I-95 North of MD 43

Congestion Trends

Traffic congestion that impacts mobility occurs due to a variety of reasons. This can include sections of a freeway where motorists merge or diverge from the roadway, locations where the volume is greater than the capacity or in weave sections where traffic is both trying to enter or exit from the freeway. Variations that influence these congestion breakdowns include automobile and truck traffic volumes, geometrics, lane width and shoulder width. This is referred to as recurring congestion. The other type of congestion, non-recurring congestion relates to events such as crashes, vehicle breakdowns and weather that cause highways to experience slowing or stop and go conditions. Over the years congestion has increased due to the limited availability of funding for infrastructure improvements in roads and public transportation which has not been able to keep up with the growth in demand. The impacts of a congested system are detrimental in several ways including increased costs to the individual user, environmental impacts and degrading the overall quality of life.

Congestion measures have changed dramatically over past several years as vehicle probe speed data is now available from a variety of private sources on a minute by minute basis over the entire year. This data, together with analyses methodologies that have been developed and tested over time, provides a detailed “picture” of mobility for travelers using the highway system in Maryland. The private data comes from INRIX, a company that provides both real-time and historic traffic speed data collected from an estimated 100 million probe vehicles nationwide including commercial vehicle fleets. In addition, public data is developed from a statewide program that collects traffic volume data on all of its roadways in a continual cycle. The University of Maryland Center for Advanced Transportation Technology (UMD CATT) uses the INRIX speed data, together with detailed traffic volume data from the SHA – Office of Planning and Preliminary Engineering to generate measures of congestion and reliability across the entire freeway system. These congestion and reliability measures have also been closely coordinated with the Washington and Baltimore Metropolitan Planning Organizations (MPOs) to ensure regional consistency in reporting.

Different agencies measure congestion by alternative methods. These measures may include delay, level of service and volume to capacity ratio. The advent of big data sets to measure congestion has become more popular. The utilization of

I-695 @ I-70

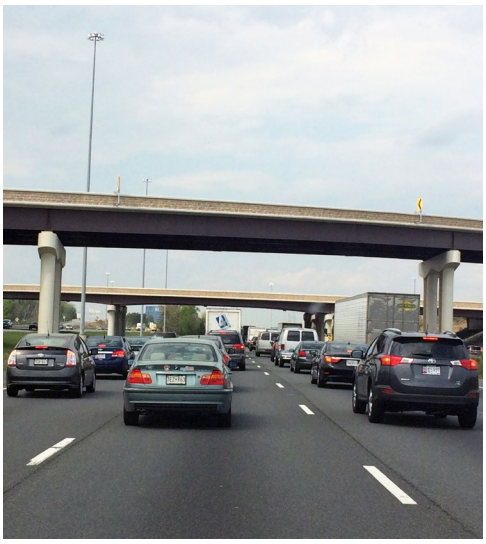
vehicle probe data allows for other measures relatively easy to communicate to a range of audiences: the Travel Time Index and the Planning Time Index. The Travel Time Index (TTI) compares the 50th percentile travel time of a trip on a segment of freeway/expressway for a particular hour to the travel time of a trip during off peak (free-flow or uncongested) conditions. The index depicts how much longer, on average, travel times are during congestion compared to free flow conditions. The higher the TTI number for a given hour of the day, the longer the travel times. For example, a TTI of 2.0 indicates that a trip that takes 5 minutes in light traffic will take twice as long, or 10 minutes in congested conditions.

For the purposes of the statewide and regional congestion maps presented in this report, the TTI is depicted as follows:

- Uncongested (TTI < 1.15)
- Moderate Congestion (1.15 < TTI < 1.3)
- Heavy Congestion (1.3 < TTI < 2.0)
- Severe Congestion (TTI > 2.0)

A network wide analysis of the TTI for each highway segment was performed to provide a comprehensive picture of the statewide Maryland freeway/expressway network for average weekday conditions. The analysis was conducted on a statewide basis and for the five major geographic regions. The congestion and reliability measures are further analyzed for the combined Baltimore - Washington region, where the majority of weekday congestion occurs.

The analysis of vehicle probe data involves 1,655 directional miles of freeways/expressways that account for approximately 95% of all these type of roadways in Maryland. This includes 1,116 directional miles of freeways/expressways in the combined Baltimore - Washington region with the remaining directional miles on the Eastern Shore, Southern Maryland and Western Maryland.



I-95 South of MD 200

CONGESTION MEASURES ON THE MARYLAND STATE FREEWAY/EXPRESSWAY NETWORK

1. Statewide Peak Hour Congestion (Percent System Congested & Percent VMT in Congested Conditions)

The TTI was computed for each section of the freeway/expressway system in Maryland for average weekday travel. The analysis was performed for the AM and PM peak hours with the highest levels of congestion occurring from 8-9 AM in the morning peak and from 5-6 PM in the afternoon peak hour. The TTI for those hours are shown in Figure 1 and 2.

Motorists experience heavy to severe congestion (TTI > 1.3) on a total of 136 road miles (8% of the statewide freeway/expressway network) during the AM peak hour (8-9 AM). This amounts to 16% of the morning peak hour VMT occurring in congested conditions.

The afternoon peak hour (5-6 PM) analysis shows that congestion is more severe in the PM peak period. Heavy to severe congestion occurs on a total of 224 road miles (13% of the statewide freeway/expressway network) during the afternoon peak hour (5-6 PM). Twenty-four (24) % of the afternoon peak hour VMT occurs in congested conditions.

A comparison was performed between 2014 and 2013 metrics. This shows that the AM peak hour performance remained relatively constant while the PM peak hour showed a 1% increase in heavy to severe congestion on the freeway/expressway system.

STATEWIDE FREEWAY/EXPRESSWAY NETWORK
(AVERAGE WEEKDAY AM & PM PEAK HOUR CONGESTION SUMMARY)

Heavy to Severe Congestion	2014		2013		CHANGE	
	AM	PM	AM	PM	AM	PM
Roadway Miles	136	224	130	209	+6	+15
Percent of Roadway Miles	8	13	8	12	0	+1
Percent of Peak Hour VMT Impacted	16	24	16	22	0	+2

Figure 1

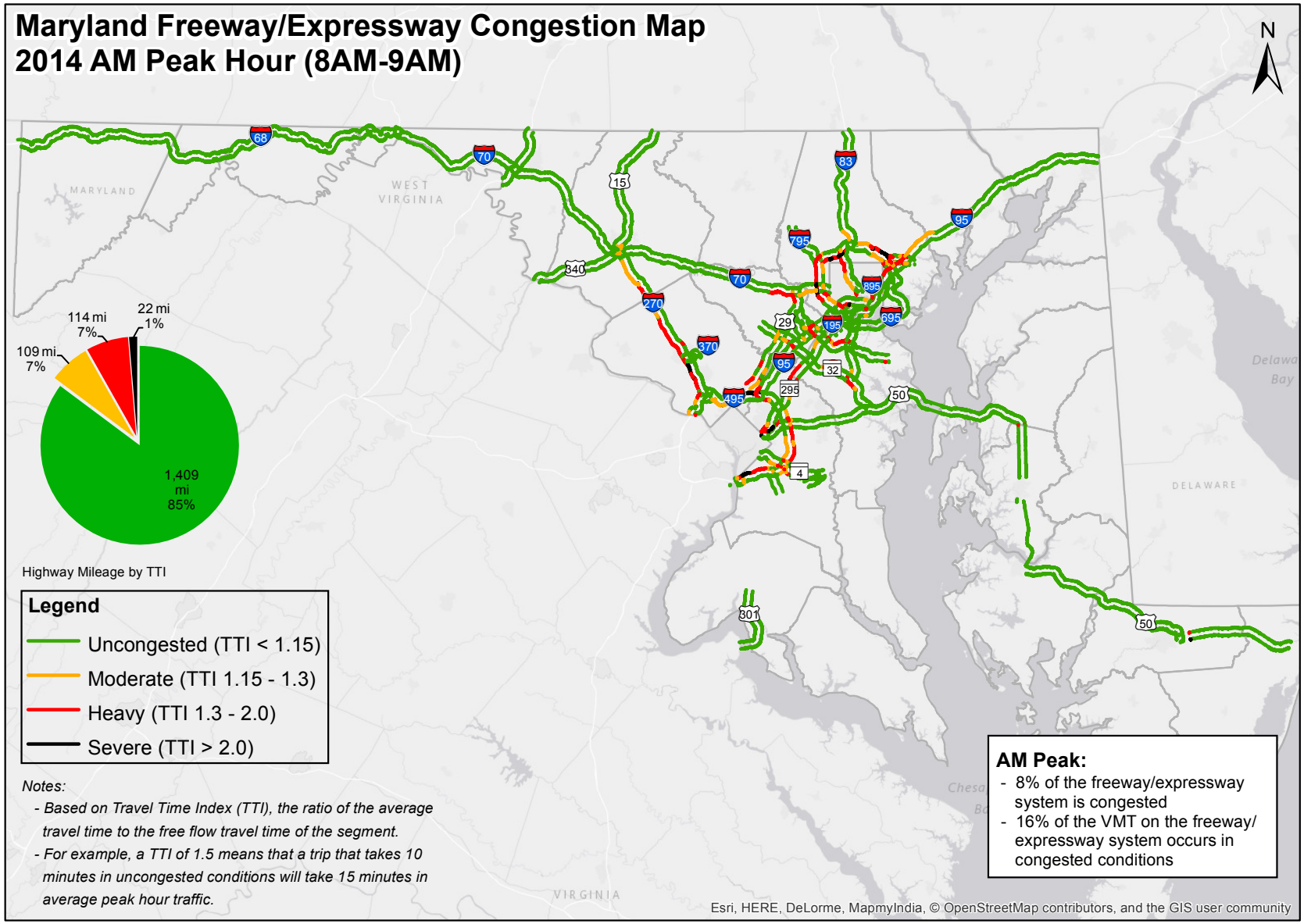

Maryland Freeway/Expressway Congestion Map
2014 AM Peak Hour (8AM-9AM)
N
MARYLAND
WEST VIRGINIA
VIRGINIA
DELAWARE
Delaware Bay
68
70
15
340
270
83
95
795
895
695
195
29
370
495
295
32
4
50
301
114 mi 7%
22 mi 1%
109 mi 7%
1,409 mi 85%
Highway Mileage by TTI
Legend
Uncongested (TTI < 1.15)
Moderate (TTI 1.15 - 1.3)
Heavy (TTI 1.3 - 2.0)
Severe (TTI > 2.0)
Notes:
- Based on Travel Time Index (TTI), the ratio of the average travel time to the free flow travel time of the segment.
- For example, a TTI of 1.5 means that a trip that takes 10 minutes in uncongested conditions will take 15 minutes in average peak hour traffic.
AM Peak:
- 8% of the freeway/expressway system is congested
- 16% of the VMT on the freeway/ expressway system occurs in congested conditions
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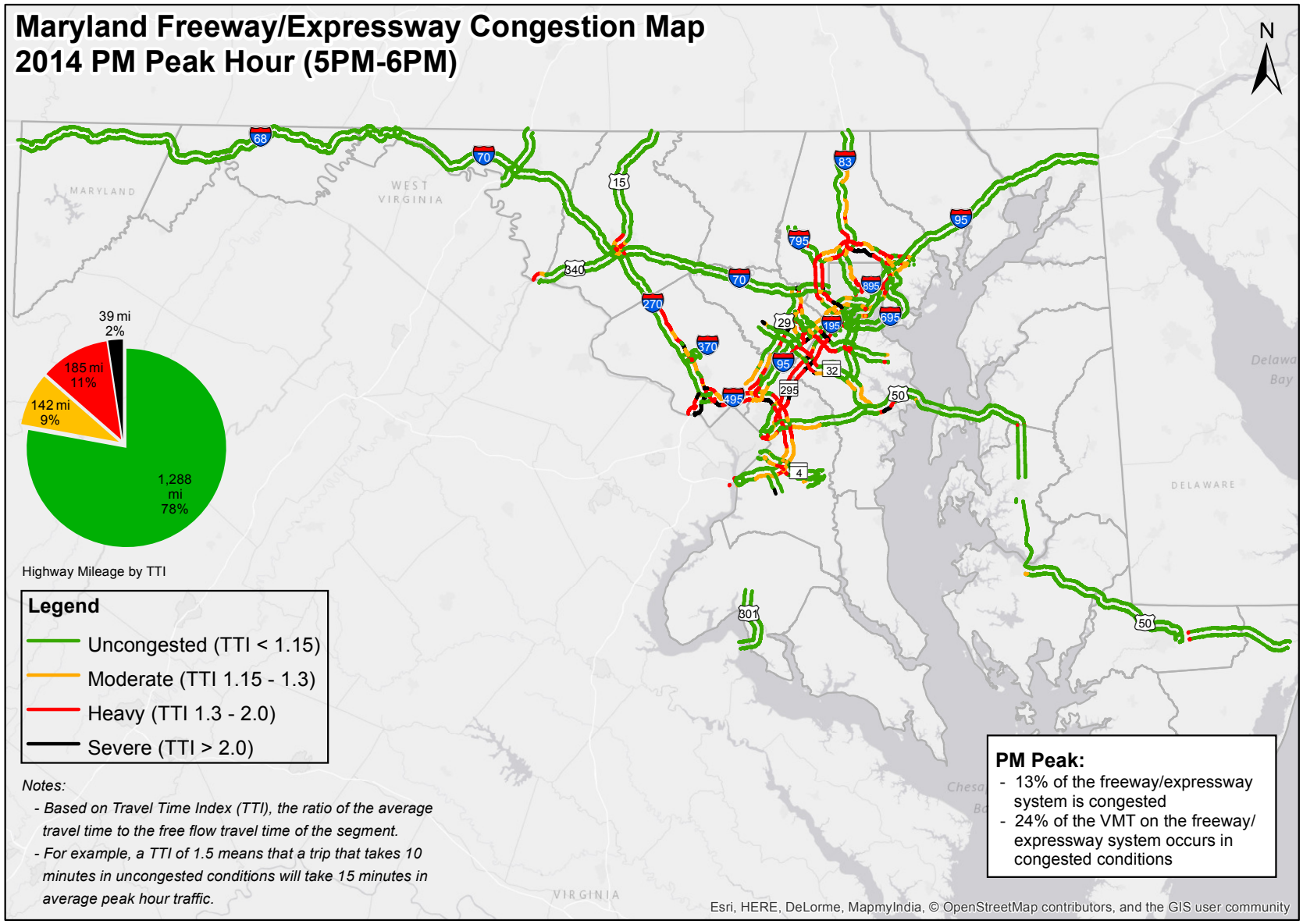
Figure 2


Maryland Freeway/Expressway Congestion Map
2014 PM Peak Hour (5PM-6PM)
N
MARYLAND
WEST VIRGINIA
VIRGINIA
DELAWARE
39 mi 2%
185 mi 11%
142 mi 9%
1,288 mi 78%
Highway Mileage by TTI
Legend
Uncongested (TTI < 1.15)
Moderate (TTI 1.15 - 1.3)
Heavy (TTI 1.3 - 2.0)
Severe (TTI > 2.0)
Notes:
- Based on Travel Time Index (TTI), the ratio of the average travel time to the free flow travel time of the segment.
- For example, a TTI of 1.5 means that a trip that takes 10 minutes in uncongested conditions will take 15 minutes in average peak hour traffic.
PM Peak:
- 13% of the freeway/expressway system is congested
- 24% of the VMT on the freeway/ expressway system occurs in congested conditions
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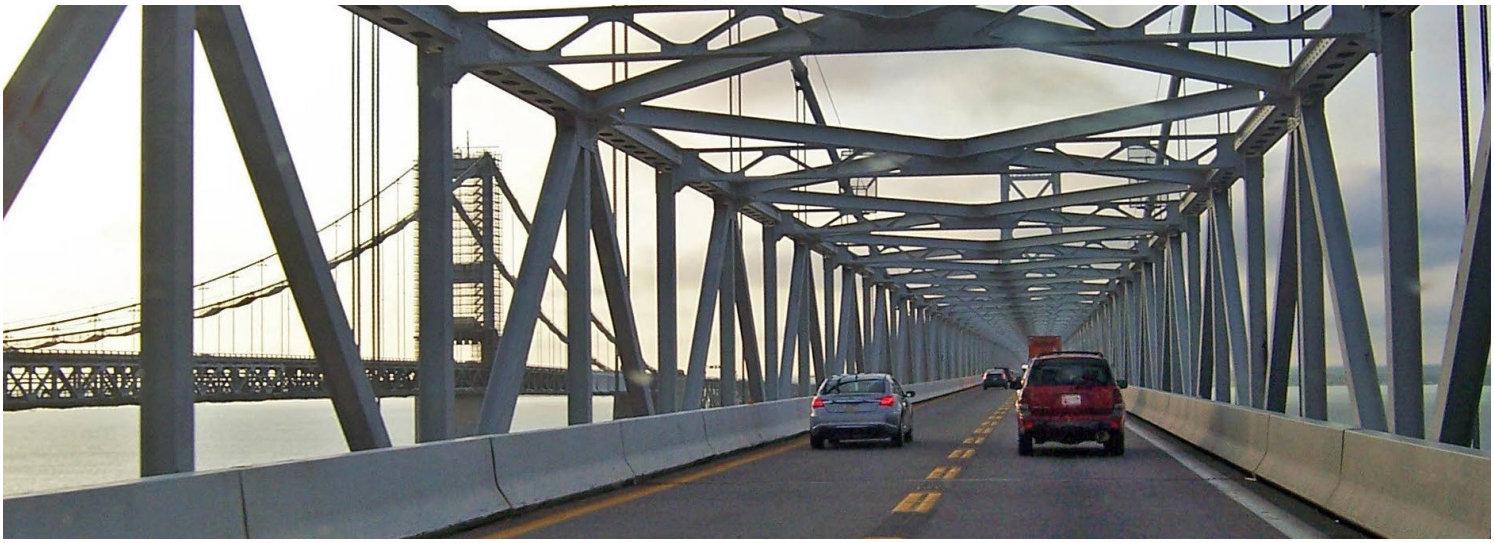

US 50/301 Bay Bridge

BALTIMORE - WASHINGTON METROPOLITAN REGION PEAK HOUR CONGESTION

Mobility issues are most prevalent in the Baltimore / Washington Region. These area roadways carry the highest traffic volumes in the state with a mixture of commuting and through travel. The high traffic volumes normally indicates speeds along these roadways are the lowest and therefore, this impacts mobility for motorists and freight operators.

Heavy to severe congestion (TTI > 1.3) occurs on 12% of the freeways/expressways in the Baltimore / Washington region, accounting for a total of 135 road miles operating under these conditions. The vehicle miles traveled under these conditions in the morning peak hour is 17% of the total morning peak hour VMT. This was an approximate 1% increase in heavy to severe congestion with an additional six road miles operating under these conditions compared to year 2013.

Motorists in the Baltimore - Washington Metropolitan region experience the highest levels of congestion in the afternoon peak hour. This amounts to a total of 221 (19%) road miles that motorists experience heavy to severe congestion (TTI > 1.3) or 28% of the total VMT that transpires in the afternoon peak hour occurs under these conditions. This shows a slight increase over 2013 (2% increase in the number of road miles with 14 more miles of the system experiencing heavy to severe congestion).

The Travel Time Index Maps are provided for the peak hours (8-9 AM and 5-6 PM) in figures 3 and 4.

EASTERN SHORE, SOUTHERN & WESTERN MARYLAND CONGESTION

The other three regions of Maryland including the Eastern Shore, Southern Maryland and Western Maryland experience limited areas of congestion throughout the year. The Eastern Shore including northeast Maryland is characterized by seasonal congestion along the US 50 and I-95 corridors. Kent Island and the Town of Elkton experience more traditional operational issues. Southern Maryland which has become a bedroom community to Washington, DC and the Lexington Park area experiences typical commuter congestion in the AM and PM peak periods. Congestion in these regions mainly occur on corridors that directly provide access to the District. Congestion in Western Maryland mainly occurs in the Hagerstown area which is the hub of two major interstate routes (I-70 and I-81) with high truck volumes and associated traffic generating land uses such as warehousing and distribution centers. Figures 1-2 highlight traffic operations in the three regions during the AM and PM peak hours.

Figure 3

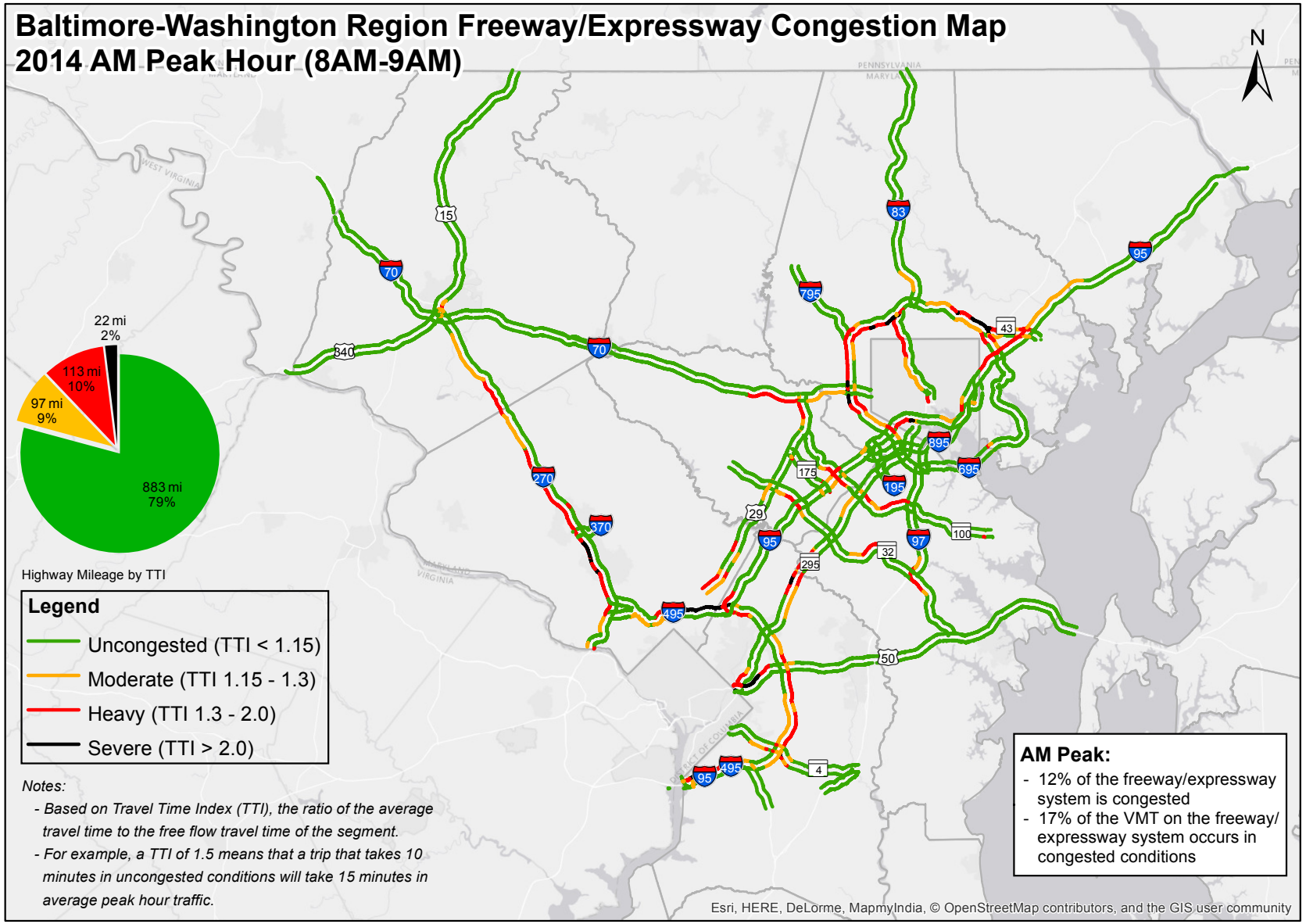
Baltimore-Washington Region Freeway/Expressway Congestion Map
2014 AM Peak Hour (8AM-9AM)
N
22 mi
2%
113 mi
10%
97 mi
9%
883 mi
79%
Highway Mileage by TTI
Legend
Uncongested (TTI < 1.15)
Moderate (TTI 1.15 - 1.3)
Heavy (TTI 1.3 - 2.0)
Severe (TTI > 2.0)
Notes:
- Based on Travel Time Index (TTI), the ratio of the average travel time to the free flow travel time of the segment.
- For example, a TTI of 1.5 means that a trip that takes 10 minutes in uncongested conditions will take 15 minutes in average peak hour traffic.
AM Peak:
- 12% of the freeway/expressway system is congested
- 17% of the VMT on the freeway/ expressway system occurs in congested conditions
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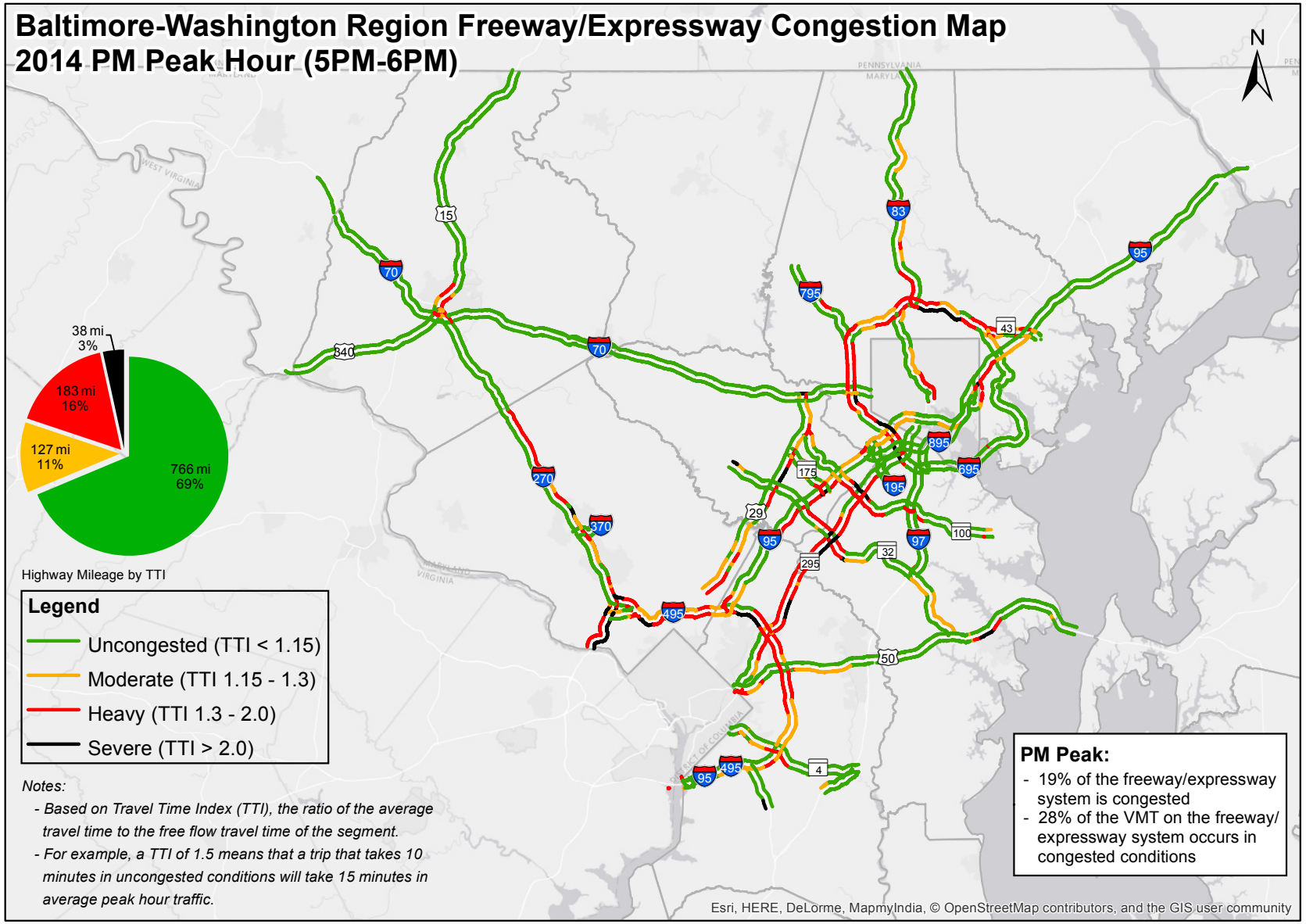
Figure 4


Baltimore-Washington Region Freeway/Expressway Congestion Map
2014 PM Peak Hour (5PM-6PM)
N
38 mi
3%
183 mi
16%
127 mi
11%
766 mi
69%
Highway Mileage by TTI
Legend
Uncongested (TTI < 1.15)
Moderate (TTI 1.15 - 1.3)
Heavy (TTI 1.3 - 2.0)
Severe (TTI > 2.0)
Notes:
- Based on Travel Time Index (TTI), the ratio of the average travel time to the free flow travel time of the segment.
- For example, a TTI of 1.5 means that a trip that takes 10 minutes in uncongested conditions will take 15 minutes in average peak hour traffic.
PM Peak:
- 19% of the freeway/expressway system is congested
- 28% of the VMT on the freeway/ expressway system occurs in congested conditions
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MD 65 South of US 40

2. Statewide Cost of Congestion

The estimated cost of congestion due to auto delay, truck delay and wasted fuel and emissions on the freeway/ expressway network in 2014 was calculated on a statewide and region wide basis. The statewide cost is estimated to be $1.7 billion which includes:

- Auto Delay Cost: $1.486 Billion
- Truck Delay Cost: $100.1 Million
- Wasted Fuel Cost: $64.8 Million
- Air Emissions Cost: $47.1 Million

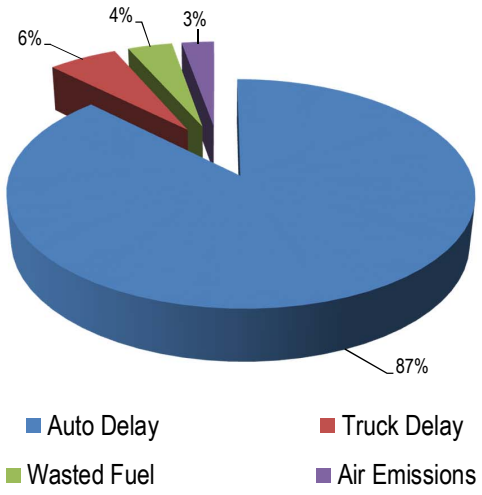
Since the majority of congestion occurs in the Baltimore / Washington region, this area experiences the highest user cost, estimated to be $1.64 billion. The cost associated with congestion for the Eastern Shore, Southern and Western Maryland regions is estimated to be $58 million. The congestion costs state and region wide for this year and compared to previous years are shown in the following table.

TOTAL COST OF CONGESTION ($MILLIONS)		
Region	**2014**	**2013**
Statewide	1,698	1,676
Baltimore Region	686	681
Washington Region	954	949
Eastern Shore Region	47	31
Southern Region	5	4
Western Region	6	11

The percent breakdown of the congestion costs by source and by different regions for the freeway/expressway system is depicted in the following graphs.

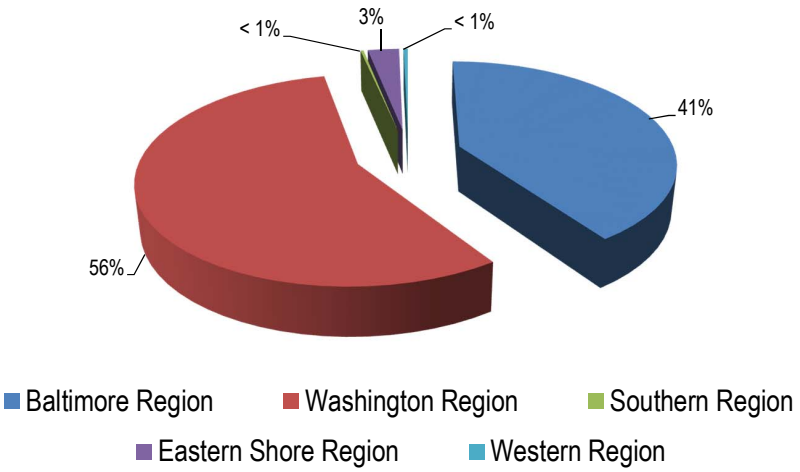
PERCENT OF STATEWIDE CONGESTION COST BY SOURCE

(TOTAL CONGESTION COST = $1.7 BILLION)



PERCENT OF STATEWIDE CONGESTION COST BY REGION

(TOTAL CONGESTION COST = $1.7 BILLION)



Top 30 Congested Segments

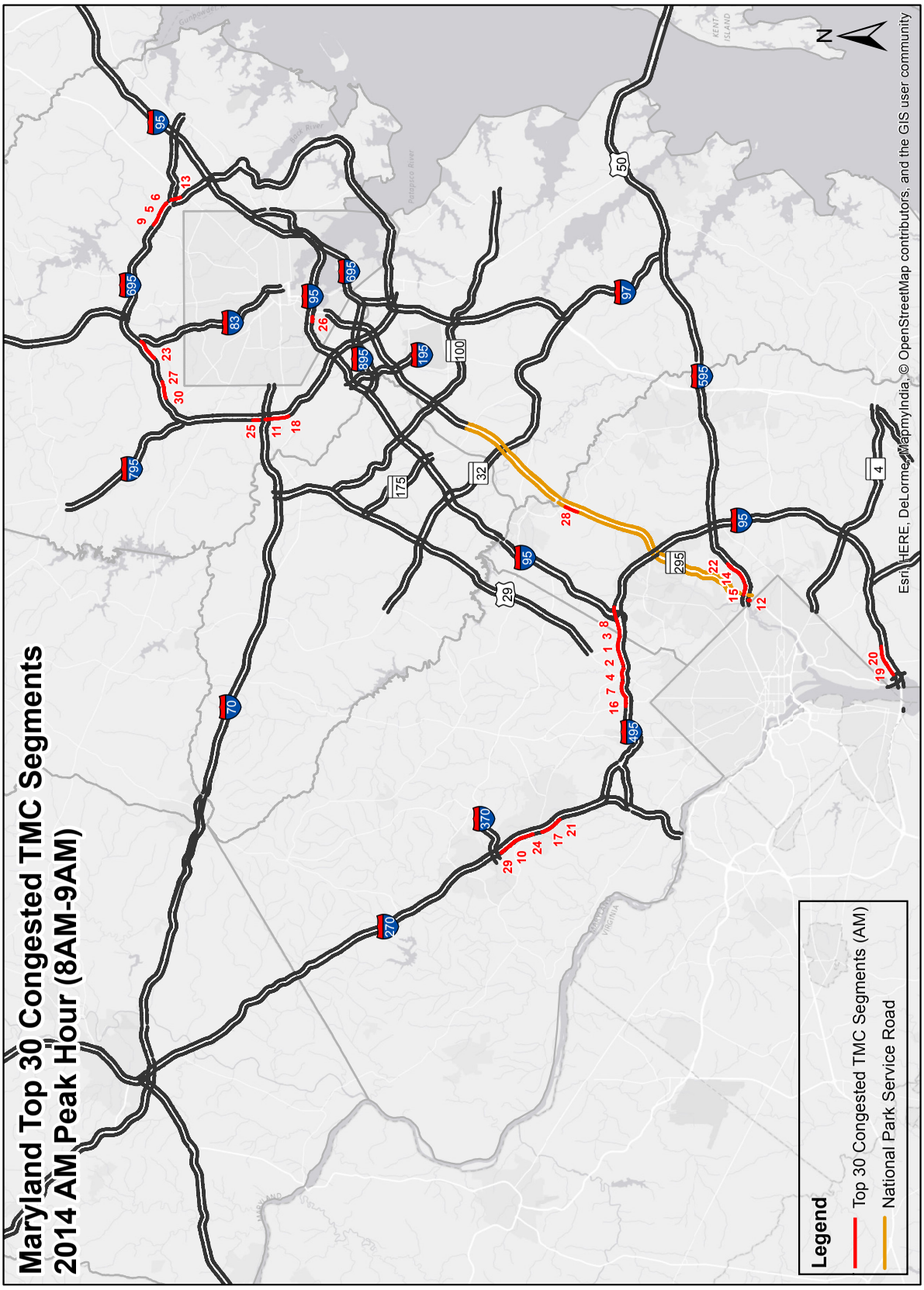
All freeway/expressway segments statewide were analyzed to determine the roadway segments that experience the highest levels of congestion in the AM peak hour (8-9 AM) and PM peak hour (5-6 PM). This analysis identified the locations with the highest TTI values. Figures 5 and 6 and the following tables depict the Top 30 locations for congestion in the peak hours, in the State on average weekdays.

2014 TOP 30 CONGESTED SEGMENTS AM PEAK

2014 RANK	ROAD	LOCATION	DIRECTION	2014 TTI	2013 RANK	RANK CHANGE 2013 TO 2014
1	I-495	@ MD 650	Outer Loop	3.98	1	0
2	I-495	MD 650 to MD 193	Outer Loop	3.94	2	0
3	I-495	Prince George's County Line to MD 650	Outer Loop	3.60	3	0
4	I-495	MD 193 to US 29	Outer Loop	3.20	4	0
5	I-695	MD 147 to MD 41*	Outer Loop	3.16	6	-1
6	I-695	MD 43 to MD 147*	Outer Loop	2.87	7	-1
7	I-495	US 29 to MD 97	Outer Loop	2.53	17	-10
8	I-495	I-95 to Montgomery County Line	Outer Loop	2.50	12	-4
9	I-695	@ MD 41*	Outer Loop	2.49	16	-7
10	I-270	Shady Grove Rd to MD 28	Southbound	2.46	9	1
11	I-695	@ I-70	Outer Loop	2.45	5	6
12	MD-295	US 50 to Washington DC/Line[1]	Southbound	2.45	10	2
13	I-695	US 1 to MD 43	Outer Loop	2.37	20	-7
14	US-50	MD 202 to MD 459	Westbound	2.37	14	0
15	US-50	MD 459 to MD 201	Westbound	2.26	22	-7
16	I-495	@ MD 97	Outer Loop	2.25	28	-12
17	I-270	@ MD 189	Southbound	2.24	15	2
18	I-695	I-70 to US 40	Outer Loop	2.17	13	5
19	I-495	MD 210 to IS 295	Inner Loop	2.14	27	-8
20	I-495	MD 414 to MD 210	Inner Loop	2.14	19	1
21	I-270	MD 189 to Montrose Rd	Southbound	2.12	23	-2
22	US-50	@ MD 202	Westbound	2.10	21	1
23	I-695	Greenspring Ave to I-83	Inner Loop	2.10	34	-111
24	I-270	@ MD 28	Southbound	2.06	50	-26
25	I-695	MD 26 to MD 122	Outer Loop	2.06	11	14
26	I-95	Washington Blvd to I-395*[2]	Northbound	2.04	48	-22
27	I-695	Stevenson Rd to Greenspring Ave	Inner Loop	2.04	36	-9
28	MD-295	@ MD 197[1]	Southbound	2.01	53	-25
29	I-270	I-370 to Shady Grove Rd	Southbound	1.99	44	-15
30	I-695	MD 129 to Stevenson Rd	Inner Loop	1.96	38	-8

[1] Owned by the National Park Service [2] Owned and Maintained by the Maryland Transportation Authority *Under or Nearby Construction

Figure 5


Maryland Top 30 Congested TMC Segments
2014 AM Peak Hour (8AM-9AM)
Legend
Top 30 Congested TMC Segments (AM)
National Park Service Road
N
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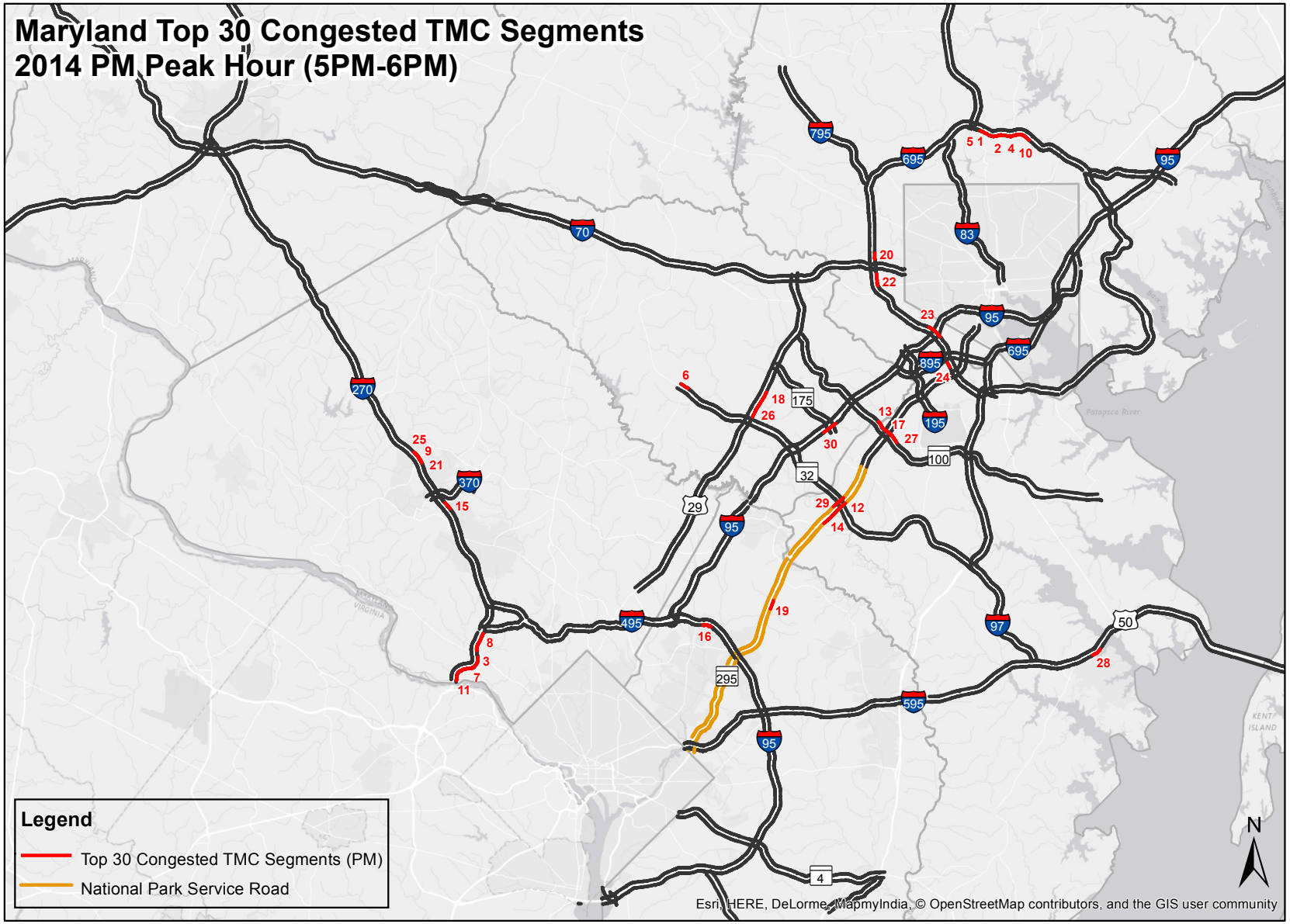
2014 TOP 30 CONGESTED SEGMENTS PM PEAK

2014 RANK	ROAD	LOCATION	DIRECTION	2014 TTI	2013 RANK	RANK CHANGE 2013 TO 2014
1	I-695	MD 139 to MD 45	Inner Loop	4.02	2	-1
2	I-695	MD 45 to MD 146	Inner Loop	3.70	4	-2
3	I-495	Cabin John Pkwy to MD 190	Inner Loop	3.59	1	2
4	I-695	@ MD 146	Inner Loop	3.38	7	-3
5	I-695	@ MD 139	Inner Loop	3.16	5	0
6	MD-32	Great Star Dr to MD 108	Westbound	3.16	3	3
7	I-495	Clara Barton Pkwy to Cabin John Pkwy	Inner Loop	3.11	6	1
8	I-495	MD 190 to I-270Y (West)	Inner Loop	3.10	8	0
9	I-270	MD 124 to Middlebrook Rd	Northbound	3.02	9	0
10	I-695	MD 146 to Providence Rd	Inner Loop	2.96	15	-5
11	I-495	@ Clara Barton Pkwy	Inner Loop	2.85	10	1
12	MD-295	@ MD 32[1]	Northbound	2.70	12	0
13	MD-100	@ Coca Cola Dr	Westbound	2.59	22	-9
14	MD-295	MD 198 to MD 32[1]	Northbound	2.57	14	0
15	I-270	@ Shady Grove Rd CD Lanes	Northbound	2.55	17	-2
16	I-495	US 1 to Greenbelt Metro	Inner Loop	2.53	27	-11
17	MD-100	@ MD 295	Westbound	2.52	21	-4
18	US-29	MD 32 to Broken Land Pkwy*	Northbound	2.52	19	-1
19	MD-295	Powder Mill Rd to MD 197[1]	Northbound	2.47	13	6
20	I-695	@ MD 122	Inner Loop	2.38	55	-35
21	I-270	MD 117 to MD 124	Northbound	2.38	23	-2
22	I-695	US 40 to I-70	Inner Loop	2.36	61	-39
23	I-695	@ I-95*	Inner Loop	2.35	11	12
24	I-695	@ Hammonds Ferry Rd/Nursery Rd	Outer Loop	2.30	41	-17
25	I-270	@ MD 124	Northbound	2.30	20	5
26	US-29	MD 32 to Broken Lane Pkwy*	Northbound	2.26	32	-6
27	MD-100	MD 713 to MD 295	Westbound	2.22	30	-3
28	US-50	@ MD 70	Eastbound	2.22	42	-14
29	MD-295	MD 32 to MD 198[1]	Southbound	2.21	25	4
30	I-95	MD 32 to MD 175	Northbound	2.21	28	2

[1] Owned by the National Park Service *Under or Nearby Construction

Figure 6


Maryland Top 30 Congested TMC Segments
2014 PM Peak Hour (5PM-6PM)
Legend
Top 30 Congested TMC Segments (PM)
National Park Service Road
N
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