

PROCESS OF UTILIZING VPP SUITE AND INRIX DATA AT COG/TPB

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System Performance, Operations and Technology Subcommittee (SPOTS) &
Vehicle Probe Data Users Group (VPDUG) Joint Meeting

September 14, 2016



Goals

- Summarize
- Share
- Feedback



Products

- Congestion Management Process (CMP) Technical Report:
 - 2010, 2012, [2014](#), and [2016](#)
- Congestion Dashboard: <https://www.mwcog.org/congestion/>
- Event analyses: <http://www.tpbne.ws/>
 - [Traffic “September Shock” \(8/30/16\)](#)
 - [SafeTrack Traffic Impact \(7/19/16\)](#)
 - [Traffic Prior to Memorial Day \(5/24/16\)](#)
- Special studies:
 - [Airport Ground Access Travel Time Study \(2016\)](#)
 - [ICC Before and After Study \(2013\)](#)



Use of VPP Suite



- Download data
- Visualization and analysis
 - Trend Map
 - Performance Charts
 - Bottleneck Ranking
 - *Customized maps*
- TMC lookup



















Download Data


1. Roads


Road Region List of TMC codes Saved TMC Set



INRIX  Search in all states...  [Advanced](#)


Your selected roads  [Remove all](#)

-    4 counties in MD (4477 tmcs)
-    DC (2114 tmcs)
-    9 counties in VA (2900 tmcs)
-    US-15 between US-17/US-29 and VA-215/Vint Hill Rd
-    US-17 between US-15/Falmouth St and US-211/W Lee Hwy

 Save as TMC set


2. Date Range 

09/12/2016  - 09/12/2016 


 Add another date range

3. Days of week

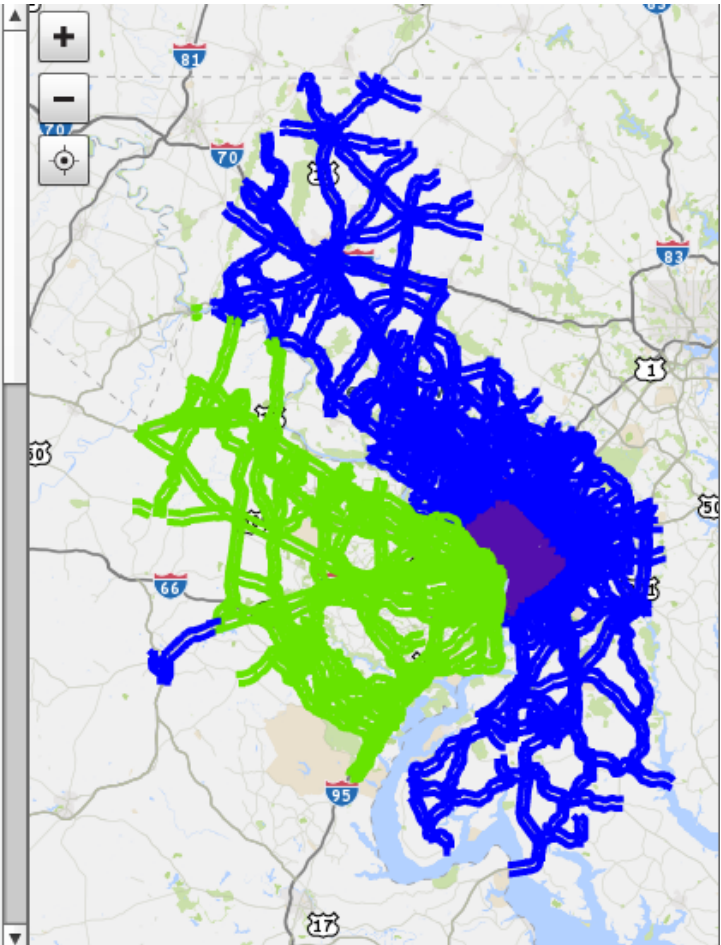
Sun Mon Tue Wed Thu Fri Sat

4. Time of day 

12 : 00 AM -to- 11 : 59 PM

 Add another time of day

Use default




The map displays a road network in the Washington, DC area. Major highways like I-495, I-270, I-66, and I-95 are visible. A dense network of roads is highlighted in blue, covering most of the region. A specific area, primarily along I-66 and I-95, is highlighted in green. A dark purple shaded area is visible in the center of the map, likely representing the city center or a specific district.



Download Data


- Be cautious in using “Saved TMC Set” as it could be outdated
 - TMCs usually updated twice a year
 - Use “Region” to select counties/cities
 - *To VPP Suite: can you update “Saved TMC Set” with map updates?*
- Be cautious in selecting “4. Time of Day” when downloading “today’s data” as incomplete data set could exist
 - Make sure the entire selected time period has already happened. e.g., 12:00 AM to ~~11:59 PM~~ 1:00 PM (other wise, incomplete data may exist)
 - *To VPP Suite: any reason?*

5. Data Sources, Fields and Quality 

HERE

INRIX

Speed Historic average speed Reference speed


Travel time Confidence score C-Value 


Select quality threshold for INRIX confidence score:


30
Real Time Data: Any segment that has adequate data, at any time of day, will report real time data.

20
Historic Average: Between 4 am and 10 pm, any segment without sufficient real time data will show the historical average for that segment during that day/time period (15 minute granularity).

10
Reference Speed: From 10 pm to 4 am, any segment without sufficient real time data will show the reference speed for that segment. Any segment that does not have calculated historical averages will show the reference speed 24 hours a day if there is not sufficient real time data.

NPMRDS (Passenger vehicles) 

NPMRDS (Trucks and passenger vehicles) 

NPMRDS (Trucks) 

TomTom

6. Download format


All data sources in one CSV file

One CSV file per data source


7. Averaging

Don't average 5 minutes 10 minutes

15 minutes 30 minutes 1 hour

8. Description 

Enter a description...

9. Notification 

Send me an email when this export is ready to download

[Submit download request](#)

Use default



Import Data to SAS

```
data a; infile P:\INRIXFull\01Raw\VPPSuite\2016q2\TPBMem1Hr2016q2\TPBMem1Hr2016q2.csv"  
delimiter = ',' missover dsd firstobs=2;
```

```
informat TMC $9.0;  
informat Datetime $19.0;  
informat Speed best.0;  
informat AveSpeed best.0;  
informat RefSpeed best.0;  
informat TravelTimeMinutes best.0;  
informat Score best.0;  
informat Cvalue best.0;  
format TMC $9.0;  
format Datetime $19.0;  
format Speed best.0;  
format AveSpeed best.0;  
format RefSpeed best.0;  
format TravelTimeMinutes best.0;  
format Score best.0;  
format Cvalue best.0;  
input TMC Datetime Speed AveSpeed RefSpeed TravelTimeMinutes Score Cvalue;  
run;
```

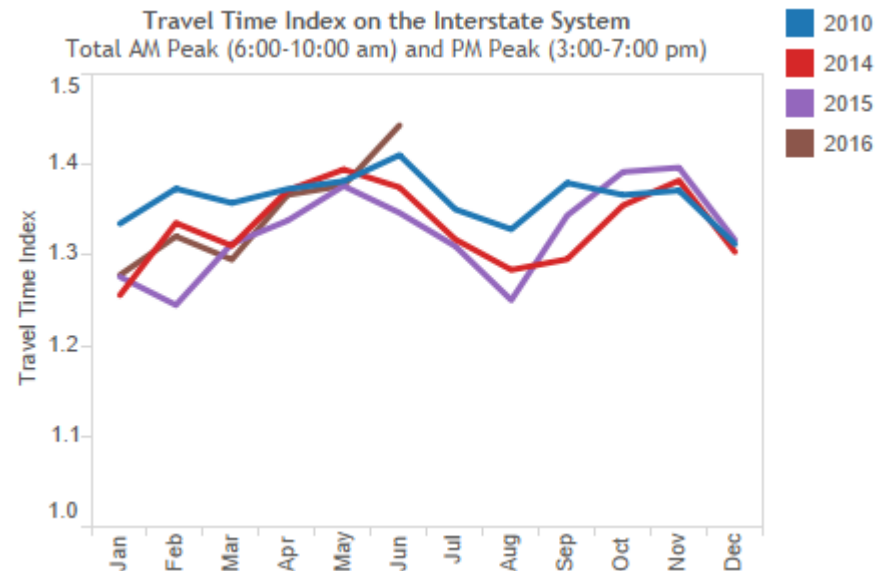
```
data r.TPBMem2016q2; set a;  
informat ET datetime.0;  
format ET datetime.0;  
ET = dhms(mdy(substrn(Datetime,6,2), substrn(Datetime,9,2), substrn(Datetime,1,4)),  
substrn(Datetime,12,2),substrn(Datetime,15,2),0);  
drop Datetime;  
run;
```

Good practice:
Always import TMC Table
“TMC_Identification.csv”
with each speed data
import; TMCs and Speed
Data go hand in hand.



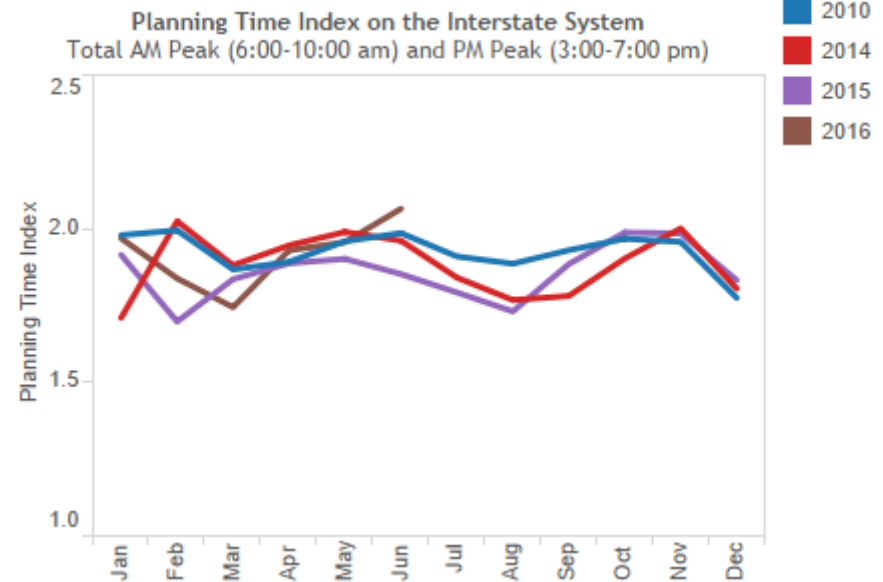
Monthly Travel Time Index

1. Aggregate the hourly data to monthly average data by day of the week and hour of the day.
 - Harmonic Mean should be used to aggregate speeds
 - For each TMC, the monthly data has 7 weekdays * 24 hours a day = 168 observations
2. For each TMC's 168 observations: $TTI = \text{Reference Speed} / \text{Speed}$ and **impose constraint: if $TTI < 1$ then $TTI = 1$**
3. Calculate regional average TTI for non-holiday weekday AM peak (6:00-10:00 am) and PM Peak (3:00-7:00 pm) respectively, **using segment length as the weight**
4. Calculate the average TTI of the AM Peak and the PM Peak to obtain an overall monthly TTI for the region



Monthly Planning Time Index

1. Aggregate the hourly data to monthly average data by day of the week and hour of the day.
 - Harmonic Mean should be used to aggregate speeds
 - For each TMC, the monthly data has 7 weekdays * 24 hours a day = 168 observations
2. For each TMC's 168 observations: $TTI = \text{Reference Speed} / \text{Speed}$
3. For each TMC: $PTI = 95^{\text{th}}$ TTI for non-holiday weekday AM peak (6:00-10:00 am) and PM Peak (3:00-7:00 pm) respectively.
4. Calculate regional average PTI for AM and PM peak respectively, **using segment length as the weight**
5. Calculate the average PTI of the AM and PM Peak to obtain an overall monthly PTI



Top 10 Bottlenecks – TMC Selection

1. Select one or more roads.

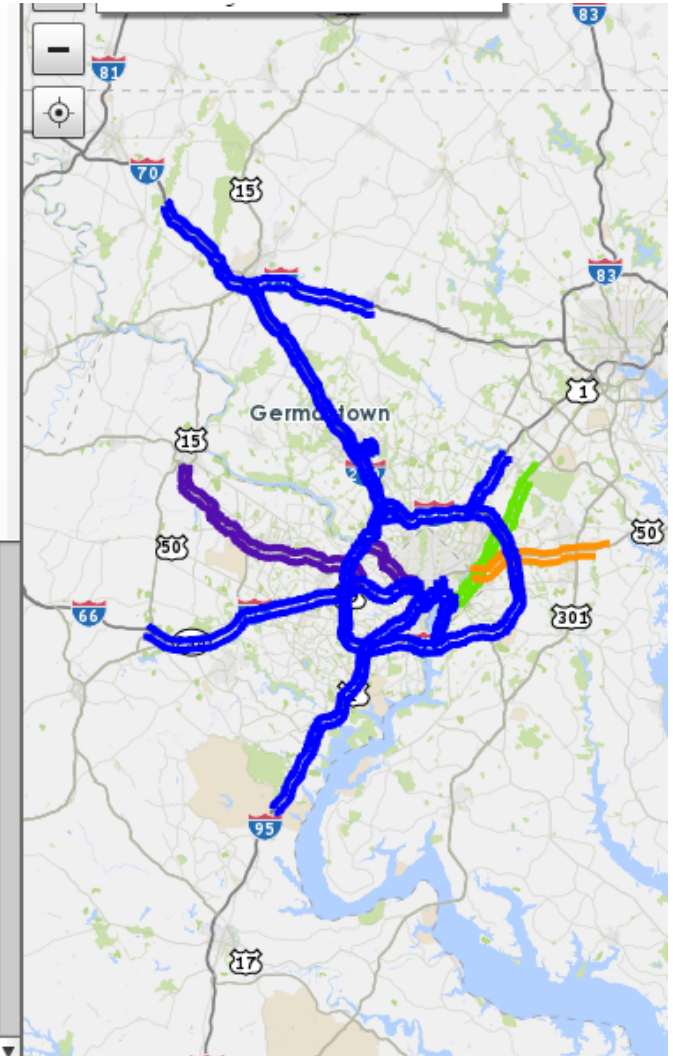
Road	Region	List of TMC codes	Saved TMC Set
Filters... Showing 132 out of 407 available TMC sets			
TMC Set	TMCs	Owner	
TPBMem_Fwy_Core	775	wpu@mwcog.org	
Bottleneck 20160201	1051	wpu@mwcog.org	
TPBMemIS20160316	785	wpu@mwcog.org	
TPBMemFwy20160325	1011	wpu@mwcog.org	
TTID-TMC Matched 20160324	273	wpu@mwcog.org	
MemorialDay20160509	1269	wpu@mwcog.org	
Surge 1: > 100%	17	wpu@mwcog.org	
Surge 1 First Week: > 100%	42	wpu@mwcog.org	
Surge 1 First Week: 50~100%	165	wpu@mwcog.org	

Add selected TMC sets

Your selected roads Remove all

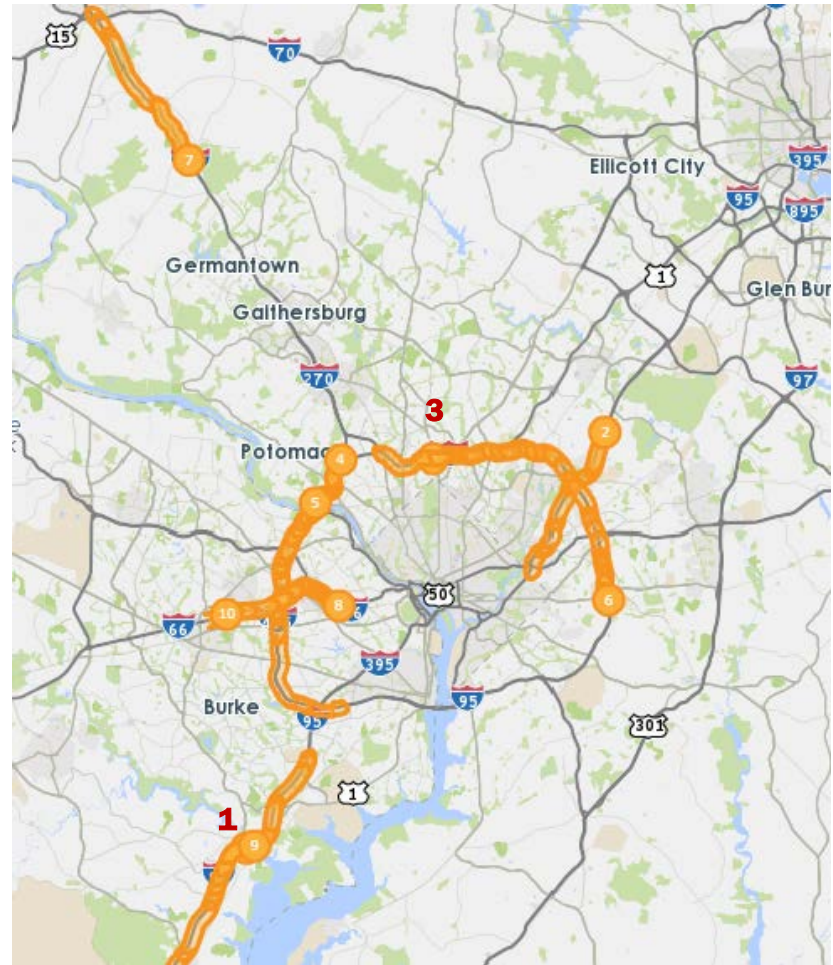
- Interstates in 14 counties throughout MD, DC, and VA (847 tmc)
- VA-267
- DC-295
- MD-295 between Eastern Ave and ARUNDEL--PRINCE GEORGE'S ...
- US-50
- US-50 between MD-295/Kenilworth Ave and ARUNDEL--PRINCE G...
- GEORGE WASHINGTON PKWY
- MD-295 between Eastern Ave and ARUNDEL--PRINCE GEORGE'S ...
- US-50 between DC--MD State Border and ARUNDEL--PRINCE GE...

Save as TMC set



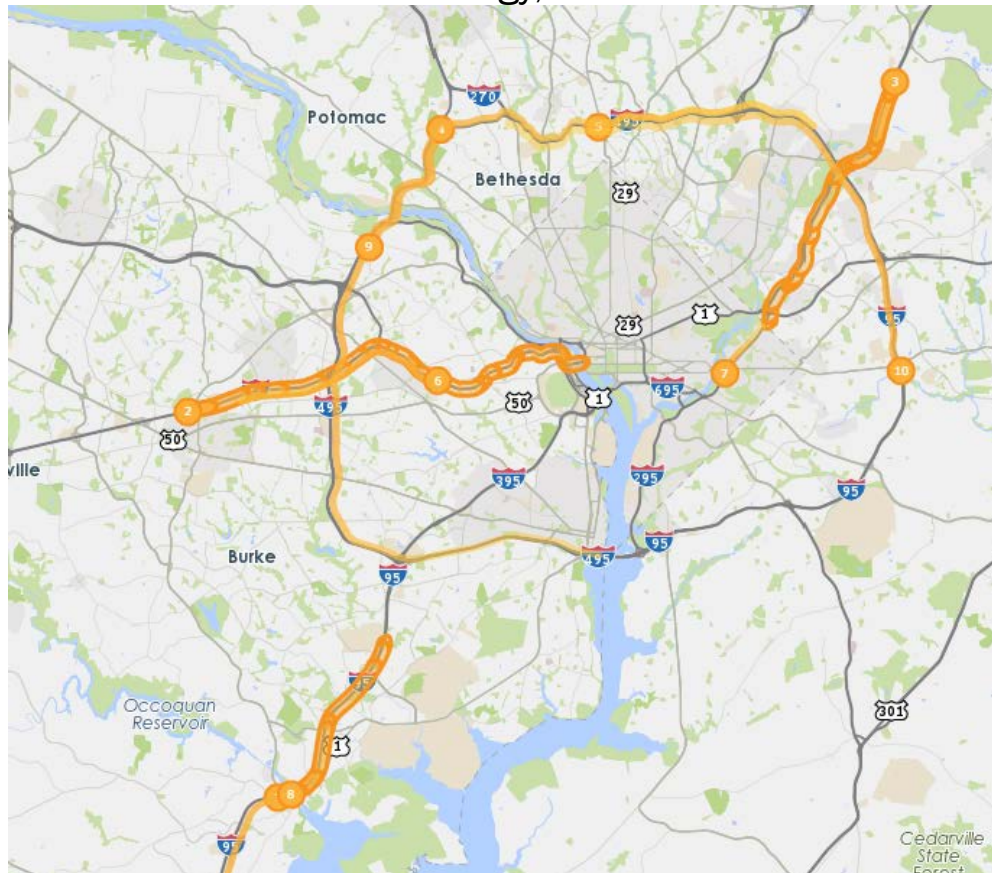
Top 10 Bottlenecks – Summary Map

- To VPP Suite:
 - Rank number too small
 - Overlap numbers
 - Directionality
 - Differentiation between bottlenecks
 - *Real-time tracking vs. historical performance assessment*

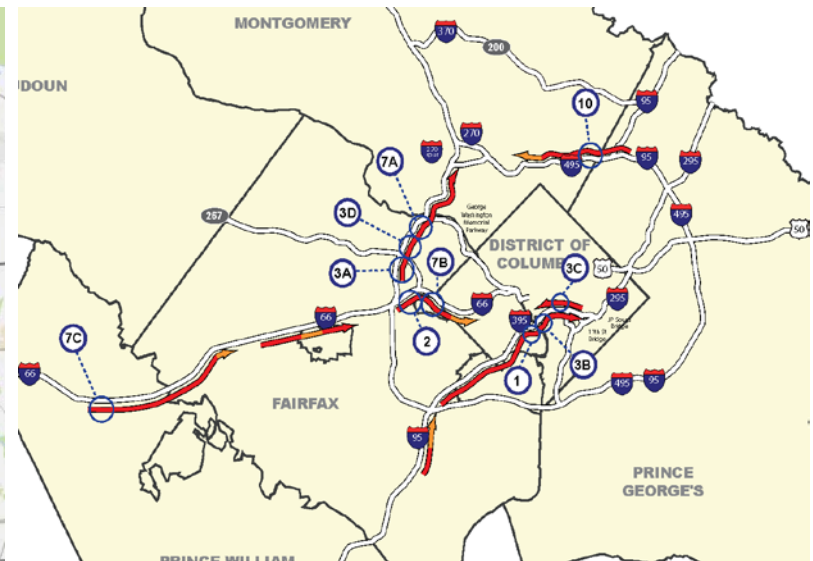


Bottlenecks – VPP Suite vs Skycomp

Vehicle Probe Project (VPP) Suite New Methodology, 2015



Skycomp, Spring 2014



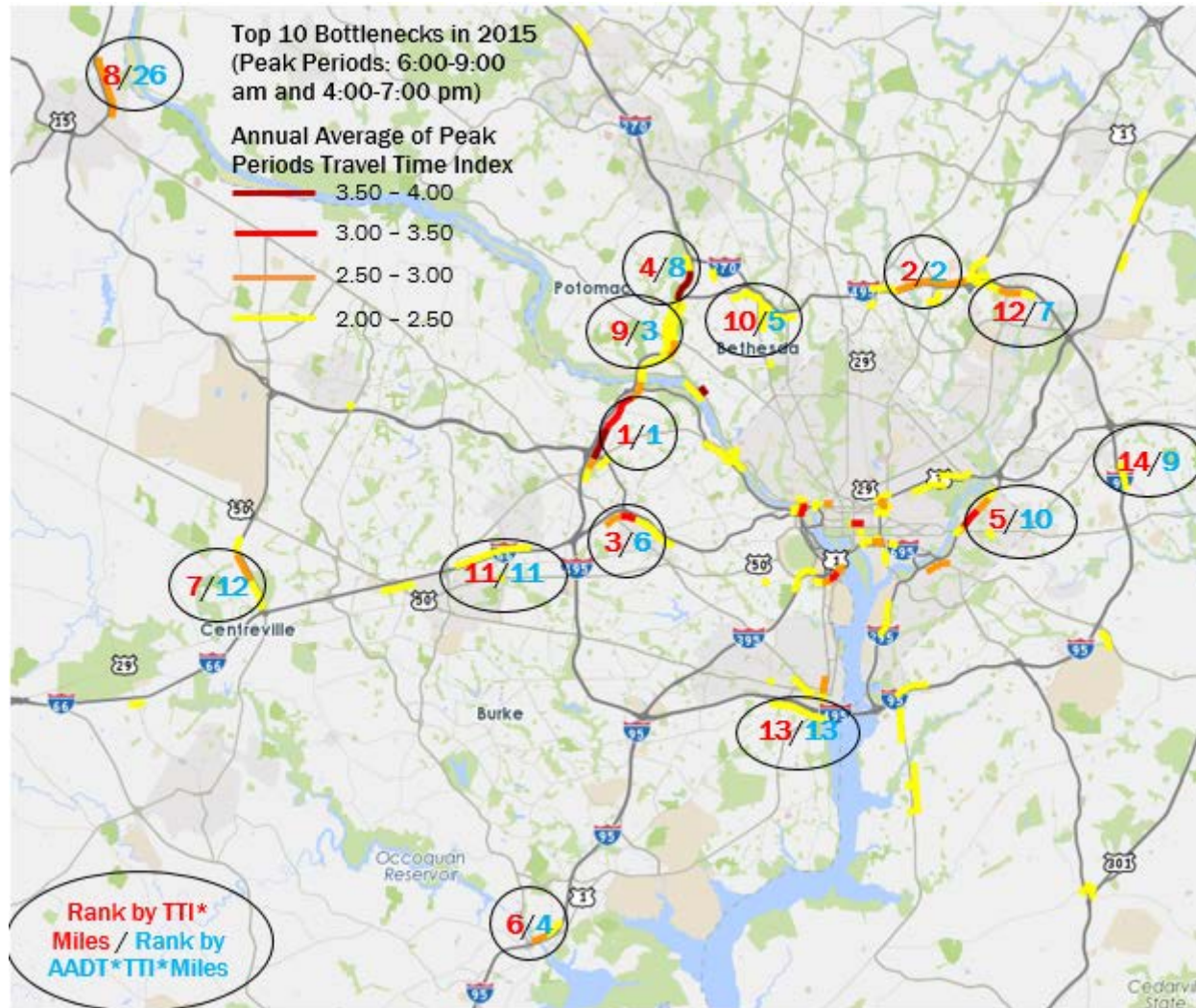
Top Ten Congested Segments on the Freeway System (2014)

Rank	Route	From	To	Density	Speed Range
1	NB I-395 (8:30-9:30 AM)	VA 27 (Washington Blvd)	VA 110 (Jefferson Davis Hwy)	150	5 MPH
2	EB I-66 (6:00-7:00 PM)	VA 7 (Leesburgh Pike)	VA 267	140	5 MPH
3A	Inner Loop I-495 (4:30-5:30 PM)	VA 123 (Chain Bridge Rd)	VA 267	120	5-10 MPH
3B	NB I-395 (8:30-9:30 AM)	VA 110 (Jefferson Davis Hwy)	George Washington Memorial Pkwy	120	5-10 MPH
3C	SB I-395 (5:00-6:00 PM)	4th St	12th St	120	5-10 MPH
3D	Inner Loop I-495 (4:30-5:30 PM)	VA 267	VA 193 (Georgetown Pike)	120	5-10 MPH
7A	Inner Loop I-495 (5:30-6:30 PM)	VA 193 (Georgetown Pike)	George Washington Memorial Pkwy	110	10-15 MPH
7B	EB I-66 (6:00-7:00 PM)	VA 267	Westmoreland St	110	10-15 MPH
7C	EB I-66 (6:00-7:00 AM)	VA 234 Bypass	VA 234 (Sudley Rd)	110	10-15 MPH
10	Outer Loop I-495 (7:00-8:00 AM)	MD 650 (New Hampshire Ave)	MD 193 (University Ave)	105	10-15 MPH

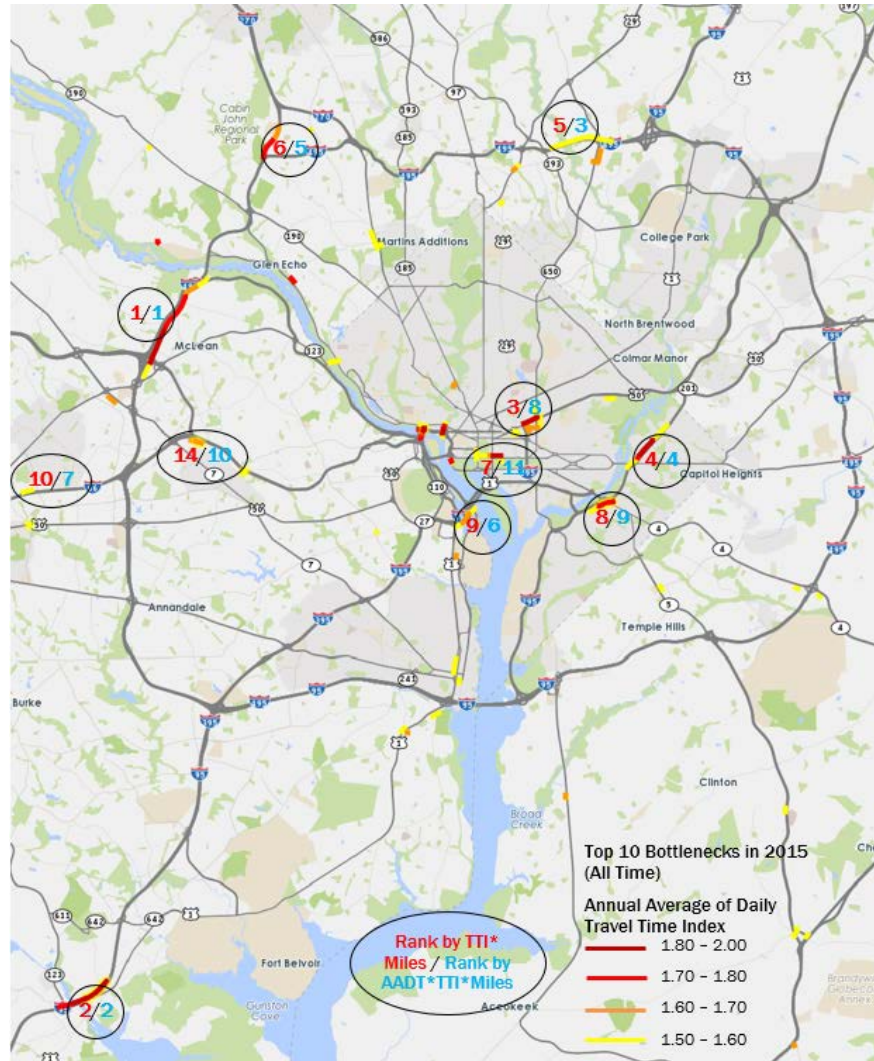
Note: Due to construction at the terminus of the Southeast Freeway, eastbound densities along this corridor were not included in the Top Ten list above.



Top Bottlenecks – Peak Periods



Top Bottlenecks – All Time



Congestion Map – Use Trend Map

1. Select one or more roads.

Road	Region	List of TMC codes	Saved TMC Set
Filters... Showing 132 out of 407 available TMC sets			
TMC Set	TMCs	Owner	
Thanksgiving	1212	wpu@mwkog.org	
Congestion Maps for Dashboard	2067	wpu@mwkog.org	
TPBMemMD	4412	wpu@mwkog.org	
Bottleneck Ranking 081415	992	wpu@mwkog.org	
Congestion Map 092915	2512	wpu@mwkog.org	
Congestion Map 100515	2479	wpu@mwkog.org	
TPBMem_Fwy_Core	775	wpu@mwkog.org	
Bottleneck 20160201	1051	wpu@mwkog.org	
TPBMemIS20160316	785	wpu@mwkog.org	

2. Create one or more time periods to analyze.

Day(s) | Month(s) | Year

April 2016 through June 2016 (3 months)

Create a single time period for this range
 Create a time period for each month within this range

Days of week

Sun Mon Tue Wed Thu Fri Sat

3. Data source

Your results for each data source will be opened in new tabs.

- HERE
- INRIX
- NPMRDS (Passenger vehicles)
- NPMRDS (Trucks and passenger vehicles)
- NPMRDS (Trucks)
- TomTom

4. Granularity

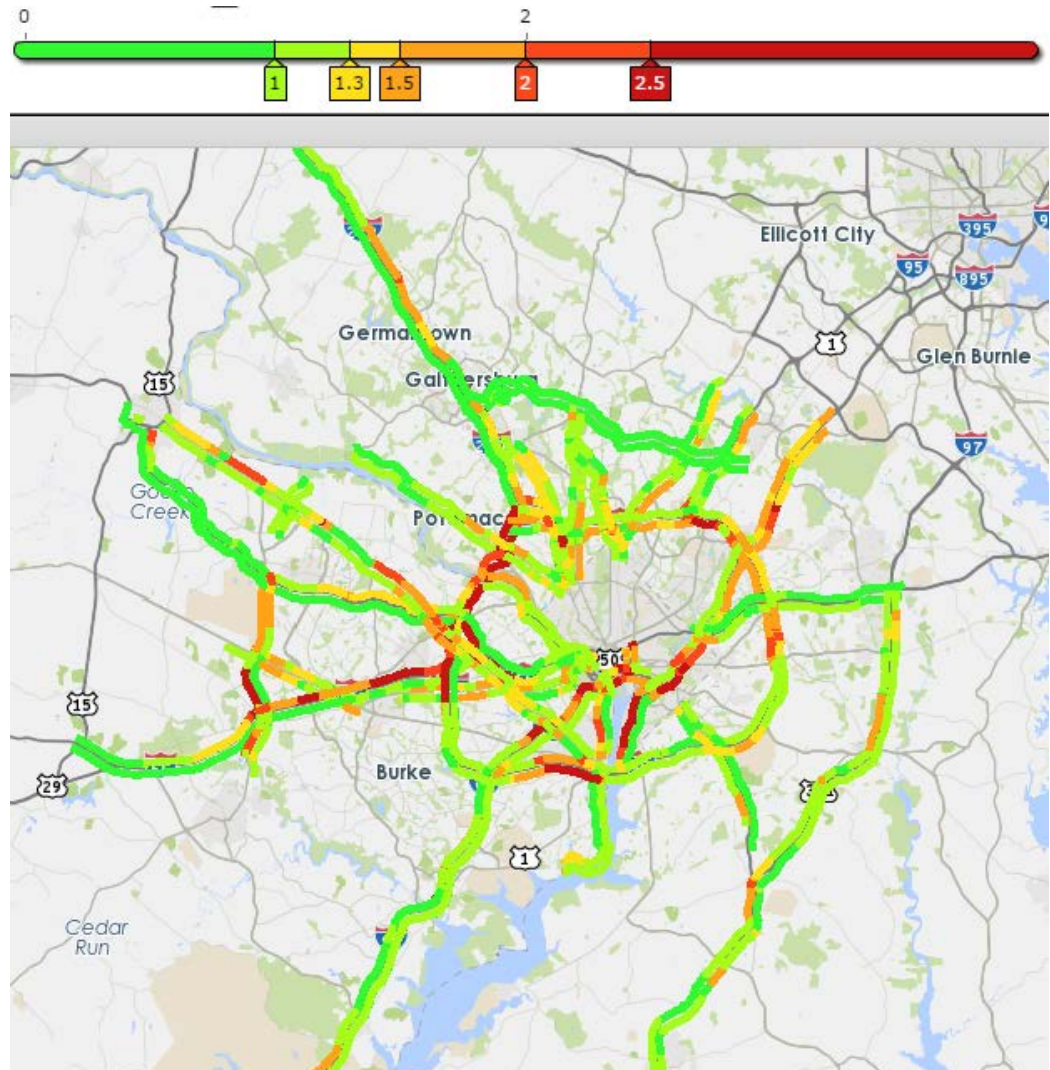
- 1 minute
- 5 minutes
- 10 minutes
- 15 minutes
- 1 hour

Submit



Congestion Map

- Select Travel Time Index as the performance measure
- Change scale bar
- Select hour: 8:00-9:00 am for AM peak hour; 5:00-6:00 pm for PM peak hour

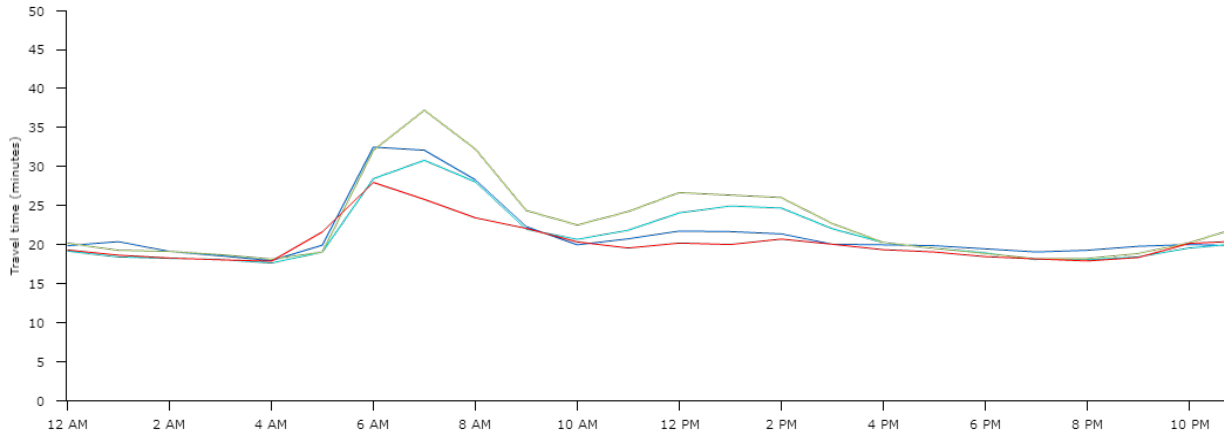


Route Travel Times – Performance Charts

Travel time for I-95 between VA-234/Exit 152 and Franconia Rd/Exit 169

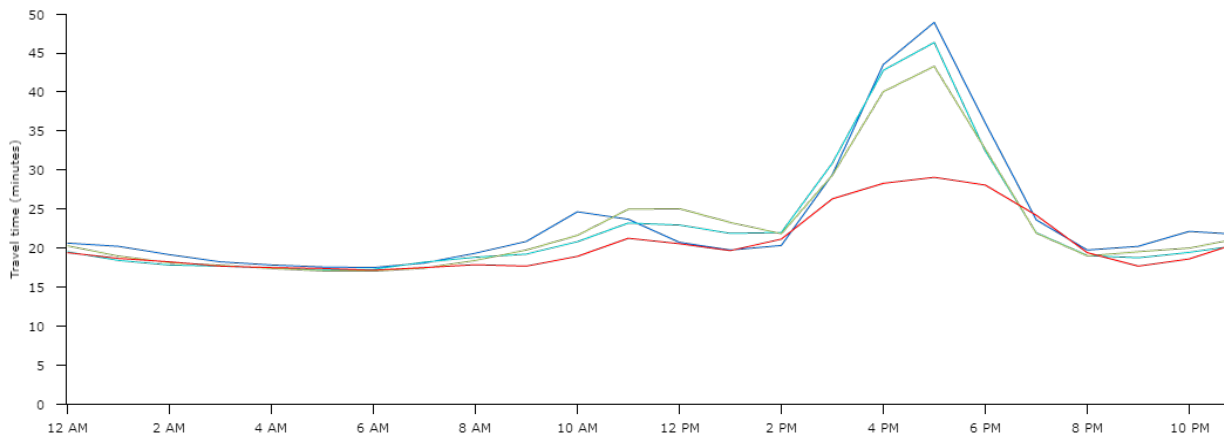
Averaged by 1 hour in 2010 (every Tue, Wed and Thu), 2013 (every Tue, Wed and Thu), 2014 (every Tue, Wed and Thu), and 2015 (every Tue, Wed and Thu)

Northbound



- To VPP Suite: font size too small

Southbound



Travel time: Time it will take to drive along the stretch of road (Distance Traveled / Speed).

2010 (every Tue, Wed and Thu) - INRIX 2013 (every Tue, Wed and Thu) - INRIX 2014 (every Tue, Wed and Thu) - INRIX 2015 (every Tue, Wed and Thu) - INRIX



Customized Maps

1. Select one or more roads.

Road	Region	List of TMC codes	Saved TMC Set
Filters... Showing 132 out of 407 available TMC sets			
TMC Set	TMCs	Owner	
SepAug5pm 50-100	117	wpu@mwcog.org	
SepAug5pm 30-50	373	wpu@mwcog.org	
SepAug6pm >100	12	wpu@mwcog.org	
SepAug6pm 50-100	192	wpu@mwcog.org	
SepAug6pm 30-50	450	wpu@mwcog.org	
2015TTIPeak > 3.5 - 4.0	4	wpu@mwcog.org	
2015TTIPeak 3.0-3.5	13	wpu@mwcog.org	
2015TTIPeak 2.5-3.0	27	wpu@mwcog.org	
2015TTIPeak 2.0-2.5	129	wpu@mwcog.org	

Add selected TMC sets

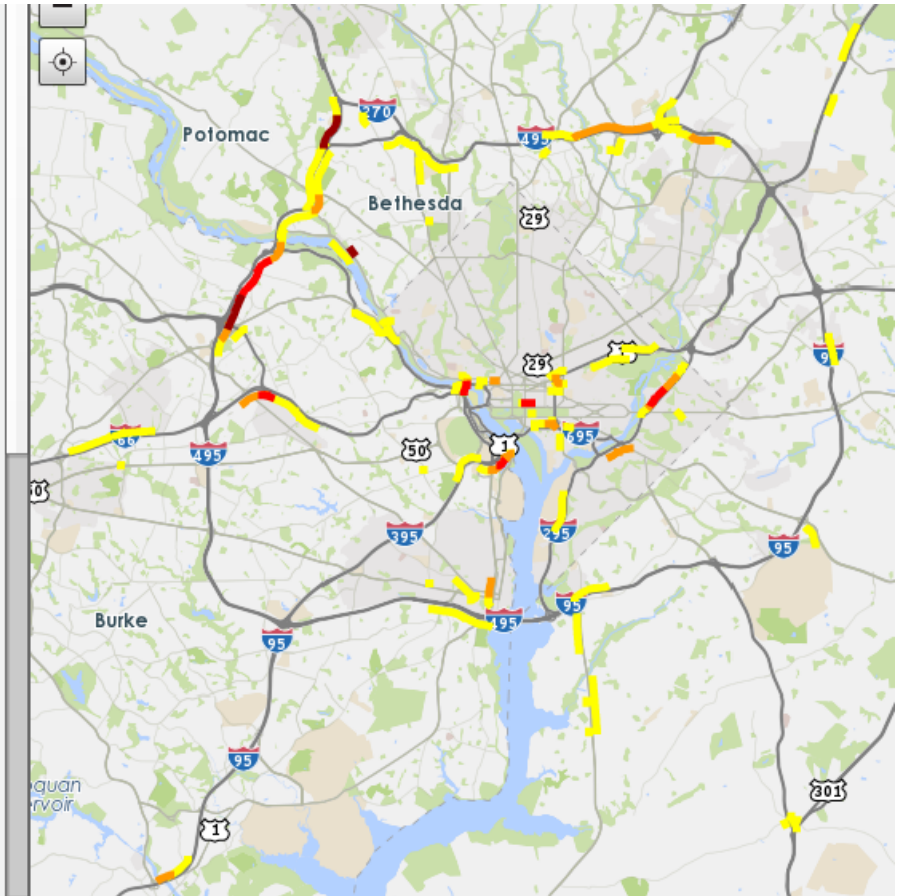
Your selected roads Remove all

- 129 tmcs
- 27 tmcs
- 13 tmcs
- 4 tmcs

Save as TMC set

2. Create one or more time periods to analyze.

Day(s) | Month(s) | Year



Summary

- VPP Suite has a number of tools that we can utilize, especially visualization of bottlenecks, maps and performance measures
- Customized computation needed sometimes for the time being
- When averaging speeds, Harmonic Mean should be used
- When averaging Travel Time Index, impose $TTI \geq 1$ first
- Use the same calculation procedure for a performance measure over time
- Speed data and TMC table go hand in hand
- Always double check your calculations, i.e. use the number of observations, total miles of TMCs, etc.
- Don't be afraid of SAS, a small number (<10) of procedures can go a long way (libname; data; proc sql; proc sort; proc summary; proc export)



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Transportation Planning Board