PROBE DATA ANALYTICS SUITE

User Group

Quarterly Web Meeting

February 9, 2017

Agenda for Feb 9, 2017

	Topic	Speaker
10:30am – 10:35am	Agenda/Meeting Overview & Introductions Coalition Update	Jesse Buerk, DVRPC, PDA Co-chair Denise Markow, I-95 Corridor Coalition
10:35am – 10:55am	Agency Spotlight Presentation: Florida Turnpike's use of PDA apps for Bottleneck Identification	Enock Mtoi Florida Turnpike/Florida DOT
10:55am – 11:10am	Probe Data Analytics Improvements • Recent Updates • Deployment Roadmap • Q1 Updates (very soon!) • Q2 Updates (next 4-5 months)	John Allen UMD CATT Lab
11:10am – 11:25am	Spotlight Presentation: Visual Exploration of GPS Traces	Nikola Marković UMD CATT
11:25am – 11:50am	Agency Input Session	All agencies
11:50am – Noon	Wrap Up - Next Meeting & Thank You	Denise Markow I-95 Corridor Coalition

Introductions

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Participating Agencies

Agency	
Baltimore Metropolitan Council	Pennsylvania DOT
Delaware Valley Regional Planning Commission	Richmond Regional TPO
Federal Highway Administration	South Jersey TPO
Florida Turnpike	Virginia DOT (and VTRC)
MWCOG	NREL
New Jersey DOT (and NJIT)	UMD – CATT Lab & CATT Works
North Carolina DOT (and ITRE/NSCU)	I-95 Corridor Coalition & support
North Jersey TPA	

Please confirm that your line is muted *6

Thank you!

Coalition Update

Denise Markow, P.E., I-95 Corridor Coalition

In the spotlight…

Agency Spotlight Presentation: Florida Turnpike's use of PDA apps for Bottleneck Identification

Enock T. Mtoi, Ph.D., Transportation Engineer

Florida Turnpike's Use of Probe Data Analytics for Bottleneck Identification

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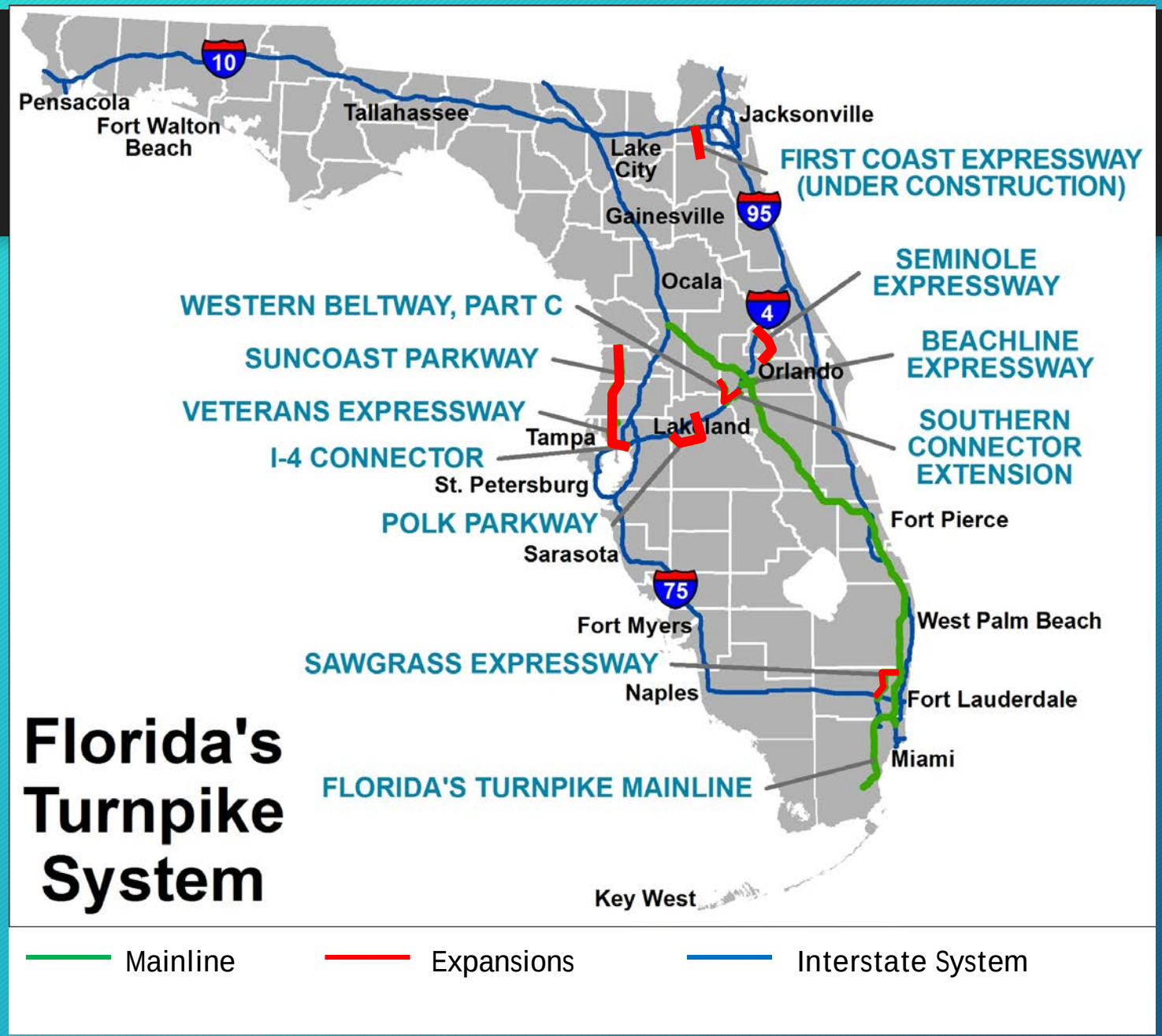
PDA User Group Meeting

February 09, 2017

Background

- Florida's Turnpike Enterprise (FTE) is part of the Florida Department of Transportation (FDOT), an agency of the State of Florida
- The Turnpike owns and operates 483 miles of toll facilities in Florida and facilitates toll collection for local districts tolled roadways
- In 2017, express lanes will be constructed on two facilities in South and West Florida (Turnpike Extension and Veteran's Expressway)

Background



- Turnpike Mainline System and Expansions
- Mainline with a length of 320 miles
- Total of 163 miles of Expansion Projects
- FTE also operates I-95 Express Lanes in Miami
- and Broward

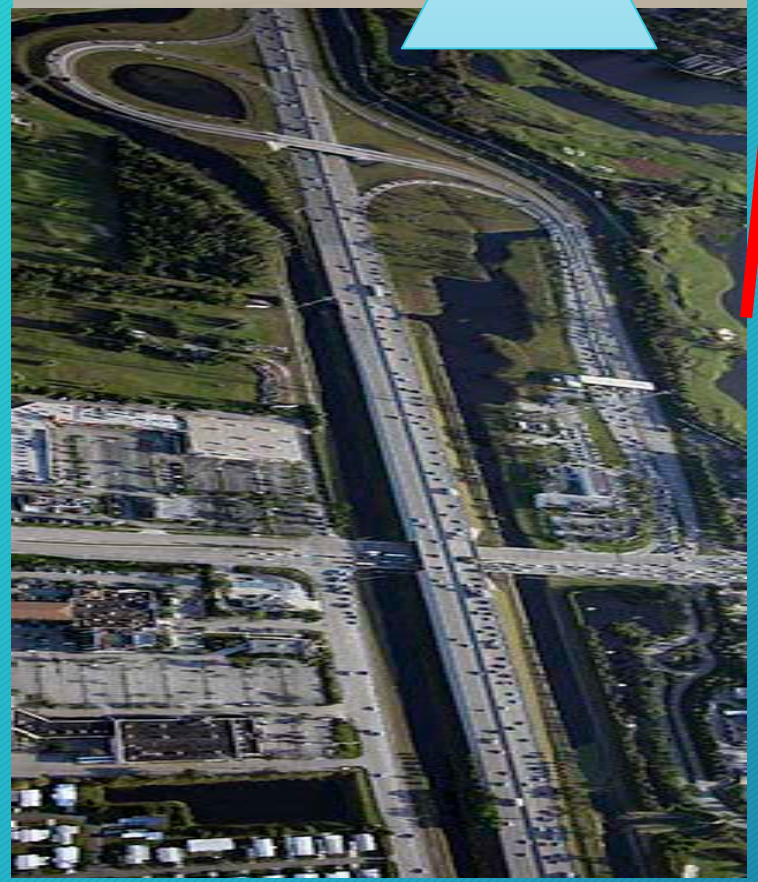
Annual System Assessment

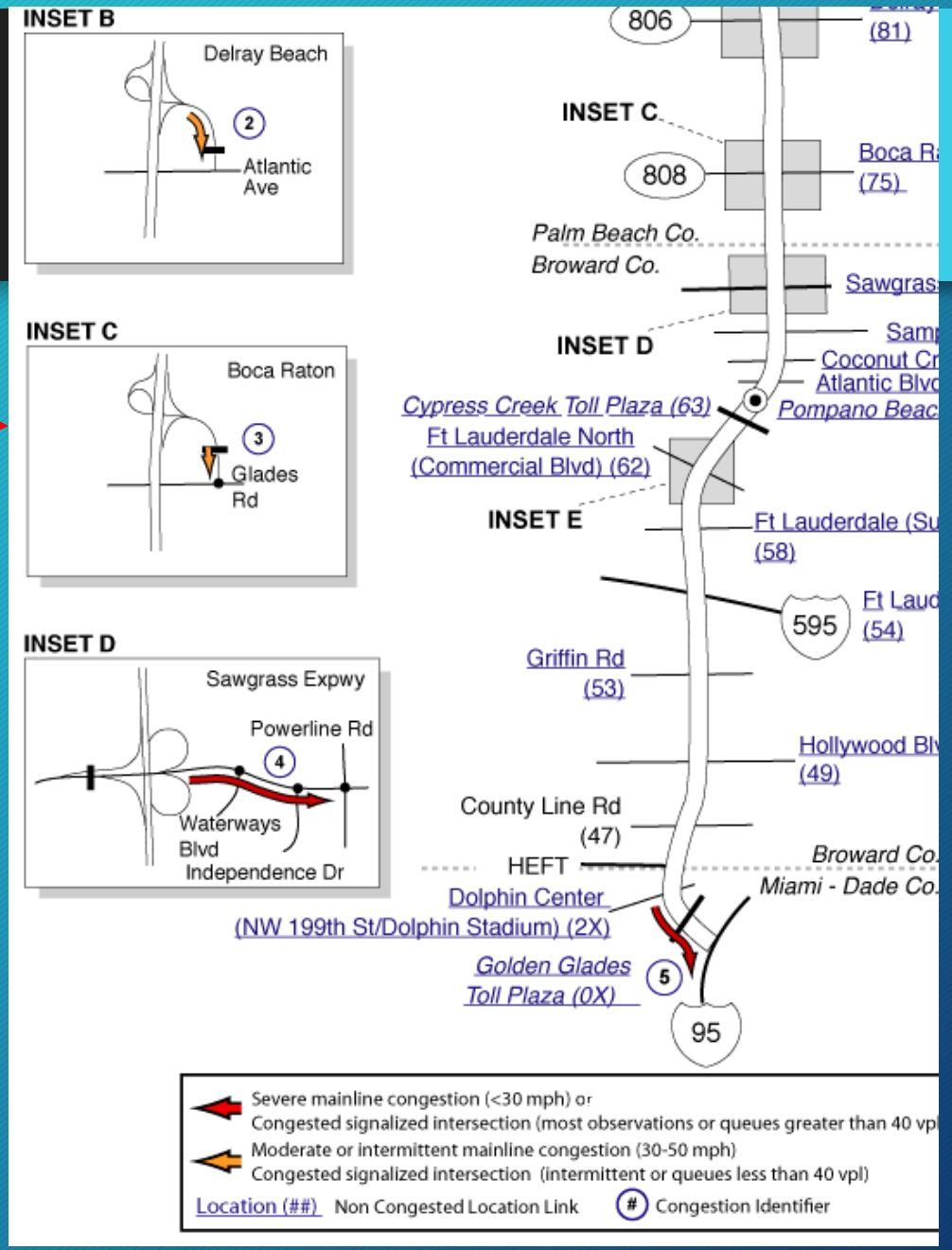
- Annual Traffic Trends report
- Initial component of long range planning process
- Identifies current and future capacity deficiencies
- More recently provides a Mobility Scorecard for each of the Turnpike systems
- Probe Data Analytics (PDA) has more recently been used in evaluating existing system deficiencies (bottlenecks)

Identifying Bottlenecks-History

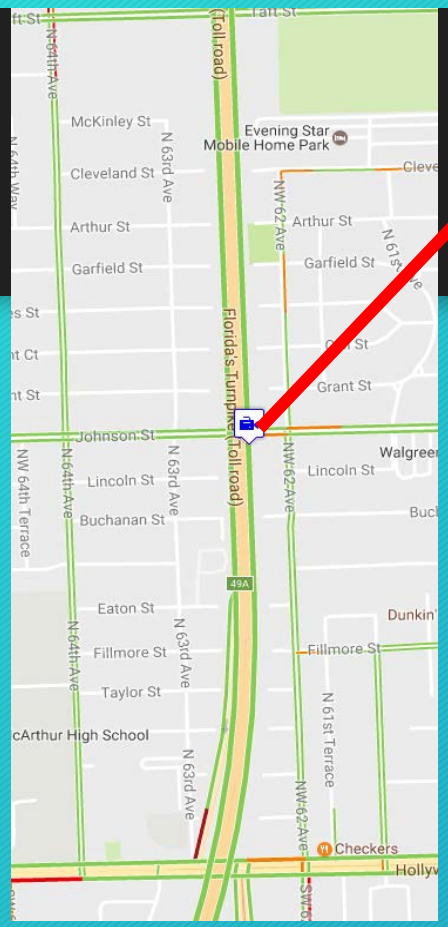
- **From 1998-2010** Florida's Turnpike commissioned Skycomp, Inc., an aerial traffic survey company to observe and document congestion on the System
  - Specially-trained observers flew aboard high-wing Cessna airplanes and patrolled each of the facilities during peak morning and evening periods of commuter travel
  - Congested locations were identified by congestion origin (i.e. freeway lane drop, merge point, toll plaza or cross-street intersections at interchanges) and severity
- **After 2010**, $ constraints resulted in a coordinated effort with Turnpike Traffic Operations.
- Monthly TMC congestion logs are provided to Planning (verified with TMC camera or field observations)

Report Production from Skycomp Aerial Surveys





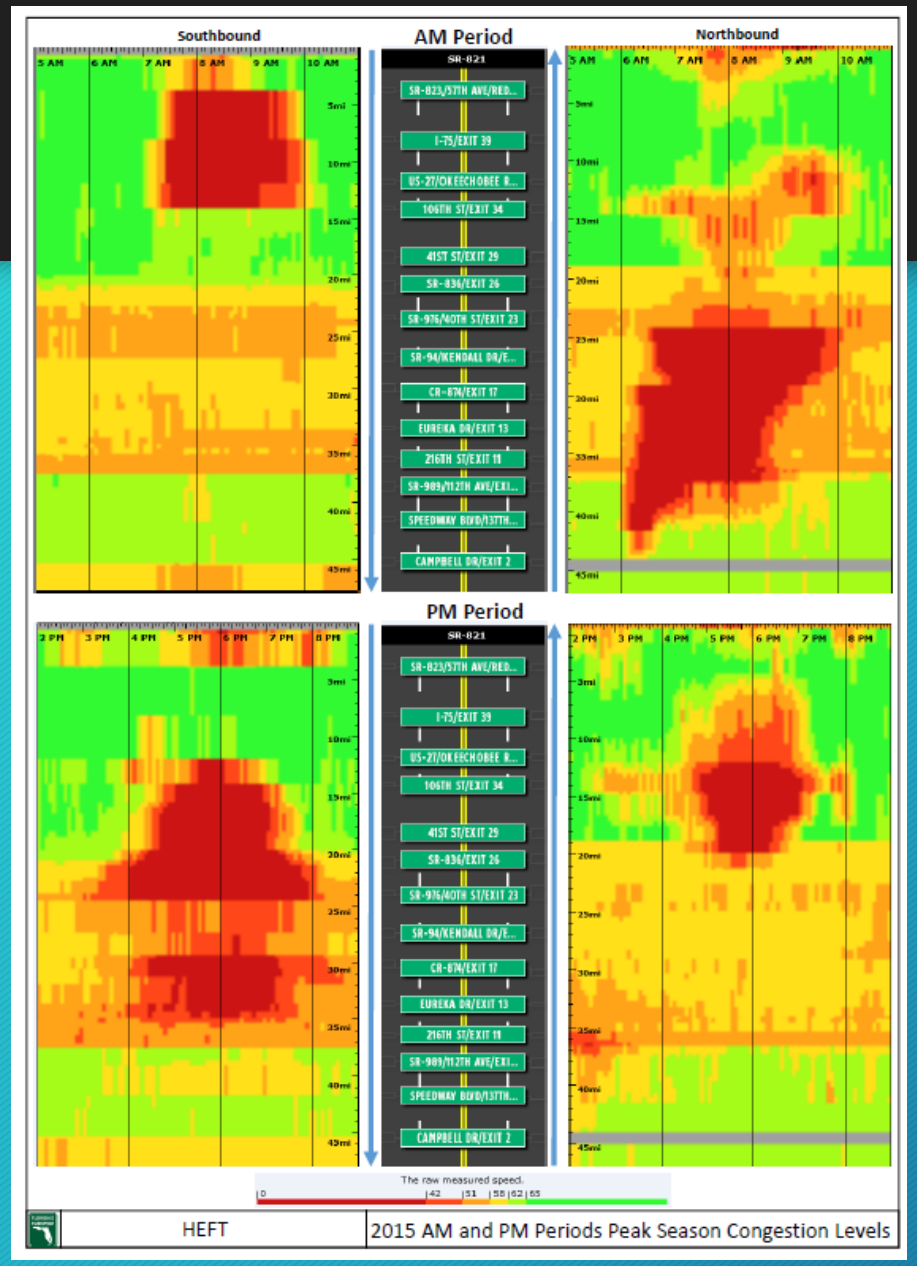
Bottleneck Identification via TMC Reports

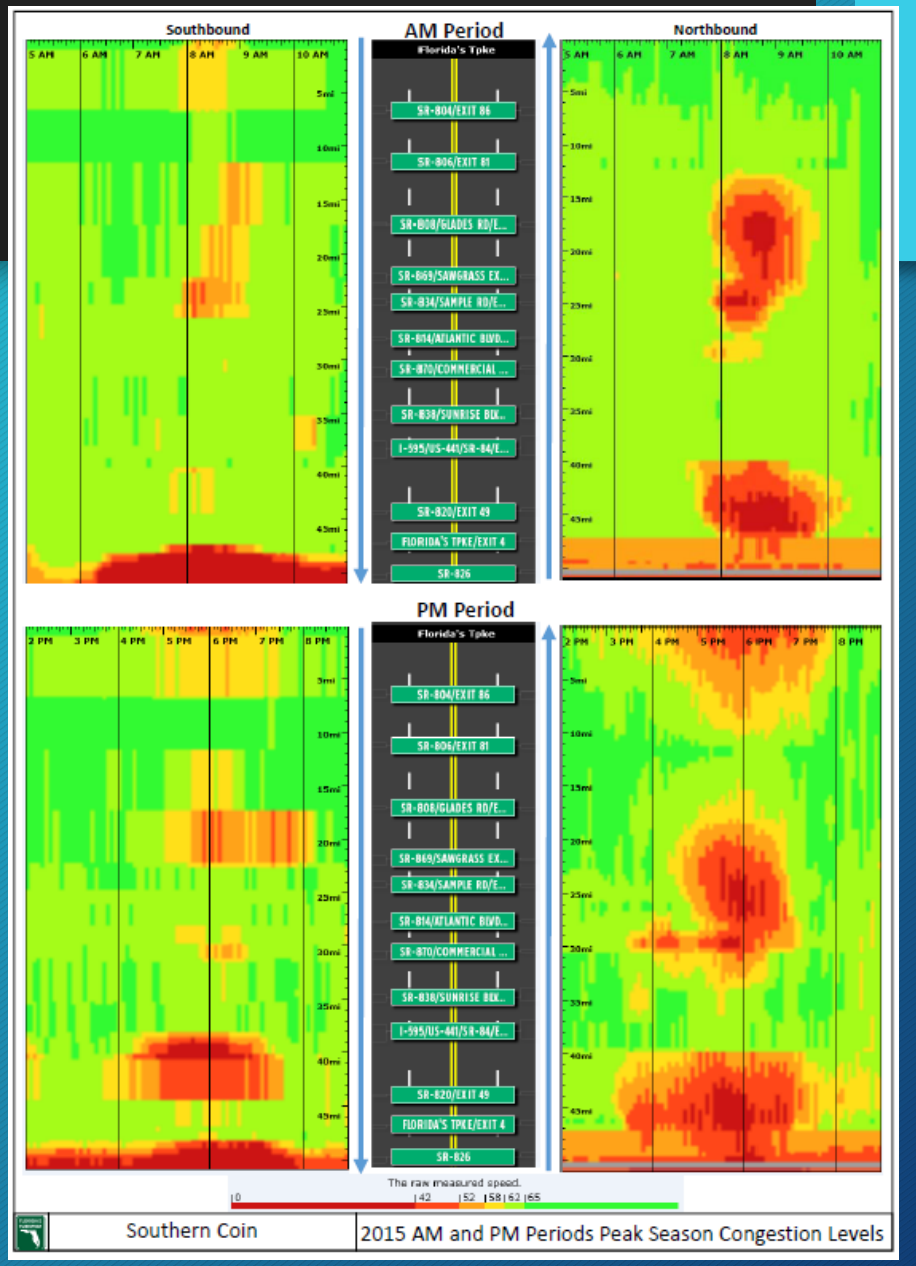


A	B	C	D
ID	Type	Date/Time	Location
797647	Off Ramp Backup	12/01/2015 07:35:29	Palm Beach on Floridas Turnpike Northbound, Ramp To Exit 75 - Glades Road / S.R. 808
797652	Off Ramp Backup	12/01/2015 07:41:36	Broward on Floridas Turnpike Northbound, Ramp To Exit 69 - Sample Road (S.R. 834)
797662	Off Ramp Backup	12/01/2015 07:52:06	Broward on Sawgrass Expressway Northbound, Ramp To Exit 21 - Florida's Turnpike
797665	Off Ramp Backup	12/01/2015 07:55:07	Broward on Floridas Turnpike Southbound, Ramp To Exit 62 - Commercial Boulevard / S.R. 870
797669	Off Ramp Backup	12/01/2015 08:10:10	Broward on Floridas Turnpike Southbound, Ramp To Exit 54 - I-595/S.R. 84/U.S. 441
797676	Off Ramp Backup	12/01/2015 08:24:01	Broward on Floridas Turnpike Southbound, Ramp To Exit 53 - Griffin Road (S.R. 818) /Orange Drive
797744	Off Ramp Backup	12/01/2015 10:50:46	Miami Dade on Floridas Turnpike Southbound, Ramp To Exit 25 - Tamiami Trail (SW 8th Street / U.S. 41)
797846	Off Ramp Backup	12/01/2015 15:23:07	Miami Dade on Floridas Turnpike Southbound, Ramp To Exit 13 - Eureka Drive (SW 184 Street)
797848	Off Ramp Backup	12/01/2015 15:25:40	Miami Dade on Floridas Turnpike Southbound, Ramp To Exit 16 - SW 117th Avenue (Coral Reef Drive)
797889	Off Ramp Backup	12/01/2015 17:08:04	Orange on SR-528 Westbound, Ramp To Exit 4 - U.S. 441 / Florida's Turnpike
797900	Off Ramp Backup	12/01/2015 17:38:23	Palm Beach on Floridas Turnpike Northbound, Ramp To Exit 86 - Boynton Beach Boulevard (S.R. 804)
798083	Off Ramp Backup	12/02/2015 07:46:47	Broward on Sawgrass Expressway Northbound, Ramp To Exit 21 - Florida's Turnpike
798088	Off Ramp Backup	12/02/2015 07:54:58	Broward on Floridas Turnpike Southbound, Ramp To Exit 62 - Commercial Boulevard / S.R. 870
798092	Off Ramp Backup	12/02/2015 07:57:30	Broward on Floridas Turnpike Northbound, Ramp To Exit 69 - Sample Road (S.R. 834)
798259	Off Ramp Backup	12/02/2015 14:40:17	Miami Dade on Floridas Turnpike Southbound, Ramp To Exit 13 - Eureka Drive (SW 184 Street)
798275	Off Ramp Backup	12/02/2015 15:10:35	Miami Dade on Floridas Turnpike Southbound, Ramp To Exit 16 - SW 117th Avenue (Coral Reef Drive)
798313	Off Ramp Backup	12/02/2015 16:50:14	Broward on Floridas Turnpike Northbound, Ramp To Exit 67 - Coconut Creek Parkway
798320	Off Ramp Backup	12/02/2015 17:08:22	Orange on SR-528 Westbound, Ramp To Exit 4 - U.S. 441 / Florida's Turnpike
798322	Off Ramp Backup	12/02/2015 17:10:31	Broward on Floridas Turnpike Southbound, At Exit 62 - Commercial Boulevard / S.R. 870
798355	Off Ramp Backup	12/02/2015 18:28:56	Broward on Floridas Turnpike Southbound, Ramp To Exit 49 - Hollywood Boulevard / Pines Blvd SR-820

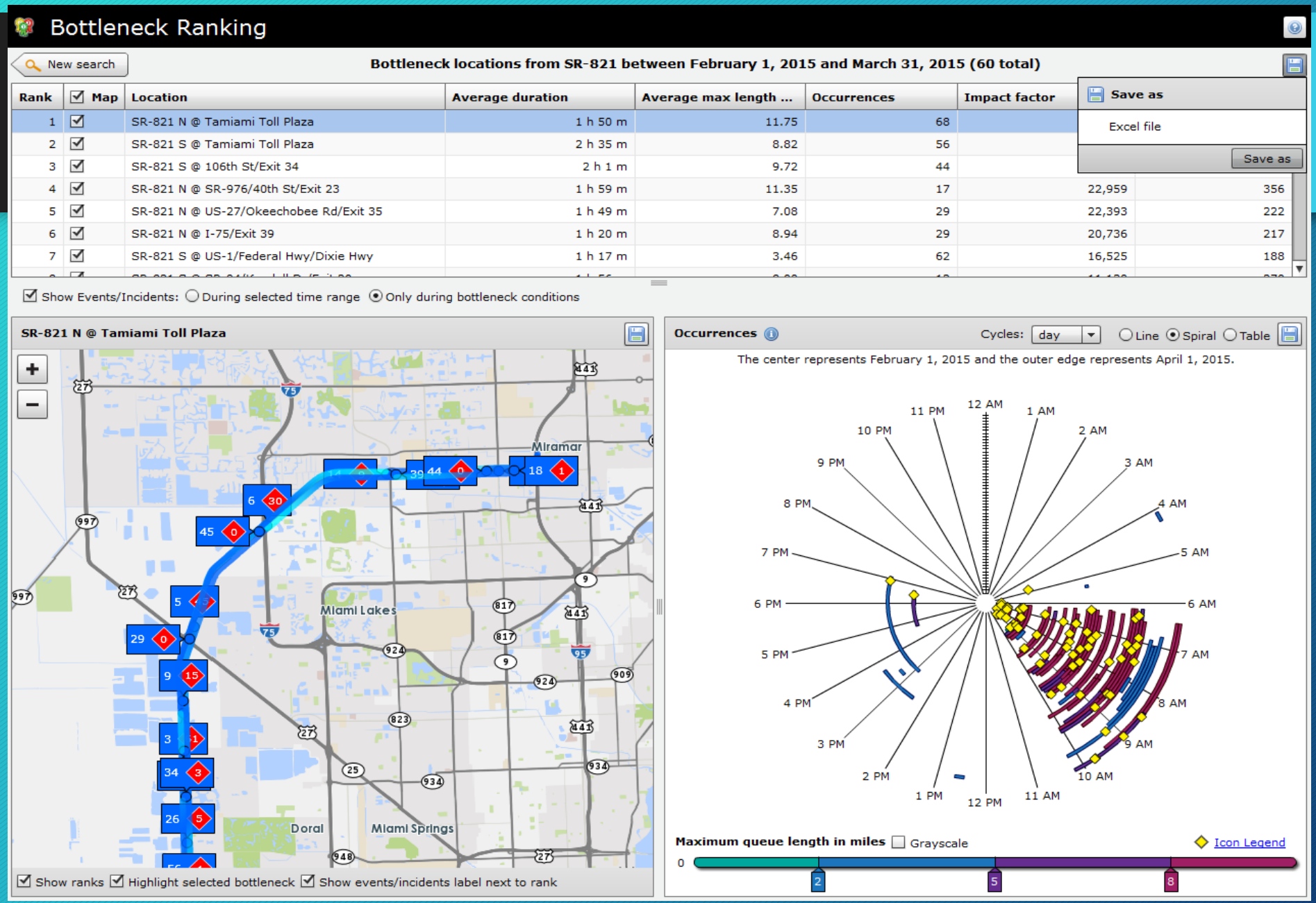
- TMC Reports are produced from SunGuide® Software and verified by TMC operators using cameras
- SunGuide® Software is an advanced traffic management system (ATMS) allowing TMC operators to monitor roadside sensors and closed-circuit television cameras, to quickly and effectively detect, verify, respond to, and clear incidents

Bottleneck Verification via Congestion Scans





The Use of PDA for Bottleneck Identification



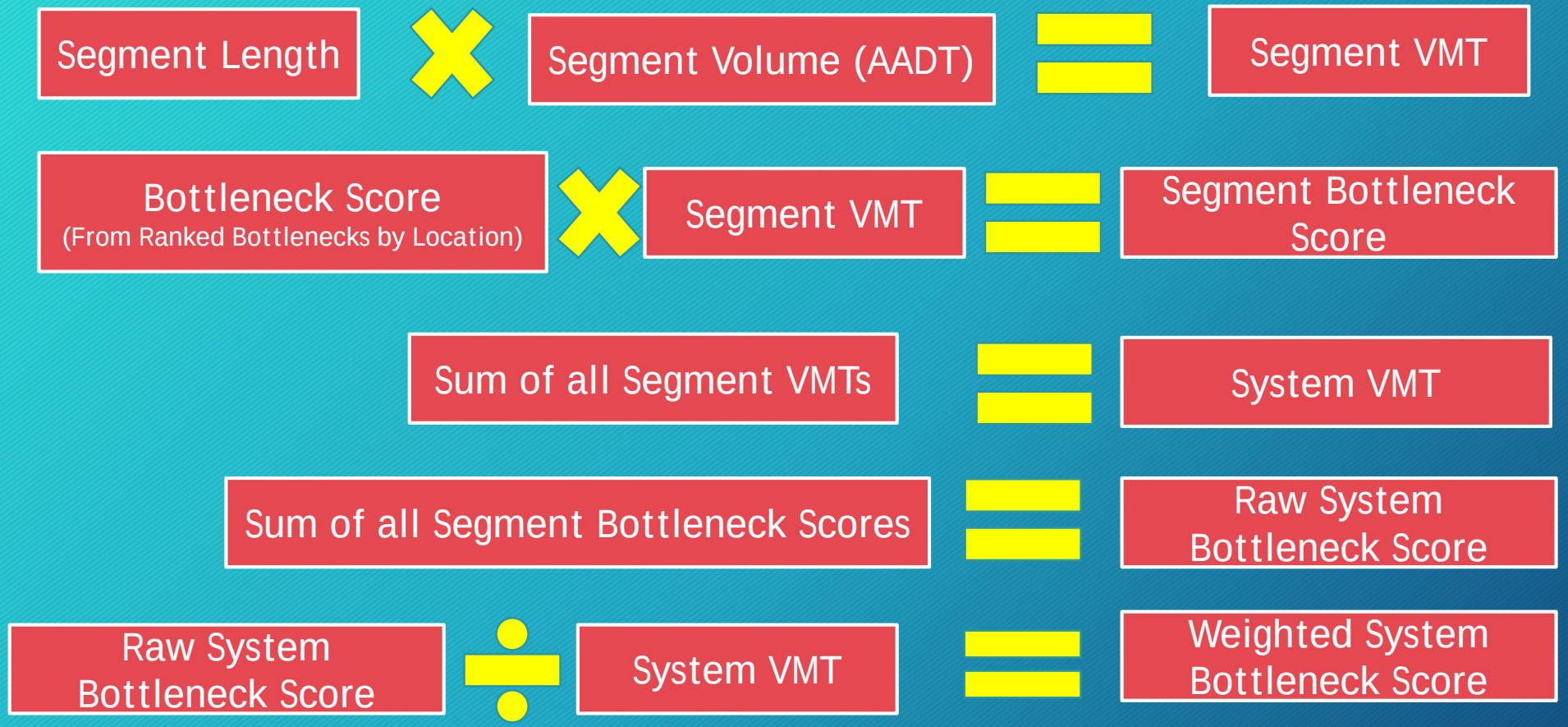
Bottleneck Ranking by Location

MP	Description	System	Average Duration (Minutes)	Average max queue (miles)	Occurrences	Probable Cause	Overall Score	Rank
25	25 - Tamiami Trail (U.S. 41/SW 8th Street)	HEFT	155	11.75	68	Ramp	87911	1
34	34 - NW 106th Street	HEFT	121	9.72	44	Ramp	51741	2
4	4 - Hillsborough Avenue	Vet	127	8.42	41	Ramp	43829	3
54	54 - Ft. Lauderdale South (595 Express Direct Connect)	S Coin	122	1.32	259	Ramp	41846	4
23	23 - Bird Road (SW 40th Street)	HEFT	119	11.35	17	Ramp	22959	5
35	35 - Okeechobee Road (U.S. 27)	HEFT	109	7.08	29	Ramp	22393	6
39	39 - I-75	HEFT	80	8.94	29	Ramp	20736	7
107	107 - S.R. 710 (SunPass only ramps)	Ticket	205	22.15	11	Ramp	18163	8
53	53 - Griffin Road	S Coin	85	6.85	31	Ramp	18056	9
49	49 - Hollywood Boulevard	S Coin	85	4.79	37	Ramp	15069	10
0	0 - I-4	BCHLN W	70	3.04	69	Ramp	14661	11
86	86 - Boynton Beach Boulevard (SR 804)	S Coin	98	15.83	9	Ramp	13958	12
75	75 - Boca Raton (Glades Boulevard)	S Coin	58	7.21	33	Ramp	13797	13
7	7 - Linebaugh Avenue	Vet	104	4.38	26	Ramp	11841	14
93	93 - Lake Worth (Lake Worth Road)	Ticket	86	8.16	16	Ramp	11232	15
20	20 - Kendall Drive (SW 88th Street)	HEFT	116	8	12	Ramp	11130	16
71	71 - Sawgrass Expressway	S Coin	69	6.54	27	Ramp	9932	17
47	47 - NW 27th Avenue (University Drive)	HEFT	45	6.12	21	Ramp	5779	18
	ANDERSON TOLL PLAZA	Vet	47	1.75	70	Plaza	5625	19
116	116 - Jupiter (Indiantown Road)	Ticket	42	15.17	13	Ramp	5290	20
81	81 - Delray Beach (Atlantic Avenue)	S Coin	110	14.98	4	Ramp	4945	21
20	20 - DEERFIELD PLAZA	SWGRSS	71	0.82	327	Plaza	4647	22
6A	6A - Waters Avenue	Vet	81	3.27	30	Ramp	4509	23
12	12 - Caribbean Boulevard (U.S. 1)/Government Center	HEFT	58	2.57	29	Ramp	4317	24
13	13 - Quail Roost Drive (Eureka Drive)	HEFT	68	3.12	22	Ramp	4243	25
152	152 - Fort Pierce (S.R. 70)	Ticket	49	11.75	7	Ramp	4031	26
43	43 - NW 57th Avenue (Red Road)	HEFT	50	4.12	24	Ramp	4019	27
37	37-Unversity Blvd	Seminole	63	5.24	12	Ramp	3961	28
54	54 - Ft. Lauderdale South (I-595/S.R. 84/U.S. 441)	S Coin	56	0.79	81	Ramp	3580	29
249	249 - Osceola Parkway	N Coin	62	7.44	13	Ramp	3289	30
2	2 - Orangewood Boulevard	BCHLN W	57	2.41	23	Ramp	3166	31
289	289 - Leesburg North (U.S. 27)	N Coin	15	8.79	154	Ramp	3162	32
97	97 - S.R. 80	Ticket	65	10.13	8	Ramp	3141	33
142	142 - Port St. Lucie (Port St. Lucie Boulevard)	Ticket	47	13.27	5	Ramp	3119	34
10	10 - HOMESTEAD PLAZA	HEFT	45	2.57	27	Plaza	3117	35
285	285 - Leesburg South (U.S. 27)	N Coin	38	13.12	92	Ramp	3055	36
	University Main Toll Plaza	Seminole	143	10.55	2	Plaza	3018	37
3	3 - Memorial Highway	Vet	89	5.65	62	Ramp	3016	38
6	6 - Tallahassee Road (SW 137th Avenue)	HEFT	61	3.84	12	Ramp	2814	39
99	99 - West Palm Beach (Okeechobee Boulevard)	Ticket	54	7.53	12	Ramp	2695	40
309	309 - I-75	N Coin	92	4.13	6	Ramp	2279	41
4	4 - Consulate Drive	BCHLN W	52	2.6	30	Ramp	2166	42
3	3A/B - S.R. 423/John Young Parkway	BCHLN W	63	3.18	10	Ramp	2001	43
47	47 - HEFT To/From Turnpike South	HEFT	33	3.03	20	Ramp	1999	44

Bottleneck Ranking by System - updated

- Segment Bottleneck Score is Calculated by Multiplying the Highest Score in the Segment by segment VMT
- The VMTs are Calculated by Multiplying Segment Length
- System Bottleneck Score is Calculated as Sum of all Segment Scores Weighted by System VMT

Bottleneck Ranking by System



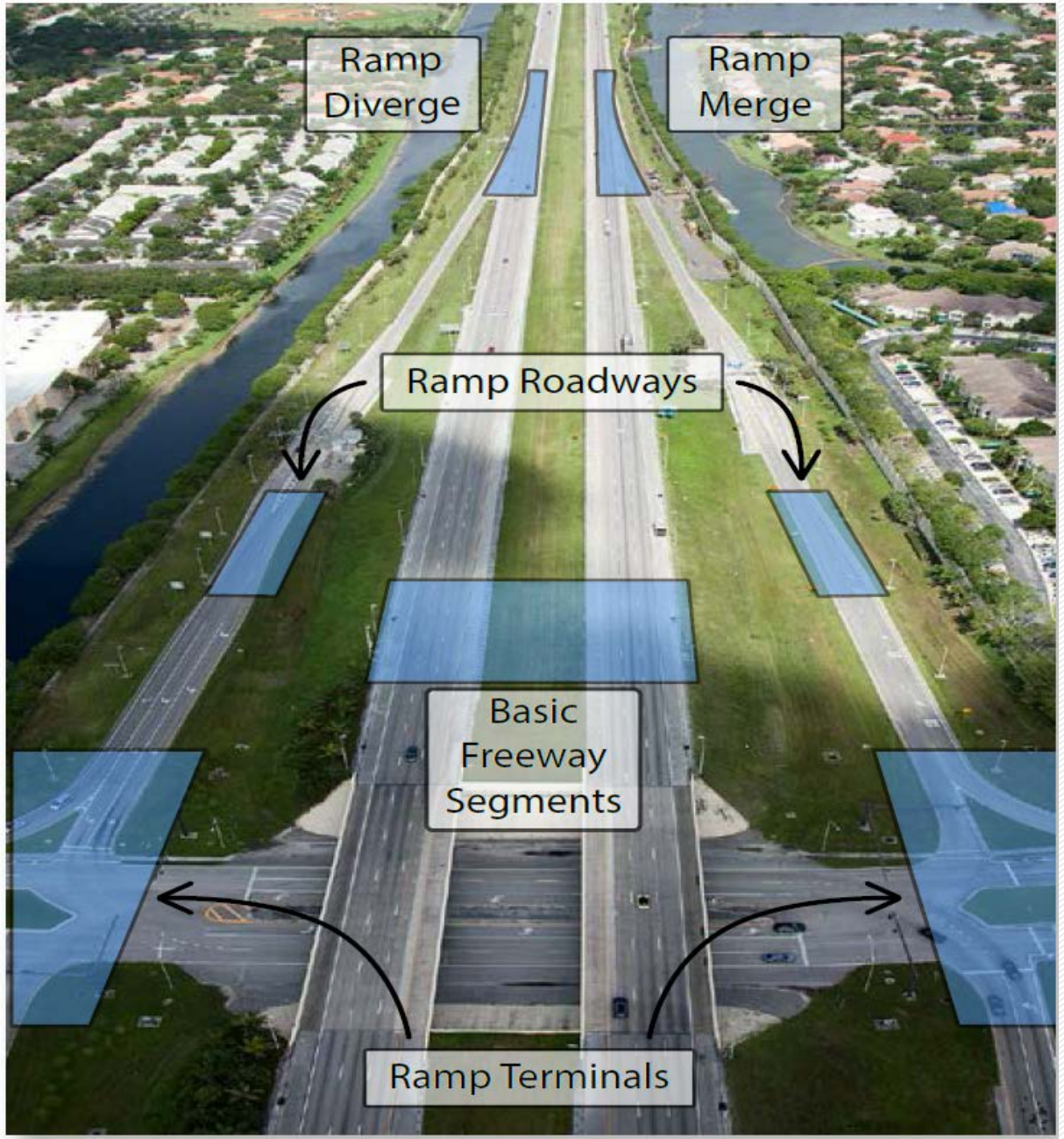
Weighted System Bottleneck Scores are calculated for all the systems and ranked from the highest to the lowest

Bottleneck Ranking by System

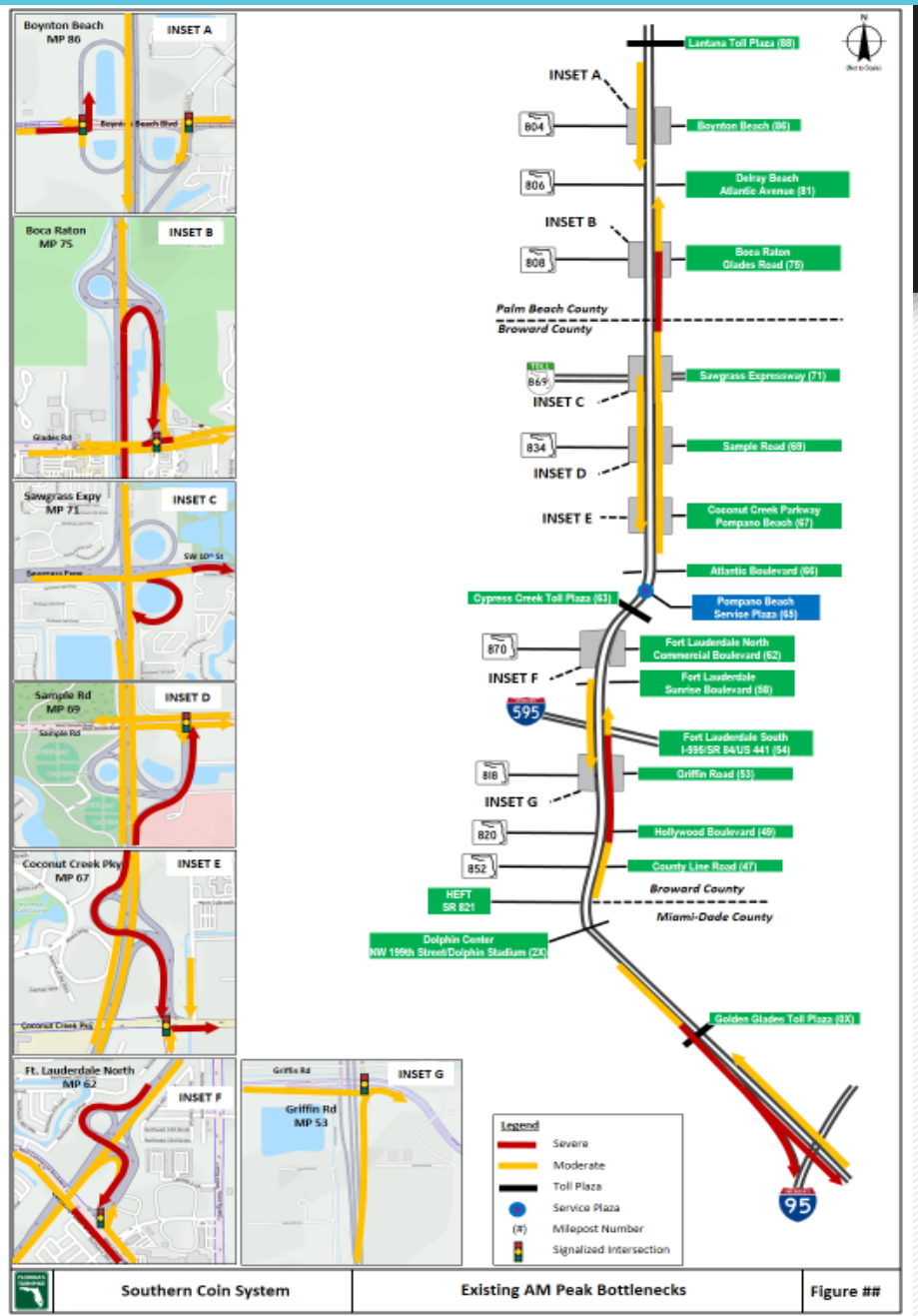
Facility	MP	Ramp	Average Congestion Occurrence Per Month	Rank
Turnpike Mainline - Homestead Extension of Florida's Turnpike (S.R. 821)	23	Southbound at Exit 23 - Bird Road (SW 40th Street)	18	1
Turnpike Mainline - Homestead Extension of Florida's Turnpike (S.R. 821)	34	Northbound at Exit 34 - NW 106th Street	17	2
Turnpike Mainline - Homestead Extension of Florida's Turnpike (S.R. 821)	23	Northbound at Exit 23 - Bird Road (SW 40th Street)	16	3
Veterans Expressway (S.R. 589)	6A	Southbound beyond Exit 6A - Waters Avenue (S.R. 584)	16	4
Turnpike Mainline - Southern Coin (S.R. 91)	50	Northbound beyond Hollywood Boulevard	13	5
Turnpike Mainline - Homestead Extension of Florida's Turnpike (S.R. 821)	35	Southbound at Exit 35 - Okeechobee Road (U.S. 27)	13	6
Turnpike Mainline - Southern Coin (S.R. 91)	0X	Southbound at Exit 0X - I-95 / US-441 / S.R. 826 / Golden Glades	9	7
Turnpike Mainline - Southern Coin (S.R. 91)	75	Northbound at Exit 75 - Glades Road / S.R. 808	8	8
Turnpike Mainline - Southern Coin (S.R. 91)	52	Southbound beyond Griffin Road	7	9
Turnpike Mainline - Ticket (S.R. 91)	90	Northbound at Lantana Toll Plaza	6	10
Beachline West Expressway (S.R. 528)	2	Eastbound beyond Exit 2 - Orangewood Boulevard	5	11

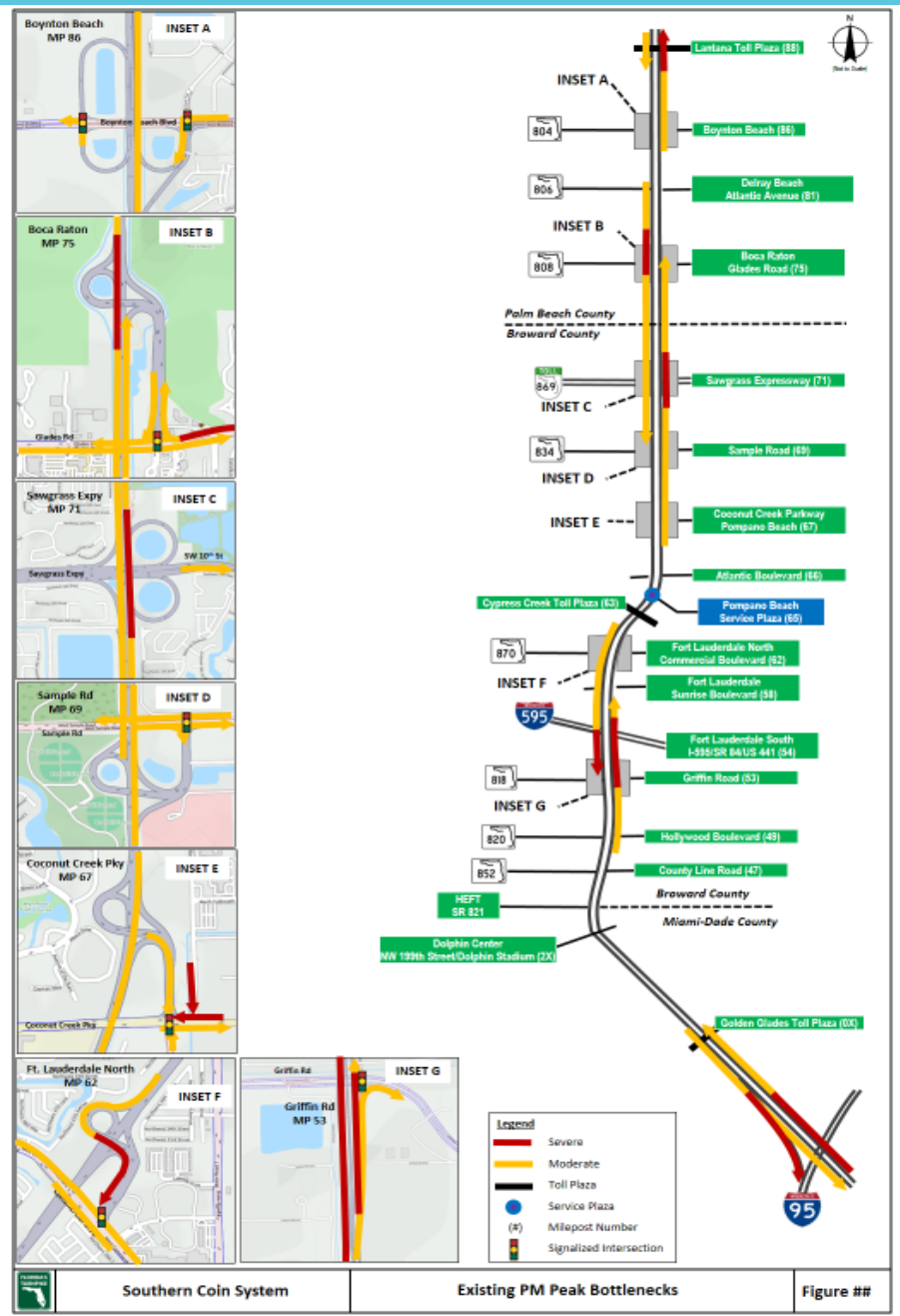
MP = Turnpike Milepost

Causes of Bottleneck: ML Capacity, Ramp, Signal??



Causes of Bottleneck: ML Capacity, Ramp, Signal??





Contribution to FTE Reports

- Probe Data Analytics (PDA) can be used to identify problem locations (Supplementary to Identifying Needs) and
- The developed bottleneck ranking can be included in the calculation of mobility score
- Quick capacity evaluations, simulation evaluation, and observed deficiencies

Contribution to FTE Reports

System	2015 Mobility Measures and Score							2014		Future Outlook		
	Transaction Growth Rate (FY 15 - FY 16)	Daily VMT / System Length	% Travel Meeting LOS Criteria	% Miles Severely Congested	Travel Time Reliability	Mobility Score (0 - 100)		Mobility Score (0 - 100)		Programmed Widening	Earliest Year of Unfunded Need	Future Trend
S.R. 821 (Homestead Extension of Florida's Turnpike)	5.2%	96,700	30%	28%	14%	12		35		✓	2025	↑
Florida's Turnpike (S.R. 91 - Southern Coin)	8.4%	103,700	75%	14%	43%	50		76		✓	2015	↓
Florida's Turnpike (S.R. 91 - Ticket System)	6.3%	39,000	88%	5%	93%	88		92			2020	↓
Florida's Turnpike (S.R. 91 - Northern Coin)	11.3%	55,800	97%	0%	92%	93		98		✓	2025	↑
Beachline West (S.R. 528)	8.0%	80,800	49%	38%	49%	31		36		✓	2020	↑
Beachline East (S.R. 528)	0.4%	35,900	100%	0%	100%	100		100			2030	Stable
Sawgrass Expressway (S.R. 869)	7.4%	76,000	77%	0%	93%	85		95		✓	n/a	Stable
Seminole Expressway (S.R. 417)	11.9%	44,100	96%	3%	96%	95		96			2016	↓
Veterans Expressway (S.R. 589)	7.6%	56,700	54%	26%	26%	26		24		✓	2035	↑
Southern Connector Extension (S.R. 417)	23.0%	22,100	100%	0%	100%	100		100			n/a	Stable
Polk Parkway (S.R. 570)	10.7%	19,300	100%	0%	100%	100		100			n/a	Stable
Suncoast Parkway (S.R. 589)	7.3%	18,700	100%	0%	100%	100		100			2030	Stable
Western Beltway (S.R. 429)	23.5%	16,800	100%	0%	100%	100		100			2045	Stable
All Systems	*8.1%*	*52,700*	*76%*	*7%*	*68%*	*67*		*78*		✓	2015	Stable

Ranges of Mobility Scores:	100	75-99	0-74

Conclusion

- The use of Probe Data Analytics (PDA) enabled us to scan FTE and other parallel systems quicker than before
- The metrics from the PDA are consistent with the knowledge we have about our system
- The data from TMC can be verified and validated without necessarily visiting sites
- Our modeling and simulations methods have improved through the use of PDA for calibration and validation

Thank You

PROBE DATA ANALYTICS SUITE

- Recent Updates
- Deployment Roadmap
- Q1 Updates (very soon!)
- Q2 Updates (next 4-5 months)

John Allen ◦ University of Maryland CATT Lab

Progress since the November 17th meeting

- **December:**
  - UDC invalid time bug fix
  - Volume prioritization bug fix
  - Rare Performance Charts “infinite loop” bug fix
- **January**
  - UDC crash bug fix
  - Links and additional documentation added per user requests
  - Tuning Hadoop Clusters
- Front-end designs for new feature requests
- The bulk of the past two months has been ***significant*** work towards future functionality (see next slides)

Current Deployment Schedule for CY 2017

Q1 (Jan-Mar)

- Query Submission pages Flash Player dependency removed
- "My History" New Functionality
- MAP-21 Final Rule Widgets
- Removal of TMC and Date range restrictions

Q2 (Apr-Jun)

- Results pages Flash Player dependency removed
- Select TMCs via click and drag
- Advanced Time Selection
- Custom graph formatting/exports
- Basic O-D Data Analytics (Phase I)*

Q3 (July-Sep)

- Sub-segment Data in results pages**
- NWS/NASA Radar Data mapped to TMCs
- Bottleneck Ranking with additional parameters (like volumes/capacity)
- Map tiling & rendering performance updates

Q4 (Oct-Dec)

- Real-time Volumes***
- TBD

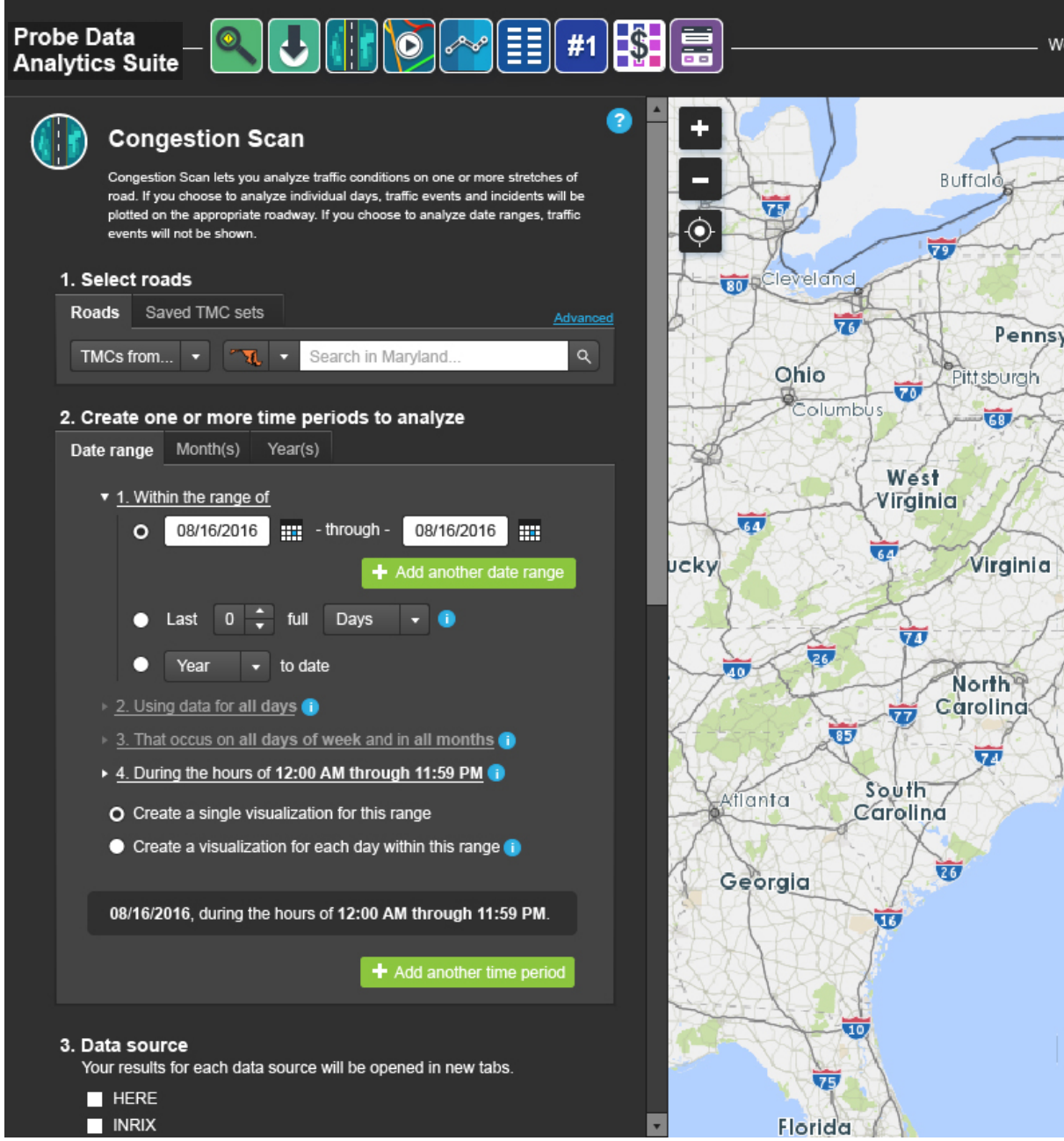
* Will require purchase of O-D Data from a vendor, and will be independent of the PDA Suite.
** Requires sub-segment data from a vendor and *may* require additional storage
*** Dependent on success of a separate I-95 CC Funded project.

Q1 & Q2
New Functionality Overview

Q1: FLASH Player Migration

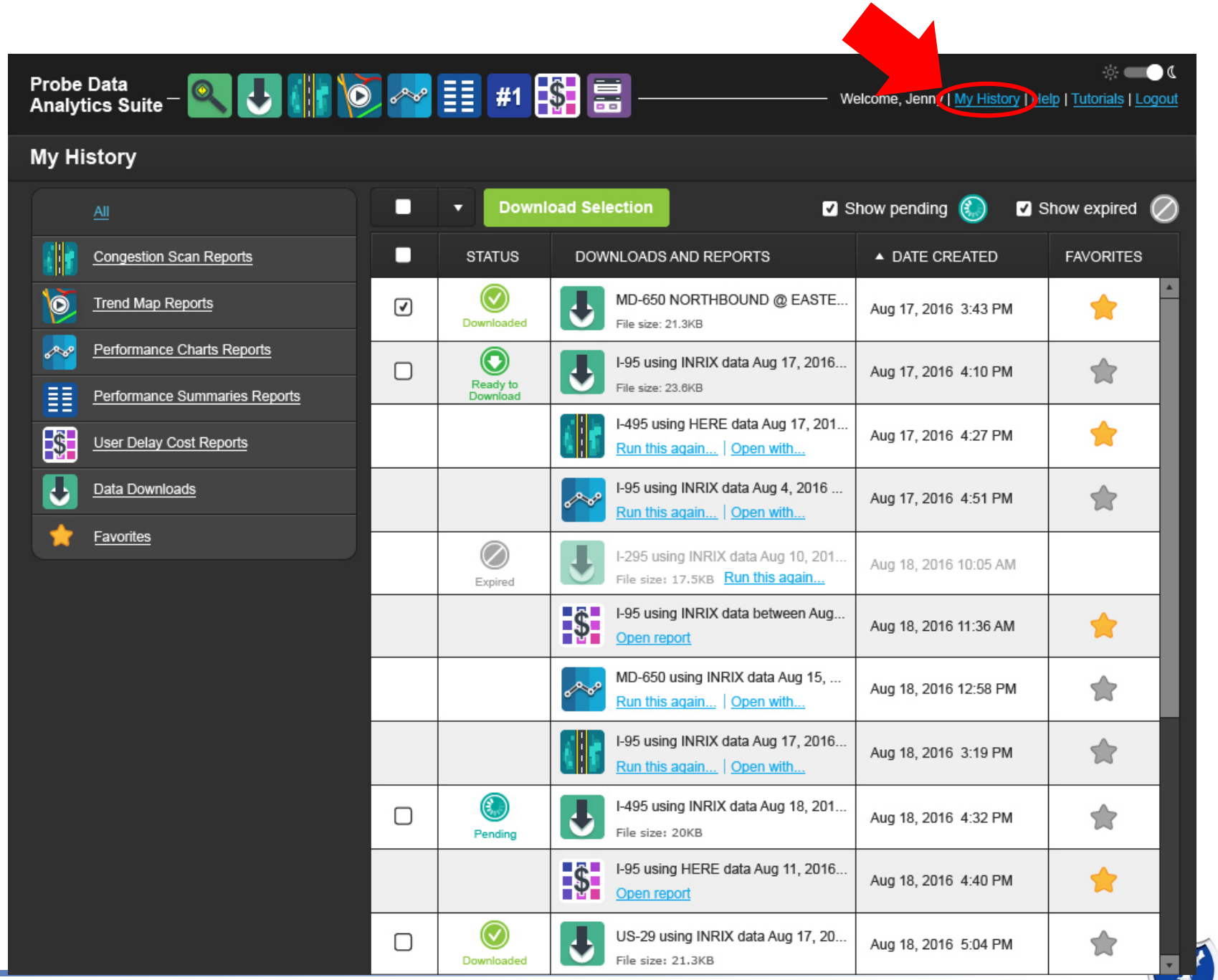
- Rework front end to newer web standards
- Enables other high value features like:
  - Advanced time selection
  - Map-based TMC selections
- Modern look/feel
- Input Pages deploy this month
- Results pages transitioned in Q2

(NOTE: Once the flash migration occurs, IE 10 and below will no longer be supported. You will need to upgrade to IE 11, or use other browsers, like Chrome and FireFox)



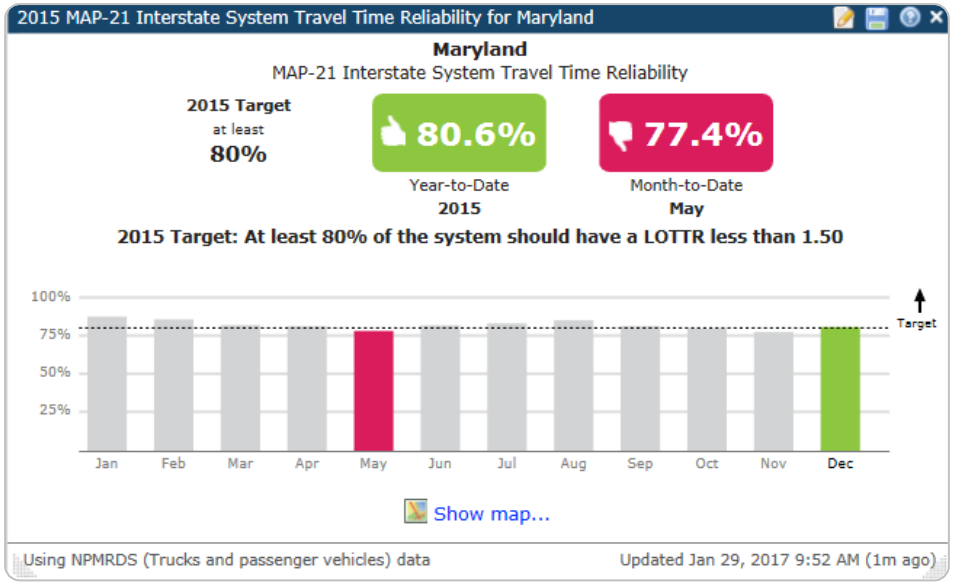
Q1: My History

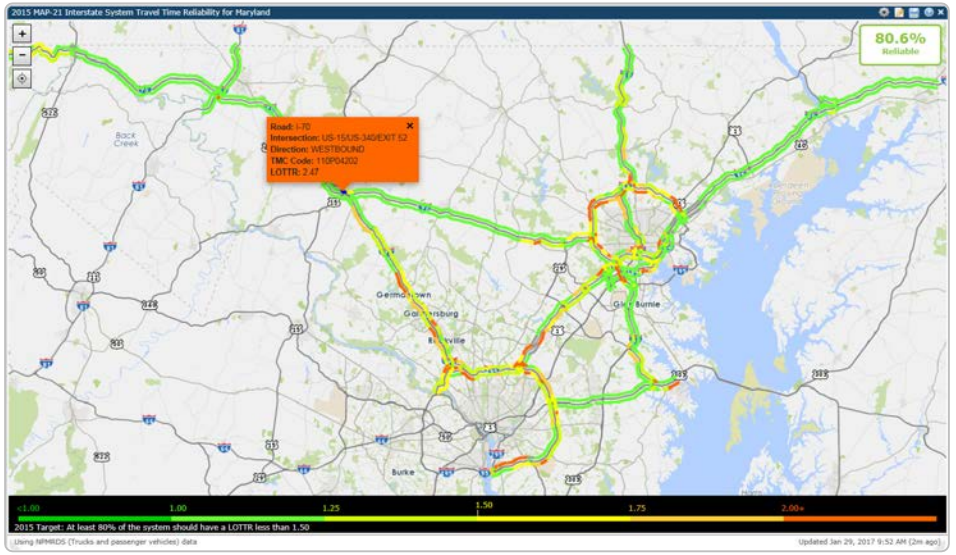
- Organizes your downloads, queries and reports



Q1: MAP-21

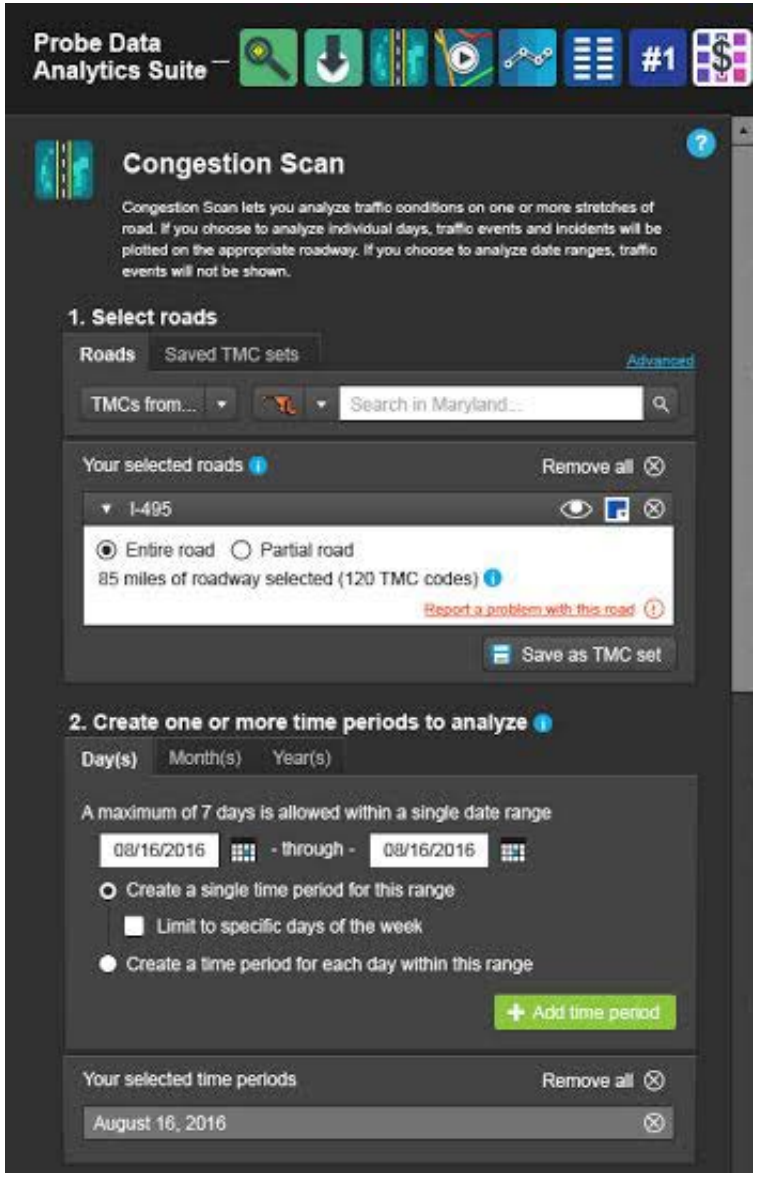
- **Final Rule** for System Performance Measures *released* January 18, 2017
- Some notable changes from the **NPRM**:
  - Removed *% of Interstate congested* PM
  - Merged PHTT measure with excessive delay into one measure – *PHED*
  - New measures: *% change in CO_2* (the GHG measure); and *% of Non-SOV Travel* measure
  - Changed the TT measure weighting (from system miles to person-miles)
- We are updating the MAP-21 widgets to accurately reflect the Final Rule requirements
- Expected deploy in next couple of weeks
- Some functionality still dependent on new NPMRDS contract
- ★ Working with Texas A&M Transportation Institute to verify/vet measures
- ★ Working with AASHTO and FHWA on continued funding models for state/local target setting support

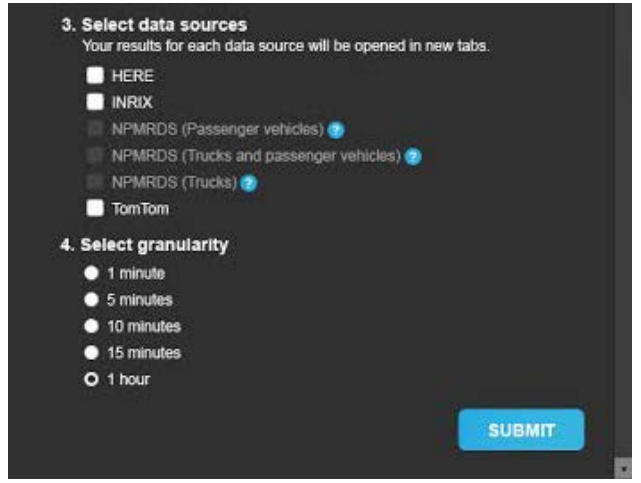




Q1: Removal of all date range, granularity and number of TMC restrictions

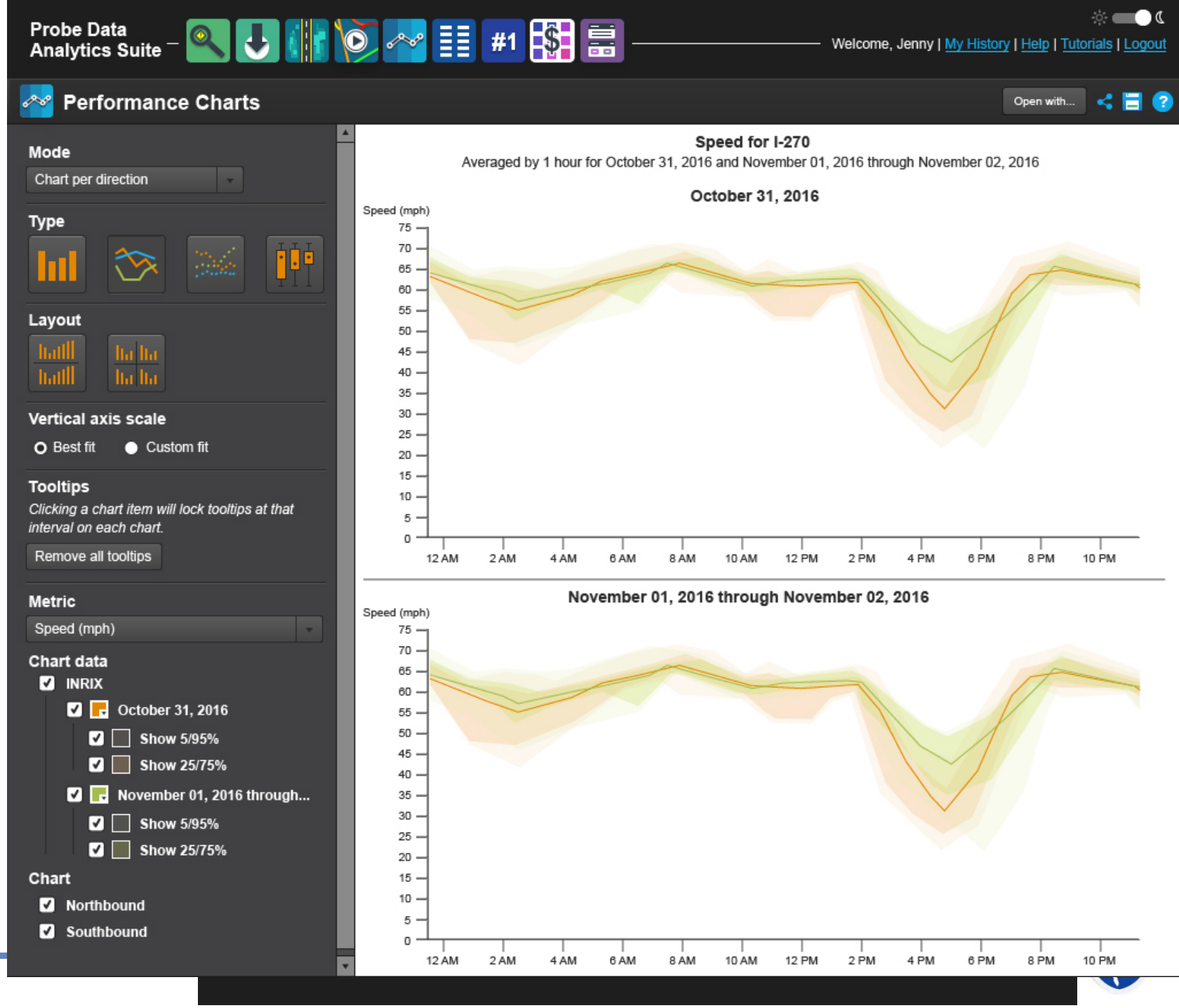
- Restrictions already lifted for:
  - Bottleneck Ranking
  - Massive Data Downloader
- All other restrictions to be lifted from other tools





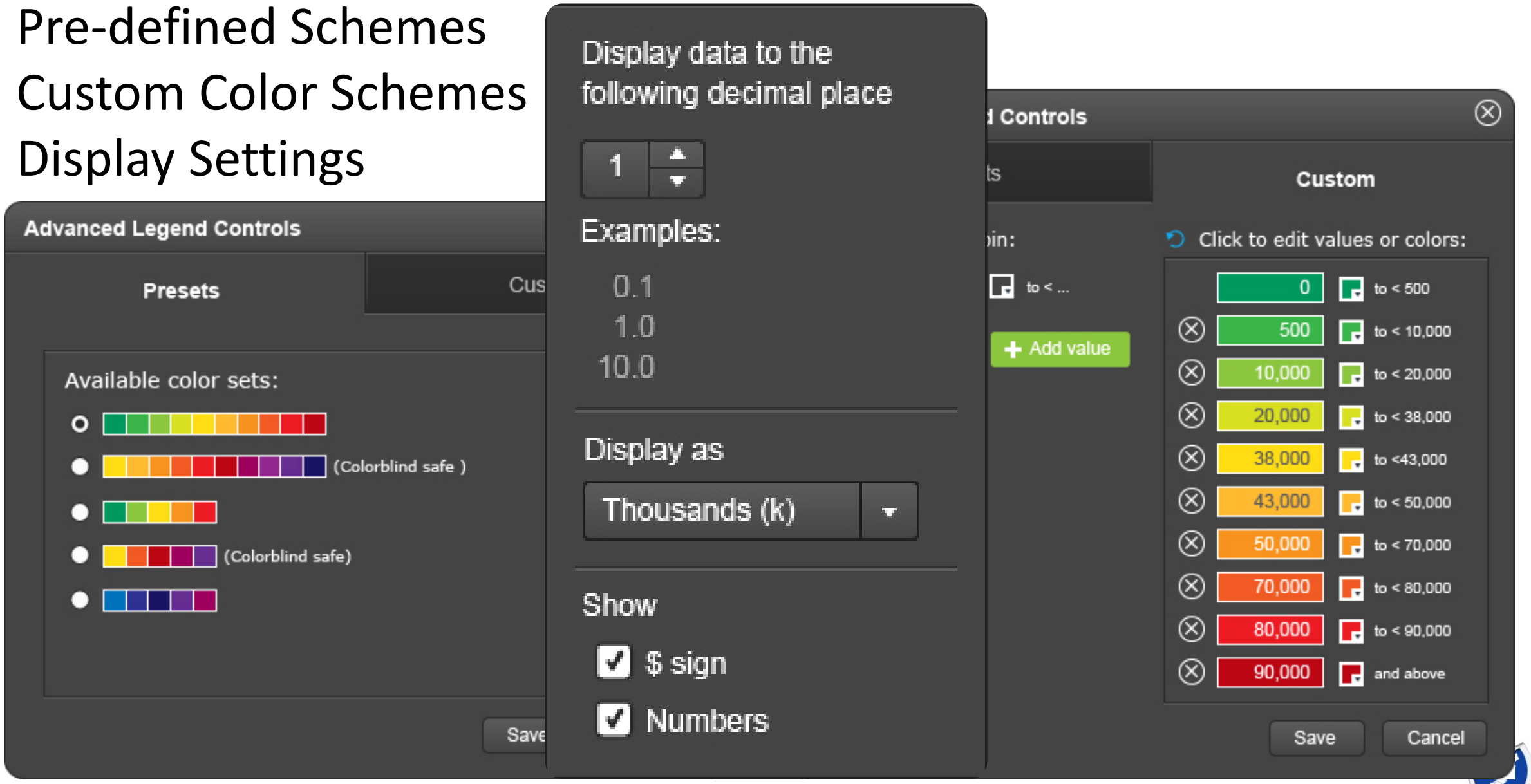
Q2: FLASH Migration (Results pages)

- No Flash Player for results pages
- New fonts, layout
- Ability to go light or dark



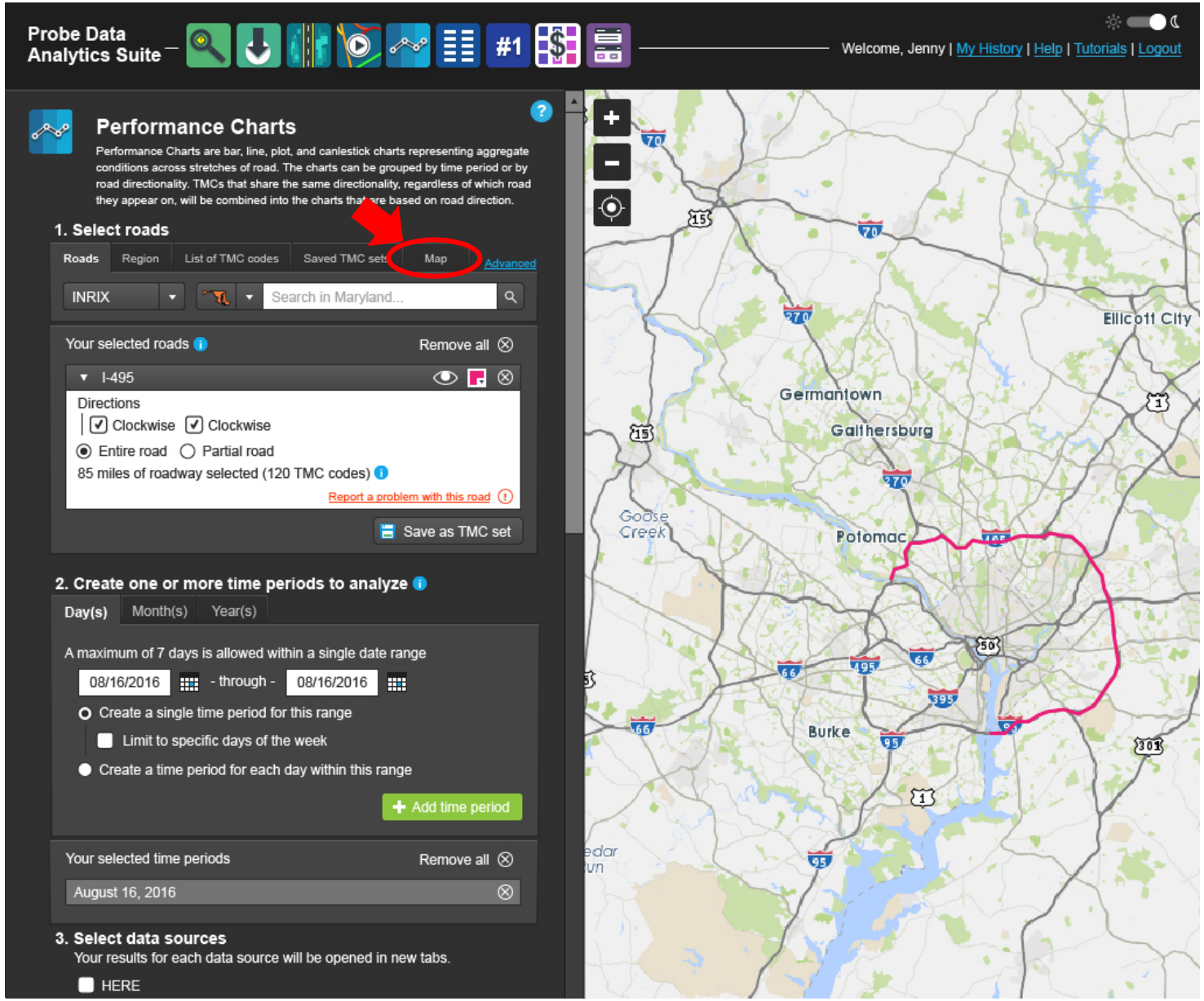
Q2: Custom Coloring for UDC Tables

- Pre-defined Schemes
- Custom Color Schemes
- Display Settings



Q2: Map Selections

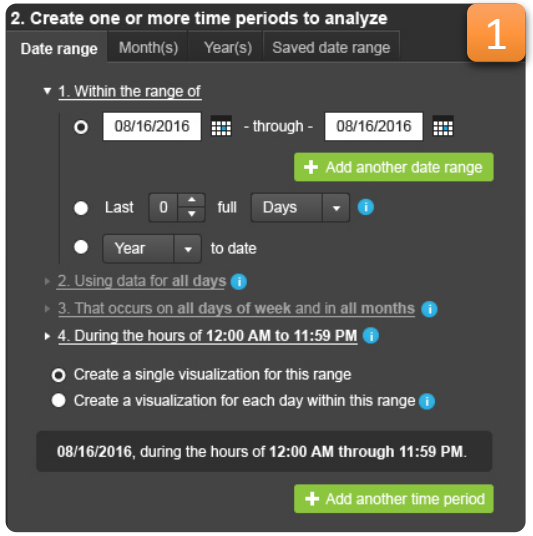
- Create and customize TMC sets using a map function under “Select roads”

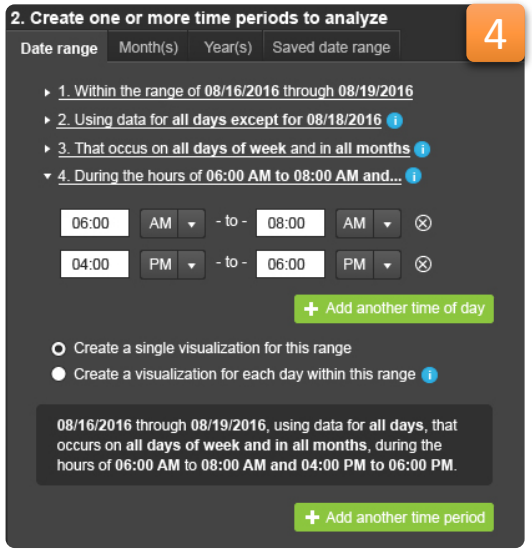


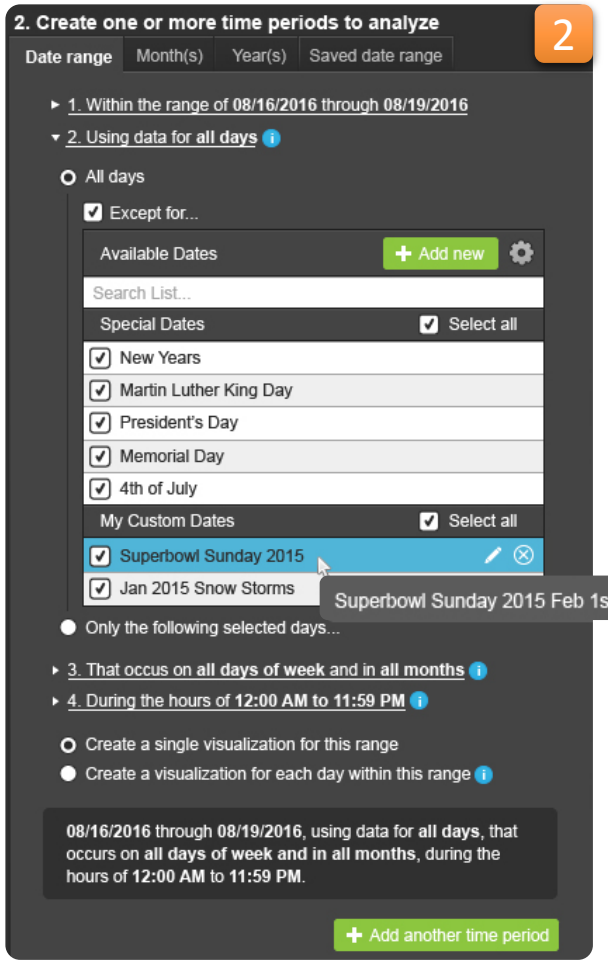
Q2: Advanced Time Selection

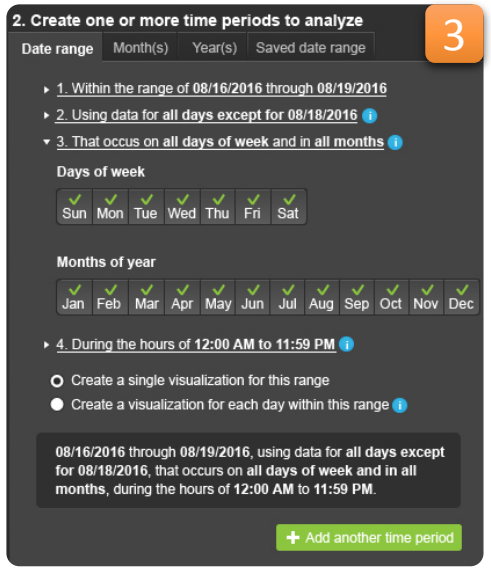
› Full control of analysis times (include/exclude holidays, certain dates, certain times, etc.)

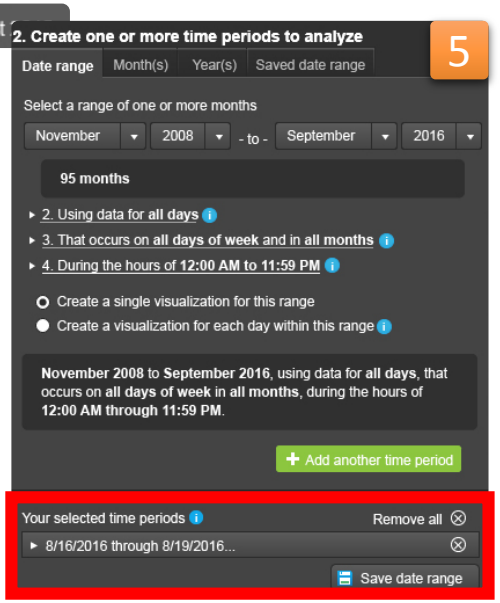
1. Select a date range
2. Include/exclude special dates
3. Customize days of week/months
4. Choose the hours
5. Save as a custom time period





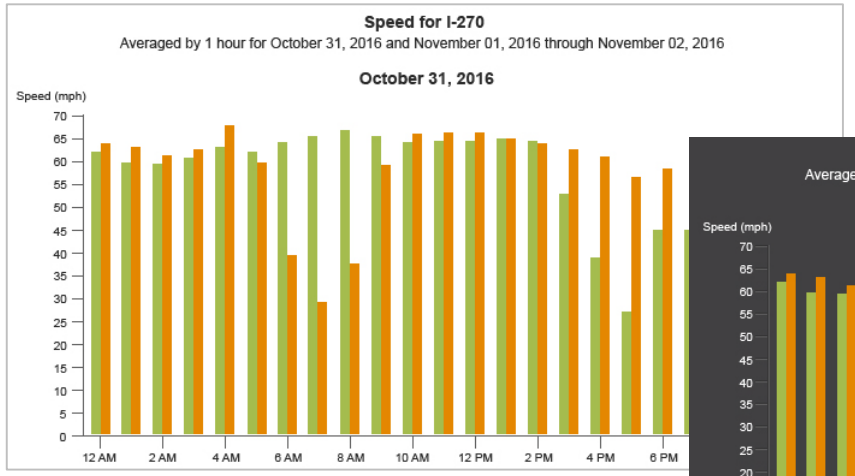


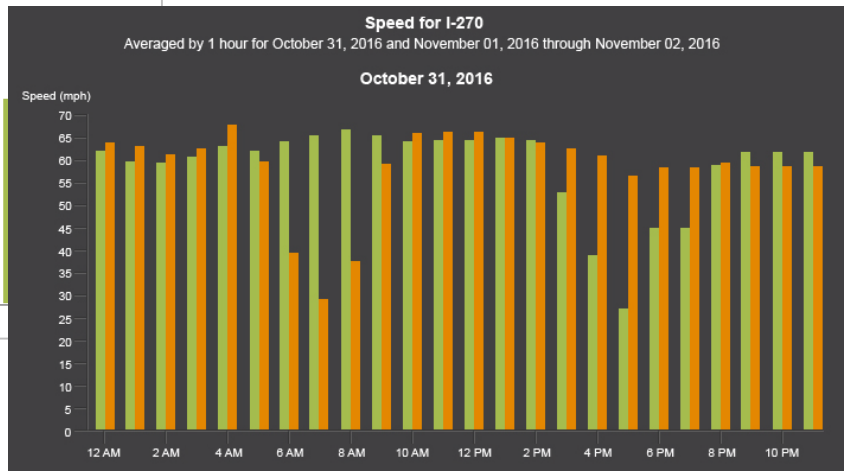




Q2: Custom Graph Formatting/Exports

- Axis thickness
- Fonts
- Font Size
- Font Colors
- Hide/Show Titles
- Background Colors





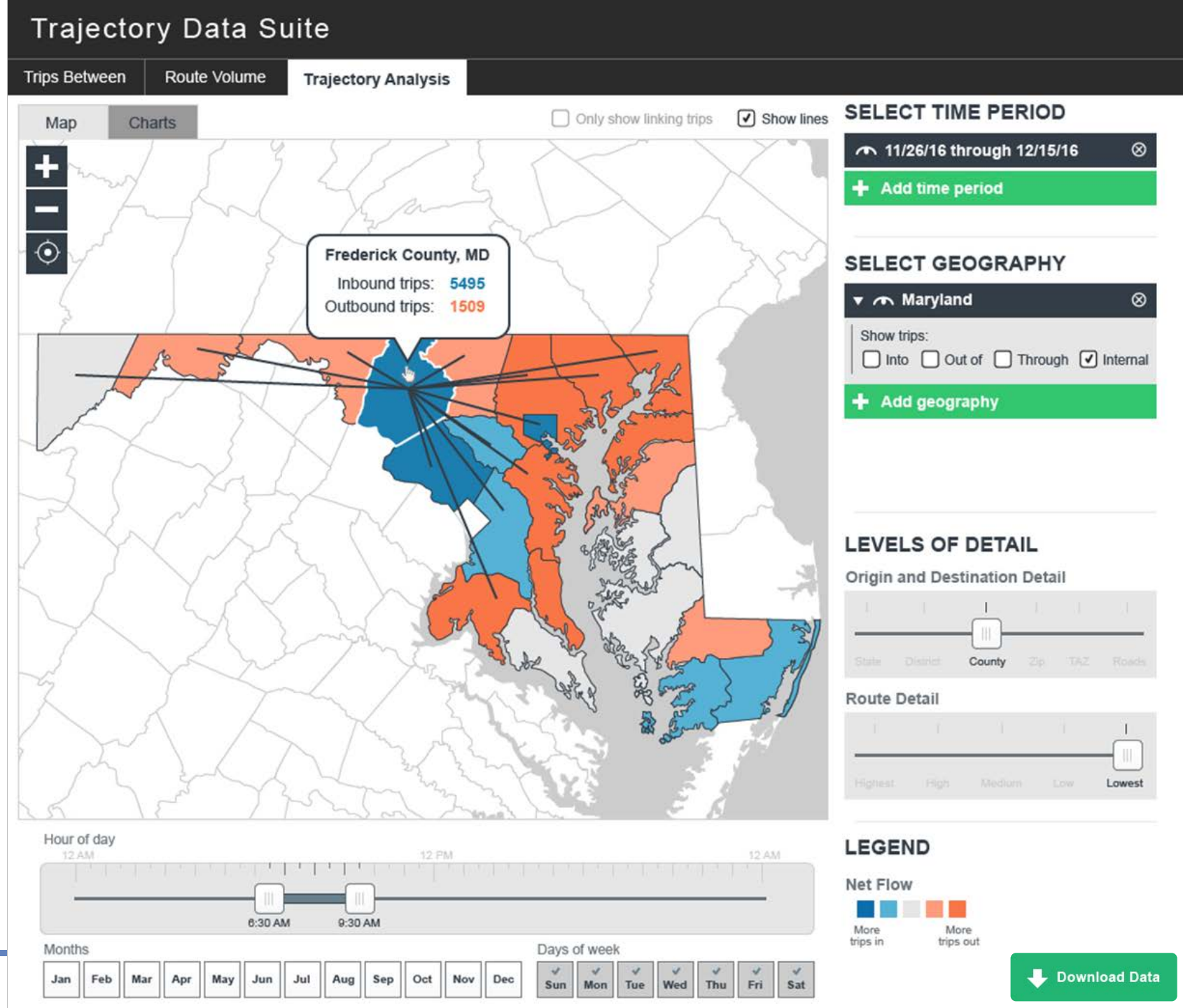
Paid for by:

pennsylvania
DEPARTMENT OF TRANSPORTATION

(Design TBD)

Q2: Trajectory (O-D) Data

- This will be a standalone app (not part of the PDA Suite)
- We are building it from a Use Case perspective, such as:
  - Traffic Impact Studies
  - Transit Routing
  - Detour Analysis
  - Evacuation Planning
- We are looking to form a Focus Group to help refine development and prioritization of additional use-cases and features



Thanks!

For more information, please contact:

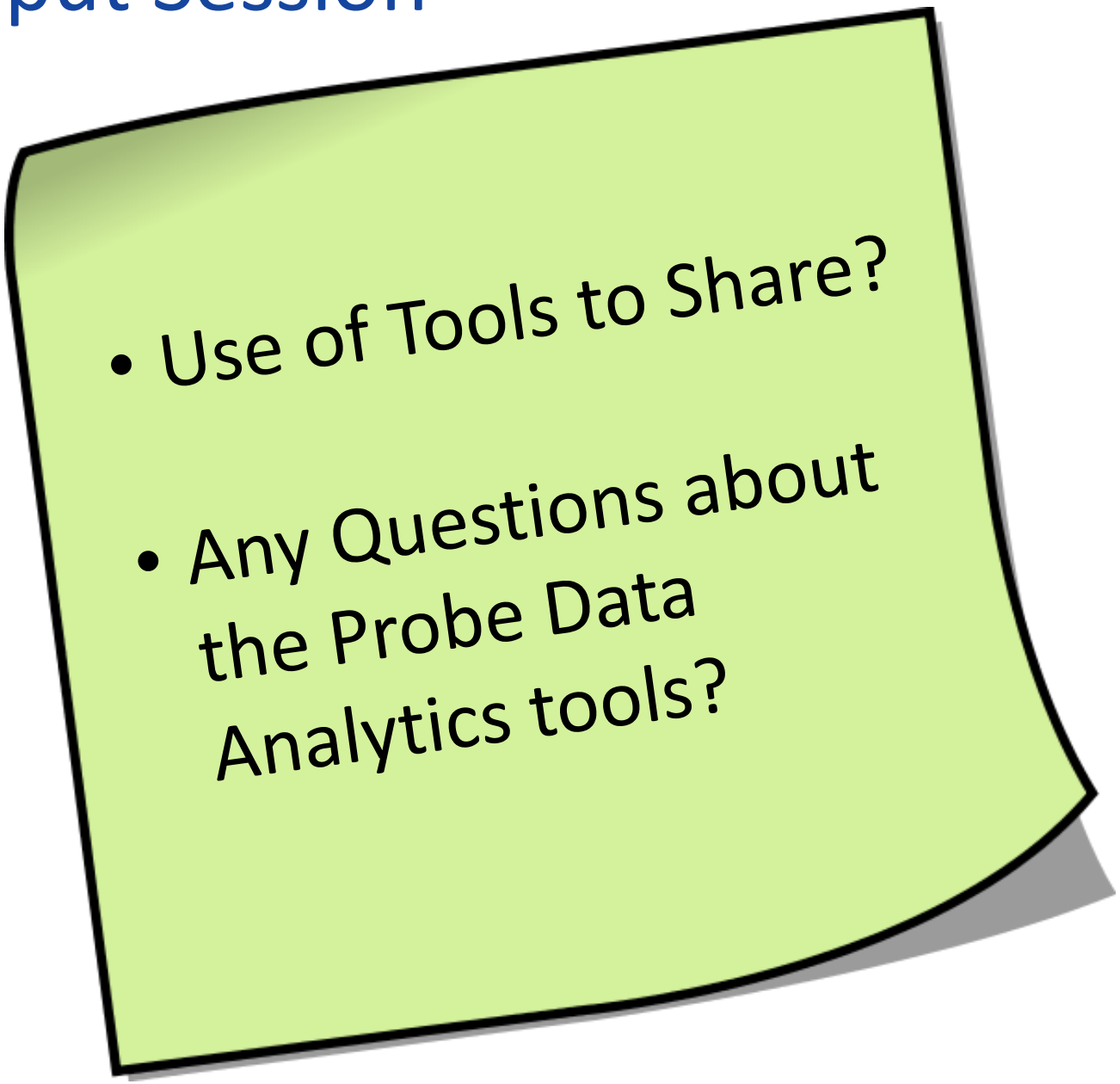
John Allen
Center for Advanced Transportation Technology Laboratory
jallen35@umd.edu | 215.666.3057 (c)

In the spotlight…

Visual Exploration of GPS Traces

Nikola Marković, Ph.D.

Agency Input Session



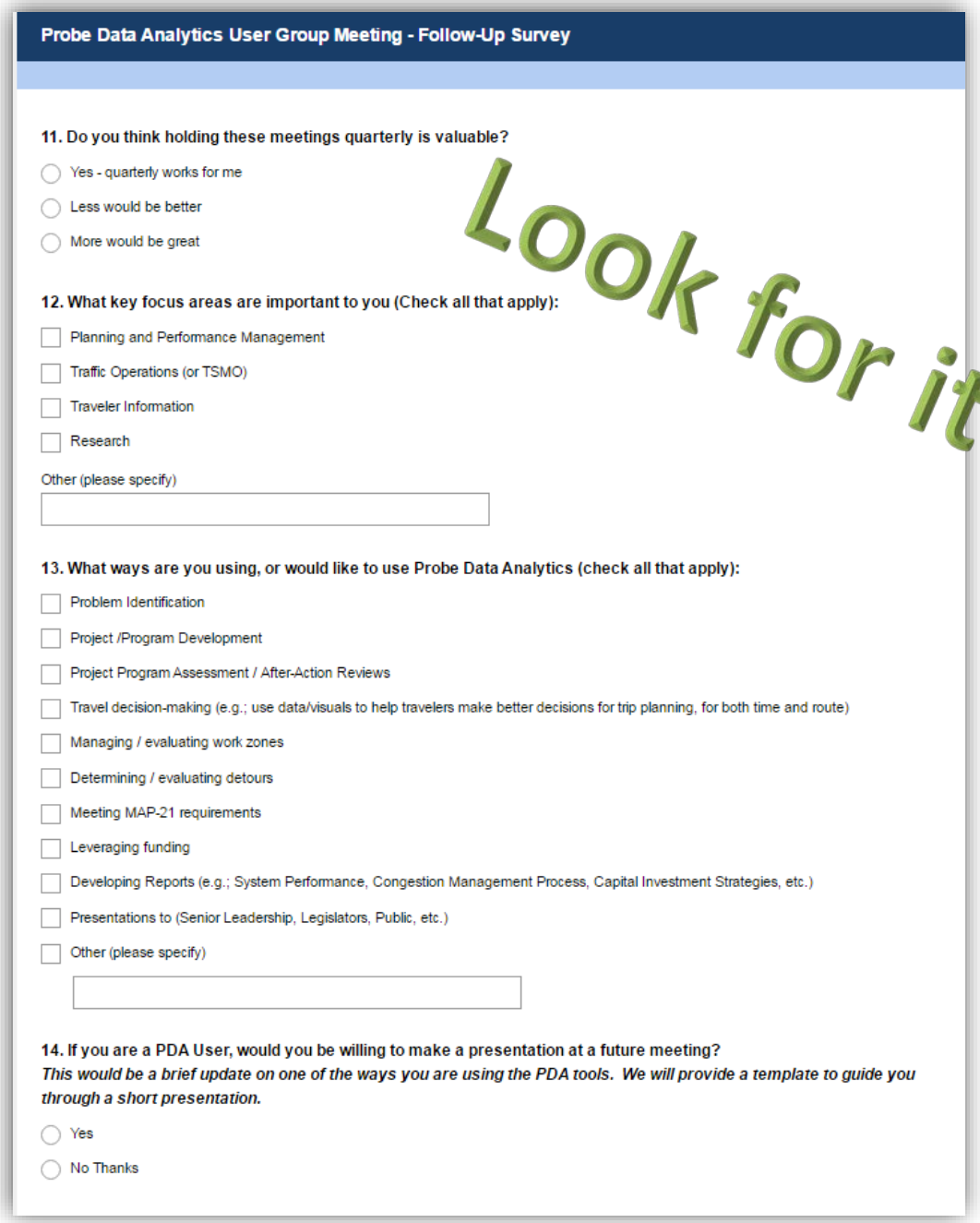
Wrap Up

Denise Markow, P.E., I-95 Corridor Coalition

- Thanks!
- Follow up Survey on Probe Data Analytics User Group meetings
- Next meeting

Follow up Survey on Probe Data Analytics User Group meetings

- What do you want to hear about/discuss during the meetings?
- How do you use the PDA tools?
- Are you willing to make a Spotlight Presentation?



Probe Data Analytics User Group Meeting - Follow-Up Survey

11. Do you think holding these meetings quarterly is valuable?

- ○ Yes - quarterly works for me
- ○ Less would be better
- ○ More would be great

12. What key focus areas are important to you (Check all that apply):

- ☐ Planning and Performance Management
- ☐ Traffic Operations (or TSMO)
- ☐ Traveler Information
- ☐ Research

Other (please specify)

13. What ways are you using, or would like to use Probe Data Analytics (check all that apply):

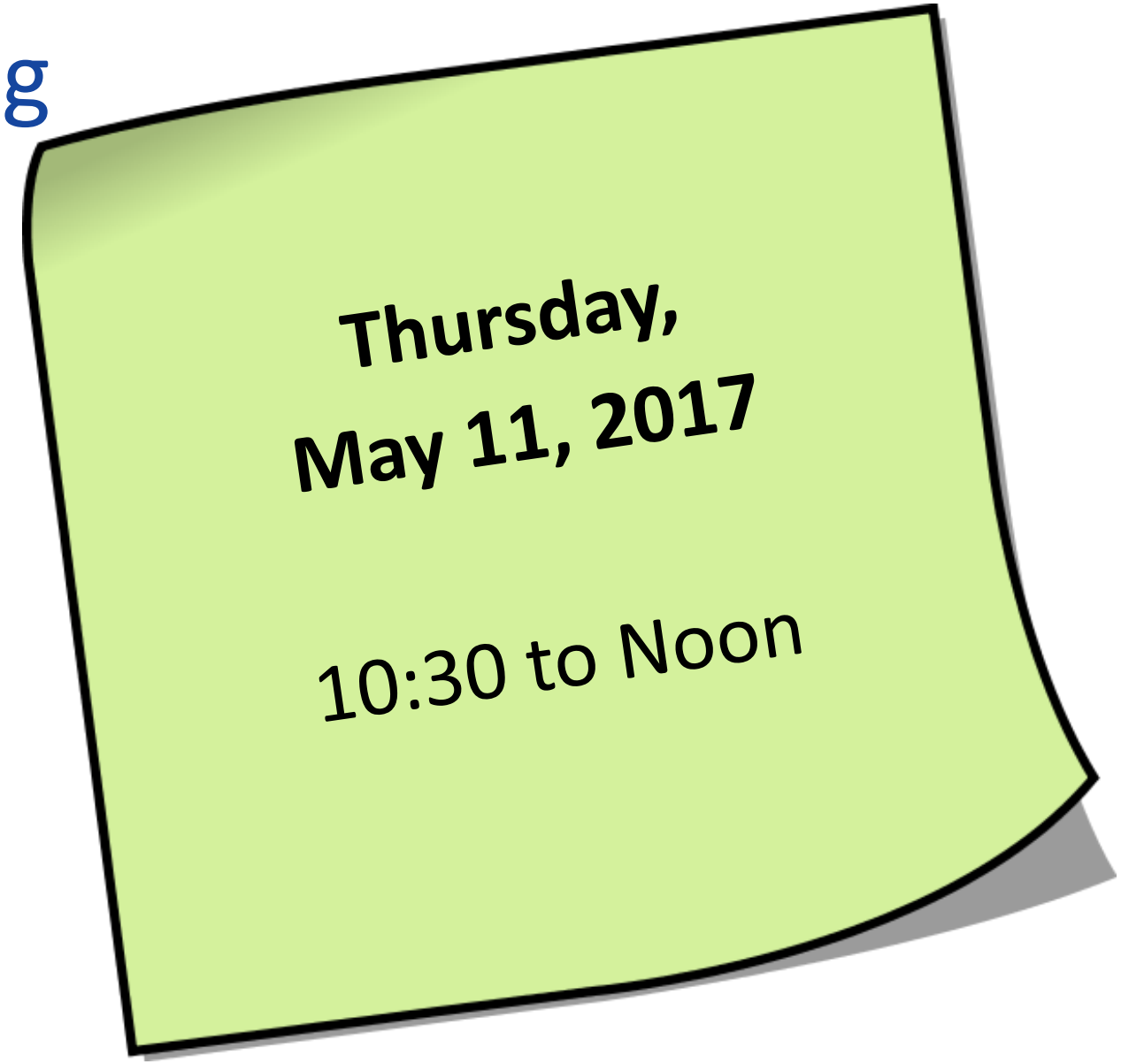
- ☐ Problem Identification
- ☐ Project /Program Development
- ☐ Project Program Assessment / After-Action Reviews
- ☐ Travel decision-making (e.g.; use data/visuals to help travelers make better decisions for trip planning, for both time and route)
- ☐ Managing / evaluating work zones
- ☐ Determining / evaluating detours
- ☐ Meeting MAP-21 requirements
- ☐ Leveraging funding
- ☐ Developing Reports (e.g.; System Performance, Congestion Management Process, Capital Investment Strategies, etc.)
- ☐ Presentations to (Senior Leadership, Legislators, Public, etc.)
- ☐ Other (please specify)

14. If you are a PDA User, would you be willing to make a presentation at a future meeting?
This would be a brief update on one of the ways you are using the PDA tools. We will provide a template to guide you through a short presentation.

- ○ Yes
- ○ No Thanks

Look for it!

Next Meeting



Thank You!

For Questions, please contact:

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VPP Suite Technical Support – vpp-support@ritis.org

Logistics – Joanna Reagle 610.228.0760 or jreagle@kmjinc.com