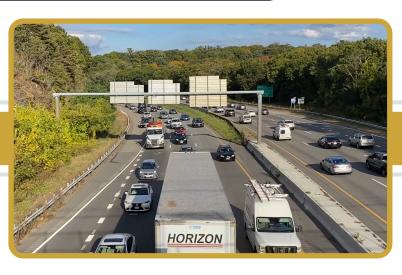
Low-Cost Improvements to Express-Highway Bottleneck Locations







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Abstract

The section of Interstate 95 (I-95) between Exits 57 and 61 that runs through Reading, Wakefield, and Lynnfield, is one of the most frequently traveled corridors in the state. Motorists on this section of I-95 regularly experience delays resulting from highway bottlenecks, particularly during peak travel periods in the morning and afternoon. The federal fiscal year 2021 *Low-Cost Improvements to Express-Highway Bottleneck Locations* study examined these conditions to identify the cause of the traffic delays and develop low-cost solutions to improve traffic operations and safety in this area. Recommendations are given for reconfiguring acceleration and deceleration lanes and adding an auxiliary lane to alleviate congestion. The results of this study provide the MassDOT Highway Division with information for beginning to design and engineer improvements to these bottleneck locations.

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Executive Summary

The purpose of the Low-Cost Improvements to Express-Highway Bottleneck Locations study was to identify low-cost improvements that will help reduce congestion at freeway bottleneck locations in the Boston Metropolitan Planning Organization (MPO) region. The study was accomplished through cooperation with the Massachusetts Department of Transportation (MassDOT) Highway Division.

Bottlenecks on the freeway network can occur where geometric elements, such as ramps or lane drops, restrict traffic flow and become a major contributor to recurring congestion. Candidate locations in this study were identified based on input from the MassDOT Highway Division and review of the MPO's Congestion Management Process data. The screening process yielded two locations on Interstate 95 (I-95) that had the potential for low-cost improvements: 1) I-95 southbound between Exit 58 (Route 129) and Exit 57 (North Avenue) in Wakefield and Reading, and 2) I-95 northbound at Exit 61 (Walnut Street) in Lynnfield.

After further review of the areas adjacent to the two locations and discussions with MassDOT Highway Division District 4 staff, MPO staff selected the northbound and southbound sections of I-95 between Exit 57 and Exit 61 for a comprehensive and systematic analysis to identify bottleneck locations for low-cost improvements. Travelers on this section of I-95 regularly experience poor levels of service and endure additional delays while entering or exiting the freeway during the weekday AM and PM peak travel periods.

MPO staff performed a series of operational and safety analyses, including traffic-volume estimations and projections, and analyses of highway capacity, travel speeds, and crash data. Staff then developed low-cost improvement proposals for the identified bottleneck locations.

The locations and proposed improvements are as follows:

- I-95 northbound between Exit 57 and Exit 58: Expand the existing paved shoulder and add an auxiliary lane between the exit ramp and the entrance ramp.
- I-95 northbound merge segment at Exit 58: Extend the acceleration length.
- *I-95 northbound diverge segment at Exit 60:* Extend the deceleration length.

- *I-95* southbound between Exit 58 and Exit 57: Expand the existing paved shoulder and add an auxiliary lane between the exit ramp and the entrance ramp.
- *I-95* southbound merge segments at Exit 59 and Exit 61: Extend the acceleration length.
- *I-95* southbound diverge segments at Exit 58 and Exit 59: Extend the deceleration length.

The study aligns with the MPO's goals of managing capacity, improving mobility, and improving safety on the region's highway system. The proposed low-cost improvements would improve the freeway facilities, make traffic operations more efficient, and reduce congestion at the identified bottleneck locations. The improvements also would reduce crashes and improve safety for the freeway users.

Chapter 1—Introduction

1.1 BACKGROUND

According to the Federal Highway Administration (FHWA), "Much of recurring congestion is due to physical bottlenecks—potentially correctible points on the highway system where traffic flow is restricted. While many of the nation's bottlenecks can only be addressed through costly major construction projects, there is a significant opportunity for the application of operational and low-cost infrastructure solutions to bring about relief at these chokepoints." ¹

The cause and duration of highway bottlenecks are various. In general, recurring bottlenecks, the subject of this study, are influenced by the design or operation present at the point where the bottleneck begins. These points may be where the highway design is less than optimal; where traffic merges, diverges, or weaves; where there are abrupt changes in highway alignment, lane drops, or narrowing of lanes; at low-clearance structures; or where traffic is disrupted intentionally for management purposes.

Since 2011, MPO staff analyzed several express-highway bottleneck locations in five previous studies; these studies were well received by the Massachusetts Department of Transportation (MassDOT) and the FHWA.² Previous study locations included sections of Interstate 95 (I-95) in Burlington, Lexington, and Weston; sections of Interstate 93 (I-93) in Woburn; sections of Route 3 in Braintree; sections of Route 24 in Canton and Randolph; sections of I-93 northbound in Wilmington; and sections of I-93 southbound in Quincy and Braintree.

¹ Federal Highway Administration, *Recurring Traffic Bottlenecks: A Primer: Focus on Low-Cost Operations Improvements* (US Department of Transportation, June 2009) p. 1.

² Seth Asante, MPO staff, memorandum to the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, "Low-Cost Improvements to Bottleneck Locations," June 2, 2011; Chen-Yuan Wang, MPO staff, memorandum to the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, "Low-Cost Improvements to Bottleneck Locations, Phase II," March 12, 2012; Seth Asante, MPO staff, memorandum to the Boston Region Metropolitan Planning Organization, "Low-Cost Improvements to Bottleneck Locations," December 3, 2015; Seth Asante, MPO staff, "Low-Cost Improvements to Bottleneck Locations," Boston Region Metropolitan Planning Organization, January 2018; and Seth Asante and Chen-Yuan Wang, MPO staff, "Low-Cost Improvements to Bottleneck Locations," Boston Region Metropolitan Planning Organization, February 2020.

The MassDOT Highway Division has implemented many of the recommendations from those studies, and the FHWA has interviewed MPO staff about these successful implementations, including

- restriping lanes to serve traffic demand better on I-95 northbound at Interchange 24 in Weston;
- restriping lanes to serve traffic demand better on I-95 southbound at Interchange 24 in Weston;
- providing two-lane exits for traffic exiting I-95 northbound to Route 3 northbound and the Middlesex Turnpike at Interchange 32 in Lexington and Burlington; and
- providing two-lane exits for traffic exiting I-95 southbound to Route 3 northbound and the Middlesex Turnpike at Interchange 32 in Burlington.

Cost estimates for low-cost bottleneck improvements that have been implemented by the MassDOT Highway Division, or currently are in design status, range between \$10,000 and \$1 million.

1.2 PURPOSE OF STUDY

The purpose of this study was twofold. First, the study aimed to identify bottleneck locations where low-cost mitigation improvements are potentially applicable. Second, the study aimed to recommend low-cost mitigation improvements based on analysis of geometric design, traffic volumes and other data, and projected service performance associated with the improvements at each location.

MPO staff conducted a series of highway operations and crash data analyses to identify low-cost methods to reduce congestion, increase safety, and improve traffic operations. Technical expertise was provided by MassDOT Highway Division staff, who are familiar with the region's express-highway system operations, to develop and evaluate a comprehensive list of potential improvements at the bottleneck locations.

1.3 REPORT ORGANIZATION

The following chapters of this report describe the selection of study locations, an assessment of the safety and operational problems, and potential improvement strategies. The final section presents the proposed low-cost improvements for several locations and recommendations. This report also includes a series of technical appendices, which cite the study methods, highway capacity analysis reports, and intersection capacity analysis reports for the signalized interchanges in the study area.

Chapter 2—Selection of Study Locations

2.1 INVENTORY OF CANDIDATE LOCATIONS

MPO staff developed an initial list of candidate locations in the Boston region based on the following:

- Consultations with MassDOT Highway Division
- Staff knowledge of bottleneck locations in the Boston region
- Review of Congestion Management Process (CMP) monitoring data, recent MPO studies, and other planning studies

The inventory process also included a review of the locations collected in the previous studies that have potential for low-cost improvements. The process yielded over 20 bottleneck locations in the Boston region for further screening.

2.2 SCREENING CANDIDATE LOCATIONS

MPO staff used the following three criteria to screen the bottleneck locations:

- 1. Does the location qualify as a bottleneck?
 - A repetitive, long traffic queue upstream trailing free-flowing traffic downstream usually characterizes the location as a bottleneck. In other words, the location experiences routine and predictable congestion because traffic volume exceeds the available capacity at that location.
- 2. Is a physical design constraint or operational conflict inherent in the location the cause of the bottleneck?

Examples of these constraints or conflicts include the following:

- Lane drop: One or more travel lanes end, requiring traffic to merge
- Weaving area: Drivers must merge across one or more lanes to access an entry or exit ramp
- *Merge area:* On-ramp traffic merges with mainline traffic to enter the freeway
- Major interchanges: High-volume traffic is directed from one freeway to another
- Can low-cost operational and geometric improvements fix the bottleneck?
 These improvements exclude costly long-term solutions such as expansion or widening of the roadway. Examples of low-cost operational

and geometric improvements include the following:

- Using a short section of shoulder as an additional travel lane or for lengthening an acceleration or deceleration lane
- Restriping merge and diverge areas to better serve traffic demand
- Providing all-purpose reversible lanes
- Changing or adding signs and striping

Based on the suggestions from MassDOT Highway Division officials and the screening criteria, MPO staff identified nine express-highway bottleneck locations that have the potential to be corrected with low-cost mitigation strategies (see Table 1). Among them, Locations 1 and 2 are considered as having high potential because there is sufficient highway layout and few constraints in the adjacent areas. The other locations were not selected in this round because of funding resources. Those locations can be considered in future bottleneck studies.

Table 1
Express-Highway Locations with Potential for Low-Cost Improvements

Location		MassDOT		
Number	City/Town	District	Express-Highway Section	Problem
			I-95 southbound between Exit 58	
			(Route 129) and Exit 57 (North	
1	Wakefield	4	Avenue)	Merge and diverge
				Merge and diverge
			I-95 northbound at Exit 61 (Walnut	during the PM
2	Lynnfield	4	Street)	commute
			I-95 northbound between Exit 53	
			(Route 38) and Exit 54 (Washington	
3	Woburn	4	Street)	Merge and diverge
			I-93 southbound between Route 16	
			on-ramp and Exit 22 (Route 16 off-	
4	Medford	4	ramp)	Merge and diverge
			Route 1 southbound between Essex	
5	Saugus	4	Street and Broadway (Route 99)	Merge and diverge
				Merge and diverge
			I-95 southbound at I-495 northbound	during the PM
6	Foxborough	5	and southbound	commute
				Merge and weave
			I-93 northbound at the end of the HOV	during the AM
7	Boston	6	zipper lane in Savin Hill	commute
	Canton and		I-93 northbound between Exit 1 (I-95)	Merge, diverge, and
8	Randolph	6	and Exit 4 (Route 24)	weave
	Canton and		I-93 southbound between Exit 1 (I-95)	Merge, diverge, and
9	Randolph	6	and Exit 4 (Route 24)	weave

Notes: 1) Shading indicates locations identified as having high potential for low-cost improvements in this study.

Source: Central Transportation Planning Staff.

²⁾ All the exit numbers are based on the recently (2020–21) updated mile-based numbers.

HOV = High occupancy vehicle. MassDOT = Massachusetts Department of Transportation.

2.3 SELECTED BOTTLENECK LOCATIONS FOR STUDY: 1-95 NORTHBOUND AND SOUTHBOUND BETWEEN EXIT 57 (NORTH AVENUE, WAKEFIELD) AND EXIT 61 (WALNUT STREET, LYNNFIELD)

After the screening process, staff further reviewed the two locations with high potential for low-cost improvements and the adjacent highway segments and found that both the northbound and southbound sections of I-95 between Exit 57 and Exit 61 were suitable for study.

Figure 1 shows the selected sections of I-95 in the study area. These sections contain five interchanges:

- Exit 57: North Avenue in Wakefield
- Exit 58: Route 129 in Wakefield and Reading
- Exit 59: Vernon Street in Wakefield and Main Street in Lynnfield
- Exit 60: Salem Street and Pleasure Island Road in Wakefield
- Exit 61: Walnut Street in Lynnfield

The distances for traffic to merge and diverge on I-95 northbound and southbound at these interchanges are generally short, some less than 500 feet. However, most of these segments appear to have sufficient highway layout with no significant terrestrial constraints. Therefore, there is space to extend the distances where traffic may merge and diverge.

Both directions of I-95 between Exit 57 and Exit 61 are usually congested in the peak periods. In general, the traffic in the peak direction (southbound in the AM peak period and northbound in the PM peak period) is much more congested than the off-peak direction. In addition to the mainline congestion, localized bottlenecks develop at the areas where traffic merges and diverges when high entry and exit volumes are present in the peak hours.

Review of the crash data also indicated that there were significant numbers of crashes on I-95 at the locations of merging and diverging traffic. This study provided a systematic review of this frequently congested section of I-95 to identify short-term improvement strategies and support long-term improvement planning.

Chapter 3—Data Collection and Analysis Methods

3.1 TRAFFIC VOLUME DATA

The MassDOT Transportation Data Management System provides traffic volume data on major express highways, arterials, and major collectors throughout the state.³ The database contains four permanent count stations in the study area:

- I-95 between Exit 57 and Exit 58 (Location ID: 4137)
- I-95 between Exit 58 and Exit 59 (Location ID: 4423)
- I-95 between Exit 59 and Exit 60 (Location ID: 4121)
- I-95 between Exit 60 and Exit 61 (Location ID: 5099)

In addition, it contains ramp counts collected in October 2020 at all the interchanges in the study area. MPO staff used these counts and available historical data to estimate traffic volumes on the I-95 northbound and southbound mainline and ramps. Staff also adjusted some of the counts collected during the COVID-19 pandemic period.⁴

3.2 CRASH DATA

MPO staff used crash data from January 2015 to December 2017 from the MassDOT Registry of Motor Vehicles database to analyze crash severity, collision type, and roadway conditions and to evaluate safety for motorists.

3.3 SPEED DATA

The CMP maintains average speed data on express-highway systems in the Boston region, incorporating the INRIX historical traffic speed data.⁵ MPO staff used the current speed data from the CMP (spring 2019 and fall 2019) to determine the average weekday travel speeds through the bottlenecks.

3.4 LEVEL OF SERVICE CRITERIA

Level of service (LOS) is a quality measure of effectiveness describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions,

³ The data are available from Massachusetts government webpage: https://www.mass.gov/traffic-volume-and-classification.

⁴ See Section 4.2.1 of this report for further description of the estimation process.

⁵ INRIX is a private company that collects roadway travel times and origin-destination data for most roadways that are collectors, arterials, limited-access roadways, or freeways.

and comfort and convenience. Factors influencing LOS are volumes, lane width, lateral obstructions, traffic composition, grade, and speed. The *Highway Capacity Manual* (HCM) methodology demonstrates driving conditions on freeways in terms of LOS ratings from A through F.⁶

The LOS criteria have been developed for each freeway component—basic freeway, ramp merge/diverge, and weaving segments. The locations and traffic flow characteristics at each of the components are described below.

- Basic freeway segments are outside of the influence area of ramps or weaving areas of the freeway. The flow in such segments occurs more smoothly than segments with merging, diverging, or weaving. The exact point at which basic freeway segments begin or end depends on local conditions, particularly the LOS operating at the time. If traffic flow is light, the influence may be negligible, whereas under congested conditions, queues may be extensive.
- Freeway merge segments are ramp junction areas where two separate traffic streams (mainline and on-ramp) join to form one stream on the mainline. The influence areas of merging segments depend on local traffic conditions.
- Freeway diverge segments are ramp junction areas where one traffic stream diverges to form two separate streams (mainline and off-ramp).
 The influence areas of merge segments depend on local traffic conditions.
- Weaving segments are areas of the freeway where two or more vehicle flows must cross paths along a length of the freeway in order to continue. They are usually formed when merge areas are closely followed by diverge areas.
- A major merge occurs when two multilane freeway segments combine to form a single freeway segment with three or more lanes. Likewise, a major diverge occurs when a freeway segment with three or more lanes splits into two multilane basic freeway segments. While these locations can create turbulence in the traffic flow, they are less restrictive than freeway ramps because speed differences are smaller and lane changes are often unnecessary.

Table 2 shows the LOS criteria for basic freeway, merge/diverge, and weaving segments. LOS A represents the best operating conditions (unrestricted operations) while LOS F represents the worst operating conditions. LOS A

⁶ Transportation Research Board of the National Academies, *Highway Capacity Manual Sixth Edition: A Guide for Multimodal Mobility Analysis*, or HCM 2016, or HCM6, (Washington, DC, October 2016).

through LOS D represent acceptable operating conditions. LOS E represents operating conditions at capacity. LOS F represents failing conditions (demand exceeds capacity). The LOS criteria characterize freeway performance measures in terms of density (passenger cars per lane mile).

Table 2
LOS Criteria for Basic Freeway, Merging/Diverging, and Weaving Segments

	Danie Francuscy Comment	Ramp Merge/Diverge and
1.00	Basic Freeway Segment	Weaving Segments
LOS	Density (pc/lane mile)	Density (pc/lane mile)
Α	0–11	0–10
В	11–18	10–20
С	18–26	20–28
D	26–35	28–35
Е	35–45	>35
F	>45	Demand exceeds capacity (V/C>1)

LOS = level of service. pc/lane mile = passenger cars per lane mile. V/C = volume-to-capacity ratio. Source: Highway Capacity Manual 2010.

The traffic operations analyses conducted by MPO staff were consistent with HCM methodologies. Using the data collected, MPO staff then built traffic analysis networks for the AM and PM peak hours and applied the Highway Capacity Software (HCS) to assess the capacity and quality of traffic flow at the potential bottleneck locations.⁷

⁷ Highway Capacity Software 7(HCS7), Version 7.9, McTrans Center, University of Florida, July 15, 2020. HCS7 implements the methodologies of HCM6.

Chapter 4—Operations and Safety Analysis

4.1 EXISTING FREEWAY CHARACTERISTICS

As explained in Section 3.4, in general, three types of segments are found on express highways (freeways):

- Freeway merge and diverge segments: Segments in which two or more traffic streams combine to form a single traffic stream (merge) or a single traffic stream divides to form two or more separate traffic streams (diverge).
- Freeway weaving segments: Segments in which two or more traffic streams traveling in the same direction cross paths along a significant length of freeway without traffic control devices. In most cases, weaving segments are formed when a diverge segment is closely followed by a merge segment.
- Basic freeway segments: All segments that are not merge, diverge, or weaving segments.

The study locations in the I-95 northbound and southbound sections between Exit 57 and Exit 61 are associated with the freeway merge segment, freeway diverge segment, and basic freeway segment operations. Figure 2 shows the three freeway segment types at the locations analyzed in this study. The operational components of the three types of freeway segments are further discussed in the next section.

In addition, freeway operations could be affected by operations at interchanges where the freeway entrance and exit ramps meet the arterial and major roadways, especially when the interchange traffic is busy and causes traffic queues extending into the freeway. Three of the five interchanges (Exits 57, 60, and 61) are under traffic signal controls and their operations in the peak hours could potentially interfere with I-95 traffic operations. To examine their potential impacts to I-95 operations, this study reviewed traffic operations at the three interchanges based on peak-hour turning movement counts collected in the summer of 2021.8

Another major factor that affects I-95 operations in the study area is the traffic conditions at the interchange of I-93 and I-95 (Exit 28 on I-93 and Exit 55 on I-95). The interchange carries significant traffic volumes from both interstate

⁸ The counts were taken during a period when the COVID-19 pandemic was less severe but still prevailing. As no historical data at the count locations were available for comparisons and adjustments, these current data were used directly for analysis.

highways and is one of the most congested locations in the state. During peak periods, the congestion has a significant impact on I-95 and causes significant delays for users of both highways. In the study area, the interchange congestion mainly affects the traffic operations on I-95 between Exit 57 and Exit 58, especially in the southbound direction during the AM peak period and in the northbound direction during the PM peak period.

The interchange of I-93 and I-95 is a major bottleneck in the region and its congestion is a much larger issue that can only be addressed through long-term transportation planning. However, the low-cost improvements proposed in this study would meaningfully improve the freeway merge and diverge operations and enhance the safety for users in the freeway sections north of the major interchange.

4.2 TRAFFIC CONDITIONS AND OPERATIONS

A number of factors potentially contributed to traffic congestion at various locations in the I-95 northbound and southbound study sections:

- High volume of traffic during the peak hours
- Short deceleration lanes affecting freeway diverging operation
- Short acceleration lanes affecting freeway merging operation
- Basic freeway segments operating at capacity during the peak hours
- Congestion at the interchange of I-93 and I-95 affecting the freeway traffic flow in the study sections
- Potential traffic queues from the interchange traffic operations

These factors are further analyzed in the following sections.

4.2.1 Traffic Volumes

The section of I-95 between Exits 57 and 61 is one of the most frequently traveled corridors in the state. This section of highway carried approximately 140,000 to 150,000 vehicles per average weekday in recent years, from 2015 to 2019, before the COVID-19 pandemic. Daily traffic on I-95 in the study area reduced significantly during this pandemic period, varying from approximately 10 to 25 percent in general to more than 50 percent in the peak pandemic period (spring 2020).

⁹ Massachusetts Governor's COVID-19 Order #5, which prohibited gatherings of more than 25 people, was issued on March 15, 2020.

¹⁰ The review was based on two resources: 1) available traffic counts on I-95 in the study area from MassDOT Transportation Data Management System, and 2) the MassDOT Mobility Dashboard (https://mobility-massdot.hub.arcgis.com) that provides information to monitor the impacts of COVID-19 on the state's transportation network, including roadways and transit

MPO staff therefore chose 2019 as the base year for the analysis of the existing traffic conditions and used the available traffic data from 2015 to 2019 to estimate the traffic volumes on an average weekday during active traveling months in the spring and fall. Figure 3 shows the estimated daily traffic volumes on the freeway and entrance and exit ramps in both the northbound and southbound directions.

From the collected data, staff found that weekday peak periods in this stretch of I-95 had been expanding to at least four hours: 6:00–10:00 AM and 2:30–6:30 PM. To perform a highway capacity analysis for assessing the existing traffic conditions, staff further identified AM and PM peak hours and estimated peakhour traffic volumes. Figures 4 and 5 show the traffic flows in the AM peak hour (6:00–7:00 AM in the southbound direction and 7:00–8:00 AM in the northbound direction) and PM peak hour (5:00–6:00 PM in both directions) separately.

During the peak hours, the I-95 mainline and the entrance and exit ramps generally carry high traffic volumes, especially at Exits 57 and 58. In general, all the study locations carry high traffic volumes on the I-95 mainline in the peak direction (northbound in the AM and southbound in the PM peak hour). Field observations indicated that the merging and diverging activities are frequently impeded by the high mainline traffic volumes during the peak hours.

4.2.2 Diverging Operations

There are a number of variables that influence the freeway diverging and merging operations at the ramp-freeway junctions. Attributes influencing the merging and diverging operations include the length and type (taper or parallel) of acceleration or deceleration lanes, sight distances, speed, the distribution of vehicles across lanes, and free flow speeds of upstream freeway traffic.

Tables 3 and 4 show key attributes observed in the diverge areas on I-95 northbound and southbound by the study interchange locations and the freeway-interchange ramp types. Appendix A contains the classification of the interchange ramp types based on *A Policy on Geometric Design of Highways and Streets* (as known as the Green Book) by the American Association of State Highway and Transportation Officials (AASHTO).

The length of the deceleration lane is one of the key attributes of particular importance to the diverging operations. Based on the design guidance for

services, and published weekly traffic volumes at permanent count stations in the state with comparison of the volumes in the same period in 2019.

minimum deceleration lengths in MassDOT's *Project Development and Design Guide*, deceleration lanes at the study locations generally require a minimal length of 440 or 470 feet.¹¹ Appendix B exhibits the design standards and the applicable minimal deceleration lengths for this study.

Table 3
Diverging Operation Attributes: I-95 Northbound Locations

Location	Exit 57	Exit 58	Exit 59	Exit 60	Exit 61
Interchange Ramp Type ^a	Diagonal	Diagonal	One Quadrant	Diagonal	Diagonal
Exit Ramp Form	Slip	Slip	Loop	Compound Curve	Slip
Ramp Advisory Speed	30 mph	30 mph	25 mph	25 mph	30 mph
Estimated Deceleration Length ^c	600 feet	350 feet	750 feet	200 feet	450 feet

^a See Appendix A.

AASHTO = American Association of State Highway and Transportation Officials. mph = miles per hour. Source: Central Transportation Planning Staff.

Table 4
Diverging Operation Attributes: I-95 Southbound Locations

Location	Exit 57	Exit 58	Exit 59	Exit 60	Exit 61
Interchange Ramp Type ^a	Diagonal	Diagonal	One Quadrant	Diagonal	One Quadrant
Exit Ramp Form	Slip	Slip	Slip	Slip	Slip
Ramp Advisory Speed	30 mph	30 mph	30 mph	30 mph	30 mph
Estimated Deceleration Length ^c	550 feet	500 feet	275 feet	575 feet	450 feet

^a See Appendix A.

AASHTO = American Association of State Highway and Transportation Officials. mph = miles per hour. Source: Central Transportation Planning Staff.

^b The length of the deceleration lane is measured from the starting point of the taper to the tip of the painted gore, as defined by the Highway Capacity Manual for capacity analysis purposes. This length may differ from the length defined by AASHTO, which is for geometric design purposes. In this study, these deceleration lengths were estimated approximately from the digital orthophotos of US Geological Survey Massachusetts 2019 and Google Earth 2021.

^b The length of the deceleration lane is measured from the starting point of the taper to the tip of the painted gore, as defined by the Highway Capacity Manual for capacity analysis purposes. This length may differ from the length defined by AASHTO, which is for geometric design purposes. In this study, these deceleration lengths were estimated approximately from the digital orthophotos of US Geological Survey Massachusetts 2019 and Google Earth 2021.

¹¹ Massachusetts Highway Department, Project Development and Design Guide, January 2006. The guidebook describes the project development procedures and design guidelines applicable to projects with MassDOT Highway Division involvement. It provides guidance to municipalities, authorities, and other entities involved in the design and development of highways and streets, and other transportation facilities. The lengths of acceleration and deceleration lanes are measured from the point where the lane reaches 12 feet wide to the first controlling curve, according to A Policy on Geometric Design of Highways and Streets by AASHTO.

Among the I-95 northbound study locations, the deceleration lane at Exit 60 has a deceleration length of approximately 200 feet, which is much shorter than the minimal design standards of 470 feet. This location (under an advisory speed of 25 miles per hour) is of particular concern as the exit ramp is short in length with a sharp compound curvature and ends at a traffic signal. During peak hours, vehicles on the ramp were observed to queue back onto the freeway section from time to time, especially in the PM peak period.

Among the I-95 southbound study locations, the deceleration lane at Exit 59 has a deceleration length of approximately 275 feet, which is shorter than the minimal design standards. A quick review of the area's digital orthophotos indicates that there is potential to extend the deceleration lane in the diverge area.

4.2.3 Merge Operations

In order to allow vehicles on ramps to accelerate for merging, acceleration lanes generally require a longer distance than deceleration lanes. Based on the design guidance in MassDOT's *Project Development and Design Guide* for minimum acceleration lengths, the assumptions for initial on-ramp speed before merging is 30 miles per hour (mph) for slip ramps and 25 mph for loop ramps. The acceleration lanes in at the study locations generally require a minimal acceleration length of 1,000 and 1,120 feet to meet design standards. Appendix C exhibits the design standards and the applicable minimal deceleration lengths for this study.

Tables 5 and 6 show key operation attributes in the merge areas on I-95 northbound and southbound at the study interchange locations. The study locations generally do not meet the minimum acceleration length design standards. Among them, the merge operations at Exits 59 and 61 on I-95 southbound are of particular concern. The acceleration lengths at both locations are much shorter than the minimal design standards. Meanwhile, drivers at both on-ramps have a limited sight distance when merging due to the loop ramp geometrics.

It is challenging to meet the minimal acceleration length standards for express highways in urban areas where the adjacent areas are densely developed. Highway capacity analyses for the merge segments in the study area indicated that opportunities exist at some of the merging locations that could improve the merging capacity and operations, although design standards still would not be met.

Table 5
Merging Operation Attributes: I-95 Northbound Locations

Location	Exit 57	Exit 58	Exit 59	Exit 60	Exit 61
Interchange Ramp Type ^a	Diagonal	Diagonal	One Quadrant	Diagonal	Diagonal
Entrance Ramp Form	Slip	Slip	Slip	Compound Curve	Slip
Assumed Initial Speed ^b	30 mph	30 mph	25 mph	25 mph	30 mph
Estimated Acceleration Length ^c	600 feet	350 feet	750 feet	200 feet	450 feet

^a See Appendix A.

AASHTO = American Association of State Highway and Transportation Officials. mph = miles per hour. Source: Central Transportation Planning Staff.

Table 6
Merging Operation Attributes: I-95 Southbound Locations

Location	Exit 57	Exit 58	Exit 59	Exit 60	Exit 61
Interchange Ramp Type ^a	Diagonal	Diagonal	One Quadrant	Diagonal	One Quadrant
Entrance Ramp Form	Slip	Slip	Loop	Slip	Loop
Assumed Initial Speed ^b	30 mph	30 mph	25 mph	30 mph	25 mph
Estimated Acceleration Length ^c	550 feet	500 feet	400 feet	500 feet	350 feet

^a See Appendix A.

AASHTO = American Association of State Highway and Transportation Officials. mph = miles per hour. Source: Central Transportation Planning Staff.

^b The initial merging speed is assumed to be comparable to the advisory speed of the exit ramp at the interchange.

^c The length of the acceleration lane is measured from the tip of the painted gore to the end point of the taper, as defined by the Highway Capacity Manual for capacity analysis purposes. This length may differ from the length defined by AASHTO, which is for geometric design purposes. In this study, these acceleration lengths were estimated approximately from the digital orthophotos of US Geological Survey Massachusetts 2019 and Google Earth 2021.

^b The initial merging speed is assumed to be comparable to the advisory speed of the exit ramp at the interchange.

^c The length of the acceleration lane is measured from the tip of the painted gore to the end point of the taper, as defined by the Highway Capacity Manual for capacity analysis purposes. This length may differ from the length defined by AASHTO, which is for geometric design purposes. In this study, these acceleration lengths were estimated approximately from the digital orthophotos of US Geological Survey Massachusetts 2019 and Google Earth 2021.

4.2.4 Basic Freeway Segment Operations

As shown in Figure 2, in the operational analysis the sections between the exit ramps and the entrance ramps at the interchanges were assumed to be operating as basic freeway segments. The only other locations identified for such analysis were the northbound and southbound sections of I-95 between Exit 59 and Exit 60. According to the *Highway Capacity Manual*, the merge segments have an influence area 1,500 feet downstream of the merge point and the diverge segments have the same influence upstream of the diverge point. In this study, therefore, the basic-freeway-segment analysis was applied only to the sections where the merge and diverge segments' influence areas do not overlap.

Attributes influencing basic-freeway-segment operation include the number of lanes, lane widths, lateral clearances, terrain and grades, degree of curvature, and total ramp density.¹² The basic freeway segments on I-95 northbound and southbound in the study area generally contain three 12-foot travel lanes, a 10-foot or more right shoulder, and a six-foot left shoulder. The terrain where the segments are located is level, with a grade generally less than two percent.

4.2.5 Highway Capacity Analyses

Based on the freeway attributes and the estimated base-year (2019) peak-hour traffic volumes, staff conducted highway capacity analyses for the merge, diverge, and freeway basic segments in the study area. Figures 6 and 7 summarize the AM and PM analyses by the segment locations on I-95 northbound and southbound. Appendices D and E contain full HCS reports of the AM and PM peak-hour capacity analyses for the various study locations.

The analyses indicated that most of the diverge segments operated at acceptable LOS D, except the diverge segment on I-95 southbound at Exit 57. The segment is estimated to operate at LOS E and near its capacity.

For the merge segments, several locations were assessed to operate at LOS E and near their capacities. These include the segment at Exit 57 on I-95 northbound during both the AM and PM peak hours, Exit 58 on I-95 southbound during both the AM and PM peak hours, Exit 59 on I-95 southbound during the AM peak hour, and Exit 61 on I-95 southbound during the AM peak hour.

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¹² The total ramp density is the average number of on-ramp, off-ramp, major merge, and major diverge junctions per mile. It applies to a six-mile segment of a freeway facility, three miles upstream and three miles downstream of the midpoint of the study segment.

All the basic freeway segments were assessed to operate at acceptable LOS D, with the segments at Exits 57, 58, and 59 generally having a high volume to capacity ratio near 0.90.

Note that HCS is not a traffic simulation software and the above capacity analyses do not include the congestion effects from the major bottleneck at the interchange of I-93 and I-95. The analyses, however, provide a baseline of the exiting traffic conditions for analyzing and assessing the future year no-build and proposed scenarios.

4.2.6 Freeway Travel Speeds

Figures 8 and 9 depict congestion scans that cover I-95 in the study area in the northbound and southbound direction separately. They show the average travel speeds on I-95 northbound from Exit 57 to Exit 61 and the average speeds on I-95 southbound from Exit 61 to Exit 57. The 2019 spring and fall midweek (Tuesday to Thursday) travel-time data (provided by INRIX) were used for this analysis.

As shown in Figure 8, travel speeds at the study locations on I-95 northbound generally slow to less than 55 mph from 2:30 PM to 6:30 PM, with the impact to travel speeds and the length of the congested period gradually decreasing from Exit 57 to Exit 61. The congestion scan clearly indicates the significance of the congestion effect from the major bottleneck upstream at the interchange of I-93 and I-95. The severe congestion at the interchange often causes stop-and-go traffic conditions on I-95 northbound during the PM peak hours when travel demand is high. Meanwhile, the exit and entrance ramps on I-95 northbound also carry high traffic volumes during the PM peak hours and the diverging and merging operations further impede the recovery of normal freeway travel speeds.

As shown in Figure 9, travel speeds at the study locations on I-95 southbound generally slow to less than 55 mph from 6:00 AM to 10:00 AM, with the impact to travel speeds and the length of congested period gradually increasing from Exit 61 to Exit 57. The congestion scan indicated the severe congestion at the major bottleneck downstream significantly reduces the travel speeds on I-95 southbound, especially between Exist 57 and Exit 59. Meanwhile, the exit and entrance ramps on I-95 southbound also carry high traffic volumes during the AM peak hours and the diverging and merging operations further reduce travel speeds in the mainline sections.

4.2.7 Interchange Traffic Operations

The study area contains five interchanges of different types, including diamond interchanges, a traffic rotary, a combined diamond, and one quadrant. Table 7

summarizes the configurations of these interchanges, the functional classification of the surrounding minor roadways, and the types of traffic controls present.

Table 7
Interchange Configurations and Traffic Operations

Location	Exit 57	Exit 58	Exit 59	Exit 60	Exit 61
Interchange Type	Diamond	Traffic Rotary	Two Quadrants Adjacent	Diamond	Diamond (NB)/ One Quadrant (SB)
Minor Roadway Functional Class	Minor Arterial	Principal Arterial/ Minor Arterial	Minor Arterial	Minor Arterial	Minor Arterial
Traffic Control	Traffic Signal	Yield to enter traffic circulation	Stop/Yield	Traffic Signal	Traffic Signal

NB = northbound. SB = southbound.

Source: Central Transportation Planning Staff.

Based on field observations, staff considered that the three signalized interchanges (Exits 57, 60, and 61) were more likely to cause traffic queues backing up onto the freeway. To examine the potential impacts of the traffic operations, staff requested MassDOT's assistance in collecting AM and PM peak-period turning movement counts at the three interchanges (collected on August 4, 2021) and conducted intersection capacity analyses for the three interchanges by using the Synchro traffic analysis and simulation program.¹³

Appendix F contains the capacity analyses at the signalized locations in both the AM and PM peak hours for the three interchanges. In general, all the signalized locations were assessed to operate at an acceptable LOS, except the Exit 60 ramp of I-95 northbound at Salem Street in Wakefield. The signalized location was assessed to operate at LOS F, with an average delay of nearly two minutes per vehicle and a queue length of approximately 300 feet during peak traffic periods.

Note that the analyses were based on the counts collected during the period that traffic increased significantly from the spring in 2020 when the COVID-19 pandemic was prevalent. However, the traffic had not reached the pre-pandemic level, according to MassDOT's COVID-19 traffic monitoring reports. The traffic operations at these interchanges should be reassessed when the traffic returns to the normal conditions.

¹³ Synchro Version 11.1 was used for the analyses. This software is developed and distributed by Trafficware Ltd. It can perform capacity analysis and traffic simulation (when combined with SimTraffic) for an individual intersection or a series of intersections in a roadway network.

4.3 CRASH DATA ANALYSIS

MPO staff collected the recent three-year (2015–17) crash reports from the MassDOT Crash Data Portal for the selected I-95 northbound and southbound sections and conducted crash data analysis. ¹⁴ In total, 463 crashes were reported in the three-year period at different locations in the study area, consisting of 206 crashes on I-95 northbound and 257 crashes on I-95 southbound. Tables 8 and 9 summarize key attributes of the total crashes in the I-95 northbound and southbound study sections separately.

Nearly 30 percent of the total crashes on the northbound side and approximately 25 percent on the southbound side caused personal injuries, including a fatal crash on the northbound side in 2015. Nearly 60 percent of the total crashes on the northbound side and nearly 70 percent on the southbound side were reported as rear-end collisions. Single vehicle (out-of-control) and sideswipe collisions (same direction) were also prevailing on the express highway in both directions.

The data indicate that 45 percent or more of the total crashes occurred during the peak traffic periods when I-95 is congested. Meanwhile, the data show that there were more crashes on the southbound side than the northbound, which may be attributed to the congestion on I-95 as the southbound is generally more congested than the northbound during the peak times of the day (see Figures 8 and 9).

¹⁴ The MassDOT Crash Data Portal is located at https://apps.impact.dot.state.ma.us/cdp/home.

Table 8
Summary of Crash Data 2015–17:
I-95 Northbound from Exit 57 to Exit 61

Statistics Period		2015	2016	2017	3-Year Total	Annual Average	Percentage
Total number of c	Total number of crashes		47	76	206	68.7	100%
Severity	Property damage only	52	37	57	146	48.7	71%
Severity	Non-fatal injury	30	10	19	59	19.7	29%
Severity	Fatality	1	0	0	1	0.3	0%
Severity	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	18	15	13	46	15.3	22%
Collision type	Rear-end	47	22	50	119	39.7	58%
Collision type	Angle	6	2	3	11	3.7	5%
Collision type	Sideswipe, same direction Sideswipe, opposite	10	7	5	22	7.3	11%
Collision type	direction	0	0	2	2	0.7	1%
Collision type	Head-on	0	0	0	0	0.0	0%
Collision type	Rear-to-rear	1	0	0	1	0.3	0%
Collision type	Not reported/unknown	1	1	3	5	1.7	2%
Occurred during weekday peak periods*		38	19	35	92	30.7	45%
Wet or icy pavement conditions		13	9	9	31	10.3	15%
Dark conditions (I	lit or unlit)	30	19	19	68	22.7	33%

^{*} Peak periods are defined as 6:00–10:00 AM and 2:30–6:30 PM.

Source: Massachusetts Department of Transportation Crash Data Portal.

Table 9
Summary of Crash Data 2015–17:
I-95 Southbound from Exit 61 to Exit 57

Statistics Period		2015	2016	2017	3-Year Total	Annual Average	Percentage
Total number of crashes		85	78	94	257	85.7	100%
Severity	Property damage only	68	54	75	197	65.7	77%
Severity	Non-fatal injury	17	24	19	60	20.0	23%
Severity	Fatality	0	0	0	0	0.0	0%
Severity	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	11	15	14	40	13.3	16%
Collision type	Rear-end	62	52	60	174	58.0	68%
Collision type	Angle	8	2	4	14	4.7	5%
Collision type	Sideswipe, same direction Sideswipe, opposite	3	9	14	26	8.7	10%
Collision type	direction	0	0	0	0	0.0	0%
Collision type	Head-on	1	0	0	1	0.3	0%
Collision type	Rear-to-rear	0	0	1	1	0.3	0%
Collision type	Not reported/unknown	0	0	1	1	0.3	0%
Occurred during weekday peak periods*		39	39	41	119	39.7	46%
Wet or icy pavement conditions		13	6	19	38	12.7	15%
Dark conditions (lit or unlit)		27	17	19	63	21.0	25%

^{*} Peak periods are defined as 6:00–10:00 AM and 2:30–6:30 PM. Source: Massachusetts Department of Transportation Crash Data Portal.

Staff further examined the crashes by their locations in the freeway corridor. Figures 10 and 11 show the approximate crash cluster sizes and locations of the crashes in the merge, diverge, and the in-between areas at Exits 57 to 61 on I-95 northbound and southbound separately. Appendices G and H summarize key attributes of the crashes at each of the interchanges on I-95 northbound and southbound separately.

On the northbound side (Figure 10), Exits 57 and 58 had a number of crashes and an injury crash rate higher than the other locations. Meanwhile, Exit 60 had a relatively high number of crashes and a high injury crash rate. In general, most of the crashes occurred in the merge and diverge areas and only a few or none occurred in the in-between areas.

On the southbound side (Figure 11), all the interchanges generally had a high number of crashes but with injury crash rates somewhat lower than those on the northbound side. This may be attributed to the slower travel speeds and more congested conditions on the southbound side. Meanwhile, none or only a few crashes occurred in the in-between areas at all the interchanges and the basic freeway segment between Exit 60 and Exit 59.

Note that the data indicated that more crashes occurred in the diverge areas than the merge areas at most of the interchanges in the study area; this finding could be the result of geocoding defaults due to insufficient information of the exact crash locations. However, even with a smaller sample size, the data indicate that crashes in the merge areas generally had a higher injury crash rate than those in the diverge areas at almost all the interchanges.

4.4 FUTURE-YEAR HIGHWAY CAPACITY ANALYSES

Staff chose 2030 as the future year and projected traffic volumes for the various freeway analysis segments by using growth factors estimated from the Boston

¹⁵ To distinguish the crash locations, staff applied a similar method to the method for defining freeway segments. The in-between area refers to the basic freeway segment between a diverge segment and a merge segment.

¹⁶ Most crash records indicate the location only at the freeway exit number with no indications of the on-ramp or off-ramp, or the location of the crash on the freeway. Staff plotted the crash data and found that the majority of the crashes were geocoded at the diverge point of the freeway at all the study interchanges. After further reviewing the police narratives and collision diagrams, staff identified the exact locations of approximately 40 to 50 percent of the total crashes at the study interchanges. These findings, however, were considered not sufficient to represent the exact number of crashes in the merge, diverge, and in-between areas at the study interchanges. As such, Figures 8 and 9 show the total number of crashes in the vicinity of each interchange with the approximate crash clusters in the merge, diverge, and in-between areas based on the proportions of the crashes whose locations were identified.

Region MPO's regional transportation planning model. The models projected that traffic in the study area would increase by seven percent (about 0.6 percent annually) on the northbound side and six percent (about 0.55 percent annually) on the southbound side in the AM peak hour, and by six percent on the northbound and seven percent on the southbound in the PM peak hour from 2019 to 2030. Figures 12 and 13 show the projected AM and PM peak hour traffic volumes at the different locations in the study area on an average weekday in 2030.

Staff then conducted highway capacity analyses based on the projected volumes and the identified freeway segment types at each study location. Figures 14 and 15 summarize the AM and PM peak hour highway capacity analyses by segment locations in the I-95 northbound and southbound directions. Appendices I and J contain full HCS reports of the 2030 AM and PM peak-hour capacity analyses for the various study locations.

The AM peak hour analyses (Figure 14) indicate that several locations on I-95 southbound would deteriorate from LOS D to LOS E with their adjacent freeway sections near capacity under the projected 2030 traffic conditions. Noticeably, the diverge segment at Exit 57 (Segment 3), the diverge segment at Exit 58 (Segment 6), and the merge segment at Exit 59 (Segment 7) would operate at LOS E with the adjacent freeway sections at capacity. Moreover, the merge segments at Exit 57 (Segment 1) and at Exit 58 (Segment 4) would fail at LOS F with the volume-to-capacity ratio of the adjacent freeway sections equal to 1.01.

The PM peak hour analyses (Figure 15) indicate that many merge and diverge segments on both I-95 northbound and southbound would deteriorate from LOS D to LOS E. Noticeably, in the peak direction (northbound) the merge segment at Exit 57 (Segment 3) and the diverge and merge segments at Exit 58 (Segments 4 and 6) would operate at LOS E with the adjacent freeway sections reaching capacity limits.

Chapter 5—Proposed Low-Cost Improvements

The analyses described in the previous chapter identified locations in the study area with operational and safety concerns. Most of them are in the merge and diverge segments where the lengths of the acceleration and deceleration areas are insufficient. Localized bottlenecks can develop at these locations when the freeway mainline sections are congested during the peak hours.

For these locations, extending the acceleration or deceleration length is one effective low-cost strategy if the adjacent terrain is suitable and the right-of-way of the freeway is sufficient. Meanwhile, for locations where the entrance and exit ramps at interchanges are closely spaced, operational efficiency may be improved by creating a continuous auxiliary lane between the entrance and exit ramps.¹⁷

The sections of I-95 studied are generally located in level terrain with sufficient right-of-way, especially on the southbound side. Based on the projected 2030 traffic volumes, MPO staff conducted a series of highway capacity analyses to assess the potential application of these improvement strategies at the various study locations. Staff identified five locations on I-95 southbound and three on I-95 northbound that have potential for such low-cost improvements.

5.1 PROPOSED IMPROVEMENTS ON I-95 SOUTHBOUND

The locations and proposed low-cost improvements at the five locations on I-95 southbound are as follows:

- 1. Exit 58 entrance ramp to Exit 57 exit ramp: Expand the existing paved shoulder and add an auxiliary lane between the two ramps.
- 2. Exit 58 diverge segment: Extend the deceleration length to approximately 750 feet long.
- 3. *Exit 59 merge segment:* Extend the acceleration length to approximately 800 feet long.
- 4. Exit 59 diverge segment: Extend the deceleration length to approximately 450 feet long.
- 5. Exit 61 merge segment: Extend the acceleration length to approximately 800 feet long.

¹⁷ Federal Highway Administration, *Freeway Management and Operations Handbook*, Chapter 5 (US Department of Transportation, September 2003, updated January 2011).

Figures 16 and 17 summarize the AM and PM peak hour highway capacity analyses at the locations proposed for improvements on I-95 southbound and northbound. For reference, they also include the capacity analyses under the 2030 no-build scenario at locations with no proposed improvements. Appendices K and L contain full HCS reports of 2030 AM and PM peak hour capacity analyses for the locations proposed for improvements. Figures 18 and 19 show the approximate locations and conceptual diagrams of the proposed low-cost improvements in the study area.

At Location 1, the section between the Exit 58 entrance ramp and Exit 57 exit ramp (Figure 18), the two ramps are located in close proximity (approximately 1,600 feet apart). Further extending the acceleration or deceleration length and reducing the space in between would potentially increase the risk of crashes. HCS tests of different deceleration and acceleration lengths also indicated that extensive lengths would require improvements to the diverging operation at Exit 58 and the merging operation at Exit 57, which are not possible in this relatively short section.

Thus, the proposed recommendation from this study is to expand the existing paved shoulder and create a 12-foot auxiliary lane with a 10-foot shoulder between the two ramps. A review of the digital orthophotos and highway layouts of the area indicated that there should be sufficient space for expansion. At the design stage of an improvement project, when there is more precise geometry information, a 12-foot shoulder should be considered if the available space can accommodate it.²⁰

With the proposed auxiliary lane, the section between the two ramps would become a highway weaving segment that could facilitate the merging operation for drivers entering from Exit 58 and the positioning and diverging operation for drivers moving toward Exit 57. The capacity analyses for the proposed weaving segment (Location 1 on I-95 southbound in Figures 16 and 17) indicated that traffic operations during both the AM and PM peak hours at this location would significantly improve to the desirable LOS D from the undesirable LOS F or atcapacity LOS E under the merging and diverging operations in the no-build scenario (Segments 3 and 4 on I-95 northbound in Figures 14 and 15).

¹⁸ Ramp spacing is defined as the distance between the painted tips of successive ramps. As in this case, both the entrance and exit ramps are the parallel type; the spacing is estimated at the end of the solid white line extending from the painted tip of the two ramps.

¹⁹ Transportation Research Board, *Guidelines for Ramp and Interchange Spacing*, National Cooperative Highway Research Program (NCHRP) Report 687 (Washington DC, 2011).

²⁰ According to the *Freeway Management and Operations Handbook*, 8- to 12-foot shoulders are desirable for auxiliary lanes, with a minimal required width of six feet.

In addition, the proposed improvement would reduce the number of crashes and improve safety for freeway users at this location. A crash modification factor (CMF) is an estimate of the change in the number crashes expected after the implementation of a countermeasure. Applying CMFs from the *Highway Safety Manual* (HSM) and the CMF Clearinghouse show that adding continuous auxiliary lanes for weaving between the entrance ramp and the exit ramp would generally reduce crashes by 20 to 25 percent.²¹

For other locations on I-95 southbound (Locations 2, 3, 4, and 5), the recommendations from this study are to extend the deceleration or acceleration lengths for the respective diverging and merge segments. The recommended lengths would depend on the adjacent terrain and development conditions.

The highway capacity analyses with the proposed improvements (Figures 16 and 17) indicated that traffic operations at these locations would improve to the desirable LOS D from the near- or at-capacity LOS E under the 2030 no-build scenario.

More importantly, the proposed improvements would reduce the number of crashes and improve safety for freeway users at these locations, especially at Location 3 (Exit 59) and Location 5 (Exit 61) where drivers enter the freeway via a loop on-ramp with a limited sight distance and a relatively short acceleration lane. Applying CMFs for lengthening an acceleration lane showed that the proposed acceleration lane extensions would reduce crashes at the merge areas by 10 to 20 percent.

Implementing the proposed improvement at Location 1 (Exit 58–Exit 57) would require widening, resurfacing, and restriping the shoulder and its adjacent areas between the entrance ramp at Exit 58 and the exit ramp at Exit 57. No right-of-way acquisition or major alignment modifications would be required other than realignment of the adjacent travel lane, adding pavement markings, and relocating existing guide signs or installing new guide signs. The proposed improvement is estimated to cost between \$500,000 and \$750,000 to construct.²²

²¹ American Association of State Highway and Transportation Officials (AASHTO), *Highway Safety Manual* (Washington, DC, 2010).; The Crash Modification Factors Clearinghouse provides a searchable online database of CMFs along with guidance and resources on using CMFs in road safety practice (www.cmfclearinghouse.org/index.cfm).

The cost was approximated from the general expenses of similar projects. The estimation is only for design and construction; it does not include right-of-way, utility relocation, or contingency costs.

Implementing the proposed improvements at Locations 2, 3, 4, and 5 would require mainly restriping the areas near the exit and/or entrance ramps at Exits 58, 59 and 61, with minor widening of the adjacent shoulders if necessary. No right-of-way acquisition or alignment modifications would be required other than adding pavement markings and relocating existing guide signs or installing new guide signs. The proposed improvements are estimated to cost between \$50,000 and \$100,000 per location to construct, depending on the length of the acceleration or deceleration lane extensions and the conditions of the adjacent areas.

5.2 PROPOSED IMPROVEMENTS ON I-95 NORTHBOUND

Unlike the southbound side, the areas adjacent to I-95 northbound generally have more constraints. These constraints include slopes and wooded areas, adjacent residential and commercial developments, and a series of sound barriers running along the shoulder area between Exit 59 and Exit 60. As such, only three locations were identified as suitable for low-cost improvements. The locations and proposed low-cost improvements are as follows:

- 1. Exit 57 entrance ramp to Exit 58 exit ramp: Expand the existing paved shoulder and add an auxiliary lane between the two ramps.
- 2. Exit 58 merge segment: Extend acceleration length to approximately 1,050 feet long.
- 3. Exit 60 diverge segment: Extend deceleration length to approximately 450 feet long.

The conditions at Location 1 are similar to its counterpart on the southbound side. The Exit 57 entrance ramp and Exit 58 exit ramp are located in close proximity (approximately 1,750 feet apart). Further extending the acceleration and deceleration lengths at the entrance and exit ramps is not adequate and would potentially increase the risk of crashes.

Thus, the proposed recommendation of this study is to expand the existing paved shoulder and create a 12-foot auxiliary lane with a six-foot shoulder between the two ramps (see Figure 18). The capacity analyses for the proposed weaving segment (Location 1 on I-95 northbound in Figures 16 and 17) indicated that traffic operations at this location would significantly improve during both the AM and PM peak hours to the desirable LOS D from the undesirable, near- or atcapacity LOS E under the merging and diverging operations in the no-build scenario (Segments 3 and 4 on I-95 northbound in Figures 14 and 15).

In addition, the proposed improvement would reduce the number of crashes and improve safety for freeway users at this location. Applying CMFs from the HSM

and the CMF Clearinghouse show that adding continuous auxiliary lanes for weaving between the entrance ramp and the exit ramp would generally reduce crashes by 20 to 25 percent.

A review the digital orthophotos indicated that the areas next to the shoulder are slightly sloping toward the south. To widen the shoulder area for adding the auxiliary lane, minor widening of the adjacent areas may be required. At minimum, a six-foot wide shoulder is currently recommended. When more information is available at the project design stage, a 10-to-12-foot shoulder should be considered.

For Location 2 (Exit 58) and Location 3 (Exit 60) on I-95 northbound, the recommendation from this study is to extend the acceleration length for the merge terminal at Exit 58 and the deceleration length in for the diverge terminal at Exit 60.

The highway capacity analyses with the proposed improvements (Figures 16 and 17) indicated that traffic operations at the two locations would improve to the desirable LOS D from the near- or at-capacity LOS E under the 2030 no-build scenario. In addition, the proposed improvement would reduce the number of crashes and improve safety for freeway users at these locations. Applying CMFs for lengthening an acceleration lane showed that the proposed acceleration lane extensions would reduce crashes at each of the two locations by 10 to 20 percent.

Implementing the proposed improvement at Location 1 would require widening, resurfacing, and restriping the shoulder and its adjacent areas between the entrance ramp at Exit 57 and the exit ramp at Exit 58. No right-of-way acquisition or major alignment modifications would be required other than realignment of the adjacent travel lane, addition of pavement markings, relocation of existing guide signs or installation of new guide signs, and potential minor modifications of the slope areas next to the shoulder. The proposed improvement is estimated to cost between \$750,000 and \$1,000,000 to construct.

Implementing the proposed improvements at Locations 2 and 3 would require mainly restriping the areas near the entrance ramp at Exit 58 and the exit ramp at Exit 60, with minor widening of the adjacent shoulders if necessary. No right-of-way acquisition or major alignment modifications would be required other than adding pavement markings and relocating existing guide signs or installing new guide signs. The proposed improvement at Location 2 is estimated to cost between \$75,000 and \$125,000 to construct. The proposed improvement at

Location 3 is estimated to cost between \$50,000 and \$100,000 to construct due to minor modifications of the adjacent slope area may be necessary.

Chapter 6—Conclusion and Next Steps

In this study, the MPO staff performed a series of operational and safety analyses for the bottleneck locations on the northbound and southbound sections of I-95 between Exit 57 and Exit 61. Low-cost improvements were then recommended for several locations on I-95 northbound and southbound:

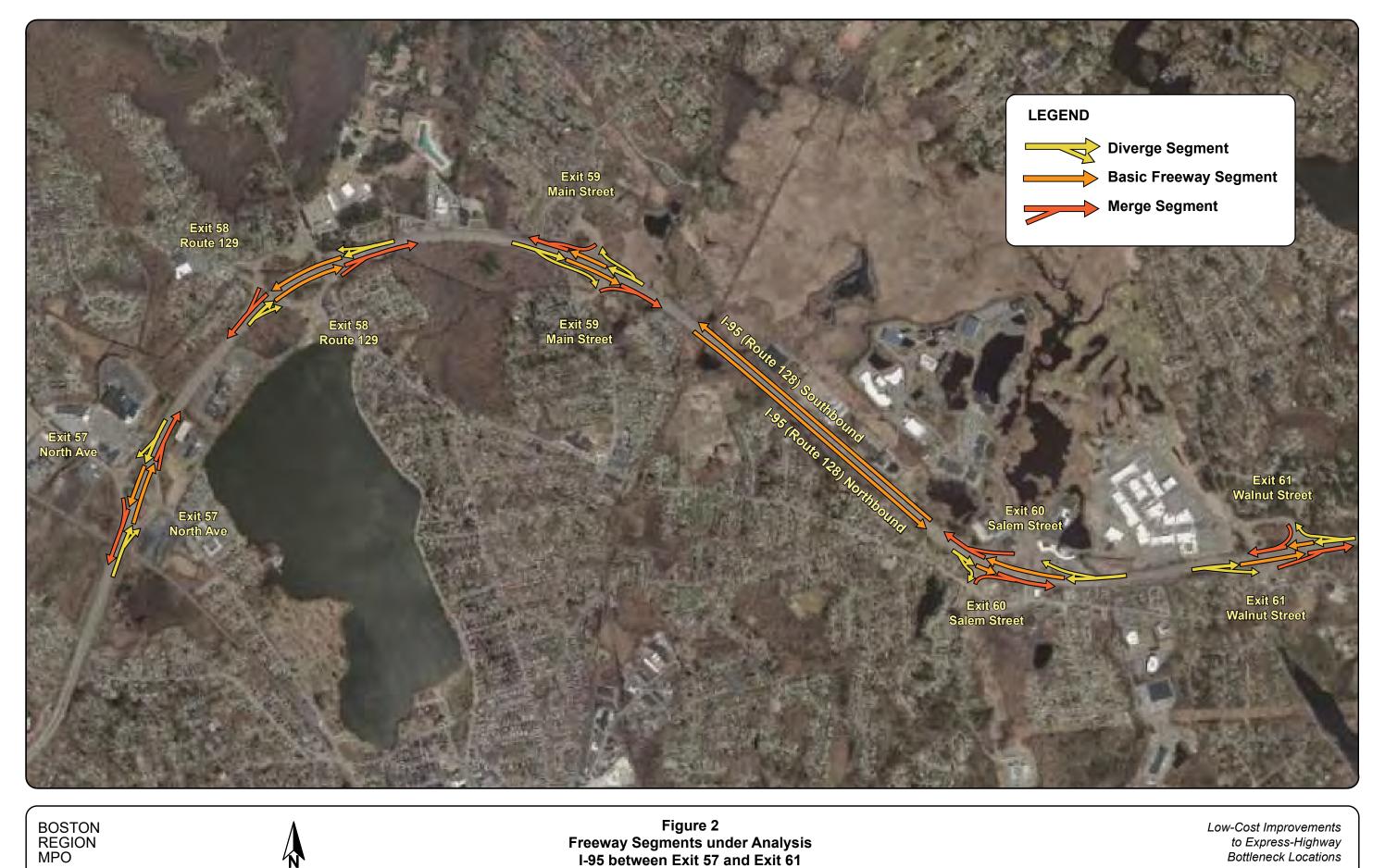
- *I-95 northbound between Exit 57 and Exit 58:* Expand the existing paved shoulder and add an auxiliary lane between the exit ramp and the entrance ramp.
- I-95 northbound merge segment at Exit 58: Extend the acceleration length.
- I-95 northbound diverge segment at Exit 60: Extend the deceleration length.
- I-95 southbound between Exit 58 and Exit 57: Expand the existing paved shoulder and add an auxiliary lane between the exit ramp and the entrance ramp.
- *I-95* southbound merge segments at Exit 59 and Exit 61: Extend the acceleration length.
- *I-95* southbound diverge segments at Exit 58 and Exit 59: Extend the deceleration length.

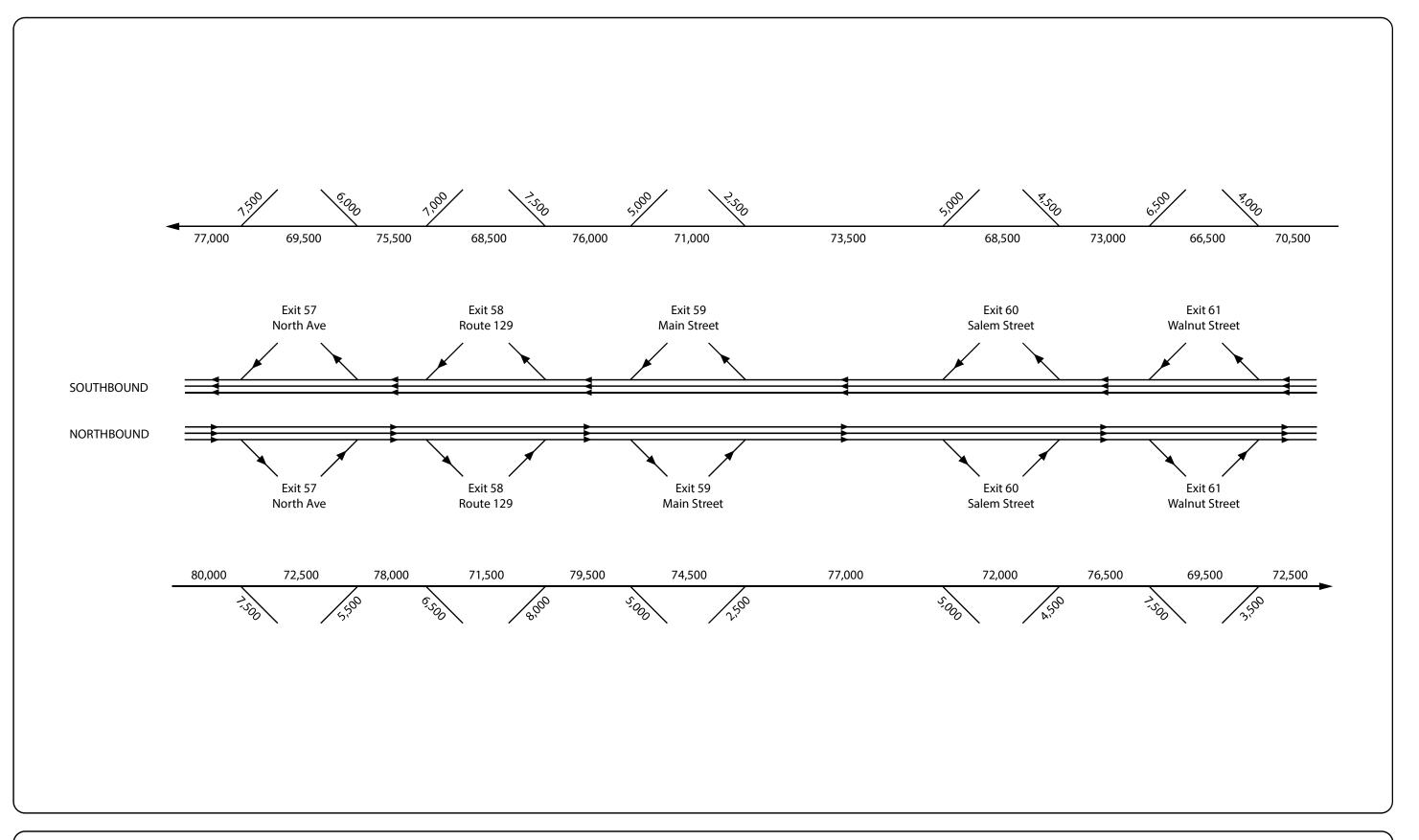
This study provides the MassDOT Highway Division with an opportunity to assess the most critical needs in the study area and to start planning design and engineering efforts. The sections between Exits 57 and 58, particularly on I-95 southbound, were considered priority locations. The implementation of improvements to priority locations would depend on available resources and further evaluations at the project design stage.

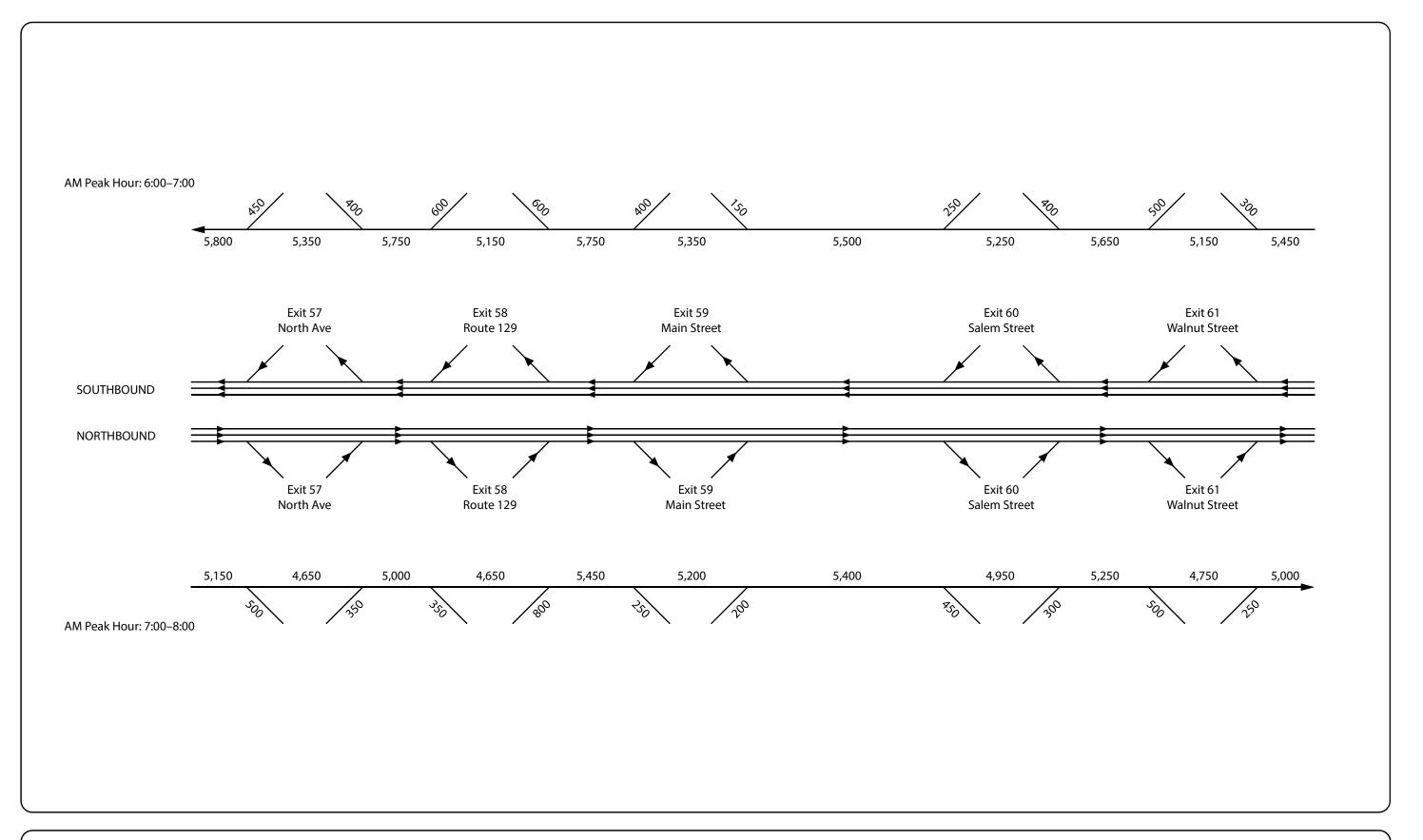
The MPO staff conducted this study in conjunction with MassDOT staff as part of the ongoing work to identify, develop, and evaluate improvements to bottleneck locations in the Boston region. The study aligns with the MPO's goals of managing capacity and improving mobility and safety on the region's highway system. If implemented, these low-cost improvements would improve the freeway facilities, make traffic operations more efficient, reduce congestion at the identified bottleneck locations, reduce crashes, and improve safety for the freeway users.

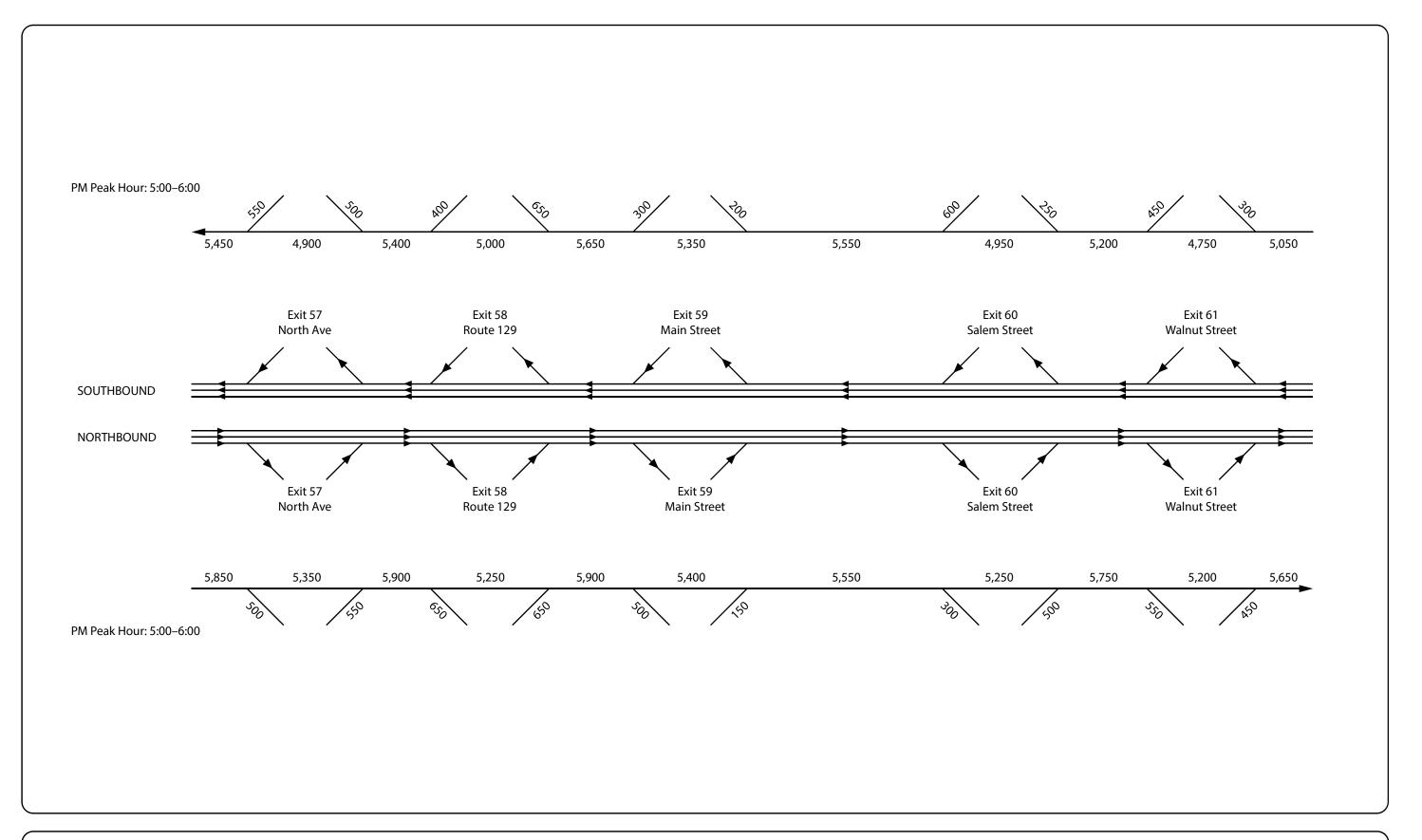


BOSTON REGION MPO

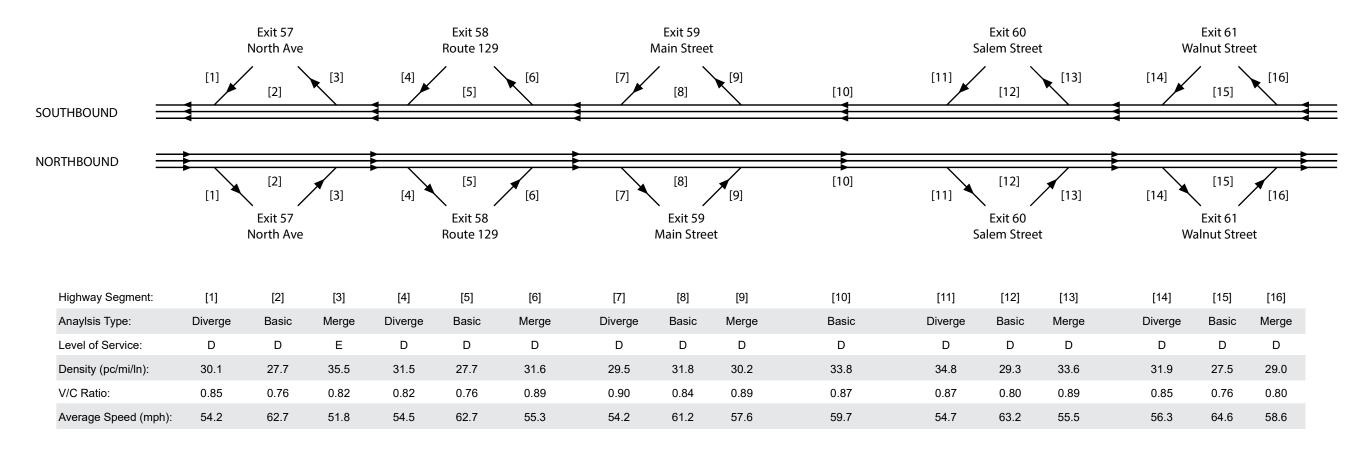








Highway Segment:	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
Anaylsis Type:	Merge	Basic	Diverge	Merge	Basic	Diverge	Merge	Basic	Diverge	Basic	Merge	Basic	Diverge	Merge	Basic	Diverge
Level of Service:	D	D	Е	Е	D	D	Е	D	D	D	D	D	D	E	D	D
Density (pc/mi/ln):	33.1	34.2	36.6	37.8	32.1	33.6	35.6	34.2	34.0	34.7	31.5	32.0	32.3	35.4	31.0	32.4
V/C Ratio:	0.95	0.87	0.94	0.94	0.84	0.94	0.94	0.87	0.90	0.88	0.88	0.84	0.91	0.90	0.83	0.87
Average Speed (mph):	54.8	58.2	54.4	49.7	59.7	53.9	53.3	58.3	56.1	59.1	57.3	61.2	56.6	54.6	61.9	56.9



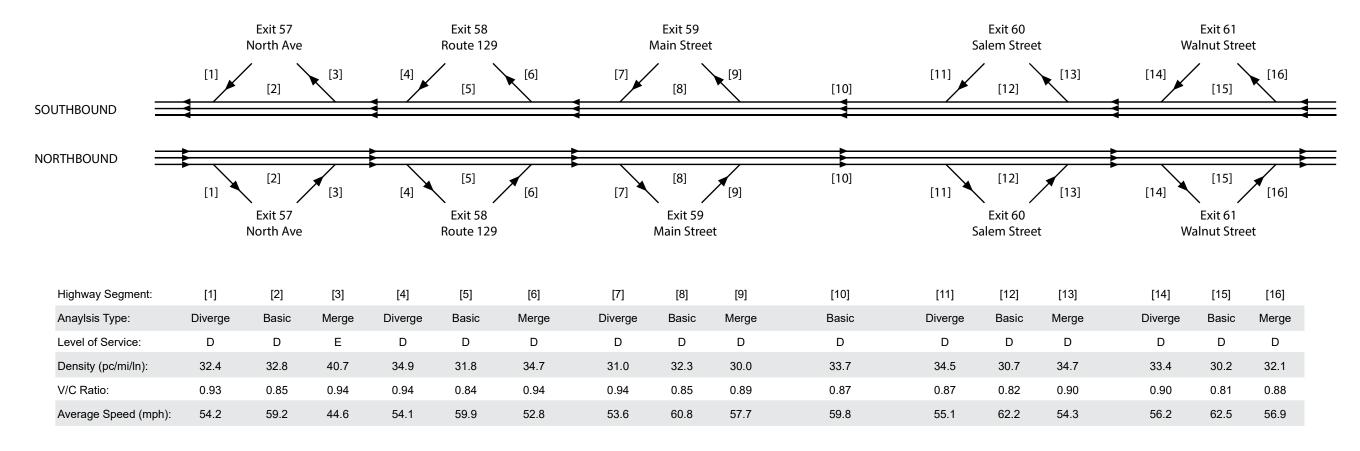
Notes:

- 1) Level of service (LOS) A through D represents acceptable operating conditions; LOS E represents operating conditions at capacity; and LOS F represents failing conditions (demand exceeds capacity).
- 2) Density (pc/mi/ln) refers to the ramp influence area (merge/diverge analysis), the weaving influence area (weaving analysis), or the freeway section (basic freeway segment analysis).
- 3) V/C ratio refers to the freeway section's volume-to-capacity ratio.
- 4) Speed (mph) refers to the ramp influence area average speed (merge/diverge analysis), the weaving and non-weaving average speed (weaving analysis), or the average of all vehicles (basic freeway segment analysis). These speeds are directly cited from Highway Capacity Software for comparison purposes only (between scenarios). A traffic simulation model, with a modeling area including the I-93/I-95 interchange, would estimate and predict the average speeds more accurately.

 pc/mi/ln = passenger cars per mile per lane. V/C= volume-to-capacity. mph = miles per hour.



Highway Segment:	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
Anaylsis Type:	Merge	Basic	Diverge	Merge	Basic	Diverge	Merge	Basic	Diverge	Basic	Merge	Basic	Diverge	Merge	Basic	Diverge
Level of Service:	D	D	D	Е	D	D	D	D	D	D	D	D	D	D	D	D
Density (pc/mi/ln):	30.9	32.8	33.9	36.0	29.5	32.7	34.3	32.8	33.7	33.7	32.1	28.0	29.5	31.0	26.4	30.0
V/C Ratio:	0.87	0.85	0.86	0.86	0.80	0.90	0.90	0.85	0.89	0.87	0.87	0.77	0.81	0.81	0.74	0.79
Average Speed (mph):	56.2	59.2	54.2	51.7	61.5	53.8	64.4	59.3	56.0	59.8	56.9	64.2	57.0	57.6	65.4	56.9

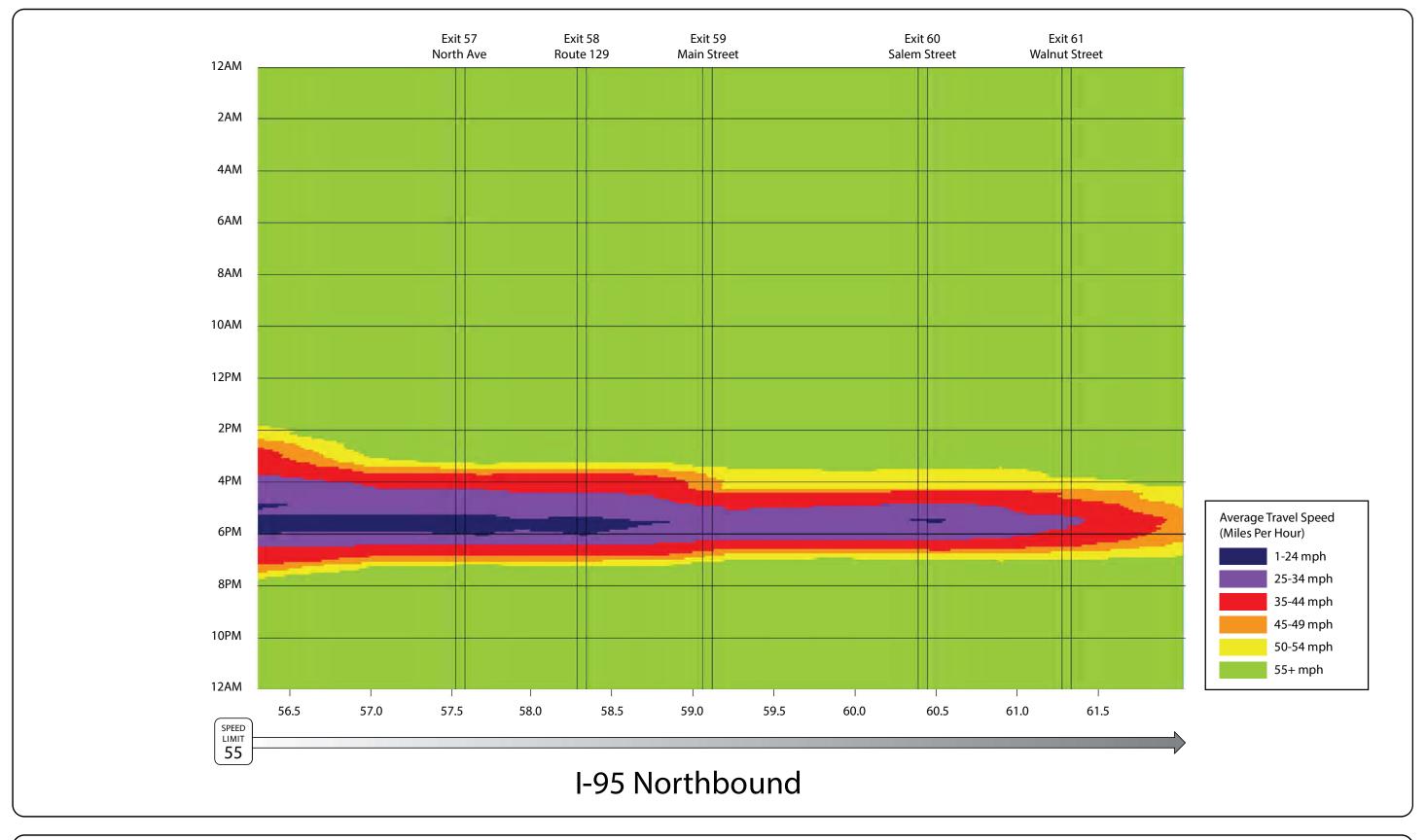


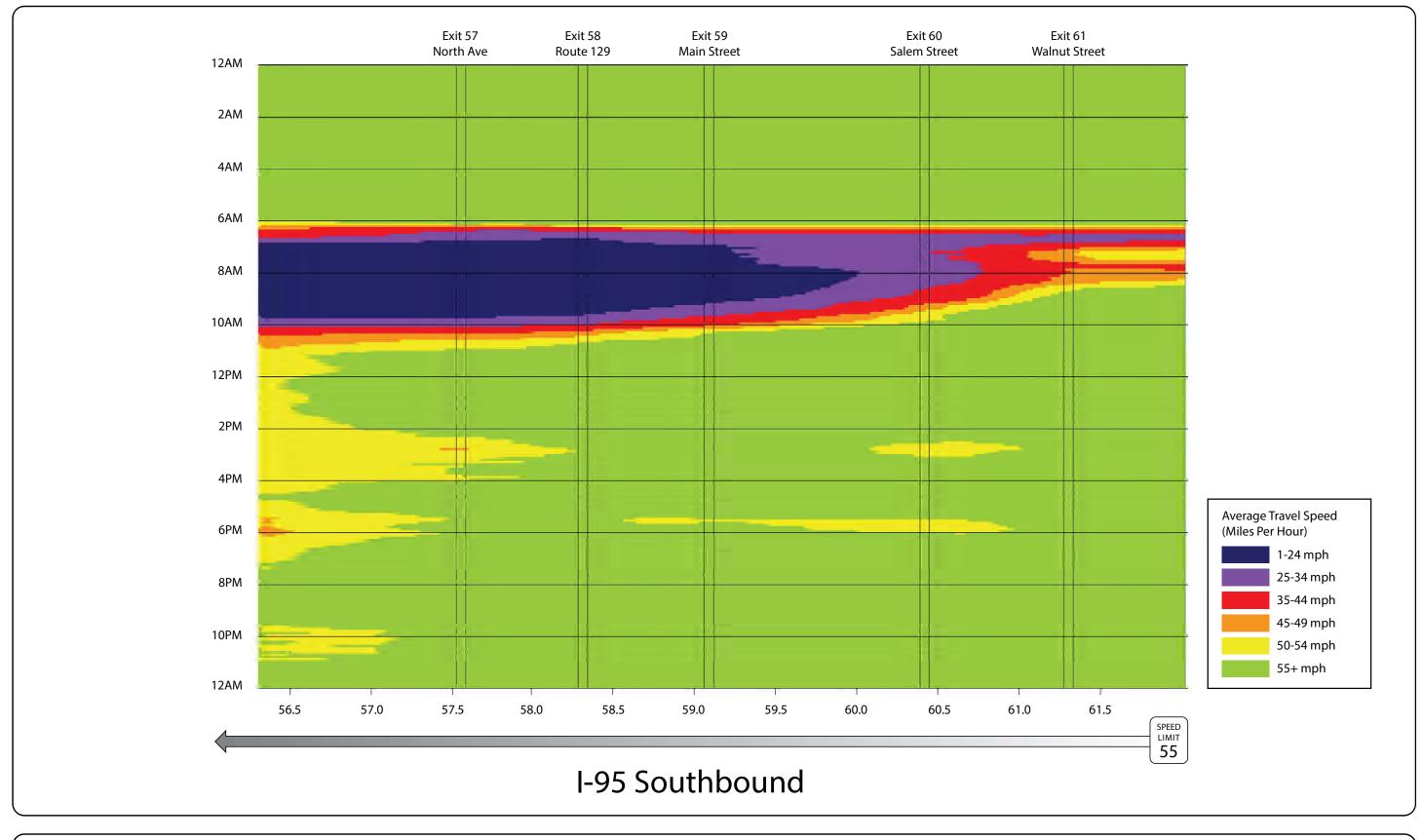
Notes:

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 pc/mi/ln = passenger cars per mile per lane. V/C= volume-to-capacity. mph = miles per hour.





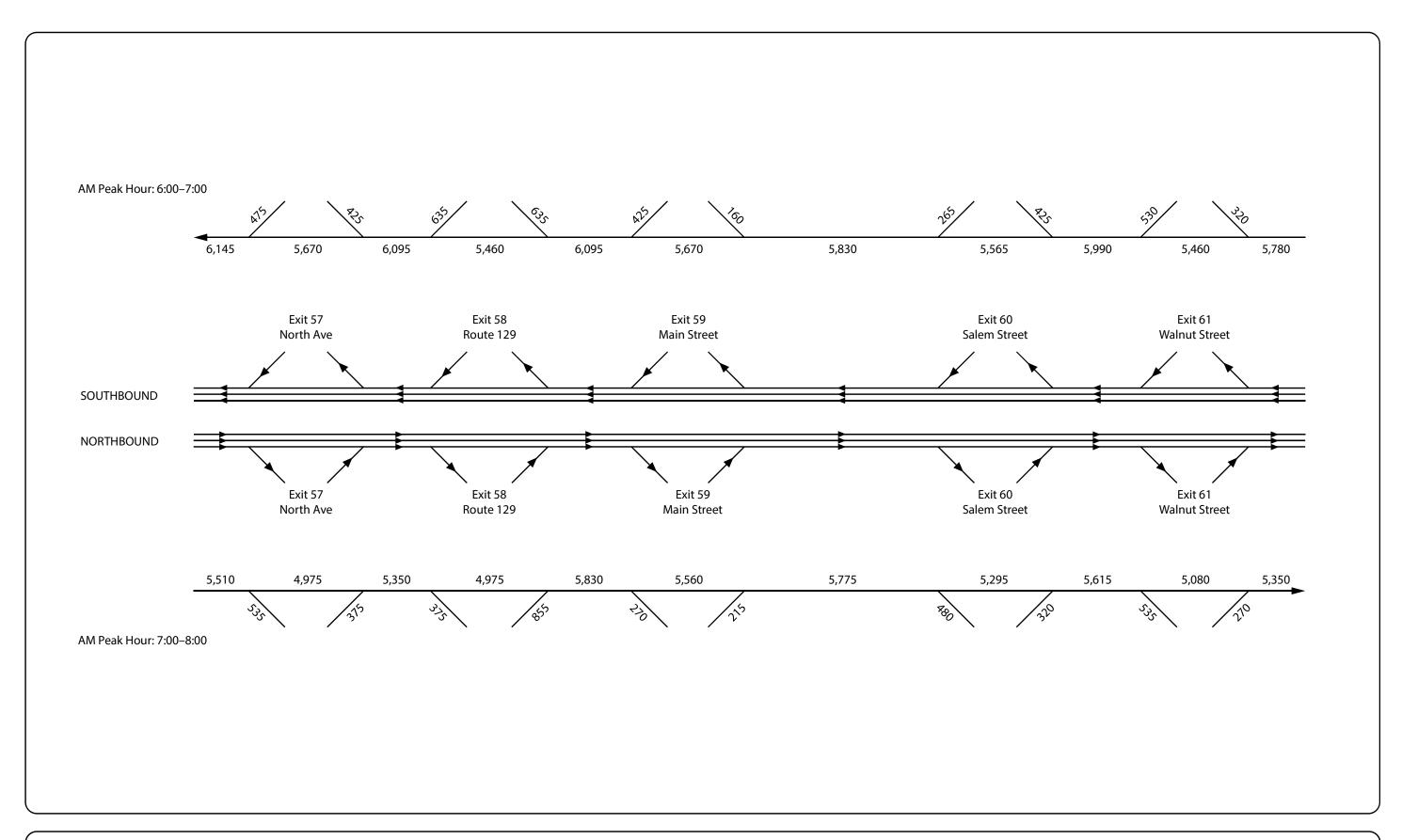


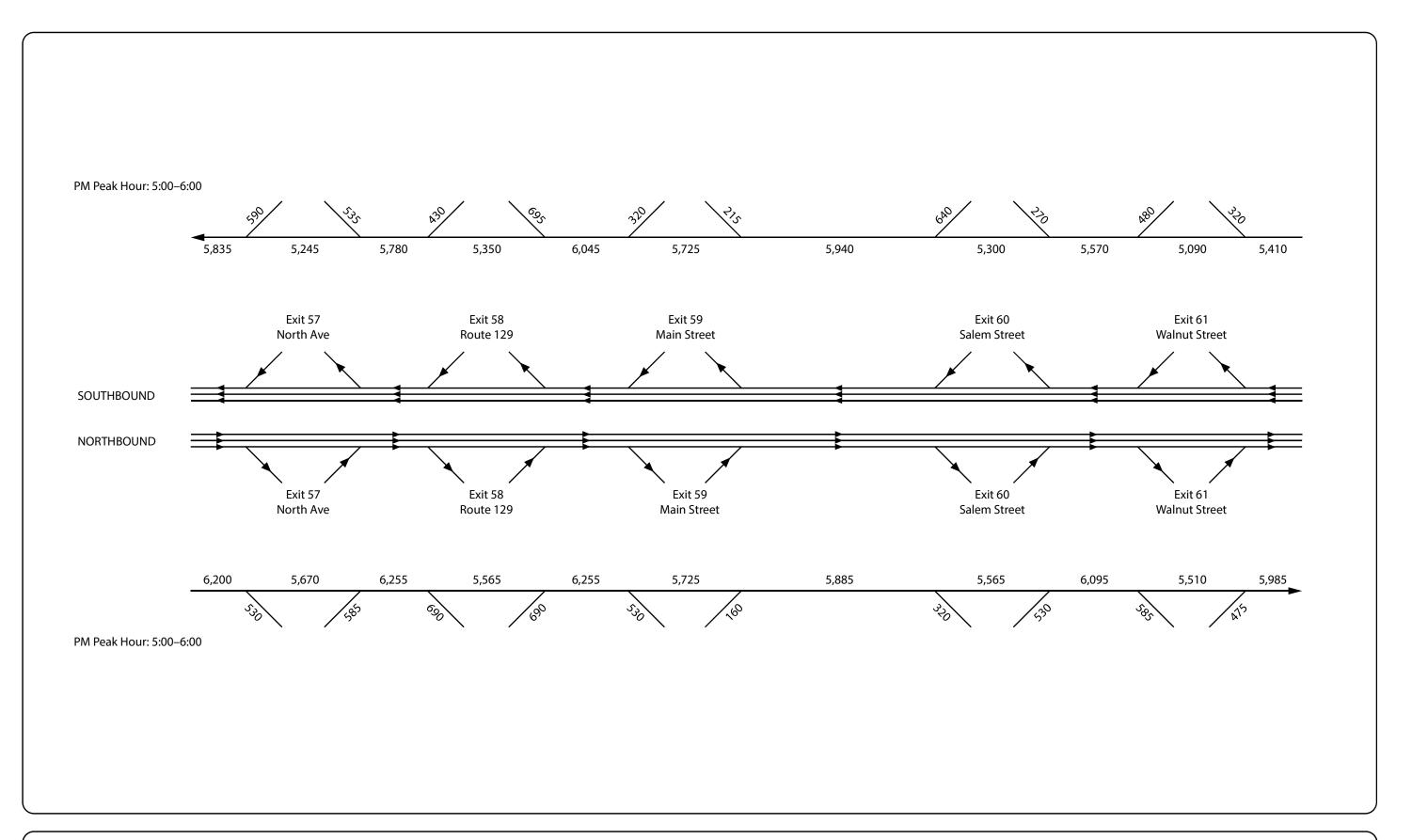




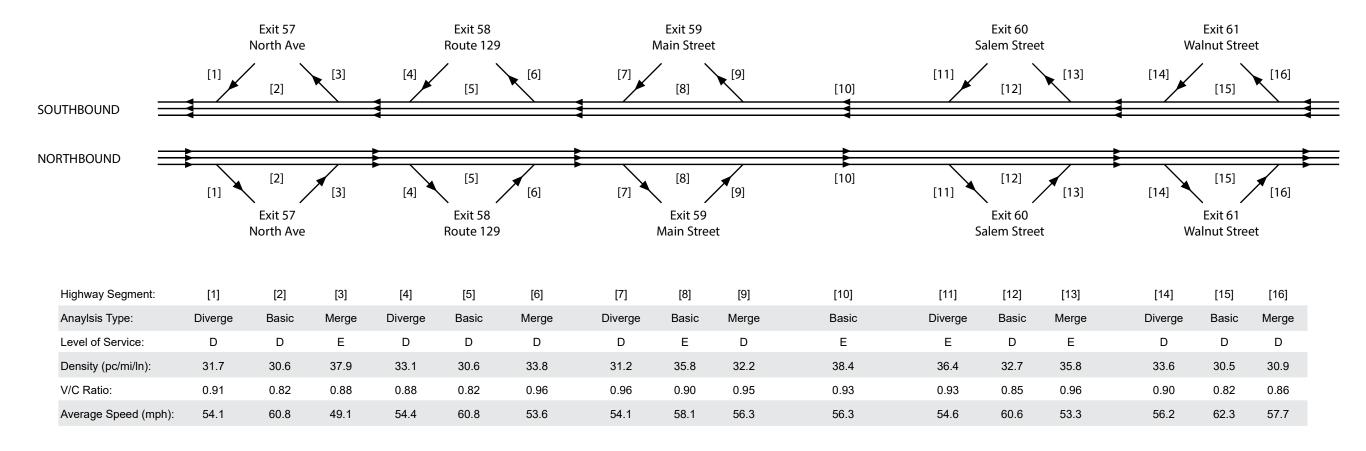








Highway Segment:	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
Anaylsis Type:	Merge	Basic	Diverge	Merge	Basic	Diverge	Merge	Basic	Diverge	Basic	Merge	Basic	Diverge	Merge	Basic	Diverge
Level of Service:	F	E	Е	F	Е	Е	Е	E	Е	Е	D	E	D	E	D	D
Density (pc/mi/ln):	-	38.1	37.6	-	35.5	35.1	37.5	38.5	35.4	38.9	33.3	35.4	33.7	37.4	34.2	33.8
V/C Ratio:	1.01	0.93	1.00	1.01	0.89	1.00	1.00	0.92	0.95	0.94	0.94	0.89	0.96	0.96	0.88	0.93
Average Speed (mph):	_	55.4	54.3	-	57.3	53.9	51.5	55.5	56.1	55.8	56.2	58.5	56.5	52.8	59.4	56.8



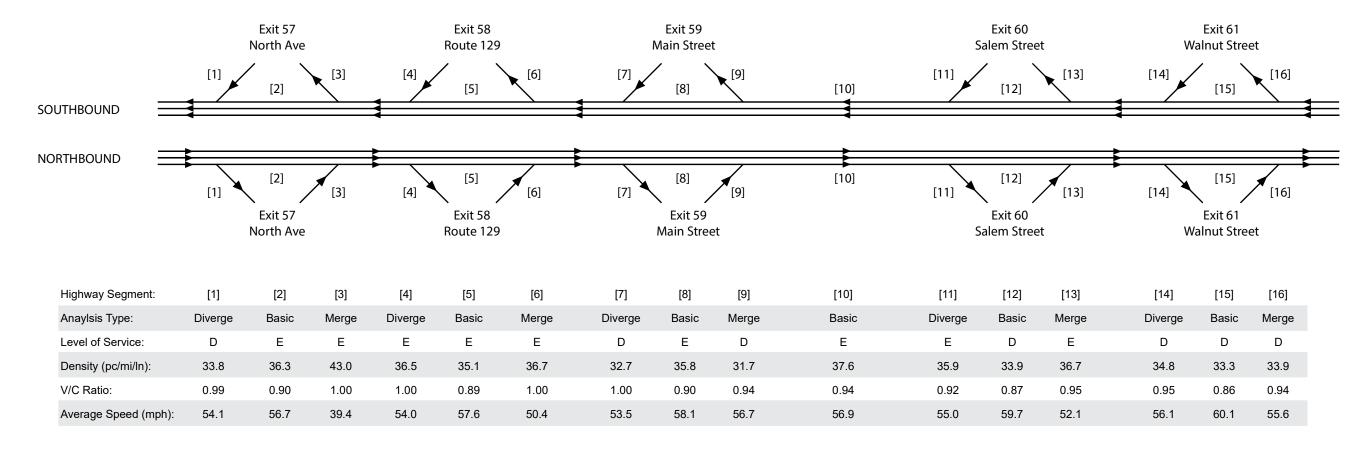
Notes

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 pc/mi/ln = passenger cars per mile per lane. V/C= volume-to-capacity. mph = miles per hour.



Highway Segment:	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
Anaylsis Type:	Merge	Basic	Diverge	Merge	Basic	Diverge	Merge	Basic	Diverge	Basic	Merge	Basic	Diverge	Merge	Basic	Diverge
Level of Service:	D	E	Е	Е	D	D	Е	E	Е	E	D	D	D	D	D	D
Density (pc/mi/ln):	32.9	37.0	35.5	38.4	32.8	34.3	36.5	36.9	35.3	38.2	34.2	31.1	31.1	32.9	29.2	31.7
V/C Ratio:	0.93	0.91	0.92	0.92	0.85	0.97	0.97	0.91	0.95	0.93	0.93	0.83	0.87	0.87	0.79	0.85
Average Speed (mph):	54.9	56.2	54.1	49.1	59.2	53.7	52.5	56.3	55.9	56.4	55.3	61.8	57.0	56.5	63.3	56.8



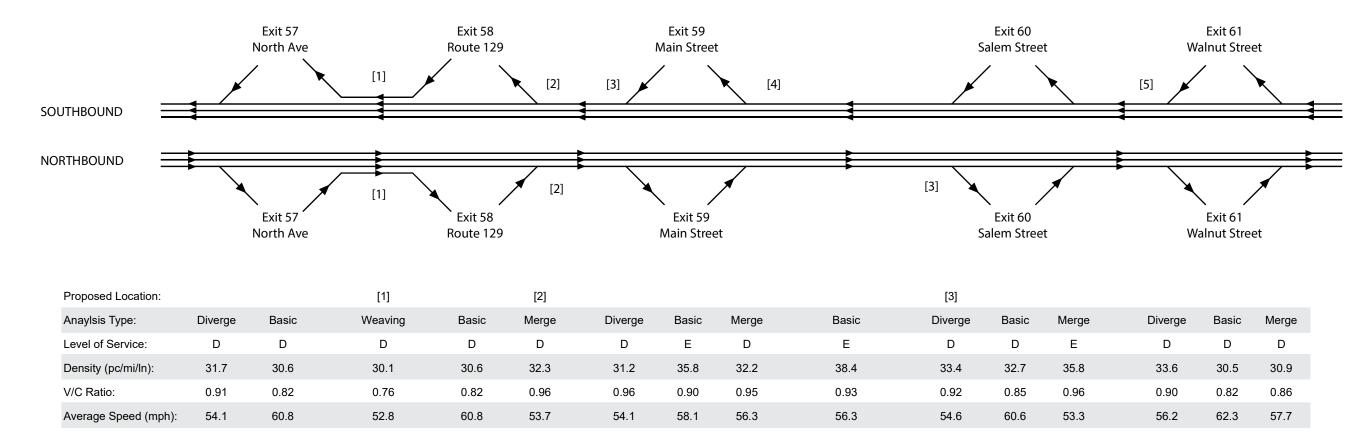
Notes

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 pc/mi/ln = passenger cars per mile per lane. V/C= volume-to-capacity. mph = miles per hour.



Proposed Location:			[1]		[2]	[3]		[4]					[5]		
Anaylsis Type:	Merge	Basic	Weaving	Basic	Diverge	Merge	Basic	Diverge	Basic	Merge	Basic	Diverge	Merge	Basic	Diverge
Level of Service:	F	E	D	E	D	D	E	D	E	D	E	D	D	D	D
Density (pc/mi/ln):	-	38.1	34.2	35.5	32.9	35.0	38.5	33.8	38.9	33.3	35.4	33.7	34.5	34.2	33.8
V/C Ratio:	1.01	0.93	0.83	0.89	1.00	1.00	0.92	0.95	0.94	0.94	0.89	0.96	0.96	0.88	0.93
Average Speed (mph):	_	55.4	50.5	57.3	53.9	52.1	55.5	56.1	55.8	56.2	58.5	56.5	53.5	59.4	56.8



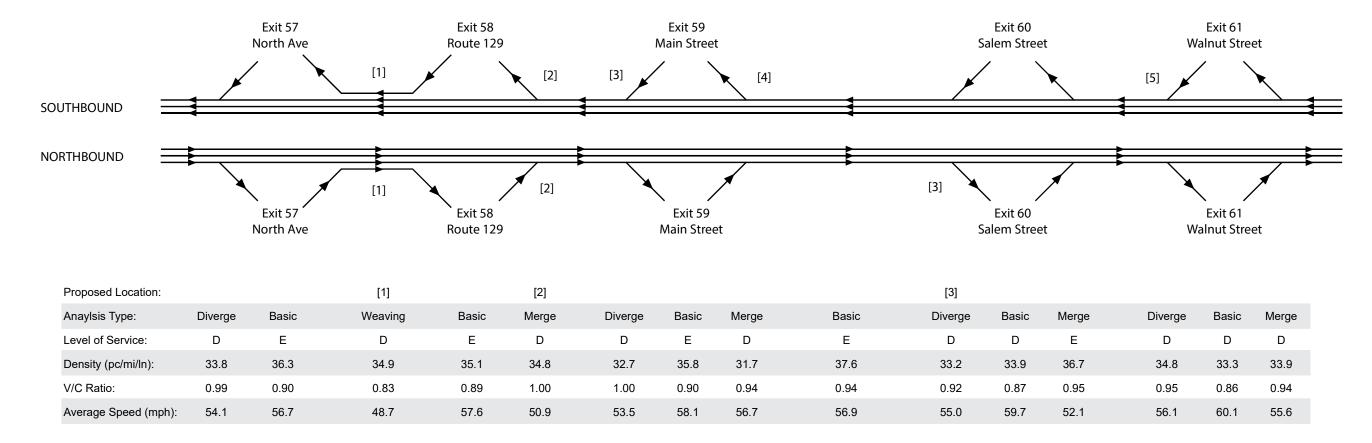
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- 2) Density (pc/mi/ln) refers to the ramp influence area (merge/diverge analysis), the weaving influence area (weaving analysis), or the freeway section (basic freeway segment analysis).
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 pc/mi/ln = passenger cars per mile per lane. V/C= volume-to-capacity. mph = miles per hour.



Proposed Location:			[1]		[2]	[3]		[4]					[5]		
Anaylsis Type:	Merge	Basic	Weaving	Basic	Diverge	Merge	Basic	Diverge	Basic	Merge	Basic	Diverge	Merge	Basic	Diverge
Level of Service:	D	Е	D	D	D	D	E	D	E	D	D	D	D	D	D
Density (pc/mi/ln):	32.9	37.0	30.5	32.8	32.1	34.0	36.9	33.7	38.2	34.2	31.1	31.1	30.6	29.2	31.7
V/C Ratio:	0.93	0.91	0.60	0.85	0.97	0.97	0.91	0.95	0.93	0.93	0.83	0.87	0.87	0.79	0.85
Average Speed (mph):	54.9	56.2	51.4	59.2	53.7	53.2	56.3	55.9	56.4	55.3	61.8	57.0	57.0	63.3	56.8



Notes:

- 1) Level of service (LOS) A through D represents acceptable operating conditions; LOS E represents operating conditions at capacity; and LOS F represents failing conditions (demand exceeds capacity).
- 2) Density (pc/mi/ln) refers to the ramp influence area (merge/diverge analysis), the weaving influence area (weaving analysis), or the freeway section (basic freeway segment analysis).
- 3) V/C ratio refers to the freeway section's volume-to-capacity ratio.
- 4) Speed (mph) refers to the ramp influence area average speed (merge/diverge analysis), the weaving and non-weaving average speed (weaving analysis), or the average of all vehicles (basic freeway segment analysis). These speeds are directly cited from Highway Capacity Software for comparison purposes only (between scenarios). A traffic simulation model, with a modeling area including the I-93/I-95 interchange, would estimate and predict the average speeds more accurately.

 pc/mi/ln = passenger cars per mile per lane. V/C= volume-to-capacity. mph = miles per hour.





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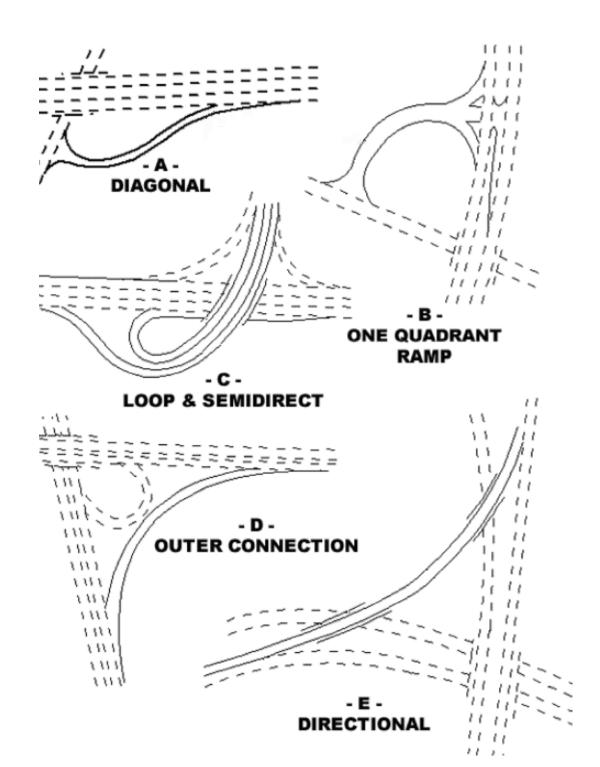


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APPENDIX A

General Types of Freeway Ramps
American Association of State Highway and Transportation Officials



APPENDIX B

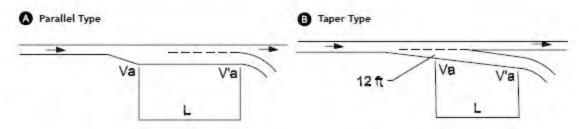
Deceleration Length Design Guidelines MassDOT Project Development and Design Guide

Exhibit 7-13 Minimum Deceleration Lengths for Exit Terminals with Flat Grades of 2% or Less

		25	celeration	n Length	L (ft) for	Design	Speed of	Exit Cur	ve VN (m	iph)
		Stop Condition	15	20	25	30	35	40	45	50
Highway Design Speed	Highway Speed Reached,		For Ave	rage Rui	nning Sp	eed on E	Exit Curve	e V'a (m	ph)	
V (mph)	Va (mph)	0	14	18	22	26	30	36	40	44
30	28	235	200	170	140	-	_	-	-	3
35	32	280	250	210	185	150		1	_	19
40	36	320	295	265	235	185	155	-	-	-
45	40	385	350	325	295	250	220	-	-	-
50	44	435	405	385	355	315	285	225	175	
55	48	480	455	440	410	380	350	285	235	Ę
60	52	530	500	480	460	430	405	350	300	24
65	55	570	540	520	500	470	440	390	340	28
70	58	615	590	570	550	520	490	440	390	34
75	61	660	635	620	600	575	535	490	440	39

V = Design Speed of Highway (mph)

V'a = Average Running Speed of Exit Curve (mph)



Source: A Policy on Geometric Design of Highways and Streets, AASHTO, 2004. Chapter 10 Grade Separations and Interchanges

Notes for This Stdy:

Applicable to diverge locations at Exits 59 and 60 on I-95 northbound

Applicable to other diverge locations in the study area

Va = Average Running Speed of Highway (mph)

VN = Design Speed of Exit Curve (mph)

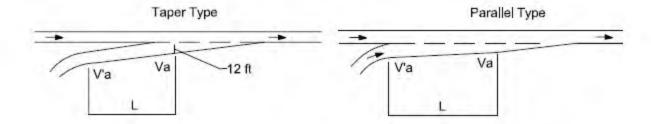
APPENDIX C

Acceleration Length Design Guidelines
MassDOT Project Development and Design Guide

Exhibit 7-14
Minimum Acceleration Lengths for Entrance Terminals with
Flat Grades of 2% or Less

		Stop Condition	15	20	25	30	35	40	45	50
Highway Design Speed	Highway Speed Reached,					peed V'a				
V (mph)	Va (mph)	0	14	18	22	26	30	36	40	44
30	28	180	140	-	-	-	-	-	-	-
35	32	280	220	160	_	_	-	- 2:	-	0-
40	36	360	300	270	210	120	-	-	-	-
45	40	560	490	440	380	280	160	-	-	-
50	44	720	660	610	550	450	350	130	-	-
55	48	960	900	810	780	670	550	320	150	-
60	52	1200	1140	1100	1020	910	800	550	420	180
65	55	1410	1350	1310	1220	1120	1000	770	600	370
70	58	1620	1560	1520	1420	1350	1230	1000	820	580
75	61	1790	1730	1630	1580	1510	1420	1160	1040	780

Note: Uniform 50:1 to 70:1 tapers are recommended where lengths of acceleration lanes exceed 1,300 feet.



Source: A Policy on Geometric Design of Highways and Streets, AASHTO, 2004. Chapter 10 Grade Separations and Interchanges

Notes for This Study:

Applicable to merge locations at Exits 59 and 61 on I-95 southbound

Applicable to other merge locations in the study area

APPENDIX D

Highway Capacity Analyses 2019 Weekday AM Peak Hour

	ŀ	HCS7 Freeway	Diverge Report				
Project Information							
Analyst	Chen-Yuan	Wang	Date	1/18/2022			
Agency	CTPS		Analysis Year	2019			
Jurisdiction	MassDOT D	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00		
Project Description	I-95 NB Ex5	7 Diverge - 2019 AM	Unit	United Sta	tes Customary		
Geometric Data							
			Freeway	Ramp			
Number of Lanes (N), In			3	1			
Free-Flow Speed (FFS), mi/h			71.1	35.0			
Segment Length (L) / Deceleration	Length (LA),1	ft	1500	600			
Terrain Type			Level	Level			
Percent Grade, %			-	-			
Segment Type / Ramp Type			Freeway Right-Sided One-Lane				
Adjustment Factors				·			
Driver Population			Mostly Familiar	niliar			
Weather Type			Non-Severe Weather	evere Weather Non-Severe Weath			
Incident Type			No Incident	-			
Final Speed Adjustment Factor (SAF	=)		0.925	0.975			
Final Capacity Adjustment Factor (C	CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000			
Demand and Capacity							
Demand Volume (Vi)			5150	500			
Peak Hour Factor (PHF)			0.94				
Total Trucks, %			5.50				
Single-Unit Trucks (SUT), %			-	-			
Tractor-Trailers (TT), %			-	-			
Heavy Vehicle Adjustment Factor (f	HV)		0.948	0.966			
Flow Rate (vi),pc/h			5779	551			
Capacity (c), pc/h			6824	1936			
Volume-to-Capacity Ratio (v/c)			0.85	0.28			
Speed and Density							
Upstream Equilibrium Distance (LEC	ૂ), ft	1999.1	Number of Outer Lanes on	Freeway (No)	1		
Distance to Upstream Ramp (LUP),	ft	3600	Speed Index (Ds)		0.489		
Downstream Equilibrium Distance ((LEQ), ft	-	Flow Outer Lanes (vOA), pc,	/h/ln	2143		
Distance to Downstream Ramp (LD	OWN), ft	1750	Off-Ramp Influence Area S	54.2			
Prop. Freeway Vehicles in Lane 1 ar	0.590	Outer Lanes Freeway Speed	67.7				
Flow in Lanes 1 and 2 (v12), pc/h 3636 Ramp Junction Speed (S), mi				(S), mi/h 58.5			
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi	/ln	32.9		
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 30.1							

HCS7 Basic Freeway Report											
Project Information											
Analyst	Chen-Yuan Wang	Date	1/18/2021								
Agency	CTPS	Analysis Year	2019								
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00								
Project Description	I-95 NB Ex57 Basic Fwy - 2019 AM	Unit	United States Customary								
Geometric Data											
Number of Lanes, In	3	Terrain Type	Level								
Segment Length (L), ft	-	Percent Grade, %	-								
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-								
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25								
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1								
Right-Side Lateral Clearance, ft	10										
Adjustment Factors		<u> </u>									
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925								
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968								
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000								
Demand and Capacity		·									
Demand Volume veh/h	4650	Heavy Vehicle Adjustment Factor (fHV)	0.948								
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1739								
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2358								
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283								
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.76								
Passenger Car Equivalent (ET)	2.000										
Speed and Density		<u> </u>									
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	62.7								
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	27.7								
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D								
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8										
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		HCS7 Freeway	Merge Report		
Project Information					
Analyst	Chen-Yuan	ı Wang	Date	1/18/202	2
Agency	CTPS		Analysis Year	2019	
Jurisdiction N	MassDOT [District 4	Time Period Analyzed	AM Peak	Hour 6:00-7:00
Project Description	-95 NB Ex	57 Merge - 2019 AM	Unit	United St	ates Customary
Geometric Data					
			Freeway	Ramp	
Number of Lanes (N), In			3	1	
Free-Flow Speed (FFS), mi/h			71.1	35.0	
Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	650	
Terrain Type			Level	Level	
Percent Grade, %			-	-	
Segment Type / Ramp Type			Freeway	Right-Sid	ed One-Lane
Adjustment Factors					
Driver Population			Mostly Familiar	Mostly Fa	miliar
Weather Type			Non-Severe Weather	Non-Seve	ere Weather
Incident Type			No Incident	-	
Final Speed Adjustment Factor (SAF)			0.925	0.975	
Final Capacity Adjustment Factor (CA	AF)		0.968	0.968	
Demand Adjustment Factor (DAF)			1.000	1.000	
Demand and Capacity					
Demand Volume (Vi)			4650	350	
Peak Hour Factor (PHF)			0.94	0.94	
Total Trucks, %			5.50		
Single-Unit Trucks (SUT), %			-	-	
Tractor-Trailers (TT), %			-	-	
Heavy Vehicle Adjustment Factor (fH	V)		0.948	0.966	
Flow Rate (vi),pc/h			5218	385	
Capacity (c), pc/h			6824	1936	
Volume-to-Capacity Ratio (v/c)			0.82	0.20	
Speed and Density					
Upstream Equilibrium Distance (LEQ),	, ft	868.8	Number of Outer Lanes on	Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft		1750	Speed Index (Ms)		0.589
Downstream Equilibrium Distance (Li	EQ), ft	3917.7	Flow Outer Lanes (vOA), pc	/h/ln	1221
Distance to Downstream Ramp (LDO)	850	On-Ramp Influence Area S	peed (SR), mi/h	51.8	
Prop. Freeway Vehicles in Lane 1 and	0.766	Outer Lanes Freeway Spee	d (SO), mi/h	63.2	
Flow in Lanes 1 and 2 (v12), pc/h	3997	Ramp Junction Speed (S), mi/h 53.9			
Flow Entering Ramp-Infl. Area (vR12),	nc/h	4382	Average Density (D), pc/mi	/In	34.7
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		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Ex	58 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1 35.0			
Segment Length (L) / Deceleration	Length (LA)	,ft	1500	350		
Terrain Type			Level Level			
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	d One-Lane		
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF	-)		0.925	0.975		
Final Capacity Adjustment Factor (C	CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			5000	350		
Peak Hour Factor (PHF)			0.94			
Total Trucks, %			5.50			
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.948	0.966		
Flow Rate (vi),pc/h			5611	385		
Capacity (c), pc/h			6824	1936		
Volume-to-Capacity Ratio (v/c)			0.82	0.20		
Speed and Density						
Upstream Equilibrium Distance (LEC	χ), ft	2212.8	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), 1	ft	850	Speed Index (DS)		0.474	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h	ı/ln	2080	
Distance to Downstream Ramp (LD	OWN), ft	2300	Off-Ramp Influence Area Spe	eed (SR), mi/h	54.5	
Prop. Freeway Vehicles in Lane 1 an	0.602	Outer Lanes Freeway Speed (SO), mi/h		68.0		
Flow in Lanes 1 and 2 (v12), pc/h	3531	Ramp Junction Speed (S), mi/h 58.8				
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/l	n	31.8	
Level of Service (LOS)		D	Density in Ramp Influence A	rea (DR), pc/mi/ln	31.5	
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HCS7 Basic Freeway Report			
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex58 Basic Fwy - 2019 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	4650	Heavy Vehicle Adjustment Factor (fHV)	0.948
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1739
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2358
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.76
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	62.7
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	27.7
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8		
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		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Ex	58 Merge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Acceleration I	Length (LA),	ft	1500	750		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				-		
Driver Population		Mostly Familiar	Mostly Far	niliar		
Weather Type		Non-Severe Weather	Non-Seve	Non-Severe Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF)			0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			4650	800		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.948	0.966		
Flow Rate (vi),pc/h			5218	881		
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.89	0.46		
Speed and Density						
Upstream Equilibrium Distance (LEC)), ft	1019.3	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	2300	Speed Index (Ms)		0.483	
Downstream Equilibrium Distance (LEQ), ft	1421.9	Flow Outer Lanes (vOA), pc/	h/ln	2098	
Distance to Downstream Ramp (LD	OWN), ft	1500	On-Ramp Influence Area Sp	peed (SR), mi/h	55.3	
Prop. Freeway Vehicles in Lane 1 an	id 2 (PFM)	0.598	Outer Lanes Freeway Speed	l (So), mi/h	62.0	
Flow in Lanes 1 and 2 (v12), pc/h		3120	Ramp Junction Speed (S), m	ni/h	57.4	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	4001	Average Density (D), pc/mi/	'In	35.4	
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	31.6	

	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022	2	
Agency	CTPS		Analysis Year	2019		
Jurisdiction N	MassDOT [District 4	Time Period Analyzed	AM Peak	Hour 6:00-7:00	
Project Description I	-95 NB Ex	59 Diverge - 2019 AM	Unit	United Sta	ates Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	30.0		
Segment Length (L) / Deceleration Le	ength (LA),	ft	1500	775		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	ed One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fa	miliar	
Weather Type		Non-Severe Weather	Non-Seve	Non-Severe Weather		
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)			0.950	0.975		
Final Capacity Adjustment Factor (CAF)			0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity				-		
Demand Volume (Vi)			5450	250		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fH\	V)		0.948	0.966	0.966	
Flow Rate (vi),pc/h			6116	275	275	
Capacity (c), pc/h			6824	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.90	0.15		
Speed and Density				-		
Upstream Equilibrium Distance (LEQ),	, ft	4528.2	Number of Outer Lanes or	n Freeway (NO)	1	
Distance to Upstream Ramp (LUP), ft		1500	Speed Index (DS)		0.528	
Downstream Equilibrium Distance (LE	EQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2371	
Distance to Downstream Ramp (LDOV	wn), ft	1125	Off-Ramp Influence Area S	Speed (SR), mi/h	54.2	
Prop. Freeway Vehicles in Lane 1 and	2 (PFD)	0.594	Outer Lanes Freeway Speed (SO), mi/h		69.0	
Flow in Lanes 1 and 2 (v12), pc/h		3745	Ramp Junction Speed (S),	mi/h	59.1	
Flow Entering Ramp-Infl. Area (vR12),	pc/h	-	Average Density (D), pc/m	i/ln	34.5	

HCS7 Basic Freeway Report					
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2019		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 NB Ex59 Basic Fwy - 2019 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000		
Demand and Capacity					
Demand Volume veh/h	5200	Heavy Vehicle Adjustment Factor (fHV)	0.948		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1945		
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2396		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2319		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.84		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	61.2		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	31.8		
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	69.6				
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		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Ex	59 Merge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data				•		
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	650		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975			
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity				·		
Demand Volume (Vi)			5200	200		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fi	⊣V)		0.948	0.966	0.966	
Flow Rate (vi),pc/h			5835	220	220	
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.89	0.11		
Speed and Density						
Upstream Equilibrium Distance (LEC)), ft	965.5	Number of Outer Lanes on Fi	reeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	1125	Speed Index (Ms)		0.434	
Downstream Equilibrium Distance (LEQ), ft	2712.3	Flow Outer Lanes (vOA), pc/h/ln		2357	
Distance to Downstream Ramp (LDC	OWN), ft	4900	On-Ramp Influence Area Speed (SR), mi/h		57.6	
Prop. Freeway Vehicles in Lane 1 an	d 2 (РFM)	0.596	Outer Lanes Freeway Speed ((SO), mi/h	62.7	
Flow in Lanes 1 and 2 (v12), pc/h		3478	Ramp Junction Speed (S), mi,	/h	59.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h	3698	Average Density (D), pc/mi/lr	1	33.9	
Level of Service (LOS)		D	Density in Ramp Influence Ar	rea (DR), pc/mi/ln	30.2	

	HCS7 Basic Fr	eeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex59-60 Basic Fwy - 2019 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5400	Heavy Vehicle Adjustment Factor (fHV)	0.948
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2020
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.87
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.7
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	33.8
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		

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	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Chen-Yu	ian Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2019		
Jurisdiction MassDC	T District 4	Time Period Analyzed	AM Peak F	lour 6:00-7:00	
Project Description I-95 NB	Ex60 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	30.0		
Segment Length (L) / Deceleration Length (L	A),ft	1500	200		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Far	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5400	450		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.50	3.50		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966	0.966	
Flow Rate (vi),pc/h		6060	496	496	
Capacity (c), pc/h		6970	1839	1839	
Volume-to-Capacity Ratio (v/c)		0.87	0.27		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	1250.6	Number of Outer Lanes on Freev	vay (No)	1	
Distance to Upstream Ramp (LUP), ft	4900	Speed Index (DS)		0.548	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2303	
Distance to Downstream Ramp (LDOWN), ft	1200	Off-Ramp Influence Area Speed (SR), mi/h		54.7	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	0.586	Outer Lanes Freeway Speed (SO),	mi/h	71.7	
Flow in Lanes 1 and 2 (v12), pc/h	3757	Ramp Junction Speed (S), mi/h		60.1	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln		33.6	
Level of Service (LOS)	D	Density in Ramp Influence Area (DR), pc/mi/ln	34.8	

	HCS7 Basic Fi	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex60 Basic Fwy - 2019 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	4950	Heavy Vehicle Adjustment Factor (fHV)	0.948
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1852
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.80
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	63.2
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	29.3
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		

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	HCS7 Freeway	Merge Report			
Project Information					
Analyst Chen-	Yuan Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2019		
Jurisdiction Massl	OOT District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description I-95 N	IB Ex60 Merge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Acceleration Length	(LA),ft	1500	625		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5250	300		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.50	3.50		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966	0.966	
Flow Rate (vi),pc/h		5891	330	330	
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.89	0.17		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	989.9	Number of Outer Lanes on Fre	eeway (No)	1	
Distance to Upstream Ramp (LUP), ft	1200	Speed Index (Ms)		0.518	
Downstream Equilibrium Distance (LEQ), fi	3059.3	Flow Outer Lanes (vOA), pc/h/ln		2103	
Distance to Downstream Ramp (LDOWN),	t 1500	On-Ramp Influence Area Spee	ed (SR), mi/h	55.5	
Prop. Freeway Vehicles in Lane 1 and 2 (P	M) 0.643	Outer Lanes Freeway Speed (S	50), mi/h	64.2	
Flow in Lanes 1 and 2 (v12), pc/h	12700			58.2	
	3788				
Flow Entering Ramp-Infl. Area (vR12), pc/h		Average Density (D), pc/mi/ln		35.6	

	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Exe	61 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	450		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population		Mostly Familiar	Mostly Fan	niliar		
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (CAF)			0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity				·		
Demand Volume (Vi)			5250	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	2.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	IV)		0.948	0.976	0.976	
Flow Rate (vi),pc/h			5891	545	545	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.85	0.28		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	1962.4	Number of Outer Lanes on Free	eway (No)	1	
Distance to Upstream Ramp (LUP), ft		1500	Speed Index (Ds)		0.489	
Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2203	
Distance to Downstream Ramp (LDC	wn), ft	1800	Off-Ramp Influence Area Speed (SR), mi/h		56.3	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.588	Outer Lanes Freeway Speed (SC), mi/h	72.1	
Flow in Lanes 1 and 2 (v12), pc/h		3688	Ramp Junction Speed (S), mi/h		61.3	
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/ln		32.0	
Level of Service (LOS)		D	Density in Ramp Influence Area	(DR), pc/mi/ln	31.9	

HCS7 Basic Freeway Report					
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2019		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 NB Ex61 Basic Fwy - 2019 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000		
Demand and Capacity					
Demand Volume veh/h	4750	Heavy Vehicle Adjustment Factor (fHV)	0.948		
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1777		
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2400		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.76		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	64.6		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	27.5		
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0				
		a.			

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		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction I	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Ex	51 Merge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				<u> </u>		
Driver Population			Mostly Familiar	Mostly Far	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF)		0.975	0.975			
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			4750	250		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fH	V)		0.948	0.966	0.966	
Flow Rate (vi),pc/h			5330	275	275	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.80	0.14		
Speed and Density						
Upstream Equilibrium Distance (LEQ)	, ft	802.6	Number of Outer Lanes on I	Freeway (NO)	1	
Distance to Upstream Ramp (LUP), ft		1800	Speed Index (Ms)		0.407	
Downstream Equilibrium Distance (L	EQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2175	
Distance to Downstream Ramp (LDO	WN), ft	-	On-Ramp Influence Area Speed (SR), mi/h		58.6	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFM)	0.592	Outer Lanes Freeway Speed	(SO), mi/h	64.0	
Flow in Lanes 1 and 2 (v12), pc/h		3155	Ramp Junction Speed (S), m	i/h	60.6	
Flow Entering Ramp-Infl. Area (vR12),	, pc/h	3430	Average Density (D), pc/mi/	In	30.8	
Level of Service (LOS)		D	Density in Ramp Influence A	rea (DR), pc/mi/ln	29.0	
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	HCS7 Freeway	Merge Report			
Project Information					
Analyst Chen-Yua	n Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2019		
Jurisdiction MassDOT	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description I-95 SB Ex	57 Merge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.4	35.0		
Segment Length (L) / Acceleration Length (LA)),ft	1500	600		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Severe Weather		
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5350	450		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.00	3.00	3.00	
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971		
Flow Rate (vi),pc/h		5978	493		
Capacity (c), pc/h		6824	1936		
Volume-to-Capacity Ratio (v/c)		0.95	0.25		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	1032.3	Number of Outer Lanes on Freewa	ay (No)	1	
Distance to Upstream Ramp (LUP), ft	1700	Speed Index (MS)		0.503	
Downstream Equilibrium Distance (LEQ), ft	945.7	Flow Outer Lanes (vOA), pc/h/ln		2427	
Distance to Downstream Ramp (LDOWN), ft	3600	On-Ramp Influence Area Speed (SR), mi/h		54.8	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.594	Outer Lanes Freeway Speed (SO), mi/h		60.5	
Flow in Lanes 1 and 2 (v12), pc/h				_	
Tiow in Lanes 1 and 2 (V12), pc/11	3551	Ramp Junction Speed (S), mi/h		56.8	
Flow Entering Ramp-Infl. Area (vR12), pc/h	3551 4044	Ramp Junction Speed (S), mi/h Average Density (D), pc/mi/ln		56.8 38.0	

HCS7 Basic Freeway Report					
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2019		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 SB Ex57 Basic Fwy - 2019 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000		
Demand and Capacity					
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.952		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1993		
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2358		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.87		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	58.2		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	34.2		
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8				
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HCS7 Freeway			Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT D	istrict 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Ex5	7 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data						
		Freeway	Ramp			
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration L	_ength (LA),ft	t	1500	600		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar Mostly Familiar		niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type		No Incident	-	-		
Final Speed Adjustment Factor (SAF)		0.925	0.975			
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)		5150	500			
Peak Hour Factor (PHF)		0.94	0.94			
Total Trucks, %		5.50	3.50			
Single-Unit Trucks (SUT), %		-	-			
Tractor-Trailers (TT), %		-	-			
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966			
Flow Rate (vi),pc/h		5779	551	551		
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.85	0.28	0.28	
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	1999.1	Number of Outer Lanes on Freeway (No)		1	
Distance to Upstream Ramp (LUP), fi	t	3600	Speed Index (Ds)		0.489	
Downstream Equilibrium Distance (I	LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2143	
Distance to Downstream Ramp (LDC	OWN), ft	1750	Off-Ramp Influence Area Speed (SR), mi/h		54.2	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.590	Outer Lanes Freeway Speed (So), mi/h		67.7	
Flow in Lanes 1 and 2 (v12), pc/h		3636	Ramp Junction Speed (S), mi/h		58.5	
Flow Entering Ramp-Infl. Area (vR12)), pc/h	-	Average Density (D), pc/mi/l	ln	32.9	
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	30.1	

Project Information Chen-Yuan Wang Date 1/18/202 Analyst Chen-Yuan Wang Date 1/18/202 Agency CTPS Analysis Year 2019 Jursdiction MassDOT District 4 Time Period Analyzed AM Peak Hour 600-700 Project Description 19-5 SB Ex/8 Merg - 2019 AM Unit United States Free Plow Speed (FPS), incl/h 3 1 Free-Plow Speed (FPS), mi/h 3 1 50 Segment Length (1) / Acceleration Length (LA), f 1500 50 50 Ferrain Type Level Level 1 50 Percent Grade, % 1 <	HCS7 Freeway Merge Report						
Agency	Project Information						
Description	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Project Description IP5 SB Ex58 Merge - 2019 AM Unit United States Customary Geometric Data Freeway Ramp Free-Flow Speed (FFS), mi/h 3 1 Segment Length (L) / Acceleration Length (LA), It 1500 550 Ferrain Type Level Level Percent Grade, % - - - Segment Type / Ramp Type Freeway Right-Side Ore-Lane Adjustment Factors Freeway Right-Side Ore-Lane Power Ropulation Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Power Ropulation Non-Severe Weather Non-Severe Weather Incident Type 1000 1,000 Final Speed Adjustment Factor (CAF) 0,968 0,968 Demand Adjustment Factor (CAF) 0,968 0,968 Demand Adjustment Factor (DAF) 5150 600 Peak Hour Factor (PHF) 5150 600 Total Trucks, % 500	Agency	CTPS		Analysis Year	2019		
Freeway	Jurisdiction I	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Free Flow Speed (FFS), mi/h 3 1 3 3 3 3 3 3 3 3	Project Description I	-95 SB Ex5	8 Merge - 2019 AM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.1 35.0 Free-Flow Speed (FFS), mi/h 71.1 35.0 Free-Flow Speed (FFS), mi/h Free Speed (FFS), mi/h 550 Free Speed (FFS), mi/h Free Speed (FFS), mi/h Free Speed Speed (FFS), mi/h Free Speed Speed (FFS), mi/h Free Speed Speed Speed (FFS), mi/h Free Speed Speed Speed (FFS), mi/h Free Speed Speed Speed Speed Speed (Speed Speed Spe	Geometric Data						
Free-Flow Speed (FFS), mi/h Segment Length (L) / Acceleration Length (LA).ft 1500 550 Terrain Type Level Level Level Percent Grade, % Segment Type / Ramp Type Freeway Right-Side One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Non-Severe Weather Incident Type Non-Severe Weather Non				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA),ft 1500 550 Terrain Type Level Level Percent Grade, %	Number of Lanes (N), In			3	1		
Level Level Level Level Percent Grade, % - - - - - - - - -	Free-Flow Speed (FFS), mi/h			71.1	35.0		
Percent Grade, % Freeway Right-Sided One-Lane	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	550		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Seve	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 5150 600 Demand Adjustment Factor (PAF) 0.94 Demand Adjustment Factor (PAF) 0.94 Demand Capacity	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity Demand Solution (Vi) 5150 600 Demand Volume (Vi) 5150 600 Demand Tactor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (Hrv) 0.952 0.971 Flow Rate (vi),pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 99.5 Number of Outer Lanes on Freeway (NO	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Nolume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fitv) 0.952 0.971 Heavy Vehicle Adjustment Factor (fitv) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (C, pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 99.5 Number of Outer Lanes on Freeway (No) 1 Speed and Density Upstream Equilibrium Distance (LEQ), ft 2600 Speed Index (Ms) 0.67	Adjustment Factors						
Incident Type	Driver Population		Mostly Familiar	Mostly Fan	niliar		
Final Speed Adjustment Factor (CAF) 0.925 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 0.94 0.94 Volume-to-Capacity Ratio (v/c) 0.994 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (No) 1 Upstream Equilibrium Distance (LEQ), ft 2600 Speed Index (Ms) 0.678 <td colspan="2">Weather Type</td> <td>Non-Severe Weather</td> <td>Non-Sever</td> <td colspan="2">Non-Severe Weather</td>	Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Demand Adjustment Factor (CAF) Demand Adjustment Factor (DAF) 1.000 1.000	Incident Type		No Incident	-	-		
Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (v),pc/h 6824 1936 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (voA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SN, mi/h) 49.7	Final Speed Adjustment Factor (SAF)		0.925	0.975			
Demand and Capacity Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (voA), pc/h/In 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (V12), pc/h 3959 Ramp Junction Speed (S), mi/h	Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Demand Adjustment Factor (DAF)			1.000	1.000		
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (voA), pc/h/ln 1796 Distance to Downstream Ramp (LDOwN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Demand and Capacity						
Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), %	Demand Volume (Vi)			5150	600		
Single-Unit Trucks (SUT), % - - - - - - - - -	Peak Hour Factor (PHF)		0.94	0.94			
Tractor-Trailers (TT), % Heavy Vehicle Adjustment Factor (fHv) Flow Rate (vi),pc/h Capacity (c), pc/h S755 6824 1936 Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 2600 Speed Index (MS) Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Ramp Junction Speed (S), mi/h Flow in Lanes 1 and 2 (v12), pc/h Ramp Junction Speed (S), mi/h 52.4	Total Trucks, %		5.00	3.00			
Heavy Vehicle Adjustment Factor (fHv) Flow Rate (vi), pc/h Capacity (c), pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow in Lanes 1 and 2 (v12), pc/h Bossa 255 O.952 O.971 For 5755 6824 O.94 O.952 O.94 O.94 O.94 O.952 O.94 O.94 O.94 O.952 O.94 O.94 O.952 O.94 O.94 O.952 O.967 O.967 O.967 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) O.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h O.688 Ramp Junction Speed (S), mi/h 52.4	Single-Unit Trucks (SUT), %		-	-			
Flow Rate (vi),pc/h Capacity (c), pc/h Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 5994 Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) Downstream Equilibrium Distance (LEQ), ft Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow in Lanes 1 and 2 (v12), pc/h 5755 6824 1936 Number of Outer Lanes on Freeway (No) 1 Speed Index (Ms) Con-Ramp Influence Area Speed (SR), mi/h 49.7 Con-Ramp Influence Area Speed (SO), mi/h Flow in Lanes 1 and 2 (v12), pc/h Speed Index (Ns) Con-Ramp Influence Area Speed (SO), mi/h Flow in Lanes 1 and 2 (v12), pc/h Speed Index (Ns) Ramp Junction Speed (S), mi/h 52.4	Tractor-Trailers (TT), %		-	-	-		
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971	0.971		
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Flow Rate (vi),pc/h		5755	657	657		
Speed and DensityUpstream Equilibrium Distance (LEQ), ft997.5Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft2600Speed Index (MS)0.678Downstream Equilibrium Distance (LEQ), ft2602.0Flow Outer Lanes (vOA), pc/h/In1796Distance to Downstream Ramp (LDOWN), ft825On-Ramp Influence Area Speed (SR), mi/h49.7Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.688Outer Lanes Freeway Speed (SO), mi/h61.1Flow in Lanes 1 and 2 (v12), pc/h3959Ramp Junction Speed (S), mi/h52.4	Capacity (c), pc/h		6824	1936	1936		
Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Volume-to-Capacity Ratio (v/c)			0.94	0.34	0.34	
Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Upstream Equilibrium Distance (LEQ)	, ft	997.5	Number of Outer Lanes on Freeway (No)		1	
Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Distance to Upstream Ramp (LUP), ft		2600	Speed Index (MS)		0.678	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Downstream Equilibrium Distance (L	EQ), ft	2602.0	Flow Outer Lanes (vOA), pc/h/ln		1796	
Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4	Distance to Downstream Ramp (LDO	wn), ft	825	On-Ramp Influence Area Speed (SR), mi/h		49.7	
	Prop. Freeway Vehicles in Lane 1 and	1 2 (PFM)	0.688	Outer Lanes Freeway Speed (SO), mi/h		61.1	
Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Flow in Lanes 1 and 2 (v12), pc/h		3959			52.4	
	Flow Entering Ramp-Infl. Area (vR12),	pc/h	4616	Average Density (D), pc/mi/ln		40.8	
Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 37.8	Level of Service (LOS)		Е	Density in Ramp Influence Are	ea (DR), pc/mi/ln	37.8	

HCS7 Basic Freeway Report					
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2019		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 NB Ex58 Basic Fwy - 2019 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors		<u> </u>			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000		
Demand and Capacity		·			
Demand Volume veh/h	4650	Heavy Vehicle Adjustment Factor (fHV)	0.948		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1739		
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2358		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.76		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	62.7		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	27.7		
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8				
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Project Information Chen Yaun Yang Date 1/18/2022 Arralyst Amalyst Yang 2019 ————————————————————————————————————	HCS7 Freeway Merge Report						
Agency	Project Information						
Jurisdiction MassBOT District 4 Time Period Analyzed AM Peak Hour 6:00 -7:00 Geometric Data Freeway Ramper Freeway Number of Lanes (N), In 3 1 Free - Flow Speed (FFS), mi/h 53 1 Segment Length (L) / Acceleration Length (LA).ft 1500 550 Ferrain Type Level Level Freerend Grade, % - - Segment Type / Ramp Type Freeway Right-Side=Tone-Lane Freeway Right-Side=Tone-Lane Adjustment Factors Freeway Robity Familiar Mostly Familiar Mostly Familiar Mostl	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Project Description Inject Description United States	Agency	CTPS		Analysis Year	2019		
Freeway	Jurisdiction N	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Number of Lanes (N), In 3 3 3 5 Free-Flow Speed (FFS), mi/h 71.1 35.0 550 Free-Flow Speed (FFS), mi/h 71.1 500 550 Ferrain Type	Project Description	-95 SB Ex5	8 Merge - 2019 AM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.1 35.0 Segment Length (L) / Acceleration Length (La), It 1500 550 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway nghts isled One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Non-Severe Weather	Geometric Data						
Free-Flow Speed (FFS), mi/h 71.1 35.0 Segment Length (L) / Acceleration Length (La), It 1500 550 Segment Length (L) / Acceleration Length (La), It 1500 550 Segment Terrain Type Level Level Level Segment Type / Segment Type / Segment Type / Ramp Type Freeway 69.0 Segment Type / Ramp Type Freeway No Segment Type / Ramp Type Mostly Familiar				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA).ft 1500 550 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Side One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Speed Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 5150 600 Demand Adjustment Factor (PAF) 9.94 0.94 Demand Capacity Demand Capacity Special Color (PAF) 0.94 0.94 Demand Capacity (CAF) 0.94 0.94 Demand Capacity (CAF) 0.99 0.94 0.94 Demand Capacity (CAF) 0.9	Number of Lanes (N), In			3	1		
Terrain Type Level Level Jean of the percent Grade, % 1 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 -	Free-Flow Speed (FFS), mi/h			71.1	35.0		
Percent Grade, % -	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	550		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,925 0,975 Final Capacity Adjustment Factor (DAF) 0,968 0,968 Demand Adjustment Factor (DAF) 1,000 1,000 Demand Capacity Demand Volume (V) 600 600 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - - Final Adjustment Factor (FHV) 0,952 0,971 Heavy Vehicle Adjustment Factor (FHV) 5755 657 Final Equilibrium Distance (LEQ), ft 0,94 0,94 Volume-to-Capacity Ratio (v/c) 5755 657 Capacity (c), pc/h 0,94 0,94 Volume-to-Capacity Ratio (v/c) 997.5 Number of Outer Lanes on Freewy (PM outer Lanes on Freewy (P	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.906 0.000 Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 9.94 3.4 Speed and Density Upstream Equilibrium Distance (LEQ), ft 99.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (Lup), ft 2600 Speed Index (MS) <t< td=""><td>Segment Type / Ramp Type</td><td></td><td></td><td>Freeway</td><td>Right-Side</td><td>d One-Lane</td></t<>	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (PAF) 5150 600 Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HrV) 0.952 0.971 Flow Rate (vi),pc/h 6824 1936 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 97.5 Number of Outer Lanes on Freeway (No) 1 Speed and Density Upstream Equilibrium Distance (LE0), ft 99.5 Number of Outer Lanes on Freeway (No)	Adjustment Factors						
No Incident	Driver Population		Mostly Familiar	Mostly Fan	niliar		
Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (vi), pc/h 6824 0.936 Capacity (c), pc/h 6824 1936 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/n 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (S), mi/h 49.7	Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (Lup), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (voA), pc/h/n 1796 Distance to Downstream Ramp (Lupown), ft 825 On-Ramp Influence Area Speed (SN	Incident Type		No Incident	-			
Demand Adjustment Factor (DAF) 1,000 1,000 Demand and Capacity Demand Volume (V) 5150 600 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 5.00 3.00	Final Speed Adjustment Factor (SAF)		0.925	0.975			
Demand and Capacity Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi), pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (voa), pc/h/ln 1796 Distance to Downstream Ramp (LUP), ft 2602.0 Flow Outer Lanes (voa), pc/h/ln 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (So), mi/h 49.7 Prop. Freeway Nemicles in Lane 1 and 2 (Vr2), pc/h 3959 Ramp Junction Speed (S),	Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Volume (Vi) 5150 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/In 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (Sn), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow In Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D),	Demand Adjustment Factor (DAF)			1.000	1.000		
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00	Demand and Capacity						
Total Trucks, % 5.00 3.00 3.00 Single-Unit Trucks (SUT), %	Demand Volume (Vi)		5150	600			
Single-Unit Trucks (SUT), % - <td colspan="2">Peak Hour Factor (PHF)</td> <td>0.94</td> <td>0.94</td> <td></td>	Peak Hour Factor (PHF)		0.94	0.94			
Tractor-Trailers (TT), % -	Total Trucks, %		5.00	3.00			
Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 5755 657 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (Ms) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Single-Unit Trucks (SUT), %		-	-			
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 2600 Distance to Upstream Ramp (LUP), ft 2600 Distance to Downstream Ramp (LDOWN), ft 825 Don-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Flow Capacity (c), pc/h 6824 Flose 24 Flose 24 Flose 24 Flose 24 Flose 24 Flose 24 Flose 25 Flose 26 Flose 26 Flose 26 Flose 26 Flose 26 Flose 27 Flose 28 Flose 27 Flose 27 Flose 27 Flose 28 Flose 27 Flose 27 Flose 28 Flose 28 Flose 28 Flose 24 Flose 27 Flose 27 Flose 27 Flose 27 Flose 28 Flose 27 Flose 27 Flose 28 Flose 27 Flose 28 Flos	Tractor-Trailers (TT), %		-	-	-		
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 6824 1936 0.34 Number of Outer Lanes on Freeway (NO) 1 Speed Index (MS) 0.678 Flow Outer Lanes (vOA), pc/h/ln 1796 On-Ramp Influence Area Speed (SR), mi/h 49.7 Ramp Junction Speed (SO), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971	0.971		
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Flow Rate (vi),pc/h		5755	657	657		
Speed and DensityUpstream Equilibrium Distance (LEQ), ft997.5Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft2600Speed Index (MS)0.678Downstream Equilibrium Distance (LEQ), ft2602.0Flow Outer Lanes (vOA), pc/h/ln1796Distance to Downstream Ramp (LDOWN), ft825On-Ramp Influence Area Speed (SR), mi/h49.7Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.688Outer Lanes Freeway Speed (SO), mi/h61.1Flow in Lanes 1 and 2 (v12), pc/h3959Ramp Junction Speed (S), mi/h52.4Flow Entering Ramp-Infl. Area (vR12), pc/h4616Average Density (D), pc/mi/ln40.8	Capacity (c), pc/h		6824	1936	1936		
Upstream Equilibrium Distance (LEQ), ft 997.5 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Volume-to-Capacity Ratio (v/c)			0.94	0.34	0.34	
Distance to Upstream Ramp (LUP), ft 2600 Speed Index (MS) 0.678 Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 2602.0 Flow Outer Lanes (vOA), pc/h/ln 1796 Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Upstream Equilibrium Distance (LEQ), ft 997.5		Number of Outer Lanes on Fr	reeway (No)	1		
Distance to Downstream Ramp (LDOWN), ft 825 On-Ramp Influence Area Speed (SR), mi/h 49.7 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Distance to Upstream Ramp (LUP), ft		2600	Speed Index (Ms)		0.678	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.688 Outer Lanes Freeway Speed (SO), mi/h 61.1 Flow in Lanes 1 and 2 (v12), pc/h 3959 Ramp Junction Speed (S), mi/h 52.4 Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Downstream Equilibrium Distance (Li	EQ), ft	2602.0	Flow Outer Lanes (vOA), pc/h/ln		1796	
Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Distance to Downstream Ramp (LDO)	wn), ft	825	On-Ramp Influence Area Speed (SR), mi/h		49.7	
Flow Entering Ramp-Infl. Area (vR12), pc/h 4616 Average Density (D), pc/mi/ln 40.8	Prop. Freeway Vehicles in Lane 1 and	I 2 (РFM)	0.688	Outer Lanes Freeway Speed (SO), mi/h		61.1	
	Flow in Lanes 1 and 2 (v12), pc/h		3959	Ramp Junction Speed (S), mi/h		52.4	
Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 37.8	Flow Entering Ramp-Infl. Area (vR12),	pc/h	4616	· ·		40.8	
	Level of Service (LOS)		E	Density in Ramp Influence Ar	ea (DR), pc/mi/ln	37.8	

Project Information Analysts Chen- Yuan Wang Date 8/10/2021 Agency CTPS Analysis Yaar 2019 - Jurisdiction MassEOT District 4 Time Period Analyzed AM Peak Period 600 7:00 Project Description 195 SB E-35 Diverge - 2019 AM Unit on the Indistrict of Control of Control Oncolor (Project Description) United States E-2019 AM Hereafted Transport (Project Description (Project Description) Freeway Ramp Analysis Yaar A geometr Length (L) / Deceleration Indigent In	HCS7 Freeway Diverge Report						
Agency CTPS	Project Information						
Mass DOT District 4	Analyst	Chen-Yuan	Wang	Date	8/10/2021		
Project Description In 195 SB Ex59 Diverge - 2019 AM Unit United States Customary Geometric Data Freeway Ramp Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.4 35.0 Segment Length (L/) Deceleration Length (LA)/T 1500 275 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Weather Type No Incident Non-Severe Weather Non-Severe Weather Non-Severe Weather Final Speed Adjustment Factor (SAF) 0.950 0.95 Final Capacity Adjustment Factor (SAF) 0.968 0.968 Demand Adjustment Factor (SAF) 0.968 0.968 Demand Sepend Adjustment Factor (DAF) 0.996 0.94 Demand Land Capacity Soo 0.91 Demand Capacity 0.94 0.94 <td cols<="" td=""><td>Agency</td><td>CTPS</td><td></td><td>Analysis Year</td><td>2019</td><td></td></td>	<td>Agency</td> <td>CTPS</td> <td></td> <td>Analysis Year</td> <td>2019</td> <td></td>	Agency	CTPS		Analysis Year	2019	
Freeway	Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak P	Period 6:00-7:00	
Number of Lanes (N), In 3 1 1 1 1 1 1 1 1 1	Project Description	I-95 SB Ex5	9 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.4 35.0 3	Geometric Data						
Free-Flow Speed (FFS), mi/h Segment Length (L) / Deceleration Length (LA),ft 1500 275 Terrain Type Level Level Level Percent Grade, % Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Mostly Familiar Mon-Severe Weather Non-Severe Weat				Freeway	Ramp		
Segment Length (L) / Deceleration Length (LA),ft 1500 275 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Incident Type No Incident - Incident Type 0.958 0.975 Final Speed Adjustment Factor (SAF) 0.968 0.975 Final Capacity Adjustment Factor (CAF) 1.000 1.000 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Capacity Demand Capacity Demand Capacity Demand Capacity Segment Type / Park 5500 150 Segment Type / Park 9.94 0.94 Total Trucks (SUT), % -	Number of Lanes (N), In			3	1		
Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,950 0,975 Final Capacity Adjustment Factor (CAF) 0,968 0,968 Demand Adjustment Factor (DAF) 1,000 1,000 Demand Volume (V) 5500 150 Demand Volume (V) 5500 150 Demand Sepacity Final Trucks, % 5.00 3,00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TI), % - - Final Equilibrium Factor (fity) 0,952 0,971 Fiow Rate (w),pc/h 6824 1936 Volume-to-Capacity	Free-Flow Speed (FFS), mi/h			71.4	35.0		
Percent Grade, % -	Segment Length (L) / Deceleration L	ength (LA),	ft	1500	275		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity Demand Type \$500 150 Demand Volume (Vi) \$500 150 Demand Type 0.94 0.94 Total Trucks, % \$500 3.00 \$0.94 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - - Heavy Vehicle Adjustment Factor (Hrv) 0.952 0.971 - Flow Rate (vi),pc/h 6824 1936 - Volume-to-Capacity Ratio (v/c)<	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 5500 150 Demand Nolume (Vi) 5500 150 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HrV) 0.952 0.971 Heavy Vehicle Adjustment Factor (HrV) 0.952 0.971 Heavy Vehicle Adjustment Factor (HrV) 0.952 0.971 Flow Rate (vi), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density <td< td=""><td>Percent Grade, %</td><td></td><td></td><td>-</td><td>-</td><td></td></td<>	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Nolume (Vi) 5500 150 Demand Factor (PHF) 0.94 0.94 Total Trucks, SW 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 0.952 0.971 Heavy Vehicle Adjustment Factor (FHV) 6824 1936 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (NO) 1	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 5500 150 Demand Volume (Vi) 5500 150 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (Hiv) 0.952 0.971 Flow Rate (vi), pc/h 6146 164 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (NO) 1 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln <td>Adjustment Factors</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Adjustment Factors						
No Incident Type	Driver Population		Mostly Familiar	Mostly Fan	niliar		
Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 1.000 Demand Volume (Vi) 5500 150 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (w),pc/h 6146 164 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (w/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) 1 O.454 <th cols<="" td=""><td colspan="2">Weather Type</td><td>Non-Severe Weather</td><td>Non-Sever</td><td colspan="2">Non-Severe Weather</td></th>	<td colspan="2">Weather Type</td> <td>Non-Severe Weather</td> <td>Non-Sever</td> <td colspan="2">Non-Severe Weather</td>	Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity	Incident Type		No Incident	-			
Demand Adjustment Factor (DAF) 1,000 1,000 Demand and Capacity 5500 150 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 5,00 3,00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0,952 0,971 Flow Rate (vi),pc/h 6146 164 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0,90 0,08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (Ds) 0.454 Downstream Equilibrium Distance (LEQ), ft Flow Outer Lanes (voA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Final Speed Adjustment Factor (SAF)		0.950	0.975			
Demand and Capacity Demand Volume (Vi) 5500 150 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 6146 164 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (Ds) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (voA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Volume (Vi) 5500 150 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 6146 164 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (Ds) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Demand Adjustment Factor (DAF)			1.000	1.000		
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (vi),pc/h 6146 164 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (Ds) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (voA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Demand and Capacity						
Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), %	Demand Volume (Vi)		5500	150			
Single-Unit Trucks (SUT), % - <td colspan="2">Peak Hour Factor (PHF)</td> <td>0.94</td> <td>0.94</td> <td></td>	Peak Hour Factor (PHF)		0.94	0.94			
Tractor-Trailers (TT), % Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 6146 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 0.08 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (No) Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Total Trucks, %		5.00	3.00			
Heavy Vehicle Adjustment Factor (fHV) Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Total Capacity (fHV) Distance to Downstream Ramp (LDOWN), ft Total Capacity (c), pc/h 6146 164 1936 1936 1936 Number of Outer Lanes on Freeway No) Speed Index (DS) Flow Outer Lanes (NOA), pc/h/In 2399 Distance to Downstream Ramp (LDOWN), ft Total Capacity (c), pc/h Total Capacity (c)	Single-Unit Trucks (SUT), %		-	-			
Flow Rate (vi),pc/h Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.90 Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Downstream Equilibrium Distance (LEQ), ft The property of t	Tractor-Trailers (TT), %		-	-	-		
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971	0.971		
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Flow Rate (vi),pc/h		6146	164	164		
Speed and Density Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Capacity (c), pc/h		6824	1936	1936		
Upstream Equilibrium Distance (LEQ), ft 1370.4 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Volume-to-Capacity Ratio (v/c)			0.90	0.08	0.08	
Distance to Upstream Ramp (LUP), ft 5600 Speed Index (DS) 0.454 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2399 Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Upstream Equilibrium Distance (LEQ)), ft	1370.4	Number of Outer Lanes on Freeway (NO)		1	
Distance to Downstream Ramp (LDOWN), ft 1250 Off-Ramp Influence Area Speed (SR), mi/h 56.1	Distance to Upstream Ramp (LUP), ft		5600	Speed Index (Ds)		0.454	
	Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2399	
Pron Freeway Vehicles in Lane 1 and 2 (PFD) 0 599 Outer Lanes Freeway Speed (SO) mi/h 68.9	Distance to Downstream Ramp (LDO	wn), ft	1250	Off-Ramp Influence Area Speed (SR), mi/h		56.1	
Outer Edited Treeway Speece (50), might	Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.599	Outer Lanes Freeway Speed (SO), mi/h		68.9	
Flow in Lanes 1 and 2 (v12), pc/h 3747 Ramp Junction Speed (S), mi/h 60.5	Flow in Lanes 1 and 2 (v12), pc/h		3747	Ramp Junction Speed (S), mi/h 6		60.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 33.9	Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/ln 33.9		33.9	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 34.0	Level of Service (LOS)		D	Density in Ramp Influence Area	a (DR), pc/mi/ln	34.0	

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 SB Ex59 Basic Fwy - 2019 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.952
Peak Hour Factor	0.94	Flow Rate (V _P), pc/h/ln	1993
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2360
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2284
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.87
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	58.3
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	34.2
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	66.0		

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HCS7 Freeway Diverge Report					
Project Information					
Analyst Chen-Yuan Wang		Date	8/10/2021		
Agency CTPS		Analysis Year	2019		
Jurisdiction MassDOT District	4	Time Period Analyzed	AM Peak Pe	eriod 6:00-7:00	
Project Description I-95 SB Ex59 Diver	rge - 2019 AM	Unit	United Stat	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.4	35.0		
Segment Length (L) / Deceleration Length (LA),ft		1500	275		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fam	niliar	
Weather Type		Non-Severe Weather	Non-Severe Weather		
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5500	150		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.00	3.00		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971		
Flow Rate (vi),pc/h		6146	164		
Capacity (c), pc/h		6824	1936		
Volume-to-Capacity Ratio (v/c)		0.90	0.08		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft 1370.4	4	Number of Outer Lanes on Freeway (NO)		1	
Distance to Upstream Ramp (LUP), ft 5600		Speed Index (Ds)		0.454	
Downstream Equilibrium Distance (LEQ), ft -		Flow Outer Lanes (vOA), pc/h/ln		2399	
Distance to Downstream Ramp (LDOWN), ft 1250		Off-Ramp Influence Area Speed (SR), mi/h		56.1	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.599		Outer Lanes Freeway Speed (SO), mi/h		68.9	
Flow in Lanes 1 and 2 (v12), pc/h 3747		Ramp Junction Speed (S), mi/h 60		60.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h -		Average Density (D), pc/mi/ln		33.9	
Level of Service (LOS) D		Density in Ramp Influence Area (Di	R), pc/mi/ln	34.0	

Chen-Yuan Wang CTPS MassDOT District 4 I-95 SB Ex59-60 Basic Fwy - 2019 AM	Date Analysis Year Time Period Analyzed Unit	1/18/2021 2019 AM Peak Hour 6:00-7:00 United States Customary
CTPS MassDOT District 4 I-95 SB Ex59-60 Basic Fwy	Analysis Year Time Period Analyzed	2019 AM Peak Hour 6:00-7:00
MassDOT District 4 I-95 SB Ex59-60 Basic Fwy	Time Period Analyzed	AM Peak Hour 6:00-7:00
I-95 SB Ex59-60 Basic Fwy	·	
	Unit	United States Customany
	I .	omica states customary
3	Terrain Type	Level
-	Percent Grade, %	-
Base	Grade Length, mi	-
75.0	Total Ramp Density (TRD), ramps/mi	1.00
12	Free-Flow Speed (FFS), mi/h	71.8
10		
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
No Incident	Demand Adjustment Factor (DAF)	1.000
5500	Heavy Vehicle Adjustment Factor (fHV)	0.952
0.94	Flow Rate (Vp), pc/h/ln	2049
5.00	Capacity (c), pc/h/ln	2400
-	Adjusted Capacity (cadj), pc/h/ln	2323
-	Volume-to-Capacity Ratio (v/c)	0.88
2.000		
0.0	Average Speed (S), mi/h	59.1
0.0	Density (D), pc/mi/ln	34.7
3.2	Level of Service (LOS)	D
70.0		
	- Base 75.0 12 10	3 Terrain Type - Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi 12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) 5500 Heavy Vehicle Adjustment Factor (fHV) 0.94 Flow Rate (Vp), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 1.2 Level of Service (LOS)

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HCS7 Freeway Merge Report				
Project Information				
Analyst Chen-Yu	an Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2019	
Jurisdiction MassDO	T District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00
Project Description I-95 NB	Ex60 Merge - 2019 AM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.8	35.0	
Segment Length (L) / Acceleration Length (L	A),ft	1500	625	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors				
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Severe Weather	
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)		0.975	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.000	1.000	
Demand and Capacity				
Demand Volume (Vi)		5250	300	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		5.50	3.50	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966	
Flow Rate (vi),pc/h		5891	330	
Capacity (c), pc/h		6970	1936	
Volume-to-Capacity Ratio (v/c)		0.89	0.17	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	989.9	Number of Outer Lanes on Freeway (NO)		1
Distance to Upstream Ramp (LUP), ft	1200	Speed Index (Ms)		0.518
Downstream Equilibrium Distance (LEQ), ft	3059.3	Flow Outer Lanes (vOA), pc/h/ln		2103
Distance to Downstream Ramp (LDOWN), ft	_		-> ''	55.5
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1500	On-Ramp Influence Area Speed (S	R), mi/n	33.3
		On-Ramp Influence Area Speed (S Outer Lanes Freeway Speed (SO), r		64.2
Flow in Lanes 1 and 2 (v12), pc/h				
<u> </u>	0.643	Outer Lanes Freeway Speed (SO), r		64.2

HCS7 Basic Freeway Report					
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2019		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 SB Ex60 Basic Fwy - 2019 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors		<u> </u>			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000		
Demand and Capacity					
Demand Volume veh/h	5250	Heavy Vehicle Adjustment Factor (fHV)	0.952		
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1956		
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.84		
Passenger Car Equivalent (ET)	2.000				
Speed and Density		<u> </u>			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	61.2		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	32.0		
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0				
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HCS7 Freeway Diverge Report					
Project Information					
Analyst Chen-Yu	an Wang	Date	8/10/2021		
Agency CTPS		Analysis Year	2019		
Jurisdiction MassDO	T District 4	Time Period Analyzed	AM Peak P	Period 6:00-7:00	
Project Description I-95 SB E	x60 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Deceleration Length (L	A),ft	1500	575		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors			<u> </u>		
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5650	400		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.00	3.00		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971	0.971	
Flow Rate (vi),pc/h		6314	438	438	
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.91	0.23	0.23	
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	2994.9	Number of Outer Lanes on Freeway (No)		1	
Distance to Upstream Ramp (LUP), ft	1500	Speed Index (Ds)		0.479	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2456	
Distance to Downstream Ramp (LDOWN), ft	1925	Off-Ramp Influence Area Speed (SR), mi/h		56.6	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	0.582	Outer Lanes Freeway Speed (SO), mi/h		71.1	
Flow in Lanes 1 and 2 (v12), pc/h		Ramp Junction Speed (S), mi/h		T	
· · · · · · · · · · · · · · · · · · ·	3858	Ramp Junction Speed (S), mi/h		61.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h	3858	Ramp Junction Speed (S), mi/h Average Density (D), pc/mi/ln		61.5 34.2	

		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 SB Ex6	51 Merge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	25.0		
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	350		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				·		
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (C.	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000	1.000	
Demand and Capacity						
Demand Volume (Vi)			5150	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	ŀV)		0.952	0.971		
Flow Rate (vi),pc/h			5755	548	548	
Capacity (c), pc/h			6970	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.90	0.30		
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	377.9	Number of Outer Lanes on I	Freeway (No)	1	
Distance to Upstream Ramp (LUP), fi	t	1125	Speed Index (Ms)		0.550	
Downstream Equilibrium Distance (LEQ), ft 2980.6		Flow Outer Lanes (vOA), pc/l	h/ln	2158		
Distance to Downstream Ramp (LDOWN), ft 1500		On-Ramp Influence Area Sp	eed (SR), mi/h	54.6		
Prop. Freeway Vehicles in Lane 1 and	d 2 (РFM)	0.625	Outer Lanes Freeway Speed (SO), mi/h		64.0	
Flow in Lanes 1 and 2 (v12), pc/h	in Lanes 1 and 2 (v12), pc/h 3597		Ramp Junction Speed (S), m	i/h	57.5	
Flow Entering Ramp-Infl. Area (vR12)), pc/h	4145	Average Density (D), pc/mi/ln 36.5		36.5	
Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 35.4					35.4	

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 SB Ex61 Basic Fwy - 2019 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5150	Heavy Vehicle Adjustment Factor (fHV)	0.952
Peak Hour Factor	0.94	Flow Rate (V _P), pc/h/ln	1918
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.83
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	61.9
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	31.0
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		

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	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Che	en-Yuan Wang	Date	8/10/2021		
Agency CTP	PS .	Analysis Year	2019		
Jurisdiction Mas	ssDOT District 4	Time Period Analyzed	AM Peak P	eriod 6:00-7:00	
Project Description I-95	SB Ex61 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Deceleration Leng	jth (LA),ft	1500	450		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000	1.000	
Demand and Capacity			·		
Demand Volume (Vi)		5450	300		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.00	3.00		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971		
Flow Rate (vi),pc/h		6090	329		
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.87	0.17		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)		0.469	
Downstream Equilibrium Distance (LEQ), ft -		Flow Outer Lanes (vOA), pc/h	ı/ln	2345	
Distance to Downstream Ramp (LDOWN)), ft 1125	Off-Ramp Influence Area Spe	eed (SR), mi/h	56.9	
Prop. Freeway Vehicles in Lane 1 and 2 ((PFD) 0.593	Outer Lanes Freeway Speed	(SO), mi/h	71.5	
Flow in Lanes 1 and 2 (v12), pc/h	3745	Ramp Junction Speed (S), mi/h 61.8		61.8	
Flow Entering Ramp-Infl. Area (vR12), pc	/h -	Average Density (D), pc/mi/ln 32.8		32.8	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 32.4					

APPENDIX E

Highway Capacity Analyses 2019 Weekday PM Peak Hour

HCS7 Freeway Diverge Report						
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT D	istrict 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Ex5	7 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration I	_ength (LA),f	t	1500	600		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.925	0.975		
Final Capacity Adjustment Factor (C	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000	1.000	
Demand and Capacity						
Demand Volume (Vi)			5850	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.985		
Flow Rate (vi),pc/h			6376	540	540	
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.93	0.28		
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	2445.6	Number of Outer Lanes on Fre	eeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	3600	Speed Index (DS)		0.488	
Downstream Equilibrium Distance (LEQ), ft -		Flow Outer Lanes (vOA), pc/h/l	ln	2474		
Distance to Downstream Ramp (LDC	OWN), ft	1750	Off-Ramp Influence Area Spee	ed (SR), mi/h	54.2	
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFD)	0.576	Outer Lanes Freeway Speed (SO), mi/h		66.4	
Flow in Lanes 1 and 2 (v12), pc/h		3902	Ramp Junction Speed (S), mi/h 58.4		58.4	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln 36.4		36.4	
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 32.4			

	HCS7 Basic Freeway Report						
Project Information							
Analyst	Chen-Yuan Wang	Date	1/18/2021				
Agency	CTPS	Analysis Year	2019				
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00				
Project Description	I-95 NB Ex57 Basic Fwy - 2019 PM	Unit	United States Customary				
Geometric Data							
Number of Lanes, In	3	Terrain Type	Level				
Segment Length (L), ft	-	Percent Grade, %	-				
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-				
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25				
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1				
Right-Side Lateral Clearance, ft	10						
Adjustment Factors							
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925				
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968				
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000				
Demand and Capacity							
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.976				
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1944				
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358				
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283				
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.85				
Passenger Car Equivalent (ET)	2.000						
Speed and Density							
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.2				
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	32.8				
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D				
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8						
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Project Information Project Information Chen-Yuan Warp Date 1/18/2022 Arralyst Chen-Yuan Warp Date 1/18/2022 Jurisdiction MassDOT District 4 Time Period Analyzed MP Peak Hour 5:00-6:00 Project Description 195 NB Ex57 Merge - 2019 PM Unit United States Feeded Project Description Feeded Project Description Feeded Project Description Feeded Project Description Segment Type 3 8			HCS7 Freeway	Merge Report			
Agency CFPS	Project Information						
Unitediction	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Project Description 1-95 NB Ex57 Merge - 2019 PM	Agency	CTPS		Analysis Year	2019		
Freeway	Jurisdiction I	MassDOT [District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Number of Lanes (N), In 3 1 1 1 1 1 1 1 1 1	Project Description	I-95 NB Ex	57 Merge - 2019 PM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3 1	Geometric Data						
Free-Flow Speed (FFS), mi/h Segment Length (L) / Acceleration Length (La).It 1500 Segment Length (L) / Acceleration Length (La).It 1500 Segment Grade, % Segment Type / Ramp Type Freeway Refeway Mostly Familiar Mostly				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA).ft 1500 650 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type No Incident Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 5350 550 Demand Adjustment Factor (PAF) 0.94 0.94 Demand Capacity Demand Capacity <td cols<="" td=""><td>Number of Lanes (N), In</td><td></td><td></td><td>3</td><td>1</td><td></td></td>	<td>Number of Lanes (N), In</td> <td></td> <td></td> <td>3</td> <td>1</td> <td></td>	Number of Lanes (N), In			3	1	
Eurein Type	Free-Flow Speed (FFS), mi/h			71.1	35.0		
Percent Grade, % -	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	650		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather <td>Terrain Type</td> <td></td> <td></td> <td>Level</td> <td>Level</td> <td></td>	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,925 0,975 Final Capacity Adjustment Factor (DAF) 0,968 0,968 Demand Adjustment Factor (DAF) 1,000 1,000 Demand Capacity Demand Volume (V) 5350 550 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, SUT), % - - Tractor-Trailers (TT), % - - Flow Rate (w), pc/h 5831 594 Capacity (c), pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0,94 0,31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) 1 Downstream Equilibrium Distance (LEQ),	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Capacity Demand Capacity Single Wind Capacity (PHF) 5350 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - - - Heavy Vehicle Adjustment Factor (Hrv) 0.976 0.985 Flow Rate (vi),pc/h 6824 1936 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Fre	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Capacity Demand Wolume (Vi) 5350 550 Demand Yolume (Vi) 5350 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HeV) 0.976 0.985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (N	Adjustment Factors						
Incident Type	Driver Population			Mostly Familiar	Mostly Fan	niliar	
Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity Demand Volume (Vi) 5350 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HrV) 0.976 0.985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (Ms) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (voA), pc/h/ln 1364 Distance to Downstream Ramp (LDown), ft	Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity 5350 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - - Heavy Vehicle Adjustment Factor (Hv) 5831 594 Capacity (c), pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Distance to Upstream Ramp (LuP), ft 1750 Speed Index (Ms) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes on Freeway (No) 1 Distance to Downstream Ramp (LDWN), ft 850 On-Ramp Influence Area Speed (SN), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1 Distance to Downstream Ramp (LDR), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1 Distance to Downstream Ramp (LDR), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Incident Type			No Incident	-	-	
Demand Adjustment Factor (DAF) 1,000 1,000 Demand and Capacity Demand Volume (Vi) 5350 550 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0,976 0,985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 584 1936 Volume-to-Capacity Ratio (v/c) 0,94 0,31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) 1 Downstream Equilibrium Distance (LEQ), ft 197.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN)	Final Speed Adjustment Factor (SAF)	ı		0.925	0.975		
Demand and Capacity Demand Volume (Vi) 5350 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 1.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (wi), pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (Ms) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (voa), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h <td>Final Capacity Adjustment Factor (CA</td> <td>AF)</td> <td></td> <td>0.968</td> <td>0.968</td> <td></td>	Final Capacity Adjustment Factor (CA	AF)		0.968	0.968		
Demand Volume (VI) 5350 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (Ms) 0.892 Downstream Equilibrium Distance (LEQ), ft 391.7 Flow Outer Lanes (vOA), pc/h/In 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (Sn), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering R	Demand Adjustment Factor (DAF)			1.000	1.000	1.000	
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (MS) 0.892 Downstream Equilibrium Distance (LEQ), ft 391.7 Flow Outer Lanes (voA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (S), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 </td <td>Demand and Capacity</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Demand and Capacity						
Total Trucks, % Single-Unit Trucks (SUT), %	Demand Volume (Vi)			5350	550		
Single-Unit Trucks (SUT),% - Tractor-Trailers (TT), % - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (MS) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOwN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFIM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 47.5 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h	Peak Hour Factor (PHF)			0.94	0.94		
Tractor-Trailers (TT), % -	Total Trucks, %			2.50	1.50		
Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 5831 594 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.31 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (Ms) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (voA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Single-Unit Trucks (SUT), %			-	-		
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1750 Distance to Upstream Ramp (LUP), ft 1750 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Diver Lanes Freeway Speed (SO), mi/h 47.5 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Tractor-Trailers (TT), %			-	-	-	
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) Distance to Upstream Ramp (LUP), ft 1750 Speed Index (Ms) Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h Prop. Freeway Vehicles in Lane 1 and 2 (PFM) O.766 Outer Lanes Freeway Speed (SO), mi/h Flow Entering Ramp-Infl. Area (vR12), pc/h Average Density (D), pc/mi/ln 45.1	Heavy Vehicle Adjustment Factor (fH	V)		0.976	0.985		
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (MS) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Flow Rate (vi),pc/h			5831	594		
Speed and DensityUpstream Equilibrium Distance (LEQ), ft1044.7Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft1750Speed Index (MS)0.892Downstream Equilibrium Distance (LEQ), ft3917.7Flow Outer Lanes (vOA), pc/h/ln1364Distance to Downstream Ramp (LDOWN), ft850On-Ramp Influence Area Speed (SR), mi/h44.6Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.766Outer Lanes Freeway Speed (SO), mi/h62.7Flow in Lanes 1 and 2 (v12), pc/h4467Ramp Junction Speed (S), mi/h47.5Flow Entering Ramp-Infl. Area (vR12), pc/h5061Average Density (D), pc/mi/ln45.1	Capacity (c), pc/h			6824	1936	1936	
Upstream Equilibrium Distance (LEQ), ft 1044.7 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1750 Speed Index (MS) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Volume-to-Capacity Ratio (v/c)			0.94	0.31		
Distance to Upstream Ramp (LUP), ft 1750 Speed Index (MS) 0.892 Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln 1364 Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Upstream Equilibrium Distance (LEQ)	, ft	1044.7	Number of Outer Lanes on Fi	reeway (No)	1	
Distance to Downstream Ramp (LDOWN), ft 850 On-Ramp Influence Area Speed (SR), mi/h 44.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Distance to Upstream Ramp (LUP), ft		1750	Speed Index (MS)		0.892	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.766 Outer Lanes Freeway Speed (SO), mi/h 62.7 Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Downstream Equilibrium Distance (LEQ), ft 3917.7		Flow Outer Lanes (vOA), pc/h,	/In	1364		
Flow in Lanes 1 and 2 (v12), pc/h 4467 Ramp Junction Speed (S), mi/h 47.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Distance to Downstream Ramp (LDOWN), ft 850		On-Ramp Influence Area Spe	ed (SR), mi/h	44.6		
Flow Entering Ramp-Infl. Area (vR12), pc/h 5061 Average Density (D), pc/mi/ln 45.1	Prop. Freeway Vehicles in Lane 1 and	d 2 (PFM)	0.766	Outer Lanes Freeway Speed ((SO), mi/h	62.7	
	Flow in Lanes 1 and 2 (v12), pc/h	Lanes 1 and 2 (v12), pc/h 4467		Ramp Junction Speed (S), mi	/h	47.5	
Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 40.7	Flow Entering Ramp-Infl. Area (vR12),	, pc/h	5061	Average Density (D), pc/mi/ln 45.1		45.1	
	Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 40.7				40.7		

Project Information				
-				
Analyst Chen-Yuan Wang Date 1/18/2022				
Agency CTPS	Analysis Year	2019		
Jurisdiction MassDOT District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description I-95 NB Ex58 Diverge - 2019 PM	Unit	United Stat	tes Customary	
Geometric Data				
	Freeway	Ramp		
Number of Lanes (N), In	3	1		
Free-Flow Speed (FFS), mi/h	71.1	35.0		
Segment Length (L) / Deceleration Length (LA),ft	1500	350		
Terrain Type	Level	Level		
Percent Grade, %	-	-		
Segment Type / Ramp Type	Freeway	Right-Side	d One-Lane	
Adjustment Factors				
Driver Population	Mostly Familiar	Mostly Fam	niliar	
Weather Type	Non-Severe Weather	Non-Severe Weather		
Incident Type	No Incident	-		
Final Speed Adjustment Factor (SAF)	0.925	0.975		
Final Capacity Adjustment Factor (CAF)	0.968	0.968		
Demand Adjustment Factor (DAF)	1.000	1.000		
Demand and Capacity				
Demand Volume (Vi)	5900	550		
Peak Hour Factor (PHF)	0.94	0.94		
Total Trucks, %	2.50	1.50		
Single-Unit Trucks (SUT), %	-	-		
Tractor-Trailers (TT), %	-	-		
Heavy Vehicle Adjustment Factor (fHV)	0.976	0.985		
Flow Rate (vi),pc/h	6431	594		
Capacity (c), pc/h	6824	1936		
Volume-to-Capacity Ratio (v/c)	0.94	0.31		
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft 3417.7	Number of Outer Lanes on Freewa	y (No)	1	
Distance to Upstream Ramp (LUP), ft 850	Speed Index (DS)		0.493	
Downstream Equilibrium Distance (LEQ), ft -	Flow Outer Lanes (vOA), pc/h/ln		2498	
Distance to Downstream Ramp (LDOWN), ft 2300	Off-Ramp Influence Area Speed (SI	R), mi/h	54.1	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.572	Outer Lanes Freeway Speed (SO), n	ni/h	66.3	
Flow in Lanes 1 and 2 (v12), pc/h 3933	Ramp Junction Speed (S), mi/h 58.3		58.3	
Flow Entering Ramp-Infl. Area (vR12), pc/h -	Average Density (D), pc/mi/ln 36.8		36.8	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 34.9				

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
Project Description	I-95 NB Ex58 Basic Fwy - 2019 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1
Right-Side Lateral Clearance, ft	10		
Adjustment Factors		<u> </u>	
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5250	Heavy Vehicle Adjustment Factor (fHV)	0.976
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1907
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.84
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.9
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	31.8
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8		
			Caractada 02/17/2022 21.42

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Project Information Chen Yuan Varian (Signey) Date 1/18/2022 Jangely Chen Yuan Varian (Signey) 1/18/2022 2019 Jarsofiction Max Dot District 4 Time Period Analyzed MP Point Varian (Signey) Project Description 195 NB Exist Merge - 2019 PM Unit of Outre June Varian (Signey) Fee Plow Speed (FFS), mi/h 3 8 many Fee Plow Speed (FFS), mi/h 1500 750 Feer Plow Speed (FFS), mi/h 1500 1500 Segment Type (FF) 1600 1500 1500 Segment Type (FFS) 1500 1500 1500			HCS7 Freeway	Merge Report			
Agency CTPS	Project Information						
Jurisdiction MassBOT District 4 Time Period Analyzed PM Peak Hour 5:00-6:00 Geometric Data Freeway Ramper Freeway Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 5 3 750 Segment Length (L) / Acceleration Length (LA).ft 1500 750 1 Ferrain Type Level Level 1	Analyst C	Chen-Yuan	Wang	Date	1/18/2022		
Project Description 195 NB k≥sk Merge - 2019 PM Unite United States	Agency	CTPS		Analysis Year	2019		
Freeway	Jurisdiction N	MassDOT D	istrict 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Number of Lanes (N), In 3 3 3 5 Free-Flow Speed (FFS), mi/h 71.4 35.0 5.0 Segment Length (L) / Acceleration Length (LA), It 1500 750 5.0 Ferrain Type Level Level Level Level Level Percent Grade, % 7.0 7.0 Segment Type / Ramp Type Freeway Right-Sided One-Lane R	Project Description I-	-95 NB Ex5	8 Merge - 2019 PM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.4 35.0 Segment Length (L) / Acceleration Length (La), It 1500 750 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway 80 ghts sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Non-Severe Weather <	Geometric Data						
Free-Flow Speed (FFS, mi/h Segment Length (L) / Acceleration Length (La), It 1500 75				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA).ft 1500 750 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Side One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Speed Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 5250 650 Demand Adjustment Factor (PHF) 0.94 0.94 Demand Capacity Demand Capacity Demand Segment Factor (PHF) 0.94 0.94 Total Trucks (SUT), % 1.50 1.50 Total Trucks (SUT), % 0.968 0.94 Total Trucks (SUT), % 0.975	Number of Lanes (N), In			3	1		
Terrain Type Level Level Jean Sugnar Sug	Free-Flow Speed (FFS), mi/h			71.4	35.0		
Percent Grade, %	Segment Length (L) / Acceleration Le	ength (LA),f	t	1500	750		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,950 0,975 Final Capacity Adjustment Factor (DAF) 0,968 0,968 Demand Adjustment Factor (DAF) 1,000 1,000 Demand Capacity Demand Sepacity Demand Wolume (V) 5250 550 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 5722 0,976 Heavy Vehicle Adjustment Factor (FHV) 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 94 0,36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (Net) 1 Distance to Upstream Ramp (LUP), ft	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.968 0.908 Demand Capacity Demand Volume (V) 5250 650 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 1.50 1.50 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - - - Heavy Vehicle Adjustment Factor (Hrv) 0.976 0.985 -	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (PAF) 5250 650 Demand Volume (Vi) 5250 650 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HvV) 0.976 0.985 Flow Rate (vi),pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 9.94 0.36 Speed and Density Upstream Equilibrium Distance (LE0), ft 1088.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upst	Adjustment Factors						
No Incident	Driver Population			Mostly Familiar	Mostly Fan	niliar	
Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity Demand Volume (Vi) 5250 650 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Flow Rate (vi), pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (MS) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/n 0.582 Distance to Downstream Ramp (LDOWN), ft 1500 On-R	Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity 5250 650 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LuP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (voA), pc/h/n 0.582 Downstream Equilibrium Distance (LEQ), ft 0.643 Outer Lanes Fre	Incident Type			No Incident	-	-	
Demand Adjustment Factor (DAF) 1,000 1,000 Demand and Capacity Demand Volume (V) 5250 650 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 2.50 1.50	Final Speed Adjustment Factor (SAF)			0.950	0.975		
Demand and Capacity Demand Volume (Vi) 5250 650 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 0.94 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Flow Rate (vi), pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (voa), pc/h/In 2043 Distance to Downstream Ramp (LUP), ft 2843.8 Flow Outer Lanes (voa), pc/h/In 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (So), mi/h 52.5 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h	Final Capacity Adjustment Factor (CA	λF)		0.968	0.968		
Demand Volume (Vi) 5250 650 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/ln 2043 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (Sn), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln </td <td>Demand Adjustment Factor (DAF)</td> <td></td> <td></td> <td>1.000</td> <td>1.000</td> <td colspan="2">1.000</td>	Demand Adjustment Factor (DAF)			1.000	1.000	1.000	
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 1.50 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 - Flow Rate (vi),pc/h 5722 702 - Capacity (c), pc/h 6824 1936 - Volume-to-Capacity Ratio (v/c) 0.94 0.36 - Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (voA), pc/h/ln 2043 Distance to Downstream Ramp (LDown), ft 1500 On-Ramp Influence Area Speed (S), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 55.5	Demand and Capacity						
Total Trucks, % Single-Unit Trucks (SUT), %	Demand Volume (Vi)			5250	650		
Single-Unit Trucks (SUT), % - Tractor-Trailers (TT), % - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/In 2043 Distance to Downstream Ramp (LDown), ft 1500 On-Ramp Influence Area Speed (Sr), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (So), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/In	Peak Hour Factor (PHF)			0.94	0.94		
Tractor-Trailers (TT), %	Total Trucks, %			2.50	1.50		
Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 5722 702 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 0.94 0.36 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/ln 2043 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Single-Unit Trucks (SUT), %			-	-	-	
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (Ms) 0.582 Downstream Equilibrium Distance (LEQ), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Tractor-Trailers (TT), %			-	-	-	
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow Entering Ramp-Infl. Area (vR12), pc/h Average Density (D), pc/mi/ln 6824 1936 0.36 Number of Outer Lanes on Freeway (NO) 1 Speed Index (MS) 0.582 Flow Outer Lanes (vOA), pc/h/ln 2043 Outer Lanes Freeway Speed (SR), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Heavy Vehicle Adjustment Factor (fH\	v)		0.976	0.985		
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (MS) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/ln 2043 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Flow Rate (vi),pc/h			5722	702	702	
Speed and DensityUpstream Equilibrium Distance (LEQ), ft1088.9Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft2300Speed Index (MS)0.582Downstream Equilibrium Distance (LEQ), ft2843.8Flow Outer Lanes (vOA), pc/h/ln2043Distance to Downstream Ramp (LDOWN), ft1500On-Ramp Influence Area Speed (SR), mi/h52.8Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.643Outer Lanes Freeway Speed (SO), mi/h62.2Flow in Lanes 1 and 2 (v12), pc/h3679Ramp Junction Speed (S), mi/h55.5Flow Entering Ramp-Infl. Area (vR12), pc/h4381Average Density (D), pc/mi/ln38.6	Capacity (c), pc/h			6824	1936	1936	
Upstream Equilibrium Distance (LEQ), ft 1088.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 2300 Speed Index (MS) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/ln 2043 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Volume-to-Capacity Ratio (v/c)			0.94	0.36	0.36	
Distance to Upstream Ramp (LuP), ft 2300 Speed Index (MS) 0.582 Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/ln 2043 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 2843.8 Flow Outer Lanes (vOA), pc/h/ln 2043 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Upstream Equilibrium Distance (LEQ),	, ft	1088.9	Number of Outer Lanes on F	reeway (No)	1	
Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Distance to Upstream Ramp (LUP), ft		2300	Speed Index (MS)		0.582	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.643 Outer Lanes Freeway Speed (SO), mi/h 62.2 Flow in Lanes 1 and 2 (v12), pc/h 3679 Ramp Junction Speed (S), mi/h 55.5 Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Downstream Equilibrium Distance (LEQ), ft 2843.8		Flow Outer Lanes (vOA), pc/h	n/ln	2043		
Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Distance to Downstream Ramp (LDOWN), ft 1500		On-Ramp Influence Area Spe	eed (SR), mi/h	52.8		
Flow Entering Ramp-Infl. Area (vR12), pc/h 4381 Average Density (D), pc/mi/ln 38.6	Prop. Freeway Vehicles in Lane 1 and	2 (PFM)	0.643	Outer Lanes Freeway Speed	(SO), mi/h	62.2	
	Flow in Lanes 1 and 2 (v12), pc/h		3679	Ramp Junction Speed (S), mi	i/h	55.5	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 34.7	Flow Entering Ramp-Infl. Area (vR12),	pc/h	4381	Average Density (D), pc/mi/ln 38.6		38.6	
	Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 34.7				34.7		

		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Ex	59 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	30.0		
Segment Length (L) / Deceleration	Length (LA)	ft	1500	775		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF	=)		0.950	0.975		
Final Capacity Adjustment Factor (C	CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000	1.000	
Demand and Capacity						
Demand Volume (Vi)			5900	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.985		
Flow Rate (vi),pc/h			6431	540		
Capacity (c), pc/h			6824	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.94	0.29	0.29	
Speed and Density						
Upstream Equilibrium Distance (LEC	ι), ft	3945.9	Number of Outer Lanes on Fr	eeway (No)	1	
Distance to Upstream Ramp (LUP), f	ft	1500	Speed Index (Ds)		0.552	
Downstream Equilibrium Distance (LEQ), ft -		Flow Outer Lanes (vOA), pc/h/	′ln	2510		
Distance to Downstream Ramp (LDC	OWN), ft	1125	Off-Ramp Influence Area Spe	ed (SR), mi/h	53.6	
Prop. Freeway Vehicles in Lane 1 an	id 2 (PFD)	0.574	Outer Lanes Freeway Speed (S	SO), mi/h	68.5	
Flow in Lanes 1 and 2 (v12), pc/h		3921	Ramp Junction Speed (S), mi/h 58.6		58.6	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/ln 36.6		36.6	
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 31.0			
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	HCS7 Basic Freeway Report						
Project Information							
Analyst	Chen-Yuan Wang	Date	1/18/2021				
Agency	CTPS	Analysis Year	2019				
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00				
Project Description	I-95 NB Ex59 Basic Fwy - 2019 PM	Unit	United States Customary				
Geometric Data							
Number of Lanes, In	3	Terrain Type	Level				
Segment Length (L), ft	-	Percent Grade, %	-				
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-				
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16				
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4				
Right-Side Lateral Clearance, ft	10						
Adjustment Factors							
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975				
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968				
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000				
Demand and Capacity							
Demand Volume veh/h	5400	Heavy Vehicle Adjustment Factor (fHV)	0.976				
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1962				
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2396				
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2319				
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.85				
Passenger Car Equivalent (ET)	2.000						
Speed and Density							
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	60.8				
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	32.3				
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	D				
Adjusted Free-Flow Speed (FFSadj), mi/h	69.6						
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	HCS7 Freeway	Merge Report		
Project Information				
Analyst Chen-Yua	n Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2019	
Jurisdiction MassDOT	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00
Project Description I-95 NB E	x59 Merge - 2019 PM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.4	35.0	
Segment Length (L) / Acceleration Length (LA)),ft	1500	650	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors				
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Severe Weather	
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)		0.975	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.000	1.000	
Demand and Capacity				
Demand Volume (Vi)		5400	150	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		2.50	1.50	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.985	
Flow Rate (vi),pc/h		5886	162	
Capacity (c), pc/h		6824	1936	
Volume-to-Capacity Ratio (v/c)		0.89	0.08	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	964.0	Number of Outer Lanes on Freewa	ay (No)	1
Distance to Upstream Ramp (LUP), ft	1125	Speed Index (Ms)		0.430
Downstream Equilibrium Distance (LEQ), ft	1808.2	Flow Outer Lanes (vOA), pc/h/ln		2378
Distance to Downstream Ramp (LDOWN), ft	4900	On-Ramp Influence Area Speed (S	SR), mi/h	57.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	n Lane 1 and 2 (PFM) 0.596 Outer Lanes Fre		Outer Lanes Freeway Speed (SO), mi/h	
Flow in Lanes 1 and 2 (v12), pc/h	3508	· ·		59.5
		Average Density (D), pc/mi/ln 33.9		
Flow Entering Ramp-Infl. Area (vR12), pc/h	3670	Average Density (D), pc/mi/ln		33.9

HCS7 Basic Freeway Report				
Project Information				
Analyst	Chen-Yuan Wang	Date	1/18/2021	
Agency	CTPS	Analysis Year	2019	
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00	
Project Description	I-95 NB Ex59-60 Basic Fwy - 2019 PM	Unit	United States Customary	
Geometric Data				
Number of Lanes, In	3	Terrain Type	Level	
Segment Length (L), ft	-	Percent Grade, %	-	
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-	
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00	
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8	
Right-Side Lateral Clearance, ft	10			
Adjustment Factors				
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975	
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968	
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000	
Demand and Capacity				
Demand Volume veh/h	5550	Heavy Vehicle Adjustment Factor (fHV)	0.976	
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2016	
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400	
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323	
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.87	
Passenger Car Equivalent (ET)	2.000			
Speed and Density				
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.8	
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	33.7	
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D	
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0			
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	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Exe	60 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	30.0		
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	200		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF))		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			5550	300		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	IV)		0.976	0.985	0.985	
Flow Rate (vi),pc/h			6049	324	324	
Capacity (c), pc/h			6970	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.87	0.18		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	873.1	Number of Outer Lanes on Fi	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft		4900	Speed Index (Ds)		0.533	
Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc/h,	/ln	2324	
Distance to Downstream Ramp (LDC	wn), ft	1200	Off-Ramp Influence Area Spe	eed (SR), mi/h	55.1	
Prop. Freeway Vehicles in Lane 1 and	ehicles in Lane 1 and 2 (PFD) 0.594 Outer L		Outer Lanes Freeway Speed (SO), mi/h		71.6	
Flow in Lanes 1 and 2 (v12), pc/h		3725	Ramp Junction Speed (S), mi	/h	60.5	
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/lr	າ	33.3	
Level of Service (LOS)		D	Density in Ramp Influence Ar	<u> </u>	34.5	

HCS7 Basic Freeway Report				
Project Information				
Analyst	Chen-Yuan Wang	Date	1/18/2021	
Agency	CTPS	Analysis Year	2019	
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00	
Project Description	I-95 NB Ex60 Basic Fwy - 2019 PM	Unit	United States Customary	
Geometric Data				
Number of Lanes, In	3	Terrain Type	Level	
Segment Length (L), ft	-	Percent Grade, %	-	
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-	
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00	
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8	
Right-Side Lateral Clearance, ft	10			
Adjustment Factors				
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975	
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968	
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000	
Demand and Capacity				
Demand Volume veh/h	5250	Heavy Vehicle Adjustment Factor (fHV)	0.976	
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1907	
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400	
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323	
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.82	
Passenger Car Equivalent (ET)	2.000			
Speed and Density				
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	62.2	
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	30.7	
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D	
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0			
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.,	Date Analysis Year	1/18/2022	
		1/18/2022	
Agency	Analysis Year	1, 10, 2022	
/ ingenity		2019	
Jurisdiction MassDOT District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00
Project Description I-95 NB Ex60 Merge - 2019 PM L	Unit	United Stat	es Customary
Geometric Data			
F	Freeway	Ramp	
Number of Lanes (N), In	3	1	
Free-Flow Speed (FFS), mi/h	71.8	35.0	
Segment Length (L) / Acceleration Length (LA),ft 1	1500	625	
Terrain Type	Level	Level	
Percent Grade, %	-	-	
Segment Type / Ramp Type	Freeway	Right-Sideo	d One-Lane
Adjustment Factors			
Driver Population	Mostly Familiar	Mostly Fam	niliar
Weather Type	Non-Severe Weather	Non-Severe Weather	
Incident Type	No Incident	-	
Final Speed Adjustment Factor (SAF)	0.975	0.975	
Final Capacity Adjustment Factor (CAF)	0.968	0.968	
Demand Adjustment Factor (DAF)	1.000	1.000	
Demand and Capacity			
Demand Volume (Vi) 5	5250	500	
Peak Hour Factor (PHF)	0.94	0.94	
Total Trucks, %	2.50	1.50	
Single-Unit Trucks (SUT), %	-	-	
Tractor-Trailers (TT), %	-	-	
Heavy Vehicle Adjustment Factor (fHV)	0.976	0.985	
Flow Rate (vi),pc/h	5722	540	
Capacity (c), pc/h	6970	1936	
Volume-to-Capacity Ratio (v/c)	0.90	0.28	
Speed and Density			
Upstream Equilibrium Distance (LEQ), ft 998.7	Number of Outer Lanes on Freeway	/ (No)	1
Distance to Upstream Ramp (LUP), ft 1200	Speed Index (MS)		0.559
Downstream Equilibrium Distance (LEQ), ft 3365.3	Flow Outer Lanes (vOA), pc/h/ln		1986
Distance to Downstream Ramp (LDOWN), ft 1500	On-Ramp Influence Area Speed (SR), mi/h	54.3
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.653	Outer Lanes Freeway Speed (So), m	ıi/h	64.7
Flow in Lanes 1 and 2 (v12), pc/h 3736 F	Ramp Junction Speed (S), mi/h		57.2
Flow Entering Ramp-Infl. Area (vR12), pc/h 4276	Average Density (D), pc/mi/ln		36.5
Level of Service (LOS) D	Density in Ramp Influence Area (DR), pc/mi/ln	34.7

	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Exe	61 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	450		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				•		
Driver Population			Mostly Familiar	Mostly Far	niliar	
Weather Type		Non-Severe Weather	Non-Seve	Non-Severe Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF))		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			5750	550		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	IV)		0.976	0.985	0.985	
Flow Rate (vi),pc/h			6267	594	594	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.90	0.31		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	3175.9	Number of Outer Lanes on	Freeway (NO)	1	
Distance to Upstream Ramp (LUP), ft		1500	Speed Index (DS)		0.493	
Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc	/h/ln	2405	
Distance to Downstream Ramp (LDC	wn), ft	1800	Off-Ramp Influence Area S	peed (SR), mi/h	56.2	
Prop. Freeway Vehicles in Lane 1 and	icles in Lane 1 and 2 (PFD) 0.576 Ou		Outer Lanes Freeway Speed (SO), mi/h		71.3	
Flow in Lanes 1 and 2 (v12), pc/h		3862	Ramp Junction Speed (S), r	mi/h	61.2	
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi	i/ln	34.1	
Level of Service (LOS)		D	Density in Ramp Influence	<u> </u>	33.4	

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
Project Description	I-95 NB Ex61 Basic Fwy - 2019 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5200	Heavy Vehicle Adjustment Factor (fHV)	0.976
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1889
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.81
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	62.5
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	30.2
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		

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	HCS7 Freeway	/ Merge Report			
Project Information					
Analyst Chen	-Yuan Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2019		
Jurisdiction Mass	DOT District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95	NB Ex61 Merge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Acceleration Lengtl	ı (LA),ft	1500	500		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5200	450		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	1.50		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.985		
Flow Rate (vi),pc/h		5668	486	486	
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.88	0.25		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	920.1	Number of Outer Lanes on Fi	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	1800	Speed Index (MS)		0.469	
Downstream Equilibrium Distance (LEQ),	t -	Flow Outer Lanes (vOA), pc/h,	/ln	2313	
Distance to Downstream Ramp (LDOWN),	ft -	On-Ramp Influence Area Spe	eed (SR), mi/h	56.9	
Prop. Freeway Vehicles in Lane 1 and 2 (F	FM) 0.592	Outer Lanes Freeway Speed (SO), mi/h		63.4	
Flow in Lanes 1 and 2 (v12), pc/h	3355	Ramp Junction Speed (S), mi	/h	59.2	
		Average Density (D), pc/mi/ln 34.7			
Flow Entering Ramp-Infl. Area (vR12), pc/	n 3841	Average Density (D), pc/mi/lr	n	34.7	

	HCS7 Freeway	Merge Report		
Project Information				
Analyst Chen-Yu	an Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2019	
Jurisdiction MassDO	Γ District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00
Project Description I-95 SB E	x57 Merge - 2019 PM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.4	35.0	
Segment Length (L) / Acceleration Length (LA	x),ft	1500	600	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors			·	
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Severe Weather	
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)		0.950	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.000	1.000	
Demand and Capacity				
Demand Volume (Vi)		4900	550	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		2.50	2.00	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	
Flow Rate (vi),pc/h		5341	597	
Capacity (c), pc/h		6824	1936	
Volume-to-Capacity Ratio (v/c)		0.87	0.31	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	918.2	Number of Outer Lanes on Freewa	y (No)	1
Distance to Upstream Ramp (LUP), ft	1700	Speed Index (MS)		0.449
Downstream Equilibrium Distance (LEQ), ft	936.5	Flow Outer Lanes (vOA), pc/h/ln		2168
Distance to Downstream Ramp (LDOWN), ft				
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.594		On-Ramp Influence Area Speed (S	R), mi/h	56.2
	3600 0.594	On-Ramp Influence Area Speed (S Outer Lanes Freeway Speed (SO), r		61.8
Flow in Lanes 1 and 2 (v12), pc/h		· · · · · · · · · · · · · · · · · · ·		
<u> </u>	0.594	Outer Lanes Freeway Speed (SO), r		61.8

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
Project Description	I-95 SB Ex57 Basic Fwy - 2019 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1
Right-Side Lateral Clearance, ft	10		
Adjustment Factors		<u> </u>	
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.976
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1944
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.85
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.2
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	32.8
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8		
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	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Chen-	Yuan Wang	Date	8/10/2021		
Agency CTPS		Analysis Year	2019		
Jurisdiction MassI	OOT District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95 S	B Ex57 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.1	35.0		
Segment Length (L) / Deceleration Length	(LA),ft	1500	225		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors			·		
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.925	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5400	500		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	2.00		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h		5886	543	543	
Capacity (c), pc/h		6824	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.86	0.28		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	2628.8	Number of Outer Lanes on Fre	eway (No)	1	
Distance to Upstream Ramp (LUP), ft	825	Speed Index (Ds)		0.489	
Downstream Equilibrium Distance (LEQ), fl	-	Flow Outer Lanes (vOA), pc/h/ln		2201	
Distance to Downstream Ramp (LDOWN), t	t 1700	Off-Ramp Influence Area Spee	d (SR), mi/h	54.2	
Prop. Freeway Vehicles in Lane 1 and 2 (Pr	D) 0.588	Outer Lanes Freeway Speed (Se	O), mi/h	67.5	
Flourin Lance 1 and 2 (v12) mg/h				50.5	
Flow in Lanes 1 and 2 (v12), pc/h	3685	Ramp Junction Speed (S), mi/h	1	58.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h		Ramp Junction Speed (S), mi/h Average Density (D), pc/mi/ln	1	33.5	

	HCS7 Freeway	/ Merge Report			
Project Information					
Analyst Che	n-Yuan Wang	Date	1/18/2022		
Agency CTP	S	Analysis Year	2019		
Jurisdiction Mas	ssDOT District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95	SB Ex58 Merge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.1	35.0		
Segment Length (L) / Acceleration Leng	th (LA),ft	1500	550		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors		•			
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.925	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5000	400		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	2.00		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h		5450	434	434	
Capacity (c), pc/h		6824	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.86	0.22		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	884.5	Number of Outer Lanes on Fi	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	2600	Speed Index (MS)		0.591	
Downstream Equilibrium Distance (LEQ),	ft 3220.9	Flow Outer Lanes (vOA), pc/h,	/ln	1515	
Distance to Downstream Ramp (LDOWN)), ft 825	On-Ramp Influence Area Spe	eed (SR), mi/h	51.7	
Prop. Freeway Vehicles in Lane 1 and 2 ((PFM) 0.722	Outer Lanes Freeway Speed ((SO), mi/h	62.1	
Flow in Lanes 1 and 2 (v12), pc/h	3935			54.0	
	1 3333	Average Density (D), pc/mi/ln 36.3			
Flow Entering Ramp-Infl. Area (vR12), pc			າ	36.3	

HCS7 Basic Freeway Report						
Chen-Yuan Wang	Date	1/18/2021				
CTPS	Analysis Year	2019				
MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00				
I-95 SB Ex58 Basic Fwy - 2019 PM	Unit	United States Customary				
3	Terrain Type	Level				
-	Percent Grade, %	-				
Base	Grade Length, mi	-				
75.0	Total Ramp Density (TRD), ramps/mi	1.25				
12	Free-Flow Speed (FFS), mi/h	71.1				
10						
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925				
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968				
No Incident	Demand Adjustment Factor (DAF)	1.000				
5000	Heavy Vehicle Adjustment Factor (fHV)	0.976				
0.94	Flow Rate (V _p), pc/h/ln	1817				
2.50	Capacity (c), pc/h/ln	2358				
-	Adjusted Capacity (cadj), pc/h/ln	2283				
-	Volume-to-Capacity Ratio (v/c)	0.80				
2.000						
0.0	Average Speed (S), mi/h	61.5				
0.0	Density (D), pc/mi/ln	29.5				
3.9	Level of Service (LOS)	D				
65.8						
	Chen-Yuan Wang	Chen-Yuan Wang CTPS Analysis Year MassDOT District 4 I-95 SB Ex58 Basic Fwy - 2019 PM Terrain Type - Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi 12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather No Incident Demand Adjustment Factor (DAF) 5000 Heavy Vehicle Adjustment Factor (fHv) 0.94 Flow Rate (Vp), pc/h/ln 2.50 Capacity (c), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 3.9 Level of Service (LOS)				

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		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 SB Ex	8 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration	Length (LA),	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Far	niliar	
Weather Type		Non-Severe Weather	Non-Sever	re Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF)			0.925	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			5650	650		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.980		
Flow Rate (vi),pc/h			6158	706		
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.90	0.36		
Speed and Density						
Upstream Equilibrium Distance (LEG	Q), ft	293.5	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP),	ft	2150	Speed Index (DS)		0.503	
Downstream Equilibrium Distance	(LEQ), ft	-	Flow Outer Lanes (vOA), pc/h	/ln	2323	
Distance to Downstream Ramp (LD	OWN), ft	2600	Off-Ramp Influence Area Spe	eed (SR), mi/h	53.8	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFD)	0.574	Outer Lanes Freeway Speed	(SO), mi/h	67.0	
Flow in Lanes 1 and 2 (v12), pc/h		3835	Ramp Junction Speed (S), mi,	/h	58.1	
Flow Entering Ramp-Infl. Area (vR1	2), pc/h	-	Average Density (D), pc/mi/lr	n	35.3	
Level of Service (LOS)		D	Density in Ramp Influence Ar	rea (DR), pc/mi/ln	32.7	

	HCS7 Freeway	Merge Report		
Project Information				
Analyst Chen-Yua	n Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2019	
Jurisdiction MassDOT	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00
Project Description I-95 SB Ex	59 Merge - 2019 PM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.4	25.0	
Segment Length (L) / Acceleration Length (LA),ft	1500	400	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors				
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Severe Weather	
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)		0.950	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.000	1.000	
Demand and Capacity				
Demand Volume (Vi)		5350	300	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %	, % 2.50		2.00	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	
Flow Rate (vi),pc/h		5831	326	
Capacity (c), pc/h		6824	1839	
Volume-to-Capacity Ratio (v/c)		0.90	0.18	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	368.8	Number of Outer Lanes on Freewa	y (No)	1
Distance to Upstream Ramp (LUP), ft	1250	Speed Index (MS)		0.521
Downstream Equilibrium Distance (LEQ), ft	4628.1	Flow Outer Lanes (vOA), pc/h/ln 2128		2128
Distance to Downstream Ramp (LDOWN), ft		On-Ramp Influence Area Speed (SR), mi/h 54.4		54.4
	2150	On-Ramp Influence Area Speed (Si	K), MI/N	34.4
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	2150 0.635	On-Ramp Influence Area Speed (So), n		61.9
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow in Lanes 1 and 2 (v12), pc/h				
· · ·	0.635	Outer Lanes Freeway Speed (SO), n		61.9

HCS7 Basic Freeway Report						
Chen-Yuan Wang	Date	1/18/2021				
CTPS	Analysis Year	2019				
MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00				
I-95 SB Ex59 Basic Fwy - 2019 PM	Unit	United States Customary				
3	Terrain Type	Level				
-	Percent Grade, %	-				
Base	Grade Length, mi	-				
75.0	Total Ramp Density (TRD), ramps/mi	1.16				
12	Free-Flow Speed (FFS), mi/h	71.4				
10						
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925				
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968				
No Incident	Demand Adjustment Factor (DAF)	1.000				
5350	Heavy Vehicle Adjustment Factor (fHV)	0.976				
0.94	Flow Rate (Vp), pc/h/ln	1944				
2.50	Capacity (c), pc/h/ln	2360				
-	Adjusted Capacity (cadj), pc/h/ln	2284				
-	Volume-to-Capacity Ratio (v/c)	0.85				
2.000						
0.0	Average Speed (S), mi/h	59.3				
0.0	Density (D), pc/mi/ln	32.8				
3.6	Level of Service (LOS)	D				
66.0						
	Chen-Yuan Wang	Chen-Yuan Wang CTPS Analysis Year MassDOT District 4 I-95 SB Ex59 Basic Fwy - 2019 PM Terrain Type - Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi 12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather No Incident Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) Flow Rate (Vp), pc/h/ln 2.50 Capacity (c), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 1. Level of Service (LOS)				

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	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Chen	-Yuan Wang	Date	8/10/2021		
Agency CTPS		Analysis Year	2019		
Jurisdiction Mass	DOT District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95 S	SB Ex59 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.4	35.0		
Segment Length (L) / Deceleration Lengtl	ı (LA),ft	1500	275		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type	Weather Type		Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000	1.000	
Demand and Capacity			·		
Demand Volume (Vi)		5550	200		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50 2.00			
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980		
Flow Rate (vi),pc/h		6049	217		
Capacity (c), pc/h		6824	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.89	0.11		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	3642.5	Number of Outer Lanes on Fi	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	5600	Speed Index (DS)		0.459	
Downstream Equilibrium Distance (LEQ), f	t -	Flow Outer Lanes (vOA), pc/h,	/ln	2339	
Distance to Downstream Ramp (LDOWN),	ft 1250	Off-Ramp Influence Area Spe	eed (SR), mi/h	56.0	
Prop. Freeway Vehicles in Lane 1 and 2 (P	FD) 0.599	Outer Lanes Freeway Speed ((SO), mi/h	69.2	
Flow in Lanes 1 and 2 (v12), pc/h	3710	Ramp Junction Speed (S), mi,	/h	60.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h		Average Density (D), pc/mi/ln 33.3			
	١ -	Average Density (D), pc/mi/ir	n 	33.3	

	HCS7 Basic Fi	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2019
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
Project Description	I-95 SB Ex59-60 Basic Fwy - 2019 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000
Demand and Capacity			
Demand Volume veh/h	5550	Heavy Vehicle Adjustment Factor (fHV)	0.976
Peak Hour Factor	0.94	Flow Rate (V _P), pc/h/ln	2016
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.87
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.8
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	33.7
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		

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Project Information Chen Yaun Varian Date 1/18/2022 Arralyst Chen Yaun Varian 1/18/2022 2019 Agency Max Dot Dated Analysis Year 2019 ————————————————————————————————————			HCS7 Freeway	Merge Report			
Agency	Project Information						
Jurisdiction MassBOT District 4 Time Period Analyzed PM Reak Hour 5:00-6:00 Geometric Data Freeway Ramper Freeway Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 5 3 5 Segment Length (L) / Acceleration Length (LA).ft 1500 500 1 Segment Type Level Level 1 1 Fereing Again Type P Ramp Type Freeway Preeway Right-Side=Tone-Lane 1 <td>Analyst</td> <td>Chen-Yuan</td> <td>ı Wang</td> <td>Date</td> <td>1/18/2022</td> <td></td>	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Project Description Inject Description United States	Agency	CTPS		Analysis Year	2019		
Freeway	Jurisdiction 1	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Number of Lanes (N), In 3 3 3 5 Free-Flow Speed (FFS), mi/h 71.8 35.0 500 Free-Flow Speed (FFS), mi/h 71.8 35.0 Segment Length (L) / Acceleration Length (LA), It 1500 500 Ferrain Type Level Level Level Percent Grade, % - - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided One-Lane Right-Sided O	Project Description I	-95 SB Ex6	60 Merge - 2019 PM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.8 35.0 Segment Length (L) / Acceleration Length (La), It 1500 500 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway No still still do Inc. Lane Adjustment Factors Driver Population Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather <	Geometric Data						
Free-Flow Speed (FFS), mi/h 71.8 35.0 Segment Length (L) / Acceleration Length (La), It 1500 500 Segment Length (L) / Acceleration Length (La), It 1500 500 Segment Terrain Type Level Level Level Segment Type / Segment Type / Segment Type / Ramp Type Freeway 60 Segment Type / Ramp Type Freeway Mostly Familiar Mos				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA).ft 1500 Somethod Segment Type Level Level Level Level Percent Grade, %	Number of Lanes (N), In			3	1		
Terrain Type Level Level Jean of the percent Grade, % 1 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 -	Free-Flow Speed (FFS), mi/h			71.8	35.0		
Percent Grade, % -	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	500		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Capacity Demand Volume (V) 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, SUT), % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 5395 651 Flow Rate (vi), pc/h 5395 651 Capacity (c), pc/h 970 1936 Volume-to-Capacity Ratio (v/c) 870 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freewy (No 0.469 Downstream Equilibr	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.906 0.000 Demand Volume (Vi) 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, SUT), % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 5395 651 Flow Rate (vi), pc/h 5395 651 Capacity (c), pc/h 6970 9.34 Speed and Density Usb stream Equilibrium Distance (LEO), ft 897.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (Lup), ft 1925 Speed Index (MS) 0.469 Downstream Equilibrium Distance (LEO), ft	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (PAF) 4950 600 Demand Volume (Vi) 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HrV) 0.976 0.980 Flow Rate (vi),pc/h 5395 651 Capacity (c), pc/h 6970 1936 Volume-to-Capacity Ratio (v/c) 0.87 0.87 Speed and Density Upstream Equilibrium Distance (LE0), ft 89.70 Number of Outer Lanes on Freeway (No) 1 <td colspan<="" td=""><td>Adjustment Factors</td><td></td><td></td><td></td><td></td><td></td></td>	<td>Adjustment Factors</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Adjustment Factors					
Incident Type	Driver Population			Mostly Familiar	Mostly Fan	niliar	
Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity Demand Volume (Vi) 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.980 Flow Rate (vi), pc/h 5395 651 Capacity (c), pc/h 6970 1936 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUp), ft 1925 Speed Index (MS) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/n 56.9 Distance to Downstream Ramp (LDown), ft 5600 On-Ramp Influence Area Speed (S), mi/h	Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand and Capacity 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5395 651 Capacity (c), pc/h 6970 1936 Volume-to-Capacity Ratio (v/c) 0.87 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LuP), ft 1925 Speed Index (Ms) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/n 2201 Distance to Downstream Ramp (LuP), ft 1330.6 Flow Outer Lanes (vO	Incident Type		No Incident	-			
Demand Adjustment Factor (DAF) 1,000 1,000 Demand and Capacity Peak Hour Factor (PHF) 4950 600 Peak Hour Factor (PHF) 0,94 0,94	Final Speed Adjustment Factor (SAF)			0.975	0.975		
Demand and Capacity Demand Volume (Vi) 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.980 Flow Rate (vi), pc/h 5395 651 Capacity (c), pc/h 6970 1936 Volume-to-Capacity Ratio (v/c) 0.87 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1925 Speed Index (Ms) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (voa), pc/h/ln 2201 Distance to Downstream Ramp (LUP), ft 1925 Speed Index (Ms)	Final Capacity Adjustment Factor (CA	Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Volume (Vi) 4950 600 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5395 651 Capacity (c), pc/h 6970 1936 Volume-to-Capacity Ratio (v/c) 0.87 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1925 Speed Index (Ms) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOwN), ft 5600 On-Ramp Influence Area Speed (Sn), mi/h 63.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction	Demand Adjustment Factor (DAF)	Demand Adjustment Factor (DAF)		1.000	1.000		
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 2.00 Single-Unit Trucks (SUT), % - </td <td>Demand and Capacity</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Demand and Capacity						
Total Trucks, % Single-Unit Trucks (SUT), %	Demand Volume (Vi)			4950	600		
Single-Unit Trucks (SUT), % - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5395 651 Capacity (c), pc/h 6970 1936 Volume-to-Capacity Ratio (v/c) 0.87 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1925 Speed Index (Ms) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOwN), ft 5600 On-Ramp Influence Area Speed (Sr), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (So), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Peak Hour Factor (PHF)			0.94	0.94		
Tractor-Trailers (TT), % -	Total Trucks, %			2.50	2.00		
Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5395 651 Capacity (c), pc/h 6970 1936 Volume-to-Capacity Ratio (v/c) 0.87 0.34 Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1925 Speed Index (Ms) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Single-Unit Trucks (SUT), %			-	-	-	
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1925 Downstream Equilibrium Distance (LEQ), ft 1330.6 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/In 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Frop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Downstream Samp - Infl. Area (vR12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Tractor-Trailers (TT), %			-	-	-	
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1925 Downstream Equilibrium Distance (LEQ), ft 1925 Downstream Equilibrium Distance (LEQ), ft 1925 Downstream Equilibrium Distance (LEQ), ft 1930 Downstream Equilibrium Distance (LEQ), ft 1925 Downstream Equilibrium Distance (LEQ), ft 1925 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 59.3 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Heavy Vehicle Adjustment Factor (fh	V)		0.976	0.980	0.980	
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1925 Speed Index (MS) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Flow Rate (vi),pc/h			5395	651	651	
Speed and DensityUpstream Equilibrium Distance (LEQ), ft897.0Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft1925Speed Index (MS)0.469Downstream Equilibrium Distance (LEQ), ft1330.6Flow Outer Lanes (vOA), pc/h/ln2201Distance to Downstream Ramp (LDOWN), ft5600On-Ramp Influence Area Speed (SR), mi/h56.9Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.592Outer Lanes Freeway Speed (SO), mi/h63.9Flow in Lanes 1 and 2 (v12), pc/h3194Ramp Junction Speed (S), mi/h59.3Flow Entering Ramp-Infl. Area (vR12), pc/h3845Average Density (D), pc/mi/ln34.0	Capacity (c), pc/h			6970	1936	1936	
Upstream Equilibrium Distance (LEQ), ft 897.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1925 Speed Index (MS) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Volume-to-Capacity Ratio (v/c)			0.87	0.34		
Distance to Upstream Ramp (LuP), ft 1925 Speed Index (MS) 0.469 Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 1330.6 Flow Outer Lanes (vOA), pc/h/ln 2201 Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Upstream Equilibrium Distance (LEQ)	, ft	897.0	Number of Outer Lanes on F	reeway (No)	1	
Distance to Downstream Ramp (LDOWN), ft 5600 On-Ramp Influence Area Speed (SR), mi/h 56.9 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Distance to Upstream Ramp (LUP), ft		1925	Speed Index (MS)		0.469	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.592 Outer Lanes Freeway Speed (SO), mi/h 63.9 Flow in Lanes 1 and 2 (v12), pc/h 3194 Ramp Junction Speed (S), mi/h 59.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Downstream Equilibrium Distance (L	EQ), ft	1330.6	Flow Outer Lanes (vOA), pc/h	/In	2201	
Flow in Lanes 1 and 2 (v12), pc/h Slow Entering Ramp-Infl. Area (vR12), pc/h	Distance to Downstream Ramp (LDO)	wn), ft	5600	On-Ramp Influence Area Spe	eed (SR), mi/h	56.9	
Flow Entering Ramp-Infl. Area (vR12), pc/h 3845 Average Density (D), pc/mi/ln 34.0	Prop. Freeway Vehicles in Lane 1 and	I 2 (РFM)	0.592	Outer Lanes Freeway Speed ((SO), mi/h	63.9	
	Flow in Lanes 1 and 2 (v12), pc/h		3194	Ramp Junction Speed (S), mi,	/h	59.3	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 32.1	Flow Entering Ramp-Infl. Area (vR12),	pc/h	3845	Average Density (D), pc/mi/lr	n	34.0	
	Level of Service (LOS)		D	Density in Ramp Influence Ar	rea (DR), pc/mi/ln	32.1	

Chen-Yuan Wang CTPS MassDOT District 4 I-95 SB Ex60 Basic Fwy - 2019 PM 3 - Base 75.0	Date Analysis Year Time Period Analyzed Unit Terrain Type Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	1/18/2021 2019 PM Peak Hour 5:00-6:00 United States Customary Level -
CTPS MassDOT District 4 I-95 SB Ex60 Basic Fwy - 2019 PM 3 - Base 75.0	Analysis Year Time Period Analyzed Unit Terrain Type Percent Grade, % Grade Length, mi	2019 PM Peak Hour 5:00-6:00 United States Customary Level
MassDOT District 4 I-95 SB Ex60 Basic Fwy - 2019 PM 3 - Base 75.0	Time Period Analyzed Unit Terrain Type Percent Grade, % Grade Length, mi	PM Peak Hour 5:00-6:00 United States Customary Level -
I-95 SB Ex60 Basic Fwy - 2019 PM 3 - Base 75.0	Terrain Type Percent Grade, % Grade Length, mi	Level -
3 - Base 75.0	Terrain Type Percent Grade, % Grade Length, mi	Level -
- Base 75.0	Percent Grade, % Grade Length, mi	-
- Base 75.0	Percent Grade, % Grade Length, mi	-
Base 75.0	Grade Length, mi	-
75.0	-	-
	Total Ramp Density (TRD), ramps/mi	1.00
12		1.00
1	Free-Flow Speed (FFS), mi/h	71.8
10		
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
No Incident	Demand Adjustment Factor (DAF)	1.000
4950	Heavy Vehicle Adjustment Factor (fHV)	0.976
0.94	Flow Rate (V _p), pc/h/ln	1798
2.50	Capacity (c), pc/h/ln	2400
-	Adjusted Capacity (cadj), pc/h/ln	2323
-	Volume-to-Capacity Ratio (v/c)	0.77
2.000		
0.0	Average Speed (S), mi/h	64.2
0.0	Density (D), pc/mi/ln	28.0
3.2	Level of Service (LOS)	D
70.0		
	Mostly Familiar Non-Severe Weather No Incident 4950 0.94 2.50 2.000 0.0 0.0 3.2	12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) 4950 Heavy Vehicle Adjustment Factor (fHV) 0.94 Flow Rate (Vp), pc/h/ln 2.50 Capacity (c), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 3.2 Level of Service (LOS)

HCSTM Freeways Version 7.9 I-95_SB_Ex60_Basic_2019_PM.xuf Generated: 02/17/2022 22:26:43

	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Chen-Y	uan Wang	Date	8/10/2021		
Agency CTPS		Analysis Year	2019		
Jurisdiction MassDC	T District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95 SB	Ex60 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Deceleration Length (_A),ft	1500	575		
Terrain Type		Level	Level		
Percent Grade, %		-			
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Far	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.000	1.000		
Demand and Capacity					
Demand Volume (Vi)		5200	250		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	2.00		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h		5668	271		
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.81	0.14		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	2701.2	Number of Outer Lanes on Free	way (No)	1	
Distance to Upstream Ramp (LUP), ft	1500	Speed Index (DS)		0.464	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2126		2126	
Distance to Downstream Ramp (LDOWN), ft	1925	Off-Ramp Influence Area Speed	(SR), mi/h	57.0	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD	0.606	Outer Lanes Freeway Speed (SO), mi/h	72.4	
Flow in Lanes 1 and 2 (v12), pc/h		· ·			
	3542	Ramp Junction Speed (S), mi/h		61.9	
Flow Entering Ramp-Infl. Area (vR12), pc/h	3542	Ramp Junction Speed (S), mi/h Average Density (D), pc/mi/ln		30.5	

Project Information Name of the Project Normal (Project Normal) Date (Project Normal) 1/18/2022 (Project Normal) Agralcy MassDOT District 4 Time Period Analyzed MP Peak Hour 5:00-6:00 Project Description 195 SB Ex61 Merge - 2019 PM Unit United States Customary Report Formal (Project Description 195 SB Ex61 Merge - 2019 PM Unit United States Customary Report Formal (Project Description 3 1 Time Project P			HCS7 Freeway	Merge Report			
Agency CTPS Analysis Year 2019 Jurisdiction Mass DOT District 4 Time Period Analyzed PM Peak Hour 5:00-6:00 Project Description 1-95 SB Es61 Merge - 2019 PM Unit United States Customary Geometric Data Free-How Speed (FFS), mi/h 3 1 1 Free-How Speed (FFS), mi/h 3 1 1 Free-How Speed (FFS), mi/h 71.8 25.0 Segment Engrith (1.) / Acceleration Length (1.A), ft 1500 350 Ferrarin Type Level Represent Factors Freeway Right-Sided One-Lane Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Non-Severe Weather Non-Severe W	Project Information						
Units diction	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Project Description L-95 SB Ex61 Merge - 2019 PM	Agency	CTPS		Analysis Year	2019		
Freeway	Jurisdiction 1	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Number of Lanes (N), In 3 1 1 1 1 1 1 1 1 1	Project Description I	-95 SB Ex6	51 Merge - 2019 PM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 71.	Geometric Data						
Free-Flow Speed (FFS), mi/h Segment Length (L) / Acceleration Length (La).lt 1500 Segment Length (L) / Acceleration Length (La).lt 1500 Segment Grade, % Segment Type / Ramp Type Freeway Refeway Mostly Familiar Paper Weather				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA).ft 1500 350 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 4750 450 Demand Wolume (V) 4750 450 Demand Sever (PHF) 0.94 0.94 Total Trucks, (SUT), % 2.50 2.00 Tractor-Traiters (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 5177 488 Gapacity (c), pc/h 5177 488 Capacit	Number of Lanes (N), In			3	1		
Eurein Type	Free-Flow Speed (FFS), mi/h			71.8	25.0		
Percent Grade, % Freeway Right - Side	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	350		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Separate Demand Volume (V) 4750 450 Demand Volume (V) 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, SUT), % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Flow Rate (w), pc/h 5177 488 Capacity (c), pc/h 5177 488 Capacity (c), pc/h 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Capacity Demand Capacity A750 450 Demand Volume (V) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - -	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand Adjustment Factor (DAF) 4750 450 Demand Volume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HvV) 0.976 0.980 Flow Rate (vi),pc/h 5177 488 Capacity (c), pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Dista	Adjustment Factors						
Incident Type	Driver Population			Mostly Familiar	Mostly Fan	niliar	
Final Speed Adjustment Factor (SAF) 0.975 0.968 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity Demand Volume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HrV) 0.976 0.980 Flow Rate (vi),pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voA), pc/h/ln 2092 Distance to Downstream Ramp (LDown), ft	Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.000 1.000 Demand And Capacity 2.50 2.00 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HV) 5177 488 Capacity (c), pc/h 5177 488 Capacity (c), pc/h 5177 488 Capacity (c), pc/h 5177 481 Capacity (c), pc/h 5177 5177 5177 Capacity (c), pc/h 5177 5177 5177 Capacity (c), pc/h 5177 5177 Capacity (c),	Incident Type			No Incident	-	-	
Demand Adjustment Factor (DAF) 1,000 1,000 Demand and Capacity 4750 450 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 2,50 2,00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0,976 0,980 Flow Rate (vi),pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0,81 0,27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0,443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/In 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3	Final Speed Adjustment Factor (SAF)			0.975	0.975		
Demand and Capacity Demand Volume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (wi), pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voa), pc/h/In 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h <td>Final Capacity Adjustment Factor (CA</td> <td>AF)</td> <td></td> <td>0.968</td> <td>0.968</td> <td></td>	Final Capacity Adjustment Factor (CA	AF)		0.968	0.968		
Demand Volume (VI) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 488 Capacity (c), pc/h 488 Capacity Ratio (v/c) 0.81 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (Sn), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Demand Adjustment Factor (DAF)			1.000	1.000	1.000	
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (S), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Demand and Capacity				·		
Total Trucks, % Single-Unit Trucks (SUT), %	Demand Volume (Vi)			4750	450		
Single-Unit Trucks (SUT),% - Tractor-Trailers (TT), % - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.980 Flow Rate (vi),pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2092 Distance to Downstream Ramp (LDOwN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFIM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h	Peak Hour Factor (PHF)			0.94	0.94		
Tractor-Trailers (TT), % -	Total Trucks, %	2.50 2.00		2.00			
Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5177 488 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.81 0.27 Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Single-Unit Trucks (SUT), %			-	-		
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Tractor-Trailers (TT), %			-	-	-	
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h 3085 Ramp Junction Speed (S), mi/h 1839 0.27 Speed Index (MS) D.37 Speed Index (MS) D.443 D.4	Heavy Vehicle Adjustment Factor (fH	V)		0.976	0.980	0.980	
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Flow Rate (vi),pc/h			5177	488		
Speed and DensityUpstream Equilibrium Distance (LEQ), ft241.3Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft1125Speed Index (MS)0.443Downstream Equilibrium Distance (LEQ), ft1844.8Flow Outer Lanes (vOA), pc/h/ln2092Distance to Downstream Ramp (LDOWN), ft1500On-Ramp Influence Area Speed (SR), mi/h57.6Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.596Outer Lanes Freeway Speed (SO), mi/h64.3Flow in Lanes 1 and 2 (v12), pc/h3085Ramp Junction Speed (S), mi/h59.9Flow Entering Ramp-Infl. Area (vR12), pc/h3573Average Density (D), pc/mi/ln31.5	Capacity (c), pc/h			6970	1839	1839	
Upstream Equilibrium Distance (LEQ), ft 241.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Volume-to-Capacity Ratio (v/c)			0.81	0.27		
Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.443 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2092 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Upstream Equilibrium Distance (LEQ)	, ft	241.3	Number of Outer Lanes on I	Freeway (NO)	1	
Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 57.6 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Distance to Upstream Ramp (LUP), ft		1125	Speed Index (Ms)		0.443	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 64.3 Flow in Lanes 1 and 2 (v12), pc/h 3085 Ramp Junction Speed (S), mi/h 59.9 Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Downstream Equilibrium Distance (L	EQ), ft	1844.8	Flow Outer Lanes (vOA), pc/h	h/ln	2092	
Flow in Lanes 1 and 2 (v12), pc/h Speed (S), mi/h Flow Entering Ramp-Infl. Area (vR12), pc/h Speed (S), mi/h Average Density (D), pc/mi/ln Speed (S), mi/h 31.5	Distance to Downstream Ramp (LDO)	wn), ft	1500	On-Ramp Influence Area Sp	eed (SR), mi/h	57.6	
Flow Entering Ramp-Infl. Area (vR12), pc/h 3573 Average Density (D), pc/mi/ln 31.5	Prop. Freeway Vehicles in Lane 1 and	I 2 (РFM)	0.596	Outer Lanes Freeway Speed	(So), mi/h	64.3	
	Flow in Lanes 1 and 2 (v12), pc/h		3085	Ramp Junction Speed (S), m	ii/h	59.9	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 31.0	Flow Entering Ramp-Infl. Area (vR12),	pc/h	3573	Average Density (D), pc/mi/	ln	31.5	
	Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	31.0	

Chen-Yuan Wang	Date	1/18/2021
CTPS	Analysis Year	2019
MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
I-95 SB Ex61 Basic Fwy - 2019 PM	Unit	United States Customary
3	Terrain Type	Level
-	Percent Grade, %	-
Base	Grade Length, mi	-
75.0	Total Ramp Density (TRD), ramps/mi	1.00
12	Free-Flow Speed (FFS), mi/h	71.8
10		
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
No Incident	Demand Adjustment Factor (DAF)	1.000
4750	Heavy Vehicle Adjustment Factor (fHV)	0.976
0.94	Flow Rate (V _p), pc/h/ln	1726
2.50	Capacity (c), pc/h/ln	2400
-	Adjusted Capacity (cadj), pc/h/ln	2323
-	Volume-to-Capacity Ratio (v/c)	0.74
2.000		
0.0	Average Speed (S), mi/h	65.4
0.0	Density (D), pc/mi/ln	26.4
3.2	Level of Service (LOS)	D
70.0		
	CTPS	CTPS Analysis Year MassDOT District 4 Time Period Analyzed I-95 SB Ex61 Basic Fwy - 2019 PM James Description of Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi 12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) 4750 Heavy Vehicle Adjustment Factor (FHV) 9.94 Flow Rate (Vp), pc/h/ln 2.50 Capacity (c), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 3.2 Level of Service (LOS)

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	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2019		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description	I-95 SB Ex6	1 Diverge - 2019 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	450		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type	Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (CA	Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.000	1.000		
Demand and Capacity						
Demand Volume (Vi)			5050	300		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fH	IV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h			5504	326		
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.79	0.17		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	-	Number of Outer Lanes on Fr	eeway (No)	1	
Distance to Upstream Ramp (LUP), ft		-	Speed Index (Ds)		0.469	
Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2035		2035	
Distance to Downstream Ramp (LDO	WN), ft	1125	Off-Ramp Influence Area Spe	ed (SR), mi/h	56.9	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.607	Outer Lanes Freeway Speed (SO), mi/h	72.8	
Flow in Lanes 1 and 2 (v12), pc/h		3469	Ramp Junction Speed (S), mi/	'h	61.9	
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/ln		29.6	
Level of Service (LOS)		D	Density in Ramp Influence Are	ea (DR), pc/mi/ln	30.0	

APPENDIX F

Intersection Capacity Analyses
Signalized Interchanges at I-95 Exits 57, 60, and 61
2021 Summer Weekday AM/PM Peak Hour

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Lane Group	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	SWL2	SWL	SWR	
Lane Configurations				1			414		1		7	
Traffic Volume (vph)	0	0	0	739	275	245	554	0	93	0	322	
Future Volume (vph)	0	0	0	739	275	245	554	0	93	0	322	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Right Turn on Red					Yes			Yes			Yes	
Link Speed (mph)	30			30			30			30		
Link Distance (ft)	822			402			673			375		
Travel Time (s)	18.7			9.1			15.3			8.5		
Confl. Peds. (#/hr)					6	6						
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.90	0.90	0.92	0.93	0.92	0.93	
Heavy Vehicles (%)	2%	2%	0%	2%	2%	2%	2%	0%	1%	2%	1%	
Shared Lane Traffic (%)												
Turn Type				NA		pm+pt	NA		Prot		Perm	
Protected Phases				6		5	2		3			
Permitted Phases						2					3	
Detector Phase				6		5	2		3		3	
Switch Phase												
Minimum Initial (s)				10.0		6.0	10.0		6.0		6.0	
Minimum Split (s)				16.0		12.0	16.0		12.0		12.0	
Total Split (s)				40.0		20.0	60.0		20.0		20.0	
Total Split (%)				50.0%		25.0%	75.0%		25.0%		25.0%	
Yellow Time (s)				4.0		4.0	4.0		4.0		4.0	
All-Red Time (s)				2.0		2.0	2.0		2.0		2.0	
Lost Time Adjust (s)				0.0			0.0		0.0		0.0	
Total Lost Time (s)				6.0			6.0		6.0		6.0	
Lead/Lag				Lead		Lag						
Lead-Lag Optimize?				Yes		Yes						
Recall Mode				C-Max		Max	C-Min		None		None	
Act Effct Green (s)				38.1			58.1		9.9		9.9	
Actuated g/C Ratio				0.48			0.73		0.12		0.12	
v/c Ratio				0.65			0.55		0.45		0.69	
Control Delay				17.5			6.7		38.3		11.5	
Queue Delay				0.0			0.0		0.0		0.0	
Total Delay				17.5			6.7		38.3		11.5	
LOS				В			Α		D		В	
Approach Delay				17.5			6.7			17.5		
Approach LOS				В			Α			В		

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 42 (53%), Referenced to phase 2:NWTL and 6:SET, Start of Green

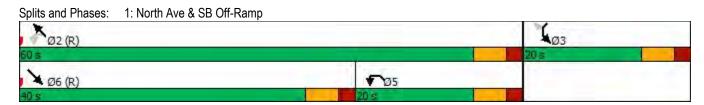
Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 70.3% ICU Level of Service C

Analysis Period (min) 15



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Lane Group	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	NEL	NER	
Lane Configurations				414			† 1>		1/4	7	
Traffic Volume (vph)	0	0	362	494	0	0	611	157	181	253	
Future Volume (vph)	0	0	362	494	0	0	611	157	181	253	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	0		0	0		0	0	200	
Storage Lanes	0	0	0		0	0		0	2	1	
Taper Length (ft)	25		25			25			25		
Right Turn on Red					Yes			Yes		Yes	
Link Speed (mph)	30			30			30		30		
Link Distance (ft)	322			673			260		405		
Travel Time (s)	7.3			15.3			5.9		9.2		
Confl. Peds. (#/hr)									4	4	
Peak Hour Factor	0.92	0.92	0.93	0.93	0.92	0.92	0.85	0.85	0.84	0.84	
Parking (#/hr)				0							
Shared Lane Traffic (%)											
Turn Type			pm+pt	NA			NA		Prot	Perm	
Protected Phases			1	6			2		4		
Permitted Phases			6							4	
Detector Phase			1	6			2		4	4	
Switch Phase											
Minimum Initial (s)			6.0	10.0			10.0		6.0	6.0	
Minimum Split (s)			12.0	16.0			16.0		12.0	12.0	
Total Split (s)			15.0	60.0			45.0		20.0	20.0	
Total Split (%)			18.8%	75.0%			56.3%		25.0%	25.0%	
Yellow Time (s)			4.0	4.0			4.0		4.0	4.0	
All-Red Time (s)			2.0	2.0			2.0		2.0	2.0	
Lost Time Adjust (s)				0.0			0.0		0.0	0.0	
Total Lost Time (s)				6.0			6.0		6.0	6.0	
Lead/Lag			Lead				Lag				
Lead-Lag Optimize?			Yes				Yes				
Recall Mode			None	C-Min			C-Min		Max	Max	
Act Effct Green (s)				49.9			49.9		18.1	18.1	
Actuated g/C Ratio				0.62			0.62		0.23	0.23	
v/c Ratio				1.31dl			0.42		0.28	0.51	
Control Delay				24.2			10.8		28.6	7.4	
Queue Delay				0.0			0.9		0.0	0.0	
Total Delay				24.2			11.7		28.6	7.4	
LOS				С			В		C	Α	
Approach Delay				24.2			11.7		16.3		
Approach LOS				С			В		В		

Area Type: Other

Cycle Length: 80

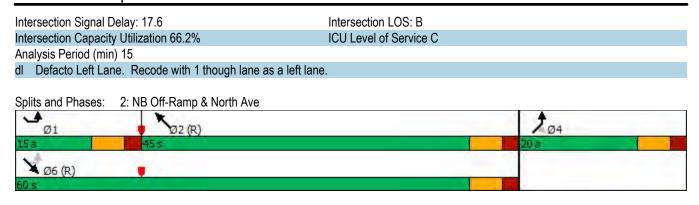
Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SETL, Start of Green, Master Intersection

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81



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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		ર્ન	7		स्	7		473			413	
Traffic Volume (vph)	42	4	12	20	1	34	25	697	19	15	695	46
Future Volume (vph)	42	4	12	20	1	34	25	697	19	15	695	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	0		0	0		0	0		0
Storage Lanes	0		1	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		242			308			260			333	
Travel Time (s)		5.5			7.0			5.9			7.6	
Confl. Peds. (#/hr)	3					3	6		1	1		6
Peak Hour Factor	0.81	0.81	0.81	0.71	0.71	0.71	0.93	0.93	0.93	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases		3			7		1	6			2	
Permitted Phases	3		3	7		7	6			2		
Detector Phase	3	3	3	7	7	7	1	6		2	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		10.0	10.0	
Minimum Split (s)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	16.0		16.0	16.0	
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	15.0	60.0		45.0	45.0	
Total Split (%)	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	18.8%	75.0%		56.3%	56.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0			0.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Min		C-Min	C-Min	
Act Effct Green (s)		8.1	8.1		8.1	8.1		63.5			63.5	
Actuated g/C Ratio		0.10	0.10		0.10	0.10		0.79			0.79	
v/c Ratio		0.41	0.05		0.22	0.18		0.31			0.35	
Control Delay		42.0	0.4		36.1	1.5		4.7			3.7	
Queue Delay		0.0	0.0		0.0	0.0		0.4			0.0	
Total Delay		42.0	0.4		36.1	1.5		5.1			3.7	
LOS		D	Α		D	Α		Α			Α	
Approach Delay		33.3			14.5			5.1			3.7	
Approach LOS		С			В			Α			Α	

Area Type: Other

Cycle Length: 80

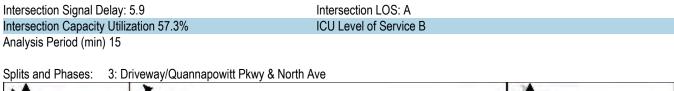
Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.41





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Lane Group	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	SWL2	SWL	SWR	
Lane Configurations				1			414		*		7	
Traffic Volume (vph)	0	0	0	426	226	229	489	0	135	0	396	
Future Volume (vph)	0	0	0	426	226	229	489	0	135	0	396	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Right Turn on Red					Yes			Yes			Yes	
Link Speed (mph)	30			30			30			30		
Link Distance (ft)	822			402			673			375		
Travel Time (s)	18.7			9.1			15.3			8.5		
Confl. Peds. (#/hr)					6	6						
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.94	0.94	0.92	0.86	0.92	0.86	
Heavy Vehicles (%)	2%	2%	0%	5%	5%	4%	4%	0%	2%	2%	2%	
Shared Lane Traffic (%)												
Turn Type				NA		pm+pt	NA		Prot		Perm	
Protected Phases				6		5	2		3			
Permitted Phases						2					3	
Detector Phase				6		5	2		3		3	
Switch Phase												
Minimum Initial (s)				10.0		6.0	10.0		6.0		6.0	
Minimum Split (s)				16.0		12.0	16.0		12.0		12.0	
Total Split (s)				35.0		30.0	65.0		15.0		15.0	
Total Split (%)				43.8%		37.5%	81.3%		18.8%		18.8%	
Yellow Time (s)				4.0		4.0	4.0		4.0		4.0	
All-Red Time (s)				2.0		2.0	2.0		2.0		2.0	
Lost Time Adjust (s)				0.0			0.0		0.0		0.0	
Total Lost Time (s)				6.0			6.0		6.0		6.0	
Lead/Lag				Lead		Lag						
Lead-Lag Optimize?				Yes		Yes						
Recall Mode				C-Max		Max	C-Min		None		None	
Act Effct Green (s)				29.1			59.1		8.9		8.9	
Actuated g/C Ratio				0.36			0.74		0.11		0.11	
v/c Ratio				0.56			0.40		0.80		0.81	
Control Delay				18.1			5.2		64.4		17.2	
Queue Delay				0.0			0.0		0.0		0.0	
Total Delay				18.1			5.2		64.4		17.2	
LOS				В			Α		Е		В	
Approach Delay				18.1			5.2			29.2		
Approach LOS				В			Α			С		

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 42 (53%), Referenced to phase 2:NWTL and 6:SET, Start of Green

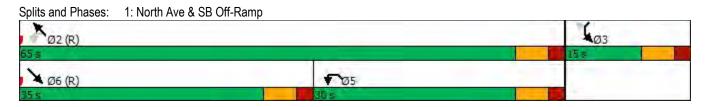
Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 16.7 Intersection LOS: B Intersection Capacity Utilization 60.2% ICU Level of Service B

Analysis Period (min) 15



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Lane Group	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	NEL	NER	
Lane Configurations				414			* 1>		1/4	7	
Traffic Volume (vph)	0	0	172	392	0	0	526	111	198	328	
Future Volume (vph)	0	0	172	392	0	0	526	111	198	328	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	0		0	0		0	0	200	
Storage Lanes	0	0	0		0	0		0	2	1	
Taper Length (ft)	25		25			25			25		
Right Turn on Red					Yes			Yes		Yes	
Link Speed (mph)	30			30			30		30		
Link Distance (ft)	322			673			260		405		
Travel Time (s)	7.3			15.3			5.9		9.2		
Confl. Peds. (#/hr)									4	4	
Peak Hour Factor	0.92	0.92	0.86	0.86	0.92	0.92	0.96	0.96	0.92	0.90	
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%	3%	3%	2%	6%	
Shared Lane Traffic (%)											
Turn Type			pm+pt	NA			NA		Prot	Perm	
Protected Phases			1	6			2		4		
Permitted Phases			6							4	
Detector Phase			1	6			2		4	4	
Switch Phase											
Minimum Initial (s)			6.0	10.0			10.0		6.0	6.0	
Minimum Split (s)			12.0	16.0			16.0		12.0	12.0	
Total Split (s)			25.0	65.0			40.0		20.0	20.0	
Total Split (%)			29.4%	76.5%			47.1%		23.5%	23.5%	
Yellow Time (s)			4.0	4.0			4.0		4.0	4.0	
All-Red Time (s)			2.0	2.0			2.0		2.0	2.0	
Lost Time Adjust (s)				0.0			0.0		0.0	0.0	
Total Lost Time (s)				6.0			6.0		6.0	6.0	
Lead/Lag			Lead				Lag				
Lead-Lag Optimize?			Yes				Yes				
Recall Mode			None	C-Min			C-Min		Max	Max	
Act Effct Green (s)				41.7			41.7		31.3	31.3	
Actuated g/C Ratio				0.49			0.49		0.37	0.37	
v/c Ratio				0.62			0.39		0.17	0.47	
Control Delay				18.5			12.0		19.4	4.7	
Queue Delay				0.0			0.6		0.0	0.0	
Total Delay				18.5			12.5		19.4	4.7	
LOS				В			В		В	Α	
Approach Delay				18.5			12.5		10.1		
Approach LOS				В			В		В		

Area Type: Other

Cycle Length: 85

Actuated Cycle Length: 85

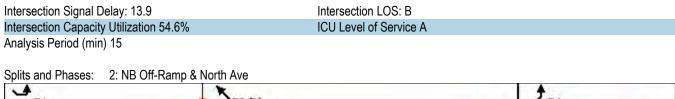
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SETL, Start of Green, Master Intersection

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Synchro 11 Report PM Scenario Page 3





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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		ર્ન	7		ર્ન	7		474			474	
Traffic Volume (vph)	23	0	9	25	2	26	58	641	45	18	571	37
Future Volume (vph)	23	0	9	25	2	26	58	641	45	18	571	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	0		0	0		0	0		0
Storage Lanes	0		1	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		242			308			260			333	
Travel Time (s)		5.5			7.0			5.9			7.6	
Confl. Peds. (#/hr)	3					3	7					7
Peak Hour Factor	0.84	0.92	0.84	0.70	0.70	0.70	0.88	0.88	0.88	0.94	0.94	0.94
Heavy Vehicles (%)	5%	2%	5%	0%	0%	0%	4%	4%	4%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases		3			7		1	6			2	
Permitted Phases	3		3	7		7	6			2		
Detector Phase	3	3	3	7	7	7	1	6		2	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		10.0	10.0	
Minimum Split (s)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	16.0		16.0	16.0	
Total Split (s)	18.0	18.0	18.0	18.0	18.0	18.0	15.0	67.0		52.0	52.0	
Total Split (%)	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	17.6%	78.8%		61.2%	61.2%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0			0.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	C-Min		C-Min	C-Min							
Act Effct Green (s)		7.4	7.4		7.4	7.4		69.2			69.2	
Actuated g/C Ratio		0.09	0.09		0.09	0.09		0.81			0.81	
v/c Ratio		0.24	0.05		0.33	0.15		0.36			0.26	
Control Delay		40.6	0.3		43.4	1.3		2.7			2.8	
Queue Delay		0.0	0.0		0.0	0.0		0.2			0.0	
Total Delay		40.6	0.3		43.4	1.3		2.9			2.8	
LOS		D	Α		D	Α		Α			Α	
Approach Delay		28.9			22.9			2.9			2.8	
Approach LOS		С			С			Α			Α	

Area Type: Other

Cycle Length: 85

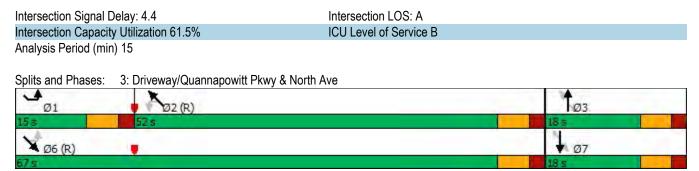
Actuated Cycle Length: 85

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.36



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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					ર્ન	7	*	^			^	7
Traffic Volume (vph)	0	0	0	208	0	182	133	561	0	0	189	101
Future Volume (vph)	0	0	0	208	0	182	133	561	0	0	189	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	200		0	0		175
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			50			25		
Satd. Flow (prot)	0	0	0	0	1736	1583	1752	3505	0	0	3505	1568
Flt Permitted					0.950		0.412					
Satd. Flow (perm)	0	0	0	0	1736	1583	760	3505	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						188						126
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		795			527			668			287	
Travel Time (s)		18.1			12.0			15.2			6.5	
Peak Hour Factor	0.92	0.92	0.92	0.97	0.97	0.97	0.95	0.95	0.92	0.92	0.80	0.80
Heavy Vehicles (%)	2%	2%	2%	4%	4%	2%	3%	3%	2%	2%	3%	3%
Shared Lane Traffic (%)	-/-	-/-		.,,	.,,		.	3 ,0		_,,	0,0	0,0
Lane Group Flow (vph)	0	0	0	0	214	188	140	591	0	0	236	126
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases				1 01111	8	. 0	5	2			6	1 01111
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase								_				J
Minimum Initial (s)				10.0	10.0	10.0	6.0	10.0			10.0	10.0
Minimum Split (s)				15.0	15.0	15.0	11.0	15.0			18.0	18.0
Total Split (s)				30.0	30.0	30.0	15.0	65.0			50.0	50.0
Total Split (%)				31.6%	31.6%	31.6%	15.8%	68.4%			52.6%	52.6%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0			2.0	2.0
Lost Time Adjust (s)				2.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.0	5.0			5.0	5.0
Lead/Lag					0.0	0.0	Lead	0.0			Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				None	None	None	None	Min			Min	Min
Act Effct Green (s)				TAOTIC	12.0	12.0	21.2	21.2			10.7	10.7
Actuated g/C Ratio					0.28	0.28	0.49	0.49			0.25	0.25
v/c Ratio					0.45	0.20	0.43	0.45			0.27	0.26
Control Delay					18.1	4.7	7.3	7.4			16.3	5.9
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					18.1	4.7	7.3	7.4			16.3	5.9
LOS					В	4.7 A	7.5 A	7.4 A			В	J.9
Approach Delay					11.8			7.4			12.7	^
					П.0			7.4 A			12.7 B	
Approach LOS						0	15					0
Queue Length 50th (ft)					47	0	15	37			26	0
Queue Length 95th (ft)		745			102	36	44	78 500			50	25
Internal Link Dist (ft)		715			447	000	000	588			207	475
Turn Bay Length (ft)					4000	200	200	2525			2050	175
Base Capacity (vph)					1092	1066	606	3505			3358	1507

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.20	0.18	0.23	0.17			0.07	0.08
Intersection Summary												
Area Type:	Other											
Cycle Length: 95												
Actuated Cycle Length: 4	3.5											
Natural Cycle: 45												
Control Type: Actuated-U	ncoordinated											
Maximum v/c Ratio: 0.45												
Intersection Signal Delay:	9.9			In	tersection	n LOS: A						
Intersection Capacity Utili	zation 39.7%			IC	CU Level of	of Service	Α					
Analysis Period (min) 15												
Splits and Phases: 1: F	Pleasure Island	d Rd & SI	3 Off-Ram	пр								
↑ ø2												
65 s												
↑ Ø5	Ø6							Ø8				
15 s 50								30 s	_			

	⊿	-	•	€	6	1
Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations	LDL	414	↑	71017	ሻሻ	7
Traffic Volume (vph)	115	236	294	204	482	27
Future Volume (vph)	115	236	294	204	482	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	1300	1300	150	0	250
Storage Lanes	0			130	2	1
Taper Length (ft)	25			•	25	
Satd. Flow (prot)	0	3320	3252	1455	3400	1568
Flt Permitted	0	0.717	3232	1400	0.950	1300
Satd. Flow (perm)	0	2419	3252	1455	3400	1568
	U	2419	3232		3400	
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			00	246		32
Link Speed (mph)		30	30		30	
Link Distance (ft)		346	296		281	
Travel Time (s)		7.9	6.7		6.4	
Peak Hour Factor	0.79	0.79	0.83	0.83	0.84	0.84
Heavy Vehicles (%)	7%	7%	11%	11%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	445	354	246	574	32
Turn Type	pm+pt	NA	NA	Prot	Prot	Perm
Protected Phases	5	2	6	6	4	
Permitted Phases	2	_			<u> </u>	4
Detector Phase	5	2	6	6	4	4
Switch Phase					7	T
Minimum Initial (s)	5.0	10.0	10.0	10.0	7.0	7.0
Minimum Split (s)	10.5	15.5	15.5	15.5	12.5	12.5
Total Split (s)	16.0	80.0	64.0	64.0	20.0	20.0
Total Split (%)	16.0%	80.0%	64.0%	64.0%	20.0%	20.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.5	5.5	5.5	5.5	5.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)		74.5	74.5	74.5	14.5	14.5
Actuated g/C Ratio		0.74	0.74	0.74	0.14	0.14
v/c Ratio		0.25	0.15	0.21	1.16	0.13
Control Delay		4.4	4.4	2.4	133.4	14.5
Queue Delay		0.0	0.0	0.6	0.8	0.0
Total Delay		4.4	4.4	2.9	134.2	14.5
LOS				2.9 A	134.Z	14.5 B
		A	A	A		В
Approach Delay		4.4	3.8		127.9	
Approach LOS		A	A		F	
Queue Length 50th (ft)		38	40	15	~225	0
Queue Length 95th (ft)		46	m47	m28	#297	24
Internal Link Dist (ft)		266	216		201	
Turn Bay Length (ft)				150		250
Base Capacity (vph)		1802	2422	1146	493	254

	9,449,19	96.856				124.5%
Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Starvation Cap Reductn		0	0	570	0	0
Spillback Cap Reductn		96	0	0	45	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.26	0.15	0.43	1.28	0.13

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Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Yellow, Master Intersection

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16 Intersection Signal Delay: 49.5 Intersection Capacity Utilization 45.7%

Intersection LOS: D ICU Level of Service A

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

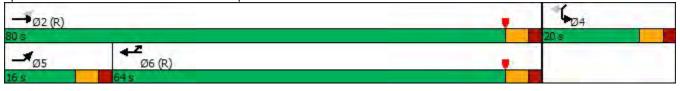
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Salem St & NB Off-Ramp



	-	•	1	•	1	-		
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9	
Lane Configurations	^ 1>	LDIT	1102	414	7	7	~~	
Traffic Volume (vph)	645	81	168	362	135	160		
Future Volume (vph)	645	81	168	362	135	160		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Satd. Flow (prot)	3437	0	0	3229	1736	1553		
Flt Permitted	UTU1	U	U	0.577	0.950	1000		
Satd. Flow (perm)	3437	0	0	1893	1736	1553		
Right Turn on Red	UTU1	Yes	U	1033	1730	Yes		
Satd. Flow (RTOR)	18	163				184		
Link Speed (mph)	30			30	30	104		
Link Distance (ft)	296			620	304			
. ,	6.7			14.1	6.9			
Travel Time (s)	0.7	2	2	14.1	0.9			
Confl. Peds. (#/hr)	0.04	2	0.00	0.90	0.07	0.87		
Peak Hour Factor	0.84	0.84	0.90		0.87			
Heavy Vehicles (%)	3%	3%	10%	10%	4%	4%		
Shared Lane Traffic (%)	004	0	0	E00	455	101		
Lane Group Flow (vph)	864	0	0	589	155	184		
Turn Type	NA		pm+pt	NA	Prot	Perm	^	
Protected Phases	2		1	6	8	0	9	
Permitted Phases	^		6	^	0	8		
Detector Phase	2		1	6	8	8		
Switch Phase	40.0		- ^	40.0	7.0	7.0	5	
Minimum Initial (s)	10.0		5.0	10.0	7.0	7.0	5.0	
Minimum Split (s)	15.5		10.5	15.5	12.5	12.5	21.0	
Total Split (s)	51.0		13.0	64.0	15.0	15.0	21.0	
Total Split (%)	51.0%		13.0%	64.0%	15.0%	15.0%	21%	
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5	2.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	1.0	
Lost Time Adjust (s)	0.0			0.0	0.0	0.0		
Total Lost Time (s)	5.5		_	5.5	5.5	5.5		
Lead/Lag	Lag		Lead					
Lead-Lag Optimize?	Yes		Yes					
Recall Mode	C-Max		None	C-Max	None	None	None	
Act Effct Green (s)	79.5			79.5	9.5	9.5		
Actuated g/C Ratio	0.80			0.80	0.10	0.10		
v/c Ratio	0.32			0.39	0.95	0.59		
Control Delay	7.1			5.7	104.0	14.8		
Queue Delay	2.0			0.0	0.0	0.0		
Total Delay	9.1			5.7	104.0	14.8		
LOS	Α			Α	F	В		
Approach Delay	9.1			5.7	55.6			
Approach LOS	А			Α	E			
Queue Length 50th (ft)	214			52	100	0		
Queue Length 95th (ft)	m203			113	#213	58		
Internal Link Dist (ft)	216			540	224			
Turn Bay Length (ft)								
Base Capacity (vph)	2736			1504	164	314		
Starvation Cap Reductn	1669			0	0	0		
Spillback Cap Reductn	0			0	0	0		

	-	*	1	200000	7			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9	
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.81			0.39	0.95	0.59		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 99 (99%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95 Intersection Signal Delay: 16.8 Intersection Capacity Utilization 56.6%

Intersection LOS: B
ICU Level of Service B

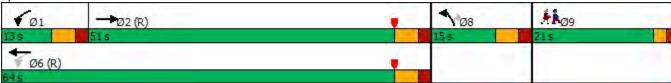
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Montrose Ave & Salem St



Lane Group		٠	→	*	•	+	•	4	†	~	1	ļ	1
Traffic Volume (yph)	Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (ynh)	Lane Configurations	*	1		*	^	7	7	1			ર્ન	7
	Traffic Volume (vph)	550		85	28		27	61		37	47		305
Storage Length (ft)	Future Volume (vph)	550	240	85	28	166	27	61	52	37	47	44	305
Storage Lanes	Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Taper Length (ft)	Storage Length (ft)	0		0	150		175	0		0	0		0
Taper Length (ft)	Storage Lanes	1		0	1		1	1		0	0		1
Fit Permitted		25			25			25			25		
Satd Flow (perm) 1066 1762 0 961 3374 1473 1267 1762 0 0 1381 1538 1768 1769 176	Satd. Flow (prot)	1752	1762	0	1687	3374	1509	1805	1762	0	0	1764	1538
Right Turn on Red Yes	Flt Permitted	0.579			0.548			0.667				0.766	
Satid. Flow (RTOR)	Satd. Flow (perm)	1066	1762	0	961	3374	1473	1267	1762	0	0	1381	1538
Link Speed (mph)	Right Turn on Red			Yes			Yes			Yes			Yes
Link Distance (ft)	Satd. Flow (RTOR)		27				120		30				372
Travel Time (s)	Link Speed (mph)		30			30			30			30	
Confil Peds. (#/hr)	Link Distance (ft)		620			336			119			668	
Peak Hour Factor 0.91 0.91 0.91 0.91 0.92 0.92 0.92 0.94 0.94 0.94 0.82 0.82 0.82 Heavy Vehicles (%) 3% 3% 3% 7% 7% 7% 0% 0% 0% 5% 5% 5% Shared Lane Traffic (%) Lane Group Flow (vph) 604 357 0 30 180 29 65 94 0 0 111 372 Turn Type pm+pt NA Perm NA 4 4 4 Perm NA Perm NA 1 4	Travel Time (s)		14.1			7.6			2.7			15.2	
Heavy Vehicles (%) 3% 3% 3% 7% 7% 7% 7% 0% 0% 0% 5% 5% 5%	Confl. Peds. (#/hr)	4		4	4		4			2	2		
Shared Lane Traffic (%) Lane Group Flow (yph) 604 357 0 30 180 29 65 94 0 0 0 111 372 37	Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.94	0.94	0.94	0.82	0.82	0.82
Shared Lane Traffic (%) Lane Group Flow (yph) 604 357 0 30 180 29 65 94 0 0 111 372 372 372 1717 179e pm+pt NA Perm NA Perm Perm NA Perm Nac NA Perm NAc Perm NAc	Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	0%	0%	0%	5%	5%	5%
Turn Type													
Protected Phases 5	Lane Group Flow (vph)	604	357	0	30	180	29	65	94	0	0	111	372
Protected Phases 5		pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Detector Phase 5 2 6 6 6 8 8 8 4 4 4 4 4 5			2			6			8			4	
Switch Phase Minimum Initial (s) 8.0 10.0 10.0 10.0 10.0 10.0 8.0 <t< td=""><td>Permitted Phases</td><td>2</td><td></td><td></td><td>6</td><td></td><td>6</td><td>8</td><td></td><td></td><td>4</td><td></td><td>4</td></t<>	Permitted Phases	2			6		6	8			4		4
Minimum Initial (s) 8.0 10.0 10.0 10.0 10.0 8.0 8.0 8.0 8.0 Minimum Split (s) 13.5 15.5 15.0 15.0 15.0 12.5 12.5 13.5 13.5 13.5 Total Split (s) 44.0% 59.0% 15.0% 15.0% 18.0%	Detector Phase	5	2		6	6	6	8	8		4	4	4
Minimum Split (s)	Switch Phase												
Total Split (s) 44.0 59.0 15.0 15.0 15.0 18.0 18.0 18.0 18.0 Total Split (%) 44.0% 59.0% 15.0% 15.0% 18.0% 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 2	Minimum Initial (s)	8.0	10.0		10.0	10.0	10.0	8.0	8.0		8.0	8.0	8.0
Total Split (%) 44.0% 59.0% 15.0% 15.0% 15.0% 18.0% 20	Minimum Split (s)	13.5	15.5		15.0	15.0	15.0	12.5	12.5		13.5	13.5	13.5
Yellow Time (s) 3.5 3.5 3.0 3.0 3.0 3.5 3.5 3.5 3.5 All-Red Time (s) 2.0 2.0 2.0 2.0 2.0 1.0 1.0 2.0 2.0 2.0 Lost Time Adjust (s) 0.0	Total Split (s)	44.0	59.0		15.0	15.0	15.0	18.0	18.0		18.0	18.0	18.0
All-Red Time (s) 2.0 2.0 2.0 2.0 2.0 1.0 1.0 2.0 2.0 2.0 2.0 Lost Time Adjust (s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Total Split (%)	44.0%	59.0%		15.0%	15.0%	15.0%	18.0%	18.0%		18.0%	18.0%	18.0%
Lost Time Adjust (s) 0.0	Yellow Time (s)	3.5	3.5		3.0	3.0	3.0	3.5	3.5		3.5	3.5	3.5
Total Lost Time (s) 5.5 5.5 5.0 5.0 5.0 4.5 4.5 5.5 5.5 Lead/Lag Lead Lag	All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.0	1.0		2.0	2.0	2.0
Lead/Lag Lag La	Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
Lead-Lag Optimize? Yes	Total Lost Time (s)	5.5	5.5		5.0	5.0	5.0	4.5	4.5			5.5	5.5
Lead-Lag Optimize? Yes	Lead/Lag	Lead			Lag	Lag	Lag						
Act Effct Green (s) 77.7 77.7 53.9 53.9 53.9 12.3 12.3 11.3 11.3 11.3 Actuated g/C Ratio 0.78 0.78 0.54 0.54 0.54 0.12 0.12 0.11 0.11 v/c Ratio 0.63 0.26 0.06 0.10 0.03 0.42 0.39 0.71 0.74 Control Delay 11.7 1.5 14.5 13.1 0.1 48.5 32.7 67.3 14.2 Queue Delay 0.0 <td></td> <td>Yes</td> <td></td>		Yes											
Actuated g/C Ratio 0.78 0.78 0.54 0.54 0.54 0.12 0.12 0.11 0.11 v/c Ratio 0.63 0.26 0.06 0.10 0.03 0.42 0.39 0.71 0.74 Control Delay 11.7 1.5 14.5 13.1 0.1 48.5 32.7 67.3 14.2 Queue Delay 0.0	Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	None
v/c Ratio 0.63 0.26 0.06 0.10 0.03 0.42 0.39 0.71 0.74 Control Delay 11.7 1.5 14.5 13.1 0.1 48.5 32.7 67.3 14.2 Queue Delay 0.0	Act Effct Green (s)	77.7	77.7		53.9	53.9	53.9	12.3	12.3			11.3	11.3
Control Delay 11.7 1.5 14.5 13.1 0.1 48.5 32.7 67.3 14.2 Queue Delay 0.0 </td <td>Actuated g/C Ratio</td> <td>0.78</td> <td>0.78</td> <td></td> <td>0.54</td> <td>0.54</td> <td>0.54</td> <td>0.12</td> <td>0.12</td> <td></td> <td></td> <td>0.11</td> <td>0.11</td>	Actuated g/C Ratio	0.78	0.78		0.54	0.54	0.54	0.12	0.12			0.11	0.11
Queue Delay 0.0 <th< td=""><td>v/c Ratio</td><td>0.63</td><td>0.26</td><td></td><td>0.06</td><td>0.10</td><td>0.03</td><td>0.42</td><td>0.39</td><td></td><td></td><td>0.71</td><td>0.74</td></th<>	v/c Ratio	0.63	0.26		0.06	0.10	0.03	0.42	0.39			0.71	0.74
Total Delay 11.7 1.5 14.5 13.1 0.1 48.5 32.7 67.3 14.2 LOS B A B B A D C E B Approach Delay 7.9 11.7 39.2 26.4 Approach LOS A B D C Queue Length 50th (ft) 147 19 9 28 0 38 37 68 0 Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588	Control Delay	11.7	1.5		14.5	13.1	0.1	48.5	32.7			67.3	14.2
LOS B A B B A D C E B Approach Delay 7.9 11.7 39.2 26.4 Approach LOS A B D C Queue Length 50th (ft) 147 19 9 28 0 38 37 68 0 Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588	Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
LOS B A B B A D C E B Approach Delay 7.9 11.7 39.2 26.4 Approach LOS A B D C Queue Length 50th (ft) 147 19 9 28 0 38 37 68 0 Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588	Total Delay	11.7	1.5		14.5	13.1	0.1	48.5	32.7			67.3	14.2
Approach LOS A B D C Queue Length 50th (ft) 147 19 9 28 0 38 37 68 0 Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588		В	Α		В	В	Α	D				Е	
Approach LOS A B D C Queue Length 50th (ft) 147 19 9 28 0 38 37 68 0 Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588	Approach Delay		7.9			11.7			39.2			26.4	
Queue Length 50th (ft) 147 19 9 28 0 38 37 68 0 Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588													
Queue Length 95th (ft) 56 23 29 57 0 82 86 #117 54 Internal Link Dist (ft) 540 256 39 588		147			9	28	0	38				68	0
Internal Link Dist (ft) 540 256 39 588													
	<u> </u>												
	Turn Bay Length (ft)				150		175						

Lane Group	Ø9	
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	
Minimum Split (s)	23.0	
Total Split (s)	23.0	
Total Split (%)	23%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	1091	1374		518	1819	849	171	263			172	517
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0
Storage Cap Reductn	0	0		0	0	0	0	0			0	0
Reduced v/c Ratio	0.55	0.26		0.06	0.10	0.03	0.38	0.36			0.65	0.72

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 86 (86%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

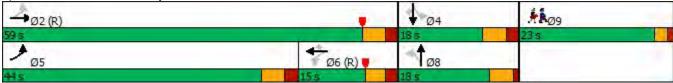
Intersection Signal Delay: 16.0 Intersection LOS: B
Intersection Capacity Utilization 63.7% ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

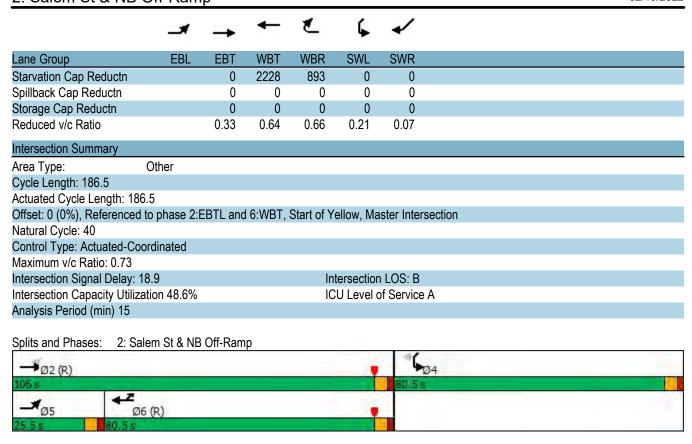
Splits and Phases: 4: Driveway/Pleasure Island Rd & Salem St



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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					ર્ન	7	*	^			^	7
Traffic Volume (vph)	0	0	0	260	1	64	191	330	0	0	392	292
Future Volume (vph)	0	0	0	260	1	64	191	330	0	0	392	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	200		0	0		175
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			50			25		
Satd. Flow (prot)	0	0	0	0	1646	1468	1770	3539	0	0	3574	1599
Flt Permitted					0.953		0.328					
Satd. Flow (perm)	0	0	0	0	1646	1468	611	3539	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						80						360
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		795			527			668			287	
Travel Time (s)		18.1			12.0			15.2			6.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85	0.85	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)		-/-	_,,	, .	, .	, .		_,,	_,,	.,,	.,,	.,,
Lane Group Flow (vph)	0	0	0	0	284	70	225	388	0	0	484	360
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases				1 01111	8	1 01111	5	2			6	1 01111
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase								_				J
Minimum Initial (s)				10.0	10.0	10.0	6.0	10.0			10.0	10.0
Minimum Split (s)				15.0	15.0	15.0	11.0	15.0			18.0	18.0
Total Split (s)				30.0	30.0	30.0	15.0	65.0			50.0	50.0
Total Split (%)				31.6%	31.6%	31.6%	15.8%	68.4%			52.6%	52.6%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0			2.0	2.0
Lost Time Adjust (s)				2.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.0	5.0			5.0	5.0
Lead/Lag					0.0	0.0	Lead	0.0			Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				None	None	None	None	Min			Min	Min
Act Effct Green (s)				TAOTIC	15.3	15.3	30.9	30.9			16.0	16.0
Actuated g/C Ratio					0.27	0.27	0.55	0.55			0.28	0.28
v/c Ratio					0.64	0.27	0.42	0.20			0.48	0.51
Control Delay					26.2	5.0	10.0	7.3			18.9	5.1
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					26.2	5.0	10.0	7.3			18.9	5.1
LOS					20.2 C	3.0 A	Α	7.3 A			10.9	3.1 A
Approach Delay					22.0	^		8.3			13.1	^
Approach LOS					22.0 C			0.5 A			13.1 B	
					84	0	34	30			68	0
Queue Length 50th (ft)					172			62				0
Queue Length 95th (ft)		715				22	81				112	35
Internal Link Dist (ft)		715			447	200	200	588			207	175
Turn Bay Length (ft)					754	200	200	2404			0004	175
Base Capacity (vph)					751	713	545	3404			2901	1365

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.38	0.10	0.41	0.11			0.17	0.26
Intersection Summary												
Area Type:	Other											
Cycle Length: 95												
Actuated Cycle Length: 56	3.5											
Natural Cycle: 45												
Control Type: Actuated-U	ncoordinated											
Maximum v/c Ratio: 0.64												
Intersection Signal Delay:	13.2			In	tersection	n LOS: B						
Intersection Capacity Utiliz	zation 55.6%			IC	CU Level of	of Service	В					
Analysis Period (min) 15												
Splits and Phases: 1: P	leasure Island	d Rd & SI	3 Off-Ram	пр								
↑ ø2												
65 s												
↑ Ø5	Ø6							Ø				
15 s 50 s	8							30 s				

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Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations		414	^	7	ሻሻ	7
Traffic Volume (vph)	236	365	396	274	245	39
Future Volume (vph)	236	365	396	274	245	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	1300	1000	150	0	250
Storage Lanes	0			130	2	1
Taper Length (ft)	25				25	
Satd. Flow (prot)	0	3472	3539	1583	3400	1568
Flt Permitted		0.654	0000	1000	0.950	1300
Satd. Flow (perm)	0	2315	3539	1583	3400	1568
Right Turn on Red	U	2010	0003	Yes	3400	Yes
				297		45
Satd. Flow (RTOR)		20	20	291	20	43
Link Speed (mph)		30	30		30	
Link Distance (ft)		346	296		281	
Travel Time (s)	0.05	7.9	6.7	0.00	6.4	0.07
Peak Hour Factor	0.95	0.95	0.88	0.88	0.87	0.87
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)		222	4=6	044	000	4-
Lane Group Flow (vph)	0	632	450	311	282	45
Turn Type	pm+pt	NA	NA	Prot	Prot	Perm
Protected Phases	5	2	6	6	4	
Permitted Phases	2	_	_	_	_	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	7.0	7.0
Minimum Split (s)	10.5	15.5	15.5	15.5	12.5	12.5
Total Split (s)	25.5	106.0	80.5	80.5	80.5	80.5
Total Split (%)	13.7%	56.8%	43.2%	43.2%	43.2%	43.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.5	5.5	5.5	5.5	5.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	140110	154.4	154.4	154.4	21.1	21.1
Actuated g/C Ratio		0.83	0.83	0.83	0.11	0.11
v/c Ratio		0.03	0.03	0.03	0.73	0.11
		4.6	3.5	0.23	91.2	18.8
Control Delay						
Queue Delay		0.0	1.3	2.1	0.0	0.0
Total Delay		4.6	4.8	3.0	91.2	18.8
LOS		A	A	Α	F	В
Approach Delay		4.6	4.1		81.2	
Approach LOS		A	A		F	
Queue Length 50th (ft)		83	49	3	175	0
Queue Length 95th (ft)		123	72	20	215	39
Internal Link Dist (ft)		266	216		201	
Turn Bay Length (ft)				150		250
Base Capacity (vph)		1915	2929	1361	1367	657



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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9	
Lane Configurations	† ‡	LDIT	1100	414	7	7	~~	
Traffic Volume (vph)	534	107	218	490	175	173		
Future Volume (vph)	534	107	218	490	175	173		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Satd. Flow (prot)	3401	0	0	3486	1787	1599		
Flt Permitted	0.101			0.615	0.950	1000		
Satd. Flow (perm)	3401	0	0	2175	1787	1599		
Right Turn on Red	0.101	Yes		2110	1101	Yes		
Satd. Flow (RTOR)	22					228		
Link Speed (mph)	30			30	30			
Link Distance (ft)	296			620	304			
Travel Time (s)	6.7			14.1	6.9			
Confl. Peds. (#/hr)	•	8	8		0.0			
Peak Hour Factor	0.94	0.94	0.89	0.89	0.76	0.76		
Heavy Vehicles (%)	3%	3%	2%	2%	1%	1%		
Shared Lane Traffic (%)	070	3,0	270	273	170	170		
Lane Group Flow (vph)	682	0	0	796	230	228		
Turn Type	NA		pm+pt	NA	Prot	Perm		
Protected Phases	2		1	6	8	. 51111	9	
Permitted Phases			6			8		
Detector Phase	2		1	6	8	8		
Switch Phase	<u>-</u>		·					
Minimum Initial (s)	10.0		5.0	10.0	7.0	7.0	5.0	
Minimum Split (s)	15.5		10.5	15.5	12.5	12.5	21.0	
Total Split (s)	85.5		25.5	112.0	25.5	25.5	21.0	
Total Split (%)	53.9%		16.1%	70.7%	16.1%	16.1%	13%	
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5	2.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	1.0	
Lost Time Adjust (s)	0.0			0.0	0.0	0.0		
Total Lost Time (s)	5.5			5.5	5.5	5.5		
Lead/Lag	Lag		Lead					
Lead-Lag Optimize?	Yes		Yes					
Recall Mode	C-Max		None	C-Max	None	None	None	
Act Effct Green (s)	127.5			127.5	20.0	20.0		
Actuated g/C Ratio	0.80			0.80	0.13	0.13		
v/c Ratio	0.25			0.46	1.02	0.57		
Control Delay	3.9			5.7	131.8	13.1		
Queue Delay	2.0			0.5	0.0	0.0		
Total Delay	5.9			6.2	131.8	13.1		
LOS	A			Α	F	В		
Approach Delay	5.9			6.2	72.7			
Approach LOS	Α			A	E			
Queue Length 50th (ft)	74			114	~252	0		
Queue Length 95th (ft)	92			141	#327	33		
Internal Link Dist (ft)	216			540	224	- 00		
Turn Bay Length (ft)	210			J-10	227			
Base Capacity (vph)	2740			1749	225	400		
Starvation Cap Reductn	1860			483	0	0		
Spillback Cap Reductn	0			403	0	0		
Opinipack Cap Reductif	U			U	U	U		

	-	*	*		7	1	
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Storage Cap Reductn	0			0	0	0	
Reduced v/c Ratio	0.78			0.63	1.02	0.57	

Intersection Summary

Area Type: Other

Cycle Length: 158.5

Actuated Cycle Length: 158.5

Offset: 99 (62%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 21.8 Intersection LOS: C
Intersection Capacity Utilization 61.6% ICU Level of Service B

Analysis Period (min) 15

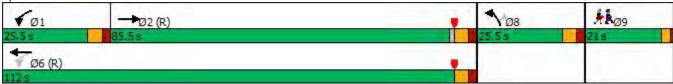
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Montrose Ave & Salem St



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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	1		1	^	7	7	f)			4	7
Traffic Volume (vph)	367	318	29	12	210	133	21	12	23	126	9	525
Future Volume (vph)	367	318	29	12	210	133	21	12	23	126	9	525
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		175	0		0	0		0
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	1818	0	1736	3471	1553	1770	1632	0	0	1712	1524
Flt Permitted	0.546			0.527			0.525				0.706	
Satd. Flow (perm)	1007	1818	0	932	3471	1553	978	1632	0	0	1239	1524
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				156		31				603
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		620			336			119			668	
Travel Time (s)		14.1			7.6			2.7			15.2	
Confl. Peds. (#/hr)			11	11					6	6		
Peak Hour Factor	0.87	0.87	0.87	0.85	0.85	0.85	0.74	0.74	0.74	0.87	0.87	0.87
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Shared Lane Traffic (%)	0,0	0,0	0,0	. , ,	.,,	.,,	=/~	_,,	_,,	• • • • • • • • • • • • • • • • • • • •	• 70	0,70
Lane Group Flow (vph)	422	399	0	14	247	156	28	47	0	0	155	603
Turn Type	pm+pt	NA	J	Perm	NA	Perm	Perm	NA	U	Perm	NA	Perm
Protected Phases	5	2		1 01111	6	1 01111	1 01111	8		1 01111	4	1 01111
Permitted Phases	2	_		6	•	6	8	•		4	•	4
Detector Phase	5	2		6	6	6	8	8		4	4	4
Switch Phase		_						J		•	•	•
Minimum Initial (s)	8.0	10.0		10.0	10.0	10.0	8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	13.5	15.5		15.0	15.0	15.0	12.5	12.5		13.5	13.5	13.5
Total Split (s)	44.0	59.0		15.0	15.0	15.0	18.0	18.0		18.0	18.0	18.0
Total Split (%)	44.0%	59.0%		15.0%	15.0%	15.0%	18.0%	18.0%		18.0%	18.0%	18.0%
Yellow Time (s)	3.5	3.5		3.0	3.0	3.0	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.0	1.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		2.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.0	5.0	5.0	4.5	4.5			5.5	5.5
Lead/Lag	Lead	0.0		Lag	Lag	Lag	7.0	7.0			0.0	0.0
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	None
Act Effct Green (s)	76.5	76.5		58.1	58.1	58.1	13.5	13.5		INOILE	12.5	12.5
Actuated g/C Ratio	0.76	0.76		0.58	0.58	0.58	0.14	0.14			0.12	0.12
v/c Ratio	0.70	0.70		0.03	0.30	0.16	0.14	0.14			1.01	0.12
Control Delay	5.7	4.1		10.5	10.2	2.3	43.0	21.4			120.1	15.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay	5.7	4.1		10.5	10.2	2.3	43.0	21.4			120.1	15.6
LOS	3.7 A	4.1 A		10.5 B	10.2 B	2.3 A	43.0 D	21.4 C			120.1 F	15.0 B
	Α			Б	7.2	Α	U					Ь
Approach LOS		4.9						29.5			36.9 D	
Approach LOS	60	A		Α	A 24	0	16	С				0
Queue Length 50th (ft)	68	61		4	34	0	16	9			~100	#12G
Queue Length 95th (ft)	96	87		13	56	24	35	31			#220	#136
Internal Link Dist (ft)		540		450	256	475		39			588	
Turn Bay Length (ft)				150		175						

Lane Group	Ø9	
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	
Minimum Split (s)	23.0	
Total Split (s)	23.0	
Total Split (%)	23%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		

	•	-	*	1	←	*	1	†	-	1	ţ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	1057	1392		541	2016	967	132	247			154	718
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0
Storage Cap Reductn	0	0		0	0	0	0	0			0	0
Reduced v/c Ratio	0.40	0.29		0.03	0.12	0.16	0.21	0.19			1.01	0.84

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 86 (86%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 18.0 Intersection LOS: B
Intersection Capacity Utilization 60.0% ICU Level of Service B

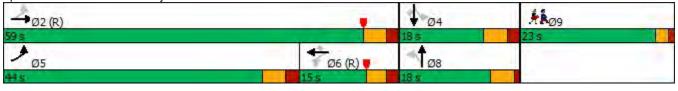
Analysis Period (min) 15

Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Driveway/Pleasure Island Rd & Salem St



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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	^	7	*	1		*	^	7	*	1	
Traffic Volume (vph)	66	51	134	131	139	33	212	90	354	29	127	87
Future Volume (vph)	66	51	134	131	139	33	212	90	354	29	127	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		150	300		250	0		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	1845	1568	1770	1801	0	1752	1845	1568	1787	1766	0
Flt Permitted	0.621			0.490			0.405			0.696		
Satd. Flow (perm)	1142	1845	1568	913	1801	0	747	1845	1568	1309	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147		10				369		25	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		347			512			708			266	
Travel Time (s)		7.9			11.6			16.1			6.0	
Confl. Peds. (#/hr)	2					2					0.0	
Peak Hour Factor	0.91	0.91	0.91	0.78	0.78	0.78	0.96	0.96	0.96	0.98	0.98	0.98
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	3%	3%	3%	1%	1%	1%
Shared Lane Traffic (%)	070	070	070	270	270	270	0,0	070	0,0	170	170	170
Lane Group Flow (vph)	73	56	147	168	220	0	221	94	369	30	219	0
Turn Type	Perm	NA	Perm	pm+pt	NA	v	pm+pt	NA	Free	Perm	NA	V
Protected Phases	1 01111	4	1 01111	3	8		5	2	1100	1 01111	6	
Permitted Phases	4	•	4	8	•		2	_	Free	6	J	
Detector Phase	4	4	4	3	8		5	2	1100	6	6	
Switch Phase		•	• • • • • • • • • • • • • • • • • • •	V	•			_		J	J	
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0		10.0	10.0	
Minimum Split (s)	12.0	12.0	12.0	12.0	11.0		12.0	16.0		16.0	16.0	
Total Split (s)	31.0	31.0	31.0	15.0	46.0		25.0	56.0		31.0	31.0	
Total Split (%)	25.0%	25.0%	25.0%	12.1%	37.1%		20.2%	45.2%		25.0%	25.0%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead	0.0		Lead	0.0		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes			Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min		Min	Min	
Act Effct Green (s)	10.4	10.4	10.4	24.8	24.8		34.5	33.5	69.6	13.9	13.9	
Actuated g/C Ratio	0.15	0.15	0.15	0.36	0.36		0.50	0.48	1.00	0.20	0.20	
v/c Ratio	0.13	0.10	0.13	0.38	0.34		0.38	0.40	0.24	0.20	0.59	
Control Delay	37.6	30.1	9.6	20.3	18.7		12.6	10.7	0.24	26.6	30.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	37.6	30.1	9.6	20.3	18.7		12.6	10.7	0.4	26.6	30.9	
LOS	37.0 D	C	3.0 A	20.5 C	В		12.0 B	10.7 B	Α	20.0 C	C	
	U	21.2		U	19.4		D	5.7		U	30.4	
Approach LOS		21.2 C			19.4 B						30.4 C	
Approach LOS	29	21	0	49	63		51	A 21	0	11		
Queue Length 50th (ft)											75 165	
Queue Length 95th (ft)	77	59	49	96	118		104	50	0	36	165	
Internal Link Dist (ft)		267			432		200	628	050		186	
Turn Bay Length (ft)							300		250			

Lane Group	Ø9	
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type	^	
Protected Phases	9	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	
Minimum Split (s)	22.0	
Total Split (s)	22.0	
Total Split (%)	18%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
, J. (-)		

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	440	711	694	452	1098		668	1367	1568	485	670	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.17	0.08	0.21	0.37	0.20		0.33	0.07	0.24	0.06	0.33	
Intersection Summary												

Area Type: Other

Cycle Length: 124

Actuated Cycle Length: 69.6

Natural Cycle: 75

Control Type: Semi Act-Uncoord Maximum v/c Ratio: 0.59 Intersection Signal Delay: 15.6 Intersection Capacity Utilization 55.6%

Intersection LOS: B ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Walnut St & Market St/SB Off-Ramp



Synchro 11 Report AM Scenario Page 3

Lane Group	Ø9
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Internación Communic	
Intersection Summary	

Synchro 11 Report Page 4 AM Scenario

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7		77					^	7	1	^	
Traffic Volume (vph)	97	0	474	0	0	0	0	550	89	111	314	0
Future Volume (vph)	97	0	474	0	0	0	0	550	89	111	314	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	300		0
Storage Lanes	1		2	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1736	0	2733	0	0	0	0	1863	1583	1787	1881	0
Flt Permitted	0.950									0.343		
Satd. Flow (perm)	1736	0	2733	0	0	0	0	1863	1546	645	1881	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			494						124			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			800			287			708	
Travel Time (s)		5.6			18.2			6.5			16.1	
Confl. Peds. (#/hr)									2	2		
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)	.,,	.,,	.,,	=/*	=/~	_,,	=/0	_,,	= / ~	. , ,	. , ,	. , ,
Lane Group Flow (vph)	101	0	494	0	0	0	0	573	93	116	327	0
Turn Type	Prot		Prot	•	•			NA	Perm	pm+pt	NA	J
Protected Phases	4		4					2	. 0	1	6	
Permitted Phases	·		•					_	2	6	· ·	
Detector Phase	4		4					2	2	1	6	
Switch Phase	·		•					-	_	•		
Minimum Initial (s)	6.0		6.0					10.0	10.0	6.0	10.0	
Minimum Split (s)	12.0		12.0					16.0	16.0	12.0	16.0	
Total Split (s)	31.0		31.0					35.0	35.0	15.0	50.0	
Total Split (%)	32.0%		32.0%					36.1%	36.1%	15.5%	51.5%	
Yellow Time (s)	3.0		3.0					3.0	3.0	3.0	3.0	
All-Red Time (s)	3.0		3.0					3.0	3.0	2.0	3.0	
Lost Time Adjust (s)	0.0		0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0					6.0	6.0	5.0	6.0	
Lead/Lag	Lag		Lag					Lag	Lag	Lead	0.0	
Lead-Lag Optimize?	Yes		Yes					Yes	Yes	Yes		
Recall Mode	None		None					C-Min	C-Min	None	C-Min	
Act Effct Green (s)	11.2		11.2					61.3	61.3	74.8	73.8	
Actuated g/C Ratio	0.12		0.12					0.63	0.63	0.77	0.76	
v/c Ratio	0.51		0.66					0.49	0.09	0.20	0.23	
Control Delay	48.4		8.1					12.2	1.1	4.0	4.2	
Queue Delay	0.0		0.0					7.9	0.0	0.0	0.0	
Total Delay	48.4		8.1					20.2	1.1	4.0	4.2	
LOS	то.т D		Α					20.2 C	Α	Α.	4.2 A	
Approach Delay	U	15.0						17.5			4.1	
Approach LOS		15.0 B						17.3 B			4.1 A	
Queue Length 50th (ft)	60	D	0					167	0	14	47	
Queue Length 95th (ft)	106		47					315	13	34	93	
	100	166	41		720			207	13	34	628	
Internal Link Dist (ft)		166			120			207		200	028	
Turn Bay Length (ft)										300		

Lane Group	Ø3	
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	3	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	7.0	
Minimum Split (s)	16.0	
Total Split (s)	16.0	
Total Split (%)	16%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
- Longth (it)		

Ø6 (R)

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	447		1071					1177	1022	616	1431	
Starvation Cap Reductn	0		0					556	0	0	0	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.23		0.46					0.92	0.09	0.19	0.23	
Intersection Summary												
Area Type:	Other											
Cycle Length: 97												
Actuated Cycle Length: 97												
Offset: 0 (0%), Referenced	to phase 2:N	NBT and	6:SBTL, S	Start of G	reen, Mas	ster Inters	ection					
Natural Cycle: 70												
Control Type: Actuated-Cod	ordinated											
Maximum v/c Ratio: 0.66												
Intersection Signal Delay: 1	3.1			In	tersection	ı LOS: B						
Intersection Capacity Utiliza	ation 53.0%			IC	U Level o	of Service	Α					
Analysis Period (min) 15												
Splits and Phases: 2: Wa	ılnut St & NE	3 Off-Ran	пр									
01	Ø2 (R)				1	Ra3		2 04				

Lane Group	Ø3
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Interportion Cummens	
Intersection Summary	

Synchro 11 Report Page 8 AM Scenario

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	1>		*	^	7		ર્લ	7	*	^	7
Traffic Volume (vph)	73	105	70	18	153	113	80	454	26	80	546	144
Future Volume (vph)	73	105	70	18	153	113	80	454	26	80	546	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		150	0		0
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1719	1701	0	1770	1863	1583	0	1868	1599	1752	3505	1568
Flt Permitted	0.315			0.638				0.832		0.343		
Satd. Flow (perm)	570	1701	0	1188	1863	1583	0	1565	1599	633	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30				156			156			157
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		260			308			259			287	
Travel Time (s)		5.9			7.0			5.9			6.5	
Peak Hour Factor	0.92	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)	0,0	0,0	0,0	270			1,0	170	.,0	0,0	0,0	0,70
Lane Group Flow (vph)	79	190	0	20	170	126	0	580	28	87	593	157
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		1 01111	8	1 01111	1 01111	2	1 01111	1	6	1 01111
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		8	8	8	2	2	2	1	6	6
Switch Phase	•						_	_	_			
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0	6.0	10.0	10.0
Minimum Split (s)	11.0	15.0		15.0	15.0	15.0	15.0	15.0	15.0	11.0	15.0	15.0
Total Split (s)	11.0	31.0		20.0	20.0	20.0	39.0	39.0	39.0	11.0	50.0	50.0
Total Split (%)	10.5%	29.5%		19.0%	19.0%	19.0%	37.1%	37.1%	37.1%	10.5%	47.6%	47.6%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	5.0		Lag	Lag	Lag	Lead	Lead	Lead	Lag	5.0	0.0
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	22.3	22.3		13.5	13.5	13.5	O-IVIAX	63.9	63.9	72.7	72.7	72.7
Actuated g/C Ratio	0.21	0.21		0.13	0.13	0.13		0.61	0.61	0.69	0.69	0.69
v/c Ratio	0.42	0.49		0.13	0.13	0.13		0.61	0.01	0.03	0.03	0.03
Control Delay	39.4	33.9		41.8	60.5	6.9		18.4	0.03	8.0	6.9	1.4
Queue Delay	0.0	0.0		0.0	0.0	0.9		0.0	0.0	0.0	0.9	0.5
	39.4	33.9		41.8	60.5	6.9		18.4	0.0	8.0	7.6	1.9
Total Delay LOS	39.4 D	33.9 C		41.0 D	60.5 E	0.9 A		10.4 B	0.0 A	6.0 A	7.0 A	1.9 A
	U	35.5		D	37.9	A		17.6	A	A	6.6	A
Approach LOS												
Approach LOS	40	D		10	100	0		B 261	0	10	A 77	0
Queue Length 50th (ft)	42	90		12	109	0		261	0	19	77 402	0
Queue Length 95th (ft)	83	158		35	181	33		391	0	36	103	21
Internal Link Dist (ft)		180			228			179	450		207	
Turn Bay Length (ft)	100	4.40		400	000	0=0		0=0	150	=00	0.40=	4404
Base Capacity (vph)	186	443		169	266	359		952	1034	502	2427	1134

Lane Group	Ø9		
Lane Configurations	20		
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s) Peak Hour Factor			
Heavy Vehicles (%) Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type Protected Phases	9		
Permitted Phases	ອ 		
Detector Phase			
Switch Phase			
	5.0		
Minimum Initial (s)	24.0		
Minimum Split (s)	24.0		
Total Split (s)	24.0		
Total Split (%) Yellow Time (s)	23%		
	1.0		
All-Red Time (s)	1.0		
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag			
Lead-Lag Optimize?	None		
Recall Mode	None		
Act Effet Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft) Base Capacity (vph)			

3: Walnut St & Salem St

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0	0	0	1431	667
Spillback Cap Reductn	0	0		0	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0		0	0	0	0	0
Reduced v/c Ratio	0.42	0.43		0.12	0.64	0.35		0.61	0.03	0.17	0.60	0.34

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 100

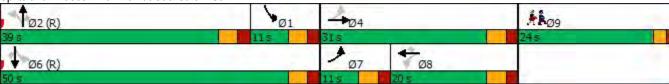
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 18.6 Intersection LOS: B
Intersection Capacity Utilization 78.2% ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Walnut St & Salem St



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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	^	7	*	7		*	^	7	*	f)	
Traffic Volume (vph)	99	159	396	106	232	53	356	122	390	23	134	95
Future Volume (vph)	99	159	396	106	232	53	356	122	390	23	134	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		150	300		250	0		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1787	1881	1599	1770	1801	0	1787	1881	1599	1770	1747	0
Flt Permitted	0.583			0.438			0.295			0.677		
Satd. Flow (perm)	1088	1881	1599	816	1801	0	555	1881	1565	1256	1747	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			421		10				398		26	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		347			512			708			266	
Travel Time (s)		7.9			11.6			16.1			6.0	
Confl. Peds. (#/hr)	5					5			2	2		
Peak Hour Factor	0.94	0.94	0.94	0.99	0.99	0.99	0.98	0.98	0.98	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	105	169	421	107	288	0	363	124	398	30	301	0
Turn Type	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	Free	Perm	NA	
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4		4	8			2		Free	6		
Detector Phase	4	4	4	3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0		10.0	10.0	
Minimum Split (s)	12.0	12.0	12.0	12.0	11.0		12.0	16.0		16.0	16.0	
Total Split (s)	31.0	31.0	31.0	15.0	46.0		25.0	56.0		31.0	31.0	
Total Split (%)	25.0%	25.0%	25.0%	12.1%	37.1%		20.2%	45.2%		25.0%	25.0%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes			Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min		Min	Min	
Act Effct Green (s)	16.5	16.5	16.5	27.1	27.1		46.0	44.9	83.5	19.4	19.4	
Actuated g/C Ratio	0.20	0.20	0.20	0.32	0.32		0.55	0.54	1.00	0.23	0.23	
v/c Ratio	0.49	0.46	0.64	0.29	0.49		0.60	0.12	0.25	0.10	0.71	
Control Delay	40.8	35.7	8.4	22.1	24.4		17.1	12.2	0.4	29.0	38.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	40.8	35.7	8.4	22.1	24.4		17.1	12.2	0.4	29.0	38.4	
LOS	D	D	Α	С	С		В	В	Α	С	D	
Approach Delay		19.9			23.8			8.9			37.6	
Approach LOS		В			C			A			D	
Queue Length 50th (ft)	52	83	0	40	115		107	32	0	13	137	
Queue Length 95th (ft)	108	151	77	80	197		212	75	0	33	204	
Internal Link Dist (ft)		267			432		<u>_</u>	628			186	
Turn Bay Length (ft)							300		250			
									_50			

Lane Group	Ø9	
Lane Configurations	~~	
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	
Minimum Split (s)	22.0	
Total Split (s)	22.0	
Total Split (%)	18%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
- Land Bay Longar (it)		

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	352	609	802	383	924		612	1171	1565	391	562	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.30	0.28	0.52	0.28	0.31		0.59	0.11	0.25	0.08	0.54	
Intersection Summary												

Intersection Summary

Area Type: Other

Cycle Length: 124

Actuated Cycle Length: 83.5

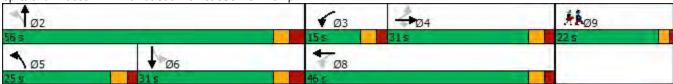
Natural Cycle: 90

Control Type: Semi Act-Uncoord Maximum v/c Ratio: 0.71 Intersection Signal Delay: 18.9

Intersection Signal Delay: 18.9 Intersection LOS: B
Intersection Capacity Utilization 71.1% ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Walnut St & Market St/SB Off-Ramp



Lane Group	Ø9
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Internación Communic	
Intersection Summary	

Synchro 11 Report Page 4 PM Scenario

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*		77					^	7	*	↑	
Traffic Volume (vph)	190	0	537	0	0	0	0	685	171	271	365	0
Future Volume (vph)	190	0	537	0	0	0	0	685	171	271	365	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	300		0
Storage Lanes	1		2	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1787	0	2814	0	0	0	0	1881	1599	1787	1881	0
Flt Permitted	0.950									0.117		
Satd. Flow (perm)	1787	0	2814	0	0	0	0	1881	1562	220	1881	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			548						146			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			800			287			708	
Travel Time (s)		5.6			18.2			6.5			16.1	
Confl. Peds. (#/hr)									2	2		
Peak Hour Factor	0.98	0.98	0.98	0.92	0.92	0.92	0.99	0.99	0.99	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	194	0	548	0	0	0	0	692	173	301	406	0
Turn Type	Prot		Prot					NA	Perm	pm+pt	NA	
Protected Phases	4		4					2		1	6	
Permitted Phases									2	6		
Detector Phase	4		4					2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0		6.0					10.0	10.0	6.0	10.0	
Minimum Split (s)	12.0		12.0					16.0	16.0	12.0	16.0	
Total Split (s)	31.0		31.0					35.0	35.0	15.0	50.0	
Total Split (%)	32.0%		32.0%					36.1%	36.1%	15.5%	51.5%	
Yellow Time (s)	3.0		3.0					3.0	3.0	3.0	3.0	
All-Red Time (s)	3.0		3.0					3.0	3.0	2.0	3.0	
Lost Time Adjust (s)	0.0		0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0					6.0	6.0	5.0	6.0	
Lead/Lag	Lag		Lag					Lag	Lag	Lead		
Lead-Lag Optimize?	Yes		Yes					Yes	Yes	Yes		
Recall Mode	None		None					C-Min	C-Min	None	C-Min	
Act Effct Green (s)	16.4		16.4					41.9	41.9	69.6	68.6	
Actuated g/C Ratio	0.17		0.17					0.43	0.43	0.72	0.71	
v/c Ratio	0.64		0.59					0.85	0.23	0.59	0.31	
Control Delay	46.6		5.6					38.0	5.9	19.5	6.7	
Queue Delay	0.0		0.0					50.8	0.5	0.0	0.0	
Total Delay	46.6		5.6					88.8	6.4	19.5	6.7	
LOS	D		A					F	Α	В	Α	
Approach Delay		16.4						72.3			12.2	
Approach LOS		В						E			В	
Queue Length 50th (ft)	112		0					363	9	88	82	
Queue Length 95th (ft)	171		44					#682	55	187	156	
Internal Link Dist (ft)		166			720			207			628	
Turn Bay Length (ft)					. = •					300	-,,	

Lane Group	Ø3	
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type	•	
Protected Phases	3	
Permitted Phases		
Detector Phase		
Switch Phase	= -	
Minimum Initial (s)	7.0	
Minimum Split (s)	16.0	
Total Split (s)	16.0	
Total Split (%)	16%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Earl Day Longth (it)		

	۶	→	*	1	←	•	1	†	1	1	ļ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	460		1132					813	758	507	1329	
Starvation Cap Reductn	0		0					293	307	0	0	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.42		0.48					1.33	0.38	0.59	0.31	

Intersection Summary

Area Type: Other

Cycle Length: 97

Actuated Cycle Length: 97

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green, Master Intersection

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

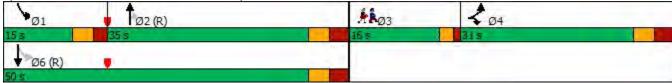
Intersection Signal Delay: 36.0 Intersection LOS: D
Intersection Capacity Utilization 74.1% ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Walnut St & NB Off-Ramp



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Lane Group	Ø3
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
l-t	
Intersection Summary	

Synchro 11 Report Page 8 PM Scenario

	۶	→	*	•	←	•	1	†	~	/	Ţ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	1>		*	^	7		ર્ન	7	*	^	7
Traffic Volume (vph)	111	147	103	24	147	120	55	609	47	124	732	82
Future Volume (vph)	111	147	103	24	147	120	55	609	47	124	732	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		150	0		0
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1737	0	1770	1863	1583	0	1855	1583	1787	3574	1599
Flt Permitted	0.349			0.586				0.871		0.254		
Satd. Flow (perm)	650	1737	0	1088	1863	1561	0	1622	1583	478	3574	1563
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		32				156			156			104
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		260			308			259			287	
Travel Time (s)		5.9			7.0			5.9			6.5	
Confl. Peds. (#/hr)	1	0.0	2	2		1	2	0.0			0.0	2
Peak Hour Factor	0.88	0.88	0.88	0.96	0.96	0.96	0.95	0.95	0.95	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)	270	270	270	270	270	270	270	270	270	1 70	170	170
Lane Group Flow (vph)	126	284	0	25	153	125	0	699	49	144	851	95
Turn Type	pm+pt	NA	· ·	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		1 01111	8	1 01111	1 01111	2	1 01111	1	6	1 01111
Permitted Phases	4	•		8	•	8	2	_	2	6	•	6
Detector Phase	7	4		8	8	8	2	2	2	1	6	6
Switch Phase	•	•					_	_	_	•	•	J
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0	6.0	10.0	10.0
Minimum Split (s)	11.0	15.0		15.0	15.0	15.0	15.0	15.0	15.0	11.0	15.0	15.0
Total Split (s)	11.0	31.0		20.0	20.0	20.0	39.0	39.0	39.0	11.0	50.0	50.0
Total Split (%)	10.5%	29.5%		19.0%	19.0%	19.0%	37.1%	37.1%	37.1%	10.5%	47.6%	47.6%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	5.0		Lag	Lag	Lag	Lead	Lead	Lead	Lag	0.0	0.0
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	24.1	24.1		13.1	13.1	13.1	O-IVIAX	59.9	59.9	70.9	70.9	70.9
Actuated g/C Ratio	0.23	0.23		0.12	0.12	0.12		0.57	0.57	0.68	0.68	0.68
v/c Ratio	0.23	0.23		0.12	0.12	0.12		0.76	0.05	0.36	0.00	0.00
Control Delay	45.7	40.8		43.6	57.4	6.8		24.2	0.03	12.0	8.0	1.3
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	1.9	0.0
Total Delay	45.7	40.8		43.6	57.4	6.8		24.2	0.0	12.0	9.9	1.3
LOS	45.7 D	40.0 D		43.0 D	57.4 E	0.0 A		24.2 C	Α	12.0 B		
	U	42.3		U	35.4	A			A	D	9.4	A
Approach LOS								22.6				
Approach LOS	70	D 151		4.5	D	0		C	0	24	A	0
Queue Length 50th (ft)	70	154		15	99	0		340	0	31	117	0
Queue Length 95th (ft)	118	234		41	165	33		521	0	53	146	13
Internal Link Dist (ft)		180			228			179	450		207	
Turn Bay Length (ft)									150			

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Lane Group	Ø9	
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	
Minimum Split (s)	24.0	
Total Split (s)	24.0	
Total Split (%)	23%	
Yellow Time (s)	2.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
- ,g (···)		

Synchro 11 Report Page 10 PM Scenario

3: Walnut St & Salem St

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	213	454		155	266	356		924	969	397	2412	1088
Starvation Cap Reductn	0	0		0	0	0		0	0	0	1355	0
Spillback Cap Reductn	0	0		0	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0		0	0	0	0	0
Reduced v/c Ratio	0.59	0.63		0.16	0.58	0.35		0.76	0.05	0.36	0.81	0.09

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 120

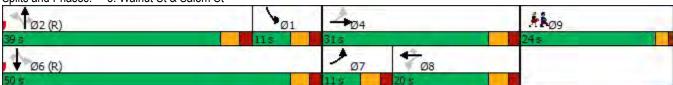
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 21.7 Intersection LOS: C
Intersection Capacity Utilization 94.4% ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 3: Walnut St & Salem St



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APPENDIX G

Summary of Crash Data I-95 Northbound at Exits 57 to 61

Table G-1
Summary of Crash Data 2015–17
I-95 Northbound at Exit 57

	2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
crashes	29	8	21	58	19.3	100%
Property damage only	20	7	16	43	14.3	74%
Non-fatal injury	9	1	5	15	5.0	26%
Fatality	0	0	0	0	0.0	0%
Not reported/unknown	0	0	0	0	0.0	0%
Single vehicle	4	1	3	8	2.7	14%
Rear-end	16	6	14	36	12.0	62%
Angle	4	0	2	6	2.0	10%
Sideswipe, same direction	4	1	0	5	1.7	9%
Sideswipe, opposite direction	0	0	0	0	0.0	0%
Head-on	0	0	0	0	0.0	0%
Rear-to-rear	0	0	0	0	0.0	0%
Not reported/unknown	1	0	2	3	1.0	5%
rian(s)	0	0	0	0	0.0	0%
s)	0	0	0	0	0.0	0%
weekday peak periods*	11	1	7	19	6.3	33%
nent conditions	7	2	3	12	4.0	21%
(lit or unlit)	7	3	4	14	4.7	24%
	Property damage only Non-fatal injury Fatality Not reported/unknown Single vehicle Rear-end Angle Sideswipe, same direction Sideswipe, opposite direction Head-on Rear-to-rear Not reported/unknown rian(s) s) weekday peak periods* nent conditions	crashes29Property damage only20Non-fatal injury9Fatality0Not reported/unknown0Single vehicle4Rear-end16Angle4Sideswipe, same direction4Sideswipe, opposite direction0Head-on0Rear-to-rear0Not reported/unknown1rian(s)0s)0weekday peak periods*11nent conditions7	crashes 29 8 Property damage only 20 7 Non-fatal injury 9 1 Fatality 0 0 Not reported/unknown 0 0 Single vehicle 4 1 Rear-end 16 6 Angle 4 0 Sideswipe, same direction 4 1 Sideswipe, opposite direction 0 0 Head-on 0 0 Rear-to-rear 0 0 Not reported/unknown 1 0 rian(s) 0 0 s) 0 0 weekday peak periods* 11 1 nent conditions 7 2	crashes 29 8 21 Property damage only 20 7 16 Non-fatal injury 9 1 5 Fatality 0 0 0 Not reported/unknown 0 0 0 Single vehicle 4 1 3 Rear-end 16 6 14 Angle 4 0 2 Sideswipe, same direction 4 1 0 Sideswipe, opposite direction 0 0 0 Head-on 0 0 0 0 Rear-to-rear 0 0 0 0 Not reported/unknown 1 0 2 rian(s) 0 0 0 s) 0 0 0 weekday peak periods* 11 1 7 nent conditions 7 2 3	crashes 29 8 21 58 Property damage only 20 7 16 43 Non-fatal injury 9 1 5 15 Fatality 0 0 0 0 Not reported/unknown 0 0 0 0 Single vehicle 4 1 3 8 Rear-end 16 6 14 36 Angle 4 0 2 6 Sideswipe, same direction 4 1 0 5 Sideswipe, opposite direction 0 0 0 0 Head-on 0 0 0 0 0 Rear-to-rear 0 0 0 0 0 Not reported/unknown 1 0 2 3 rian(s) 0 0 0 0 s) 0 0 0 0 weekday peak periods* 11 1 7<	crashes 29 8 21 58 19.3 Property damage only 20 7 16 43 14.3 Non-fatal injury 9 1 5 15 5.0 Fatality 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 Single vehicle 4 1 3 8 2.7 Rear-end 16 6 14 36 12.0 Angle 4 0 2 6 2.0 Sideswipe, same direction 4 1 0 5 1.7 Sideswipe, opposite direction 0 0 0 0 0 0 Head-on 0 0 0 0 0 0 0 Not reported/unknown 1 0 2 3 1.0 rian(s) 0 0 0 0 0 0

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table G-2 Summary of Crash Data 2015–17 I-95 Northbound at Exit 58

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
Total number of	crashes	17	19	16	52	17.3	100%
Severity	Property damage only	10	11	11	32	10.7	62%
	Non-fatal injury	7	8	5	20	6.7	38%
	Fatality	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	1	8	5	14	4.7	27%
	Rear-end	14	7	8	29	9.7	56%
	Angle	0	2	2	4	1.3	8%
	Sideswipe, same direction	2	2	0	4	1.3	8%
	Sideswipe, opposite direction	0	0	0	0	0.0	0%
	Head-on	0	0	0	0	0.0	0%
	Rear-to-rear	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	1	1	0.3	2%
Involved pedest	rian(s)	0	0	0	0	0.0	0%
Involved cyclist((s)	0	0	0	0	0.0	0%
Occurred during	weekday peak periods*	8	8	5	21	7.0	40%
Wet or icy paver		1	3	2	6	2.0	12%
Dark conditions		4	6	6	16	5.3	31%

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table G-3
Summary of Crash Data 2015–17
I-95 Northbound at Exit 59

7 3	9	13	20		
3		13	29		100%
	9	10	22	7.3	76%
4	0	3	7	2.3	24%
0	0	0	0	0.0	0%
0	0	0	0	0.0	0%
4	2	3	9	3.0	31%
2	5	7	14	4.7	48%
0	0	0	0	0.0	0%
1	1	2	4	1.3	14%
0	0	1	1	0.3	3%
0	0	0	0	0.0	0%
0	0	0	0	0.0	0%
0	1	0	1	0.3	3%
0	0	0	0	0.0	0%
0	0	0	0	0.0	0%
2	5	7	14	4.7	48%
2	2	2	6	2.0	21%
5	5	2	12	4 0	41%
_	0 1 0 0 0 0 0 0 2 2	0 0 2 5 2 2	0 0 0 0 0 0 2 5 7 2 2 2	0 0 0 0 1 1 2 4 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 7 14 2 2 2 6	0 0 0 0.0 1 1 2 4 1.3 0 0 1 1 0.3 0 0 0 0 0.0 0 0 0 0 0.0 0 0 0 0 0.0 0 0 0 0 0.0 2 5 7 14 4.7 2 2 6 2.0

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table G-4
Summary of Crash Data 2015–17
I-95 Northbound at Exit 60

Statistics Period	1	2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
Total number of	crashes	17	8	15	40	13.3	100%
Severity	Property damage only	8	7	11	26	8.7	65%
	Non-fatal injury	8	1	4	13	4.3	33%
	Fatality	1	0	0	1	0.3	3%
	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	5	4	1	10	3.3	25%
	Rear-end	9	1	11	21	7.0	53%
	Angle	1	0	0	1	0.3	3%
	Sideswipe, same direction	1	3	3	7	2.3	18%
	Sideswipe, opposite direction	0	0	0	0	0.0	0%
	Head-on	0	0	0	0	0.0	0%
	Rear-to-rear	1	0	0	1	0.3	3%
	Not reported/unknown	0	0	0	0	0.0	0%
Involved pedest	rian(s)	0	0	0	0	0.0	0%
Involved cyclist	(s)	0	0	0	0	0.0	0%
Occurred during	weekday peak periods*	9	4	9	22	7.3	55%
Wet or icy paver		2	2	3	7	2.3	18%
Dark conditions		8	5	6	19	6.3	48%
* Dook poriodo or	es defined as OC:00 10:00 AM and 0	20 C.20 DN4					

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table G-5
Summary of Crash Data 2015–17
I-95 Northbound at Exit 61

	2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
crashes	13	3	12	28	9.3	100%
Property damage only	11	3	9	23	7.7	82%
Non-fatal injury	2	0	3	5	1.7	18%
Fatality	0	0	0	0	0.0	0%
Not reported/unknown	0	0	0	0	0.0	0%
Single vehicle	4	0	1	5	1.7	18%
Rear-end	6	3	10	19	6.3	68%
Angle	1	0	0	1	0.3	4%
Sideswipe, same direction	2	0	0	2	0.7	7%
Sideswipe, opposite direction	0	0	1	1	0.3	4%
Head-on	0	0	0	0	0.0	0%
Rear-to-rear	0	0	0	0	0.0	0%
Not reported/unknown	0	0	0	0	0.0	0%
rian(s)	0	0	0	0	0.0	0%
(s)	0	0	0	0	0.0	0%
weekday peak periods*	8	1	7	16	5.3	57%
nent conditions	1	0	0	1	0.3	4%
(lit or unlit)	6	0	1	7	2.3	25%
	Crashes Property damage only Non-fatal injury Fatality Not reported/unknown Single vehicle Rear-end Angle Sideswipe, same direction Sideswipe, opposite direction Head-on Rear-to-rear Not reported/unknown rian(s) s) weekday peak periods* nent conditions (lit or unlit)	crashes13Property damage only11Non-fatal injury2Fatality0Not reported/unknown0Single vehicle4Rear-end6Angle1Sideswipe, same direction2Sideswipe, opposite direction0Head-on0Rear-to-rear0Not reported/unknown0rian(s)0s)0weekday peak periods*8nent conditions1	crashes 13 3 Property damage only 11 3 Non-fatal injury 2 0 Fatality 0 0 Not reported/unknown 0 0 Single vehicle 4 0 Rear-end 6 3 Angle 1 0 Sideswipe, same direction 2 0 Sideswipe, opposite direction 0 0 Head-on 0 0 Rear-to-rear 0 0 Not reported/unknown 0 0 rian(s) 0 0 s) 0 0 weekday peak periods* 8 1 nent conditions 1 0 (lit or unlit) 6 0	crashes 13 3 12 Property damage only 11 3 9 Non-fatal injury 2 0 3 Fatality 0 0 0 Not reported/unknown 0 0 0 Single vehicle 4 0 1 Rear-end 6 3 10 Angle 1 0 0 Sideswipe, same direction 2 0 0 Sideswipe, opposite direction 0 0 1 Head-on 0 0 0 0 Rear-to-rear 0 0 0 0 Not reported/unknown 0 0 0 0 rian(s) 0 0 0 0 weekday peak periods* 8 1 7 nent conditions 1 0 0 (lit or unlit) 6 0 1	crashes 13 3 12 28 Property damage only 11 3 9 23 Non-fatal injury 2 0 3 5 Fatality 0 0 0 0 Not reported/unknown 0 0 0 0 Single vehicle 4 0 1 5 Rear-end 6 3 10 19 Angle 1 0 0 1 Angle 1 0 0 1 Sideswipe, same direction 2 0 0 2 Sideswipe, opposite direction 0 0 1 1 Head-on 0 0 0 0 0 Rear-to-rear 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 s) 0 0 0 0 0 weekday peak periods* 8	crashes 13 3 12 28 9.3 Property damage only 11 3 9 23 7.7 Non-fatal injury 2 0 3 5 1.7 Fatality 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 Single vehicle 4 0 1 5 1.7 Rear-end 6 3 10 19 6.3 Angle 1 0 0 1 0.3 Sideswipe, same direction 2 0 0 2 0.7 Sideswipe, opposite direction 0 0 1 1 0.3 Head-on 0 0 0 0 0 0 Rear-to-rear 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 <t< td=""></t<>

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

APPENDIX H

Summary of Crash Data I-95 Southbound at Exits 57 to 61

Table H-1
Summary of Crash Data 2015–17
I-95 Southbound at Exit 57

	2015	2016	2017	3-Yr. Total	Annual Avg.	Percetage
crashes	22	14	23	59	19.7	100%
Property damage only	14	10	17	41	13.7	69%
Non-fatal injury	8	4	6	18	6.0	31%
Fatality	0	0	0	0	0.0	0%
Not reported/unknown	0	0	0	0	0.0	0%
Single vehicle	2	3	3	8	2.7	14%
Rear-end	14	8	16	38	12.7	64%
Angle	4	0	0	4	1.3	7%
Sideswipe, same direction	1	3	4	8	2.7	14%
Sideswipe, opposite direction	0	0	0	0	0.0	0%
Head-on	1	0	0	1	0.3	2%
Rear-to-rear	0	0	0	0	0.0	0%
Not reported/unknown	0	0	0	0	0.0	0%
rian(s)	1	0	0	1	0.3	2%
s)	0	0	0	0	0.0	0%
weekday peak periods*	11	6	6	23	7.7	39%
nent conditions	2	1	7	10	3.3	17%
(lit or unlit)	7	3	3	13	4.3	22%
	Property damage only Non-fatal injury Fatality Not reported/unknown Single vehicle Rear-end Angle Sideswipe, same direction Sideswipe, opposite direction Head-on Rear-to-rear Not reported/unknown rian(s) s) weekday peak periods* nent conditions (lit or unlit)	Property damage only Non-fatal injury Fatality Not reported/unknown Single vehicle Rear-end Angle Sideswipe, same direction Sideswipe, opposite direction Head-on Rear-to-rear Not reported/unknown Tian(s) Sideswipe ak periods* Thent conditions 2 (lit or unlit) 1 1 1 1 1 1 1 1 1 1 1 1 1	Property damage only 14 10 Non-fatal injury 8 4 Fatality 0 0 Not reported/unknown 0 0 Single vehicle 2 3 Rear-end 14 8 Angle 4 0 Sideswipe, same direction 1 3 Sideswipe, opposite direction 0 0 Head-on 1 0 Rear-to-rear 0 0 Not reported/unknown 0 0 rian(s) 1 0 s) 0 0 weekday peak periods* 11 6 nent conditions 2 1	Property damage only 14 10 17 Non-fatal injury 8 4 6 Fatality 0 0 0 Not reported/unknown 0 0 0 Single vehicle 2 3 3 Rear-end 14 8 16 Angle 4 0 0 Sideswipe, same direction 1 3 4 Sideswipe, opposite direction 0 0 0 Head-on 1 0 0 Rear-to-rear 0 0 0 Not reported/unknown 0 0 0 Sian(s) 1 0 0 Answer 1 0 0 Sian(s) 1 0 0	Property damage only 14 10 17 41 Non-fatal injury 8 4 6 18 Fatality 0 0 0 0 Not reported/unknown 0 0 0 0 Single vehicle 2 3 3 8 Rear-end 14 8 16 38 Angle 4 0 0 4 Sideswipe, same direction 1 3 4 8 Sideswipe, opposite direction 0 0 0 0 Head-on 1 0 0 0 Not reported/unknown 0 0 0 0 Not reported/unknown 0 0 0 0 s) 0 0 0 0 s) 0 0 0 0 veekday peak periods* 11 6 6 23 nent conditions 2 1 7 10	Property damage only 14 10 17 41 13.7 Non-fatal injury 8 4 6 18 6.0 Fatality 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 Single vehicle 2 3 3 8 2.7 Rear-end 14 8 16 38 12.7 Angle 4 0 0 4 1.3 Sideswipe, same direction 1 3 4 8 2.7 Sideswipe, opposite direction 0 0 0 0 0 0 0 Head-on 1 0 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 0 0 rian(s) 1 0 0 0 0 0 0 0 0

^{*} Peak periods are defined as 6:00–10:00 AM and 2:30–6:30 PM.

Table H-2 Summary of Crash Data 2015–17 I-95 Southbound at Exit 58

Statistics Period	d	2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
Total number of	crashes	9	15	15	39	13.0	100%
Severity	Property damage only	9	12	11	32	10.7	82%
	Non-fatal injury	0	3	4	7	2.3	18%
	Fatality	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	1	1	5	7	2.3	18%
	Rear-end	5	12	7	24	8.0	62%
	Angle	2	1	0	3	1.0	8%
	Sideswipe, same direction	1	1	3	5	1.7	13%
	Sideswipe, opposite direction	0	0	0	0	0.0	0%
	Head-on	0	0	0	0	0.0	0%
	Rear-to-rear	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	0	0	0.0	0%
Involved pedest	rian(s)	0	0	0	0	0.0	0%
Involved cyclist		0	0	0	0	0.0	0%
Occurred during	y weekday peak periods*	3	8	8	19	6.3	49%
Wet or icy pavei		2	1	1	4	1.3	10%
Dark conditions		3	3	4	10	3.3	26%

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table H-3
Summary of Crash Data 2015–17
I-95 Southbound at Exit 59

	2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
crashes	14	20	12	46	15.3	100%
Property damage only	12	11	9	32	10.7	70%
Non-fatal injury	2	9	3	14	4.7	30%
Fatality	0	0	0	0	0.0	0%
Not reported/unknown	0	0	0	0	0.0	0%
Single vehicle	2	2	0	4	1.3	9%
Rear-end	12	17	8	37	12.3	80%
Angle	0	0	1	1	0.3	2%
Sideswipe, same direction	0	1	2	3	1.0	7%
Sideswipe, opposite direction	0	0	0	0	0.0	0%
Head-on	0	0	0	0	0.0	0%
Rear-to-rear	0	0	0	0	0.0	0%
Not reported/unknown	0	0	1	1	0.3	2%
rian(s)	0	0	0	0	0.0	0%
Involved cyclist(s)		0	0	0	0.0	0%
Occurred during weekday peak periods*		10	5	23	7.7	50%
nent conditions	2	1	3	6	2.0	13%
Dark conditions (lit or unlit)		5	2	10	3.3	22%
	Property damage only Non-fatal injury Fatality Not reported/unknown Single vehicle Rear-end Angle Sideswipe, same direction Sideswipe, opposite direction Head-on Rear-to-rear Not reported/unknown rian(s) s) weekday peak periods* nent conditions	crashes14Property damage only12Non-fatal injury2Fatality0Not reported/unknown0Single vehicle2Rear-end12Angle0Sideswipe, same direction0Sideswipe, opposite direction0Head-on0Rear-to-rear0Not reported/unknown0rian(s)0s)0weekday peak periods*8nent conditions2	crashes 14 20 Property damage only 12 11 Non-fatal injury 2 9 Fatality 0 0 Not reported/unknown 0 0 Single vehicle 2 2 Rear-end 12 17 Angle 0 0 Sideswipe, same direction 0 1 Sideswipe, opposite direction 0 0 Head-on 0 0 Rear-to-rear 0 0 Not reported/unknown 0 0 rian(s) 0 0 s) 0 0 weekday peak periods* 8 10 nent conditions 2 1	crashes 14 20 12 Property damage only 12 11 9 Non-fatal injury 2 9 3 Fatality 0 0 0 Not reported/unknown 0 0 0 Single vehicle 2 2 2 0 Rear-end 12 17 8 Angle 0 0 1 2 Sideswipe, same direction 0 1 2 2 Sideswipe, opposite direction 0 0 0 0 Head-on 0 0 0 0 Rear-to-rear 0 0 0 0 Not reported/unknown 0 0 0 0 Vian(s) 0 0 0 0 Image: Properties of the conditions 0 0 0 Not reported/unknown 0 0 0 0 Image: Properties of the conditions 0 0 <	crashes 14 20 12 46 Property damage only 12 11 9 32 Non-fatal injury 2 9 3 14 Fatality 0 0 0 0 Not reported/unknown 0 0 0 0 Single vehicle 2 2 2 0 4 Rear-end 12 17 8 37 Angle 0 0 1 1 Sideswipe, same direction 0 1 2 3 Sideswipe, opposite direction 0 0 0 0 Head-on 0 0 0 0 0 Rear-to-rear 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 s) 0 0 0 0 0	crashes 14 20 12 46 15.3 Property damage only 12 11 9 32 10.7 Non-fatal injury 2 9 3 14 4.7 Fatality 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 Single vehicle 2 2 2 0 4 1.3 Rear-end 12 17 8 37 12.3 Angle 0 0 1 1 0.3 Sideswipe, same direction 0 1 2 3 1.0 Sideswipe, opposite direction 0 0 0 0 0 0 Head-on 0 0 0 0 0 0 0 Not reported/unknown 0 0 0 0 0 0 0 Not reported/unknown 0 0 0

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table H-4
Summary of Crash Data 2015–17
I-95 Southbound at Exit 60

Statistics Period Total number of crashes		2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
		17	15	19	51	17.0	100%
Severity	Property damage only	13	12	16	41	13.7	80%
	Non-fatal injury	4	3	3	10	3.3	20%
	Fatality	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	3	5	3	11	3.7	22%
	Rear-end	14	7	13	34	11.3	67%
	Angle	0	0	3	3	1.0	6%
	Sideswipe, same direction	0	3	0	3	1.0	6%
	Sideswipe, opposite direction	0	0	0	0	0.0	0%
	Head-on	0	0	0	0	0.0	0%
	Rear-to-rear	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	0	0	0.0	0%
Involved pedest	rian(s)	0	0	0	0	0.0	0%
Involved cyclist(s)		0	0	0	0	0.0	0%
Occurred during weekday peak periods*		7	11	10	28	9.3	55%
Wet or icy pavement conditions		3	2	2	7	2.3	14%
Dark conditions	(lit or unlit)	5	2	5	12	4.0	24%

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

Table H-5
Summary of Crash Data 2015–17
I-95 Southbound at Exit 61

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.	Percentage
Total number of crashes		23	14	25	62	20.7	100%
Severity	Property damage only	20	9	22	51	17.0	82%
	Non-fatal injury	3	5	3	11	3.7	18%
	Fatality	0	0	0	0	0.0	0%
	Not reported/unknown	0	0	0	0	0.0	0%
Collision type	Single vehicle	3	4	3	10	3.3	16%
	Rear-end	17	8	16	41	13.7	66%
	Angle	2	1	0	3	1.0	5%
	Sideswipe, same direction	1	1	5	7	2.3	11%
	Sideswipe, opposite direction	0	0	0	0	0.0	0%
	Head-on	0	0	0	0	0.0	0%
	Rear-to-rear	0	0	1	1	0.3	2%
	Not reported/unknown	0	0	0	0	0.0	0%
Involved pedest	rian(s)	0	0	0	0	0.0	0%
Involved cyclist((s)	0	0	0	0	0.0	0%
Occurred during weekday peak periods*		10	4	12	26	8.7	42%
Wet or icy pavement conditions		4	1	6	11	3.7	18%
Dark conditions (lit or unlit)		9	4	5	18	6.0	29%

^{*} Peak periods are defined as 06:00–10:00 AM and 2:30–6:30 PM.

APPENDIX I

Highway Capacity Analyses AM Peak Hour: 2030 No-Build Scenario

	ŀ	HCS7 Freeway	Diverge Report		
Project Information					
Analyst	Chen-Yuan	Wang	Date	1/18/2022	
Agency	CTPS		Analysis Year	2030	
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00
Project Description	I-95 NB Ex	57 Diverge - 2030 AM	Unit	United Sta	tes Customary
Geometric Data					
			Freeway	Ramp	
Number of Lanes (N), In			3	1	
Free-Flow Speed (FFS), mi/h			71.1	35.0	
Segment Length (L) / Deceleration I	Length (LA),	ft	1500	600	
Terrain Type			Level	Level	
Percent Grade, %			-	-	
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane
Adjustment Factors					
Driver Population			Mostly Familiar	Mostly Fan	niliar
Weather Type			Non-Severe Weather	Non-Sever	e Weather
Incident Type			No Incident	-	
Final Speed Adjustment Factor (SAF	·)		0.925	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.070		
Demand and Capacity					
Demand Volume (Vi)			5150	500	
Peak Hour Factor (PHF)			0.94 0.94		
Total Trucks, %			5.50	0 3.50	
Single-Unit Trucks (SUT), %			-	-	
Tractor-Trailers (TT), %			-	-	
Heavy Vehicle Adjustment Factor (fi	HV)		0.948	0.966	
Flow Rate (vi),pc/h			6183	589	
Capacity (c), pc/h			6824	1936	
Volume-to-Capacity Ratio (v/c)			0.91	0.30	
Speed and Density					
Upstream Equilibrium Distance (LEC), ft	1923.1	Number of Outer Lanes on F	reeway (No)	1
Distance to Upstream Ramp (LUP), f	t	3600	Speed Index (Ds)		0.493
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2		2361
Distance to Downstream Ramp (LDC	OWN), ft	1750	Off-Ramp Influence Area Speed (SR), mi/h 5		54.1
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFD)	0.578	Outer Lanes Freeway Speed (SO), mi/h 66.9		66.9
Flow in Lanes 1 and 2 (v12), pc/h		3822	Ramp Junction Speed (S), mi	i/h	58.4
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/l	n	35.3
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 31.7		

Chen-Yuan Wang	Date	T
-	Date	Т
CTPS		1/18/2021
	Analysis Year	2030
MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
I-95 NB Ex57 Basic Fwy - 2030 AM	Unit	United States Customary
3	Terrain Type	Level
-	Percent Grade, %	-
Base	Grade Length, mi	-
75.0	Total Ramp Density (TRD), ramps/mi	1.25
12	Free-Flow Speed (FFS), mi/h	71.1
10		
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
No Incident	Demand Adjustment Factor (DAF)	1.070
4650	Heavy Vehicle Adjustment Factor (fHV)	0.948
0.94	Flow Rate (Vp), pc/h/ln	1861
5.50	Capacity (c), pc/h/ln	2358
-	Adjusted Capacity (cadj), pc/h/ln	2283
-	Volume-to-Capacity Ratio (v/c)	0.82
2.000		
0.0	Average Speed (S), mi/h	60.8
0.0	Density (D), pc/mi/ln	30.6
3.9	Level of Service (LOS)	D
65.8		
	I-95 NB Ex57 Basic Fwy - 2030 AM	I-95 NB Ex57 Basic Fwy - 2030 AM Terrain Type Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) 4650 Heavy Vehicle Adjustment Factor (fHv) 0.94 Flow Rate (Vp), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 1.0 Level of Service (LOS)

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	HCS7 Freeway	Merge Report		
Project Information				
Analyst Chen-Yu	an Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2030	
Jurisdiction MassDO	Γ District 4	Time Period Analyzed	AM Peak H	lour 5:00-6:00
Project Description I-95 NB B	x57 Merge - 2030 AM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.1	35.0	
Segment Length (L) / Acceleration Length (LA	x),ft	1500	650	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors			·	
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Sever	e Weather
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)		0.925	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.070	1.070	
Demand and Capacity				
Demand Volume (Vi)		4650	350	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		5.50	3.50	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966	
Flow Rate (vi),pc/h		5584	412	
Capacity (c), pc/h		6824	1936	
Volume-to-Capacity Ratio (v/c)		0.88	0.21	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	952.9	Number of Outer Lanes on Freeway (No)		1
Distance to Upstream Ramp (LUP), ft	1750	Speed Index (Ms)		0.701
Downstream Equilibrium Distance (LEQ), ft	3917.7	Flow Outer Lanes (vOA), pc/h/ln		1307
Distance to Downstream Ramp (LDOWN), ft		On-Ramp Influence Area Speed (SR), mi/h		49.1
	850	On-Ramp Influence Area Speed (S	R), mi/n 	45.1
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	850 0.766	On-Ramp Influence Area Speed (SO), r		62.9
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Flow in Lanes 1 and 2 (v12), pc/h				
<u> </u>	0.766	Outer Lanes Freeway Speed (SO), r		62.9

		HCS7 Freeway	Diverge Report		
Project Information					
Analyst	Chen-Yuar	n Wang	Date	1/18/2022	
Agency	CTPS		Analysis Year	2030	
Jurisdiction	MassDOT	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00
Project Description	I-95 NB Ex	58 Diverge - 2030 AM	Unit	United Sta	tes Customary
Geometric Data					
			Freeway	Ramp	
Number of Lanes (N), In			3	1	
Free-Flow Speed (FFS), mi/h			71.1	35.0	
Segment Length (L) / Deceleration	Length (LA)	,ft	1500	350	
Terrain Type			Level	Level	
Percent Grade, %			-	-	
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane
Adjustment Factors					
Driver Population			Mostly Familiar	Mostly Fan	niliar
Weather Type			Non-Severe Weather	Non-Sever	e Weather
Incident Type			No Incident	-	
Final Speed Adjustment Factor (SAF)		0.925	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070	
Demand and Capacity				·	
Demand Volume (Vi)			5000	350	
Peak Hour Factor (PHF)			0.94	0.94	
Total Trucks, %			5.50	3.50	
Single-Unit Trucks (SUT), %			-	-	
Tractor-Trailers (TT), %			-	-	
Heavy Vehicle Adjustment Factor (fi	HV)		0.948	0.966	
Flow Rate (vi),pc/h			6004	412	
Capacity (c), pc/h			6824	1936	
Volume-to-Capacity Ratio (v/c)			0.88	0.21	
Speed and Density				·	
Upstream Equilibrium Distance (LEC), ft	2125.8	Number of Outer Lanes on	Freeway (No)	1
Distance to Upstream Ramp (LUP), f	t	850	Speed Index (Ds)		0.477
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2287
Distance to Downstream Ramp (LDC	OWN), ft	2300	Off-Ramp Influence Area Speed (SR), mi/h		54.4
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFD)	0.591	Outer Lanes Freeway Speed	l (So), mi/h	67.2
Flow in Lanes 1 and 2 (v12), pc/h		3717	Ramp Junction Speed (S), m	ni/h	58.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln 34.1		34.1
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	33.1
Converget © 2022 University of Florida, All I	o' - l- t - D	LICCEM F	rays Version 7.9	C -	nerated: 02/17/2022 1/:58:5

	HCS7 Basic Fi	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex58 Basic Fwy - 2030 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070
Demand and Capacity			
Demand Volume veh/h	4650	Heavy Vehicle Adjustment Factor (fHV)	0.948
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1861
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2358
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.82
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	60.8
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	30.6
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8		

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		HCS7 Freeway	Merge Report		
Project Information					
Analyst	Chen-Yuan	ı Wang	Date	1/18/2022	
Agency	CTPS		Analysis Year	2030	
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak F	lour 6:00-7:00
Project Description	I-95 NB Ex	58 Merge - 2030 AM	Unit	United Sta	tes Customary
Geometric Data					
			Freeway	Ramp	
Number of Lanes (N), In			3	1	
Free-Flow Speed (FFS), mi/h			71.4	35.0	
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	750	
Terrain Type			Level	Level	
Percent Grade, %			-	-	
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane
Adjustment Factors					
Driver Population			Mostly Familiar	Mostly Fan	niliar
Weather Type			Non-Severe Weather	Non-Sever	e Weather
Incident Type			No Incident	-	
Final Speed Adjustment Factor (SAF)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070	
Demand and Capacity					
Demand Volume (Vi)			4650	800	
Peak Hour Factor (PHF)			0.94	0.94	
Total Trucks, %			5.50	3.50	
Single-Unit Trucks (SUT), %			-	-	
Tractor-Trailers (TT), %			-	-	
Heavy Vehicle Adjustment Factor (f	IV)		0.948	0.966	
Flow Rate (vi),pc/h			5584	943	
Capacity (c), pc/h			6824	1936	
Volume-to-Capacity Ratio (v/c)			0.96	0.49	
Speed and Density					
Upstream Equilibrium Distance (LEQ)), ft	1110.9	Number of Outer Lanes on Freeway (No)		1
Distance to Upstream Ramp (LUP), ft		2300	Speed Index (Ms)		0.552
Downstream Equilibrium Distance (L	.EQ), ft	1449.9	Flow Outer Lanes (vOA), pc/h/ln		2245
Distance to Downstream Ramp (LDC	wn), ft	1500	On-Ramp Influence Area Speed (SR), mi/h		53.6
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFM)	0.598	Outer Lanes Freeway Speed (Sc	O), mi/h	61.5
Flow in Lanes 1 and 2 (v12), pc/h		3339	Ramp Junction Speed (S), mi/h		56.1
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	4282	Average Density (D), pc/mi/ln 38.8		38.8
Level of Service (LOS)		D	Density in Ramp Influence Area	(DR), pc/mi/ln	33.8

	HCS7 Freeway	Diverge Report		
Project Information				
Analyst Chen-Yua	an Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2030	
Jurisdiction MassDOT	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00
Project Description I-95 NB E	x59 Diverge - 2030 AM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.4	30.0	
Segment Length (L) / Deceleration Length (LA	x),ft	1500	775	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors				
Driver Population		Mostly Familiar	Mostly Far	niliar
Weather Type		Non-Severe Weather	Non-Sever	e Weather
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)		0.950	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.070	1.070	
Demand and Capacity				
Demand Volume (Vi)		5450	250	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		5.50	3.50	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966	
Flow Rate (vi),pc/h		6545	295	
Capacity (c), pc/h		6824	1839	
Volume-to-Capacity Ratio (v/c)		0.96	0.16	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	4338.4	Number of Outer Lanes on Freeway (NO)		1
Distance to Upstream Ramp (LUP), ft	1500	Speed Index (Ds)		0.530
Downstream Equilibrium Distance (LEQ), ft	<u> </u>	Flow Outer Lanes (vOA), pc/h/ln		2606
Distance to Downstream Ramp (LDOWN), ft	1125	Off-Ramp Influence Area Speed (SR), mi/h		54.1
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	0.583	Outer Lanes Freeway Speed (SO), mi/h 68		68.1
Flow in Lanes 1 and 2 (v12), pc/h	3939	Ramp Junction Speed (S), mi/h 58.9		58.9
EL E : D (A / - :-) /		Average Density (D), pc/mi/ln 37.0		
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln		37.0

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex59 Basic Fwy - 2030 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070
Demand and Capacity			
Demand Volume veh/h	5200	Heavy Vehicle Adjustment Factor (fHV)	0.948
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2081
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2396
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2319
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.90
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	58.1
Right-Side Lateral Clearance Adj. (frlc)	0.0	Density (D), pc/mi/ln	35.8
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFSadj), mi/h	69.6		
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		HCS7 Freeway	Merge Report		
Project Information					
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022	
Agency	CTPS		Analysis Year	2030	
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00
Project Description	I-95 NB Ex	59 Merge - 2030 AM	Unit	United Sta	tes Customary
Geometric Data					
			Freeway	Ramp	
Number of Lanes (N), In			3	1	
Free-Flow Speed (FFS), mi/h			71.4	35.0	
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	650	
Terrain Type			Level	Level	
Percent Grade, %			-	-	
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane
Adjustment Factors				•	
Driver Population			Mostly Familiar	Mostly Fan	niliar
Weather Type			Non-Severe Weather	Non-Sever	e Weather
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070	
Demand and Capacity				·	
Demand Volume (Vi)			5200	200	
Peak Hour Factor (PHF)			0.94	0.94	
Total Trucks, %			5.50	3.50	
Single-Unit Trucks (SUT), %			-	-	
Tractor-Trailers (TT), %			-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.948	0.966	
Flow Rate (vi),pc/h			6244	236	
Capacity (c), pc/h			6824	1936	
Volume-to-Capacity Ratio (v/c)			0.95	0.12	
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	1056.4	Number of Outer Lanes on Freeway (No)		1
Distance to Upstream Ramp (LUP), fi	t	1125	Speed Index (Ms)		0.481
Downstream Equilibrium Distance (I	LEQ), ft	2712.3	Flow Outer Lanes (vOA), pc/h/ln		2523
Distance to Downstream Ramp (LDC	OWN), ft	4900	On-Ramp Influence Area Speed (SR), mi/h		56.3
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFM)	0.596	Outer Lanes Freeway Speed (SO), mi/h		61.7
Flow in Lanes 1 and 2 (v12), pc/h		3721	Ramp Junction Speed (S), m	ni/h	58.3
Flow Entering Ramp-Infl. Area (vR12)), pc/h	3957	Average Density (D), pc/mi/ln 37.0		37.0
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	32.2

	HCS7 Basic Fr	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex59-60 Basic Fwy - 2030 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070
Demand and Capacity			
Demand Volume veh/h	5400	Heavy Vehicle Adjustment Factor (fHV)	0.948
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2161
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.93
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	56.3
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	38.4
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	Е
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		

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	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/202	2	
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak	Hour 6:00-7:00	
Project Description	I-95 NB Exe	50 Diverge - 2030 AM	Unit	United St	ates Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1	1	
Free-Flow Speed (FFS), mi/h			71.8	30.0	30.0	
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	200		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Sid	ed One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fa	miliar	
Weather Type			Non-Severe Weather	Non-Seve	ere Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)		1.070	1.070			
Demand and Capacity						
Demand Volume (Vi)			5400	450		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %						
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	ŀV)		0.948	0.966	966	
Flow Rate (vi),pc/h			6484	531		
Capacity (c), pc/h			6970	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.93	0.29		
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	1201.3	Number of Outer Lanes or	n Freeway (No)	1	
Distance to Upstream Ramp (LUP), fi	t	4900	Speed Index (Ds) 0.551		0.551	
Downstream Equilibrium Distance (l	LEQ), ft	-	Flow Outer Lanes (voa), po	c/h/ln	2542	
Distance to Downstream Ramp (LDC	OWN), ft	1200	Off-Ramp Influence Area S	Speed (SR), mi/h	54.6	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.573	Outer Lanes Freeway Spee	ed (SO), mi/h	70.8	
Flow in Lanes 1 and 2 (v12), pc/h		3942	Ramp Junction Speed (S),	mi/h	60.0	
Flow Entering Ramp-Infl. Area (vR12)), pc/h	-	Average Density (D), pc/m	ni/ln	36.0	
Level of Service (LOS)		Е	Density in Ramp Influence	Area (DR), pc/mi/lr	36.4	

	HCS7 Basic Freeway Report				
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2030		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 NB Ex60 Basic Fwy - 2030 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070		
Demand and Capacity					
Demand Volume veh/h	4950	Heavy Vehicle Adjustment Factor (fHV)	0.948		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	1981		
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2400		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.85		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	60.6		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	32.7		
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0				
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	ŀ	HCS7 Freeway	Merge Report			
Project Information						
Analyst Ch	hen-Yuan \	Wang	Date	1/18/2022	2	
Agency CT	TPS		Analysis Year	2030		
Jurisdiction Ma	lassDOT Di	strict 4	Time Period Analyzed	AM Peak	Hour 6:00-7:00	
Project Description I-9	95 NB Ex60) Merge - 2030 AM	Unit	United St	ates Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1	1	
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Acceleration Length	ngth (LA),ft		1500	625		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	ed One-Lane	
Adjustment Factors				•		
Driver Population			Mostly Familiar	Mostly Fa	miliar	
Weather Type			Non-Severe Weather	Non-Seve	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)		1.070	1.070			
Demand and Capacity				·		
Demand Volume (Vi)			5250	300		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fHV))		0.948	0.966		
Flow Rate (vi),pc/h			6304	354	354	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.96	0.18		
Speed and Density						
Upstream Equilibrium Distance (LEQ), fl	ft	1083.4	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), ft		1200	Speed Index (Ms) 0.598		0.598	
Downstream Equilibrium Distance (LEQ	Q), ft 3	3059.3	Flow Outer Lanes (vOA), pc,	/h/ln	2251	
Distance to Downstream Ramp (LDOWN	'N), ft	1500	On-Ramp Influence Area S	peed (SR), mi/h	53.3	
Prop. Freeway Vehicles in Lane 1 and 2	2 (PFM)	0.643	Outer Lanes Freeway Speed	d (So), mi/h	63.7	
Flow in Lanes 1 and 2 (v12), pc/h		4053	Ramp Junction Speed (S), r	ni/h	56.4	
Flow Entering Ramp-Infl. Area (vR12), p			Average Density (D), pc/mi/ln 39.3			
Tiow Littering Kamp-IIII. Area (VK12), p	oc/h	4407	Average Density (D), pc/mi	/In 	39.3	

	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Exe	61 Diverge - 2030 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1	1	
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	450		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF))		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			5250	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	2.50		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	IV)		0.948	0.976		
Flow Rate (vi),pc/h			6304	583		
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.90	0.30	0.30	
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	1886.8	Number of Outer Lanes on Fre	eeway (No)	1	
Distance to Upstream Ramp (LUP), ft		1500	Speed Index (Ds) 0.492		0.492	
Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc/h/	In	2426	
Distance to Downstream Ramp (LDC	wn), ft	1800	Off-Ramp Influence Area Spee	ed (SR), mi/h	56.2	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.576	Outer Lanes Freeway Speed (S	SO), mi/h	71.2	
Flow in Lanes 1 and 2 (v12), pc/h		3878	Ramp Junction Speed (S), mi/l	h	61.2	
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/ln		34.3	
Level of Service (LOS)		D	Density in Ramp Influence Are	<u> </u>	33.6	

	HCS7 Basic Freeway Report					
Project Information	Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021			
Agency	CTPS	Analysis Year	2030			
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00			
Project Description	I-95 NB Ex61 Basic Fwy - 2030 AM	Unit	United States Customary			
Geometric Data						
Number of Lanes, In	3	Terrain Type	Level			
Segment Length (L), ft	-	Percent Grade, %	-			
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-			
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00			
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8			
Right-Side Lateral Clearance, ft	10					
Adjustment Factors						
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975			
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968			
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070			
Demand and Capacity						
Demand Volume veh/h	4750	Heavy Vehicle Adjustment Factor (fHV)	0.948			
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1901			
Total Trucks, %	5.50	Capacity (c), pc/h/ln	2400			
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323			
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.82			
Passenger Car Equivalent (ET)	2.000					
Speed and Density						
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	62.3			
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	30.5			
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D			
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0					
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	HCS7 Freeway	Merge Report			
Project Information					
Analyst Chen-Y	uan Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2030		
Jurisdiction MassD0	OT District 4	Time Period Analyzed	AM Peak F	lour 6:00-7:00	
Project Description I-95 NE	Ex61 Merge - 2030 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1	1	
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Acceleration Length (A),ft	1500	500		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.070	1.070		
Demand and Capacity					
Demand Volume (Vi)		4750	250		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.50	3.50		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.948	0.966		
Flow Rate (vi),pc/h		5703	295	295	
Capacity (c), pc/h		6970	1936		
Volume-to-Capacity Ratio (v/c)		0.86	0.15		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	886.7	Number of Outer Lanes on Freew	ay (No)	1	
Distance to Upstream Ramp (LUP), ft	1800	Speed Index (MS)		0.440	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2327	
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h 57.7		57.7	
		Outer Lanes Freeway Speed (SO), mi/h 63.3			
Prop. Freeway Vehicles in Lane 1 and 2 (PFN) 0.592	Outer Lanes Freeway Speed (SO),	mi/h	63.3	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM Flow in Lanes 1 and 2 (v12), pc/h) 0.592 3376	Outer Lanes Freeway Speed (SO), Ramp Junction Speed (S), mi/h	mi/h	63.3 59.8	
<u> </u>			mi/h		

		HCS7 Freeway	Merge Report			
Project Information						
Analyst C	Chen-Yuan	Wang	Date	-	1/18/2022	
Agency C	TPS		Analysis Year	2	2030	
Jurisdiction N	/lassDOT [District 4	Time Period Analyzed	,	AM Peak H	lour 6:00-7:00
Project Description I-	-95 SB Ex5	7 Merge - 2030 AM	Unit	ι	United Stat	tes Customary
Geometric Data						
			Freeway	F	Ramp	
Number of Lanes (N), In			3	1	1	
Free-Flow Speed (FFS), mi/h			71.1	3	35.0	
Segment Length (L) / Acceleration Le	ngth (LA),f	t	1500	6	500	
Terrain Type			Level	L	Level	
Percent Grade, %			-	-	-	
Segment Type / Ramp Type			Freeway	F	Right-Side	d One-Lane
Adjustment Factors						
Driver Population			Mostly Familiar	١	Mostly Fan	niliar
Weather Type			Non-Severe Weather	1	Non-Sever	e Weather
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.950	C	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	(0.968		
Demand Adjustment Factor (DAF)		1.060	1	1.060		
Demand and Capacity						
Demand Volume (Vi)			5350		450	
Peak Hour Factor (PHF)			0.94	(0.94	
Total Trucks, %			5.00	3	3.00	
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fhv	/)		0.952	(0.971	
Flow Rate (vi),pc/h			6337	5	523	
Capacity (c), pc/h			6824	1	1936	
Volume-to-Capacity Ratio (v/c)			1.01	(0.27	
Speed and Density						
Upstream Equilibrium Distance (LEQ),	ft	-	Number of Outer Lanes or	n Freeway	(No)	1
Distance to Upstream Ramp (LUP), ft		1700	Speed Index (Ms)			-
Downstream Equilibrium Distance (LE	(Q), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2573		2573	
Distance to Downstream Ramp (LDOV	VN), ft	3600	On-Ramp Influence Area S	Speed (SR),	mi/h	-
Prop. Freeway Vehicles in Lane 1 and	2 (PFM)	0.594	Outer Lanes Freeway Spee	ed (SO), mi/	/h	-
Flow in Lanes 1 and 2 (v12), pc/h		3764	Ramp Junction Speed (S),	mi/h		-
Flow Entering Ramp-Infl. Area (vR12),	pc/h	4287	Average Density (D), pc/m	ni/ln		-
Level of Service (LOS)		F	Density in Ramp Influence	Area (DR),	, pc/mi/ln	-
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	HCS7 Basic Freeway Report				
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2030		
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00		
Project Description	I-95 SB Ex57 Basic Fwy - 2030 AM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060		
Demand and Capacity					
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.952		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2112		
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2358		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.93		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	55.4		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	38.1		
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	E		
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8				
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	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	AM Peak F	Period 6:00-7:00	
Project Description	I-95 SB Ex5	7 Diverge - 2030 AM	Unit	United Sta	ates Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration	Length (LA),	ft	1500	225		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	ed One-Lane	
Adjustment Factors				·		
Driver Population			Mostly Familiar	Mostly Far	miliar	
Weather Type			Non-Severe Weather	Non-Seve	Non-Severe Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF	=)		0.925	0.975		
Final Capacity Adjustment Factor (C	CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity				-		
Demand Volume (Vi)			5750	400		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.952	0.971		
Flow Rate (vi),pc/h			6811	465		
Capacity (c), pc/h			6824	1936		
Volume-to-Capacity Ratio (v/c)			1.00	0.24		
Speed and Density						
Upstream Equilibrium Distance (LEC	ૂ), ft	3418.6	Number of Outer Lanes or	n Freeway (No)	1	
Distance to Upstream Ramp (LUP),	ft	825	Speed Index (Ds)		0.482	
Downstream Equilibrium Distance ((LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2700		2700	
Distance to Downstream Ramp (LD	OWN), ft	1700	Off-Ramp Influence Area Speed (SR), mi/h 54.3		54.3	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFD)	0.568	Outer Lanes Freeway Speed (SO), mi/h 65.6		65.6	
Flow in Lanes 1 and 2 (v12), pc/h		4111	Ramp Junction Speed (S), mi/h 58.3			
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/m	i/ln	38.9	
Level of Service (LOS)		Е	Density in Ramp Influence	Area (DR), pc/mi/ln	37.6	

Project Information Name of the Project Name			HCS7 Freeway	Merge Report		
Agency CTPS Analysis Year 2030 Jurisdiction MassDOT District 4 Time Period Analyzed AM Peak Hour 6:00-7:00 Project Description 1-95 SB Ex59 Merge - 2030 AM Unit United States Customary Geometric Data Free-Flow Speed (FFS), mi/h 3 1 1 Free-Flow Speed (FFS), mi/h 3 3 1 1 Free-Flow Speed (FFS), mi/h 3 3 1 1 Free-Flow Speed (FFS), mi/h 3 3 1 1 Free-Flow Speed (FFS), mi/h 4 30.0 Segment Length (1./ Acceleration Length (1.A.) ↑ 1500 400 400 Ferrain Type	Project Information					
Designation Mass DOT District 4 Time Period Analyzed AM Peak Hour 6:00-7:00	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022	
Project Description Inject Description Inject Description Inject Description Inject Description Inject Description Inject Description Freeway Ramp Mumber of Lanes (N), In 3 1	Agency	CTPS		Analysis Year	2030	
Freeway	Jurisdiction N	MassDOT [District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00
Number of Lanes (N), In 3 1 1 1 1 1 1 1 1 1	Project Description	-95 SB Ex5	59 Merge - 2030 AM	Unit	United Sta	tes Customary
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS), mi/h 71.4 30.0 Segment Length (L) / Acceleration Length (La), ft 1500 400 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather	Geometric Data					
Free-Flow Speed (FFS), mi/h Segment Length (L) / Acceleration Length (La), It 1500 1500 1500 1500 1500 1500 1500 150				Freeway	Ramp	
Segment Length (L) / Acceleration Length (LA),ft 1500 400 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Speed Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 5350 400 Demand Seption For (PHF) 0.94 0.94 Demand Capacity Demand Volume (V) 0.94 0.94 Demand Seption Factor (PHF) 0.94 0.94 Demand Seption Factor (PHF) 0.99 0.94 D	Number of Lanes (N), In			3	1	
Everein Type	Free-Flow Speed (FFS), mi/h			71.4	30.0	
Percent Grade, % -	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	400	
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident	Terrain Type			Level	Level	
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,950 0,975 Final Capacity Adjustment Factor (DAF) 0,968 0,968 Demand Adjustment Factor (DAF) 1,060 1,060 Demand Volume (Vi) Peak Hour Factor (PHF) 5350 400 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, (SUT), % - - Tractor-Trailers (TT), % - - Flow Rate (vi), pc/h 6337 465 Flow Rate (vi), pc/h 6824 1839 Volume-to-Capacity Ratio (v/c) 1,00 0,25 Speed and Density Upstream Equilibrium Distance (LEQ), ft 758.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 125 Speed Index (Ms) 0.632 Downstream Equilibrium Distance (LEQ), ft 4314.0 Flow Outer L	Percent Grade, %			-	-	
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,950 0,975 Final Capacity Adjustment Factor (DAF) 0,968 0,968 Demand Adjustment Factor (DAF) 0,968 0,968 Demand Capacity Demand Volume (V) \$550 400 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 5,00 3,00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HHV) 0,952 0,971 Flow Rate (vi),pc/h 6824 1839 Volume-to-Capacity Ratio (v/c) 100 0,25 Speed and Density Upstream Equilibrium Distance (LEQ), ft 758.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 125 Speed Index (MS) 50.62	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.950 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand Adjustment Factor (PAF) 1.060 400 Demand Volume (Vi) \$350 400 Demand Yolume (Vi) \$0.94 0.94 Demand Yolume (Vi) \$0.94 0.94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (Hrv) 0.952 0.971 Flow Rate (vi),pc/h 6824 1839 Volume-to-Capacity Ratio (v/c) 1.00 0.25 Speed and Density Upstream Equilibrium Distance (LEQ), ft 758.0 Number of Outer Lanes on Freeway (NO) 1						

	HCS7 Basic Fi	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 SB Ex58 Basic Fwy - 2030 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060
Demand and Capacity			
Demand Volume veh/h	5150	Heavy Vehicle Adjustment Factor (fHV)	0.952
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2033
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2358
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.89
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	57.3
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	35.5
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8		
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		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak P	eriod 6:00-7:00	
Project Description	I-95 SB Ex5	8 Diverge - 2030 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration I	Length (LA),	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				·		
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF	·)		0.925	0.975		
Final Capacity Adjustment Factor (C	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5750	600		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.952	0.971	0.971	
Flow Rate (vi),pc/h			6811	697	697	
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			1.00	0.36		
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	2509.1	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	2150	Speed Index (DS)		0.502	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2700		2700	
Distance to Downstream Ramp (LDC	OWN), ft	2600	Off-Ramp Influence Area Speed (SR), mi/h 53.9			
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFD)	0.558	Outer Lanes Freeway Speed (SO), mi/h 65.6			
Flow in Lanes 1 and 2 (v12), pc/h		4111	Ramp Junction Speed (S), mi/h 58.0		58.0	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln 39.1			
Level of Service (LOS)		Е	Density in Ramp Influence A	rea (DR), pc/mi/ln	35.1	

	HCS7 Freeway	Merge Report			
Project Information					
Analyst Chen-Yua	n Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2030		
Jurisdiction MassDOT	District 4	Time Period Analyzed	AM Peak F	lour 6:00-7:00	
Project Description I-95 SB Ex	59 Merge - 2030 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.4	30.0		
Segment Length (L) / Acceleration Length (LA)	,ft	1500	400		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.060	1.060		
Demand and Capacity					
Demand Volume (Vi)		5350	400		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.00	3.00		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971	0.971	
Flow Rate (vi),pc/h		6337	465	465	
Capacity (c), pc/h		6824	1839	1839	
Volume-to-Capacity Ratio (v/c)		1.00	0.25		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	758.0	Number of Outer Lanes on Freew	ay (No)	1	
Distance to Upstream Ramp (LUP), ft	125	Speed Index (MS)		0.632	
Downstream Equilibrium Distance (LEQ), ft	Equilibrium Distance (LEQ), ft 4314.0			2351	
Distance to Downstream Ramp (LDOWN), ft	2150	On-Ramp Influence Area Speed (SR), mi/h 51.5		51.5	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.629	Outer Lanes Freeway Speed (SO),	mi/h	61.0	
Flow in Lanes 1 and 2 (v12), pc/h	3986	Ramp Junction Speed (S), mi/h 54.4		54.4	
		Average Density (D), pc/mi/ln 41.7			
Flow Entering Ramp-Infl. Area (vR12), pc/h	4451	Average Density (D), pc/mi/ln		41.7	

	HCS7 Basic Fi	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 SB Ex59 Basic Fwy - 2030 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060
Demand and Capacity			
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.952
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2112
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2360
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2284
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.92
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	55.5
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	38.1
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFSadj), mi/h	66.0		
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	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Chen-Yu	ıan Wang	Date	8/10/2021		
Agency CTPS		Analysis Year	2030		
Jurisdiction MassDC	T District 4	Time Period Analyzed	AM Peak P	Period 6:00-7:00	
Project Description I-95 SB	Ex59 Diverge - 2019 AM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.4	35.0		
Segment Length (L) / Deceleration Length (I	A),ft	1500	275		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors			<u> </u>		
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.060	1.060		
Demand and Capacity					
Demand Volume (Vi)		5500	150		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		5.00	3.00		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.952	0.971	0.971	
Flow Rate (vi),pc/h		6515	174		
Capacity (c), pc/h		6824	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.95	0.09		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	1319.4	Number of Outer Lanes on Freew	ay (No)	1	
Distance to Upstream Ramp (LUP), ft	5600	Speed Index (DS)		0.455	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2606		2606	
Distance to Downstream Ramp (LDOWN), ft	1250	Off-Ramp Influence Area Speed (SR), mi/h 56.1		56.1	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)		Outer Lanes Freeway Speed (SO), mi/h 68.1		68.1	
El 1 1 1 10 () (l	0.589	Outer Lanes Freeway Speed (SO),	mı/h ———	00.1	
Flow in Lanes 1 and 2 (v12), pc/h	0.589 3909	Outer Lanes Freeway Speed (SO), Ramp Junction Speed (S), mi/h	mi/h	60.4	
Flow In Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h			mi/h		

	HCS7 Basic Fr	eeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 SB Ex59-60 Basic Fwy - 2030 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060
Demand and Capacity			
Demand Volume veh/h	5500	Heavy Vehicle Adjustment Factor (fHV)	0.952
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2172
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2396
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2319
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.94
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	55.8
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	38.9
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFSadj), mi/h	69.6		

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	ŀ	HCS7 Freeway	Merge Report			
Project Information						
Analyst Ch	nen-Yuan \	Wang	Date	1/18/2022		
Agency CT	TPS		Analysis Year	2030		
Jurisdiction Ma	assDOT Di	strict 4	Time Period Analyzed	AM Peak H	Hour 6:00-7:00	
Project Description I-9	95 SB Ex60	Merge - 2030 AM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Acceleration Len	ngth (LA),ft		1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Far	niliar	
Weather Type			Non-Severe Weather	Non-Seve	Non-Severe Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (CAF)	·)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5250	250		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fHV))		0.952	0.971	0.971	
Flow Rate (vi),pc/h			6219	290	290	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.93	0.15		
Speed and Density						
Upstream Equilibrium Distance (LEQ), f	ft 9	996.0	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), ft		1925	Speed Index (Ms)		0.494	
Downstream Equilibrium Distance (LEC	eam Equilibrium Distance (LEQ), ft 1007.7		Flow Outer Lanes (vOA), pc/	/h/ln	2537	
Distance to Downstream Ramp (LDOWI	'N), ft !	5600	On-Ramp Influence Area Speed (SR), mi/h 56.2		56.2	
Prop. Freeway Vehicles in Lane 1 and 2	2 (PFM) (0.592	Outer Lanes Freeway Speed (SO), mi/h 62.0		62.0	
Flow in Lanes 1 and 2 (v12), pc/h		3682	Ramp Junction Speed (S), n	ni/h	58.3	
Flow Entering Ramp-Infl. Area (vR12), p			Average Density (D), pc/mi/ln 37.2			
Flow Entering Ramp-IIII. Area (VR12), p	oc/h 3	3972	Average Density (D), pc/mi/	/In	37.2	

	HCS7 Basic Fi	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00
Project Description	I-95 SB Ex60 Basic Fwy - 2030 AM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060
Demand and Capacity			
Demand Volume veh/h	5250	Heavy Vehicle Adjustment Factor (fHV)	0.952
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2073
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.89
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	58.5
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	35.4
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0		
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		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	ı Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction I	MassDOT [District 4	Time Period Analyzed	AM Peak P	eriod 6:00-7:00	
Project Description I	I-95 SB Ex6	60 Diverge - 2030 AM	Unit	United Sta	tes Customary	
Geometric Data				<u> </u>		
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Deceleration Lo	ength (LA),	ft	1500	575		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors			· 			
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (CA	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5650	400		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fH	V)		0.952	0.971	0.971	
Flow Rate (vi),pc/h			6693	465	465	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.96	0.24		
Speed and Density						
Upstream Equilibrium Distance (LEQ)	, ft	2889.6	Number of Outer Lanes on Fr	eeway (No)	1	
Distance to Upstream Ramp (LUP), ft		1500	Speed Index (Ds)		0.482	
Downstream Equilibrium Distance (L	EQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 2672		2672	
Distance to Downstream Ramp (LDO	wn), ft	1925	Off-Ramp Influence Area Speed (SR), mi/h 56.5			
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.571	Outer Lanes Freeway Speed (So), mi/h	70.3	
Flow in Lanes 1 and 2 (v12), pc/h		4021	Ramp Junction Speed (S), mi/h 61.3		61.3	
Flow Entering Ramp-Infl. Area (vR12),	, pc/h	-	Average Density (D), pc/mi/ln 36.4			
Level of Service (LOS)		D	Density in Ramp Influence Are	ea (DR), pc/mi/ln	33.7	
Convright © 2022 University of Florida, All Ri	· lete Deces	LICCENT F	rays Version 7.9	C-	nerated: 02/17/2022 16:13:4:	

Project Information Chen-Yuan Wang Date 1/18/2022 Analyst Chen-Yuan Wang Date 1/18/2022 Jurisdiction MassDOT District 4 Time Period Analyzed AMP Peak Hour 600-700 Project Description 1-95 SB Ex61 Merge - 2030 AM Unit United States Customary Geometric Data Free Flow Speed (FFS), mi/h 3 1 Free Flow Speed (FFS), mi/h 1500 350 Free Flow Speed (FFS), mi/h Level Level Free Flow Speed (FFS), mi/h 1500 350 Free Flow Speed (FFS), mi/h Free Way Right-Sided One-Lane Adjustment Factor (FAF) Freeway Right-Sided One-Lane Adjustment Factor (SAF) Non Severe Weather Non Severe Weather Non Severe Weather Non			HCS7 Freeway	Merge Report			
Agency CTPS	Project Information						
Durisdiction MassDOT District 4 Time Period Analyzed AM Peak Hour 6:00-7:00	Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Project Description 1-95 SB Ex61 Merge - 2030 AM Unit United States Customary	Agency	CTPS		Analysis Year	2030		
	Jurisdiction N	MassDOT D	District 4	Time Period Analyzed	AM Peak F	lour 6:00-7:00	
Freeway Ramp Number of Lanes (N), In 3 1	Project Description I	-95 SB Ex6	1 Merge - 2030 AM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 3	Geometric Data						
Free-Flow Speed (FFS), mi/h Segment Length (L) / Acceleration Length (LA),ft 1500 350 Terrain Type Level Level Level Level Level Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Non-Severe Weather Non-Severe Weath				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA),ft 1500 350	Number of Lanes (N), In			3	1		
Level Level Level Percent Grade, %	Free-Flow Speed (FFS), mi/h			71.8	30.0		
Percent Grade, % -	Segment Length (L) / Acceleration Le	ength (LA),f	t	1500	350		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand Volume (V) Speam Advolume (V) \$150 \$0 Peam Advolume (V) \$150 \$0 Demand Volume (V) \$150 \$0 Demand Volume (V) \$150 \$0 Peam Advolume (V) \$0.94 \$0.94 Peam Advolume (V) \$0.94 \$0.94 Volume Active (PHF) \$0.94 \$0.94 Volume Active (PHF) \$0.952 \$0.971 Flow End (V), pc/h \$0.952 \$0.971 <td< td=""><td>Terrain Type</td><td></td><td></td><td>Level</td><td>Level</td><td></td></td<>	Terrain Type			Level	Level		
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand Capacity Demand Volume (Vi) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - Leavy Vehicle Adjustment Factor (filvy) 0.952 0.971 Flow Rate (vi),pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 70.99 Number of Outer Lanes on Freeway (NO) 1 Distance	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand Capacity Demand Volume (Vi) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - - Leavy Vehicle Adjustment Factor (fhty) 0.952 0.971 Flow Rate (vi),pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft <	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand and Capacity Demand Volume (VI) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (voA), pc/h/In 2288	Adjustment Factors						
No Incident Type	Driver Population			Mostly Familiar	Mostly Far	niliar	
Final Speed Adjustment Factor (SAF) Final Capacity Adjustment Factor (CAF) Demand Adjustment Factor (DAF) Demand Adjustment Factor (DAF) Demand and Capacity Demand Volume (Vi) Demand Volume (Vi) S150 S00 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % S.00 3.00 Single-Unit Trucks (SUT), %	Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand and Capacity Demand Volume (Vi) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 6100 581 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SN), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Incident Type			No Incident	-		
Demand Adjustment Factor (DAF) 1.060 1.060 Demand and Capacity Demand Volume (Vi) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fitv) 0.952 0.971 Flow Rate (vi),pc/h 6100 581 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Pro	Final Speed Adjustment Factor (SAF)			0.975	0.975		
Demand and Capacity Demand Volume (Vi) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.952 0.971 Flow Rate (vi),pc/h 6100 581 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (voa), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h	Final Capacity Adjustment Factor (CA	AF)		0.968	0.968		
Demand Volume (V) 5150 500 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (vi), pc/h 6100 581 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 56.1 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering	Demand Adjustment Factor (DAF)			1.060	1.060		
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 5.00 3.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.952 0.971 Flow Rate (w), pc/h 6100 581 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.96 0.32 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln<	Demand and Capacity						
Total Trucks, % 5.00 3.00	Demand Volume (Vi)			5150	500		
Single-Unit Trucks (SUT), % - - - - - - - - -	Peak Hour Factor (PHF)			0.94	0.94		
Tractor-Trailers (TT), % -	Total Trucks, %			5.00	3.00	3.00	
Heavy Vehicle Adjustment Factor (fHV) Flow Rate (vi),pc/h Capacity (c), pc/h Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) O.96 Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (voA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) Need Index (Ms) On-Ramp Influence Area Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Single-Unit Trucks (SUT), %			-	-	-	
Flow Rate (vi),pc/h Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Upstream Equilibrium Distance (LEQ), ft Downstream Equilibrium Distance (LEQ), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Solution Capacity (No) Don-Ramp Influence Area Speed (SR), mi/h Solution Speed (SO), mi/h Flow in Lanes 1 and 2 (v12), pc/h Ramp Junction Speed (S), mi/h Solution Speed (S), mi/h Solution Speed (S), mi/h Average Density (D), pc/mi/ln 39.7	Tractor-Trailers (TT), %			-	-	-	
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Equilibrium Distance (LEQ), ft Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Downstream Freeway Vehicles in Lane 1 and 2 (PFM) Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp	Heavy Vehicle Adjustment Factor (fh	V)		0.952	0.971	0.971	
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Flow Rate (vi),pc/h			6100	581	581	
Speed and Density Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Capacity (c), pc/h			6970	1839	1839	
Upstream Equilibrium Distance (LEQ), ft 709.9 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Volume-to-Capacity Ratio (v/c)			0.96	0.32		
Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.616 Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 2980.6 Flow Outer Lanes (vOA), pc/h/ln 2288 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Upstream Equilibrium Distance (LEQ),	, ft	709.9	Number of Outer Lanes on Free	eway (No)	1	
Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 52.8 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Distance to Upstream Ramp (LUP), ft		1125	Speed Index (MS)		0.616	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.625 Outer Lanes Freeway Speed (SO), mi/h 63.6 Flow in Lanes 1 and 2 (v12), pc/h 3812 Ramp Junction Speed (S), mi/h 56.1 Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Downstream Equilibrium Distance (LE	librium Distance (LEQ), ft 2980.6		Flow Outer Lanes (vOA), pc/h/lr	1	2288	
Flow in Lanes 1 and 2 (v12), pc/h Slow Entering Ramp-Infl. Area (vR12), pc/h	Distance to Downstream Ramp (LDOV	wn), ft	1500	On-Ramp Influence Area Speed (SR), mi/h 52.8		52.8	
Flow Entering Ramp-Infl. Area (vR12), pc/h 4393 Average Density (D), pc/mi/ln 39.7	Prop. Freeway Vehicles in Lane 1 and	1 2 (Рғм)	0.625	Outer Lanes Freeway Speed (SO), mi/h 63.6		63.6	
	Flow in Lanes 1 and 2 (v12), pc/h		3812	Ramp Junction Speed (S), mi/h 56.1		56.1	
Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 37.4	Flow Entering Ramp-Infl. Area (vR12),	pc/h	4393	Average Density (D), pc/mi/ln 39.7			
	Level of Service (LOS)		Е	Density in Ramp Influence Area	a (DR), pc/mi/ln	37.4	

HCS7 Basic Freeway Report					
Chen-Yuan Wang	Date	1/18/2021			
CTPS	Analysis Year	2030			
MassDOT District 4	Time Period Analyzed	AM Peak Hour 6:00-7:00			
I-95 SB Ex61 Basic Fwy - 2030 AM	Unit	United States Customary			
3	Terrain Type	Level			
-	Percent Grade, %	-			
Base	Grade Length, mi	-			
75.0	Total Ramp Density (TRD), ramps/mi	1.00			
12	Free-Flow Speed (FFS), mi/h	71.8			
10					
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975			
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968			
No Incident	Demand Adjustment Factor (DAF)	1.060			
5150	Heavy Vehicle Adjustment Factor (fHV)	0.952			
0.94	Flow Rate (V _p), pc/h/ln	2033			
5.00	Capacity (c), pc/h/ln	2400			
-	Adjusted Capacity (cadj), pc/h/ln	2323			
-	Volume-to-Capacity Ratio (v/c)	0.88			
2.000					
0.0	Average Speed (S), mi/h	59.4			
0.0	Density (D), pc/mi/ln	34.2			
3.2	Level of Service (LOS)	D			
70.0	İ				
	Chen-Yuan Wang	Chen-Yuan Wang CTPS Analysis Year MassDOT District 4 I-95 SB Ex61 Basic Fwy - 2030 AM Terrain Type - Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi 12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) 5150 Heavy Vehicle Adjustment Factor (fHv) 0.94 Flow Rate (Vp), pc/h/ln 5.00 Capacity (c), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln - Volume-to-Capacity Ratio (v/c) 2.000 0.0 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 3.2 Level of Service (LOS)			

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	ay Diverge Report			
Project Information				
Analyst Chen-Yuan Wang	Date	8/10/2021		
Agency CTPS	Analysis Year	2030		
Jurisdiction MassDOT District 4	Time Period Analyzed	AM Peak P	eriod 6:00-7:00	
Project Description I-95 SB Ex61 Diverge - 2030 AI	M Unit	United Sta	tes Customary	
Geometric Data	<u>'</u>			
	Freeway	Ramp		
Number of Lanes (N), In	3	1		
Free-Flow Speed (FFS), mi/h	71.8	35.0		
Segment Length (L) / Deceleration Length (LA),ft	1500	450		
Terrain Type	Level	Level		
Percent Grade, %	-	-		
Segment Type / Ramp Type	Freeway	Right-Side	d One-Lane	
Adjustment Factors				
Driver Population	Mostly Familiar	Mostly Fan	niliar	
Weather Type	Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type	No Incident	-	-	
Final Speed Adjustment Factor (SAF)	0.975	0.975	0.975	
Final Capacity Adjustment Factor (CAF)	0.968	0.968		
Demand Adjustment Factor (DAF)	1.060	1.060	1.060	
Demand and Capacity		·		
Demand Volume (Vi)	5450	300		
Peak Hour Factor (PHF)	0.94	0.94		
Total Trucks, %	5.00	3.00		
Single-Unit Trucks (SUT), %	-	-		
Tractor-Trailers (TT), %	-	-	-	
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.971		
Flow Rate (vi),pc/h	6456	348	348	
Capacity (c), pc/h	6970	1936	1936	
Volume-to-Capacity Ratio (v/c)	0.93	0.18		
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft -	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft -	Speed Index (DS)		0.471	
Downstream Equilibrium Distance (LEQ), ft -	rium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2547		2547	
Distance to Downstream Ramp (LDOWN), ft 1125	Off-Ramp Influence Area Spe	eed (SR), mi/h	56.8	
Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.583	Outer Lanes Freeway Speed	Outer Lanes Freeway Speed (SO), mi/h 70.8		
Flow in Lanes 1 and 2 (v12), pc/h 3909	Ramp Junction Speed (S), mi	Ramp Junction Speed (S), mi/h 61.6		
Flow Entering Ramp-Infl. Area (vR12), pc/h	Average Density (D), pc/mi/li	n	34.9	
Level of Service (LOS) D	Density in Ramp Influence A	rea (DR), pc/mi/ln	33.8	

APPENDIX J

Highway Capacity Analyses PM Peak Hour: 2030 No-Build Scenario

		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Ex	57 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration I	Length (LA),	ft	1500	600		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF	·)		0.925	0.975	0.975	
Final Capacity Adjustment Factor (C	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060	1.060	
Demand and Capacity						
Demand Volume (Vi)			5850	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fi	HV)		0.976	0.985		
Flow Rate (vi),pc/h			6759	572	572	
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.99	0.30		
Speed and Density						
Upstream Equilibrium Distance (LEC), ft	2360.4	Number of Outer Lanes on Fre	eeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	3600	Speed Index (DS)		0.491	
Downstream Equilibrium Distance (Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2691		2691			
Distance to Downstream Ramp (LDC	tream Ramp (LDOWN), ft 1750 Off		Off-Ramp Influence Area Spee	ed (SR), mi/h	54.1	
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFD) 0.565		Outer Lanes Freeway Speed (SO), mi/h		65.6	
Flow in Lanes 1 and 2 (v12), pc/h		4068	Ramp Junction Speed (S), mi/h 5		58.2	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln		38.7	
Level of Service (LOS)		D	Density in Ramp Influence Are	<u> </u>	33.8	

	HCS7 Basic Freeway Report				
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2030		
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00		
Project Description	I-95 NB Ex57 Basic Fwy - 2030 PM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060		
Demand and Capacity					
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.976		
Peak Hour Factor	0.94	Flow Rate (V _P), pc/h/ln	2060		
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.90		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	56.7		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	36.3		
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	E		
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8				
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	HCS7 Freew	ay Merge Report			
Project Information					
Analyst Che	en-Yuan Wang	Date	1/18/2022		
Agency CTF	PS	Analysis Year	2030		
Jurisdiction Ma	ssDOT District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95	5 NB Ex57 Merge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.1	35.0		
Segment Length (L) / Acceleration Leng	th (LA),ft	1500	650		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors		•	·		
Driver Population		Mostly Familiar	Mostly Far	niliar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-	-	
Final Speed Adjustment Factor (SAF)		0.925	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.060	1.060	1.060	
Demand and Capacity					
Demand Volume (Vi)		5350	550		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	1.50		
Single-Unit Trucks (SUT), %		-	-	-	
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.985		
Flow Rate (vi),pc/h		6181	630	630	
Capacity (c), pc/h		6824	1936	1936	
Volume-to-Capacity Ratio (v/c)		1.00	0.33	0.33	
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	1127.3	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	1750	Speed Index (Ms)		1.110	
Downstream Equilibrium Distance (LEQ)	ownstream Equilibrium Distance (LEQ), ft 3917.7 Flow Outer Lanes (vOA), pc/h/ln		n/ln	1446	
Distance to Downstream Ramp (LDOWN	istance to Downstream Ramp (LDOWN), ft 850		eed (SR), mi/h	39.4	
Prop. Freeway Vehicles in Lane 1 and 2	(PFM) 0.766	Outer Lanes Freeway Speed	Outer Lanes Freeway Speed (SO), mi/h		
Flow in Lanes 1 and 2 (v12), pc/h		Ramp Junction Speed (S), mi/h		42.7	
· · · · · · · · · · · · · · · · · · ·	4735	Ramp Junction Speed (S), mi	1/11	72.7	
Flow Entering Ramp-Infl. Area (vR12), po		Average Density (D), pc/mi/li		53.2	

Project Information Nanayst Analyst Nama Maries Nama <th colspan<="" th=""><th></th><th></th><th>HCS7 Freeway</th><th>Diverge Report</th><th></th><th></th></th>	<th></th> <th></th> <th>HCS7 Freeway</th> <th>Diverge Report</th> <th></th> <th></th>			HCS7 Freeway	Diverge Report			
Agency	Project Information							
Durisdiction	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022			
Project Description In 95 NB is 36 Diverge - 2030 PM Unit United States	Agency	CTPS		Analysis Year	2030			
Freeway	Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak P	eriod 5:00-6:00		
Freeway Ramp Number of Lanes (N), In 3 1 Temper (Decideration Length (LA), It 3 5 Temper (Decideration Length (LA), It 71.1 35.0 Temper (Decideration Length (LA), It 1500 Temper (Decideration Length (LA), It 1500 Temper (Decideration Length (LA), It Temper (Decideration Length (LE), It 30.0 Temper (Decideration Length (LE), It 30.0 Temper (Decideration Length (LE), It 30.0	Project Description	I-95 NB Ex	58 Diverge - 2030 PM	Unit	United Sta	tes Customary		
Number of Lanes (N), In 3 1 Free-Flow Speed (FFS, mi/h 71.1 35.0 Segment Length (L) / Deceleration Length (La), It 1500 35.0 Terrain Type Level Level Percent Grade, % e spith-sided One-Lane Segment Type / Ramp Type Freeway mostly Smith is/ed one-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Indicate Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Indicate Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-	Geometric Data							
Free-Flow Speed (FFS), mi/h Segment Length (L) / Deceleration Length (LA),ft 1500 350 1500				Freeway	Ramp			
Segment Length (L) / Deceleration Length (LA). ★ 1500 350 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Side One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Lincident Type Non-Severe Weather Non-Severe Weather Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Speed Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.968 0.968 Demand Capacity Demand and Capacity Demand Septiment Factor (PAF) 9.94 0.94 Demand Capacity (PAF) 0.94 0.94 Total Trucks (SUT), % 1.00 0.98 1.00 Total Trucks (SUT), % 0.97 0.98 1.00 <td colspan<="" td=""><td>Number of Lanes (N), In</td><td></td><td></td><td>3</td><td>1</td><td></td></td>	<td>Number of Lanes (N), In</td> <td></td> <td></td> <td>3</td> <td>1</td> <td></td>	Number of Lanes (N), In			3	1		
Terrain Type Level Level Percent Grade, %	Free-Flow Speed (FFS), mi/h			71.1	35.0			
Percent Grade, %	Segment Length (L) / Deceleration L	ength (LA),	ft	1500	350			
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar Mostly Familiar	Terrain Type			Level	Level			
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0,925 0,975 Final Capacity Adjustment Factor (DAF) 0,968 0,968 Demand Adjustment Factor (DAF) 1,060 1,060 Demand Capacity Demand Volume (V) 5900 550 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, (SUT), % 2.50 1,50 Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (Hiv) 0,976 0,985 Heavy Vehicle Adjustment Factor (Hiv) 6824 1936 Yolume-to-Capacity Ratio (v/c) 817 630 Capacity (c), pc/h 6824 1936 Yolume-to-Capacity Ratio (v/c) 1,00 0,33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freewy (NO) 1	Percent Grade, %			-	-			
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 0.968 0.968 Demand Volume (Vi) 5900 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, SUT), % - - Tractor-Trailers (TT), % - - Flow Rate (vi), pc/h 6817 630 Flow Atte (vi), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 100 0.33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 330.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (Luo), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (voA), pc/h/ln 54.0	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane		
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand Adjustment Factor (PAF) 5900 550 Demand Volume (Vi) 5900 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HvV) 0.976 0.985 Flow Rate (vi),pc/h 6817 630 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 1.00 0.33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (NO) 1 <td colspa<="" td=""><td>Adjustment Factors</td><td></td><td></td><td></td><td><u> </u></td><td></td></td>	<td>Adjustment Factors</td> <td></td> <td></td> <td></td> <td><u> </u></td> <td></td>	Adjustment Factors				<u> </u>		
Incident Type	Driver Population			Mostly Familiar	Mostly Fan	niliar		
Final Speed Adjustment Factor (SAF) 0.925 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand And Capacity Demand Volume (Vi) 5900 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Flow Rate (vi), pc/h 6824 1936 Capacity (c), pc/h 6824 1936 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/n 54.0 54.0 Distance to Downstream Ramp (LDOWN), ft 2300	Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather		
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.060 1.060 Demand And Capacity Sepace And Capacity Demand Volume (Vi) 5900 550 550 1.50 550 1.50 550 1.50 <th colsp<="" td=""><td>Incident Type</td><td></td><td></td><td>No Incident</td><td>-</td><td colspan="2">-</td></th>	<td>Incident Type</td> <td></td> <td></td> <td>No Incident</td> <td>-</td> <td colspan="2">-</td>	Incident Type			No Incident	-	-	
Demand Adjustment Factor (DAF) 1,060 1,060 Demand and Capacity Demand Volume (Vi) 5900 550 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 1,50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0,976 0,985 Flow Rate (wi),pc/h 6817 630 - Capacity (c), pc/h 6824 1936 - - Capacity (c), pc/h 6824 1936 - - Capacity (c), pc/h 1,00 0,33 - Speed and Density Upstream Equilibrium Distance (LEQ), ft 301,0 Number of Outer Lanes on Freewy (No) 0,496	Final Speed Adjustment Factor (SAF)			0.925	0.975			
Demand and Capacity Demand Volume (Vi) 5900 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 1.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi), pc/h 6817 630 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 1.00 0.33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (voA), pc/h/ln 2700 Distance to Downstream Ramp (LUP), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 58.1 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h	Final Capacity Adjustment Factor (CA	AF)		0.968	0.968			
Demand Volume (Vi) 5900 550 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 6817 630 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 1.00 0.33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 850 Speed Index (Ds) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOwn), ft 2300 Off-Ramp Influence Area Speed (Sn), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 55.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 56.6 Flow Entering Ramp	Demand Adjustment Factor (DAF)			1.060	1.060	1.060		
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 1.50 1.50 Single-Unit Trucks (SUT), % - -	Demand and Capacity							
Total Trucks, % Single-Unit Trucks (SUT), % Flow Rate (vi), pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Upstream Equilibrium Distance (LEQ), ft Distance to Upstream Ramp (LUP), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Distance to Downstream Ramp (LDOWN), ft Prop. Freeway Vehicles in Lane 1 and 2 (PFD) Flow in Lanes 1 and 2 (v12), pc/h Tractor-Trailers (TT), %	Demand Volume (Vi)			5900	550			
Single-Unit Trucks (SUT), % - Tractor-Trailers (TT), % -	Peak Hour Factor (PHF)			0.94	0.94			
Tractor-Trailers (TT), % - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.985 Flow Rate (vi),pc/h 6817 630 Capacity (c), pc/h 100 0.33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 850 Speed Index (Ds) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Total Trucks, %			2.50	1.50			
Heavy Vehicle Adjustment Factor (fHv) 0.976 0.985 Flow Rate (vi),pc/h 6817 630 Capacity (c), pc/h 6824 1936 Volume-to-Capacity Ratio (v/c) 1.00 0.33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 850 Speed Index (DS) 0.496 Downstream Ramp (LUP), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (voA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Single-Unit Trucks (SUT), %			-	-	-		
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 850 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (voA), pc/h/ln Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h Prop. Freeway Vehicles in Lane 1 and 2 (PFD) Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h Average Density (D), pc/mi/ln 530 6817 6824 1936 10.0 0.33 Speed and Density 10.0 11 12.0 13.0 14.0 15.6 16.6 16.6 16.6 16.6 16.6 16.6 16.7	Tractor-Trailers (TT), %			-	-	-		
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) 1.00 1.00 33 Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (NO) Distance to Upstream Ramp (LUP), ft 850 Speed Index (DS) Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Heavy Vehicle Adjustment Factor (fH	V)		0.976	0.985			
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Flow Rate (vi),pc/h			6817	630	630		
Speed and DensityUpstream Equilibrium Distance (LEQ), ft3301.0Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft850Speed Index (DS)0.496Downstream Equilibrium Distance (LEQ), ft-Flow Outer Lanes (vOA), pc/h/ln2700Distance to Downstream Ramp (LDOWN), ft2300Off-Ramp Influence Area Speed (SR), mi/h54.0Prop. Freeway Vehicles in Lane 1 and 2 (PFD)0.561Outer Lanes Freeway Speed (SO), mi/h65.6Flow in Lanes 1 and 2 (v12), pc/h4117Ramp Junction Speed (S), mi/h58.1Flow Entering Ramp-Infl. Area (vR12), pc/h-Average Density (D), pc/mi/ln39.1	Capacity (c), pc/h			6824	1936	1936		
Upstream Equilibrium Distance (LEQ), ft 3301.0 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Volume-to-Capacity Ratio (v/c)			1.00	0.33			
Distance to Upstream Ramp (LUP), ft 850 Speed Index (DS) 0.496 Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Speed and Density				·			
Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln 2700 Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Upstream Equilibrium Distance (LEQ)	, ft	3301.0	Number of Outer Lanes on I	Freeway (NO)	1		
Distance to Downstream Ramp (LDOWN), ft 2300 Off-Ramp Influence Area Speed (SR), mi/h 54.0 Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h 65.6 Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Distance to Upstream Ramp (LUP), ft	:	850	Speed Index (DS)		0.496		
Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.561 Outer Lanes Freeway Speed (SO), mi/h Flow in Lanes 1 and 2 (v12), pc/h 4117 Ramp Junction Speed (S), mi/h 58.1 Flow Entering Ramp-Infl. Area (vR12), pc/h Average Density (D), pc/mi/ln 39.1	Downstream Equilibrium Distance (LEQ), ft - Flow Outer Lanes (vOA), pc/h/ln		2700					
Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h Average Density (D), pc/mi/ln 39.1	Distance to Downstream Ramp (LDO	Distance to Downstream Ramp (LDOWN), ft 2300		Off-Ramp Influence Area Sp	eed (SR), mi/h	54.0		
Flow Entering Ramp-Infl. Area (vR12), pc/h - Average Density (D), pc/mi/ln 39.1	Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.561	Outer Lanes Freeway Speed (SO), mi/h		65.6		
	Flow in Lanes 1 and 2 (v12), pc/h	n Lanes 1 and 2 (v12), pc/h 4117		Ramp Junction Speed (S), m	i/h	58.1		
Level of Service (LOS) E Density in Ramp Influence Area (DR), pc/mi/ln 36.5	Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/l	In	39.1		
	Level of Service (LOS)		E	Density in Ramp Influence A	rea (DR), pc/mi/ln	36.5		

	HCS7 Basic Freeway Report				
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2030		
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00		
Project Description	I-95 NB Ex58 Basic Fwy - 2030 PM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060		
Demand and Capacity					
Demand Volume veh/h	5250	Heavy Vehicle Adjustment Factor (fHV)	0.976		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2022		
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.89		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	57.6		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	35.1		
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	E		
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8				
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		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Ex	58 Merge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	750		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				•		
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF))		0.950	0.975		
Final Capacity Adjustment Factor (CA	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060	1.060	
Demand and Capacity						
Demand Volume (Vi)			5250	650		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fH	IV)		0.976	0.985		
Flow Rate (vi),pc/h			6066	744	744	
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			1.00	0.38		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	1171.5	Number of Outer Lanes on	Freeway (NO)	1	
Distance to Upstream Ramp (LUP), ft	t	2300	Speed Index (Ms)		0.675	
Downstream Equilibrium Distance (LEQ), ft 2843.8		Flow Outer Lanes (vOA), pc/	h/ln	2166		
Distance to Downstream Ramp (LDC	stance to Downstream Ramp (LDOWN), ft 1500		On-Ramp Influence Area Sp	peed (SR), mi/h	50.4	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFM)	0.643	Outer Lanes Freeway Speed	l (So), mi/h	61.8	
Flow in Lanes 1 and 2 (v12), pc/h	/12), pc/h 3900		Ramp Junction Speed (S), m	ni/h	53.5	
Flow Entering Ramp-Infl. Area (vR12)), pc/h	4644	Average Density (D), pc/mi/	'In	42.4	
Level of Service (LOS)		E	Density in Ramp Influence A	Area (DR), pc/mi/ln	36.7	

	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Ex	59 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	30.0		
Segment Length (L) / Deceleration	Length (LA),	ft	1500	775		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF	:)		0.950	0.975		
Final Capacity Adjustment Factor (C	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060	1.060	
Demand and Capacity				-		
Demand Volume (Vi)			5900	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (fi	⊣V)		0.976	0.985		
Flow Rate (vi),pc/h			6817	572	572	
Capacity (c), pc/h			6824	1839	1839	
Volume-to-Capacity Ratio (v/c)			1.00	0.31	0.31	
Speed and Density						
Upstream Equilibrium Distance (LEC), ft	3807.9	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	1500	Speed Index (Ds)		0.555	
Downstream Equilibrium Distance (LEQ), ft - Flo		Flow Outer Lanes (vOA), pc/	h/ln	2700		
Distance to Downstream Ramp (LDG	Distance to Downstream Ramp (LDOWN), ft 1125		Off-Ramp Influence Area Sp	peed (SR), mi/h	53.5	
Prop. Freeway Vehicles in Lane 1 an	Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.563		Outer Lanes Freeway Speed (SO), mi/h		67.7	
Flow in Lanes 1 and 2 (v12), pc/h		4117	Ramp Junction Speed (S), m	ni/h	58.3	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/	′In	39.0	
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	32.7	

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
Project Description	I-95 NB Ex59 Basic Fwy - 2030 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060
Demand and Capacity			
Demand Volume veh/h	5400	Heavy Vehicle Adjustment Factor (fHV)	0.976
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2080
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2396
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2319
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.90
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	58.1
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	35.8
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	E
Adjusted Free-Flow Speed (FFSadj), mi/h	69.6		
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		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description	I-95 NB Ex	59 Merge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	650		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				·		
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type			No Incident	-	-	
Final Speed Adjustment Factor (SAF	:)		0.975	0.975		
Final Capacity Adjustment Factor (C	AF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060	1.060	
Demand and Capacity						
Demand Volume (Vi)			5400	150		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	⊣V)		0.976	0.985		
Flow Rate (vi),pc/h			6239	172	172	
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.94	0.09		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	1041.7	Number of Outer Lanes on F	Freeway (NO)	1	
Distance to Upstream Ramp (LUP), f	t	1125	Speed Index (Ms)		0.467	
Downstream Equilibrium Distance (Downstream Equilibrium Distance (LEQ), ft 1808.2 Flow Outer Lanes		Flow Outer Lanes (vOA), pc/h	n/ln	2521	
Distance to Downstream Ramp (LDC	(LDOWN), ft 4900 On-Rar		On-Ramp Influence Area Sp	eed (SR), mi/h	56.7	
Prop. Freeway Vehicles in Lane 1 an	d 2 (РFM)	0.596	Outer Lanes Freeway Speed (SO), mi/h		61.7	
Flow in Lanes 1 and 2 (v12), pc/h		3718	Ramp Junction Speed (S), m	i/h	58.6	
Flow Entering Ramp-Infl. Area (vR12), pc/h	3890	Average Density (D), pc/mi/l	ln	36.5	
Level of Service (LOS)		D	Density in Ramp Influence A	rea (DR), pc/mi/ln	31.7	

	HCS7 Basic Freeway Report				
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2030		
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00		
Project Description	I-95 NB Ex59-60 Basic Fwy - 2030 PM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060		
Demand and Capacity					
Demand Volume veh/h	5550	Heavy Vehicle Adjustment Factor (fHV)	0.976		
Peak Hour Factor	0.94	Flow Rate (V _p), pc/h/ln	2137		
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.92		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	56.9		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	37.6		
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	E		
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0				
			C		

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	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description	I-95 NB Exe	60 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	30.0		
Segment Length (L) / Deceleration L	ength (LA),	ft	1500	200		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (Ca	AF)		0.968 0.968			
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5550	300		
Peak Hour Factor (PHF)			0.94 0.94			
Total Trucks, %			2.50	1.50		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	IV)		0.976	0.985		
Flow Rate (vi),pc/h			6412	343		
Capacity (c), pc/h			6970	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.92	0.19		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	841.8	Number of Outer Lanes on Fre	eeway (No)	1	
Distance to Upstream Ramp (LUP), ft		4900	Speed Index (Ds)		0.534	
Downstream Equilibrium Distance (L	.EQ), ft	-	Flow Outer Lanes (vOA), pc/h/	ln	2525	
Distance to Downstream Ramp (LDC	wn), ft	1200	Off-Ramp Influence Area Spee	ed (SR), mi/h	55.0	
Prop. Freeway Vehicles in Lane 1 and	d 2 (PFD)	0.584	Outer Lanes Freeway Speed (S	60), mi/h	70.8	
Flow in Lanes 1 and 2 (v12), pc/h		3887	Ramp Junction Speed (S), mi/l	h	60.3	
Flow Entering Ramp-Infl. Area (vR12)	, pc/h	-	Average Density (D), pc/mi/ln		35.4	
Level of Service (LOS)		Е	Density in Ramp Influence Are	ea (DR), pc/mi/ln	35.9	

HCS7 Basic Freeway Report						
Project Information						
Analyst	Chen-Yuan Wang	Date	1/18/2021			
Agency	CTPS	Analysis Year	2030			
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00			
Project Description	I-95 NB Ex60 Basic Fwy - 2030 PM	Unit	United States Customary			
Geometric Data						
Number of Lanes, In	3	Terrain Type	Level			
Segment Length (L), ft	-	Percent Grade, %	-			
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-			
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00			
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8			
Right-Side Lateral Clearance, ft	10					
Adjustment Factors						
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975			
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968			
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060			
Demand and Capacity						
Demand Volume veh/h	5250	Heavy Vehicle Adjustment Factor (fHV)	0.976			
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2022			
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400			
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323			
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.87			
Passenger Car Equivalent (ET)	2.000					
Speed and Density						
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.7			
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	33.9			
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D			
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0					
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	HCS7 Freeway	Merge Report			
Project Information					
Analyst Chen-Yu	an Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2030		
Jurisdiction MassDO	Γ District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description I-95 NB I	Ex60 Merge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Acceleration Length (LA	x),ft	1500	625		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors			•		
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	r Non-Severe Weather		
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)	eed Adjustment Factor (SAF) 0.975 0.975		0.975		
Final Capacity Adjustment Factor (CAF)	nal Capacity Adjustment Factor (CAF)		0.968		
Demand Adjustment Factor (DAF)		1.060	1.060	1.060	
Demand and Capacity					
Demand Volume (Vi)		5250	500		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	1.50		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.985		
Flow Rate (vi),pc/h		6066	572		
Capacity (c), pc/h		6970	1936		
Volume-to-Capacity Ratio (v/c)		0.95	0.30		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	1079.1	Number of Outer Lanes on Freewa	y (No)	1	
Distance to Upstream Ramp (LUP), ft	1200	Speed Index (MS)		0.641	
Downstream Equilibrium Distance (LEQ), ft	3365.3	Flow Outer Lanes (vOA), pc/h/ln		2105	
Distance to Downstream Ramp (LDOWN), ft	1500	On-Ramp Influence Area Speed (S	R), mi/h	52.1	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)		Outer Lanes Freeway Speed (SO), mi/h 64.2			
	0.653	Outer Lanes Freeway Speed (SO), r	mi/h	04.2	
Flow in Lanes 1 and 2 (v12), pc/h	0.653 3961	Outer Lanes Freeway Speed (SO), r Ramp Junction Speed (S), mi/h	ni/h	55.4	
Flow in Lanes 1 and 2 (v12), pc/h Flow Entering Ramp-Infl. Area (vR12), pc/h			ni/h		

	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Chen	-Yuan Wang	Date	1/18/2022		
Agency CTPS		Analysis Year	2030		
Jurisdiction Mass	DOT District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-95 I	NB Ex61 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Deceleration Lengt	h (LA),ft	1500	450		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	niliar	
Weather Type		Non-Severe Weather	Non-Sever	e Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.060	1.060	1.060	
Demand and Capacity			·		
Demand Volume (Vi)		5750	550		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	1.50		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-		
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.985		
Flow Rate (vi),pc/h		6643	630		
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.95	0.33	0.33	
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	3069.2	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	1500	Speed Index (DS)		0.496	
Downstream Equilibrium Distance (LEQ), f	ft -	Flow Outer Lanes (vOA), pc/h	/ln	2616	
Distance to Downstream Ramp (LDOWN),	ft 1800	Off-Ramp Influence Area Spe	eed (SR), mi/h	56.1	
Prop. Freeway Vehicles in Lane 1 and 2 (F	PFD) 0.565	Outer Lanes Freeway Speed	(SO), mi/h	70.5	
Flow in Lanes 1 and 2 (v12), pc/h	4027	Ramp Junction Speed (S), mi	/h	61.0	
Flow Entering Romp Infl Area (vB12) not		Average Density (D), pc/mi/ln 36.3			
Flow Entering Ramp-Infl. Area (vR12), pc/l	h -	Average Density (D), pc/mi/li	n	36.3	

HCS7 Basic Freeway Report					
Project Information					
Analyst	Chen-Yuan Wang	Date	1/18/2021		
Agency	CTPS	Analysis Year	2030		
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00		
Project Description	I-95 NB Ex61 Basic Fwy -2030 PM	Unit	United States Customary		
Geometric Data					
Number of Lanes, In	3	Terrain Type	Level		
Segment Length (L), ft	-	Percent Grade, %	-		
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-		
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00		
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8		
Right-Side Lateral Clearance, ft	10				
Adjustment Factors					
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975		
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968		
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.060		
Demand and Capacity					
Demand Volume veh/h	5200	Heavy Vehicle Adjustment Factor (fHV)	0.976		
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2003		
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400		
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323		
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.86		
Passenger Car Equivalent (ET)	2.000				
Speed and Density					
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	60.1		
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	33.3		
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D		
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0				

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	HCS7 Freeway	Merge Report		
Project Information				
Analyst Chen-Yua	n Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2030	
Jurisdiction MassDOT	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00
Project Description I-95 NB E	x61 Merge - 2030 PM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.8	35.0	
Segment Length (L) / Acceleration Length (LA)),ft	1500	500	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors				
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Severe Weather	
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)	Speed Adjustment Factor (SAF) 0.975		0.975	
nal Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.060	1.060	
Demand and Capacity				
Demand Volume (Vi)		5200	450	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		2.50	1.50	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.985	
Flow Rate (vi),pc/h		6008	515	
Capacity (c), pc/h		6970	1936	
Volume-to-Capacity Ratio (v/c)		0.94	0.27	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	999.0	Number of Outer Lanes on Freew	ay (No)	1
Distance to Upstream Ramp (LUP), ft	1800	Speed Index (MS)		0.516
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2451
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (S	SR), mi/h	55.6
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.592	Outer Lanes Freeway Speed (SO),	mi/h	62.6
Flow in Lanes 1 and 2 (v12), pc/h				
	3557	Ramp Junction Speed (S), mi/h		58.0
Flow Entering Ramp-Infl. Area (vR12), pc/h	3557 4072	Ramp Junction Speed (S), mi/h Average Density (D), pc/mi/ln		37.5

	HCS7 Freeway	Merge Report		
Project Information				
Analyst Chen-Yua	n Wang	Date	1/18/2022	
Agency CTPS		Analysis Year	2030	
Jurisdiction MassDOT	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00
Project Description I-95 SB Ex	57 Merge - 2030 PM	Unit	United Sta	tes Customary
Geometric Data				
		Freeway	Ramp	
Number of Lanes (N), In		3	1	
Free-Flow Speed (FFS), mi/h		71.4	35.0	
Segment Length (L) / Acceleration Length (LA),ft	1500	600	
Terrain Type		Level	Level	
Percent Grade, %		-	-	
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane
Adjustment Factors				
Driver Population		Mostly Familiar	Mostly Fan	niliar
Weather Type		Non-Severe Weather	Non-Severe Weather	
Incident Type		No Incident	-	
Final Speed Adjustment Factor (SAF)	djustment Factor (SAF) 0.950 0.975			
Final Capacity Adjustment Factor (CAF)		0.968	0.968	
Demand Adjustment Factor (DAF)		1.070	1.070	
Demand and Capacity				
Demand Volume (Vi)		4900	550	
Peak Hour Factor (PHF)		0.94	0.94	
Total Trucks, %		2.50	2.00	
Single-Unit Trucks (SUT), %		-	-	
Tractor-Trailers (TT), %		-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	
Flow Rate (vi),pc/h		5715	638	
Capacity (c), pc/h		6824	1936	
Volume-to-Capacity Ratio (v/c)		0.93	0.33	
Speed and Density				
Upstream Equilibrium Distance (LEQ), ft	1007.1	Number of Outer Lanes on Freewa	y (No)	1
Distance to Upstream Ramp (LUP), ft	1700	Speed Index (MS)		0.500
Downstream Equilibrium Distance (LEQ), ft	936.5	Flow Outer Lanes (vOA), pc/h/ln		2320
Distance to Downstream Ramp (LDOWN), ft		On-Ramp Influence Area Speed (SR), mi/h 54.9		540
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	3600	On-Ramp Influence Area Speed (S	R), mi/h	54.9
Trop. rreeway verneles in Lane 1 and 2 (1111)	3600 0.594	On-Ramp Influence Area Speed (S Outer Lanes Freeway Speed (SO), r		61.2
Flow in Lanes 1 and 2 (v12), pc/h				
<u> </u>	0.594	Outer Lanes Freeway Speed (SO), r		61.2

	HCS7 Basic Freeway Report						
Project Information							
Analyst	Chen-Yuan Wang	Date	1/18/2021				
Agency	CTPS	Analysis Year	2030				
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00				
Project Description	I-95 SB Ex57 Basic Fwy - 2030 PM	Unit	United States Customary				
Geometric Data							
Number of Lanes, In	3	Terrain Type	Level				
Segment Length (L), ft	-	Percent Grade, %	-				
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-				
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25				
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1				
Right-Side Lateral Clearance, ft	10						
Adjustment Factors							
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925				
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968				
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070				
Demand and Capacity							
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.976				
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	2080				
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358				
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283				
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.91				
Passenger Car Equivalent (ET)	2.000						
Speed and Density							
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	56.2				
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	37.0				
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	E				
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8						
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	ŀ	HCS7 Freeway	Diverge Report			
Project Information						
Analyst C	hen-Yuan	Wang	Date	8/10/2021		
Agency C	TPS		Analysis Year	2030		
Jurisdiction N	lassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description I-	-95 SB Ex5	7 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration Le	ngth (LA),	ft	1500	225		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors				<u> </u>		
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)		0.925	0.975			
Final Capacity Adjustment Factor (CAF)			0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			5400	500		
Peak Hour Factor (PHF)			0.94 0.94			
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (fhv	′)		0.976	0.980		
Flow Rate (vi),pc/h			6298	581		
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.92	0.30		
Speed and Density						
Upstream Equilibrium Distance (LEQ),	ft	2527.9	Number of Outer Lanes on F	reeway (NO)	1	
Distance to Upstream Ramp (LUP), ft		825	Speed Index (DS)		0.492	
Downstream Equilibrium Distance (LE	Q), ft	-	Flow Outer Lanes (vOA), pc/h	n/ln	2424	
Distance to Downstream Ramp (LDOW	vn), ft	1700	Off-Ramp Influence Area Sp	eed (SR), mi/h	54.1	
Prop. Freeway Vehicles in Lane 1 and	2 (PFD)	0.576	Outer Lanes Freeway Speed	(SO), mi/h	66.6	
Flow in Lanes 1 and 2 (v12), pc/h		3874	Ramp Junction Speed (S), m	i/h	58.3	
Flow Entering Ramp-Infl. Area (vR12),	pc/h	-	Average Density (D), pc/mi/l	ln	36.0	
Level of Service (LOS)		Е	Density in Ramp Influence A	rea (DR), pc/mi/ln	35.5	

		HCS7 Freeway	Merge Report				
Project Information							
Analyst Ch	nen-Yuan	Wang	Date		1/18/2022		
Agency CT	ΓPS		Analysis Year		2030		
Jurisdiction Ma	assDOT D	District 4	Time Period Analyzed		PM Peak H	our 5:00-6:00	
Project Description I-9	95 SB Ex5	8 Merge - 2030 PM	Unit		United Stat	tes Customary	
Geometric Data							
			Freeway		Ramp		
Number of Lanes (N), In			3		1		
Free-Flow Speed (FFS), mi/h			71.1		35.0		
Segment Length (L) / Acceleration Len	ngth (LA),f	t	1500		550		
Terrain Type			Level		Level		
Percent Grade, %			-		-		
Segment Type / Ramp Type			Freeway		Right-Side	d One-Lane	
Adjustment Factors							
Driver Population			Mostly Familiar		Mostly Fam	niliar	
Weather Type			Non-Severe Weather		Non-Severe Weather		
Incident Type			No Incident	-			
Final Speed Adjustment Factor (SAF)	Speed Adjustment Factor (SAF) 0.925 0.975						
Final Capacity Adjustment Factor (CAF	nal Capacity Adjustment Factor (CAF)		0.968		0.968		
Demand Adjustment Factor (DAF)			1.070		1.070		
Demand and Capacity							
Demand Volume (Vi)			5000		400		
Peak Hour Factor (PHF)			0.94		0.94		
Total Trucks, %			2.50		2.00		
Single-Unit Trucks (SUT), %			-		-		
Tractor-Trailers (TT), %			-		-		
Heavy Vehicle Adjustment Factor (fHV)			0.976		0.980		
Flow Rate (vi),pc/h			5831		465		
Capacity (c), pc/h			6824		1936		
Volume-to-Capacity Ratio (v/c)			0.92		0.24		
Speed and Density							
Upstream Equilibrium Distance (LEQ), f	ft	972.7	Number of Outer Lanes o	n Freeway	/ (No)	1	
Distance to Upstream Ramp (LUP), ft		2600	Speed Index (Ms)			0.702	
Downstream Equilibrium Distance (LEC	Q), ft	3220.9	Flow Outer Lanes (vOA), p	c/h/ln		1621	
Distance to Downstream Ramp (LDOWI	N), ft	825	On-Ramp Influence Area	Speed (SR), mi/h	49.1	
Prop. Freeway Vehicles in Lane 1 and 2	2 (PFM)	0.722	Outer Lanes Freeway Spe	ed (So), m	ni/h	61.8	
Flow in Lanes 1 and 2 (v12), pc/h		4210	Ramp Junction Speed (S), mi/h 51.8		51.8		
		4210	Trainp surietion speed (5),		Average Density (D), pc/mi/ln 40.5		
Flow Entering Ramp-Infl. Area (vR12), p	oc/h	4675					

	HCS7 Basic F	reeway Report	
Project Information			
Analyst	Chen-Yuan Wang	Date	1/18/2021
Agency	CTPS	Analysis Year	2030
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00
Project Description	I-95 SB Ex58 Basic Fwy - 2030 PM	Unit	United States Customary
Geometric Data			
Number of Lanes, In	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.25
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.1
Right-Side Lateral Clearance, ft	10		
Adjustment Factors			
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070
Demand and Capacity			
Demand Volume veh/h	5000	Heavy Vehicle Adjustment Factor (fHV)	0.976
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1944
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2358
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2283
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.85
Passenger Car Equivalent (ET)	2.000		
Speed and Density			
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	59.2
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	32.8
Total Ramp Density Adjustment	3.9	Level of Service (LOS)	D
Adjusted Free-Flow Speed (FFSadj), mi/h	65.8		
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	I	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	ı Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak I	Hour 5:00-6:00	
Project Description	I-95 SB Ex5	8 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration I	Length (LA),	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	ed One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Far	Mostly Familiar	
Weather Type			Non-Severe Weather	Non-Seve	re Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF	·)		0.925	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			5650	650		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (fi	HV)		0.976	0.980		
Flow Rate (vi),pc/h			6590	756		
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.97	0.39		
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	282.6	Number of Outer Lanes on	Freeway (NO)	1	
Distance to Upstream Ramp (LUP), f	t	2150	Speed Index (Ds)		0.508	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc,	/h/ln	2567	
Distance to Downstream Ramp (LDC	OWN), ft	2600	Off-Ramp Influence Area S	peed (SR), mi/h	53.7	
Prop. Freeway Vehicles in Lane 1 an	chicles in Lane 1 and 2 (PFD) 0.560		Outer Lanes Freeway Speed (SO), mi/h		66.1	
Flow in Lanes 1 and 2 (v12), pc/h		4023	Ramp Junction Speed (S), r	mi/h	57.9	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi	/ln	37.9	
Level of Service (LOS)		D	Density in Ramp Influence	Area (DR), pc/mi/ln	34.3	

		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description	I-95 SB Ex5	59 Merge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	25.0		
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	400		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	Mostly Familiar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF)			0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			5350	300		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	⊣V)		0.976	0.980	0.980	
Flow Rate (vi),pc/h			6239	348	348	
Capacity (c), pc/h			6824	1839	1839	
Volume-to-Capacity Ratio (v/c)			0.97	0.19		
Speed and Density						
Upstream Equilibrium Distance (LEQ)), ft	460.8	Number of Outer Lanes on I	Freeway (NO)	1	
Distance to Upstream Ramp (LUP), f	t	1250	Speed Index (Ms)		0.592	
Downstream Equilibrium Distance (LEQ), ft	4628.1	Flow Outer Lanes (vOA), pc/h/ln		2277	
Distance to Downstream Ramp (LDC	OWN), ft	2150	On-Ramp Influence Area Sp	eed (SR), mi/h	52.5	
Prop. Freeway Vehicles in Lane 1 an	d 2 (РFM)	0.635	Outer Lanes Freeway Speed	(SO), mi/h	61.4	
Flow in Lanes 1 and 2 (v12), pc/h		3962	Ramp Junction Speed (S), m	i/h	55.3	
Flow Entering Ramp-Infl. Area (vR12), pc/h	4310	Average Density (D), pc/mi/l	ln	39.7	
Level of Service (LOS)		Е	Density in Ramp Influence A	rea (DR), pc/mi/ln	36.5	

	HCS7 Basic F	reeway Report				
Project Information						
Analyst	Chen-Yuan Wang	Date	1/18/2021			
Agency	CTPS	Analysis Year	2030			
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00			
Project Description	I-95 SB Ex59 Basic Fwy - 2030 PM	Unit	United States Customary			
Geometric Data						
Number of Lanes, In	3	Terrain Type	Level			
Segment Length (L), ft	-	Percent Grade, %	-			
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-			
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.16			
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.4			
Right-Side Lateral Clearance, ft	10					
Adjustment Factors						
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.925			
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968			
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070			
Demand and Capacity						
Demand Volume veh/h	5350	Heavy Vehicle Adjustment Factor (fHV)	0.976			
Peak Hour Factor	0.94	Flow Rate (V _P), pc/h/ln	2080			
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2360			
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2284			
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.91			
Passenger Car Equivalent (ET)	2.000					
Speed and Density						
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	56.3			
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	36.9			
Total Ramp Density Adjustment	3.6	Level of Service (LOS)	E			
Adjusted Free-Flow Speed (FFSadj), mi/h	66.0					
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	I	HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuan	n Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT [District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 SB Ex5	59 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Deceleration	Length (LA),	ft	1500	275		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Far	Mostly Familiar	
Weather Type			Non-Severe Weather	Non-Sever	re Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF	=)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			5550	200		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.980		
Flow Rate (vi),pc/h			6472	232		
Capacity (c), pc/h			6824	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.95	0.12		
Speed and Density						
Upstream Equilibrium Distance (LEC	Q), ft	3487.8	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), t	ft	5600	Speed Index (DS)		0.461	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/	/h/ln	2571	
Distance to Downstream Ramp (LD	OWN), ft	1250	Off-Ramp Influence Area S	peed (SR), mi/h	55.9	
Prop. Freeway Vehicles in Lane 1 ar	es in Lane 1 and 2 (PFD) 0.588		Outer Lanes Freeway Speed (SO), mi/h		68.2	
Flow in Lanes 1 and 2 (v12), pc/h		3901	Ramp Junction Speed (S), n	ni/h	60.2	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi,	/ln	35.8	
Level of Service (LOS)		Е	Density in Ramp Influence	Area (DR), pc/mi/ln	35.3	

HCS7 Basic Fi	reeway Report					
Chen-Yuan Wang	Date	1/18/2021				
CTPS	Analysis Year	2030				
MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00				
I-95 SB Ex59-60 Basic Fwy - 2030 PM	Unit	United States Customary				
Geometric Data						
3	Terrain Type	Level				
-	Percent Grade, %	-				
Base	Grade Length, mi	-				
75.0	Total Ramp Density (TRD), ramps/mi	1.00				
12	Free-Flow Speed (FFS), mi/h	71.8				
10						
Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975				
Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968				
No Incident	Demand Adjustment Factor (DAF)	1.070				
5550	Heavy Vehicle Adjustment Factor (fHV)	0.976				
0.94	Flow Rate (Vp), pc/h/ln	2157				
2.50	Capacity (c), pc/h/ln	2400				
-	Adjusted Capacity (cadj), pc/h/ln	2323				
-	Volume-to-Capacity Ratio (v/c)	0.93				
2.000						
Speed and Density						
0.0	Average Speed (S), mi/h	56.4				
0.0	Density (D), pc/mi/ln	38.2				
3.2	Level of Service (LOS)	E				
70.0						
	Chen-Yuan Wang CTPS MassDOT District 4 I-95 SB Ex59-60 Basic Fwy - 2030 PM 3 - Base 75.0 12 10 Mostly Familiar Non-Severe Weather No Incident 5550 0.94 2.50 - - 2.000 0.0 0.0 3.2	CTPS MassDOT District 4 I-95 SB Ex59-60 Basic Fwy - 2030 PM Terrain Type Percent Grade, % Base Grade Length, mi 75.0 Total Ramp Density (TRD), ramps/mi 12 Free-Flow Speed (FFS), mi/h 10 Mostly Familiar Final Speed Adjustment Factor (SAF) Non-Severe Weather Final Capacity Adjustment Factor (CAF) No Incident Demand Adjustment Factor (DAF) 5550 Heavy Vehicle Adjustment Factor (fhtv) 0.94 Flow Rate (Vp), pc/h/ln 2.50 Capacity (c), pc/h/ln - Adjusted Capacity (cadj), pc/h/ln Volume-to-Capacity Ratio (v/c) 2.000 Average Speed (S), mi/h 0.0 Density (D), pc/mi/ln 3.2 Level of Service (LOS)				

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		HCS7 Freeway	Merge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 SB Ex6	60 Merge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Acceleration L	ength (LA),	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	Mostly Familiar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type		No Incident	-	-		
Final Speed Adjustment Factor (SAF)			0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			4950	600		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h			5773	697	697	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.93	0.36		
Speed and Density				·		
Upstream Equilibrium Distance (LEQ), ft	987.7	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	1925	Speed Index (Ms)		0.526	
Downstream Equilibrium Distance (I	LEQ), ft	1330.6	Flow Outer Lanes (vOA), pc/h/ln		2355	
Distance to Downstream Ramp (LDC	OWN), ft	5600	On-Ramp Influence Area Sp	peed (SR), mi/h	55.3	
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFM)	0.592	Outer Lanes Freeway Speed	l (So), mi/h	63.1	
Flow in Lanes 1 and 2 (v12), pc/h		3418	Ramp Junction Speed (S), m	ni/h	57.9	
Flow Entering Ramp-Infl. Area (vR12), pc/h	4115	Average Density (D), pc/mi/	′ln	37.2	
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	34.2	
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	HCS7 Basic Freeway Report					
Project Information						
Analyst	Chen-Yuan Wang	Date	1/18/2021			
Agency	CTPS	Analysis Year	2030			
Jurisdiction	MassDOT District 4	Time Period Analyzed	PM Peak Hour 5:00-6:00			
Project Description	I-95 SB Ex60 Basic Fwy - 2030 PM	Unit	United States Customary			
Geometric Data						
Number of Lanes, In	3	Terrain Type	Level			
Segment Length (L), ft	-	Percent Grade, %	-			
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-			
Base Free-Flow Speed (BFFS), mi/h	75.0	Total Ramp Density (TRD), ramps/mi	1.00			
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	71.8			
Right-Side Lateral Clearance, ft	10					
Adjustment Factors						
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975			
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968			
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.070			
Demand and Capacity						
Demand Volume veh/h	4950	Heavy Vehicle Adjustment Factor (fHV)	0.976			
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1924			
Total Trucks, %	2.50	Capacity (c), pc/h/ln	2400			
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	2323			
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.83			
Passenger Car Equivalent (ET)	2.000					
Speed and Density						
Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	61.8			
Right-Side Lateral Clearance Adj. (fRLC)	0.0	Density (D), pc/mi/ln	31.1			
Total Ramp Density Adjustment	3.2	Level of Service (LOS)	D			
Adjusted Free-Flow Speed (FFSadj), mi/h	70.0					

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	HCS7 Freeway	Diverge Report			
Project Information					
Analyst Che	en-Yuan Wang	Date	8/10/2021		
Agency CTF	PS	Analysis Year	2030		
Jurisdiction Ma	ssDOT District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description I-95	5 SB Ex60 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data					
		Freeway	Ramp		
Number of Lanes (N), In		3	1		
Free-Flow Speed (FFS), mi/h		71.8	35.0		
Segment Length (L) / Deceleration Leng	gth (LA),ft	1500	575		
Terrain Type		Level	Level		
Percent Grade, %		-	-		
Segment Type / Ramp Type		Freeway	Right-Side	d One-Lane	
Adjustment Factors					
Driver Population		Mostly Familiar	Mostly Fan	Mostly Familiar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather	
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)		1.070	1.070	1.070	
Demand and Capacity			·		
Demand Volume (Vi)		5200	250		
Peak Hour Factor (PHF)		0.94	0.94		
Total Trucks, %		2.50	2.00		
Single-Unit Trucks (SUT), %		-	-		
Tractor-Trailers (TT), %		-	-	-	
Heavy Vehicle Adjustment Factor (fHV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h		6065	291		
Capacity (c), pc/h		6970	1936	1936	
Volume-to-Capacity Ratio (v/c)		0.87	0.15		
Speed and Density					
Upstream Equilibrium Distance (LEQ), ft	2592.1	Number of Outer Lanes on F	reeway (No)	1	
Distance to Upstream Ramp (LUP), ft	1500	Speed Index (DS)		0.466	
Downstream Equilibrium Distance (LEQ)), ft -	Flow Outer Lanes (vOA), pc/h/ln 2338		2338	
Distance to Downstream Ramp (LDOWN	ı), ft 1925	Off-Ramp Influence Area Spe	eed (SR), mi/h	57.0	
Prop. Freeway Vehicles in Lane 1 and 2	(PFD) 0.595	Outer Lanes Freeway Speed (SO), mi/h		71.6	
Flow in Lanes 1 and 2 (v12), pc/h	3727	Ramp Junction Speed (S), mi,	/h	61.9	
Flow Entering Ramp-Infl. Area (vR12), po	c/h -	Average Density (D), pc/mi/lr	n	32.7	

Project Information Project Information Chen Yuan Wang Date 1/18/2022 Arralyst Chen Yuan Wang Date 1/18/2022 Jurisdiction MassDOT District 4 Time Period Analyzed MP Peak Hour 5:00-6:00 Project Description 195 SB Ex61 Merge - 2030 PM Unit United States Customary Commetric Data Free Pion Speed (FS), mi/h 3 1 ————————————————————————————————————			HCS7 Freeway	Merge Report			
Agency CFPS	Project Information						
Units diction	Analyst	Chen-Yuan	ı Wang	Date	1/18/2022		
Project Description L-95 SB Ex61 Merge - 2030 PM	Agency	CTPS		Analysis Year	2030		
Freeway	Jurisdiction 1	MassDOT [District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Number of Lanes (N), In 3 1 1 1 1 1 1 1 1 1	Project Description I	-95 SB Ex6	51 Merge - 2030 PM	Unit	United Sta	tes Customary	
Number of Lanes (N), In 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 25.0 71.8 71.	Geometric Data						
Free-Flow Speed (FFS), mi/h Segment Length (L) / Acceleration Length (La).lt 1500 Segment Length (L) / Acceleration Length (La).lt 1500 Segment Type / Remp Type Freeway Segment Type / Ramp Type Freeway Segment Type / Ramp Type Freeway Mostly Familiar Non-Severe Weather				Freeway	Ramp		
Segment Length (L) / Acceleration Length (LA).ft 1500 350 Terrain Type Level Level Percent Grade, % - - Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.070 1.070 Demand Adjustment Factor (DAF) 4750 450 Demand Wolume (V) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, (SUT), % - - Tractor-Traiters (TT), % - - Heavy Vehicle Adjustment Factor (FHV) 5339 523 Gapacity (c), pc/h 0.980	Number of Lanes (N), In			3	1		
Eurein Type	Free-Flow Speed (FFS), mi/h			71.8	25.0		
Percent Grade, % -	Segment Length (L) / Acceleration Le	ength (LA),	ft	1500	350		
Segment Type / Ramp Type Freeway Right-Sided One-Lane Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Incident Type Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather Non-Severe Weather <td colsp<="" td=""><td>Terrain Type</td><td></td><td></td><td>Level</td><td>Level</td><td></td></td>	<td>Terrain Type</td> <td></td> <td></td> <td>Level</td> <td>Level</td> <td></td>	Terrain Type			Level	Level	
Adjustment Factors Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.070 1.070 Demand Capacity Demand Volume (V) 450 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, SUT), % - - Tractor-Trailers (TT), % - - Flow Rate (w), p.c/h 5539 523 Capacity (c), p.c/h 5539 523 Capacity (c), p.c/h 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.482 Downstream Equilibriu	Percent Grade, %			-	-		
Driver Population Mostly Familiar Mostly Familiar Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.070 1.070 Demand Capacity Demand Capacity A750 450 Demand Volume (V) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks (SUT), % - - Tractor-Trailers (TT), % - -	Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Weather Type Non-Severe Weather Non-Severe Weather Incident Type No Incident - Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.070 1.070 Demand Adjustment Factor (DAF) 1.070 450 Demand Wolume (Vi) 4750 450 Demand Yolume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (Hev) 0.976 0.980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3	Adjustment Factors						
Incident Type	Driver Population			Mostly Familiar	Mostly Fan	Mostly Familiar	
Final Speed Adjustment Factor (SAF) 0.975 0.975 Final Capacity Adjustment Factor (DAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.070 1.070 Demand And Capacity Demand Volume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (HrV) 0.976 0.980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voA), pc/h/ln 2238 Distance to Downstream Ramp (LDown), ft	Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather	
Final Capacity Adjustment Factor (CAF) 0.968 0.968 Demand Adjustment Factor (DAF) 1.070 1.070 Demand and Capacity Demand Volume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - - Tractor-Trailers (TT), % - - - Heavy Vehicle Adjustment Factor (fHv) 5539 523 Capacity (c), pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Incident Type			No Incident	-		
Demand Adjustment Factor (DAF) 1,070 1,070 Demand and Capacity 4750 450 Peak Hour Factor (PHF) 0,94 0,94 Total Trucks, % 2,50 2,00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0,976 0,980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0,87 0,28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7	Final Speed Adjustment Factor (SAF)			0.975	0.975		
Demand and Capacity Demand Volume (Vi) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (wi), pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voa), pc/h/In 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h <td colspan="2">Final Capacity Adjustment Factor (CAF)</td> <td>0.968</td> <td>0.968</td> <td></td>	Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Volume (VI) 4750 450 Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % - - Tractor-Trailers (TT), % - - Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (No) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (Sn), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction	Demand Adjustment Factor (DAF)			1.070	1.070	1.070	
Peak Hour Factor (PHF) 0.94 0.94 Total Trucks, % 2.50 2.00 Single-Unit Trucks (SUT), % -	Demand and Capacity						
Total Trucks, % Single-Unit Trucks (SUT), %	Demand Volume (Vi)			4750	450		
Single-Unit Trucks (SUT),% - Tractor-Trailers (TT), % - Heavy Vehicle Adjustment Factor (fHV) 0.976 0.980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOwN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFIM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h	Peak Hour Factor (PHF)			0.94	0.94		
Tractor-Trailers (TT), % Heavy Vehicle Adjustment Factor (fHV) 0.976 0.980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 1125 Downstream Ramp (LUP), ft 1125 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/In 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow In Lanes 1 and 2 (v12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Total Trucks, %			2.50	2.00		
Heavy Vehicle Adjustment Factor (fHv) 0.976 0.980 Flow Rate (vi),pc/h 5539 523 Capacity (c), pc/h 6970 1839 Volume-to-Capacity Ratio (v/c) 0.87 0.28 Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (Ms) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (voA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Single-Unit Trucks (SUT), %			-	-		
Flow Rate (vi),pc/h Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 1125 Downstream Equilibrium Distance (LEQ), ft 1125 Speed Index (MS) On-Ramp Influence Area Speed (SR), mi/h 1125 Downstream Equilibrium Distance (LEQ), ft 1125 Downstream Equilibri	Tractor-Trailers (TT), %			-	-	-	
Capacity (c), pc/h Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Heavy Vehicle Adjustment Factor (fh	V)		0.976	0.980	0.980	
Volume-to-Capacity Ratio (v/c) Speed and Density Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Flow Rate (vi),pc/h			5539	523	523	
Speed and DensityUpstream Equilibrium Distance (LEQ), ft326.3Number of Outer Lanes on Freeway (NO)1Distance to Upstream Ramp (LUP), ft1125Speed Index (MS)0.482Downstream Equilibrium Distance (LEQ), ft1844.8Flow Outer Lanes (vOA), pc/h/ln2238Distance to Downstream Ramp (LDOWN), ft1500On-Ramp Influence Area Speed (SR), mi/h56.5Prop. Freeway Vehicles in Lane 1 and 2 (PFM)0.596Outer Lanes Freeway Speed (SO), mi/h63.7Flow in Lanes 1 and 2 (v12), pc/h3301Ramp Junction Speed (S), mi/h59.0Flow Entering Ramp-Infl. Area (vR12), pc/h3824Average Density (D), pc/mi/ln34.2	Capacity (c), pc/h			6970	1839	1839	
Upstream Equilibrium Distance (LEQ), ft 326.3 Number of Outer Lanes on Freeway (NO) 1 Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Volume-to-Capacity Ratio (v/c)			0.87	0.28		
Distance to Upstream Ramp (LUP), ft 1125 Speed Index (MS) 0.482 Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Speed and Density						
Downstream Equilibrium Distance (LEQ), ft 1844.8 Flow Outer Lanes (vOA), pc/h/ln 2238 Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Upstream Equilibrium Distance (LEQ)	, ft	326.3	Number of Outer Lanes on F	reeway (No)	1	
Distance to Downstream Ramp (LDOWN), ft 1500 On-Ramp Influence Area Speed (SR), mi/h 56.5 Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Distance to Upstream Ramp (LUP), ft		1125	Speed Index (MS)		0.482	
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.596 Outer Lanes Freeway Speed (SO), mi/h 63.7 Flow in Lanes 1 and 2 (v12), pc/h 3301 Ramp Junction Speed (S), mi/h 59.0 Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Downstream Equilibrium Distance (L	EQ), ft	1844.8	Flow Outer Lanes (vOA), pc/h/ln		2238	
Flow in Lanes 1 and 2 (v12), pc/h Speed (S), mi/h Flow Entering Ramp-Infl. Area (vR12), pc/h Speed (S), mi/h Average Density (D), pc/mi/ln Speed (S), mi/h 34.2	Distance to Downstream Ramp (LDO)	wn), ft	1500	On-Ramp Influence Area Spe	eed (SR), mi/h	56.5	
Flow Entering Ramp-Infl. Area (vR12), pc/h 3824 Average Density (D), pc/mi/ln 34.2	Prop. Freeway Vehicles in Lane 1 and	I 2 (РFM)	0.596	Outer Lanes Freeway Speed	(SO), mi/h	63.7	
	Flow in Lanes 1 and 2 (v12), pc/h		3301	Ramp Junction Speed (S), mi	i/h	59.0	
Level of Service (LOS) Density in Ramp Influence Area (DR), pc/mi/ln 32.9	Flow Entering Ramp-Infl. Area (vR12),	pc/h	3824	Average Density (D), pc/mi/l	n	34.2	
	Level of Service (LOS)		D	Density in Ramp Influence A	rea (DR), pc/mi/ln	32.9	

Date Analysis Year Time Period Analyzed Unit Terrain Type Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi Free-Flow Speed (FFS), mi/h	1/18/2021 2030 PM Peak Hour 5:00-6:00 United States Customary Level 1.00 71.8
Analysis Year Time Period Analyzed Unit Terrain Type Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	2030 PM Peak Hour 5:00-6:00 United States Customary Level 1.00
Time Period Analyzed Unit Terrain Type Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	PM Peak Hour 5:00-6:00 United States Customary Level 1.00
Terrain Type Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	Level 1.00
Terrain Type Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	Level 1.00
Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	- - 1.00
Percent Grade, % Grade Length, mi Total Ramp Density (TRD), ramps/mi	- - 1.00
Grade Length, mi Total Ramp Density (TRD), ramps/mi	
Total Ramp Density (TRD), ramps/mi	
Free-Flow Speed (FFS), mi/h	71.8
Final Speed Adjustment Factor (SAF)	0.975
Final Capacity Adjustment Factor (CAF)	0.968
Demand Adjustment Factor (DAF)	1.070
Heavy Vehicle Adjustment Factor (fHV)	0.976
Flow Rate (V _p), pc/h/ln	1846
Capacity (c), pc/h/ln	2400
Adjusted Capacity (cadj), pc/h/ln	2323
Volume-to-Capacity Ratio (v/c)	0.79
Average Speed (S), mi/h	63.3
Density (D), pc/mi/ln	29.2
Level of Service (LOS)	D
	apacity (c), pc/h/ln djusted Capacity (cadj), pc/h/ln olume-to-Capacity Ratio (v/c) verage Speed (S), mi/h ensity (D), pc/mi/ln

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		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 SB Exe	61 Diverge - 2030 PM	Unit	United Sta	tes Customary	
Geometric Data				·		
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	35.0		
Segment Length (L) / Deceleration I	_ength (LA)	ft	1500	450		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	Mostly Familiar	
Weather Type		Non-Severe Weather	Non-Sever	Non-Severe Weather		
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF)		0.975	0.975		
Final Capacity Adjustment Factor (C	Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity				•		
Demand Volume (Vi)			5050	300		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.980	0.980	
Flow Rate (vi),pc/h			5890	348	348	
Capacity (c), pc/h			6970	1936	1936	
Volume-to-Capacity Ratio (v/c)			0.85	0.18		
Speed and Density						
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on	Freeway (No)	1	
Distance to Upstream Ramp (LUP), f	t	-	Speed Index (Ds)		0.471	
Downstream Equilibrium Distance (I	LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2233	
Distance to Downstream Ramp (LDC	OWN), ft	1125	Off-Ramp Influence Area Sp	peed (SR), mi/h	56.8	
Prop. Freeway Vehicles in Lane 1 an	d 2 (PFD)	0.597	Outer Lanes Freeway Speed	l (So), mi/h	72.0	
Flow in Lanes 1 and 2 (v12), pc/h		3657	Ramp Junction Speed (S), m	ni/h	61.7	
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/	/In	31.8	
Level of Service (LOS)		D	Density in Ramp Influence A	Area (DR), pc/mi/ln	31.7	
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APPENDIX K

Highway Capacity Analyses
AM Peak Hour: 2030 Proposed Improvements Scenario

H	HCS7 Freeway	Weaving Repo	rt	
Project Information				
Analyst	Chen-Yuan Wang	Date		1/21/2022
Agency	CTPS	Analysis Year		2030
Jurisdiction	MassDOT District 4	Time Period Analyzed		AM Peak Hour 6:00-7:00
Project Description	I-95 NB Ex57-58 Weaving - 2030 AM Proposed Scenario	Unit		United States Customary
Geometric Data				
Number of Lanes (N), In	4	Segment Type		Freeway
Segment Length (Ls), ft	1250	Number of Maneuver	Lanes (NWL), In	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane	e Changes (LCRF), lc	1
Terrain Type	Level	Freeway-to-Ramp Land	e Changes (LCFR), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane C	Changes (LCRR), Ic	0
Interchange Density (ID), int/mi	1.25	Cross Weaving Manag	ed Lane	No
Adjustment Factors				
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)		0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)		0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)		1.070
Demand and Capacity				•
	FF	RF	RR	FR
Demand Volume (Vi), veh/h	4650	315	35	315
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	5.50	3.50	3.50	3.50
Heavy Vehicle Adjustment Factor (fHV)	0.948	0.966	0.966	0.966
Flow Rate (vi), pc/h	5583	371	41	371
Weaving Flow Rate (vw), pc/h	742	Freeway Max Capacity	(cIFL), pc/h/ln	2358
Non-Weaving Flow Rate (vnw), pc/h	5624	Density-Based Capacity	y (cIWL), pc/h/ln	2170
Total Flow Rate (v), pc/h	6366	Demand Flow-Based C	apacity (c৷w), pc/h	20513
Volume Ratio (VR)	0.117	Weaving Segment Cap	acity (cW), veh/h	8248
Minimum Lane Change Rate (LCMIN), lc/h	742	Adjusted Weaving Area Capacity, pc/h		8402
Maximum Weaving Length (LMAX), ft	3705	Volume-to-Capacity Ratio (v/c)		0.76
Speed and Density				
Non-Weaving Vehicle Index (INW)	879	Average Weaving Spee	ed (SW), mi/h	52.6
Non-Weaving Lane Change Rate (LCNW), lc/h	1066	Average Non-Weaving	52.8	
Weaving Lane Change Rate (LCW), lc/h	1110	Average Speed (S), mi/	/h	52.8
Weaving Lane Change Rate (LCAII), lc/h	2176	Density (D), pc/mi/ln		30.1
Weaving Intensity Factor (W)	0.350	Level of Service (LOS)		D
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		HCS7 Freeway	/ Merge Report		
Project Information					
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022	
Agency	CTPS		Analysis Year	2030	
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 5:00-6:00
Project Description	I-95 NB Ex Proposed S	58 Merge - 2030 AM Scenario	Unit	United Sta	tes Customary
Geometric Data					
			Freeway	Ramp	
Number of Lanes (N), In			3	1	
Free-Flow Speed (FFS), mi/h			71.4	35.0	
Segment Length (L) / Acceleration	Length (LA),	ft	1500	1050	
Terrain Type			Level	Level	
Percent Grade, %			-	-	
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane
Adjustment Factors					
Driver Population			Mostly Familiar	Mostly Fan	niliar
Weather Type			Non-Severe Weather	Non-Sever	e Weather
Incident Type		No Incident	-		
Final Speed Adjustment Factor (SAI	=)		0.950	0.975	
Final Capacity Adjustment Factor (CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070	
Demand and Capacity					
Demand Volume (Vi)			4650	800	
Peak Hour Factor (PHF)			0.94	0.94	
Total Trucks, %			5.50	3.50	
Single-Unit Trucks (SUT), %			-	-	
Tractor-Trailers (TT), %			-	-	
Heavy Vehicle Adjustment Factor (f	HV)		0.948	0.966	
Flow Rate (vi),pc/h			5584	943	
Capacity (c), pc/h			6824	1936	
Volume-to-Capacity Ratio (v/c)			0.96	0.49	
Speed and Density					
Upstream Equilibrium Distance (LEC	Q), ft	1244.1	Number of Outer Lanes on Freew	ay (No)	1
Distance to Upstream Ramp (LUP),	ft	2300	Speed Index (Ms) 0.5		0.546
Downstream Equilibrium Distance (LEQ), ft	1240.2	Flow Outer Lanes (vOA), pc/h/ln		2195
Distance to Downstream Ramp (LD	OWN), ft	1500	On-Ramp Influence Area Speed (SR), mi/h	53.7
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFM)	0.607	Outer Lanes Freeway Speed (SO),	mi/h	61.7
Flow in Lanes 1 and 2 (v12), pc/h		3389	Ramp Junction Speed (S), mi/h		56.1
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	4332	Average Density (D), pc/mi/ln		38.8
Level of Service (LOS)		D	Density in Ramp Influence Area (I	DR), pc/mi/ln	32.3

HCS7 Freeway Diverge Report						
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/24/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 NB Ex Proposed S	60 Diverge - 2030 AM Scenario	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	30.0		
Segment Length (L) / Deceleration	Length (LA),	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAF	=)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5400 450			
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.50	3.50		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.948	0.966		
Flow Rate (vi),pc/h			6423	525		
Capacity (c), pc/h			6970	1839		
Volume-to-Capacity Ratio (v/c)			0.92	0.29		
Speed and Density						
Upstream Equilibrium Distance (LEC	Q), ft	1231.4	Number of Outer Lanes on Fre	eeway (No)	1	
Distance to Upstream Ramp (LUP), f	ft	4900	Speed Index (Ds)		0.551	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln 250		2507	
Distance to Downstream Ramp (LD	OWN), ft	1200	Off-Ramp Influence Area Spee	ed (SR), mi/h	54.6	
Prop. Freeway Vehicles in Lane 1 an	nd 2 (PFD)	0.575	Outer Lanes Freeway Speed (S	60), mi/h	70.9	
Flow in Lanes 1 and 2 (v12), pc/h		3916	Ramp Junction Speed (S), mi/h	h	60.0	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/ln		35.7	
Level of Service (LOS)		D	Density in Ramp Influence Are	ea (DR), pc/mi/ln	33.4	

ŀ	HCS7 Freeway	Weaving Repo	rt				
Project Information							
Analyst	Chen-Yuan Wang	Date		1/18/2022			
Agency	CTPS	Analysis Year		2030			
Jurisdiction	MassDOT District 4	Time Period Analyzed		AM Peak Hour 6:00-7:00			
Project Description	I-95 SB Ex57-58 Weaving - 2030 AM Proposed Scenario	Unit		United States Customary			
Geometric Data							
Number of Lanes (N), In	4	Segment Type		Freeway			
Segment Length (Ls), ft	1250	Number of Maneuver	Lanes (NWL), In	2			
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane	e Changes (LCRF), lc	1			
Terrain Type	Level	Freeway-to-Ramp Land	e Changes (LCFR), Ic	1			
Percent Grade, %	-	Ramp-to-Ramp Lane C	Changes (LCRR), Ic	0			
Interchange Density (ID), int/mi	1.25	Cross Weaving Manag	ed Lane	No			
Adjustment Factors							
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)		0.925			
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)		0.968			
Incident Type	No Incident	Demand Adjustment Factor (DAF)		1.060			
Demand and Capacity				•			
	FF	RF	RR	FR			
Demand Volume (Vi), veh/h	4930	570	30	320			
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94			
Total Trucks, %	5.00	3.00	3.00	3.00			
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.971	0.971	0.971			
Flow Rate (vi), pc/h	5840	662	35	372			
Weaving Flow Rate (vw), pc/h	1034	Freeway Max Capacity	(cIFL), pc/h/ln	2358			
Non-Weaving Flow Rate (vnw), pc/h	5875	Density-Based Capacity	y (cIWL), pc/h/ln	2145			
Total Flow Rate (v), pc/h	6909	Demand Flow-Based C	apacity (c৷w), pc/h	16000			
Volume Ratio (VR)	0.150	Weaving Segment Cap	acity (cW), veh/h	8193			
Minimum Lane Change Rate (LCMIN), lc/h	1034	Adjusted Weaving Area	a Capacity, pc/h	8305			
Maximum Weaving Length (LMAX), ft	4031	Volume-to-Capacity Ra	atio (v/c)	0.83			
Speed and Density							
Non-Weaving Vehicle Index (INW)	918	Average Weaving Spee	ed (Sw), mi/h	51.5			
Non-Weaving Lane Change Rate (LCNW), lc/h	1117	Average Non-Weaving		50.1			
Weaving Lane Change Rate (LCW), lc/h	1402	Average Speed (S), mi/	•	50.3			
Weaving Lane Change Rate (LCAII), lc/h	2519	Density (D), pc/mi/ln		34.3			
Weaving Intensity Factor (W)	0.393	Level of Service (LOS)		D			
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		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT	District 4	Time Period Analyzed	AM Peak P	eriod 6:00-7:00	
Project Description	I-95 SB Ext Proposed	58 Diverge - 2030 AM Scenario	Unit	United Sta	tes Customary	
Geometric Data				·		
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration	Length (LA)	,ft	1500	750		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAI	=)		0.925	0.975		
Final Capacity Adjustment Factor (C	CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5750	600		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00	3.00	
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.952	0.971		
Flow Rate (vi),pc/h			6811	697		
Capacity (c), pc/h			6824	1936		
Volume-to-Capacity Ratio (v/c)			1.00	0.36		
Speed and Density						
Upstream Equilibrium Distance (LEC	Q), ft	2509.1	Number of Outer Lanes on Free	way (No)	1	
Distance to Upstream Ramp (LUP),	ft	2150	Speed Index (DS)		0.502	
Downstream Equilibrium Distance ((LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2700	
Distance to Downstream Ramp (LD	OWN), ft	2600	Off-Ramp Influence Area Speed	(SR), mi/h	53.9	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFD)	0.558	Outer Lanes Freeway Speed (SO)	, mi/h	65.6	
Flow in Lanes 1 and 2 (v12), pc/h		4111	Ramp Junction Speed (S), mi/h		58.0	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/ln		39.1	
Level of Service (LOS)		D	Density in Ramp Influence Area	(DR), pc/mi/ln	32.9	

		HCS7 Freeway	/ Merge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 SB Ex5 Proposed S	59 Merge - 2030 AM Scenario	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	30.0		
Segment Length (L) / Acceleration	Length (LA),	ft	1500	800		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAF)		0.950	0.975			
Final Capacity Adjustment Factor (CAF)			0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5350	400		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00	3.00	
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.952	0.971		
Flow Rate (vi),pc/h			6337	465		
Capacity (c), pc/h			6824	1839		
Volume-to-Capacity Ratio (v/c)			1.00	0.25		
Speed and Density						
Upstream Equilibrium Distance (LEC	Q), ft	935.6	Number of Outer Lanes on Freew	ray (No)	1	
Distance to Upstream Ramp (LUP),	ft	125	Speed Index (Ms) 0.		0.609	
Downstream Equilibrium Distance (LEQ), ft	3368.1	Flow Outer Lanes (vOA), pc/h/ln 23		2351	
Distance to Downstream Ramp (LD	nce to Downstream Ramp (LDOWN), ft 2150		On-Ramp Influence Area Speed (SR), mi/h	52.1	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFM)	0.629	Outer Lanes Freeway Speed (SO),	mi/h	61.0	
Flow in Lanes 1 and 2 (v12), pc/h		3986	Ramp Junction Speed (S), mi/h		54.9	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	4451	Average Density (D), pc/mi/ln		41.3	
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln	35.0	

HCS7 Freeway Diverge Report						
Project Information						
Analyst	Chen-Yuar	n Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak P	eriod 6:00-7:00	
Project Description	I-95 SB Ext Proposed S	59 Diverge - 2019 AM Scenario	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Deceleration	Length (LA),	ft	1500	450		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SAI	=)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5500 150			
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00		
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.952	0.971		
Flow Rate (vi),pc/h			6515	174		
Capacity (c), pc/h			6824	1936		
Volume-to-Capacity Ratio (v/c)			0.95	0.09		
Speed and Density						
Upstream Equilibrium Distance (LEC	Q), ft	1319.4	Number of Outer Lanes on Fr	eeway (No)	1	
Distance to Upstream Ramp (LUP), t	ft	5600	Speed Index (DS) 0.4		0.455	
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2606	
Distance to Downstream Ramp (LD	OWN), ft	1250	Off-Ramp Influence Area Spe	ed (SR), mi/h	56.1	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFD)	0.589	Outer Lanes Freeway Speed (SO), mi/h	68.1	
Flow in Lanes 1 and 2 (v12), pc/h		3909	Ramp Junction Speed (S), mi/	'h	60.4	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/ln	ı	36.0	
Level of Service (LOS)		D	Density in Ramp Influence Are	ea (DR), pc/mi/ln	33.8	

		HCS7 Freeway	/ Merge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/21/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	AM Peak H	lour 6:00-7:00	
Project Description	I-95 SB Exe Proposed S	51 Merge - 2030 AM Scenario	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	30.0		
Segment Length (L) / Acceleration	Length (LA),	ft	1500	800		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type		No Incident	-			
Final Speed Adjustment Factor (SA	F)		0.975	0.975		
Final Capacity Adjustment Factor (CAF)		0.968	0.968			
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5150	500		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			5.00	3.00	3.00	
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.952	0.971		
Flow Rate (vi),pc/h			6100	581		
Capacity (c), pc/h			6970	1839		
Volume-to-Capacity Ratio (v/c)			0.96	0.32		
Speed and Density						
Upstream Equilibrium Distance (LEG	Q), ft	909.7	Number of Outer Lanes on Freew	ay (No)	1	
Distance to Upstream Ramp (LUP),	ft	1125	Speed Index (Ms) 0.5		0.590	
Downstream Equilibrium Distance	(LEQ), ft	2245.4	Flow Outer Lanes (vOA), pc/h/ln 2		2288	
Distance to Downstream Ramp (LD	OWN), ft	1500	On-Ramp Influence Area Speed (SR), mi/h	53.5	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFM)	0.625	Outer Lanes Freeway Speed (SO),	mi/h	63.6	
Flow in Lanes 1 and 2 (v12), pc/h		3812	Ramp Junction Speed (S), mi/h		56.6	
Flow Entering Ramp-Infl. Area (vR1	2), pc/h	4393	Average Density (D), pc/mi/ln		39.3	
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 34.5			

APPENDIX L

Highway Capacity Analyses
PM Peak Hour: 2030 Proposed Improvements Scenario

ŀ	HCS7 Freeway '	Weaving Repo	rt	
Project Information				
Analyst	Chen-Yuan Wang	Date		1/21/2022
Agency	CTPS	Analysis Year		2030
Jurisdiction	MassDOT District 4	Time Period Analyzed		PM Peak Hour 5:00-6:00
Project Description	I-95 NB Ex57-58 Weaving - 2030 PM Proposed Scenario	Unit		United States Customary
Geometric Data				
Number of Lanes (N), In	4	Segment Type		Freeway
Segment Length (Ls), ft	1250	Number of Maneuver	Lanes (NWL), In	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane	e Changes (LCRF), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane	e Changes (LCFR), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane C	Changes (LCRR), Ic	0
Interchange Density (ID), int/mi	1.25	Cross Weaving Manag	ed Lane	No
Adjustment Factors				
Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)		0.925
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)		0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)		1.060
Demand and Capacity				
	FF	RF	RR	FR
Demand Volume (Vi), veh/h	4730	520	30	620
Peak Hour Factor (PHF)	0.94	0.94	0.94	0.94
Total Trucks, %	2.50	1.50	1.50	1.50
Heavy Vehicle Adjustment Factor (fHV)	0.976	0.985	0.985	0.985
Flow Rate (vi), pc/h	5465	595	34	710
Weaving Flow Rate (vw), pc/h	1305	Freeway Max Capacity	(cIFL), pc/h/ln	2358
Non-Weaving Flow Rate (vNW), pc/h	5499	Density-Based Capacity	y (cIWL), pc/h/ln	2113
Total Flow Rate (v), pc/h	6804	Demand Flow-Based C	apacity (cIW), pc/h	12500
Volume Ratio (VR)	0.192	Weaving Segment Cap	acity (cW), veh/h	8264
Minimum Lane Change Rate (LCMIN), lc/h	1305	Adjusted Weaving Area	a Capacity, pc/h	8182
Maximum Weaving Length (LMAX), ft	4455	Volume-to-Capacity Ratio (v/c)		0.83
Speed and Density				
Non-Weaving Vehicle Index (INW)	859	Average Weaving Spee	ed (SW), mi/h	50.9
Non-Weaving Lane Change Rate (LCNW), lc/h	1040	Average Non-Weaving		48.2
Weaving Lane Change Rate (LCW), lc/h	1673	Average Speed (S), mi/	•	48.7
Weaving Lane Change Rate (LCAII), Ic/h	2713	Density (D), pc/mi/ln		34.9
Weaving Intensity Factor (W)	0.417	Level of Service (LOS)		D
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		HCS7 Freeway	/ Merge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 NB Ex Proposed S	58 Merge - 2030 PM Scenario	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.4	35.0		
Segment Length (L) / Acceleration	Length (LA),	ft	1500	1050		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAI	=)		0.950	0.975		
Final Capacity Adjustment Factor (CAF)			0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5250	650		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50	1.50	
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.985		
Flow Rate (vi),pc/h			6066	744		
Capacity (c), pc/h			6824	1936		
Volume-to-Capacity Ratio (v/c)			1.00	0.38		
Speed and Density						
Upstream Equilibrium Distance (LEG	Ω), ft	1304.7	Number of Outer Lanes on Freev	vay (No)	1	
Distance to Upstream Ramp (LUP),	ft	2300	Speed Index (Ms) 0.6		0.655	
Downstream Equilibrium Distance	(LEQ), ft	2432.5	Flow Outer Lanes (vOA), pc/h/ln 2		2166	
Distance to Downstream Ramp (LD	OWN), ft	1500	On-Ramp Influence Area Speed	(SR), mi/h	50.9	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFM)	0.643	Outer Lanes Freeway Speed (SO)	, mi/h	61.8	
Flow in Lanes 1 and 2 (v12), pc/h		3900	Ramp Junction Speed (S), mi/h		53.9	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	4644	Average Density (D), pc/mi/ln		42.1	
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 34.8			

		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	1/18/2022		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00	
Project Description	I-95 NB Ex Proposed	60 Diverge - 2030 PM Scenario	Unit	United Sta	tes Customary	
Geometric Data						
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.8	30.0		
Segment Length (L) / Deceleration	Length (LA)	ft	1500	500		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAI	=)		0.975	0.975		
Final Capacity Adjustment Factor (0	CAF)		0.968	0.968		
Demand Adjustment Factor (DAF)			1.060	1.060		
Demand and Capacity						
Demand Volume (Vi)			5550	300		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	1.50	1.50	
Single-Unit Trucks (SUT), %			-	-	-	
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.985		
Flow Rate (vi),pc/h			6412	343		
Capacity (c), pc/h			6970	1839		
Volume-to-Capacity Ratio (v/c)			0.92	0.19		
Speed and Density						
Upstream Equilibrium Distance (LEG	Q), ft	841.8	Number of Outer Lanes on Free	vay (No)	1	
Distance to Upstream Ramp (LUP),	ft	4900	Speed Index (Ds)		0.534	
Downstream Equilibrium Distance	tream Equilibrium Distance (LEQ), ft -		Flow Outer Lanes (vOA), pc/h/ln		2525	
Distance to Downstream Ramp (LD	OWN), ft	1200	Off-Ramp Influence Area Speed	(SR), mi/h	55.0	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFD)	0.584	Outer Lanes Freeway Speed (SO)	, mi/h	70.8	
Flow in Lanes 1 and 2 (v12), pc/h		3887	Ramp Junction Speed (S), mi/h		60.3	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/ln		35.4	
Level of Service (LOS)		D	Density in Ramp Influence Area	(DR), pc/mi/ln	33.2	

Project Information Analyst Chen-Yuan Wang Date Agency CTPS Analysis Year Jurisdiction MassDOT District 4 Time Period Analyzed Project Description I-95 SB Ex57-58 Weaving - 2030 PM Proposed Scenario Unit Geometric Data Number of Lanes (N), In 4 Segment Type Segment Length (Ls), ft 1250 Number of Maneuver Lanes (N) Mayer of Maneuver Lanes	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	1/24/2022 2030 PM Peak Hour 5:00-6:00 United States Customary Freeway 2 1 1 0 No 0.925 0.968 1.070
Agency CTPS Analysis Year Jurisdiction MassDOT District 4 Time Period Analyzed Project Description I-95 SB Ex57-58 Weaving - 2030 PM Proposed Scenario Geometric Data Number of Lanes (N), In 4 Segment Type Segment Length (Ls), ft 1250 Number of Maneuver Lanes (N) Weaving Configuration One-Sided Ramp-to-Freeway Lane Change Terrain Type Level Freeway-to-Ramp Lane Changes Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor (Education Type Non-Severe Weather Final Capacity Adjustment Factor (Education Type Non-Severe Weather Final Capacity Adjustment Factor (Education Type Non-Severe Weather Type	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	2030 PM Peak Hour 5:00-6:00 United States Customary Freeway 2 1 1 0 No 0.925 0.968
Jurisdiction MassDOT District 4 Time Period Analyzed Project Description I-95 SB Ex57-58 Weaving - 2030 PM Proposed Scenario Geometric Data Number of Lanes (N), In 4 Segment Type Segment Length (Ls), ft 1250 Number of Maneuver Lanes (N) Weaving Configuration One-Sided Ramp-to-Freeway Lane Change Freeway-to-Ramp Lane Change Percent Grade, % - Ramp-to-Ramp Lane Changes Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor (Death of Type Non-Severe Weather Final Capacity Adjustment Factor (Death Type No Incident Demand Adjustment Factor (Death Type No Incident Demand Adjustment Factor (Death Type Non-Severe Weather Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (firv) 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	PM Peak Hour 5:00-6:00 United States Customary Freeway 2 1 1 0 No 0.925 0.968
Project Description I-95 SB Ex57-58 Weaving - 2030 PM Proposed Scenario Geometric Data Number of Lanes (N), In Segment Length (Ls), ft 1250 Number of Maneuver Lanes (N) Weaving Configuration One-Sided Ramp-to-Freeway Lane Change Freeway-to-Ramp Lane Change Percent Grade, % Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor (Demand Adjustment Factor (Demand And Capacity FF RF Demand And Capacity FF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 0.94 1.98 1.99 1.90	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	Freeway 2 1 1 0 No 0.925 0.968
Weaving - 2030 PM Proposed Scenario Geometric Data Number of Lanes (N), In 4 Segment Type Segment Length (Ls), ft 1250 Number of Maneuver Lanes (N) Weaving Configuration One-Sided Ramp-to-Freeway Lane Change Terrain Type Level Freeway-to-Ramp Lane Changes Percent Grade, % - Ramp-to-Ramp Lane Changes Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Final Capacity Adjustment Factor (D Incident Type No Incident Demand Adjustment Factor (D Demand and Capacity FF RF R Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHv) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	Customary Freeway 2 1 1 0 No 0.925 0.968
Number of Lanes (N), In 4 Segment Type Segment Length (Ls), ft 1250 Number of Maneuver Lanes (N) Weaving Configuration One-Sided Ramp-to-Freeway Lane Change Terrain Type Level Freeway-to-Ramp Lane Change Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Final Capacity Adjustment Factor (D Demand and Capacity FF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	2 1 1 0 No 0.925 0.968
Segment Length (Ls), ft 1250 Number of Maneuver Lanes (Now Weaving Configuration) One-Sided Ramp-to-Freeway Lane Change Freeway-to-Ramp Lane Changes Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Incident Type No Incident Demand Adjustment Factor (Demand Adjustment Factor (Demand Adjustment Factor (Demand Volume (Vi), veh/h Peak Hour Factor (PHF) O.94 O.94 O.94 O.94 O.94 O.980 Flow Rate (vi), pc/h S283 420 Amp-to-Freeway Lane (Nameus (Nameus (Nameus)) Ramp-to-Freeway Lane Change Ramp-to-Famp Lane Chang	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	2 1 1 0 No 0.925 0.968
Weaving Configuration One-Sided Ramp-to-Freeway Lane Change Frerain Type Level Freeway-to-Ramp Lane Changes Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Incident Type No Incident Demand Adjustment Factor (Demand Adjustment Factor) Demand and Capacity FF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) Flow Rate (vi), pc/h 5283 420 46	es (LCRF), Ic es (LCRR), Ic (LCRR), Ic	1 1 0 No No 0.925 0.968
Terrain Type Level Freeway-to-Ramp Lane Changes Percent Grade, % - Ramp-to-Ramp Lane Changes Interchange Density (ID), int/mi 1.25 Cross Weaving Managed Lane Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Final Capacity Adjustment Factor (Demand Adjustment Factor (Demand Adjustment Factor (Demand Adjustment Factor (Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHv) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	es (LCFR), Ic (LCRR), Ic	1 0 No 0.925 0.968
Percent Grade, % Interchange Density (ID), int/mi Adjustment Factors Driver Population Mostly Familiar Non-Severe Weather Incident Type No Incident No Incident Final Capacity Adjustment Factor (Demand Adjustment Factor (Demand Adjustment Factor (Demand Adjustment Factor (Demand Volume (Vi), veh/h) Peak Hour Factor (PHF) Total Trucks, % Plow Rate (vi), pc/h Pak Hour Factor (fHV) Percent Grade, % Ramp-to-Ramp Lane Changes Cross Weaving Managed Lane Ramp-to-Ramp Lane Changes Cross Weaving Managed Lane Ramp-to-Ramp Lane Changes Cross Weaving Managed Lane Final Speed Adjustment Factor (Demand Ad	(LCRR), Ic	0 No 0.925 0.968
Interchange Density (ID), int/mi Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Incident Type No Incident Pemand Adjustment Factor (Demand Volume (Vi), veh/h Peak Hour Factor (PHF) O.94 O.94 O.94 O.94 O.94 O.94 O.94 Flow Rate (vi), pc/h Demand Volume (Vi), pc/h Demand Volume (Factor (FHV) O.976 O.976 O.980 Flow Rate (vi), pc/h	(SAF) cor (CAF)	0.925 0.968
Adjustment Factors Driver Population Mostly Familiar Final Speed Adjustment Factor (Deather Type Non-Severe Weather Incident Type No Incident Demand Adjustment Factor (Demand and Capacity) Demand and Capacity FF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	(SAF) cor (CAF)	0.925 0.968
Driver Population Mostly Familiar Final Speed Adjustment Factor Weather Type Non-Severe Weather Final Capacity Adjustment Factor (Demand and Capacity Pemand and Capacity FF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHv) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	or (CAF)	0.968
Weather Type Non-Severe Weather Incident Type No Incident Demand Adjustment Factor (Demand Ad	or (CAF)	0.968
Incident Type No Incident Demand Adjustment Factor (Demand Adjust		
Demand and Capacity FF RF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	AF)	1.070
FF RF Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46		
Demand Volume (Vi), veh/h 4530 360 40 Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46		
Peak Hour Factor (PHF) 0.94 0.94 0.94 Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46	RR	FR
Total Trucks, % 2.50 2.50 2.00 Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46		460
Heavy Vehicle Adjustment Factor (fHV) 0.976 0.976 0.980 Flow Rate (vi), pc/h 5283 420 46		0.94
Flow Rate (vi), pc/h 5283 420 46		2.00
N TO TO THE TOTAL THE TOTAL TO		0.980
Weaving Flow Rate (vw), pc/h 954 Freeway Max Capacity (cIFL), p		534
	:/h/ln	2358
Non-Weaving Flow Rate (vNW), pc/h 5329 Density-Based Capacity (cIWL),	pc/h/ln	2144
Total Flow Rate (v), pc/h 6283 Demand Flow-Based Capacity	(cIW), pc/h	15789
Volume Ratio (VR) 0.152 Weaving Segment Capacity (cv	v), veh/h	8373
Minimum Lane Change Rate (LCMIN), lc/h 954 Adjusted Weaving Area Capac	ty, pc/h	8301
Maximum Weaving Length (LMAX), ft 4051 Volume-to-Capacity Ratio (v/c		0.76
Speed and Density		
Non-Weaving Vehicle Index (INW) 833 Average Weaving Speed (SW),	mi/h	52.1
Non-Weaving Lane Change Rate (LCNW), Ic/h 1005 Average Non-Weaving Speed	(SNW), mi/h	51.4
Weaving Lane Change Rate (LCW), Ic/h 1322 Average Speed (S), mi/h		51.5
Weaving Lane Change Rate (LCAII), Ic/h 2327 Density (D), pc/mi/ln		30.5
Weaving Intensity Factor (W) 0.369 Level of Service (LOS)		

		HCS7 Freeway	Diverge Report			
Project Information						
Analyst	Chen-Yuar	n Wang	Date	8/10/2021		
Agency	CTPS		Analysis Year	2030		
Jurisdiction	MassDOT	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00	
Project Description	I-95 SB Ext Proposed	58 Diverge - 2030 PM Scenario	Unit	United Sta	tes Customary	
Geometric Data			·			
			Freeway	Ramp		
Number of Lanes (N), In			3	1		
Free-Flow Speed (FFS), mi/h			71.1	35.0		
Segment Length (L) / Deceleration	Length (LA)	,ft	1500	750		
Terrain Type			Level	Level		
Percent Grade, %			-	-		
Segment Type / Ramp Type			Freeway	Right-Side	d One-Lane	
Adjustment Factors						
Driver Population			Mostly Familiar	Mostly Fan	niliar	
Weather Type			Non-Severe Weather	Non-Sever	e Weather	
Incident Type			No Incident	-		
Final Speed Adjustment Factor (SAI	=)		0.925	0.975		
Final Capacity Adjustment Factor (CAF)			0.968	0.968		
Demand Adjustment Factor (DAF)			1.070	1.070		
Demand and Capacity						
Demand Volume (Vi)			5650	650		
Peak Hour Factor (PHF)			0.94	0.94		
Total Trucks, %			2.50	2.00	2.00	
Single-Unit Trucks (SUT), %			-	-		
Tractor-Trailers (TT), %			-	-		
Heavy Vehicle Adjustment Factor (f	HV)		0.976	0.980		
Flow Rate (vi),pc/h			6590	756		
Capacity (c), pc/h			6824	1936		
Volume-to-Capacity Ratio (v/c)			0.97	0.39		
Speed and Density						
Upstream Equilibrium Distance (LEG	Q), ft	1971.6	Number of Outer Lanes on Freew	vay (No)	1	
Distance to Upstream Ramp (LUP),	ft	2150	Speed Index (Ds) 0		0.508	
Downstream Equilibrium Distance	(LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln		2567	
Distance to Downstream Ramp (LD	OWN), ft	2600	Off-Ramp Influence Area Speed ((SR), mi/h	53.7	
Prop. Freeway Vehicles in Lane 1 ar	nd 2 (PFD)	0.560	Outer Lanes Freeway Speed (SO),	mi/h	66.1	
Flow in Lanes 1 and 2 (v12), pc/h		4023	Ramp Junction Speed (S), mi/h		57.9	
Flow Entering Ramp-Infl. Area (vR12	2), pc/h	-	Average Density (D), pc/mi/ln		37.9	
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln	32.1	

HCS7 Freeway Merge Report								
Project Information								
Analyst	Chen-Yuar	ı Wang	Date	1/18/2022				
Agency	CTPS		Analysis Year	2030	2030			
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00			
Project Description	I-95 SB Ex5 Proposed S	59 Merge - 2030 PM Scenario	Unit	United Sta	United States Customary			
Geometric Data								
			Freeway Ramp					
Number of Lanes (N), In			3	1	1			
Free-Flow Speed (FFS), mi/h			71.4	30.0				
Segment Length (L) / Acceleration	Length (LA),	ft	1500	800	800			
Terrain Type			Level	Level	Level			
Percent Grade, %			-	-	-			
Segment Type / Ramp Type			Freeway	Right-Side	Right-Sided One-Lane			
Adjustment Factors								
Driver Population			Mostly Familiar	Mostly Fan	Mostly Familiar			
Weather Type			Non-Severe Weather	Non-Severe Weather				
Incident Type			No Incident	-				
Final Speed Adjustment Factor (SAI	=)		0.950	0.975				
Final Capacity Adjustment Factor (CAF)			0.968	0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070				
Demand and Capacity								
Demand Volume (Vi)			5350	300				
Peak Hour Factor (PHF)			0.94	0.94				
Total Trucks, %			2.50	2.00				
Single-Unit Trucks (SUT), %			-	-				
Tractor-Trailers (TT), %			-	-				
Heavy Vehicle Adjustment Factor (fHV)			0.976	0.980				
Flow Rate (vi),pc/h			6239	348				
Capacity (c), pc/h			6824	1839				
Volume-to-Capacity Ratio (v/c)			0.97	0.19				
Speed and Density								
Upstream Equilibrium Distance (LEC	Q), ft	889.6	Number of Outer Lanes on Freew	ay (No)	1			
Distance to Upstream Ramp (LUP),	ft	125	Speed Index (Ms)	ex (MS)				
Downstream Equilibrium Distance (LEQ), ft 3613.3		Flow Outer Lanes (vOA), pc/h/ln		2277				
Distance to Downstream Ramp (LDOWN), ft 2150		On-Ramp Influence Area Speed (SR), mi/h		53.2				
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.635		Outer Lanes Freeway Speed (SO), mi/h		61.4				
Flow in Lanes 1 and 2 (v12), pc/h 3962		Ramp Junction Speed (S), mi/h		55.8				
Flow Entering Ramp-Infl. Area (vR12), pc/h 4310		Average Density (D), pc/mi/ln		39.3				
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 34.0		34.0			

		HCS7 Freeway	Diverge Report					
Project Information								
Analyst	Chen-Yuar	n Wang	Date	8/10/2021				
Agency	CTPS		Analysis Year	2030	2030			
Jurisdiction	MassDOT	District 4	Time Period Analyzed	PM Peak H	lour 5:00-6:00			
Project Description	I-95 SB Ext Proposed	59 Diverge - 2019 PM Scenario	Unit	United Sta	United States Customary			
Geometric Data								
			Freeway Ramp					
Number of Lanes (N), In			3	1	1			
Free-Flow Speed (FFS), mi/h			71.4	35.0	35.0			
Segment Length (L) / Deceleration	Length (LA)	ft	1500	450	450			
Terrain Type			Level	Level	Level			
Percent Grade, %			-	-	-			
Segment Type / Ramp Type			Freeway	Right-Side	Right-Sided One-Lane			
Adjustment Factors								
Driver Population			Mostly Familiar	Mostly Fan	Mostly Familiar			
Weather Type			Non-Severe Weather	Non-Sever	Non-Severe Weather			
Incident Type			No Incident	-	-			
Final Speed Adjustment Factor (SAI	=)		0.950	0.975	0.975			
Final Capacity Adjustment Factor (CAF)			0.968	0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070	1.070			
Demand and Capacity								
Demand Volume (Vi)			5550	200	200			
Peak Hour Factor (PHF)			0.94	0.94	0.94			
Total Trucks, %			2.50	3.00	3.00			
Single-Unit Trucks (SUT), %			-	-	-			
Tractor-Trailers (TT), %	Tractor-Trailers (TT), %			-	-			
Heavy Vehicle Adjustment Factor (fHV)			0.976	0.971	0.971			
Flow Rate (vi),pc/h	Flow Rate (vi),pc/h			234	234			
Capacity (c), pc/h			6824	1936	1936			
Volume-to-Capacity Ratio (v/c)			0.95	0.12	0.12			
Speed and Density								
Upstream Equilibrium Distance (LEG	χ), ft	3221.9	Number of Outer Lanes on Free	way (No)	1			
Distance to Upstream Ramp (LUP),	ft	5600	Speed Index (DS)		0.461			
Downstream Equilibrium Distance (LEQ), ft -		Flow Outer Lanes (vOA), pc/h/ln		2576				
Distance to Downstream Ramp (LDOWN), ft 1250		Off-Ramp Influence Area Speed (SR), mi/h		55.9				
Prop. Freeway Vehicles in Lane 1 and 2 (PFD) 0.587		Outer Lanes Freeway Speed (SO), mi/h		68.2				
Flow in Lanes 1 and 2 (v12), pc/h 3896		Ramp Junction Speed (S), mi/h		60.2				
low Entering Ramp-Infl. Area (vR12), pc/h		Average Density (D), pc/mi/ln		35.8				
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 33.7		33.7			

HCS7 Freeway Merge Report								
Project Information								
Analyst	Chen-Yuar	n Wang	Date	1/21/2022				
Agency	CTPS		Analysis Year	2030	2030			
Jurisdiction	MassDOT I	District 4	Time Period Analyzed	PM Peak H	our 5:00-6:00			
Project Description	I-95 SB Exe Proposed S	51 Merge - 2030 PM Scenario	Unit	United Sta	United States Customary			
Geometric Data								
			Freeway Ramp					
Number of Lanes (N), In			3	1	1			
Free-Flow Speed (FFS), mi/h			71.8	30.0				
Segment Length (L) / Acceleration	Length (LA),	ft	1500	800				
Terrain Type			Level	Level	Level			
Percent Grade, %			-	-	-			
Segment Type / Ramp Type			Freeway	Right-Side	Right-Sided One-Lane			
Adjustment Factors								
Driver Population			Mostly Familiar	Mostly Familiar				
Weather Type			Non-Severe Weather	Non-Severe Weather				
Incident Type			No Incident	-				
Final Speed Adjustment Factor (SAI	F)		0.975	0.975				
Final Capacity Adjustment Factor (CAF)			0.968	0.968	0.968			
Demand Adjustment Factor (DAF)			1.070	1.070				
Demand and Capacity								
Demand Volume (Vi)			4750	450				
Peak Hour Factor (PHF)			0.94	0.94				
Total Trucks, %			2.50	2.00				
Single-Unit Trucks (SUT), %			-	-				
Tractor-Trailers (TT), %			-	-				
Heavy Vehicle Adjustment Factor (fHV)			0.976	0.980				
Flow Rate (vi),pc/h			5539	523				
Capacity (c), pc/h	Capacity (c), pc/h			1839				
Volume-to-Capacity Ratio (v/c)			0.87	0.28				
Speed and Density								
Upstream Equilibrium Distance (LEG	Q), ft	777.2	Number of Outer Lanes on Freew	ay (No)	1			
Distance to Upstream Ramp (LUP),	ce to Upstream Ramp (LUP), ft 1125		Speed Index (Ms)		0.463			
Downstream Equilibrium Distance (LEQ), ft 1667.7		Flow Outer Lanes (vOA), pc/h/ln		2182				
Distance to Downstream Ramp (LDOWN), ft 1500		On-Ramp Influence Area Speed (SR), mi/h		57.0				
Prop. Freeway Vehicles in Lane 1 and 2 (PFM) 0.606		Outer Lanes Freeway Speed (SO), mi/h		63.9				
Flow in Lanes 1 and 2 (v12), pc/h 3357		Ramp Junction Speed (S), mi/h		59.3				
Flow Entering Ramp-Infl. Area (vR12), pc/h 3880		Average Density (D), pc/mi/ln		34.1				
Level of Service (LOS)		D	Density in Ramp Influence Area (DR), pc/mi/ln 30.6		30.6			