

An Interactive, Scalable Before-After Evaluation of 95 Express Lanes in Virginia

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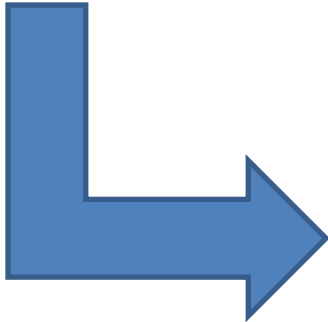
NATMEC 2016

Overview

- Background
- Workflow and Outputs
 - Scalability
 - Interactivity
 - Data quality assessments

Background

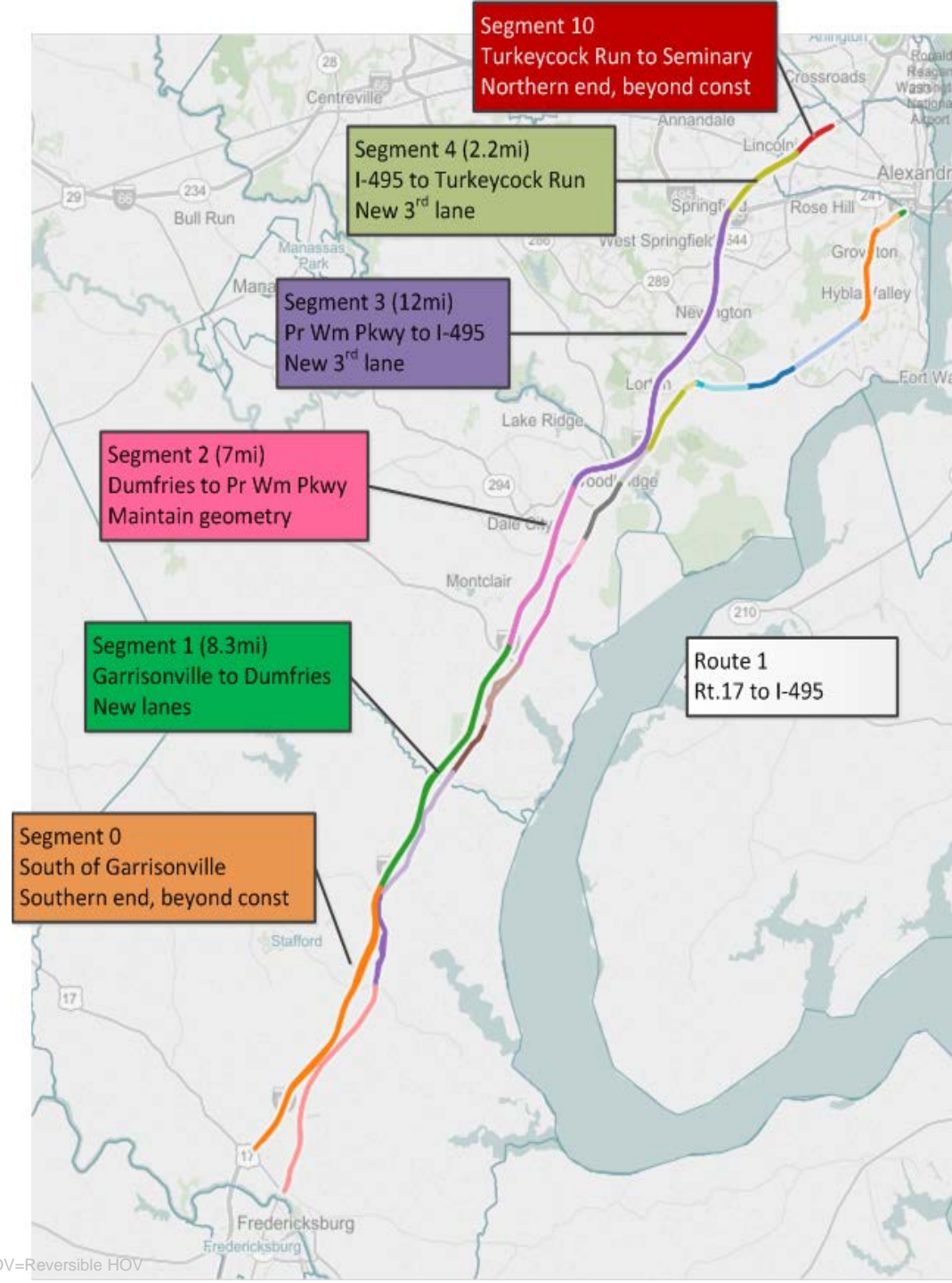
Courtesy: Google Earth



Billion-dollar public-private partnership; Fluor-Transurban, design-build contract; 73 years concession to manage and fund all operations and maintenance; Dynamic pricing, for reliability of trip travel time; EZ pass required for all vehicles. Car and van pools, motorcycles, emergency vehicles, buses are free. Hybrids were previously free; Trucks are not allowed.

More Details

- Previously RHOV lanes
- Dec 14, 2015 – open free; Dec 29 – open with tolls
- 29-mile corridor: 4 construction segments
- ATM, narrow shoulders



Project Purpose

- Evaluate speed, volume changes
 - on general purpose and reversible lanes, within each segment; and on Route 1.
 - during weekdays (T-R), Fridays, weekends.
 - during pre-peak, peak (old RHOV hours) and post-peak periods.
- Crashes

Project Scope

- a week, a month, few months after the lanes open
- snapshot analysis
 - 2 mos before (Oct-Nov 2014) and 2 mos after (Jan-Feb 2015)

Project Scope

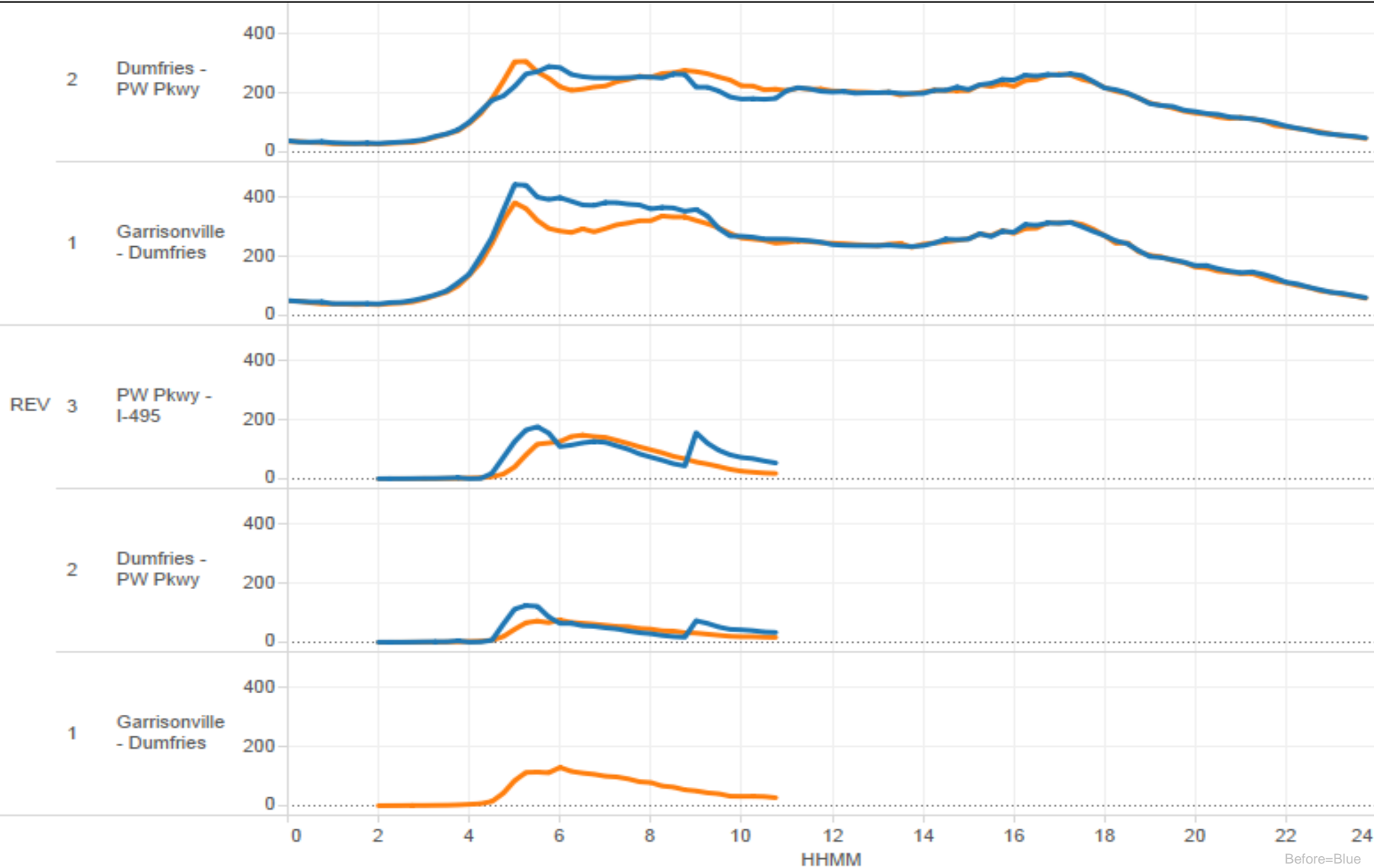
- Lot of data, options, graphs

The image displays a Tableau project configuration interface with several interactive controls:

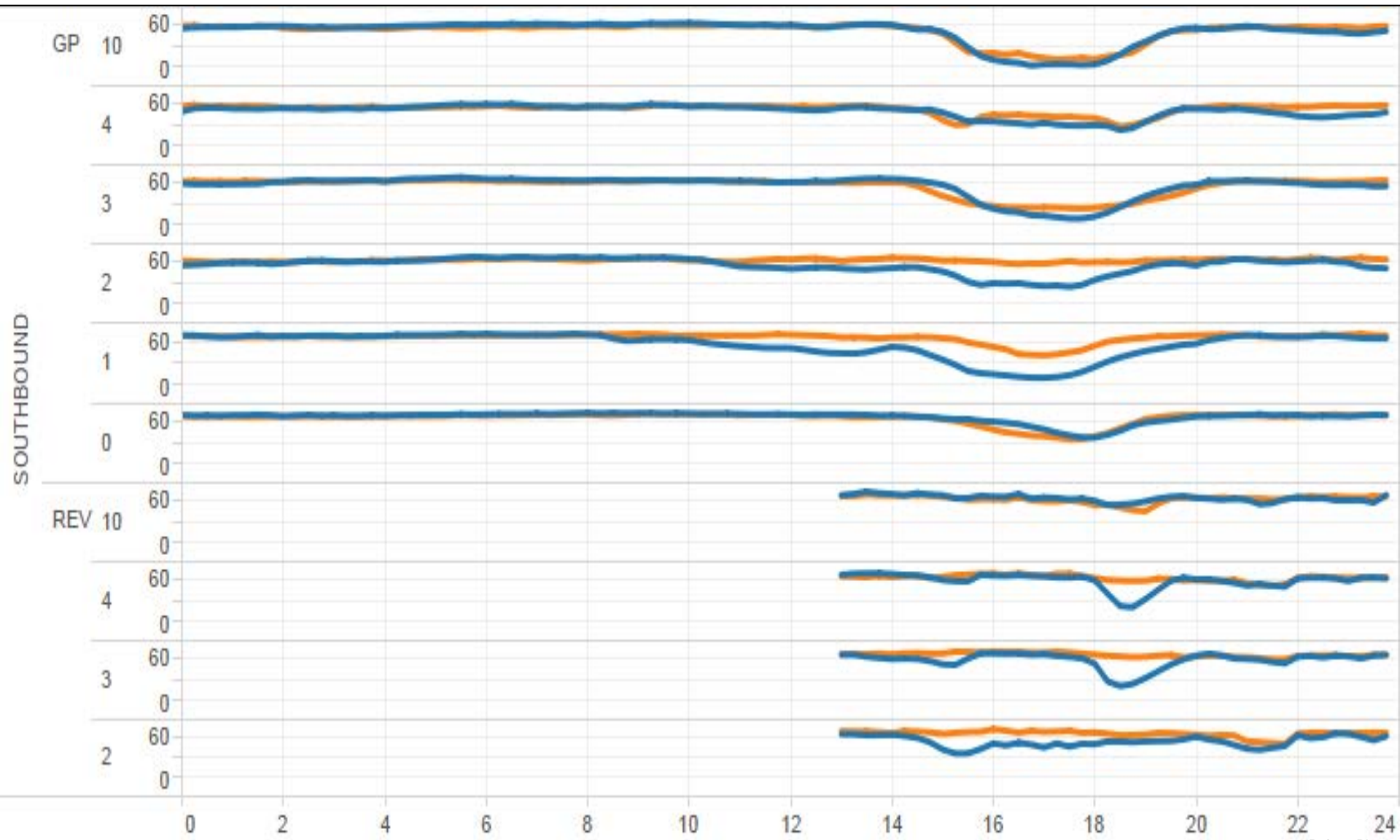
- AMperiodStart:** A text input field containing "6:00" and a slider below it.
- AMperiodEnd:** A text input field containing "9:00" and a slider below it.
- PMperiodStart:** A text input field containing "15:30" and a slider below it.
- PMperiodEnd:** A text input field containing "18:00" and a slider below it.
- FirstDayofBeforePeriod:** A date input field containing "10/1/2014".
- LastDayofBeforePeriod:** A date input field containing "12/12/2014".
- FirstDayofAfterPeriod:** A date input field containing "12/29/2014".
- LastDayofAfterPeriod:** A date input field containing "2/28/2015".
- Exclusion Dates:** A dropdown menu with the text "(Multiple values)" and a downward arrow.
- DOW:** A list of days with checkboxes: (All) [], Null [x], Sunday [], Monday [], Tuesday [x], Wednesday [x], Thursday [x], Friday [], Saturday [].
- BI-PTIpercent:** A text input field containing "0.85" and a slider below it.
- Road Type:** Radio buttons for Interstate [x] and Rt-1 [].
- Direction:** Radio buttons for NORTHBOUND [x] and SOUTHBOUND [].
- Lane Type:** Radio buttons for GP [x] and REV [].

Tableau provided interactive, drill-down capabilities, beyond a set of static graphs. What happens if we include or exclude Fridays, or specific dates; Only Monday mornings? Change peak period definitions? Different percentage value for Buffer Index?

Sample Results: 95NB Volumes



95SB Speeds



Before=Blue

Rt.1 Ranked Bottlenecks

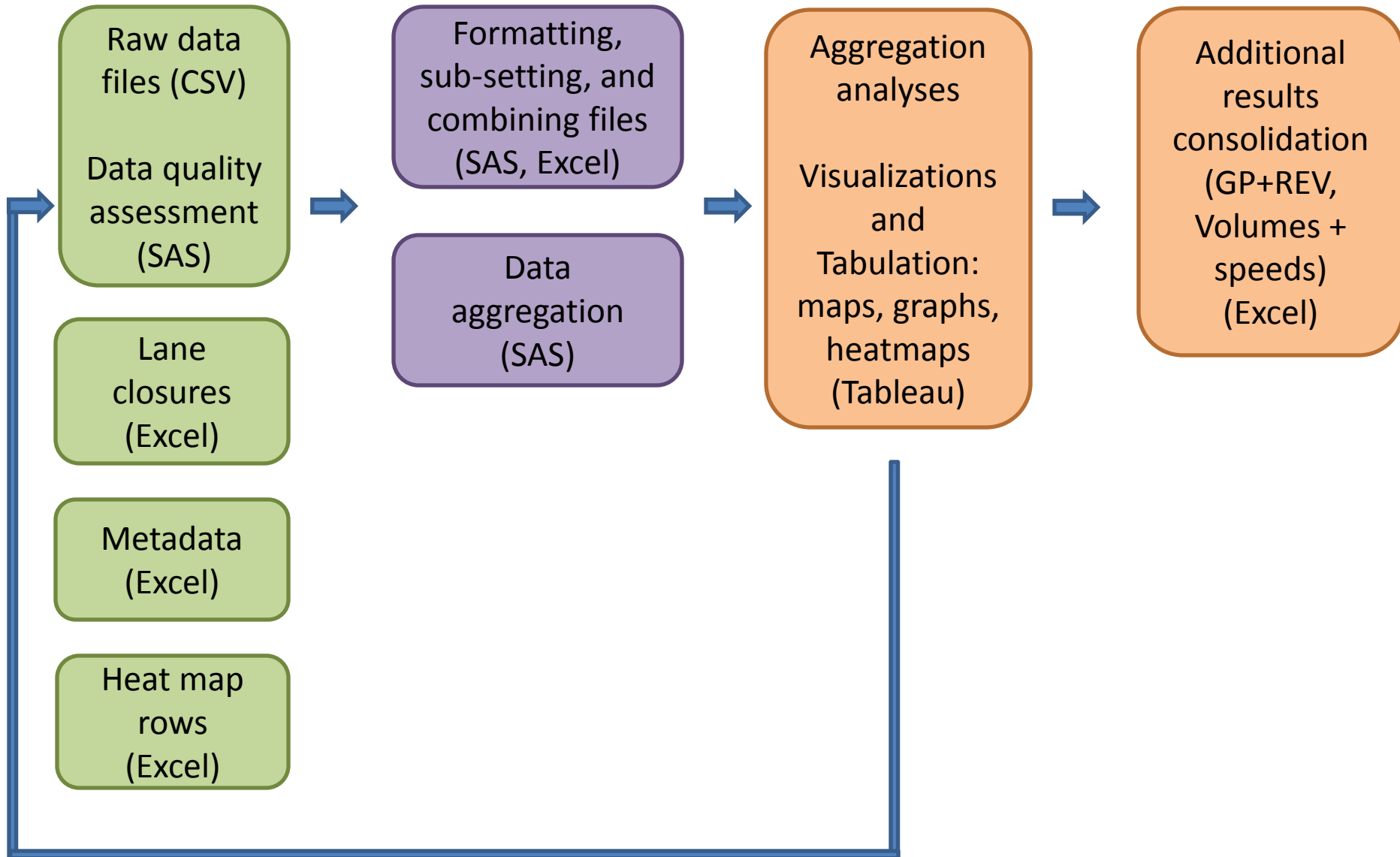
Rank	Direction	Tmc Code	Length (mi)	North interchange	South interchange	PeakPeriod2	After Speed & Change
1	NORTHBOUND	110+09531	0.9	Opitz Blvd	Dale Blvd.	PMpre-peak	25.25 -10.5%
2	NORTHBOUND	110+09524	2.2	Courthouse Rd.	Rt.17	AMpre-peak	40.60 -7.5%
3	NORTHBOUND	110+09531	0.9	Opitz Blvd	Dale Blvd.	AMpost-peak	26.85 -7.4%
4	NORTHBOUND	110+09531	0.9	Opitz Blvd	Dale Blvd.	PMpeak	26.53 -6.8%
5	NORTHBOUND	110+09531	0.9	Opitz Blvd	Dale Blvd.	AMpre-peak	32.06 -6.6%
6	NORTHBOUND	110+09531	0.9	Opitz Blvd	Dale Blvd.	OffPeak	30.19 -6.5%
7	SOUTHBOUND	110-09530	0.9	Opitz Blvd	Dale Blvd.	PMpre-peak	30.93 -6.5%
8	NORTHBOUND	110+05639	1.6	Fairfax County Pkwy	Telegraph Road	AMpost-peak	38.57 -6.4%
9	NORTHBOUND	110+05647	0.9	Huntington Ave.	N Kings Hwy (VA 241)	AMpost-peak	33.05 -5.8%
10	SOUTHBOUND	110-05634	1.1	Lorton Rd.	I-95	PMpre-peak	43.87 -5.6%

Rt.1 Data Quality Analysis

Benefits of Tableau

- Fast and easy setup
- Interactive, drill down analyses using filters
 - Limitations exist. But very powerful!!
- Multiple output options: Graphs, maps, heat maps, tables

Workflow Overview



Workflow outside Tableau

- Subset
 - Delete unused direction of reversible lanes data
- Formatting
 - Date and time together (lane closures, volume data) + format
 - Multiple Excel files (65,536 rows limit)
- Heat maps
 - Used TMC lengths to create dummy rows
- Initial aggregation of only high quality data
- Metadata changes: Rt.1 @Telegraph Rd.

Southbound									
Seg.	Lane Type	AM Peak				PM Peak			
		Vol*	%	Speed*	%	Vol*	%	Speed*	%
10	GP	-	-	58.40	-4.1%	-	-	30.58	28.3%
	REV	-	-	-	-	4,588	-14.8%	61.04	-4.8%
	Total	-	-	-	-	-	-	-	-
4	GP	12,969	4.4%	57.00	-1.9%	15,401	11.9%	47.78	17.9%
	REV	-	-	-	-	-	-	65.73	3.6%
	Total	-	-	-	-	-	-	-	-
3	GP	10,010	-7.0%	61.50	-2.8%	13,763	1.6%	37.77	23.3%
	REV	-	-	-	-	8,775	41.0%	67.06	4.5%
	Total	-	-	-	-	22,558	14.0%	-	-
2	GP	9,458	-5.9%	63.45	-1.6%	10,391	19.5%	61.12	76.5%
	REV	-	-	-	-	3,450	72.7%	66.09	29.9%
	Total	-	-	-	-	13,841	29.4%	-	-
1	GP	9,307	-7.4%	66.23	0.4%	8,561	-7.9%	50.52	89.2%
	REV	-	-	-	-	2,758	-	-	-
	Total	-	-	-	-	11,319	21.7%	-	-
0	GP	7,231	-6.6%	67.10	-2.1%	11,791	-0.7%	48.61	-11.5%



Northbound									
Seg.	Lane Type	AM Peak				PM Peak			
		Vol*	%	Speed*	%	Vol*	%	Speed*	%
10	GP	13,402	11.9%	31.61	-5.8%	12,459	0.3%	55.09	1.5%
	REV	6,379	-14.5%	54.29	-8.4%	-	-	-	-
	Total	19,781	1.8%	-	-	-	-	-	-
4	GP	10,288	-5.5%	30.52	6.3%	8,605	-3.3%	55.80	10.2%
	REV	-	-	60.43	-3.3%	-	-	-	-
	Total	-	-	-	-	-	-	-	-
3	GP	19,509	0.1%	48.86	50.7%	11,180	-3.0%	62.80	0.6%
	REV	8,294	23.6%	65.51	6.0%	-	-	-	-
	Total	27,805	6.1%	-	-	-	-	-	-
2	GP	11,476	-6.6%	52.54	66.4%	9,645	-3.8%	62.83	-1.4%
	REV	2,523	28.5%	67.95	3.2%	-	-	-	-
	Total	13,999	-1.8%	-	-	-	-	-	-
1	GP	11,024	-17.5%	63.44	4.9%	8,838	-0.2%	64.61	-2.6%
	REV	2,176	-	-	-	-	-	-	-
	Total	13,200	-1.3%	-	-	-	-	-	-
0	GP	12,850	-2.0%	56.49	6.2%	7,554	-5.1%	68.81	-0.3%

Lane	Seg.	SouthBound												NorthBound											
		Volume			Speed			Volume			Speed			Volume			Speed								
		Pre-AM	AM	Post-AM	Pre-AM	AM	Post-AM	Pre-PM	PM	Post-PM	Pre-PM	PM	Post-PM	Pre-AM	AM	Post-AM	Pre-AM	AM	Post-AM	Pre-PM	PM	Post-PM	Pre-PM	PM	Post-PM
GP	10	-	-	-	-5.1%	-4.1%	-2.7%	-	-	-	-0.3%	28.3%	-1.2%	6.8%	11.9%	2.2%	-3.0%	-5.8%	-7.4%	5.8%	0.3%	-3.0%	2.7%	1.5%	1.7%
	4	1.9%	4.4%	11.7%	-3.7%	-1.9%	-2.2%	29.5%	11.9%	24.2%	-1.8%	17.9%	6.1%	19.7%	-5.5%	11.6%	-4.3%	6.3%	-5.4%	-1.4%	-3.3%	-5.8%	33.0%	10.2%	6.8%
	3	-14.0%	-7.0%	-4.0%	-3.4%	-2.8%	-0.5%	23.8%	1.6%	19.6%	-7.8%	23.3%	0.5%	8.9%	0.1%	18.3%	-7.1%	50.7%	18.7%	-0.3%	-3.0%	-3.8%	32.1%	0.6%	-0.3%
	2	-10.4%	-5.9%	-0.4%	-2.5%	-1.6%	-0.4%	15.3%	19.5%	2.1%	27.8%	76.5%	21.6%	8.1%	-6.6%	24.5%	-23.2%	66.4%	-1.2%	-0.9%	-3.8%	-1.0%	13.6%	-1.4%	-2.2%
	1	-12.5%	-7.4%	-6.2%	-1.9%	0.4%	7.1%	-6.3%	-7.9%	-23.5%	36.7%	89.2%	34.0%	-18.9%	-17.5%	-4.1%	9.5%	4.9%	7.8%	0.2%	-0.2%	-0.4%	2.9%	-2.6%	0.3%
	0	-11.7%	-6.6%	-2.7%	-1.5%	-2.1%	-1.6%	1.0%	-0.7%	-10.4%	-3.0%	-11.5%	1.7%	-10.5%	-2.0%	-2.0%	7.1%	6.2%	4.8%	-3.5%	-5.1%	-4.7%	-1.5%	-0.3%	-0.3%

Rev	10	-60.6%	-14.8%	-39.2%	-1.5%	-4.8%	-6.4%	-27.4%	-14.5%	-17.4%	-2.0%	-8.4%	-3.4%
	4	-	-	-	-0.4%	3.6%	29.4%	-	-	-	-2.2%	-3.3%	-1.6%
	3	-51.6%	41.0%	-38.7%	10.7%	4.5%	42.0%	-42.0%	23.6%	-60.0%	2.2%	6.0%	13.4%
	2	-58.7%	72.7%	-35.6%	14.5%	29.9%	15.2%	-44.0%	28.5%	-55.6%	-4.0%	3.2%	0.2%

- Note:
- *After Period Peak Period Volume and Speed. Holidays and suspect data excluded.
 - Before Period: 10/1-12/12. After Period: 12/29-2/28. Day of Week: Tuesday, Wednesday, Thursday.
 - AM Peak: 6:00-9:00. PM Peak: 15:30-18:00
 - AM Pre-Peak: 5:00-6:00; AM Post-Peak: 9:00-10:00; PM Pre-Peak: 13:00-15:30; PM Post-Peak: 18:00-20:00.

Tableau Limitations

- Color palettes – nice, but limited
- Aggregation of aggregation
 - Combined average volume on GP + REV lanes
- Time of day and date
- Uniform cell size in tables

- Information overload: no easy way out
 - Many outputs, data quality assessments
 - Many tabs or many files?
 - Filters on each tab, or one filters tab?
 - Color-coded tabs

Take Aways

- Scalability and interactivity desired, but also overwhelming
- Customization, semi-automation feasible with these tools
- Build and they will come!

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