

# RITIS Workshop

## Using Trip Analytics to Support Operations & Planning

April 20, 2023



Our Team Welcomes You!



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CATT Lab



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CATT Lab



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CATT Lab

# RITIS Workshop

Today we're presenting a 90-minute workshop on using **Trip Analytics**, divided into two sessions:

## Introduction: How it works (10 minutes)

### Session 1 for Operators (1:00pm – 1:45pm)

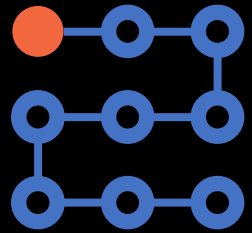
- "Last-mile" routes and travel time statistics
- Testing device deployments (ramp metering)
- Detour route planning
- Signal timing Before & After use case

### Session 2 for Planners (1:45 – 2:30pm)

#### Introduction: (5 minutes)

- OD matrices for model calibration, etc. (from macro to micro)
- Bottleneck Mitigation Before & After use case
- Document urban truck route compliance in neighborhoods

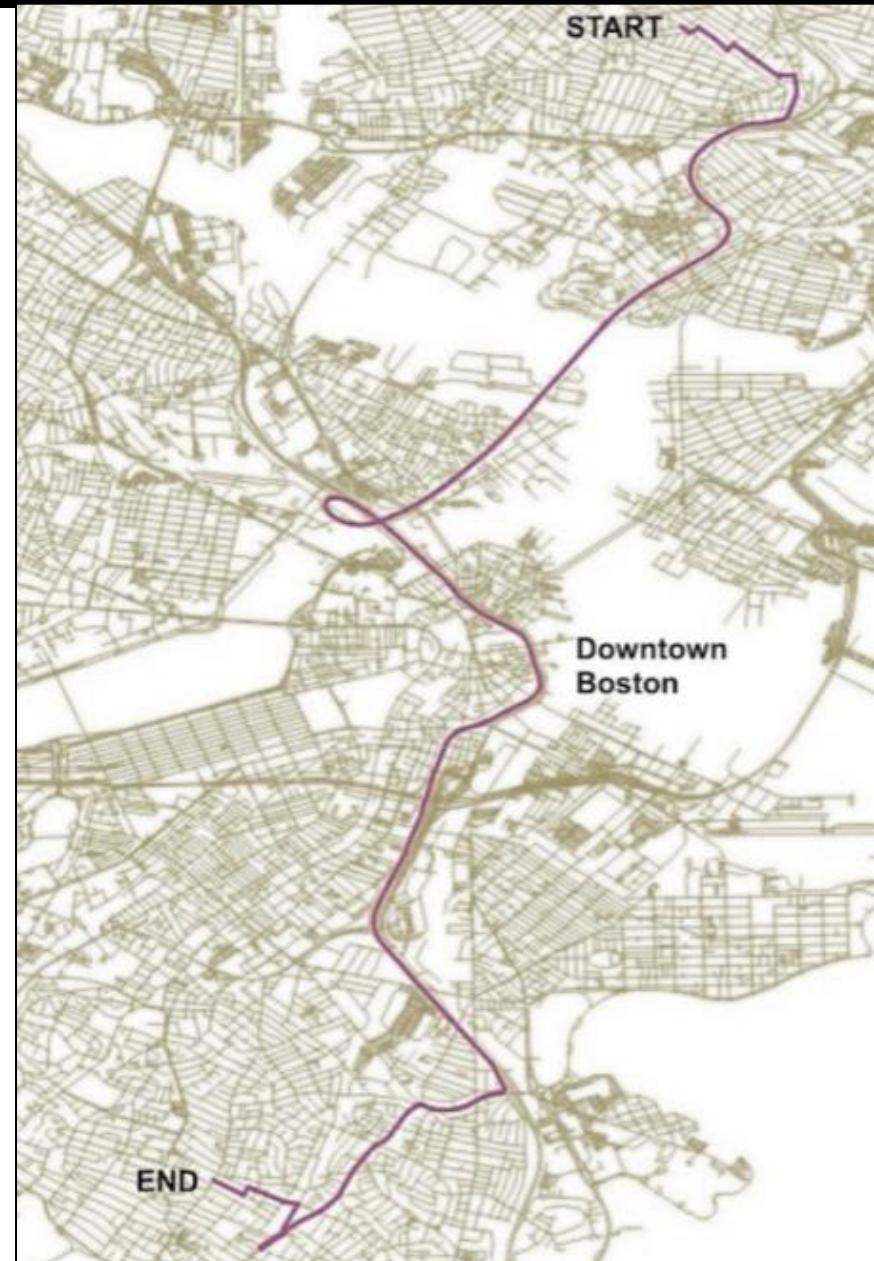




# Trip Analytics Introduction

## The Big Picture – What are we doing here?

- We want to learn about patterns of how things move – in this case, cars or trucks on highways – by analyzing samples of real-world trips
- Data sources are GPS pings from cell phones, connected vehicles and trucking fleets, etc., fitted to roadway networks
- When datasets like this includes full pathways, more insight can be gained than when only the start- and endpoints are provided



## Where we start:

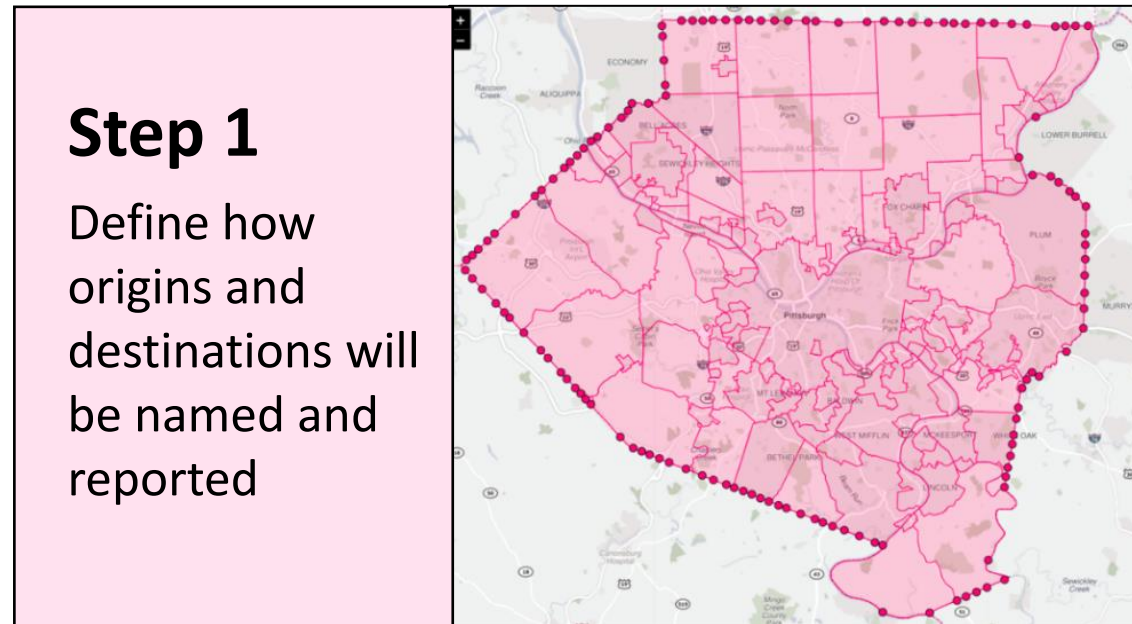
We need a map with roads and zones (like counties, census tracts, or other / custom) so we can report trip patterns (O's, D's, and shared routes)

We need fixed names of places, just like a...

- deck plan for an ocean liner or jet
- stadium or concert hall venue map
- floor plan for a building

These names will define the origins and destinations of the trips we care about

Therefore, **Step 1** is to set up zones and gates to define O's and D's:



## Step 1

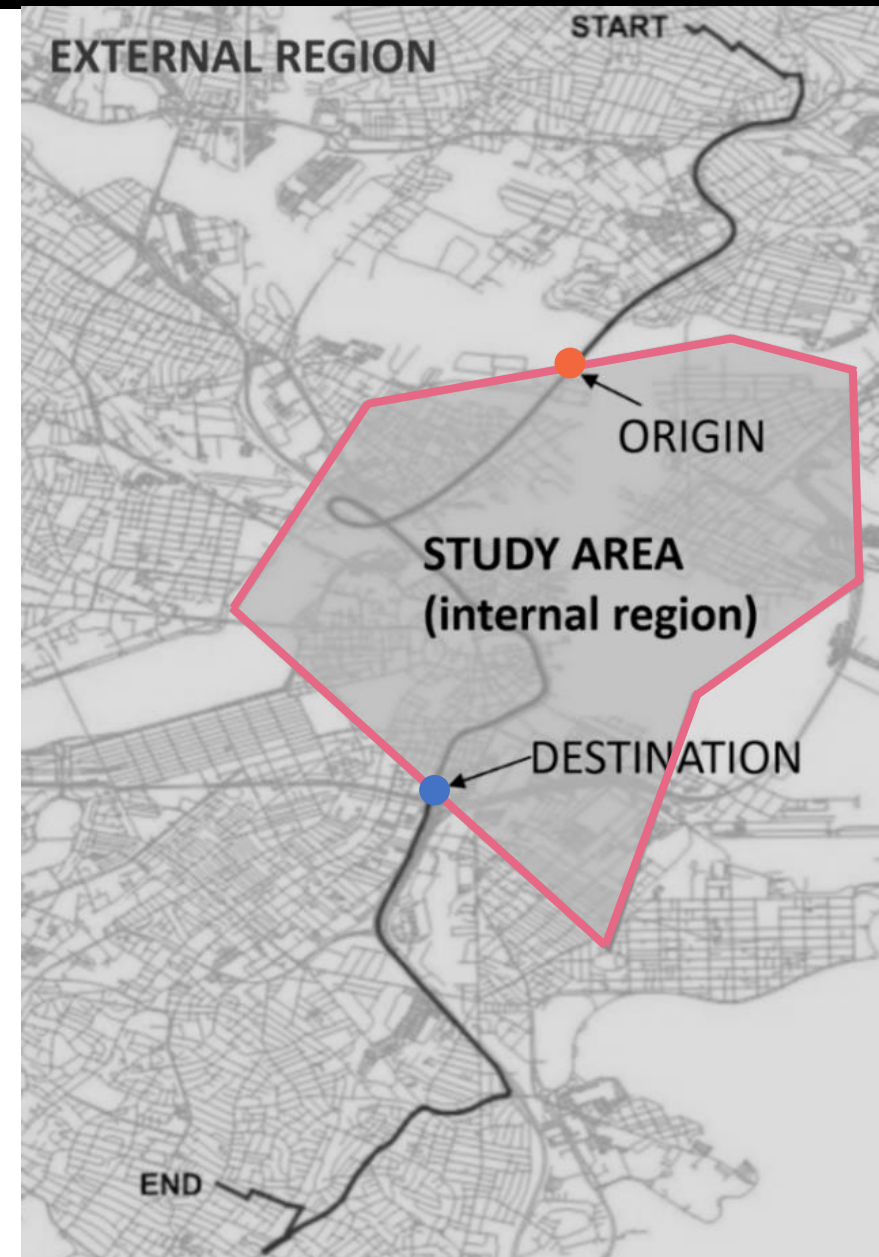
Define how origins and destinations will be named and reported

Define a **pink** study area, internal zones, and OD gates (**red dots**) or external zones

Set-up is done **just once**, at the start of each new study

All investigations begin by defining a ***study area***:

- Any polygon can serve as a bounded study area; this divides the map into internal and external regions (right)
- A study area can be unbounded such that it contains the full extent of all pathways in the dataset (i.e. everywhere is ‘internal’)





## Step 1

Define how origins and destinations will be named and reported

## 1. Define the Study Area

(bounded / unbounded?)

(assemble from zones or load a custom polygon)

### 1. Study: Pittsburgh truck study

**Define Study Area**

Your study area may be bounded or unbounded. If bounded, origins and destinations for trips that started or ended externally are reported as the road segments on which those trips crossed the boundary line (these are called *OD gates*). Otherwise, internal zones are used to report all origins and destinations.

Choose one of the following options:

**Option 1**  Do not bound the study area.

**Option 2**  Use the data set's base geography to bound the study area.

**Option 3**  Use a custom geography to bound the study area.

Use Predefined Areas  Load File

Assemble a single, contiguous area by selecting adjacent areas. Make selections by clicking on the map or from one of the following sets:

Counties  
Pennsylvania (Allegheny County) ▼

Subcounties  
Select... ▼

TAZs  
Select... ▼

ZIP Codes  
Select... ▼

Next

# SET-UP

## Step 1

Define how origins and destinations will be named and reported

### 1. Define the Study Area

(bounded / unbounded?)

(assemble from zones or load a custom polygon)

### 1. Study: Pittsburgh truck study

**Define Study Area**

Your study area may be bounded or unbounded. If bounded, origins and destinations for trips that started or ended externally are reported as the road segments on which those trips crossed the boundary line (these are called *OD gates*). Otherwise, internal zones are used to report all origins and destinations.

Choose one of the following options:

- Option 1**  Do not bound the study area.
- Option 2**  Use the data set's base geography to bound the study area.
- Option 3**  Use a custom geography to bound the study area.

Use Predefined Areas  Load File

Assemble a single, contiguous area by selecting adjacent areas. Make selections by clicking on the map or from one of the following sets:

- Counties  
Pennsylvania (Allegheny County)
- Subcounties  
Select...
- TAZs  
Select...
- ZIP Codes  
Select...

Next



**Specify Internal Zones for Origins and Destinations**

Internal zones will be used to report origins and destinations inside the study area. You may specify a predefined zone layer (e.g. counties or ZIP codes), or load a zone file in GeoJSON format.

Use Predefined Zones  Load File

Subcounty

Next

**Specify External Zones**

External zones will only be used when the analyst wants information beyond the OD gates, to understand where external (trimmed) legs actually started or ended. A control box will be provided later enabling the analyst to toggle between OD gates and external zones.

County

Next

**Name Study**

Pittsburgh truck study

Save Changes Create Clone Study Cancel

### 2. Define internal zones

### 3. Define external zones (if needed)

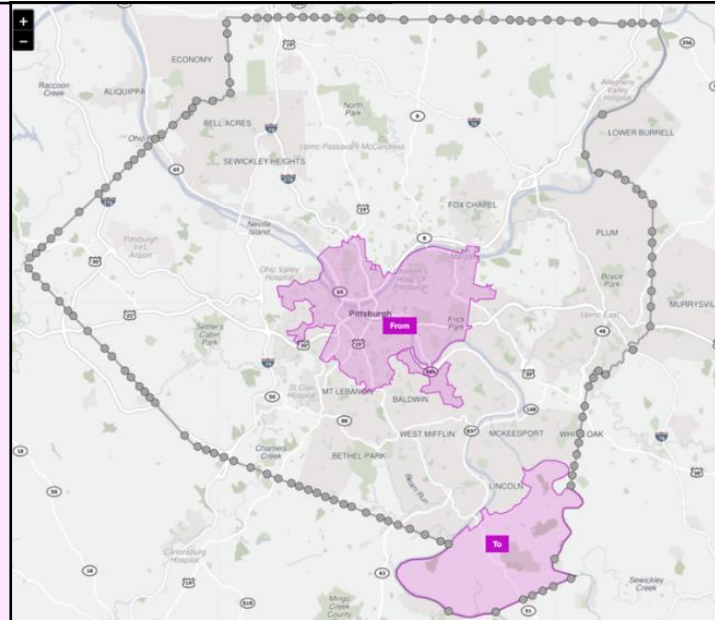
### 4. Save to My Studies

Now that we have decided how to name the origins and destinations of the trips we care about, we can go about finding the trips we care about!

(Over and over, for different scenarios)

## Step 2

Set filters and submit as many queries as needed to achieve study goals



Spatial filter polygons are **purple**

Each query finds a group of similar trips based on **where** they went, **when** they went there, and **which ones** went there

## Step 2

Set filters and submit as many queries as needed to achieve study goals

Name or load any polygon as a spatial filter, and use intuitive menus to set the parameters

Use flexible pass-through check-boxes to gather similar trips:

Select pass-through settings for this filter:

...commuter arrivals, 7-9 a.m.	<input type="checkbox"/> Started Inside	<input checked="" type="checkbox"/> Ended Inside	
	<input checked="" type="checkbox"/> Started Outside	<input type="checkbox"/> Ended Outside	
...commuter departures, 4-6 p.m.	<input checked="" type="checkbox"/> Started Inside	<input type="checkbox"/> Ended Inside	
	<input type="checkbox"/> Started Outside	<input checked="" type="checkbox"/> Ended Outside	
...cut-through traffic	<input type="checkbox"/> Started Inside	<input type="checkbox"/> Ended Inside	
	<input checked="" type="checkbox"/> Started Outside	<input checked="" type="checkbox"/> Ended Outside	
...local-only traffic	<input checked="" type="checkbox"/> Started Inside	<input checked="" type="checkbox"/> Ended Inside	
	<input type="checkbox"/> Started Outside	<input type="checkbox"/> Ended Outside	
User wants all samples analyzed	<input checked="" type="checkbox"/> Started Inside	<input checked="" type="checkbox"/> Ended Inside	
	<input checked="" type="checkbox"/> Started Outside	<input checked="" type="checkbox"/> Ended Outside	

### 1. Where did they go? (spatial)

**Set Spatial Filter(s)**

**Spatial Filter 1**

From  To

Use an area as a Spatial Filter: Mount Oliver - 0035174401214810 (Allegheny County), Pennsylvania and Pittsburgh - 0036100001214818 (Allegheny County), Pennsylvania

Include trips that:

Started Inside

Started Outside

**Spatial Filter 2**

From  To

Use an area as a Spatial Filter: Elizabeth - 0032300001215802 (Allegheny County), Pennsylvania and Forward - 0032689601215805 (Allegheny County), Pennsylvania

Include trips that:

Ended Inside

Ended Outside

### 2. When did they go there? (temporal)

**Set Temporal Filter(s)**

Choose a time range to analyze data in.

Use precise temporal filtering. ⓘ

Times  Dates  Months  Year

**Start Month**

**End Month**

**4 months**

**Time of Day:**

All day

- to -

**Days of Week:**

Sun Mon  Tue  Wed  Thu  Fri  Sat

**Done**

### 3. Which ones went there? (other attributes)

**Set Other Filter(s)**

Choose from the following filtering options to narrow down your trips.

Vehicle type

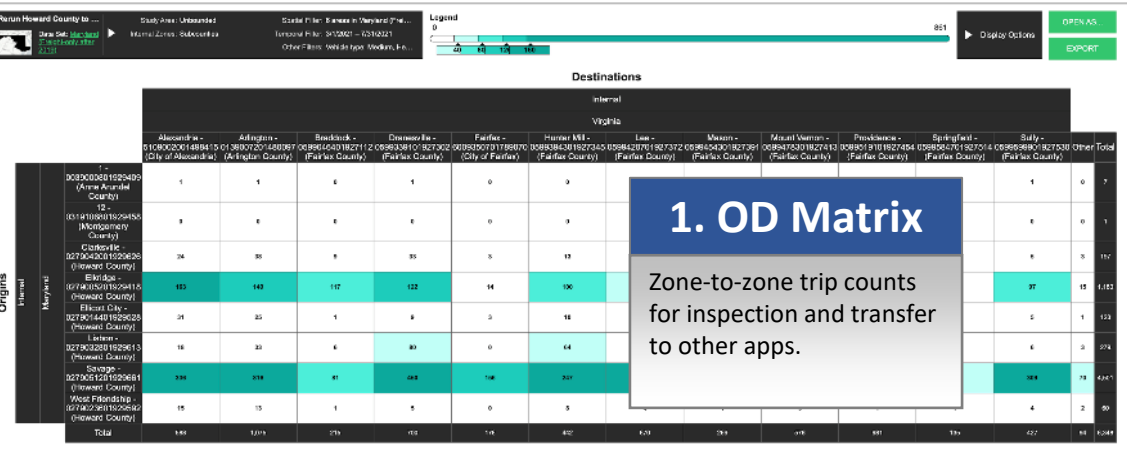
Light

Medium

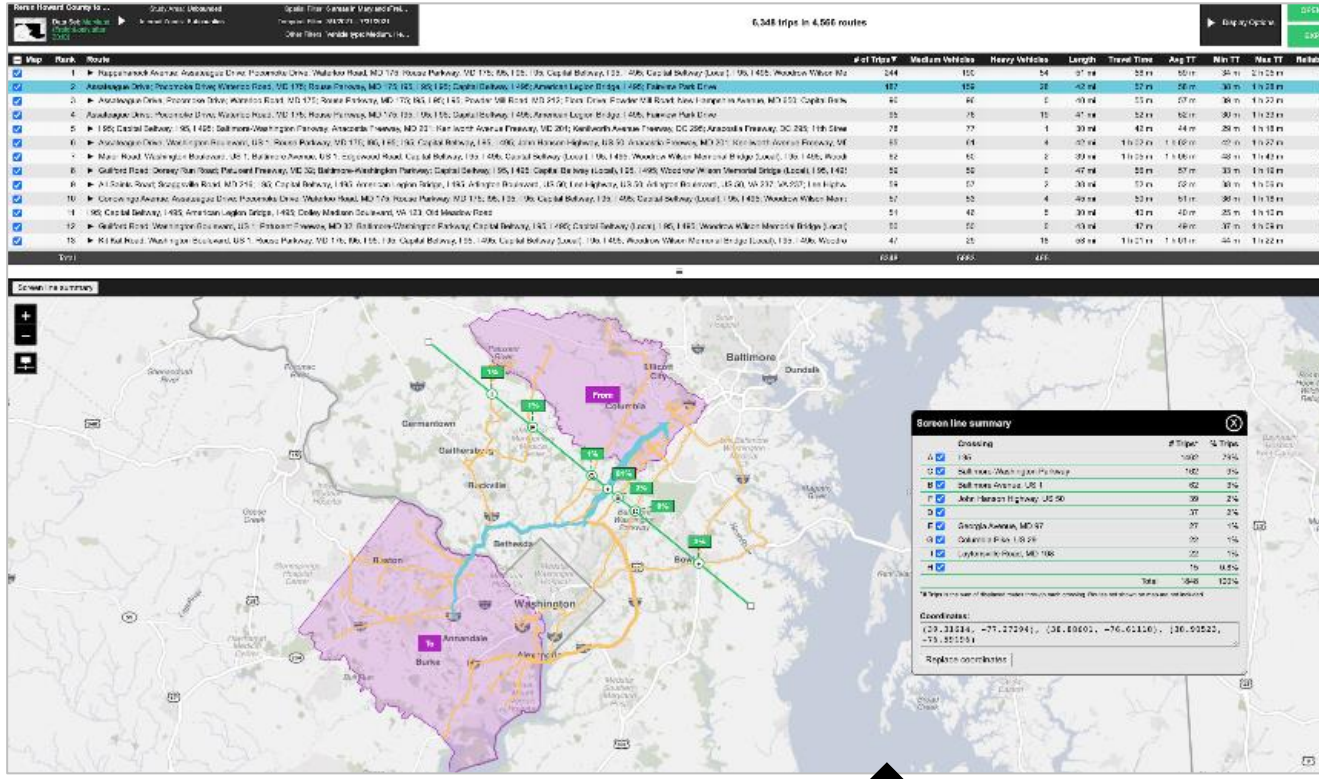
Heavy

**Done**

Each query produces a set of three matching reports, with the O/Ds, routes and travel times of those trips

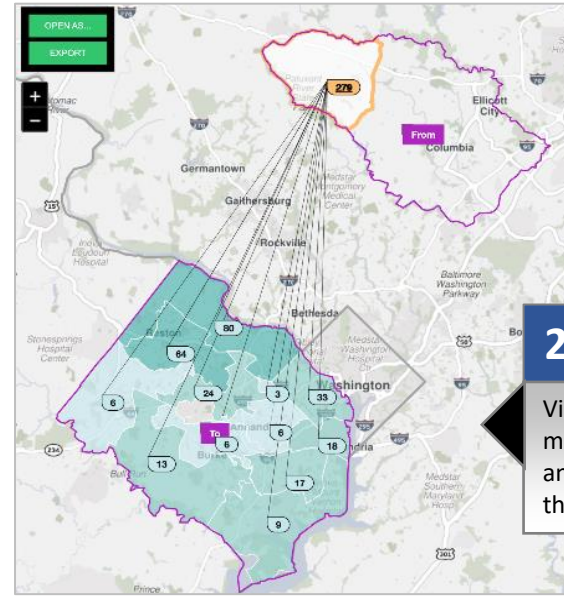
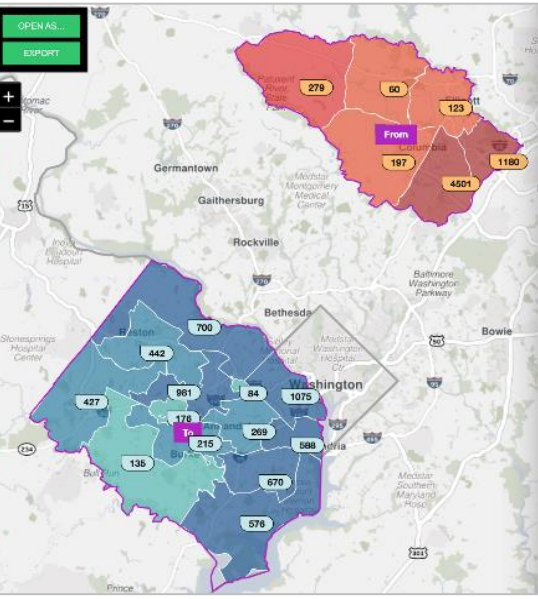


**1. OD Matrix**  
Zone-to-zone trip counts for inspection and transfer to other apps.



**Route line summary**

Crossing	# Trips	% Trips
135	100	25%
Southview, Washington Parkway	102	26%
Southview, US 28	62	16%
Miner, Southview, US 28	39	10%
Georgia Avenue, MD 97	37	9%
Calverton Park, I-828	30	8%
Lyonsville, MD 106	22	6%
<b>Total</b>	<b>394</b>	<b>100%</b>



**2. Zone Map**  
Visualize each OD matrix on a map. Click any zone to break out the trip count.

**3. Route Map & Table**  
For every trip in the OD matrix, see segment-by-segment pathways of each unique route. Get trip counts, travel times, and reliability metrics for each route. Draw screen lines or cordon lines to produce sample counts and split percentages for each crossing. Make a time series to document trends or the impact of events.

# REGIONAL INTEGRATED TRANSPORTATION INFORMATION SYSTEM

A data-driven platform for transportation analysis, monitoring, and data visualization

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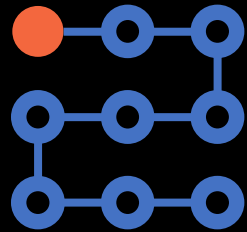
Site navigation

[INTRODUCTION](#)

LOG IN

Log-in at [ritis.org](https://ritis.org), follow links to Trip Analytics  
or go directly to [trips.ritis.org](https://trips.ritis.org)

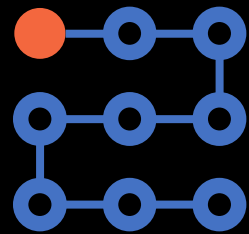
New user registration:  
Go to [ritis.org](https://ritis.org),  
click "Request an Account"



# Trip Analytics

## Orientation to the screens (screen share)





# Trip Analytics for Operations

## General applications for **Operations**

- Plan for major construction, detour, or regional event
- Make a contingency plan for major emergency
- Show the need for a ramp meter, or evaluate its effectiveness
- Conduct a post-mortem review of a major incident or event
- Document truck route compliance near neighborhoods
- Make the case for a new investment in ITS infrastructure
- Document the benefits of prior investments





Event

# Army-Navy Game

SATURDAY, DECEMBER 10, 2022

Land of the free, home of the game...

## 3. Example: Sporting Event Traffic Analysis

Question: What routes were taken to various parking sections around Lincoln Financial Field?

What were the associated travel times? Where were attendees driving from?

# 570 sample trips are in the dataset that entered in the Army-Navy parking area within 4 hours of kick-off

Route Map report

Trip Analytics
Logged in as gjordan1@umd.edu | [My Studies](#) | [Help](#)
Switch data set
Logout

**Sports Complex**

Data Set: Pennsylvania

Study Area: Custom Geography

Internal Zones: Custom

External Zones: Subcounties

Spatial Filter: 1 area in Pennsylvania Da...

Temporal Filter: 12/10/2022

Other Filters: Vehicle type: Light

**570 trips in 570 routes**

Open as...

Export

Map	Rank	Route	# of Trips	Light Vehicles	Length	Travel Time	Avg TT	5% TT	95% TT	Reliability
<input checked="" type="checkbox"/>	284	South 15th Street; Pollock Street; South Broad Street, PA 611; Packer Avenue; South Juniper Street								
<input checked="" type="checkbox"/>	285	West Germantown Pike; Sandy Hill Road; East Germantown Pike; Mid County Expressway, I 476; I 476; Delaware Expressway, I 95; South Governor Print	1	1	33 mi	1 h 06 m	1 h 06 m	1 h 06 m	1 h 06 m	1
<input checked="" type="checkbox"/>	286	New Jersey Turnpike, I 95, NJTP; New Jersey Turnpike, NJTP; New Jersey Turnpike; North Black Horse Pike, NJ 168; I 295; North-South Freeway, I 76; W	1	1	42 mi	42 m	42 m	42 m	42 m	1
<input checked="" type="checkbox"/>	287	Delaware Expressway, I 95; South Broad Street, PA 611	1	1	4 mi	8 m	8 m	8 m	8 m	1
<input checked="" type="checkbox"/>	288	Tranquility Court; NJ 70; US 206, NJ 70; I 295; North-South Freeway, I 76; Walt Whitman Bridge, I 76; Walt Whitman Bridge, I 76, Walt Whitman Bridge, I 76	1	1	36 mi	52 m	52 m	52 m	52 m	1
<input checked="" type="checkbox"/>	289	John F. Kennedy Memorial Highway, I-95; John F. Kennedy Memorial Highway, I 95; John F. Kennedy Memorial Highway, I 95, John F. Kennedy Memorial H	1	1	76 mi	1 h 23 m	1 h 23 m	1 h 23 m	1 h 23 m	1
<input checked="" type="checkbox"/>	290	Beachside Avenue; Greens Farms Road; Nyala Farms Road; Sherwood Island Connector; I 95; I 95, I 95; New England Thruway, I 95, New England Thruway, I 95; New England Thruway, I 95; Main Street, US 1; Boston Post Road, US 1; Hutchinson River Parkway, HRP; Hutchinson River Parkway, HR; Bruckner Expressway, I 95; Throgs Neck Expressway, I 695; Throgs Neck Expressway; Randall Avenue; Cross Bronx Expressway; Cross Bronx Expressway, I 295; Cross Bronx Expressway, I 95; Cross Bronx Expressway, I 95, US 1; Trans-Manhattan Expressway, I 95, US 1; George Washington Bridge (lower level), I 95, US 1; George Washington Bridge (lower level), I 95, US 1, George Washington Bridge (lower level), I 95, US 1; George Washington Bridge Plaza, I 95, US 1; New Jersey Turnpike, I 95, NJTP; New Jersey Turnpike (Express Lanes), I 95, NJTP; New Jersey Turnpike, I 95; New Jersey Turnpike, I 95, NJTP Southbound; New Jersey Turnpike Southbound, I 95, NJTP; New Jersey Turnpike (TRUCK Lanes), I 95, NJTP; New Jersey Turnpike, NJTP; New Jersey Turnpike, NJ 73; I 295; North-South Freeway, I 76; Walt Whitman Bridge, I 76; Walt Whitman Bridge, I 76, Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; South 7th Street; Pattison Avenue; South 11th Street	1	1	154 mi	2 h 47 m	2 h 47 m	2 h 47 m	2 h 47 m	1
<input checked="" type="checkbox"/>	291	Stapler Place; West 16th Street; North Scott Street; Lovering Avenue; North Adams Street; I 95, US 202, I 95, I 95, I 95, Delaware Expressway, I 95, Delaware	1	1	27 mi	42 m	42 m	42 m	42 m	1
<input checked="" type="checkbox"/>	292	Lehann Circle; Saxer Avenue; East Baltimore Pike; Baltimore Pike; Mid County Expressway, I 476; I 476; Delaware Expressway, I 95; Girar J Point Bridge, I	1	1	18 mi	34 m	34 m	34 m	34 m	1
<input checked="" type="checkbox"/>	293	Memorial Drive; North Dupont Highway, US 13; Wilmington Bypass, I 495; Philadelphia Pike, US 13; Philadelphia Pike, US 13, Philadelphia Pike, US 13; Wt	1	1	28 mi	45 m	45 m	45 m	45 m	1
<input checked="" type="checkbox"/>	294	North 19th Street; John F. Kennedy Boulevard, PA 3; Market Street, PA 3; South 23rd Street; Walnut Street; Schuylkill Expressway, I 76; South 26th Street;	1	1	7 mi	29 m	29 m	29 m	29 m	1
<input checked="" type="checkbox"/>	295	Sandstone Court; Phillips Avenue; Street Road; Meehan Drive; Addison Way; Easton Road, PA 611; Pennsylvania Turnpike, I 276, PATP; Pennsylvania Tur	1	1	51 mi	1 h 35 m	1 h 35 m	1 h 35 m	1 h 35 m	1
<input checked="" type="checkbox"/>	296	South 8th Street; Tasker Street; South 10th Street; Packer Avenue; South Darien Street; Pattison Avenue	1	1	2 mi	13 m	13 m	13 m	13 m	1
Total			570	570						

(routes taken to game by the 570 sampled vehicles; a trip from Bridgeport, CT is highlighted)

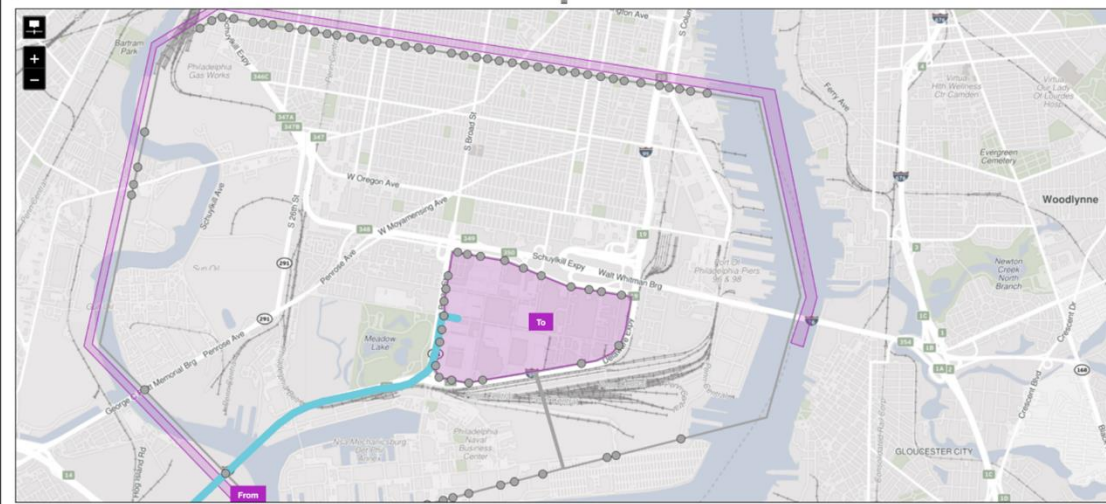
Report External Origins and Destinations

Using OD gates
 Using external zones

# “Last-mile” routes w/ travel time statistics FROM a cordon line TO the parking area entrances (ranked #1,2,3,4)

Route Map report

Map	Rank	Route	# of Trips	Light Vehicles	Length	Travel Time	Avg TT	5% TT	95% TT	Reliability
<input checked="" type="checkbox"/>	1	Grand Point Bridge, I 95, Delaware Expressway, I 95, South Broad Street, PA 611, Pattison Avenue	54	54	3 mi	6 m	6 m	3 m	10 m	1.45
<input checked="" type="checkbox"/>	2	Walt Whitman Bridge, I 76, Walt Whitman Bridge, I 76, Schuylkill Expressway, I 76, South 7th Street	37	37	3 mi	3 m	4 m	3 m	5 m	1.15
<input checked="" type="checkbox"/>	3	Delaware Expressway, I 95, South Broad Street, PA 611, Pattison Avenue	17	17	4 mi	8 m	9 m	6 m	15 m	1.46
Total			397	397						

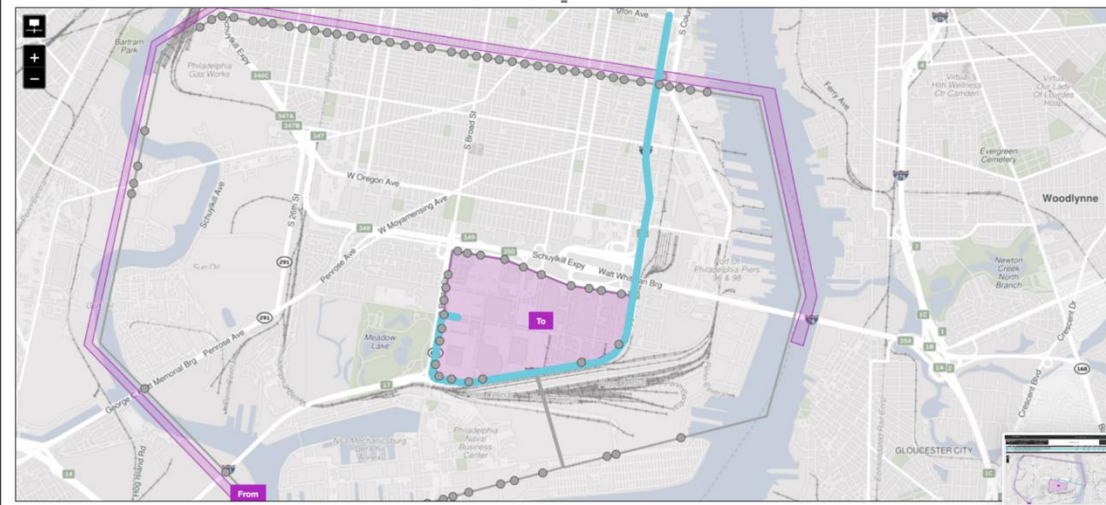


Trip Analytics | Logged in as gordan1@umd.edu | My Studies | Help | Switch data set | Logout

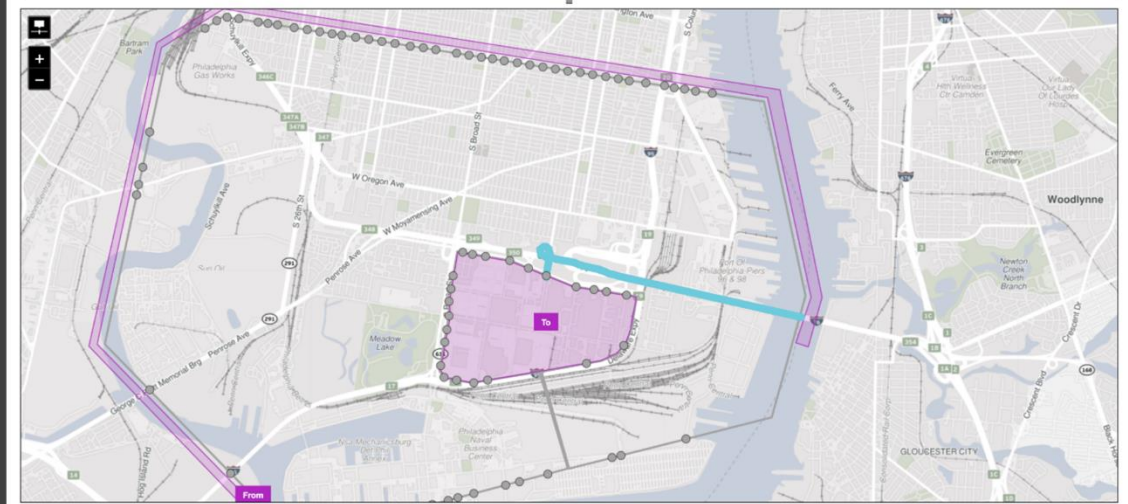
Last-mile TT Study Area: Study Area: Custom Geography | Spatial Filter: 2 custom areas in Pennsylv... | Temporal Filter: 12/10/2022

397 trips in 93 routes

Map	Rank	Route	# of Trips	Light Vehicles	Length	Travel Time	Avg TT	5% TT	95% TT	Reliability
<input checked="" type="checkbox"/>	1	Grand Point Bridge, I 95, Delaware Expressway, I 95, South Broad Street, PA 611, Pattison Avenue	54	54	3 mi	6 m	6 m	3 m	10 m	1.45
<input checked="" type="checkbox"/>	2	Walt Whitman Bridge, I 76, Walt Whitman Bridge, I 76, Schuylkill Expressway, I 76, South 7th Street	37	37	3 mi	3 m	4 m	3 m	5 m	1.15
<input checked="" type="checkbox"/>	3	Delaware Expressway, I 95, South Broad Street, PA 611, Pattison Avenue	17	17	4 mi	8 m	9 m	6 m	15 m	1.46
Total			397	397						



Map	Rank	Route	# of Trips	Light Vehicles	Length	Travel Time	Avg TT	5% TT	95% TT	Reliability
<input checked="" type="checkbox"/>	1	Grand Point Bridge, I 95, Delaware Expressway, I 95, South Broad Street, PA 611, Pattison Avenue	54	54	3 mi	6 m	6 m	3 m	10 m	1.45
<input checked="" type="checkbox"/>	2	Walt Whitman Bridge, I 76, Walt Whitman Bridge, I 76, Schuylkill Expressway, I 76, South 7th Street	37	37	3 mi	3 m	4 m	3 m	5 m	1.15
<input checked="" type="checkbox"/>	3	Delaware Expressway, I 95, South Broad Street, PA 611, Pattison Avenue	17	17	4 mi	8 m	9 m	6 m	15 m	1.46
Total			397	397						

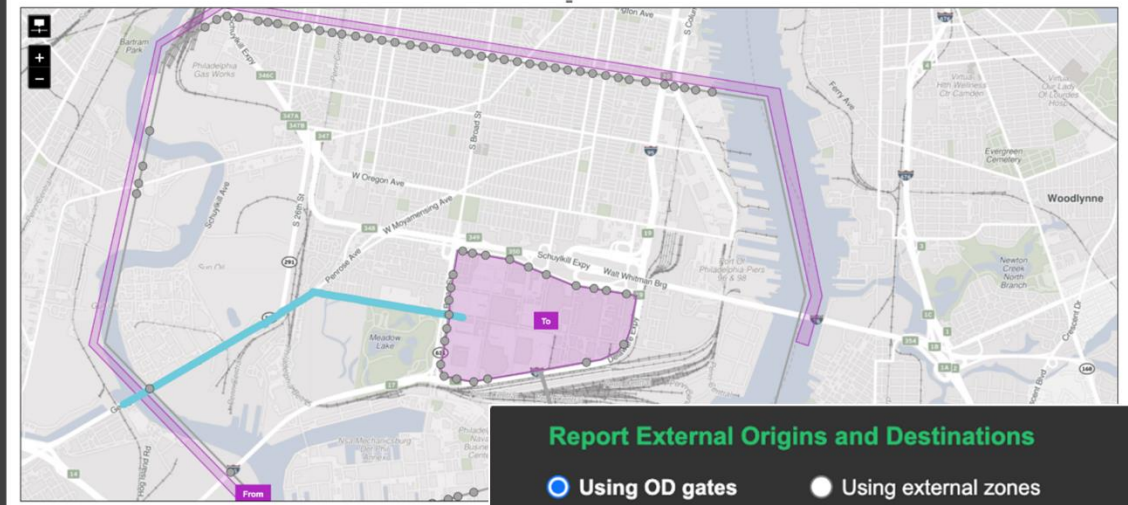


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Last-mile TT Study Area: Study Area: Custom Geography | Spatial Filter: 2 custom areas in Pennsylv... | Temporal Filter: 12/10/2022

397 trips in 93 routes

Map	Rank	Route	# of Trips	Light Vehicles	Length	Travel Time	Avg TT	5% TT	95% TT	Reliability
<input checked="" type="checkbox"/>	4	Pierce Avenue, PA 291, Pattison Avenue	16	16	2 mi	5 m	6 m	3 m	15 m	1.07
<input checked="" type="checkbox"/>	5	Schuylkill Expressway, I 76, South Durien Street	15	15	3 mi	4 m	4 m	4 m	5 m	1.1
<input checked="" type="checkbox"/>	6	Delaware Expressway, I 95, South Front Street	15	15	2 mi	4 m	5 m	2 m	16 m	1.23
Total			397	397						



Report External Origins and Destinations

Using OD gates  Using external zones

Route Map report (export)

(see previous slide)



File Home Insert Page Layout Formulas Data Review View PowerPivot Tell me what you want to do...

Q45

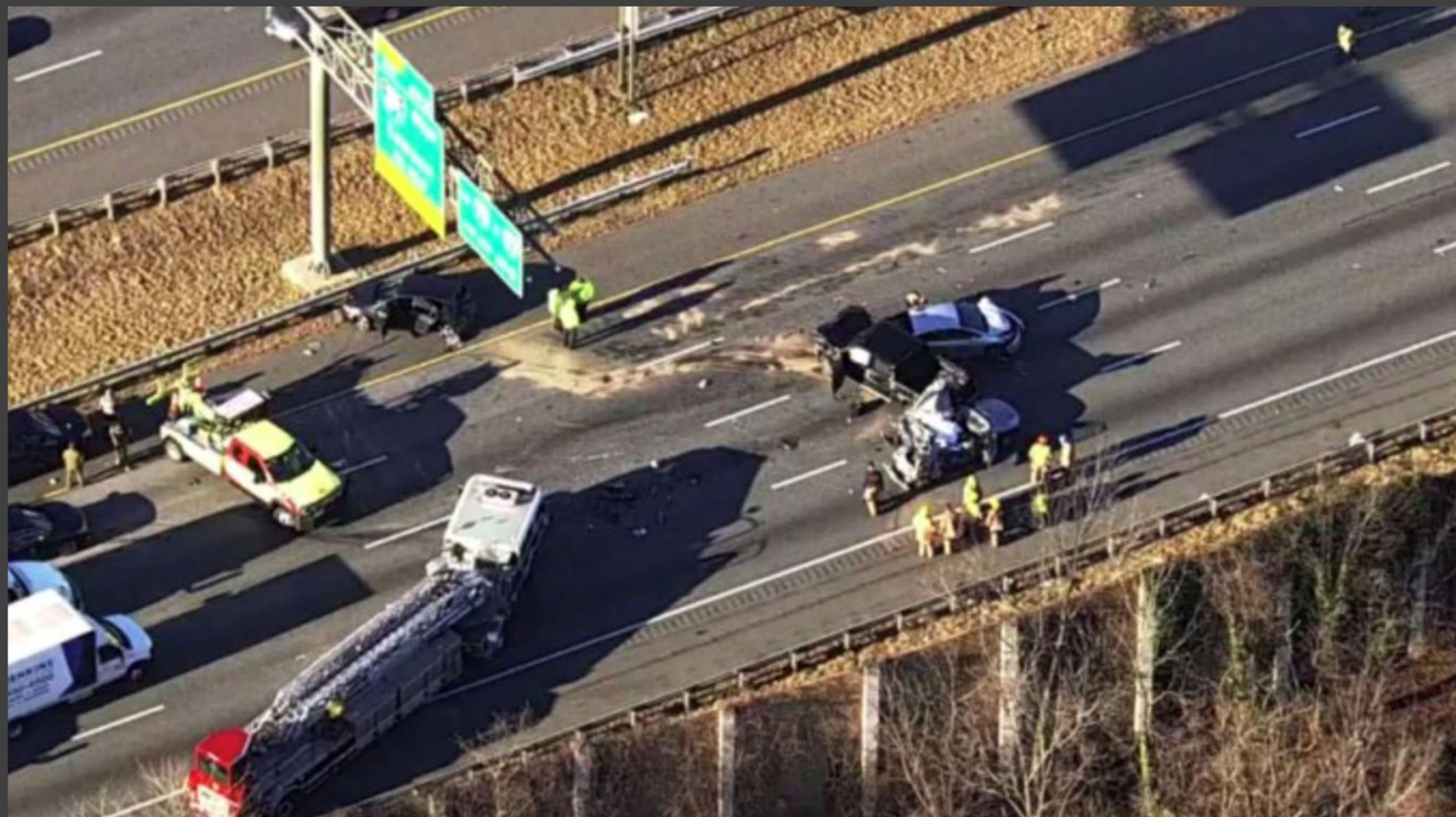
	A	B	C	D	E	F	G	H	I	J	K	L
1	Rank	Route	# of Trips	Light Vehicles	Length	Travel Time	Avg TT	5% TT	95% TT	Reliability	Avg TT (hr)	Avg Speed
2	1	Girard Point Bridge, I 95; Delaware Expressway, I 95; South Broad Street, PA 611; Pattison Avenue	54	54	2.59	0:05:31	0:05:58	0:03:25	0:09:31	1.45	0.0041435	26
3	2	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; South 7th Street	37	37	3.3	0:03:20	0:03:31	0:02:42	0:05:04	1.15	0.0024421	56
4	3	Delaware Expressway, I 95; South Broad Street, PA 611; Pattison Avenue	17	17	4.01	0:07:35	0:08:53	0:05:56	0:14:45	1.46	0.006169	27
5	4	Penrose Avenue, PA 291; Pattison Avenue	16	16	2.46	0:05:04	0:06:16	0:03:28	0:15:17	1.67	0.0043519	24
6	5	Schuylkill Expressway, I 76; South Darien Street	15	15	3.04	0:04:07	0:04:14	0:03:45	0:05:04	1.1	0.0029398	43
7	6	Delaware Expressway, I 95; South Front Street	15	15	2.22	0:03:43	0:04:46	0:01:50	0:17:30	1.23	0.0033102	28
8	7	Delaware Expressway, I 95; South Broad Street, PA 611; South 11th Street	15	15	3.88	0:05:02	0:04:54	0:04:02	0:05:39	1.04	0.0034028	48
9	8	Schuylkill Expressway, I 76; South Broad Street, PA 611; South Broad Street; Pattison Avenue	14	14	3.03	0:05:26	0:05:57	0:04:02	0:09:12	1.29	0.0041319	31
10	9	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; South 7th Street; Packer Avenue; South Darien Street	14	14	3.41	0:03:53	0:04:07	0:03:09	0:06:32	1.15	0.0028588	50
11	10	Girard Point Bridge, I 95; Delaware Expressway, I 95; South Broad Street, PA 611; North Access Road	11	11	2.41	0:04:02	0:04:51	0:02:42	0:09:41	1.52	0.0033681	30
12	11	Girard Point Bridge, I 95; Delaware Expressway, I 95; Packer Avenue; South Lawrence Street	10	10	4.25	0:04:37	0:04:52	0:04:00	0:05:42	1.13	0.0033796	52
13	12	Girard Point Bridge, I 95; Delaware Expressway, I 95; South Broad Street, PA 611; South Broad Street; Pattison Avenue	9	9	2.62	0:03:29	0:04:29	0:02:32	0:07:11	1.95	0.0031134	35
14	13	Delaware Expressway, I 95; South Front Street; Packer Avenue; South 7th Street	9	9	2.73	0:04:38	0:05:44	0:03:35	0:12:47	1.47	0.0039815	29
15	14	Penrose Avenue, PA 291; Pattison Avenue	8	8	2.45	0:05:43	0:05:31	0:03:29	0:08:16	1.07	0.003831	27
16	15	South Broad Street, PA 611; South Broad Street; Pattison Avenue	8	8	1.88	0:08:45	0:10:17	0:06:21	0:14:34	1.54	0.0071412	11
17	16	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; South Front Street	8	8	3.48	0:03:29	0:03:35	0:02:58	0:04:06	1.15	0.0024884	58
18	17	Delaware Expressway, I 95; South Broad Street, PA 611; North Access Road	7	7	3.83	0:05:04	0:05:07	0:04:35	0:05:37	1.1	0.0035532	45
19	18	Girard Point Bridge, I 95; Delaware Expressway, I 95; Packer Avenue; South Darien Street	6	6	4.58	0:06:14	0:06:12	0:05:09	0:07:16	1.06	0.0043056	44
20	19	Delaware Expressway, I 95; South Front Street; Packer Avenue; South 10th Street	5	5	3.02	0:05:15	0:06:31	0:05:05	0:11:41	1.02	0.0045255	28
21	20	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; Pollock Street; South Broad Street, PA 611; Hartranft Street	5	5	3.97	0:05:00	0:05:23	0:03:58	0:06:58	1.27	0.0037384	44
22	21	South 10th Street; Packer Avenue; South Darien Street	5	5	1.45	0:09:44	0:09:43	0:07:40	0:12:00	1	0.0067477	9
23	22	Penrose Avenue, PA 291; South 26th Street; Langley Avenue; League Island Boulevard; South Broad Street; South Broad Street, PA 611; South 11th Street	5	5	3.25	0:07:15	0:06:58	0:05:56	0:08:03	1.05	0.004838	28
24	23	Schuylkill Expressway, I 76; South Darien Street										39
25	24	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; South Front Street										46
26	25	South 10th Street; Packer Avenue; South Darien Street										49
27	26	Schuylkill Expressway, I 76; South Darien Street										30
28	27	Schuylkill Expressway, I 76; Packer Avenue; South 7th Street	4	4	3.15	0:04:16	0:04:30	0:04:07	0:04:55	1.15	0.003125	42
29	28	Girard Point Bridge, I 95; Delaware Expressway, I 95; South Broad Street, PA 611	3	3	2.58	0:07:20	0:06:41	0:03:55	0:08:50	1.2	0.0046412	23
30	29	South 61st Street; Passyunk Avenue; Schuylkill Expressway, I 76; South Darien Street	3	3	3.18	0:06:25	0:06:19	0:05:34	0:07:00	1.09	0.0043866	30
31	30	Girard Point Bridge, I 95; Delaware Expressway, I 95; Packer Avenue; South 7th Street	3	3	4.44	0:05:47	0:05:45	0:05:32	0:05:58	1.03	0.0039931	46
32	31	South 10th Street; Packer Avenue; South Darien Street	3	3	3.9	0:10:31	0:12:57	0:08:38	0:19:44	1.87	0.0089931	18
33	32	Delaware Expressway, I 95; South Front Street; Packer Avenue; South Darien Street	3	3	2.88	0:04:52	0:04:45	0:04:23	0:05:02	1.03	0.0032986	36
34	33	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; Delaware Expressway, I 95; South Broad Street, PA 611; Pattison Avenue	3	3	4.24	0:05:59	0:06:01	0:04:51	0:07:15	1.21	0.0041782	42
35	34	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; Delaware Expressway, I 95; South Broad Street, PA 611; Pattison Avenue	3	3	5.68	0:07:57	0:08:18	0:07:53	0:09:04	1.14	0.0057639	41
36	35	Penrose Avenue, PA 291; Schuylkill Expressway, I 76; South Darien Street	3	3	3.1	0:05:07	0:05:18	0:04:53	0:05:56	1.15	0.0036806	35
37	36	Schuylkill Expressway, I 76; South Darien Street	2	2	3.21	0:03:55	0:04:18	0:03:55	0:04:42	1.2	0.0029861	45
38	37	Penrose Avenue, PA 291; Pattison Avenue; South Broad Street, PA 611; Zinkoff Boulevard; South 11th Street	2	2	3.08	0:05:07	0:07:02	0:05:07	0:08:57	1.74	0.0048843	26
39	38	South Broad Street, PA 611; South Broad Street; Pattison Avenue; West Shunk Street; South 15th Street; Oregon Avenue; South 16th Street; West Porter Street; Snyder Avenue; South 2nd Street; McKean Street; East Moyamensing Avenue; Schuylkill Expressway, I 76	1	1	4.22	0:04:27	0:04:27	0:04:27	0:04:27	1	0.0030903	57
40	39	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; Pollock Street; South Broad Street, PA 611; Delaware Expressway, I 95; Penrose Avenue, PA 291; Pattison Avenue	1	1	7.92	2:46:52	2:46:52	2:46:52	2:46:52	1	0.1158796	3
41	40	Penrose Avenue, PA 291; Pattison Avenue	1	1	9.08	0:18:49	0:18:49	0:18:49	0:18:49	1	0.0130671	29
42	41	Penrose Avenue, PA 291; Pattison Avenue	1	1	2.48	0:27:36	0:27:36	0:27:36	0:27:36	1	0.0191667	5
43	42	Hartranft Street	1	1	3.49	0:17:09	0:17:09	0:17:09	0:17:09	1	0.0119097	12
44	43	Girard Point Bridge, I 95; Delaware Expressway, I 95; South Broad Street, PA 611; South Broad Street; Pattison Avenue; Penrose Avenue, PA 291	1	1	7.32	0:38:13	0:38:13	0:38:13	0:38:13	1	0.0265394	11
45	44	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; Pollock Street; South Broad Street, PA 611; Packer Avenue; South 19th Street; Schley Street; South 18th Street; Forrestal Street; South Smedley Street; Curtin Street; Geary Street	1	1	4.77	0:09:39	0:09:39	0:09:39	0:09:39	1	0.0067014	30
46	45	Girard Point Bridge, I 95; Delaware Expressway, I 95; South Broad Street, PA 611; Pattison Avenue; South 11th Street	1	1	3.08	0:21:01	0:21:01	0:21:01	0:21:01	1	0.0145949	9
47	46	Delaware Expressway, I 95; South Broad Street, PA 611	1	1	3.6	0:06:32	0:06:32	0:06:32	0:06:32	1	0.004537	33
48	47	Walt Whitman Bridge, I 76;Walt Whitman Bridge, I 76; Schuylkill Expressway, I 76; South 7th Street; South 11th Street; South Broad Street, PA 611; Packer Avenue; South Broad Street; Pattison Avenue	1	1	5.02	0:18:29	0:18:29	0:18:29	0:18:29	1	0.0128356	16
49	48	Schuylkill Expressway, I 76; West Oregon Vane Avenue; Oregon Avenue/Vane Avenue; Oregon Avenue; South 20th Street; Pattison Avenue	1	1	3.23	0:09:44	0:09:44	0:09:44	0:09:44	1	0.0067593	20
50	49		1	1	3.61	0:09:40	0:09:40	0:09:40	0:09:40	1	0.006711	16

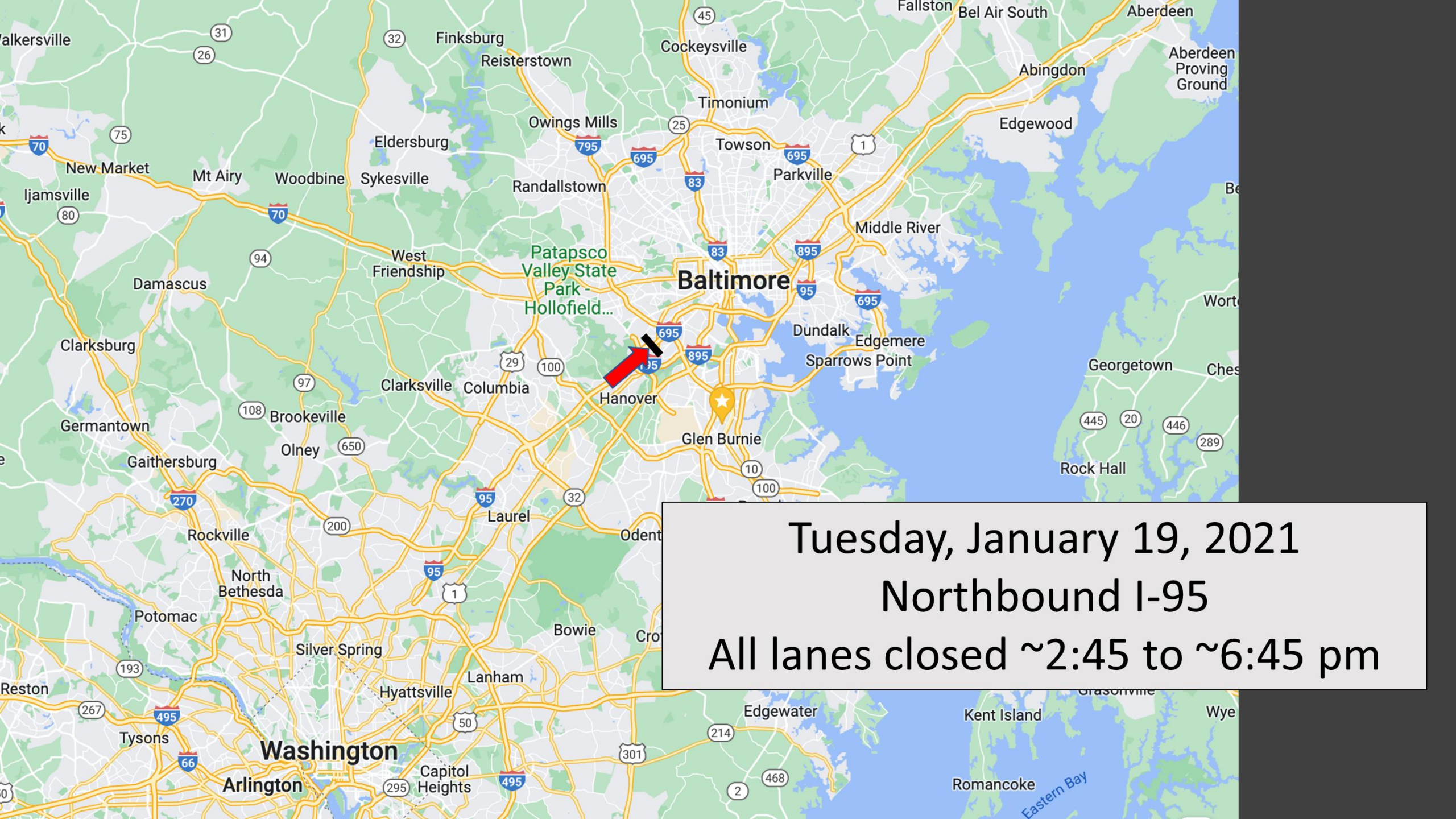
Export table with last-mile travel time statistics

Last-mile TT Study Army-Navy-ro



**Example 5:  
Post-mortem  
Analysis of  
Detour Routes near  
Baltimore**





**Tuesday, January 19, 2021**  
**Northbound I-95**  
**All lanes closed ~2:45 to ~6:45 pm**



# 2. Set Filters and Submit Query

## ▼ Set Spatial Filter(s)

▶ **Spatial Filter 1** (X)

From     To

Use a custom area as a Spatial Filter: MD 2021-01-19 Sampling li  
ne south V2.geojson

Include trips that:

- Started Inside
- Started Outside

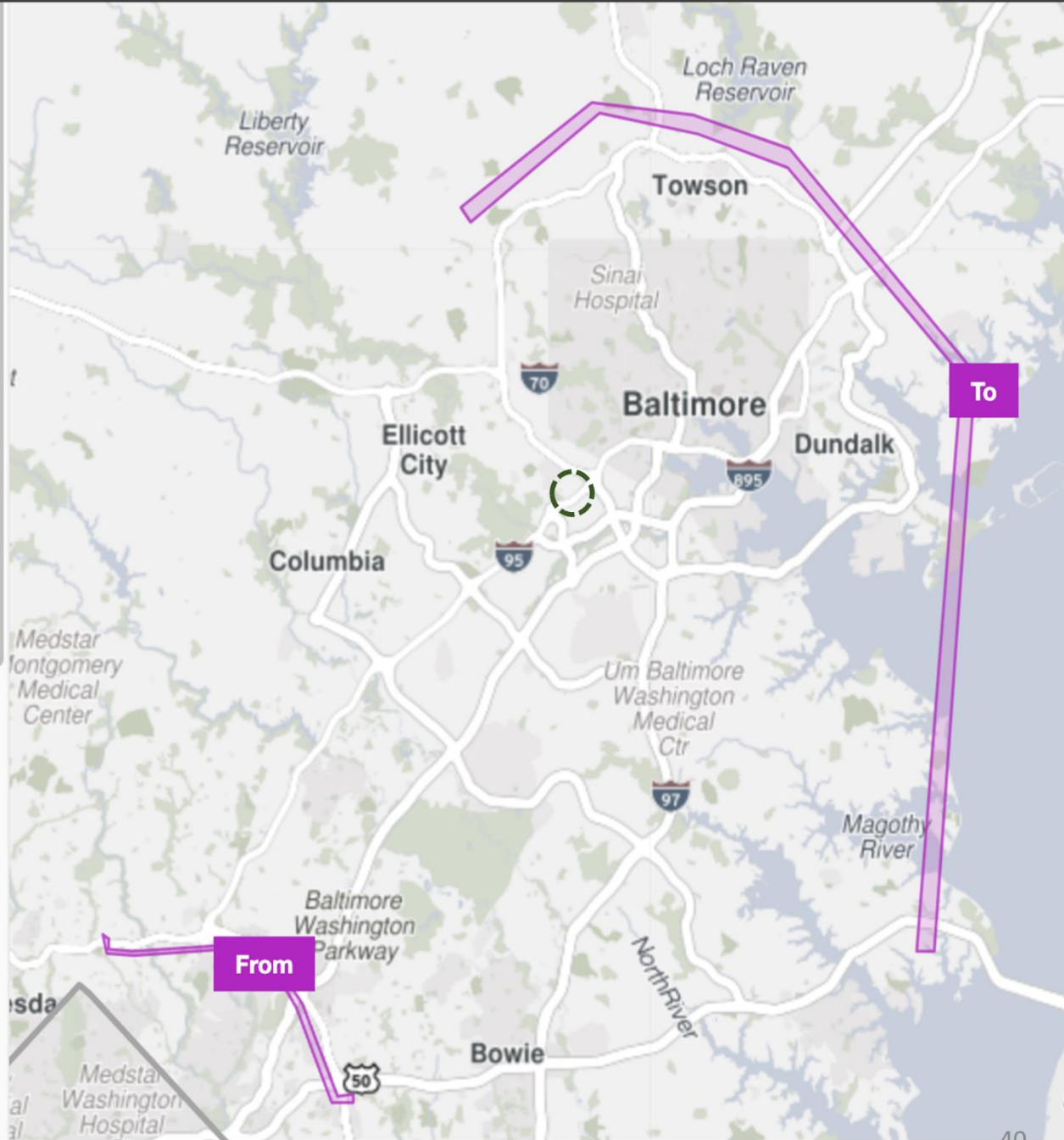
▶ **Spatial Filter 2** (X)

From     To

Use a custom area as a Spatial Filter: MD 2021-01-19 Sampling li  
ne north V2.geojson

Include trips that:

- Ended Inside
- Ended Outside



Truck crash detour in MD

Study Area: Unbounded

Spatial Filter: 2 custom areas in Maryla...

Data Set: Maryland (Freight-only after 2019)

Internal Zones: Counties

Temporal Filter: 1/26/2021 - 1/26/2021

Other Filters: Vehicle type: Medium, He...

184 trips in 184 routes

Display Options

OPEN AS...

EXPORT

Screen line summary

Screen line summary

Crossing	# Trips*	% Trips
<input checked="" type="checkbox"/> B I 95	111	60%
<input checked="" type="checkbox"/> A John Hanson Highway, US 50, US 301	50	27%
<input checked="" type="checkbox"/> C Baltimore-Washington Parkway	10	5%
<input checked="" type="checkbox"/> D Columbia Pike, US 29	8	4%
<input checked="" type="checkbox"/> E Robert Crain Highway, MD 3	2	1%
<input checked="" type="checkbox"/> G	2	1%
<input checked="" type="checkbox"/> F	1	0.5%
<input checked="" type="checkbox"/> H I 95	1	0.5%
<b>Total</b>	<b>185</b>	<b>100%</b>

\*# Trips is the sum of displayed routes through each crossing. Routes not shown on map are not included.

Warning!Route 24 crosses the screen line more than once, inflating trip count

Coordinates:  
(39.19474, -76.91551), (39.00939, -76.66147), (38.93201, -76.65529), (38.93522, -76.64842)

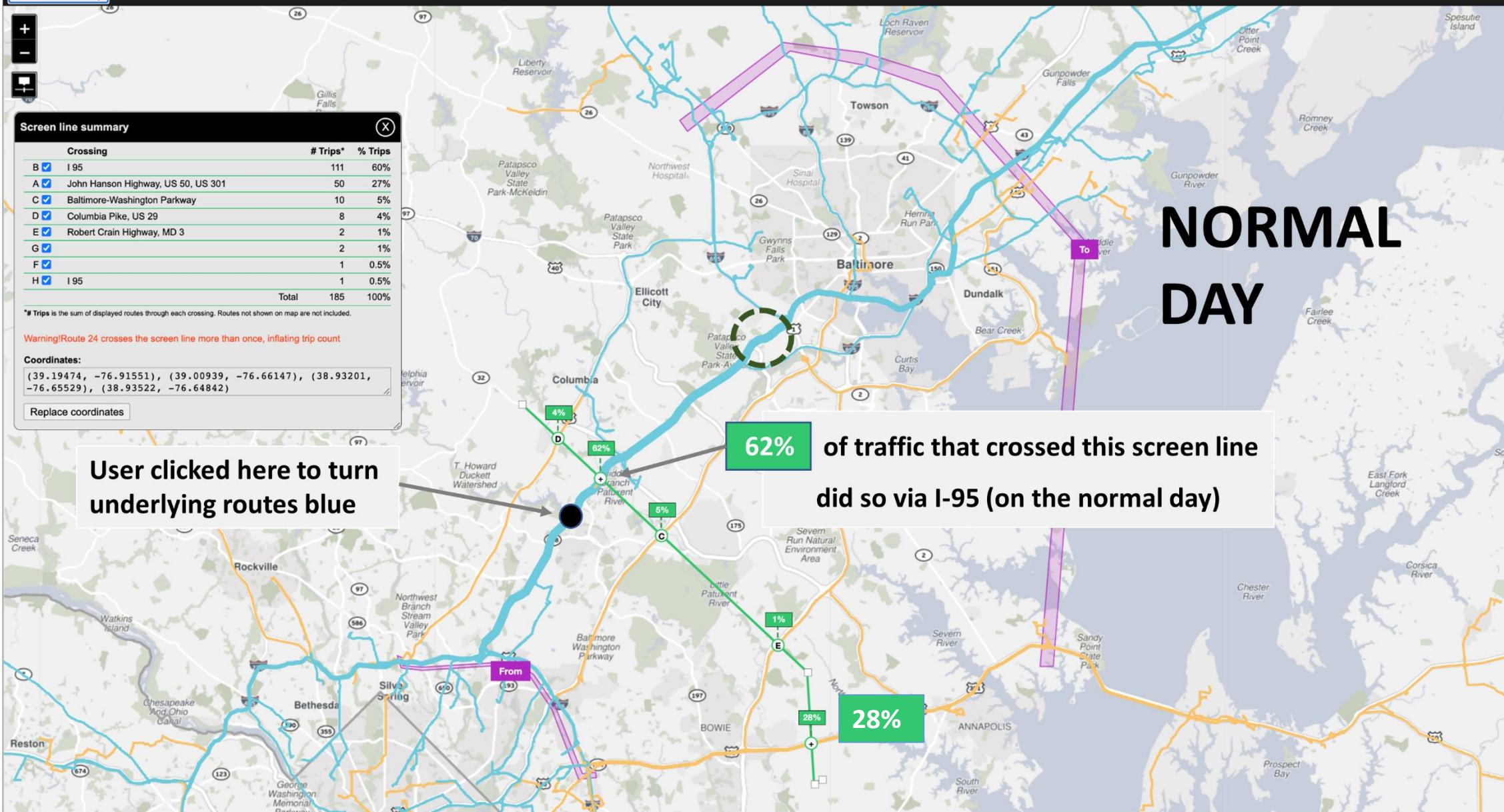
Replace coordinates

# NORMAL DAY

User clicked here to turn underlying routes blue

62% of traffic that crossed this screen line did so via I-95 (on the normal day)

28%



Truck crash detour in MD

Study Area: Unbounded

Spatial Filter: 2 custom areas in Maryla...

Data Set: Maryland (Freight-only after 2019)

Internal Zones: Counties

Temporal Filter: 1/19/2021 - 1/19/2021

Other Filters: Vehicle type: Medium, He...

129 trips in 129 routes

Display Options

OPEN AS...

EXPORT

Screen line summary

Screen line summary

Crossing	# Trips*	% Trips
<input checked="" type="checkbox"/> A John Hanson Highway, US 50, US 301	57	44%
<input checked="" type="checkbox"/> B I 95	46	36%
<input checked="" type="checkbox"/> C Columbia Pike, US 29	11	9%
<input checked="" type="checkbox"/> E Baltimore-Washington Parkway	9	7%
<input checked="" type="checkbox"/> F Robert Crain Highway, MD 3	4	3%
<input checked="" type="checkbox"/> D Washington Boulevard, US 1	1	0.8%
<input checked="" type="checkbox"/> G	1	0.8%
<b>Total</b>	<b>129</b>	<b>100%</b>

\*# Trips is the sum of displayed routes through each crossing. Routes not shown on map are not included.

Coordinates:

(39.19474, -76.91551), (39.00939, -76.66147), (38.93201, -76.65529), (38.93522, -76.64842)

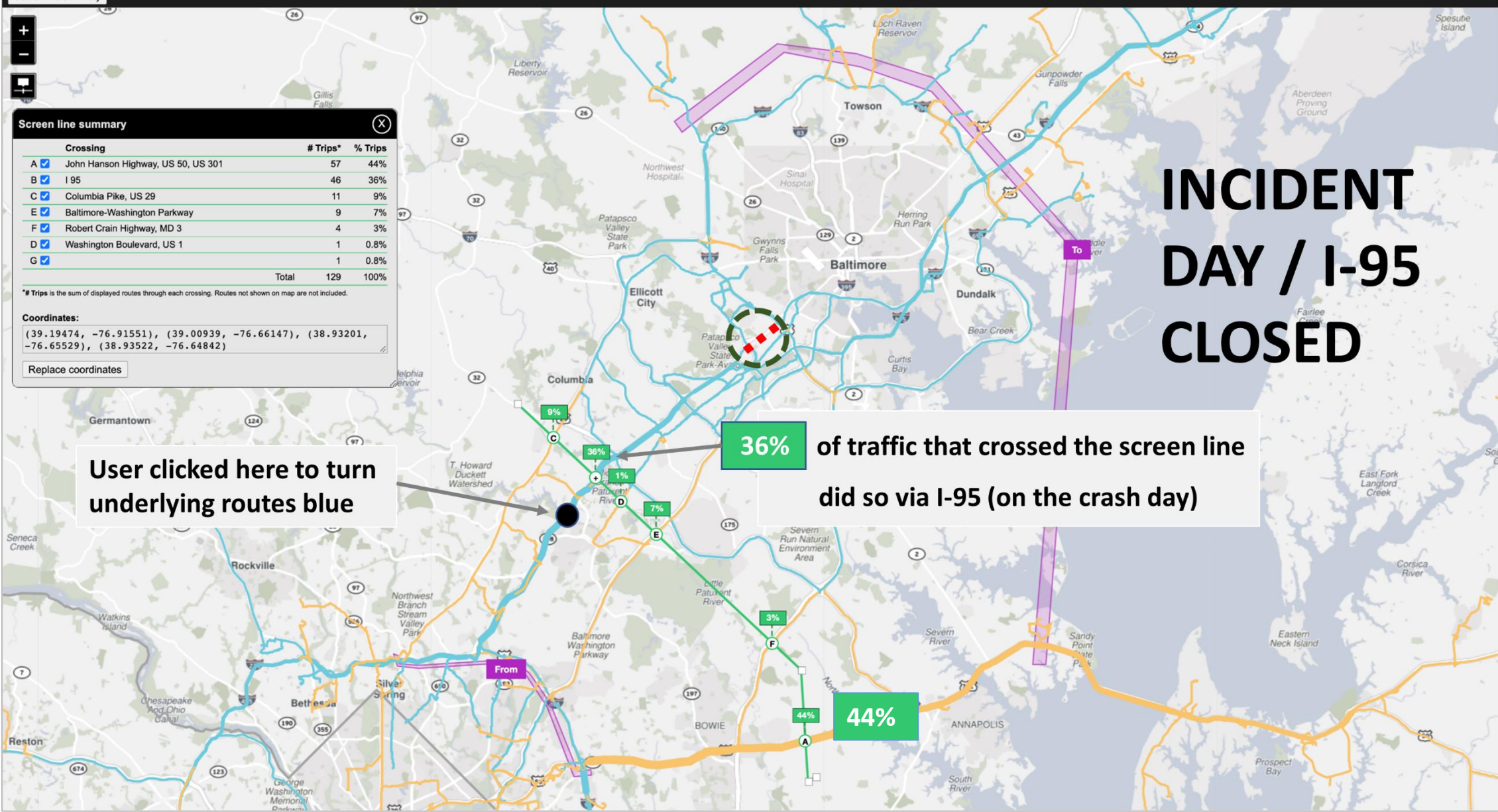
Replace coordinates

# INCIDENT DAY / I-95 CLOSED

User clicked here to turn underlying routes blue

36% of traffic that crossed the screen line did so via I-95 (on the crash day)

44%





# Trip Analytics for Operations DEMO

# RITIS Workshop

Today we're presenting a 90-minute workshop on using **Trip Analytics**, divided into two sessions:

**Introduction: How it works (10 minutes)**

**Session 1 for Operators (1:00pm – 1:45pm)**

- "Last-mile" routes and travel time statistics
- Testing device deployments (ramp metering)
- Detour route planning
- Signal timing Before & After use case

**Session 2 for Planners (1:45 – 2:30pm)**

**Introduction (5 minutes)**

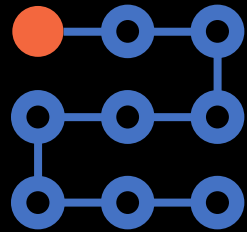
- OD matrices for model calibration, etc. (from macro to micro)
- Bottleneck Mitigation Before & After use case
- Document urban truck route compliance in neighborhoods



## General applications for **Planning**

- Understand the intricacies of regional traffic patterns
- Calibrate or validate travel demand models
- Provide information and basic data for major investment studies
- Evaluate potential sites for:
  - Terminals
  - Transit stops
  - Park-n-rides
  - EV charging stations and more
- Prioritize proposed or existing transportation improvement projects
- Quantify and document the benefits of infrastructure investments





# Trip Analytics for Planning

Zone Map report

**PA statewide OD for TDM: County**

**Study Summary**

- Study Area: Base Geography
- Internal Zones: Counties
- External Zones: States
- Spatial Filter: 1 area in Pennsylva...
- Temporal Filter: 10/1/2022 - 12/31/2...
- Other Filters: Vehicle type: Light

Data Set: Pennsylvania

[Open as...](#)

[Export](#)

**Zone Map Controls**

**Map Options**

Show trip...

- Origins and destinations
- Origins
- Destinations

Show values on map

- Sample counts
- Percentages

Show base geography

Show study area

Show spatial filter

**Color thresholds**

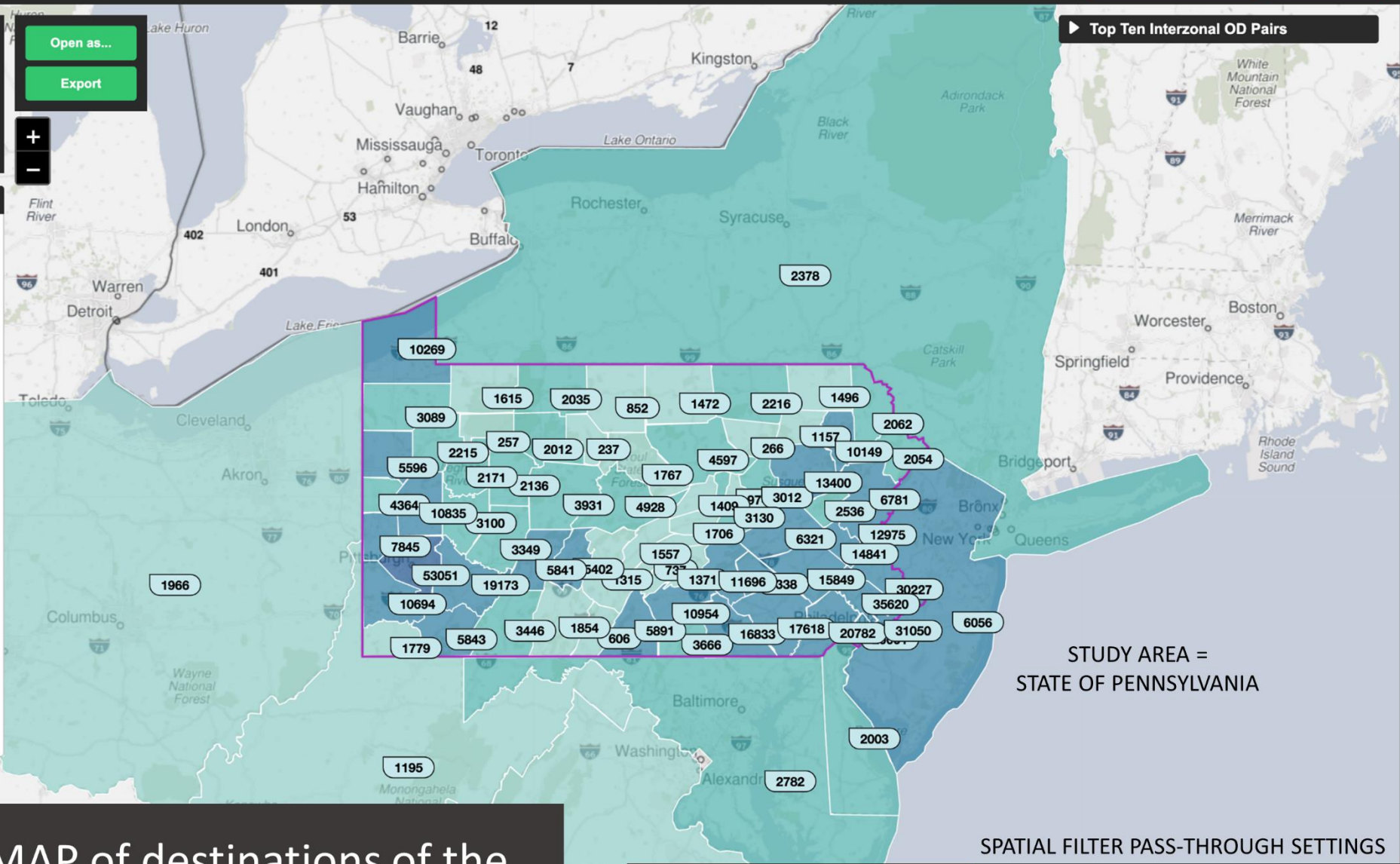
- Enter exact values
- Hide lowest color range

Destinations

100 42609

2000 5000

Map does not show 3 undefined destinations.



Top Ten Interzonal OD Pairs

STUDY AREA = STATE OF PENNSYLVANIA

SPATIAL FILTER PASS-THROUGH SETTINGS

User wants all samples analyzed

- Started Inside
- Ended Inside
- Started Outside
- Ended Outside

Macro-level ZONE MAP of destinations of the trips in the Pennsylvania dataset (n>100)

(For this query, the study area was chosen as the spatial filter)



**Freight study of Allegheny**

**Study Summary**

- Study Area: Custom Geography
- Internal Zones: TAZs
- External Zones: Counties
- Spatial Filter: 1 area in Pennsylv...
- Temporal Filter: 12/1/2022 – 12/31/2...
- Other Filters: Vehicle type: Heavy

Data Set: [Pennsylvania](#)

[Open as...](#)

[Export](#)

+

-

**Zone Map Controls**

**Map Options**

Show trip...

- Origins and destinations
- Origins
- Destinations

Show values on map

Show base geography

Show study area

Show spatial filter

**Color thresholds**

Enter exact values

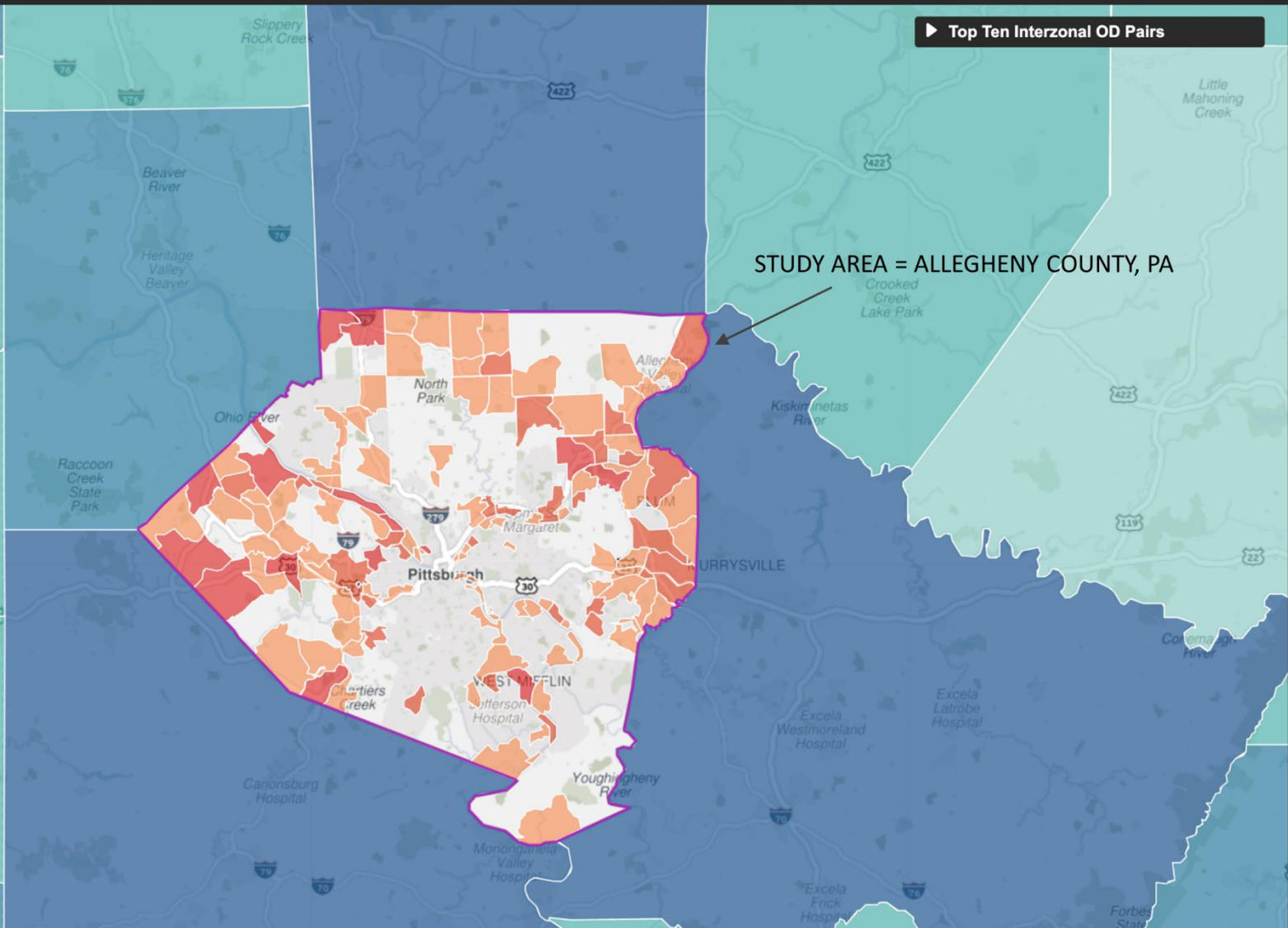
Hide lowest color range

Origins  
Destinations

10 50 250 1000

▶ Top Ten Interzonal OD Pairs

STUDY AREA = ALLEGHENY COUNTY, PA



**SPATIAL FILTER PASS-THROUGH SETTINGS:**

- Started Inside
- Ended Inside
- Started Outside
- Ended Outside

ZONE MAP of freight OD counts leaving Allegheny County

(For this query, the study area was chosen as the spatial filter)

Zone Map report



## 2. Example: New highway bridge & freeway opened (CSV T Project / Route 147)

Questions: How did route choices change? Were travel time benefits achieved?

Trip Analytics

Logged in as gjordan1@umd.edu | My Studies | Help | Switch data set | Logout

Using the Pennsylvania data set | Switch data set

### 1. Study: PA CSVT Travel Time Study Area from US 15 / Rte 147 split to I-80

- Define Study Area
  - Option 3: Using Custom Geography as Study Area
  - Number of study area OD gates: 163
- Specify Internal Zones for Origins and Destinations
  - Subcounties
- Specify External Zones
  - Counties
- Name Study
 

The study name will keep related analyses together for easy retrieval in My Studies.

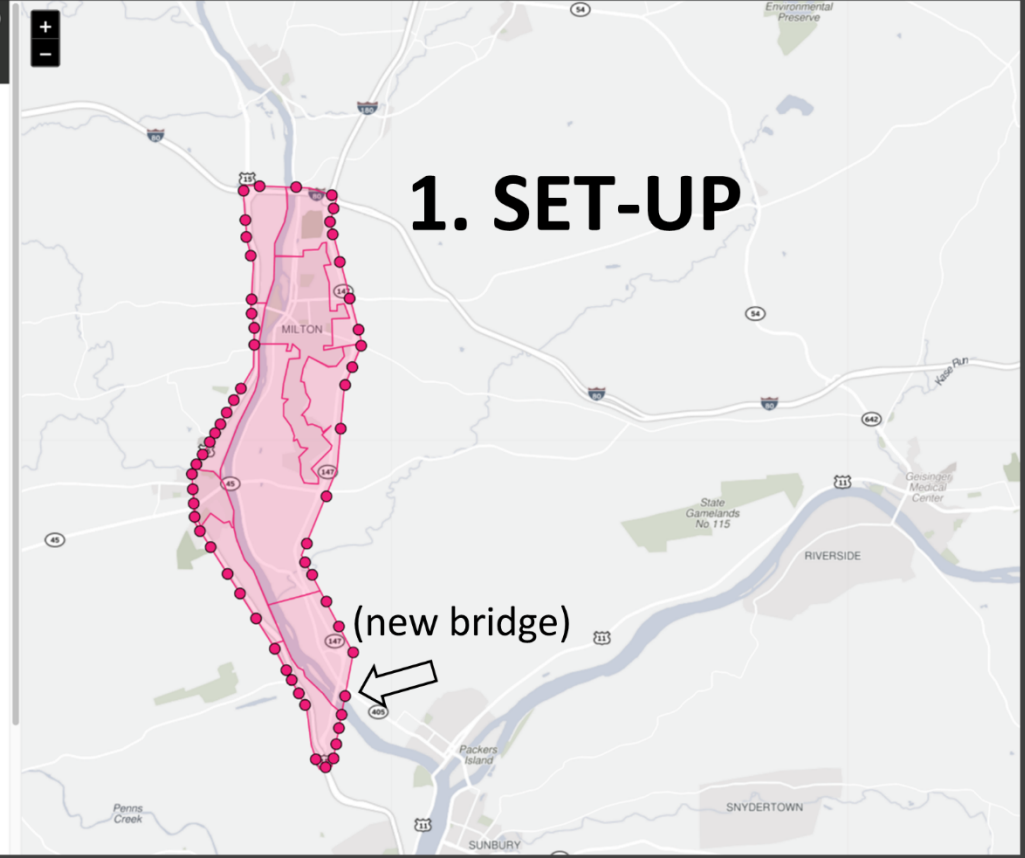
PA CSVT Travel Time Study Area from US 15 / Rte 147 split to I-80

Notes (optional):

Save Changes | Create Clone Study | Cancel

### 2. Set Filters and Submit Query

- Filter(s)
  - Spatial Filter(s):
    - From: Use a custom area as a Spatial Filter: PA CSVT GATE US 15 south of new 147 bridge.geojson
    - Include trips that: Started Outside
    - To: Use a custom area as a Spatial Filter: PA CSVT GATE across I-80.geojson
    - Include trips that: Ended Outside
  - Temporal Filter(s):



# 1. SET-UP

(new bridge)

This study area was designed to consolidate samples to get robust travel time statistics on both US 15 (west side of the river) and the new corridor across the river to the east

PA CSVT Travel Time Stud... Study Area: Custom Geography Spatial Filter: 2 custom areas in Pennsylv...  
 Data Set: Pennsylvania Internal Zones: Subcounties Temporal Filter: 4/4/2022 - 4/15/2022  
 External Zones: OD gates Other Filters: Vehicle type: all

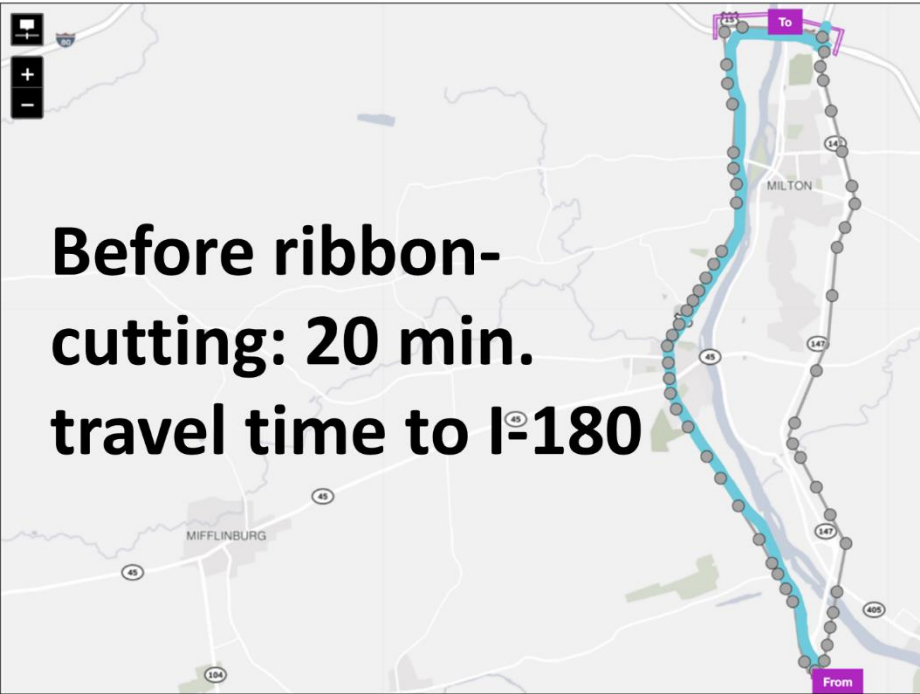
4,408 trips in 75 routes

Display Options

Open as...

Export

Map	Rank	Route	# of Trips	Light Vehicles	Medium Vehicles	Heavy Vehicles	Length	Travel Time	Avg TT	Min TT	Max TT	Reliability
<input checked="" type="checkbox"/>	1	US 15; Westbranch Highway, US 15; South Derr Drive, US 15; North Derr Drive, US 15	3423	3125	152	146	13 mi	16 m	17 m	9 m	4 h 15 m	1.09
<input checked="" type="checkbox"/>	2	US 15; Westbranch Highway, US 15; South Derr Drive, US 15; North Derr Drive, US 15	405	320	49	36	13 mi	17 m	18 m	13 m	1 h 34 m	1.11
<input checked="" type="checkbox"/>	3	US 15; Westbranch Highway, US 15; South Derr Drive, US 15; North Derr Drive, US 15; I 80; I 180	310	218	49	43	15 mi	20 m	21 m	14 m	3 h 07 m	1.09
<input checked="" type="checkbox"/>	4	US 15; Westbranch Highway, US 15; South Derr Drive, US 15; North Derr Drive, US 15; I 80	48	27	21	0	15 mi	19 m	19 m	15 m	30 m	1.09
Total			4408	3894	285	229						



PA CSVT Travel Time Stud... Study Area: Custom Geography Spatial Filter: 2 custom areas in Pennsylv...  
 Data Set: Pennsylvania Internal Zones: Subcounties Temporal Filter: 12/5/2022 - 12/16/2022  
 External Zones: OD gates Other Filters: Vehicle type: all

3,085 trips in 135 routes

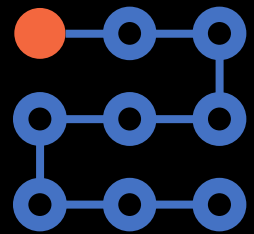
Display Options

Open as...

Export

Map	Rank	Route	# of Trips	Light Vehicles	Medium Vehicles	Heavy Vehicles	Length	Travel Time	Avg TT	Min TT	Max TT	Reliability
<input checked="" type="checkbox"/>	1	US 15; Westbranch Highway, US 15; Central Susquehanna Valley Thruway, PA 147; Central Susquehanna Valley	1404	849	330	225	12 mi	11 m	11 m	8 m	51 m	1.06
<input checked="" type="checkbox"/>	2	US 15; Westbranch Highway, US 15; South Derr Drive, US 15; North Derr Drive, US 15	851	701	84	66	13 mi	16 m	17 m	11 m	1 h 37 m	1.1
<input checked="" type="checkbox"/>	3	US 15; Westbranch Highway, US 15; Central Susquehanna Valley Thruway, PA 147; Central Susquehanna Valley	265	217	39	9	14 mi	12 m	13 m	11 m	37 m	1.06
<input checked="" type="checkbox"/>	4	US 15; Westbranch Highway, US 15; South Derr Drive, US 15; North Derr Drive, US 15	121	81	17	23	13 mi	17 m	18 m	13 m	26 m	1.09
Total			3085	2153	563	369						





# Trip Analytics for Planning DEMO

# Contact Information



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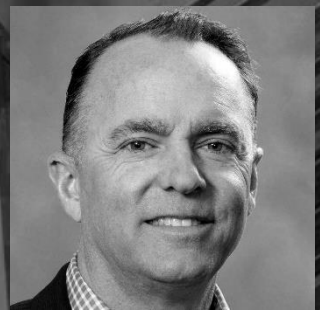
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**Rick Ayers**

[rayers@umd.edu](mailto:rayers@umd.edu)

# EXTRAS

HOW TO LOG IN Log-on; beta vs. legacy

Planning: Show NHTS National, Truck, and add-on (GA)

Are datasets representative?  
What about privacy?

Show My Studies

Show geojson.io?

ADD report examples

## TIPS

Get sample counts > % > outside counts for expansion – ODMs, zone maps, screen & cordon lines

+ sample count until %'s stop changing significantly

## 1:00pm-1:45pm, ET - Session 1: For Operators

How to draw a "travel time study area" to get:

- "Last-mile" routes and travel time statistics for event-related traffic moving between an outer cordon line and a central parking district
- Travel time measurements along primary and parallel corridors to test a new ramp meter installation or other device deployments
- options while planning detour routes, or later, find out how many drivers followed the recommended detour route
- Before/after documentation of flow improvements from signal retiming along a corridor (while quantifying travel time changes for crossing traffic)

## 1:45pm-2:30pm, ET- Session 2: For Planners

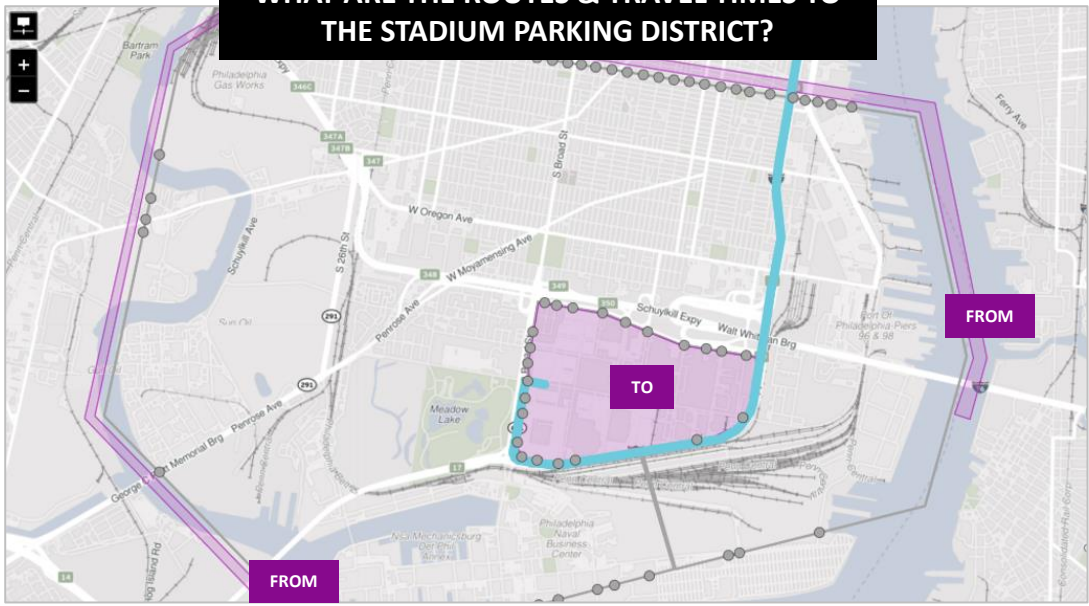
How to:

- Calibrate or validate an MPO/DOT macro-level travel demand model (TDM) for specific subregions in a planning area
- For micro-simulation packages such as VISSIM, Aimsun, or Transmodeler, use small "cookie cutter" study areas to calibrate or validate base line OD tables
- Provide before/after documentation of the travel time and reliability benefits by completing a bottleneck mitigation project (scuttle your floating cars for good)
- Document urban truck route compliance with measured travel times through & around neighborhoods

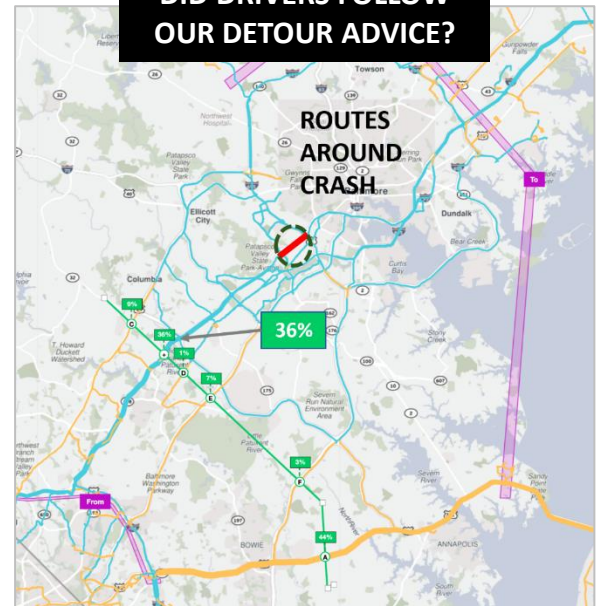
**ARE PORT TRUCKS CUTTING THROUGH NEIGHBORHOODS?**



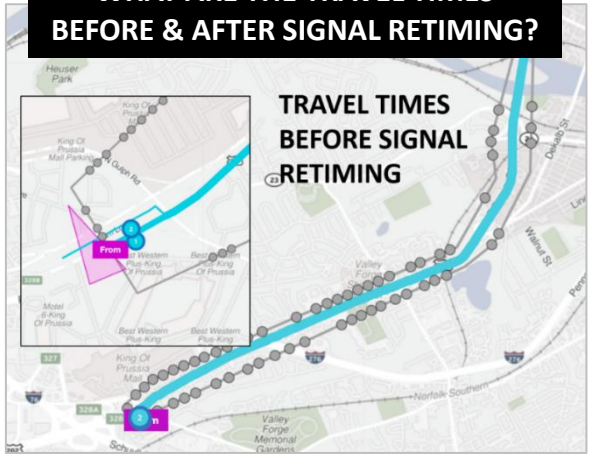
**WHAT ARE THE ROUTES & TRAVEL TIMES TO THE STADIUM PARKING DISTRICT?**



**DID DRIVERS FOLLOW OUR DETOUR ADVICE?**



**WHAT ARE THE TRAVEL TIMES BEFORE & AFTER SIGNAL RETIMING?**



**Trip Analytics** can provide answers to a variety of Planning and Operations questions

**WHAT ARE THE TRAVEL TIME BENEFITS OF A NEW BRIDGE & HIGHWAY?**

