I-295 Corridor Update

Scarborough to Brunswick

June 2018

I-295 Corridor Update

Scarborough to Brunswick

Prepared by

Maine Department of Transportation

Bureau of Planning

Transportation Analysis

June 2018

Table of Contents

I. Introduction

In 2010, the Maine Department of Transportation (MaineDOT), Portland Area Comprehensive Transportation System (PACTS) and other stakeholders completed an analysis of Interstate 295 from its starting point in Scarborough to Brunswick, 28 miles to the north. The purpose of the analysis was to evaluate near-term needs in the I-295 corridor and identify the issues that need to be addressed to ensure safe, efficient, and reliable operation for the long term.

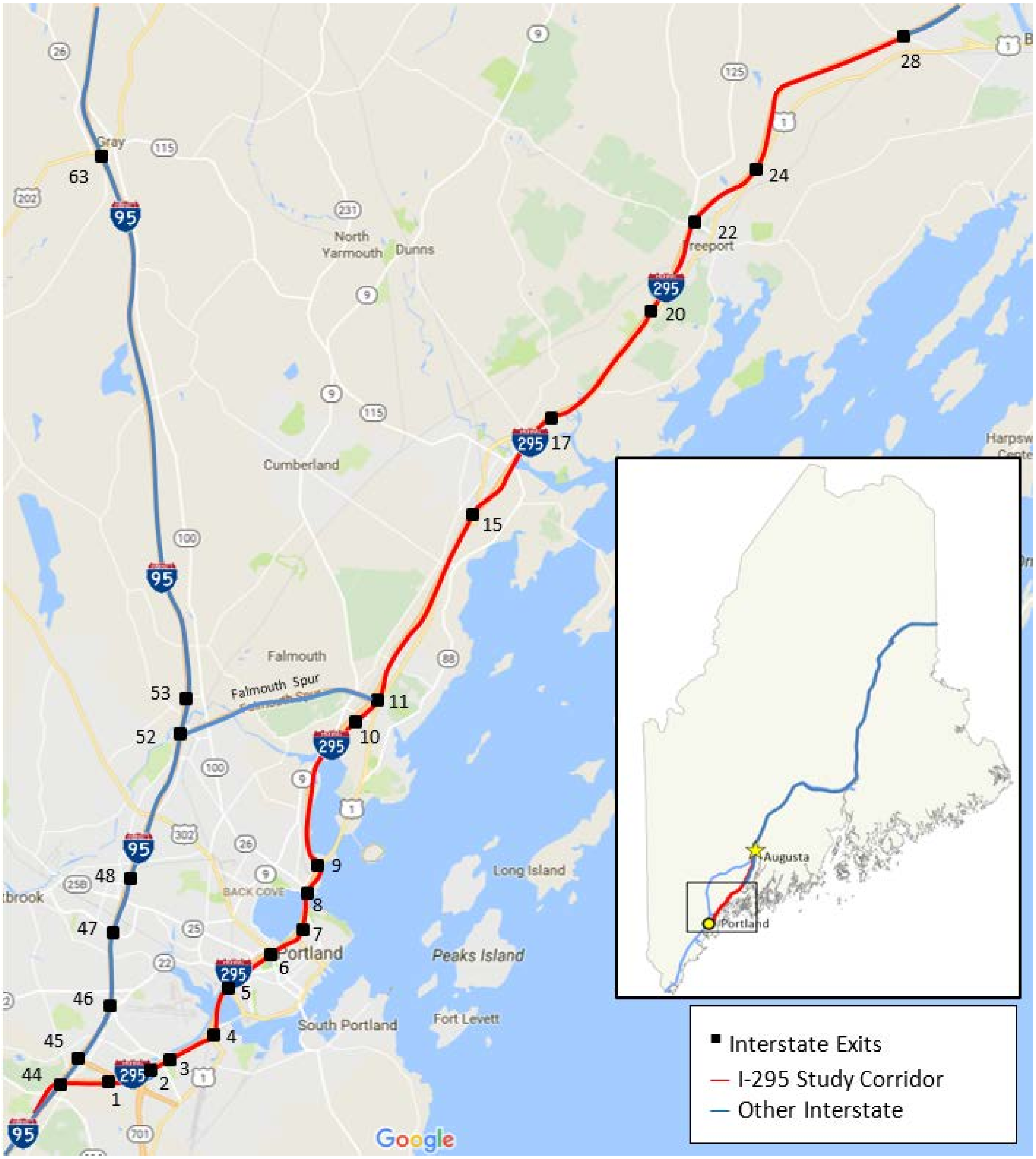
A. Background

In 2010, MaineDOT published the I-295 Corridor Study – Scarborough to Brunswick, which recommended near-term and long-term improvements for the corridor. Since then, the near-term recommendations, which consisted mainly of improvements to existing interchanges, have largely been completed. Traffic volumes seemed to reach a plateau in the early years of the 21st century, but with the resurgence of the regional economy after the Great Recession, traffic volumes appear to be on the rise again. With the increase in volumes has come an increase in crashes and concerns about the congestion and safety along the corridor.

B. Purpose and Need

The purpose of the study update is to evaluate the operational needs of the I-295 corridor. With the resurgence in traffic growth in recent years, the capacities of some portions of the Corridor are being severely tested, resulting in frequent traffic congestion and delay, particularly in South Portland and Portland. While traffic volumes have grown, the number of crashes in the corridor has grown faster. Crashes and minor incidents anywhere along the highway create traffic hazards that temporarily reduce highway capacity and produce massive traffic backups. The delays from high volumes and frequent incidents result in unreliable travel times. The goal of the I-295 Corridor Update is to provide near-term, mid-term and long-term direction for investments that will address the growing operational problems and anticipate the actions necessary to plan for the long-term operational needs in this corridor.

Figure I-1. Study Area



C. Study Process

For the I-295 Corridor Update, the process chosen by MaineDOT is to undertake a technical analysis of the corridor similar to the analysis used in the 2010 Study, but with updated data on existing conditions, new travel demand forecasts from the Portland Area Comprehensive Transportation System (PACTS), the Metropolitan Planning Organization for the Greater Portland region, and updated analysis techniques.

As indicated by the chapter titles of this report, the analysis begins with a review of existing and future conditions. Considered in the future conditions analysis is the consideration of future scenarios involving potential major projects under study by the Maine Turnpike Authority (MTA). Strategies to improve the conditions are assessed based on the opportunities available in the corridor. From this assessment, more specific actions under these strategies are identified and evaluated further, based on expected benefits and costs and potential environmental factors. Then, draft recommendations are made for near-term and mid-term implementation and long-term consideration.

The update report, with its recommendations, is then released for public review and comment. The comments received by MaineDOT from the public are reviewed, summarized, and incorporated in the final update report. The report, along with the comments, will help guide the direction of future improvements on I-295.

II. Existing Conditions

A. Transportation Inventory

The transportation inventory for the I-295 Corridor Study Update consists of readily available baseline information about roadway geometry, recent crash history, and recent reported highway incidents. The inventory is subdivided into discussions of mainline segments, interchanges, and related transportation facilities and services.

1. Segments

The I-295 corridor study area is approximately 28 miles long, from Scarborough to Brunswick. The urban area consists of segments beginning at the southern end of I-295 in Scarborough north to the Portland city line between Exit 9 and Exit 10. North of the Portland city line to Exit 28 is considered rural freeway. The corridor has two through-lanes in both the northbound and southbound directions as well as short three-lane and four-lane segments at some high traffic volume locations in Portland and South Portland. Table II-1 shows the lengths and speeds of each segment in the study corridor. Segments are defined as the basic mainline segment between interchanges and are highlighted in green. There are 18 southbound and 19 northbound basic mainline segments in the study corridor. Additionally, ramp-to-ramp segments at interchanges are included in the table and are highlighted in blue. There are 14 southbound and 15 northbound ramp-to-ramp segments.

Table II-1. Existing Segment Lengths

Segment Type:	Rural	
Segment Speed:	65	
Segment	**Length (ft)**	
	Southbound	**Northbound**
Exit 28	6000	3400
Exit 28-22	26000	23000
Exit 24	-	3500
Exit 22-24	-	6700
Exit 22	1000	900
Exit 22-20	6200	6800
Exit 20	3100	3900
Exit 20-17	14000	13600
Exit 17	3700	2900
Exit 17-15	7900	8000
Exit 15	1800	1300
Exit 15-11	20500	22300
Exit 11-10	1900	600
Exit 10	1000	900
Exit 10-9	19100	18600

Segment Type:	Urban	
Segment Speed:	50	
Segment	**Length (ft)**	
	Southbound	**Northbound**
Exit 9	700	800
Exit 9-8	1200	1300
Exit 8	1000	800
Exit 8-7	2300	2100
Exit 7	1600	2600
Exit 7-6B	1600	500
Exit 6B	1000	1000
Exit 6B-6A	300	300
Exit 6A	1100	1000
Exit 6A-5B	2700	2100
Exit 5B	500	-
Exit 5B-5A	400	800
Exit 5A	2300	3000

Segment Type:	Urban	
Segment Speed:	55	
Segment	**Length (ft)**	
	Southbound	**Northbound**
Exit 5A-4	4000	2500
Exit 4	2100	3500
Exit 4-3	2200	2300
Exit 3-2	1900	3400
Exit 2-1	3200	3600
Exit 1	-	1600
S. of Exit 1	11000	4500

2. Interchanges

The I-295 study corridor includes 17 interchanges that provide on-and-off access between I-295 and major highways and arterials in the corridor municipalities extending from Scarborough to Brunswick.

Table II-2 and Table II-3 show existing information about the interchanges along the I-295 study corridor including the interchange location, interchange type, existing acceleration and deceleration lengths, and the minimum required acceleration and deceleration lengths. The 2004 AASHTO Policy on Geometric Design of Highways and Streets Exhibits 10-70 and 10-73 were used to find the minimum required acceleration and deceleration lengths for each ramp. The existing acceleration and deceleration lengths are measured from the point at which the left edge of the ramp lane and the right edge of the freeway lanes converge to the end of the taper segment.

The length of an acceleration or deceleration lane has a significant effect on the efficiency of merging and diverging. Short lanes do not provide vehicles with an adequate opportunity to accelerate to freeway speeds before merging nor proper length for deceleration off-line. This results in vehicles having to accelerate or decelerate on the mainline, disrupting the flow of through vehicles, creating congestion, delays, and safety concerns. Several of the existing ramps do not meet today’s length standards or traffic volume capacities. In the northbound direction, there are four on-ramps and one off-ramp that are deficient. In the southbound direction, there are three on-ramps and one off-ramp that are deficient. These ramps are highlighted in blue.

Table II-2. Northbound Interchanges

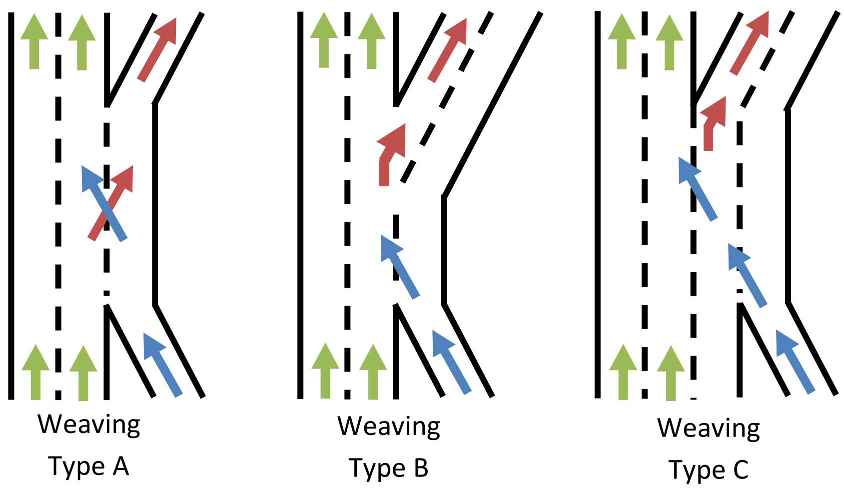
Northbound						
Interchange Number	**Town**	**Cross Road**	**Type**	**On/Off**	**Existing Accel/Decel Length (ft)**	**Minimum Req' Accel/Decel Length (ft)**
1	South Portland	Rte. 703	Partial Clover	off	450	350
				on	550	670
2	South Portland	Scarborough Connector	Partial Direct	on	1300	-
3	South Portland	Westbrook Street	Half Diamond	weave	2300	-
4	South Portland	Rte. 1 Veterans Bridge	Partial Direct	on	1000	320
5	Portland	Congress Street	Modified Diamond	off	700	285
				on	450	450
				on	650	450
6	Portland	Forest Avenue	Cloverleaf	off	300	285
				weave	300	-
				weave	500	-
7	Portland	Franklin Arterial	Trumpet	on	2100	450
8	Portland	Washington Avenue	Overlap	weave	800	-
9	Portland	Rte. 1 Martin's Point	Overlap	weave	800	-
10	Falmouth	Bucknam Road	Partial Cloverleaf	off	200	470
				on	250	1000
11	Falmouth	Falmouth Spur	Half Trumpet	on	1520	1310
15	Yarmouth	Rte. 1	Modified Diamond	off	770	470
				on	750	1000
17	Yarmouth	Rte. 1	Diamond	off	750	440
				on	1000	1000
20	Freeport	Desert Road	Diamond	off	1000	1000
				on	750	440
22	Freeport	Rte. 125/136	Partial Cloverleaf	off	550	470
				on	1000	1000
24	Freeport	Rte. 1	Half Trumpet	off	525	440
				on	1000	1000
28	Brunswick	Rte. 1	Trumpet	off	1200	-
				on	750	1000

Table II-3. Southbound Interchanges

Southbound						
Interchange Number	**Town**	**Cross Road**	**Type**	**On/Off**	**Accel/Decel Length (ft)**	**Minimum Req' Accel/Decel Length (ft)**
28	Brunswick	Rte. 1	Trumpet	off	750	470
				on	2367	-
22	Freeport	Rte. 125/136	Partial Cloverleaf	off	500	470
				on	1200	1000
20	Freeport	Desert Road	Diamond	off	450	440
				on	800	1000
17	Yarmouth	Rte. 1	Diamond	off	800	440
				on	650	1000
15	Yarmouth	Rte. 1	Modified Diamond	off	744	440
				on	1141	1120
11	Falmouth	Falmouth Spur	Half Trumpet	off	550	520
10	Falmouth	Bucknam Road	Partial Cloverleaf	off	235	440
				on	550	1000
9	Portland	Rte. 1 Martin's Point	Overlap	weave	700	-
8		Washington Avenue	Overlap	weave	1000	-
7	Portland	Franklin Arterial	Trumpet	off	2300	285
				on	550	550
6	Portland	Forest Ave	Cloverleaf	off	325	285
				weave	300	-
				on	662	450
5	Portland	Congress Street	Modified Diamond	off	750	285
				weave	400	-
				on	727	450
4	South Portland	Rte. 1 Veterans Bridge	Partial Direct	off	410	410
3	South Portland	Westbrook Street	Half Diamond	weave	2200	-
2	South Portland	Scarborough Connector	Partial Direct	off	1241	235
1	South Portland	Rte. 703	Partial Cloverleaf	off	800	235

In the urban area, there are six weaving segments in the each of the northbound and southbound directions, located either within interchanges or between closely spaced interchanges. The Highway Capacity Manual classifies a weaving segment as the length of highway, formed by merge and diverge points, over which traffic streams cross paths through lane change maneuvers, without the aid of traffic signals. Weaving segments are classified into three weaving types: Type A, Type B, and Type C. Figure II-1 shows these three classifications. Type A is the most common type of weaving segment, where all the weaving vehicles must make one lane change. Type B is the most efficient, where one weaving movement can be made without making a lane change and the other movement requires just one lane change. Type C requires one weaving maneuver to make two or more lane changes and the other makes no lane changes.

Figure II-1. Weaving Type Configurations



The location and weave type classification of each weaving segment on I-295 are shown in Table II-4. I-295 has at least one of each type of weaving segment, resulting in either three- or four-lane freeway widths at each of these interchanges.

Table II-4. I-295 Weaving Segments

	Location	Number of Lanes	Weave Type
Northbound	Exit 3 to 4	3	A
	Exit 6A to 6B	3	A
	Exit 6B to 7	3	A
	Exit 7 to 8	3	A
	Exit 8 (on ramp to off ramp)	4	C
	Exit 9 (on ramp to off ramp)	3	B
Southbound	Exit 9 (on ramp to off ramp)	3	A
	Exit 8 (on ramp to off ramp)	4	B
	Exit 8 to 7	3	A
	Exit 6B to 6A	3	A
	Exit 5B to 5A	3	A
	Exit 4 to 3	3	A

3. Related Transportation Facilities and Services

Within the area along the I-295 corridor are related transportation facilities and services. These features include parallel transportation facilities and mass transportation services that complement I-295 by providing more transportation options for I-295 users. Some are services use I-295 as part of their travel route.

Route 1

Route 1 runs parallel to I-295. Before I-295, Route 1 was the major north/south highway between Portland and Brunswick. Currently, Route 1 directly interchanges traffic with I-295 at Exits 4, 9, 15, 17, 24, and 28; Exits 1, 2, 10, 20, and 22 also have close connections with Route 1. I-295 is also designated as Route 1 between Exits 4 and 9.

Due to its proximity and easy access to I-295, Route 1 can serve as an alternate route for some north/south traffic during traffic incidents. However, Route 1 has fewer lanes and provides access to village centers and other land developments, so capacities and travel speeds are lower than those of I-295 speeds.

The Maine Turnpike

The Maine Turnpike is a 109-mile controlled-access toll highway that extends from Kittery to Augusta by way of Portland and Lewiston-Auburn. The Maine Turnpike carries the designation of I-95, which extends beyond the Maine Turnpike north from Augusta to Houlton and south from Kittery, along the Atlantic seaboard of the United States. I-95 can act as an alternate route for I-295 from Portland to Augusta.

The Falmouth Spur is a 4-mile controlled-access highway that is also a part of the Maine Turnpike, connecting I-95 with I-295. When used in combination with I-95, the Falmouth Spur provides an alternate route to I-295 for traffic passing through the Portland/South Portland area between Falmouth and Scarborough.

The Maine Turnpike Authority (MTA) has been assessing the Maine Turnpike for capacity improvements, including the potential for widening the highway. The MTA Portland Area Mainline Needs Assessment examines I-95 from Exit 42 in Scarborough to Exit 53 in Falmouth. Future improvements coming out of this assessment may shift some traffic from I-295 onto I-95, thus creating the potential for a reduction in congestion along the I-295 study corridor.

Gorham Bypass

Gorham and other suburban municipalities west of Portland generate significant commuter traffic into Portland, much of it experiencing significant delays. MaineDOT constructed a partial bypass around Gorham village to alleviate some of the congestion, but congestion remains in many locations. The MTA has been investigating the feasibility of connecting I-95 to the existing bypass to provide additional congestion relief. Such a facility would likely affect commuter routes between Gorham and Portland and my affect the use of I-295, particularly between I-95 and the Portland Peninsula.

Express Bus Services

In recent years, the Greater Portland area has developed express commuter bus services using I-95 and I-295 to connect points north and south to Portland.

The ZOOM Bus is an express commuter bus service connecting the Biddeford-Saco area with the Portland Peninsula for more than a decade. The ZOOM Bus is operated by Shuttlebus, which also provided local bus services to Biddeford, Saco, and other communities.

Metro BREEZ is an express bus service connecting Portland, Yarmouth, and Freeport since June 2016 and was recently expanded to Brunswick in August 2017. This bus service completes 14 roundtrips, Monday thru Friday, with five stops in Portland, and three each in Yarmouth, Freeport, and Brunswick. Annual ridership for BREEZ in fiscal year 2018 is expected to be 53,000. This service is operated by Metro.

Local Bus Services

Two fixed-route local bus services, Metro and the South Portland Bus Service, operate in the I-295 corridor. Metro serves Portland, Westbrook, the Maine Mall, and the Falmouth Crossing. The South Portland Bus Service serves South Portland and downtown Portland. The combined annual ridership of the two services is over 2 million in 2017.

GO Maine

GO Maine is a statewide service provided for commuters that promotes ridesharing, transit use, and other transportation demand management (TDM) options. GO Maine coordinates carpools and vanpools statewide, many of which use the I-295 corridor. This service is managed by the Greater Portland Council of Governments.

Pan Am Railways and the Downeaster

Pan Am Railways is a freight railroad connecting Portland to both the north, toward Yarmouth, Brunswick, Auburn, and Maine points north and east, and to the south, toward Boston and points west. Pan Am is the host railroad for the Amtrak Downeaster passenger rail service, established between Portland and Boston and recently extended from Portland to Brunswick. In 2017, the Downeaster served over 550,000 riders. The Downeaster is managed by the Northern New England Passenger Rail Authority.

B. Traffic Volumes

Traffic volumes are the most basic measure of highway use. Usually measured in daily or hourly terms, traffic volume data is collected through the use of permanent traffic counting stations or portable short-term counting installations.

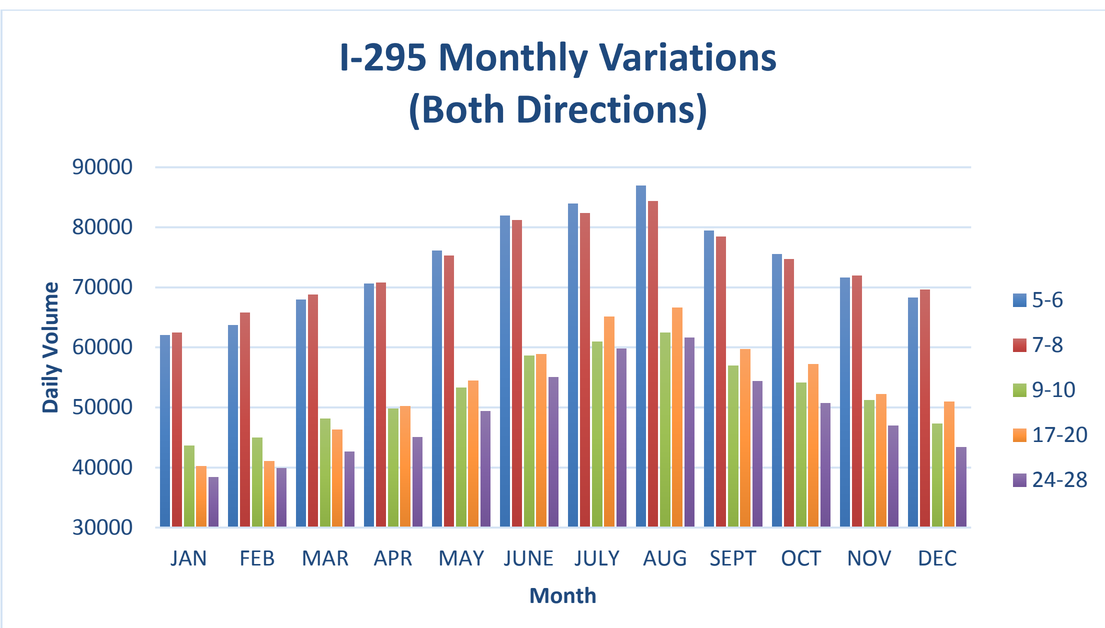
Five permanent traffic counting stations are located on I-295: three in Portland (between Exits 5 and 6, Exits 7 and 8, and Exits 9 and 10), one in Freeport (between Exits 17 and 20), and one in Brunswick (between Exits 24 and 28). These stations provided data for an analysis of I-295 traffic flow variation, including monthly, daily, and hourly variations.

The existing conditions traffic volumes for most locations in the I-295 corridor are based on the most recent traffic count data available for analysis, including 2014 portable traffic volume counts and 2015 and 2016 permanent count station data. The 2014 and 2015 count data was scaled to 2016 volumes using I-295 permanent count stations with similar traffic patterns and multiple years of data.

1. Monthly Variation

Figure II-2 shows the monthly variation in the average daily traffic in Portland (2016), Freeport (2015), and Brunswick (2016). The Annual Average Daily Traffic (AADT) is the total annual traffic volume divided by the number of days in a year. The AADT averages around 74,000 in Portland and around 63,000 from Portland to Freeport. The AADT in Brunswick is about 49,000. The peak months are July and August, and the low month is January.

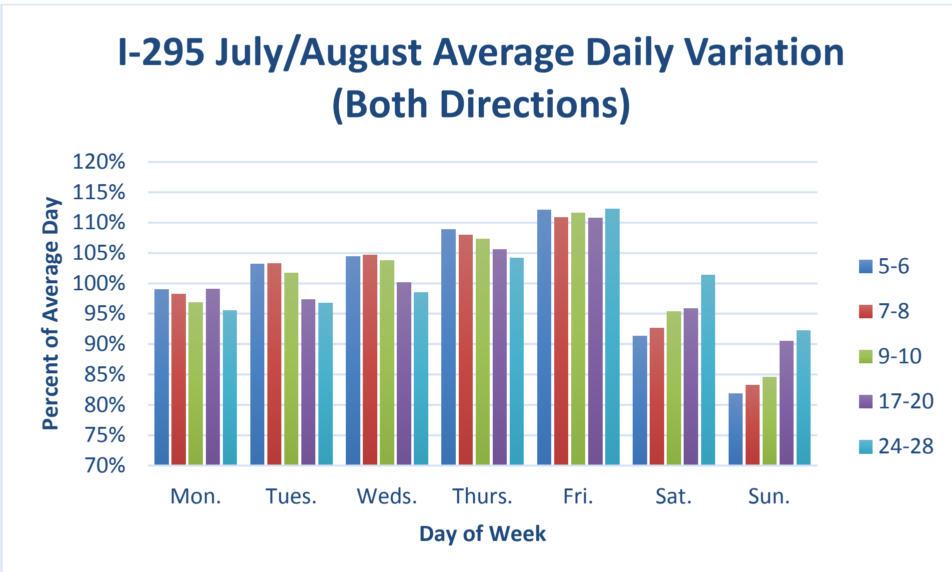
Figure II-2. I-295 Monthly Variations in AADT (Both Directions)



2. Daily Variation

Figure II-3 shows the average daily variation for July and August traffic volumes expressed as a percent of the average daily traffic volume. The day with the highest volumes is Friday. Saturday and Sunday both have significantly lower volumes, with Sunday's volumes being the lowest. The reduction in volumes on the weekend, particularly Sunday, is smaller in the more rural portion of the corridor. This may be attributed to weekend tourism traffic.

Figure II-3. I-295 Daily Variations in Percent AADT (Both Directions)



3. Design Hour Volumes

The design policy of the American Association of State Highways and Transportation Officials (AASHTO) recognizes that "Economic considerations in the planning and design of highways make it impractical to design for the highest expected hourly volumes". To account for this, a design hour volume (DHV) is based on the 30th highest hour of the year. The baseline DHVs were developed from the permanent count stations on I-295 in Portland, Freeport, and Brunswick. These volumes were supplemented by 2014, 24-hour traffic counts along the corridor, which were scaled to October 2016 volumes. DHVs were determined for both northbound and southbound directions because I-295 is a divided highway with access available only at grade separated interchanges. Given the distinct AM and PM peaks in hourly traffic flow, both AM and PM DHVs were analyzed. AM peak-hour volumes in October from 7 to 8 AM are representative of the 30th highest hour for the AM. For the PM, July/August volumes from 4 to 5 PM are representative of the 30th highest hour. The PM peak-hour is influenced by seasonal recreational trips in summer, particularly in July and August. Although most of the 24-hour traffic counts on the I-295 corridor were collected in October, year-round count information in Portland, Freeport, and Brunswick enabled PM peak-hour counts to be adjusted to July/August levels to obtain the PM DHVs. The AM and PM 2016 DHVs are in Appendix A.

Figure II-4 and Figure II-5 show the July/August average weekday traffic volumes along I-295 at the permanent count stations in Portland between Exit 5 and Exit 6 and Freeport between Exit 17 and Exit 20, respectively. The volumes in Freeport clearly show a typical city commuter-type pattern, with greater volumes headed in-bound toward the city in the AM peak hour, and greater out-bound volumes in the PM peak hour. In Portland, however, the volumes tend to represent a more consistent pattern, with AM and PM peak hour volumes being similar for both directions.

Figure II-4. Average July-August Weekday Volumes for Portland, Exit 5-6

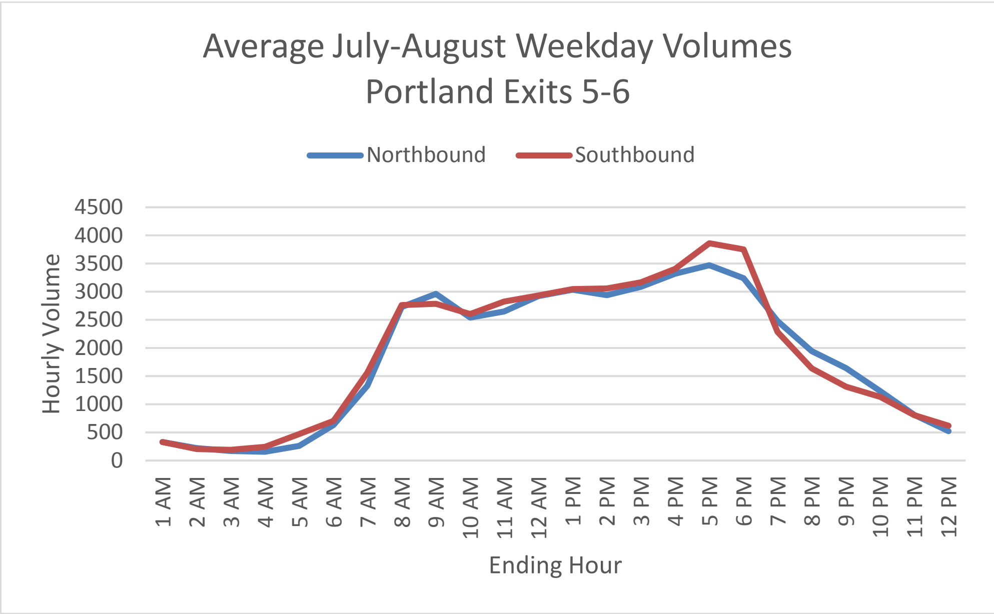
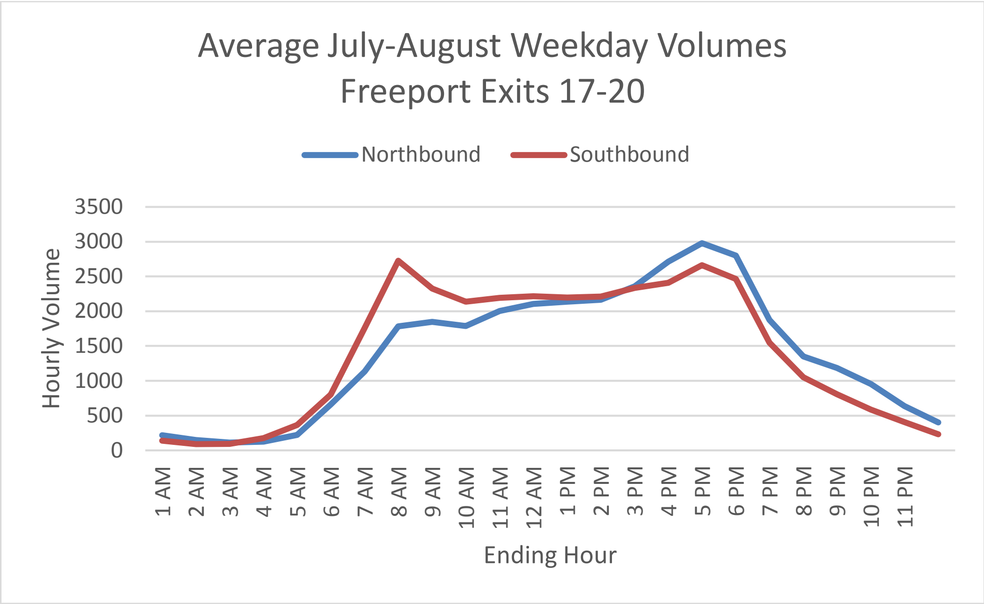


Figure II-5. Average July-August Weekday Volumes for Freeport, Exit 17-20



4. Truck Traffic

Heavy vehicle traffic data was compiled from available traffic count locations. Heavy vehicles include trucks with six or more tires and also buses. In Freeport, heavy vehicles represent about 8.8% of the AADT. In Portland, heavy vehicles represent about 7.3% of the AADT. In both of locations, the total heavy vehicle traffic volume averages between 5,000 and 6,000 per day. The percentages of trucks that were used for peak-hour analysis can be found in the FREEVAL results in Appendix B (tractor trailers) and Appendix C (single unit trucks).

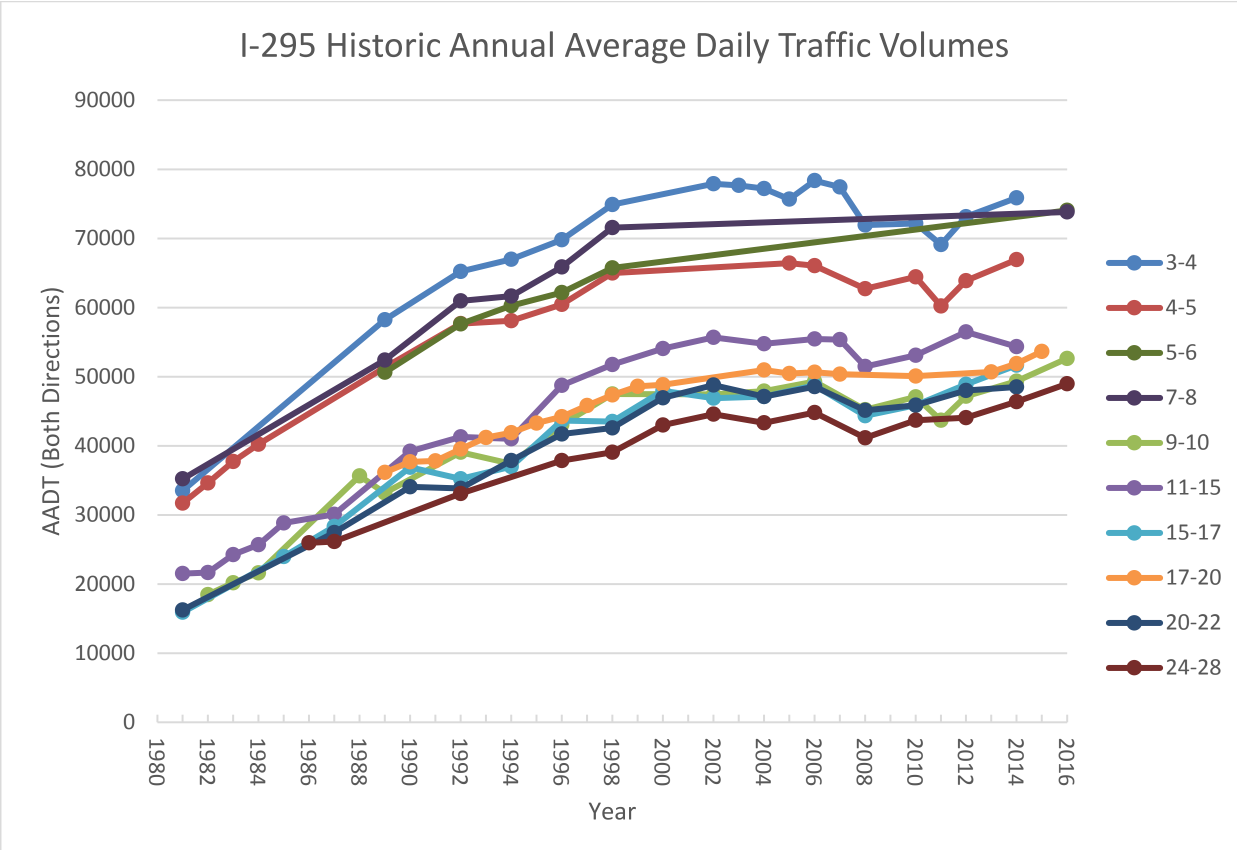
5. Mass Transportation Users

The regional and intercity transportation services provided by ZOOM, the Metro BREEZE, and the Amtrak Downeaster currently serve hundreds of daily riders who might otherwise use private automobiles on I-295.

6. Historical Traffic Growth

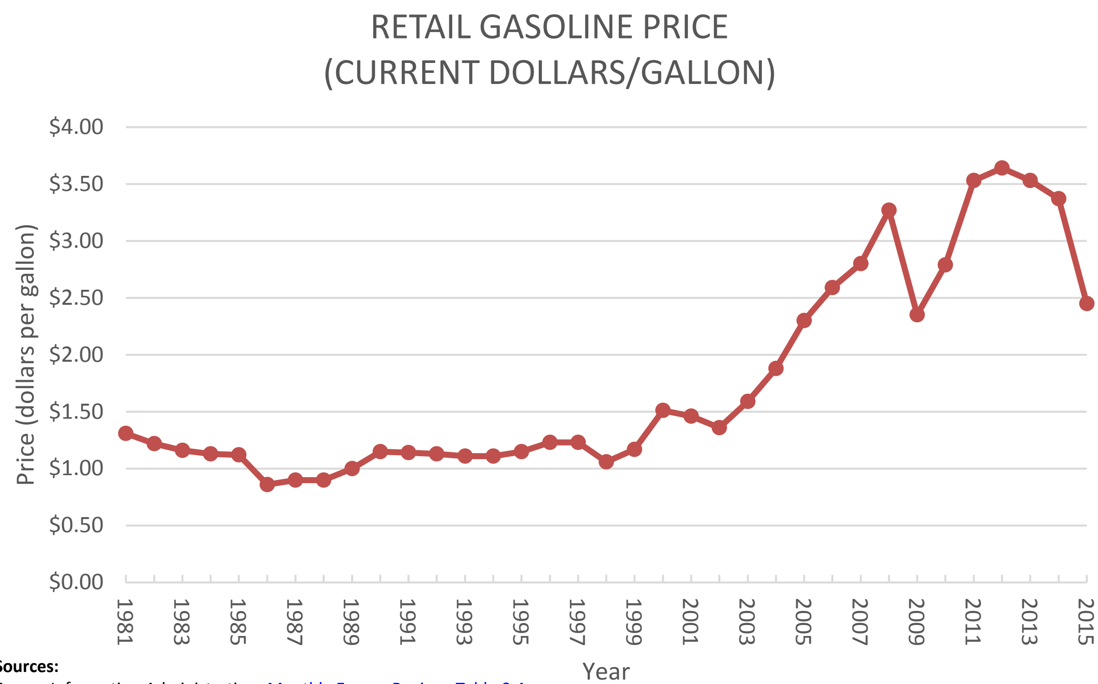
Figure II-6 shows the historical growth in annual average daily traffic volumes for combined northbound and southbound directions along the I-295 study corridor from Scarborough to Brunswick. The data shown represents locations with the greatest number of historical traffic counts along the corridor as well as the new permanent count stations between Exits 5 and 6 and between Exits 7 and 8. At the new permanent count stations, historical data between 1998 and 2016 is not available. Figure II-6 clearly shows the difference in traffic volumes between the portion of I-295 south of Exit 9 and the portion north. The highest volumes in the I-295 corridor are in South Portland and Portland between Exits 3 and 9.

Figure II-6. I-295 Historical Traffic Growth



In general, traffic volumes climbed steadily until 2002, where they became nearly constant or decreased slightly until 2006. In 2006, traffic volumes peaked at most locations started to decline, due to the 2007-2009 recession. In the northern portion of the corridor, volumes reached their lowest point in 2008. After 2008, traffic volumes started to increase again and have been increasing through 2016. In the southern portion of the corridor, volumes reached their lowest point in 2011. The bottoms in traffic volumes in 2008 and 2011 may be related to high points in gasoline prices. Figure II-7 shows average historical annual gasoline pump prices from 1981 to 2015. The years of increasingly high gasoline prices correspond with years of slowing traffic growth. Other than energy cost changes, periods of slow increases or decreases in AADT are likely due to economic slowdowns.

Figure II-7. Historic Retail Gasoline Prices



Sources:
Energy Information Administration, Monthly Energy Review, Table 9.4.
U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Table 1.1.9.
Implicit Price Deflators for Gross Domestic Product, February 2016.

C. Safety and Mobility Operating Conditions

Operating conditions in the corridor are measured for the quality of safety and mobility provided. Safety is measured in the frequency and severity of crashes. Mobility is usually measured in average speeds and level of service. Utilization of capacity is an important factor affecting level of service. A newer mobility measure is reliability, which is an indicator of the consistency of the speeds and levels of service. The frequency of incidents, of which crashes are the most serious type, are an indicator of operation that affects safety, capacity, level of service, and reliability.

1. Travel Speeds

There are three speed limit zones along the I-295 corridor: 65mph north of Exit 9, 50 mph from Exit 9 to Exit 5A, and 55mph south of Exit 5A. The 65mph zone is considered rural freeway, and the 50 and 55mph zones are both urban freeway. In 2014 the speed limit on the rural segment was raised from 65mph to 70mph, but the speed limit was lowered back to 65mph in early 2017 following a significant increase in vehicle crashes along the corridor. Data showed that the increased speed may have contributed in-part to the 29% increase in crashes on that stretch of I-295 during a two-year span between the year before the state raised the speed limit and the year after it had been in effect a full year. Increased traffic volumes, as well as driver distraction, also played a role in the increase in crashes.

In 2016, the FHWA acquired a national data set of average travel times on the National Highway System, which includes I-295. The data set was made available to State Departments of Transportation for use in performance management activities. The National Performance Management Research Data Set (NPMRDS) is year-round probe-based (cellphone, GPS) travel time data set made available by the Federal Highway Administration (FHWA). These travel times are beneficial in determining existing average speeds, areas of delay, and reliability of travel times throughout the corridor. The travel speeds can be used to calibrate models to better represent real-life scenarios.

Table II-5 shows the observed NPMRDS AM and PM peak hour speeds for northbound and southbound directions on I-295. The AM peak hour speeds represent October speeds from 7:00 AM to 8:00 AM and the PM peak hour speeds represent combined July and August speeds from 4:00 PM to 5:00 PM. These are the hours and months where the AM and PM peak hours are representative of peak traffic volumes. The lowest speed, south of Exit 1, is due to vehicles slowing for the toll booth. These speeds were used to calibrate the baseline model that was creating using FREEVAL, a Highway Capacity Manual computational engine.

Table II-5. Existing NPMRDS AM and PM Peak Hour Speeds (NB & SB)

Northbound		
Location	**AM**	**PM**
24 on to 28 on	68.2	68.5
22 on to 24 on	68.1	68.2
20 on to 22 on	67.3	67.1
17 on to 20 on	67.1	64.3
15 on to 17 on	68.1	66.3
11 on to 15 on	67.0	61.0
10 on to 11 on	63.1	51.2
9 off to 10 on	65.8	58.1
9 on to 9 off	55.7	47.7
8 off to 9 on	52.1	42.3
8 on to 8 off	52.9	39.4
7 on to 8 on	58.3	46.0
6B on to 7 on	57.6	43.0
5N on to 6B on	54.9	46.5
5 off to 5N on	53.0	41.6
4 on to 5 off	55.8	46.0
3 on to 4 on	59.1	41.9
2 on to 3 on	57.1	54.5
1 on to 2 on	58.7	56.3
1 off to 1 on	43.5	46.4
toll to 1 off	12.9	18.3
95 to toll	46.5	49.8

Southbound		
Location	**AM**	**PM**
28 to (24)	69.2	67.8
(24) to 22 on	68.2	67.0
22 on to 20 on	67.7	66.5
20 on to 17 on	67.8	66.4
17 on to 15 on	59.1	65.7
15 on to 11 off	63.8	66.5
11 off to 10 on	63.6	63.1
10 on to 9 on	64.9	64.3
9 on to 9 off	50.4	50.3
9 off to 8 on	47.3	44.5
8 on to 8 off	48.3	44.8
8 off to 7 on	53.4	32.4
7 on to 6A/B	51.5	33.9
6A/B to 5B on	54.3	36.7
5B on to 5A on	52.6	30.7
5A on to 4 on	59.4	48.7
4 on to 3 off	60.5	56.4
3 off to 2 off	60.8	56.7
2 off to 1 off	62.4	61.6
1off to toll	35.9	29.8
toll - 95	45.2	47.6

In addition to the observed speeds, free-flow speed (FFS) and 50th percentile average speeds were calculated from the NPMRDS data. FFS are based on 20th percentile travel times. These speeds are shown for both northbound and southbound directions in Table II-6. The free-flow speed is the average speed of vehicles on a given segment, measured under low-volume conditions, when drivers are free to drive at their desired speed and not constrained by the presence of other vehicles. This is the speed that is used in the Highway Capacity Manual analysis.

Table II-6. Existing Free-Flow Speed and 50th Percentile Average Speeds (NB & SB)

Northbound		
Location	**Free-Flow**	**50th Percentile**
24 on to 28 on	69	67
22 on to 24 on	69	67
20 on to 22 on	68	66
17 on to 20 on	67	65
15 on to 17 on	68	66
11 on to 15 on	68	66
10 on to 11 on	73	64
9 off to 10 on	66	64
9 on to 9 off	57	54
8 off to 9 on	61	55
8 on to 8 off	55	52
7 on to 8 on	59	56
6B on to 7 on	58	56
5N on to 6B on	57	55
5 off to 5N on	58	54
4 on to 5 off	59	57
3 on to 4 on	62	59
2 on to 3 on	64	61
1 on to 2 on	63	59
1 off to 1 on	50	44
toll to 1 off	26	20
95 to toll	53	49

Southbound		
Location	**Free-Flow**	**50th Percentile**
28 to (24)	69	67
(24) to 22 on	69	67
22 on to 20 on	69	67
20 on to 17 on	69	67
17 on to 15 on	68	66
15 on to 11 off	69	67
11 off to 10 on	71	66
10 on to 9 on	66	64
9 on to 9 off	61	54
9 off to 8 on	59	53
8 on to 8 off	55	50
8 off to 7 on	56	54
7 on to 6A/B	56	53
6A/B to 5B on	57	54
5B on to 5A on	59	56
5A on to 4 on	60	58
4 on to 3 off	62	59
3 off to 2 off	70	60
2 off to 1 off	64	61
1off to toll	43	33
toll - 95	50	45

2. Crashes

From 2014 to 2016 there were 1,275 total reported crashes on the study corridor, from Scarborough to Portland. There were 648 crashes northbound direction and 627 in the southbound direction. Table II-7 shows the number of crashes that occurred in each of the three years from 2014 to 2016 for each direction. Overall, the number of crashes increased by 9.5% from 2014 to 2015 and 15.9% from 2015 to 2016, resulting in an overall increase in crashes of 26.9% from 2014 to 2016. Table II-7 also shows the severity of the crashes the occurred. The injury severity classifications are as follows: “K” represents a fatal crash, “A” is incapacitating, “B” is non-incapacitating, “C” is possible injury, and “PD” is property damage only. In the three-year period from 2014 to 2016, approximately one quarter of all crashes resulted in some level of injury. Crash summaries can be found in Appendix D and E (northbound) and Appendix F and G (southbound).

Table II-7. I-295 Crashes and Severity, 2014-2016

	Number of Crashes				Crash Severity (Total, 2014-2016)					
	2014	**2015**	**2016**	**Total**	**K**	**A**	**B**	**C**	**PD**	**% Injury**
NB	196	194	258	648	1	15	71	72	489	24.5%
SB	183	221	223	627	0	20	60	80	467	25.5%
Total	379	415	481	**1275**	1	35	131	152	956	25.0%

3. High Crash Locations

Crash data from 2014 to 2016 was used to identify high crash locations (HCLs) along the study corridor. A HCL is a highway location that has eight (8) or more traffic crashes and a critical rate factor (CRF) greater than 1.00 in a three-year period. A location with a CRF greater than 1.00 has a frequency of crashes that is greater than the statewide average for similar locations.

Based on the crash data, thirteen locations along the I-295 study corridor meet the criteria for high crash locations. Table II-8 summarizes the high crash location, the number of crashes, injury type, and the CRF for these locations. Collision diagrams were prepared for these locations to determine if there were any evident crash patterns or trends that may indicate correctable deficiencies. These diagrams are provided in Appendix H (northbound) and Appendix I (southbound).

Table II-8. I-295 High Crash Locations

Town	Direction	Location Type	Location	Total Crashes	Injury Type					Percent Injury	CRF
					K	**A**	**B**	**C**	**PD**		
S. Portland	NB	Mainline	Exit 3 to Crossover	28	0	0	4	3	21	25.0	1.63
S. Portland	NB	Mainline	Crossover to Exit 4	14	0	1	1	1	11	21.4	1.44
S. Portland	NB	Mainline	Exit 4 to Portland TL	13	0	0	2	2	9	30.8	1.29
Portland	NB	Mainline	Portland TL to Exit 5	11	0	0	1	2	8	30.0	1.21
Portland	NB	Mainline	Exit 6A to Exit 6B	8	0	0	0	1	7	12.5	1.71
Portland	SB	Mainline	Exit 6B to 6A	8	0	0	1	1	6	25.0	1.85
Portland	NB	Mainline	Exit 8	19	0	0	3	1	15	21.1	1.64
Portland	SB	Mainline	Exit 8	15	0	0	5	0	10	33.3	1.15
Portland	NB	Mainline	Exit 9	13	0	0	2	0	11	15.4	1.46
Portland	SB	Mainline	Exit 9	8	0	0	3	0	5	37.5	1.04
Cumberland	SB	Mainline	Exit 15 to Crossover	29	0	3	0	0	26	10.3	1.22
Yarmouth	SB	Mainline	Freeport TL to Exit 17	18	0	0	0	1	17	5.6	1.36
Yarmouth	NB	Mainline	Exit 17	26	0	0	3	2	21	19.2	1.36

4. Highway Incidents

The MaineDOT received incident data from the Maine State Police for 2015 and 2016 along the I-295 corridor. Incidents are defined as crashes, breakdowns, and other random events that occur on the highway. These events can cause congestion delay on highways and expose other drivers to hazardous conditions, known to lead to secondary crashes.

Figure II-8 shows the monthly incident variation along the study area for both northbound and southbound directions. There were 8005 incidents from 2015 to 2016. The highest month for incidents in 2015 and 2016 occurred in August (1,161), with July being second highest with 1,151 incidents. The lowest month was March with 745 incidents.

Figure II-8. Monthly Incident Variation

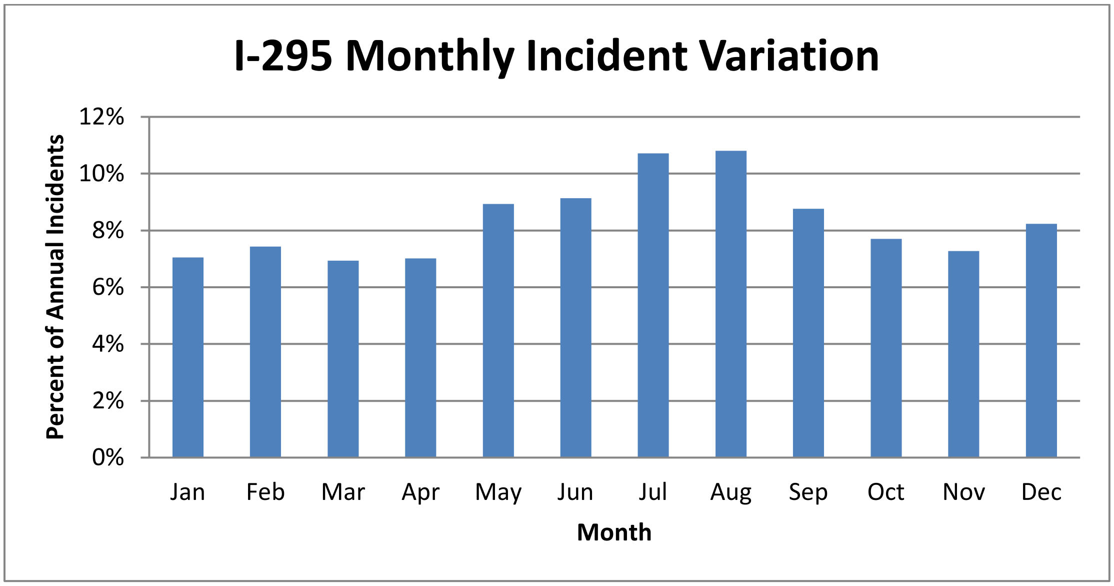
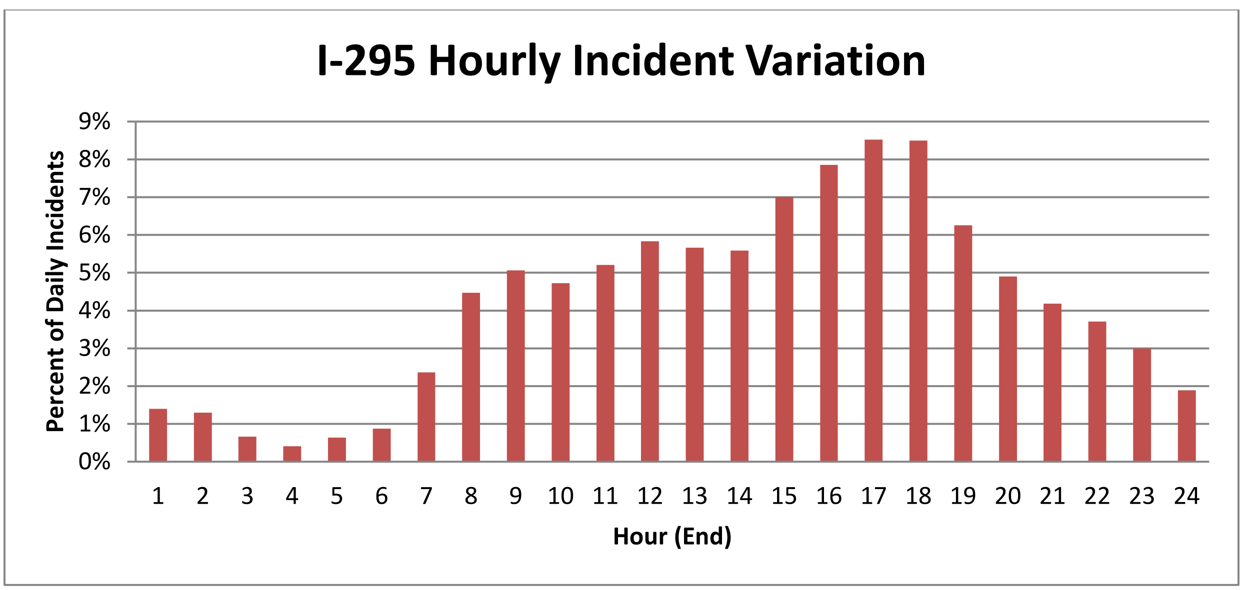


Figure II-9 shows the hourly incident variation along the study area for 2015 and 2016 combined. The peak hours of incidents occur from 4:00 PM to 6:00 PM with approximately 680 reported incidents in each hour. In the two years, there were a total of 358 incidents in the 7:00-8:00 AM peak hour.

Figure II-9. Hourly Incident Variation



A sample of both northbound and southbound crashes from 2014-2016 were reviewed to see how speed was affected by crash severity for both the segment on which the crash occurred and the segment just upstream. This shows the effect traffic incidents have on mainline speeds. In the northbound direction, 39 no-injury crashes, 9 non-incapacitating, and 8 incapacitating crashes were analyzed. In the southbound direction, 27 no injury, 10 non-incapacitating, and 8 incapacitating crashes were analyzed. Figure II-10 and Figure II-11 show the average percent reduction in speed for each crash type for each direction. In general, the reduction in speed is greater if the crash is more severe. However, in the northbound direction, the upstream segment has a smaller speed reduction for incapacitating crashes than non-incapacitating crashes. This is likely due to the small sample size. Length of time for crash resolution, length of segments, and crash location may also have a significant effect on the results.

Figure II-10. Northbound Average Percent Reduction in Speed During Crashes

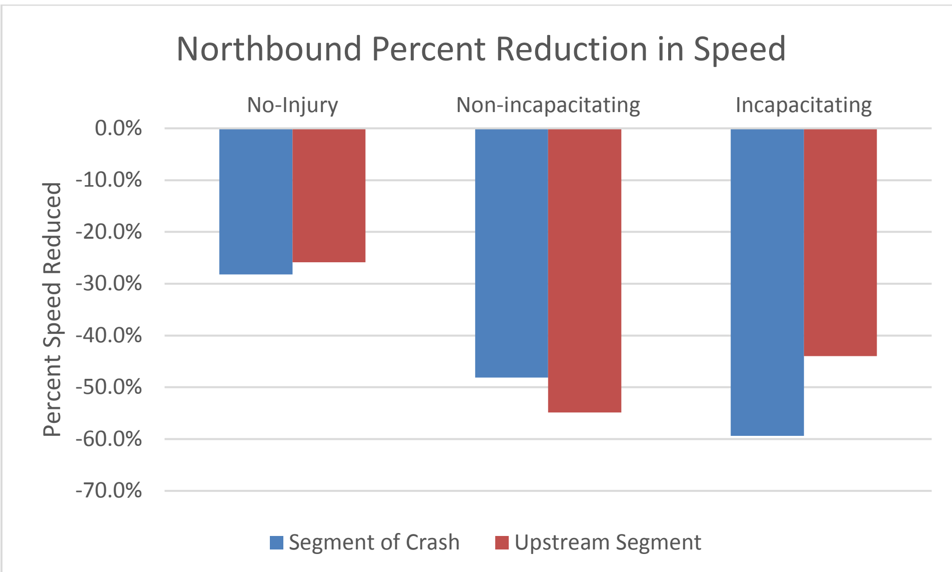
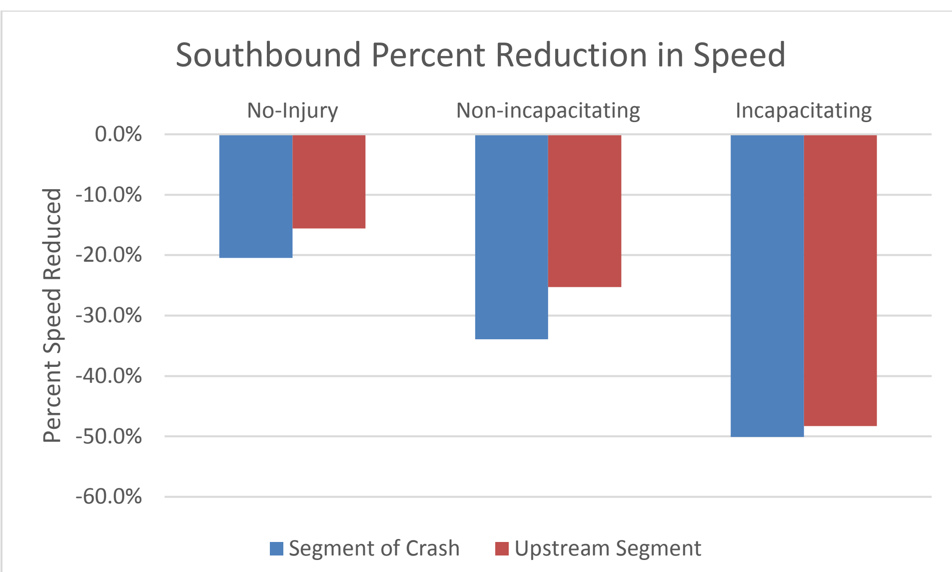


Figure II-11. Southbound Average Percent Reduction in Speed During Crashes



5. Capacity

Volume-capacity (v/c) ratios were determined for each segment along the I-295 corridor under existing conditions. Table II-9 shows the demand-based v/c ratios for both northbound and southbound directions in the AM and PM peak hours. Many of the segments in Portland and South Portland (between Exit 4 and 9) have a demand greater than 70% of the capacity for at least one of the peak hours. Several segments operate near or over 90% capacity in the PM peak hour, including from Exit 5 to Exit 6 in the northbound direction, where demand exceeds capacity (v/c ratio greater than 1.00).

Table II-9. Demand-Based Volume-Capacity Ratios, Existing

Northbound		
Location	AM	PM
28 off to 28 on	0.253	0.390
24 on to 28 off	0.413	0.643
24 off to 24 on	0.380	0.584
22 on to 24 off	0.415	0.620
22 off to 22 on	0.354	0.547
20 on to 22 off	0.403	0.666
20 off to 20 on	0.376	0.585
17 on to 20 off	0.509	0.732
17 off to 17 on	0.417	0.625
15 on to 17 off	0.479	0.712
15 off to 15 on	0.423	0.649
11 on to 15 off	0.531	0.793
10 on to 11 on	0.423	0.628
10 off to 10 on	0.345	0.543
9 off to 10 on	0.422	0.702
9 on to 9 off	0.491	0.740
8 off to 9 on	0.533	0.880
8 on to 8 off	0.491	0.772
7 on to 8 on	0.475	0.733
7 off to 7 on	0.617	0.813
6B on to 7 on	0.712	0.870
6B off to 6B on	0.659	0.831
6A on to 6B off	0.609	0.726
6A off to 6A on	0.745	0.878
5N on to 6A off	0.889	1.014
5S on to 5N on	0.818	0.908
5 off to 5S on	0.724	0.743
4 on to 5 off	0.825	0.810
4 off to 4 on	0.641	0.676
3 on to 4 off	0.735	0.671
2 on to 3 on	0.799	0.599
1 on to 2 on	0.498	0.367
1 off to 1 on	0.292	0.179
95 to 1 off	0.324	0.198

Southbound		
Location	AM	PM
28 off to 28 on	0.289	0.308
28 on to 22 off	0.595	0.558
22 off to 22 on	0.482	0.472
22 on to 20 off	0.658	0.564
20 off to 20 on	0.588	0.521
20 on to 17 off	0.740	0.669
17 off to 17 on	0.654	0.578
17 on to 15 off	0.740	0.637
15 off to 15 on	0.694	0.573
15 on to 11 off	0.808	0.621
11 off to 10 off	0.619	0.458
10 off to 10 on	0.522	0.375
10 on to 9 on	0.684	0.500
9 on to 9 off	0.723	0.534
9 off to 8 on	0.868	0.619
8 on to 8 off	0.767	0.583
8 off to 7 off	0.687	0.532
7 off to 7 on	0.765	0.669
7 on to 6B off	0.878	0.865
6B off to 6B on	0.834	0.823
6B on to 6A off	0.675	0.758
6A off to 6A on	0.735	0.801
6A on to 5B off	0.830	0.973
5B off to 5B on	0.685	0.837
5B on to 5A off	0.584	0.703
5A off to 5A on	0.611	0.857
5A on to 4 off	0.615	0.828
4 off to 4 on	0.528	0.643
4 on to 3 off	0.525	0.747
3 off to 2 off	0.467	0.651
2 off to 1 off	0.307	0.527
1 off to 95	0.214	0.310

6. Level of Service

Level of service (LOS) is a qualitative measure that describes operation conditions within a traffic stream. LOS considers several variables including speed and travel time, vehicles maneuverability, traffic interruptions, comfort, and convenience. There are six levels of service defined by the Highway Capacity Manual, ranging from “A” to “F”, with “A” representing the best operational condition and “F” representing the worst. On freeways, the LOS for the corridor is determined by the density (passenger cars per mile per lane) of the traffic stream. The LOS thresholds for a basic freeway segment are summarized in Table II-10.

Table II-10. Basic Freeway LOS Thresholds

Level of Service	Density Range (pc/mi/ln)
A	0-11
B	>11-18
C	>18-26
D	>26-35
E	>35-45
F	>45

Appendix J includes diagrams of the 2016 AM and PM peak design hour LOS (existing conditions) for the study area for each basic freeway segment, weaving segment, on-ramp, and off-ramp. Table II-11 gives a broader summary of LOS based on the three speed zones in the study area: north of Exit 9 (65 mph), Exit 9 to Exit 5 (50 mph), and south of Exit 5 (55 mph). Each of these segments operates at LOS C or better in both the northbound and southbound directions for both the AM and PM peak hours except for the northbound 50mph segment, which operates at LOS E in the PM peak hour. The table summarizes the average speed for each speed zone as well as the average density and resulting LOS.

Table II-11. 2016 AM & PM LOS by Speed Zone, NB & SB

Baseline								
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Southbound	N of 9 on	55	64.6	66.2	22.2	C	18.2	C
Southbound	9 on to 5A on	50	51.9	50.8	25.9	C	25.5	C
Southbound	S of 5A on	65	50.3	49.6	13.7	B	20.1	C
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Northbound	S of 5 off	55	53.5	39.0	20.8	C	40.5	E
Northbound	9 off to 5 off	50	53.9	41.8	21.9	C	42.3	E
Northbound	N of 9 on	65	66.2	64.0	14.4	B	23.1	C

7. Reliability

A reliability rating was produced for each segment on the I-295 study corridor. The reliability rating, based on the 2016 Highway Capacity Manual, is the percentage of vehicle-miles traveled (VMT) on the freeway facility that experiences a time travel index (TTI) of less than 1.33. The time travel index is the ratio of the actual travel time to the free-flow travel time. The reliability rating approximates the points beyond which travel times become much more variable or unreliable. Table II-12 shows the 50th percentile and 80th percentile TTIs as well as the reliability rating for each segment in the northbound and southbound directions for the AM and PM peak hours. Many of the segments have a reliability rating of over 90%.

Several segments, however, have TTIs greater than 1.33 and a reliability rating under 80%. Except for the southernmost segments, which are affected by toll plaza operations at I-95 Exit 44, the least reliable segments are located in the southbound Exit 5 area during the PM peak and in the northbound Exit 10 area also during the PM peak. These segments can be considered unreliable during the PM peak hour. There are also several segments in South Portland, Portland, and Falmouth where the peak-hour reliability is between 80% and 90% in the AM and/or PM peak hour. The locations with travel time reliability below 90% are the most unreliable segment in the I-295 corridor.

Table II-12. 50th and 80th Percentile Time Travel Indexes and Reliability Ratings, NB & SB

Northbound						
Location	AM			PM		
	TTI(50)	TTI(80)	Reliability Rating	TTI(50)	TTI(80)	Reliability Rating
24 on to 28 on	1.02	1.04	96.17%	1.00	1.03	95.63%
22 on to 24 on	1.02	1.05	98.90%	1.01	1.04	97.54%
20 on to 22 on	1.02	1.05	98.63%	1.02	1.06	97.27%
17 on to 20 on	1.01	1.04	98.63%	1.01	1.06	97.54%
15 on to 17 on	1.01	1.04	98.63%	1.01	1.05	94.81%
11 on to 15 on	1.01	1.04	98.63%	1.02	1.08	92.35%
10 on to 11 on	1.14	1.29	85.21%	1.14	1.34	77.37%
9 off to 10 on	1.01	1.04	88.77%	1.02	1.08	88.80%
9 on to 9 off	1.03	1.07	99.17%	1.05	1.11	91.48%
8 off to 9 on	1.11	1.19	98.85%	1.17	1.22	94.69%
8 on to 8 off	1.04	1.08	94.72%	1.09	1.15	90.41%
7 on to 8 on	1.03	1.07	98.06%	1.06	1.11	94.79%
6B on to 7 on	1.02	1.06	98.63%	1.06	1.13	94.54%
5N on to 6B on	1.03	1.06	97.80%	1.08	1.15	93.72%
5 off to 5N on	1.06	1.12	98.62%	1.10	1.19	93.99%
4 on to 5 off	1.04	1.09	98.90%	1.06	1.15	90.71%
3 on to 4 on	1.03	1.07	98.08%	1.03	1.12	87.43%
2 on to 3 on	1.09	1.14	97.78%	1.06	1.12	91.46%
1 on to 2 on	1.06	1.12	96.98%	1.04	1.10	92.60%
1 off to 1 on	1.14	1.31	89.59%	1.09	1.24	95.34%
toll to 1 off	1.34	1.86	46.94%	1.33	1.75	49.03%
95 to toll	1.07	1.15	92.60%	1.06	1.14	92.60%

Southbound						
Location	AM			PM		
	TTI(50)	TTI(80)	Reliability Rating	TTI(50)	TTI(80)	Reliability Rating
28 to (24)	1.00	1.03	98.36%	1.02	1.05	98.36%
(24) to 22 on	1.01	1.04	98.63%	1.02	1.05	98.36%
22 on to 20 on	1.01	1.04	98.90%	1.03	1.06	97.27%
20 on to 17 on	1.01	1.03	97.81%	1.02	1.05	97.27%
17 on to 15 on	1.02	1.07	95.62%	1.02	1.06	96.72%
15 on to 11 off	1.02	1.09	99.18%	1.02	1.05	94.54%
11 off to 10 on	1.09	1.17	96.29%	1.10	1.17	97.26%
10 on to 9 on	1.02	1.06	95.05%	1.02	1.05	95.08%
9 on to 9 off	1.17	1.28	87.07%	1.14	1.21	98.36%
9 off to 8 on	1.15	1.28	85.93%	1.16	1.25	91.64%
8 on to 8 off	1.11	1.17	95.84%	1.11	1.17	94.54%
8 off to 7 on	1.04	1.09	98.05%	1.06	1.15	86.89%
7 on to 6A/B	1.04	1.11	98.07%	1.12	1.30	81.69%
6A/B to 5B on	1.03	1.07	97.25%	1.09	1.25	84.97%
5B on to 5A on	1.04	1.08	97.53%	1.12	1.46	76.23%
5A on to 4 on	1.01	1.05	97.80%	1.09	1.18	91.53%
4 on to 3 off	1.02	1.07	98.62%	1.08	1.15	96.45%
3 off to 2 off	1.14	1.21	94.75%	1.18	1.27	88.46%
2 off to 1 off	1.03	1.08	98.04%	1.04	1.08	98.08%
1off to toll	1.19	1.59	64.17%	1.28	1.74	56.01%
toll - 95	1.07	1.20	90.68%	1.06	1.15	94.54%

D. Environmental Overview

The I-295 Corridor, between Scarborough and Brunswick, passes through a varied natural and man-made environment. Table II-13 summarizes the environment east and west of the I-295 right-of-way for the 28 miles from Scarborough to Brunswick. It is a mix of rural, suburban, and urban resources, man-made and natural. These environmental resources could affect or be affected by potential improvement actions along I-295, depending on the scope of the action. Those actions which require the least construction and stay within the existing right-of-way are likely to have the lowest environmental effects.

Table II-13. Affected Environment Along I-295 Corridor

City/Town	West Side Resources/Constraints	Corridor	East Side Resources/Constraints
Brunswick	Rural Area	Exit 28	Rural Area
Freeport	Rural Area	Exit 24	Route 1
	Suburban Area	Exit 22	Freeport Village Area
		Exit 20	
Freeport	Suburban Area		Route 1 Commercial Area
Yarmouth		Exit 17	
	Yarmouth Village Area		Yarmouth Village Area
Yarmouth		Exit 15	
Cumberland	St. Lawrence & Atlantic R.R.		Route 1
Falmouth	St. Lawrence & Atlantic R.R.	Exit 11	
			Route 1 Commercial Area
		Exit 10	
Falmouth	St. Lawrence & Atlantic R.R.		Presumpscot River
Portland	Urban Residential Area	Exit 9	Urban Residential Area
			Industrial Area
		Exit 8	Casco Bay
	Back Cove, Ped/Bike Trail		
		Exit 7	Potential Rail Corridor, Marginal Way Urban Residential &
	Commercial Area	Exit 6	
	Urban Residential Area, USM		Union Branch, Deering Oaks Park
Portland	Rail/Bus Passenger Terminal	Exit 5	Urban Residential Area
	Fore River		Fore River
South Portland	Long Creek	Exit 4	Industrial Area
			Urban Residential Area
		Exit 3	
			West Broadway
	Long Creek	Exit 2	
South Portland	Commercial Area	Exit 1	West Broadway
Scarborough	Comercial Area		Commercial Area
		I-95	

1. Physical and Biological Environment

Located within a few miles of the coast of southern Maine, I-295 is close to several notable tidal bodies of water in the southern part of the corridor. Among these are Long Creek in south Portland, the Fore River, Back Cove and Casco Bay in Portland, the Presumpscot River in Falmouth, and the Royal River in Yarmouth.

Land types along the corridor are dominated by urban uses in the southern portion, but gradually give way to forested rural land in the northern portion. The highway passes through rolling terrain, resulting in fills in low areas and cuts exposing rock outcroppings in higher areas.

2. Land Use, Cultural, Social, and Economic Environment

There are a mix of urban lands along the I-295 corridor. From Scarborough through Portland, land uses are mainly commercial or urban residential. The corridor also closely parallels several transportation facilities such as the Union Branch (former railroad) corridor in Portland, the St. Lawrence & Atlantic Railroad in Falmouth and Cumberland, and Route 1 in Cumberland. Established village areas can be found near I-295 in Yarmouth and Freeport.

The key cultural and social resources along the corridor are the recreational and educational facilities in Portland. Located in the area between Exits 5 and 8 are resources such as Back Cove, Hadlock Field, Fitzpatrick Stadium, tennis courts, ball fields, Deering Oaks Park, and the University of Southern Maine campus. Deering Oaks is also listed on the National Register of Historic Places.

At the I-295 interchanges, traffic to and from I-295 interacts with the local traffic environment, which, in addition to vehicular traffic, includes pedestrian and bicycle traffic, particularly in urban locations.

3. Atmospheric Environment

The atmospheric environment of the I-295 Corridor has two major components: air and noise.

Under the rules of the Clean Air Act and Clean Air Act Amendments of 1990, air quality in Maine's Area 1, where the I-295 corridor is located, was once a non-attainment area, but achieved attainment status in recent years. Area 1 has been shown to meet current air quality standards, but continues to be closely monitored for compliance.

Noise conditions in the I-295 Corridor are believed to vary considerably depending on location. Areas near highway segments with more traffic volume or areas closer to the highway will tend to have higher levels of highway noise. At least two areas near I-295 have been observed to have noise levels above 66 decibels (dBA). One is in the urban residential neighborhood near Exit 9 in Portland, and the other is in the urban residential neighborhood adjacent to the east side of I-295 between Exits 3 and 4 in South Portland.

III. Future Conditions

Future conditions analysis includes a forecast of future volumes and a focus on future operating conditions. Any known committed changes to the transportation inventory are considered in the future conditions. External factors and trends that could affect the future performance of the corridor are also discussed.

A. Forecast

The traffic volume forecast for the I-295 corridor is based on the growth factors produced by the PACTS travel demand model. The base year for the model is 2016. The forecast horizon year is 2040. The socio-economic inputs (regional and local 2040 population and employment forecasts) to the PACTS model are products of the GPCOG, which forecasted growth from 2014 to 2040. Their GPCOG analysis shows expected overall growth in the PACTS region of 23% in population and 27% in employment.

The principal outputs of the PACTS model used in the I-295 Corridor Update are 2016-to-2040 growth factors for peak-hour volumes on each segment of I-295, plus regional changes in vehicle-miles traveled (VMT) and vehicle-hours (VHT). These growth factors for AM and PM peak hour are shown in Table III-1. For the AM peak hour, the highest growth factors are located south of Exit 11 (Falmouth Spur), indicating substantial growth in commuter traffic in the core of the PACTS area. For the PM peak hour, the highest growth factors are located north of Exit 11, indicating substantial growth in through traffic, bypassing the portion of I-295 south of Exit 11. In both cases, the segments of I-295 with the highest growth may see an increase in traffic demand of 20% or more.

Table III-1. I-295 2016-to-2040 Baseline Peak-Hour Growth Factors

I-295 Segments by Exit Number	2016-40 Growth Factors AM Peak Hour (Fall)	2016-40 Growth Factors PM Peak Hour (Summer)
N of 28	**1.10**	**1.24**
28 to 24	**1.10**	**1.24**
24 to 22	**1.10**	**1.24**
22 to 20	**1.11**	**1.16**
20 to 17	**1.13**	**1.16**
17 to 15	**1.15**	**1.17**
15 to 11	**1.16**	**1.14**
10 to 11	**1.18**	**1.13**
10 to 9	**1.24**	**1.15**
9 to 8	**1.23**	**1.14**
8 - Tukey Br	**1.21**	**1.15**
8 to 7	**1.19**	**1.13**
7 to 6	**1.19**	**1.12**
6 to 5	**1.19**	**1.10**
5 to 4	**1.20**	**1.10**
4 to 3	**1.23**	**1.12**
3 to 2	**1.23**	**1.13**
2 to 1	**1.20**	**1.06**
S of 1	**1.10**	**1.00**

B. Safety and Mobility Operating Conditions

Expected 2040 traffic demand on I-295 is likely to affect safety and mobility. Volume-capacity (v/c) ratios were calculated for forecasted 2040 traffic volumes. Table III-2 shows the v/c ratios for each segment, northbound and southbound, for the AM and PM peak hours. Without any upgrades to the I-295 corridor, many Portland/South Portland interstate segments would operate at over 90% capacity, with several segments having a demand that exceed capacity in each of the peak hours. Locations with high volume-capacity ratios are potential capacity constraints that directly affect the speeds along the corridor; as traffic volumes approach corridor capacity, travel speeds decrease. Decreases in speeds due to capacity constraints can adversely affect the speeds and levels of service on upstream segments.

Table III-2. Demand-Based Volume-Capacity Ratios, 2040 Volumes

Northbound		
Location	AM	PM
28 off to 28 on	0.278	0.484
24 on to 28 off	0.455	0.798
24 off to 24 on	0.418	0.724
22 on to 24 off	0.456	0.769
22 off to 22 on	0.394	0.655
20 on to 22 off	0.448	0.773
20 off to 20 on	0.421	0.678
17 on to 20 off	0.575	0.849
17 off to 17 on	0.475	0.731
15 on to 17 off	0.551	0.833
15 off to 15 on	0.491	0.753
11 on to 15 off	0.616	0.904
10 on to 11 on	0.499	0.710
10 off to 10 on	0.422	0.614
9 off to 10 on	0.523	0.808
9 on to 9 off	0.595	0.841
8 off to 9 on	0.656	1.003
8 on to 8 off	0.596	0.896
7 on to 8 on	0.566	0.828
7 off to 7 on	0.735	0.911
6B on to 7 on	0.848	0.978
6B off to 6B on	0.784	0.922
6A on to 6B off	0.725	0.806
6A off to 6A on	0.887	0.975
5N on to 6A off	1.058	1.115
5S on to 5N on	0.974	0.999
5 off to 5S on	0.870	0.817
4 on to 5 off	0.990	0.891
4 off to 4 on	0.803	0.744
3 on to 4 off	0.901	0.755
2 on to 3 on	0.983	0.676
1 on to 2 on	0.598	0.388
1 off to 1 on	0.324	0.179
95 to 1 off	0.356	0.198

Southbound		
Location	AM	PM
28 off to 28 on	0.318	0.381
28 on to 22 off	0.654	0.692
22 off to 22 on	0.541	0.562
22 on to 20 off	0.730	0.654
20 off to 20 on	0.660	0.599
20 on to 17 off	0.836	0.776
17 off to 17 on	0.747	0.674
17 on to 15 off	0.851	0.745
15 off to 15 on	0.801	0.659
15 on to 11 off	0.937	0.708
11 off to 10 off	0.729	0.518
10 off to 10 on	0.626	0.420
10 on to 9 on	0.848	0.575
9 on to 9 off	0.882	0.607
9 off to 8 on	1.067	0.706
8 on to 8 off	0.931	0.677
8 off to 7 off	0.818	0.601
7 off to 7 on	0.916	0.761
7 on to 6B off	1.045	0.969
6B off to 6B on	0.992	0.922
6B on to 6A off	0.804	0.852
6A off to 6A on	0.874	0.889
6A on to 5B off	0.988	1.070
5B off to 5B on	0.815	0.921
5B on to 5A off	0.693	0.773
5A off to 5A on	0.733	0.943
5A on to 4 off	0.738	0.910
4 off to 4 on	0.639	0.707
4 on to 3 off	0.649	0.857
3 off to 2 off	0.575	0.709
2 off to 1 off	0.368	0.558
1 off to 95	0.236	0.310

Table III-3 compares 2016 and 2040 AM and PM peak-hour speeds, densities and LOS by speed zone along the I-295 corridor. The expected traffic growth would reduce peak-hour travel speeds. In the northbound direction, reductions most evident in the 55-mph zone south of Exit 5, particularly in the AM peak hour. In the southbound direction, reductions would be most evident in the 50-mph zone between Exits 9 and 5. Slower speeds are directly related to increases in density along the corridor, which results in lower LOS with 2040 volumes. In 2040, a LOS F can be expected in the 55-mph zone in the northbound direction in both the AM and PM peak hours, and in the 50-mph zone in the southbound direction in the PM peak hour. LOS E can be expected in the AM peak hour in the southbound 50mph zone and in the PM peak hour in the northbound 50-mph zone. Least affected by the growth would be the 65-mph zone north of Exit 9 where average density is typically lowers than the rest of the corridor. Appendix K includes diagrams of the 2040 AM and PM peak hour LOS for the study area for each basic freeway segment, weaving segment, on-ramp, and off-ramp.

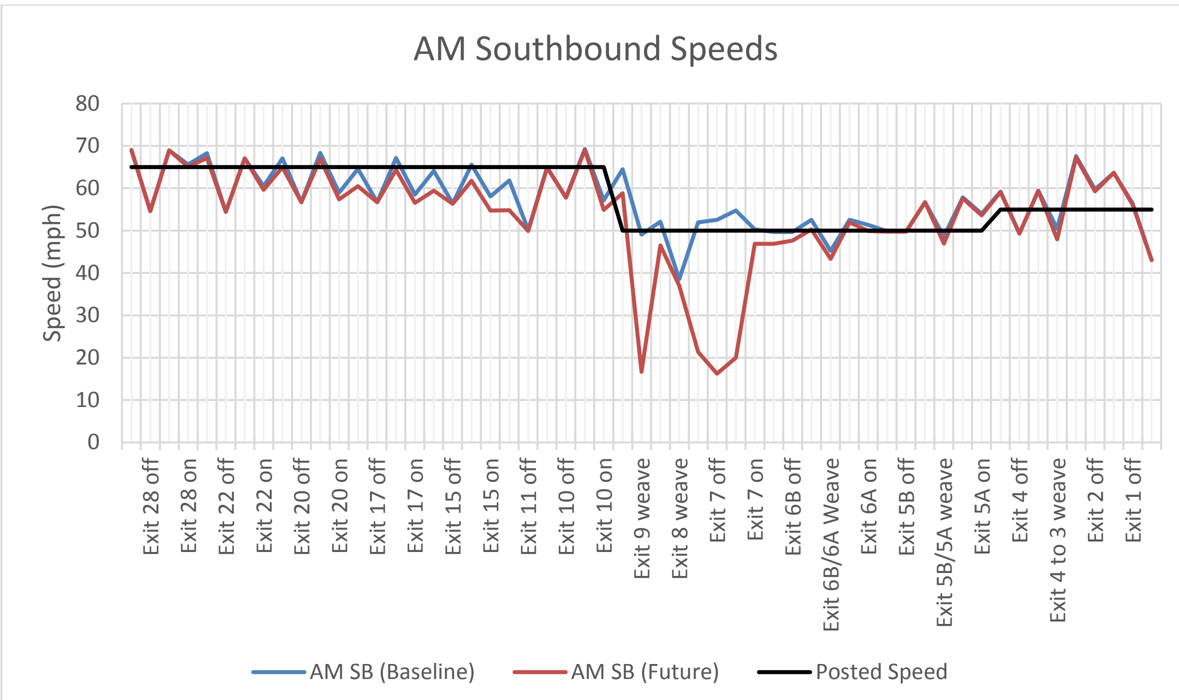
Table III-3. 2016-2040 AM & PM LOS by Speed Zone, NB & SB

Baseline								
Southbound	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
	N of 9 on	55	64.6	66.2	22.2	C	18.2	C
	9 on to 5A on	50	51.9	50.8	25.9	C	25.5	C
	S of 5A on	65	50.3	49.6	13.7	B	20.1	C
Northbound	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
	S of 5 off	55	53.5	39.0	20.8	C	40.5	E
	9 off to 5 off	50	53.9	41.8	21.9	C	42.3	E
	N of 9 on	65	66.2	64.0	14.4	B	23.1	C

Future (2040 Base)								
Southbound	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
	N of 9 on	55	61.7	64.8	27.0	D	22.0	C
	9 on to 5A on	50	42.2	30.9	43.0	E	64.3	F
	S of 5A on	65	50.0	49.4	15.3	B	19.9	C
Northbound	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
	S of 5 off	55	33.1	35.9	49.9	F	50.6	F
	9 off to 5 off	50	53.2	40.5	23.4	C	44.9	E
	N of 9 on	65	66.0	60.7	16.6	B	28.8	D

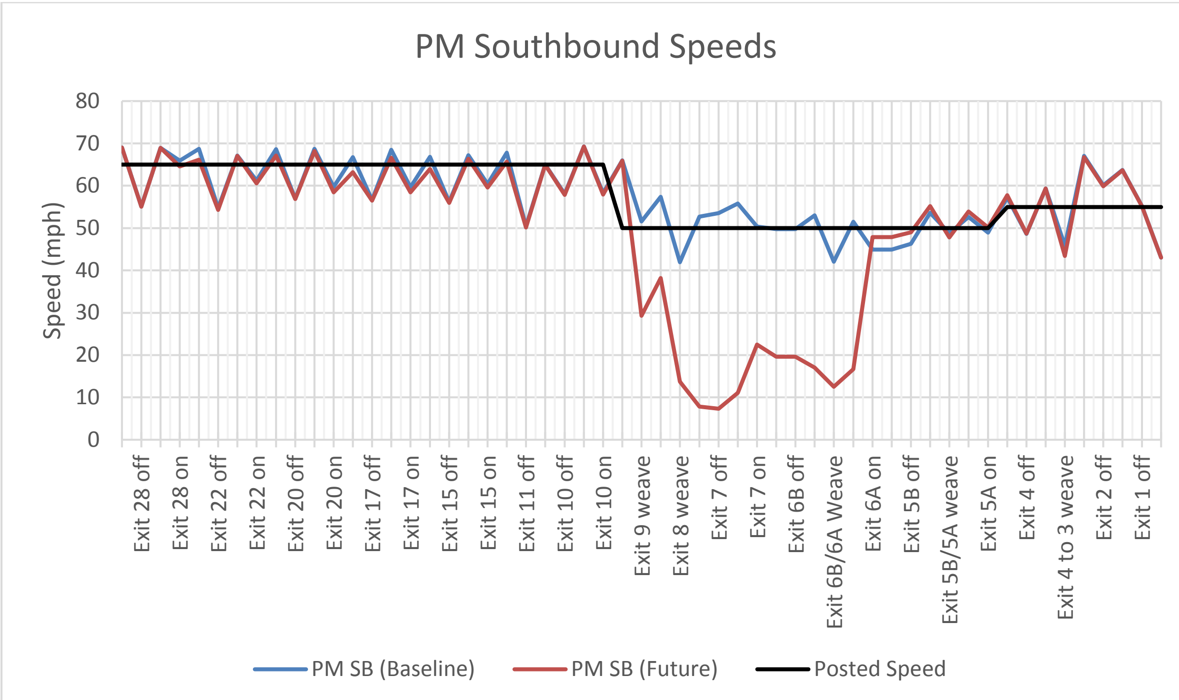
Under no-build conditions, speeds for both existing and 2040 traffic volumes were calculated using FREEVAL, a Highway Capacity Manual computational engine. Figure III-1 to Figure III-4 show the southbound and northbound existing and 2040 speeds along the corridor for both AM and PM peak hours. The figures show that, with 2040 traffic volumes, future speeds would be slower than baseline speeds throughout the corridor. Locations with congestion issues are indicated by corridor speeds that are significantly lower than either the speed limit or average free-flow speeds.

Figure III-1. AM Southbound FREEVAL Speeds, Existing & 2040



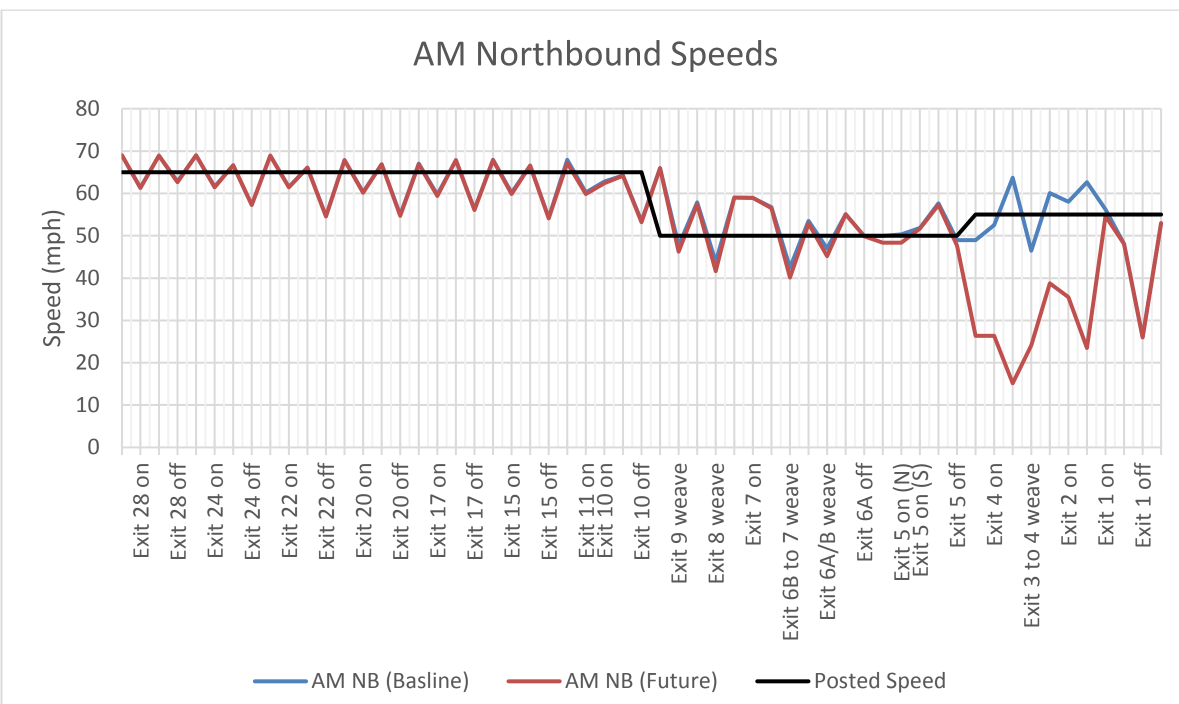
In Figure III-1 (AM Southbound Speeds), there would likely be near Exit 7 with 2040 volumes, indicated by a speed of around 15 mph in a 50-mph speed zone. Exit 7 also indicates congestion issues in the southbound direction. Speeds between Exit 20 and Exit 11would be somewhat lower in the AM peak hour. Significant congestion issues in the northbound direction occur around Exit 4 and Exit 5. The low speeds south of Exit 1 are a result of the toll booth.

Figure III-2. PM Southbound FREEVAL Speeds, Existing & 2040



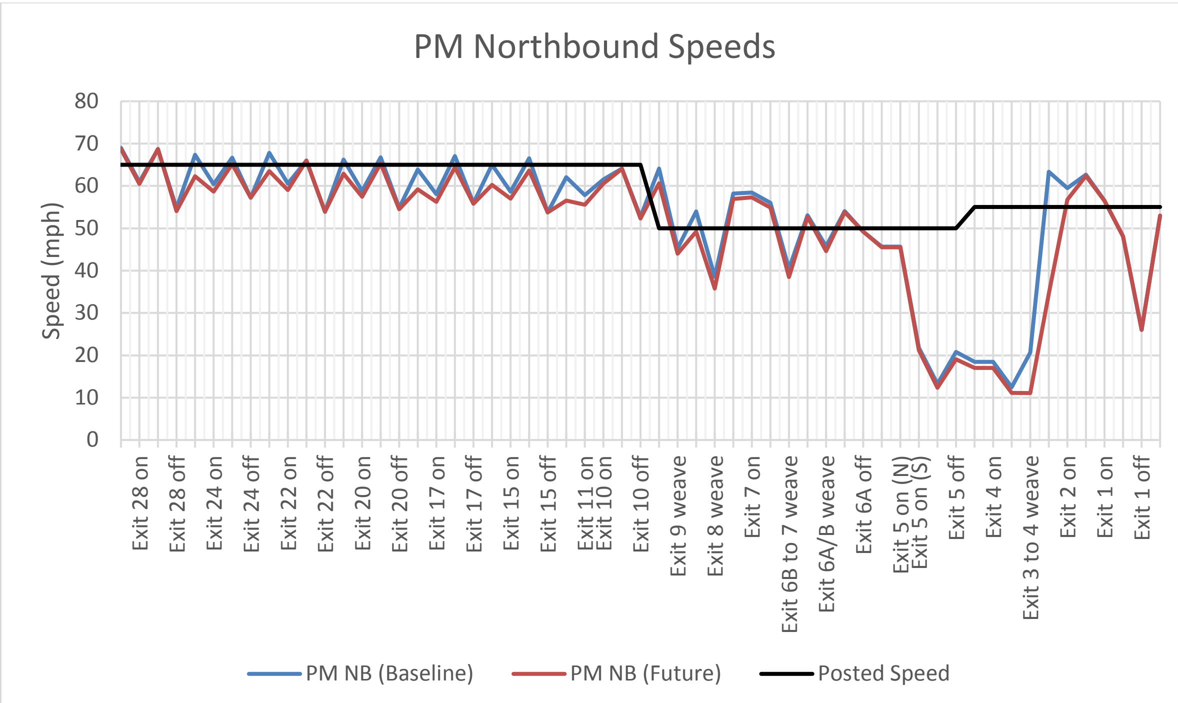
In Figure III-2 (PM Southbound Speeds), congested speeds would exist between Exits 5 and 9, but other sections in the corridor would see minor changes in speed. This pattern indicates a capacity constraint in the Exit 6-Exit 5 area in Portland.

Figure III-3. AM Northbound FREEVAL Speeds, Existing & 2040



In Figure III-3 (AM Northbound Speeds), the congested speeds would appear in sections between Exits 2 and 6, but speeds north of Exit 6 would be similar to baseline speeds. This pattern indicates a northbound capacity constraint near Exit 5 in the AM peak hour.

Figure III-4. PM Northbound FREEVAL Speeds, Existing & 2040



In Figure III-4 (PM Northbound Speeds), congested speed would occur deeper into Portland, closer to Exit 6. The future and baseline patterns are similar. Somewhat lower speed could be expected north of Portland with future volumes.

Overall, with 2040 peak hour volumes, congested speeds in the 10 to 20 mph range can be expected at various locations from Exit 9 south, in both the northbound and southbound directions. The principal traffic capacity constraints would appear in Portland near Exits 5, 6, and 7. Their effects would be felt north and south of the Portland Peninsula.

C. External Factors and Trends

The future of the I-295 corridor is not only affected by traffic growth and actions taken in the corridor to respond to that growth, but also external factors and trends. These include actions taken to improve other related transportation facilities and services that can influence I-295 users. The initiatives by the Maine Turnpike Authority (MTA) to address transportation needs on I-95 and its connections are major factors. Other factors and trends, on a national scale, can affect the travel demand and future capacity of all highways, including I-295. New technologies that change the way we use automobiles can have a major influence on I-295 users. These factors will affect future improvement needs in the I-295 corridor.

1. I-95/Maine Turnpike

The two major initiatives of the MTA that could ultimately influence future traffic volumes on the I-295 corridor are the Portland Area Mainline Needs Assessment and the potential feasibility study of improving transportation connections between I-95 and Gorham. Both efforts could lead to new highway capacity that would affect future volumes on portions of I-295. One could result in additional lanes on I-95. The other could create a new east-west highway corridor in the Greater Portland region. Both are treated as new highway capacity scenarios in the Alternatives and Analysis chapters of this I-295 Corridor Update report.

Portland Area Mainline Needs Assessment

In 2017, the MTA began the Portland Area Mainline Needs Assessment to determine how to address the growing traffic volumes on the Portland-area section of I-95 between Scarborough to Falmouth. In 2016, the MTA completed an evaluation of most of the Turnpike's length, which revealed that traffic on the Portland-area section has been increasing to the point where future safety and mobility is a major concern. The needs assessment will gather and evaluate the long-term needs of that corridor and result in recommendations for transportation improvements.

This section of I-95 (south of the Falmouth Spur) is a critical piece of the overall transportation network of Greater Portland. It provides Interstate access to the western areas of Portland and South Portland and to the regional communities west of I-95, efficiently linking travelers to modal choices like the Portland Jetport and providing reliable mobility for travelers looking to pass through the region. Use of this stretch of highway by Interstate through traffic allows I-295 south of Exit 11 in Falmouth to function primarily as Interstate access for Portland and South Portland.

The scope of work for this needs assessment includes a detailed examination of existing conditions including crash data, traffic volumes, and operating conditions, as well as development of a realistic forecast of future traffic volumes and future operations. The needs assessment is planned for completion in 2018.

Gorham Connector

The MTA was the lead agency for the Gorham East-West Corridor Feasibility Study. The study, completed in 2014, analyzed the existing highway infrastructure and future capacity needs west of Route 1 in York and Cumberland Counties including the Greater Gorham and Sanford areas, exploring options for improving east-west transportation connections between the Greater Portland area and points west. This study concluded that there were two capacity scenarios that should be further evaluated including: widen existing roads, most notably Routes 22, 114, and Running Hill Road, or create a new highway spur connecting I-95 to Gorham and other points west.

In early 2017, a legislative bill called for a study into the creation of the new, tolled highway spur from I-95 to Gorham, known as the Gorham Connector. This connector would link the Route 114 roundabout at the Bernard P. Rines Bypass in South Gorham with I-95 near Maine Turnpike Exit 45 in South Portland. The Gorham Connector would reduce significant congestion issues along Route 114 and 22, which connect Portland, the Maine Mall area, and the Portland International Jetport with suburban communities to the west. This spur would greatly reduce substantial commuter travel times between the Greater Gorham area and Portland, however, it would likely place higher traffic demands on both I-95 and I-295.

2. Other

Changing technology has the potential to have a major influence on the use of I-295 in the long term. Worldwide technical advances in communications and the computation of data are changing transportation facilities, vehicles, and the way travelers use them. Potentially, they can have a major effect on highway safety, capacity, level of service, and reliability. The effects are expected to be positive, but many unknowns remain in the timeline and process of adopting these future technologies.

Ridesharing

Modern ridesharing is a type of carpooling service that arranges one-time shared rides on short notice. This type of carpooling succeeds using GPS navigation devices, smartphones, and social networks. Ridesharing companies, including Uber and Lyft, have a large presence in the Greater Portland Area. Ridesharing can serve areas that may not be covered by a public transit system and act as a transit feeder service, capable of serving one-time trips as well as recurring commute trips and scheduled trips. With an increase in ridesharing, traffic volumes have the potential to decrease in urban centers as vehicle occupancy increases.

Connected and Autonomous Vehicles

Connected and autonomous vehicles (CAVs) are likely to have a significant impact on all aspects of transportation within the next two decades. Although there are no definitive answers to how CAVs will affect traffic congestion, mobility, land development, and other transportation issues, much research has been done to advance the technology.

CAV applications could mitigate non-recurring congestion events by reducing safety-incident related delays by informing other CAVs of the delay, thus enabling those vehicles to choose alternate routes. These technologies could also positively impact recurring congestion by increasing system efficiency through adoption of vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and vehicle-to-everything (V2X), such as cell phones or bicycles, communications. CAVs that are safer than human drivers would also enable the reduction of crash-related delays. CAVs that operate with more precision and control than a human driver could reduce headways, therefore increasing capacity, and eventually allow for the redesign of infrastructure to include narrower lanes, therefore increasing capacity. Increases in ridesharing also offer the potential to reduce traffic volumes and congestion. However, autonomous vehicles and connected vehicles are likely to decrease the cost of driving, which is likely to increase demand for driving and likewise increase vehicle-miles travelled (VMT). Fully automated vehicles (SAE Level 4/5) can also mobilize individuals who were not previously able to drive, allow for more productive in-vehicle time for work, pleasure, or sleep, as well as create the opportunity for zero-occupancy vehicles (i.e. delivery vehicles). This could enable many different services and opportunities for motorists, which could increase vehicular travel demand. The net effect of CAVs on VMT and demand cannot be predicted.

CAVs will also have a significant impact on land use and development. CAVs will increase safety and convenience of vehicle travel, which could lower transportation costs and thus increase people's willingness to travel farther, adding to sprawl. However, it is also possible that if that technology is incorporated into transit and shared vehicles, vehicle ownership could decrease and transit and shared mobility could increase, resulting in a growth in higher-density areas. In another effect, shared fully autonomous vehicles (SAE level 4/5) could reduce the need for parking near destinations, which is currently mandated through parking minimums for new developments. Today's vehicles are parked 95% of the time, a percentage that is likely to decrease significantly as shared mobility and the number of fully autonomous vehicles increases. These factors are likely to influence changes or reductions in parking requirements and significant portions of parking in urban areas could be reused for other, more beneficial, land uses.

IV. Alternatives

A wide range of alternative can be considered meet existing and future needs in the I-295 corridor. First, strategies are identified and assessed. Within the strategies are potential actions that could be evaluated further. From the most promising strategies for the I-295 corridor come specific candidate actions selected for analysis.

A. Strategies, Actions, and Options

To address the existing and future needs of the I-295 corridor, a broad range of strategies were analyzed. Each strategy represents a different approach to help resolve functional problems in the corridor. Strategies are either oriented toward specific locations or corridor-wide solutions as well as physical geometric improvements or traffic demand relief and traveler behavior.

Each strategy is accompanied by one or more actions. Each action is a specific project or program that may help resolve deficiencies in the I-295 corridor, many of which are location-specific. Table IV-1 shows the strategies and actions analyzed for the I-295 Corridor Study Update. For some actions, there may be multiple options, each aimed at achieving the same purpose.

Table IV-1. Strategies and Actions

Strategies	Characteristics	Actions
Auxiliary Lanes	• Relatively low cost • Targeted toward specific interchange ramps or short highway segments • For improved efficiency and safety at on-ramps and off-ramps	• Increase acceleration and/or deceleration lengths at interchange ramp junctions • Install auxiliary lanes between closely spaced interchanges • Install pull-off areas for law enforcement and emergency stops
Intelligent Transportation Systems (ITS)	• Relatively low cost • Applies corridor-wide or to portion of the corridor • For improved efficiency of existing facilities	• Reliable travel time information in advance of major Interstate decision points • Accommodation plan for CAVs on the Interstate System in Maine • Install ramp metering at critical on-ramps • Service patrols • Variable speed limits
Commuter Transit	• For relief of travel demand in the corridor • Involves alternative transportation facilities and services	• Expand express commuter services
Interchange Improvement	• Major improvements at specific interchanges	• Ramp reconfigurations
New Highway Capacity	• For added vehicular capacity • Involves construction of additional lanes for use by general traffic	• Add capacity on I-95 between Exits 44 and 52 (Maine Turnpike Authority)

B. Strategy Assessment

Each of the considered strategies was assessed for its relative cost, effectiveness, and practicability in addressing corridor problems before identifying specific actions.

1. Auxiliary Lanes

Auxiliary lanes can improve the operation of I-295 by removing entering, exiting or stopped vehicles from the thru travel lanes. Vehicles accelerating from on-ramps, decelerating to on-ramps, and stopped vehicles on shoulders can disrupt the smooth flow of traffic on the mainline. Acceleration lanes help maintain smooth traffic flow by allowing entering vehicles to reach highway speed before entering the thru lanes. Similarly, deceleration lanes allow exiting vehicles to decelerate after leaving the thru lanes. Shoulders and emergency refuge areas provide space for stopped vehicles outside of the thru lanes.

Acceleration and Deceleration Lanes

Many of the identified problems in the corridor relate to on-ramp and off-ramp junctions with the I-295 mainline. Many of these ramps have acceleration and deceleration lanes that are shorter than those in the guidelines of the American Association of State Highway and Transportation Officials (AASHTO). Actions to increase the lengths of these ramps are relatively low in cost, require no additional right-of-way, and would improve safety and operation on the highway. This strategy would include construction of additional length to the acceleration and deceleration lanes parallel to the two mainline lanes of I-295 at the ramp junctions or along short segments of I-295 between interchanges. The added lengths allow for users of the on- and off-ramps to accelerate or decelerate with less interference with the flow of mainline traffic. In addition, installing auxiliary lanes between closely spaced interchanges can increase capacity on congested highway segments. This approach is likely to reduce crashes and congestion on I-295.

The minimum required acceleration and deceleration lane lengths are identified via AASHTO guidelines for the mainline design speed of 50 to 65 mph (based on the ramp locations along I-295), and a ramp design speed ranging from 30 to 35 mph based on ramp cautionary speed and geometry. Weaving segments were not considered. Table IV-2 shows the mainline and ramp speeds used to obtain each minimum acceleration or deceleration length.

Table IV-2. AASHTO Acceleration & Deceleration Length Criteria

Mainline Speed	Ramp Speed	Req' Length	Ramp Type
55	30	670	on
65	35	1000	on
65	30	470	off
65	35	440	off

Candidates for these improvements were drawn from ramp locations where acceleration or deceleration lanes were shorter than the AASHTO criteria highlighted above. Table IV-3 shows the acceleration and deceleration lanes that have been considered.

Table IV-3. Candidate Ramps for Acceleration & Deceleration Length Improvements

	Interchange Number	Town	Cross Road	On/Off	Accel/Dec Length (feet)	
					Existing	Improved
Northbound	1	South Portland	Rte. 703	on	550	670
	10	Falmouth	Bucknam Road	off	200	470
				on	250	1000
	15	Yarmouth	Rte. 1	on	750	1000
	28	Brunswick	Rte. 1	on	750	1000
Southbound	20	Freeport	Desert Road	on	800	1000
	17	Yarmouth	Rte. 1	on	650	1000
	10	Falmouth	Bucknam Road	off	235	440
				on	550	1000

There are other locations along I-295 that may benefit from added auxiliary lanes that serve both accelerating and decelerating traffic. These auxiliary lanes are located on I-295 segments between closely spaced interchanges on the Portland Peninsula. These include the segment between Exit 5 and 6 NB, Exit 7 and 6 SB, and Exit 6 and 5 SB. Table IV-4 below shows the length and existing LOS of these segments. Although the ramp lengths at these interchanges are adequate per AASHTO guidelines, the mainline segment between the interchanges may benefit from the added capacity of an auxiliary lane used by on-ramp and off-ramp traffic.

Table IV-4. Candidate Auxiliary Lane Locations

Segment	Direction	Length (ft)	AM LOS	PM LOS
Exit 5 to Exit 6	NB	2100	D	D
Exit 7 to Exit 6	SB	1600	D	D
Exit 6 to Exit 5	SB	2700	C	D

Emergency Refuge Areas (ERAs)

Vehicles stopped on shoulders for enforcement, emergency, or breakdown reasons can adversely impact highway capacity even though they are removed from the travel lanes. In Maine, Title 29-A, §2054-9 requires "the operator of a vehicle passing a stationary authorize emergency vehicle using an emergency light or stationary public service vehicle using its authorized lights, with due regard to the safety and traffic conditions, shall: A. Pass in a lane not adjacent to that of the authorized emergency vehicles or public service vehicle, if possible; or B. If passing in a nonadjacent lane is impossible or unsafe, pass the emergency vehicle or public service vehicle at a careful and prudent speed reasonable for passing the authorized emergency vehicle or public service vehicle safely." This statute contributes directly to a reduction in capacity during a traffic incident in the shoulder, as vehicles are required by law to slow and move over, if possible, when passing. It is also common for vehicles to move over and slow down for other, non-emergency vehicles stopped in the shoulder. Table IV-5 shows the per-lane capacity adjustment factors based on incident type and number of directional lanes on the facility. As shown, an incident that blocks the shoulder can reduce capacity to 81 percent on a freeway with two lanes per direction, such as I-295.

Table IV-5. Per-Lane Capacity Adjustment Factors by Incident Type and Number of Directional Lanes

Directional Lanes	No Incident	Shoulder Closed	1 Lane Closed	2 Lanes Closed	3 Lanes Closed
2	1.00	0.81	0.70	N/A	N/A
3	1.00	0.83	0.74	0.51	N/A
4	1.00	0.85	0.77	0.50	0.52

Source: HCM 6th Edition
Notes: N/A = not applicable - the number of lanes closed equals or exceeds the number of directional lanes. The methodology does not permit all direction lanes of a facility to be closed.

Some agencies have built simple emergency refuge areas (ERAs) adjacent to the highway shoulder to provide safe places for traffic incidents and emergency stopping in a way that minimizes impact on capacity. Many of these facilities are located along hard shoulders that have been replaced with an additional lane for use at peak times for transit and high-occupancy vehicles, offering refuge while these lanes are open. However, Table IV-5 supports the idea that adding refuge areas adjacent to the hard shoulder, thus eliminating the shoulder blockage during emergency events, could mitigate the negative effect on capacity.

Highways England is converting existing motorways into ‘smart’ motorways by replacing the hard shoulder with an extra lane to help minimize congestion and reduce travel times. Refuge areas are thus provided for emergency situations where the shoulder is no longer available for refuge. These refuge areas, designed with a 70mph mainline speed and adequate stopping sight distances and taper lengths, allow for vehicles to safely exit traffic in the event of an emergency. Highways England’s ERAs are spaced approximately 1.6 miles apart and Emergency Roadside Telephones are available at these locations. In Great Britain, ERAs are spaced approximately every 500 meters (~0.31 miles), and are also equipped with emergency call boxes, as shown in Figure IV-1. However, many articles express concerns with the emergency roadside telephones as they may lead to “high risk” pedestrian movements adjacent to the highway. Regarding design of ERAs, England uses a 25m (82ft) entrance taper and a 45m (148ft) exit taper length.

Figure IV-1. Emergency Refuge Area in Great Britain with Emergency Roadside Telephone

In the US, several states have ERAs along portions of their highways. For example, Massachusetts has pull-out areas every ½ mile along facilities where shoulder running at peak times was deployed. These areas have a required minimum width of 10ft, with a desired width of 12ft. Figure IV-2 and Figure IV-3 show the start of the pull-out area along I-93 in Methuen, Massachusetts, and an overhead view of the same pull-out area, respectively. A sign that reads "Emergency Stopping Only" is also present at these locations.

Figure IV-2. Emergency Refuge Area in Methuen, Massachusetts

Figure IV-3. Overhead View of ERA in Methuen, Massachusetts

On Virginia highways with shoulder running, emergency pull-outs are located wherever space is available, with the lowest spacing being about ½ mile and the greatest being 2.5 miles between pull-out areas. In general, 300-foot taper lengths are used for these pull-out areas. Figure IV-4 shows a Virginia DOT I-66 regulatory sign for an emergency pull-out area.

Figure IV-4. Virginia DOT I-66 Regulatory Sign for an ERA

Maine currently prohibits travel on the shoulder along it's highways. Converting the shoulder to an extra lane for use by traveling vehicles and providing refuge areas for stops may be beneficial on portion of I-295 where traffic volumes are higher and congestion is greater during the peak hours. This would ease the demands on the capacity of mainline thru lanes and minimize capacity reduction during traffic incidents. How this would affect the application of Title 29-A, §2054-9 statute would need to be considered.

2. Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) has been defined as the application of advanced sensor, computer, electronics, and communications technologies and management strategies – in an integrated manner – to increase the safety and efficiency of the surface transportation system. ITS is an established strategy that helps realize operational potential on existing highways. These technologies help transportation agencies inform motorists of current roadway conditions and minimize duration and impact of traffic incidents, crashes, and other traffic events. ITS, which includes elements such as traffic monitoring, motorist information, service patrols, and a centralized control center, could be a cost-effective way of managing traffic congestion and maximizing public safety.

For I-295, ITS means what is known in many places as a freeway management system. In Maine, it might encompass I-295, I-95, and other similar highways with full control of access. A cost-effective freeway management system would be planned and designed using a systems-engineering approach, from a concept of operations, to implementation, maintenance and operations, and operations assessment. Essential elements of a freeway management system would include traffic monitoring, motorist information, incident response, and a traffic management center.

Traffic Monitoring

Traffic monitoring provides the real-time information needed to assess the current performance of the highways in the system. Full time detection of traffic volumes and speeds provide the information needed to detect incidents and other problems on the highway. It also provides traffic data that can be used for highway planning purposes. Traffic monitoring is most effective when sensors are located on each highway segment between ramps and on ramps themselves. In addition to sensors for traffic volumes and speeds, video monitoring can be used to obtain live images of operations at key locations on the highway.

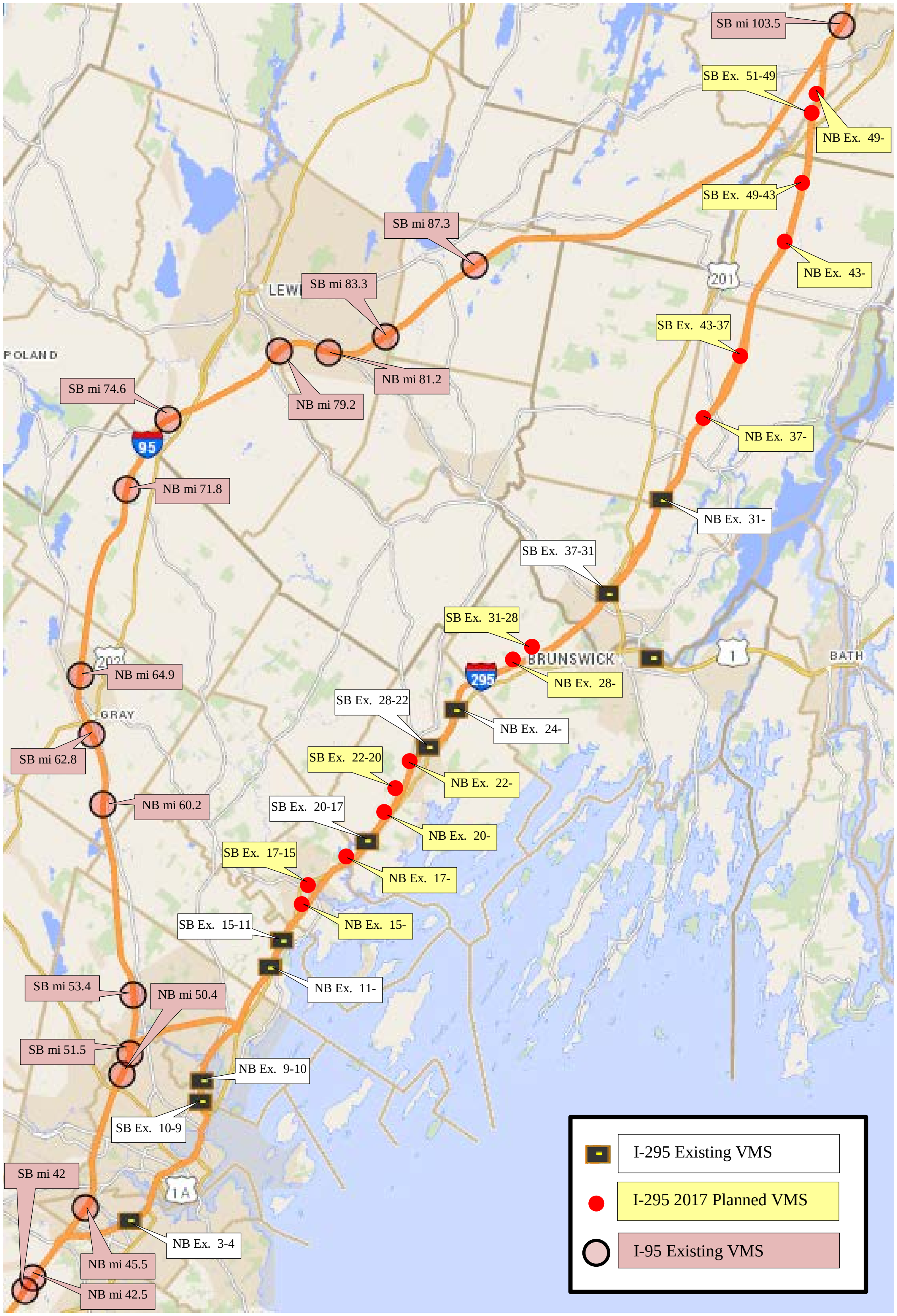
In the Greater Portland area, traffic monitoring equipment is permanently installed on all mainline segments of I-95 (the Maine Turnpike) and its interchange ramps, currently for use in historical data collection. The Maine Turnpike Authority also has a limited number of video installations at select locations to monitor real-time conditions. Currently, I-295 has five mainline segments where continuous traffic volume data is collected, three of which are new 2016 stations in Portland between Exits 5 and 6, Exits 7 and 8, and Exits 9 and 10.

Motorist Information

Means of transmitting real-time information to motorists are necessary to ensure that motorists have data needed to make timely transportation decisions. A common way of communicating current information to motorists is through variable message signing, VMS (also known as changeable message signs or CMS). Signs for the dynamic display of reliable travel times is a form of VMS.

The Maine Turnpike Authority and the Maine Department of Transportation have installed VMS at select locations along the Maine Turnpike and I-295. The deployment and use of VMS signs has been expanding for safety messaging and alerts. The MTA and MaineDOT are developing a system for dynamic display of travel times at key decision points on I-95 and I-295. Figure IV-5 shows the existing I-295 VMS locations in white, additional “permanent” portable VMS planned in 2017 and installed on I-295 by 2018, in yellow, and existing VMS locations on I-95 in red. The VMS signs on I-295, northbound between Exit 3 and 4, and southbound between Exit 9 and 10, were installed per recommendation of the 2010 I-295 Corridor Study.

Figure IV-5. Existing VMS Locations, I-295 & I-95



In addition to variable message signs, reliable travel time information in advance of major interstate decision points may also help drivers make better route choices on their commutes. Locations where travel time dynamic message signs may be beneficial are on I-95 NB, south of Exit 44 and south of Exit 52, I-95 SB north of Exit 103, and I-295 SB north of Exit 11. These are locations where drivers can decide between using I-95 or I-295. These signs display real-time travel information. This enables the redirection of traffic to less-congested roadways during peak hours and traffic incidents.

With such technologies, it may be of interest to have a real-time travel information website. In January, Connecticut DOT unveiled its new, real-time travel information website "CT Travel Smart" (www.CTTravelSmart.org). This system incorporates data collected from the CTDOT's Statewide Intelligent System network and Highway Operations Center, consolidating real-time travel information in a user-friendly program to provide dynamic functionality, such as trip planning and subscription services. This system also features an interactive traveler information map, list screens with information on incidents, travel times, and camera feeds, driving and transit trip planning features, and services that allow users to receive personalized alerts regarding travel conditions on specified routes. A similar program could further help reduce travel times and congestion along I-295.

Transportation Management Center

A transportation management center (TMC) is necessary to process the information coming from the highway, dispatch information to responders, and communicate conditions to motorists. The TMC must operate through lines of communications and protocols established jointly among the agencies that will make the management system work.

In the I-295 Corridor, the Maine Department of Transportation, the Maine Turnpike Authority, the Main State Police, and local and regional government entities have a role in traffic management. These agencies currently have control functions for dealing with situations on all or part of the Interstate highway network, but these functions are not fully integrated. These agencies would plan, design, and establish a TMC that monitors and responds the network in a comprehensive manner.

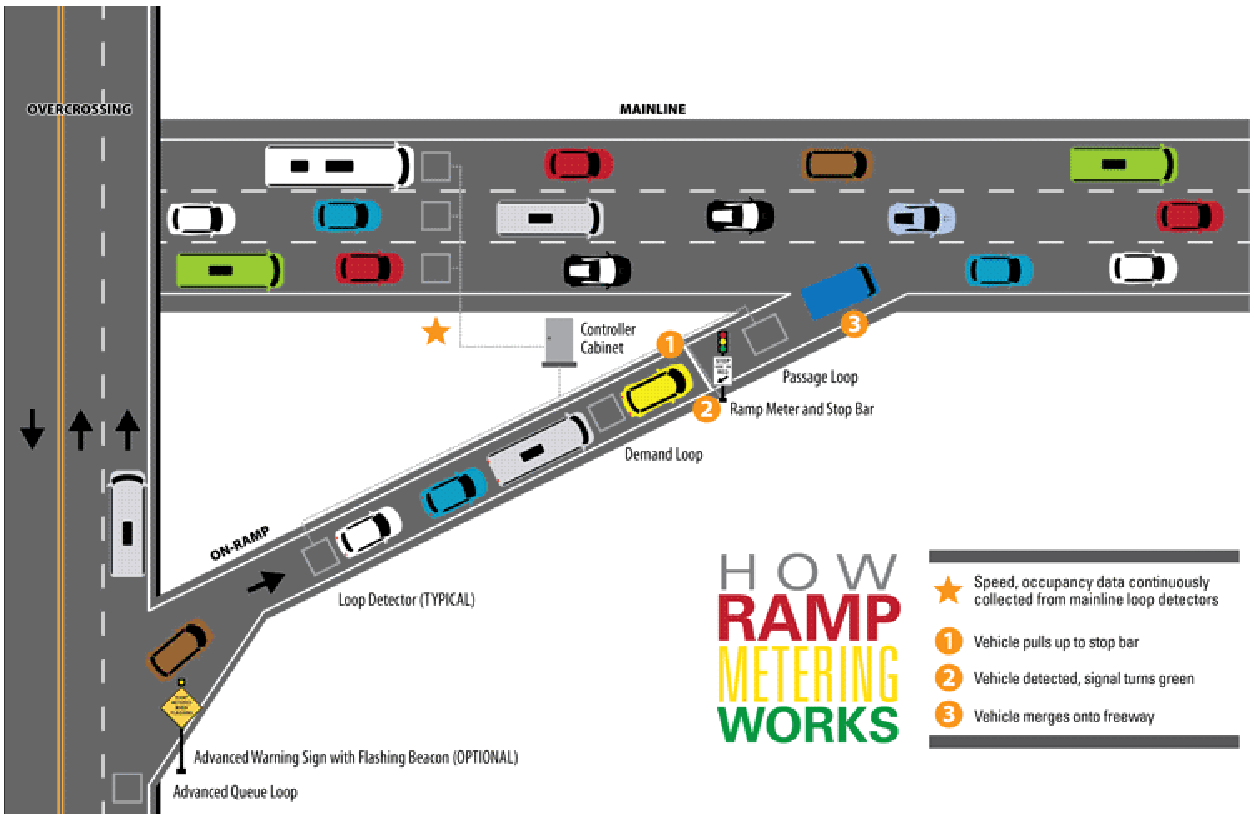
Service Patrols

Service patrols can be an effective tool for managing highway incidents. This service, which involves vehicles and personnel dedicated to patrolling a highway to resolve incidents quickly and effectively, can help identify incidents and be the responder for those incidents that do not require emergency response. Such incidents would include stalled vehicles, vehicles with flat tires, or debris in the roadway. Service patrols can shorten the duration of incidents, allow emergency responders to be more available for emergency tasks, and provide much-appreciated help to motorists in trouble. Working with a TMC, service patrols can identify and verify traffic incidents and report them for further action, as appropriate.

Ramp Metering

Ramp metering is another strategy that may help improve I-295 operations. Ramp metering reduces overall freeway congestion by managing the amount of traffic that enters the freeway and by breaking up platoons that make it difficult for traffic to merge onto the freeway. Ramp meters are traffic signals installed on on-ramps to control the frequency at which vehicles enter the flow of traffic. Vehicles queue up on the on-ramp and are individually released onto the mainline, often at a rate dependent on mainline traffic volumes and speeds, as shown in Figure IV-6. Ramp metering helps to improve traffic speeds and travel times, as well as reduce collisions, reducing congestion and improving overall safety.

Figure IV-6. Ramp Metering



Several states have developed guidelines for use of ramp metering within their state. In review of these guidelines, the following criteria can be used to warrant the use of ramp metering:

1. During a typical 15-minute period, is the freeway speed less than 45mph due to recurring congestion adjacent to or within 2 miles downstream of the entrance ramp?
2. Do the ramp volumes fall between 300 to 900vph for single-lane ramps or 300 to 1,800vph for dual-lane ramps?
3. During a typical 15-minute period, does the entrance ramp and right-most freeway lane flow rate exceed 1,900vph? -or- Is the ramp volume plus mainline volume greater than

the following: 2,650vph for two mainline lanes, 4,250vph for three mainline lanes, 5,850vph for four mainline lanes?

4. Can acceptable queue storage distance be provided (8% of the pre-metered ramp peak hour volume in vehicles at 25-feet per vehicle)?
5. Can acceptable acceleration distance be provided (via AASHTO design guidelines)?

Other factors that may be considered include: crash history, ramp spacing, existing freeway LOS, and existing ramp queue lengths. It should be noted that these ramp metering warrant criteria vary state to state and the criteria highlighted above are based on average values from a variety of ramp metering design manuals or design guides, including those from CalTrans, TxDOT, ADOT, MnDOT, and WSDOT. An in-depth study of ramp metering should be completed before a ramp metering solution is implemented on Maine on-ramps.

Maine does not currently utilize ramp metering. All on-ramps along the study corridor were analyzed for ramp metering feasibility using existing mainline and on-ramp volumes. Table IV-6 shows the preliminary screening results for these ramps. On-ramps north of Exit 9 are excluded from the results as they do not meet criterion #3 --- having a recurring freeway speed less than 45mph. As shown in Table IV-6, on-ramps south of Exit 9 generally do not have enough vehicle storage to meet criterion #5 --- having adequate storage and acceleration length on the ramp. Only the northbound on-ramp at Exit 4 meets all criteria under existing conditions. However, other on-ramps might meet ramp metering criteria if ramp volumes increased or if acceleration lengths and/or queue storage were increased. Further study of ramp metering impacts would be recommended on a case by case basis in the context of other ramp or interchange improvements.

Table IV-6. NB & SB Ramp Metering Assessment

Criteria		Southbound On-Ramps: 4 W	5A	5B W	6A	6B W	7	8 W	9 W
	Number of Existing Lanes	2	1	1	1	1	1	2	1
1	Mainline Speed (<45 mph)	No	No	No	Yes	PM	Yes	Yes	No
2	Ramp Volume (vph) (1 lane: 300-900, 2 lane: 300-1800)	Yes	No	PM	Yes	PM	Yes	Yes	Yes
3	Total Volume (>2650 vph)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4+5	1 lane on-ramp Existing > Queue + Accel	AM	No	No	No	No	No	No	No
4+5	2 lane on-ramp Existing > Queue/2 + Accel	Yes	Yes	No	AM	No	Yes	No	No
Warrants met under existing conditions?		No	No	No	No	No	No	No	No

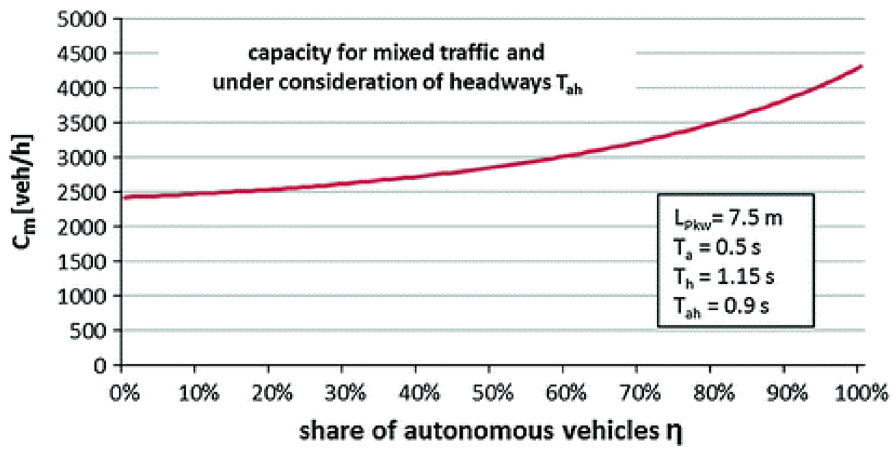
Criteria		Northbound On-Ramps: 1	2	3 W	4	5S	5N	6A W	6B W	7	8 W	9 W
		1	1	1	1	1	1	1	1	1	1	1
1		No	No	No	Yes	PM	Yes	No	Yes	No	Yes	No
2		PM	No	AM	Yes	Yes	No	No	Yes	No	Yes	No
3		AM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	PM	Yes	PM
4+5		No	No	AM	Yes	No	AM	No	No	AM	No	No
4+5		PM	No	Yes	Yes	No	Yes	No	No	Yes	No	No
Warrants met under existing conditions?		No	No	No	Yes	No	No	No	No	No	No	No

Connected and Automated Vehicles

Over the next several decades connected and automated vehicles are expected to become commonplace on Maine roadways. It is important that an accommodation plan be considered for Level 4 and 5 CAVs on the Interstate System. Level 4 and 5 CAVs, designated as Automated Driving Systems (ADS), do not require a human driver. ADS will have an impact on capacity, travel times, efficiency, and safety along Maine highways. Although no official recommendations have been established regarding action items, it is important to monitor other states activities and national guidelines, such as the National Highway Traffic Safety Administration's (NHTSA) Automated Driving Systems 2.0, A Vision for Safety guidelines. NHTSA strongly encourages States not to codify this guidance as a legal requirement for any phases of development, testing, or deployment of ADS. As policy and regulations develop, it may be beneficial for Maine to start researching and analyzing how ADS will impact capacity and traffic operations on state highways.

A 2016 report by Bernhard Friedrich, The Effect of Autonomous Vehicles on Traffic, analyzes the effect of CAVs on roadway capacity. CAVs have many benefits, one of which allows them to communicate with surrounding vehicles, infrastructure, etc., allowing for smoother acceleration, deceleration, and faster reaction times. This allows the vehicles to safely travel closer together, reducing necessary headway between vehicles. Figure IV-7 shows the capacity of a freeway lane in relation to the share of autonomous vehicles on the roadway. This figure assumes that all vehicles are cars and considers larger time gaps for CAVs following vehicles driven by people. If CAVs were to make up 50% of the vehicle fleet, capacity for ideal conditions could increase from 2,400 vehicles per hour per lane to about 2,850 vehicles per hour, nearly a 20% increase. If 80% of the fleet were CAVs, capacity would increase by about 45%. If all vehicles were CAVs, a capacity of approximately 4,300 vehicles per hour, an 80% increase, could be achieved.

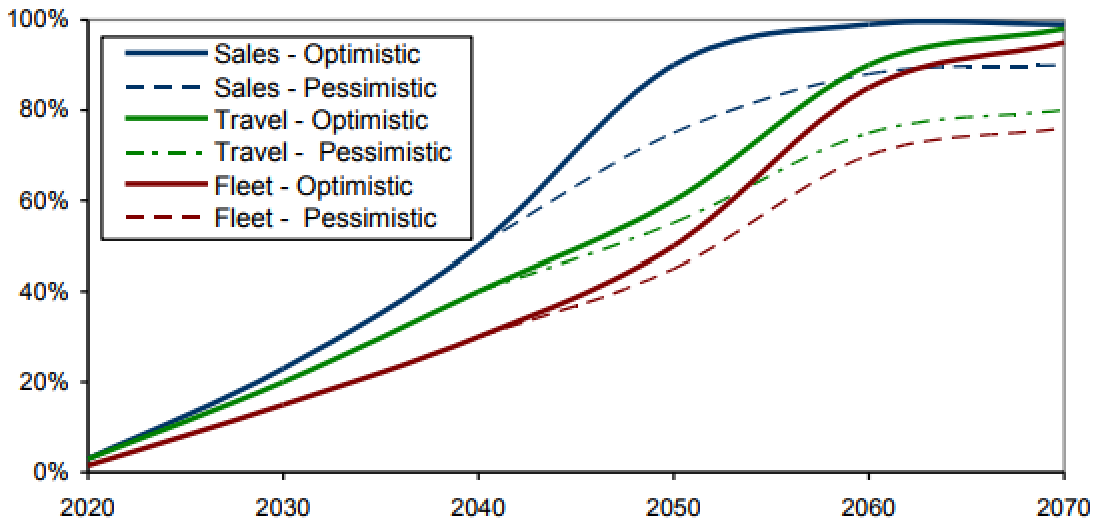
Figure IV-7. Freeway Capacity for Mixed CAV and non-CAV Traffic Under Ideal conditions



Source: The Effect of Autonomous Vehicles on Traffic, Bernhard Friedrich. Fig. 16.10

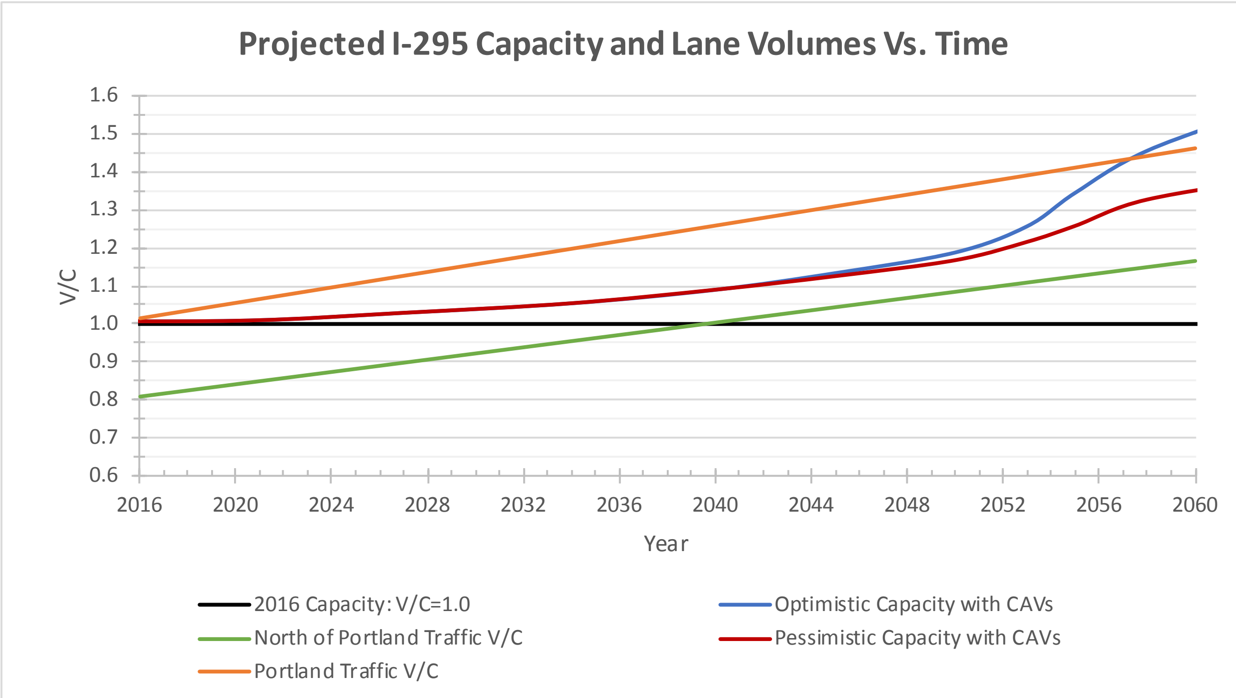
A 2017 report, Autonomous Vehicle Implementation Predictions, by Todd Litman from the Victoria Transport Policy Institute, explores the rate of fleet penetration by autonomous vehicles. Figure IV-8 from the report estimates the autonomous vehicle sales, fleet penetration, and travel projections based on patterns of other vehicle technologies, including air bags, automatic transmissions, navigation systems, optional GPS services, and hybrid vehicles.

Figure IV-8. Autonomous Vehicle Sales, Fleet, and Travel Projections



Using this information, Figure IV-9 was produced. Figure IV-9 combines the capacity, share of autonomous vehicles and fleet penetration of autonomous vehicles, and timeline to show growth in I-295 capacity over time as autonomous vehicles become more common on roadways. The black horizontal line represents existing (2016) capacity in the I-295 corridor, with a fixed value of 1.0. The green and orange lines represent the traffic growth forecasts in the I-295 corridor in relation to the capacity of the corridor. The orange line represents growth in I-295 traffic volume in Portland, where existing capacity is already being reached. The green line represents growth in I-295 traffic volume north of Portland, where about 80% of existing capacity is being reached, but capacity would be exceeded by 2040. The blue and red lines represent the I-295 capacity as modified by increasing numbers of CAVs in the vehicle fleet, blue being the optimistic scenario and red being the pessimistic scenario. The increase in capacity brought about by increasing numbers of CAVs can raise the capacity above the future travel demand in the I-295 corridor north of Portland, but it cannot keep travel demand on I-295 in Portland from exceeding capacity until a time when CAVs represent about 80% of the vehicle fleet.

Figure IV-9. Projected Capacity and Volume Growth Vs. Time



Whether the presence of CAVs in the fleet will contribute to a further increase in volumes, as well as capacity, remains to be seen. It will depend on how CAVs are regulated and on the technical progress toward CAVs capable of self-driving on any roads under any reasonable conditions. Because freeways like I-295 are highways with controlled access and fewer uncontrolled situations, it is reasonable to expect that CAVs may be self-driving on freeways before they are self-driving on roads and streets with uncontrolled access. Having the ability of CAVs to reliably operate driverless is a major milestone in further CAV technology development. In any case, CAVs have great safety and efficiency potential and should be considered in any long-term strategy for the I-295 corridor.

3. Commuter Transit

Expansion or improvements to commuter transit alternatives, such as the ZOOM Bus, Metro BREEZ, local bus services, and GO Maine may have positive impacts on the I-295 corridor. Expansion of commuter services results in a reduction in low occupancy vehicles, helping to relieve congestion. Options that may increase use of these services are improved websites, mobile applications, increased awareness, additional frequencies of service, additional travel routes, and additional hours of operation to accommodate more users. Additional use of transit services can be encouraged through cost-saving options for frequent users.

The hourly traffic volumes show that there is a clear commuter pattern in the Portland area. North of Portland, the AM peak hour shows greater in-bound (I-295 southbound toward Portland) volumes than out-bound (I-295 northbound) volumes. Similarly, the PM peak hour shows greater out-bound (northbound) volumes than in-bound volumes. Commuter transit services that take advantage of this commuter pattern could contribute significantly to improving existing congestion issues.

4. Interchange Improvement

Interchange improvements are costlier, however potentially more effective than, auxiliary lane improvements and may require expanded right-of-way. These improvements could involve construction of ramps at existing interchanges to create full-service four-ramp interchanges and/or major modifications to existing interchanges to address poor traffic operations. Interchange improvement is a strategy to be analyzed further. In the I-295 corridor, Exits 4, 6, 10, 11, and 20 have been suggested in past studies for improvements that could involve ramp reconfigurations.

Exit 4

Located in South Portland, Exit 4 currently has four ramps. Two ramps connect points south on I-295 to the Veterans Memorial Bridge between Portland and South Portland: a southbound on-ramp and a northbound off-ramp. Two other ramps connect points north on I-295 to South Portland's Main Street: a southbound off-ramp and a northbound on-ramp. The 2010 I-295 Corridor Study identified the potential to provide additional access to South Portland by modifying Exit 4 to connect South Portland to points south. The southbound on-ramp from Veterans Memorial Bridge could be modified to provide a Main Street feeder connection by way of a new signalized intersection. This enhancement access to I-295 at Exit 4 is currently in the design phase. A modification to the northbound off-ramp to gain access to South Portland from points south was also proposed, but the concept, which would have required right-of-way through part of a storage tank farm and the construction of a new bridge, proved too costly to develop further.

Exit 6

Located in Portland at Forest Avenue (Route 302), Exit 6 is a full-service cloverleaf interchange. In the I-295 Corridor Study, Exit 6 was recommended for short-term improvement involving modification to the loop off-ramps to reduce the frequency of crashes where ramps entered Forest Avenue. Those improvements were constructed in 2016. The I-295 Corridor Study also evaluated alternatives to reconfigure the cloverleaf interchange to other types such as a diamond, a partial cloverleaf, and a single-point urban interchange (SPUI). The evaluation found that each of these alternatives consolidated ramp traffic to fewer ramps, but unsatisfactory levels of service persisted. More recently, a 2017 PACTS-sponsored study of Forest Avenue identified a SPUI concept as a potentially beneficial configuration for Forest Avenue. However, it is unclear whether this concept would be compatible with the I-295 mainline. Also, the 2017 Forest Avenue study recommended signalization of the Exit 6A northbound off-ramp and related improvements on Forest Avenue to improve Interstate access to nearby Marginal Way.

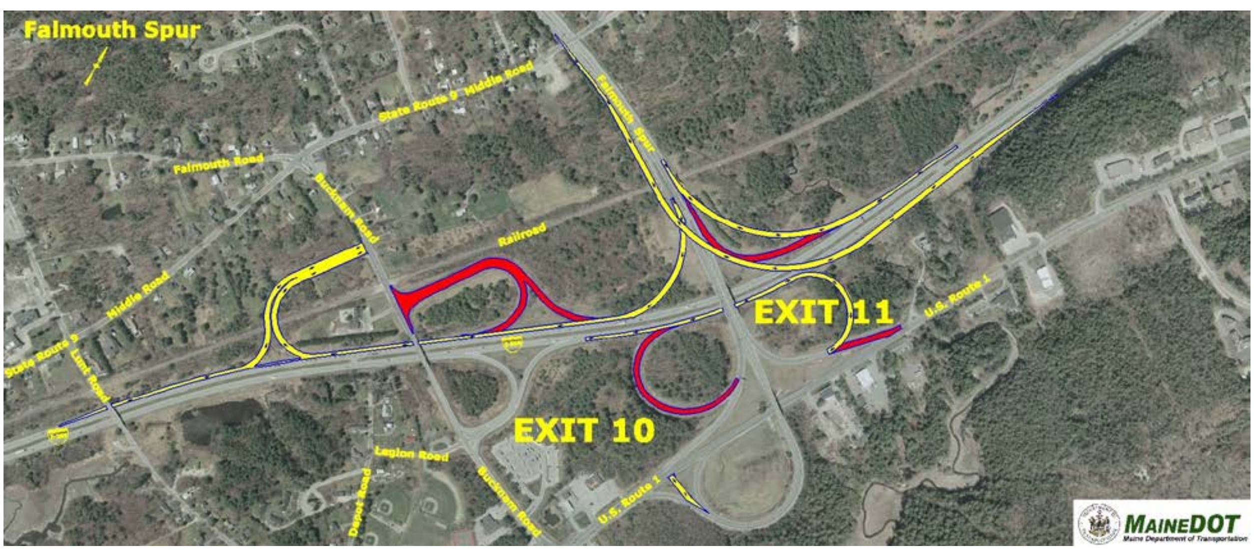
Exits 10 and 11

In Falmouth, Exits 10 and 11 are closely spaced interchanges connecting with Bucknam Road and the MTA Falmouth Spur, respectively. Exit 10, a full-service interchange, links Falmouth to points north and south along I-295. Exit 11 is a partial service interchange linking the Falmouth Spur to points north along I-295. There are no ramps connecting the Falmouth Spur to points south. The Falmouth Spur connection to I-295 points south must be made by way of its Route 1 connection, Bucknam Road, and Exit 10.

One potential interchange improvement would be to convert Exit 11 to a full-service interchange, with two added ramps. The potential benefit of a full-service Exit 11 would be a connection between I-95 (the Maine Turnpike) and I-295 that would allow I-95 users to have access to the Portland and South Portland portions of I-295 by way of the Falmouth Spur. This could provide traffic relief for other routes into Portland, particularly those originating from I-95 service areas north of Portland, such as the Gray or Lewiston-Auburn areas.

One version of this concept is shown in Figure IV-10, originally presented in the 2010 I-295 Corridor Study. In addition to improving acceleration and deceleration lanes for Exits 10 and 11, it would create two new ramps for Exit 11, a northbound off-ramp and a southbound on-ramp to and from the Falmouth Spur. However, it would require the relocation of Exit 10 southbound ramps and the conversion of the northbound on-ramp from the existing loop ramp to a flyover ramp. Both features would be costly components to such a project. In the figure, new or relocated ramps are shown in yellow. Ramps removed are shown in red.

Figure IV-10. 2010 Concept of a Full-Service Exit 11



A full-service interchange at Exit 11 has the potential of improving I-95 access to Portland by way of two new ramps connecting the Falmouth Spur to I-295. These connections would allow I-95 traffic north of Portland to connect with I-295 in Falmouth for trips to and from the south in Portland and South Portland. Table IV-7 shows how future growth in mainline I-295 traffic volumes could be affected by a full-service Exit 11. As shown in the table, a full-service Exit 11 would add volumes on I-295 between Exit 11 and Exit 8 (Tukey Bridge). Much of this added traffic would come from Portland area arterials such as Washington Ave (SR 26).

Table IV-7. Effect of Full-Service Exit 11 on I-295 Traffic Volume Growth Factors

AM Peak-Hour		I-295	PM Peak-Hour	
2040 Baseline (No-Build)	With Full Service Exit 11	Segments by Exit Number	2040 Baseline (No-Build)	With Full Service Exit 11
1.10	**1.10**	N of 28	**1.24**	**1.24**
1.10	**1.10**	28 to 24	**1.24**	**1.24**
1.10	**1.10**	24 to 22	**1.24**	**1.24**
1.11	**1.11**	22 to 20	**1.16**	**1.17**
1.13	**1.13**	20 to 17	**1.16**	**1.16**
1.15	**1.15**	17 to 15	**1.17**	**1.16**
1.16	**1.16**	15 to 11	**1.14**	**1.13**
1.20	**1.24**	10 to 11	**1.13**	**1.17**
1.24	**1.27**	10 to 9	**1.15**	**1.18**
1.23	**1.26**	9 to 8	**1.14**	**1.17**
1.21	**1.21**	8 - Tukey Br	**1.15**	**1.15**
1.19	**1.19**	8 to 7	**1.13**	**1.13**
1.19	**1.19**	7/6B weave	**1.12**	**1.12**
1.19	**1.19**	6A to 5B	**1.10**	**1.10**
1.20	**1.20**	5 to 4	**1.10**	**1.10**
1.23	**1.23**	4/3 weave	**1.12**	**1.12**
1.23	**1.23**	3 to 2	**1.13**	**1.13**
1.20	**1.20**	2 to 1	**1.06**	**1.06**
1.10	**1.10**	S of 1	**1.00**	**1.00**
Baseline Growth		Reduced Growth		Increased Growth

Exit 20

This Freeport interchange at Desert Road is an unsignalized diamond interchange. The bridge carrying Desert Road over I-295 is a potential candidate for future replacement due to its deteriorating condition. A 2013 study considered the potential of a diverging diamond interchange (DDI) as a means of addressing ramp queuing and bicycle/pedestrian issues. The 2018 North of Portland Route 1 Complete Streets Corridor Plan suggested a modified diamond configuration for Exit 20. A new 2018 analysis of interchange options is looking at Exit 20 in a comprehensive way to identify a preferred direction, given the likelihood of bridge replacement.

Other Interchange Improvements

While the potential interchange improvements at Exits 4, 6, 10, 11, and 20 would involve new or relocated interchange ramps, smaller improvements addressing intersections at ramp terminals have and continue to be evaluated and implemented. Intersections at Exits 7, 10, and 17 are expected to be improved by projects to install new traffic signals and make other intersection modifications. Other potential intersection modifications are being considered at the planning phase for Exits 15 and 22. For the purpose of the I-295 Corridor Update, the planning and development of these smaller actions are not discussed further in this report as they are more tactical than strategic.

5. New Highway Capacity

New highway capacity can be one of the costliest strategies, but it can be most effective where traffic demand exceeds highway capacity. The future conditions analysis shows that urban sections of I-295 may not have enough capacity to accommodate forecasted 2040 travel demands, especially on the Portland Peninsula. It may be possible to increase I-295 on some of these sections by constructing new travel lanes in the existing median, this strategy has cost and environmental challenges due to its proximity to urban land uses. Given the limited financial resources of MaineDOT and its need for preservation, maintenance, and safe operation of the existing transportation system as its top priorities, adding new highway capacity by increasing the number of general-purpose travel lanes on the I-295 corridor is not a realistic future action. However, there are two new highway capacity actions, not directly involving I-295, that could affect the strain on I-295 capacity by changing the growth in traffic demand on the corridor.

One potential action under the new highway capacity strategy would be adding capacity on I-95 between Exits 44 and 52. This could involve an additional travel lane in each direction on I-95, giving the highway three lanes northbound and three lanes southbound. It is possible that additional capacity on I-95 would reduce the growth of traffic on I-295 through Portland and South Portland by making I-95 a higher-capacity and more reliable route for thru traffic than I-295 would be. This action would fall under the jurisdiction of the Maine Turnpike Authority (MTA).

Another MTA action that could affect the I-295 corridor would be the construction of a new connecting highway between the Gorham Bypass and I-95, potentially near I-95 Exit 45 in South Portland. Although it would not be expected to be an alternative to I-295 for thru travelers, it could have the effect of directing Portland-bound traffic from communities west of I-95 to use I-295 to reach the Portland Peninsula.

Both actions are evaluated as possible new highway capacity scenarios in the future. The PACTS travel demand model is a useful tool for show how both action may affect future traffic growth on I-295. Table IV-8 below compares the AM peak and PM peak growth factors of the 2040 I-295 baseline condition with three other scenarios: the widening of I-95, the Gorham Connector, and the combination of both new capacity actions.

The widening of I-95 would reduce volumes on I-295 by about 4%, offsetting about 25% of the growth in the baseline scenario. This effect would be limited to I-295 segments south of Exit 11, which serves the Falmouth Spur connection between I-95 and I-295. Segments of I-295 north of Exit 11 would see little difference in future volumes. This reduction in volume on I-295 would be the result of a shift of Interstate thru traffic between points north of Falmouth and points south of Scarborough.

The Gorham Connector scenario would have mixed effects on I-295 volumes. The presence of the connector would encourage more Portland-bound traffic to use I-295. This effect would be most evident between I-295 Exits 2 and 5, where the future volume growth could be increased by as much as a third. The other effect of this scenario would be to discourage the use of I-295 as a route for thru traffic, due to the increased congestion between Exits 2 and 5. The combination of the I-95 widening and the Gorham Connector would lessen the I-295 growth effects of the Gorham Connector.

Table IV-8. 2016-2040 Growth Factors for New Highway Capacity Scenarios

AM Peak-Hour Growth Factors				I-295 Segments by Exit Number	PM Peak-Hour Growth Factors			
2040 Baseline (No-Build)	With Widened I-95 (Turnpike)	With Gorham Connector (Toll Rd)	With Widened I-95 & Gorham Connector		2040 Baseline (No-Build)	With Widened I-95 (Turnpike)	With Gorham Connector (Toll Rd)	With Widened I-95 & Gorham Connector
1.10	**1.10**	**1.10**	**1.10**	N of 28	**1.24**	**1.24**	**1.24**	**1.24**
1.10	**1.10**	**1.10**	**1.10**	28 to 24	**1.24**	**1.22**	**1.24**	**1.24**
1.10	**1.10**	**1.10**	**1.10**	24 to 22	**1.24**	**1.22**	**1.24**	**1.24**
1.11	**1.11**	**1.11**	**1.11**	22 to 20	**1.16**	**1.16**	**1.17**	**1.17**
1.13	**1.13**	**1.13**	**1.13**	20 to 17	**1.16**	**1.16**	**1.16**	**1.16**
1.15	**1.15**	**1.16**	**1.15**	17 to 15	**1.17**	**1.17**	**1.17**	**1.16**
1.16	**1.16**	**1.16**	**1.16**	15 to 11	**1.14**	**1.14**	**1.15**	**1.14**
1.20	**1.16**	**1.18**	**1.16**	10 to 11	**1.13**	**1.08**	**1.09**	**1.07**
1.24	**1.20**	**1.22**	**1.20**	10 to 9	**1.15**	**1.09**	**1.11**	**1.09**
1.23	**1.19**	**1.21**	**1.19**	9 to 8	**1.14**	**1.08**	**1.11**	**1.08**
1.21	**1.17**	**1.19**	**1.17**	8 - Tukey Br	**1.15**	**1.09**	**1.12**	**1.07**
1.19	**1.15**	**1.17**	**1.15**	8 to 7	**1.13**	**1.08**	**1.10**	**1.06**
1.19	**1.15**	**1.16**	**1.14**	7/6B weave	**1.12**	**1.07**	**1.09**	**1.06**
1.19	**1.14**	**1.18**	**1.15**	6A to 5B	**1.10**	**1.05**	**1.08**	**1.05**
1.20	**1.15**	**1.21**	**1.18**	5 to 4	**1.10**	**1.04**	**1.11**	**1.07**
1.23	**1.18**	**1.29**	**1.25**	4/3 weave	**1.12**	**1.07**	**1.15**	**1.12**
1.23	**1.18**	**1.29**	**1.25**	3 to 2	**1.13**	**1.08**	**1.18**	**1.14**
1.20	**1.15**	**1.31**	**1.27**	2 to 1	**1.06**	**1.05**	**1.15**	**1.10**
1.10	**1.06**	**1.11**	**1.08**	S of 1	**1.00**	**1.00**	**1.00**	**1.03**
		Baseline Growth		Reduced Growth		Increased Growth		

The new highway capacity strategy has the potential to reduce transportation costs to users at the regional level. Table IV-9 shows the impact of the new highway capacity scenarios on daily vehicle-miles traveled (VMT) and vehicle-hours traveled (VHT), as estimated by the PACTS travel demand model. New highway capacity projects tend to increase VMT but reduce VHT. Reductions in delays and travel times, which reduce VHT, represent the major measurable benefits of actions that increase highway capacity. Both the I-95 widening and the Gorham connector increase VMT and reduce VHT. Interesting to note is that the combination of the two actions results a lower VMT increase than the sum of their individual VMT impacts, and that, for fall weekdays, the combination results in a higher VHT reduction than the sum of their individual VHT impacts.

Table IV-9. Regional Effects of New Highway Capacity Scenarios on VMT and VHT

Regional Transportation Impact	2040 Baseline (No-Build)	With Widened I-95 (Turnpike)	With Gorham Connector (Toll Rd)	With Widened I-95 & Gorham Connector
Fall Weekday				
VMT	9,903,119	9,904,528	9,923,442	9,909,154
Change in VMT		1,409	20,323	6,035
VHT	240,683	240,546	239,400	238,832
Change in VHT		-137	-1,283	-1,851
Summer Weekday				
VMT	10,393,863	10,404,319	10,415,453	10,410,314
Change in VMT		10,456	21,590	16,451
VHT	250,497	250,187	249,260	249,055
Change in VHT		-310	-1,237	-1,442

As a result of their effect on the future growth of traffic volumes on I-295, the MTA new capacity scenarios also may affect future LOS on I-295. Table IV-10 shows the 2040 AM and PM peak-hour LOS for the three speed zones on I-295: 55 mph (south of Exit 5), 50 mph (between Exits 5 and 9), and 65 mph (north of Exit 9).

As the table shows, the widening of I-95 (Turnpike), by reducing traffic growth on I-295, would result in 2040 peak-hour speeds somewhat higher than the 2040 peak-hour baseline speeds. This would reduce vehicle density and improve LOS. The most noticeable improvements would be change in the southbound AM peak hour between Exits 9 and 5, from LOS E to LOS D, and in the northbound PM peak hour south of Exit 5, from LOS F to LOS E. Nevertheless, LOS F would persist in the northbound AM peak hour south of Exit 5 and in the southbound PM peak hour between Exits 9 and 5.

The Gorham Connector (Toll Road) scenario would result in generally lower speeds and slightly lower LOS than the I-95 widening scenario. The combined scenario of the I-95 widening and Gorham Connector would result in LOS similar to that of the I-95 widening.

The major finding of these new capacity scenarios regarding LOS is that none of them would result in a major change on I-295, but that the I-95 widening would have beneficial effects throughout the southern portion of I-295, between Scarborough and Falmouth.

Table IV-10. 2040 AM & PM LOS by Speed Zone, NB & SB, for Baseline and MTA New Capacity Scenarios

Future (2040 Base)								
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Southbound	N of 9 on	55	61.7	64.8	27.0	D	22.0	C
	9 on to 5A on	50	42.2	30.9	43.0	E	64.3	F
	S of 5A on	65	50.0	49.4	15.3	B	19.9	C
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Northbound	S of 5 off	55	33.1	35.9	49.9	F	50.6	F
	9 off to 5 off	50	53.2	40.5	23.4	C	44.9	E
	N of 9 on	65	66.0	60.7	16.6	B	28.8	D

Future (2040 Widen Turnpike)								
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Southbound	N of 9 on	55	61.9	64.9	26.7	D	21.8	C
	9 on to 5A on	50	49.4	30.9	31.4	D	64.0	F
	S of 5A on	65	50.1	49.5	15.0	B	19.8	C
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Northbound	S of 5 off	55	31.0	38.4	52.1	F	41.5	E
	9 off to 5 off	50	53.3	40.9	23.2	C	44.1	E
	N of 9 on	65	66.0	60.9	16.5	B	28.5	D

Future (2040 Gorham Toll Road)								
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Southbound	N of 9 on	55	61.7	64.8	26.9	D	22.0	C
	9 on to 5A on	50	49.2	30.0	31.8	D	66.6	F
	S of 5A on	65	49.9	49.3	16.1	B	20.6	C
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Northbound	S of 5 off	55	30.4	37.5	53.5	F	46.6	F
	9 off to 5 off	50	53.4	42.6	23.0	C	39.0	E
	N of 9 on	65	66.0	60.8	16.6	B	28.6	D

Future (2040 Gorham Toll Road & Widen Turnpike)								
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Southbound	N of 9 on	55	61.9	64.8	26.7	D	21.8	C
	9 on to 5A on	50	49.4	31.1	31.5	D	64.7	F
	S of 5A on	65	50.0	49.4	15.7	B	20.7	C
	By Speed Zone	Posted Speed	FREEVAL Speed		Average Density (pc/mi/ln)			
			AM	PM	AM		PM	
Northbound	S of 5 off	55	35.2	38.7	46.6	F	42.0	E
	9 off to 5 off	50	53.5	41.2	22.8	C	43.5	E
	N of 9 on	65	66.0	60.9	16.5	B	28.5	D

C. Candidate Actions

From the strategies selected for further analysis, candidate actions were identified. These candidate actions would be evaluated for effectiveness, cost, and potential implementation issues. Table IV-11 is a list of candidate actions for analysis. Descriptions of the candidate actions follow.

Table IV-11. Candidate Actions for Analysis

Strategies	Actions	Locations
Auxiliary Lanes	Increase acceleration and/or deceleration lengths at interchange ramp junctions	NB Exit 1 NB/SB Exit 10 NB Exit 15 SB Exit 17 SB Exit 20 NB Exit 28
	Install auxiliary lanes between closely spaced interchanges	NB Exit 5 to Exit 6 SB Exit 7 to Exit 6 SB Exit 6 to Exit 5
	Install pull-off areas (ERAs) for law enforcement and emergency stops	Approximately 1 per mile, north of Portland
Intelligent Transportation Systems (ITS)	Install reliable travel time dynamic message signs	I-95 NB, south of Exit 44 I-95 NB, south of Exit 52 I-95 SB, north of Exit 103 I-295 SB, north of Exit 11
	Maintain other variable message signing	Scarborough to Brunswick
	Establish service patrol	Scarborough to Brunswick
	Establish an accommodation plan for CAVs	Scarborough to Brunswick
	Ramp metering	TBD
Commuter Transit	Expand express commuter services	Brunswick to Portland
Interchange Improvements	Ramp reconfigurations	Exit 10 and 11
	Local road intersection improvements	Exit 20
New Highway Capacity	Add capacity on I-95	Exit 44 to Exit 52

1. Auxiliary Lanes

Three types of Auxiliary lanes are candidate actions for implementation: increases in acceleration or deceleration lengths at ramps, auxiliary lanes between closely spaced interchanges, and emergency refuge areas. Increased acceleration and deceleration lengths can raise the operating potential of the freeway by providing more physical space for vehicles to enter and exit the freeway smoothly. This can improve the level of service capability of the freeway. Between closely spaced interchanges, these extended auxiliary lanes overlap and merge into a single auxiliary lane between interchanges and similarly raise the operating potential of the freeway. Emergency refuge areas not raise the operating potential, but allow the freeway to maintain its operating potential by allowing stopped vehicles to be positioned further from the travel lanes and reduce the impact of these stops on traffic flow and capacity.

Increase Acceleration/Deceleration Lengths

Many of the identified problems with the I-295 corridor relate to on-ramp and off-ramp junctions with the I-295 mainline. Some of these ramp junctions have acceleration and deceleration lanes that are shorter than those in AASHTO guidelines. Actions to increase the lengths of these acceleration and deceleration lanes are relatively low in cost and require no additional right-of-way. Potential implementation issues include lateral clearance constraints and I-295 bridge widths. Table IV-12 highlights the ramps that are considered.

Table IV-12. Ramps Considered for Acceleration & Deceleration Length Improvements

Interchange Number	Direction	Ramp Type
1	NB	on
10	NB/SB	off
	NB/SB	on
15	NB	on
17	SB	on
20	SB	on
28	NB	on

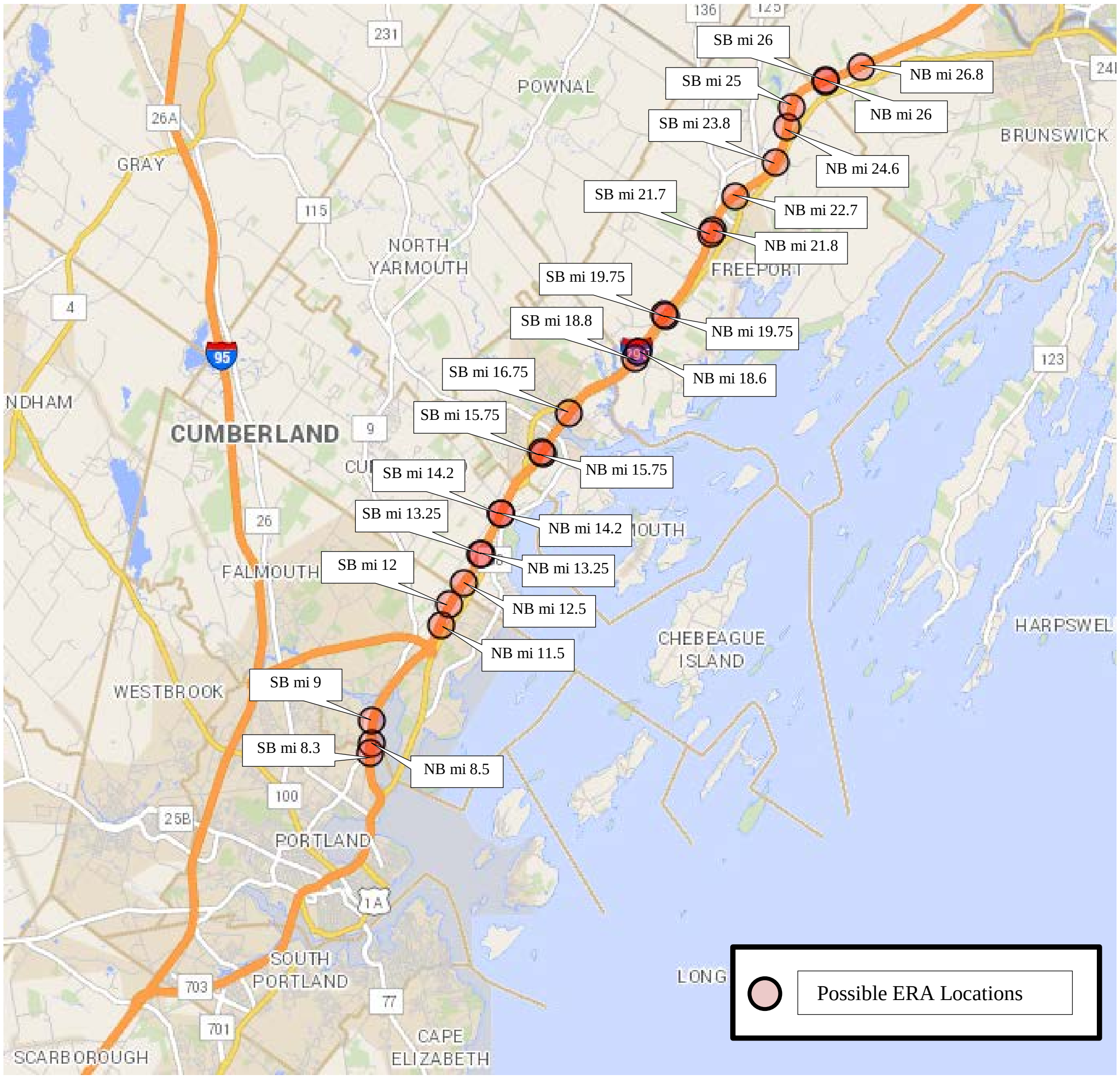
Install Auxiliary Lanes Between Close Interchanges

Short segments between ramps can have a negative effect on capacity along the corridor. Increasing capacity through the installation of auxiliary lanes can improve mobility along these segments. Segments that are considered for auxiliary lanes are between Exit 5 and 6 NB, Exit 7 and 6 SB, and Exit 6 and 5 SB.

Install Emergency Refuge Areas

Installing ERAs along I-295 north of Portland could reduce congestion issues during incidents on the highway. These areas, installed on the outside of the shoulder, provide a safe refuge for vehicles to pull over, reducing the need for vehicles on the mainline to move over or slow down for vehicles stopped in the shoulder. Potential locations for ERAs along I-295 are shown in Figure IV-11. These locations represent areas in which ERAs could be installed with minimal construction. Ideally, there would be at least one ERA per mile between interchanges north of Portland. However, to achieve this some areas would need significant construction including large amounts of cut, fill, or blasting. Areas that limit ERA location possibilities include areas next to a stream or culvert, segments with guardrails, areas requiring lots of cut, fill, or drainage work, and locations that would have limited visibility.

Figure IV-11. Potential Locations for ERAs



2. Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) includes several components that can contribute to the overall success in improving safety, mobility, and reliability on I-295. Variable message signing (VMS) provides motorists with useful information about current highway conditions. Dynamic message signs that provide frequently updated information on travel times to key points along a route are part of VMS. Freeway service patrols and ramp metering are also components of ITS. In the background are roadside detection, roadside communication, and a freeway management center that monitor conditions, connect systems, and coordinate operations.

Install Reliable Travel Time Dynamic Message Signs

Reliable travel time dynamic message signs could be effective at strategic locations where through traffic chooses whether to use I-295 or I-95 to get across Portland. Such locations include I-95 northbound south of Exit 44 and I-295 southbound north of Exit 11.

A similar pair of travel time signs installed on I-95 northbound south of Exit 52 and I-95 southbound north of Exit 103 (near West Gardiner, outside of the Greater Portland area) could provide effective messages for long-distance travelers between Portland (and points south) and Augusta (and points north). The benefits of this sign pair would be seen in the improvement of travel time reliability for I-295 north of Falmouth and for I-95 between Portland and Augusta.

The success of reliable travel time dynamic message signs will depend on the availability of reliable travel time data collected from I-95 and I-295 in real time. This means the collection of travel times on every interchange-to-interchange segment on both Interstate routes. This data, summarized at frequent intervals, can provide drivers with updated travel time information with equal frequency. The data can also be used to identify the segment where an incident has occurred so drivers can know what to expect ahead. Automated travel time messaging based on the real-time data can provide reliable information and allow traffic management operators and dispatches to concentrate on other important tasks.

Maintain Variable Message Signing

A combination of VMS and reliable travel time dynamic message signs could significantly reduce congestion on I-295 by relaying real-time information to motorists, allowing them to choose alternate routes to avoid congested areas. By the end of 2017, there are expected to be 22 VMS along I-295.

Establish Service Patrol

The Maine Turnpike Authority, in providing its own service patrol, has shown the viability of this service on Maine Interstate highways. A similar type of service could be provided on I-295. A service patrol on I-295 would concentrate on corridor locations and times of day in which volumes and the potential for incidents would be highest.

Ramp Metering

Although the strategy assessment showed very I-295 ramps that met warrants for ramp metering, there may be an opportunity to identify one or more locations in the corridor where the effects of ramp metering could be beneficial. A more in-depth look at the potential effectiveness of ramp metering at certain locations could be pursued.

Establish Accommodation Plan for CAVs

Although fully connected and automated vehicles may be decades away, the effects of growing numbers of vehicles with some advanced capabilities can have a noticeable impact. Vehicles that can self-drive in certain situations such as Interstate highway driving could benefit safety, capacity, and reliability. A plan for accommodating partially and fully connected and automated vehicles should be considered.

Variable Speed Limits

The effectiveness of variable speed limits, based on experience in other states, is uncertain. Given the difficulty in enforcing variable speed limits and the considerable expense of installing such a system in a corridor such as I-295, variable speed limits are not proposed for further analysis.

3. Commuter Transit

Expanding commuter transit services could reduce vehicle-miles traveled and provide some congestion relief on I-295. With a clear traffic pattern of inbound AM and outbound PM peaks, the Brunswick-to-Portland portion of the I-295 corridor provides the best opportunity to provide the most impact.

4. Interchange Improvement

The interchange improvements strategy includes construction of new or modified ramps at existing interchanges to create full-service four-ramp interchanges and/or major modifications to existing interchanges to address poor operations. Two interchanges were identified for improvement considerations: Exit 11 (includes Exit 10 ramp lengthening) and Exit 20.

Exit 10 and Exit 11

One candidate action to improve Exits 10 and 11 would be to convert Exit 11 to a full-service interchange. One version of this concept is shown in Figure IV-10, originally presented in the 2010 I-295 Corridor Study. In addition to improving acceleration and deceleration lanes, it would also create two new ramps, a northbound off-ramp and a southbound on-ramp to and from the Falmouth Spur. However, it would require the relocation of Exit 10 southbound ramps and the conversion of the northbound on-ramp from the existing loop ramp to a flyover ramp. For analysis purposes in this report, the 2010 full-service interchange is the concept evaluated.

A less ambitious improvement action would be to make the changes to Exits 10 and 11 necessary to provide an adequate acceleration length for the Exit 10 northbound on-ramp. Major interchange reconstruction for Exit 11 would need to occur to resolve northbound Exit 10 on-ramp acceleration length deficiencies. Currently, the Exit 10 on-ramp is approximately 300 feet in length and there is inadequate spacing between Exit 10 and Exit 11 to provide the recommended 1000-foot acceleration lane length. The reconstruction of the northbound Exit 11 on-ramp from adjacent to I-295 under the bridge, to between the bridge pier and abutment, would allow for the Exit 11 on-ramp to approach I-295 further north, as illustrated in Figure IV-12. This would be similar in layout to the northbound Exit 15 off-ramp. This added segment length between Exit 10 and Exit 11 on-ramps would allow for lengthening of the northbound Exit 10 on-ramp to current standards. While this concept is not a component of the 2010 full-service Exit 11 concept, it would be worthwhile to consider in any future ramp planning for Exits 10 or 11.

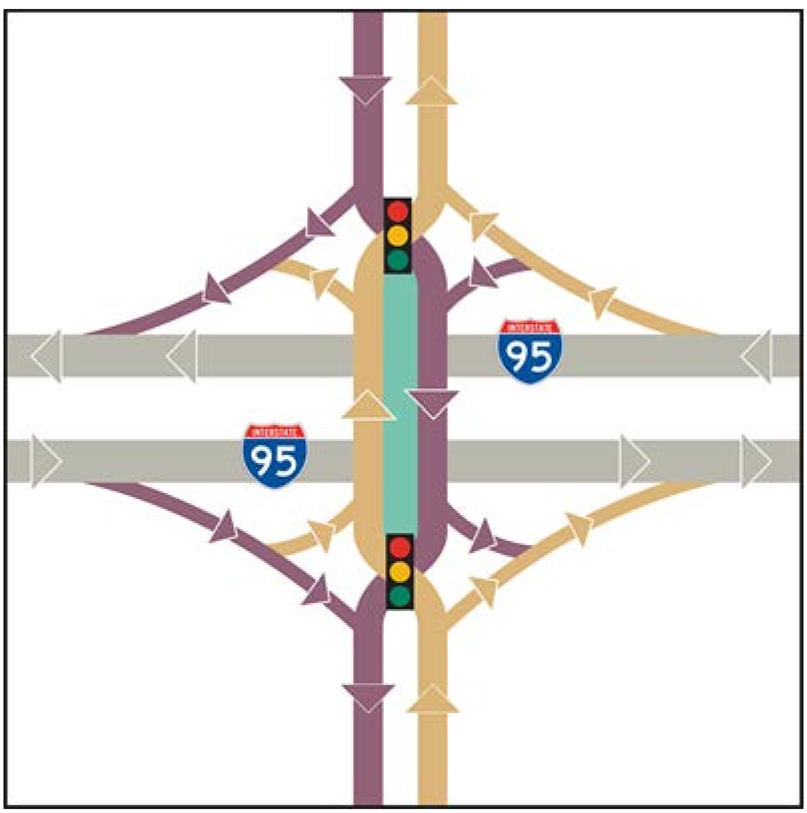
Figure IV-12. Exit 10 and Exit 11 Concept to Improve Northbound Acceleration Lanes

Exit 20

An upcoming study will evaluate interchange improvements to improve operations and safety at the intersections of the northbound and southbound I-295 ramps with Desert Road in Freeport. Options that could significantly improve the operations at this interchange include a diverging diamond interchange (DDI), a single point urban interchange (SPUI), a roundabout at one or both intersections, and intersection improvements (turning lanes, realignment, signal timing improvements, etc.).

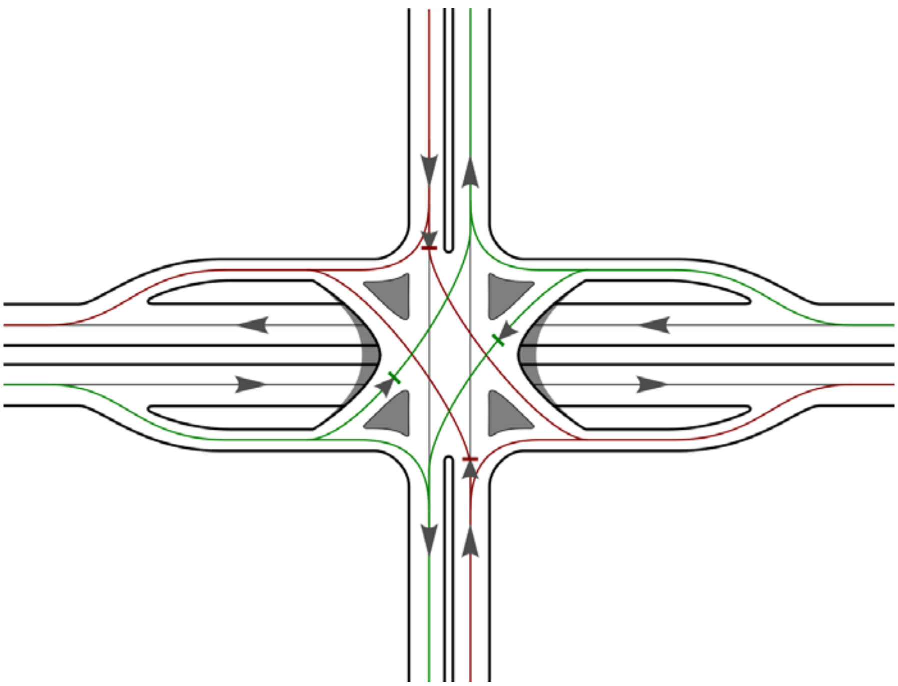
The interchange has been previously evaluated as a potential location for a diverging diamond interchange (DDI). A DDI is a type of diamond interchange at which traffic on the non-interstate roadway crosses to the opposite side of the road on the bridge over the interstate via two signalized intersections at each end of the bridge. This concept is illustrated in Figure IV-13. This configuration allows for a simple, two-phase signal timing plan, increasing throughput. One complication of this strategy is the proximity of the northbound ramps intersection to the Desert Road/Lower Main Street/US 1 intersection. The previous evaluation of this concept faced a lot of public pushback and was later dismissed. In recent years, the DDI concept has been considered and has moved into the design phase for the Hogan Road interchange on I-95 in Bangor. This implementation, as well as improved knowledge on the DDI concept has created reason to re-evaluate the DDI as a solution.

Figure IV-13. DDI Concept



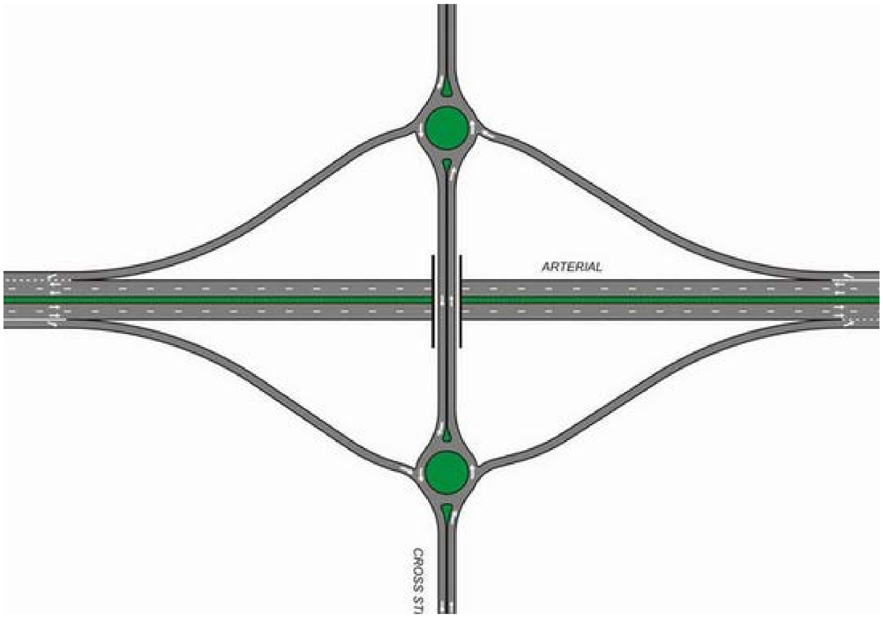
Another alternative intersection that could be considered at the Exit 20 interchange is a single point urban interchange (SPUI). The SPUI is similar to a traditional diamond interchange but has the advantage of allowing opposing left turns to proceed simultaneously. This is achieved by combining the two intersections of the diamond interchange into a single intersection over (or under) the free-flowing road. The concept of a SPUI is illustrated in Figure IV-14. All through traffic and turning traffic for the interchange can be controlled from a single set of traffic signals, increasing efficiency and reducing queue lengths at the intersection. The SPUI also allows for wider turns, which would ease movement for large vehicles. Research also suggests that, while the SPUI may not have a significant reduction in overall crashes when compared to a traditional diamond interchange, there is a significant reduction in the severity of crashes.

Figure IV-14. SPUI Concept



Another option to improve safety and operations at this interchange is installing a roundabout at one or both ramp intersections on Desert Road. The double roundabout interchange concept is shown in Figure IV-15. The capacity of a roundabout varies based on entry angle, lane width, and the number of entry and circulating lanes. A single-lane roundabout can handle approximately 20,000-26,000 vehicles per day, while a two-lane roundabout can support 40,000-50,000. Under many conditions a roundabout operates with less delay than with signalized or all-way stop approaches. Where they have been installed, modern roundabouts are also statistically safer for drivers and pedestrians than traditional intersections.

Figure IV-15. Double Roundabout Interchange Concept



Other intersection improvements that may improve efficiency, capacity, and safety at the Exit 20 interchange in Freeport include adding additional turn lanes, realignment or modifications to the I-295 ramps, relocation of ramp/Desert Road intersections, signalizing the ramp intersections, and improving or modifying the signal timings at the Desert Road/Lower Main Street/US 1 intersection.

5. New Highway Capacity

New highway capacity, because of its cost and its potential for environmental impacts or other complications, can take several years to develop. To proceed with this strategy requires in-depth economic feasibility analysis and potentially an environmental assessment to determine whether the proposed action would have a significant environmental impact.

As stated in the Strategy Assessment section of this report, adding general purpose travel lanes to I-295, especially in Portland and South Portland where the volumes are highest and the existing capacity is under the most pressure, is not a realistic alternative for MaineDOT to pursue. However, with its ability to reduce thru traffic on I-295 south of Exit 11, the concept of added capacity on I-95 between Exits 44 and 52 is a valuable strategic action to the I-295 corridor.

V. Analysis

FREEVAL, a macroscopic freeway analysis tool based on the Highway Capacity Manual (HCM), was used for analysis of the I-295 corridor. The FREEVAL software analyzes the freeway corridor a whole, rather than analyzing ramps and segments individually. This shows how one congested location can affect other upstream and downstream locations. For the analysis of actions which can improve the basic level of service potential of I-295, FREEVAL is an important tool.

For actions such as installing emergency refuge areas (ERAs) or ITS enhancements, which address incidents and non-recurring congestion, the analysis is based primarily on the expected year-round performance of these actions in reducing the impacts of incidents and other events.

For some actions, the I-295 corridor was separated into two parts: the southern, more urban portion beginning of I-295 in Scarborough to the Portland city line between Exits 9 and 10, and the northern, more rural portion from the Portland city line to Exit 28.

A. Auxiliary Lanes

Along the I-295 corridor several locations are identified as having deficient on-ramp and off-ramp acceleration and deceleration lengths. These ramps are potential locations for ramp extensions. Appendices K and L, include LOS diagrams for future (2040) AM and PM peak hours at these locations. Appendix K has the performance information for the baseline, or no-build, conditions. Appendix L has the performance information for the extended acceleration and deceleration lanes.

Acceleration Lanes

Table V-1 is a summary of the effect of extending deficient acceleration lanes at on-ramps on LOS. In comparison with the future no-build conditions, extension of the acceleration lanes would modestly improve LOS at all locations. At some locations, northbound at Exits 10 and 28 and southbound at Exits 20 and 10, the improvement would be enough to raise the performance to the next LOS. In the case of the northbound Exit 5S on-ramp, the downstream PM peak-hour congestion and queuing between Exits 5 and 6 would prevent the LOS from rising above F.

Table V-1. Level of Service Impact of Extended Acceleration Lanes on Deficient On-Ramps

On-Ramps	2040 AM Peak		2040 PM Peak	
	No-Build	Extended Accel. Lane	No-Build	Extended Accel. Lane
NB Exit 1 On-Ramp	C	C	B	B
NB Exit 5S On-Ramp	C	C	F*	F*
NB Exit 10 On-Ramp	C	B	D	C
NB Exit 17 On-Ramp	B	B	D	D
NB Exit 20 On-Ramp	B	B	C	C
NB Exit 28 On-Ramp	B	A	B	B
SB Exit 20 On-Ramp	D	C	C	C
SB Exit 17 On-Ramp	D	D	C	C
SB Exit 10 On-Ramp	D	D	C	B

*LOS F due to downstream capacity constraint

Deceleration Lanes

Table V-2 is a summary of the LOS for extending deficient deceleration lanes at on-ramps. In comparison with the future no-build conditions, extension of the deceleration lanes would marginally improve LOS at all locations. At one location, northbound at Exits 10, the improvement would be enough to raise the performance to the next LOS. In the case of the southbound Exit 6B off-ramp, the downstream PM peak-hour congestion and queuing between Exits 6 and 5 would prevent the LOS from rising above F.

Table V-2. Level of Service Impact of Extended Deceleration Lanes on Deficient Off-Ramps

Off-Ramps	2040 AM Peak		2040 PM Peak	
	No-Build	Extended Decel. Lane	No-Build	Extended Decel. Lane
NB Exit 1 Off-Ramp	B	B	A	A
NB Exit 6A Off-Ramp	D	D	D	D
NB Exit 10 Off-Ramp	C	B	D	D
NB Exit 17 Off-Ramp	B	B	D	D
NB Exit 20 Off-Ramp	B	B	C	C
SB Exit 28 Off-Ramp	B	B	B	B
SB Exit 17 Off-Ramp	D	D	C	C
SB Exit 11 Off-Ramp	E	E	C	C
SB Exit 10 Off-Ramp	D	D	C	C
SB Exit 6B Off-Ramp	D	D	F*	F*
SB Exit 4 Off-Ramp	C	C	D	D

*LOS F due to downstream capacity constraint

In several locations, extending the acceleration and deceleration lanes to current standards will improve operation, safety, and level of service. However, this approach does not add capacity. Other approaches, such as auxiliary lanes or interchange improvements, may add capacity.

Auxiliary Lanes Between Closely Spaced Interchanges

The three locations between Exits 5, 6, and 7 where continuous auxiliary lanes can be installed between the upstream on-ramp and the downstream off-ramp each currently have an on-ramp junction, a mainline segment, and an off-ramp junction. A continuous auxiliary lane between adjacent interchanges would address capacity constraints that constrict the flow of traffic downstream and create queuing and LOS F upstream. The auxiliary lane would consolidate the two junctions and one segment into a single Type A weaving section with an improved level of service. Figure II-1 illustrates the configuration of a Type A weaving section. The capacity to get on and off I-295 and to travel between the interchanges would be enhanced but the number of through travel lanes would not be increased.

In some cases, there may be locations that are potential capacity constraints. These are locations where the forecasted demand volume would exceed the capacity if the upstream capacity constraint was not reducing the flow of traffic downstream. Eliminating and upstream capacity constraint can change a downstream potential capacity constraint into a new capacity constraint.

Two of these locations are in the southbound direction, between Exits 7 and 6 and between Exits 6 and 5. Table V-3 shows how the auxiliary lanes would affect southbound capacity constraints on I-295 in the Portland-South-Portland area under future (2040) peak-hour conditions. In the future baseline, capacity constraints would exist between Exits 9 and 8 and Exits 7 and 6 in the AM peak and between Exits 6 and 5 in the PM peak. Each of these constraints would cause congestion and queuing at a high density with LOS F on upstream segments. Potential capacity constraints would exist downstream at Exit 5, but the upstream capacity constraint would prevent volumes from reaching full peak-hour demand. As a result, the potential capacity constraints would be less congested and operate at a higher LOS.

With the installation of the two southbound auxiliary lanes, capacity constraints would be eliminated between Exits 7, 6, and 5. In the AM peak, the queuing would be eliminated except for the constraint between Exits 9 and 8. In the PM peak, the potential capacity constraint at Exit 5A (on) would become the new capacity constraint, and the congestion, queuing, and LOS F would extend upstream from there. To more effectively reduce southbound queuing on this portion of I-295, capacity constraints between Exits 9 and 8 and at Exit 5A (on) would need to be addressed.

Table V-3. Effects of Auxiliary Lanes between Exits 7, 6, and 5 on Southbound Capacity Constraints and Queuing

Southbound	2016 Baseline		2040 Baseline		2040 w/Aux Lanes between Exits 5, 6, 7	
Peak Hour	AM	PM	AM	PM	AM	PM
Exit 9 weave			F		F	
			1.067		1.067	
Exit 8 weave				F		
			F	F		
Exit 7 off			F	F		F
			F	F		F
Exit 7 on			1.045	F		F
			1.045	F		F
Exit 6B off			1.045	F		F
				F		F
Exit 6B/6A Weave				F		F
				F		F
Exit 6A on				1.070		F
				1.070		F
Exit 5B off				1.050		F
						F
Exit 5B/5A weave						F
						F
Exit 5A on				1.017		1.017
Exit 4 off						
Exit 4 to 3 weave						
Exit 2 off						
Exit 1 off						

F	1.000	1.000
Congested Queues (density LOS)	Capacity Constraint (volume/capacity ratio)	Potential Capacity Constraint (demand/capacity ratio)

The third auxiliary lane location is in the northbound direction, between Exits 5 and 6. Table V-4 show this auxiliary lane would affect northbound capacity constraints under future peak-hour conditions. In the future baseline, capacity constraints would exist at Exit 5 (off) in the AM peak and between Exits 5 and 6 in the PM peak. Potential capacity constraints would exist between Exits 6 and 7 in the AM peak and between Exits 8 and 9 in the PM peak.

With the installation of the northbound auxiliary lane, Exit 5A would remain as the capacity constraint in the AM peak, but the potential capacity constraint between Exits 5 and 6 would be eliminated. In the PM peak, the segment between Exits 8 and 9 would become the new capacity constraint. To more effectively reduce northbound queuing on this portion of I-295, capacity constraints at Exit 5A (off) and between Exits 8 and 9 would need to be addressed.

Table V-4. Effects of Auxiliary Lane between Exits 5 and 6 on Northbound Capacity Constraints and Queuing

Northbound	2016 Baseline		2040 Baseline		2040 w/Aux Lane between Exits 5, 6	
Peak Hour	AM	PM	AM	PM	AM	PM
Exit 9 weave						
				1.003		1.003
Exit 8 weave						F
						F
Exit 7 on						F
Exit 6B to 7 weave						
Exit 6A/B weave						
Exit 6A off			1.029	1.089		
		1.014	1.058	1.115		
Exit 5 on (N)		1.014	1.058	1.115		
Exit 5 on (S)		F		F		
		F		F		
Exit 5 off		F	1.106	F	1.106	
		F	F	F	F	
Exit 4 on		F	F	F	F	
		F	F	F	F	
Exit 3 to 4 weave		F	F	F	F	
			F		F	
Exit 2 on			F		F	
			F		F	
Exit 1 on						
Exit 1 off						

F	1.000	1.000
Congested Queues (density LOS)	Capacity Constraint (volume/capacity ratio)	Potential Capacity Constraint (demand/capacity ratio)

Auxiliary lanes between closely spaced interchanges in Portland have an ability to address some of the existing and future capacity constraints in the southern portion of the I-295 corridor. To be fully effective, other actions would be needed on the southerly end of Exit 5 and between Exits 8 and 9. An improved southbound acceleration lane at the Exit 5A on-ramp and an improved northbound deceleration lane at the Exit 5 off-ramp could be beneficial. The southbound on-ramp may also be a candidate for ramp metering to reduce I-295 queuing in the PM peak. Between Exits 8 and 9, the feasibility of temporary use of the shoulder for peak-period use could be investigated. Peak-period shoulder use between adjacent interchanges also could be considered between Exits 5, 6, and 7 to obtain some of the benefits of full auxiliary lanes.

Emergency Refuge Areas

Unlike other auxiliary lanes, emergency refuge areas (ERAs) would focus on reducing the impacts of incidents on traffic flow, particularly north of Portland where the wider spacing of interchanges provides space for their installation. With adequate frequency, most emergency or enforcement stops could be made at an ERA, with a full shoulder separating the stopped vehicles from travel lanes. Capacity impacts of the stopped vehicles could be greatly reduced. Reductions in secondary crashes and delay from incidents could be significant. For the purpose of this analysis, the ERAs are expected to be located between Exit 9 in Portland and Exit 28 in Brunswick. A total of 26 ERAs would be spaced approximately one mile from adjacent ERAs or interchanges. Table V-5 shows that ERAs could reduce delays from incidents by more than 25 % and reduce secondary crashes resulting from incidents by close to 70%.

Table V-5. Annual Impact of Emergency Refuge Areas on Crashes and Delays Due to Incidents on I-295 north of Portland

I-295 north of Portland to Brunswick	2016 baseline	2040 baseline	2040 with ERAs	Reduction with ERAs
Crashes	272	316	296	20
Other Incidents	2064	2394	2394	0
Delay from Incidents (VHT)	139463	347591	272832	74759
Secondary Crashes	25	29	9	20

B. Intelligent Transportation Systems

The intelligent transportation systems (ITS) strategy would include several elements that would work together to improve I-295 safety and mobility. These elements include installing reliable travel time dynamic message signs and other variable message signs, establishing a service patrol, ramp metering, and establishing an accommodation plan for CAVs. Working together as a freeway management system, the ITS strategy could have a beneficial impact on mobility and safety. While CAVs may eventually increase the capacity of freeways and ramp metering can enable on-ramp traffic to merge more smoothly onto the mainline, the other ITS elements do not increase the capacity or the level of service capability of the freeway, but do improve the reliability by reducing the impacts of non-recurring incidents on traffic flow and improve the safety by reducing the duration and intensity of these impacts. The major effects on reliability are the reductions in travel delays and secondary crashes due to incidents.

Freeway Service Patrols

Freeway service patrols operating in the I-295 corridor would be focused on reducing the duration of incidents by clearing hazardous debris from the roadway, assisting motorists in disabled vehicles, and warning motorists of hazardous conditions ahead. The results would be reduced delay and fewer secondary crashes. Freeway service patrols would normally operate during hours with high traffic volumes and a high probability incidents. For the purposes of this analysis, the patrols would operate on Monday through Friday during the eight busiest hours of the day. Table V-6 shows that such a service patrol could reduce secondary crashes by 10% and delay from incidents by about 6%.

Table V-6. Annual Impact of Freeway Service Patrols on Crashes and Delays Due to Incidents on I-295

I-295 Scarborough to Brunswick	2016 baseline	2040 baseline	2040 with FSP	Reduction with FSP
Crashes	425	484	479	5
Other Incidents	3575	4056	4056	0
Delay from Incidents (VHT)	464009	828169	781442	46727
Secondary Crashes	39	45	40	5

Variable Message Signs

In the analysis of variable message signs, travel time reliability signs and the more common and more frequently located variable message signs are combined into a single family of actions. This family would also include the traffic monitoring, communications systems, and traffic control center that normally support variable message signs. Table V-7 shows that both the number of secondary crashes and the delay from incidents could be reduced by 50% or more.

Table V-7. Annual Impact of Variable Message Signs on Crashes and Delays Due to Incidents on I-295

I-295 Scarborough to Brunswick	2016 baseline	2040 baseline	2040 with VMS	Reduction with VMS
Crashes	425	484	459	25
Other Incidents	3575	4056	4056	0
Delay from Incidents (VHT)	464009	828169	545139	283030
Secondary Crashes	39	45	20	25

C. Commuter Transit

The impact of expanding commuter transit services along the I-295 corridor was analyzed for additional bus routes from Brunswick to Portland and Yarmouth to Portland, based on recommended service improvements from the 2011 Portland North Study. The predicted bus ridership and number of passenger vehicles removed from the corridor directly correlates to the data presented in the 2011 study. While the implementation of Metro BREEZ service between Brunswick and Portland is a substantial advancement in commuter transit service in the I-295 corridor, the analysis is intended to illustrate the

With existing traffic volumes, estimated daily boarding in Yarmouth and Brunswick were 296 and 679, respectively. Vehicle occupancy was estimated at 1.2 persons per vehicle, resulting in daily vehicles removed from I-295 of 247 from Yarmouth and 566 from Brunswick. Using peak hour volumes, the number of vehicles removed from the interstate in the AM and PM peak hour, in both the northbound and southbound directions, were estimated. These values are summarized in Table V-8.

Table V-8. Impact of Upgraded Commuter Transit Service on I-295 Daily and Peak-Hour Volumes

	Daily Boardings	Daily Vehicles Removed from I-295	Peak Hour Vehicles Removed from I-295	AM Inbound/PM Outbound Vehicles Removed from I-295	AM Outbound/PM Inbound Vehicles Removed from I-295
Yarmouth	296	247	35	30	5
Brunswick	679	566	79	68	11

The Table V-8 values were used to estimate the mobility impacts on I-295 from Brunswick to Portland in terms of reduction in vehicle miles travelled (VMT) and vehicles hours travelled (VHT). With improved commuter transit from Brunswick and Yarmouth to Portland, it was calculated that I-295 could see an annual reduction of 2,172,259 VMT. This value is calculated assuming 254 operating days.

The HSM computational engine, FREEVAL, was used to estimate peak hour VHT savings along the corridor. The peak hour VHT savings were converted to an annual VHT savings using annual mobility benefit multipliers. The analysis estimates an annual vehicle-hour savings of 100,521 vehicle-hours.

D. Interchange Improvement

A full-service Exit 11 has the potential to reduce transportation costs to users at the regional level. Table V-9 shows the impact of the interchange improvement on daily vehicle-miles traveled (VMT) and vehicle-hours traveled (VHT), as estimated by the PACTS travel demand model. The Exit 11 improvement would tend to increase VMT but reduce VHT. The model results indicate that the summer weekday effects on VMT and VHT would be around double what would occur in a fall weekday. Reductions in delays and travel times, which reduce VHT, represent the major measurable benefits of adding ramps to a partial interchange like Exit 11.

Table V-9. Effect of Full-Service Exit 11 on Regional VMT and VHT

Regional Transportation Impact	2040 Baseline (No-Build)	With Full Service Exit 11
Fall Weekday		
VMT	9,903,119	9,903,634
Change in VMT		515
VHT	240,683	240,648
Change in VHT		-35
Summer Weekday		
VMT	10,393,863	10,395,009
Change in VMT		1,146
VHT	250,497	250,423
Change in VHT		-74

The full-service interchange would also have a safety benefit from removing some traffic from urban arterial streets like Washington Avenue (SR 26) and placing it on the controlled-access highways like the Falmouth Spur and I-295. However, some of that safety benefit would be offset by the increase in VMT.

E. New Highway Capacity

The potential widening of I-95 between Exits 44 and 52 has been identified as a candidate action to provide future traffic relief for I-295 south of Exit 11. As the I-95 widening proposal is undergoing a detailed assessment of feasibility by the Maine Turnpike Authority, a detailed analysis of this proposal is not included in the I-295 Corridor Update. However, some information from the MTA feasibility assessment is presented in the Effectiveness, Cost, and Challenges section of the Analysis chapter.

F. Effectiveness, Cost, and Challenges

In this part of the analysis, the candidate actions are compared in terms of effectiveness at improving safety and mobility, in cost to implement, and in the challenges presented by implementation.

1. Effectiveness

In Table V-10, the effectiveness of each candidate action is summarized. Each action would have a beneficial impact on safety and mobility. The impacts are rated as minor (for less than $100,000 in annual benefit), moderate (for $100,000 to $1,000,000 in annual benefit), and major (for more than $1,000,000 in annual benefit.

Each type of action generates benefits in its own way. Auxiliary lane actions and interchange improvements can impact safety and mobility by raising the physical capabilities of I-295. ITS actions can modify the operation of I-295 in ways that allow it to function as close as possible to its capabilities. The commuter transit and I-95 capacity improvements offer better safety and mobility on I-295 by removing some of the traffic that can move by different paths and transportation modes.

Table V-10. Effectiveness of Candidate Actions

Strategies	Actions	Locations	Mobility Impact	Safety Impact
Auxiliary Lanes	Increase acceleration and/or deceleration lengths at interchange ramp junctions	NB Exit 1 NB/SB Exit 10 NB Exit 15 SB Exit 17 SB Exit 20 NB Exit 28	minor, from reduced vehicle density	moderate, from reduced conflicts
	Install auxiliary lanes between closely spaced interchanges	NB Exit 5 to Exit 6 SB Exit 7 to Exit 6 SB Exit 6 to Exit 5	major, from reduced density and lane changing	moderate, from reduced conflicts
	Install pull-off areas (ERAs) for law enforcement and emergency stops	approximately 1 per mile, north of Portland to Brunswick, 26 in total	major, from reduced incident impacts on capacity	major, from fewer secondary crashes
Intelligent Transportation Systems (ITS)	Install freeway management system, including transportation management center, roadside information (VMS), roadside detection, and roadside communications	Scarborough to Brunswick	major, from reduced incident impacts and fewer secondary crashes	major, from fewer secondary crashes
	Establish service patrol	Scarborough to Brunswick	moderate, from reduced incident duration	moderate, from fewer secondary crashes
	Establish an accommodation plan for CAVs	Scarborough to Brunswick	TBD	major expected, due to reduced driver error
Commuter Transit	Expand express commuter services	Brunswick to Portland	major, from reduced VMT, VHT	moderate, from reduced VMT
Interchange Improvements	Ramp additions and reconfigurations	Exit 10 and 11	major, from traffic shift from arterials	moderate, from reduced VHT
	Interchange reconfiguration	Exit 20	TBD	TBD
New Highway Capacity	Add capacity on I-95*	Exit 44 to Exit 52	major, from reduced density and fewer secondary crashes	major, from reduced density and fewer secondary crashes

*Maine Turnpike Authority initiative

2. Cost

The costs of potential actions in Table V-11 are estimated in terms of current (2018) dollars, mainly from the implementation (design and construction) costs, except for actions where operations are a major cost component. The most costly projects involve major construction, such as interchange improvements and the adding of capacity on I-95. The least costly are improvements to acceleration and deceleration lengths, ERAs, and the freeway service patrol. For the ITS and commuter transit actions, operating cost is a substantial component to total cost. The total annualized cost is based on the spreading of the capital cost over the life of the project. It is used in comparison with annual benefits in a benefit/cost analysis.

Table V-11. Costs of Candidate Actions

Strategies	Actions	Locations	Capital Cost	Annual Operating Cost	Total Annualized Cost
Auxiliary Lanes	Increase acceleration and/or deceleration lengths at interchange ramp junctions	NB Exit 1 on-ramp	$ 50,000		$ 4,400
		NB Exit 10 on-ramp	$ 210,000		$ 18,300
		NB Exit 10 off-ramp	$ 53,000		$ 4,600
		NB Exit 15 on-ramp	$ 77,000		$ 6,700
		NB Exit 28 on-ramp	$ 74,000		$ 6,500
		SB Exit 20 on-ramp	$ 61,000		$ 5,300
		SB Exit 17 on-ramp	$ 111,000		$ 9,700
		SB Exit 10 off-ramp	$ 38,000		$ 3,300
		SB Exit 10 on-ramp	$ 132,000		$ 11,500
		Total	$ 806,000		$ 70,300
	Install auxiliary lanes between closely spaced interchanges	NB Exit 5 to Exit 6	$ 570,000		$ 151,400
		SB Exit 7 to Exit 6	$ 437,000		
		SB Exit 6 to Exit 5	$ 730,000		
	Install pull-off areas (ERAs) for law enforcement and emergency stops	approximately 1 per mile, north of Portland to Brunswick, 26 in total	$ 155,000 each		$ 13,500 each
			$ 4,030,000 total		$ 351,000 total
Intelligent Transportation Systems (ITS)	Install freeway management system, including transportation management center, roadside information (VMS), roadside detection, and roadside communications	TMC	$ 1,000,000	$ 800,000	$ 900,000
		roadside VMS	$ 2,300,000	$ 100,000	$ 120,000
		roadside detection	$ 600,000	$ 50,000	$ 420,000
		roadside communications	$ 2,500,000	$ 150,000	$ 1,000,000
		Total, Scarborough to Brunswick	$ 6,400,000	$ 1,100,000	$ 2,440,000
	Establish service patrol	Scarborough to Brunswick		$ 105,000	$ 105,000
	Establish an accommodation plan for CAVs	Scarborough to Brunswick	TBD		TBD
Commuter Transit	Expand express commuter services	Brunswick to Portland	$ 800,000	$ 475,000	$ 545,000
Interchange Improvements	Ramp additions and reconfigurations	Exit 10 and 11	$ 35,000,000		$ 35,000,000
	Interchange reconfiguration	Exit 20	TBD		TBD
New Highway Capacity	Add capacity on I-95*	I-95, Exit 44 to Exit 53	$ 160,000,000		$ 13,950,000

*Cost data from Portland Area Mainline Needs Assessment

3. Implementation Challenges

As part of the alternatives analysis, implementation challenges were assessed for all the candidate improvement actions. The findings of the assessment are summarized in Table V-12.

Table V-12. Implementation Challenges of Candidate Actions

Strategies	Actions	Locations	Implementation Challenges
Auxiliary Lanes	Increase acceleration and/or deceleration lengths at interchange ramp junctions	NB Exit 1 on-ramp	minimal
		NB Exit 10 on-ramp	exit 11 impacts, cost
		NB Exit 10 off-ramp	minimal
		NB Exit 15 on-ramp	minimal
		NB Exit 28 on-ramp	minimal
		SB Exit 20 on-ramp	coordination with Exit 20 reconfiguration
		SB Exit 17 on-ramp	potential bridge constraint
		SB Exit 10 off-ramp	minimal
		SB Exit 10 on-ramp	minimal
	Install auxiliary lanes between closely spaced interchanges	NB Exit 5 to Exit 6 SB Exit 7 to Exit 6 SB Exit 6 to Exit 5	noise analysis, potential bridge constraints
	Install pull-off areas (ERAs) for law enforcement and emergency stops	approximately 1 per mile, north of Portland to Brunswick, 26 in total	minimal
Intelligent Transportation Systems (ITS)	Install freeway management system, including transportation management center, roadside information (VMS), roadside detection, and roadside communications	Scarborough to Brunswick	cost, implementation plan, stakeholder coordination
	Establish service patrol	Scarborough to Brunswick	minimal
	Establish an accommodation plan for CAVs	Scarborough to Brunswick	implementation plan
Commuter Transit	Expand express commuter services	Brunswick to Portland	unknowns
			funding
Interchange Improvements	Ramp additions and reconfigurations	Exit 10 and 11	cost, potential ROW impacts
	Interchange reconfiguration	Exit 20	potential cost and ROW impacts, coordination with bridge project
New Highway Capacity	Add capacity on I-95*	I-95, Exit 44 to Exit 53	cost, environmental permitting process

*Maine Turnpike Authority initiative

Among auxiliary lane actions, implementation challenges would be expected to be generally minimal where interchange ramp acceleration or deceleration lengths would be lengthened, although highway, bridge, and drainage constraints could increase cost. Installations of auxiliary lanes between closely spaced urban interchanges could have impacts to existing bridges or noise levels. Installation of emergency refuge areas (ERAs) would be expected to have minimal challenges, provided they are placed in locations without major fill issues. Large projects have cost and environmental challenges.

Installation of ITS and commuter transit facilities and services would be expected to have minimal environmental challenges, but, in the case of ITS, the biggest challenge may be a coordinated implementation plan that responds to advances in technology. If commuter transit expansion were to be implemented on a large scale, changes in the infrastructure along the corridor may be needed to accommodate more transit in an effective manner.

4. Benefit/Cost

A benefit/cost analysis of the candidate actions is conducted to determine the relative cost-effectiveness of the actions in terms of the value of safety and mobility benefits per unit of cost. The analysis offers an indication of economic feasibility and priority. Mobility benefits may include reductions in vehicle-miles traveled (VMT) and vehicle-hours traveled (VHT). The safety benefits come from reduced crash costs.

Table V-13 compares the benefits and costs for potential actions analyzed. A benefit/cost (B/C) ratio represents the combined (safety and mobility) annual benefit divided by the total annualized cost. B/C ratios greater than 1.0 show that benefits exceed the costs. Nearly all the potential actions show benefits greater than the cost. The major exception is the interchange improvement that would make Exit 11 a full-service interchange. The high capital cost exceeds the expected benefits. Some B/C ratios can be raised if the costs of actions can be reduced. The costs and benefits of Exit 20 improvements or CAV accommodations are yet to be determined.

Table V-13. Benefits and Costs for Potential Actions

Strategies	Actions	Locations	Annual Mobility Benefit	Annual Safety Benefit	Combined Annual Benefit	Total Annualized Cost	B/C Ratio
Auxiliary Lanes	Increase acceleration and/or deceleration lengths at interchange ramp junctions	NB Exit 1 on-ramp	$ 2,600	$ 7,300	$ 9,900	$ 4,400	2.3
		NB Exit 10 on-ramp	$ 13,900	$ 38,200	$ 52,100	$ 18,300	2.8
		NB Exit 10 off-ramp	$ -	$ 45,000	$ 45,000	$ 4,600	9.8
		NB Exit 15 on-ramp	$ 600	$ 133,800	$ 134,400	$ 6,700	20.1
		NB Exit 28 on-ramp	$ 200	$ -	$ 200	$ 6,500	0.0
		SB Exit 20 on-ramp	$ 300	$ 16,800	$ 17,100	$ 5,300	3.2
		SB Exit 17 on-ramp	$ 600	$ 11,200	$ 11,800	$ 9,700	1.2
		SB Exit 10 off-ramp	$ -	$ 22,500	$ 22,500	$ 3,300	6.8
		SB Exit 10 on-ramp	$ 1,300	$ 54,900	$ 56,200	$ 11,500	4.9
		Total	$ 19,500	$ 329,700	$ 349,200	$ 70,300	5.0
	Install auxiliary lanes between closely spaced interchanges	NB Exit 5 to Exit 6 SB Exit 7 to Exit 6 SB Exit 6 to Exit 5	$ 1,493,000	$ 418,000	$ 1,911,000	$ 151,400	12.6
	Install pull-off areas (ERAs) for law enforcement and emergency stops	approximately 1 per mile, north of Portland to Brunswick, 26 in total	$ 40,300 each $ 1,047,800 total	$ 38,800 each $ 1,008,800 total	$ 79,100 each $ 2,056,600 total	$ 13,500 each $ 351,000 total	5.9
Intelligent Transportation Systems (ITS)	Install freeway management system, including transportation management center, roadside information (VMS), roadside detection, and roadside communications	TMC roadside VMS roadside detection roadside communications	$ 3,962,000	$ 1,270,000	$ 5,232,000	$ 900,000 $ 120,000 $ 420,000 $ 1,000,000	2.1
		Total, Scarborough to Brunswick				$ 2,440,000	
	Establish service patrol	Scarborough to Brunswick	$ 654,000	$ 254,000	$ 908,000	$ 105,000	8.6
	Establish an accommodation plan for CAVs	Scarborough to Brunswick	TBD	TBD	TBD	TBD	TBD
Commuter Transit	Expand express commuter services	Brunswick to Portland — VMT VHT	$ 923,000 $ 793,000	$ 369,000	$ 2,085,000	$ 545,000	3.8
Interchange Improvements	Ramp additions and reconfigurations	Exit 10 and 11	$ 1,087,000	$ 533,000	$ 1,620,000	$ 3,051,000	0.5
	interchange reconfiguration	Exit 20	TBD	TBD	TBD	TBD	TBD
New Highway Capacity	Add capacity on I-95*	I-95, Exit 44 to Exit 53				$ 13,950,000	2.8

*Cost data from Portland Area Mainline Needs Assessment

VI. Recommendations

The recommendations of this report are grouped into three categories regarding implementation schedule. The most immediate category is near-term improvements. The actions considered near-term improvements are relatively simple and low-cost improvements that can be implemented within three years. Near-term improvements are cost-effective actions that can have an immediate benefit to safety or mobility with a minimum of environmental issues. Next are the mid-term improvements, which have an implementation horizon of three to ten years. These improvements are potentially cost-effective actions that need additional analysis or coordination of stakeholders to implement. They may be more costly and environmentally sensitive than near-term improvements. Finally, the long-term improvements, with an implementation horizon greater than ten years, are actions that often have more complicated environmental and funding issues than the other improvement categories and require a more in-depth alternatives analysis. Implementation typically is focused on accommodating long-term growth in travel demands, rather than addressing current needs. For each of the improvements: near-term, mid-term, and long-term, the location, problems, recommended action, benefits, challenges, coordination needs, and status are identified.

A. Near-Term Improvements

With the existing issues of safety, mobility, and reliability in the I-295 corridor, near-term improvements are needed to address deficiencies. The following pages summarize the near-term improvement recommendations for the I-295 Corridor Update. These recommendations consist of auxiliary lane improvements and implementation of intelligent transportation system (ITS) enhancements. In general, the near-term improvements can be implemented at a relatively low cost and with fewer environmental issues than costlier mid-range and long-range improvements.

Near-Term Improvements Strategy: Auxiliary Lanes

Project: Extension of Acceleration Lanes and Deceleration Lanes

City/Town: South Portland, Falmouth, Yarmouth, Freeport

Location: Exits 1, 10, 11, 15, 17, 20,

Problem: Some on-ramps and off-ramps in the I-295 corridor have substandard acceleration or deceleration lengths. Substandard ramps provide a lower level of service at ramp junctions, increase delay, and increase the risk of crashes.

Recommended Action: Where opportunities exist, upgrade existing ramps to provide acceleration and deceleration lengths to current standards. Include, as part of this action, the analysis of ramp metering feasibility at key on-ramps.

Benefits:

- Safety of ramp operations would be improved.
- Levels of service at ramp junctions would be raised.
- Delays on the I-295 mainline and ramps would be reduced.

Challenges and Coordination Needs:

- Ramp improvements should be designed to minimize cost of upgrades and impacts to drainage patterns at the improvement site.
- Some improvements at Exits 10, 11, and 20 may require further coordination with related feasibility efforts. See section on Mid-Term Improvements.

Status: Unprogrammed and unfunded, but improvements would be candidate actions for the 2019-20-21 work plan.

Near-Term Improvements Strategy: Auxiliary Lanes

Project: Install Emergency Refuge Areas

City/Town: Portland to Brunswick

Location: Exit 9 to Exit 28

Problem: As traffic volumes have grown on I-295, congestion, incidents, and the number of crashes have increased, and the reliability of travel times on the corridor has decreased. In the interest of safety on I-295 and other highways in Maine, state law requires that motorists shift lanes or slow down when passing stalled or emergency vehicles stopped on the shoulder. While this requirement provides more safety to the occupants of the vehicles stopped on the shoulder, the lane shifting or slowing of traffic passing by disrupts traffic flow in the travel lanes, reducing the capacity of the highway and creating a potential for sideswipe or rear-end crashes. This effect is especially felt on high-volume corridors like I-295.

Recommended Action: Install emergency refuge areas(ERAs) at approximately one-mile intervals along I-295, northbound and southbound, between Portland and Brunswick. These ERAs, located off the existing shoulders, would serve as places where vehicles making emergency or enforcement stops can park without triggering lane changes or slowing vehicles in the travel lanes. Use of these ERAs would reduce disruption to travel flow in the travel lanes, reduce congestion, increasing travel time reliability, and reduce the risk of secondary crashes.

Benefits:

- Motor vehicle laws, including speed limits, could be more safely enforced.
- Vehicle stops would produce less congestion.
- The potential for secondary crashes would be reduced.
- Travel time reliability along the corridor would be improved.
- ERAs would provide potential sites for safe access to roadside ITS devices.

Challenges and Coordination Needs:

- Sites should be located and designed to minimize cost of installation and impacts to drainage patterns within the right-of-way.

Status: Unprogrammed and unfunded, but a candidate action for the 2019-20-21 work plan.

Near-Term Improvements Strategy: Intelligent Transportation Systems

Project: Implementation of Freeway Service Patrol

City/Town: South Portland to Brunswick

Location: Exit 1 to Exit 28

Problem: As traffic volumes have grown on I-295, congestion, incidents, and the number of crashes have increased, and the reliability of travel times on the corridor has decreased. Incidents such as crashes or vehicles stopped on shoulders result in losses of highway capacity that create traffic congestion when traffic volumes are moderate or high. The average duration of an incident on I-95 and I-295 is close to an hour. When congested conditions are created, backups result in delays to travelers and raise the risk of secondary crashes. Longer incidents result in more delays and greater risk of crashes.

Recommended Action: Employ one or more service vehicles to patrol heavily traveled portions of I-295 on a daily basis to respond to incidents, assist motorists, and remove roadside debris as necessary. These service patrols also can be used to verify conditions on the road detected by other means. The use of service patrols can reduce the duration of incidents on the portions of highways covered. The greatest demand for this service is likely to be during the mid-day to early evening hours, Monday through Friday, but additional service could be provided to extend hours, days, or miles patrolled, especially when volumes are seasonally higher.

Benefits:

- Durations of incidents would be reduced.
- Vehicular delay and risk of secondary crashes due to incidents would be reduced.
- Travel time reliability along the corridor would be improved.

Challenges and Coordination Needs:

- The operation of I-295 service patrols should be coordinated with other I-95 service patrols, Maine State Police, and other first responders.
- Sponsorship by insurance companies or other interested organizations could minimize the cost of implementation.
- For maximum benefit, the signs should be operated in coordination with other ITS applications through a transportation management center (TMC).

Status: MaineDOT is actively seeking potential sponsors for such a service.

Near-Term Improvements Strategy: Intelligent Transportation Systems

Project: Installation of Variable Message Signs

City/Town: Portland

Location: Various locations on I-295

Problem: As traffic volumes have grown on I-295, congestion, incidents, and the number of crashes have increased, and the reliability of travel times on the corridor has decreased. Incidents such as crashes or vehicles stopped on shoulders result in losses of highway capacity that create traffic congestion when traffic volumes are moderate or high. The average duration of an incident on I-95 and I-295 is close to an hour. When congested conditions are created, backups result in delays to travelers and raise the risk of secondary crashes.

Recommended Action: Install variable message signs in advance of interchanges on I-295 to alert drivers to road conditions ahead and allow them to make informed decisions on whether or not to seek an alternate route.

Benefits:

- More drivers would be able to avoid incident areas.
- The duration and severity of backups from incidents would be reduced by reducing traffic flow into incident areas.
- Vehicular delay and risk of secondary crashes due to incidents would be reduced.
- Travel time reliability along the corridor would be improved.
- The signs would be available for use in communicating general traffic safety messages to drivers.

Challenges and Coordination Needs:

- For maximum benefit, the signs should be operated in coordination with other ITS applications through a transportation management center (TMC).

Status: Variable message signs have been deployed for all I-295 interchanges north of Portland.

Near-Term Improvements Strategy: Intelligent Transportation Systems

Project: Installation of Travel Time Reliability Monitors and Signs

City/Town: Scarborough, Portland, Falmouth, and other communities`

Location: Various locations on I-95 and I-295

Problem: As traffic volumes have grown on I-295, congestion, incidents, and the number of crashes have increased, and the reliability of travel times on the corridor has decreased. Incidents such as crashes or vehicles stopped on shoulders result in losses of highway capacity that create traffic congestion when traffic volumes are moderate or high. The average duration of an incident on I-95 and I-295 is close to an hour. When congested conditions are created, backups result in delays to travelers and raise the risk of secondary crashes.

Recommended Action: Install a system of devices for real-time monitoring of travel times and speeds on I-95 and I-295 and travel-time message signs in advance of key decision points on I-95 and I-295 to inform drivers of expected travel times, whether normal or delayed, to major destinations ahead and allow them to make informed decisions on whether or not to take an alternate route. Vehicle detection devices for travel time monitoring will be spaced for an appropriate level of travel time accuracy and timely messaging.

Benefits:

- More drivers would be able to avoid incident areas.
- The duration and severity of backups from incidents would be reduced by reducing traffic flow into incident areas.
- Vehicular delay and risk of secondary crashes due to incidents would be reduced.
- Travel time reliability along the corridor would be improved.
- The signs would be available for use in communicating general traffic safety messages to drivers.

Challenges and Coordination Needs:

- MaineDOT and the Maine Turnpike Authority (MTA) would need to coordinate monitoring and reporting responsibilities and delivery of consistent travel time messaging for the traveling public.
- For maximum benefit, the monitoring devices and message signs should be operated in coordination with other ITS applications through a transportation management center (TMC).

Status: MaineDOT and the MTA are in the process of coordinating travel time messaging procedures.

B. Mid-Term Improvements

Short-term improvements can have an immediate impact on the safety and reliability of the I-295 corridor, but more can be done to improve the corridor further and address growing traffic volumes. The recommended mid-term improvements include further actions to develop auxiliary lanes and ITS enhancements for the I-295 corridor. They also include improvements which can serve as holding actions to mitigate the growth of travel on the corridor.

Mid-Term Improvements Strategy: Auxiliary Lanes

Project: Installation of Auxiliary Lanes Between Closely Spaced Interchanges

City/Town: Portland

Location: Exits 5 to 7

Problem: In Portland, I-295 interchanges are closely spaced within the urban environment of the Portland Peninsula. The tight spacing of interchanges and the constrained highway alignment creates a series of segments that have some of the highest volumes in the I-295 corridor, but also have reduced capacity, lower reliability and little opportunity for extension of acceleration and deceleration lanes at on-ramps and off-ramps, respectively.

Recommended Action: Install outside auxiliary lanes between the on-ramps and off-ramps of closely spaced interchanges to serve both acceleration and deceleration functions. As part of this action, review opportunities for cost-effective ramp metering created by the installation of auxiliary lanes. These auxiliary lanes would be at the following locations:

- Northbound between Exit 5 and Exit 6
- Southbound between Exit 7 and Exit 6
- Southbound between Exit 6 and Exit 5

Benefits:

- Ramp entries and exits at these locations would be safer.
- Levels of service at ramp junctions would be raised without increasing through-lane capacity.
- Travel time reliability through the Portland Peninsula would be improved.

Challenges and Coordination Needs:

- Impacts to abutting properties, parks and residential areas, should be minimized.
- A noise analysis for each of the three locations may be required.
- The optimum balance of Portland and MaineDOT interests should be found.

Status: Unfunded and unscheduled.

Mid-Term Improvements Strategy: Intelligent Transportation Systems

Project: Establish a Fully-Coordinated Transportation Management Center

City/Town: Statewide

Location: Statewide

Problem: As traffic volumes grow and incidents increase on Maine's Interstate System and other high priority highways, the need grows to operate the highway system as reliably as possible. ITS devices such as variable message signs, monitoring systems, and service patrols need to be operated in a coordinated manner to achieve their full potential for improving the reliability of the highway network.

Recommended Action: Develop a regional freeway management center or a statewide transportation management center to coordinate actions necessary to inform the traveling public, respond to incidents and other events, and resolve real-time issues in an expeditious and efficient manner.

Benefits:

- Motorists would receive more timely and accurate information about travel conditions statewide.
- More drivers would be able to avoid incident areas.
- The duration and severity of backups from incidents would be reduced by reducing traffic flow into incident areas.
- Vehicular delay and risk of secondary crashes due to incidents would be reduced.
- Travel time reliability along corridors would be improved.
- The signs would be available for use in communicating general traffic safety messages to drivers.

Challenges and Coordination Needs:

- The Maine Turnpike Authority, Maine State Police, and other first responders would need to be integrated into the operation.
- Information provided to the public about traveling conditions must be current, accurate, and reliable.

Status: The Maine Turnpike Authority has an operating control center for its 109 miles of I-95. MaineDOT has been enhancing its radio room operations.

Mid-Term Improvements Strategy: New Highway Capacity

Project: I-95 Widening

City/Town: Portland, South Portland

Location: I-95 Exit 44 to Exit 52

Problem: Forecasted population and employment growth in Portland and surrounding communities is expected to increase travel demand on I-295 by about 20% by 2040. For the urban core of the I-295 corridor in Portland and South Portland, where vehicular demand on some segments is already is at the limits of existing capacity during peak hours, this growth in travel demand would increase the severity of traffic congestion, spreading to more hours and more segments. While space in the median is available for an additional travel lane in each direction in much of the core, earlier proposals have indicated that such an action may not receive local popular support.

Recommended Action: Support the efforts of the Maine Turnpike Authority to increase capacity in the I-95 corridor through Portland and South Portland.

Benefits:

- In Portland and South Portland, additional capacity on I-95 would be expected to reduce future growth in travel demand on I-295 from 20% down to 15%.
- I-95 would be the clear preferred route for thru traffic between Scarborough (and points south) and Falmouth (and points north).
- Future traffic safety and mobility in both corridors would be improved.

Challenges and Coordination Needs:

- Public support would be needed.
- Environmental processes would be followed.

Status: Currently being analyzed for feasibility by the MTA in the Portland Area Mainline Needs Assessment, which is scheduled to be completed in 2018.

Mid-Term Improvements Strategy: Interchange Improvements

Project: Exits 10 and 11 Feasibility Assessment

City/Town: Falmouth

Location: I-295 Exit 10 at Bucknam Road and Exit 11 at the Falmouth Spur

Problem: Exits 10 and 11 are in close proximity. This situation complicates efforts to improve both of these interchanges. The closeness of the existing northbound on-ramp of Exit 10 to the Exit 11 northbound on-ramp prevents extending the Exit 10 acceleration length without modifying the Exit 11 on-ramp. The closeness of the interchanges also complicates the feasibility of converting Exit 11 to a full-service interchange that connects the Falmouth Spur with south-oriented I-295 locations in Portland and South Portland. A costly conceptual solution to both issues that was proposed in the 2010 I-295 Corridor Study is considered infeasible in terms of benefit-cost.

Recommended Action: Conduct a feasibility assessment of interchange modification alternatives that could address the needs of Exit 10, Exit 11 or both. MaineDOT's assessment of Exits 10 and 11 would involve the Town of Falmouth, the Maine Turnpike Authority and PACTS as existing and future conditions are evaluated and alternatives are analyzed.

Benefits:

- Exit 10 would operate more safely and efficiently.
- If economically feasible, a full-service Exit 11 would improve access to the Portland Peninsula from I-95 points north of Portland.

Challenges and Coordination Needs:

- Current access between the Falmouth Spur and Route 1 may be modified.
- Depending on the scope of the alternative, right-of-way impacts are possible.
- The Maine Turnpike Authority and the Town of Falmouth may be affected by some alternatives.

Status: Unfunded and unscheduled.

Mid-Term Improvements		Strategy:	Interchange Improvements

Project:	**Exit 20 Feasibility Assessment**

City/Town:	Freeport

Location:	I-295 Exit 20 at Desert Road

Problem:	The bridge that carries Desert Road over I-295 at Exit 20 needs to be replaced, due to the deteriorated condition of the 60-year-old structure. In addition to the need for a bridge replacement, the northbound off-ramp has been seen to have excessive queuing that spills back along the ramp toward the I-295 northbound travel lanes, a sign of operational deficiencies at the interchange. Also, the Town of Freeport, which continues to see land development and population growth, sees Desert Road as an important link between the more developed east side of town and the less developed, but growing, west side of town. Vehicular, bicycle, and pedestrian connections between the two sides are important Freeport issues.

Recommended Action: Conduct a feasibility assessment of interchange modification alternatives that could address the needs of Exit 20 and the Desert Road crossing of I-295. The MaineDOT assessment of Exit 20 would involve the Town of Freeport as existing and future conditions are evaluated and alternatives are analyzed.

Benefits:

- The bridge replacement project would have the right placement and size to meet both I-295 and local transportation needs.
- Exit 20 would operate more safely and efficiently.
- Travelers of all modes would have improved cross-town transportation access for all users.

Challenges and Coordination Needs:

- Close proximity of Route 1 and Hunter Road intersections to Exit 20 will constrain Exit 20 configuration options.
- Accommodation of all users of Exit 20 and Desert Road need to find a good balance.

Status:	A feasibility assessment has been funded, data collection has been scheduled, and traffic analysis begins in the summer of 2018.

C. Long-Term Improvements

For the long term, the I-295 corridor faces a number of emerging challenges and opportunities.

One of the challenges is the expected growth in travel along the corridor. Traffic growth strains the capacity of the highway, creating congestion, reducing reliability, and reducing safety. In the southern part of the corridor, between Scarborough and Falmouth, the growth is generated by the development and redevelopment of Portland and South Portland. In the northern part of the corridor, between Falmouth and Brunswick, the growth is a combination of Portland-oriented growth, suburban growth, and growth in thru traffic.

The northern part of I-295 has greater ability to absorb the growth in traffic volume than does the southern part. The volumes on northern part of I-295 are lower and the capacity, because the mainline is not as tightly constrained and the interchanges are more widely spaced, is higher. The northern part of I-295 can continue to function at an acceptable level, provided that the near-term and mid-term ITS and auxiliary lane improvements are made.

The strain on capacity caused by this growth is expected to be felt most heavily in the southern part of I-295, particularly around the Portland Peninsula, where existing peak-hour volumes are highest and push up against existing capacity, creating congestion and reduced travel time reliability. This condition can be expected to grow and intensify as traffic volumes increase. Increasing the capacity of I-295 is possible in locations where space in the median exists to construct an added through lane in each direction. However, new mainline lane capacity is costly and would not address the entire capacity need. Because the growth in volume in the southern part of I-295 is expected from local development, new interchange capacity would also be needed. This may be more difficult to achieve than new mainline capacity because increased interchange capacity depends on increased intersection capacity on arterials at and near the interchanges. Adding to the challenge of increasing intersection capacity is the desire for arterials to accommodate all modes of urban transportation. Still another challenge is the provision of added parking capacity for residents, commuters, and visitors. Adequate vehicular capacity to accommodate expected growth requires mainline, interchange, arterial, and parking capacity. If this capacity cannot be provided, either growth expectations need to be lowered or opportunities for alternative means to mitigate vehicular travel demand need to be pursued. The long-term improvements discussed in the following pages present long-term directions that could be explored.

Long-Term Improvements Strategy: New Highway Capacity

Project: Assessment of the Future Effectiveness of the Core Transportation System

City/Town: Portland, South Portland

Location: Exit 1 to Exit 9

Problem: Forecasted population and employment growth in Portland and surrounding communities is expected to increase travel demand on I-295 by 20% by 2040. For the urban core of the I-295 corridor in Portland and South Portland, where vehicular demand on some segments is already is at the limits of existing capacity during peak hours, this growth in travel demand would increase the severity of traffic congestion, spreading to more hours and more segments. While space in the median is available for an additional travel lane in each direction in much of the core, earlier proposals have indicated that such an action may not receive local popular support. Furthermore, additional vehicular traffic would need to compete for street space with other modal demands on the arterials of the two cities, and the parking capacity for growing numbers of residents and employees would need to keep pace. The increase in vehicular travel demand would strain the capacity of, not only I-295, but also its interchanges, urban arterials, and parking facilities. Local and regional efforts are ongoing to mitigate vehicular travel demand through projects to better accommodate pedestrians, bicyclists, and transit riders for short trips and to enhance express bus services for longer trips that often use I-295. With the anticipated growth in population and employment in the Portland area, what is the mix of transportation choices and capacities needed to accommodate this growth, and how big a role will I-295 need to play in the transportation system?

Recommended Action: Assess the future travel demands, existing capacities, and potential opportunities in the core of the two cities to develop a long-range plan to accommodate travel needs with an affordable, balanced, and effective transportation system. Identify the best mixes of local transportation (pedestrian, bicycle, transit, vehicular, parking) capacity and regional transportation (express transit, vehicular, parking) capacity to accommodate the future development in the core communities. Then, determine the appropriate configuration of I-295, its interchanges, and other transportation facilities and services to provide the needed capacity.

Benefits:

- The regional transportation system providing access to Portland and South Portland would scaled to future travel demands.
- Efficient use of space available for future development and transportation infrastructure could be achieved.

Challenges and Coordination Needs:

- Collaboration of MaineDOT, Portland, South Portland, PACTS, transit providers, and others would be needed to find effective solutions.
- Balancing the needs of competing public interests could present challenges.
- Funding to meet transportation capacity needs could be challenging.

Status: Unfunded and unscheduled.

Long-Term Improvements Strategy: Intelligent Transportation Systems

Project: Connected and Automated Vehicles (CAV)

City/Town: Statewide

Location: Statewide

Problem: Forecasted population and employment growth in Portland and surrounding communities is expected to increase travel demand on I-295 by about 20% by 2040. For the urban core of the I-295 corridor in Portland and South Portland, where vehicular demand on some segments is already is at the limits of existing capacity during peak hours, this growth in travel demand would increase the severity of traffic congestion, spreading to more hours and more segments. While space in the median is available for an additional travel lane in each direction in much of the core, earlier proposals have indicated that such an action may not receive local popular support. For other parts of the I-295 corridor, this growth in travel demand would increase peak-hour congestion, reduce travel time reliability, and decrease traffic safety.

Recommended Action: Continue to monitor developments in CAV technology and prepare I-295 and other controlled access highways for the operation of CAVs as an increasing share of the vehicle mix.

Benefits:

- Traffic safety would be improved by reducing the chances of human error and improving reaction time between vehicles.
- Vehicular capacity on controlled access highways would be increased by allowing closer spacing of vehicles, reducing the future need for additional travel lanes.
- Traveler could gain greater personal productivity when drivers can transfer of driving task to the vehicle.

Challenges and Coordination Needs:

- CAV operation on controlled access highways are likely to precede operation on uncontrolled highways, due to the technical challenges of CAV operation on uncontrolled facilities. Therefore, benefits to I-295 mainline safety and capacity would arrive before benefits to interchanges at arterial and collector streets.
- The legal framework, public acceptance, and market penetration of CAVs will take time.

Status: MaineDOT leads an interagency group monitoring and addressing CAV developments.

Appendices

A. 2016 DHV

B. Percent Heavy Vehicles, Tractor Trailers

C. Percent Heavy Vehicles, Single Unit Trucks

D. Crash Summary I - Northbound

E. Crash Summary II - Northbound

F. Crash Summary I - Southbound

G. Crash Summary II - Southbound

H. High Crash Location Diagrams - Northbound

I. High Crash Location Diagrams - Southbound

J. 2016 FREEVAL Level of Service

K. 2040 FREEVAL Level of Service

L. 2040 FREEVAL Accel/Dec Extensions Level of Service

M. 2040 FREEVAL Auxiliary Lanes

N. Ramp Metering Analysis

A. 2016 DHV

AM Baseline

		Southbound Ramps	Southbound Mainline	Northbound Mainline	Northbound Ramps	
			1574	1112		
	off	385			116	on
Exit 28			1189	996		
	on	1335			608	off
				1605		
					55	on
Exit 24				1550		
					61	off
			2524	1611		
	off	470			172	on
Exit 22			2054	1438		
	on	761			210	off
			2815	1649		
	off	297			177	on
Exit 20			2518	1472		
	on	590			551	off
			3108	2023		
	off	287			377	on
Exit 17			2821	1646		
	on	368			264	off
			3189	1910		
	off	202			154	on
Exit 15			2987	1755		
	on	505			355	off
			3492	2110		
Exit 11	off	807			310	on
			2685	1800		
Exit 10	off	406			357	on
			2279	1443		
	on	675			320	off
			2954	1764		
Exit 9	on	536			457	off
			3490	2220		
	off	238			264	on
			3252	1957		

AM Baseline

		Southbound Ramps	Southbound Mainline	Northbound Mainline	Northbound Ramps	
			3252	1957		
Exit 8	on	1324			907	off
			4576	2864		
	off	814			359	on
			3762	2505		
	off	932			275	on
Exit 7			2829	2230		
	on	423			758	off
			3252	2988		
	off	221			603	on
Exit 6B			3031	2385		
	on	129			453	off
			3160	2839		
	off	492			125	on
Exit 6A			2668	2713		
	on	362			432	off
			3029	3146		
Exit 5B	off	518			155	on
			2511			
	on	205		2990		
			2716		322	on
	off	445		2668		
Exit 5A			2271			
	on	295			743	off
Fore River Br			2566	3410		
	off	361			704	on
Exit 4			2204	2707		
	on	638			1242	off
			2842	3948		
Exit 3	off	828			715	on
			2014	3233		
Exit 2	off	734			1114	on
			1280	2119		
	off	487			967	on
Exit 1				1153		
					145	off
			793	1297		

PM Baseline

		Ramps	Southbound Mainline	Northbound Mainline	Ramps	
			1442	1832		
	off	201			235	on
Exit 28			1241	1597		
	on	1108			1043	off
				2640		
					165	on
Exit 24				2475		
					73	off
			2349	2548		
	off	362			238	on
Exit 22			1987	2310		
	on	386			531	off
			2373	2841		
	off	184			396	on
Exit 20			2190	2445		
	on	563			645	off
			2753	3090		
	off	312			438	on
Exit 17			2441	2652		
	on	251			365	off
			2691	3017		
	off	270			201	on
Exit 15			2421	2817		
	on	212			578	off
			2633	3394		
Exit 11	off	673			636	on
			1960	2758		
Exit 10	off	338			413	on
			1623	2345		
	on	525			663	off
			2147	3008		
Exit 9	on	391			555	off
			2538	3563		
	off	231			238	on
			2307	3325		

PM Baseline

		Ramps	Southbound Mainline	Northbound Mainline	Ramps	
			2307	3325		
Exit 8	on	1119			1337	off
			3426	4661		
	off	535			645	on
			2891	4016		
	off	428			1016	on
Exit 7			2463	2999		
	on	740			823	off
			3204	3822		
	off	211			727	on
Exit 6B			2993	3096		
	on	435			388	off
			3428	3483		
	off	523			240	on
Exit 6A			2905	3243		
	on	637			396	off
			3542	3639		
Exit 5B	off	467			289	on
			3075			
	on	326		3350		
			3401		564	on
	off	192		2786		
Exit 5A			3209			
	on	272			615	off
Fore River Bridge			3481	3401		
	off	777			502	on
Exit 4			2704	2899		
	on	1308			770	off
			4012	3669		
Exit 3	off	1166			1176	on
			2845	2493		
Exit 2	off	603			937	on
			2242	1556		
	off	1079			869	on
Exit 1				687		
					86	off
			1164	773		

B. Percent Heavy Vehicles, Tractor Trailers

AM Baseline TT

		Ramps	Southbound Mainline	Northbound Mainline	Ramps	
			3.43	5.43		
	off	2.63			5.43	on
Exit 28			3.69	5.43		
	on	4.18			7.78	off
				6.32		
					6.32	on
Exit 24				6.32		
					6.32	off
			3.95	6.32		
	off	6.94			6.32	on
Exit 22			3.27	6.32		
	on	0.73			1.16	off
			2.58	5.66		
	off	3.17			11.15	on
Exit 20			2.51	5.00		
	on	1.98			3.49	off
			2.41	4.59		
	off	1.92			2.80	on
Exit 17			2.46	5.00		
	on	0.64			1.38	off
			2.25	4.50		
	off	1.07			3.54	on
Exit 15			2.33	4.59		
	on	0.88			5.09	off
			2.12	4.67		
Exit 11	off	2.22			6.70	on
			2.09	4.32		
Exit 10	off	2.26			4.32	on
			2.06	4.32		
	on	1.14			3.28	off
			1.85	4.13		
Exit 9	on	0.51			0.31	off
			1.64	3.35		
	off	0.00			1.02	on
			1.76	3.66		

AM Baseline TT

		Ramps	Southbound Mainline	Northbound Mainline	Ramps	
			1.76	3.66		
Exit 8	on	0.85			2.16	off
			1.50	3.18		
	off	1.50			0.28	on
			1.50	3.60		
	off	0.71			2.53	on
Exit 7			1.76	3.73		
	on	0.71			2.76	off
			1.62	3.49		
	off	1.06			4.46	on
Exit 6B			1.67	3.24		
	on	1.06			2.49	off
			1.64	3.12		
	off	0.50			5.70	on
Exit 6A			1.85	3.00		
	on	1.85			3.00	off
			1.85	3.00		
Exit 5B	off	0.96			2.00	on
			2.03			
	on	4.47		3.05		
			2.22		4.65	on
	off	1.57		2.86		
Exit 5A			2.34			
	on	0.91			0.52	off
Fore River Br			2.18	2.35		
	off	2.18			0.92	on
Exit 4			2.18	2.72		
	on	2.38			3.50	off
			2.22	2.97		
Exit 3	off	0.76			1.33	on
			2.83	3.33		
Exit 2	off	2.53			5.49	on
			3.00	2.19		
	off	0.79			0.69	on
Exit 1				3.45		
					3.45	off
			4.36	3.45		

		PM Baseline TT				
		Southbound	Northbound			
	Ramps		Mainline	Mainline	Ramps	
			5.50	3.59		
	off	8.71			3.59	on
Exit 28			4.98	3.59		
	on	3.88			2.53	off
				3.17		
					3.17	on
Exit 24				3.17		
					3.17	off
			4.46	3.17		
	off	4.93			3.17	on
Exit 22			4.38	3.17		
	on	3.85			1.75	off
			4.29	2.91		
	off	1.66			4.54	on
Exit 20			4.51	2.64		
	on	1.87			1.49	off
			3.97	2.40		
	off	1.78			2.52	on
Exit 17			4.25	2.38		
	on	1.45			3.37	off
			3.99	2.50		
	off	3.90			5.53	on
Exit 15			4.00	2.29		
	on	4.00			1.02	off
			4.00	2.07		
Exit 11	off	5.73			1.29	on
			3.41	2.25		
Exit 10	off	6.27			2.25	on
			2.81	2.25		
	on	1.54			5.47	off
			2.50	2.96		
Exit 9	on	0.77			0.07	off
			2.23	2.51		
	off	0.39			4.68	on
			2.42	2.35		

		PM Baseline TT				
		Southbound	Northbound			
	Ramps		Mainline	Mainline	Ramps	
			2.42	2.35		
Exit 8	on	1.14			1.29	off
			2.00	2.05		
	off	2.00			0.43	on
			2.00	2.31		
	off	0.47			0.84	on
Exit 7			2.27	2.81		
	on	0.47			0.93	off
			1.85	2.40		
	off	1.49			4.13	on
Exit 6B			1.88	2.00		
	on	1.49			2.68	off
			1.83	2.08		
	off	0.87			1.06	on
Exit 6A			2.00	2.15		
	on	2.00			5.37	off
			2.00	2.50		
Exit 5B	off	2.66			1.00	on
			1.90			
	on	0.85		2.63		
			1.80		4.73	on
	off	1.00		2.20		
Exit 5A			1.85			
	on	1.00			0.74	off
Fore River Bridge			1.78	1.94		
	off	1.78			1.19	on
Exit 4			1.78	2.07		
	on	1.37			1.50	off
			1.65	1.95		
Exit 3	off	0.37			1.04	on
			2.17	2.38		
Exit 2	off	2.80			1.85	on
			2.00	2.70		
	off	0.32			0.61	on
Exit 1				5.35		
					5.35	off
			3.56	5.35		

C. Percent Heavy Vehicles, Single Unit Truck

AM Baseline SUT

		Ramps	Southbound Mainline	Northbound Mainline	Ramps	
			3.50	4.66		
	off	4.23			4.66	on
Exit 28			3.27	4.66		
	on	2.82			5.56	off
				5.00		
					5.00	on
Exit 24				5.00		
					5.00	off
			3.03	5.00		
	off	1.92			5.00	on
Exit 22			3.29	5.00		
	on	4.23			4.84	off
			3.54	4.98		
	off	3.88			5.15	on
Exit 20			3.50	4.96		
	on	0.87			2.32	off
			3.00	4.24		
	off	5.06			2.28	on
Exit 17			2.79	4.69		
	on	2.36			3.32	off
			2.74	4.50		
	off	3.04			4.44	on
Exit 15			2.72	4.51		
	on	3.96			4.53	off
			2.90	4.51		
Exit 11	off	3.81			13.92	on
			2.63	2.89		
Exit 10	off	4.17			2.89	on
			2.35	2.89		
	on	0.82			3.77	off
			2.00	3.05		
Exit 9	on	2.39			2.88	off
			2.06	3.02		
	off	1.42			1.02	on
			2.11	3.28		

AM Baseline SUT

		Ramps	Southbound Mainline	Northbound Mainline	Ramps	
			2.11	3.28		
Exit 8	on	1.74			4.06	off
			2.00	3.53		
	off	2.00			3.32	on
			2.00	3.56		
	off	1.41			3.97	on
Exit 7			2.19	3.51		
	on	1.41			3.18	off
			2.09	3.42		
	off	1.60			3.76	on
Exit 6B			2.13	3.34		
	on	1.60			2.28	off
			2.11	3.17		
	off	2.69			6.83	on
Exit 6A			2.00	3.00		
	on	2.00			3.00	off
			2.00	3.00		
Exit 5B	off	1.60			3.00	on
			2.08			
	on	3.17		3.00		
			2.16		4.41	on
	off	1.14		2.83		
Exit 5A			2.36			
	on	3.63			2.97	off
Fore River Br			2.51	2.86		
	off	2.51			4.23	on
Exit 4			2.51	2.50		
	on	2.66			4.62	off
			2.54	3.17		
Exit 3	off	1.59			2.74	on
			2.94	3.26		
Exit 2	off	1.95			5.92	on
			3.50	1.87		
	off	1.02			1.40	on
Exit 1				2.26		
					2.26	off
			5.02	2.26		

PM Baseline SUT

	Southbound Ramps		Southbound Mainline	Northbound Mainline	Northbound Ramps	
			3.45	3.72		
	off	3.76			3.72	on
Exit 28			3.40	3.72		
	on	3.29			4.30	off
				3.95		
					3.95	on
Exit 24				3.95		
					0.46	off
			3.35	3.85		
	off	2.66			3.85	on
Exit 22			3.48	3.85		
	on	4.24			0.21	off
			3.60	3.17		
	off	4.80			7.37	on
Exit 20			3.50	2.49		
	on	0.81			0.43	off
			2.95	2.06		
	off	0.60			2.42	on
Exit 17			3.25	2.00		
	on	0.56			2.00	off
			3.00	2.00		
	off	3.00			3.97	on
Exit 15			3.00	1.86		
	on	4.37			1.04	off
			3.11	1.72		
Exit 11	off	3.98			2.24	on
			2.81	1.60		
Exit 10	off	4.25			1.60	on
			2.51	1.60		
	on	0.42			2.28	off
			2.00	1.75		
Exit 9	on	1.73			1.03	off
			1.96	1.64		
	off	0.39			3.17	on
			2.12	1.53		

PM Baseline SUT

	Southbound Ramps		Southbound Mainline	Northbound Mainline	Northbound Ramps	
			2.12	1.53		
Exit 8	on	1.76			3.02	off
			2.00	1.96		
	off	2.00			1.50	on
			2.00	2.03		
	off	1.17			1.28	on
Exit 7			2.14	2.28		
	on	1.17			2.12	off
			1.92	2.25		
	off	2.27			5.06	on
Exit 6B			1.89	1.59		
	on	2.27			7.53	off
			1.94	2.25		
	off	1.62			0.49	on
Exit 6A			2.00	2.38		
	on	2.00			3.48	off
			2.00	2.50		
Exit 5B	off	1.41			3.00	on
			2.09			
	on	3.02		2.46		
			2.18		6.53	on
	off	3.00		1.63		
Exit 5A			2.13			
	on	2.13			2.12	off
Fore River Bridge			2.13	1.72		
	off	2.13			2.09	on
Exit 4			2.13	1.66		
	on	1.89			2.17	off
			2.05	1.76		
Exit 3	off	1.80			0.99	on
			2.16	2.13		
Exit 2	off	0.87			3.02	on
			2.50	1.59		
	off	0.60			0.15	on
Exit 1				3.41		
					3.41	off
			4.26	3.41		

D. Crash Summary I – Northbound

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary Report

Report Selections and Input Parameters

REPORT SELECTIONS

☑ Crash Summary I ☐ Section Detail ☑ Crash Summary II ☐ 1320 Public ☐ 1320 Private ☐ 1320 Summary

REPORT DESCRIPTION

I 295 NB from Toll Plaza in Scarborough to Exit 28 On Ramp in Bruswick

REPORT PARAMETERS

Year 2014, Start Month 1 through Year 2016 End Month: 12

Route: **0295X**	Start Node: **19238**	Start Offset: **0**	☐ **Exclude First Node**
	End Node: **19229**	End Offset: **0**	☐ **Exclude Last Node**

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	CRF
19238	0295X - 0.57	Non Int I 295 NB	2	1	0	0	0	0	1	0.0	4.088	0.08 Statewide Crash Rate:	0.33 0.12	0.00
71276	0295X - 0.66	Int of CROSSOVER RD I 295 NB	1	1	0	0	0	0	1	0.0	4.090	0.08 Statewide Crash Rate:	0.12 0.03	0.00
19237	0295X - 0.84	TL Scarborough South Portland	2	0	0	0	0	0	0	0.0	4.088	0.00 Statewide Crash Rate:	0.33 0.12	0.00
19236	0295X - 1	Int of I 295 NB RAMP OFF TO ROUTE 8239	2	0	0	0	0	0	0	0.0	4.088	0.00 Statewide Crash Rate:	0.33 0.12	0.00
19234	0295X - 1.30	Int of I 295 NB RAMP ON FROM ROUTE 8239	2	1	0	0	0	1	0	100.0	6.826	0.05 Statewide Crash Rate:	0.29 0.12	0.00
19242	0295X - 1.99	Int of I 295 NB RAMP ON FROM SCARBOROUGH CONNEC	2	2	0	0	0	0	2	0.0	10.855	0.06 Statewide Crash Rate:	0.26 0.12	0.00
19244	0295X - 2.44	Int of I 295 NB RAMP ON FROM WESTBROOK ST	2	2	0	0	0	0	2	0.0	14.549	0.05 Statewide Crash Rate:	0.24 0.12	0.00
71274	0295X - 2.73	Int of CROSSOVER RD I 295 NB	2	0	0	0	0	0	0	0.0	14.551	0.00 Statewide Crash Rate:	0.24 0.12	0.00
19245	0295X - 2.87	Int of I 295 NB RAMP OFF TO VETERANS BRIDGE	2	2	0	0	0	1	1	50.0	14.549	0.05 Statewide Crash Rate:	0.24 0.12	0.00
19177	0295X - 3.54	Int of I 295 NB US ROUTE 1 HWY RAMP	2	2	0	0	0	0	2	0.0	13.333	0.05 Statewide Crash Rate:	0.25 0.12	0.00
19178	0295X - 3.70	TL Portland South Portland	2	0	0	0	0	0	0	0.0	13.333	0.00 Statewide Crash Rate:	0.25 0.12	0.00
71272	0295X - 3.84	Int of CROSSOVER RD I 295 NB	2	0	0	0	0	0	0	0.0	13.335	0.00 Statewide Crash Rate:	0.25 0.12	0.00
19179	0295X - 4.01	Int of I 295 NB SLIP RAMP ON OFF 295 NB	2	1	0	0	0	0	1	0.0	13.333	0.02 Statewide Crash Rate:	0.25 0.12	0.00
19180	0295X - 4.26	BRG 6292 I 295 NB over FORE RIVER PARKWAY	2	0	0	0	0	0	0	0.0	10.731	0.00 Statewide Crash Rate:	0.26 0.12	0.00
19188	0295X - 4.58	Int of I 295 NB SLIP RAMP ON OFF 295 NB	2	6	0	0	0	0	6	0.0	12.695	0.16 Statewide Crash Rate:	0.25 0.12	0.00
17641	0295X - 4.74	Int of I 295 NB RAMP ON FROM PARK AV	2	2	0	0	0	0	2	0.0	13.534	0.05 Statewide Crash Rate:	0.25 0.12	0.00
19189	0295X - 5.14	Int of I 295 NB RAMP A OFF TO FOREST AV	2	3	0	0	0	1	2	33.3	13.534	0.07 Statewide Crash Rate:	0.25 0.12	0.00
19175	0295X - 5.33	Int of I 295 NB RAMP C ON FROM FOREST AV	2	4	0	0	2	1	1	75.0	12.775	0.10 Statewide Crash Rate:	0.25 0.12	0.00
19194	0295X - 5.39	Int of I 295 NB RAMP E OFF TO FOREST AV	2	3	0	1	0	0	2	33.3	12.775	0.08 Statewide Crash Rate:	0.25 0.12	0.00
19195	0295X - 5.58	Int of I 295 NB RAMP G ON FROM FOREST AV	2	3	0	0	0	0	3	0.0	13.545	0.07 Statewide Crash Rate:	0.25 0.12	0.00
19196	0295X - 5.68	Int of I 295 NB RAMP A OFF TO FRANKLIN ST ART	2	3	0	0	0	0	3	0.0	13.545	0.07 Statewide Crash Rate:	0.25 0.12	0.00
19199	0295X - 6.18	Int of I 295 NB RAMP C ON FROM FRANKLIN ST ART	2	0	0	0	0	0	0	0.0	13.870	0.00 Statewide Crash Rate:	0.25 0.12	0.00

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	Injury Crashes K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	CRF
71270	0295X - 6.25	Int of CROSSOVER RD I 295 NB	2	0	0	0	0	0	0	0.0	13.875	0.00	0.25	0.00
												Statewide Crash Rate:	0.12	
18718	0295X - 6.57	Int of I 295 NB WASHINGTON AV	2	4	0	0	1	1	2	50.0	15.987	0.08	0.24	0.00
												Statewide Crash Rate:	0.12	
18719	0295X - 6.73	Int of I 295 NB WASHINGTON AV	2	2	0	0	0	0	2	0.0	15.987	0.04	0.24	0.00
												Statewide Crash Rate:	0.12	
18720	0295X - 6.97	Int of I 295 NB US 1 NB	2	1	0	0	0	0	1	0.0	12.140	0.03	0.25	0.00
												Statewide Crash Rate:	0.12	
17642	0295X - 7.12	Int of I 295 NB US 1 NB	2	1	0	0	1	0	0	100.0	12.140	0.03	0.25	0.00
												Statewide Crash Rate:	0.12	
71268	0295X - 7.73	Int of CROSSOVER RD I 295 NB	2	0	0	0	0	0	0	0.0	9.860	0.00	0.27	0.00
												Statewide Crash Rate:	0.12	
18724	0295X - 8.46	TL Falmouth Portland	2	0	0	0	0	0	0	0.0	9.859	0.00	0.27	0.00
												Statewide Crash Rate:	0.12	
71266	0295X - 8.99	Int of CROSSOVER RD I 295 NB	2	0	0	0	0	0	0	0.0	9.860	0.00	0.27	0.00
												Statewide Crash Rate:	0.12	
18725	0295X - 9.45	BRG 5828 I 295 NB over PRESUMPSCOT RIVER	2	1	0	0	0	0	1	0.0	9.859	0.03	0.27	0.00
												Statewide Crash Rate:	0.12	
18727	0295X - 10.25	BRG 5829 I 295 NB under LUNT RD	2	0	0	0	0	0	0	0.0	9.859	0.00	0.27	0.00
												Statewide Crash Rate:	0.12	
71264	0295X - 10.54	Int of CROSSOVER RD I 295 NB	2	1	0	0	0	0	1	0.0	9.860	0.03	0.27	0.00
												Statewide Crash Rate:	0.12	
18730	0295X - 10.65	Int of I 295 NB RAMP OFF TO BUCKNAM RD	2	4	0	0	1	0	3	25.0	9.859	0.14	0.27	0.00
												Statewide Crash Rate:	0.12	
18732	0295X - 10.82	Int of I 295 NB RAMP ON FROM BUCKNAM RD	2	2	0	0	0	1	1	50.0	9.172	0.07	0.27	0.00
												Statewide Crash Rate:	0.12	
18733	0295X - 10.94	Int of I 295 NB I 495 EB	2	5	0	0	0	0	5	0.0	10.669	0.16	0.26	0.00
												Statewide Crash Rate:	0.12	
71262	0295X - 11.30	Int of CROSSOVER RD I 295 NB	2	1	0	0	1	0	0	100.0	10.671	0.03	0.26	0.00
												Statewide Crash Rate:	0.12	
71259	0295X - 12.30	Int of CROSSOVER RD I 295 NB	1	0	0	0	0	0	0	0.0	10.671	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
18624	0295X - 12.34	TL Cumberland Falmouth	1	0	0	0	0	0	0	0.0	10.669	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
71257	0295X - 14.34	Int of CROSSOVER RD I 295 NB	1	0	0	0	0	0	0	0.0	10.671	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
18626	0295X - 15.08	TL Cumberland Yarmouth	2	0	0	0	0	0	0	0.0	10.669	0.00	0.26	0.00
												Statewide Crash Rate:	0.12	
69063	0295X - 15.17	Int of I 295 NB RAMP A OFF TO US 1	2	2	0	0	0	0	2	0.0	10.669	0.06	0.26	0.00
												Statewide Crash Rate:	0.12	
69062	0295X - 15.42	Int of I 295 NB RAMP TO I 295	2	1	0	0	0	0	1	0.0	9.972	0.03	0.27	0.00
												Statewide Crash Rate:	0.12	
71255	0295X - 15.53	Int of CROSSOVER RD I 295 NB	2	0	0	0	0	0	0	0.0	9.974	0.00	0.27	0.00
												Statewide Crash Rate:	0.12	

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	CRF
71253	0295X - 16.76	Int of CROSSOVER RD I 295 NB	2	1	0	0	1	0	0	100.0	9.974	0.03	0.27	0.00
												Statewide Crash Rate:	0.12	
19278	0295X - 16.94	Int of I 295 NB RAMP C OFF TO US 1	2	2	0	1	0	1	0	100.0	9.972	0.07	0.27	0.00
												Statewide Crash Rate:	0.12	
18632	0295X - 17.67	Int of I 295 NB RAMP D ON FROM US 1	1	0	0	0	0	0	0	0.0	10.111	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
15826	0295X - 17.98	TL Freeport Yarmouth	1	0	0	0	0	0	0	0.0	10.111	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
71251	0295X - 18.77	Int of CROSSOVER RD I 295 NB	1	0	0	0	0	0	0	0.0	10.112	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
71249	0295X - 20.11	Int of CROSSOVER RD I 295 NB	1	0	0	0	0	0	0	0.0	10.112	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
15831	0295X - 20.25	Int of I 295 NB RAMP G OFF TO DESERT RD	1	0	0	0	0	0	0	0.0	10.111	0.00	0.09	0.00
												Statewide Crash Rate:	0.03	
18634	0295X - 20.99	Int of I 295 NB RAMP H ON FROM DESERT RD	1	0	0	0	0	0	0	0.0	9.359	0.00	0.10	0.00
												Statewide Crash Rate:	0.03	
19276	0295X - 22.27	Int of I 295 NB RAMP OFF TO ROUTE 125 AND 136	2	3	0	0	2	1	0	100.0	9.359	0.11	0.27	0.00
												Statewide Crash Rate:	0.12	
19258	0295X - 22.44	Int of I 295 NB RAMP ON FROM ROUTE 125 AND 136	2	1	0	0	0	0	1	0.0	8.902	0.04	0.27	0.00
												Statewide Crash Rate:	0.12	
71247	0295X - 23.37	Int of CROSSOVER RD I 295 NB	1	0	0	0	0	0	0	0.0	8.904	0.00	0.10	0.00
												Statewide Crash Rate:	0.03	
19264	0295X - 23.70	Int of I 295 NB RAMP OFF TO US 1	1	1	0	0	1	0	0	100.0	8.902	0.04	0.10	0.00
												Statewide Crash Rate:	0.03	
18637	0295X - 23.80	Int of I 295 NB RAMP ON FROM US 1	1	0	0	0	0	0	0	0.0	9.271	0.00	0.10	0.00
												Statewide Crash Rate:	0.03	
18638	0295X - 25.71	TL Brunswick Freeport	1	0	0	0	0	0	0	0.0	8.888	0.00	0.10	0.00
												Statewide Crash Rate:	0.03	
71242	0295X - 26.59	Int of CROSSOVER RD I 295 NB	1	0	0	0	0	0	0	0.0	8.890	0.00	0.10	0.00
												Statewide Crash Rate:	0.03	
19228	0295X - 28.15	Int of EXIT 28 NB OFF I 295 NB	1	3	0	0	1	0	2	33.3	8.888	0.11	0.10	1.15
												Statewide Crash Rate:	0.03	
19229	0295X - 28.80	Int of EXIT 28 NB ON I 295 NB	1	0	0	0	0	0	0	0.0	5.953	0.00	0.11	0.00
												Statewide Crash Rate:	0.03	
Study Years: 3.00			**NODE TOTALS:**	72	0	2	11	8	51	29.2	648.793	0.04	0.12	0.32

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
71276	19238	3967900	0 - 0.09	0295X - 0.57	0.09	1	0	0	0	0	0	0	0.0	0.00368	0.00	212.11	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
19237	71276	3967899	0 - 0.18	0295X - 0.66	0.18	1	1	0	0	0	0	1	0.0	0.00736	45.30	177.80	0.00
TL Scarborough South Portland				INT 295 NB											Statewide Crash Rate: 62.92		
19236	19237	3139313	0 - 0.16	0295X - 0.84	0.16	2	1	0	0	0	0	1	0.0	0.00654	50.96	211.59	0.00
Int of I 295 NB RAMP OFF TO ROUTE 8239				INT 295 NB											Statewide Crash Rate: 76.37		
19234	19236	3139312	0 - 0.30	0295X - 1	0.30	2	0	0	0	0	0	0	0.0	0.01076	0.00	186.16	0.00
Int of I 295 NB RAMP ON FROM ROUTE 8239				INT 295 NB											Statewide Crash Rate: 76.37		
19242	19234	3937844	0 - 0.40	0295X - 1.30	0.40	2	3	0	0	0	0	3	0.0	0.02730	36.63	148.92	0.00
Int of I 295 NB RAMP ON FROM SCARBOROUGH CONNECTOR				INT 295 NB											Statewide Crash Rate: 76.37		
19242	19234	3937844	0.40 - 0.69	0295X - 1.70	0.29	2	7	0	0	3	1	3	57.1	0.01979	117.88	160.33	0.00
Int of I 295 NB RAMP ON FROM SCARBOROUGH CONNECTOR				INT 295 NB											Statewide Crash Rate: 76.37		
19244	19242	3937740	0 - 0.45	0295X - 1.99	0.45	2	11	0	0	1	2	8	27.3	0.04885	75.06	131.76	0.00
Int of I 295 NB RAMP ON FROM WESTBROOK ST				INT 295 NB											Statewide Crash Rate: 76.37		
19244	71274	4033591	0 - 0.29	0295X - 2.44	0.29	2	28	0	0	4	3	21	25.0	0.04219	221.21	135.69	1.63
Int of I 295 NB RAMP ON FROM WESTBROOK ST				INT 295 NB											Statewide Crash Rate: 76.37		
71274	19245	3967877	0 - 0.14	0295X - 2.73	0.14	2	14	0	1	1	1	11	21.4	0.02037	229.11	159.26	1.44
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
19177	19245	3115791	0 - 0.67	0295X - 2.87	0.67	2	14	0	1	2	1	10	28.6	0.07786	59.93	120.81	0.00
Int of I 295 NB US ROUTE 1 HWY RAMP				INT 295 NB											Statewide Crash Rate: 76.37		
19177	19178	2523558	0 - 0.16	0295X - 3.54	0.16	2	13	0	0	2	2	9	30.8	0.02133	203.12	157.54	1.29
Int of I 295 NB US ROUTE 1 HWY RAMP				INT 295 NB											Statewide Crash Rate: 76.37		
19178	71272	3967856	0 - 0.01	0295X - 3.70	0.01	2	1	0	0	0	0	1	0.0	0.00133	250.00	307.31	0.00
TL Portland South Portland				INT 295 NB											Statewide Crash Rate: 76.37		
19178	71272	3967856	0.01 - 0.14	0295X - 3.71	0.13	2	10	0	0	1	2	7	30.0	0.01733	192.31	165.47	1.16
TL Portland South Portland				INT 295 NB											Statewide Crash Rate: 76.37		
71272	19179	4033594	0 - 0.17	0295X - 3.84	0.17	2	2	0	0	1	0	1	50.0	0.02267	29.41	155.34	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
19179	19180	3119821	0 - 0.25	0295X - 4.01	0.25	2	3	0	0	0	1	2	33.3	0.02683	37.28	149.51	0.00
Int of I 295 NB SLIP RAMP ON OFF 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
19180	19188	3943961	0 - 0.32	0295X - 4.26	0.32	2	4	0	0	0	1	3	25.0	0.03434	38.83	141.65	0.00
BRG 6292 I 295 NB over FORE RIVER PARKWAY				INT 295 NB											Statewide Crash Rate: 76.37		
17641	19188	3139309	0 - 0.16	0295X - 4.58	0.16	2	3	0	0	0	0	3	0.0	0.02031	49.23	159.36	0.00
Int of I 295 NB RAMP ON FROM PARK AV				INT 295 NB											Statewide Crash Rate: 76.37		
17641	19189	3115788	0 - 0.40	0295X - 4.74	0.40	2	19	0	0	4	1	14	26.3	0.05414	116.99	129.15	0.00
Int of I 295 NB RAMP ON FROM PARK AV				INT 295 NB											Statewide Crash Rate: 76.37		

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
19175	19189	3139308	0 - 0.19	0295X - 5.14	0.19	2	7	0	0	1	0	6	14.3	0.02270	102.80	155.30	0.00
Int of I 295 NB RAMP C ON FROM FOREST AV				INT 295 NB											Statewide Crash Rate: 76.37		
19175	19194	3139307	0 - 0.06	0295X - 5.33	0.06	2	8	0	0	0	1	7	12.5	0.00767	347.90	203.08	1.71
Int of I 295 NB RAMP C ON FROM FOREST AV				INT 295 NB											Statewide Crash Rate: 76.37		
19194	19195	3139306	0 - 0.19	0295X - 5.39	0.19	2	3	0	0	0	2	1	66.7	0.02101	47.59	158.10	0.00
Int of I 295 NB RAMP E OFF TO FOREST AV				INT 295 NB											Statewide Crash Rate: 76.37		
19195	19196	3139305	0 - 0.10	0295X - 5.58	0.10	2	7	0	0	2	0	5	28.6	0.01355	172.26	175.74	0.00
Int of I 295 NB RAMP G ON FROM FOREST AV				INT 295 NB											Statewide Crash Rate: 76.37		
19196	19199	3115787	0 - 0.50	0295X - 5.68	0.50	2	11	0	0	1	2	8	27.3	0.05502	66.64	128.75	0.00
Int of I 295 NB RAMP A OFF TO FRANKLIN ST ART				INT 295 NB											Statewide Crash Rate: 76.37		
71270	19199	3967836	0 - 0.07	0295X - 6.18	0.07	2	2	0	0	0	1	1	50.0	0.00971	68.65	191.10	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
18718	71270	3967835	0 - 0.32	0295X - 6.25	0.32	2	12	0	0	1	3	8	33.3	0.04440	90.10	134.30	0.00
Int of I 295 NB WASHINGTON AV				INT 295 NB											Statewide Crash Rate: 76.37		
18718	18719	3139304	0 - 0.16	0295X - 6.57	0.16	2	19	0	0	3	1	15	21.1	0.02558	247.60	151.12	1.64
Int of I 295 NB WASHINGTON AV				INT 295 NB											Statewide Crash Rate: 76.37		
18719	18720	3129692	0 - 0.24	0295X - 6.73	0.24	2	11	0	0	1	0	10	9.1	0.02651	138.32	149.91	0.00
Int of I 295 NB WASHINGTON AV				INT 295 NB											Statewide Crash Rate: 76.37		
17642	18720	3139303	0 - 0.15	0295X - 6.97	0.15	2	13	0	0	2	0	11	15.4	0.01821	237.97	163.53	1.46
Int of I 295 NB US 1 NB				INT 295 NB											Statewide Crash Rate: 76.37		
17642	71268	3967804	0 - 0.61	0295X - 7.12	0.61	2	17	0	0	1	1	15	11.8	0.06014	94.23	126.60	0.00
Int of I 295 NB US 1 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71268	18724	3967805	0 - 0.73	0295X - 7.73	0.73	2	7	0	0	1	0	6	14.3	0.07197	32.42	122.50	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
18724	71266	3967783	0 - 0.53	0295X - 8.46	0.53	2	6	0	0	0	1	5	16.7	0.05225	38.28	130.04	0.00
TL Falmouth Portland				INT 295 NB											Statewide Crash Rate: 76.37		
71266	18725	3967784	0 - 0.46	0295X - 8.99	0.46	2	5	0	1	1	1	2	60.0	0.04535	36.75	133.73	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
18725	18727	3120756	0 - 0.80	0295X - 9.45	0.80	2	21	0	0	0	3	18	14.3	0.07887	88.75	120.54	0.00
BRG 5828 I 295 NB over PRESUMPSCOT RIVER				INT 295 NB											Statewide Crash Rate: 76.37		
18727	71264	3967762	0 - 0.29	0295X - 10.25	0.29	2	6	0	0	1	1	4	33.3	0.02859	69.95	147.41	0.00
BRG 5829 I 295 NB under LUNT RD				INT 295 NB											Statewide Crash Rate: 76.37		
71264	18730	3967763	0 - 0.11	0295X - 10.54	0.11	2	4	0	0	0	0	4	0.0	0.01084	122.95	185.81	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
18730	18732	3122995	0 - 0.17	0295X - 10.65	0.17	2	4	0	0	2	0	2	50.0	0.01319	101.12	176.92	0.00
Int of I 295 NB RAMP OFF TO BUCKNAM RD				INT 295 NB											Statewide Crash Rate: 76.37		
18732	18733	3123996	0 - 0.12	0295X - 10.82	0.12	2	7	0	0	0	0	7	0.0	0.01101	211.99	185.11	1.15
Int of I 295 NB RAMP ON FROM BUCKNAM RD				INT 295 NB											Statewide Crash Rate: 76.37		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
71262	18733	3967742	0 - 0.11	0295X - 10.94	0.11	2	4	1	0	0	0	3	25.0	0.01174	113.61	182.14	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71262	18733	3967742	0.11 - 0.30	0295X - 11.05	0.19	2	4	0	0	0	1	3	25.0	0.02027	65.78	159.44	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71262	18733	3967742	0.30 - 0.36	0295X - 11.24	0.06	2	0	0	0	0	0	0	0.0	0.00640	0.00	212.78	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71259	71262	3967741	0 - 1	0295X - 11.30	1	1	20	0	0	1	1	18	10.0	0.10669	62.49	97.48	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
18624	71259	3967718	0 - 0.04	0295X - 12.30	0.04	1	2	0	0	0	1	1	50.0	0.00427	156.22	204.45	0.00
TL Cumberland Falmouth				INT 295 NB											Statewide Crash Rate: 62.92		
18624	71257	3967694	0 - 2	0295X - 12.34	2	1	34	0	1	2	3	28	17.6	0.21338	53.11	87.68	0.00
TL Cumberland Falmouth				INT 295 NB											Statewide Crash Rate: 62.92		
71257	18626	3967695	0 - 0.74	0295X - 14.34	0.74	1	16	0	0	3	2	11	31.3	0.07895	67.55	102.79	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
18626	69063	3505667	0 - 0.09	0295X - 15.08	0.09	2	2	0	0	1	0	1	50.0	0.00960	69.43	191.65	0.00
TL Cumberland Yarmouth				INT 295 NB											Statewide Crash Rate: 76.37		
69063	69062	3944350	0 - 0.07	0295X - 15.17	0.07	2	1	0	0	0	0	1	0.0	0.00654	50.96	211.59	0.00
Int of I 295 NB RAMP A OFF TO US 1				INT 295 NB											Statewide Crash Rate: 76.37		
69063	69062	3944350	0.07 - 0.25	0295X - 15.24	0.18	2	2	0	0	0	0	2	0.0	0.01682	39.64	166.68	0.00
Int of I 295 NB RAMP A OFF TO US 1				INT 295 NB											Statewide Crash Rate: 76.37		
69062	71255	3967674	0 - 0.11	0295X - 15.42	0.11	1	6	0	0	0	3	3	50.0	0.01097	182.33	160.37	1.14
Int of I 295 NB RAMP TO I 295				INT 295 NB											Statewide Crash Rate: 62.92		
71255	71253	4033596	0 - 0.22	0295X - 15.53	0.22	2	1	0	0	0	0	1	0.0	0.02194	15.19	156.52	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71255	71253	4033596	0.22 - 1.23	0295X - 15.75	1.01	2	18	0	1	0	4	13	27.8	0.10072	59.57	115.67	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71253	19278	3967655	0 - 0.14	0295X - 16.76	0.14	2	6	0	0	0	1	5	16.7	0.01396	143.26	174.43	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
71253	19278	3967655	0.14 - 0.18	0295X - 16.90	0.04	2	2	0	0	0	0	2	0.0	0.00399	167.14	240.38	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 76.37		
18632	19278	3115786	0 - 0.73	0295X - 16.94	0.73	1	26	0	0	3	2	21	19.2	0.06429	134.80	106.85	1.26
Int of I 295 NB RAMP D ON FROM US 1				INT 295 NB											Statewide Crash Rate: 62.92		
15826	18632	3121423	0 - 0.31	0295X - 17.67	0.31	1	2	0	1	0	0	1	50.0	0.03134	21.27	124.24	0.00
TL Freeport Yarmouth				INT 295 NB											Statewide Crash Rate: 62.92		
15826	71251	3967626	0 - 0.79	0295X - 17.98	0.79	1	15	0	1	2	3	9	40.0	0.07987	62.60	102.58	0.00
TL Freeport Yarmouth				INT 295 NB											Statewide Crash Rate: 62.92		
71251	71249	3967627	0 - 1.34	0295X - 18.77	1.34	1	15	0	0	0	1	14	6.7	0.13548	36.91	93.74	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
71249	15831	3967607	0 - 0.14	0295X - 20.11	0.14	1	1	0	0	1	0	0	100.0	0.01415	23.55	150.30	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Sections																		
Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
15831	18634	3122991	0 - 0.74	0295X - 20.25	0.74	1	4	0	0	0	1	3	25.0	0.06145	21.70	107.80	0.00
Int of I 295 NB RAMP G OFF TO DESERT RD				INT 295 NB											Statewide Crash Rate: 62.92		
18634	19276	3115915	0 - 1.28	0295X - 20.99	1.28	1	22	0	1	0	3	18	18.2	0.11979	61.22	95.61	0.00
Int of I 295 NB RAMP H ON FROM DESERT RD				INT 295 NB											Statewide Crash Rate: 62.92		
19258	19276	3139325	0 - 0.17	0295X - 22.27	0.17	1	2	0	0	1	0	1	50.0	0.01336	49.90	152.51	0.00
Int of I 295 NB RAMP ON FROM ROUTE 125 AND 136				INT 295 NB											Statewide Crash Rate: 62.92		
19258	71247	3967586	0 - 0.93	0295X - 22.44	0.93	1	8	0	0	2	1	5	37.5	0.08279	32.21	101.91	0.00
Int of I 295 NB RAMP ON FROM ROUTE 125 AND 136				INT 295 NB											Statewide Crash Rate: 62.92		
71247	19264	3967587	0 - 0.33	0295X - 23.37	0.33	1	4	0	0	0	1	3	25.0	0.02938	45.39	126.08	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
18637	19264	3122990	0 - 0.10	0295X - 23.70	0.10	1	2	0	0	1	0	1	50.0	0.00857	77.82	170.93	0.00
Int of I 295 NB RAMP ON FROM US 1				INT 295 NB											Statewide Crash Rate: 62.92		
18637	18638	3115796	0 - 1.91	0295X - 23.80	1.91	1	23	0	2	2	1	18	21.7	0.16976	45.16	90.57	0.00
Int of I 295 NB RAMP ON FROM US 1				INT 295 NB											Statewide Crash Rate: 62.92		
18638	71242	3967537	0 - 0.88	0295X - 25.71	0.88	1	6	0	0	2	0	4	33.3	0.07821	25.57	102.97	0.00
TL Brunswick Freeport				INT 295 NB											Statewide Crash Rate: 62.92		
71242	19228	3967538	0 - 1.56	0295X - 26.59	1.56	1	20	0	2	2	3	13	35.0	0.13865	48.08	93.40	0.00
Int of CROSSOVER RD I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
19228	19229	3115794	0 - 0.65	0295X - 28.15	0.65	1	4	0	1	1	0	2	50.0	0.03488	38.23	121.31	0.00
Int of EXIT 28 NB OFF I 295 NB				INT 295 NB											Statewide Crash Rate: 62.92		
Study Years: 3.00				**Section Totals:**	28.23		576	1	13	60	64	438	24.0	2.76774	69.37	76.52	0.91
				Grand Totals:	28.23		648	1	15	71	72	489	24.5	2.76774	78.04	98.28	0.79

E. Crash Summary II – Northbound

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Day and Hour

	Hour of Day																									
	AM												PM													
Day Of Week	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Un**	**Tot**
SUNDAY	3	4	2	0	2	2	3	1	2	2	2	3	2	5	1	1	3	3	6	2	2	3	3	1	0	58
MONDAY	2	0	2	0	0	3	3	8	6	4	4	1	6	6	5	3	13	16	4	2	0	3	3	0	0	94
TUESDAY	2	1	2	2	0	1	2	4	4	1	2	1	7	5	2	7	10	14	2	2	1	1	2	1	0	76
WEDNESDAY	3	3	0	0	0	2	3	7	2	1	2	1	2	6	6	9	14	21	3	0	3	1	2	1	0	92
THURSDAY	2	1	1	0	0	2	2	5	3	2	2	2	1	3	3	9	23	26	7	3	2	0	3	2	0	104
FRIDAY	2	3	2	2	0	0	1	2	6	7	4	5	1	10	9	22	31	31	6	5	1	3	5	4	0	162
SATURDAY	2	1	3	1	0	1	2	2	1	5	5	2	6	3	5	1	2	5	1	0	4	5	3	2	0	62
Totals	16	13	12	5	2	11	16	29	24	22	21	15	25	38	31	52	96	116	29	14	13	16	21	11	0	**648**

Vehicle Counts by Type

Unit Type	Total	Unit Type	Total
1-Passenger Car	711	23-Bicyclist	0
2-(Sport) Utility Vehicle	195	24-Witness	51
3-Passenger Van	40	25-Other	9
4-Cargo Van (10K lbs or Less)	13	**Total**	**1213**
5-Pickup	121		
6-Motor Home	2		
7-School Bus	0		
8-Transit Bus	1		
9-Motor Coach	0		
10-Other Bus	0		
11-Motorcycle	10		
12-Moped	0		
13-Low Speed Vehicle	0		
14-Autocycle	0		
15-Experimental	0		
16-Other Light Trucks (10,000 lbs or Less)	3		
17-Medium/Heavy Trucks (More than 10,000 lbs)	57		
18-ATV - (4 wheel)	0		
20-ATV - (2 wheel)	0		
21-Snowmobile	0		
22-Pedestrian	0		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Driver Action at Time of Crash

Driver Action at Time of Crash	Dr 1	Dr 2	Dr 3	Dr 4	Dr 5	Other	Total
No Contributing Action	121	358	59	8	3	1	550
Ran Off Roadway	40	1	0	0	0	0	41
Failed to Yield Right-of-Way	42	2	1	0	0	0	45
Ran Red Light	1	0	0	0	0	0	1
Ran Stop Sign	0	0	0	0	0	0	0
Disregarded Other Traffic Sign	2	0	0	0	0	0	2
Disregarded Other Road Markings	0	0	0	0	0	0	0
Exceeded Posted Speed Limit	5	0	0	0	0	0	5
Drove Too Fast For Conditions	94	5	0	0	0	0	99
Improper Turn	3	0	0	0	0	0	3
Improper Backing	1	1	0	0	0	0	2
Improper Passing	5	0	0	0	0	0	5
Wrong Way	3	0	0	0	0	0	3
Followed Too Closely	209	23	14	5	3	5	259
Failed to Keep in Proper Lane	48	3	0	0	0	0	51
Operated Motor Vehicle in Erratic, Reckless, Careless, Negligent or Aggressive Manner	17	4	0	0	0	0	21
Swerved or Avoided Due to Wind, Slippery Surface, Motor Vehicle, Object, Non-Motorist in Roadway	13	6	0	0	0	0	19
Over-Correcting/Over-Steering	6	0	0	0	0	0	6
Other Contributing Action	20	1	0	0	0	0	21
Unknown	10	3	0	0	0	0	13
Total	640	407	74	13	6	6	1146

Crashes by Apparent Physical Condition And Driver

Apparent Physical Condition	Dr 1	Dr 2	Dr 3	Dr 4	Dr 5	Other	Total
Apparently Normal	578	404	74	13	5	6	1080
Physically Impaired or Handicapped	5	0	0	0	1	0	6
Emotional(Depressed, Angry, Disturbed, etc.)	1	0	0	0	0	0	1
Ill (Sick)	3	0	0	0	0	0	3
Asleep or Fatigued	23	0	0	0	0	0	23
Under the Influence of Medications/Drugs/Alcohol	24	1	0	0	0	0	25
Other	6	2	0	0	0	0	8
Total	640	407	74	13	6	6	1146

Driver Age by Unit Type

Age	Driver	Bicycle	SnowMobile	Pedestrian	ATV	Total
09-Under	0	0	0	0	0	0
10-14	0	0	0	0	0	0
15-19	66	0	0	0	0	66
20-24	158	0	0	0	0	158
25-29	157	0	0	0	0	157
30-39	219	0	0	0	0	219
40-49	189	0	0	0	0	189
50-59	189	0	0	0	0	189
60-69	107	0	0	0	0	107
70-79	50	0	0	0	0	50
80-Over	11	0	0	0	0	11
Unknown	16	0	0	0	0	16
Total	1162	0	0	0	0	1162

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Most Harmful Event

Most Harmful Event	Total	Most Harmful Event	Total
1-Overturn / Rollover	32	38-Other Fixed Object (wall, building, tunnel, etc.)	1
2-Fire / Explosion	3	39-Unknown	10
3-Immersion	0	40-Gate or Cable	0
4-Jackknife	2	41-Pressure Ridge	0
5-Cargo / Equipment Loss Or Shift	6	**Total**	**1152**
6-Fell / Jumped from Motor Vehicle	1		
7-Thrown or Falling Object	10		
8-Other Non-Collision	10		
9-Pedestrian	0		
10-Pedalcycle	0		
11-Railway Vehicle - Train, Engine	0		
12-Animal	35		
13-Motor Vehicle in Transport	891		
14-Parked Motor Vehicle	8		
15-Struck by Falling, Shifting Cargo or Anything Set in Motion by Motor Vehicle	7		
16-Work Zone / Maintenance Equipment	0		
17-Other Non-Fixed Object	9		
18-Impact Attenuator / Crash Cushion	0		
19-Bridge Overhead Structure	0		
20-Bridge Pier or Support	2		
21-Bridge Rail	2		
22-Cable Barrier	25		
23-Culvert	0		
24-Curb	0		
25-Ditch	12		
26-Embankment	5		
27-Guardrail Face	66		
28-Guardrail End	2		
29-Concrete Traffic Barrier	5		
30-Other Traffic Barrier	1		
31-Tree (Standing)	4		
32-Utility Pole / Light Support	0		
33-Traffic Sign Support	2		
34-Traffic Signal Support	0		
35-Fence	1		
36-Mailbox	0		
37-Other Post Pole or Support	0		

Traffic Control Devices

Traffic Control Device	Total
1-Traffic Signals (Stop & Go)	0
2-Traffic Signals (Flashing)	8
3-Advisory/Warning Sign	24
4-Stop Signs - All Approaches	0
5-Stop Signs - Other	1
6-Yield Sign	19
7-Curve Warning Sign	4
8-Officer, Flagman, School Patrol	0
9-School Bus Stop Arm	0
10-School Zone Sign	0
11-R.R. Crossing Device	0
12-No Passing Zone	2
13-None	564
14-Other	26
Total	**648**

Injury Data

Severity Code	Injury Crashes	Number Of Injuries
K	1	1
A	15	17
B	71	96
C	72	92
PD	489	0
Total	**648**	**206**

Road Character

Road Grade	Total
1-Level	477
2-On Grade	159
3-Top of Hill	7
4-Bottom of Hill	4
5-Other	1
Total	**648**

Light

Light Condition	Total
1-Daylight	439
2-Dawn	12
3-Dusk	12
4-Dark - Lighted	75
5-Dark - Not Lighted	110
6-Dark - Unknown Lighting	0
7-Unknown	0
Total	**648**

Crash Summary II - Characteristics

Crashes by Year and Month

Month	2014	2015	2016	Total
JANUARY	17	19	20	56
FEBRUARY	13	17	15	45
MARCH	5	10	9	24
APRIL	9	14	20	43
MAY	10	13	15	38
JUNE	17	13	28	58
JULY	20	21	18	59
AUGUST	21	24	33	78
SEPTEMBER	20	15	25	60
OCTOBER	18	13	26	57
NOVEMBER	26	24	21	71
DECEMBER	20	11	28	59
Total	**196**	**194**	**258**	**648**

Report is limited to the last 10 years of data.

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Crash Type and Type of Location

Crash Type	Straight Road	Curved Road	Three Leg Intersection	Four Leg Intersection	Five or More Leg Intersection	Driveways	Bridges	Interchanges	Other	Parking Lot	Private Way	Cross Over	Railroad Crossing	Traffic Circle-Roundabout	Total
Object in Road	7	1	0	0	0	0	2	0	0	0	0	0	0	0	10
Rear End - Sideswipe	283	43	1	0	0	0	19	40	1	0	0	3	0	0	390
Head-on - Sideswipe	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Intersection Movement	0	0	1	0	0	0	0	9	0	0	0	0	0	0	10
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Went Off Road	117	28	0	0	0	0	0	16	0	0	0	1	0	0	162
All Other Animal	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Bicycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	6	1	0	0	0	0	13	0	0	0	0	0	0	0	20
Jackknife	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Rollover	3	0	0	0	0	0	0	1	0	0	0	0	0	0	4
Fire	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Submersion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thrown or Falling Object	8	1	0	0	0	0	1	0	0	0	0	0	0	0	10
Bear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deer	25	7	0	0	0	0	0	0	0	0	0	0	0	0	32
Moose	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	459	81	2	0	0	0	35	66	1	0	0	4	0	0	648

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Weather, Light Condition and Road Surface

Weather / Light	Dry	Ice/Frost	Mud, Dirt, Gravel	Oil	Other	Sand	Slush	Snow	Unknown	Water (Standing, Moving)	Wet	Total
Blowing Sand, Soil, Dirt												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Blowing Snow												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	1	0	0	0	0	1
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	3	0	0	0	3
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Clear												
Dark - Lighted	46	2	0	0	0	0	0	0	0	0	1	49
Dark - Not Lighted	71	0	0	0	0	0	0	0	0	0	0	71
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	4	0	0	0	0	0	0	0	0	0	0	4
Daylight	316	0	0	0	0	0	0	0	0	0	7	323
Dusk	5	1	0	0	0	0	0	0	0	0	0	6
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Cloudy												
Dark - Lighted	6	0	0	0	0	0	0	0	0	0	4	10
Dark - Not Lighted	8	0	0	0	0	0	0	0	0	0	2	10
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	1	1
Daylight	36	0	0	0	0	0	1	0	0	0	9	46
Dusk	1	0	0	0	0	0	0	0	0	0	2	3
Unknown	0	0	0	0	0	0	0	0	0	0	0	0

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Weather, Light Condition and Road Surface

Weather / Light	Dry	Ice/Frost	Mud, Dirt, Gravel	Oil	Other	Sand	Slush	Snow	Unknown	Water (Standing, Moving)	Wet	Total
Fog, Smog, Smoke												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	1	1
Dark - Not Lighted	1	0	0	0	0	0	0	0	0	0	2	3
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	1	0	0	0	0	0	0	0	0	0	0	1
Daylight	0	0	0	0	0	0	0	0	0	0	1	1
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Other												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Rain												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	6	6
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	1	9	10
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	2	2
Daylight	0	0	0	0	0	0	1	0	0	0	26	27
Dusk	0	0	0	0	0	0	0	0	0	0	1	1
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Severe Crosswinds												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Weather, Light Condition and Road Surface

Weather / Light	Dry	Ice/Frost	Mud, Dirt, Gravel	Oil	Other	Sand	Slush	Snow	Unknown	Water (Standing, Moving)	Wet	Total
Sleet, Hail (Freezing Rain or Drizzle)												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	6	0	0	0	0	0	0	0	0	0	6
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	1	1	0	0	0	2
Daylight	0	1	0	0	0	0	1	0	0	0	1	3
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Snow												
Dark - Lighted	0	0	0	0	0	0	0	8	0	0	1	9
Dark - Not Lighted	0	0	0	0	0	0	0	8	0	0	1	9
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	2	0	0	0	2
Daylight	0	3	0	0	0	0	2	27	0	0	4	36
Dusk	0	0	0	0	0	0	0	2	0	0	0	2
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**495**	**13**	**0**	**0**	**0**	**0**	**7**	**51**	**0**	**1**	**81**	**648**

F. Crash Summary I – Southbound

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary Report

Report Selections and Input Parameters

REPORT SELECTIONS

☑ Crash Summary I ☐ Section Detail ☑ Crash Summary II ☐ 1320 Public ☐ 1320 Private ☐ 1320 Summary

REPORT DESCRIPTION

I 295 SB from Exit 28 Off Ramp in Bruswick to Toll Plaza in Scarborough

REPORT PARAMETERS

Year 2014, Start Month 1 through Year 2016 End Month: 12

Route: **0295S**	Start Node: **9968**	Start Offset: **0**	☐ **Exclude First Node**
	End Node: **17916**	End Offset: **0**	☐ **Exclude Last Node**

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	Statewide Crash Rate	CRF
9968	0295S - 24.27	Int of EXIT 28 SB OFF I 295 SB	1	0	0	0	0	0	0	0.0	5.709	0.00	0.11	0.03	0.00
19231	0295S - 25.40	Int of EXIT 28 SB ON I 295 SB	1	2	0	0	1	0	1	50.0	8.986	0.07	0.10	0.03	0.00
71245	0295S - 25.91	Int of I 295 SB TURNAROUND RD	1	0	0	0	0	0	0	0.0	8.986	0.00	0.10	0.03	0.00
71243	0295S - 25.96	Int of CROSSOVER RD I 295 SB TURNAROUND RD	1	0	0	0	0	0	0	0.0	8.988	0.00	0.10	0.03	0.00
18713	0295S - 26.84	TL Brunswick Freeport	1	0	0	0	0	0	0	0.0	8.986	0.00	0.10	0.03	0.00
71248	0295S - 29.18	Int of CROSSOVER RD I 295 SB	1	0	0	0	0	0	0	0.0	8.988	0.00	0.10	0.03	0.00
18710	0295S - 30.33	Int of I 295 SB RAMP OFF TO ROUTE 125 AND 136	1	1	0	0	0	0	1	0.0	8.986	0.04	0.10	0.03	0.00
19253	0295S - 30.52	Int of I 295 SB RAMP ON FROM ROUTE 125 AND 136	1	5	0	0	0	0	5	0.0	9.344	0.18	0.10	0.03	1.85
19254	0295S - 31.70	Int of I 295 SB RAMP E OFF TO DESERT RD	1	1	0	0	1	0	0	100.0	9.344	0.04	0.10	0.03	0.00
18709	0295S - 32.29	Int of I 295 SB RAMP F ON FROM DESERT RD	1	0	0	0	0	0	0	0.0	9.917	0.00	0.09	0.03	0.00
71250	0295S - 32.46	Int of CROSSOVER RD I 295 SB	1	1	0	0	1	0	0	100.0	9.919	0.03	0.09	0.03	0.00
18706	0295S - 33.15	BRG 0585 I 295 SB under COUNTY RD	1	0	0	0	0	0	0	0.0	9.917	0.00	0.09	0.03	0.00
71252	0295S - 33.79	Int of CROSSOVER RD I 295 SB	1	0	0	0	0	0	0	0.0	9.919	0.00	0.09	0.03	0.00
18704	0295S - 34.57	TL Freeport Yarmouth	1	0	0	0	0	0	0	0.0	9.917	0.00	0.09	0.03	0.00
18703	0295S - 34.94	Int of I 295 SB RAMP A OFF TO US 1	2	0	0	0	0	0	0	0.0	9.917	0.00	0.27	0.12	0.00
19375	0295S - 35.65	Int of I 295 SB RAMP B ON FROM US 1	2	4	0	0	0	0	4	0.0	9.884	0.13	0.27	0.12	0.00
71254	0295S - 35.81	Int of CROSSOVER RD I 295 SB	2	0	0	0	0	0	0	0.0	9.886	0.00	0.27	0.12	0.00
18700	0295S - 36.40	Non Int I 295 SB	2	0	0	0	0	0	0	0.0	9.884	0.00	0.27	0.12	0.00
71256	0295S - 37.05	Int of CROSSOVER RD I 295 SB	2	0	0	0	0	0	0	0.0	9.886	0.00	0.27	0.12	0.00
18698	0295S - 37.14	Int of I 295 SB RAMP B OFF TO US 1	2	0	0	0	0	0	0	0.0	9.884	0.00	0.27	0.12	0.00
69064	0295S - 37.49	Int of I 295 SB RAMP TO I 295	2	0	0	0	0	0	0	0.0	10.227	0.00	0.26	0.12	0.00
18695	0295S - 37.50	TL Cumberland Yarmouth	2	0	0	0	0	0	0	0.0	10.227	0.00	0.26	0.12	0.00

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	Injury Crashes K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	CRF
71258	0295S - 38.25	Int of CROSSOVER RD I 295 SB	1	0	0	0	0	0	0	0.0	10.229	0.00 Statewide Crash Rate:	0.09 0.03	0.00
18694	0295S - 38.61	BRG 5801 I 295 SB under TUTTLE RD	1	0	0	0	0	0	0	0.0	10.227	0.00 Statewide Crash Rate:	0.09 0.03	0.00
18693	0295S - 40.24	TL Cumberland Falmouth	1	0	0	0	0	0	0	0.0	10.227	0.00 Statewide Crash Rate:	0.09 0.03	0.00
71260	0295S - 40.28	Int of CROSSOVER RD I 295 SB	1	0	0	0	0	0	0	0.0	10.229	0.00 Statewide Crash Rate:	0.09 0.03	0.00
18692	0295S - 40.75	BRG 5792 I 295 SB under JOHNSON RD	1	0	0	0	0	0	0	0.0	10.227	0.00 Statewide Crash Rate:	0.09 0.03	0.00
71263	0295S - 41.29	Int of CROSSOVER RD I 295 SB	1	0	0	0	0	0	0	0.0	10.229	0.00 Statewide Crash Rate:	0.09 0.03	0.00
18690	0295S - 41.37	Int of I 295 SB I 495 WB	2	3	0	0	2	0	1	66.7	10.227	0.10 Statewide Crash Rate:	0.26 0.12	0.00
18750	0295S - 41.73	Int of I 295 SB RAMP OFF TO BUCKNAM RD	2	2	0	0	0	0	2	0.0	8.895	0.07 Statewide Crash Rate:	0.27 0.12	0.00
18749	0295S - 41.91	Int of I 295 SB RAMP ON TO BUCKNAM RD	2	3	0	0	0	1	2	33.3	9.355	0.11 Statewide Crash Rate:	0.27 0.12	0.00
71265	0295S - 42.05	Int of CROSSOVER RD I 295 SB	2	3	0	0	0	1	2	33.3	9.357	0.11 Statewide Crash Rate:	0.27 0.12	0.00
18745	0295S - 43.15	BRG 1505 I 295 SB over PRESUMPSCOT RIVER	2	0	0	0	0	0	0	0.0	9.355	0.00 Statewide Crash Rate:	0.27 0.12	0.00
71267	0295S - 43.62	Int of CROSSOVER RD I 295 SB	2	1	0	0	0	0	1	0.0	9.357	0.04 Statewide Crash Rate:	0.27 0.12	0.00
18743	0295S - 44.15	TL Falmouth Portland	2	0	0	0	0	0	0	0.0	9.355	0.00 Statewide Crash Rate:	0.27 0.12	0.00
71269	0295S - 44.89	Int of CROSSOVER RD I 295 SB	2	0	0	0	0	0	0	0.0	9.357	0.00 Statewide Crash Rate:	0.27 0.12	0.00
18741	0295S - 45.52	Int of I 295 SB RAMP ON FROM VERANDA ST	2	0	0	0	0	0	0	0.0	11.508	0.00 Statewide Crash Rate:	0.26 0.12	0.00
18659	0295S - 45.65	Int of CHAS LORING SB, I 295 SB	2	1	0	0	0	1	0	100.0	11.508	0.03 Statewide Crash Rate:	0.26 0.12	0.00
18738	0295S - 45.87	Int of I 295 SB WASH AV SB	2	2	0	0	0	1	1	50.0	15.666	0.04 Statewide Crash Rate:	0.24 0.12	0.00
18734	0295S - 46.06	Int of I 295 SB WASH AV SB	2	3	0	0	0	0	3	0.0	15.666	0.06 Statewide Crash Rate:	0.24 0.12	0.00
71271	0295S - 46.39	Int of CROSSOVER RD I 295 SB	2	0	0	0	0	0	0	0.0	13.072	0.00 Statewide Crash Rate:	0.25 0.12	0.00
19222	0295S - 46.49	Int of I 295 SB RAMP OFF TO FRANKLIN ST ART	2	2	0	0	0	0	2	0.0	13.071	0.05 Statewide Crash Rate:	0.25 0.12	0.00
19221	0295S - 46.79	Int of I 295 SB RAMP B ON FROM FRANKLIN ST ART	2	9	0	0	1	0	8	11.1	13.253	0.23 Statewide Crash Rate:	0.25 0.12	0.00
19220	0295S - 47.10	Int of I 295 SB RAMP D OFF TO FOREST AV	2	1	0	0	0	0	1	0.0	13.253	0.03 Statewide Crash Rate:	0.25 0.12	0.00

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	CRF
19219	0295S - 47.28	Int of I 295 SB RAMP B ON FROM FOREST AV	2	10	0	0	0	2	8	20.0	13.841	0.24 Statewide Crash Rate:	0.25 0.12	0.00
19214	0295S - 47.33	Int of I 295 SB RAMP H OFF TO FOREST AV	2	8	0	0	1	3	4	50.0	13.841	0.19 Statewide Crash Rate:	0.25 0.12	0.00
19213	0295S - 47.54	Int of I 295 SB RAMP F ON FROM FOREST AV	2	3	0	0	0	0	3	0.0	13.494	0.07 Statewide Crash Rate:	0.25 0.12	0.00
19212	0295S - 48.06	Int of I 295 SB RAMP D OFF TO CONGRESS ST	2	3	0	0	0	1	2	33.3	13.494	0.07 Statewide Crash Rate:	0.25 0.12	0.00
19211	0295S - 48.15	Int of I 295 SB RAMP B ON FROM CONGRESS ST	2	4	0	0	1	0	3	25.0	12.895	0.10 Statewide Crash Rate:	0.25 0.12	0.00
19207	0295S - 48.22	Int of I 295 SB RAMP OFF 295 SB	2	2	0	1	0	0	1	50.0	12.895	0.05 Statewide Crash Rate:	0.25 0.12	0.00
19185	0295S - 48.65	Int of I 295 SB RINV 3200154	2	1	0	0	1	0	0	100.0	13.082	0.03 Statewide Crash Rate:	0.25 0.12	0.00
71273	0295S - 48.81	Int of CROSSOVER RD I 295 SB	2	1	0	0	1	0	0	100.0	13.083	0.03 Statewide Crash Rate:	0.25 0.12	0.00
19204	0295S - 48.96	TL Portland South Portland	2	0	0	0	0	0	0	0.0	13.082	0.00 Statewide Crash Rate:	0.25 0.12	0.00
19202	0295S - 49.40	Int of I 295 SB ROUTE 1	2	1	0	0	1	0	0	100.0	13.082	0.03 Statewide Crash Rate:	0.25 0.12	0.00
19252	0295S - 49.80	Int of I 295 SB RAMP ON FROM VETERANS BRIDGE	2	6	0	2	0	0	4	33.3	15.403	0.13 Statewide Crash Rate:	0.24 0.12	0.00
71275	0295S - 49.91	Int of CROSSOVER RD I 295 SB	2	0	0	0	0	0	0	0.0	15.405	0.00 Statewide Crash Rate:	0.24 0.12	0.00
19251	0295S - 50.21	Int of I 295 SB RAMP OFF WESTBROOK ST	2	2	0	1	0	0	1	50.0	15.403	0.04 Statewide Crash Rate:	0.24 0.12	0.00
19249	0295S - 50.57	Int of I 295 SB RAMP OFF TO SCARBOROUGH CONNECTC	2	1	0	0	0	0	1	0.0	10.432	0.03 Statewide Crash Rate:	0.26 0.12	0.00
19233	0295S - 51.17	Int of I 295 SB RAMP OFF TO ROUTE 8239	2	1	0	0	0	1	0	100.0	7.570	0.04 Statewide Crash Rate:	0.29 0.12	0.00
19232	0295S - 51.82	TL Scarborough South Portland	2	0	0	0	0	0	0	0.0	5.391	0.00 Statewide Crash Rate:	0.31 0.12	0.00
71277	0295S - 51.98	Int of CROSSOVER RD I 295 SB	1	0	0	0	0	0	0	0.0	5.393	0.00 Statewide Crash Rate:	0.11 0.03	0.00
17916	0295S - 52.10	Non Int I 295 SB	2	6	0	0	0	1	5	16.7	5.391	0.37 Statewide Crash Rate:	0.31 0.12	1.19
Study Years: 3.00		**NODE TOTALS:**		93	0	4	11	12	66	29.0	664.501	0.05	0.11	0.42

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
9968	19231	3937955	0 - 1.13	0295S - 24.27	1.13	1	10	0	1	0	0	9	10.0	0.05770	57.77	109.14	0.00
Int of EXIT 28 SB OFF I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
71245	19231	3967545	0 - 0.51	0295S - 25.40	0.51	1	9	0	0	0	1	8	11.1	0.04583	65.46	114.39	0.00
Int of I 295 SB TURNAROUND RD				INT 295 SB											Statewide Crash Rate: 62.92		
71243	71245	3967544	0 - 0.05	0295S - 25.91	0.05	1	1	0	0	0	1	0	100.0	0.00449	74.22	201.84	0.00
Int of CROSSOVER RD I 295 SB TURNAROUND RD				INT 295 SB											Statewide Crash Rate: 62.92		
18713	71243	3967540	0 - 0.88	0295S - 25.96	0.88	1	6	0	0	2	0	4	33.3	0.07908	25.29	102.76	0.00
TL Brunswick Freeport				INT 295 SB											Statewide Crash Rate: 62.92		
71248	18713	4033587	0 - 2.34	0295S - 26.84	2.34	1	27	0	2	1	2	22	18.5	0.21028	42.80	87.85	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
18710	71248	3967588	0 - 1.15	0295S - 29.18	1.15	1	16	0	0	2	1	13	18.8	0.10334	51.61	98.01	0.00
Int of I 295 SB RAMP OFF TO ROUTE 125 AND 136				INT 295 SB											Statewide Crash Rate: 62.92		
18710	19253	2523253	0 - 0.19	0295S - 30.33	0.19	1	0	0	0	0	0	0	0.0	0.01442	0.00	149.61	0.00
Int of I 295 SB RAMP OFF TO ROUTE 125 AND 136				INT 295 SB											Statewide Crash Rate: 62.92		
19253	19254	3123434	0 - 1.18	0295S - 30.52	1.18	1	21	0	1	2	4	14	33.3	0.11026	63.49	96.94	0.00
Int of I 295 SB RAMP ON FROM ROUTE 125 AND 136				INT 295 SB											Statewide Crash Rate: 62.92		
18709	19254	3122985	0 - 0.59	0295S - 31.70	0.59	1	2	0	0	0	0	2	0.0	0.05007	13.31	112.31	0.00
Int of I 295 SB RAMP F ON FROM DESERT RD				INT 295 SB											Statewide Crash Rate: 62.92		
71250	18709	3967609	0 - 0.17	0295S - 32.29	0.17	1	4	0	0	0	0	4	0.0	0.01686	79.09	143.89	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
18706	71250	4033592	0 - 0.69	0295S - 32.46	0.69	1	9	0	0	2	0	7	22.2	0.06843	43.84	105.58	0.00
BRG 0585 I 295 SB under COUNTY RD				INT 295 SB											Statewide Crash Rate: 62.92		
71252	18706	3967629	0 - 0.64	0295S - 33.15	0.64	1	7	0	0	1	2	4	42.9	0.06347	36.76	107.12	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
18704	71252	3967628	0 - 0.78	0295S - 33.79	0.78	1	9	0	0	1	1	7	22.2	0.07735	38.78	103.18	0.00
TL Freeport Yarmouth				INT 295 SB											Statewide Crash Rate: 62.92		
18704	18703	3937752	0 - 0.37	0295S - 34.57	0.37	1	18	0	0	0	1	17	5.6	0.03669	163.52	119.96	1.36
TL Freeport Yarmouth				INT 295 SB											Statewide Crash Rate: 62.92		
18703	19375	3106774	0 - 0.71	0295S - 34.94	0.71	1	20	0	0	1	3	16	20.0	0.06142	108.54	107.81	1.01
Int of I 295 SB RAMP A OFF TO US 1				INT 295 SB											Statewide Crash Rate: 62.92		
71254	19375	3967657	0 - 0.14	0295S - 35.65	0.14	2	4	0	0	0	0	4	0.0	0.01384	96.35	174.81	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
71254	19375	3967657	0.14 - 0.16	0295S - 35.79	0.02	2	0	0	0	0	0	0	0.0	0.00198	0.00	284.38	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
18700	71254	4033597	0 - 0.59	0295S - 35.81	0.59	2	21	0	0	1	4	16	23.8	0.05832	120.03	127.33	0.00
Non Int I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
									Injury Crashes								
18700	71256	3967676	0 - 0.43	0295S - 36.40	0.43	2	13	0	0	1	2	10	23.1	0.04250	101.96	135.49	0.00
Non Int I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
18700	71256	3967676	0.43 - 0.65	0295S - 36.83	0.22	2	7	0	0	0	2	5	28.6	0.02175	107.30	156.84	0.00
Non Int I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
71256	18698	3967677	0 - 0.09	0295S - 37.05	0.09	1	2	0	0	0	0	2	0.0	0.00890	74.94	169.26	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
69064	18698	3937765	0 - 0.16	0295S - 37.14	0.16	2	10	0	0	0	2	8	20.0	0.01505	221.49	171.24	1.29
Int of I 295 SB RAMP TO I 295				INT 295 SB											Statewide Crash Rate: 76.37		
69064	18698	3937765	0.16 - 0.35	0295S - 37.30	0.19	2	3	0	0	0	0	3	0.0	0.01787	55.96	164.27	0.00
Int of I 295 SB RAMP TO I 295				INT 295 SB											Statewide Crash Rate: 76.37		
18695	69064	3505672	0 - 0.01	0295S - 37.49	0.01	2	0	0	0	0	0	0	0.0	0.00102	0.00	319.82	0.00
TL Cumberland Yarmouth				INT 295 SB											Statewide Crash Rate: 76.37		
71258	18695	3967697	0 - 0.75	0295S - 37.50	0.75	1	29	0	3	0	0	26	10.3	0.07670	126.02	103.34	1.22
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
18694	71258	3967696	0 - 0.36	0295S - 38.25	0.36	1	6	0	0	2	1	3	50.0	0.03682	54.32	119.88	0.00
BRG 5801 I 295 SB under TUTTLE RD				INT 295 SB											Statewide Crash Rate: 62.92		
18693	18694	3106765	0 - 1.63	0295S - 38.61	1.63	1	27	0	1	0	6	20	25.9	0.16670	53.99	90.81	0.00
TL Cumberland Falmouth				INT 295 SB											Statewide Crash Rate: 62.92		
71260	18693	3967721	0 - 0.04	0295S - 40.24	0.04	1	2	0	0	1	0	1	50.0	0.00409	162.96	206.63	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
18692	71260	3967720	0 - 0.47	0295S - 40.28	0.47	1	11	0	1	1	1	8	27.3	0.04807	76.28	113.26	0.00
BRG 5792 I 295 SB under JOHNSON RD				INT 295 SB											Statewide Crash Rate: 62.92		
18692	71263	3967743	0 - 0.53	0295S - 40.75	0.53	1	11	0	0	1	0	10	9.1	0.05420	67.64	110.52	0.00
BRG 5792 I 295 SB under JOHNSON RD				INT 295 SB											Statewide Crash Rate: 62.92		
18692	71263	3967743	0.53 - 0.54	0295S - 41.28	0.01	1	0	0	0	0	0	0	0.0	0.00102	0.00	268.85	0.00
BRG 5792 I 295 SB under JOHNSON RD				INT 295 SB											Statewide Crash Rate: 62.92		
71263	18690	3967744	0 - 0.08	0295S - 41.29	0.08	1	5	0	0	0	1	4	20.0	0.00818	203.70	172.97	1.18
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
18690	18750	3106761	0 - 0.22	0295S - 41.37	0.22	2	4	0	0	0	1	3	25.0	0.01957	68.13	160.76	0.00
Int of I 295 SB I 495 WB				INT 295 SB											Statewide Crash Rate: 76.37		
18690	18750	3106761	0.22 - 0.36	0295S - 41.59	0.14	2	4	0	0	1	0	3	25.0	0.01245	107.07	179.45	0.00
Int of I 295 SB I 495 WB				INT 295 SB											Statewide Crash Rate: 76.37		
18749	18750	3106793	0 - 0.18	0295S - 41.73	0.18	2	1	0	0	0	0	1	0.0	0.01402	23.77	174.25	0.00
Int of I 295 SB RAMP ON TO BUCKNAM RD				INT 295 SB											Statewide Crash Rate: 76.37		
71265	18749	3967765	0 - 0.14	0295S - 41.91	0.14	2	4	0	0	0	2	2	50.0	0.01310	101.81	177.21	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
18745	71265	3967764	0 - 1.10	0295S - 42.05	1.10	2	13	0	1	3	3	6	53.8	0.10290	42.11	115.27	0.00
BRG 1505 I 295 SB over PRESUMPSCOT RIVER				INT 295 SB											Statewide Crash Rate: 76.37		
71267	18745	4033595	0 - 0.47	0295S - 43.15	0.47	2	5	0	0	0	0	5	0.0	0.04397	37.91	134.56	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
18743	71267	3967785	0 - 0.53	0295S - 43.62	0.53	2	9	0	0	1	0	8	11.1	0.04958	60.51	131.38	0.00
TL Falmouth Portland				INT 295 SB											Statewide Crash Rate: 76.37		
71269	18743	3967808	0 - 0.74	0295S - 44.15	0.74	2	9	0	0	0	5	4	55.6	0.06923	43.34	123.36	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
18741	71269	3967807	0 - 0.63	0295S - 44.89	0.63	2	11	0	0	4	2	5	54.5	0.05894	62.21	127.08	0.00
Int of I 295 SB RAMP ON FROM VERANDA ST				INT 295 SB											Statewide Crash Rate: 76.37		
18659	18741	3106748	0 - 0.13	0295S - 45.52	0.13	2	8	0	0	3	0	5	37.5	0.01496	178.24	171.49	1.04
Int of CHAS LORING SB, I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
18659	18738	3106747	0 - 0.22	0295S - 45.65	0.22	2	6	0	0	0	2	4	33.3	0.02385	83.86	153.54	0.00
Int of CHAS LORING SB, I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
18734	18738	3106784	0 - 0.19	0295S - 45.87	0.19	2	15	0	0	5	0	10	33.3	0.02977	167.98	146.11	1.15
Int of I 295 SB WASH AV SB				INT 295 SB											Statewide Crash Rate: 76.37		
18734	71271	3967837	0 - 0.33	0295S - 46.06	0.33	2	7	0	2	0	0	5	28.6	0.04313	54.10	135.09	0.00
Int of I 295 SB WASH AV SB				INT 295 SB											Statewide Crash Rate: 76.37		
71271	19222	3967838	0 - 0.10	0295S - 46.39	0.10	2	4	0	1	0	0	3	25.0	0.01307	102.01	177.30	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
19221	19222	3106873	0 - 0.30	0295S - 46.49	0.30	2	4	0	0	1	0	3	25.0	0.03181	41.92	144.00	0.00
Int of I 295 SB RAMP B ON FROM FRANKLIN ST ART				INT 295 SB											Statewide Crash Rate: 76.37		
19220	19221	3106872	0 - 0.31	0295S - 46.79	0.31	2	16	0	1	1	4	10	37.5	0.04108	129.81	136.44	0.00
Int of I 295 SB RAMP D OFF TO FOREST AV				INT 295 SB											Statewide Crash Rate: 76.37		
19219	19220	3106871	0 - 0.18	0295S - 47.10	0.18	2	4	0	0	0	0	4	0.0	0.02273	58.67	155.25	0.00
Int of I 295 SB RAMP B ON FROM FOREST AV				INT 295 SB											Statewide Crash Rate: 76.37		
19214	19219	3106869	0 - 0.05	0295S - 47.28	0.05	2	8	0	0	1	1	6	25.0	0.00692	385.33	208.52	1.85
Int of I 295 SB RAMP H OFF TO FOREST AV				INT 295 SB											Statewide Crash Rate: 76.37		
19213	19214	3106868	0 - 0.21	0295S - 47.33	0.21	2	7	0	1	1	3	2	71.4	0.02447	95.37	152.65	0.00
Int of I 295 SB RAMP F ON FROM FOREST AV				INT 295 SB											Statewide Crash Rate: 76.37		
19212	19213	3106867	0 - 0.52	0295S - 47.54	0.52	2	21	0	0	2	2	17	19.0	0.07017	99.76	123.06	0.00
Int of I 295 SB RAMP D OFF TO CONGRESS ST				INT 295 SB											Statewide Crash Rate: 76.37		
19211	19212	3106866	0 - 0.09	0295S - 48.06	0.09	2	5	0	0	0	2	3	40.0	0.01064	156.64	186.71	0.00
Int of I 295 SB RAMP B ON FROM CONGRESS ST				INT 295 SB											Statewide Crash Rate: 76.37		
19207	19211	3106861	0 - 0.07	0295S - 48.15	0.07	2	1	0	0	0	0	1	0.0	0.00903	36.93	194.70	0.00
Int of I 295 SB RAMP OFF 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
19185	19207	3943968	0 - 0.43	0295S - 48.22	0.43	2	5	0	0	2	0	3	40.0	0.05040	33.07	130.96	0.00
Int of I 295 SB RINV 3200154				INT 295 SB											Statewide Crash Rate: 76.37		
19185	71273	4033593	0 - 0.16	0295S - 48.65	0.16	2	4	0	0	0	0	4	0.0	0.02093	63.70	158.24	0.00
Int of I 295 SB RINV 3200154				INT 295 SB											Statewide Crash Rate: 76.37		
71273	19204	4033588	0 - 0.14	0295S - 48.81	0.14	2	7	0	0	2	0	5	28.6	0.01831	127.41	163.31	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
71273	19204	4033588	0.14 - 0.15	0295S - 48.95	0.01	2	0	0	0	0	0	0	0.0	0.00131	0.00	308.31	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
19202	19204	3106856	0 - 0.44	0295S - 48.96	0.44	2	10	0	0	2	0	8	20.0	0.05756	57.91	127.65	0.00
Int of I 295 SB ROUTE 1				INT 295 SB											Statewide Crash Rate: 76.37		
19202	19252	3106857	0 - 0.40	0295S - 49.40	0.40	2	11	0	0	0	2	9	18.2	0.04608	79.58	133.30	0.00
Int of I 295 SB ROUTE 1				INT 295 SB											Statewide Crash Rate: 76.37		
71275	19252	3967879	0 - 0.11	0295S - 49.80	0.11	2	1	0	0	0	0	1	0.0	0.01694	19.67	166.38	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 76.37		
19251	71275	4033589	0 - 0.30	0295S - 49.91	0.30	2	6	0	0	0	0	6	0.0	0.04621	43.28	133.23	0.00
Int of I 295 SB RAMP OFF WESTBROOK ST				INT 295 SB											Statewide Crash Rate: 76.37		
19249	19251	3106880	0 - 0.36	0295S - 50.21	0.36	2	4	0	0	0	0	4	0.0	0.03755	35.50	139.00	0.00
Int of I 295 SB RAMP OFF TO SCARBOROUGH CONNECTOR				INT 295 SB											Statewide Crash Rate: 76.37		
19233	19249	3106876	0 - 0.60	0295S - 50.57	0.60	2	6	0	1	1	3	1	83.3	0.04542	44.03	133.69	0.00
Int of I 295 SB RAMP OFF TO ROUTE 8239				INT 295 SB											Statewide Crash Rate: 76.37		
19232	19233	3106874	0 - 0.65	0295S - 51.17	0.65	2	1	0	0	0	0	1	0.0	0.03504	9.51	141.04	0.00
TL Scarborough South Portland				INT 295 SB											Statewide Crash Rate: 76.37		
71277	19232	3967902	0 - 0.16	0295S - 51.82	0.16	1	0	0	0	0	0	0	0.0	0.00863	0.00	170.62	0.00
Int of CROSSOVER RD I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
17916	71277	3967901	0 - 0.12	0295S - 51.98	0.12	1	3	0	0	0	1	2	33.3	0.00647	154.58	183.83	0.00
Non Int I 295 SB				INT 295 SB											Statewide Crash Rate: 62.92		
Study Years: 3.00				**Section Totals:**	27.83		534	0	16	49	68	401	24.9	2.69293	66.10	76.76	0.86
				Grand Totals:	27.83		627	0	20	60	80	467	25.5	2.69293	77.61	98.92	0.78

G. Crash Summary II – Southbound

Crash Summary II - Characteristics

Crashes by Day and Hour

	AM												Hour of Day / PM													
Day Of Week	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Un**	**Tot**
SUNDAY	1	4	2	2	2	3	2	4	4	5	3	6	4	5	6	1	3	2	5	2	3	1	0	1	0	71
MONDAY	3	0	0	0	3	3	0	10	12	3	4	6	9	9	9	9	9	10	0	4	3	1	3	3	0	113
TUESDAY	2	0	1	2	1	1	5	10	11	4	2	1	7	6	4	4	11	9	3	2	1	3	2	1	0	93
WEDNESDAY	4	2	1	1	2	2	4	9	7	3	5	4	3	4	3	4	4	14	5	2	2	1	2	3	0	91
THURSDAY	3	0	0	1	0	1	3	9	10	4	5	1	3	6	4	2	11	13	2	4	2	2	2	1	0	89
FRIDAY	4	1	0	1	0	1	0	4	3	11	4	2	4	1	5	6	16	13	4	3	3	1	1	4	0	92
SATURDAY	1	3	1	1	0	1	2	9	2	4	3	6	6	7	3	2	3	7	1	5	5	1	3	2	0	78
Totals	18	10	5	8	8	12	16	55	49	34	26	26	36	38	34	28	57	68	20	22	19	10	13	15	0	**627**

Vehicle Counts by Type

Unit Type	Total	Unit Type	Total
1-Passenger Car	633	23-Bicyclist	0
2-(Sport) Utility Vehicle	204	24-Witness	67
3-Passenger Van	31	25-Other	17
4-Cargo Van (10K lbs or Less)	11	**Total**	**1133**
5-Pickup	100		
6-Motor Home	2		
7-School Bus	0		
8-Transit Bus	0		
9-Motor Coach	0		
10-Other Bus	0		
11-Motorcycle	7		
12-Moped	0		
13-Low Speed Vehicle	0		
14-Autocycle	0		
15-Experimental	0		
16-Other Light Trucks (10,000 lbs or Less)	1		
17-Medium/Heavy Trucks (More than 10,000 lbs)	60		
18-ATV - (4 wheel)	0		
20-ATV - (2 wheel)	0		
21-Snowmobile	0		
22-Pedestrian	0		

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Driver Action at Time of Crash

Driver Action at Time of Crash	Dr 1	Dr 2	Dr 3	Dr 4	Dr 5	Other	Total
No Contributing Action	118	302	47	10	1	0	478
Ran Off Roadway	42	2	0	0	0	0	44
Failed to Yield Right-of-Way	33	3	0	0	0	0	36
Ran Red Light	0	0	0	0	0	0	0
Ran Stop Sign	0	0	0	0	0	0	0
Disregarded Other Traffic Sign	1	0	0	0	0	0	1
Disregarded Other Road Markings	0	0	0	0	0	0	0
Exceeded Posted Speed Limit	2	0	0	0	0	0	2
Drove Too Fast For Conditions	120	4	0	0	0	0	124
Improper Turn	5	0	0	0	0	0	5
Improper Backing	0	0	0	0	0	0	0
Improper Passing	5	1	0	0	0	0	6
Wrong Way	2	1	0	0	0	0	3
Followed Too Closely	160	25	12	2	1	0	200
Failed to Keep in Proper Lane	55	8	0	0	0	0	63
Operated Motor Vehicle in Erratic, Reckless, Careless, Negligent or Aggressive Manner	15	0	0	0	0	0	15
Swerved or Avoided Due to Wind, Slippery Surface, Motor Vehicle, Object, Non-Motorist in Roadway	9	3	0	1	0	0	13
Over-Correcting/Over-Steering	9	0	0	0	0	0	9
Other Contributing Action	27	5	1	0	0	0	33
Unknown	7	4	0	0	0	0	11
Total	610	358	60	13	2	0	1043

Crashes by Apparent Physical Condition And Driver

Apparent Physical Condition	Dr 1	Dr 2	Dr 3	Dr 4	Dr 5	Other	Total
Apparently Normal	558	355	60	13	2	0	988
Physically Impaired or Handicapped	2	0	0	0	0	0	2
Emotional(Depressed, Angry, Disturbed, etc.)	2	0	0	0	0	0	2
Ill (Sick)	2	0	0	0	0	0	2
Asleep or Fatigued	18	1	0	0	0	0	19
Under the Influence of Medications/Drugs/Alcohol	19	0	0	0	0	0	19
Other	9	2	0	0	0	0	11
Total	610	358	60	13	2	0	1043

Driver Age by Unit Type

Age	Driver	Bicycle	SnowMobile	Pedestrian	ATV	Total
09-Under	0	0	0	0	0	0
10-14	0	0	0	0	0	0
15-19	71	0	0	0	0	71
20-24	157	0	0	0	0	157
25-29	139	0	0	0	0	139
30-39	173	0	0	0	0	173
40-49	174	0	0	0	0	174
50-59	169	0	0	0	0	169
60-69	119	0	0	0	0	119
70-79	31	0	0	0	0	31
80-Over	10	0	0	0	0	10
Unknown	23	0	0	0	0	23
Total	1066	0	0	0	0	1066

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Most Harmful Event

Most Harmful Event	Total
1-Overturn / Rollover	36
2-Fire / Explosion	4
3-Immersion	1
4-Jackknife	1
5-Cargo / Equipment Loss Or Shift	8
6-Fell / Jumped from Motor Vehicle	0
7-Thrown or Falling Object	4
8-Other Non-Collision	7
9-Pedestrian	0
10-Pedalcycle	0
11-Railway Vehicle - Train, Engine	0
12-Animal	42
13-Motor Vehicle in Transport	764
14-Parked Motor Vehicle	2
15-Struck by Falling, Shifting Cargo or Anything Set in Motion by Motor Vehicle	5
16-Work Zone / Maintenance Equipment	2
17-Other Non-Fixed Object	2
18-Impact Attenuator / Crash Cushion	4
19-Bridge Overhead Structure	0
20-Bridge Pier or Support	0
21-Bridge Rail	4
22-Cable Barrier	39
23-Culvert	0
24-Curb	0
25-Ditch	14
26-Embankment	9
27-Guardrail Face	76
28-Guardrail End	4
29-Concrete Traffic Barrier	7
30-Other Traffic Barrier	0
31-Tree (Standing)	3
32-Utility Pole / Light Support	0
33-Traffic Sign Support	1
34-Traffic Signal Support	0
35-Fence	0
36-Mailbox	0
37-Other Post Pole or Support	1
38-Other Fixed Object (wall, building, tunnel, etc.)	1
39-Unknown	6
40-Gate or Cable	0
41-Pressure Ridge	0
Total	**1047**

Traffic Control Devices

Traffic Control Device	Total
1-Traffic Signals (Stop & Go)	0
2-Traffic Signals (Flashing)	16
3-Advisory/Warning Sign	22
4-Stop Signs - All Approaches	1
5-Stop Signs - Other	1
6-Yield Sign	29
7-Curve Warning Sign	5
8-Officer, Flagman, School Patrol	0
9-School Bus Stop Arm	0
10-School Zone Sign	0
11-R.R. Crossing Device	0
12-No Passing Zone	3
13-None	534
14-Other	16
Total	**627**

Injury Data

Severity Code	Injury Crashes	Number Of Injuries
K	0	0
A	20	22
B	60	80
C	80	107
PD	467	0
Total	**627**	**209**

Road Character

Road Grade	Total
1-Level	485
2-On Grade	136
3-Top of Hill	3
4-Bottom of Hill	3
5-Other	0
Total	**627**

Light

Light Condition	Total
1-Daylight	415
2-Dawn	12
3-Dusk	23
4-Dark - Lighted	57
5-Dark - Not Lighted	119
6-Dark - Unknown Lighting	1
7-Unknown	0
Total	**627**

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Year and Month

Month	2014	2015	2016	Total
JANUARY	23	22	16	61
FEBRUARY	12	24	18	54
MARCH	16	10	7	33
APRIL	6	13	12	31
MAY	7	19	18	44
JUNE	16	21	19	56
JULY	12	17	21	50
AUGUST	15	22	22	59
SEPTEMBER	12	14	18	44
OCTOBER	25	16	20	61
NOVEMBER	16	20	29	65
DECEMBER	23	23	23	69
Total	**183**	**221**	**223**	**627**

Report is limited to the last 10 years of data.

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Crash Type and Type of Location

Crash Type	Straight Road	Curved Road	Three Leg Intersection	Four Leg Intersection	Five or More Leg Intersection	Driveways	Bridges	Interchanges	Other	Parking Lot	Private Way	Cross Over	Railroad Crossing	Traffic Circle-Roundabout	Total
Object in Road	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Rear End - Sideswipe	219	31	2	0	0	0	20	51	4	0	0	5	0	0	332
Head-on - Sideswipe	2	1	0	0	0	0	0	0	0	0	0	0	0	0	3
Intersection Movement	0	0	0	0	0	0	0	11	0	0	0	0	0	0	11
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Went Off Road	146	34	0	0	0	0	0	13	1	0	0	1	0	0	195
All Other Animal	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Bicycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	2	1	0	0	0	0	10	3	1	0	0	0	0	0	17
Jackknife	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rollover	7	0	0	0	0	0	0	1	0	0	0	0	0	0	8
Fire	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Submersion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thrown or Falling Object	3	0	0	0	0	0	0	1	0	0	0	0	0	0	4
Bear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deer	38	2	0	0	0	0	0	2	0	0	0	0	0	0	42
Moose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkey	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	**432**	**69**	**2**	**0**	**0**	**0**	**30**	**82**	**6**	**0**	**0**	**6**	**0**	**0**	**627**

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Weather, Light Condition and Road Surface

Weather / Light	Dry	Ice/Frost	Mud, Dirt, Gravel	Oil	Other	Sand	Slush	Snow	Unknown	Water (Standing, Moving)	Wet	Total
Blowing Sand, Soil, Dirt												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Blowing Snow												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Clear												
Dark - Lighted	33	1	0	0	0	0	0	0	0	0	0	34
Dark - Not Lighted	57	1	0	0	0	0	0	0	0	0	2	60
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	3	1	0	0	0	0	0	0	0	0	0	4
Daylight	253	3	0	0	0	0	2	3	0	0	6	267
Dusk	13	0	0	0	0	0	0	0	0	0	1	14
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Cloudy												
Dark - Lighted	5	0	0	0	0	0	0	0	0	0	1	6
Dark - Not Lighted	15	0	0	0	0	0	0	0	0	0	1	16
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	43	0	0	0	0	0	1	0	0	0	7	51
Dusk	1	0	0	0	0	0	0	0	0	0	1	2
Unknown	0	0	0	0	0	0	0	0	0	0	0	0

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

Crashes by Weather, Light Condition and Road Surface

Weather Light	Dry	Ice/Frost	Mud, Dirt, Gravel	Oil	Other	Sand	Slush	Snow	Unknown	Water (Standing, Moving)	Wet	Total
Fog, Smog, Smoke												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	1	0	0	0	0	0	0	0	0	0	0	1
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	1	1
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Other												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Rain												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	6	6
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	3	31	34
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	4	4
Daylight	0	1	0	0	0	0	0	0	0	0	37	38
Dusk	0	0	0	0	0	0	0	0	0	0	3	3
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Severe Crosswinds												
Dark - Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	0	0	0	0	0	0	0	0	0	0	0
Daylight	0	0	0	0	0	0	0	0	0	0	0	0
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0

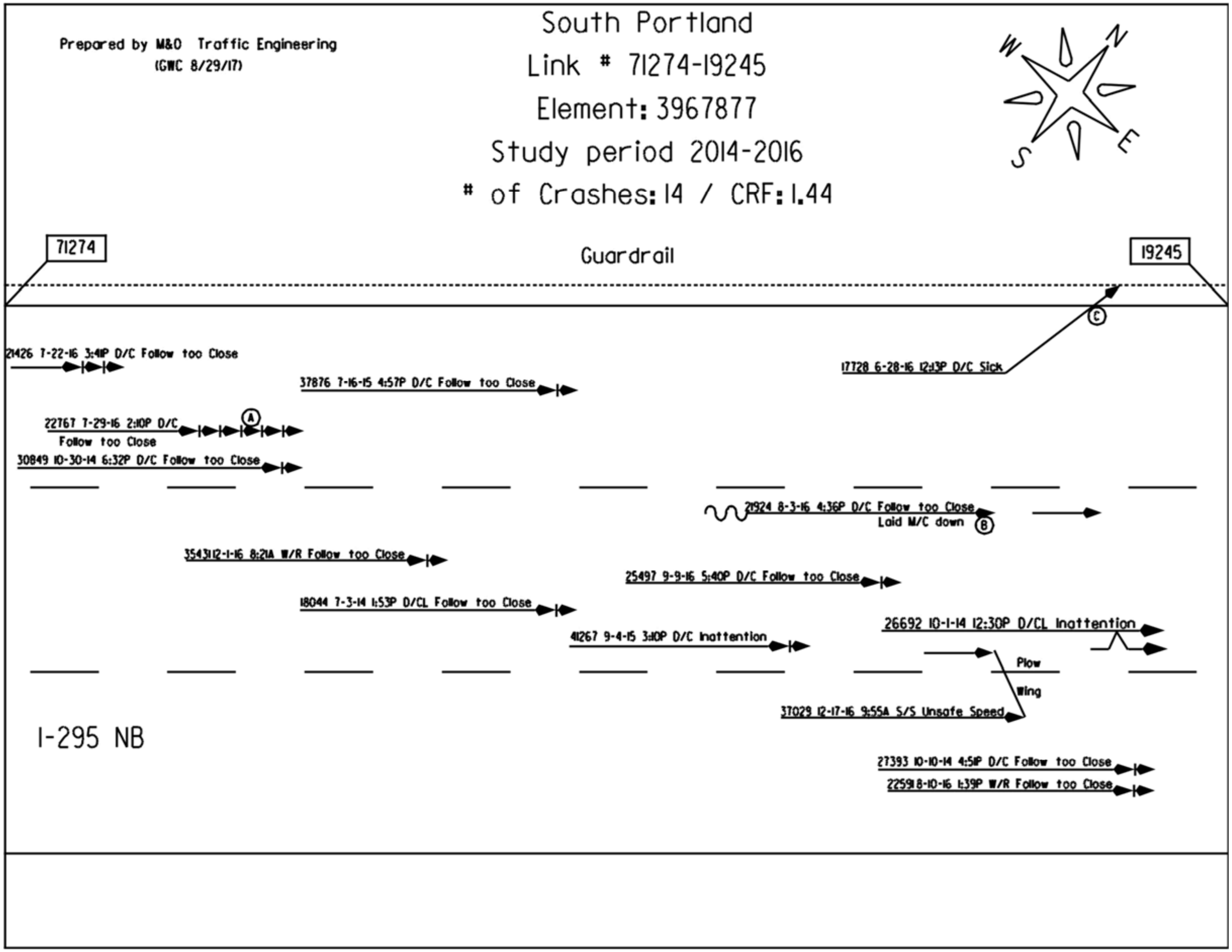
Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary II - Characteristics

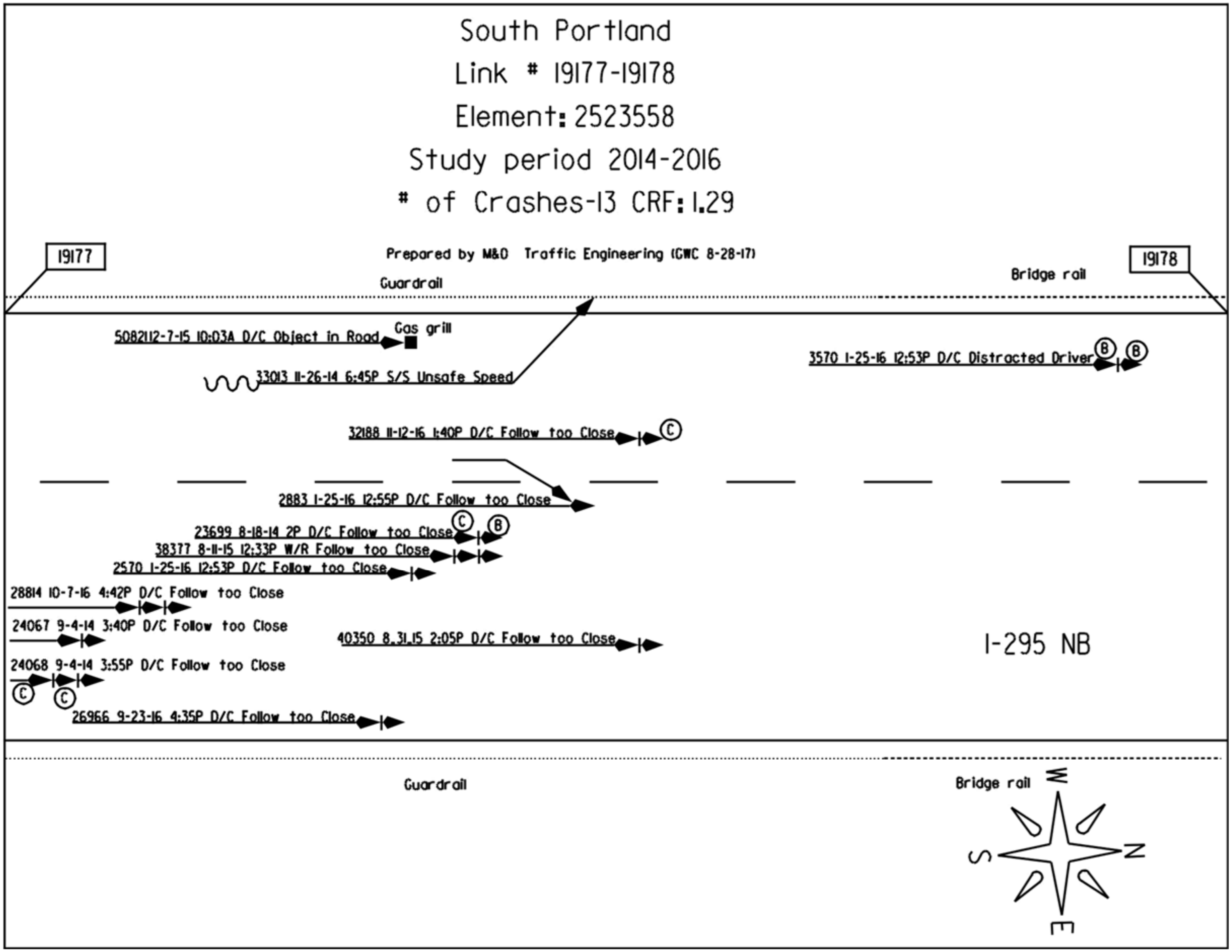
Crashes by Weather, Light Condition and Road Surface

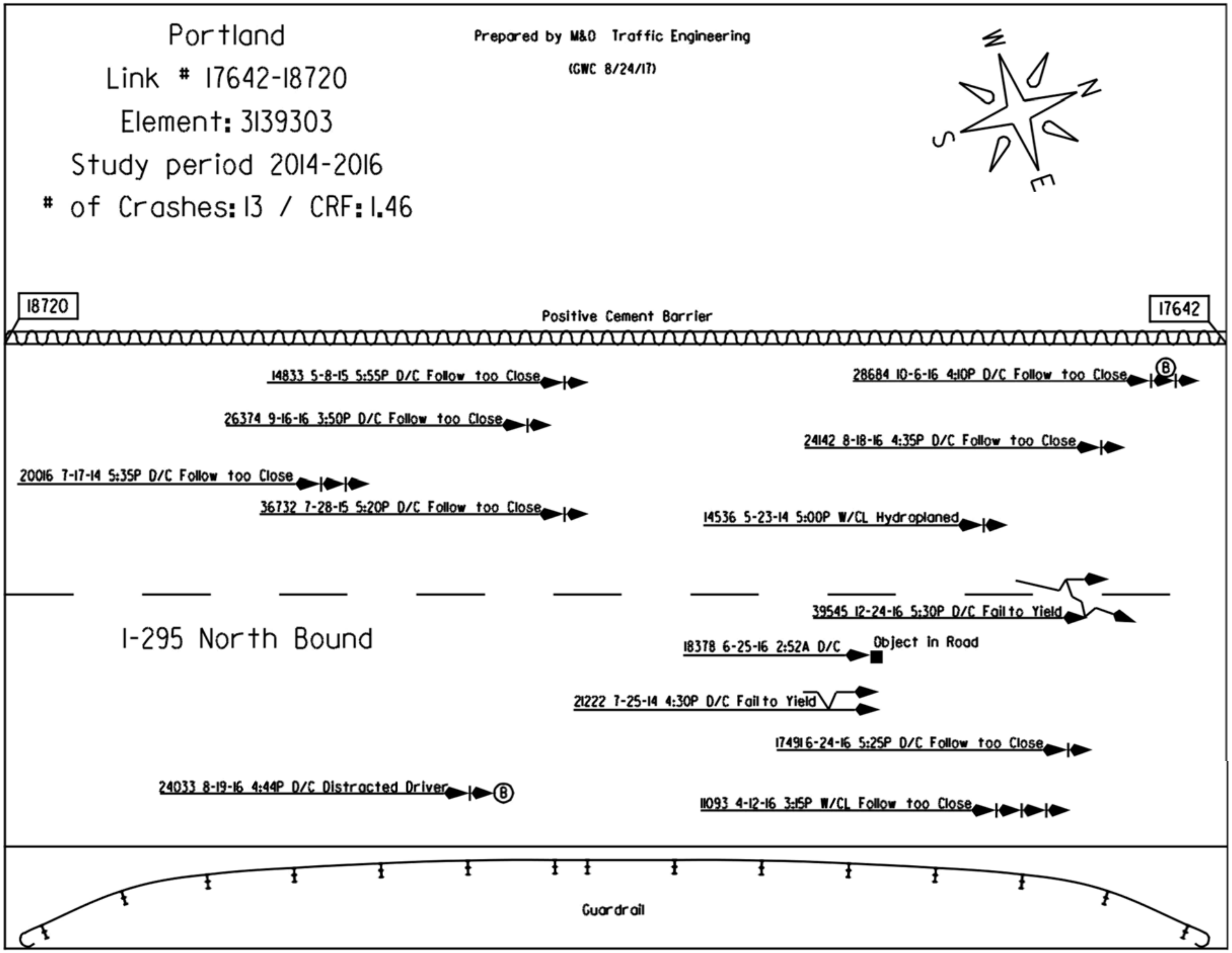
Weather / Light	Dry	Ice/Frost	Mud, Dirt, Gravel	Oil	Other	Sand	Slush	Snow	Unknown	Water (Standing, Moving)	Wet	Total
Sleet, Hail (Freezing Rain or Drizzle)												
Dark - Lighted	0	2	0	0	0	0	2	0	0	0	0	4
Dark - Not Lighted	0	0	0	0	0	0	0	0	0	0	0	0
Dark - Unknown Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Dawn	0	1	0	0	0	0	0	0	0	0	0	1
Daylight	0	1	0	0	0	0	5	0	0	0	0	6
Dusk	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Snow												
Dark - Lighted	0	0	0	0	0	0	1	6	0	0	0	7
Dark - Not Lighted	0	0	0	0	0	0	0	8	0	0	0	8
Dark - Unknown Lighting	0	0	0	0	0	0	0	1	0	0	0	1
Dawn	0	0	0	0	0	0	0	3	0	0	0	3
Daylight	0	7	0	0	0	0	3	38	0	0	4	52
Dusk	0	0	0	0	0	0	0	4	0	0	0	4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**424**	**18**	**0**	**0**	**0**	**0**	**14**	**63**	**0**	**3**	**105**	**627**

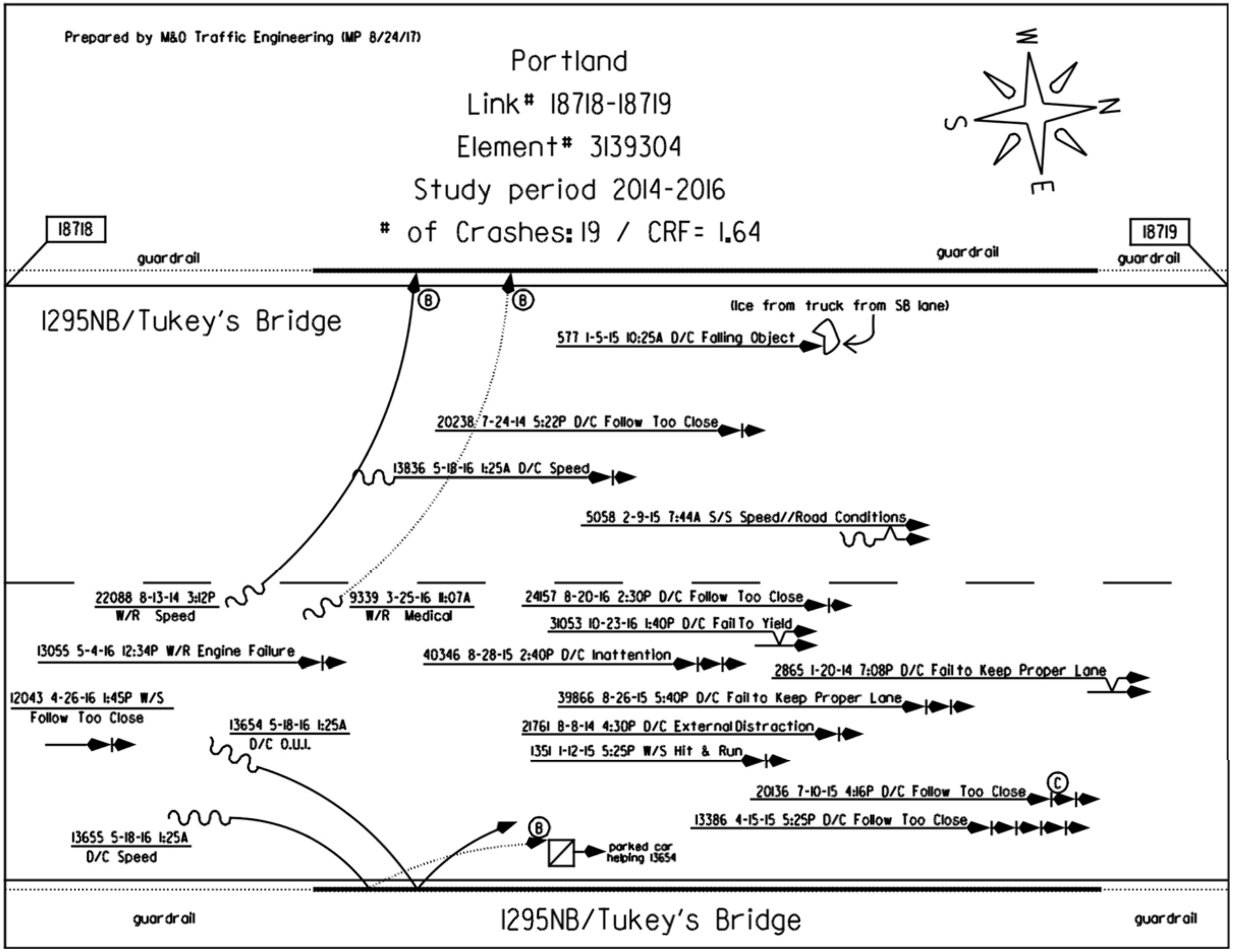
H. High Crash Location Diagrams - Northbound



Prepared by M&O Traffic Engineering
(GWC 8/29/17)
South Portland
Link # 71274-19245
Element: 3967877
Study period 2014-2016
# of Crashes: 14 / CRF: 1.44
W
N
S
E
71274
Guardrail
19245
21426 7-22-16 3:41P D/C Follow too Close
17728 6-28-16 12:13P D/C Sick
37876 7-16-15 4:57P D/C Follow too Close
22767 7-29-16 2:10P D/C
Follow too Close
30849 10-30-14 6:32P D/C Follow too Close
21924 8-3-16 4:36P D/C Follow too Close
Laid M/C down
35431 12-1-16 8:21A W/R Follow too Close
25497 9-9-16 5:40P D/C Follow too Close
18044 7-3-14 1:53P D/CL Follow too Close
26692 10-1-14 12:30P D/CL Inattention
41267 9-4-15 3:10P D/C Inattention
Plow
Wing
37029 12-17-16 9:55A S/S Unsafe Speed
I-295 NB
27393 10-10-14 4:51P D/C Follow too Close
22591 8-10-16 1:39P W/R Follow too Close


South Portland
Link # 19177-19178
Element: 2523558
Study period 2014-2016
# of Crashes-13 CRF: 1.29
Prepared by M&O Traffic Engineering (GWC 8-28-17)
19177
19178
Guardrail
Bridge rail
5082112-7-15 10:03A D/C Object in Road
Gas grill
33013 11-26-14 6:45P S/S Unsafe Speed
3570 1-25-16 12:53P D/C Distracted Driver
B
B
32188 11-12-16 1:40P D/C Follow too Close
C
2883 1-25-16 12:55P D/C Follow too Close
23699 8-18-14 2P D/C Follow too Close
C
B
38377 8-11-15 12:33P W/R Follow too Close
2570 1-25-16 12:53P D/C Follow too Close
28814 10-7-16 4:42P D/C Follow too Close
24067 9-4-14 3:40P D/C Follow too Close
40350 8.31.15 2:05P D/C Follow too Close
I-295 NB
24068 9-4-14 3:55P D/C Follow too Close
C
C
26966 9-23-16 4:35P D/C Follow too Close
Guardrail
Bridge rail
W
N
S
E


Portland
Link # 17642-18720
Element: 3139303
Study period 2014-2016
# of Crashes: 13 / CRF: 1.46
Prepared by M&O Traffic Engineering
(GWC 8/24/17)
W
N
S
E
18720
17642
Positive Cement Barrier
14833 5-8-15 5:55P D/C Follow too Close
28684 10-6-16 4:10P D/C Follow too Close
B
26374 9-16-16 3:50P D/C Follow too Close
24142 8-18-16 4:35P D/C Follow too Close
20016 7-17-14 5:35P D/C Follow too Close
36732 7-28-15 5:20P D/C Follow too Close
14536 5-23-14 5:00P W/CL Hydroplaned
39545 12-24-16 5:30P D/C Fail to Yield
I-295 North Bound
18378 6-25-16 2:52A D/C
Object in Road
21222 7-25-14 4:30P D/C Fail to Yield
17491 6-24-16 5:25P D/C Follow too Close
24033 8-19-16 4:44P D/C Distracted Driver
B
11093 4-12-16 3:15P W/CL Follow too Close
Guardrail


Prepared by M&O Traffic Engineering (MP 8/24/17)
Portland
Link# 18718-18719
Element# 3139304
Study period 2014-2016
# of Crashes: 19 / CRF= 1.64
18718
18719
guardrail
guardrail
guardrail
I295NB/Tukey's Bridge
(Ice from truck from SB lane)
577 1-5-15 10:25A D/C Falling Object
20238 7-24-14 5:22P D/C Follow Too Close
13836 5-18-16 1:25A D/C Speed
5058 2-9-15 7:44A S/S Speed//Road Conditions
22088 8-13-14 3:12P
W/R Speed
9339 3-25-16 11:07A
W/R Medical
24157 8-20-16 2:30P D/C Follow Too Close
31053 10-23-16 1:40P D/C Fail To Yield
13055 5-4-16 12:34P W/R Engine Failure
40346 8-28-15 2:40P D/C Inattention
2865 1-20-14 7:08P D/C Fail to Keep Proper Lane
12043 4-26-16 1:45P W/S
Follow Too Close
39866 8-26-15 5:40P D/C Fail to Keep Proper Lane
13654 5-18-16 1:25A
D/C O.U.I.
21761 8-8-14 4:30P D/C External Distraction
1351 1-12-15 5:25P W/S Hit & Run
20136 7-10-15 4:16P D/C Follow Too Close
13386 4-15-15 5:25P D/C Follow Too Close
13655 5-18-16 1:25A
D/C Speed
parked car
helping 13654
guardrail
I295NB/Tukey's Bridge
guardrail

Portland

Link # 19175-19194

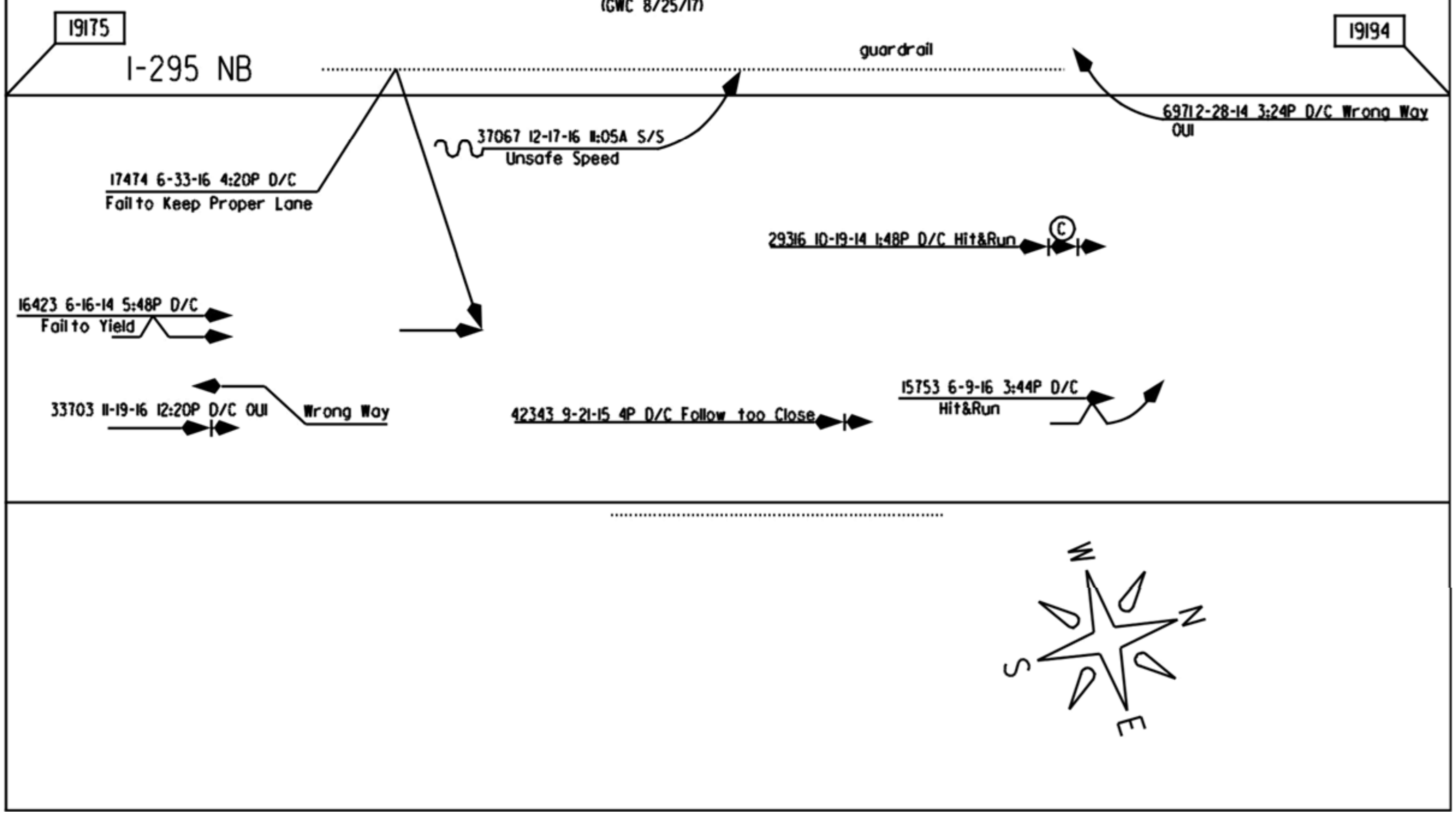
Element: 3139307

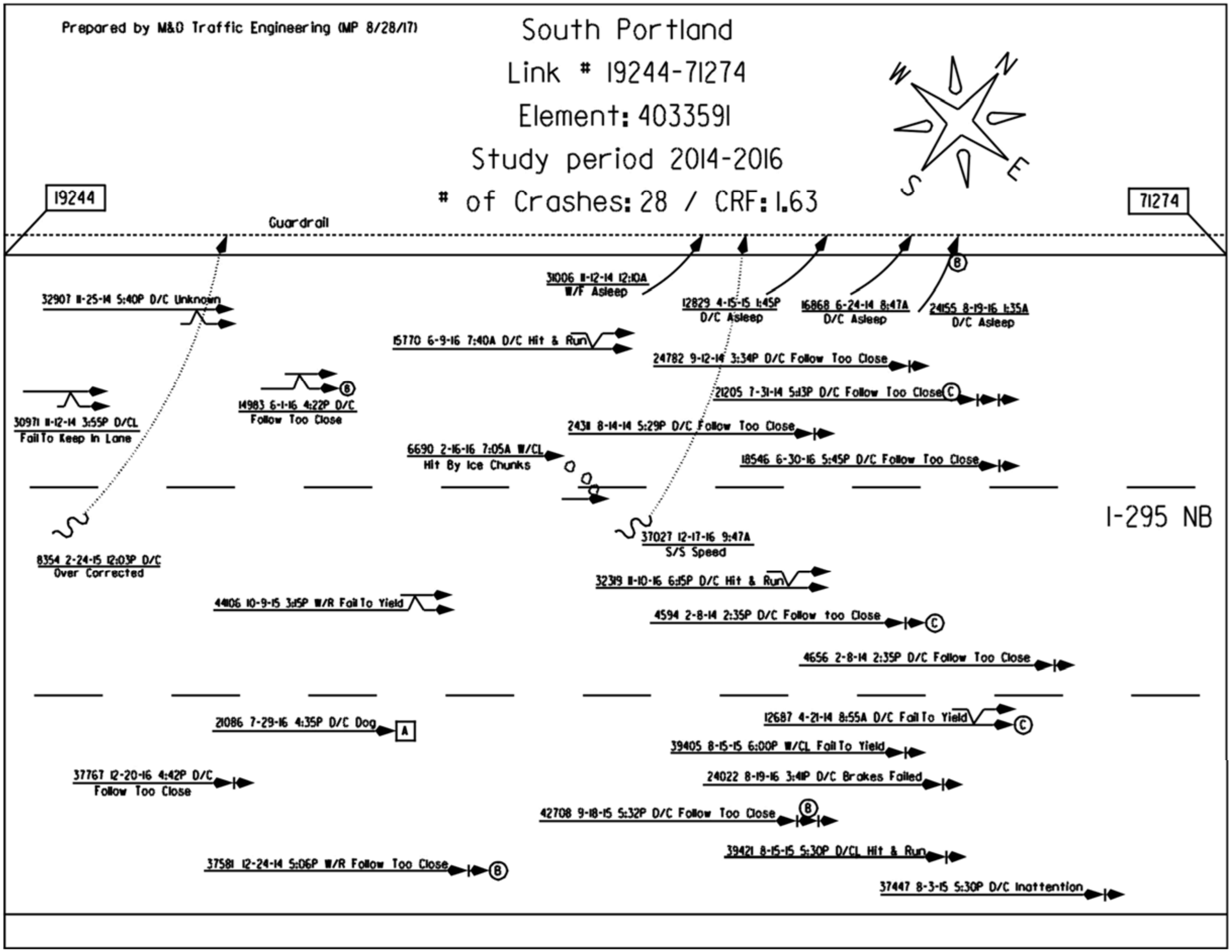
Study period 2014-2016

# of Crashes-8 / CRF: 1.71

Prepared by M&O Traffic Engineering

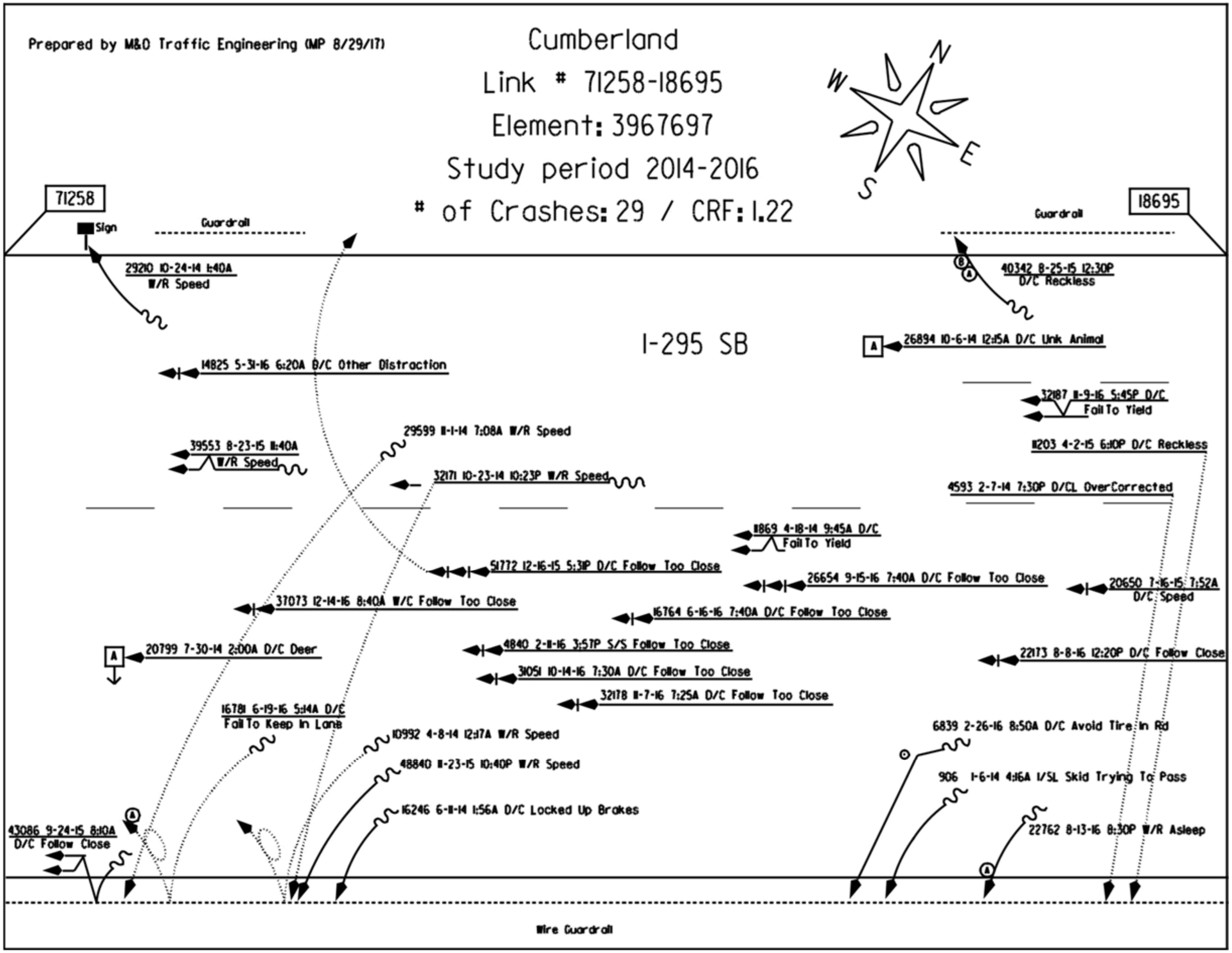
(GWC 8/25/17)

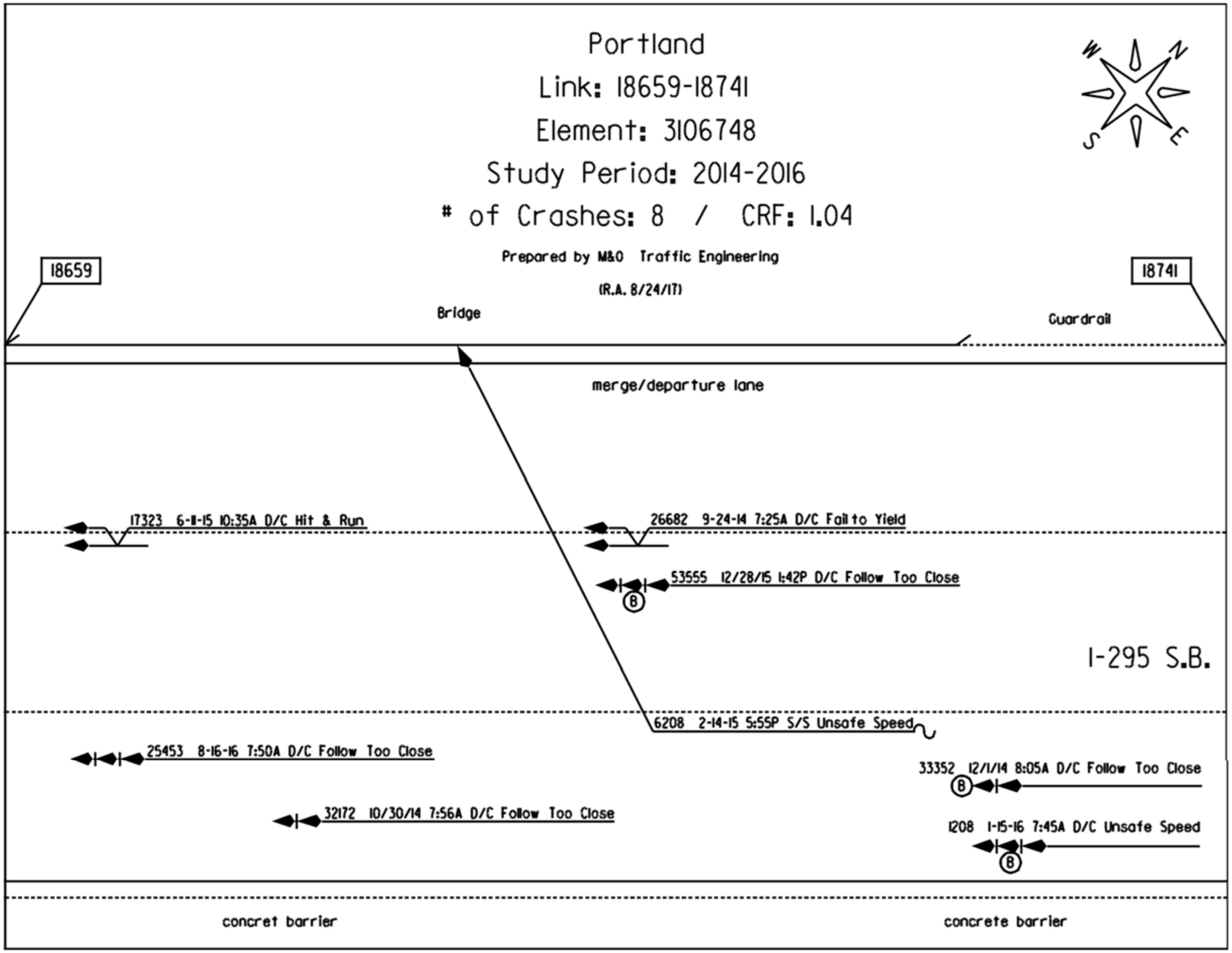


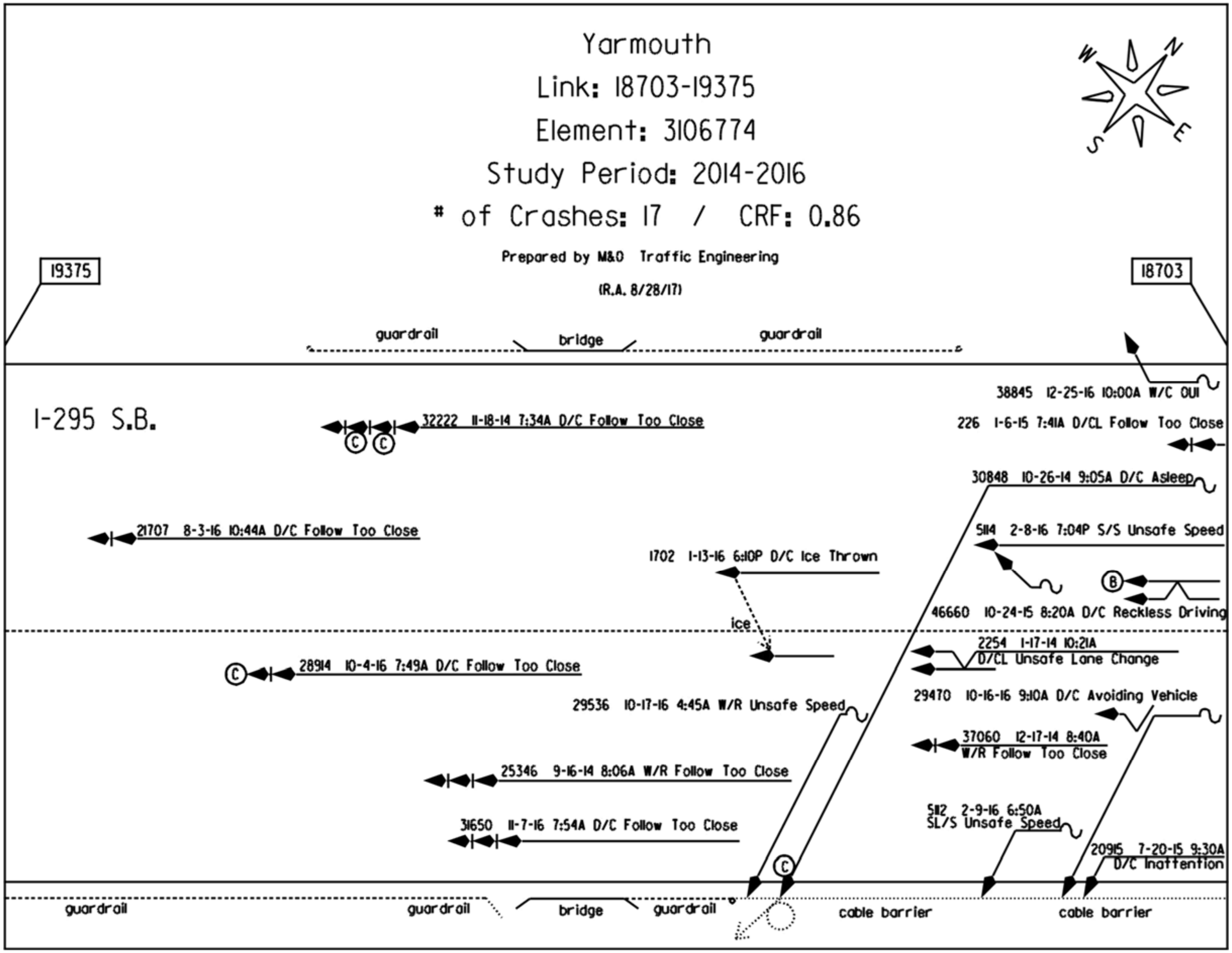


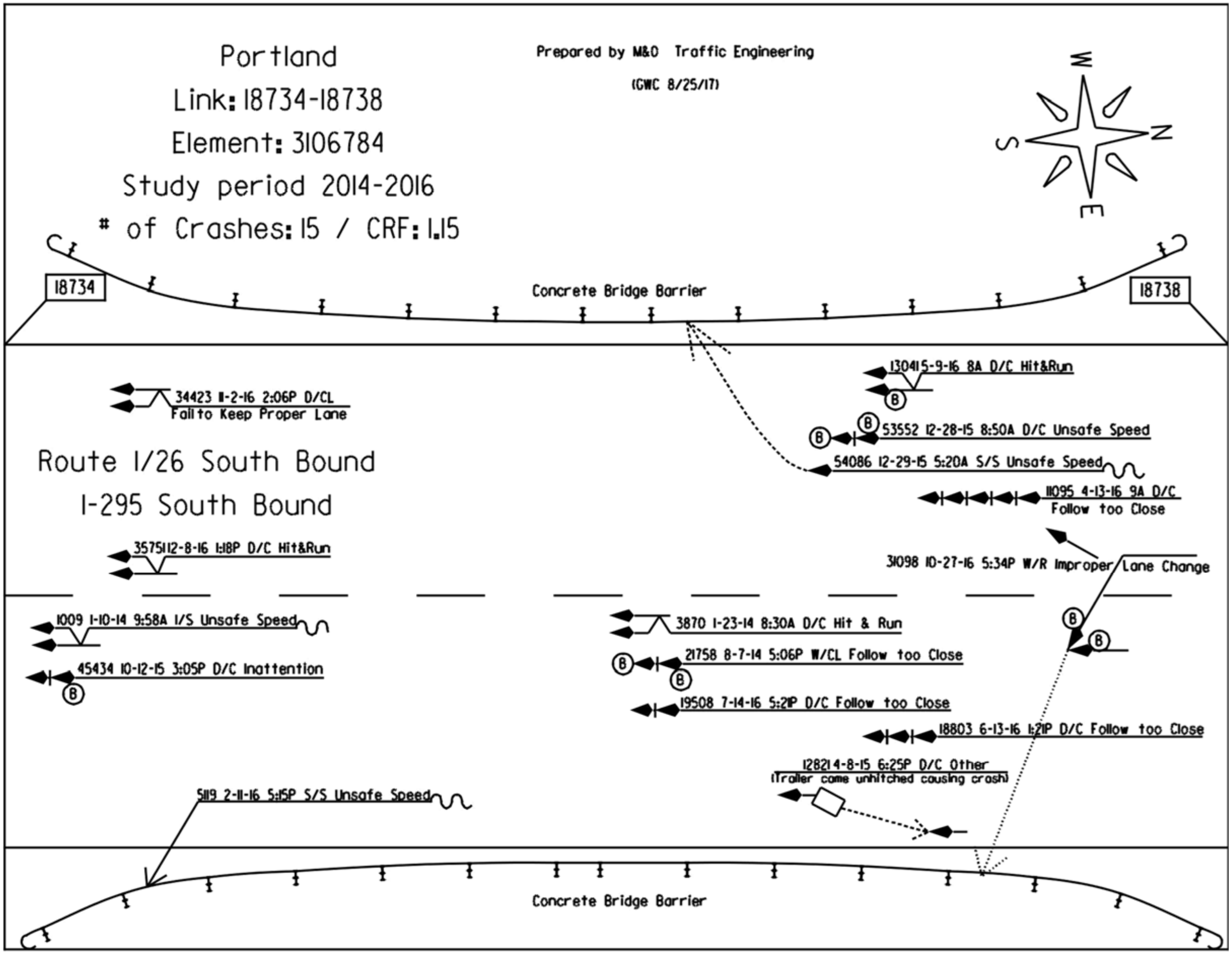
Prepared by M&O Traffic Engineering (MP 8/28/17)
South Portland
Link # 19244-71274
Element: 4033591
Study period 2014-2016
# of Crashes: 28 / CRF: 1.63
W
N
E
S
19244
71274
Guardrail
31006 11-12-14 12:10A
W/F Asleep
12829 4-15-15 1:45P
D/C Asleep
16868 6-24-14 8:47A
D/C Asleep
24155 8-19-16 1:35A
D/C Asleep
B
32907 11-25-14 5:40P D/C Unknown
15770 6-9-16 7:40A D/C Hit & Run
24782 9-12-14 3:34P D/C Follow Too Close
B
14983 6-1-16 4:22P D/C
Follow Too Close
21205 7-31-14 5:13P D/C Follow Too Close
C
30971 11-12-14 3:55P D/CL
Fail To Keep In Lane
2431 8-14-14 5:29P D/C Follow Too Close
6690 2-16-16 7:05A W/CL
Hit By Ice Chunks
18546 6-30-16 5:45P D/C Follow Too Close
I-295 NB
37027 12-17-16 9:47A
S/S Speed
8354 2-24-15 12:03P D/C
Over Corrected
32319 11-10-16 6:15P D/C Hit & Run
44106 10-9-15 3:15P W/R Fail To Yield
4594 2-8-14 2:35P D/C Follow too Close
C
4656 2-8-14 2:35P D/C Follow Too Close
12687 4-21-14 8:55A D/C Fail To Yield
C
21086 7-29-16 4:35P D/C Dog
A
39405 8-15-15 6:00P W/CL Fail To Yield
24022 8-19-16 3:41P D/C Brakes Failed
37767 12-20-16 4:42P D/C
Follow Too Close
42708 9-18-15 5:32P D/C Follow Too Close
B
39421 8-15-15 5:30P D/CL Hit & Run
37581 12-24-14 5:06P W/R Follow Too Close
B
37447 8-3-15 5:30P D/C Inattention

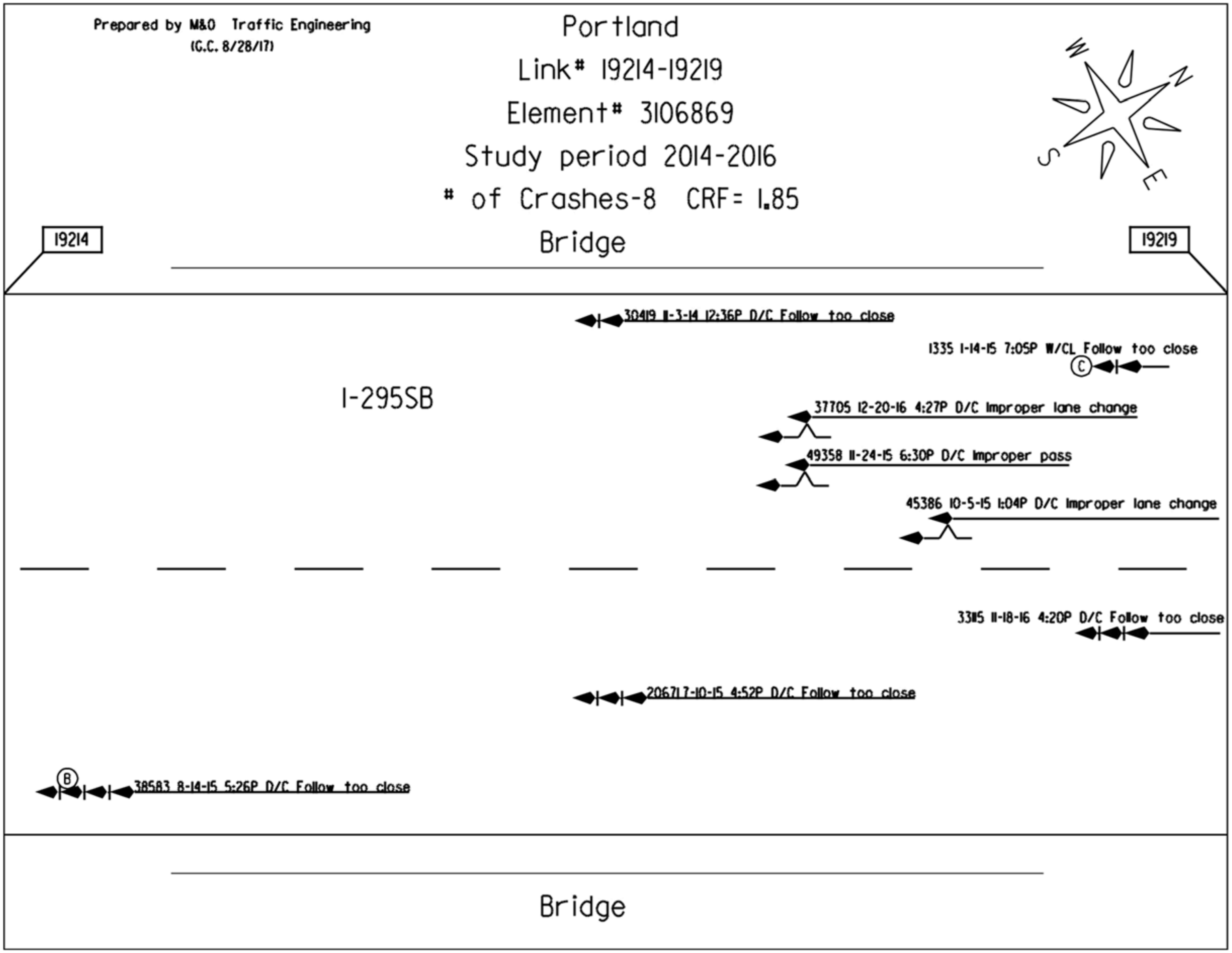
I. High Crash Location Diagrams – Southbound


Prepared by M&O Traffic Engineering (MP 8/29/17)
Cumberland
Link # 71258-18695
Element: 3967697
Study period 2014-2016
# of Crashes: 29 / CRF: 1.22
N
E
S
W
71258
18695
Sign
Guardrail
Guardrail
I-295 SB
29210 10-24-14 1:40A W/R Speed
40342 8-25-15 12:30P D/C Reckless
26894 10-6-14 12:15A D/C Unk Animal
14825 5-31-16 6:20A D/C Other Distraction
32187 11-9-16 5:45P D/C Fail To Yield
29599 11-1-14 7:08A W/R Speed
39553 8-23-15 11:40A W/R Speed
11203 4-2-15 6:10P D/C Reckless
32171 10-23-14 10:23P W/R Speed
4593 2-7-14 7:30P D/CL OverCorrected
11869 4-18-14 9:45A D/C Fail To Yield
51772 12-16-15 5:31P D/C Follow Too Close
26654 9-15-16 7:40A D/C Follow Too Close
37073 12-14-16 8:40A W/C Follow Too Close
20650 7-16-15 7:52A D/C Speed
16764 6-16-16 7:40A D/C Follow Too Close
4840 2-11-16 3:57P S/S Follow Too Close
20799 7-30-14 2:00A D/C Deer
22173 8-8-16 12:20P D/C Follow Close
31051 10-14-16 7:30A D/C Follow Too Close
32178 11-7-16 7:25A D/C Follow Too Close
16781 6-19-16 5:14A D/C Fail To Keep In Lane
6839 2-26-16 8:50A D/C Avoid Tire In Rd
10992 4-8-14 12:17A W/R Speed
48840 11-23-15 10:40P W/R Speed
906 1-6-14 4:16A I/SL Skid Trying To Pass
16246 6-11-14 1:56A D/C Locked Up Brakes
43086 9-24-15 8:10A D/C Follow Close
22762 8-13-16 8:30P W/R Asleep
Wire Guardrail

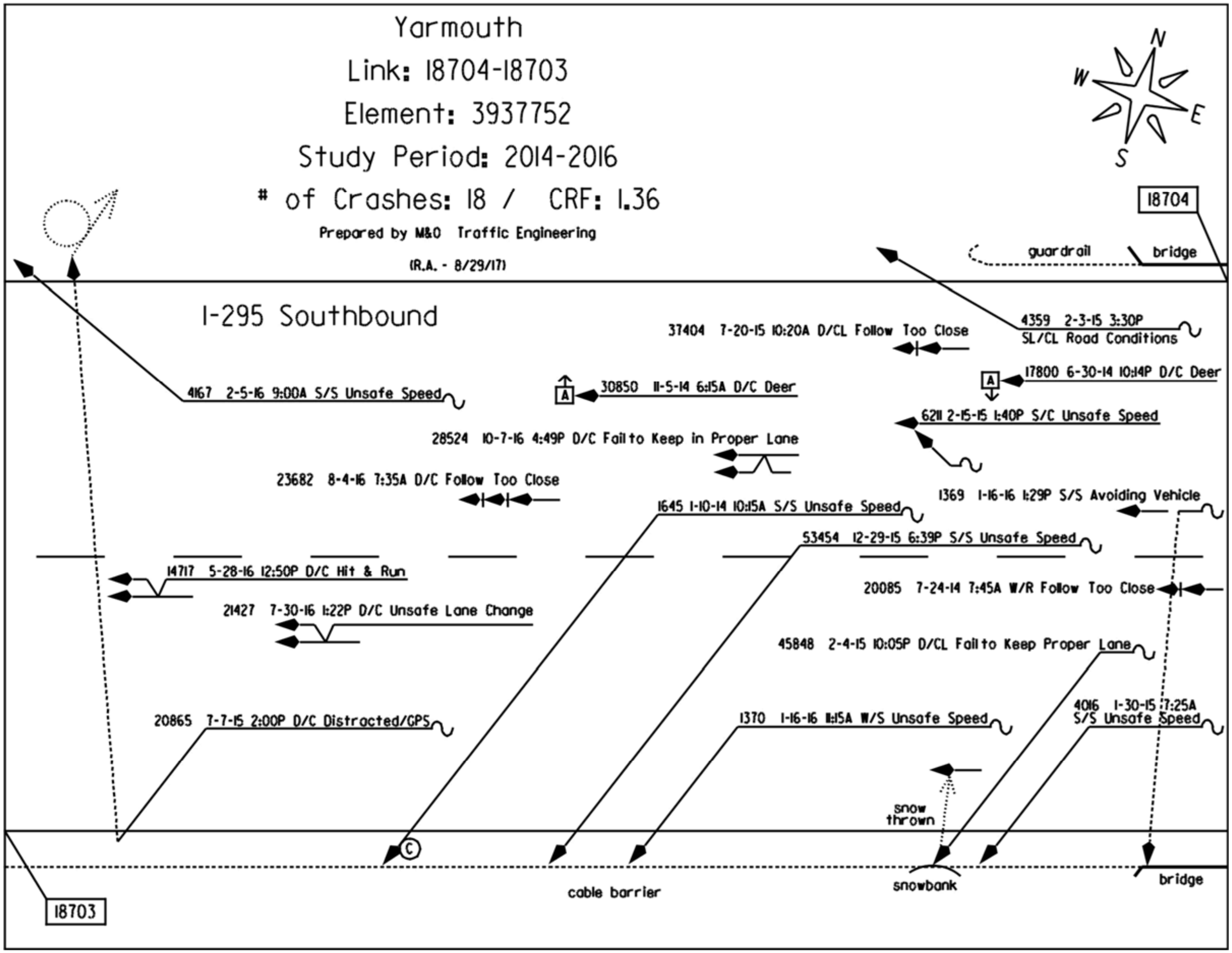

Portland
Link: 18659-18741
Element: 3106748
Study Period: 2014-2016
# of Crashes: 8 / CRF: 1.04
Prepared by M&O Traffic Engineering
(R.A. 8/24/17)
W
N
S
E
18659
18741
Bridge
Guardrail
merge/departure lane
17323 6-11-15 10:35A D/C Hit & Run
26682 9-24-14 7:25A D/C Fail to Yield
53555 12/28/15 1:42P D/C Follow Too Close
B
I-295 S.B.
6208 2-14-15 5:55P S/S Unsafe Speed
25453 8-16-16 7:50A D/C Follow Too Close
33352 12/1/14 8:05A D/C Follow Too Close
B
32172 10/30/14 7:56A D/C Follow Too Close
1208 1-15-16 7:45A D/C Unsafe Speed
B
concret barrier
concrete barrier

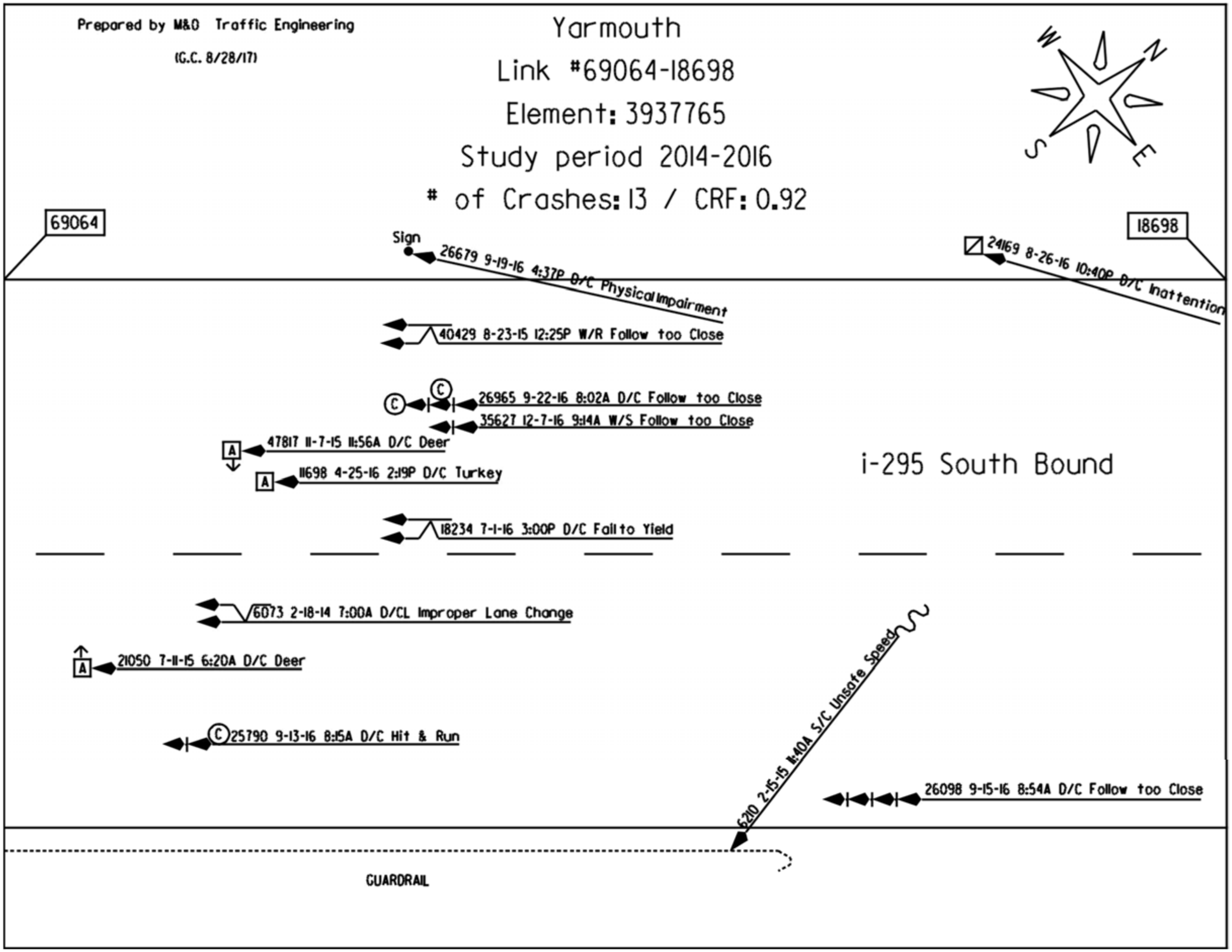

Yarmouth
Link: 18703-19375
Element: 3106774
Study Period: 2014-2016
# of Crashes: 17 / CRF: 0.86
Prepared by M&O Traffic Engineering
(R.A. 8/28/17)
W
N
S
E
19375
18703
guardrail
bridge
guardrail
I-295 S.B.
38845 12-25-16 10:00A W/C OUI
226 1-6-15 7:41A D/CL Follow Too Close
32222 11-18-14 7:34A D/C Follow Too Close
C
C
30848 10-26-14 9:05A D/C Asleep
21707 8-3-16 10:44A D/C Follow Too Close
5114 2-8-16 7:04P S/S Unsafe Speed
1702 1-13-16 6:10P D/C Ice Thrown
B
46660 10-24-15 8:20A D/C Reckless Driving
ice
2254 1-17-14 10:21A
D/CL Unsafe Lane Change
C
28914 10-4-16 7:49A D/C Follow Too Close
29536 10-17-16 4:45A W/R Unsafe Speed
29470 10-16-16 9:10A D/C Avoiding Vehicle
37060 12-17-14 8:40A
W/R Follow Too Close
25346 9-16-14 8:06A W/R Follow Too Close
31650 11-7-16 7:54A D/C Follow Too Close
5112 2-9-16 6:50A
SL/S Unsafe Speed
20915 7-20-15 9:30A
D/C Inattention
C
guardrail
guardrail
bridge
guardrail
cable barrier
cable barrier


Portland
Link: 18734-18738
Element: 3106784
Study period 2014-2016
# of Crashes: 15 / CRF: 1.15
Prepared by M&O Traffic Engineering
(GWC 8/25/17)
W
N
S
E
18734
18738
Concrete Bridge Barrier
130415-9-16 8A D/C Hit&Run
34423 11-2-16 2:06P D/CL
Fail to Keep Proper Lane
53552 12-28-15 8:50A D/C Unsafe Speed
54086 12-29-15 5:20A S/S Unsafe Speed
Route 1/26 South Bound
I-295 South Bound
11095 4-13-16 9A D/C
Follow too Close
35751 12-8-16 1:18P D/C Hit&Run
31098 10-27-16 5:34P W/R Improper Lane Change
1009 1-10-14 9:58A I/S Unsafe Speed
3870 1-23-14 8:30A D/C Hit & Run
21758 8-7-14 5:06P W/CL Follow too Close
45434 10-12-15 3:05P D/C Inattention
19508 7-14-16 5:21P D/C Follow too Close
18803 6-13-16 1:21P D/C Follow too Close
12821 4-8-15 6:25P D/C Other
(Trailer came unhitched causing crash)
5119 2-11-16 5:15P S/S Unsafe Speed
Concrete Bridge Barrier



Prepared by M&O Traffic Engineering
(G.C. 8/28/17)
Portland
Link# 19214-19219
Element# 3106869
Study period 2014-2016
# of Crashes-8 CRF= 1.85
Bridge
W
N
S
E
19214
19219
30419 11-3-14 12:36P D/C Follow too close
1335 1-14-15 7:05P W/CL Follow too close
C
I-295SB
37705 12-20-16 4:27P D/C Improper lane change
49358 11-24-15 6:30P D/C Improper pass
45386 10-5-15 1:04P D/C Improper lane change
33115 11-18-16 4:20P D/C Follow too close
206717-10-15 4:52P D/C Follow too close
B
38583 8-14-15 5:26P D/C Follow too close
Bridge


Yarmouth
Link: 18704-18703
Element: 3937752
Study Period: 2014-2016
# of Crashes: 18 / CRF: 1.36
Prepared by M&O Traffic Engineering
(R.A. - 8/29/17)
18704
guardrail
bridge
I-295 Southbound
4359 2-3-15 3:30P
SL/CL Road Conditions
37404 7-20-15 10:20A D/CL Follow Too Close
17800 6-30-14 10:14P D/C Deer
30850 11-5-14 6:15A D/C Deer
4167 2-5-16 9:00A S/S Unsafe Speed
6211 2-15-15 1:40P S/C Unsafe Speed
28524 10-7-16 4:49P D/C Fail to Keep in Proper Lane
23682 8-4-16 7:35A D/C Follow Too Close
1369 1-16-16 1:29P S/S Avoiding Vehicle
1645 1-10-14 10:15A S/S Unsafe Speed
53454 12-29-15 6:39P S/S Unsafe Speed
14717 5-28-16 12:50P D/C Hit & Run
20085 7-24-14 7:45A W/R Follow Too Close
21427 7-30-16 1:22P D/C Unsafe Lane Change
45848 2-4-15 10:05P D/CL Fail to Keep Proper Lane
4016 1-30-15 7:25A
S/S Unsafe Speed
20865 7-7-15 2:00P D/C Distracted/GPS
1370 1-16-16 11:15A W/S Unsafe Speed
snow thrown
snowbank
cable barrier
bridge
18703


Prepared by M&O Traffic Engineering
(G.C. 8/28/17)
Yarmouth
Link #69064-18698
Element: 3937765
Study period 2014-2016
# of Crashes: 13 / CRF: 0.92
W
N
S
E
69064
18698
Sign
26679 9-19-16 4:37P D/C Physical Impairment
24169 8-26-16 10:40P D/C Inattention
40429 8-23-15 12:25P W/R Follow too Close
C
26965 9-22-16 8:02A D/C Follow too Close
35627 12-7-16 9:14A W/S Follow too Close
A
47817 11-7-15 11:56A D/C Deer
11698 4-25-16 2:19P D/C Turkey
i-295 South Bound
18234 7-1-16 3:00P D/C Fail to Yield
6073 2-18-14 7:00A D/CL Improper Lane Change
21050 7-11-15 6:20A D/C Deer
25790 9-13-16 8:15A D/C Hit & Run
6210 2-15-15 11:40A S/C Unsafe Speed
26098 9-15-16 8:54A D/C Follow too Close
GUARDRAIL

J. 2016 FREEVAL Level of Service

AM SB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27
AM SB		Exit 28 off		Exit 28 on		Exit 22 off		Exit 22 on		Exit 20 off		Exit 20 on		Exit 17 off		Exit 17 on		Exit 15 off		Exit 15 on		Exit 11 off		Exit 10 off		Exit 10 on	E
Speed (mph)	69.0	54.7	69.0	65.7	68.3	54.5	67.1	60.5	67.0	56.7	68.4	59.0	64.6	56.7	67.1	58.5	64.1	56.4	65.5	58.1	61.9	50.1	64.9	57.9	69.3	57.1	64.5
D/C	0.371	0.371	0.289	0.614	0.595	0.595	0.482	0.658	0.658	0.658	0.588	0.740	0.740	0.740	0.654	0.737	0.740	0.740	0.694	0.808	0.808	0.808	0.619	0.617	0.522	0.684	0.684
Density Based LOS	B	B	B	B	C	C	C	C	C	C	C	C	D	C	C	C	D	C	D	C	E	D	C	C	C	C	D
VHT	11.23	2.04	4.90	2.73	40.27	3.29	1.45	3.30	6.36	3.53	5.41	3.74	25.06	3.89	7.36	3.87	11.54	4.02	3.89	4.27	46.78	4.95	0.78	3.30	1.56	3.67	38.15

AM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
AM SB		Exit 9 weave		Exit 8 weave		Exit 7 off		Exit 7 on		Exit 6B off		Exit 6B/6A Weave		Exit 6A on		Exit 5B off		Exit 5B/5A weave		Exit 5A on		Exit 4 off		Exit 4 to 3 weave		Exit 2 off		Exit 1 off	
Speed (mph)	64.5	49.1	52.1	38.5	51.9	52.5	54.8	50.3	49.7	49.7	52.6	45.2	52.5	51.3	49.9	49.9	56.7	48.6	57.8	54.0	59.2	49.3	59.4	50.4	67.6	59.7	63.7	56.4	43.0
D/C	0.684	0.723	0.868	0.767	0.687	0.687	0.765	0.878	0.878	0.878	0.834	0.675	0.735	0.830	0.830	0.815	0.685	0.584	0.611	0.687	0.615	0.615	0.528	0.525	0.467	0.467	0.307	0.307	0.214
Density Based LOS	D	C	D	D	C	A	D	C	D	D	D	C	C	C	C	C	C	B	C	C	C	C	C	B	B	B	A	A	A
VHT	38.15	2.36	3.55	5.62	2.74	5.09	3.91	0.31	4.34	0.31	2.73	0.99	2.64	3.35	0.86	3.45	1.05	1.06	4.28	3.38	2.05	3.69	3.69	5.87	0.56	2.40	1.62	1.61	9.61

AM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
AM NB		Exit 1 off		Exit 1 on		Exit 2 on		Exit 3 to 4 weave		Exit 4 on		Exit 5 off		Exit 5 on (S)	Exit 5 on (N)		Exit 6A off		Exit 6A/B weave		Exit 6B to 7 weave		Exit 7 on		Exit 8 weave		Exit 9 weave	
Speed (mph)	53.0	26.0	48.1	56.2	62.6	58.0	60.1	46.5	63.7	52.5	48.9	48.9	57.6	51.8	50.3	50.0	50.0	55.1	47.0	53.5	42.5	56.7	58.9	59.0	43.8	57.9	47.7	66.0
D/C	0.324	0.368	0.292	0.498	0.498	0.799	0.799	0.735	0.641	0.825	0.825	0.922	0.724	0.818	0.889	0.889	0.864	0.745	0.609	0.659	0.712	0.617	0.460	0.475	0.491	0.533	0.491	0.422
Density Based LOS	B	B	B	B	B	C	D	D	C	C	D	D	C	C	C	D	D	C	C	C	C	C	B	B	B	B	B	B
VHT	3.48	3.54	1.82	2.68	3.36	3.96	2.29	9.25	7.04	3.08	1.65	3.30	6.58	2.19	1.78	2.68	1.79	2.33	0.86	2.11	1.67	4.84	3.02	1.21	2.48	2.08	1.76	21.64

AM NB	N28	N29	N30	N31	N32	N33	N34	N35	N36	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46	N47	N48	N49	N50	N51	N52	N53	N54	N55	N56	N57
AM NB		Exit 10 off		Exit 10 on	Exit 11 on		Exit 15 off		Exit 15 on		Exit 17 off		Exit 17 on		Exit 20 off		Exit 20 on		Exit 22 off		Exit 22 on		Exit 24 off		Exit 24 on		Exit 28 off		Exit 28 on	
Speed (mph)	66.0	53.4	64.2	62.8	60.3	68.0	54.3	66.6	60.2	68.0	56.2	67.9	59.7	67.0	55.0	66.8	60.3	67.9	54.6	66.1	61.5	68.9	57.3	66.7	61.6	69.0	62.8	68.9	61.4	69.0
D/C	0.422	0.422	0.345	0.423	0.509	0.531	0.509	0.423	0.460	0.479	0.460	0.417	0.489	0.509	0.489	0.376	0.423	0.403	0.403	0.354	0.395	0.415	0.395	0.380	0.413	0.413	0.393	0.253	0.282	0.282
Density Based LOS	B	B	B	B	B	C	B	B	B	C	B	B	B	C	B	B	B	B	B	B	B	B	B	B	B	B	A	B	B	B
VHT	21.64	2.35	0.96	0.81	2.49	28.37	2.76	1.62	2.25	6.65	2.41	4.48	2.41	15.15	2.61	4.07	1.94	4.37	2.14	0.93	1.86	4.10	2.00	0.55	1.85	22.03	1.81	2.33	1.29	6.87

PM SB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27
PM SB		Exit 28 off		Exit 28 on		Exit 22 off		Exit 22 on		Exit 20 off		Exit 20 on		Exit 17 off		Exit 17 on		Exit 15 off		Exit 15 on		Exit 11 off		Exit 10 off		Exit 10 on	E
Speed (mph)	69.0	55.2	69.0	65.9	68.7	54.7	67.1	61.2	68.6	57.0	68.7	59.8	66.8	56.6	68.5	59.6	66.8	56.2	67.2	60.4	67.8	50.4	65.0	58.0	69.3	58.3	66.0
D/C	0.346	0.346	0.308	0.578	0.558	0.558	0.472	0.564	0.564	0.564	0.521	0.669	0.669	0.669	0.578	0.634	0.637	0.637	0.573	0.621	0.621	0.621	0.458	0.457	0.375	0.500	0.500
Density Based LOS	B	B	B	B	C	C	C	B	C	C	C	C	D	C	C	C	C	C	C	B	C	C	C	B	B	B	C
VHT	10.29	1.86	5.11	2.53	37.24	3.05	1.40	2.75	5.24	2.96	4.68	3.27	21.48	3.45	6.24	3.21	9.34	3.40	3.07	3.10	32.17	3.71	0.57	2.40	1.11	2.62	27.11

PM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
PM SB		Exit 9 weave		Exit 8 weave		Exit 7 off		Exit 7 on		Exit 6B off		Exit 6B/6A Weave		Exit 6A on		Exit 5B off		Exit 5B/5A weave		Exit 5A on		Exit 4 off		Exit 4 to 3 weave		Exit 2 off		Exit 1 off	
Speed (mph)	66.0	51.5	57.4	41.9	52.7	53.5	55.8	50.3	49.7	49.7	53.0	42.0	51.5	44.9	44.9	46.3	53.6	48.8	52.7	49.0	57.2	48.6	59.4	45.9	67.1	60.1	63.7	55.2	43.0
D/C	0.500	0.534	0.619	0.583	0.532	0.532	0.669	0.865	0.865	0.865	0.823	0.758	0.801	0.973	0.973	0.955	0.837	0.703	0.857	0.925	0.828	0.828	0.643	0.747	0.651	0.651	0.527	0.527	0.310
Density Based LOS	C	B	C	C	B	A	C	C	D	D	D	D	D	D	D	D	D	C	D	D	D	D	C	D	C	B	B	B	B
VHT	27.11	1.63	2.28	3.87	2.08	3.83	3.34	0.30	4.27	0.31	2.68	1.16	2.94	4.48	1.12	4.35	1.36	1.32	6.64	5.05	2.88	5.08	4.53	9.11	0.80	3.36	2.83	2.88	14.10

PM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
PM NB		Exit 1 off		Exit 1 on		Exit 2 on		Exit 3 to 4 weave		Exit 4 on		Exit 5 off		Exit 5 on (S)	Exit 5 on (N)		Exit 6A off		Exit 6A/B weave		Exit 6B to 7 weave		Exit 7 on		Exit 8 weave		Exit 9	
Speed (mph)	53.0	26.0	48.1	56.5	62.6	59.5	63.4	20.6	12.5	18.4	18.4	20.8	13.2	21.7	45.7	45.7	49.2	54.1	45.8	53.1	40.4	56.0	58.4	58.2	38.5	54.0	45.3	64.7
D/C	0.198	0.226	0.179	0.367	0.367	0.599	0.599	0.671	0.676	0.810	0.810	0.906	0.743	0.908	1.014	1.014	0.990	0.878	0.726	0.831	0.870	0.813	0.718	0.733	0.772	0.880	0.740	0.702
Density Based LOS	A	A	A	B	B	B	C	F	F	F	F	F	F	F	D	D	D	D	C	D	D	C	C	C	D	D	C	C
VHT	2.07	2.11	1.08	1.96	2.47	2.98	1.68	17.55	33.95	7.85	3.89	6.90	26.67	5.31	2.08	3.12	1.93	2.60	1.00	2.55	2.10	6.18	4.66	1.87	4.40	3.64	2.87	36.24

PM NB	N28	N29	N30	N31	N32	N33	N34	N35	N36	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46	N47	N48	N49	N50	N51	N52	N53	N54	N55	N56	N57
PM NB		Exit 10 off		Exit 10 on	Exit 11 on		Exit 15 off		Exit 15 on		Exit 17 off		Exit 17 on		Exit 20 off		Exit 20 on		Exit 22 off		Exit 22 on		Exit 24 off		Exit 24 on		Exit 28 off		Exit 28 on	
Speed (mph)	64.7	52.7	64.1	61.5	57.8	62.1	53.8	66.5	58.6	65.0	56.0	67.0	58.1	63.8	54.8	66.8	58.8	66.2	53.9	66.0	60.6	67.8	57.3	66.7	60.4	67.4	54.7	68.7	60.9	69.0
D/C	0.702	0.702	0.543	0.628	0.779	0.793	0.779	0.649	0.697	0.712	0.697	0.625	0.717	0.732	0.717	0.585	0.686	0.666	0.666	0.547	0.601	0.620	0.601	0.584	0.643	0.643	0.623	0.390	0.448	0.448
Density Based LOS	C	D	C	C	C	D	C	C	C	D	C	C	C	D	C	C	C	D	C	C	B	C	C	C	C	C	B	B	B	C
VHT	36.24	4.06	1.56	1.27	4.17	49.96	4.48	2.61	3.65	10.99	3.83	7.31	3.78	24.29	4.01	6.76	3.43	7.72	3.75	1.49	2.99	6.58	3.16	0.88	3.10	37.11	3.43	3.74	2.13	11.31

K. 2040 FREEVAL Level of Service

AM SB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27
AM SB		Exit 28 off	0	Exit 28 on	0	Exit 22 off	0	Exit 22 on	0	Exit 20 off	0	Exit 20 on	0	Exit 17 off	0	Exit 17 on	0	Exit 15 off	0	Exit 15 on	0	Exit 11 off	0	Exit 10 off	0	Exit 10 on	0
Speed (mph)	69.0	54.6	69.0	65.1	67.1	54.5	67.1	59.7	64.9	56.7	67.0	57.4	60.5	56.7	64.3	56.5	59.4	56.3	61.7	54.8	54.8	49.9	64.9	57.8	69.1	54.9	58.9
D/C	0.408	0.408	0.318	0.675	0.654	0.654	0.541	0.730	0.730	0.730	0.660	0.836	0.836	0.836	0.747	0.848	0.851	0.851	0.801	0.937	0.937	0.937	0.729	0.726	0.626	0.848	0.848
Density Based LOS	B	B	B	B	C	C	C	C	D	D	C	D	E	D	D	D	E	D	D	D	E	E	D	D	C	D	E
VHT	12.36	2.25	5.39	3.03	45.04	3.62	1.63	3.72	7.29	3.92	6.20	4.34	30.23	4.40	8.78	4.61	14.33	4.62	4.76	5.25	61.25	5.76	0.92	3.89	1.87	4.74	51.86

AM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
AM SB	0	xit 9 weav	0	xit 8 weav	0	Exit 7 off	0	Exit 7 on	0	Exit 6B off	0	6B/6A We	0	Exit 6A on	0	Exit 5B off	0	5B/5A we	0	Exit 5A on	0	Exit 4 off	0	t 4 to 3 wea	0	Exit 2 off	0	Exit 1 off	0
Speed (mph)	58.9	16.7	46.5	37.0	21.4	16.2	20.0	46.9	46.9	47.6	50.3	43.3	51.9	49.9	49.8	49.8	56.7	47.0	57.7	53.6	59.2	49.3	59.4	48.0	67.3	59.3	63.6	56.1	43.0
D/C	0.848	0.882	1.067	0.931	0.818	0.818	0.916	1.045	1.045	1.045	0.992	0.804	0.874	0.988	0.988	0.970	0.815	0.693	0.733	0.825	0.738	0.738	0.639	0.649	0.575	0.575	0.368	0.368	0.236
Density Based LOS	E	F	E	D	F	F	F	D	D	D	D	C	D	C	D	C	C	C	C	C	C	C	C	C	B	B	B	A	A
VHT	51.86	7.57	4.33	6.21	6.90	17.10	11.20	0.35	4.87	0.34	3.02	1.10	2.85	3.72	0.93	3.73	1.13	1.19	4.71	3.77	2.28	4.10	4.12	7.15	0.66	2.80	1.83	1.83	9.96

AM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
AM NB	0	Exit 1 off	0	Exit 1 on	0	Exit 2 on	0	t 3 to 4 wea	0	Exit 4 on	0	Exit 5 off	0	Exit 5 on (S)	Exit 5 on (N)	0	Exit 6A off	0	t 6A/B wea	0	6B to 7 we	0	Exit 7 on	0	xit 8 weav	0	xit 9 weav	0
Speed (mph)	53.0	26.0	48.1	54.6	23.5	35.5	38.7	24.1	15.2	26.4	26.4	47.7	57.2	51.7	48.4	48.4	49.9	55.0	45.2	52.9	40.1	56.5	58.9	59.0	41.6	57.5	46.3	66.0
D/C	0.356	0.405	0.324	0.598	0.598	0.983	0.983	0.901	0.803	0.990	0.990	1.106	0.870	0.974	1.058	1.058	1.029	0.887	0.725	0.784	0.848	0.735	0.547	0.566	0.596	0.656	0.595	0.523
Density Based LOS	B	B	B	C	F	F	F	F	F	F	F	D	C	C	C	D	D	D	C	C	D	C	B	B	C	C	B	B
VHT	3.82	3.90	2.02	3.31	11.20	7.27	3.97	18.42	30.65	6.30	3.13	3.46	6.76	2.26	1.92	2.88	1.86	2.42	0.93	2.23	1.89	5.22	3.28	1.31	2.92	2.39	2.07	25.07

AM NB	N28	N29	N30	N31	N32	N33	N34	N35	N36	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46	N47	N48	N49	N50	N51	N52	N53	N54	N55	N56	N57
AM NB	0	Exit 10 off	0	Exit 10 on	Exit 11 on	0	Exit 15 off	0	Exit 15 on	0	Exit 17 off	0	Exit 17 on	0	Exit 20 off	0	Exit 20 on	0	Exit 22 off	0	Exit 22 on	0	Exit 24 off	0	Exit 24 on	0	Exit 28 off	0	Exit 28 on	0
Speed (mph)	66.0	53.2	64.2	62.4	59.8	67.2	54.1	66.6	59.9	67.9	56.1	67.8	59.4	66.8	54.7	66.8	60.1	67.9	54.6	66.1	61.4	68.9	57.3	66.7	61.5	69.0	62.7	68.9	61.3	69.0
D/C	0.523	0.523	0.422	0.499	0.591	0.616	0.591	0.491	0.529	0.551	0.529	0.475	0.552	0.575	0.552	0.421	0.469	0.448	0.448	0.394	0.434	0.456	0.434	0.418	0.455	0.455	0.433	0.278	0.310	0.310
Density Based LOS	B	C	B	C	B	C	C	C	B	C	B	C	B	C	B	B	B	C	B	B	B	C	B	B	B	C	B	B	B	B
VHT	25.07	2.92	1.17	0.97	2.91	33.29	3.21	1.88	2.61	7.66	2.78	5.11	2.73	17.16	2.97	4.55	2.16	4.85	2.38	1.03	2.05	4.51	2.20	0.61	2.04	24.23	2.00	2.56	1.42	7.55

PM SB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27
PM SB		Exit 28 off	0	Exit 28 on	0	Exit 22 off	0	Exit 22 on	0	Exit 20 off	0	Exit 20 on	0	Exit 17 off	0	Exit 17 on	0	Exit 15 off	0	Exit 15 on	0	Exit 11 off	0	Exit 10 off	0	Exit 10 on	0
Speed (mph)	69.0	55.0	69.0	64.6	66.2	54.3	67.1	60.6	67.1	56.8	68.2	58.5	63.2	56.5	66.6	58.4	63.9	56.0	66.4	59.6	65.7	50.1	65.0	57.9	69.3	57.9	65.9
D/C	0.429	0.429	0.381	0.717	0.692	0.692	0.562	0.654	0.654	0.654	0.599	0.776	0.776	0.776	0.674	0.742	0.745	0.745	0.659	0.708	0.708	0.708	0.518	0.516	0.420	0.575	0.575
Density Based LOS	B	B	B	B	D	C	C	C	C	C	C	C	D	C	D	C	D	C	C	C	D	C	C	C	B	C	C
VHT	12.76	2.31	6.34	3.20	47.95	3.81	1.67	3.23	6.21	3.44	5.42	3.88	26.31	4.01	7.48	3.83	11.42	4.00	3.57	3.58	37.88	4.25	0.65	2.72	1.24	3.03	31.21

PM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
PM SB	0	xit 9 weav	0	xit 8 weav	0	Exit 7 off	0	Exit 7 on	0	Exit 6B off	0	6B/6A We	0	Exit 6A on	0	Exit 5B off	0	5B/5A we	0	Exit 5A on	0	Exit 4 off	0	t 4 to 3 wea	0	Exit 2 off	0	Exit 1 off	0
Speed (mph)	65.9	29.3	38.2	13.7	7.8	7.3	11.1	22.5	19.6	19.6	17.0	12.5	16.7	47.9	47.9	49.0	55.2	47.8	53.9	50.2	57.8	48.7	59.4	43.4	66.8	59.9	63.7	55.1	43.0
D/C	0.575	0.607	0.706	0.677	0.601	0.601	0.761	0.969	0.969	0.969	0.922	0.852	0.889	1.070	1.070	1.050	0.921	0.773	0.943	1.017	0.910	0.910	0.707	0.857	0.709	0.709	0.558	0.558	0.310
Density Based LOS	C	D	E	F	F	F	F	F	F	F	F	F	F	D	D	C	D	C	D	C	D	D	C	D	C	B	B	B	B
VHT	31.21	3.27	3.91	10.80	12.59	25.14	15.22	0.63	9.93	0.71	7.63	3.66	8.48	4.02	1.00	3.93	1.26	1.31	6.28	4.83	2.80	4.98	4.44	10.09	0.82	3.41	2.79	2.84	13.07

PM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
PM NB	0	Exit 1 off	0	Exit 1 on	0	Exit 2 on	0	t 3 to 4 wea	0	Exit 4 on	0	Exit 5 off	0	Exit 5 on (S)	Exit 5 on (N)	0	Exit 6A off	0	t 6A/B wea	0	6B to 7 we	0	Exit 7 on	0	xit 8 weav	0	Exit 9	0
Speed (mph)	53.0	26.0	48.1	56.5	62.4	56.8	34.5	11.1	11.1	17.0	17.0	19.1	12.3	21.2	45.5	45.5	49.2	53.8	44.6	52.7	38.5	54.9	57.3	56.9	35.8	49.2	44.0	62.8
D/C	0.198	0.226	0.179	0.388	0.388	0.676	0.676	0.755	0.744	0.891	0.891	0.996	0.817	0.999	1.115	1.115	1.089	0.975	0.806	0.922	0.978	0.911	0.811	0.828	0.896	1.003	0.841	0.808
Density Based LOS	A	A	A	B	B	C	E	F	F	F	F	F	F	F	D	D	D	D	C	D	D	D	C	C	E	E	D	D
VHT	2.07	2.11	1.08	2.07	2.63	3.52	3.39	30.77	35.76	8.22	4.08	7.28	27.61	5.40	2.09	3.13	1.93	2.64	1.04	2.61	2.31	6.60	5.11	2.06	5.23	4.37	3.24	41.37

PM NB	N28	N29	N30	N31	N32	N33	N34	N35	N36	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46	N47	N48	N49	N50	N51	N52	N53	N54	N55	N56	N57
PM NB	0	Exit 10 off	0	Exit 10 on	Exit 11 on	0	Exit 15 off	0	Exit 15 on	0	Exit 17 off	0	Exit 17 on	0	Exit 20 off	0	Exit 20 on	0	Exit 22 off	0	Exit 22 on	0	Exit 24 off	0	Exit 24 on	0	Exit 28 off	0	Exit 28 on	0
Speed (mph)	62.8	52.3	64.0	60.5	55.6	56.5	53.7	63.7	57.0	60.3	55.8	64.4	56.3	59.2	54.5	65.3	57.4	62.9	53.9	66.0	59.1	63.5	57.2	65.2	58.7	62.3	54.1	68.7	60.4	68.7
D/C	0.808	0.808	0.614	0.710	0.888	0.904	0.888	0.753	0.816	0.833	0.816	0.731	0.831	0.849	0.831	0.678	0.795	0.773	0.773	0.655	0.745	0.769	0.745	0.724	0.798	0.798	0.772	0.484	0.555	0.555
Density Based LOS	D	D	C	D	C	E	D	D	D	E	D	D	D	E	C	D	C	D	D	C	C	D	D	D	C	D	C	C	B	C
VHT	41.37	4.69	1.76	1.46	4.94	62.55	5.11	3.16	4.40	13.86	4.49	8.90	4.52	30.40	4.67	8.02	4.08	9.43	4.34	1.79	3.80	8.71	3.92	1.11	3.96	49.75	4.30	4.64	2.67	14.08

L. 2040 FREEVAL Accel/Dec Extensions Level of Service

AM SB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27
AM SB		Exit 28 off	0	Exit 28 on	0	Exit 22 off	0	Exit 22 on	0	Exit 20 off	0	Exit 20 on	0	Exit 17 off	0	Exit 17 on	0	Exit 15 off	0	Exit 15 on	0	Exit 11 off	0	Exit 10 off	0	Exit 10 on	0
Speed (mph)	69.0	54.6	69.0	65.1	67.1	54.5	67.1	59.7	64.9	56.7	67.0	57.8	60.5	56.7	64.3	57.2	59.4	56.3	61.7	54.8	54.8	49.9	64.9	57.8	69.1	55.6	58.9
D/C	0.408	0.408	0.318	0.675	0.654	0.654	0.541	0.730	0.730	0.730	0.660	0.836	0.836	0.836	0.747	0.848	0.851	0.851	0.801	0.937	0.937	0.937	0.729	0.726	0.626	0.848	0.848
Density Based LOS	B	B	B	B	C	C	C	C	D	D	C	C	E	D	D	D	E	D	D	D	E	E	D	D	C	D	E
VHT	12.36	2.25	5.39	3.03	45.04	3.62	1.63	3.72	7.29	3.92	6.20	4.32	30.23	4.40	8.78	4.56	14.33	4.62	4.76	5.25	61.25	5.76	0.92	3.89	1.87	4.68	51.86

AM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
AM SB	0	xit 9 weav	0	xit 8 weav	0	Exit 7 off	0	Exit 7 on	0	Exit 6B off	0	6B/6A We	0	Exit 6A on	0	Exit 5B off	0	5B/5A we	0	Exit 5A on	0	Exit 4 off	0	t 4 to 3 wea	0	Exit 2 off	0	Exit 1 off	0
Speed (mph)	58.9	16.7	46.5	37.0	21.4	16.2	20.0	46.9	46.9	47.6	50.3	43.3	51.9	49.9	49.8	49.8	56.7	47.0	57.7	53.6	59.2	49.3	59.4	48.0	67.3	59.3	63.6	56.1	43.0
D/C	0.848	0.882	1.067	0.931	0.818	0.818	0.916	1.045	1.045	1.045	0.992	0.804	0.874	0.988	0.988	0.970	0.815	0.693	0.733	0.825	0.738	0.738	0.639	0.649	0.575	0.575	0.368	0.368	0.236
Density Based LOS	E	F	E	D	F	F	F	D	D	D	D	C	D	C	D	C	C	C	C	C	C	C	C	C	B	B	B	A	A
VHT	51.86	7.57	4.33	6.21	6.90	17.10	11.20	0.35	4.87	0.34	3.02	1.10	2.85	3.72	0.93	3.73	1.13	1.19	4.71	3.77	2.28	4.10	4.12	7.15	0.66	2.80	1.83	1.83	9.96

AM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
AM NB	0	Exit 1 off	0	Exit 1 on	0	Exit 2 on	0	t 3 to 4 wea	0	Exit 4 on	0	Exit 5 off	0	Exit 5 on (S)	Exit 5 on (N)	0	Exit 6A off	0	t 6A/B wea	0	6B to 7 we	0	Exit 7 on	0	xit 8 weav	0	xit 9 weav	0
Speed (mph)	53.0	26.0	48.1	56.4	23.5	35.5	38.7	24.1	15.2	26.4	26.4	47.7	57.2	51.7	48.4	48.4	49.9	55.0	45.2	52.9	40.1	56.5	58.9	59.0	41.6	57.5	46.3	66.0
D/C	0.356	0.405	0.324	0.598	0.598	0.983	0.983	0.901	0.803	0.990	0.990	1.106	0.870	0.974	1.058	1.058	1.029	0.887	0.725	0.784	0.848	0.735	0.547	0.566	0.596	0.656	0.595	0.523
Density Based LOS	B	B	B	C	F	F	F	F	F	F	F	D	C	C	C	D	D	D	C	C	D	C	B	B	C	C	B	B
VHT	3.82	3.90	2.02	3.20	11.20	7.27	3.97	18.42	30.65	6.30	3.13	3.46	6.76	2.26	1.92	2.88	1.86	2.42	0.93	2.23	1.89	5.22	3.28	1.31	2.92	2.39	2.07	25.07

AM NB	N28	N29	N30	N31	N32	N33	N34	N35	N36	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46	N47	N48	N49	N50	N51	N52	N53	N54	N55	N56	N57
AM NB	0	Exit 10 off	0	Exit 10 on	Exit 11 on	0	Exit 15 off	0	Exit 15 on	0	Exit 17 off	0	Exit 17 on	0	Exit 20 off	0	Exit 20 on	0	Exit 22 off	0	Exit 22 on	0	Exit 24 off	0	Exit 24 on	0	Exit 28 off	0	Exit 28 on	0
Speed (mph)	66.0	53.2	64.2	64.2	59.8	67.2	54.1	66.6	60.3	67.9	56.1	67.8	59.4	66.8	54.7	66.8	60.1	67.9	54.6	66.1	61.4	68.9	57.3	66.7	61.5	69.0	62.7	68.9	61.8	69.0
D/C	0.523	0.523	0.422	0.499	0.591	0.616	0.591	0.491	0.529	0.551	0.529	0.475	0.552	0.575	0.552	0.421	0.469	0.448	0.448	0.394	0.434	0.456	0.434	0.418	0.455	0.455	0.433	0.278	0.310	0.310
Density Based LOS	B	B	B	B	B	C	C	C	B	C	B	C	B	C	B	B	B	C	B	B	B	C	B	B	B	C	B	B	A	B
VHT	25.07	2.92	1.17	2.19	2.91	31.91	3.21	1.88	2.59	7.66	2.78	5.11	2.73	17.16	2.97	4.55	2.16	4.85	2.38	1.03	2.05	4.51	2.20	0.61	2.04	24.23	2.00	2.56	1.41	7.55

PM SB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27
PM SB		Exit 28 off	0	Exit 28 on	0	Exit 22 off	0	Exit 22 on	0	Exit 20 off	0	Exit 20 on	0	Exit 17 off	0	Exit 17 on	0	Exit 15 off	0	Exit 15 on	0	Exit 11 off	0	Exit 10 off	0	Exit 10 on	0
Speed (mph)	69.0	55.0	69.0	64.6	66.2	54.3	67.1	60.6	67.1	56.8	68.2	58.9	63.2	56.5	66.6	59.1	63.9	56.0	66.4	59.6	65.7	50.1	65.0	57.9	69.3	58.6	65.9
D/C	0.429	0.429	0.381	0.717	0.692	0.692	0.562	0.654	0.654	0.654	0.599	0.776	0.776	0.776	0.674	0.742	0.745	0.745	0.659	0.708	0.708	0.708	0.518	0.516	0.420	0.575	0.575
Density Based LOS	B	B	B	B	D	C	C	C	C	C	C	C	D	C	D	C	D	C	C	C	D	C	C	C	B	B	C
VHT	12.76	2.31	6.34	3.20	47.95	3.81	1.67	3.23	6.21	3.44	5.42	3.85	26.31	4.01	7.48	3.79	11.42	4.00	3.57	3.58	37.88	4.25	0.65	2.72	1.24	2.99	31.21

PM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
PM SB	0	xit 9 weav	0	xit 8 weav	0	Exit 7 off	0	Exit 7 on	0	Exit 6B off	0	6B/6A We	0	Exit 6A on	0	Exit 5B off	0	5B/5A we	0	Exit 5A on	0	Exit 4 off	0	t 4 to 3 wea	0	Exit 2 off	0	Exit 1 off	0
Speed (mph)	65.9	29.3	38.2	13.7	7.8	7.3	11.1	22.5	19.6	19.6	17.0	12.5	16.7	47.9	47.9	49.0	55.2	47.8	53.9	50.2	57.8	48.7	59.4	43.4	66.8	59.9	63.7	55.1	43.0
D/C	0.575	0.607	0.706	0.677	0.601	0.601	0.761	0.969	0.969	0.969	0.922	0.852	0.889	1.070	1.070	1.050	0.921	0.773	0.943	1.017	0.910	0.910	0.707	0.857	0.709	0.709	0.558	0.558	0.310
Density Based LOS	C	D	E	F	F	F	F	F	F	F	F	F	F	D	D	C	D	C	D	C	D	D	C	D	C	B	B	B	B
VHT	31.21	3.27	3.91	10.80	12.59	25.14	15.22	0.63	9.93	0.71	7.63	3.66	8.48	4.02	1.00	3.93	1.26	1.31	6.28	4.83	2.80	4.98	4.44	10.09	0.82	3.41	2.79	2.84	13.07

PM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
PM NB	0	Exit 1 off	0	Exit 1 on	0	Exit 2 on	0	t 3 to 4 wea	0	Exit 4 on	0	Exit 5 off	0	Exit 5 on (S)	Exit 5 on (N)	0	Exit 6A off	0	t 6A/B wea	0	6B to 7 we	0	Exit 7 on	0	xit 8 weav	0	Exit 9	0
Speed (mph)	53.0	26.0	48.1	56.6	62.4	56.8	34.5	11.1	11.1	17.0	17.0	19.1	12.3	21.2	45.5	45.5	49.2	53.8	44.6	52.7	38.5	54.9	57.3	56.9	35.8	49.2	44.0	62.8
D/C	0.198	0.226	0.179	0.388	0.388	0.676	0.676	0.755	0.744	0.891	0.891	0.996	0.817	0.999	1.115	1.115	1.089	0.975	0.806	0.922	0.978	0.911	0.811	0.828	0.896	1.003	0.841	0.808
Density Based LOS	A	A	A	B	B	C	E	F	F	F	F	F	F	F	D	D	D	D	C	D	D	D	C	C	E	E	D	D
VHT	2.07	2.11	1.08	2.07	2.63	3.52	3.39	30.77	35.76	8.22	4.08	7.28	27.61	5.40	2.09	3.13	1.93	2.64	1.04	2.61	2.31	6.60	5.11	2.06	5.23	4.37	3.24	41.37

PM NB	N28	N29	N30	N31	N32	N33	N34	N35	N36	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46	N47	N48	N49	N50	N51	N52	N53	N54	N55	N56	N57
PM NB	0	Exit 10 off	0	Exit 10 on	Exit 11 on	0	Exit 15 off	0	Exit 15 on	0	Exit 17 off	0	Exit 17 on	0	Exit 20 off	0	Exit 20 on	0	Exit 22 off	0	Exit 22 on	0	Exit 24 off	0	Exit 24 on	0	Exit 28 off	0	Exit 28 on	0
Speed (mph)	62.8	52.3	64.0	62.3	55.6	56.5	53.7	63.7	57.4	60.3	55.8	64.4	56.3	59.2	54.5	65.3	57.4	62.9	53.9	66.0	59.1	63.5	57.2	65.2	58.7	62.3	54.1	68.7	60.9	68.7
D/C	0.808	0.808	0.614	0.710	0.888	0.904	0.888	0.753	0.816	0.833	0.816	0.731	0.831	0.849	0.831	0.678	0.795	0.773	0.773	0.655	0.745	0.769	0.745	0.724	0.798	0.798	0.772	0.484	0.555	0.555
Density Based LOS	D	D	C	C	C	E	D	D	C	E	D	D	D	E	C	D	C	D	D	C	C	D	D	D	C	D	C	C	B	C
VHT	41.37	4.69	1.76	3.32	4.94	59.96	5.11	3.16	4.37	13.86	4.49	8.90	4.52	30.40	4.67	8.02	4.08	9.43	4.34	1.79	3.80	8.71	3.92	1.11	3.96	49.75	4.30	4.64	2.65	14.08

M. 2040 FREEVAL Auxiliary Lanes

AM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
AM SB	0	xit 9 weave	0	xit 8 weave	0	Exit 7 off	0	Exit 7 on	0	Exit 6B off	0	6B/6A We	0	Exit 6A on	0	Exit 5B off	0	t 5B/5A wea	0	Exit 5A on	0	Exit 4 off	0	t 4 to 3 wea	0	Exit 2 off	0	Exit 1 off	0
Speed (mph)	58.9	15.8	48.4	35.2	51.2	52.3	52.7	55.2	55.2	55.8	48.7	43.3	51.9	56.2	56.2	56.8	56.7	47.0	57.7	53.5	59.1	49.3	59.4	48.0	67.3	59.3	63.6	56.1	43.0
D/C	0.848	0.882	1.067	0.931	0.818	0.818	0.916	0.697	0.697	0.697	0.992	0.804	0.874	0.659	0.659	0.647	0.815	0.693	0.733	0.825	0.738	0.738	0.639	0.649	0.575	0.575	0.368	0.368	0.236
Density Based LOS	E	F	E	E	C	A	D	C	C	C	E	C	D	C	C	C	C	C	C	C	C	C	C	C	B	B	B	B	A
VHT	51.86	7.82	4.09	6.75	3.01	5.51	4.41	0.31	4.27	0.30	3.22	1.14	2.94	3.39	0.85	3.36	1.16	1.22	4.82	3.86	2.33	4.19	4.21	7.27	0.67	2.84	1.86	1.86	10.12

AM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
AM NB	0	Exit 1 off	0	Exit 1 on	0	Exit 2 on	0	t 3 to 4 wea	0	Exit 4 on	0	Exit 5 off	0	Exit 5 on (S	xit 5 on (N	0	Exit 6A off	0	it 6A/B wea	0	6B to 7 we	0	Exit 7 on	0	xit 8 weave	0	xit 9 weave	0
Speed (mph)	53.0	26.0	48.1	54.6	23.5	35.5	38.7	24.1	15.2	26.4	26.4	47.7	57.2	51.7	55.3	55.3	56.5	55.1	45.2	52.9	40.1	56.5	58.9	59.0	41.6	57.5	46.3	66.0
D/C	0.356	0.405	0.324	0.598	0.598	0.983	0.983	0.901	0.803	0.990	0.990	1.106	0.870	0.974	0.705	0.705	0.686	0.887	0.725	0.784	0.848	0.735	0.547	0.566	0.596	0.656	0.595	0.523
Density Based LOS	B	B	B	C	F	F	F	F	F	F	F	D	C	C	C	C	C	D	C	C	D	C	B	B	C	C	B	B
VHT	3.82	3.90	2.02	3.31	11.20	7.27	3.97	18.42	30.65	6.30	3.13	3.46	6.76	2.26	1.68	2.52	1.64	2.42	0.93	2.23	1.89	5.22	3.28	1.31	2.92	2.39	2.07	25.07

PM SB	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54	S55
PM SB	0	xit 9 weave	0	xit 8 weave	0	Exit 7 off	0	Exit 7 on	0	Exit 6B off	0	6B/6A We	0	Exit 6A on	0	Exit 5B off	0	t 5B/5A wea	0	Exit 5A on	0	Exit 4 off	0	t 4 to 3 wea	0	Exit 2 off	0	Exit 1 off	0
Speed (mph)	65.9	50.5	57.2	39.9	52.2	23.2	14.3	9.4	9.4	9.4	19.1	13.7	18.3	12.0	11.8	11.8	21.6	12.8	24.2	48.6	57.1	48.6	59.4	43.4	66.8	59.9	63.7	55.1	43.0
D/C	0.575	0.607	0.706	0.677	0.601	0.601	0.761	0.646	0.646	0.646	0.922	0.852	0.889	0.713	0.713	0.700	0.921	0.773	0.943	1.017	0.910	0.910	0.707	0.857	0.709	0.709	0.558	0.558	0.310
Density Based LOS	C	B	C	C	C	F	F	F	F	F	F	F	F	F	F	F	F	F	F	D	D	D	C	D	C	B	B	B	B
VHT	31.21	1.90	2.61	4.68	2.37	9.29	13.03	1.56	21.81	1.56	7.14	3.49	8.03	16.57	4.22	16.87	3.33	5.02	14.39	5.11	2.90	5.11	4.55	10.25	0.83	3.47	2.83	2.89	13.28

PM NB	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N24	N25	N26	N27	N28
PM NB	0	Exit 1 off	0	Exit 1 on	0	Exit 2 on	0	t 3 to 4 wea	0	Exit 4 on	0	Exit 5 off	0	Exit 5 on (S	xit 5 on (N	0	Exit 6A off	0	it 6A/B wea	0	6B to 7 we	0	Exit 7 on	0	xit 8 weave	0	Exit 9	0
Speed (mph)	53.0	26.0	48.1	56.5	62.6	59.0	63.3	45.9	61.9	51.7	43.6	43.6	54.5	43.1	52.5	52.5	55.7	44.8	44.6	48.4	38.5	41.1	17.6	18.0	17.9	48.9	44.0	62.7
D/C	0.198	0.226	0.179	0.388	0.388	0.676	0.676	0.755	0.744	0.891	0.891	0.996	0.817	0.999	0.743	0.743	0.726	0.975	0.806	0.922	0.978	0.911	0.811	0.828	0.896	1.003	0.841	0.808
Density Based LOS	A	A	A	B	B	B	C	D	D	D	D	D	D	D	C	C	C	E	D	E	E	E	F	F	F	E	D	D
VHT	2.07	2.11	1.08	2.07	2.62	3.39	1.90	9.76	8.54	3.43	2.03	4.07	7.98	3.24	2.16	3.25	2.04	3.81	1.23	3.36	2.51	9.59	17.02	6.67	10.53	4.43	3.26	41.67

N. Ramp Metering Analysis

Criteria		Time	Southbound							
			4 W	5A	5B W	6A	6B W	7	8 W	9 W
1	Speed (<45)	AM	50.4	54	49	43	45	38	38.5	49
		PM	46	46	49	43	13	28	20.4	52
2	Ramp Volume (vph) (1 lane: 300-900 2 lane: 300-1800)	AM	638	295	205	361	129	423	1324	536
		PM	1308	272	326	637	435	741	1119	391
	Mainline Volume	AM	2842	2566	2716	3029	3160	3252	4576	3490
		PM	3662	3029	2922	3991	2887	2871	3426	5238
3	Total Volume (>2650)	AM	3480	2861	2921	3390	3289	3675	5900	4026
		PM	4970	3301	3248	4628	3322	3612	4545	5629
4	Req' Queue Length (ft) (Ramp vol*0.08*25)	AM	1276	590	410	722	258	846	2648	1072
		PM	2616	544	652	1274	870	1482	2238	782
5	Req' Acceleration Length	AM/PM	**450**	450	400	450	300	550	**450**	700
	1 lane, req' total length	AM	1726	1040	810	1172	558	1396	3098	1772
		PM	3066	994	1052	1724	1170	2032	2688	1482
	2 lane, req' total length	AM	1088	745	605	811	429	973	1774	1236
		PM	1758	722	726	1087	735	1291	1569	1091
	Existing Total On-Ramp Length	AM/PM	2200	750	400	850	300	1300	1000	700
4 + 5	1 lane on-ramp: Existing > Queue + Accel?	AM	yes	no	no	no	no	no	no	no
		PM	no	no	no	no	no	no	no	no
4 + 5	2 lane on-ramp: Existing > Queue/2 + Accel?	AM	yes	yes	no	yes	no	yes	no	no
		PM	yes	yes	no	no	no	yes	no	no
	1 lane metered on-ramp, additional length req'	AM	0	290	410	322	258	96	2098	1072
		PM	866	244	652	874	870	732	1688	782
	2 lane metered on-ramp, additional length req'	AM	0	0	205	0	129	0	774	536
		PM	0	0	326	237	435	0	569	391
AM, Criteria 1-5 Met?			no	no	no	YES, 2 lane	no	YES, 2 lane	no	no
PM, Criteria 1-5 Met?			no	no	no	no	no	YES, 2 lane	no	no

Criteria		Time	Northbound										
			1	2	3 W	4	5S	5N	6A W	6B W	7	8 W	9 W
1	Speed (<45)	AM	56	59	46	23	50	44	67	42	59	44	48
		PM	57	60	48	25	19	43	46	40	56	39	45
2	Ramp Volume (vph) (1 lane: 300-900 2 lane: 300-1800)	AM	966	1114	602	703	322	156	126	603	275	359	263
		PM	869	937	1176	502	564	289	240	726	1017	645	238
	Mainline Volume	AM	2119	3233	3835	3108	2721	2877	2607	2793	2360	2719	2121
		PM	1556	2493	3669	3141	2660	2949	2868	3276	3587	4232	3257
3	Total Volume (>2650)	AM	3085	4347	4437	3811	3043	3033	2733	3396	2635	3078	2384
		PM	2425	3430	4845	3643	3224	3238	3108	4002	4604	4877	3495
4	Req' Queue Length (ft) (Ramp vol*0.08*25)	AM	1932	2228	1204	1406	644	312	252	1206	550	718	526
		PM	1738	1874	2352	1004	1128	578	480	1452	2034	1290	476
5	Req' Acceleration Length	AM/PM	670	1618	450	320	450	450	300	500	450	800	800
	1 lane, req' total length (ft)	AM	2602	3846	1654	1726	1094	762	552	1706	1000	1518	1326
		PM	2408	3492	2802	1324	1578	1028	780	1952	2484	2090	1276
	2 lane, req' total length (ft)	AM	1636	2732	1052	1023	772	606	426	1103	725	1159	1063
		PM	1539	2555	1626	822	1014	739	540	1226	1467	1445	1038
	Existing Total On-Ramp Length	AM/PM	1600	1618	2300	1900	500	900	300	500	2100	800	800
4 + 5	1 lane on-ramp: Existing > Queue + Accel?	AM	no	no	yes	yes	no	yes	no	no	yes	no	no
		PM	no	no	no	yes	no	no	no	no	no	no	no
4 + 5	2 lane on-ramp: Existing > Queue/2 + Accel?	AM	no	no	yes	yes	no	yes	no	no	yes	no	no
		PM	yes	no	yes	yes	no	yes	no	no	yes	no	no
	1 lane metered on-ramp, additional length req'	AM	1002	2228	0	0	594	0	252	1206	0	718	526
		PM	808	1874	502	0	1078	128	480	1452	384	1290	476
	2 lane metered on-ramp, additional length req'	AM	36	1114	0	0	272	0	126	603	0	359	263
		PM	0	937	0	0	514	0	240	726	0	645	238
AM, Criteria 1-5 Met?			no	no	no	YES, 1 lane	no	no	no	no	no	no	no
PM, Criteria 1-5 Met?			no	no	no	YES, 1 lane	no	no	no	no	no	no	no