062	204
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2304	228
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.55	0.11

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.449
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2304	Ramp Junction Speed (S), mi/h	49.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	23.4
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information			
Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data		
	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Volume (V_i), veh/h	2062	232
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2304	259
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.61	0.13

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	22.5
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.339
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2304	Ramp Junction Speed (S), mi/h	50.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2563	Average Density (D), pc/mi/ln	25.3
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1051	23
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1174	26
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.29	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.300
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1174	Ramp Junction Speed (S), mi/h	51.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1200	Average Density (D), pc/mi/ln	11.7
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB off ramp - North interchange alternative	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2261	149
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2527	167
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.60	0.08

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	26.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.378
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2527	Ramp Junction Speed (S), mi/h	50.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	25.2
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2261	5
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2527	6
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.60	0.00

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	20.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.311
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2527	Ramp Junction Speed (S), mi/h	51.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2533	Average Density (D), pc/mi/ln	24.8
Level of Service (LOS)	B		

PM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2680	72
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2995	80
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.71	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	30.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.435
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2995	Ramp Junction Speed (S), mi/h	49.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	30.4
Level of Service (LOS)	D		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2680	46
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2995	51
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.73	0.03

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	29.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.403
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	49.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2995	Ramp Junction Speed (S), mi/h	49.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3046	Average Density (D), pc/mi/ln	30.6
Level of Service (LOS)	D		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1432	16
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1600	18
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.38	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.430
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1600	Ramp Junction Speed (S), mi/h	49.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.2
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1432	262
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1600	293
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.45	0.15

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	17.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.315
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1600	Ramp Junction Speed (S), mi/h	50.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1893	Average Density (D), pc/mi/ln	18.6
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2726	73
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3046	82
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.74	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	27.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.376
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3046	Ramp Junction Speed (S), mi/h	50.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3128	Average Density (D), pc/mi/ln	31.2
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB off ramp - North interchange alternative	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1446	13
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1616	15
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.38	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.364
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1616	Ramp Junction Speed (S), mi/h	50.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.1
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2017
Jurisdiction	US 169 SB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1446	2
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1616	2
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.39	0.00

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.281
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1616	Ramp Junction Speed (S), mi/h	51.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1618	Average Density (D), pc/mi/ln	15.8
Level of Service (LOS)	B		

Appendix E

Strategies C1, C4, C5, C7 and C8

Ramp analysis

(Highway Capacity Software)

Year 2023

AM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1103	338
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1233	378
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.29	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	14.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.462
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1233	Ramp Junction Speed (S), mi/h	49.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	12.6
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1103	12
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1233	13
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.30	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	15.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.335
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1233	Ramp Junction Speed (S), mi/h	50.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1246	Average Density (D), pc/mi/ln	12.3
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2194	217
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2452	242
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.58	0.12

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	19.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_s)	0.450
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2452	Ramp Junction Speed (S), mi/h	49.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	24.9
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information			
Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data		
	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Volume (V_i), veh/h	2194	241
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2452	269
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.65	0.13

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	23.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.348
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2452	Ramp Junction Speed (S), mi/h	50.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2721	Average Density (D), pc/mi/ln	26.9
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1115	24
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1246	27
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.30	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.301
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1246	Ramp Junction Speed (S), mi/h	51.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1273	Average Density (D), pc/mi/ln	12.5
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 SB off ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2406	158
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2689	177
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.64	0.09

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	27.4
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.379
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2689	Ramp Junction Speed (S), mi/h	50.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	26.8
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information			
Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 SB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data		
	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Volume (V_i), veh/h	2406	5
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2689	6
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.64	0.00

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	21.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.319
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2689	Ramp Junction Speed (S), mi/h	50.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2695	Average Density (D), pc/mi/ln	26.5
Level of Service (LOS)	C		

PM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2845	76
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3179	85
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.76	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	31.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.436
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3179	Ramp Junction Speed (S), mi/h	49.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	32.2
Level of Service (LOS)	D		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2845	47
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3179	53
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.77	0.03

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	30.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.420
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	49.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3179	Ramp Junction Speed (S), mi/h	49.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3232	Average Density (D), pc/mi/ln	32.6
Level of Service (LOS)	D		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1524	17
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1703	19
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.41	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	13.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.430
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1703	Ramp Junction Speed (S), mi/h	49.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	17.2
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1524	274
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1703	306
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.48	0.15

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.318
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1703	Ramp Junction Speed (S), mi/h	50.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2009	Average Density (D), pc/mi/ln	19.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2892	77
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3232	86
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.79	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	28.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.394
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	49.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3232	Ramp Junction Speed (S), mi/h	49.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3318	Average Density (D), pc/mi/ln	33.2
Level of Service (LOS)	D		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 SB off ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1539	14
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1720	16
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.41	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	19.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.364
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1720	Ramp Junction Speed (S), mi/h	50.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	17.1
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2023
Jurisdiction	US 169 SB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1539	2
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1720	2
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.41	0.00

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	13.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.283
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1720	Ramp Junction Speed (S), mi/h	51.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1722	Average Density (D), pc/mi/ln	16.8
Level of Service (LOS)	B		

Appendix F

Strategies C1, C4, C5, C7 and C8

Ramp analysis

(Highway Capacity Software)

Year 2040

AM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1306	400
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1459	447
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.35	0.22

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	16.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.468
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	48.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1459	Ramp Junction Speed (S), mi/h	48.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	14.9
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1306	13
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1459	15
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.35	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	17.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.338
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1459	Ramp Junction Speed (S), mi/h	50.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1474	Average Density (D), pc/mi/ln	14.6
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2615	256
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2922	286
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.70	0.14

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	23.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.454
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2922	Ramp Junction Speed (S), mi/h	49.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	29.8
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 SB on ramp	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2615	269
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2922	301
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.77	0.15

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	27.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.387
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2922	Ramp Junction Speed (S), mi/h	50.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3223	Average Density (D), pc/mi/ln	32.2
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1320	29
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	1475	32
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.36	0.02

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	14.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.304
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1475	Ramp Junction Speed (S), mi/h	51.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1507	Average Density (D), pc/mi/ln	14.8
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 SB off ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2866	187
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3203	209
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.76	0.10

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	31.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.382
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3203	Ramp Junction Speed (S), mi/h	50.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	32.0
Level of Service (LOS)	D		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 SB on ramp - North interchange	Time Period Analyzed	AM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	2866	5
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3203	6
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.76	0.00

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	25.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.358
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3203	Ramp Junction Speed (S), mi/h	50.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3209	Average Density (D), pc/mi/ln	31.9
Level of Service (LOS)	C		

PM Peak

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/27/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 NB off ramp - S of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	3369	91
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3765	102
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.90	0.05

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	36.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.437
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3765	Ramp Junction Speed (S), mi/h	49.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	38.2
Level of Service (LOS)	E		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 NB on ramp - N of Harlem Rd	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	3369	51
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3765	57
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.91	0.03

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	35.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.499
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	48.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3765	Ramp Junction Speed (S), mi/h	48.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3822	Average Density (D), pc/mi/ln	39.4
Level of Service (LOS)	E		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 - SB off ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	640
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1818	20
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2032	22
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.48	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	16.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.430
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	49.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2032	Ramp Junction Speed (S), mi/h	49.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	20.6
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 SB on ramp - Right in right out	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	460
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1818	312
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2032	349
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.57	0.17

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	21.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.331
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	50.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2032	Ramp Junction Speed (S), mi/h	50.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2381	Average Density (D), pc/mi/ln	23.5
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 NB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	430
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	3420	92
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	3822	103
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.93	0.05

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	33.4
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.484
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	48.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3822	Ramp Junction Speed (S), mi/h	48.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3925	Average Density (D), pc/mi/ln	40.3
Level of Service (LOS)	D		

HCS7 Freeway Diverge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 SB off ramp - North interchange alternative	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	40.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1836	16
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2052	18
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.49	0.01

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	21.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.365
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	50.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2052	Ramp Junction Speed (S), mi/h	50.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	20.4
Level of Service (LOS)	C		

HCS7 Freeway Merge Report

Project Information

Analyst	PB	Date	11/28/2017
Agency	Garver	Analysis Year	2040
Jurisdiction	US 169 SB on ramp - North interchange	Time Period Analyzed	PM Peak
Project Description	US 169 Capacity analysis - Alternatives 1, 4, 5 & North interchange alternative		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	55.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	1836	2
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (v_i), pc/h	2052	2
Capacity (c), pc/h	4200	2000
Volume-to-Capacity Ratio (v/c)	0.49	0.00

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	16.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.292
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	51.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2052	Ramp Junction Speed (S), mi/h	51.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2054	Average Density (D), pc/mi/ln	20.1
Level of Service (LOS)	B		

Appendix G

Strategies C1, C7 and C8

Synchro analysis

Year 2017

AM Peak

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	15	0	0	0	0	0	286	32	0	0	0
Future Vol, veh/h	10	15	0	0	0	0	0	286	32	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	11	16	0	0	0	0	0	311	35	0	0	0

Major/Minor	Minor2			Major1		
Conflicting Flow All	329	346	-	-	0	0
Stage 1	0	0	-	-	-	-
Stage 2	329	346	-	-	-	-
Critical Hdwy	6.45	6.55	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	-	-
Pot Cap-1 Maneuver	659	572	0	0	-	-
Stage 1	-	-	0	0	-	-
Stage 2	722	630	0	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	659	0	-	-	-	-
Mov Cap-2 Maneuver	659	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	722	0	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	10.7	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1
Capacity (veh/h)	-	-	659
HCM Lane V/C Ratio	-	-	0.041
HCM Control Delay (s)	-	-	10.7
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	42	2	286	10	0	0	0	0
Future Vol, veh/h	0	0	0	0	42	2	286	10	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	46	2	311	11	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	633	11	0	0	-
Stage 1	-	633	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	393	1061	-	-	0
Stage 1	0	469	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1061	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.6	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1061
HCM Lane V/C Ratio	-	-	0.045
HCM Control Delay (s)	-	-	8.6
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	9.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	312	12	0	0	28
Future Vol, veh/h	16	312	12	0	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	17	339	13	0	0	30

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	43	13	0	-	-	-
Stage 1	13	-	-	-	-	-
Stage 2	30	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	960	1059	-	0	0	-
Stage 1	1002	-	-	0	0	-
Stage 2	985	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	960	1059	-	-	-	-
Mov Cap-2 Maneuver	960	-	-	-	-	-
Stage 1	1002	-	-	-	-	-
Stage 2	985	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	1054	-
HCM Lane V/C Ratio	-	0.338	-
HCM Control Delay (s)	-	10.2	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	1.5	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	6	6	318	22	2
Future Vol, veh/h	5	6	6	318	22	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	5	7	7	346	24	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	385	25	26	0	-	0
Stage 1	25	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	612	1043	1569	-	-	-
Stage 1	990	-	-	-	-	-
Stage 2	699	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	608	1043	1569	-	-	-
Mov Cap-2 Maneuver	608	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	699	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	787	-	-
HCM Lane V/C Ratio	0.004	-	0.015	-	-
HCM Control Delay (s)	7.3	0	9.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	2	137	186	22	151
Future Vol, veh/h	99	2	137	186	22	151
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	2	149	202	24	164

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	606	106	188	0	-	0
Stage 1	106	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	455	940	1368	-	-	-
Stage 1	911	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	399	940	1368	-	-	-
Mov Cap-2 Maneuver	399	-	-	-	-	-
Stage 1	799	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.2	3.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1368	-	404	-	-
HCM Lane V/C Ratio	0.109	-	0.272	-	-
HCM Control Delay (s)	8	0	17.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	0	137	148	173	150
Future Vol, veh/h	99	0	137	148	173	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	0	149	161	188	163

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	729	270	351	0	-	0
Stage 1	270	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	386	761	1191	-	-	-
Stage 1	768	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	333	761	1191	-	-	-
Mov Cap-2 Maneuver	333	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.9	4.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1191	-	333	-	-
HCM Lane V/C Ratio	0.125	-	0.323	-	-
HCM Control Delay (s)	8.5	0	20.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.4	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	202	2	25	222	10	121
Future Vol, veh/h	202	2	25	222	10	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	220	2	27	241	11	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	302	148	0	0	268	0
Stage 1	148	-	-	-	-	-
Stage 2	154	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	683	891	-	-	1278	-
Stage 1	872	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	677	891	-	-	1278	-
Mov Cap-2 Maneuver	677	-	-	-	-	-
Stage 1	864	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	679	1278	-
HCM Lane V/C Ratio	-	-	0.327	0.009	-
HCM Control Delay (s)	-	-	12.9	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	10	17	131	11
Future Vol, veh/h	0	0	10	17	131	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	11	18	142	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	188	148	154	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	794	891	1408	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	788	891	1408	-	-	-
Mov Cap-2 Maneuver	788	-	-	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1408	-	-	-	-
HCM Lane V/C Ratio	0.008	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	7.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	129	0	20	12	13	1	0	2	15
Future Vol, veh/h	0	1	0	129	0	20	12	13	1	0	2	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	140	0	22	13	14	1	0	2	16

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	62	59	15	51	51	10	18	0	0	15	0	0
Stage 1	41	41	-	10	10	-	-	-	-	-	-	-
Stage 2	21	18	-	41	41	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	926	826	1056	941	835	1063	1579	-	-	1583	-	-
Stage 1	966	855	-	1003	881	-	-	-	-	-	-	-
Stage 2	990	874	-	966	855	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	902	819	1056	934	828	1063	1579	-	-	1583	-	-
Mov Cap-2 Maneuver	902	819	-	934	828	-	-	-	-	-	-	-
Stage 1	958	848	-	995	881	-	-	-	-	-	-	-
Stage 2	970	874	-	957	848	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.4	9.6	3.4	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	819	1583	-	-	1579	-	-	949
HCM Lane V/C Ratio	0.001	-	-	-	0.008	-	-	0.171
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	9.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.6

PM Peak

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	21	0	0	0	0	0	54	18	0	0	0
Future Vol, veh/h	39	21	0	0	0	0	0	54	18	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	42	23	0	0	0	0	0	59	20	0	0	0

Major/Minor	Minor2			Major1		
Conflicting Flow All	69	79	-	-	0	0
Stage 1	0	0	-	-	-	-
Stage 2	69	79	-	-	-	-
Critical Hdwy	6.45	6.55	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	-	-
Pot Cap-1 Maneuver	928	806	0	0	-	-
Stage 1	-	-	0	0	-	-
Stage 2	946	823	0	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	928	0	-	-	-	-
Mov Cap-2 Maneuver	928	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	946	0	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	9.2	0
HCM LOS	A	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1
Capacity (veh/h)	-	-	928
HCM Lane V/C Ratio	-	-	0.07
HCM Control Delay (s)	-	-	9.2
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	61	7	54	39	0	0	0	0
Future Vol, veh/h	0	0	0	0	61	7	54	39	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	66	8	59	42	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	160	42	0	0	-
Stage 1	-	160	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	727	1020	-	-	0
Stage 1	0	760	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1020	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.8	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1020
HCM Lane V/C Ratio	-	-	0.072
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	90	22	0	0	72
Future Vol, veh/h	25	90	22	0	0	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	27	98	24	0	0	78

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	102	24	0	-	-	-
Stage 1	24	-	-	-	-	-
Stage 2	78	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	889	1044	-	0	0	-
Stage 1	991	-	-	0	0	-
Stage 2	938	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	889	1044	-	-	-	-
Mov Cap-2 Maneuver	889	-	-	-	-	-
Stage 1	991	-	-	-	-	-
Stage 2	938	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	1006	-
HCM Lane V/C Ratio	-	0.124	-
HCM Control Delay (s)	-	9.1	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.4	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	20	12	100	52	18
Future Vol, veh/h	11	20	12	100	52	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	12	22	13	109	57	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	202	67	77	0	-	0
Stage 1	67	-	-	-	-	-
Stage 2	135	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	780	988	1503	-	-	-
Stage 1	948	-	-	-	-	-
Stage 2	884	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	773	988	1503	-	-	-
Mov Cap-2 Maneuver	773	-	-	-	-	-
Stage 1	939	-	-	-	-	-
Stage 2	884	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1503	-	899	-	-
HCM Lane V/C Ratio	0.009	-	0.037	-	-
HCM Control Delay (s)	7.4	0	9.2	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	98	29	0	111	41	0
Future Vol, veh/h	98	29	0	111	41	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	107	32	0	121	45	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	166	45	45	0	-	0
Stage 1	45	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	818	1016	1544	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	897	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	818	1016	1544	-	-	-
Mov Cap-2 Maneuver	818	-	-	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	897	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1544	-	856	-	-
HCM Lane V/C Ratio	-	-	0.161	-	-
HCM Control Delay (s)	0	-	10	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	17	0	209	24	0
Future Vol, veh/h	99	17	0	209	24	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	18	0	227	26	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	253	26	26	0	-	0
Stage 1	26	-	-	-	-	-
Stage 2	227	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	729	1041	1569	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	729	1041	1569	-	-	-
Mov Cap-2 Maneuver	729	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	804	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	762	-	-
HCM Lane V/C Ratio	-	-	0.165	-	-
HCM Control Delay (s)	0	-	10.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	1	59	249	13	9
Future Vol, veh/h	15	1	59	249	13	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	16	1	64	271	14	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	238	200	0	0	335	0
Stage 1	200	-	-	-	-	-
Stage 2	38	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	744	833	-	-	1208	-
Stage 1	827	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	735	833	-	-	1208	-
Mov Cap-2 Maneuver	735	-	-	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	4.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	740	1208	-
HCM Lane V/C Ratio	-	-	0.024	0.012	-
HCM Control Delay (s)	-	-	10	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	7	0	60	15	0
Future Vol, veh/h	9	7	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	10	8	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	971	-	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	67
Future Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	8	0	7	9	8	0	1	1	73

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	69	102	8	67	66	38	74	0	0	8	0	0
Stage 1	26	26	-	40	40	-	-	-	-	-	-	-
Stage 2	43	76	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	916	782	1065	919	819	1025	1507	-	-	1593	-	-
Stage 1	984	868	-	967	856	-	-	-	-	-	-	-
Stage 2	964	826	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	905	777	1065	913	813	1025	1507	-	-	1593	-	-
Mov Cap-2 Maneuver	905	777	-	913	813	-	-	-	-	-	-	-
Stage 1	978	863	-	961	855	-	-	-	-	-	-	-
Stage 2	957	825	-	976	863	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.8	3.9	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1507	-	-	961
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-	0.015
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix H

Strategies C1, C7 and C8

Synchro analysis

Year 2023

AM Peak

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	16	0	0	0	0	0	304	34	0	0	0
Future Vol, veh/h	10	16	0	0	0	0	0	304	34	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	11	17	0	0	0	0	0	330	37	0	0	0

Major/Minor	Minor2			Major1		
Conflicting Flow All	349	367	-	-	0	0
Stage 1	0	0	-	-	-	-
Stage 2	349	367	-	-	-	-
Critical Hdwy	6.45	6.55	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	-	-
Pot Cap-1 Maneuver	642	557	0	0	-	-
Stage 1	-	-	0	0	-	-
Stage 2	707	617	0	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	642	0	-	-	-	-
Mov Cap-2 Maneuver	642	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	707	0	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	10.9	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1
Capacity (veh/h)	-	-	642
HCM Lane V/C Ratio	-	-	0.044
HCM Control Delay (s)	-	-	10.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	44	2	304	10	0	0	0	0
Future Vol, veh/h	0	0	0	0	44	2	304	10	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	48	2	330	11	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	671	11	0	0	-
Stage 1	-	671	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	374	1061	-	-	0
Stage 1	0	450	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1061	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.6	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1061
HCM Lane V/C Ratio	-	-	0.047
HCM Control Delay (s)	-	-	8.6
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	9.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	330	12	0	0	29
Future Vol, veh/h	17	330	12	0	0	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	18	359	13	0	0	32

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	45	13	0	-	-	-
Stage 1	13	-	-	-	-	-
Stage 2	32	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	958	1059	-	0	0	-
Stage 1	1002	-	-	0	0	-
Stage 2	983	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	958	1059	-	-	-	-
Mov Cap-2 Maneuver	958	-	-	-	-	-
Stage 1	1002	-	-	-	-	-
Stage 2	983	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	1054	-
HCM Lane V/C Ratio	-	0.358	-
HCM Control Delay (s)	-	10.3	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	1.6	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	6	6	336	22	2
Future Vol, veh/h	5	6	6	336	22	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	5	7	7	365	24	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	404	25	26	0	-	0
Stage 1	25	-	-	-	-	-
Stage 2	379	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	597	1043	1569	-	-	-
Stage 1	990	-	-	-	-	-
Stage 2	686	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	593	1043	1569	-	-	-
Mov Cap-2 Maneuver	593	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	776	-	-
HCM Lane V/C Ratio	0.004	-	0.015	-	-
HCM Control Delay (s)	7.3	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	2	148	193	22	157
Future Vol, veh/h	103	2	148	193	22	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	2	161	210	24	171

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	642	110	195	0	-	0
Stage 1	110	-	-	-	-	-
Stage 2	532	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	434	935	1360	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	376	935	1360	-	-	-
Mov Cap-2 Maneuver	376	-	-	-	-	-
Stage 1	785	-	-	-	-	-
Stage 2	583	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.5	3.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1360	-	380	-	-
HCM Lane V/C Ratio	0.118	-	0.3	-	-
HCM Control Delay (s)	8	0	18.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.2	-	-

Intersection						
Int Delay, s/veh	4.8					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	0	143	153	179	157
Future Vol, veh/h	103	0	143	153	179	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	0	155	166	195	171

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	757	281	366	0	-	0
Stage 1	281	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	371	751	1176	-	-	-
Stage 1	760	-	-	-	-	-
Stage 2	619	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	317	751	1176	-	-	-
Mov Cap-2 Maneuver	317	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	619	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.4	4.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1176	-	317	-	-
HCM Lane V/C Ratio	0.132	-	0.353	-	-
HCM Control Delay (s)	8.5	0	22.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	1.5	-	-

Intersection							
Int Delay, s/veh	4.9						

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	214	2	25	231	11	121
Future Vol, veh/h	214	2	25	231	11	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	233	2	27	251	12	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	309	153	0	0	278	0
Stage 1	153	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	677	885	-	-	1268	-
Stage 1	868	-	-	-	-	-
Stage 2	865	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	670	885	-	-	1268	-
Mov Cap-2 Maneuver	670	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	865	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	672	1268	-
HCM Lane V/C Ratio	-	-	0.349	0.009	-
HCM Control Delay (s)	-	-	13.2	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	9	18	132	18
Future Vol, veh/h	0	0	9	18	132	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	10	20	143	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	193	153	163	0	-	0
Stage 1	153	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	789	885	1398	-	-	-
Stage 1	868	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	783	885	1398	-	-	-
Mov Cap-2 Maneuver	783	-	-	-	-	-
Stage 1	862	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1398	-	-	-	-
HCM Lane V/C Ratio	0.007	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	7.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	137	0	21	13	13	1	0	2	16
Future Vol, veh/h	0	1	0	137	0	21	13	13	1	0	2	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	149	0	23	14	14	1	0	2	17

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	65	62	15	54	54	11	19	0	0	15	0	0
Stage 1	43	43	-	11	11	-	-	-	-	-	-	-
Stage 2	22	19	-	43	43	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	921	823	1056	937	831	1061	1578	-	-	1583	-	-
Stage 1	964	853	-	1002	880	-	-	-	-	-	-	-
Stage 2	989	874	-	964	853	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	895	816	1056	930	824	1061	1578	-	-	1583	-	-
Mov Cap-2 Maneuver	895	816	-	930	824	-	-	-	-	-	-	-
Stage 1	955	845	-	993	880	-	-	-	-	-	-	-
Stage 2	968	874	-	954	845	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.4	9.6	3.5	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	816	1583	-	-	1578	-	-	946
HCM Lane V/C Ratio	0.001	-	-	-	0.009	-	-	0.182
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	9.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.7

PM Peak

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	22	0	0	0	0	0	57	19	0	0	0
Future Vol, veh/h	40	22	0	0	0	0	0	57	19	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	43	24	0	0	0	0	0	62	21	0	0	0

Major/Minor	Minor2						Major1					
Conflicting Flow All	73	83	-				-	0	0			
Stage 1	0	0	-				-	-	-			
Stage 2	73	83	-				-	-	-			
Critical Hdwy	6.45	6.55	-				-	-	-			
Critical Hdwy Stg 1	-	-	-				-	-	-			
Critical Hdwy Stg 2	5.45	5.55	-				-	-	-			
Follow-up Hdwy	3.545	4.045	-				-	-	-			
Pot Cap-1 Maneuver	923	801	0				0	-	-			
Stage 1	-	-	0				0	-	-			
Stage 2	942	820	0				0	-	-			
Platoon blocked, %								-	-			
Mov Cap-1 Maneuver	923	0	-				-	-	-			
Mov Cap-2 Maneuver	923	0	-				-	-	-			
Stage 1	-	0	-				-	-	-			
Stage 2	942	0	-				-	-	-			

Approach	EB	NB
HCM Control Delay, s	9.2	0
HCM LOS	A	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1
Capacity (veh/h)	-	-	923
HCM Lane V/C Ratio	-	-	0.073
HCM Control Delay (s)	-	-	9.2
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	63	7	57	40	0	0	0	0
Future Vol, veh/h	0	0	0	0	63	7	57	40	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	68	8	62	43	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	167	43	0	0	-
Stage 1	-	167	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	720	1019	-	-	0
Stage 1	0	755	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1019	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.8	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1019
HCM Lane V/C Ratio	-	-	0.075
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	5.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	94	22	0	0	74
Future Vol, veh/h	26	94	22	0	0	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	28	102	24	0	0	80

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	104	24	0	-	-	-
Stage 1	24	-	-	-	-	-
Stage 2	80	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	887	1044	-	0	0	-
Stage 1	991	-	-	0	0	-
Stage 2	936	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	887	1044	-	-	-	-
Mov Cap-2 Maneuver	887	-	-	-	-	-
Stage 1	991	-	-	-	-	-
Stage 2	936	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	1005	-
HCM Lane V/C Ratio	-	0.13	-
HCM Control Delay (s)	-	9.1	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.4	-

Intersection						
Int Delay, s/veh	1.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	20	12	104	53	19
Future Vol, veh/h	11	20	12	104	53	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	12	22	13	113	58	21

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	208	69	79	0	-	0
Stage 1	69	-	-	-	-	-
Stage 2	139	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	774	986	1500	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	767	986	1500	-	-	-
Mov Cap-2 Maneuver	767	-	-	-	-	-
Stage 1	937	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1500	-	895	-	-
HCM Lane V/C Ratio	0.009	-	0.038	-	-
HCM Control Delay (s)	7.4	0	9.2	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	102	30	0	115	43	0
Future Vol, veh/h	102	30	0	115	43	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	111	33	0	125	47	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	172	47	47	0	-	0
Stage 1	47	-	-	-	-	-
Stage 2	125	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	811	1014	1541	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	893	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	811	1014	1541	-	-	-
Mov Cap-2 Maneuver	811	-	-	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1541	-	850	-	-
HCM Lane V/C Ratio	-	-	0.169	-	-
HCM Control Delay (s)	0	-	10.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	18	0	217	25	0
Future Vol, veh/h	103	18	0	217	25	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	20	0	236	27	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	263	27	27	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	720	1040	1568	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	796	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	720	1040	1568	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	796	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1568	-	755	-	-
HCM Lane V/C Ratio	-	-	0.174	-	-
HCM Control Delay (s)	0	-	10.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	1	59	260	14	9
Future Vol, veh/h	16	1	59	260	14	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	17	1	64	283	15	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	246	206	0	0	347	0
Stage 1	206	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	736	827	-	-	1195	-
Stage 1	821	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	726	827	-	-	1195	-
Mov Cap-2 Maneuver	726	-	-	-	-	-
Stage 1	810	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	4.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	731	1195	-
HCM Lane V/C Ratio	-	-	0.025	0.013	-
HCM Control Delay (s)	-	-	10.1	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	7	0	60	15	0
Future Vol, veh/h	13	7	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	14	8	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	959	-	-
HCM Lane V/C Ratio	-	-	0.023	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	7	0	7	8	7	0	1	1	71
Future Vol, veh/h	0	0	1	7	0	7	8	7	0	1	1	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	8	0	8	9	8	0	1	1	77

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	72	106	8	69	68	40	78	0	0	8	0	0
Stage 1	26	26	-	42	42	-	-	-	-	-	-	-
Stage 2	46	80	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	912	778	1065	916	817	1023	1502	-	-	1593	-	-
Stage 1	984	868	-	965	854	-	-	-	-	-	-	-
Stage 2	960	823	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	900	773	1065	911	811	1023	1502	-	-	1593	-	-
Mov Cap-2 Maneuver	900	773	-	911	811	-	-	-	-	-	-	-
Stage 1	978	863	-	959	853	-	-	-	-	-	-	-
Stage 2	952	822	-	976	863	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.8	4	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1502	-	-	964
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-	0.016
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix I

Strategies C1, C7 and C8

Synchro analysis

Year 2040

AM Peak

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	17	0	0	0	0	0	360	40	0	0	0
Future Vol, veh/h	11	17	0	0	0	0	0	360	40	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	12	18	0	0	0	0	0	391	43	0	0	0

Major/Minor	Minor2			Major1		
Conflicting Flow All	413	434	-	-	0	0
Stage 1	0	0	-	-	-	-
Stage 2	413	434	-	-	-	-
Critical Hdwy	6.45	6.55	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	-	-
Pot Cap-1 Maneuver	590	511	0	0	-	-
Stage 1	-	-	0	0	-	-
Stage 2	661	576	0	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	590	0	-	-	-	-
Mov Cap-2 Maneuver	590	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	661	0	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	11.4	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1
Capacity (veh/h)	-	-	590
HCM Lane V/C Ratio	-	-	0.052
HCM Control Delay (s)	-	-	11.4
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	49	2	360	11	0	0	0	0
Future Vol, veh/h	0	0	0	0	49	2	360	11	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	53	2	391	12	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	794	12	0	0	-
Stage 1	-	794	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	317	1060	-	-	0
Stage 1	0	396	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1060	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.6	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1060
HCM Lane V/C Ratio	-	-	0.052
HCM Control Delay (s)	-	-	8.6
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	9.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	389	12	0	0	31
Future Vol, veh/h	19	389	12	0	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	21	423	13	0	0	34

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	47	13	0	-	-	-
Stage 1	13	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	955	1059	-	0	0	-
Stage 1	1002	-	-	0	0	-
Stage 2	981	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	955	1059	-	-	-	-
Mov Cap-2 Maneuver	955	-	-	-	-	-
Stage 1	1002	-	-	-	-	-
Stage 2	981	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	1054	-
HCM Lane V/C Ratio	-	0.421	-
HCM Control Delay (s)	-	10.9	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	2.1	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	7	7	393	24	2
Future Vol, veh/h	6	7	7	393	24	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	7	8	8	427	26	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	470	27	28	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	443	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	547	1040	1566	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	543	1040	1566	-	-	-
Mov Cap-2 Maneuver	543	-	-	-	-	-
Stage 1	981	-	-	-	-	-
Stage 2	641	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1566	-	731	-	-
HCM Lane V/C Ratio	0.005	-	0.019	-	-
HCM Control Delay (s)	7.3	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	115	2	173	226	24	191
Future Vol, veh/h	115	2	173	226	24	191
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	125	2	188	246	26	208

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	752	130	234	0	-	0
Stage 1	130	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	374	912	1316	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	530	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	312	912	1316	-	-	-
Mov Cap-2 Maneuver	312	-	-	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	530	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.9	3.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1316	-	316	-	-
HCM Lane V/C Ratio	0.143	-	0.402	-	-
HCM Control Delay (s)	8.2	0	23.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	1.9	-	-

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	0	173	168	215	191
Future Vol, veh/h	114	0	173	168	215	191
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	0	188	183	234	208

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	897	338	442	0	-	0
Stage 1	338	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	307	697	1102	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	567	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	249	697	1102	-	-	-
Mov Cap-2 Maneuver	249	-	-	-	-	-
Stage 1	580	-	-	-	-	-
Stage 2	567	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	33	4.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1102	-	249	-	-
HCM Lane V/C Ratio	0.171	-	0.498	-	-
HCM Control Delay (s)	8.9	0	33	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.6	-	2.6	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	254	3	25	257	13	152
Future Vol, veh/h	254	3	25	257	13	152
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	276	3	27	279	14	165

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	360	167	0	0	306	0
Stage 1	167	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	633	869	-	-	1238	-
Stage 1	855	-	-	-	-	-
Stage 2	833	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	625	869	-	-	1238	-
Mov Cap-2 Maneuver	625	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	833	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.3	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	627	1238	-
HCM Lane V/C Ratio	-	-	0.446	0.011	-
HCM Control Delay (s)	-	-	15.3	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	8	20	165	10
Future Vol, veh/h	0	0	8	20	165	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	9	22	179	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	225	185	190	0	-	0
Stage 1	185	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	757	850	1366	-	-	-
Stage 1	839	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	752	850	1366	-	-	-
Mov Cap-2 Maneuver	752	-	-	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1366	-	-	-	-
HCM Lane V/C Ratio	0.006	-	-	-	-
HCM Control Delay (s)	7.7	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	8.3

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	162	0	25	14	13	1	0	2	18
Future Vol, veh/h	0	1	0	162	0	25	14	13	1	0	2	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	176	0	27	15	14	1	0	2	20

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	71	67	15	57	57	12	22	0	0	15	0	0
Stage 1	45	45	-	12	12	-	-	-	-	-	-	-
Stage 2	26	22	-	45	45	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	913	818	1056	933	828	1060	1574	-	-	1583	-	-
Stage 1	961	852	-	1001	880	-	-	-	-	-	-	-
Stage 2	984	871	-	961	852	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	883	810	1056	925	820	1060	1574	-	-	1583	-	-
Mov Cap-2 Maneuver	883	810	-	925	820	-	-	-	-	-	-	-
Stage 1	951	843	-	991	880	-	-	-	-	-	-	-
Stage 2	959	871	-	950	843	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.5	9.9	3.7	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	810	1583	-	-	1574	-	-	941
HCM Lane V/C Ratio	0.001	-	-	-	0.01	-	-	0.216
HCM Control Delay (s)	9.5	0	-	-	7.3	0	-	9.9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.8

PM Peak

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	43	24	0	0	0	0	0	68	23	0	0	0
Future Vol, veh/h	43	24	0	0	0	0	0	68	23	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	47	26	0	0	0	0	0	74	25	0	0	0

Major/Minor	Minor2			Major1		
Conflicting Flow All	87	99	-	-	0	0
Stage 1	0	0	-	-	-	-
Stage 2	87	99	-	-	-	-
Critical Hdwy	6.45	6.55	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	-	-
Pot Cap-1 Maneuver	907	785	0	0	-	-
Stage 1	-	-	0	0	-	-
Stage 2	929	807	0	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	907	0	-	-	-	-
Mov Cap-2 Maneuver	907	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	929	0	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	9.3	0
HCM LOS	A	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1
Capacity (veh/h)	-	-	907
HCM Lane V/C Ratio	-	-	0.08
HCM Control Delay (s)	-	-	9.3
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.3

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	70	8	68	43	0	0	0	0
Future Vol, veh/h	0	0	0	0	70	8	68	43	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	76	9	74	47	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	195	47	0	0	-
Stage 1	-	195	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	695	1014	-	-	0
Stage 1	0	734	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1014	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.9	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1014
HCM Lane V/C Ratio	-	-	0.084
HCM Control Delay (s)	-	-	8.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.3

Intersection	
Int Delay, s/veh	5.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	107	22	0	0	79
Future Vol, veh/h	31	107	22	0	0	79
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	34	116	24	0	0	86

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	110	24	0	-	-	-
Stage 1	24	-	-	-	-	-
Stage 2	86	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	-	-
Pot Cap-1 Maneuver	880	1044	-	0	0	-
Stage 1	991	-	-	0	0	-
Stage 2	930	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	880	1044	-	-	-	-
Mov Cap-2 Maneuver	880	-	-	-	-	-
Stage 1	991	-	-	-	-	-
Stage 2	930	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	1002	-
HCM Lane V/C Ratio	-	0.15	-
HCM Control Delay (s)	-	9.2	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.5	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	22	13	116	57	21
Future Vol, veh/h	13	22	13	116	57	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	14	24	14	126	62	23

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	228	74	85	0	-	0
Stage 1	74	-	-	-	-	-
Stage 2	154	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	754	979	1493	-	-	-
Stage 1	941	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	746	979	1493	-	-	-
Mov Cap-2 Maneuver	746	-	-	-	-	-
Stage 1	932	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1493	-	877	-	-
HCM Lane V/C Ratio	0.009	-	0.043	-	-
HCM Control Delay (s)	7.4	0	9.3	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	113	30	0	128	47	0
Future Vol, veh/h	113	30	0	128	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	123	33	0	139	51	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	190	51	51	0	-	0
Stage 1	51	-	-	-	-	-
Stage 2	139	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	792	1009	1536	-	-	-
Stage 1	964	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	792	1009	1536	-	-	-
Mov Cap-2 Maneuver	792	-	-	-	-	-
Stage 1	964	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1536	-	829	-	-
HCM Lane V/C Ratio	-	-	0.187	-	-
HCM Control Delay (s)	0	-	10.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	19	0	241	28	0
Future Vol, veh/h	114	19	0	241	28	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	21	0	262	30	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	292	30	30	0	-	0
Stage 1	30	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	693	1036	1564	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	775	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	693	1036	1564	-	-	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	775	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1564	-	727	-	-
HCM Lane V/C Ratio	-	-	0.199	-	-
HCM Control Delay (s)	0	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	1	59	296	16	9
Future Vol, veh/h	19	1	59	296	16	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	21	1	64	322	17	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	269	225	0	0	386	0
Stage 1	225	-	-	-	-	-
Stage 2	44	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	714	807	-	-	1156	-
Stage 1	805	-	-	-	-	-
Stage 2	971	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	703	807	-	-	1156	-
Mov Cap-2 Maneuver	703	-	-	-	-	-
Stage 1	793	-	-	-	-	-
Stage 2	971	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	5.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	708	1156	-
HCM Lane V/C Ratio	-	-	0.031	0.015	-
HCM Control Delay (s)	-	-	10.2	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection						
Int Delay, s/veh	2.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	26	7	0	60	17	0
Future Vol, veh/h	26	7	0	60	17	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	28	8	0	65	18	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	83	18	18	0	-	0
Stage 1	18	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	911	1052	1579	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	911	1052	1579	-	-	-
Mov Cap-2 Maneuver	911	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1579	-	938	-	-
HCM Lane V/C Ratio	-	-	0.038	-	-
HCM Control Delay (s)	0	-	9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	2

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	9	0	8	10	7	0	1	1	84
Future Vol, veh/h	0	0	1	9	0	8	10	7	0	1	1	84
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	10	0	9	11	8	0	1	1	91

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	83	124	8	80	79	47	92	0	0	8	0	0
Stage 1	30	30	-	49	49	-	-	-	-	-	-	-
Stage 2	53	94	-	31	30	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	897	761	1065	901	806	1014	1484	-	-	1593	-	-
Stage 1	979	864	-	957	848	-	-	-	-	-	-	-
Stage 2	952	811	-	978	864	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	884	755	1065	895	800	1014	1484	-	-	1593	-	-
Mov Cap-2 Maneuver	884	755	-	895	800	-	-	-	-	-	-	-
Stage 1	972	858	-	950	847	-	-	-	-	-	-	-
Stage 2	943	810	-	970	858	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.9	4.4	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1484	-	-	947
HCM Lane V/C Ratio	0.001	0.001	-	-	0.007	-	-	0.02
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Appendix J

Strategies C4, C7 and C8

Synchro analysis

Year 2017

AM Peak

Intersection						
Int Delay, s/veh	5.6					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑			↰	
Traffic Vol, veh/h	0	15	0	0	27	0
Future Vol, veh/h	0	15	0	0	27	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	16	0	0	29	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	16	-
Stage 1	-	-	0	-
Stage 2	-	-	16	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	995	0
Stage 1	0	-	-	0
Stage 2	0	-	999	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	995	-
Mov Cap-2 Maneuver	-	-	995	-
Stage 1	-	-	-	-
Stage 2	-	-	999	-

Approach	EB	SB
HCM Control Delay, s	0	8.7
HCM LOS		A

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	995
HCM Lane V/C Ratio	-	0.029
HCM Control Delay (s)	-	8.7
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	11	0	0	38	8
Future Vol, veh/h	0	11	0	0	38	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	16974	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	12	0	0	41	9

Major/Minor	Minor2				Major2	
Conflicting Flow All	-	46			-	0
Stage 1	-	-			-	-
Stage 2	-	-			-	-
Critical Hdwy	-	6.25			-	-
Critical Hdwy Stg 1	-	-			-	-
Critical Hdwy Stg 2	-	-			-	-
Follow-up Hdwy	-	3.345			-	-
Pot Cap-1 Maneuver	0	1015			-	-
Stage 1	0	-			-	-
Stage 2	0	-			-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	1015			-	-
Mov Cap-2 Maneuver	-	-			-	-
Stage 1	-	-			-	-
Stage 2	-	-			-	-

Approach	EB	SB
HCM Control Delay, s	8.6	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	1015	-	-
HCM Lane V/C Ratio	0.012	-	-
HCM Control Delay (s)	8.6	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	0	318	0	0	42	0
Future Vol, veh/h	0	318	0	0	42	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	346	0	0	46	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	346	-
Stage 1	-	-	0	-
Stage 2	-	-	346	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	645	0
Stage 1	0	-	-	0
Stage 2	0	-	710	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	645	-
Mov Cap-2 Maneuver	-	-	645	-
Stage 1	-	-	-	-
Stage 2	-	-	710	-

Approach	NB	NE
HCM Control Delay, s	0	11
HCM LOS		B

Minor Lane/Major Mvmt	NELn1	NBT
Capacity (veh/h)	645	-
HCM Lane V/C Ratio	0.071	-
HCM Control Delay (s)	11	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	42	2	303	10	0	0	0	0
Future Vol, veh/h	0	0	0	0	42	2	303	10	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	46	2	329	11	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	669	11	0	0	-
Stage 1	-	669	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	375	1061	-	-	0
Stage 1	0	451	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1061	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.6	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1061
HCM Lane V/C Ratio	-	-	0.045
HCM Control Delay (s)	-	-	8.6
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	4.2

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	24	22	0
Future Vol, veh/h	0	0	0	24	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	0	26	24	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	26	-
Stage 1	-	-	0	-
Stage 2	-	-	26	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	982	0
Stage 1	0	-	-	0
Stage 2	0	-	989	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	982	-
Mov Cap-2 Maneuver	-	-	982	-
Stage 1	-	-	-	-
Stage 2	-	-	989	-

Approach	SB	SW
HCM Control Delay, s	0	8.8
HCM LOS		A

Minor Lane/Major Mvmt	SBT	SWLn1
Capacity (veh/h)	-	982
HCM Lane V/C Ratio	-	0.024
HCM Control Delay (s)	-	8.8
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	2	137	186	22	151
Future Vol, veh/h	99	2	137	186	22	151
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	2	149	202	24	164

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	606	106	188	0	-	0
Stage 1	106	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	455	940	1368	-	-	-
Stage 1	911	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	399	940	1368	-	-	-
Mov Cap-2 Maneuver	399	-	-	-	-	-
Stage 1	799	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.2	3.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1368	-	404	-	-
HCM Lane V/C Ratio	0.109	-	0.272	-	-
HCM Control Delay (s)	8	0	17.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.1	-	-

Intersection						
Int Delay, s/veh	4.6					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	0	137	148	173	150
Future Vol, veh/h	99	0	137	148	173	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	0	149	161	188	163

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	729	270	351	0	-	0
Stage 1	270	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	386	761	1191	-	-	-
Stage 1	768	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	333	761	1191	-	-	-
Mov Cap-2 Maneuver	333	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.9	4.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1191	-	333	-	-
HCM Lane V/C Ratio	0.125	-	0.323	-	-
HCM Control Delay (s)	8.5	0	20.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.4	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	202	2	25	222	10	121
Future Vol, veh/h	202	2	25	222	10	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	220	2	27	241	11	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	302	148	0	0	268	0
Stage 1	148	-	-	-	-	-
Stage 2	154	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	683	891	-	-	1278	-
Stage 1	872	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	677	891	-	-	1278	-
Mov Cap-2 Maneuver	677	-	-	-	-	-
Stage 1	864	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	679	1278	-
HCM Lane V/C Ratio	-	-	0.327	0.009	-
HCM Control Delay (s)	-	-	12.9	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	10	17	131	11
Future Vol, veh/h	0	0	10	17	131	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	11	18	142	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	188	148	154	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	794	891	1408	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	788	891	1408	-	-	-
Mov Cap-2 Maneuver	788	-	-	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1408	-	-	-	-
HCM Lane V/C Ratio	0.008	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	7.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	129	0	20	12	13	1	0	2	15
Future Vol, veh/h	0	1	0	129	0	20	12	13	1	0	2	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	140	0	22	13	14	1	0	2	16

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	62	59	15	51	51	10	18	0	0	15	0	0
Stage 1	41	41	-	10	10	-	-	-	-	-	-	-
Stage 2	21	18	-	41	41	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	926	826	1056	941	835	1063	1579	-	-	1583	-	-
Stage 1	966	855	-	1003	881	-	-	-	-	-	-	-
Stage 2	990	874	-	966	855	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	902	819	1056	934	828	1063	1579	-	-	1583	-	-
Mov Cap-2 Maneuver	902	819	-	934	828	-	-	-	-	-	-	-
Stage 1	958	848	-	995	881	-	-	-	-	-	-	-
Stage 2	970	874	-	957	848	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.4	9.6	3.4	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	819	1583	-	-	1579	-	-	949
HCM Lane V/C Ratio	0.001	-	-	-	0.008	-	-	0.171
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	9.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.6

PM Peak

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	35	0	0	58	0
Future Vol, veh/h	0	35	0	0	58	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	38	0	0	63	0

Major/Minor	Major1				Minor2	
Conflicting Flow All	-	0			38	-
Stage 1	-	-			0	-
Stage 2	-	-			38	-
Critical Hdwy	-	-			6.45	-
Critical Hdwy Stg 1	-	-			-	-
Critical Hdwy Stg 2	-	-			5.45	-
Follow-up Hdwy	-	-			3.545	-
Pot Cap-1 Maneuver	0	-			967	0
Stage 1	0	-			-	0
Stage 2	0	-			977	0
Platoon blocked, %		-				
Mov Cap-1 Maneuver	-	-			967	-
Mov Cap-2 Maneuver	-	-			967	-
Stage 1	-	-			-	-
Stage 2	-	-			977	-

Approach	EB	SB
HCM Control Delay, s	0	9
HCM LOS		A

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	967
HCM Lane V/C Ratio	-	0.065
HCM Control Delay (s)	-	9
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.2

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	31	0	0	77	28
Future Vol, veh/h	0	31	0	0	77	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	16974	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	34	0	0	84	30

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	99	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.25	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.345	-	-
Pot Cap-1 Maneuver	0	949	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	949	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s	8.9	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	949	-	-
HCM Lane V/C Ratio	0.036	-	-
HCM Control Delay (s)	8.9	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	5.3					

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		↑			↰	
Traffic Vol, veh/h	0	72	0	0	93	0
Future Vol, veh/h	0	72	0	0	93	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	78	0	0	101	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	78	-
Stage 1	-	-	0	-
Stage 2	-	-	78	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	917	0
Stage 1	0	-	-	0
Stage 2	0	-	938	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	917	-
Mov Cap-2 Maneuver	-	-	917	-
Stage 1	-	-	-	-
Stage 2	-	-	938	-

Approach	NB	NE
HCM Control Delay, s	0	9.4
HCM LOS		A

Minor Lane/Major Mvmt	NELn1	NBT
Capacity (veh/h)	917	-
HCM Lane V/C Ratio	0.11	-
HCM Control Delay (s)	9.4	-
HCM Lane LOS	A	-
HCM 95th %tile Q(veh)	0.4	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	61	7	86	39	0	0	0	0
Future Vol, veh/h	0	0	0	0	61	7	86	39	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	66	8	93	42	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	228	42	0	0	-
Stage 1	-	228	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	666	1020	-	-	0
Stage 1	0	710	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1020	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.8	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1020
HCM Lane V/C Ratio	-	-	0.072
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	3.2

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	68	37	0
Future Vol, veh/h	0	0	0	68	37	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	0	74	40	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	74	-
Stage 1	-	-	0	-
Stage 2	-	-	74	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	922	0
Stage 1	0	-	-	0
Stage 2	0	-	941	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	922	-
Mov Cap-2 Maneuver	-	-	922	-
Stage 1	-	-	-	-
Stage 2	-	-	941	-

Approach	SB	SW
HCM Control Delay, s	0	9.1
HCM LOS		A

Minor Lane/Major Mvmt	SBT	SWLn1
Capacity (veh/h)	-	922
HCM Lane V/C Ratio	-	0.044
HCM Control Delay (s)	-	9.1
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	98	27	0	111	41	0
Future Vol, veh/h	98	27	0	111	41	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	107	29	0	121	45	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	166	45	45	0	-	0
Stage 1	45	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	818	1016	1544	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	897	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	818	1016	1544	-	-	-
Mov Cap-2 Maneuver	818	-	-	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	897	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1544	-	854	-	-
HCM Lane V/C Ratio	-	-	0.159	-	-
HCM Control Delay (s)	0	-	10	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	17	0	209	24	0
Future Vol, veh/h	99	17	0	209	24	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	18	0	227	26	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	253	26	26	0	-	0
Stage 1	26	-	-	-	-	-
Stage 2	227	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	729	1041	1569	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	729	1041	1569	-	-	-
Mov Cap-2 Maneuver	729	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	804	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	762	-	-
HCM Lane V/C Ratio	-	-	0.165	-	-
HCM Control Delay (s)	0	-	10.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	1	59	251	13	9
Future Vol, veh/h	15	1	59	251	13	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	16	1	64	273	14	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	239	201	0	0	337	0
Stage 1	201	-	-	-	-	-
Stage 2	38	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	743	832	-	-	1206	-
Stage 1	826	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	734	832	-	-	1206	-
Mov Cap-2 Maneuver	734	-	-	-	-	-
Stage 1	816	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	4.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	739	1206	-
HCM Lane V/C Ratio	-	-	0.024	0.012	-
HCM Control Delay (s)	-	-	10	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	7	0	60	15	0
Future Vol, veh/h	9	7	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	10	8	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	971	-	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	67
Future Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	8	0	7	9	8	0	1	1	73

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	69	102	8	67	66	38	74	0	0	8	0	0
Stage 1	26	26	-	40	40	-	-	-	-	-	-	-
Stage 2	43	76	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	916	782	1065	919	819	1025	1507	-	-	1593	-	-
Stage 1	984	868	-	967	856	-	-	-	-	-	-	-
Stage 2	964	826	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	905	777	1065	913	813	1025	1507	-	-	1593	-	-
Mov Cap-2 Maneuver	905	777	-	913	813	-	-	-	-	-	-	-
Stage 1	978	863	-	961	855	-	-	-	-	-	-	-
Stage 2	957	825	-	976	863	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.8	3.9	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1507	-	-	961
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-	0.015
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix K

Strategies C4, C7 and C8

Synchro analysis

Year 2023

AM Peak

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	15	0	0	28	0
Future Vol, veh/h	0	15	0	0	28	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	16	0	0	30	0

Major/Minor	Major1				Minor2	
Conflicting Flow All	-	0			16	-
Stage 1	-	-			0	-
Stage 2	-	-			16	-
Critical Hdwy	-	-			6.45	-
Critical Hdwy Stg 1	-	-			-	-
Critical Hdwy Stg 2	-	-			5.45	-
Follow-up Hdwy	-	-			3.545	-
Pot Cap-1 Maneuver	0	-			995	0
Stage 1	0	-			-	0
Stage 2	0	-			999	0
Platoon blocked, %		-				
Mov Cap-1 Maneuver	-	-			995	-
Mov Cap-2 Maneuver	-	-			995	-
Stage 1	-	-			-	-
Stage 2	-	-			999	-

Approach	EB	SB
HCM Control Delay, s	0	8.7
HCM LOS		A

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	995
HCM Lane V/C Ratio	-	0.031
HCM Control Delay (s)	-	8.7
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection							
Int Delay, s/veh	1.7						

Movement	EBL	EBR	NBL	NBT		SBT	SBR
Lane Configurations							
Traffic Vol, veh/h	0	11	0	0		38	8
Future Vol, veh/h	0	11	0	0		38	8
Conflicting Peds, #/hr	0	0	0	0		0	0
Sign Control	Stop	Stop	Free	Free		Free	Free
RT Channelized	-	None	-	None		-	None
Storage Length	-	0	-	-		-	-
Veh in Median Storage, #	0	-	-	16974		0	-
Grade, %	0	-	-	0		0	-
Peak Hour Factor	92	92	92	92		92	92
Heavy Vehicles, %	5	5	5	5		5	5
Mvmt Flow	0	12	0	0		41	9

Major/Minor	Minor2					Major2	
Conflicting Flow All	-	46				-	0
Stage 1	-	-				-	-
Stage 2	-	-				-	-
Critical Hdwy	-	6.25				-	-
Critical Hdwy Stg 1	-	-				-	-
Critical Hdwy Stg 2	-	-				-	-
Follow-up Hdwy	-	3.345				-	-
Pot Cap-1 Maneuver	0	1015				-	-
Stage 1	0	-				-	-
Stage 2	0	-				-	-
Platoon blocked, %						-	-
Mov Cap-1 Maneuver	-	1015				-	-
Mov Cap-2 Maneuver	-	-				-	-
Stage 1	-	-				-	-
Stage 2	-	-				-	-

Approach	EB	SB
HCM Control Delay, s	8.6	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	1015	-	-
HCM Lane V/C Ratio	0.012	-	-
HCM Control Delay (s)	8.6	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	1.3					

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		↑			↰	
Traffic Vol, veh/h	0	338	0	0	43	0
Future Vol, veh/h	0	338	0	0	43	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	367	0	0	47	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	367	-
Stage 1	-	-	0	-
Stage 2	-	-	367	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	627	0
Stage 1	0	-	-	0
Stage 2	0	-	694	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	627	-
Mov Cap-2 Maneuver	-	-	627	-
Stage 1	-	-	-	-
Stage 2	-	-	694	-

Approach	NB	NE
HCM Control Delay, s	0	11.2
HCM LOS		B

Minor Lane/Major Mvmt	NELn1	NBT
Capacity (veh/h)	627	-
HCM Lane V/C Ratio	0.075	-
HCM Control Delay (s)	11.2	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	44	2	321	10	0	0	0	0
Future Vol, veh/h	0	0	0	0	44	2	321	10	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	48	2	349	11	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	709	11	0	0	-
Stage 1	-	709	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	355	1061	-	-	0
Stage 1	0	433	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1061	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.6	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1061
HCM Lane V/C Ratio	-	-	0.047
HCM Control Delay (s)	-	-	8.6
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	4.3

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	24	23	0
Future Vol, veh/h	0	0	0	24	23	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	0	26	25	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	26	-
Stage 1	-	-	0	-
Stage 2	-	-	26	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	982	0
Stage 1	0	-	-	0
Stage 2	0	-	989	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	982	-
Mov Cap-2 Maneuver	-	-	982	-
Stage 1	-	-	-	-
Stage 2	-	-	989	-

Approach	SB	SW
HCM Control Delay, s	0	8.8
HCM LOS		A

Minor Lane/Major Mvmt	SBT	SWLn1
Capacity (veh/h)	-	982
HCM Lane V/C Ratio	-	0.025
HCM Control Delay (s)	-	8.8
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection						
Int Delay, s/veh	4.9					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	2	142	199	22	157
Future Vol, veh/h	103	2	142	199	22	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	2	154	216	24	171

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	634	110	195	0	-	0
Stage 1	110	-	-	-	-	-
Stage 2	524	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	438	935	1360	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	381	935	1360	-	-	-
Mov Cap-2 Maneuver	381	-	-	-	-	-
Stage 1	790	-	-	-	-	-
Stage 2	588	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.2	3.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1360	-	385	-	-
HCM Lane V/C Ratio	0.113	-	0.296	-	-
HCM Control Delay (s)	8	0	18.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.2	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	0	149	153	179	156
Future Vol, veh/h	103	0	149	153	179	156
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	0	162	166	195	170

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	770	280	365	0	-	0
Stage 1	280	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	365	752	1177	-	-	-
Stage 1	760	-	-	-	-	-
Stage 2	610	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	310	752	1177	-	-	-
Mov Cap-2 Maneuver	310	-	-	-	-	-
Stage 1	644	-	-	-	-	-
Stage 2	610	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23	4.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1177	-	310	-	-
HCM Lane V/C Ratio	0.138	-	0.361	-	-
HCM Control Delay (s)	8.5	0	23	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	1.6	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	214	2	25	231	11	121
Future Vol, veh/h	214	2	25	231	11	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	233	2	27	251	12	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	309	153	0	0	278	0
Stage 1	153	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	677	885	-	-	1268	-
Stage 1	868	-	-	-	-	-
Stage 2	865	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	670	885	-	-	1268	-
Mov Cap-2 Maneuver	670	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	865	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	672	1268	-
HCM Lane V/C Ratio	-	-	0.349	0.009	-
HCM Control Delay (s)	-	-	13.2	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	9	18	132	18
Future Vol, veh/h	0	0	9	18	132	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	10	20	143	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	193	153	163	0	-	0
Stage 1	153	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	789	885	1398	-	-	-
Stage 1	868	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	783	885	1398	-	-	-
Mov Cap-2 Maneuver	783	-	-	-	-	-
Stage 1	862	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1398	-	-	-	-
HCM Lane V/C Ratio	0.007	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	7.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	137	0	21	13	13	1	0	2	16
Future Vol, veh/h	0	1	0	137	0	21	13	13	1	0	2	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	149	0	23	14	14	1	0	2	17

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	65	62	15	54	54	11	19	0	0	15	0	0
Stage 1	43	43	-	11	11	-	-	-	-	-	-	-
Stage 2	22	19	-	43	43	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	921	823	1056	937	831	1061	1578	-	-	1583	-	-
Stage 1	964	853	-	1002	880	-	-	-	-	-	-	-
Stage 2	989	874	-	964	853	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	895	816	1056	930	824	1061	1578	-	-	1583	-	-
Mov Cap-2 Maneuver	895	816	-	930	824	-	-	-	-	-	-	-
Stage 1	955	845	-	993	880	-	-	-	-	-	-	-
Stage 2	968	874	-	954	845	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.4	9.6	3.5	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	816	1583	-	-	1578	-	-	946
HCM Lane V/C Ratio	0.001	-	-	-	0.009	-	-	0.182
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	9.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.7

PM Peak

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	35	0	0	60	0
Future Vol, veh/h	0	35	0	0	60	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	38	0	0	65	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	38	-
Stage 1	-	-	0	-
Stage 2	-	-	38	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	967	0
Stage 1	0	-	-	0
Stage 2	0	-	977	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	967	-
Mov Cap-2 Maneuver	-	-	967	-
Stage 1	-	-	-	-
Stage 2	-	-	977	-

Approach	EB	SB
HCM Control Delay, s	0	9
HCM LOS		A

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	967
HCM Lane V/C Ratio	-	0.067
HCM Control Delay (s)	-	9
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.2

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	32	0	0	80	29
Future Vol, veh/h	0	32	0	0	80	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	16974	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	35	0	0	87	32

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	103	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.25	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.345	-	-
Pot Cap-1 Maneuver	0	944	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	944	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s	9	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	944	-	-
HCM Lane V/C Ratio	0.037	-	-
HCM Control Delay (s)	9	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection	
Int Delay, s/veh	5.3

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	0	76	0	0	95	0
Future Vol, veh/h	0	76	0	0	95	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	83	0	0	103	0

Major/Minor	Major1				Minor2	
Conflicting Flow All	-	0			83	-
Stage 1	-	-			0	-
Stage 2	-	-			83	-
Critical Hdwy	-	-			6.45	-
Critical Hdwy Stg 1	-	-			-	-
Critical Hdwy Stg 2	-	-			5.45	-
Follow-up Hdwy	-	-			3.545	-
Pot Cap-1 Maneuver	0	-			911	0
Stage 1	0	-			-	0
Stage 2	0	-			933	0
Platoon blocked, %		-				
Mov Cap-1 Maneuver	-	-			911	-
Mov Cap-2 Maneuver	-	-			911	-
Stage 1	-	-			-	-
Stage 2	-	-			933	-

Approach	NB	NE
HCM Control Delay, s	0	9.5
HCM LOS		A

Minor Lane/Major Mvmt	NELn1	NBT
Capacity (veh/h)	911	-
HCM Lane V/C Ratio	0.113	-
HCM Control Delay (s)	9.5	-
HCM Lane LOS	A	-
HCM 95th %tile Q(veh)	0.4	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	63	7	90	40	0	0	0	0
Future Vol, veh/h	0	0	0	0	63	7	90	40	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	68	8	98	43	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	239	43	0	0	-
Stage 1	-	239	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	657	1019	-	-	0
Stage 1	0	702	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1019	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.8	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1019
HCM Lane V/C Ratio	-	-	0.075
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	3.3

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	70	39	0
Future Vol, veh/h	0	0	0	70	39	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	0	76	42	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	76	-
Stage 1	-	-	0	-
Stage 2	-	-	76	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	920	0
Stage 1	0	-	-	0
Stage 2	0	-	939	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	920	-
Mov Cap-2 Maneuver	-	-	920	-
Stage 1	-	-	-	-
Stage 2	-	-	939	-

Approach	SB	SW
HCM Control Delay, s	0	9.1
HCM LOS		A

Minor Lane/Major Mvmt	SBT	SWLn1
Capacity (veh/h)	-	920
HCM Lane V/C Ratio	-	0.046
HCM Control Delay (s)	-	9.1
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	102	27	0	115	43	0
Future Vol, veh/h	102	27	0	115	43	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	111	29	0	125	47	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	172	47	47	0	-	0
Stage 1	47	-	-	-	-	-
Stage 2	125	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	811	1014	1541	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	893	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	811	1014	1541	-	-	-
Mov Cap-2 Maneuver	811	-	-	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1541	-	846	-	-
HCM Lane V/C Ratio	-	-	0.166	-	-
HCM Control Delay (s)	0	-	10.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	18	0	217	25	0
Future Vol, veh/h	103	18	0	217	25	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	20	0	236	27	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	263	27	27	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	720	1040	1568	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	796	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	720	1040	1568	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	796	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1568	-	755	-	-
HCM Lane V/C Ratio	-	-	0.174	-	-
HCM Control Delay (s)	0	-	10.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	1	59	260	14	9
Future Vol, veh/h	16	1	59	260	14	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	17	1	64	283	15	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	246	206	0	0	347	0
Stage 1	206	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	736	827	-	-	1195	-
Stage 1	821	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	726	827	-	-	1195	-
Mov Cap-2 Maneuver	726	-	-	-	-	-
Stage 1	810	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	4.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	731	1195	-
HCM Lane V/C Ratio	-	-	0.025	0.013	-
HCM Control Delay (s)	-	-	10.1	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection						
Int Delay, s/veh	1.9					
Movement	**EBL**	**EBR**	**NBL**	**NBT**	**SBT**	**SBR**
Lane Configurations						
Traffic Vol, veh/h	13	8	0	60	15	0
Future Vol, veh/h	13	8	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	14	9	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	963	-	-
HCM Lane V/C Ratio	-	-	0.024	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	71
Future Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	8	0	7	9	8	0	1	1	77

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	71	106	8	69	68	40	78	0	0	8	0	0
Stage 1	26	26	-	42	42	-	-	-	-	-	-	-
Stage 2	45	80	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	913	778	1065	916	817	1023	1502	-	-	1593	-	-
Stage 1	984	868	-	965	854	-	-	-	-	-	-	-
Stage 2	961	823	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	902	773	1065	911	811	1023	1502	-	-	1593	-	-
Mov Cap-2 Maneuver	902	773	-	911	811	-	-	-	-	-	-	-
Stage 1	978	863	-	959	853	-	-	-	-	-	-	-
Stage 2	954	822	-	976	863	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.8	4	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1502	-	-	959
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-	0.015
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix L

Strategies C4, C7 and C8

Synchro analysis

Year 2040

AM Peak

Intersection						
Int Delay, s/veh	5.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑			↰	
Traffic Vol, veh/h	0	15	0	0	31	0
Future Vol, veh/h	0	15	0	0	31	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	16	0	0	34	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	16	-
Stage 1	-	-	0	-
Stage 2	-	-	16	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	995	0
Stage 1	0	-	-	0
Stage 2	0	-	999	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	995	-
Mov Cap-2 Maneuver	-	-	995	-
Stage 1	-	-	-	-
Stage 2	-	-	999	-

Approach	EB	SB
HCM Control Delay, s	0	8.7
HCM LOS		A

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	995
HCM Lane V/C Ratio	-	0.034
HCM Control Delay (s)	-	8.7
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	13	0	0	43	10
Future Vol, veh/h	0	13	0	0	43	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	16974	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	14	0	0	47	11

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	53	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.25	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.345	-	-
Pot Cap-1 Maneuver	0	1006	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	1006	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s	8.6	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	1006	-	-
HCM Lane V/C Ratio	0.014	-	-
HCM Control Delay (s)	8.6	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	0	400	0	0	47	0
Future Vol, veh/h	0	400	0	0	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	435	0	0	51	0

Major/Minor	Major1				Minor2	
Conflicting Flow All	-	0			435	-
Stage 1	-	-			0	-
Stage 2	-	-			435	-
Critical Hdwy	-	-			6.45	-
Critical Hdwy Stg 1	-	-			-	-
Critical Hdwy Stg 2	-	-			5.45	-
Follow-up Hdwy	-	-			3.545	-
Pot Cap-1 Maneuver	0	-			573	0
Stage 1	0	-			-	0
Stage 2	0	-			646	0
Platoon blocked, %		-				
Mov Cap-1 Maneuver	-	-			573	-
Mov Cap-2 Maneuver	-	-			573	-
Stage 1	-	-			-	-
Stage 2	-	-			646	-

Approach	NB	NE
HCM Control Delay, s	0	11.9
HCM LOS		B

Minor Lane/Major Mvmt	NELn1	NBT
Capacity (veh/h)	573	-
HCM Lane V/C Ratio	0.089	-
HCM Control Delay (s)	11.9	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.3	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	49	2	377	11	0	0	0	0
Future Vol, veh/h	0	0	0	0	49	2	377	11	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	53	2	410	12	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	832	12	0	0	-
Stage 1	-	832	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	301	1060	-	-	0
Stage 1	0	380	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1060	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.6	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1060
HCM Lane V/C Ratio	-	-	0.052
HCM Control Delay (s)	-	-	8.6
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	4.5

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	26	27	0
Future Vol, veh/h	0	0	0	26	27	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	0	28	29	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	28	-
Stage 1	-	-	0	-
Stage 2	-	-	28	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	979	0
Stage 1	0	-	-	0
Stage 2	0	-	987	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	979	-
Mov Cap-2 Maneuver	-	-	979	-
Stage 1	-	-	-	-
Stage 2	-	-	987	-

Approach	SB	SW
HCM Control Delay, s	0	8.8
HCM LOS		A

Minor Lane/Major Mvmt	SBT	SWLn1
Capacity (veh/h)	-	979
HCM Lane V/C Ratio	-	0.03
HCM Control Delay (s)	-	8.8
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	2	173	226	24	176
Future Vol, veh/h	114	2	173	226	24	176
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	2	188	246	26	191

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	744	122	217	0	-	0
Stage 1	122	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	378	921	1335	-	-	-
Stage 1	896	-	-	-	-	-
Stage 2	530	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	316	921	1335	-	-	-
Mov Cap-2 Maneuver	316	-	-	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	530	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.4	3.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1335	-	320	-	-
HCM Lane V/C Ratio	0.141	-	0.394	-	-
HCM Control Delay (s)	8.1	0	23.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	1.8	-	-

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	0	173	167	200	175
Future Vol, veh/h	114	0	173	167	200	175
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	0	188	182	217	190

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	870	312	407	0	-	0
Stage 1	312	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	318	721	1136	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	567	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	259	721	1136	-	-	-
Mov Cap-2 Maneuver	259	-	-	-	-	-
Stage 1	600	-	-	-	-	-
Stage 2	567	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	31	4.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1136	-	259	-	-
HCM Lane V/C Ratio	0.166	-	0.478	-	-
HCM Control Delay (s)	8.8	0	31	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.6	-	2.4	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	254	3	25	257	13	121
Future Vol, veh/h	254	3	25	257	13	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	276	3	27	279	14	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	327	167	0	0	306	0
Stage 1	167	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	661	869	-	-	1238	-
Stage 1	855	-	-	-	-	-
Stage 2	861	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	653	869	-	-	1238	-
Mov Cap-2 Maneuver	653	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	861	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	655	1238	-
HCM Lane V/C Ratio	-	-	0.426	0.011	-
HCM Control Delay (s)	-	-	14.5	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	2.1	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	8	20	134	42
Future Vol, veh/h	0	0	8	20	134	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	9	22	146	46

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	209	169	192	0	-	0
Stage 1	169	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	773	867	1364	-	-	-
Stage 1	854	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	768	867	1364	-	-	-
Mov Cap-2 Maneuver	768	-	-	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1364	-	-	-	-
HCM Lane V/C Ratio	0.006	-	-	-	-
HCM Control Delay (s)	7.7	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	8.3

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	162	0	25	14	13	1	0	2	18
Future Vol, veh/h	0	1	0	162	0	25	14	13	1	0	2	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	176	0	27	15	14	1	0	2	20

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	71	67	15	57	57	12	22	0	0	15	0	0
Stage 1	45	45	-	12	12	-	-	-	-	-	-	-
Stage 2	26	22	-	45	45	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	913	818	1056	933	828	1060	1574	-	-	1583	-	-
Stage 1	961	852	-	1001	880	-	-	-	-	-	-	-
Stage 2	984	871	-	961	852	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	883	810	1056	925	820	1060	1574	-	-	1583	-	-
Mov Cap-2 Maneuver	883	810	-	925	820	-	-	-	-	-	-	-
Stage 1	951	843	-	991	880	-	-	-	-	-	-	-
Stage 2	959	871	-	950	843	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.5	9.9	3.7	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	810	1583	-	-	1574	-	-	941
HCM Lane V/C Ratio	0.001	-	-	-	0.01	-	-	0.216
HCM Control Delay (s)	9.5	0	-	-	7.3	0	-	9.9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.8

PM Peak

Intersection						
Int Delay, s/veh	5.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	35	0	0	66	0
Future Vol, veh/h	0	35	0	0	66	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	38	0	0	72	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	38	-
Stage 1	-	-	0	-
Stage 2	-	-	38	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	967	0
Stage 1	0	-	-	0
Stage 2	0	-	977	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	967	-
Mov Cap-2 Maneuver	-	-	967	-
Stage 1	-	-	-	-
Stage 2	-	-	977	-

Approach	EB	SB
HCM Control Delay, s	0	9
HCM LOS		A

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	967
HCM Lane V/C Ratio	-	0.074
HCM Control Delay (s)	-	9
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.2

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	35	0	0	88	32
Future Vol, veh/h	0	35	0	0	88	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	16974	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	38	0	0	96	35

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	114	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.25	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.345	-	-
Pot Cap-1 Maneuver	0	931	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	931	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s	9	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	931	-	-
HCM Lane V/C Ratio	0.041	-	-
HCM Control Delay (s)	9	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	5.1					

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	0	91	0	0	101	0
Future Vol, veh/h	0	91	0	0	101	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	99	0	0	110	0

Major/Minor	Major1				Minor2	
Conflicting Flow All	-	0			99	-
Stage 1	-	-			0	-
Stage 2	-	-			99	-
Critical Hdwy	-	-			6.45	-
Critical Hdwy Stg 1	-	-			-	-
Critical Hdwy Stg 2	-	-			5.45	-
Follow-up Hdwy	-	-			3.545	-
Pot Cap-1 Maneuver	0	-			893	0
Stage 1	0	-			-	0
Stage 2	0	-			917	0
Platoon blocked, %		-				
Mov Cap-1 Maneuver	-	-			893	-
Mov Cap-2 Maneuver	-	-			893	-
Stage 1	-	-			-	-
Stage 2	-	-			917	-

Approach	NB				NE	
HCM Control Delay, s	0				9.6	
HCM LOS					A	

Minor Lane/Major Mvmt	NELn1	NBT
Capacity (veh/h)	893	-
HCM Lane V/C Ratio	0.123	-
HCM Control Delay (s)	9.6	-
HCM Lane LOS	A	-
HCM 95th %tile Q(veh)	0.4	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	70	8	103	43	0	0	0	0
Future Vol, veh/h	0	0	0	0	70	8	103	43	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	76	9	112	47	0	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	271	47	0	0	-
Stage 1	-	271	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	5.55	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	0	631	1014	-	-	0
Stage 1	0	680	-	-	-	0
Stage 2	0	-	-	-	-	0
Platoon blocked, %					-	
Mov Cap-1 Maneuver	-	0	1014	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.9	
HCM LOS	A	

Minor Lane/Major Mvmt	NBL	NBT	WBLn1
Capacity (veh/h)	-	-	1014
HCM Lane V/C Ratio	-	-	0.084
HCM Control Delay (s)	-	-	8.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.3

Intersection	
Int Delay, s/veh	3.5

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations				↑	↰	
Traffic Vol, veh/h	0	0	0	75	45	0
Future Vol, veh/h	0	0	0	75	45	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	0	82	49	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	82	-
Stage 1	-	-	0	-
Stage 2	-	-	82	-
Critical Hdwy	-	-	6.45	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.45	-
Follow-up Hdwy	-	-	3.545	-
Pot Cap-1 Maneuver	0	-	913	0
Stage 1	0	-	-	0
Stage 2	0	-	934	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	913	-
Mov Cap-2 Maneuver	-	-	913	-
Stage 1	-	-	-	-
Stage 2	-	-	934	-

Approach	SB	SW
HCM Control Delay, s	0	9.2
HCM LOS		A

Minor Lane/Major Mvmt	SBT	SWLn1
Capacity (veh/h)	-	913
HCM Lane V/C Ratio	-	0.054
HCM Control Delay (s)	-	9.2
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.2

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	113	30	0	128	45	0
Future Vol, veh/h	113	30	0	128	45	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	123	33	0	139	49	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	188	49	49	0	-	0
Stage 1	49	-	-	-	-	-
Stage 2	139	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	794	1011	1539	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	794	1011	1539	-	-	-
Mov Cap-2 Maneuver	794	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1539	-	831	-	-
HCM Lane V/C Ratio	-	-	0.187	-	-
HCM Control Delay (s)	0	-	10.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection						
Int Delay, s/veh	3.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	17	0	241	28	0
Future Vol, veh/h	114	17	0	241	28	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	18	0	262	30	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	292	30	30	0	-	0
Stage 1	30	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	693	1036	1564	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	775	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	693	1036	1564	-	-	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	775	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1564	-	724	-	-
HCM Lane V/C Ratio	-	-	0.197	-	-
HCM Control Delay (s)	0	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	1	59	296	16	9
Future Vol, veh/h	19	1	59	296	16	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	21	1	64	322	17	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	269	225	0	0	386	0
Stage 1	225	-	-	-	-	-
Stage 2	44	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	714	807	-	-	1156	-
Stage 1	805	-	-	-	-	-
Stage 2	971	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	703	807	-	-	1156	-
Mov Cap-2 Maneuver	703	-	-	-	-	-
Stage 1	793	-	-	-	-	-
Stage 2	971	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	5.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	708	1156	-
HCM Lane V/C Ratio	-	-	0.031	0.015	-
HCM Control Delay (s)	-	-	10.2	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	26	8	0	60	17	0
Future Vol, veh/h	26	8	0	60	17	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	28	9	0	65	18	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	83	18	18	0	-	0
Stage 1	18	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	911	1052	1579	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	911	1052	1579	-	-	-
Mov Cap-2 Maneuver	911	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1579	-	941	-	-
HCM Lane V/C Ratio	-	-	0.039	-	-
HCM Control Delay (s)	0	-	9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	2

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	9	0	8	10	7	0	1	1	84
Future Vol, veh/h	0	0	1	9	0	8	10	7	0	1	1	84
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	10	0	9	11	8	0	1	1	91

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	83	124	8	80	79	47	92	0	0	8	0	0
Stage 1	30	30	-	49	49	-	-	-	-	-	-	-
Stage 2	53	94	-	31	30	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	897	761	1065	901	806	1014	1484	-	-	1593	-	-
Stage 1	979	864	-	957	848	-	-	-	-	-	-	-
Stage 2	952	811	-	978	864	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	884	755	1065	895	800	1014	1484	-	-	1593	-	-
Mov Cap-2 Maneuver	884	755	-	895	800	-	-	-	-	-	-	-
Stage 1	972	858	-	950	847	-	-	-	-	-	-	-
Stage 2	943	810	-	970	858	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.9	4.4	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1484	-	-	947
HCM Lane V/C Ratio	0.001	0.001	-	-	0.007	-	-	0.02
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Appendix M

Strategies C5, C7 and C8

Synchro analysis

Year 2017

AM Peak

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	15	0	0	42	2	286	0	32	0	0	0
Future Vol, veh/h	10	15	0	0	42	2	286	0	32	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	11	16	0	0	46	2	311	0	35	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	664	657	-	-	640	18	0	0	0
Stage 1	0	0	-	-	640	-	-	-	-
Stage 2	664	657	-	-	0	-	-	-	-
Critical Hdwy	7.15	6.55	-	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	-	-	-	5.55	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	370	381	0	0	390	1052	-	-	-
Stage 1	-	-	0	0	465	-	-	-	-
Stage 2	445	457	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	336	381	-	-	390	1052	-	-	-
Mov Cap-2 Maneuver	336	381	-	-	390	-	-	-	-
Stage 1	-	-	-	-	465	-	-	-	-
Stage 2	400	457	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	15.8	15.2	
HCM LOS	C	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	362	401
HCM Lane V/C Ratio	-	-	-	0.075	0.119
HCM Control Delay (s)	-	-	-	15.8	15.2
HCM Lane LOS	-	-	-	C	C
HCM 95th %tile Q(veh)	-	-	-	0.2	0.4

Intersection	
Int Delay, s/veh	9.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	312	12	3	22	6
Future Vol, veh/h	16	312	12	3	22	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	17	339	13	3	24	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	70	15	0	0	16	0
Stage 1	15	-	-	-	-	-
Stage 2	55	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	927	1056	-	-	1582	-
Stage 1	1000	-	-	-	-	-
Stage 2	960	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	913	1056	-	-	1582	-
Mov Cap-2 Maneuver	913	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	960	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	5.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1048	1582	-
HCM Lane V/C Ratio	-	-	0.34	0.015	-
HCM Control Delay (s)	-	-	10.2	7.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	6	6	318	22	2
Future Vol, veh/h	5	6	6	318	22	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	5	7	7	346	24	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	385	25	26	0	-	0
Stage 1	25	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	612	1043	1569	-	-	-
Stage 1	990	-	-	-	-	-
Stage 2	699	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	608	1043	1569	-	-	-
Mov Cap-2 Maneuver	608	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	699	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	787	-	-
HCM Lane V/C Ratio	0.004	-	0.015	-	-
HCM Control Delay (s)	7.3	0	9.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection						
Int Delay, s/veh	4.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	2	137	186	22	151
Future Vol, veh/h	99	2	137	186	22	151
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	2	149	202	24	164

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	606	106	188	0	-	0
Stage 1	106	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	455	940	1368	-	-	-
Stage 1	911	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	399	940	1368	-	-	-
Mov Cap-2 Maneuver	399	-	-	-	-	-
Stage 1	799	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.2	3.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1368	-	404	-	-
HCM Lane V/C Ratio	0.109	-	0.272	-	-
HCM Control Delay (s)	8	0	17.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	0	137	148	173	150
Future Vol, veh/h	99	0	137	148	173	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	0	149	161	188	163

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	729	270	351	0	-	0
Stage 1	270	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	386	761	1191	-	-	-
Stage 1	768	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	333	761	1191	-	-	-
Mov Cap-2 Maneuver	333	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.9	4.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1191	-	333	-	-
HCM Lane V/C Ratio	0.125	-	0.323	-	-
HCM Control Delay (s)	8.5	0	20.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.4	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	202	2	25	222	10	121
Future Vol, veh/h	202	2	25	222	10	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	220	2	27	241	11	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	302	148	0	0	268	0
Stage 1	148	-	-	-	-	-
Stage 2	154	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	683	891	-	-	1278	-
Stage 1	872	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	677	891	-	-	1278	-
Mov Cap-2 Maneuver	677	-	-	-	-	-
Stage 1	864	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	679	1278	-
HCM Lane V/C Ratio	-	-	0.327	0.009	-
HCM Control Delay (s)	-	-	12.9	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	10	17	131	11
Future Vol, veh/h	0	0	10	17	131	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	11	18	142	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	188	148	154	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	794	891	1408	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	788	891	1408	-	-	-
Mov Cap-2 Maneuver	788	-	-	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1408	-	-	-	-
HCM Lane V/C Ratio	0.008	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	7.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	129	0	20	12	13	1	0	2	15
Future Vol, veh/h	0	1	0	129	0	20	12	13	1	0	2	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	140	0	22	13	14	1	0	2	16

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	62	59	15	51	51	10	18	0	0	15	0	0
Stage 1	41	41	-	10	10	-	-	-	-	-	-	-
Stage 2	21	18	-	41	41	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	926	826	1056	941	835	1063	1579	-	-	1583	-	-
Stage 1	966	855	-	1003	881	-	-	-	-	-	-	-
Stage 2	990	874	-	966	855	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	902	819	1056	934	828	1063	1579	-	-	1583	-	-
Mov Cap-2 Maneuver	902	819	-	934	828	-	-	-	-	-	-	-
Stage 1	958	848	-	995	881	-	-	-	-	-	-	-
Stage 2	970	874	-	957	848	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.4	9.6	3.4	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	819	1583	-	-	1579	-	-	949
HCM Lane V/C Ratio	0.001	-	-	-	0.008	-	-	0.171
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	9.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.6

PM Peak

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	21	0	0	61	7	54	0	18	0	0	0
Future Vol, veh/h	39	21	0	0	61	7	54	0	18	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	42	23	0	0	66	8	59	0	20	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	165	138	-	-	128	10	0	0	0
Stage 1	0	0	-	-	128	-	-	-	-
Stage 2	165	138	-	-	0	-	-	-	-
Critical Hdwy	7.15	6.55	-	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	-	-	-	5.55	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	793	747	0	0	757	1063	-	-	-
Stage 1	-	-	0	0	784	-	-	-	-
Stage 2	830	777	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	734	747	-	-	757	1063	-	-	-
Mov Cap-2 Maneuver	734	747	-	-	757	-	-	-	-
Stage 1	-	-	-	-	784	-	-	-	-
Stage 2	754	777	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.4	10.1	
HCM LOS	B	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	738	780
HCM Lane V/C Ratio	-	-	-	0.088	0.095
HCM Control Delay (s)	-	-	-	10.4	10.1
HCM Lane LOS	-	-	-	B	B
HCM 95th %tile Q(veh)	-	-	-	0.3	0.3

Intersection	
Int Delay, s/veh	6.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	90	22	13	47	25
Future Vol, veh/h	25	90	22	13	47	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	27	98	24	14	51	27

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	160	31	0	0	38	0
Stage 1	31	-	-	-	-	-
Stage 2	129	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	824	1035	-	-	1553	-
Stage 1	984	-	-	-	-	-
Stage 2	890	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	797	1035	-	-	1553	-
Mov Cap-2 Maneuver	797	-	-	-	-	-
Stage 1	952	-	-	-	-	-
Stage 2	890	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	4.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	972	1553	-
HCM Lane V/C Ratio	-	-	0.129	0.033	-
HCM Control Delay (s)	-	-	9.3	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	20	12	100	52	18
Future Vol, veh/h	11	20	12	100	52	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	12	22	13	109	57	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	202	67	77	0	-	0
Stage 1	67	-	-	-	-	-
Stage 2	135	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	780	988	1503	-	-	-
Stage 1	948	-	-	-	-	-
Stage 2	884	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	773	988	1503	-	-	-
Mov Cap-2 Maneuver	773	-	-	-	-	-
Stage 1	939	-	-	-	-	-
Stage 2	884	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1503	-	899	-	-
HCM Lane V/C Ratio	0.009	-	0.037	-	-
HCM Control Delay (s)	7.4	0	9.2	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	98	29	0	111	41	0
Future Vol, veh/h	98	29	0	111	41	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	107	32	0	121	45	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	166	45	45	0	-	0
Stage 1	45	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	818	1016	1544	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	897	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	818	1016	1544	-	-	-
Mov Cap-2 Maneuver	818	-	-	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	897	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1544	-	856	-	-
HCM Lane V/C Ratio	-	-	0.161	-	-
HCM Control Delay (s)	0	-	10	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	99	17	0	209	24	0
Future Vol, veh/h	99	17	0	209	24	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	108	18	0	227	26	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	253	26	26	0	-	0
Stage 1	26	-	-	-	-	-
Stage 2	227	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	729	1041	1569	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	729	1041	1569	-	-	-
Mov Cap-2 Maneuver	729	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	804	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	762	-	-
HCM Lane V/C Ratio	-	-	0.165	-	-
HCM Control Delay (s)	0	-	10.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	1	59	249	13	9
Future Vol, veh/h	15	1	59	249	13	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	16	1	64	271	14	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	238	200	0	0	335	0
Stage 1	200	-	-	-	-	-
Stage 2	38	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	744	833	-	-	1208	-
Stage 1	827	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	735	833	-	-	1208	-
Mov Cap-2 Maneuver	735	-	-	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	4.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	740	1208	-
HCM Lane V/C Ratio	-	-	0.024	0.012	-
HCM Control Delay (s)	-	-	10	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	7	0	60	15	0
Future Vol, veh/h	9	7	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	10	8	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	971	-	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	67
Future Vol, veh/h	0	0	1	7	0	6	8	7	0	1	1	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	8	0	7	9	8	0	1	1	73

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	69	102	8	67	66	38	74	0	0	8	0	0
Stage 1	26	26	-	40	40	-	-	-	-	-	-	-
Stage 2	43	76	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	916	782	1065	919	819	1025	1507	-	-	1593	-	-
Stage 1	984	868	-	967	856	-	-	-	-	-	-	-
Stage 2	964	826	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	905	777	1065	913	813	1025	1507	-	-	1593	-	-
Mov Cap-2 Maneuver	905	777	-	913	813	-	-	-	-	-	-	-
Stage 1	978	863	-	961	855	-	-	-	-	-	-	-
Stage 2	957	825	-	976	863	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.8	3.9	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1507	-	-	961
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-	0.015
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix N

Strategies C5, C7 and C8

Synchro analysis

Year 2023

AM Peak

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	16	0	0	44	2	304	0	34	0	0	0
Future Vol, veh/h	10	16	0	0	44	2	304	0	34	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	11	17	0	0	48	2	330	0	37	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	704	697	-	-	679	19	0	0	0
Stage 1	0	0	-	-	679	-	-	-	-
Stage 2	704	697	-	-	0	-	-	-	-
Critical Hdwy	7.15	6.55	-	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	-	-	-	5.55	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	348	361	0	0	370	1051	-	-	-
Stage 1	-	-	0	0	447	-	-	-	-
Stage 2	423	438	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	313	361	-	-	370	1051	-	-	-
Mov Cap-2 Maneuver	313	361	-	-	370	-	-	-	-
Stage 1	-	-	-	-	447	-	-	-	-
Stage 2	377	438	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	16.5	15.9	
HCM LOS	C	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	341	381
HCM Lane V/C Ratio	-	-	-	0.083	0.131
HCM Control Delay (s)	-	-	-	16.5	15.9
HCM Lane LOS	-	-	-	C	C
HCM 95th %tile Q(veh)	-	-	-	0.3	0.4

Intersection	
Int Delay, s/veh	9.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	330	12	3	23	6
Future Vol, veh/h	17	330	12	3	23	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	18	359	13	3	25	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	72	15	0	0	16	0
Stage 1	15	-	-	-	-	-
Stage 2	57	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	925	1056	-	-	1582	-
Stage 1	1000	-	-	-	-	-
Stage 2	958	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	910	1056	-	-	1582	-
Mov Cap-2 Maneuver	910	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	958	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	5.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1048	1582	-
HCM Lane V/C Ratio	-	-	0.36	0.016	-
HCM Control Delay (s)	-	-	10.4	7.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.7	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	6	6	336	22	2
Future Vol, veh/h	5	6	6	336	22	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	5	7	7	365	24	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	404	25	26	0	-	0
Stage 1	25	-	-	-	-	-
Stage 2	379	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	597	1043	1569	-	-	-
Stage 1	990	-	-	-	-	-
Stage 2	686	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	593	1043	1569	-	-	-
Mov Cap-2 Maneuver	593	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1569	-	776	-	-
HCM Lane V/C Ratio	0.004	-	0.015	-	-
HCM Control Delay (s)	7.3	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	2	148	193	22	157
Future Vol, veh/h	103	2	148	193	22	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	2	161	210	24	171

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	642	110	195	0	-	0
Stage 1	110	-	-	-	-	-
Stage 2	532	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	434	935	1360	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	376	935	1360	-	-	-
Mov Cap-2 Maneuver	376	-	-	-	-	-
Stage 1	785	-	-	-	-	-
Stage 2	583	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.5	3.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1360	-	380	-	-
HCM Lane V/C Ratio	0.118	-	0.3	-	-
HCM Control Delay (s)	8	0	18.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.2	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	0	143	153	179	157
Future Vol, veh/h	103	0	143	153	179	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	0	155	166	195	171

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	757	281	366	0	-	0
Stage 1	281	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	371	751	1176	-	-	-
Stage 1	760	-	-	-	-	-
Stage 2	619	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	317	751	1176	-	-	-
Mov Cap-2 Maneuver	317	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	619	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.4	4.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1176	-	317	-	-
HCM Lane V/C Ratio	0.132	-	0.353	-	-
HCM Control Delay (s)	8.5	0	22.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	1.5	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	214	2	25	231	11	121
Future Vol, veh/h	214	2	25	231	11	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	233	2	27	251	12	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	309	153	0	0	278	0
Stage 1	153	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	677	885	-	-	1268	-
Stage 1	868	-	-	-	-	-
Stage 2	865	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	670	885	-	-	1268	-
Mov Cap-2 Maneuver	670	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	865	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	672	1268	-
HCM Lane V/C Ratio	-	-	0.349	0.009	-
HCM Control Delay (s)	-	-	13.2	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	9	18	132	18
Future Vol, veh/h	0	0	9	18	132	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	10	20	143	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	193	153	163	0	-	0
Stage 1	153	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	789	885	1398	-	-	-
Stage 1	868	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	783	885	1398	-	-	-
Mov Cap-2 Maneuver	783	-	-	-	-	-
Stage 1	862	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	2.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1398	-	-	-	-
HCM Lane V/C Ratio	0.007	-	-	-	-
HCM Control Delay (s)	7.6	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection												
Int Delay, s/veh	7.9											

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	137	0	21	13	13	1	0	2	16
Future Vol, veh/h	0	1	0	137	0	21	13	13	1	0	2	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	149	0	23	14	14	1	0	2	17

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	65	62	15	54	54	11	19	0	0	15	0	0
Stage 1	43	43	-	11	11	-	-	-	-	-	-	-
Stage 2	22	19	-	43	43	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	921	823	1056	937	831	1061	1578	-	-	1583	-	-
Stage 1	964	853	-	1002	880	-	-	-	-	-	-	-
Stage 2	989	874	-	964	853	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	895	816	1056	930	824	1061	1578	-	-	1583	-	-
Mov Cap-2 Maneuver	895	816	-	930	824	-	-	-	-	-	-	-
Stage 1	955	845	-	993	880	-	-	-	-	-	-	-
Stage 2	968	874	-	954	845	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.4	9.6	3.5	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	816	1583	-	-	1578	-	-	946
HCM Lane V/C Ratio	0.001	-	-	-	0.009	-	-	0.182
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	9.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.7

PM Peak

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	22	0	0	63	7	57	0	19	0	0	0
Future Vol, veh/h	40	22	0	0	63	7	57	0	19	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	43	24	0	0	68	8	62	0	21	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	173	145	-	-	135	11	0	0	0
Stage 1	0	0	-	-	135	-	-	-	-
Stage 2	173	145	-	-	0	-	-	-	-
Critical Hdwy	7.15	6.55	-	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	-	-	-	5.55	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	783	741	0	0	750	1061	-	-	-
Stage 1	-	-	0	0	779	-	-	-	-
Stage 2	822	771	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	723	741	-	-	750	1061	-	-	-
Mov Cap-2 Maneuver	723	741	-	-	750	-	-	-	-
Stage 1	-	-	-	-	779	-	-	-	-
Stage 2	744	771	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.4	10.2	
HCM LOS	B	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	729	773
HCM Lane V/C Ratio	-	-	-	0.092	0.098
HCM Control Delay (s)	-	-	-	10.4	10.2
HCM Lane LOS	-	-	-	B	B
HCM 95th %tile Q(veh)	-	-	-	0.3	0.3

Intersection	
Int Delay, s/veh	6.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	94	22	13	48	25
Future Vol, veh/h	26	94	22	13	48	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	28	102	24	14	52	27

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	162	31	0	0	38	0
Stage 1	31	-	-	-	-	-
Stage 2	131	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	822	1035	-	-	1553	-
Stage 1	984	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	794	1035	-	-	1553	-
Mov Cap-2 Maneuver	794	-	-	-	-	-
Stage 1	951	-	-	-	-	-
Stage 2	888	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	4.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	971	1553	-
HCM Lane V/C Ratio	-	-	0.134	0.034	-
HCM Control Delay (s)	-	-	9.3	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	20	12	104	53	19
Future Vol, veh/h	11	20	12	104	53	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	12	22	13	113	58	21

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	208	69	79	0	-	0
Stage 1	69	-	-	-	-	-
Stage 2	139	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	774	986	1500	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	767	986	1500	-	-	-
Mov Cap-2 Maneuver	767	-	-	-	-	-
Stage 1	937	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1500	-	895	-	-
HCM Lane V/C Ratio	0.009	-	0.038	-	-
HCM Control Delay (s)	7.4	0	9.2	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	102	30	0	115	43	0
Future Vol, veh/h	102	30	0	115	43	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	111	33	0	125	47	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	172	47	47	0	-	0
Stage 1	47	-	-	-	-	-
Stage 2	125	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	811	1014	1541	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	893	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	811	1014	1541	-	-	-
Mov Cap-2 Maneuver	811	-	-	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1541	-	850	-	-
HCM Lane V/C Ratio	-	-	0.169	-	-
HCM Control Delay (s)	0	-	10.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	18	0	217	25	0
Future Vol, veh/h	103	18	0	217	25	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	112	20	0	236	27	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	263	27	27	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	720	1040	1568	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	796	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	720	1040	1568	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	796	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1568	-	755	-	-
HCM Lane V/C Ratio	-	-	0.174	-	-
HCM Control Delay (s)	0	-	10.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	1	59	260	14	9
Future Vol, veh/h	16	1	59	260	14	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	17	1	64	283	15	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	246	206	0	0	347	0
Stage 1	206	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	736	827	-	-	1195	-
Stage 1	821	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	726	827	-	-	1195	-
Mov Cap-2 Maneuver	726	-	-	-	-	-
Stage 1	810	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	4.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	731	1195	-
HCM Lane V/C Ratio	-	-	0.025	0.013	-
HCM Control Delay (s)	-	-	10.1	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	8	0	60	15	0
Future Vol, veh/h	13	8	0	60	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	14	9	0	65	16	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	81	16	16	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	914	1055	1582	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	914	1055	1582	-	-	-
Mov Cap-2 Maneuver	914	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1582	-	963	-	-
HCM Lane V/C Ratio	-	-	0.024	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	7	0	7	8	7	0	1	1	71
Future Vol, veh/h	0	0	1	7	0	7	8	7	0	1	1	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	8	0	8	9	8	0	1	1	77

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	72	106	8	69	68	40	78	0	0	8	0	0
Stage 1	26	26	-	42	42	-	-	-	-	-	-	-
Stage 2	46	80	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	912	778	1065	916	817	1023	1502	-	-	1593	-	-
Stage 1	984	868	-	965	854	-	-	-	-	-	-	-
Stage 2	960	823	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	900	773	1065	911	811	1023	1502	-	-	1593	-	-
Mov Cap-2 Maneuver	900	773	-	911	811	-	-	-	-	-	-	-
Stage 1	978	863	-	959	853	-	-	-	-	-	-	-
Stage 2	952	822	-	976	863	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.8	4	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1502	-	-	964
HCM Lane V/C Ratio	0.001	0.001	-	-	0.006	-	-	0.016
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix O

Strategies C5, C7 and C8

Synchro analysis

Year 2040

AM Peak

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	17	0	0	49	2	360	0	40	0	0	0
Future Vol, veh/h	11	17	0	0	49	2	360	0	40	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	12	18	0	0	53	2	391	0	43	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	831	825	-	-	804	22	0	0	0
Stage 1	0	0	-	-	804	-	-	-	-
Stage 2	831	825	-	-	0	-	-	-	-
Critical Hdwy	7.15	6.55	-	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	-	-	-	5.55	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	285	304	0	0	313	1047	-	-	-
Stage 1	-	-	0	0	391	-	-	-	-
Stage 2	360	383	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	247	304	-	-	313	1047	-	-	-
Mov Cap-2 Maneuver	247	304	-	-	313	-	-	-	-
Stage 1	-	-	-	-	391	-	-	-	-
Stage 2	310	383	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	19.5	18.5	
HCM LOS	C	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	279	322
HCM Lane V/C Ratio	-	-	-	0.109	0.172
HCM Control Delay (s)	-	-	-	19.5	18.5
HCM Lane LOS	-	-	-	C	C
HCM 95th %tile Q(veh)	-	-	-	0.4	0.6

Intersection	
Int Delay, s/veh	10.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	389	12	3	25	6
Future Vol, veh/h	19	389	12	3	25	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	21	423	13	3	27	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	76	15	0	0	16	0
Stage 1	15	-	-	-	-	-
Stage 2	61	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	920	1056	-	-	1582	-
Stage 1	1000	-	-	-	-	-
Stage 2	954	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	904	1056	-	-	1582	-
Mov Cap-2 Maneuver	904	-	-	-	-	-
Stage 1	983	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	5.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1048	1582	-
HCM Lane V/C Ratio	-	-	0.423	0.017	-
HCM Control Delay (s)	-	-	10.9	7.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	2.1	0.1	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	7	7	393	24	2
Future Vol, veh/h	6	7	7	393	24	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	7	8	8	427	26	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	470	27	28	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	443	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	547	1040	1566	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	543	1040	1566	-	-	-
Mov Cap-2 Maneuver	543	-	-	-	-	-
Stage 1	981	-	-	-	-	-
Stage 2	641	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1566	-	731	-	-
HCM Lane V/C Ratio	0.005	-	0.019	-	-
HCM Control Delay (s)	7.3	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection						
Int Delay, s/veh	5.8					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	115	2	173	226	24	191
Future Vol, veh/h	115	2	173	226	24	191
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	125	2	188	246	26	208

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	752	130	234	0	-	0
Stage 1	130	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	374	912	1316	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	530	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	312	912	1316	-	-	-
Mov Cap-2 Maneuver	312	-	-	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	530	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.9	3.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1316	-	316	-	-
HCM Lane V/C Ratio	0.143	-	0.402	-	-
HCM Control Delay (s)	8.2	0	23.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	1.9	-	-

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	0	173	168	215	191
Future Vol, veh/h	114	0	173	168	215	191
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	0	188	183	234	208

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	897	338	442	0	-	0
Stage 1	338	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	307	697	1102	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	567	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	249	697	1102	-	-	-
Mov Cap-2 Maneuver	249	-	-	-	-	-
Stage 1	580	-	-	-	-	-
Stage 2	567	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	33	4.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1102	-	249	-	-
HCM Lane V/C Ratio	0.171	-	0.498	-	-
HCM Control Delay (s)	8.9	0	33	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.6	-	2.6	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	254	3	25	257	13	152
Future Vol, veh/h	254	3	25	257	13	152
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	276	3	27	279	14	165

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	360	167	0	0	306	0
Stage 1	167	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	633	869	-	-	1238	-
Stage 1	855	-	-	-	-	-
Stage 2	833	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	625	869	-	-	1238	-
Mov Cap-2 Maneuver	625	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	833	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.3	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	627	1238	-
HCM Lane V/C Ratio	-	-	0.446	0.011	-
HCM Control Delay (s)	-	-	15.3	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0	-

Intersection						
Int Delay, s/veh	0.3					
Movement	**EBL**	**EBR**	**NBL**	**NBT**	**SBT**	**SBR**
Lane Configurations						
Traffic Vol, veh/h	0	0	8	20	165	10
Future Vol, veh/h	0	0	8	20	165	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	0	0	9	22	179	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	225	185	190	0	-	0
Stage 1	185	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	757	850	1366	-	-	-
Stage 1	839	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	752	850	1366	-	-	-
Mov Cap-2 Maneuver	752	-	-	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Approach	**EB**		**NB**		**SB**	
HCM Control Delay, s	0		2.2		0	
HCM LOS	A					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1366	-	-	-	-
HCM Lane V/C Ratio	0.006	-	-	-	-
HCM Control Delay (s)	7.7	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	8.3

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	0	1	0	162	0	25	14	13	1	0	2	18
Future Vol, veh/h	0	1	0	162	0	25	14	13	1	0	2	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	1	0	176	0	27	15	14	1	0	2	20

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	71	67	15	57	57	12	22	0	0	15	0	0
Stage 1	45	45	-	12	12	-	-	-	-	-	-	-
Stage 2	26	22	-	45	45	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	913	818	1056	933	828	1060	1574	-	-	1583	-	-
Stage 1	961	852	-	1001	880	-	-	-	-	-	-	-
Stage 2	984	871	-	961	852	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	883	810	1056	925	820	1060	1574	-	-	1583	-	-
Mov Cap-2 Maneuver	883	810	-	925	820	-	-	-	-	-	-	-
Stage 1	951	843	-	991	880	-	-	-	-	-	-	-
Stage 2	959	871	-	950	843	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	9.5	9.9	3.7	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	810	1583	-	-	1574	-	-	941
HCM Lane V/C Ratio	0.001	-	-	-	0.01	-	-	0.216
HCM Control Delay (s)	9.5	0	-	-	7.3	0	-	9.9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.8

PM Peak

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	43	24	0	0	70	8	68	0	23	0	0	0
Future Vol, veh/h	43	24	0	0	70	8	68	0	23	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	47	26	0	0	76	9	74	0	25	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	203	173	-	-	161	13	0	0	0
Stage 1	0	0	-	-	161	-	-	-	-
Stage 2	203	173	-	-	0	-	-	-	-
Critical Hdwy	7.15	6.55	-	-	6.55	6.25	4.15	-	-
Critical Hdwy Stg 1	-	-	-	-	5.55	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	-	-	4.045	3.345	2.245	-	-
Pot Cap-1 Maneuver	749	715	0	0	726	1059	-	-	-
Stage 1	-	-	0	0	759	-	-	-	-
Stage 2	792	750	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	683	715	-	-	726	1059	-	-	-
Mov Cap-2 Maneuver	683	715	-	-	726	-	-	-	-
Stage 1	-	-	-	-	759	-	-	-	-
Stage 2	707	750	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.8	10.4	
HCM LOS	B	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	694	750
HCM Lane V/C Ratio	-	-	-	0.105	0.113
HCM Control Delay (s)	-	-	-	10.8	10.4
HCM Lane LOS	-	-	-	B	B
HCM 95th %tile Q(veh)	-	-	-	0.4	0.4

Intersection	
Int Delay, s/veh	6.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	107	22	13	54	25
Future Vol, veh/h	31	107	22	13	54	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	34	116	24	14	59	27

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	176	31	0	0	38	0
Stage 1	31	-	-	-	-	-
Stage 2	145	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	807	1035	-	-	1553	-
Stage 1	984	-	-	-	-	-
Stage 2	875	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	776	1035	-	-	1553	-
Mov Cap-2 Maneuver	776	-	-	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	875	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	5.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	963	1553	-
HCM Lane V/C Ratio	-	-	0.156	0.038	-
HCM Control Delay (s)	-	-	9.4	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.1	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	22	13	116	57	21
Future Vol, veh/h	13	22	13	116	57	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	14	24	14	126	62	23

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	228	74	85	0	-	0
Stage 1	74	-	-	-	-	-
Stage 2	154	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	754	979	1493	-	-	-
Stage 1	941	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	746	979	1493	-	-	-
Mov Cap-2 Maneuver	746	-	-	-	-	-
Stage 1	932	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1493	-	877	-	-
HCM Lane V/C Ratio	0.009	-	0.043	-	-
HCM Control Delay (s)	7.4	0	9.3	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection						
Int Delay, s/veh	4.6					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	113	30	0	128	47	0
Future Vol, veh/h	113	30	0	128	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	123	33	0	139	51	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	190	51	51	0	-	0
Stage 1	51	-	-	-	-	-
Stage 2	139	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	792	1009	1536	-	-	-
Stage 1	964	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	792	1009	1536	-	-	-
Mov Cap-2 Maneuver	792	-	-	-	-	-
Stage 1	964	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1536	-	829	-	-
HCM Lane V/C Ratio	-	-	0.187	-	-
HCM Control Delay (s)	0	-	10.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	114	19	0	241	28	0
Future Vol, veh/h	114	19	0	241	28	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	124	21	0	262	30	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	292	30	30	0	-	0
Stage 1	30	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	693	1036	1564	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	775	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	693	1036	1564	-	-	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	775	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1564	-	727	-	-
HCM Lane V/C Ratio	-	-	0.199	-	-
HCM Control Delay (s)	0	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection						
Int Delay, s/veh	0.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	1	59	296	16	9
Future Vol, veh/h	19	1	59	296	16	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	21	1	64	322	17	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	269	225	0	0	386	0
Stage 1	225	-	-	-	-	-
Stage 2	44	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	714	807	-	-	1156	-
Stage 1	805	-	-	-	-	-
Stage 2	971	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	703	807	-	-	1156	-
Mov Cap-2 Maneuver	703	-	-	-	-	-
Stage 1	793	-	-	-	-	-
Stage 2	971	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	5.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	708	1156	-
HCM Lane V/C Ratio	-	-	0.031	0.015	-
HCM Control Delay (s)	-	-	10.2	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	26	7	0	60	17	0
Future Vol, veh/h	26	7	0	60	17	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	28	8	0	65	18	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	83	18	18	0	-	0
Stage 1	18	-	-	-	-	-
Stage 2	65	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	911	1052	1579	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	911	1052	1579	-	-	-
Mov Cap-2 Maneuver	911	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1579	-	938	-	-
HCM Lane V/C Ratio	-	-	0.038	-	-
HCM Control Delay (s)	0	-	9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	2

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	9	0	8	10	7	0	1	1	84
Future Vol, veh/h	0	0	1	9	0	8	10	7	0	1	1	84
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	0	0	1	10	0	9	11	8	0	1	1	91

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	83	124	8	80	79	47	92	0	0	8	0	0
Stage 1	30	30	-	49	49	-	-	-	-	-	-	-
Stage 2	53	94	-	31	30	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	897	761	1065	901	806	1014	1484	-	-	1593	-	-
Stage 1	979	864	-	957	848	-	-	-	-	-	-	-
Stage 2	952	811	-	978	864	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	884	755	1065	895	800	1014	1484	-	-	1593	-	-
Mov Cap-2 Maneuver	884	755	-	895	800	-	-	-	-	-	-	-
Stage 1	972	858	-	950	847	-	-	-	-	-	-	-
Stage 2	943	810	-	970	858	-	-	-	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	8.4	8.9	4.4	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBLn1	NWL	NWT	NWR	SEL	SET	SER	SBLn1
Capacity (veh/h)	1065	1593	-	-	1484	-	-	947
HCM Lane V/C Ratio	0.001	0.001	-	-	0.007	-	-	0.02
HCM Control Delay (s)	8.4	7.3	0	-	7.4	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1