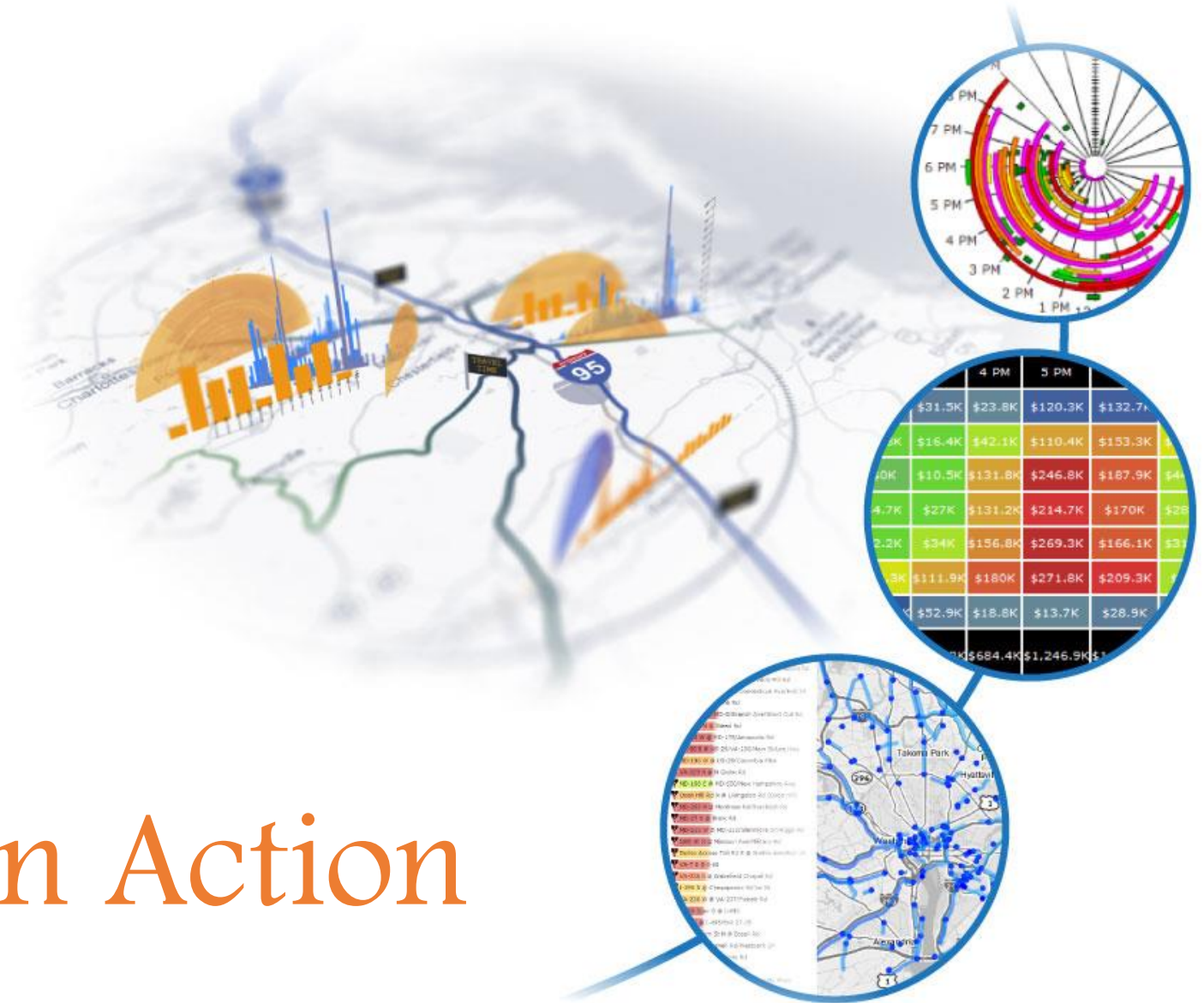


Real-World Problems, Real-World Answers: Probe Data Analytics in Action



Michael L. Pack & Drew Lund
University of Maryland CATT Laboratory



Presentation



Researchers



Media/3rd Parties



Operations



Travelers

Integration



Data



Traffic



Events



Parking



Weather



Signals



CAD

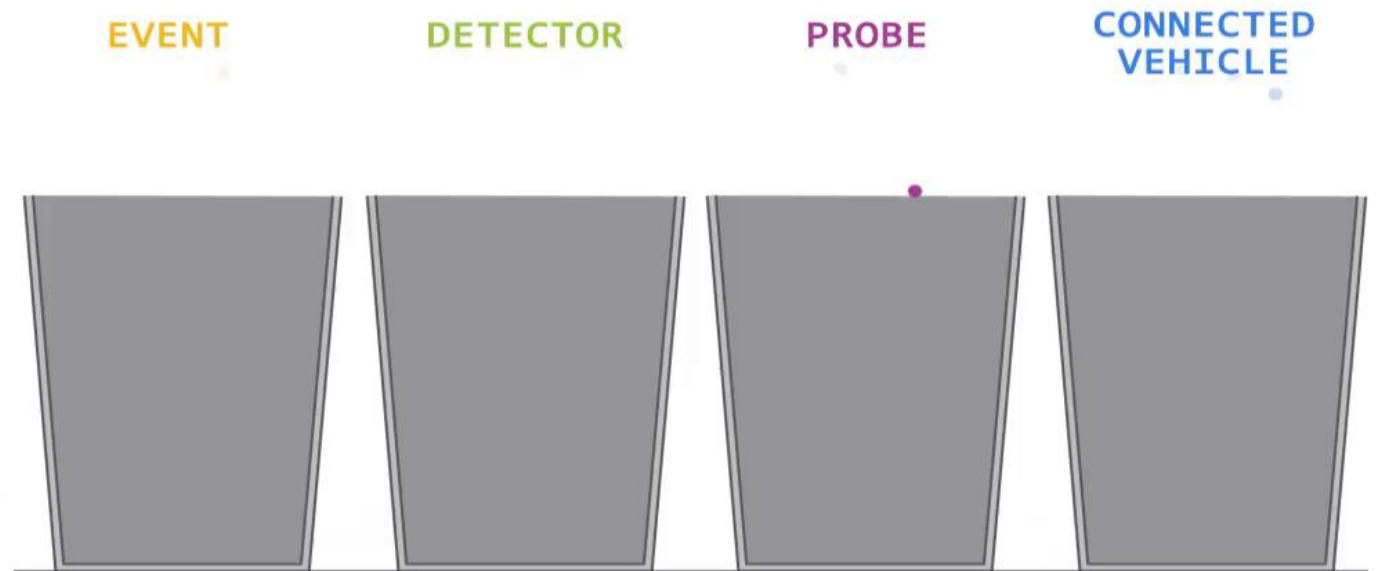


Transit

How much data are we getting today?

- RITIS Today

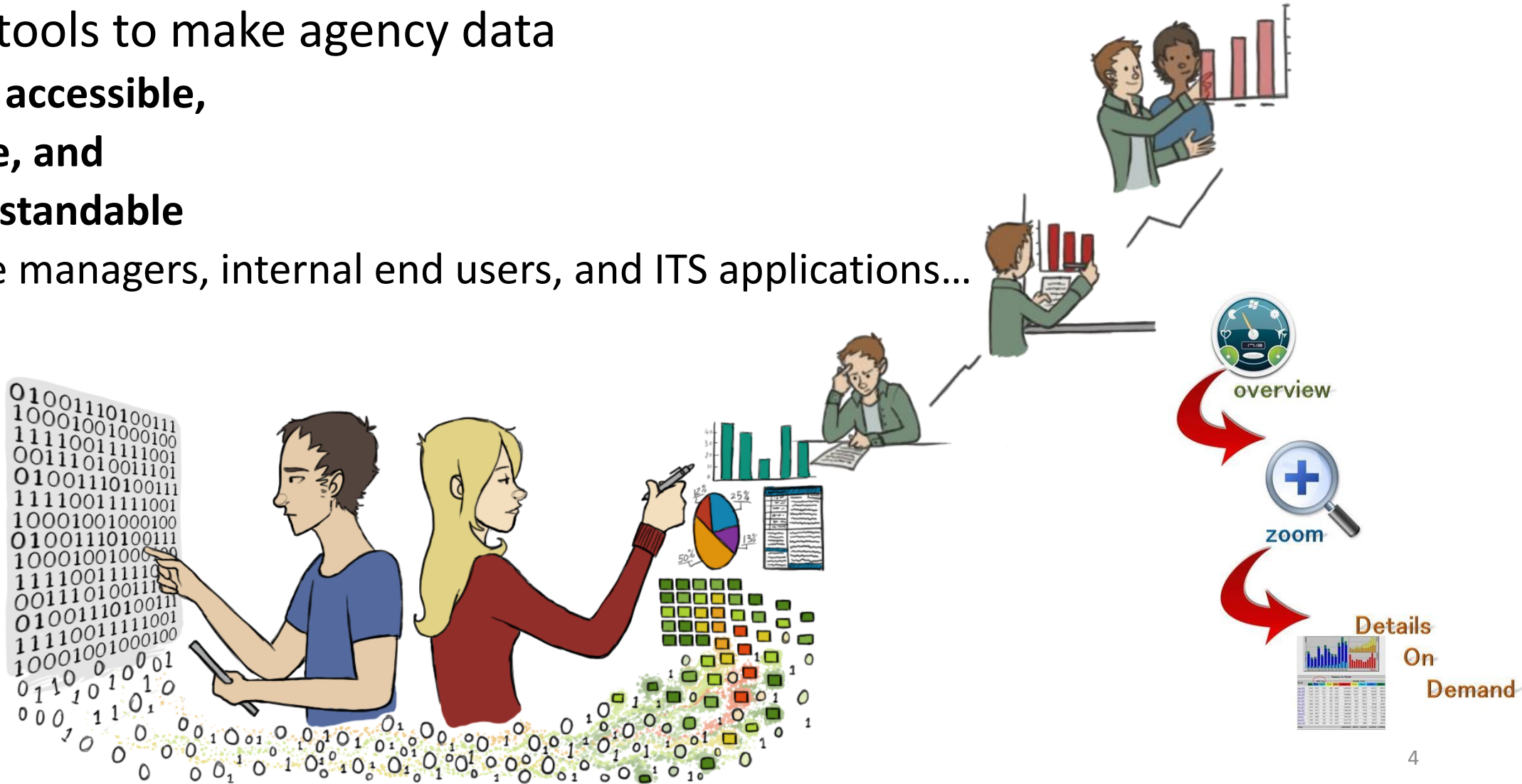
- Traffic events: 10,000 records per day: 0.001 Gb/day
- Traffic detectors: 35,000,000 records per day: 5 Gb/day
- Probe vehicle data: 4,200,000,000 records per day: 550 Gb/day
- CCTV, weather, radio, etc: NO,STA,TSK,EPT records per day: ??? Tb/day



Our Goal: Give you Tools & Power!!!

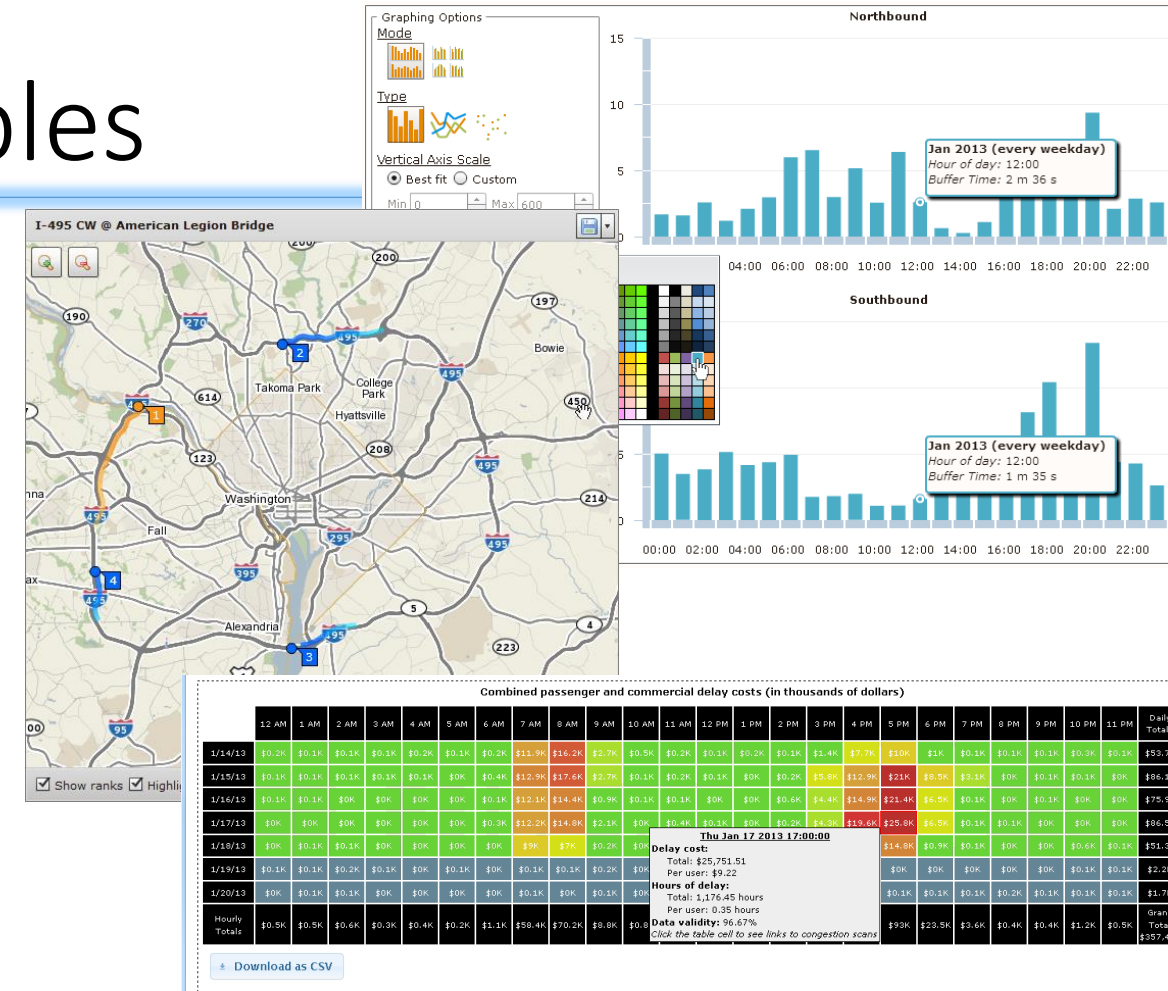
- Provide tools to make agency data
 - easily accessible,
 - usable, and
 - understandable

To these managers, internal end users, and ITS applications...



Congestion Reporting Examples

- System Performance Reporting
- Problem Identification
- Project Prioritization
- After Action Incident Review
- Before & After Studies
- Operations
- Travel Time Analysis
- Work Zone Monitoring



What's New
06/06/14**Vehicle Probe Project Suite Dashboard**

Explore the relationships between bottlenecks and traffic events in real-time and in the past.

**Massive Raw Data Downloader**

Download raw probe data from our archive for offline analysis.

**Congestion Scan**

Analyze the rise and fall of congested conditions on a stretch of road.

**Trend Map**

Create animated maps of roadway conditions.

**Performance Charts**

Chart performance metrics over time.

**Performance Summaries**

Report on Buffer Time Index, Planning Time Index, and other performance metrics.

**Bottleneck Ranking**

Rank bottlenecks and discover which ones have the greatest impact.

**User Delay Cost Analysis**

Put a dollar amount on how much a road's performance impacts its users.

**[My reports](#)****FAQs**

Frequently asked questions and their answers.

**Tutorials**

Learn how to use each of the tools in the suite.

Sponsored by



Good performance measures are like a really good movie

- They (1) tell a compelling story from beginning to end (2) about a compelling issue, and they (3) make important discoveries/observations along the way.
- There is no single number that can do this!
- You need several key measures that, when combined, point out the state of your system in a meaningful, and easily understood way.



Performance Measures =
Story Telling

Who is your audience?

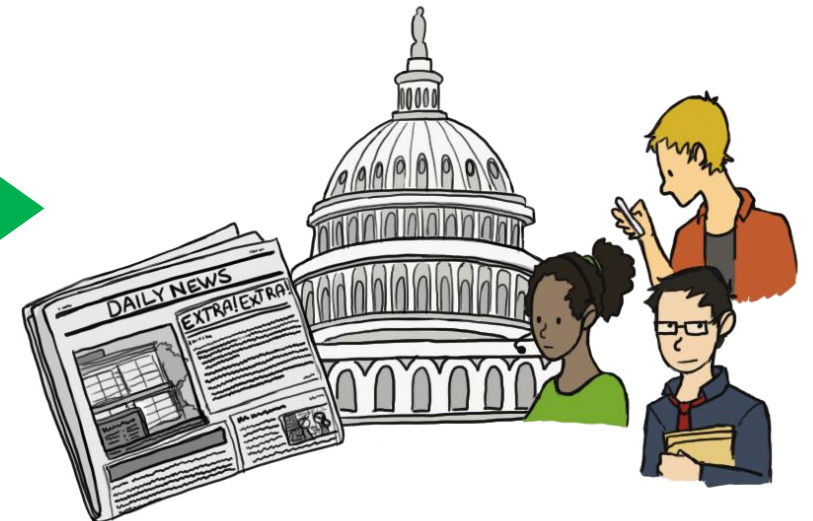


- Engineers
- Planners
- Operators



Vs.

- Legislators
- Media
- Decision Makers
- Public



The following slides have real-world examples the types of questions our users are asked, along with examples of how the VPP Suite is helping to answer them.

A bad day...

- A high level manager in your department just arrived at work and complained about an accident that occurred along his commute this morning around 7:00 AM. The media and some public officials are calling the office, too, to try to get more information about what happened.
- This manager wants you to find out the details about this incident, but specifically, to figure out how long the bottleneck grew, and how long the delays lasted. Any additional info you can glean would make his day (which isn't off to a good start.)

Historic Analysis

Vehicle Probe Project Suite Dashboard

Welcome, packml@umd.edu | [FAQs](#) | [Screenshots](#) | [Logout](#)

[Data exports](#) [Settings](#) [Help](#)

Vehicle Probe Project Suite Dashboard

Collision

Location	I-495 WEST AT EXIT 35 I 270
Started	May 15, 2012 6:44 AM
Ended	May 15, 2012 7:11 AM
Duration	26 m 40 s

[Timeline](#)

Updated May 15, 2012 7:11 AM

I-495 CCW @ MD-355/Wisconsin Ave/Exit 34

Road	I-495 Counterclockwise
Starting point	MD-355/Wisconsin Ave/Exit 34
Began	May 15, 2012 6:21 AM
Ended	May 15, 2012 11:42 AM
Duration	5 h 21 m
Queue length	10.50 miles
Average queue length	5.09 miles

Travel Time Index Over Time

What time would you like to see data for?

Right now, and keep the data up to date in real-time

A previous point in time

05/15/2012 07:07

Done

Filters Time selection

You're looking at data from May 15, 2012 @ 7:07 AM. Bottlenecks are shown at their maximum length. There are 1060 bottlenecks and 11980 events.

© 2013 Michael L. Pack, UMD CATT Laboratory

Winter Weather Worries

- Snowmageddon 2014. There's been a request from the Governor's office to produce some examples that depict how bad traffic was during the January 21st, 2014 snow storm compared to normal weekday traffic. What can you show in just a few minutes?



Trend Map

[Open Report As...](#)

1 hour

12:00 AM 6:00 AM 12:00 PM 6:00 PM 11:00 PM

4:00 PM 1x

New request

Color Thresholds

0 50

10 mph 20 mph 30 mph 44 mph 55 mph

Time Periods

Compare against...

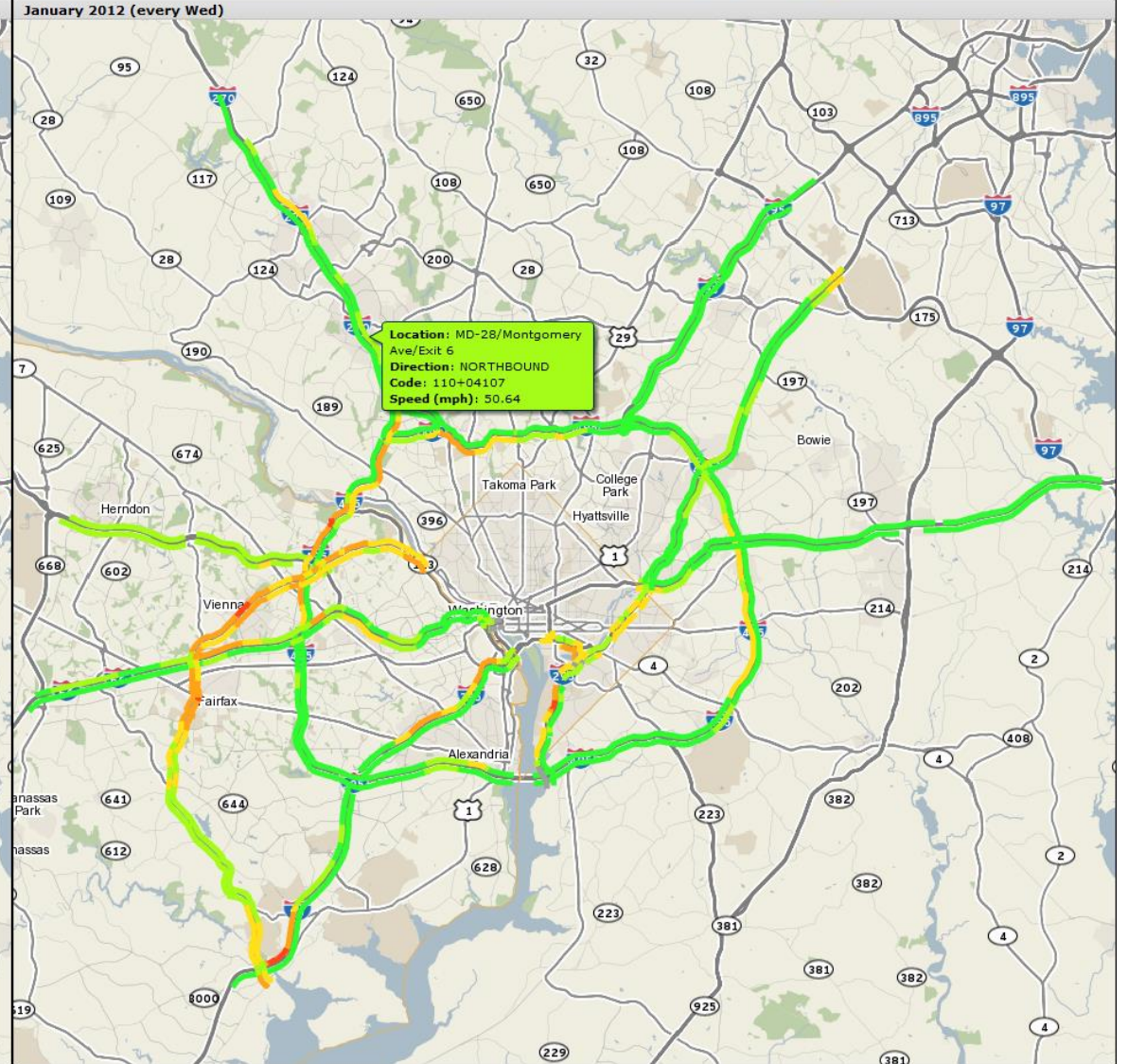
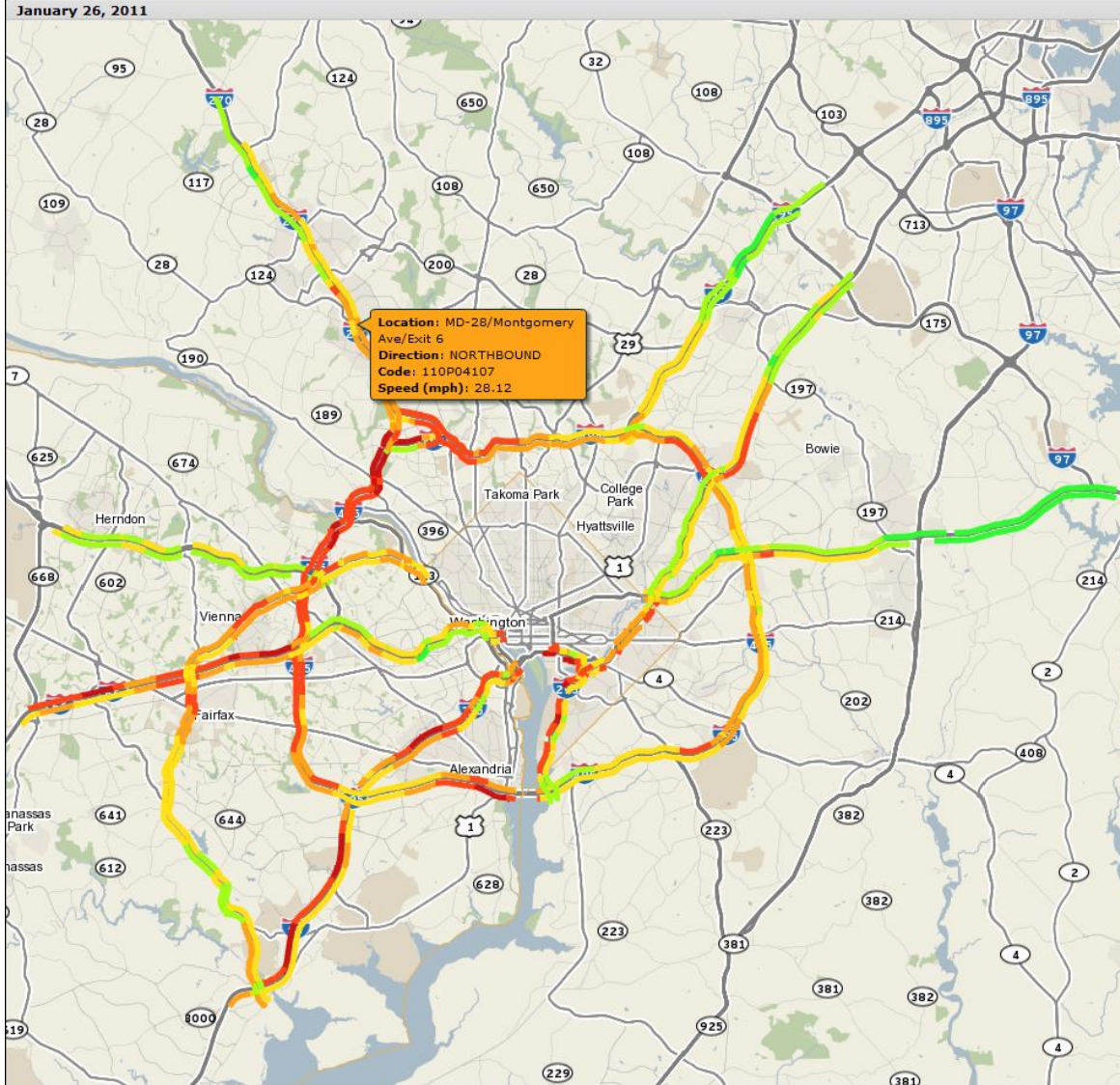
Performance Metric

Speed

Map Controls

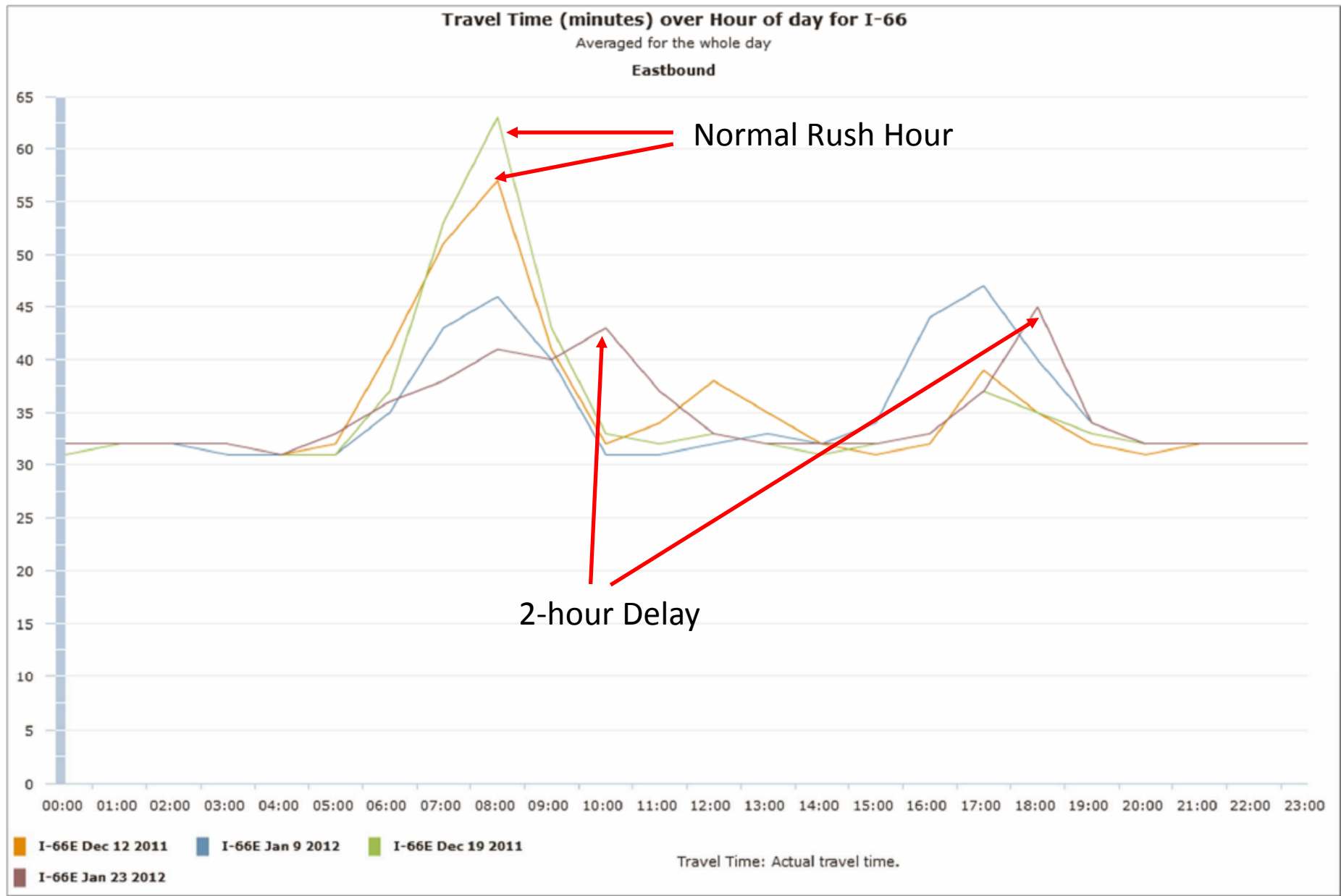
Map Layout

Tile Horizontal Vertical



2-hour delayed Opening

- It's winter. Yesterday there was concern about icy roads in the morning. As a precautionary measure, the federal government (and most of the schools in the area) decided to open 2-hours late. Traffic seemed better than usual in the AM, and there weren't many accidents. Traffic even seemed better in the PM. Several politicians (and the media) are calling to ask for some stats on how the commute compared to normal. What are you going to tell them?



Data Provided by the I-95 Corridor Coalition Vehicle Probe Project Suite / RITIS / MATOC

Statewide Reporting

- You've been asked to provide a monthly state-wide congestion report to the Secretary. This report only needs to cover the interstates, but it needs to highlight where the worst congestion occurred (top 10 locations) and some basic stats about the severity of the congestion at each of these locations. You also need to let the Secretary know if the congestion is about the same, better, or worse than the previous 2-weeks. What do you do?

Firefox | The Vehicle Probe Project Suite - Bott... | The Vehicle Probe Project Suite | Report Archive | User Delay Analysis Report

vpp.ritis.org/suite/#ranking/

Vehicle Probe Project Suite | Bottleneck Ranking | Welcome, packml@umd.edu | FAQs | Screencasts | Logout

Bottleneck Ranking

New search

Bottleneck locations on Maryland Interstates between March 1, 2013 and March 31, 2013 (702 total) Export to CSV

Location	Average duration	Average max length (miles)	Occurrences	Impact factor
I-95 N @ MD-100/Exit 43	2 h 6 m	10.74	39	52,769
I-495 CCW @ MD-185/Connecticut Ave/Exit 33	2 h 33 m	8.07	32	39,499
I-695 CCW @ MD-144/Frederick Rd/Exit 13	1 h 51 m	16.55	19	34,898
I-695 CW @ MD-147/Harford Rd/Exit 31	2 h 25 m	9.73	24	33,852
I-695 CW @ I-795/Exit 19	2 h 5 m	5.37	49	32,893
I-270 N @ I-70/US-40	1 h 29 m	8.71	40	31,009
I-270 N @ Middlebrook Rd/Exit 13	1 h 43 m	6.77	43	29,964

I-695 CW @ I-795/Exit 19

Occurrences Spiral Table Export to CSV

In this time spiral each trip around the circle represents a . The center represent March 1, 2013 and the outer edge represents April 1, 2013.

Maximum queue length < 1 ■ ■ ■ ■ ■ > 10 miles

View video demos of these tools at www.vpp.ritis.org/suite/screencast

I just spend \$200M, and all I got was this...

- You just spent \$200M on a 6-month major road widening project along that corridor you (and everybody else) hate. Some commuters are now complaining that things haven't improved---in fact, they claim things have gotten worse. You can see the headlines now: "\$200M fattens road, shrinks commuter patience!"
- What can you produce to show the true impact of this recent investment (positive or negative).

Answer #1: better or worse?



Answer #2: show me the money

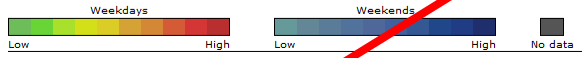
Combined passenger and commercial delay costs

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Total
6/18/12	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0	\$3.7K	\$3.3K	\$0.7K	\$0.3K	\$0.6K	\$0.4K	\$4.3K	\$1.3K	\$0.6K	\$7.8K	\$6.7K	\$3.8K	\$0	\$0	\$0	\$1.1K	\$0	\$35.3K
6/19/12	\$0	\$0	\$0	\$0.3K	\$0	\$0	\$0	\$1.1K	\$1.6K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0	\$0	\$0.9K	\$6.7K	\$0.7K	\$0	\$0.1K	\$0	\$0.2K	\$0	\$13.2K
6/20/12	\$0.3K	\$0.3K	\$0	\$0	\$0.2K	\$0	\$0	\$0.6K	\$1.2K	\$0.3K	\$0.3K	\$0	\$0	\$0.3K	\$0.4K	\$0	\$0.4K	\$3.8K	\$1.1K	\$0	\$0	\$0.2K	\$0.3K	\$0.6K	\$10.2K
6/21/12	\$1.1K	\$1.0K	\$0.1K	\$0	\$0.1K	\$0.1K	\$0	\$3.5K	\$26.2K	\$3.1K	\$0.9K	\$1	\$0.3K	\$0	\$0.5K	\$0.5K	\$0.5K	\$7.4K	\$4.8K	\$0.6K	\$0	\$0.8K	\$0.1K	\$0	\$53.3K
6/22/12	\$0.1K	\$0.6K	\$0.1K	\$0.3K	\$0.3K	\$0	\$0	\$0	\$0	\$0.3K	\$0.3K	\$0	\$0	\$0	\$0	\$0.5K	\$21.9K	\$69.3K	\$19.0K	\$0	\$0	\$0.2K	\$0.5K	\$0.1K	\$113.8K
Hourly Totals	\$1.7K	\$1.9K	\$0.4K	\$0.9K	\$0.7K	\$0.3K	\$0	\$8.8K	\$32.3K	\$4.4K	\$2.0K	\$2.9K	\$1.1K	\$5.1K	\$2.1K	\$1.5K	\$31.6K	\$94.0K	\$29.4K	\$0.6K	\$0.1K	\$1.2K	\$2.2K	\$0.7K	Total: \$225.8K

Notes

- All displayed costs are rounded to the closest hundredth value.
- Costs shown in the tooltips are the actual values.
- Delay metrics are displayed for every hour of every day within the selected time range.
- The totals for every hour are shown in the bottom row while the totals for every day are shown in the rightmost column.
- The grand total for the entire time period is shown at the bottom right corner. This grand total only applies to the table it is associated with.

Legend



This mobility report was created by the [CATT Lab](#) for private use within the Michigan Department of Transportation system. [Need help?](#)

	3 PM	4 PM	5 PM	6 PM
	\$0.6K	\$7.8K	\$6.7K	\$3.8K
	\$0	\$0.9K	\$6.7K	\$0.7K
	\$0	\$0.4K	\$3.8K	\$1.1K
	\$0.5K	\$0.5K	\$7.4K	\$4.8K
	\$0.5K	\$21.9K	\$69.3K	\$19.0K
	\$1.5K	\$31.6K	\$94.0K	\$29.4K

	10 PM	11 PM	Daily Totals
	\$1.1K	\$0	\$35.3K
	\$0.2K	\$0	\$13.2K
	\$0.3K	\$0.6K	\$10.2K
	\$0.1K	\$0	\$53.3K
	\$0.5K	\$0.1K	\$113.8K
	\$2.2K	\$0.7K	Total: \$225.8K



Monday, January 14, 2013 to Sunday, January 20, 2013

I-94 between mile marker 210 and mile marker 225

Report parameters

- Passenger: 94% of the traffic volume at \$17.09 per vehicle.
- Commercial: 6% of the traffic volume at \$30.14 per vehicle.
- Delay is calculated for segments whose speeds fall below 60 mph.

Display:

- Total cost
 Cost per user
 Total delay
 Delay per user
 Coverage

Grouping options:

- All vehicles
 Only passenger vehicles
 Only commercial vehicles

Combined passenger and commercial delay costs (in thousands of dollars)

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Totals
1/14/13	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.2K	\$11.9K	\$16.2K	\$2.7K	\$0.5K	\$0.2K	\$0.1K	\$0.2K	\$0.1K	\$1.4K	\$7.7K	\$10K	\$1K	\$0.1K	\$0.1K	\$0.1K	\$0.3K	\$0.1K	\$53.7K
1/15/13	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0.4K	\$12.9K	\$17.6K	\$2.7K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.2K	\$5.8K	\$12.9K	\$21K	\$8.5K	\$3.1K	\$0K	\$0.1K	\$0.1K	\$0K	\$86.1K
1/16/13	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$12.1K	\$14.4K	\$0.9K	\$0.1K	\$0.1K	\$0K	\$0K	\$0.6K	\$4.4K	\$14.9K	\$21.4K	\$6.5K	\$0.1K	\$0K	\$0.1K	\$0K	\$0K	\$75.9K
1/17/13	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.3K	\$12.2K	\$14.8K	\$2.1K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$86.5K
1/18/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$9K	\$7K	\$0.2K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$51.3K
1/19/13	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$0.2K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$2.2K
1/20/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0.1K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.1K	\$1.7K
Hourly Totals	\$0.5K	\$0.5K	\$0.6K	\$0.3K	\$0.4K	\$0.2K	\$1.1K	\$58.4K	\$70.2K	\$8.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	Grand Total \$357,444

Thu Jan 17 2013 17:00:00

Delay cost:
 Total: \$25,751.51
 Per user: \$9.22

Hours of delay:
 Total: 1,176.45 hours
 Per user: 0.35 hours

Data validity: 96.67%

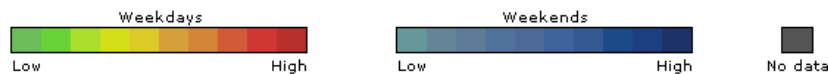
Click the table cell to see links to congestion scans

[Download as CSV](#)

Notes

- Only the values in the 'Total cost' display mode are rounded to the nearest hundredth and displayed in thousands. All other display modes show the actual values.
- The range of values for the colored backgrounds of each cell are based on the data of the selected display mode.
- Delay metrics are displayed for every hour of every day within the selected time range.
- The totals for every hour are shown in the bottom row while the totals for every day are shown in the rightmost column.
- The grand total for the entire time period is shown as the actual value and displayed at the bottom right corner.

Legend



Shorten my commute...

- Your DOT is starting an innovative campaign to encourage commuters to be flexible in their working hours to shift demand on a heavily congested corridor in your region. As part of your campaign, you've been asked to choose a small corridor and compare travel times during the AM commute each day to show how much of a shift in your commute start can impact your average travel time on that corridor.



Historic Probe Data Explorer

Travel Time for I-270 from I-270 to I-370/Sam Eig Hwy/Exit 9
 Averaged for every Tuesday, Wednesday and Thursday in January 2011.



- [Introduction](#)
- [Search Criteria](#)
- [Visualization Technique](#)
- [Final Visualization](#)

Graphing Options

Mode

Type

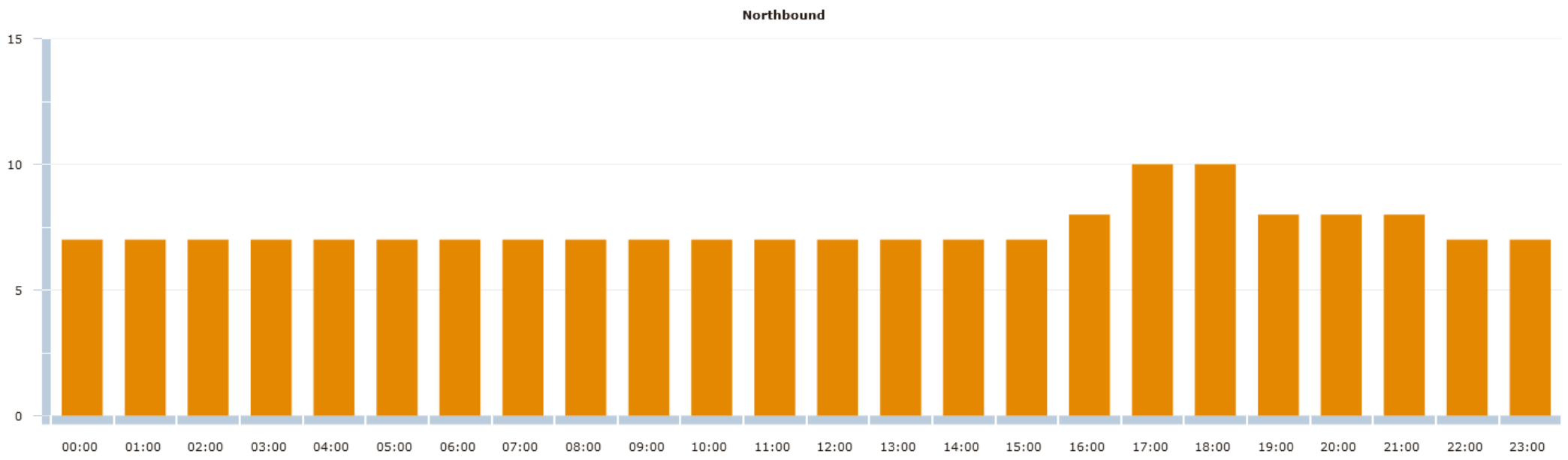
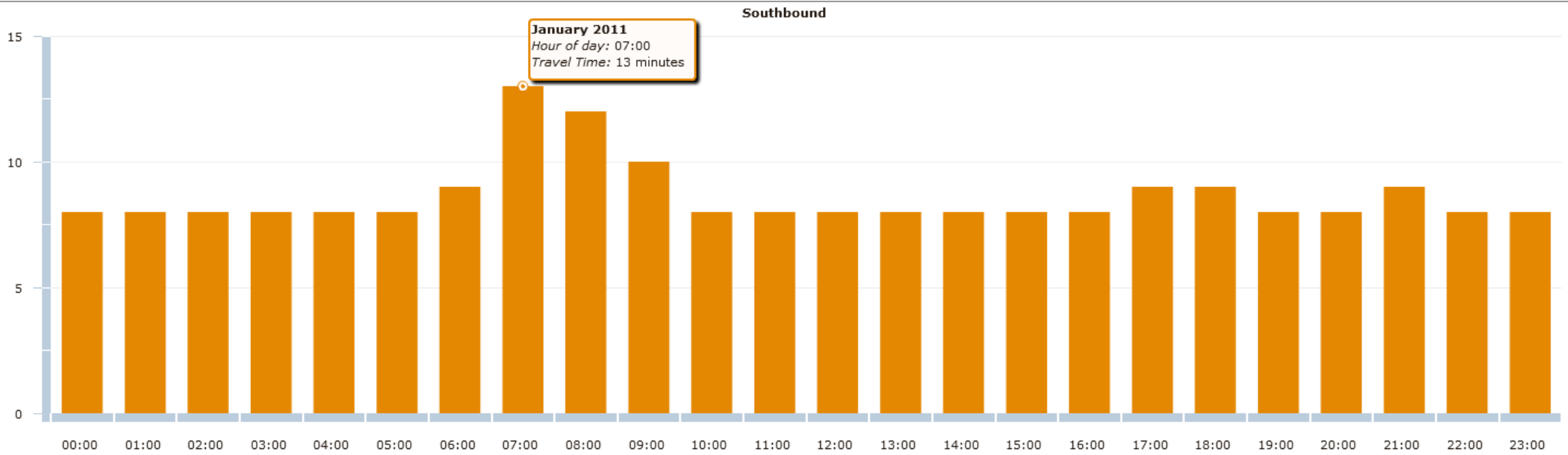
Vertical Axis Scale
 Best fit Custom
 Min Max

Data Options

Data Type
 Travel Time (minutes)

Toggle Graphs
 Southbound
 Northbound

Graph Data
 January 2011



The model modeler...

- Your agency is trying to model a small 5-mile corridor in your state. As part of the modeling process, you've been asked to provide some stats to the modelers. They need to know how speeds, planning time, travel times, etc. change during specific times of the day (like the morning rush hour and the evening rush hour.) They also want to know how these values change with the seasons (Summer vs. Winter).
- What info can you give them, and how might you get it?

Historic Probe Data Explorer

Performance Summaries for I-270 from I-270 to I-370/Sam Eig Hwy/Exit 9



Introduction > Search Criteria > Visualization Technique > **Final Visualization**

Selected Time Bins

06:00-08:00

0:00 6:00 12:00 18:00 24:00

6:00 8:00

[+ Add another time range](#)

January 2011 Northbound January 2011 Southbound

Average Speed (mph)
06:00-08:00

Monday	60
Tuesday	59
Wednesday	57
Thursday	59
Friday	59
Saturday	60
Sunday	58
Weekends	59
Weekdays	58
All Days	58

Buffer Index
06:00-08:00

Monday	0.07
Tuesday	0.11
Wednesday	0.12
Thursday	0.15
Friday	0.1
Saturday	0.09
Sunday	0.09
Weekends	0.09
Weekdays	0.11
All Days	0.1

Buffer Time (minutes)
06:00-08:00

Monday	1
Tuesday	1
Wednesday	1
Thursday	1
Friday	1
Saturday	1
Sunday	1
Weekends	1
Weekdays	1
All Days	1

Travel Time Index
06:00-08:00

Monday	1.04
Tuesday	1.05
Wednesday	1.09
Thursday	1.07
Friday	1.06
Saturday	1.04
Sunday	1.06
Weekends	1.05
Weekdays	1.06
All Days	1.06

Travel Time (minutes)
06:00-08:00

Monday	7
Tuesday	7
Wednesday	7
Thursday	7
Friday	7
Saturday	7
Sunday	7
Weekends	7
Weekdays	7
All Days	7

Planning Time Index
06:00-08:00

Monday	1.13
Tuesday	1.16
Wednesday	1.19
Thursday	1.22
Friday	1.14
Saturday	1.12
Sunday	1.15
Weekends	1.13
Weekdays	1.17
All Days	1.15

Planning Time (minutes)
06:00-08:00

Monday	8
Tuesday	8
Wednesday	8
Thursday	8
Friday	8
Saturday	8
Sunday	8
Weekends	8
Weekdays	8
All Days	8

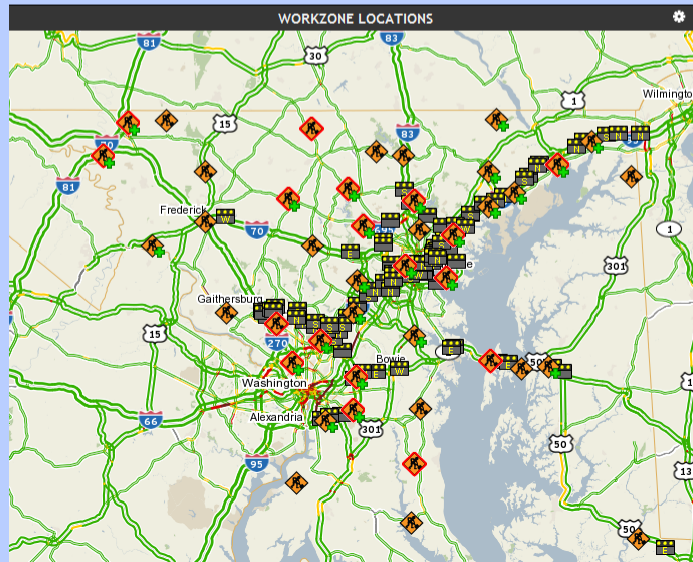
Work Zone Mgmt

Critical Work Zone Parameters

Workzone Dashboard

CURRENT WORKZONES IN MARYLAND			
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
▼ Maryland (79)	2043	1.73	\$417,258.00
▼ Allegany (3)	0	0	\$16,330.00
🚧 I-68 EAST AT PLEASANT VALLEY RD	0	0	\$6,711.00
🚧 US 220 SOUTH SOUTH OF MP 12.75	0	0	\$7,262.00
🚧 I-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$2,357.00
▼ Anne Arundel (2)	0	0	\$5,932.00
🚧 MD 198 EAST AT MD 295	0	0	\$1,019.00
🚧 MD 2 NORTH AT MD 255	0	0	\$4,913.00
▼ Baltimore (15)	197	0.29	\$86,363.00
🚧 MD 26 EAST AT DEER PARK RD	0	0	\$9,509.00
🚧 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	\$8,652.00
🚧 MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	\$3,466.00
🚧 I-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	\$4,828.00
🚧 I-895 SOUTH PRIOR TO EXIT 4 MD 295 BALTIMORE WASHINGTON PARKWAY (LONG-TERM & CONTINUOUS)	113	0	\$7,203.00
🚧 MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	0	0	\$124.00
🚧 I-83 NORTH AT EXIT 27 MD 137 MT CARMEL RD	0	0	\$727.00
🚧 US 1 NORTH BETWEEN FORGE RD AND PERRY HALL RD	0	0	\$6,771.00
🚧 I-70 EAST BETWEEN ROLLING RD AND COOKS LA	0	0	\$1,999.00
🚧 MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.29	\$8,729.00
🚧 I-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0	0	\$8,305.00
🚧 MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$9,603.00
🚧 MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$7,745.00
🚧 I-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0	\$6,251.00
🚧 MD 45 SOUTH FROM WINDWOOD RD TO DUNKIRK RD	0	0	\$2,451.00
▼ Baltimore City (5)	178	0.02	\$20,924.00
🚧 I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	17	0	\$5,839.00
🚧 I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	0	0.02	\$9,235.00
🚧 I-895 NORTH AT POTEET ST ON POTEET ST	0	0	\$1,506.00
🚧 I-695 INNER LOOP PAST EXIT 1 MD 173 HAWKINS POINT RD	0	0	\$1,842.00
🚧 I-895 SOUTH AT EXIT 7 MD 2 POTEET ST (LONG TERM-CONTINUOUS 1/02/14-06/31/14)	161	0	\$2,502.00
▼ Calvert (1)	0	0	\$2,603.00
🚧 MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$2,603.00
▼ Carroll (4)	1	0	\$14,346.00
🚧 MD 26 WEST AT MP 16.7	0	0	\$4,612.00
🚧 MD 97 SOUTH/NORTH AT OLD HANOVER RD	0	0	\$1,724.00
🚧 MD 140 EAST PAST DEDE RD	0	0	\$1,991.00
🚧 MD 26 EAST/WEST BETWEEN MD 27 AND BUFFALO RD	1	0	\$6,019.00
▼ Cecil (4)	20	0	\$26,871.00
🚧 US 40 WEST AT Thomas Hatem Memorial Bridge	0	0	\$8,342.00
🚧 I-95 SOUTH PRIOR TO EXIT 100 MD 272 NORTHEAST RD (MM 99.54 -96.73)	19	0	\$5,095.00

TOP CRITICAL WORKZONES		
SEVERITY/EVENT	TOP CRITICAL RANGE	
▼ Major (80)	0 5 10 15 20	
🚧 MD 216 EAST/WEST BETWEEN I-95 AND US 29		0 \$3,450.00
🚧 MD 26 WEST AT MP 16.7		0 \$3,907.00
🚧 MD 26 EAST AT DEER PARK RD		0 \$9,925.00
🚧 MD 528 NORTH FROM 56TH ST TO 72ND ST		0 \$6,555.00
🚧 I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)		0 \$9,027.00
🚧 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]		1.28 \$8,780.00
🚧 I-95 OUTER LOOP AT ARDWICK ARDMORE RD		0 \$9,742.00
🚧 MD 191 EAST AT LELAND ST		0 \$3,318.00
🚧 I-81 SOUTH FROM MP 0.84 TO MP 3.13		0 \$9,515.00
🚧 US 40 EAST/WEST FROM WASHINGTON ST TO I-81		0 \$3,772.00
🚧 MD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180		0 \$6,082.00
🚧 I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)		0.02 \$6,082.00
🚧 MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA		0 \$2,558.00
🚧 MD 193 SOUTH/NORTH AT CAPITAL BELTWAY		0 \$4,539.00
🚧 US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD		0 \$3,138.00
🚧 MD 136 SOUTH/NORTH AT KERR RD		0 \$9,216.00
🚧 I-895 NORTH AT POTEET ST ON POTEET ST		0 \$3,103.00
🚧 MD 64 EAST FROM FRANKS RUN RD TO MD 418		0 \$1,843.00
🚧 MD 68 EAST/WEST AT MD 63		0 \$5,726.00
🚧 MD 97 SOUTH/NORTH AT I-70		0 \$4,761.00



USER DELAY COST BY CORRIDOR AND DAY OF WEEK					
	Total User Delay Cost				Daily Totals
	I-95	I-695	US-50	I-70	
Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
Fri 4/11/2014	\$1,806,342.05	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
Sat 4/12/2014	\$3,367,462.75	\$179,057.99	\$107,675.02	\$6,721.70	\$3,660,917.46
Sun 4/13/2014	\$2,548,281.10	\$37,468.98	\$83,927.57	\$8,015.17	\$2,677,692.82
Mon 4/14/2014	\$2,661,674.91	\$323,977.01	\$198,868.28	\$184,730.13	\$3,369,250.33
Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,311.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03



Individual Work Zone

Planned Closure @ I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD

Started: Thu, Apr 24, 2014 at 09:24:56 AM

SETTINGS

Data Type...
 Measured Speeds
 Comparison to Historical Average

Show...
 Work Zone Bounds
 Posted Speeds
 Associated DMS
 Nearby Cameras
 Nearby Incidents
 Lane Status
 Bottlenecks (when available)
 5 miles upstream
 5 miles downstream

Permit Information
 Project Information
 Site Details
 Configure Alerts

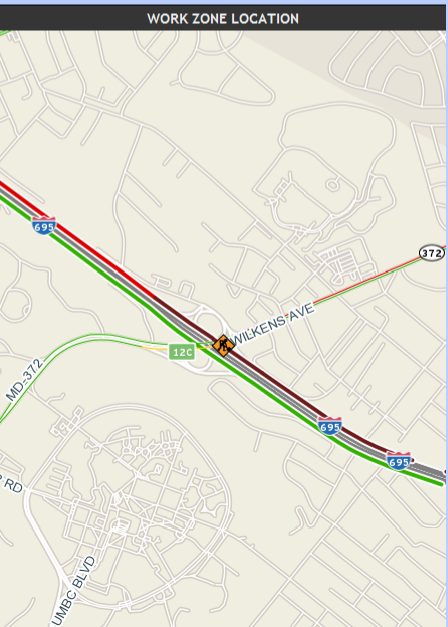
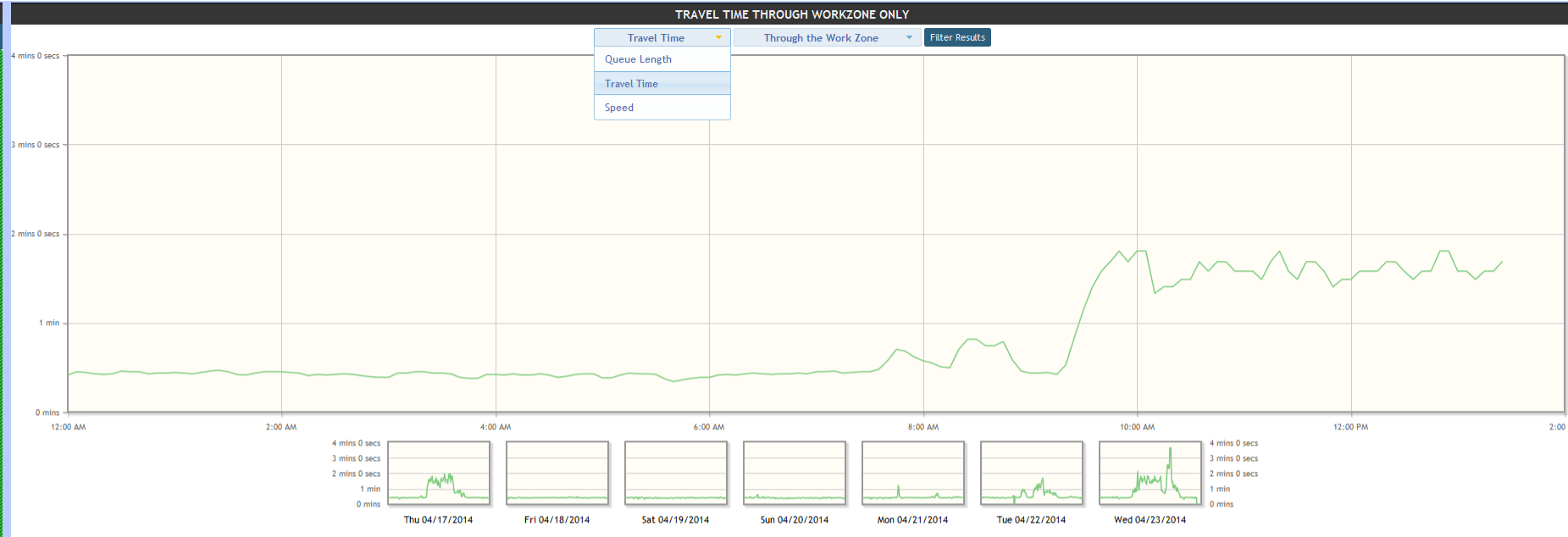
CURRENT CONDITIONS

↓ INNER LOOP ↓ ↑ OUTER LOOP ↑

SPEED LIMIT 55

+6 MPH (10%)	+5 MPH (8%)
+7 MPH (12%)	+3 MPH (5%)
+8 MPH (14%)	0 MPH (0%)
-1 MPH (-2%)	-2 MPH (-3%)
0 MPH (0%)	-1 MPH (-2%)
0 MPH (0%)	+4 MPH (7%)
-1 MPH (-2%)	-5 MPH (-8%)
-1 MPH (-2%)	-9 MPH (-16%)
-2 MPH (-3%)	-9 MPH (-16%)
0 MPH (0%)	-38 MPH (-67%)
+2 MPH (3%)	-42 MPH (-72%)
+1 MPH (2%)	-46 MPH (-77%)
+1 MPH (2%)	-40 MPH (-67%)
+3 MPH (5%)	-2 MPH (-3%)
+2 MPH (3%)	-3 MPH (-5%)
+3 MPH (5%)	-1 MPH (-2%)
+1 MPH (2%)	0 MPH (0%)
+3 MPH (5%)	0 MPH (0%)
+2 MPH (3%)	0 MPH (0%)
+3 MPH (5%)	0 MPH (0%)
-7 MPH (-13%)	-3 MPH (-5%)
+4 MPH (7%)	-1 MPH (-2%)
+4 MPH (7%)	-2 MPH (-3%)
+4 MPH (7%)	-1 MPH (-2%)

SPEED LIMIT 55



USER DELAY COST

Total User Delay Cost

	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/17/2014	\$11.52	\$183.00	\$9,306.97	\$16,405.23	\$2,958.90	\$67.58	\$28,933.20
Fri 4/18/2014	\$6.17	\$29.46	\$82.00	\$221.35	\$127.06	\$50.00	\$516.04
Sat 4/19/2014	\$27.17	\$7.65	\$3.12	\$22.42	\$17.28	\$46.01	\$123.66
Sun 4/20/2014	\$39.81	\$24.66	\$0.00	\$6.13	\$26.78	\$18.42	\$115.80
Mon 4/21/2014	\$2.46	\$48.75	\$788.33	\$103.20	\$899.54	\$131.35	\$1,973.63
Tue 4/22/2014	\$25.38	\$264.46	\$1,819.65	\$8,771.39	\$2,675.70	\$189.00	\$13,745.58
Wed 4/23/2014	\$20.52	\$477.24	\$12,525.82	\$13,993.07	\$16,213.27	\$80.23	\$43,310.14
Hourly Totals	\$133.04	\$1,035.22	\$24,525.89	\$39,522.78	\$22,918.53	\$582.59	Grand Total: \$88,718.06

Legend: Weekend (Dark Blue), Lowest (Green), Highest (Red), No Data (Grey)

Cameras and Graph Options

Planned Closure @ US 29 SOUTH AT INDUSTRIAL PKWY

Started: Thu, Apr 17, 2014 at 09:16:31 AM

SETTINGS

Data Type...

- Measured Speeds
- Comparison to Historical Average

Show...

- Work Zone Bounds
- Posted Speeds
- Associated DMS
- Nearby Cameras
- Nearby Incidents
- Lane Status
- Bottlenecks (when available)

5 miles upstream

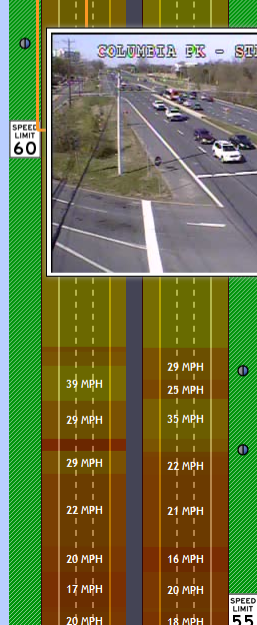
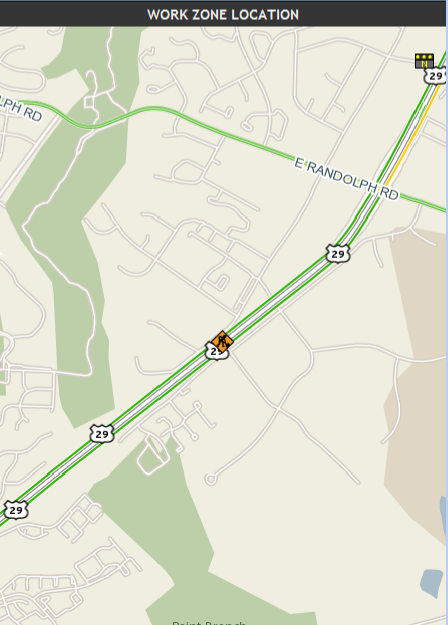
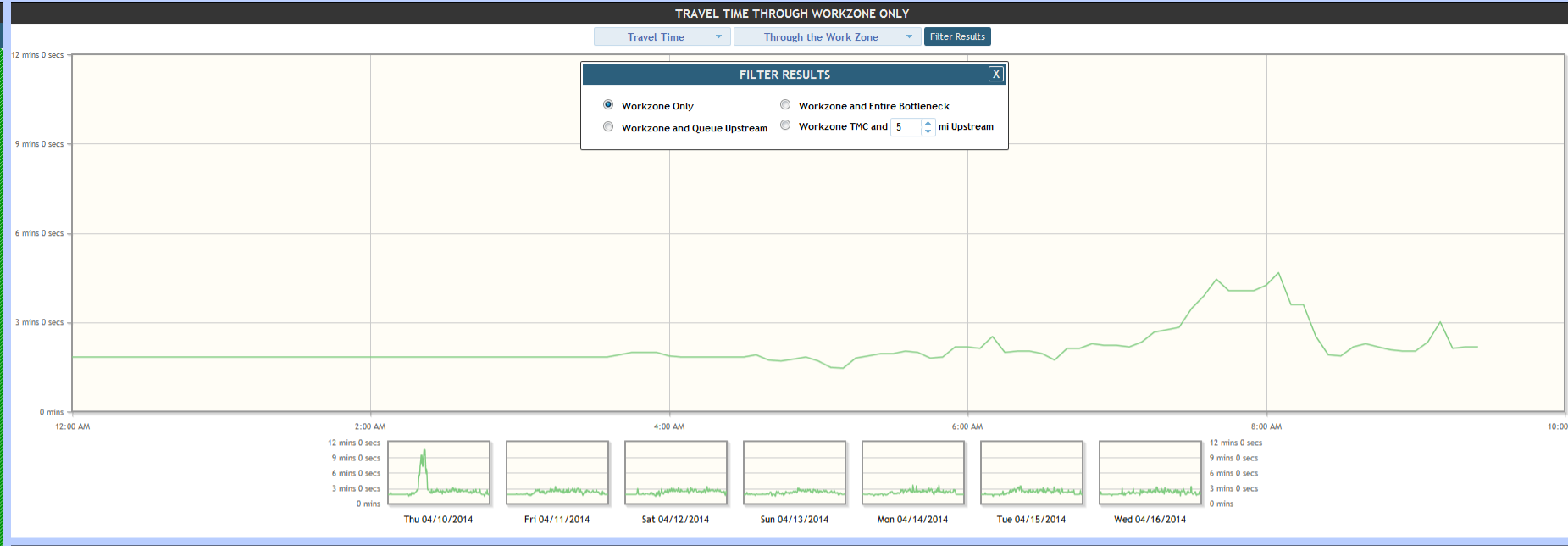
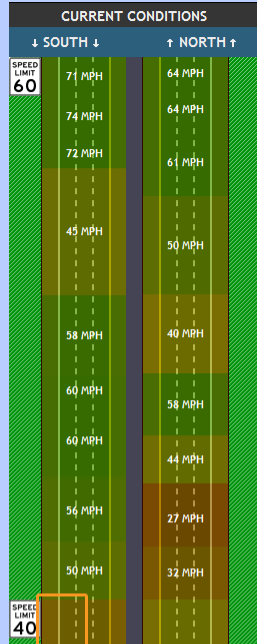
5 miles downstream

Permit Information

Project Information

Site Details

Configure Alerts



USER DELAY COST

Total User Delay Cost

	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/10/2014	\$5.78	\$6,873.19	\$12,665.11	\$3,206.89	\$2,729.29	\$727.68	\$26,207.94
Fri 4/11/2014	\$1.43	\$1,659.88	\$2,890.60	\$3,409.59	\$2,672.82	\$725.83	\$11,360.16
Sat 4/12/2014	\$28.72	\$157.52	\$2,128.63	\$3,515.62	\$2,832.64	\$1,460.89	\$10,124.02
Sun 4/13/2014	\$26.27	\$130.17	\$903.41	\$3,146.27	\$2,241.61	\$563.40	\$7,011.13
Mon 4/14/2014	\$6.28	\$745.76	\$2,621.76	\$3,140.43	\$2,590.54	\$687.18	\$9,791.94
Tue 4/15/2014	\$4.02	\$1,656.16	\$3,762.04	\$3,180.66	\$2,815.89	\$621.03	\$12,039.80
Wed 4/16/2014	\$13.48	\$999.74	\$1,930.41	\$3,092.66	\$2,405.12	\$598.21	\$9,039.62
Hourly Totals	\$85.97	\$12,222.42	\$26,901.96	\$22,692.12	\$18,287.90	\$5,384.23	Grand Total: \$85,574.60

Weekend Lowest Highest No Data

Alert Interface

SETTINGS

Data Type...

- Measured Speeds
- Comparison to Historical Average

Show...

- Work Zone Bounds
- Posted Speeds
- Associated DMS
- Nearby Cameras
- Nearby Incidents
- Lane Status
- Bottlenecks (when available)

5 miles upstream }
5 miles downstream }

Permit Information

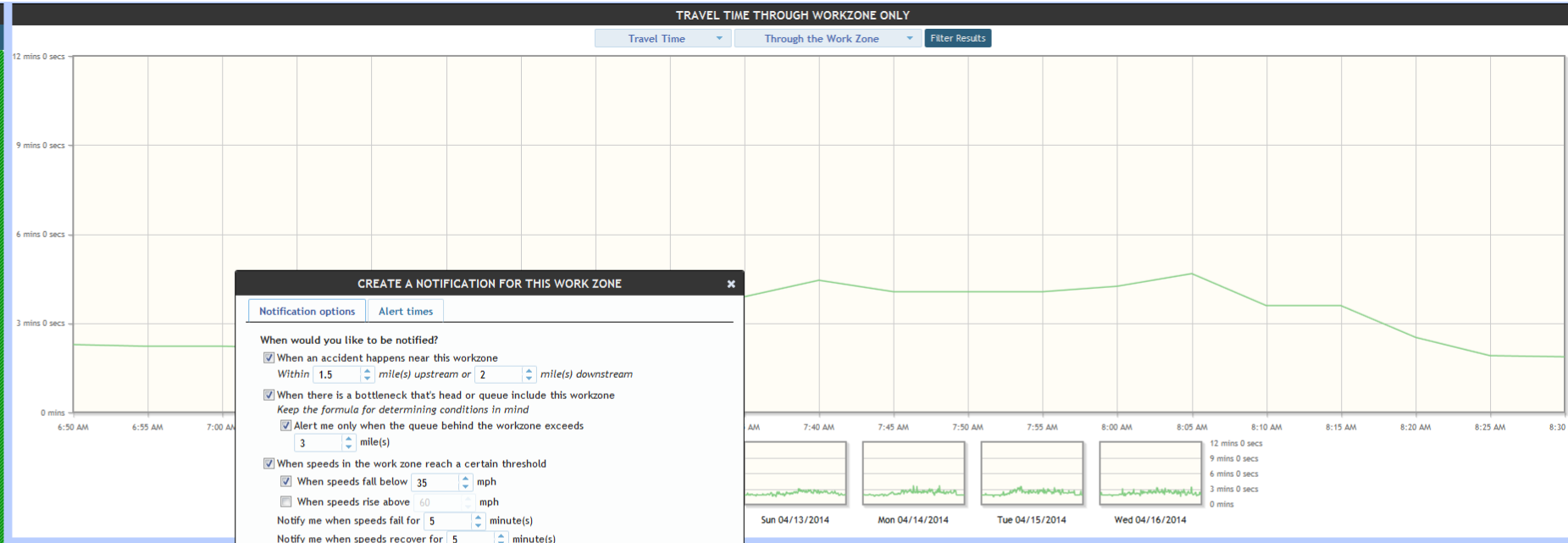
Project Information

Site Details

Configure Alerts

COMPARISON TO HISTORIC AVERAGE

	↓ SOUTH ↓	↑ NORTH ↑
SPEED LIMIT 65	-12 MPH (-20%)	-1 MPH (-2%)
	-13 MPH (-21%)	-2 MPH (-3%)
	-12 MPH (-20%)	-2 MPH (-3%)
	+5 MPH (10%)	-2 MPH (-4%)
	-2 MPH (-4%)	+11 MPH (22%)
	-6 MPH (-10%)	0 MPH (0%)
	-13 MPH (-25%)	+2 MPH (4%)
	-14 MPH (-30%)	+3 MPH (8%)
	-2 MPH (-4%)	+14 MPH (27%)
SPEED LIMIT 40		
	-9 MPH (-21%)	-1 MPH (-2%)
	-6 MPH (-20%)	-6 MPH (-17%)
		+4 MPH (13%)
	-1 MPH (-2%)	+11 MPH (28%)
	+4 MPH (11%)	+3 MPH (9%)
	-5 MPH (-20%)	0 MPH (0%)
	+1 MPH (5%)	-2 MPH (-11%)
	-1 MPH (-5%)	+6 MPH (33%)
	+13 MPH (57%)	-1 MPH (-5%)
	-1 MPH (-5%)	+2 MPH (8%)
SPEED LIMIT 60		



CREATE A NOTIFICATION FOR THIS WORK ZONE

Notification options | Alert times

When would you like to be notified?

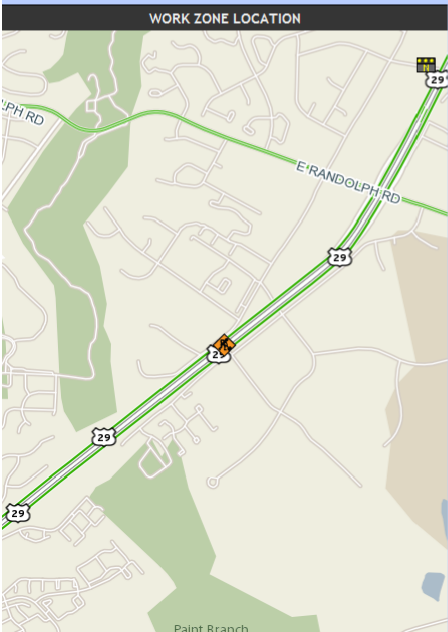
- When an accident happens near this workzone
Within 1.5 mile(s) upstream or 2 mile(s) downstream
- When there is a bottleneck that's head or queue include this workzone
Keep the formula for determining conditions in mind
 Alert me only when the queue behind the workzone exceeds 3 mile(s)
- When speeds in the work zone reach a certain threshold
 - When speeds fall below 35 mph
 - When speeds rise above 60 mph

Notify me when speeds fall for 5 minute(s)
Notify me when speeds recover for 5 minute(s)

How would you like to be notified?

- Send me an email
We'll send an email to ivanovn@umd.edu
- Send me a text message
Enter your phone number: 301-405-0000 | Verizon Wireless

Next



USER DELAY COST

Total User Delay Cost

	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/10/2014	\$3,206.89	\$2,729.29	\$727.68	\$26,207.94
Fri 4/11/2014	\$3,409.59	\$2,672.82	\$725.83	\$11,360.16
Sat 4/12/2014	\$3,515.62	\$2,832.64	\$1,460.89	\$10,124.02
Sun 4/13/2014	\$26.27	\$130.17	\$903.41	\$3,146.27
Mon 4/14/2014	\$6.28	\$745.76	\$2,621.76	\$3,140.43
Tue 4/15/2014	\$4.02	\$1,656.16	\$3,762.04	\$3,180.66
Wed 4/16/2014	\$13.48	\$999.74	\$1,930.41	\$3,092.66
Hourly Totals	\$85.97	\$12,222.42	\$26,901.96	\$22,692.12
				\$18,287.90
				\$5,384.23
				Grand Total: \$85,574.60



Questions & Discussion

Michael L. Pack

PackML@umd.edu

301.405.0722



View video demos of these tools at
www.vpp.ritis.org/suite/screencast

UDC for NJ

- <https://vpp.ritis.org/delay-analysis/report/61451e32-809b-4570-94ba-f120555b1fd3/>
- <https://vpp.ritis.org/delay-analysis/report/573839ac-5dad-425a-9cb2-4283d4b40576/>
- Pack I-76
- <https://vpp.ritis.org/delay-analysis/report/ec73e87c-7eb8-44f8-a879-4b5c398bfa6c/>
- <https://vpp.ritis.org/delay-analysis/report/ef16d773-5af3-40f3-b8b3-6af103837278/>

View video demos of these tools at
www.vpp.ritis.org/suite/screencast