Reliability Trends

Roadway users normally accept some level of congestion. It is when there is a substantial increase in the variability or unreliability of the system that motorists' frustration and anxiety increases greatly. A high degree of variability of travel times between two locations increases the potential for not arriving at a destination on time. A late arrival to a destination has a cost associated with it that varies by trip purpose and nature. For example, the penalty for not allowing enough" buffer time" to catch a flight, or make an appointment, or have a truck delivery on time have very high costs associated with it. Improving reliability leads to less uncertainty; which in turn decreases motorist frustration, allowing trips to be better planned and meet expectations of the motorists using the system.

The variation in reliability is greatly impacted by incidents that cause non-recurring congestion. In addition, reliability is critical for transit operations. Variations in travel time are difficult for transit operators to provide reliable schedules. This in turn can lead to a decrease in rider confidence and the potential to reduce ridership on the impacted routes.

The Planning Time Index (PTI) measures trip reliability. The PTI represents the total time a traveler should allow to make sure they arrive at their destination on-time while taking into account potential impacts due to traffic incidents or weather. As evaluated in Maryland, this represents the 95th percentile travel time for a section of roadway. A PTI of 1.5 means the total trip time under light traffic conditions should be increased by 50% to make sure of an on time arrival. So if a trip takes 10 minutes under uncongested traffic conditions where the PTI is 1.5 the total trip time should be increased to 15 minutes to ensure arriving on time. The lower the PTI number, the more reliable the trip while the higher the number, the less reliable the trip. For the purposes of the statewide and Baltimore - Washington region reliability maps presented in this report, the PTI is categorized for freeways/expressways as follows:

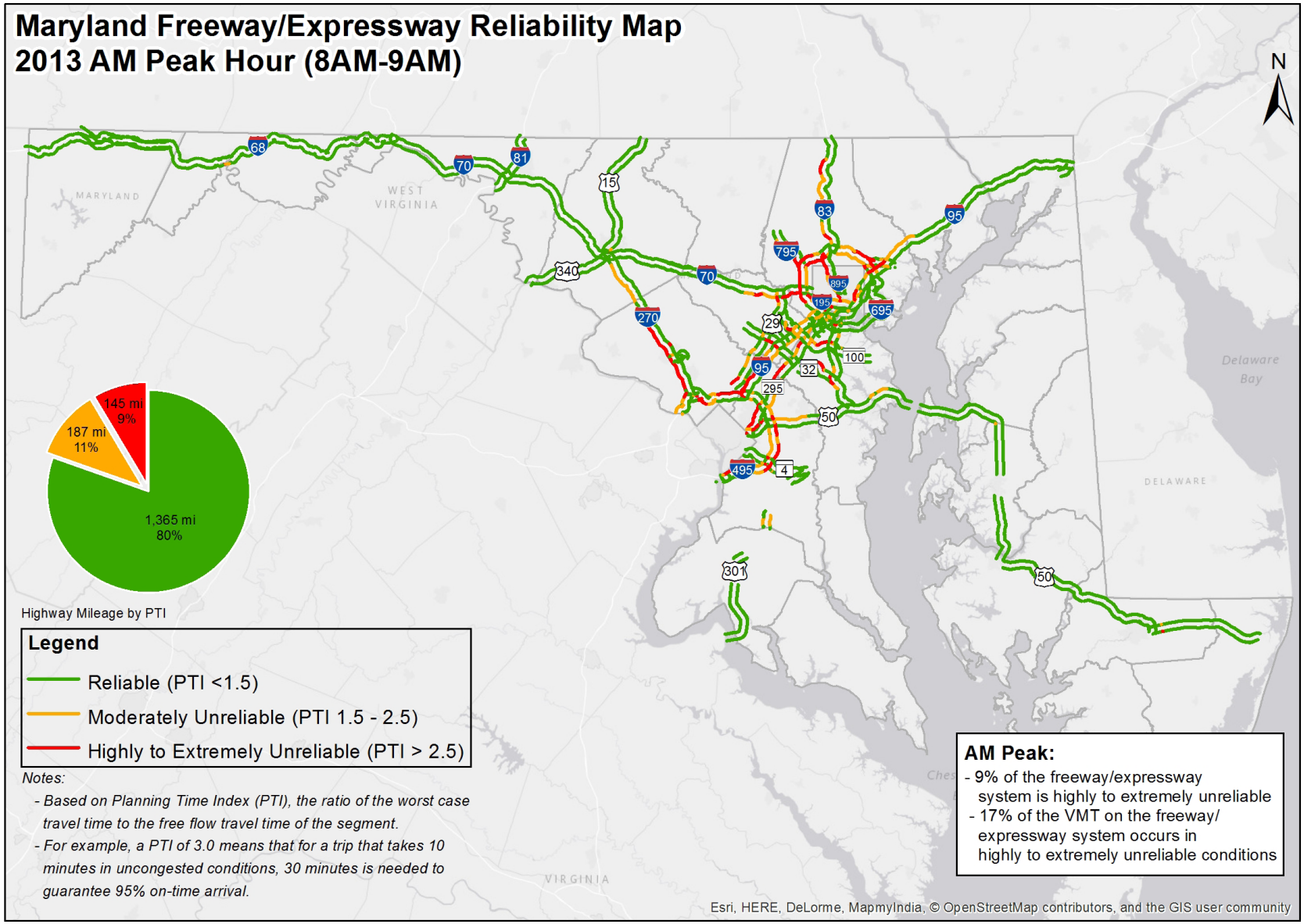
- Reliable (PTI $\leq$1.5)
- Moderately Unreliable (1.5 <PTI <2.5)
- Highly to Extremely Unreliable (PTI >2.5)

1. Statewide Freeway/Expressway Peak Hour Reliability

Reliability which was measured by the PTI was developed on a statewide basis for the peak hours (8-9 AM and 5-6 PM) of the network. The results are shown in figures 7 and 8.

Motorists experience highly to extremely unreliable conditions (PTI >2.5) on a total of 145 road miles (9% of the statewide freeway/expressway network) in the AM peak hour. The vehicle miles traveled under these unreliable conditions is estimated to be 17% of the morning peak hour, VMT.

In the afternoon peak hour, 213 road miles (13% of the statewide freeway/expressway network) operate under highly to extremely unreliable conditions (PTI >2.5). The vehicle miles traveled under these unreliable conditions is estimated to be 22% of the afternoon peak hour, VMT.


Maryland Freeway/Expressway Reliability Map
2013 AM Peak Hour (8AM-9AM)
N
MARYLAND
WEST VIRGINIA
VIRGINIA
DELAWARE
Delaware Bay
145 mi
9%
187 mi
11%
1,365 mi
80%
Highway Mileage by PTI
Legend
Reliable (PTI <1.5)
Moderately Unreliable (PTI 1.5 - 2.5)
Highly to Extremely Unreliable (PTI > 2.5)
Notes:
- Based on Planning Time Index (PTI), the ratio of the worst case travel time to the free flow travel time of the segment.
- For example, a PTI of 3.0 means that for a trip that takes 10 minutes in uncongested conditions, 30 minutes is needed to guarantee 95% on-time arrival.
AM Peak:
- 9% of the freeway/expressway system is highly to extremely unreliable
- 17% of the VMT on the freeway/ expressway system occurs in highly to extremely unreliable conditions
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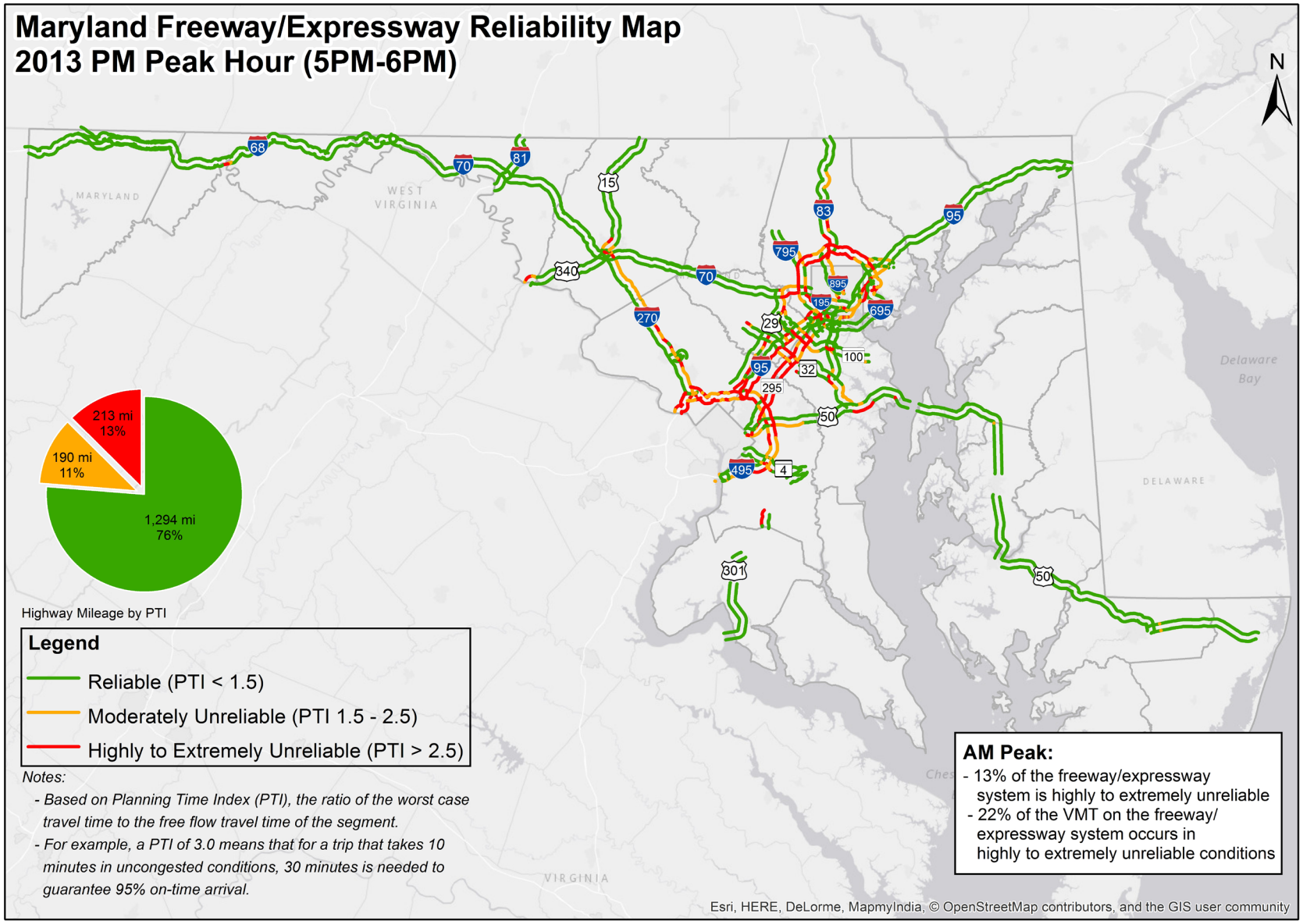
Maryland Freeway/Expressway Reliability Map
2013 PM Peak Hour (5PM-6PM)
N
MARYLAND
WEST VIRGINIA
VIRGINIA
DELAWARE
Delaware Bay
68
70
81
15
340
270
83
795
895
195
695
95
29
100
32
295
50
495
4
301
213 mi
13%
190 mi
11%
1,294 mi
76%
Highway Mileage by PTI
Legend
Reliable (PTI < 1.5)
Moderately Unreliable (PTI 1.5 - 2.5)
Highly to Extremely Unreliable (PTI > 2.5)
Notes:
- Based on Planning Time Index (PTI), the ratio of the worst case travel time to the free flow travel time of the segment.
- For example, a PTI of 3.0 means that for a trip that takes 10 minutes in uncongested conditions, 30 minutes is needed to guarantee 95% on-time arrival.
AM Peak:
- 13% of the freeway/expressway system is highly to extremely unreliable
- 22% of the VMT on the freeway/ expressway system occurs in highly to extremely unreliable conditions
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A comparison was performed on the statewide peak hour reliability over the past three years. The reliability on the freeway/expressway system has decreased slightly over the 2011 trends. The 2012 reliability showed a much lower percentage of roadways that was experiencing highly to extremely unreliable conditions.

RELIABILITY TRENDS ON MARYLAND FREEWAYS/EXPRESSWAYS

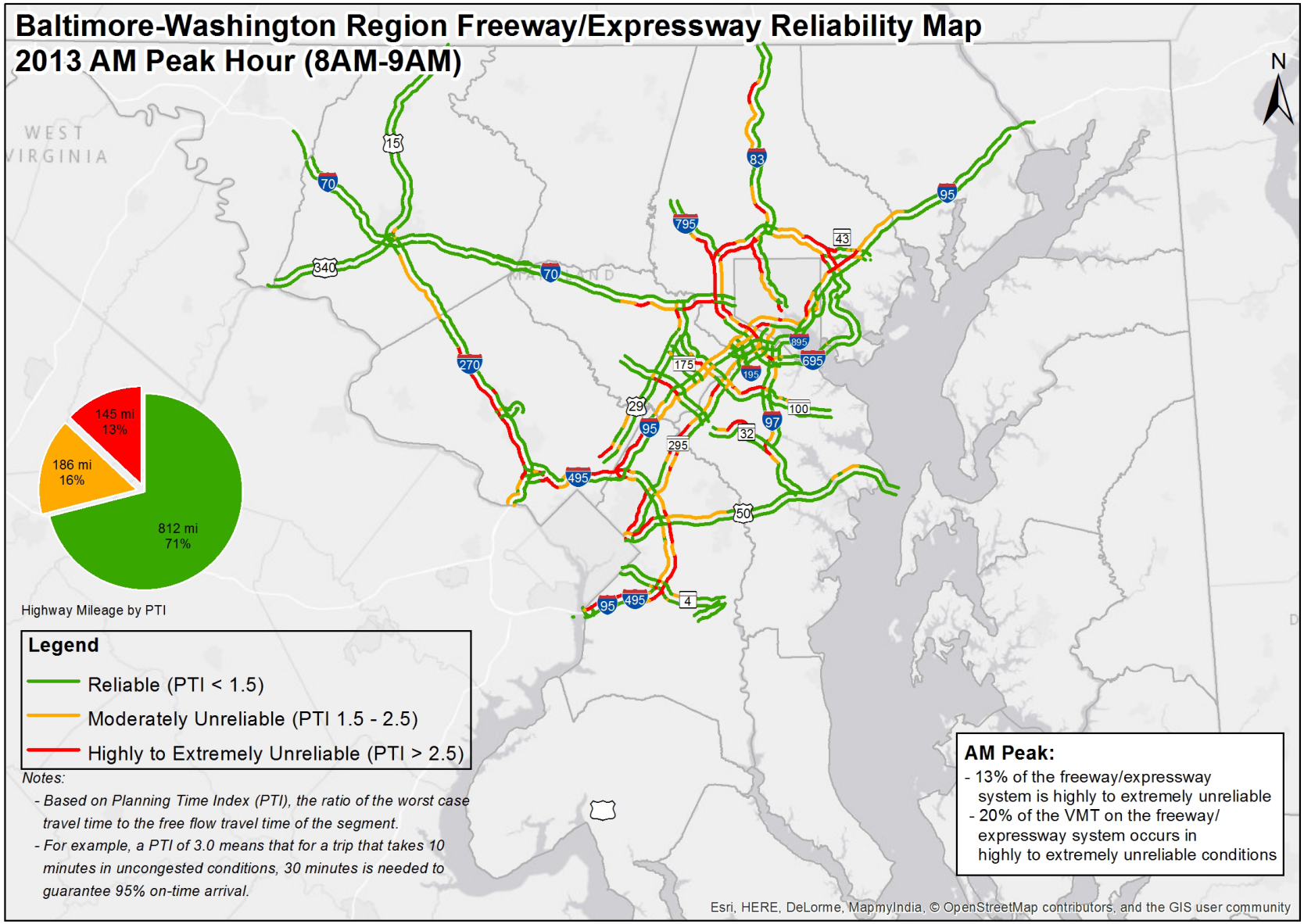
Highly to Extremely Unreliable Conditions	2013		2012		2011	
	AM	PM	AM	PM	AM	PM
Number of Roadway Miles	145	213	26	71	140	188
Percent of Roadway Miles	9	13	2	4	8	11

2. Baltimore - Washington Region Peak Hour Reliability

The AM (8-9) and PM (5-6) peak hours were used to calculate the PTI on the freeways/expressways in the Baltimore - Washington region. The reliability maps for the region are shown in figures 9 and 10.

There was a total of 145 road miles (13% of network) where motorists experience highly to extremely unreliable (PTI >2.5) conditions in the morning peak hour. Twenty (20)% of the morning peak hour VMT occurs in highly to extremely unreliable conditions.

During the PM peak hour, motorists experience highly to extremely unreliable conditions (PTI > 2.5) on 211 road miles within the Baltimore - Washington region. This represents 18% of the network. Twenty-six (26)% of the afternoon peak hour VMT in the Baltimore-Washington region occurs in highly or extremely unreliable conditions.


Baltimore-Washington Region Freeway/Expressway Reliability Map
2013 AM Peak Hour (8AM-9AM)
N
WEST VIRGINIA
145 mi 13%
186 mi 16%
812 mi 71%
Highway Mileage by PTI
Legend
Reliable (PTI < 1.5)
Moderately Unreliable (PTI 1.5 - 2.5)
Highly to Extremely Unreliable (PTI > 2.5)
Notes:
- Based on Planning Time Index (PTI), the ratio of the worst case travel time to the free flow travel time of the segment.
- For example, a PTI of 3.0 means that for a trip that takes 10 minutes in uncongested conditions, 30 minutes is needed to guarantee 95% on-time arrival.
AM Peak:
- 13% of the freeway/expressway system is highly to extremely unreliable
- 20% of the VMT on the freeway/ expressway system occurs in highly to extremely unreliable conditions
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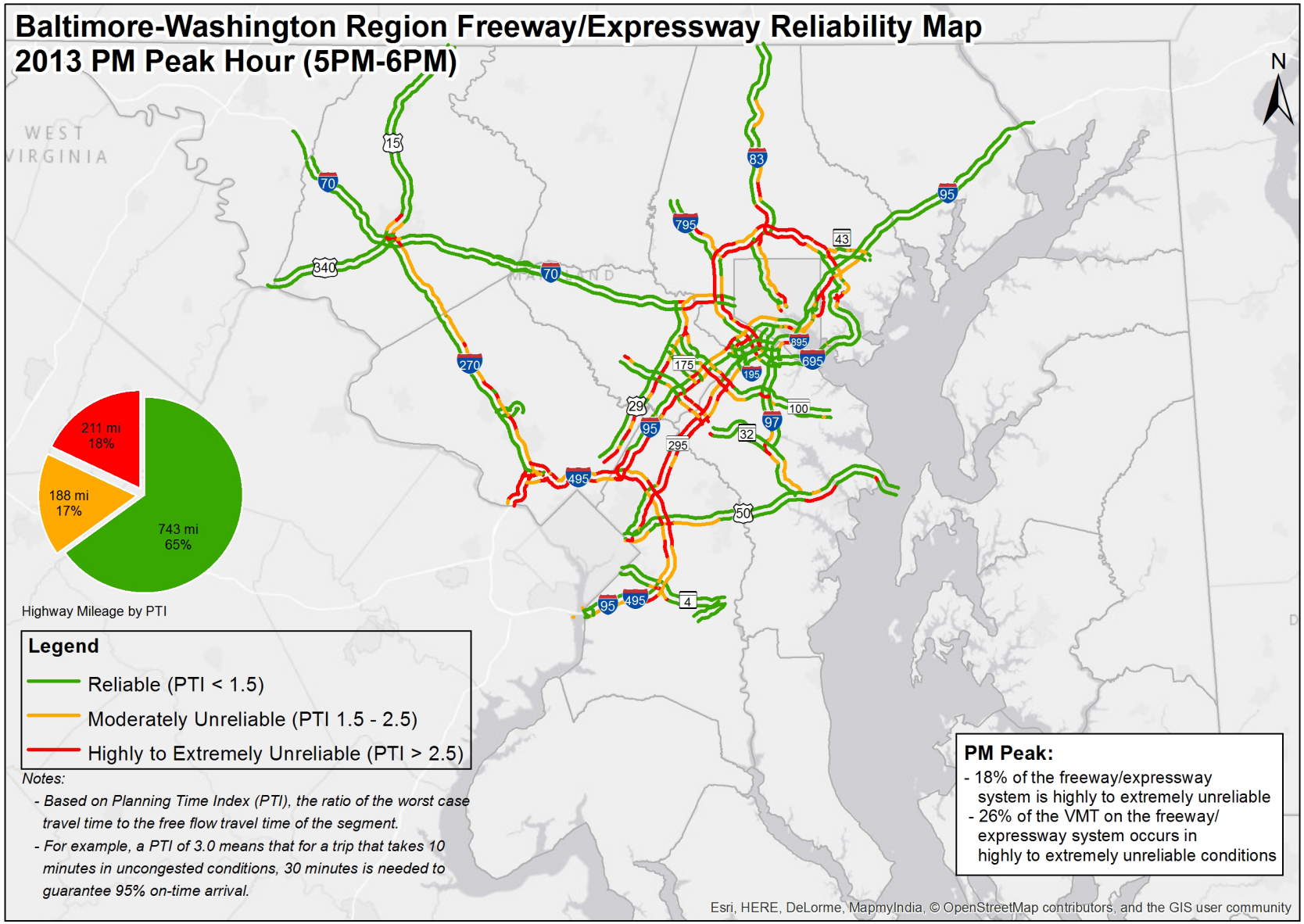
Baltimore-Washington Region Freeway/Expressway Reliability Map
2013 PM Peak Hour (5PM-6PM)
N
WEST VIRGINIA
211 mi 18%
188 mi 17%
743 mi 65%
Highway Mileage by PTI
Legend
Reliable (PTI < 1.5)
Moderately Unreliable (PTI 1.5 - 2.5)
Highly to Extremely Unreliable (PTI > 2.5)
Notes:
- Based on Planning Time Index (PTI), the ratio of the worst case travel time to the free flow travel time of the segment.
- For example, a PTI of 3.0 means that for a trip that takes 10 minutes in uncongested conditions, 30 minutes is needed to guarantee 95% on-time arrival.
PM Peak:
- 18% of the freeway/expressway system is highly to extremely unreliable
- 26% of the VMT on the freeway/ expressway system occurs in highly to extremely unreliable conditions
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Top 30 Unreliable Segments

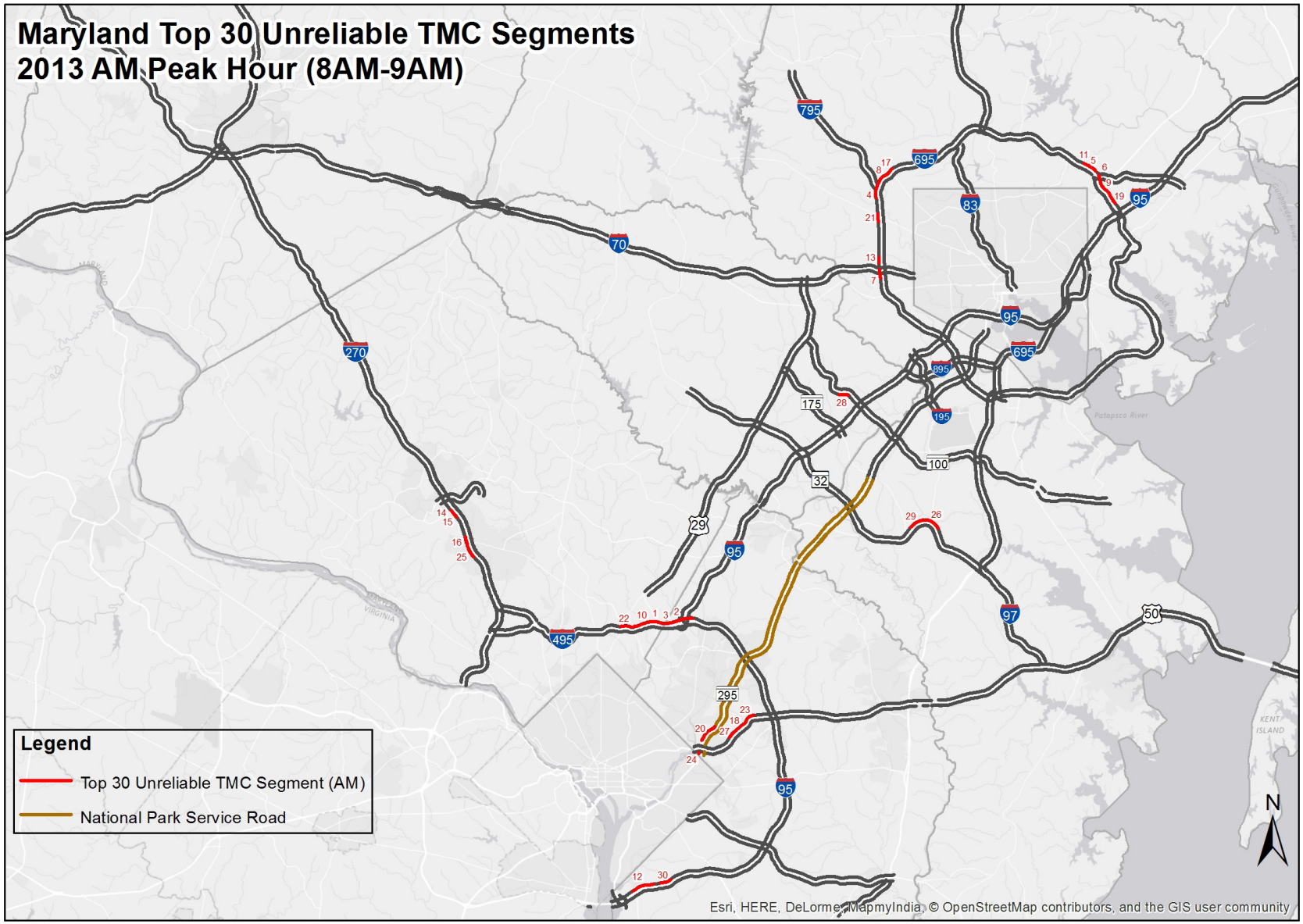
The top 30 most unreliable freeway/expressway segments based on the PTI for the AM peak hour (8-9 AM) and PM peak hour (5-6 PM) are listed in the following tables and shown in Figures 11 - 12:

2013 TOP 30 UNRELIABLE SEGMENTS AM PEAK

2013 Rank	Road	Location	Direction	2013 PTI	2012 Rank	Rank Change 2012 to 2013
1	I-495	@ MD 650	OUTER LOOP	8.29	2	-1
2	I-495	I-95 TO MONTOGMERY CO/L	OUTER LOOP	8.18	1	1
3	I-495	PRINCE GEORGES CO/L TO MD 650	OUTER LOOP	7.86	3	0
4	I-695	IS 795 TO MD 26	OUTER LOOP	7.71	14	-10
5	I-695	MD 43 TO MD 147	OUTER LOOP	7.47	6	-1
6	I-695	US 1 TO MD 43	OUTER LOOP	7.45	10	-4
7	I-695	IS 70 TO US 40	OUTER LOOP	7.33	9	-2
8	I-695	MD 140 TO IS 795	OUTER LOOP	7.17	35	-27
9	I-695	@ US 1	OUTER LOOP	7.15	32	-23
10	I-495	MD 650 TO MD 193*	OUTER LOOP	7.13	4	6
11	I-695	MD 147 TO MD 41	OUTER LOOP	7.00	5	6
12	I-95	MD 414 TO MD 210	INNER LOOP	6.86	285	-273
13	I-695	MD 26 TO MD 122	OUTER LOOP	6.45	55	-42
14	I-270	SHADY GROVE RD TO MD 28	SOUTHBOUND	6.18	7	7
15	I-270	SHADY GROVE RD TO MD 28 CD LANES	SOUTHBOUND	6.18	8	7
16	I-270	@ MD 28	SOUTHBOUND	6.11	27	-11
17	I-695	@ MD 140	OUTER LOOP	6.06	104	-87
18	US-50	MD 410 TO MD 202	WESTBOUND	6.01	30	-12
19	I-695	IS 95 TO US 1	OUTER LOOP	5.84	119	-100
20	MD-295	MD 202 TO US 50[1]	SOUTHBOUND	5.83	94	-74
21	I-695	@ MD 26	OUTER LOOP	5.51	34	-13
22	I-495	MD 193 TO US 29*	OUTER LOOP	5.45	15	7
23	US-50	@ MD 410	WESTBOUND	5.26	45	-22
24	MD-295	US 50 TO WASHINGTON DC/L[1]	SOUTHBOUND	5.09	164	-140
25	I-270	MD 28 TO MD 189	SOUTHBOUND	5.06	21	4
26	MD-32	SAPPINGTON STATION RD TO MD 170	WESTBOUND	5.04	260	-234
27	US-50	MD 202 TO MD 459	WESTBOUND	5.03	33	-6
28	MD-100	SNOWDEN RIVER PKWY TO MD 103	EASTBOUND	4.98	96	-68
29	MD-32	MD 170 TO MD 175	WESTBOUND	4.76	182	-153
30	I-95	@ MD 414	INNER LOOP	4.75	1604	-1574

[1]Maintained by the National Park Service *Under Construction

Figure 11


Maryland Top 30 Unreliable TMC Segments
2013 AM Peak Hour (8AM-9AM)
Legend
Top 30 Unreliable TMC Segment (AM)
National Park Service Road
N
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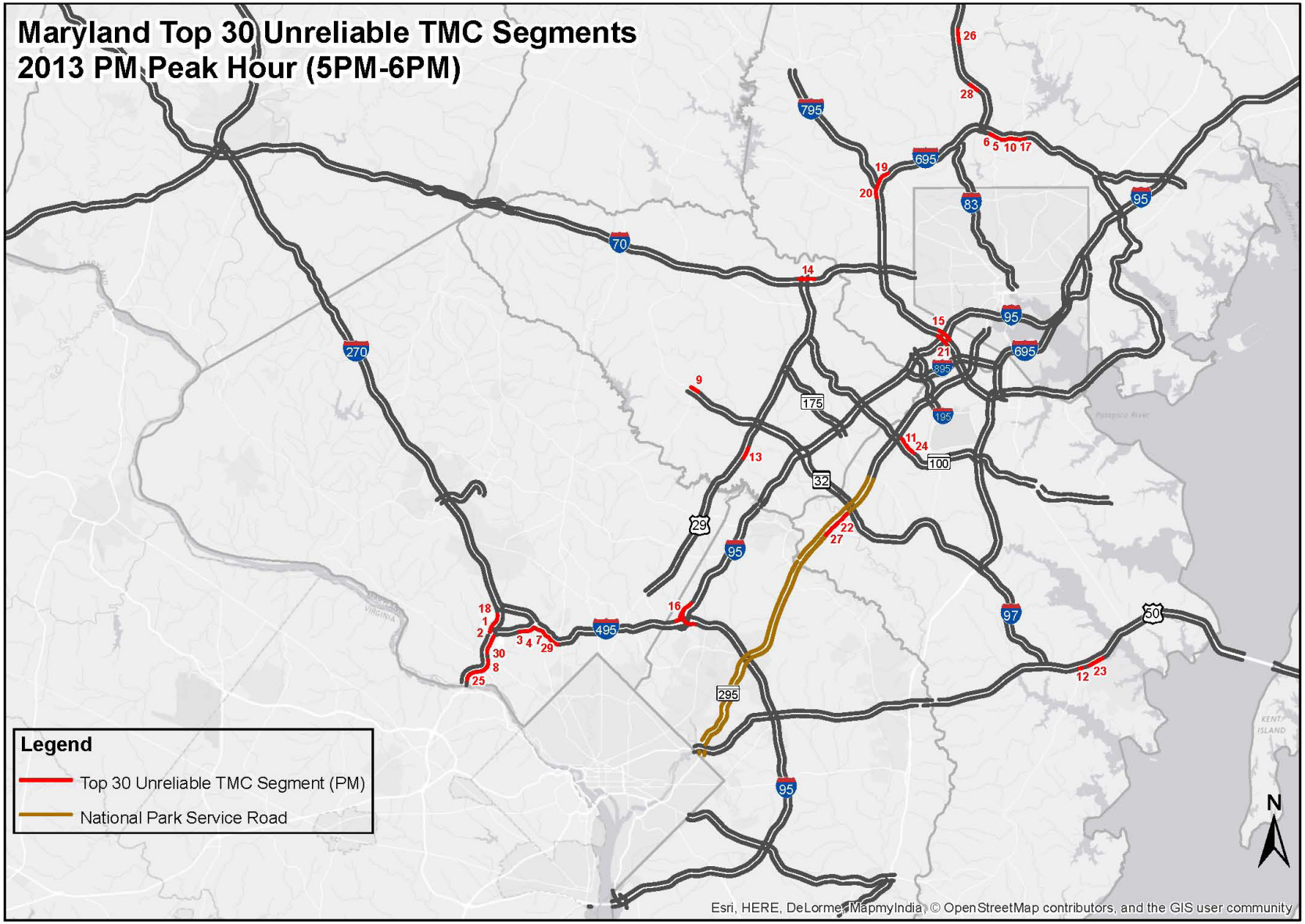
2013 TOP 30 UNRELIABLE SEGMENTS PM PEAK

2013 Rank	Road	Location	Direction	2013 PTI	2012 Rank	Rank Change 2012 to 2013
1	I-270 Spur	@ DEMOCRACY BLVD	SOUTHBOUND	9.30	1	0
2	I-270 Spur	@ IS 495	SOUTHBOUND	8.86	2	0
3	I-495	@ MD 187	INNER LOOP	8.01	4	-1
4	I-495	MD 187 TO MD 355	INNER LOOP	7.94	3	1
5	I-695	MD 139 TO MD 45	INNER LOOP	7.89	18	-13
6	I-695	@ MD 139	INNER LOOP	7.67	31	-25
7	I-495	MD 355 TO MD 185	INNER LOOP	7.40	5	2
8	I-495	CABIN JOHN PKWY TO MD 190	INNER LOOP	6.96	12	-4
9	MD-32	GREAT STAR DR TO MD 108	WESTBOUND	6.71	9	0
10	I-695	MD 45 TO MD 146	INNER LOOP	6.39	35	-25
11	MD-100	MD 713 TO MD 295	WESTBOUND	6.18	259	-248
12	US-50	@ MD 450	EASTBOUND	6.18	25	-13
13	US-29	MD 216 TO JOHNS HOPKINS RD	NORTHBOUND	5.95	196	-183
14	I-70	@ US 29	WESTBOUND	5.89	101	-87
15	I-695	@ IS 95	INNER LOOP	5.79	185	-170
16	I-95	MD 212 TO IS 495	SOUTHBOUND	5.64	140	-124
17	I-695	@ MD 146	INNER LOOP	5.63	56	-39
18	I-270 Spur	IS 270 TO DEMOCRACY BLVD	SOUTHBOUND	5.53	11	7
19	I-695	MD 140 TO IS 795	OUTER LOOP	5.48	211	-192
20	I-695	IS 795 TO MD 26	OUTER LOOP	5.48	165	-145
21	I-695	@ IS 95	OUTER LOOP	5.39	246	-225
22	MD-295	MD 198 TO MD 32[1]	NORTHBOUND	5.39	40	-18
23	US-50	@ MD 70	EASTBOUND	5.29	15	8
24	MD-100	MD 170 TO MD 713	WESTBOUND	5.28	433	-409
25	I-495	CLARA BARTON PKWY TO CABIN JOHN PKWY	INNER LOOP	5.17	41	-16
26	I-83	WARREN RD TO SHAWAN RD	NORTHBOUND	5.11	70	-44
27	MD-295	@ MD 198[1]	NORTHBOUND	5.02	106	-79
28	I-83	PADONIA RD TO TIMONIUM RD	SOUTHBOUND	5.00	258	-230
29	I-495	@ MD 185	INNER LOOP	4.98	20	9
30	I-495	@ IS 270Y Split	INNER LOOP	4.98	24	6

[1]Maintained by the National Park Service *Under Construction


Maryland Top 30 Unreliable TMC Segments
2013 PM Peak Hour (5PM-6PM)
Legend
Top 30 Unreliable TMC Segment (PM)
National Park Service Road
N
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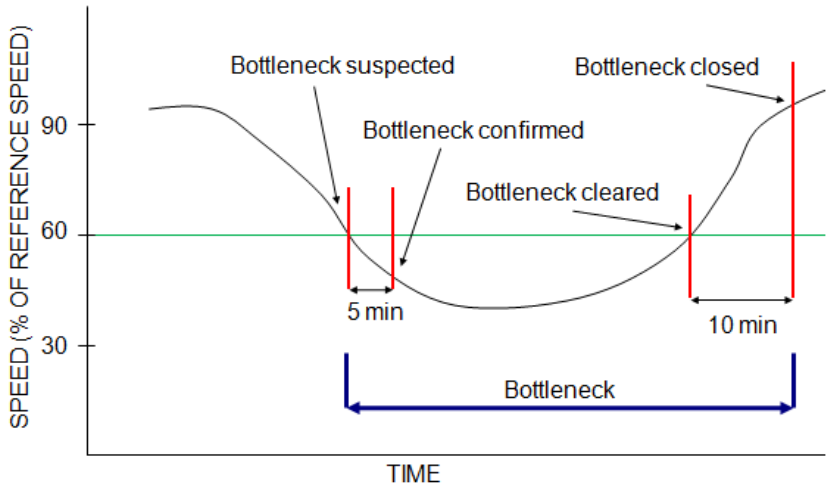
Top 30 Bottleneck Locations

The top 30 bottleneck locations were identified for Maryland in 2013. The ranking is based on speed observations used to calculate their occurrence. The ranking of the segments is performed by comparing the duration, intensity and frequency with which the bottlenecks occur during an entire average weekday.

A bottleneck, as defined by the Vehicle Probe Project (VPP) Suite, occurs when, "the speeds observed for a roadway segment drop below 60% of the free flow speed for a period greater than 5 minutes. Adjacent roadway segments meeting this condition are joined together to form a bottleneck queue. The duration of the bottleneck is calculated till the time speeds are greater than 60% for more than 10 minutes." This definition uses minute-to-minute speeds available across the state highway system to determine congestion patterns. This is graphically shown below:



The analysis is based on INRIX probe data for interstates and major roadways within Maryland available through the Vehicle Probe Project. The ranking is based on impact factors (computed as the number of times a bottleneck occurs on a particular segment, times its duration and the average queue length). The following page identifies the Top 30 Bottlenecks. These are shown in Figure 13.

2013 TOP 30 BOTTLENECK LOCATIONS

2013 Rank	Location	Road	Direction	Q1	Q2	Q3	Q4	Average Duration (Minutes)	Average MAX Length	Impact Factor	2012 Rank	Rank Change 2012 to 2013
1	I-495 IL @ I-270 Spur	I-495	INNER LOOP	172	266	214	208	185.5	13.83	1993724	18	-17
2	I-695 IL @ MD-147/Harford Rd/Exit 31	I-695	INNER LOOP	95	105	97	116	165.25	10.58	712794	5	-3
3	I-95 N @ MD-100/Exit 43	I-95	NORTHBOUND	96	195	162	127	122.5	10.53	699231	6	-3
4	I-695 OL @ Edmondson Ave/Exit 14*	I-695	OUTER LOOP	170	208	197	135	128	8.43	696761	8	-4
5	US-29 N @ MD-175	US-29	NORTHBOUND	169	135	126	159	139.5	8.84	617074	N/A	N/A
6	I-270 Spur S @ I-270	I-270	SOUTHBOUND	182	251	210	241	100.75	7.35	589191	3	+3
7	I-95 OL @ Greenbelt Metro Dr/Exit 24	I-495	OUTER LOOP	88	125	105	90	133	10.8	515630	28	-21
8	MD-295 N @ MD-197/Exit 11[1]	MD-295	NORTHBOUND	91	115	122	116	166.5	7.38	502221	4	+4
9	I-270 N @ MD-80/Exit 26	I-270	NORTHBOUND	64	90	127	76	100.75	9.75	303944	2	+7
10	I-270 Local N @ MD 124	I-270	NORTHBOUND	162	156	128	159	126.25	4.28	254174	1037	-1027
11	MD-295 S @ MD-193[1]	MD-295	SOUTHBOUND	112	101	92	85	95.75	7.58	252559	12	-1
12	I-695 IL @ Security Blvd/Exit 17	I-695	INNER LOOP	104	169	197	144	102.75	4.44	252163	N/A	N/A
13	I-95 N @ MD-43/Exit 67[2].*	I-95	NORTHBOUND	44	97	113	82	109.5	7.77	244868	10	+3
14	I-270 N @ I-70/US-40	I-270	NORTHBOUND	85	106	81	128	83.25	8.07	227055	7	+7
15	I-270 S @ MD-109/Exit 22	I-270	SOUTHBOUND	126	178	156	118	84.25	4.62	206370	15	0
16	I-695 OL @ MD-144/Exit 13*	I-695	OUTER LOOP	66	46	55	40	142.5	8.96	201943	14	+2
17	I-495 OL @ MD-185/Connecticut Ave/Exit 33	I-495	OUTER LOOP	68	79	60	63	127.25	6.2	192474	23	-6
18	I-695 IL @ I-83/MD-25/Exit 23	I-695	INNER LOOP	94	117	111	104	82.25	5.22	173842	27	-9
19	I-695 IL @ MD-26/Exit 18	I-695	INNER LOOP	33	54	60	55	131.5	6.79	171284	22	-3
20	I-95 S @ I-495/Exit 27-25	I-95	SOUTHBOUND	113	179	163	155	85.25	3.59	169575	25	-5
21	MD-295 S @ Powder Mill Rd[1]	MD-295	SOUTHBOUND	61	135	166	114	82.75	4.72	169333	85	-64
22	I-695 IL @ MD-41/Perring Pkwy/Exit 30	I-695	INNER LOOP	87	98	88	68	84	6.35	166460	19	+3
23	MD-295 N @ MD 32[1]	MD-295	NORTHBOUND	41	74	75	46	92.25	7.53	151493	36	-13
24	I-495 OL @ MD-97/Georgia Ave/Exit 31	I-495	OUTER LOOP	78	118	99	114	102	3.47	141485	26	-2
25	I-270 N @ Middlebrook Rd/Exit 13	I-270	NORTHBOUND	98	91	0	83	104	5.99	141129	11	+14
26	MD-295 S @ DC Line[1]	MD-295	SOUTHBOUND	91	95	103	78	114.5	4.1	141111	31	-5
27	I-95 IL @ MD-214/Exit 15	I-495	INNER LOOP	65	84	157	111	71.5	6.02	139754	59	-32
28	US-50 W @ Bay Bridge	US-50	WESTBOUND	22	121	199	41	50.75	5.59	136461	32	-4
29	MD-295 S @ MD-198[1]	MD-295	SOUTHBOUND	79	123	147	113	88	3.28	131422	35	-6
30	I-95 OL @ US-50/Exit 19	I-495	OUTER LOOP	0	101	114	113	89.33	4.6	129385	N/A	N/A

Q1: Jan-Mar Q2: Apr-June Q3: July-Sept Q4: Oct-Dec

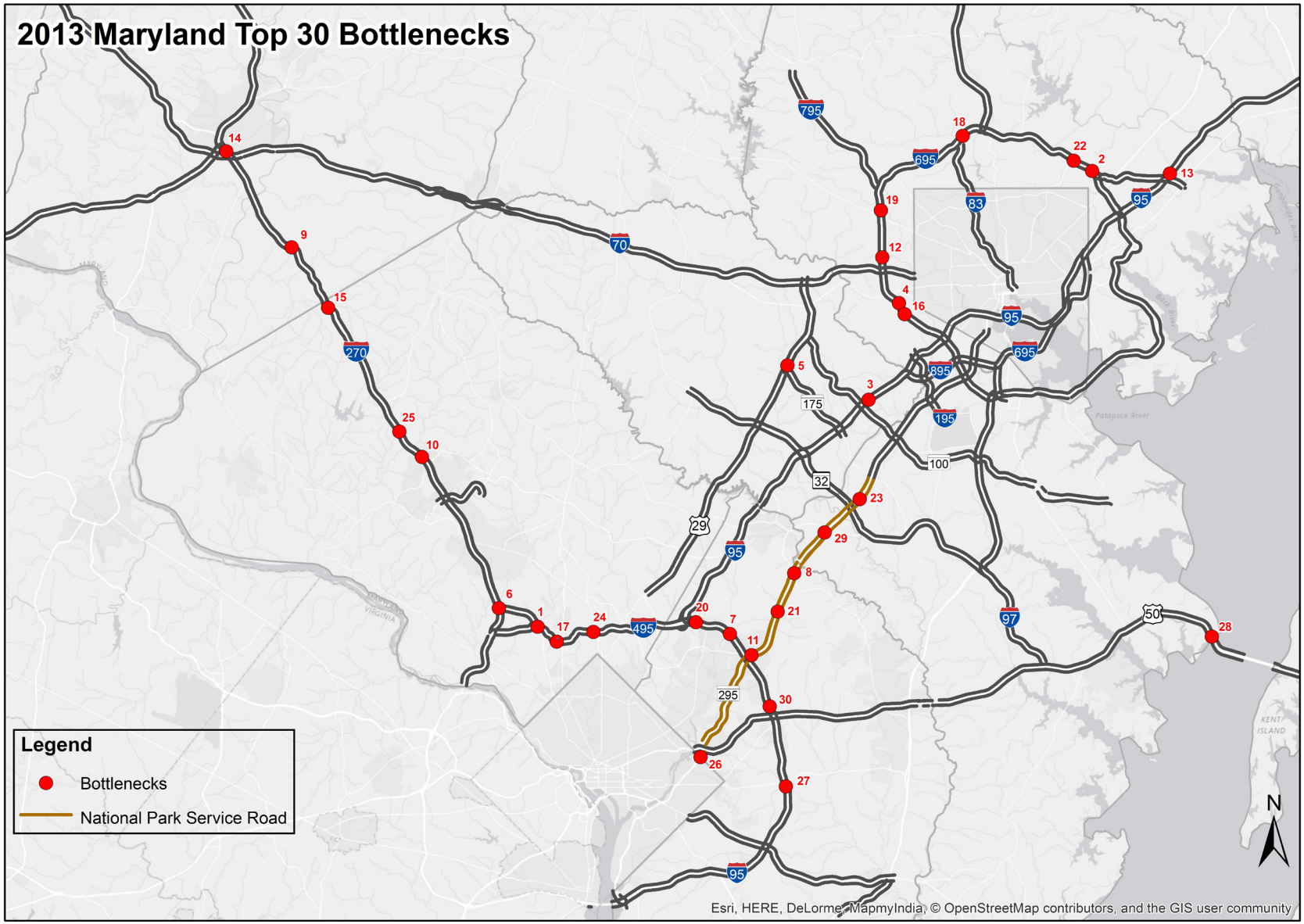
Occurrences: # of times speed dropped below 60% of the free flow speeds

Impact factor = Sum of Occurrence per quarter x Avg. Duration per Quarter x Queue Length per Quarter

1: Owned by National Park Service

2: Owned and Operated by Maryland Transportation Authority

*Under Construction


2013 Maryland Top 30 Bottlenecks
Legend
Bottlenecks
National Park Service Road
N
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