ATLANTA REGIONAL COMMISSION

HIGHLIGHTS: ATLANTA REGIONAL FREIGHT MOBILITY PLAN UPDATE

DVGMTF Downtown Delivery Symposium II

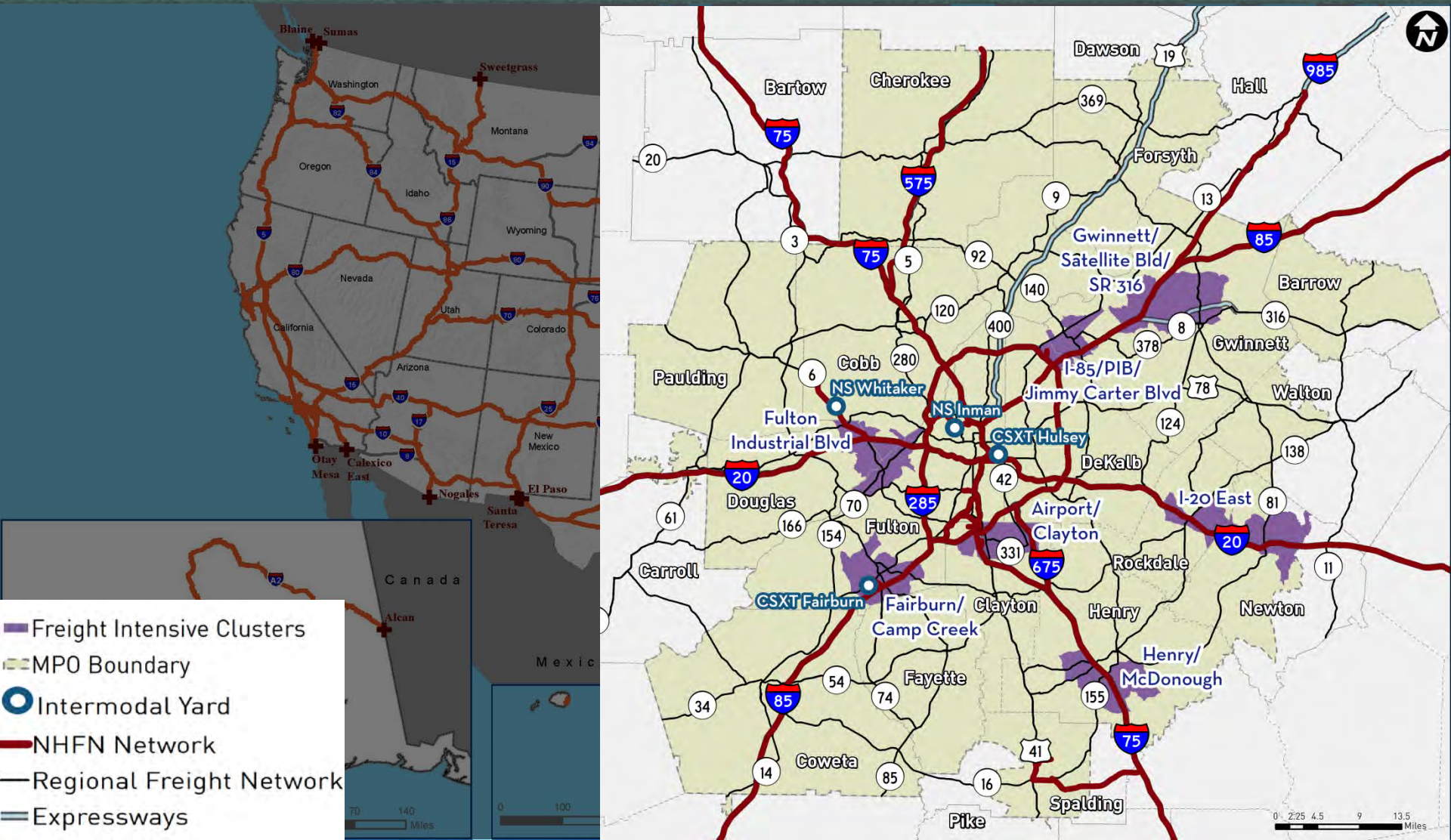
July 13, 2016

WSP | PARSONS BRINCKERHOFF

Atlanta in the Primary Highway Freight System

ATLANTA REGIONAL COMMISSION

WSP | PARSONS BRINCKERHOFF

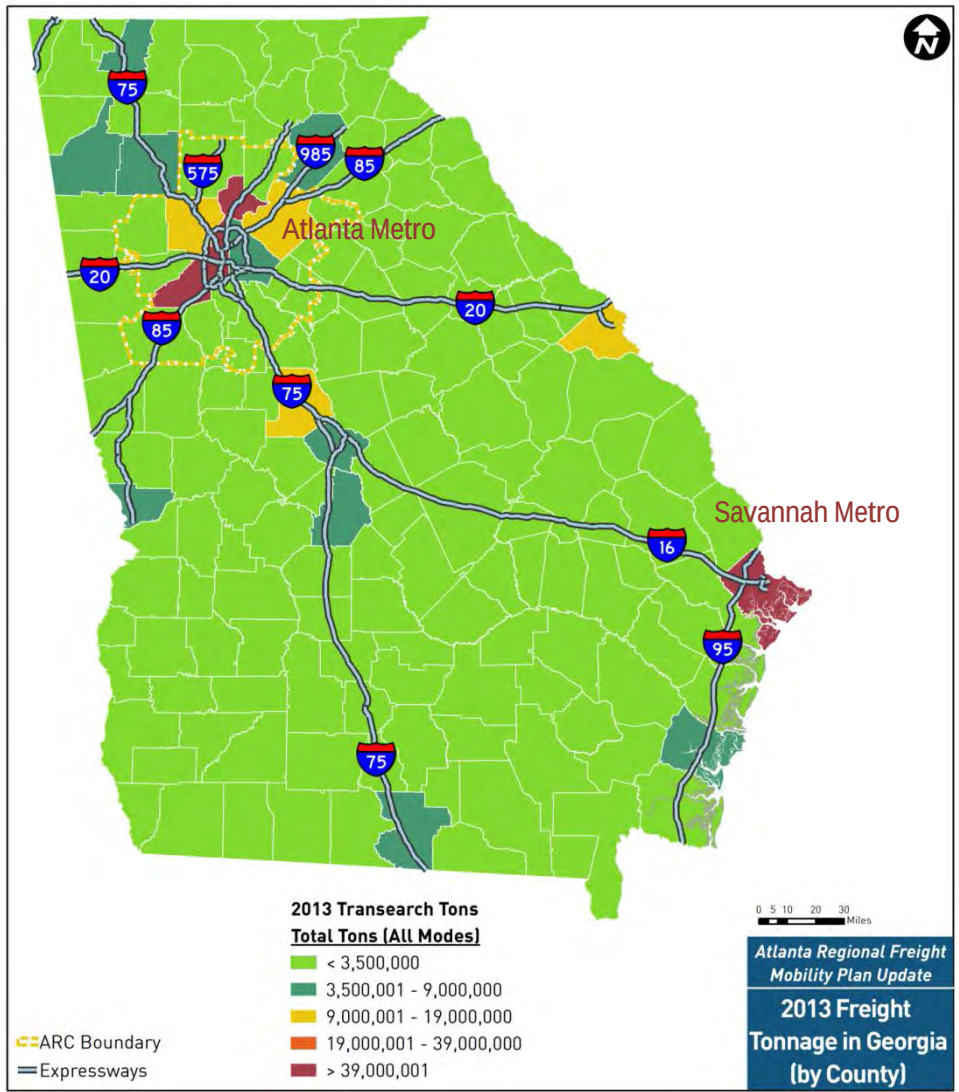


Who Atlanta Is in Supply Chain Logistics

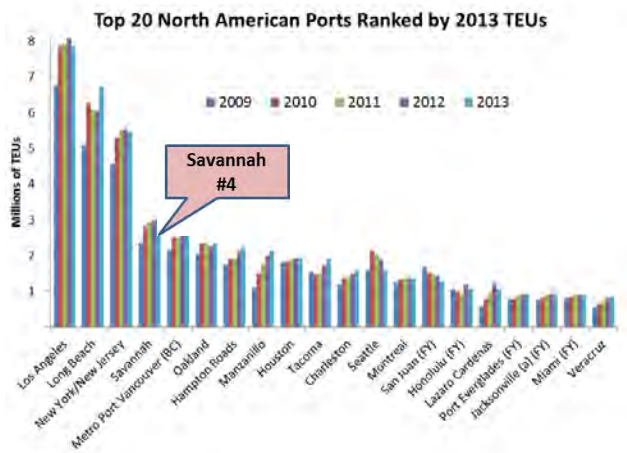
- The top metropolitan economy in the Southeast
- The top manufacturing center in the Southeast
- The distribution hub of the Southeast
- The 2nd largest population center in the Southeast (after Miami)
- The catalyst for the largest container port in the Southeast

Top US Manufacturing Centers by Employment, 2013		
Rank	Metropolitan Statistical Area	Employment
1	Los Angeles	508,526
2	Chicago	386,575
3	New York	338,127
4	Dallas	231,789
5	Houston	223,777
6	Detroit	207,036
7	Minneapolis	176,604
8	Philadelphia	168,032
9	Boston	152,822
10	Seattle	152,339
11	Atlanta	133,107
12	Cleveland	121,442
13	Milwaukee	113,926
14	San Francisco	105,958
15	San Diego	100,475

Interdependence in GA's Freight Centers



- Atlanta & Savannah metro's are GA's two primary freight centers
- Savannah is #4 container port in North America
- Two metro's paired in supply chain dynamics
  - Savannah is Port of Atlanta



Atlanta-Savannah Truck and Train Flows

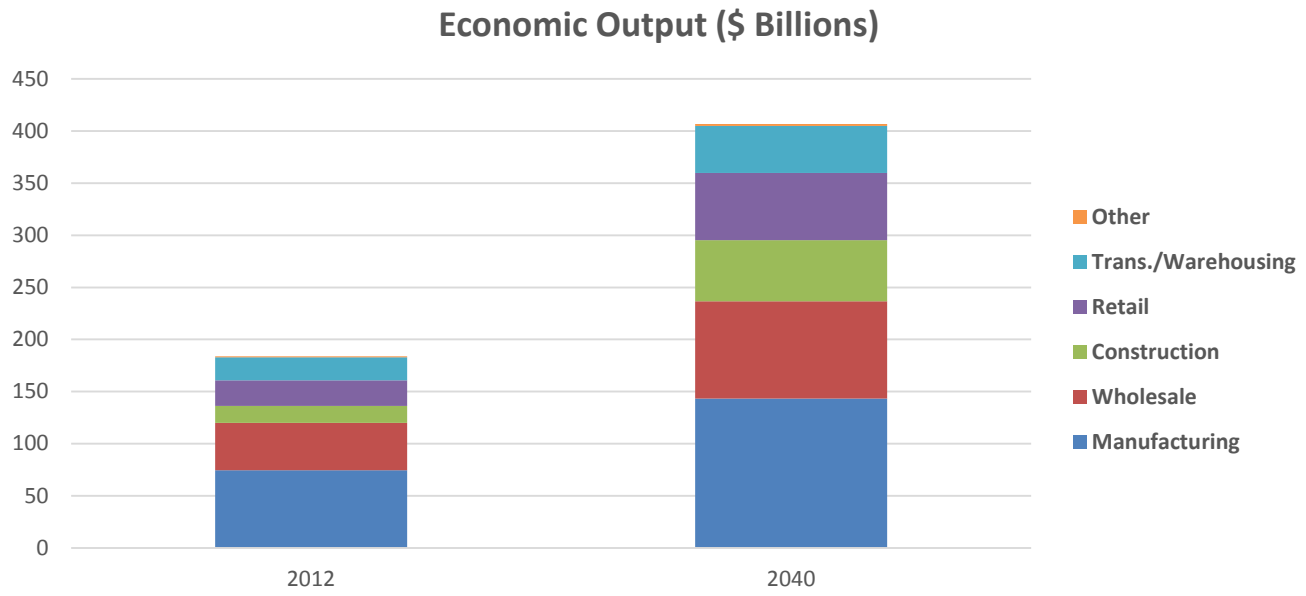
Mode	Between Atlanta and Port of Savannah	Between Atlanta and Rest of Chatham County	Total Between Atlanta and Chatham County
Loaded Trucks Annual	71,532	31,967	103,499
Loaded Trucks per Day	286	128	414
Total Trucks Annual	162,500	72,750	235,250
Total Trucks Per Day*	650	291	941
Number of IMX Trains Per Day	3	0	3

Note: Data represent both directions of traffic. Daily figures based on 250 workday year

Source: 2013 ARC Transearch Data, *2015 Draft GDOT Truck Survey, GDOT OTD, consultant analysis

Freight in Atlanta's Economy

- Output from freight dependent industries is 38% of the total regional economy
- Forecast to grow from $184 billion in 2012 to $407 billion in 2040



Source: REMI for ARC

Freight in Atlanta's Employment Base

- 31% of regional jobs are freight dependent
- Freight dependent jobs are forecast to grow from 900,000 in 2012 to 1.3 million in 2040

Source: REMI for ARC

ARC Vision & Goals: The Region's Plan

- **Region's Vision:** *Win the Future through world-class infrastructure, a competitive economy, and healthy, livable communities*
- **Freight Vision:** ***Metropolitan Atlanta will win the future, remaining and growing as the capital of the South by sustaining our stature through industry, trade, and cultural vitality, and by serving the people through enhancement of our role as a global hub for goods, services, and enterprise.***

➡ 17 freight objectives serving the Region's 6 Goals

Example: Healthy, Livable Communities Goals

- *Developing additional, walkable, vibrant centers that support people of all ages and abilities*

  Example freight facets:

  - Livable means supplied
  - Redevelopment
  - Areas of “strategic regional importance”
  - Job access

- *Promoting health, arts, and other aspects of a high quality of life*

  Example freight facets:

  - 24-hour communities
  - Energy efficiency
  - Event & film-production logistics

World Class Infrastructure: Goals & Freight Objectives

ATLANTA REGIONAL COMMISSION

WSP | PARSONS BRINCKERHOFF

The Atlanta Region's Plan Vision Outcome 2: World Class Infrastructure

Goal: Ensuring a comprehensive transportation network, incorporating regional transit and 21st Century technology

Freight Objectives:

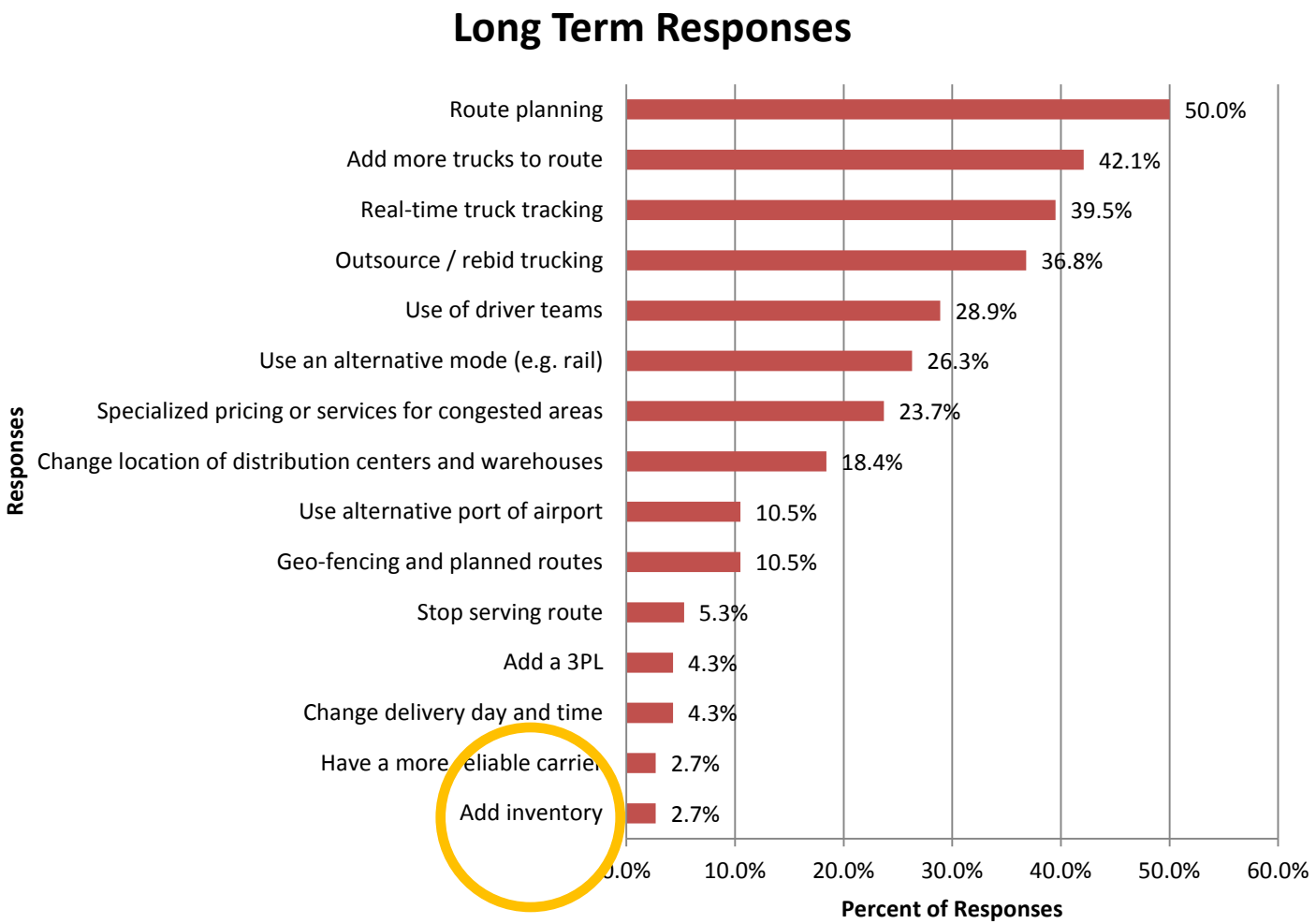
- Protect, manage, and invest in the regional truck route system
- Ensure competitive freight performance in six key dimensions: travel time, reliability, cost, safety, sustainability, and risk management
- Manage the critical role of first, last and transfer miles in the end-to-end performance of the region's supply chains
- Plan for the impact and promote the appropriate use of information, connected vehicle technologies, and driverless vehicle technologies to improve the productivity, safety, and visibility of freight movement
- Plan and preserve industrial land uses for job creation and efficient service to markets and population

Goal: Secured, long term water supply

Freight Objectives:

- Understand the intensity of water demand in industrial processes and incorporate in development planning

Shipper Performance Management: Reliability (NCHRP 8-99)

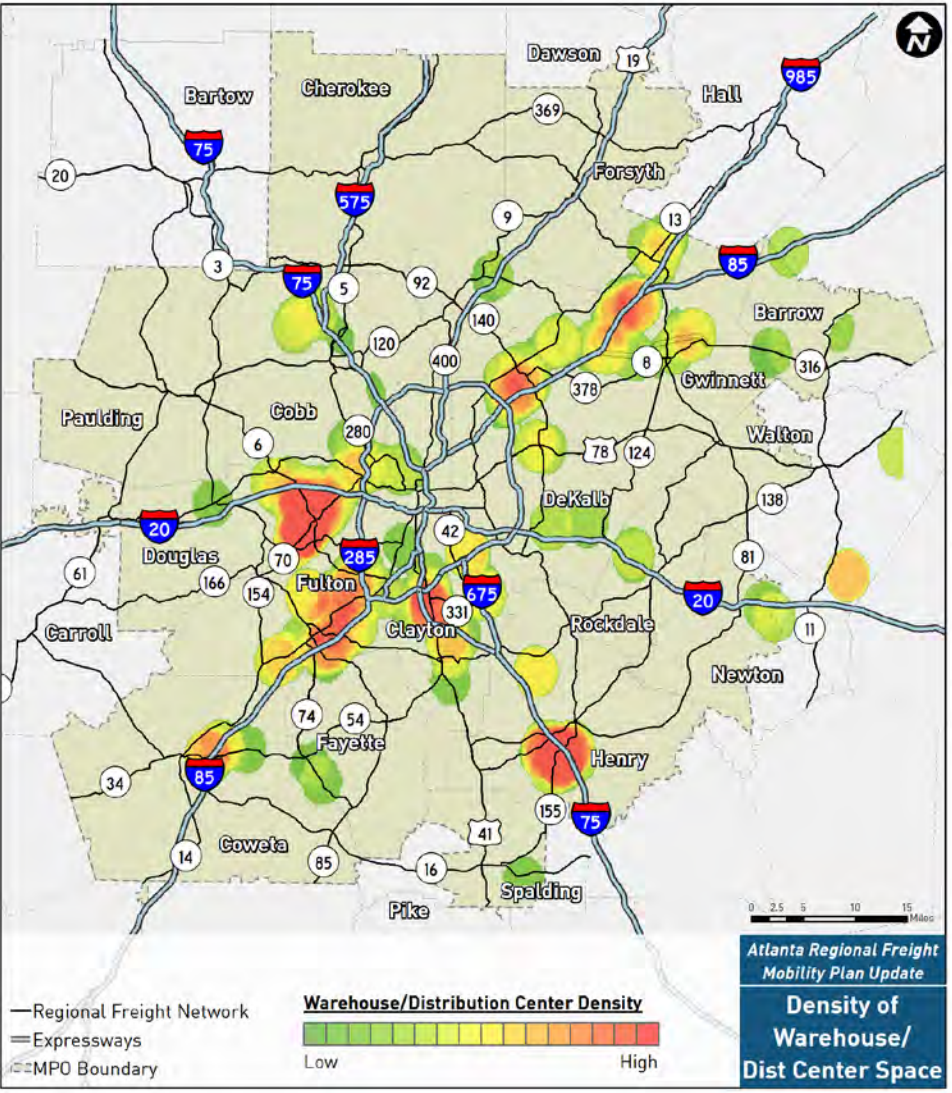


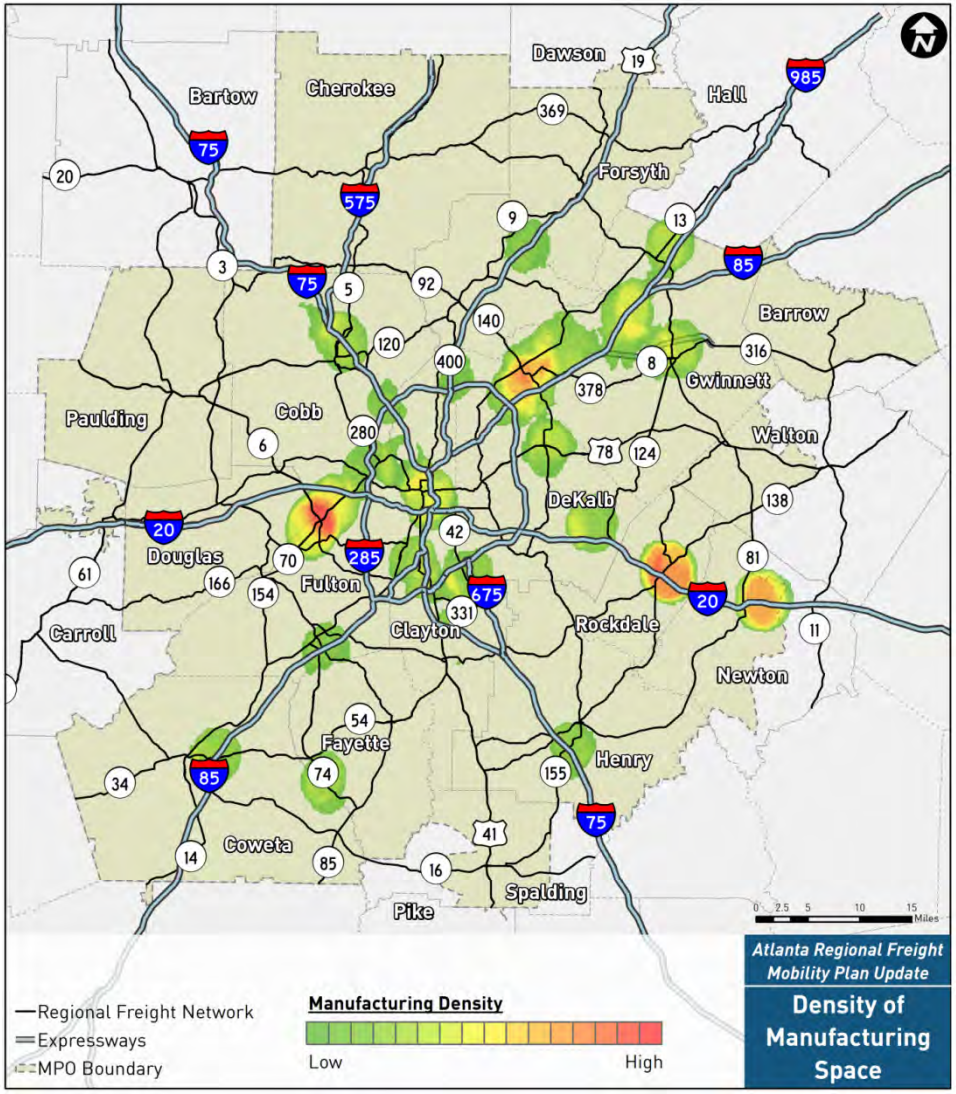
Reliability: Buffer Time on Non-Interstates (PM Peak)

Industrial Clustering

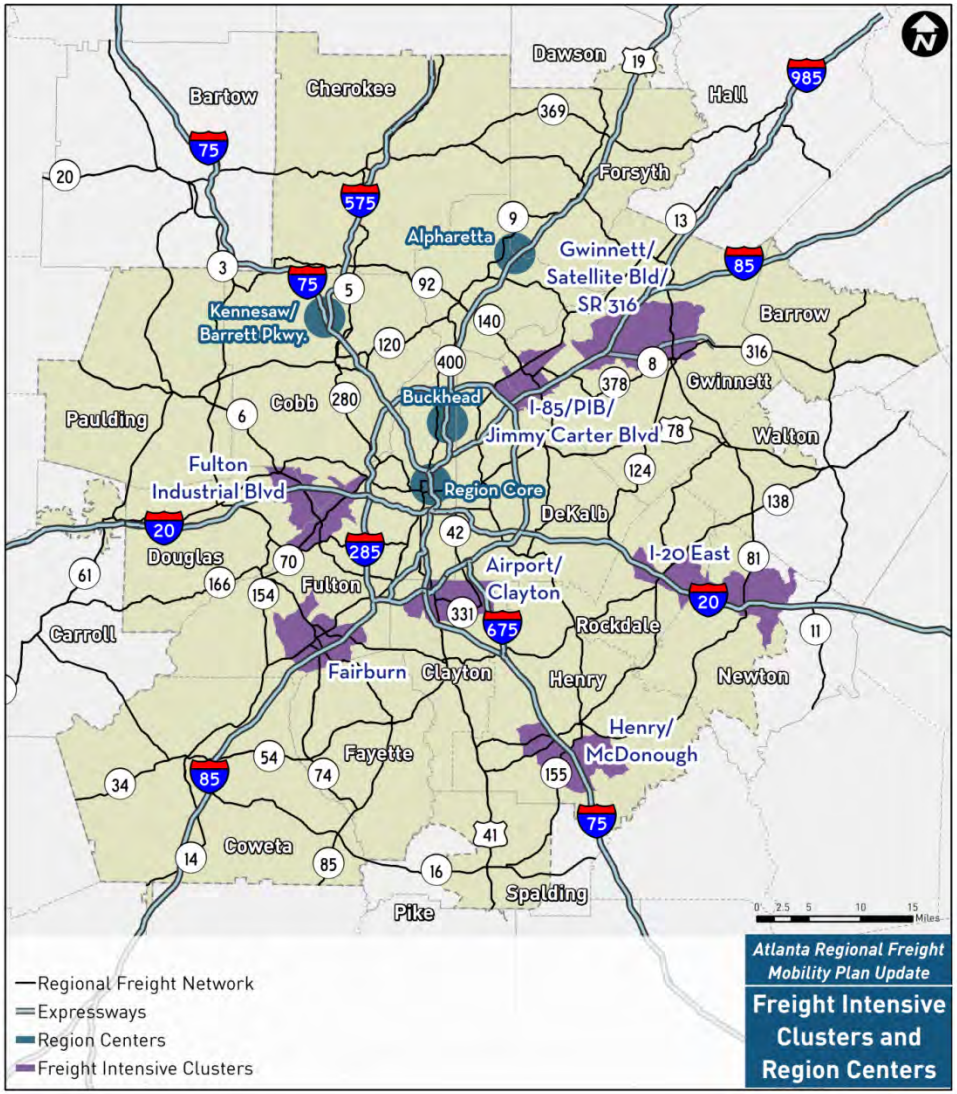
ATLANTA REGIONAL COMMISSION

WSP | PARSONS BRINCKERHOFF





Freight Intensive Clusters & Region Centers



Cluster-Based Performance Measurement

ATLANTA REGIONAL COMMISSION

WSP | PARSONS BRINCKERHOFF

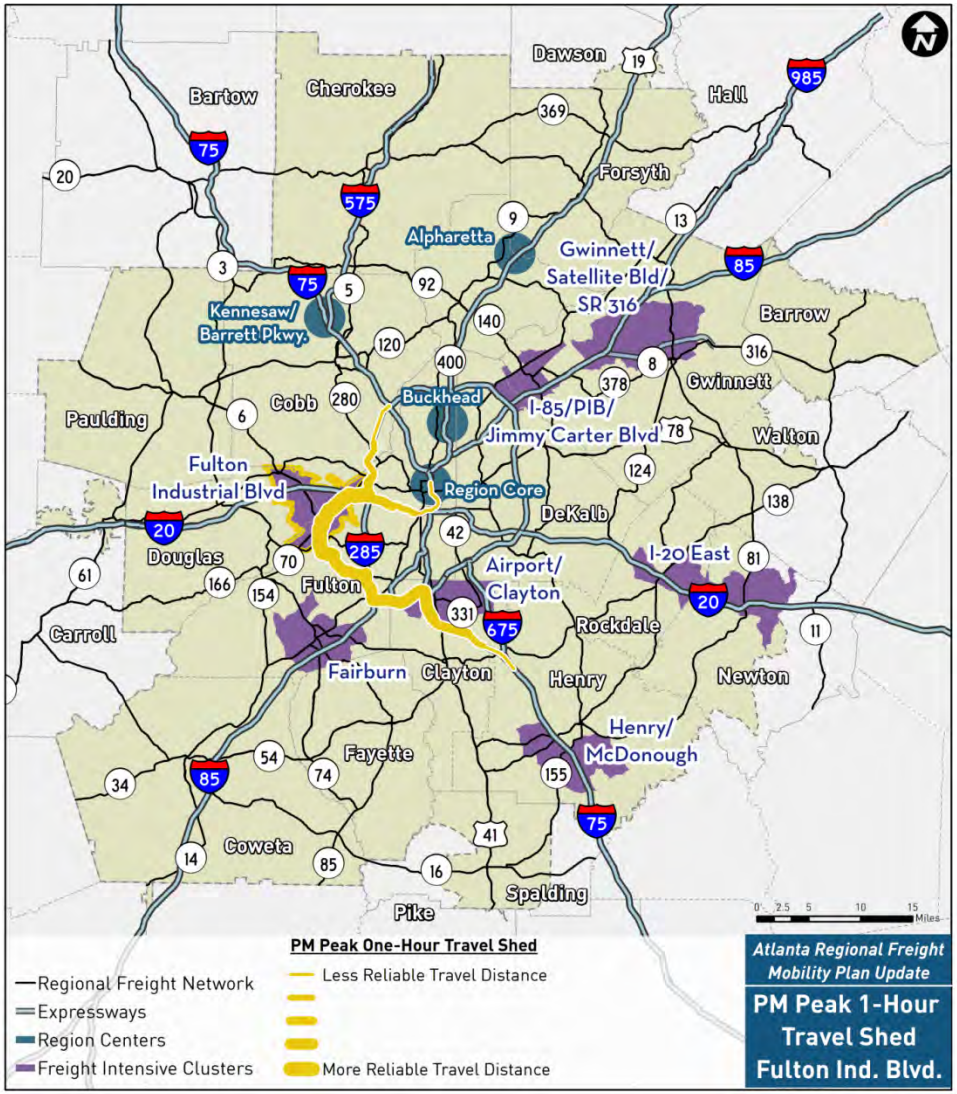
- 7 Origin Clusters to 7 Destination Clusters
  - Cross-coverage of region

ORIGINS: Manufacturing & Distribution	DESTINATIONS: Region Centers & Distribution						
	Region Core	Buckhead	Kennesaw/ Barrett Pkwy	Alpharetta	Airport/ Clayton Co	McDonough/ Henry Co	Gwinnett/ Satellite Blvd./SR 316
Fulton Industrial Blvd.							
I-85/PIB/JC Blvd.							
I-20 East/Conyers/ Covington							
Fairburn/Camp Creek							
Airport/Clayton							
McDonough/Henry							
Gwinnett/Satellite Blvd./SR 316							

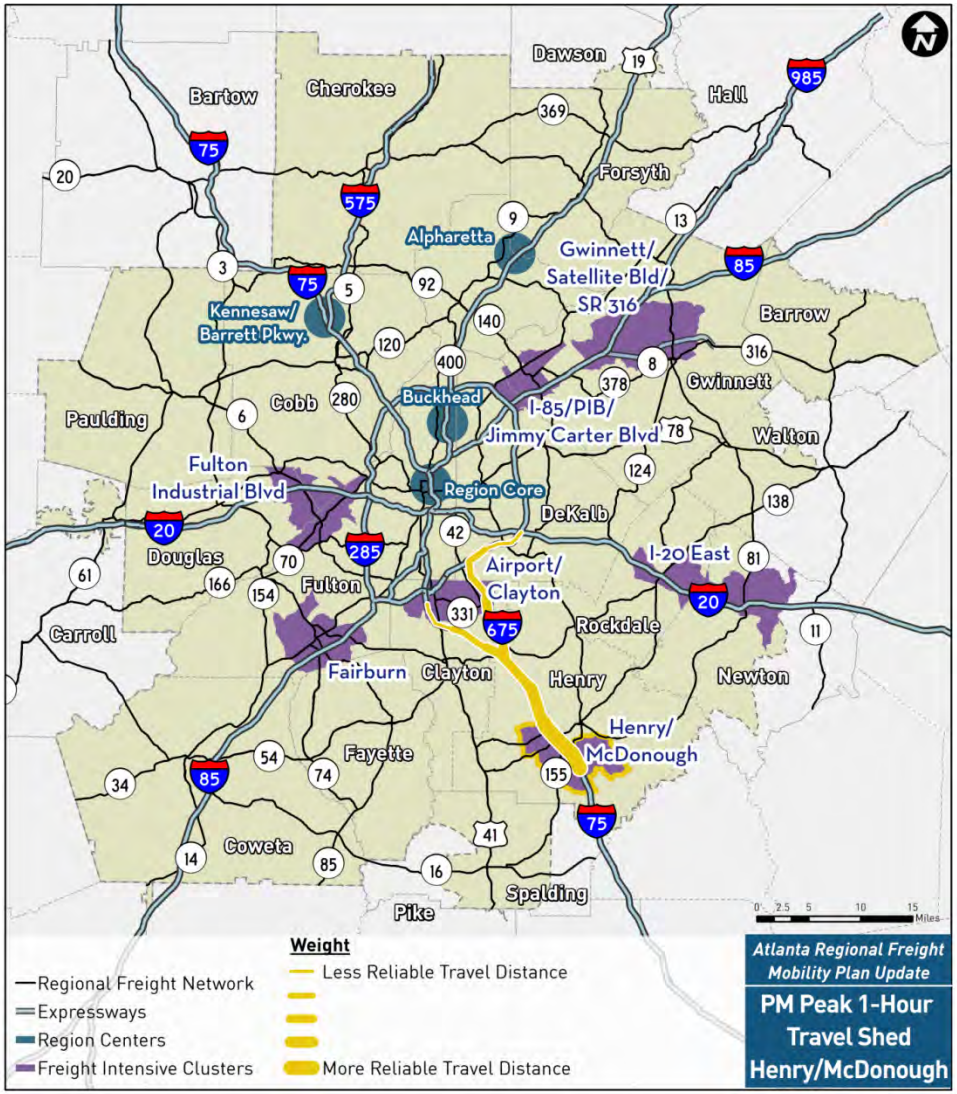
Fulton Industrial Blvd. 1 Hour Travel Shed (PM Peak)

ATLANTA REGIONAL COMMISSION

WSP | PARSONS BRINCKERHOFF



McDonough/Henry 1 Hour Travel Shed (PM Peak)



Cluster Summary: 1-Hour Travel Sheds at PM Peak

ATLANTA REGIONAL COMMISSION

WSP | PARSONS BRINCKERHOFF

	DESTINATION						
ORIGIN	Region Core	Buckhead	Kennesaw/ Barrett Pkwy	Alpharetta	Airport/ Clayton	McDonough/ Henry	Gwinnett/ Satellite Blvd/ SR 316
Fulton Industrial Blvd	✓	⊘	⊘	⊘	✓	⊘	⊘
I-85 / PIB/ Jimmy Carter Blvd	✓	✓	⊘	✓	⊘	⊘	✓
I-20 East	✓	✓	⊘	⊘	✓	✓	⊘
Fairburn/ Camp Creek	✓	✓	⊘	⊘	✓	⊘	⊘
Airport/ Clayton	✓	✓	⊘	⊘	✓	⊘	⊘
McDonough/ Henry	⊘	⊘	⊘	⊘	✓	✓	⊘
Gwinnett/ Satellite Blvd/ SR 316	⊘	✓	⊘	✓	⊘	⊘	✓

Addressing Performance: Projects in Context

Strategies & Initiatives: Home Delivery Study

- Purpose: track and assess profound and costly shift in retail with large effect on freight patterns
  - Storefront vs. on-line strategies being invented
- Objective: ensure transportation planning keeps pace with change

Factors:

- Battle for convenience
  - Store or collection point pickup vs. delivery to consumer door
  - Same day and 1 hour delivery require local staging facilities
- Battle to capture and grow limited route density
  - "Prime"-style free delivery encourages household bulks (e.g. paper products, pet food) ➡ means more and larger delivery trucks
  - Emerging afternoon delivery pattern
- Developing demography: e.g. on-line millennials; aging, less-mobile baby boomers

Strategies & Initiatives: Home Delivery (cont'd)

- Challenge and opportunity for community integration of freight
  - Neighborhood conflicts and security concerns
  - Consumer benefits of freight become visible
  - Venue for cleaner, safer trucks e.g. via alternative fuels, CAV technology
- Convenience becomes performance factor for consumer-driven freight

ATLANTA REGIONAL COMMISSION

Thank you!

WSP | PARSONS BRINCKERHOFF

Joe Bryan BryanJG@pbworld.com

Local Connector, Global Impact: Making the Case for Funding

presented to

DVRPC Downtown Delivery Symposium

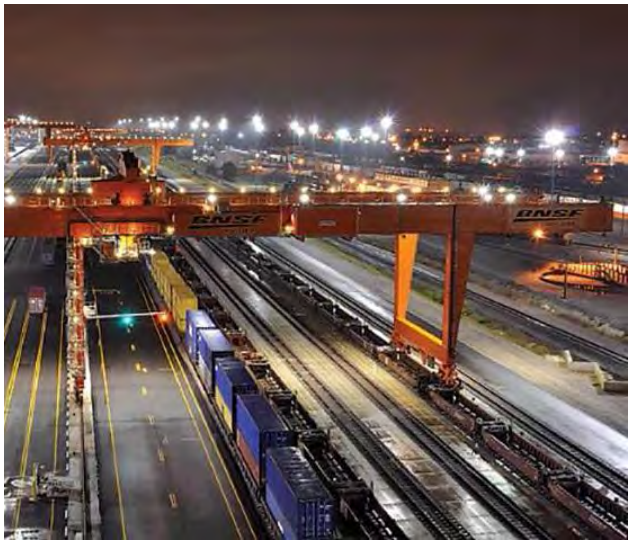
presented by

Paula Dowell, PhD

Think Forward

Memphis- A Global Freight Hub

- Busiest air cargo hub in the country
- Nation's 4th largest inland water port
- Five class 1 railroads and 9 intermodal yards
- Four interstate corridors



CAMBRIDGE SYSTEMATICS

Lamar Avenue by the Numbers

- Over 20 Fortune 500 companies
- 98.7 million sq ft industrial space
- 490 truck terminals, 19 freight intermodal terminals, 4 rail yards and 3 air cargo facilities
- 40,000 AADT with over 30% truck
- Estimated 13,000 hours of daily delay

CAMBRIDGE SYSTEMATICS

Key Businesses Served by Lamar Avenue

General Motors	Ford Motors	McKesson
Hewlett-Packard	ATT	Johnson & Johnson
Target	UPS	Nike
Kroger	Disney	FedEx
Sears	TJ Maxx	Cummins
Jabil	Coca-Cola	Hersey
Fujitsu	Sharp	Williams Sonoma

Public and Private Sector Support for Lamar Avenue Investments

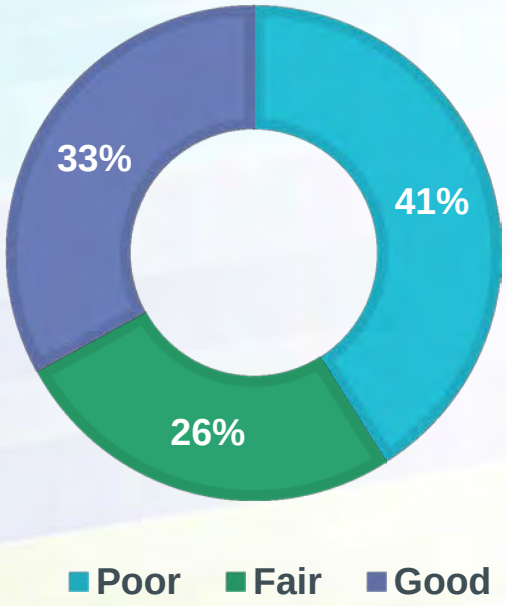
Corridor Level Of Service

Intersection	Peak Hour a.m. (7:30-8:30)	Lunch (11:30-12:30)	Midday (2:30-3:30)	p.m. (4:30-5:30)	Average
Lamar at American Way	C	C	D	F	D
Lamar at Pearson	B	D	B	B	C
Lamar at Democrat	C	E	B	B	C
Lamar at Knight Arnold	B	C	B	C	C
Lamar at Winchester	F	F	F	F	F
Lamar at Concorde	E	B	A	B	C
Lamar at Shelby	F	F	F	F	F
Lamar at Tuggle	E	F	A	B	D
Lamar at Holmes	F	E	E	F	F
Average	D	D	C	D	D

CAMBRIDGE SYSTEMATICS

An Urban Connector in Need

AVERAGE PAVEMENT CONDITIONS

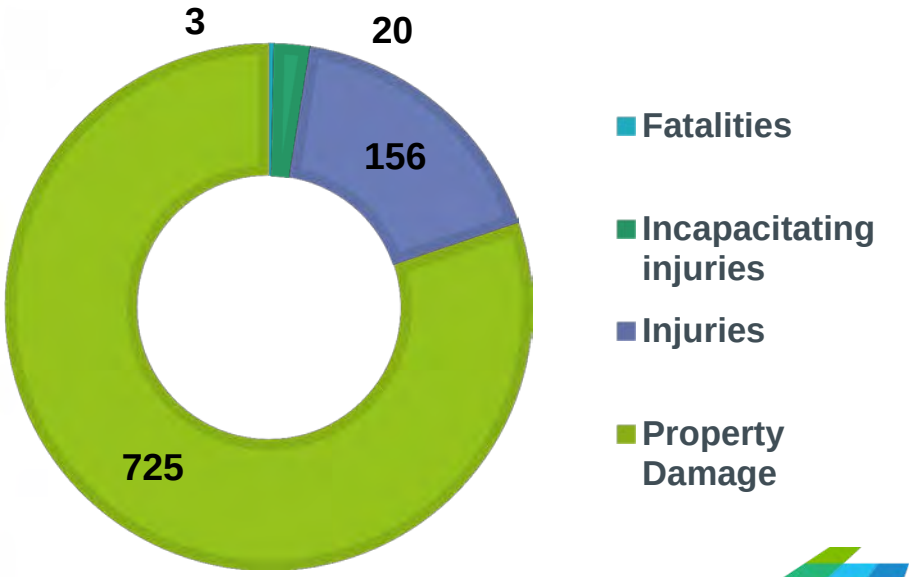


Vehicle Hours of Delay (VHD)

+6,813 VHD

Total increase of **52%** from base year to future no build

CRASHES, 2013-2014



CAMBRIDGE SYSTEMATICS

A Plan for Improvement

- Expand from 4 to 6 lanes
- Upgrade the Lamar Avenue/East Holmes intersection to an interchange.
- Upgrade the Lamar Avenue/East Shelby intersection to an interchange.
- Upgrade the Lamar Avenue/Winchester Road intersection to an interchange
- Repave the 4.1 miles of the corridor
- Cost - $300 million

Project Traffic Benefits

	2010 Base Year	2040 No-Build	2040 Build	%-Change 2040 Build-2040 No Build
Total Daily Delay	13,070	19,883	18,478	-7,1%
AM Peak Delay/Auto	476	800	634	-20.7%
AM Peak Delay/Truck	132	176	159	--9.7%
PM Peak Delay/Auto	591	909	760	-16.5%
PM Peak Delay/Truck	338	601	450	-25.0%

Project Benefits

Benefit Category	Savings	Discounted at 3%
State of Good Repair (SOGR)	Pavement Maintenance Cost	$89,090,642
Economic Competitiveness	Travel Time Costs	$156,197,960
	Vehicle Operating Costs	$539,361,221
Livability	Noise Costs	$14,070,198
Sustainability	Social Cost of Carbon Emissions	$48,071,640
	Non-Carbon Emission Costs	$4,079,711
Safety	Motor Vehicle Crashes	$92,675,916
	Total Benefits (B) =	**$943,547,287**

Economic Impacts, 2020-2040

Employment	Income	Gross State Product
3,680	$402 million	$569 million

Getting the Project Done

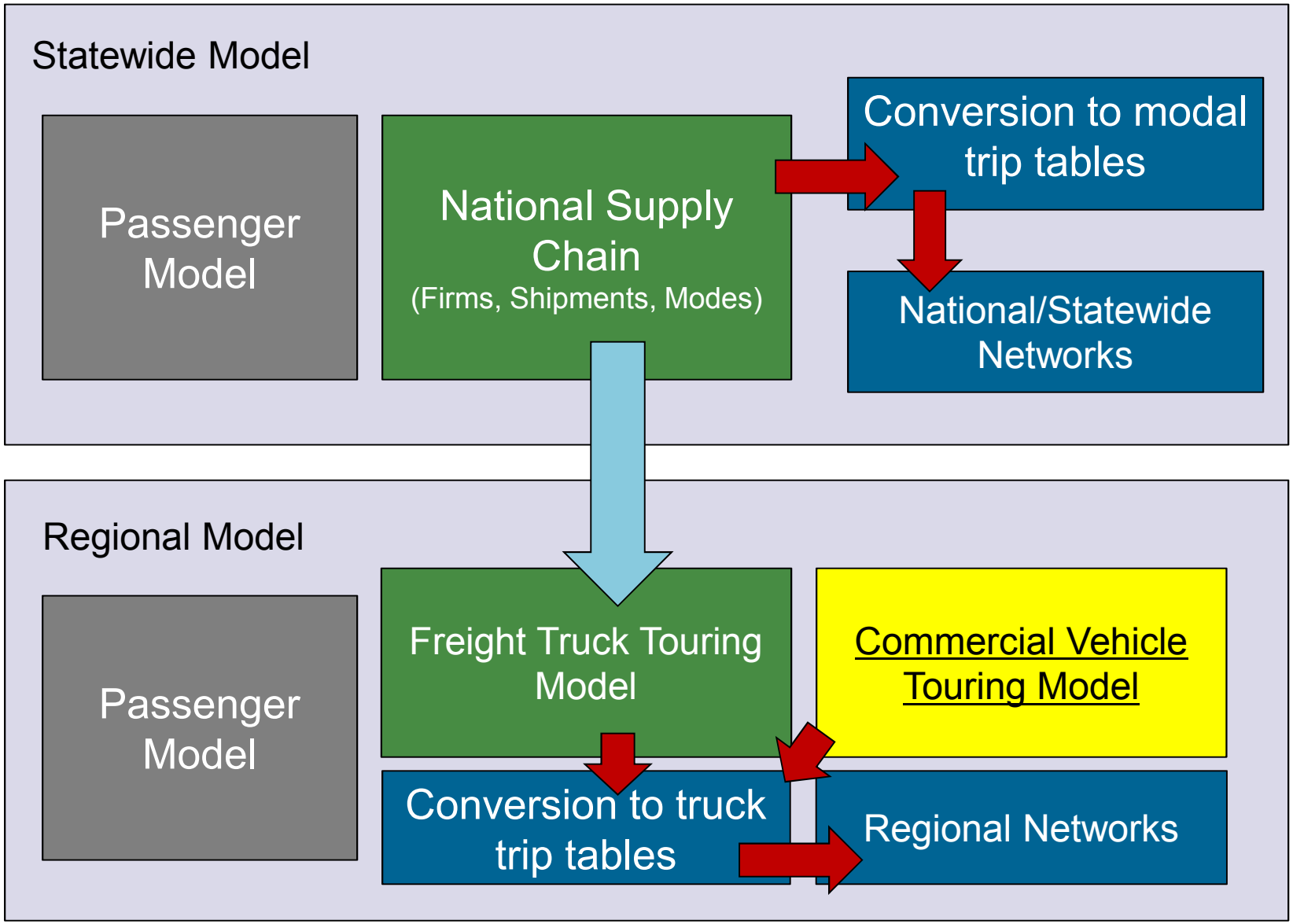
- Coalition of stakeholders
  - Chamber of Commerce
  - FedEx, BNSF, JB Hunt, NS, CSX, UPS
  - TN, MS, AR
  - Community leaders
- Funding
  - State
  - Federal
  - Local
  - Private

RSG
the science of insight

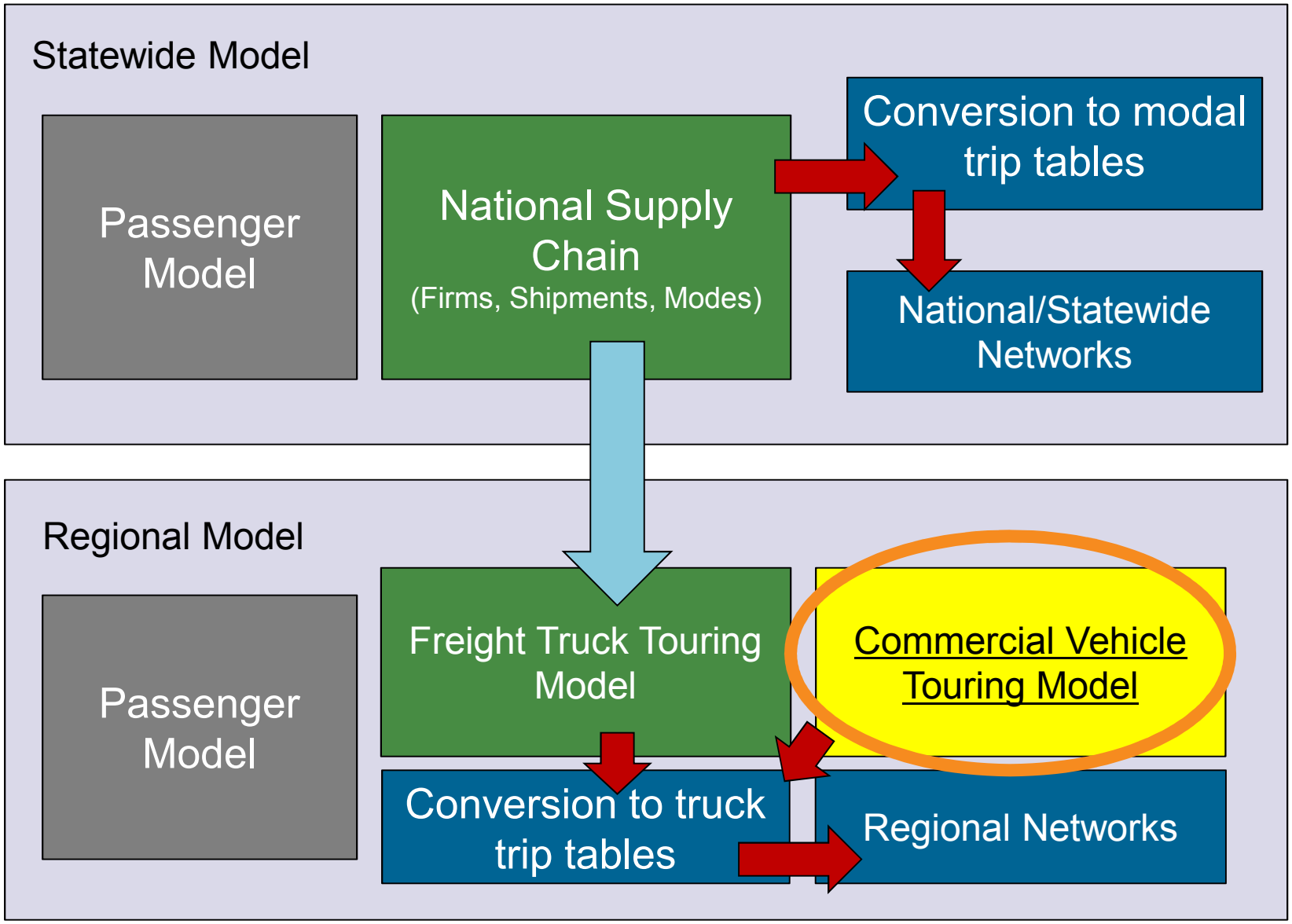
Including Commercial Vehicle Touring in Regional Models

Erica Wygonik, PhD, PE

Model Design



Model Design



Commercial Vehicle Touring Model (CVTM)

- Concept
- Structure
- Model Development & Verification

Commercial Vehicle Touring Model (CVTM)

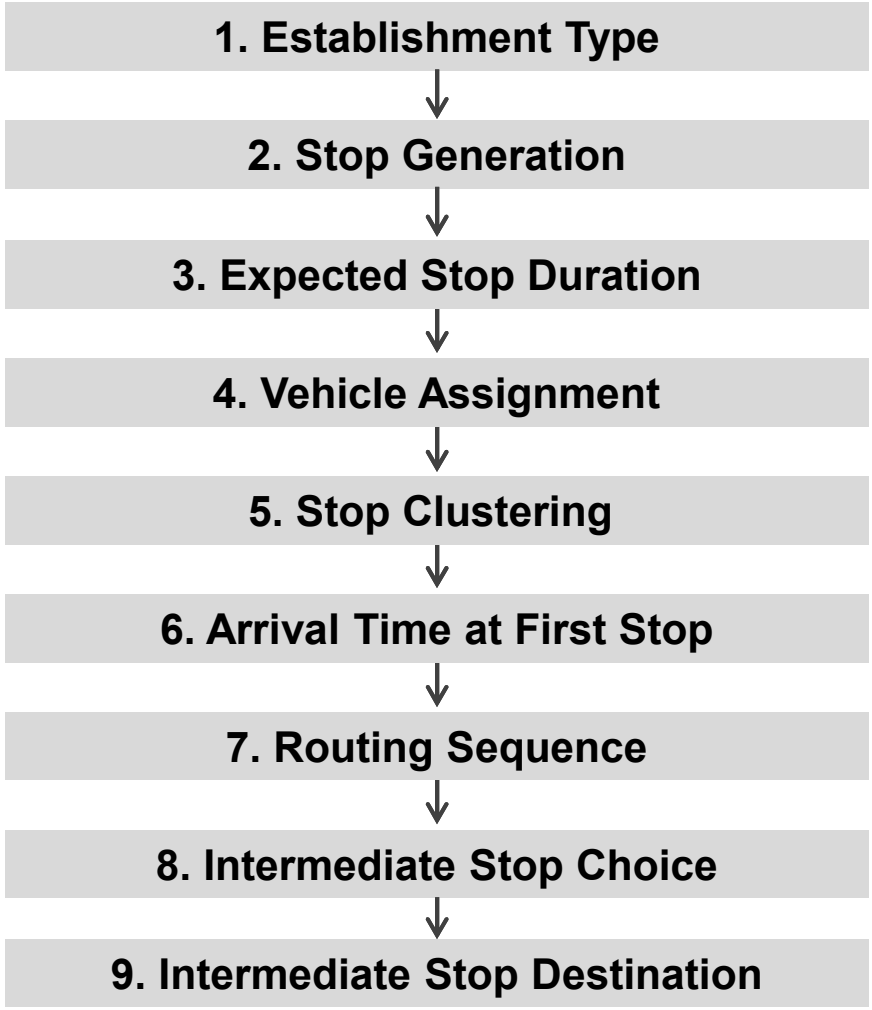
- Focuses on the non-freight, service sector
- Important differences between commercial service provision and freight flows
  - Estimated using establishment survey data
    - not regular movement of freight / freight flows
  - Infrequent demand by individual customers
  - Short time horizons for service call dispatching is common
  - Some destinations may be considered “intermediate stops”
  - Service may include pick up/drop off materials/equipment

Freight Truck vs. Commercial Vehicle Touring

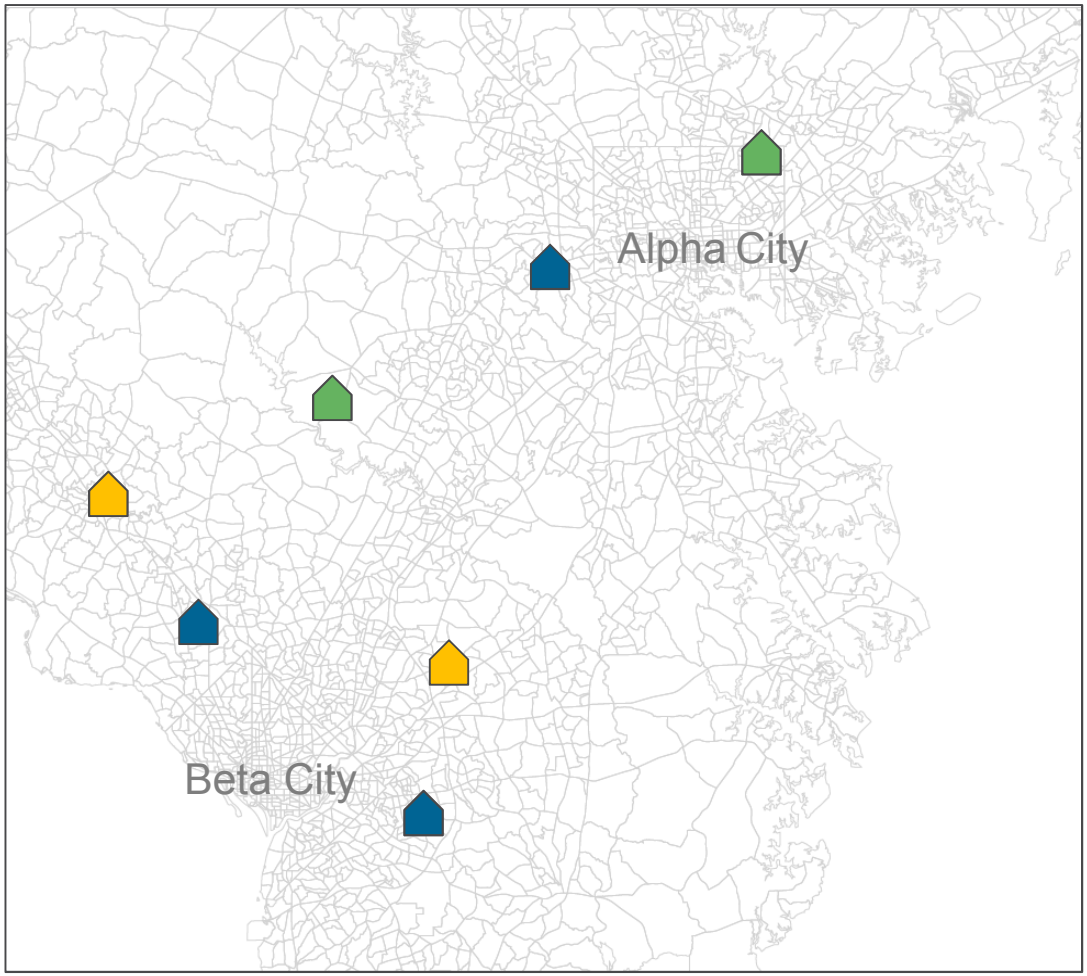
	Freight Truck Touring Model	Commercial Vehicle Touring Model
Vehicle Classes	Medium and Heavy	**Light,** Medium, and Heavy
Trip/stop purposes	Delivery of shipments to businesses	Service stops at all businesses and home, delivery of shipments to homes
Connections to external demand	Connected to external freight flows	Not influenced by external demand

Components of Commercial Vehicle Touring

- Customers generate service stops by purpose, location and time of day (arrival time)
- Stop durations are predicted
- Firms then choose whether to group assigned stops into a single tour or multiple-driver tours.
- Drivers sequence stops
- Firms may generate “intermediate” stops in between customer stops and return home



1. Establishment Type

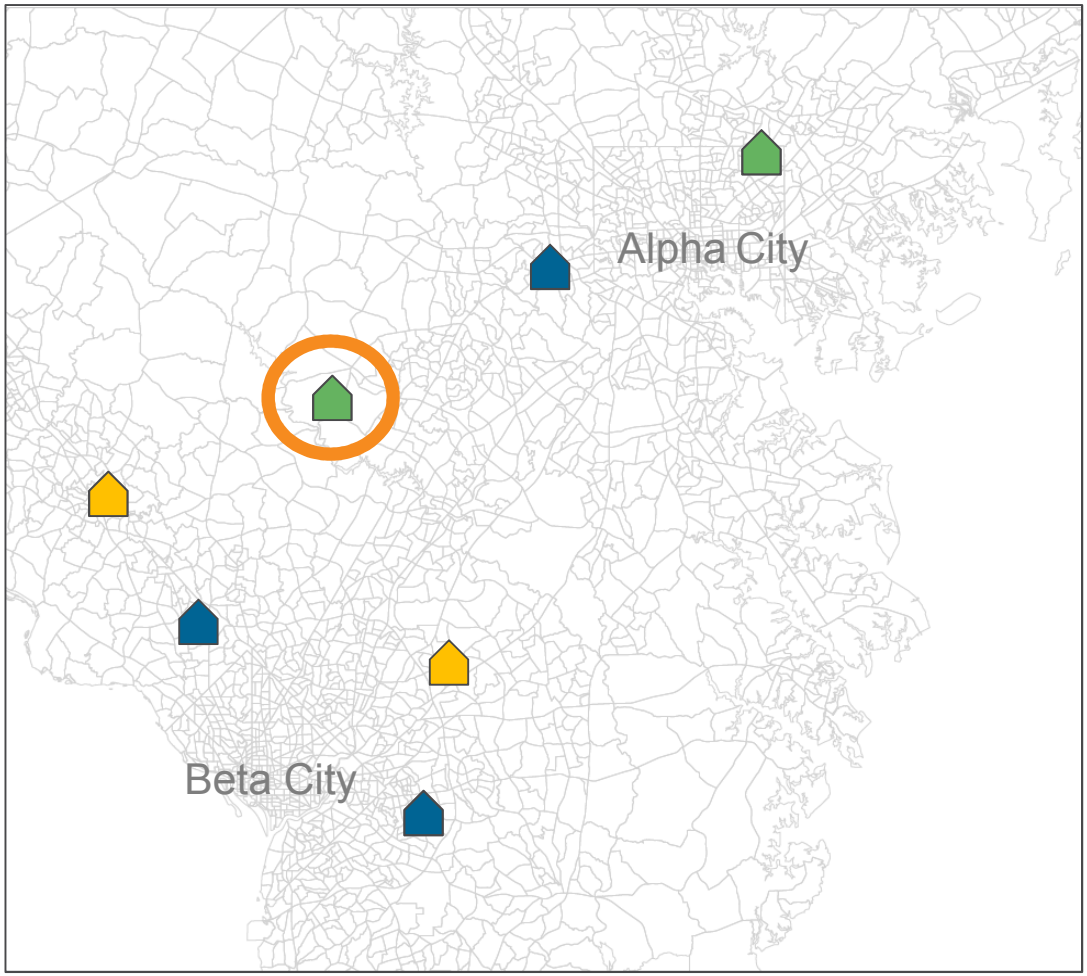


Note: not all firms depicted

For each <u>synthesized firm</u>…

- Uses observed patterns of establishment types by industry
- Predicts type of establishment:
  - Goods delivery
  - Services
  - Both

1. Establishment Type

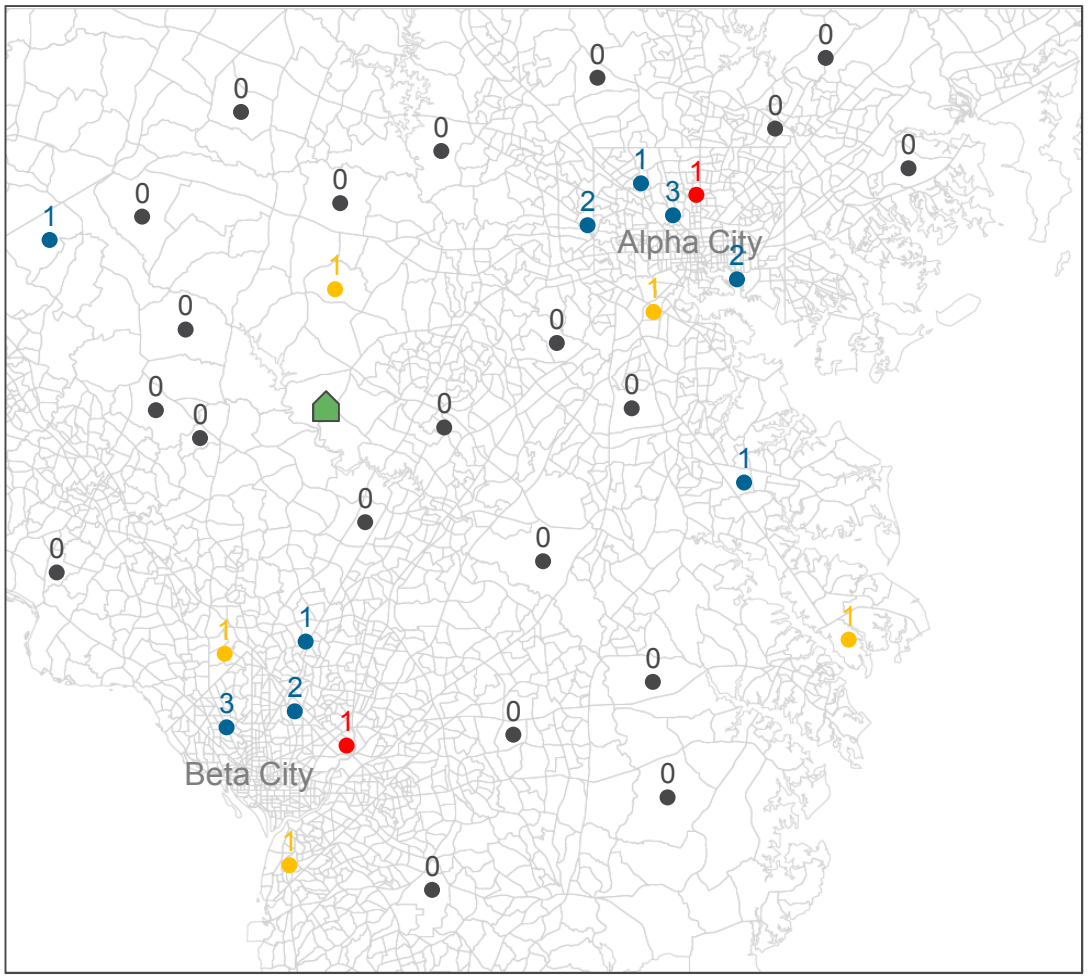


Note: not all firms depicted

For each <u>synthesized firm</u>…

- Uses observed patterns of establishment types by industry
- Predicts type of establishment:
  - Goods delivery
  - Services
  - Both

2. Stop Generation

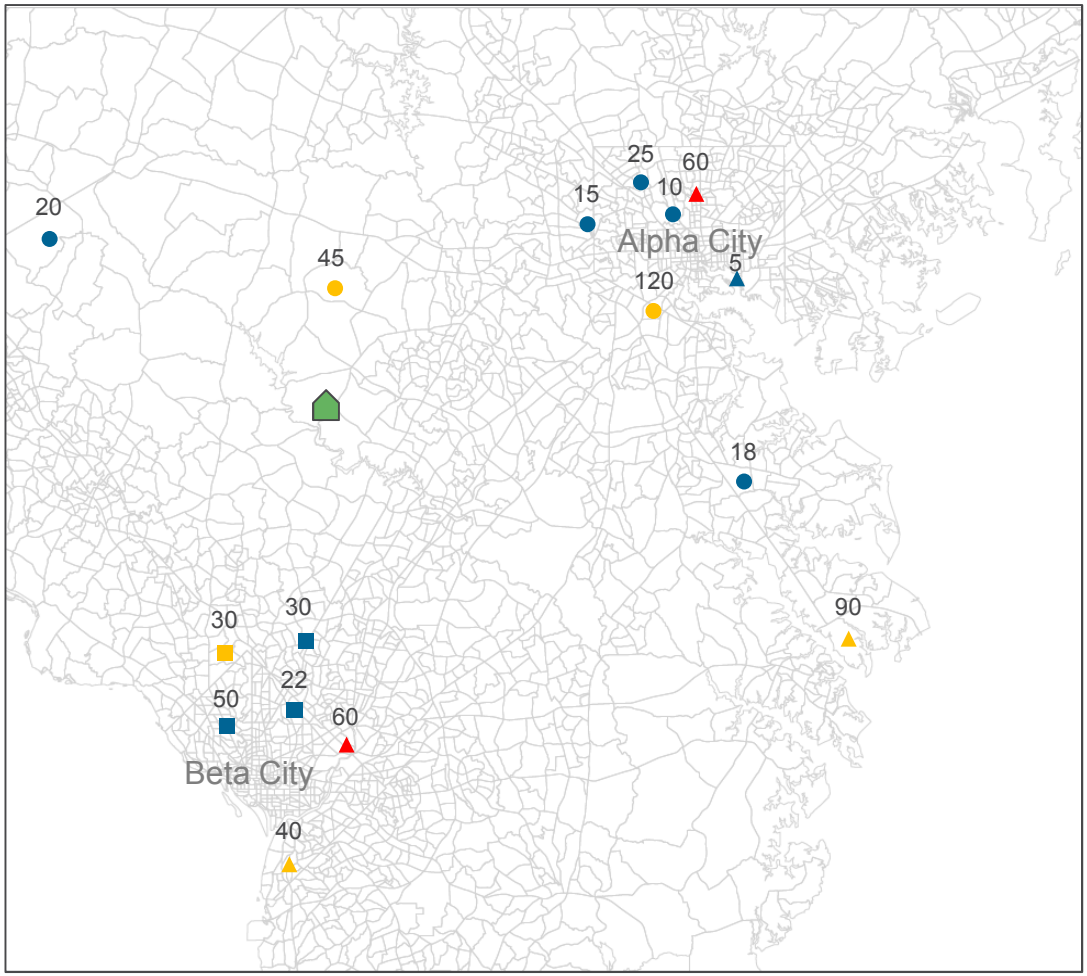


For each <u>synthesized firm</u>…

- The model decides if any stops occur in a Transportation Analysis Zone (TAZ)
- Then assigns the number of
  - goods
  - service
  - meeting

  stops in each TAZ
- Number of stops based on
  - firm size & industry,
  - stop purpose,
  - socio-economic characteristics

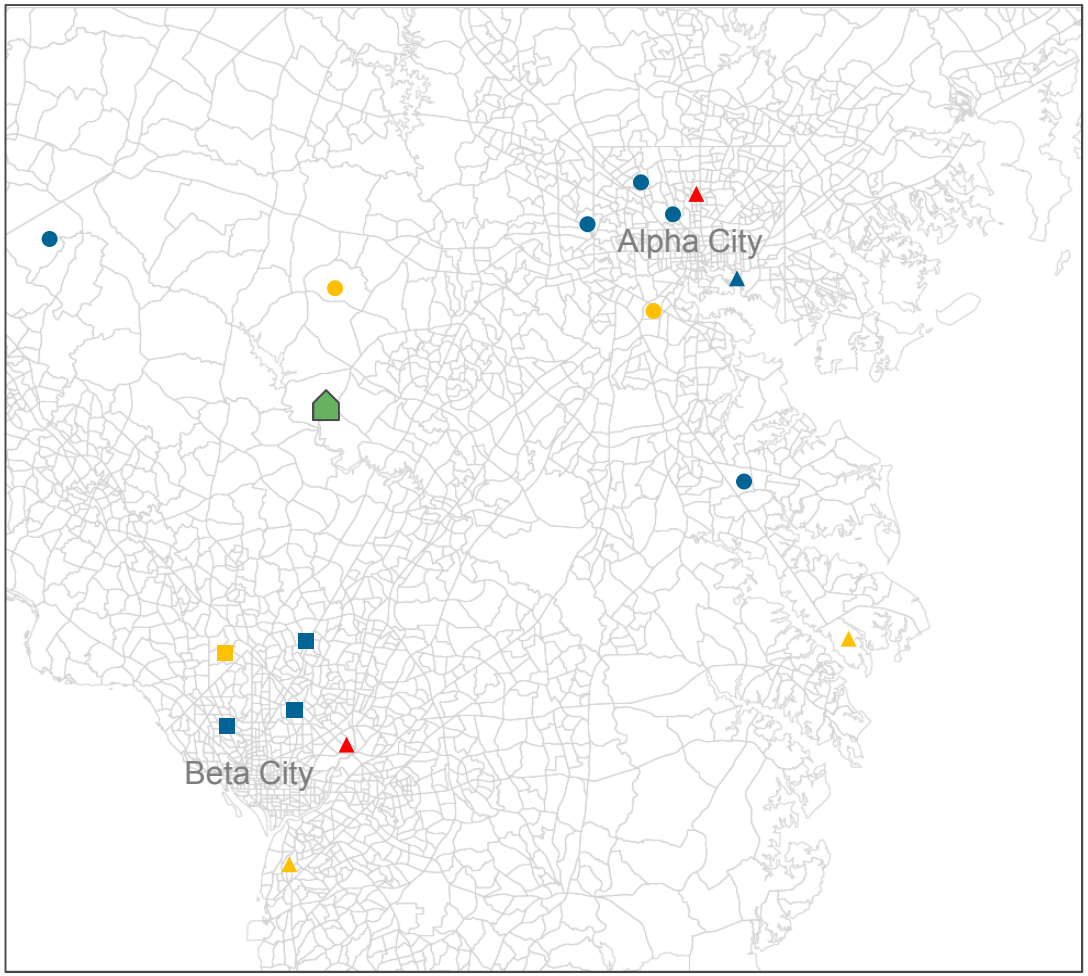
3. Expected Stop Duration



For each <u>stop</u>…

- Stop duration (minutes) is assigned based on
  - Industry
  - Stop purpose

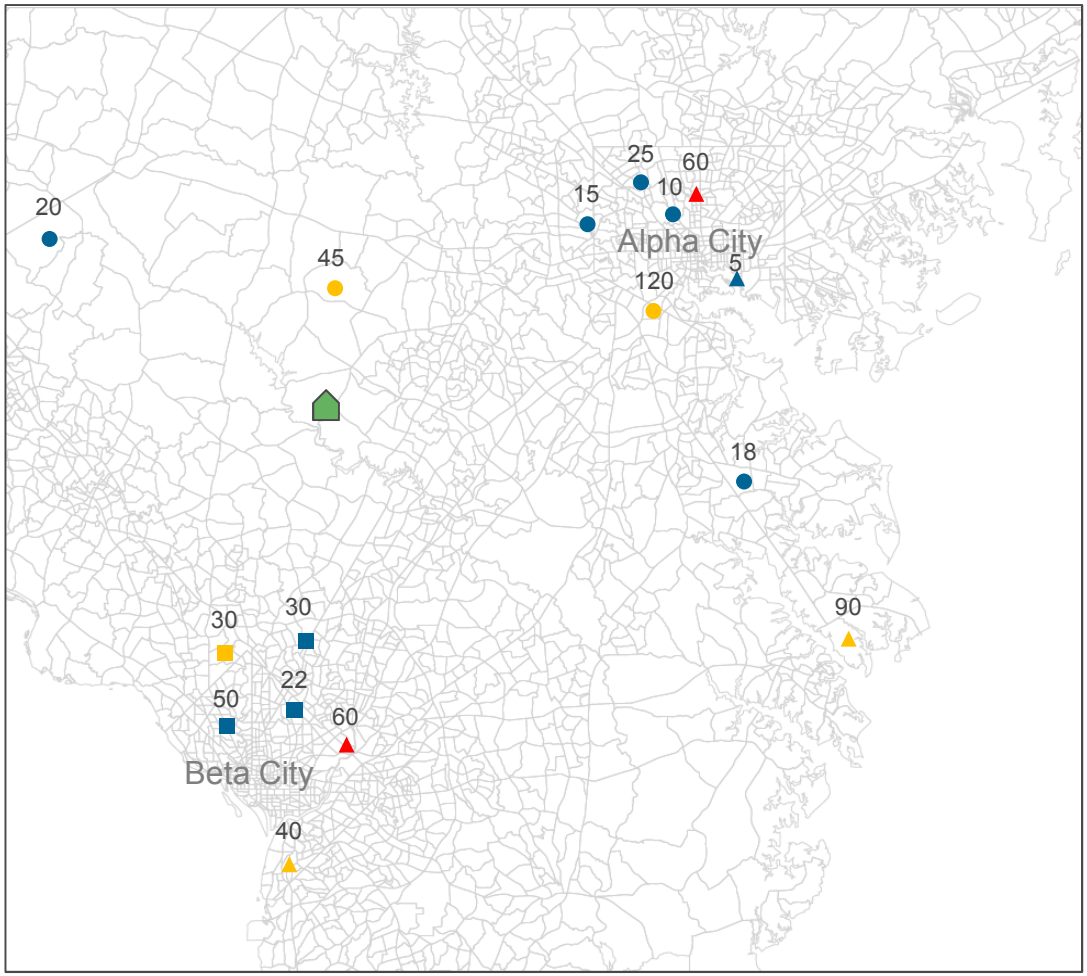
4. Vehicle Assignment



For each <u>stop</u>…

- The model predicts commercial vehicle type for each stop:
  - ▲ Light: car, van, pickup
  - ● Medium: single-unit truck
  - ■ Heavy: multi-unit truck
- Vehicle type based on:
  - Firm industry
  - Distance
  - Stop purpose

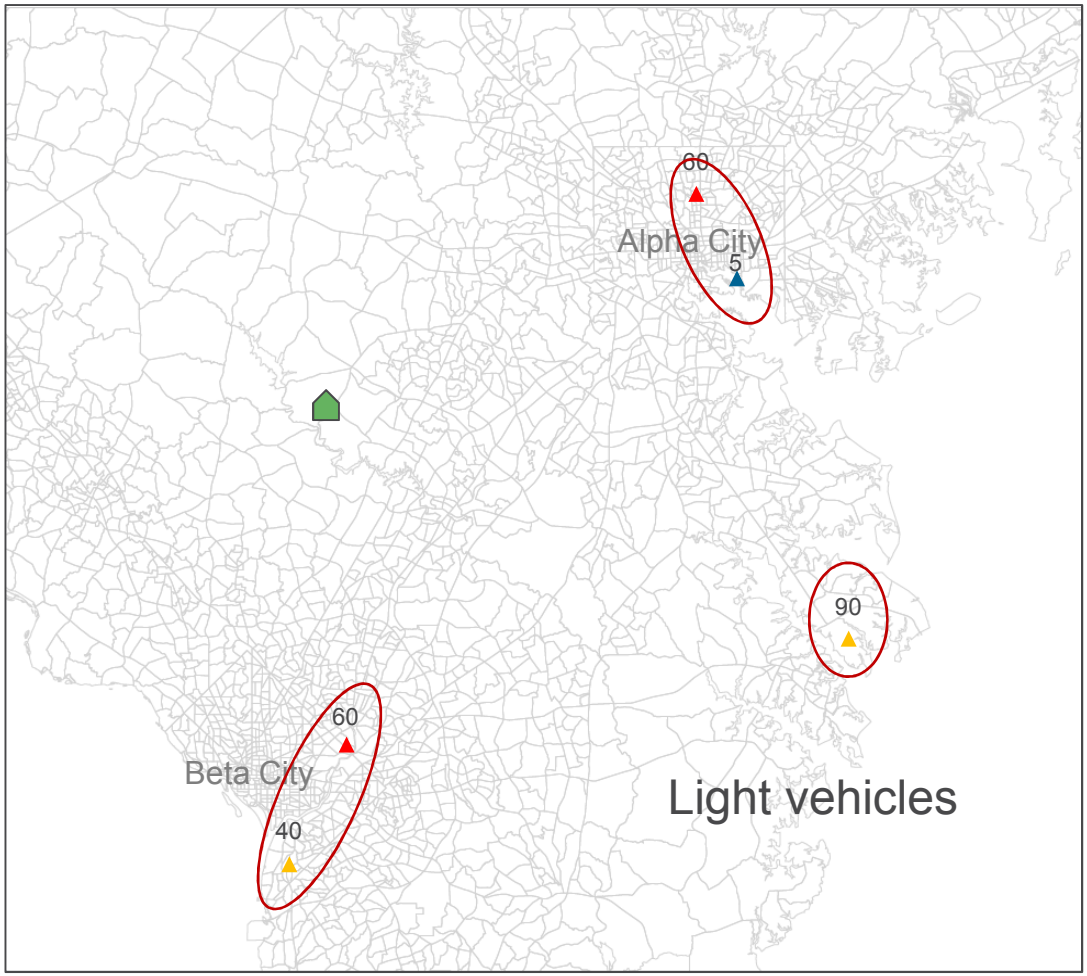
5. Stop Clustering



For each <u>vehicle type</u>…

- Clustering groups close stops into tours
- Assignment limits tour lengths without creating too many short tours
  - Based on
    - stop duration
    - Time of day
  - Travel time not known (stops not yet sequenced)

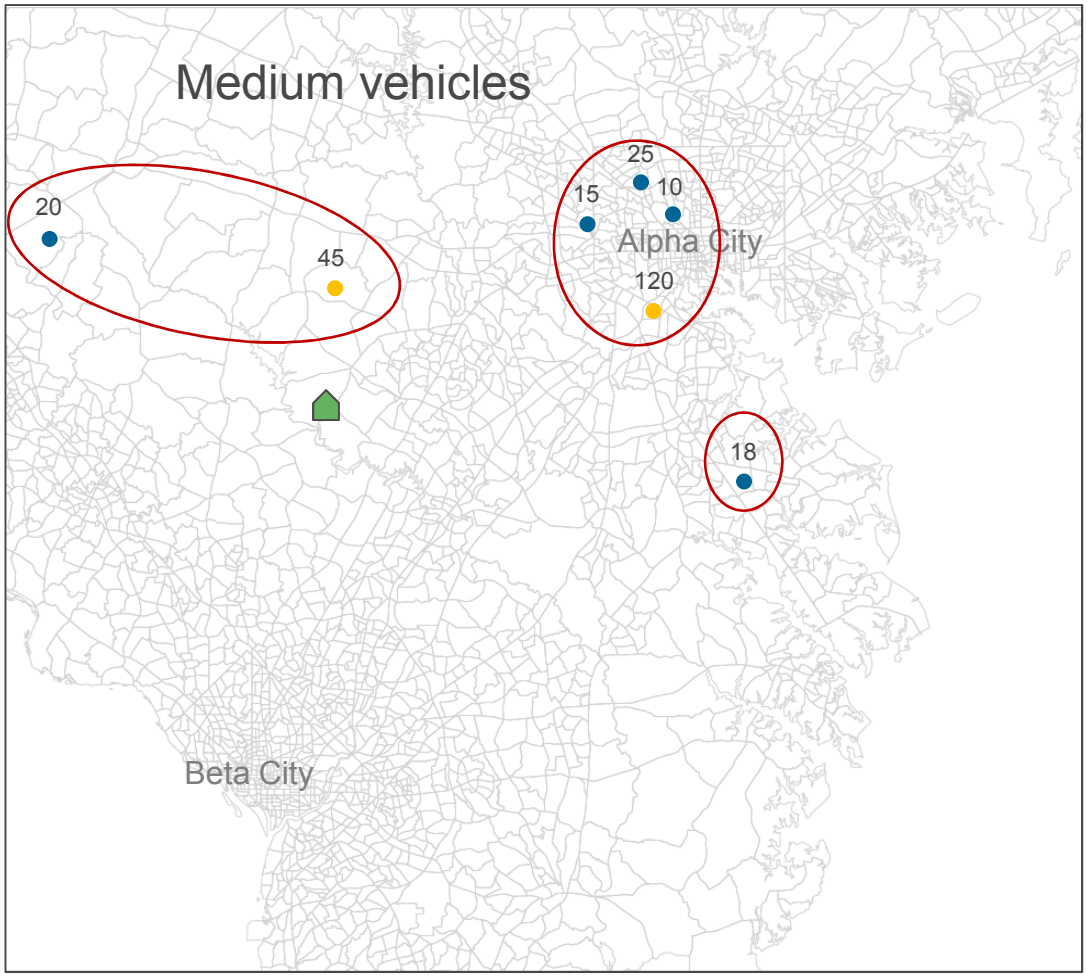
5. Stop Clustering



For each <u>vehicle type</u>…

- Clustering groups close stops into tours
- Assignment limits tour lengths without creating too many short tours
  - Based on
    - stop duration
    - Time of day
  - Travel time not known (stops not yet sequenced)

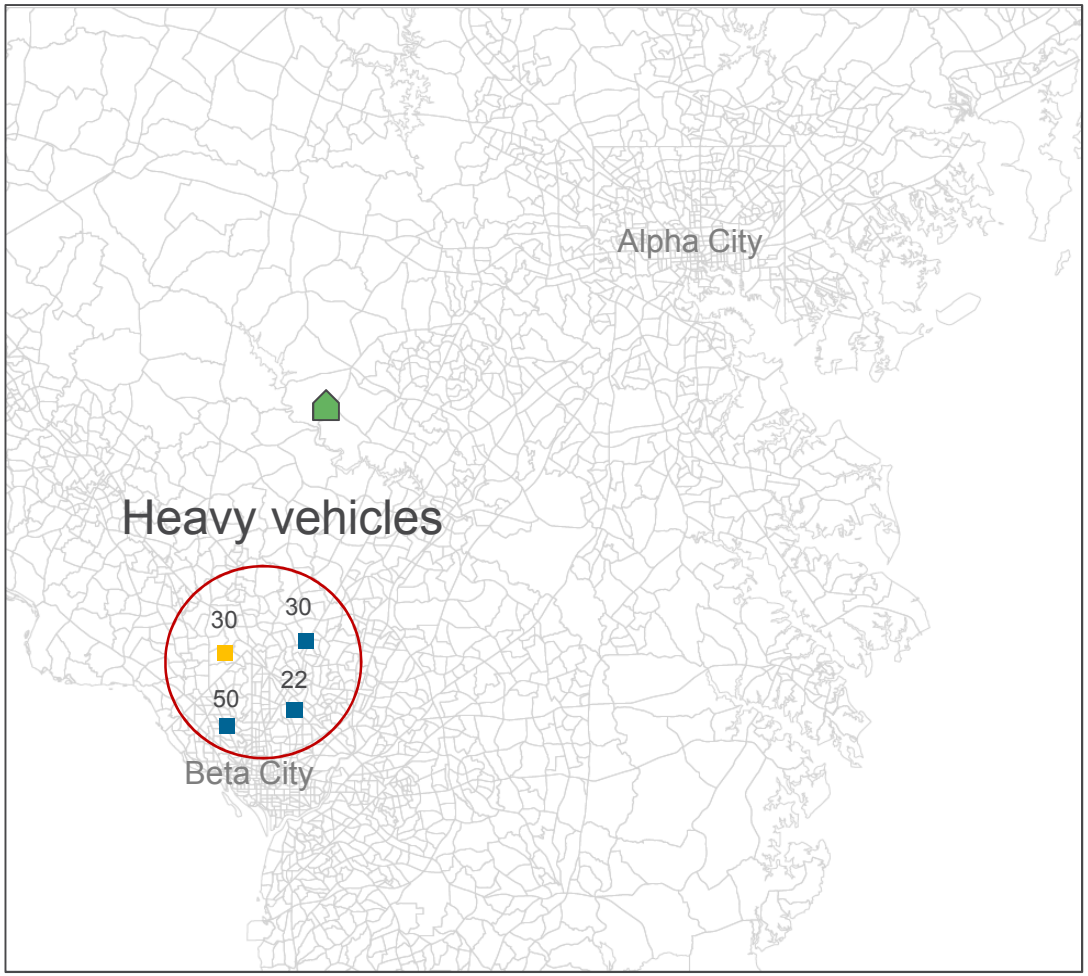
5. Stop Clustering



For each <u>vehicle type</u>…

- Clustering groups close stops into tours
- Assignment limits tour lengths without creating too many short tours
  - Based on
    - stop duration
    - Time of day
  - Travel time not known (stops not yet sequenced)

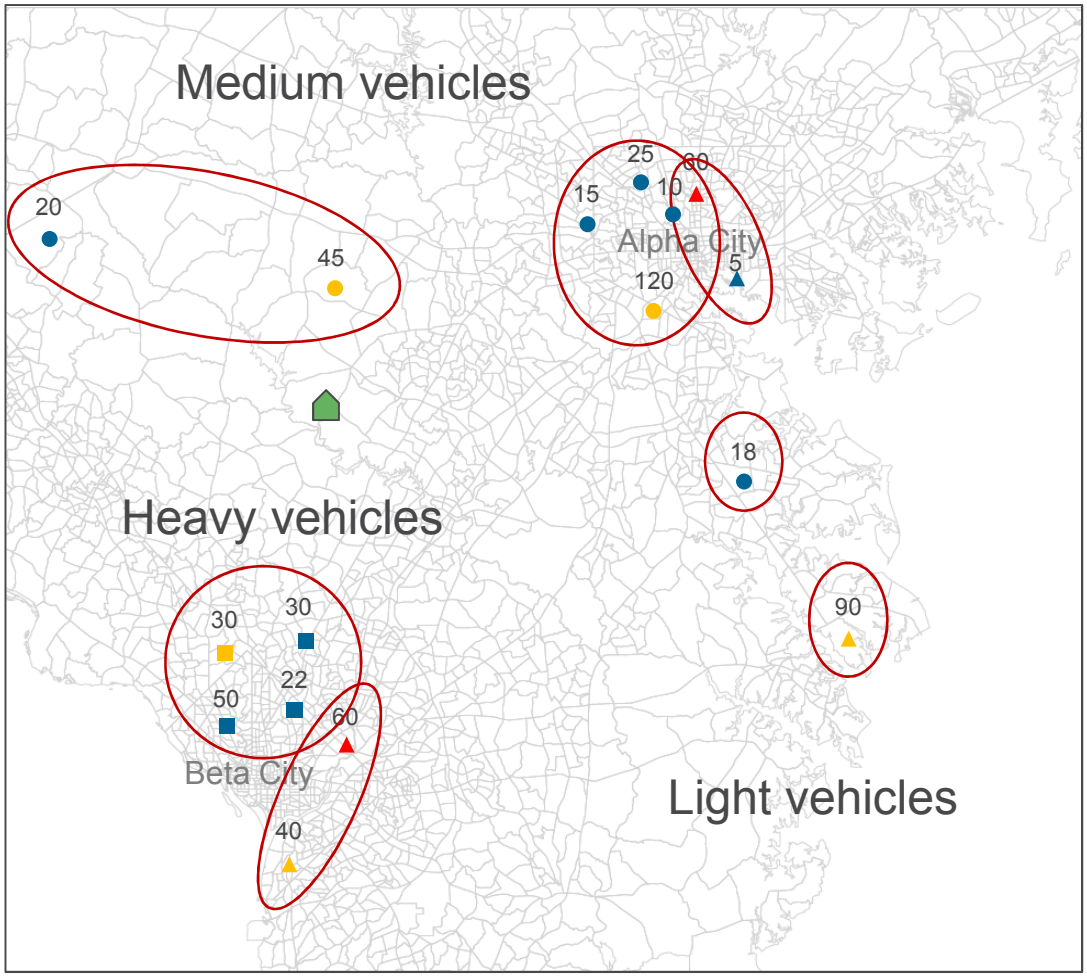
5. Stop Clustering



For each <u>vehicle type</u>…

- Clustering groups close stops into tours
- Assignment limits tour lengths without creating too many short tours
  - Based on
    - stop duration
    - Time of day
  - Travel time not known (stops not yet sequenced)

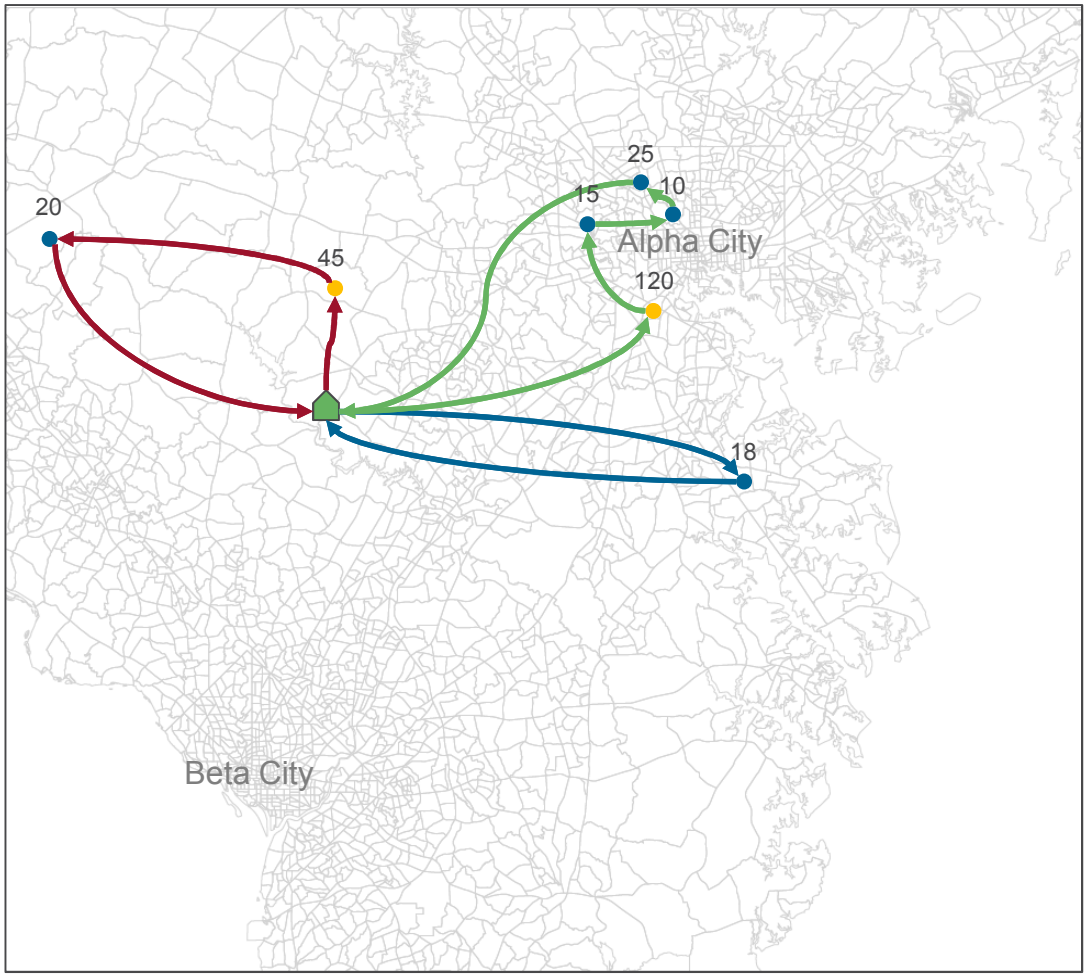
5. Stop Clustering



For each <u>vehicle type</u>…

- Clustering groups close stops into tours
- Assignment limits tour lengths without creating too many short tours
  - Based on
    - stop duration
    - Time of day
  - Travel time not known (stops not yet sequenced)

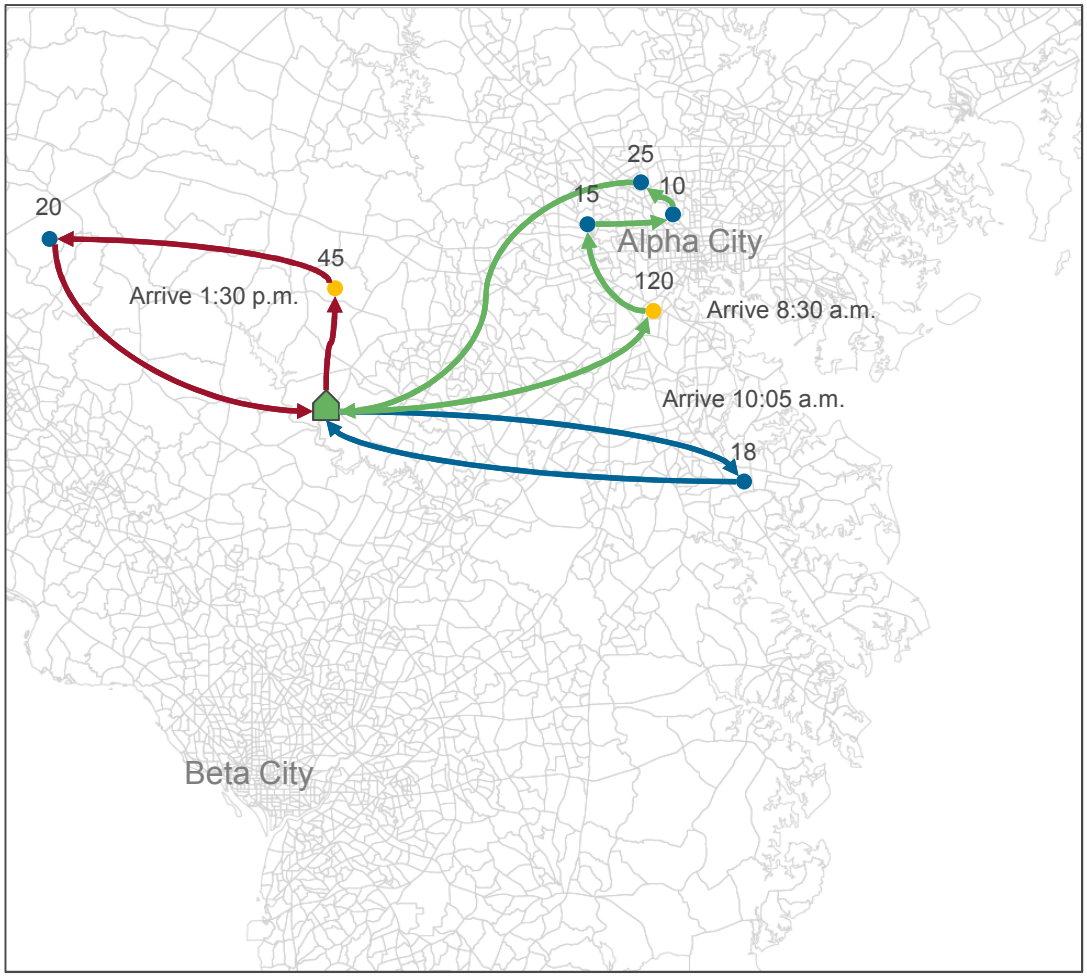
7. Routing Sequence



For each tour…

- Stops sequenced using Traveling Salesman algorithm
- Provides reasonably short tour patterns
- Avoids unrealistic tour patterns but not a true optimization
- Computationally feasible and generates realistic touring patterns

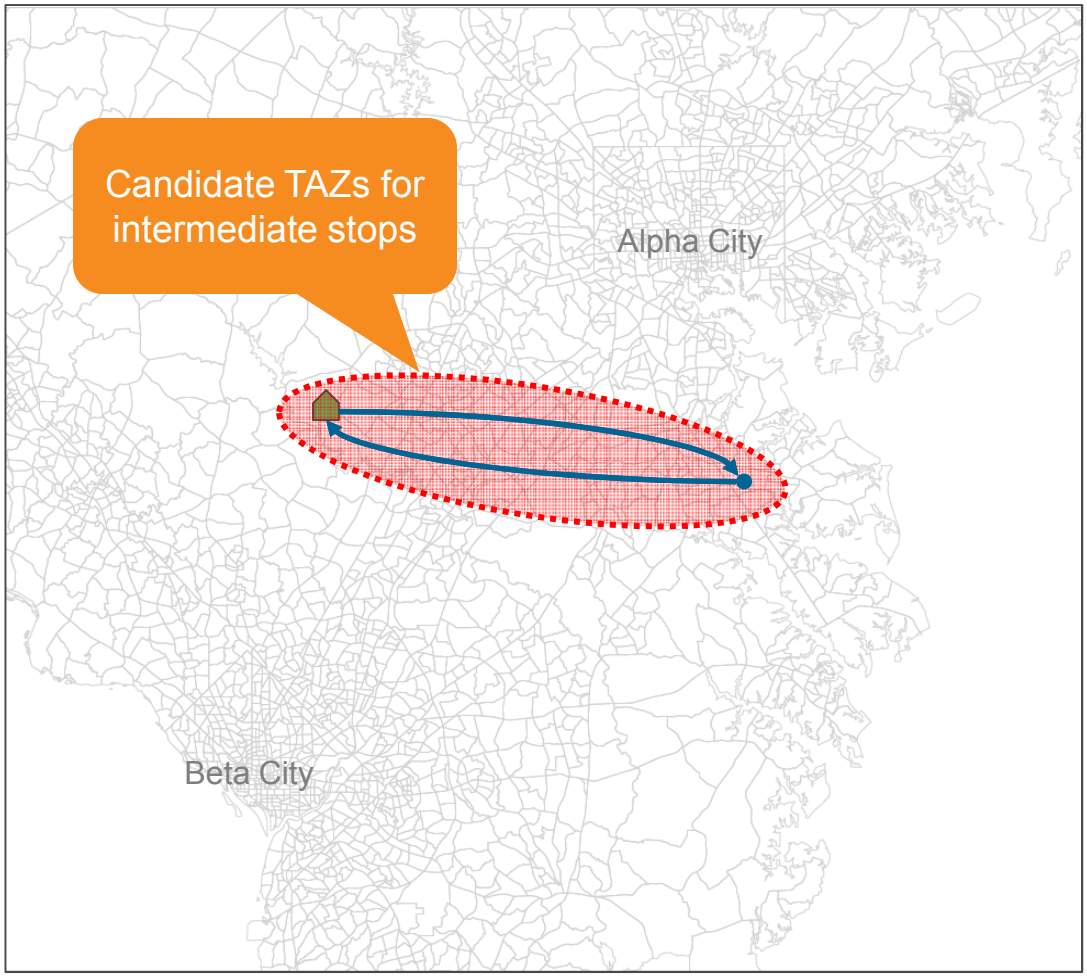
6. Arrival Time at First Stop



For each <u>tour</u>…

- Arrival time at first scheduled stop predicted as function of tour length
- Simulated arrival time windows of 30 to 60 minutes

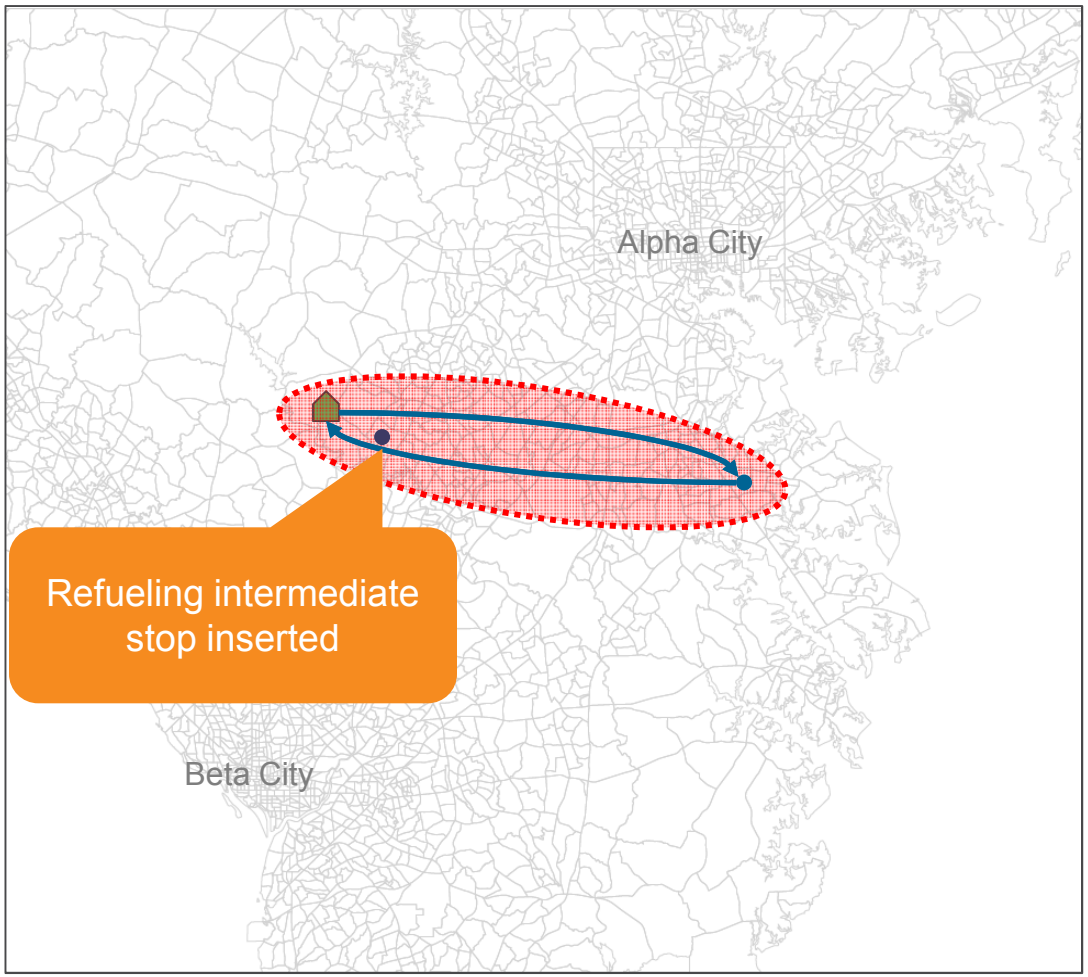
8. Intermediate Stop Choice



For each <u>trip</u>…

- Intermediate stop model predicts whether an intermediate stop is inserted
  - Meal/break
  - Refueling/vehicle service
  - Other
- Allowed locations are within reasonable distance of trip (e.g., 3 miles)
- Stop duration model applied to any inserted stops
- Trip plan updated

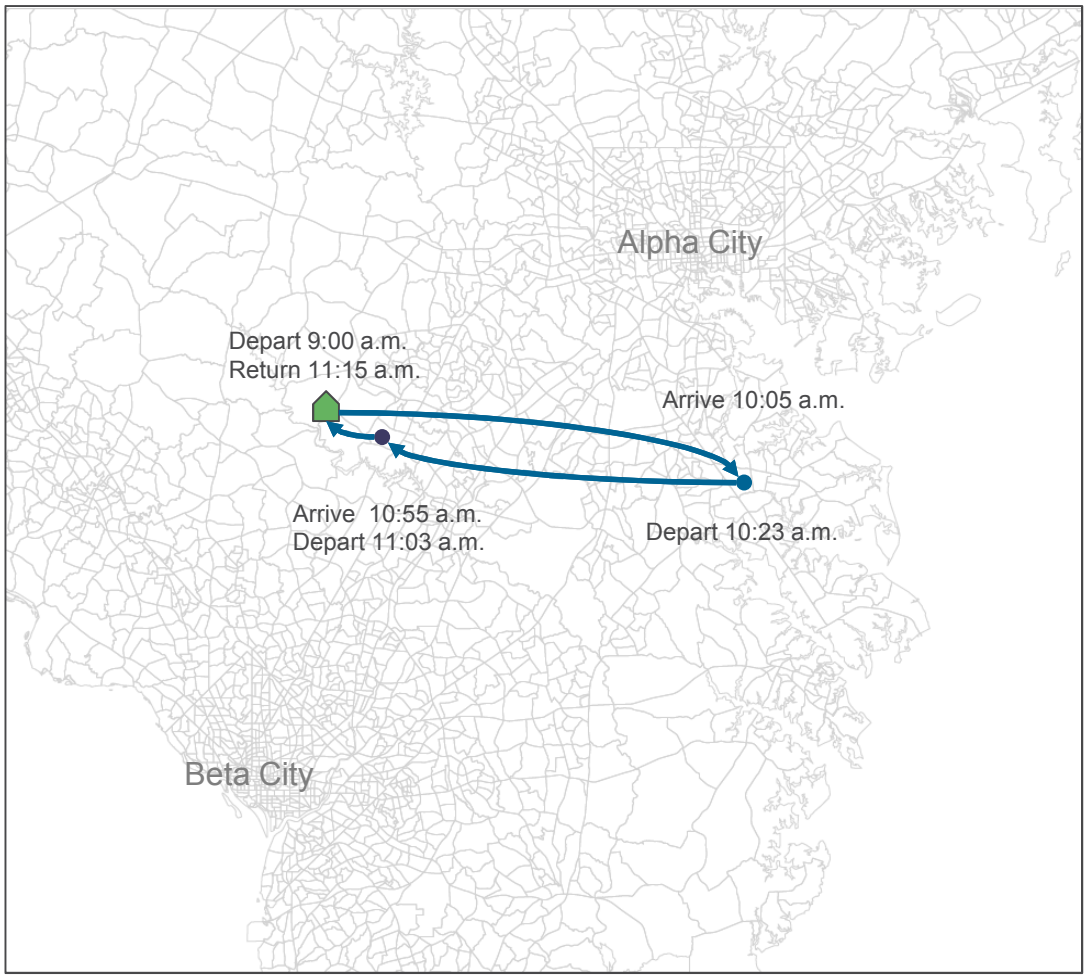
8. Intermediate Stop Choice



For each trip…

- Intermediate stop model predicts whether an intermediate stop is inserted
  - Meal/break
  - Refueling/vehicle service
  - Other
- Allowed locations are within reasonable distance of trip (e.g., 3 miles)
- Stop duration model applied to any inserted stops
- Trip plan updated

9. Intermediate Stop Destination



For each <u>trip</u>…

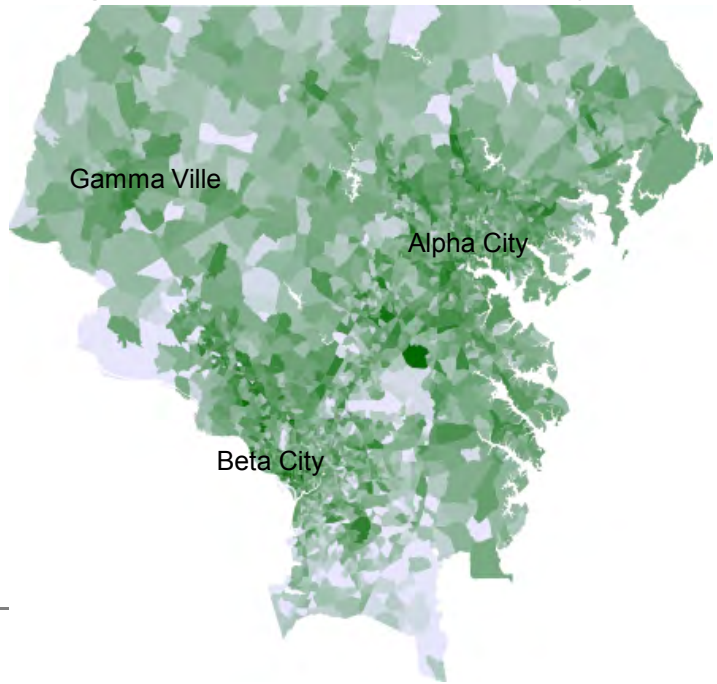
- Intermediate stop model predicts whether an intermediate stop is inserted
  - Meal/break
  - Refueling/vehicle service
  - Other
- Allowed locations are within reasonable distance of trip (e.g., 3 miles)
- Stop duration model applied to any inserted stops
- Trip plan updated

Outputs

- The model produces a trip list similar to a truck trip diary
- This output can be processed into various forms:
  - Trip tables for assignment
  - Tabular outputs such as stops by county
  - Map based outputs such as stop by purpose by TAZ

	Stop Purpose			
County	**Goods**	**Service**	**Meeting**	**Intermediate**
Anne Arundel County, MD	28,972	30,743	19,036	5,627
Baltimore City, MD	29,781	57,012	36,985	9,441
Baltimore County, MD	40,935	58,665	31,336	8,589
Carroll County, MD	3,467	6,784	2,294	1,137
Frederick County, MD	5,802	11,165	4,475	1,814
Harford County, MD	4,124	10,165	3,925	1,542
Howard County, MD	17,811	21,523	11,265	3,570
Montgomery County, MD	56,734	83,324	36,520	11,643
Prince George's County, MD	19,881	31,974	13,766	5,399
District of Columbia	52,629	143,370	70,374	19,004
Total	**260,136**	**454,725**	**229,976**	**67,766**

Log(Number) of Service Stops by TAZ



Tuning & Testing

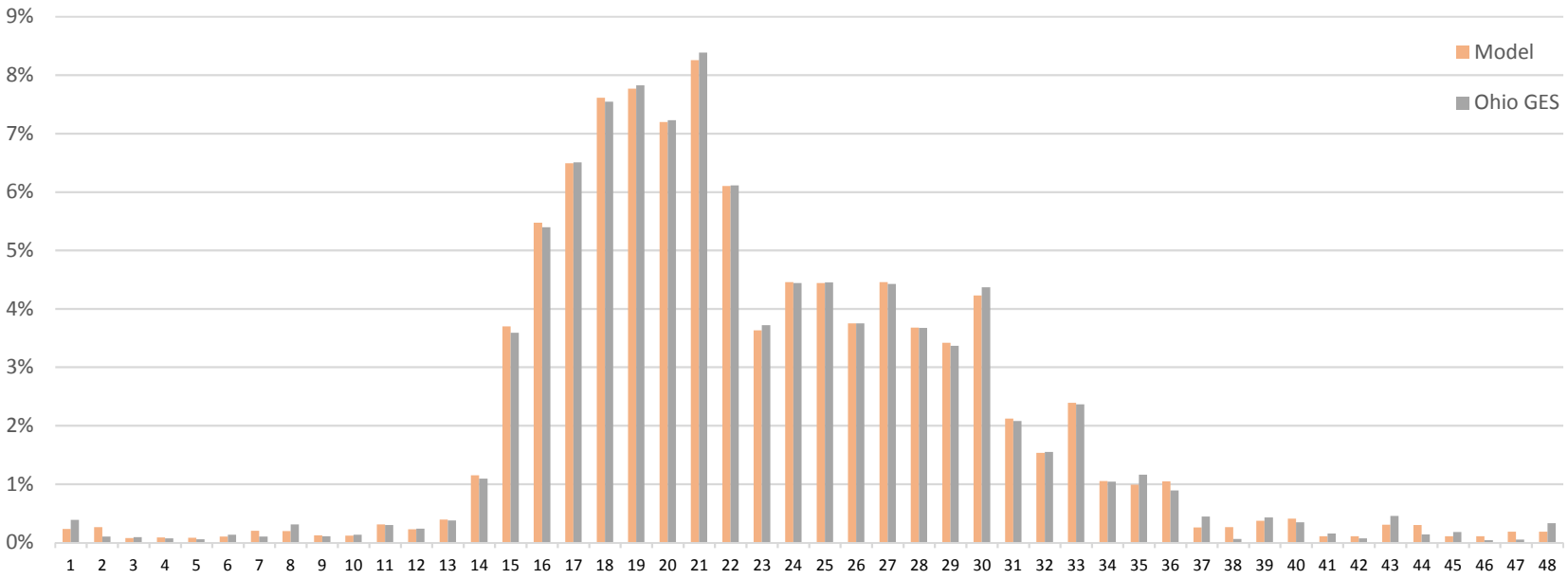
- Calibration of the model has focused on matching observed distributions from the Ohio Establishment survey
- Model could be re-estimated and/or re-calibrated with local data (e.g. establishment survey data, ATRI GPS data)

Vehicle Shares (All Activities)

	Simulation				Ohio GES			
	N (stops)	*Light*	*Medium*	*Heavy*	*N (stops)*	*Light*	*Medium*	*Heavy*
Agriculture	688	40%	53%	7%	1,007	40%	52%	8%
Construction	82,675	71%	22%	8%	606	71%	22%	8%
Government	49,513	90%	7%	3%	1,112	90%	7%	3%
Health	61,102	96%	4%	0%	302	96%	4%	0%
Hotel & Real Estate	36,115	93%	7%	0%	130	93%	7%	0%
Manufacturing	7,373	37%	35%	28%	211	36%	35%	29%
Other Services	247,519	89%	10%	2%	629	89%	9%	2%
Retail	249,715	68%	21%	11%	320	68%	21%	11%
Transportation Handling	35,051	4%	22%	74%	349	4%	22%	74%
Wholesale	46,368	29%	46%	25%	2,754	29%	46%	25%
Overall	**816,119**	**74%**	**16%**	**10%**	**7,420**	**74%**	**18%**	**8%**

Tuning & Testing

- Calibration of the model has focused on matching observed distributions from the Ohio Establishment survey
- Model could be re-estimated and/or re-calibrated with local data (e.g. establishment survey data, ATRI GPS data)



Applications / Implementation

- **Modeling**
  - Assess travel and economic benefits of freight infrastructure improvements
  - Create maps of goods and service delivery patterns
  - Evaluate infrastructure needs
  - Consider influence of supply chains
- **Environmental**
  - Emissions analysis (additional detail on freight vehicle type)
- **Stakeholder Outreach**
  - Address local issues with last mile access and egress to freight facilities
  - Performance management
  - Communication & messaging of transportation investments

Contacts

www.rsginc.com

Erica Wygonik, PhD, PE
Modeler
Erica.Wygonik@rsginc.com

Colin Smith
Project Manager
Colin.Smith@rsginc.com

Maren Outwater
Principal in Charge
Maren.Outwater@rsginc.com

John Gliebe, PhD
Modeling Lead
John.Gliebe@rsginc.com

Telling the Freight Mobility Story: National and Texas Experiences

Bill Eisele, Ph.D., P.E.
Texas A&M Transportation Institute
Senior Research Engineer & Program Manager

Delaware Valley Regional Planning Commission
Downtown Delivery Symposium II
July 13, 2016
Philadelphia, PA

My Key Messages

- Congestion is on the rise in growing urban areas
- Data are improving to help agencies tell their story of person and goods movement (and investment needs)
- There are proven methods and measures available (using these improving datasets)
  - *Urban Mobility Scorecard*
  - Texas examples

http://mobility.tamu.edu

What Does Freight Mobility Analysis Take?

- Manipulating “big mobility data” and creating mobility information all audiences can understand
- Developing messages that inform decision-making
- Helping communicate what you are doing, and why

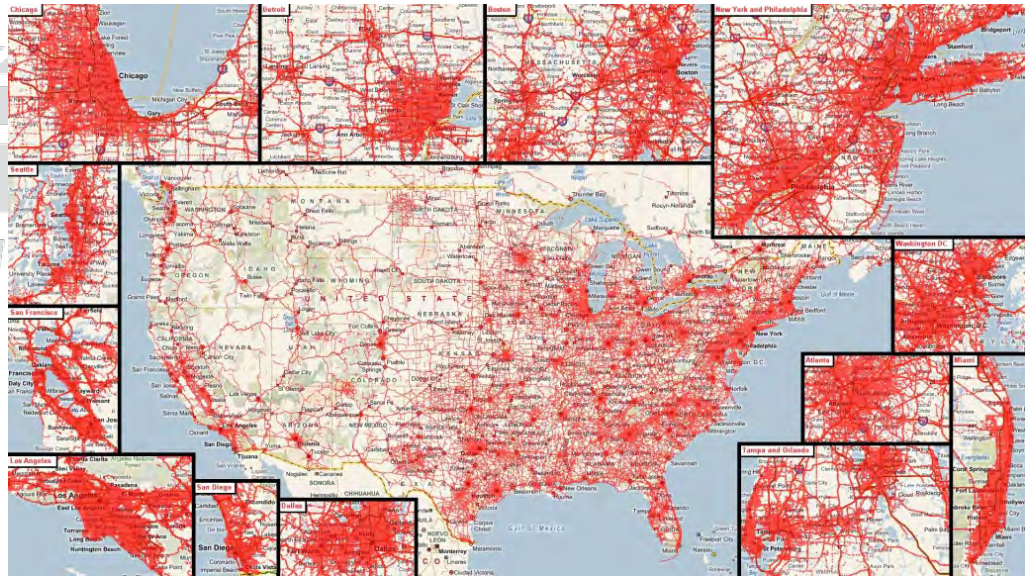
http://mobility.tamu.edu

Urban Mobility Scorecard
Partnership with INRIX

- Since 2010
- Nationwide speeds
- More accurate
- More corridor detail
- Calculate reliability

Billions of GPS probe reports per day

INRIX



Combined with HPMS (FHWA) volume data for performance measures

Source: Inrix

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Texas A&M Transportation Institute

Congestion in the U.S. (2014 Data)

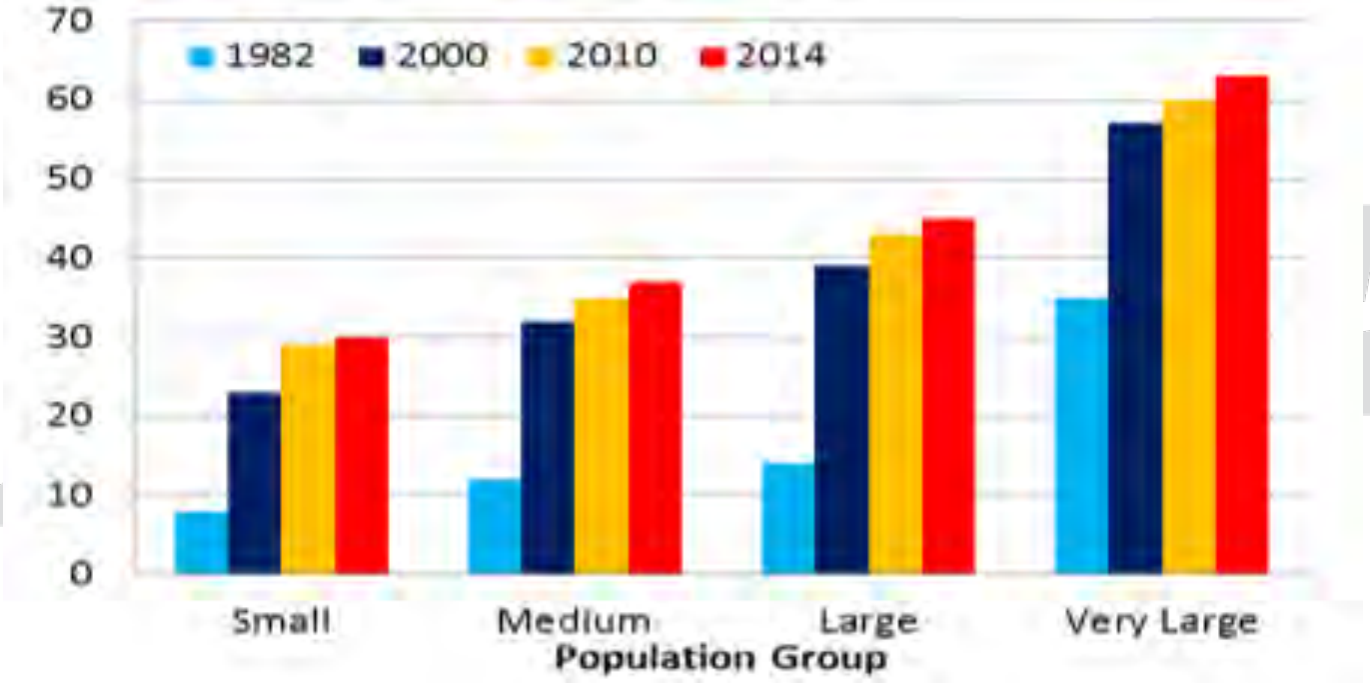
- Hours of Delay
  - 6.9 billion hours
  - Average of 42 hours per auto commuter
- Wasted Fuel
  - 3.1 billion gallons
  - Average of 19 gallons per auto commuter
- Congestion Cost
  - $160 billion (wasted time and fuel)
  - Average of $960 per auto commuter
  - Truck only - $28 billion
- Travel Time Index – 1.22
- Freeway Planning Time Index – 2.41

http://mobility.tamu.edu

Congestion is Getting Worse in Cities of All Sizes

Very Large = 3 M +
Large = 1 M - 3 M
Medium = 500 K - 1 M
Small = Below 500 K

Delay per Auto Commuter



Freight Congestion
A Key Element of the 21st Century Economy

- U.S. urban truck delay
  - $28B cost
- In addition…
  - Inventory costs
  - Just-in-time operations
  - Fleet productivity
  - Distribution centers

Most Congested Areas with Greatest "Tax"

Average peak period auto commuter

• Washington DC (1)	82 hours	$1,834 (1)
• Los Angeles (2)	80 hours	$1,711 (3)
• San Fran-Oakland (3)	78 hours	$1,675 (4)
• New York (4)	74 hours	$1,739 (2)
• San Jose (5)	67 hours	$1,422 (8)
• Philadelphia (22)	48 hours	$1,112 (26)
• Average (471 Areas)	42 hours	$960

http://mobility.tamu.edu

Where is the Truck Cost?

	Cost (wasted time & fuel)
• New York	$2.8 Billion
• Los Angeles	$1.7 Billion
• Chicago	$1.5 Billion
• Houston	$1.1 Billion
• Miami	$0.7 Billion
• Philadelphia (#9)	$683 Million
• Average (471 areas)	$60 Million

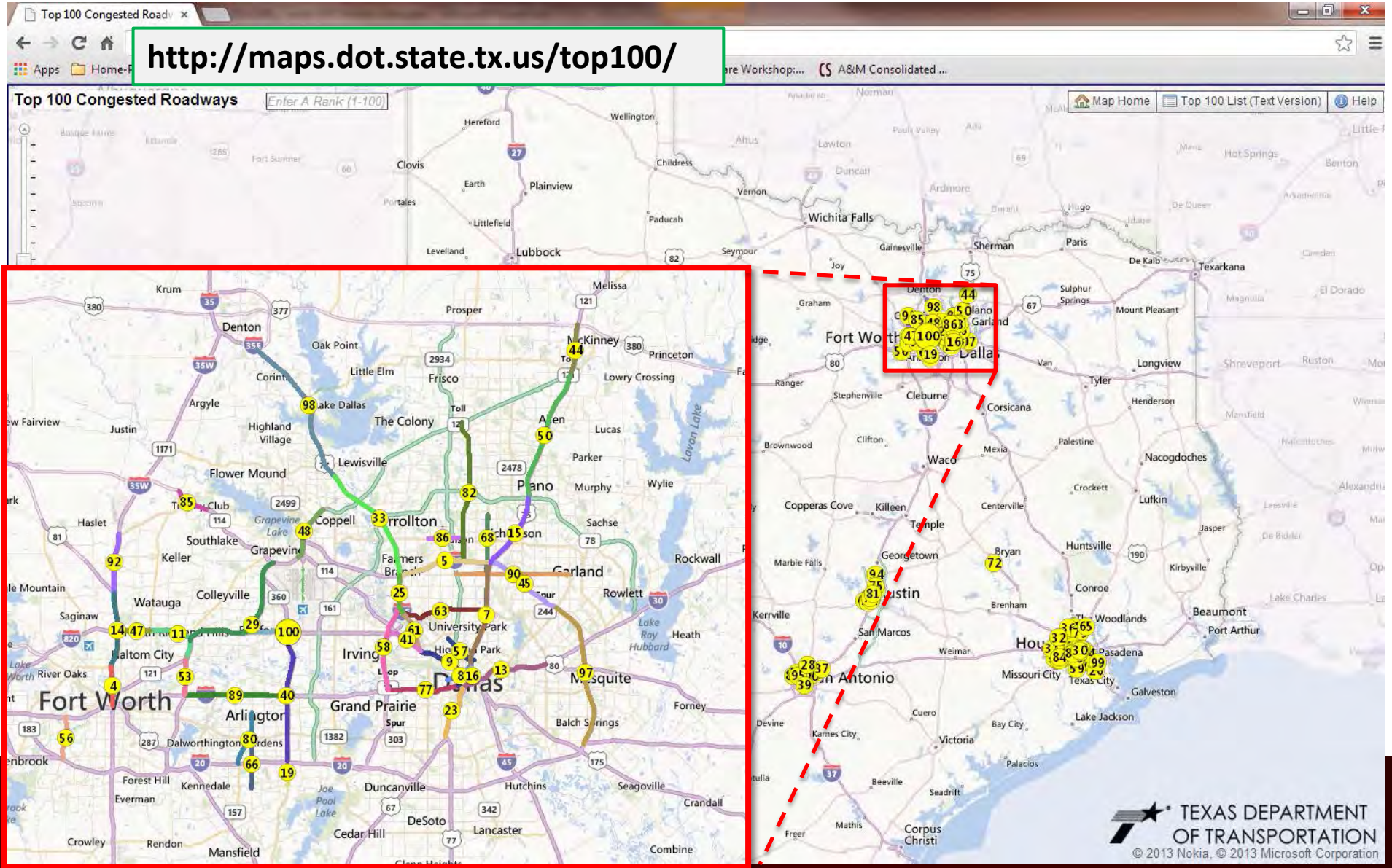
http://mobility.tamu.edu

The Future of UMS

- Total travel time (door to door)
- Multi-modal
  - Truck
  - Public Transportation
  - Bike / Ped
  - Travel options (telework, etc)
- Operational Treatments

http://mobility.tamu.edu

Texas DOT 100 Most Congested Roads



Statewide Performance Measures

- Texas 100 Most Congested Roadways
  - Speed data (trucks & “all vehicles”) (yearly RFP)
  - Volume data (state highway inventory)
  - Roadway information (state highway inventory)
- Match speed map to Texas DOT Roadway Inventory (RHiNo) network
- Provide local data for MPO and TxDOT District use (partnership)
  - Identify problems
  - Analyze possible solutions
  - Congestion management reporting
  - MAP-21 reporting

http://mobility.tamu.edu

Performance Measures

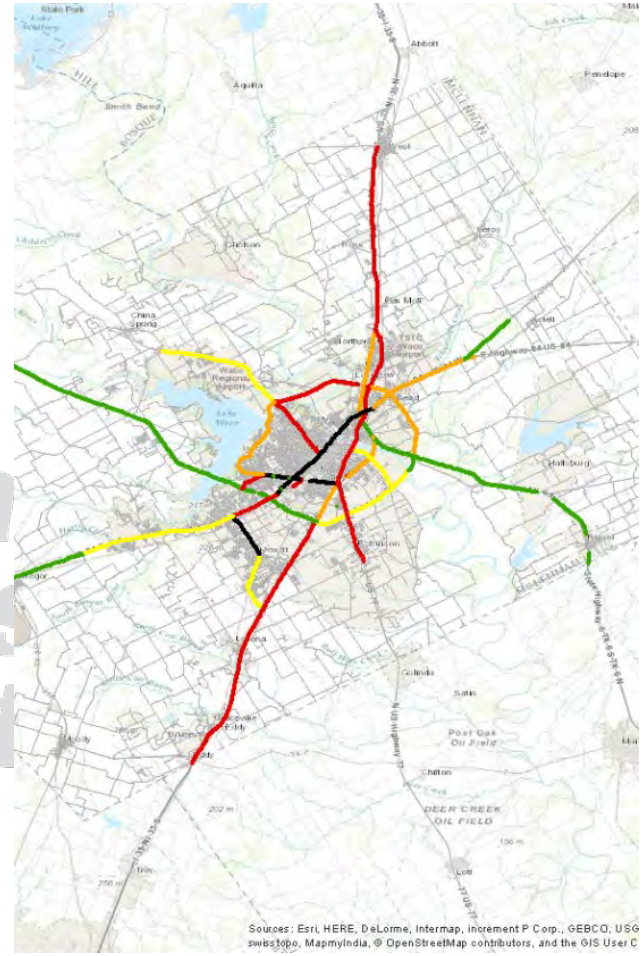
- "Total magnitude" measures
  - Hours of delay
  - Hours of truck delay
  - Delay per mile
- "Individual" traveler measures
  - Texas congestion index (travel time index)
  - Commuter stress index
  - Planning time index (reliability)
- Use speed AND volume to find the biggest problems

http://mobility.tamu.edu

Travel Delay per Mile

Most Congested Roadway Sections

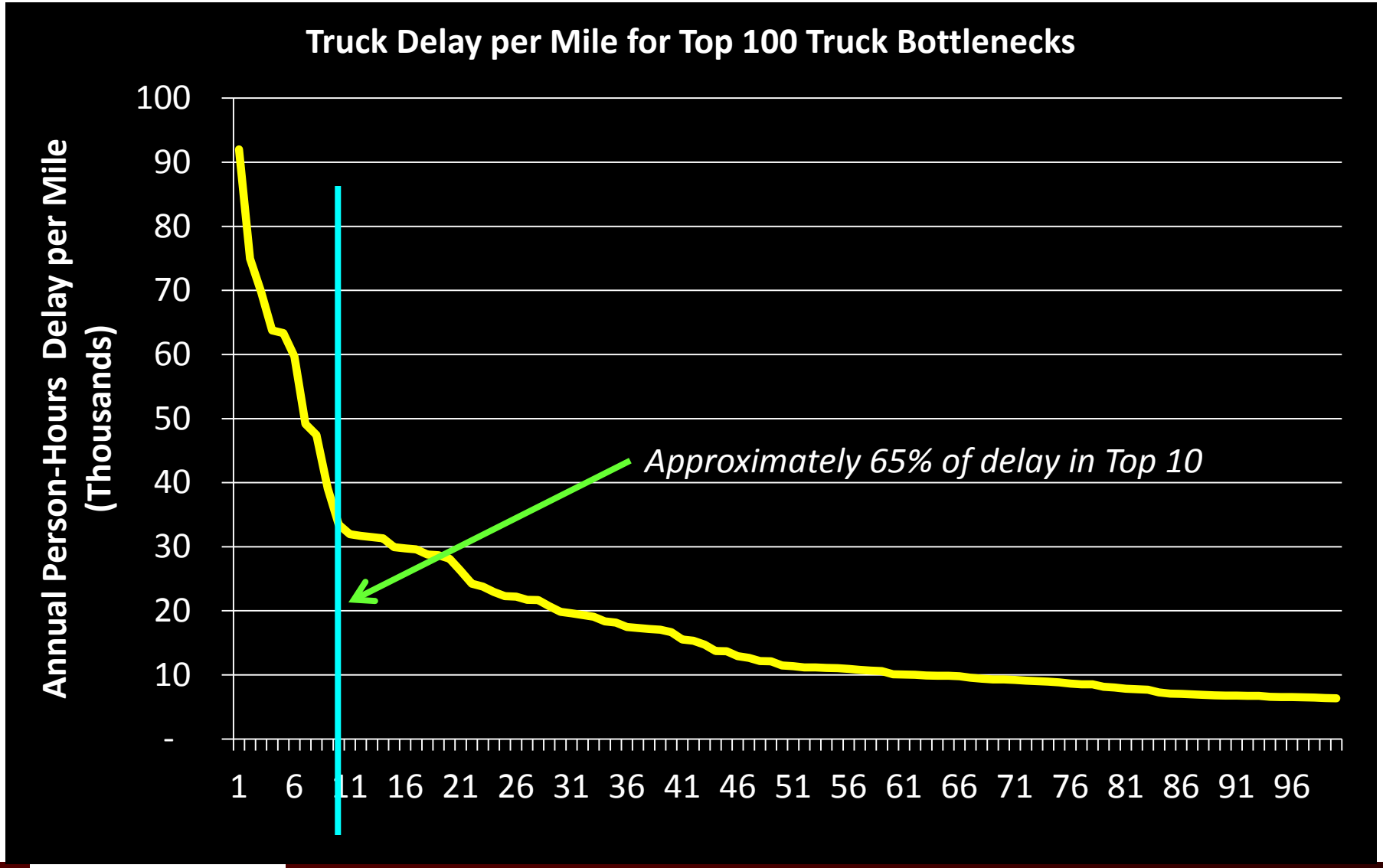
- Compare sections of different lengths
- 24-hour measure
- Off-peaks and weekends matter
- Truck delay per mile is also available



From the “Freight 50” – the Top 10 (2015)

	Delay per Mile (000)	
• Austin	Truck	All Vehicles
– #1 IH-35 (US290N to SH 71)	115	976 (#1)
• Houston	Truck	All Vehicles
– #5 US-59 (IH-10 to SH-288)	72	811 (#3)
– #7 IH 610 (IH-10 to US 59)	53	972 (#2)
– #8 US-59 (IH 610W to SH 288)	53	609 (#4)
– #9 IH 45 (Sam Houston Tollway to IH 610N)	51	525 (#10)
• Dallas		
– #2 IH-345/US 75/IH-45 (Woodall Rogers Freeway to US 175)	93	355 (#23)
– #3 IH-635 (IH-35E to US-75)	83	579 (#7)
– #10 IH 35E (SH 183 to IH 30)	49	605 (#5)
• Fort Worth		
– #4 IH-35W (US 81/US 287)	82	600 (#6)
– #6 IH-35W/US 287 (SH-183 to IH 30)	54	532 (#9)

The Top 10 – In a League of Their Own



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

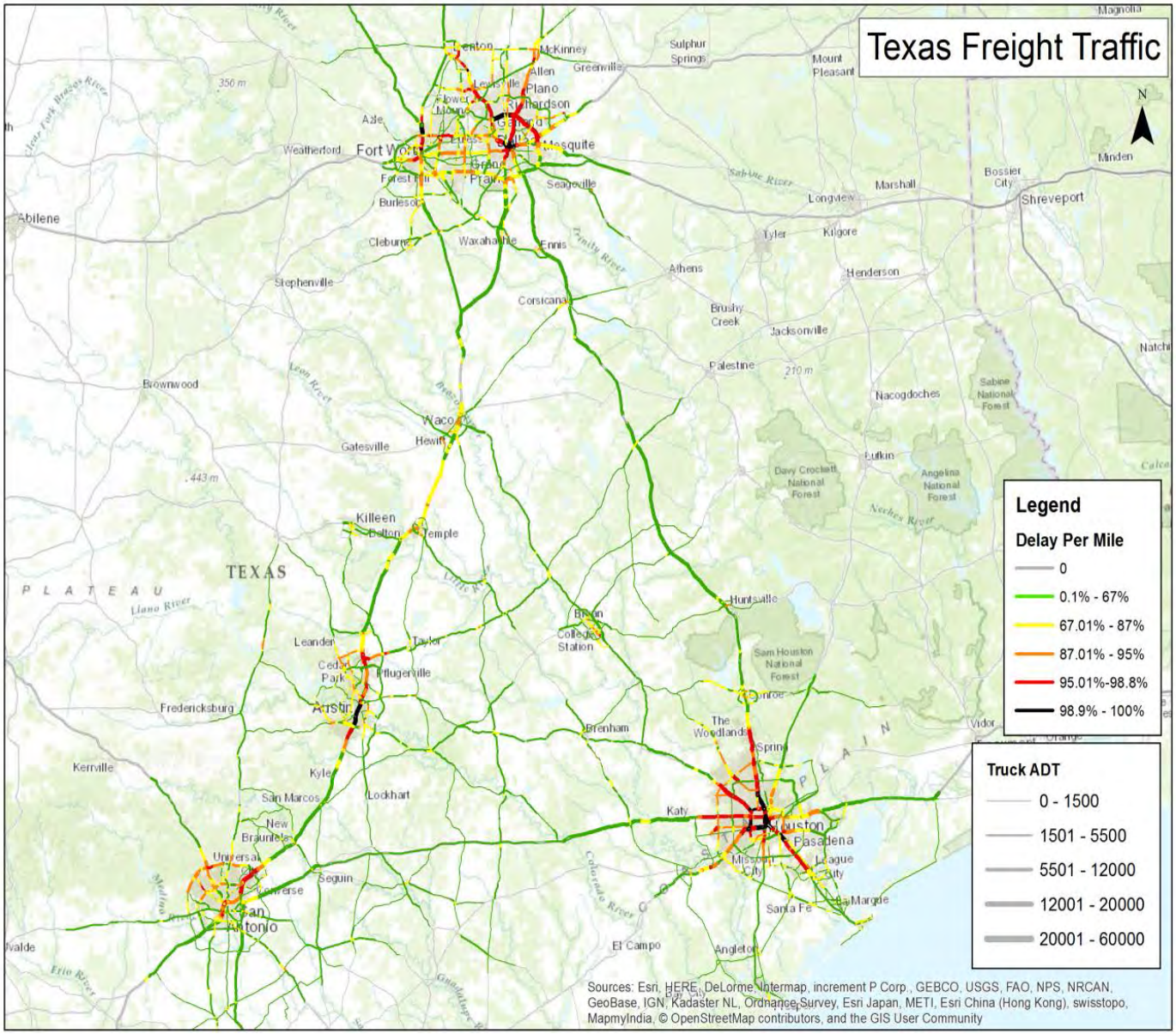
Texas A&M Transportation Institute

Inconsistent Trip Times for Top 5

	Planning Time Index (95th percentile)
IH-35 (Austin)	5.08
US 59 (Houston)	4.23
IH-10 (Houston)	4.00
Mopac (Austin)	3.85
Woodall Rodgers Freeway (Dallas)	3.68

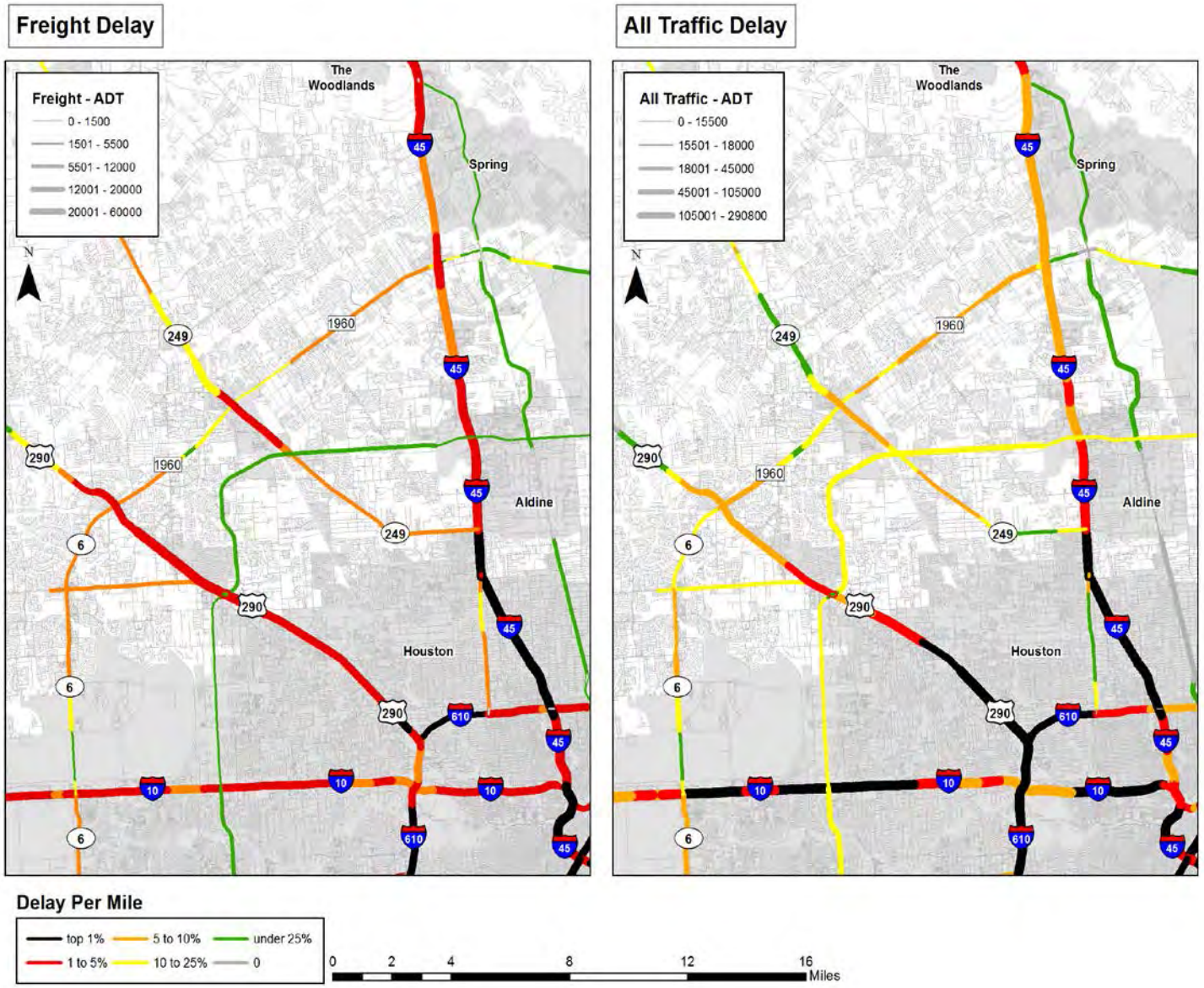
PTI of 3.00 means trucker has to allocate 60 minutes for a trip that takes 20 minutes in the off-peak to make 19 of 20 deliveries.

http://mobility.tamu.edu



Statewide Truck Congestion Map

- Delay per mile (color) and
- Volumes (line width)



Northwest Houston

- Truck delays compared to All Vehicles delays
- Sam Houston Tollway cars > trucks
- I-45 N of Tollway trucks > cars
- US 290 NW trucks > cars
- I-10 from downtown cars > trucks

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Texas A&M Transportation Institute

Contact

Bill Eisele, Ph.D., P.E.

Texas A&M Transportation Institute

(979) 845-8550

bill-eisele@tamu.edu

http://mobility.tamu.edu

(And you can find me on LinkedIn)

PHILADELPHIA DELIVERY *Handbook*

Downtown Delivery Symposium II

DVRPC Office of Freight and Aviation Planning

dvrpc

July 13, 2016
DVRPC, PHILADELPHIA, PA

Delaware Valley Regional Planning Commission

- Designated Metropolitan Planning Organization for the 9 county, bi-state region
- Prepares a long range plan and coordinates transportation funding
- Works collaboratively with both the freight community and local communities

dvrpc

Urban Street (R)evolution

Rittenhouse Square: 18th St. and Chancellor St.

- City bike share program begun in 2015
- Massive road closures during Papal visit in 2015
- 10 new protected bike lanes being added in 2016
- Curbless streets being investigated

- Bigger, articulated buses
- Bus lanes on Market St.
- Parklets
- Sidewalk cafes
- Sharrows
- Carshare

dvrpc

Recipe for Increased Urban Deliveries

- Population growth
- Employment changes
- New construction
- E-commerce
- Higher truck volumes

dvrpc

Project Goals

- Raise awareness about the importance of deliveries
- Identify hotspots and success stories
- Create city-wide standards
- Integrate last-mile operations with other modes
- Establish Philadelphia as a global leader

Steering Committee

- Nick Baker
- Mike Carroll
- Charlotte Castle

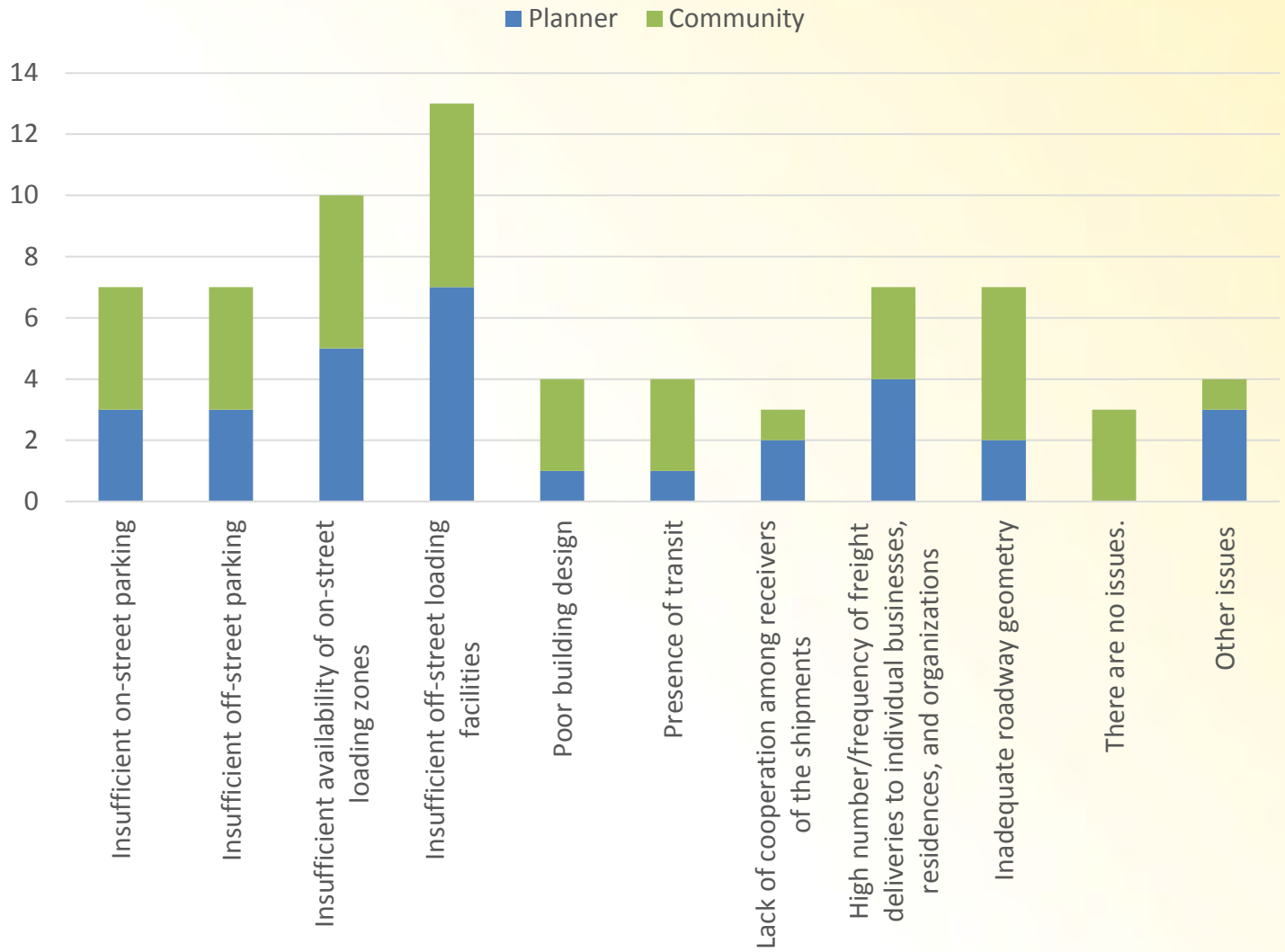
- Vadim Fleysh
- Curtis Gregory
- John Haak

- Angie Dixon
- Ted Dahlburg
- Karen Fegely

- David Kanthor
- Mike Ruane
- Ema Yamamoto

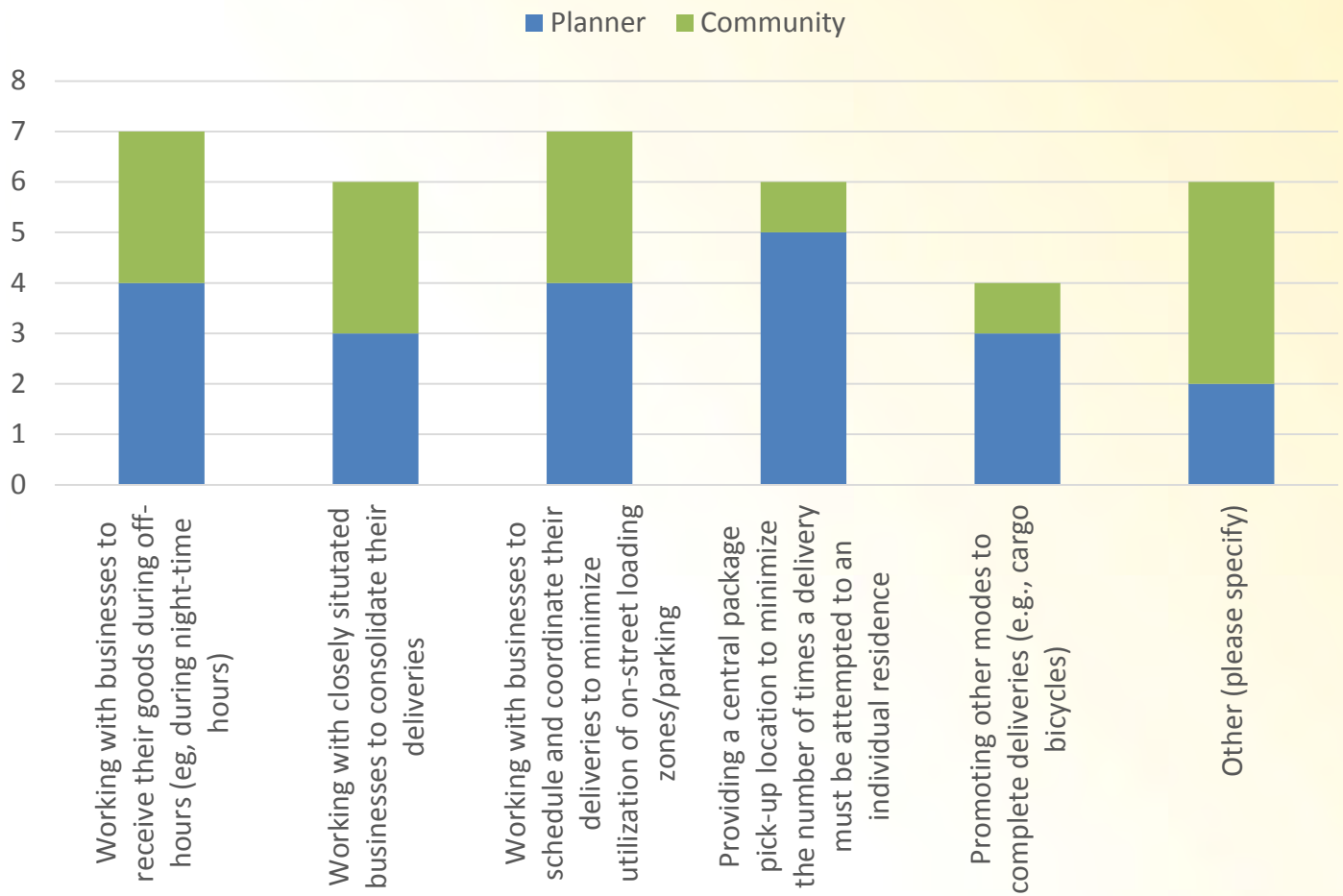
dvrpc

In the Planning District, traffic and community issues related to freight deliveries are generally caused by



dvrpc

I believe that the following strategies could help alleviate the issue at the specified location in previous question



dvrpc

Philadelphia Delivery Handbook Contents

- Background and issues
- Best practices
- Safety tips
- Maps
- Funding programs
- Photos
- Contacts

dvrpc

Sample One–Day LTL Truck Trip Log

Delivery				
Stops	Bills	Pieces	Weight	Returns
7	7	8	5258	1

Pickup				
Stops	Bills	Pieces	Weight	Stop No Freight
2	5	10	6756	0

Stop	Enroute	Arrive	Miles	Stop Time	Status
--	10:43	10:58	–	0:00	Terminal
1	10:58	11:42	17	0:32	Delivery Clear
2	12:14	12:53	5	0:39	Delivery Clear
3	13:32	13:32	2	0:01	Pickup
4	13:33	13:41	1	0:44	Delivery Clear
5	14:25	14:34	2	0:17	Delivery Clear
6	14:51	15:14	5	0:21	Delivery Clear
7	15:35	16:00	5	0:58	Delivery Clear
8	16:58	16:59	1	0:53	Delivery Clear
9	17:52	18:51	12	0:31	Pickup
–	19:22	19:38	6	0:00	Terminal

Source: YRC Freight

Call-out Boxes

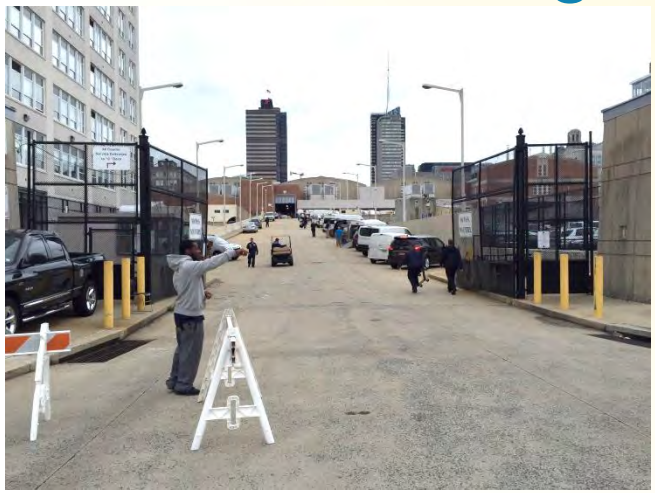
- Types of trucks
  - Package car, straight, tractor-trailer, LNG, cargo bike, Philadelphia recycling truck, side guards
- New trends
  - Amazon lockers
  - Uber for trucks
- New technologies
  - Drones
  - Autonomous vehicles

Cargo Van,
Philadelphia Car Show, 2016

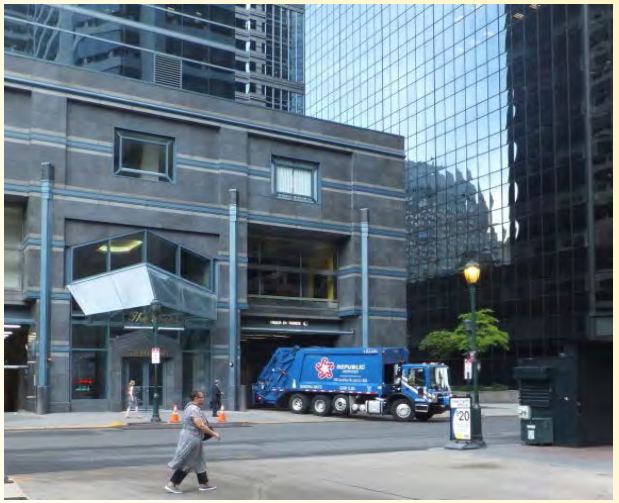
Cargo Services,
Sparrow Cycling

dvrpc

Internal Loading Entrances



PA Convention Center



Two Liberty Place

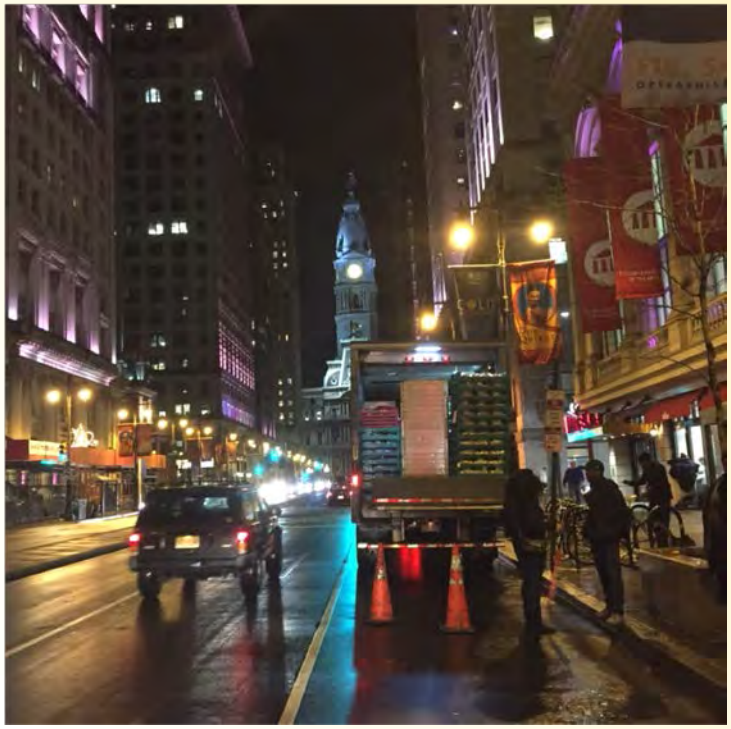
American College of Physicians

The Gallery

dvrpc

RPI Collaboration

- Rensselaer Polytechnic Institute awarded an FHWA OHD project entitled, “Engaging Large Retailers in Off-Hour Delivery Programs”
- Seeks to advance knowledge of OHD programs in urban areas nationwide
- RPI is working with DVRPC, the City of Seattle, and District DOT in Washington, D.C.
- The main intent is to design and pilot test a series of novel approaches



9PM Delivery, Wawa
Broad and Walnut streets

dvrpc

Pennsylvania Motor Truck Association

- Statewide motor transportation industry association headquartered in Camp Hill, PA
- Active Philadelphia/Delaware Valley Chapter
- Major emphasis on safety
- Supported by American Transportation Research Institute
- *If you bought it, a truck brought it!*

Funding

- FAST Act
  - National Highway Freight Network
  - FASTLANE
  - Truck stops
- TIGER
- CMAQ
- Safety
- TCDI
- PennDOT Multi-modal
- EPA SmartWay

dvrpc

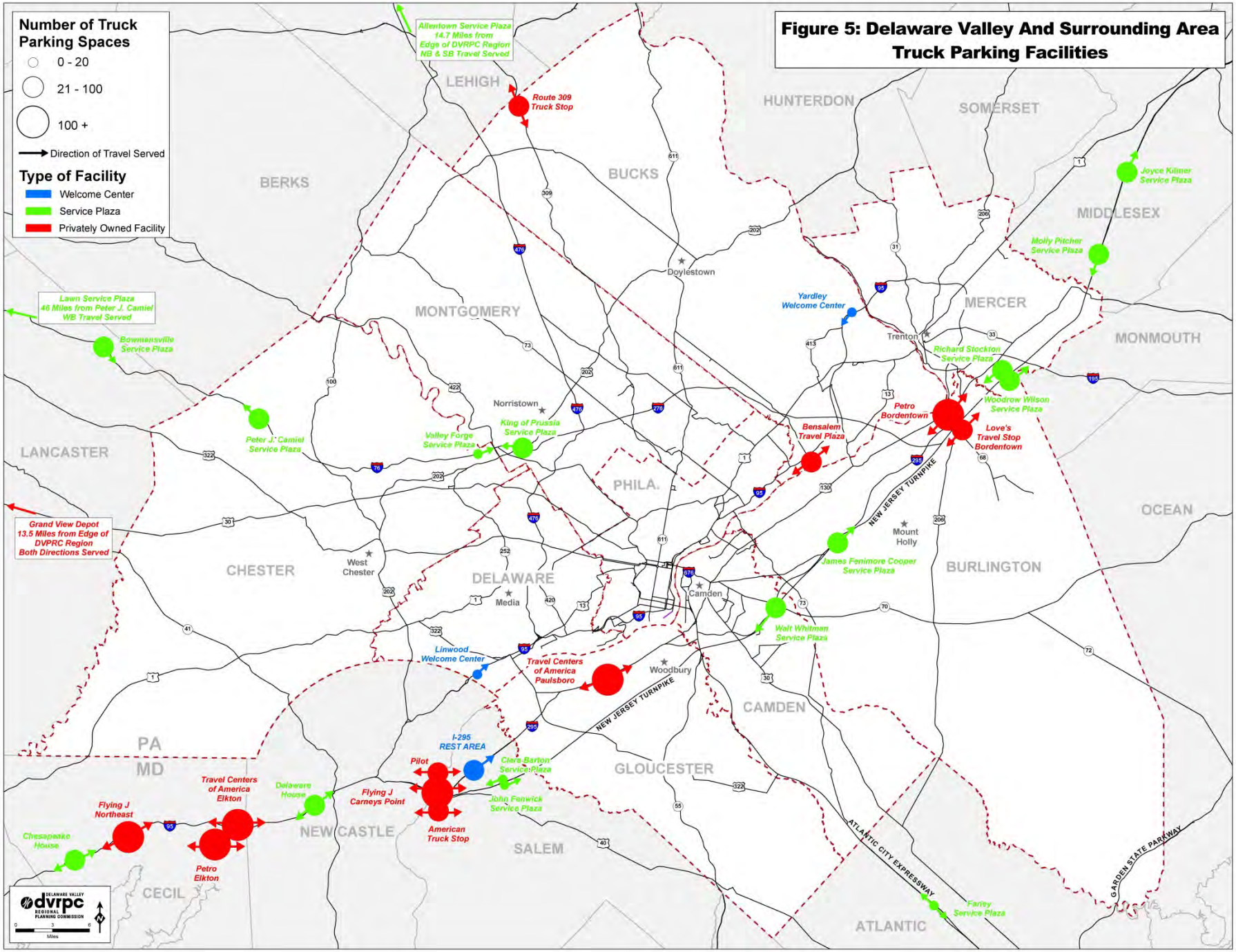


Figure 5: Delaware Valley And Surrounding Area
Truck Parking Facilities
Number of Truck Parking Spaces
0 - 20
21 - 100
100 +
Direction of Travel Served
Type of Facility
Welcome Center
Service Plaza
Privately Owned Facility
Allentown Service Plaza
14.7 Miles from Edge of DVRPC Region
NB & SB Travel Served
Route 309 Truck Stop
Lawn Service Plaza
46 Miles from Peter J. Camiel
WB Travel Served
Bowmansville Service Plaza
Peter J. Camiel Service Plaza
Grand View Depot
13.5 Miles from Edge of DVRPC Region
Both Directions Served
Valley Forge Service Plaza
King of Prussia Service Plaza
Linwood Welcome Center
Travel Centers of America Paulsboro
I-295 REST AREA
Pilot
Flying J Carneys Point
American Truck Stop
Clara Barton Service Plaza
John Fenwick Service Plaza
Delaware House
Travel Centers of America Elkton
Flying J Northeast
Chesapeake House
Petro Elkton
Yardley Welcome Center
Bensalem Travel Plaza
Petro Bordentown
Love's Travel Stop Bordentown
Richard Stockton Service Plaza
Woodrow Wilson Service Plaza
James Fenimore Cooper Service Plaza
Walt Whitman Service Plaza
Joyce Kilmer Service Plaza
Molly Pitcher Service Plaza
Farley Service Plaza
LEHIGH
BERKS
BUCKS
HUNTERDON
SOMERSET
MIDDLESEX
MONTGOMERY
MERCER
MONMOUTH
LANCASTER
CHESTER
DELAWARE
PHILA.
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
CUMBERLAND
ATLANTIC
CECIL
NEW CASTLE
PA
MD
Doylestown
Norristown
West Chester
Media
Camden
Woodbury
Mount Holly
Trenton
NEW JERSEY TURNPIKE
ATLANTIC CITY EXPRESSWAY
GARDEN STATE PARKWAY
dvrpc
DELAWARE VALLEY REGIONAL PLANNING COMMISSION
Miles

Next Steps

- Publish Philadelphia Delivery Handbook
- Complete data analyses
- Increase web presence and resources
- Continue and expand work group
- Downtown Delivery Symposium III

dvrpc

PHILADELPHIA
DELIVERY
Handbook

Data Collection and Analysis

DVRPC Office of Freight and Aviation Planning

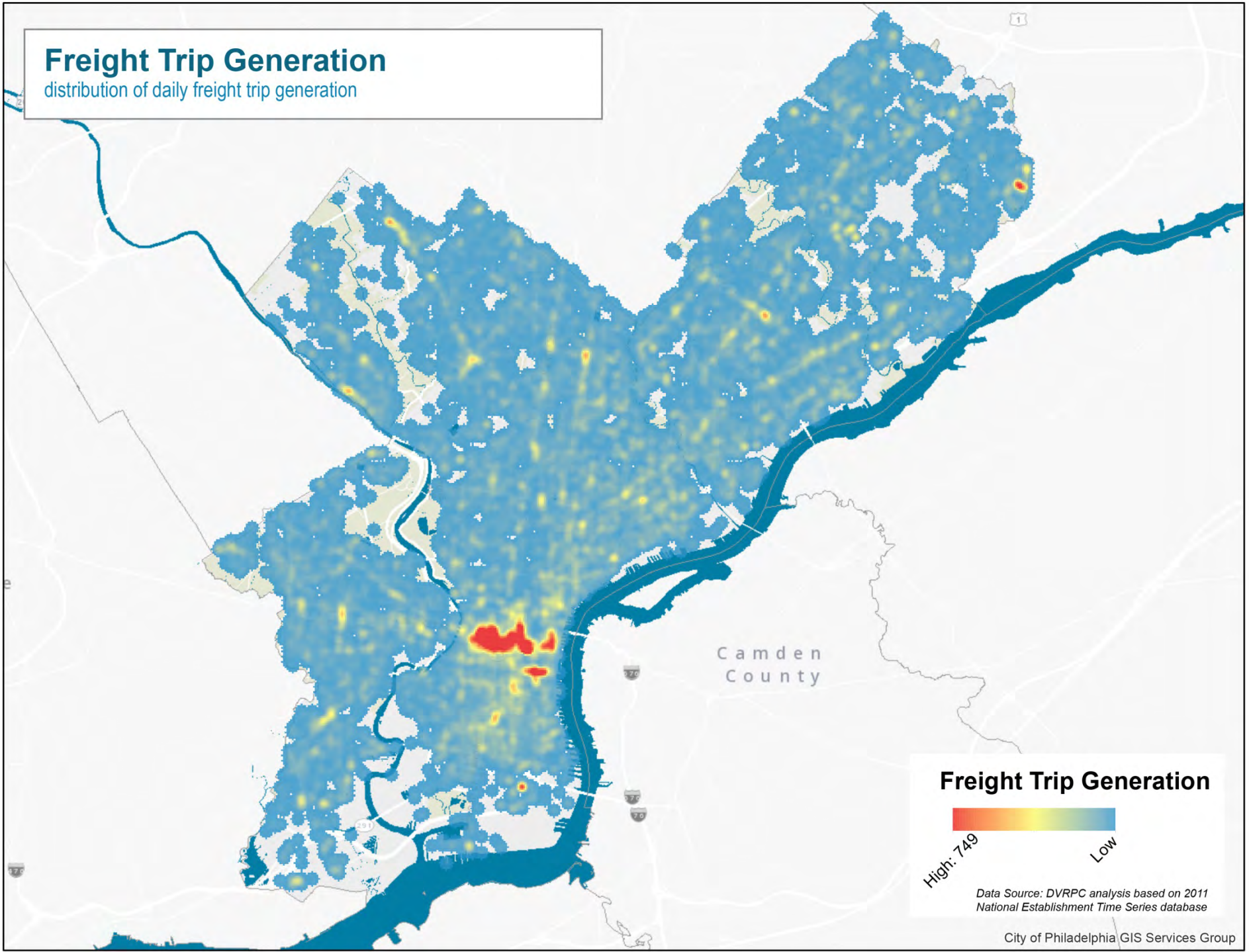
dvrpc

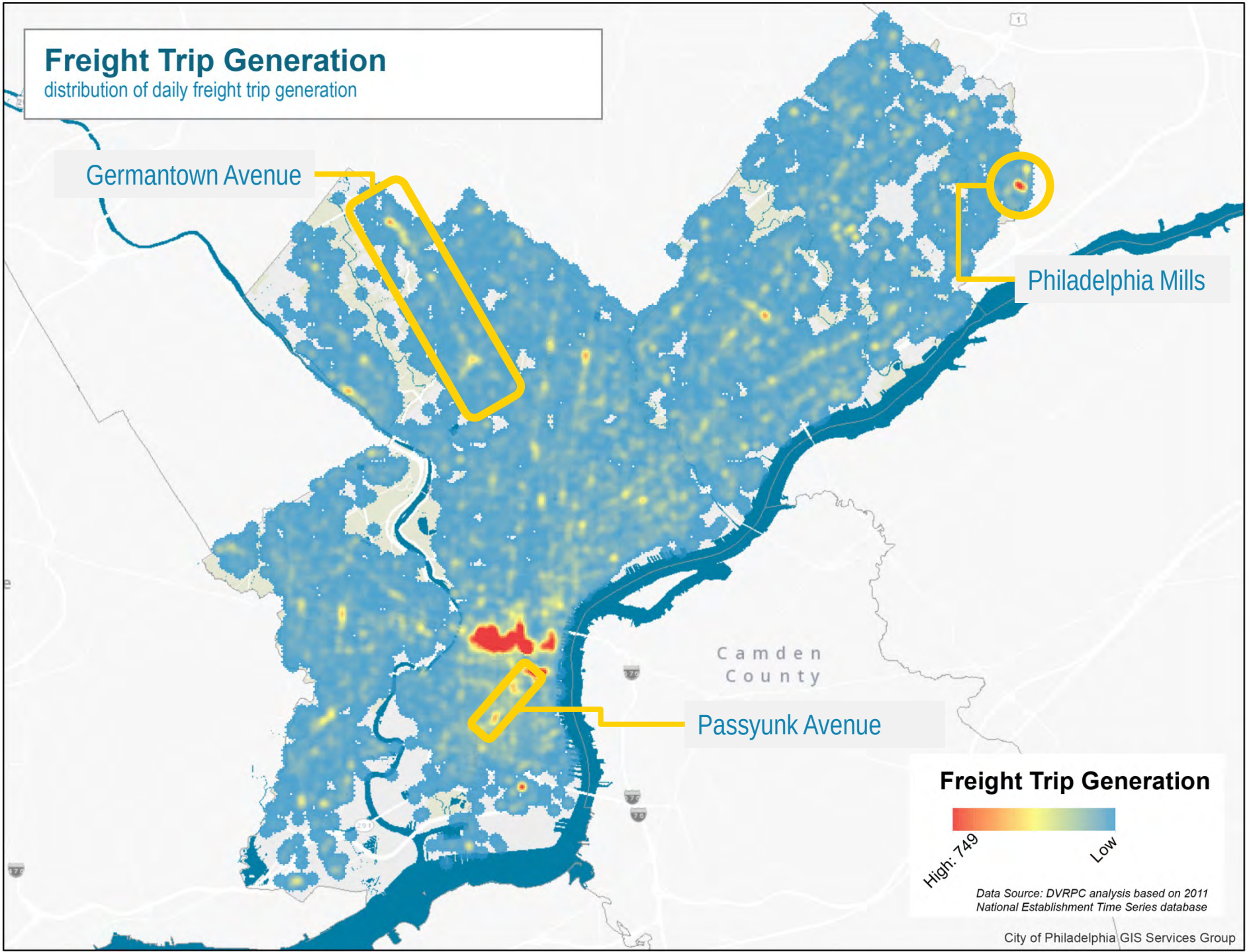
July 13, 2016
DVRPC OFFICES, PHILADELPHIA, PA

Understanding Demand

- Identify demand for freight deliveries
- Create a hierarchy of corridors
- Utilize as foundation for evaluation of supply/capacity gaps

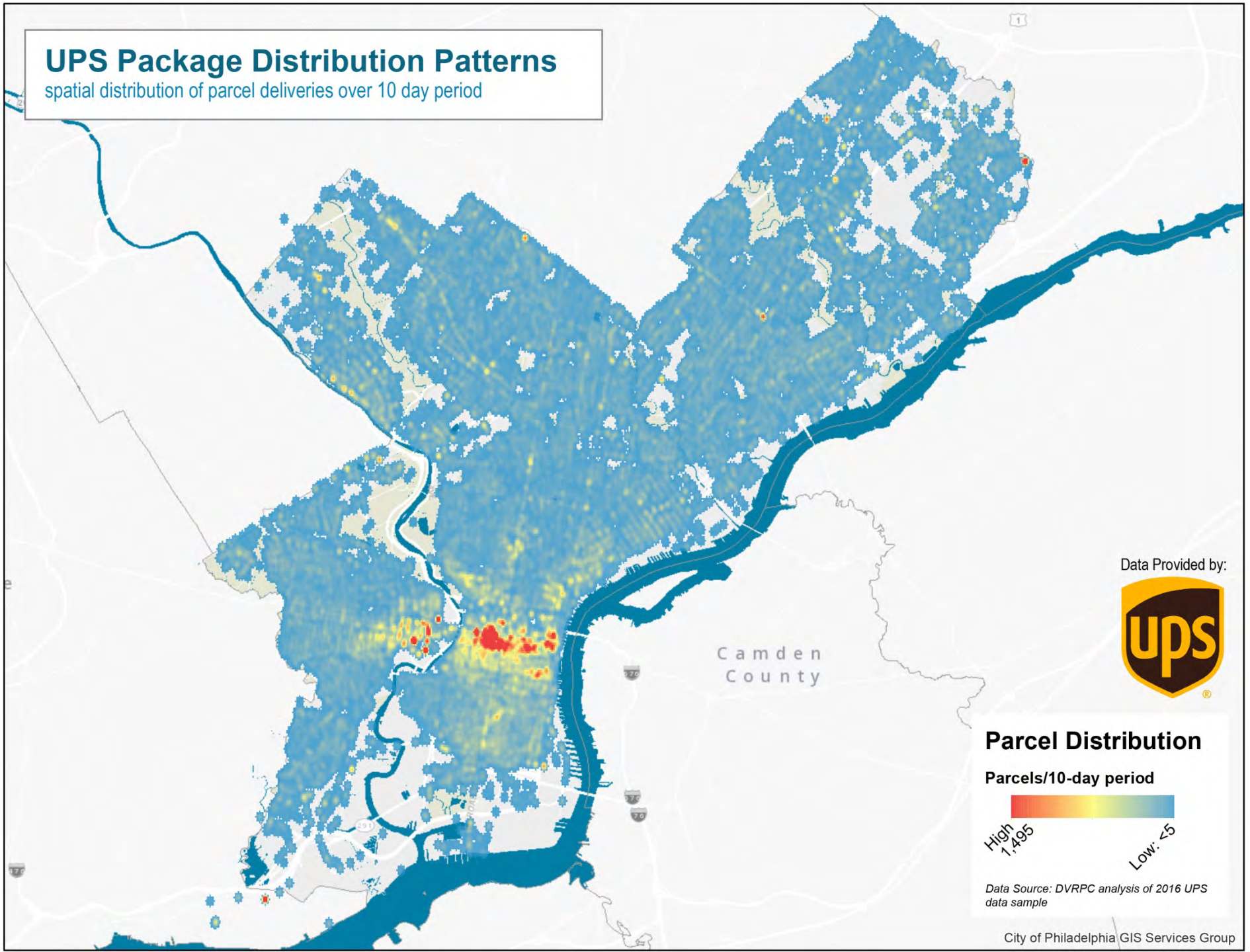
dvrpc


Freight Trip Generation
distribution of daily freight trip generation
Camden
County
Freight Trip Generation
High: 749
Low
Data Source: DVRPC analysis based on 2011
National Establishment Time Series database
City of Philadelphia GIS Services Group


Freight Trip Generation
distribution of daily freight trip generation
Germantown Avenue
Philadelphia Mills
Camden County
Passyunk Avenue
Freight Trip Generation
High: 749
Low
Data Source: DVRPC analysis based on 2011 National Establishment Time Series database
City of Philadelphia GIS Services Group

UPS Package Distribution Patterns

spatial distribution of parcel deliveries over 10 day period



Data Provided by:

Parcel Distribution

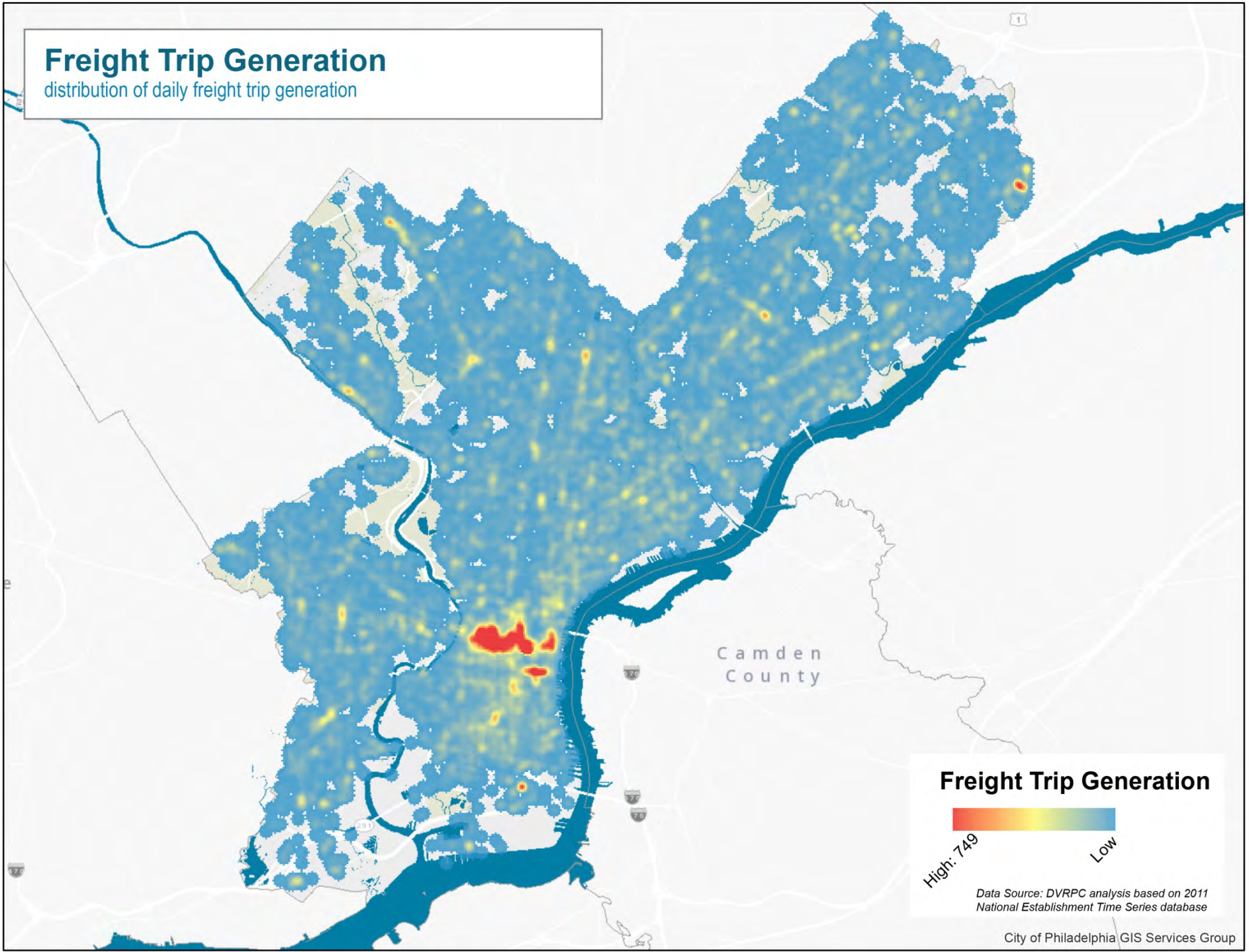
Parcels/10-day period

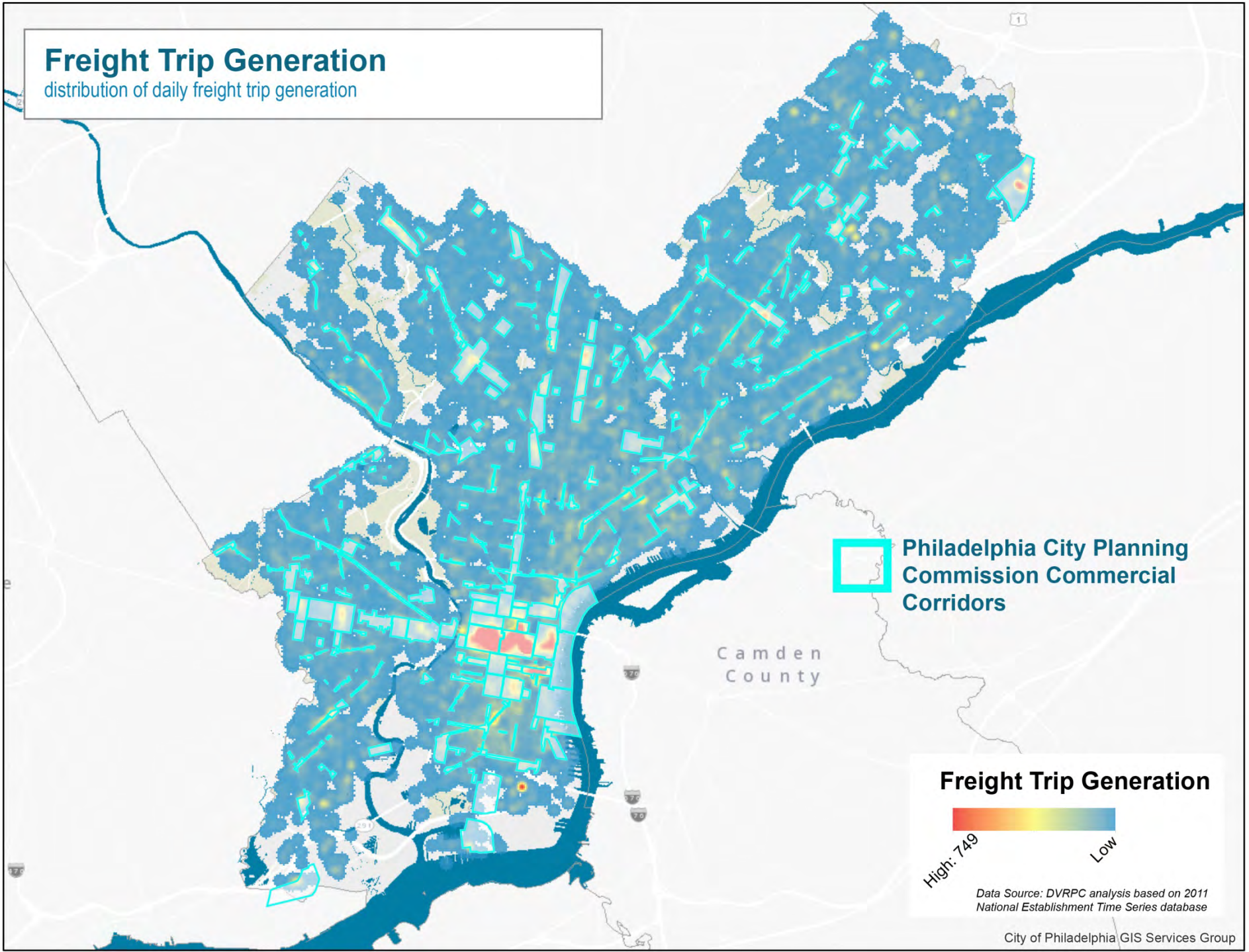
High 1,495

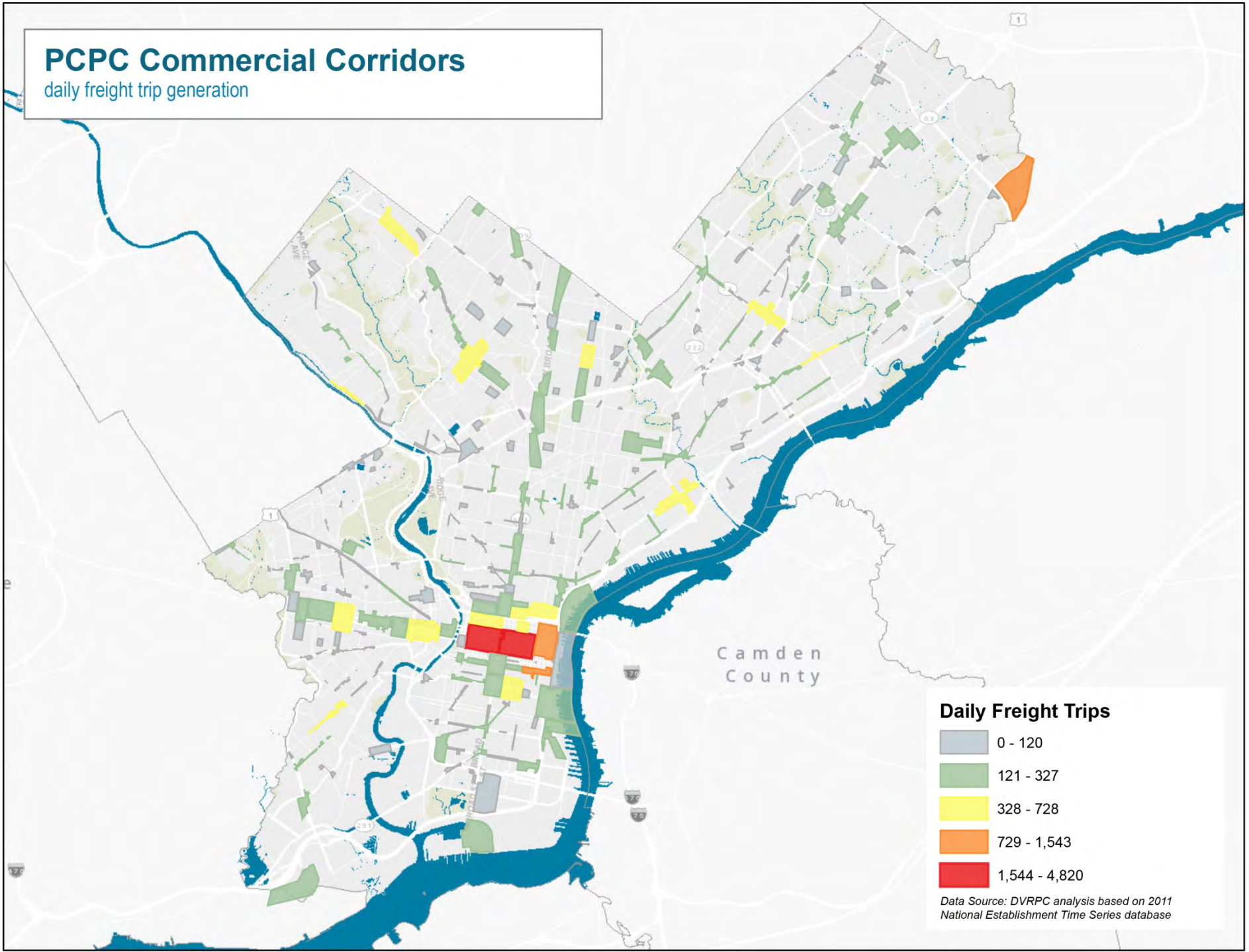
Low: <5

Data Source: DVRPC analysis of 2016 UPS data sample

City of Philadelphia GIS Services Group

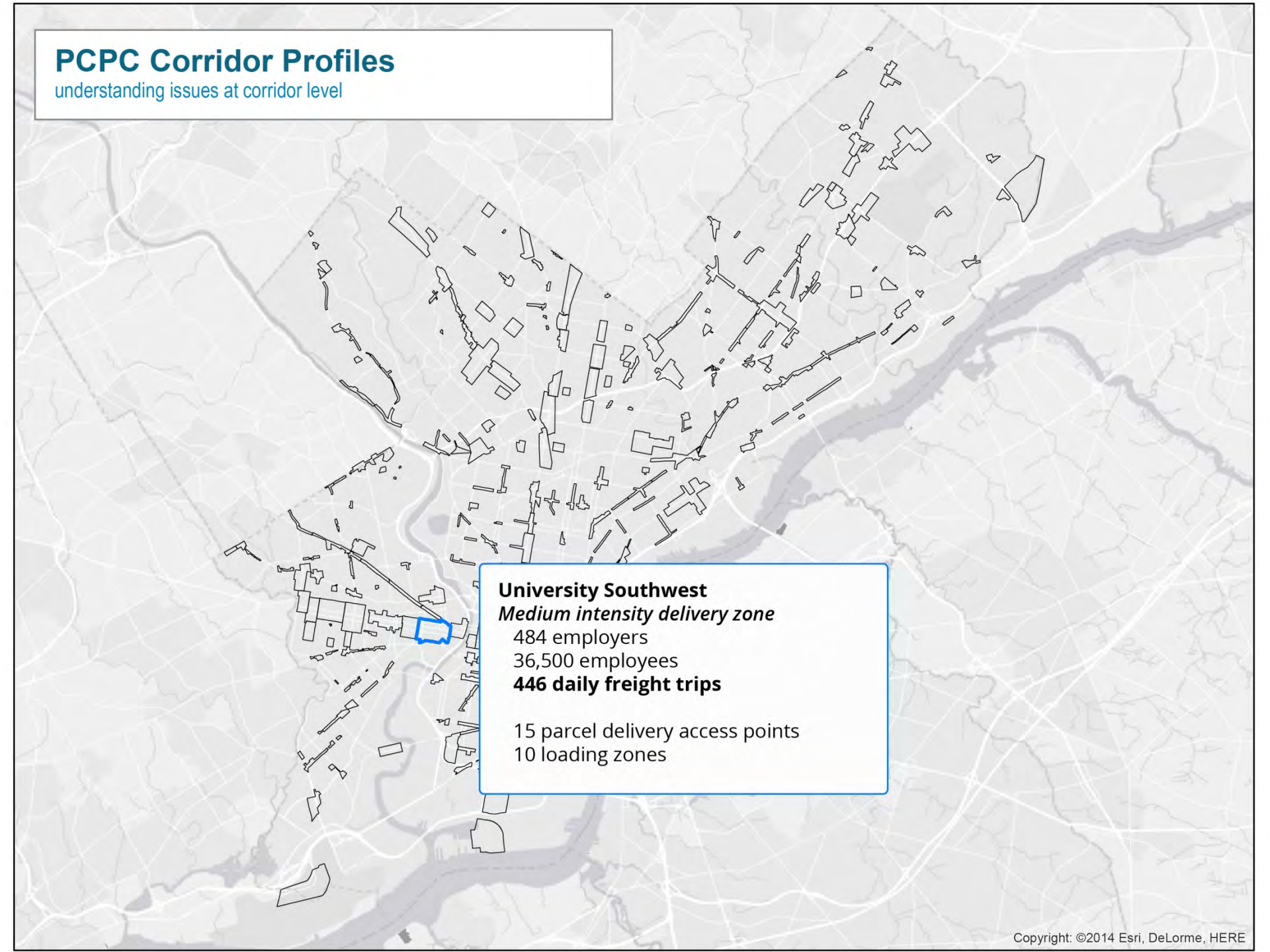

Freight Trip Generation
distribution of daily freight trip generation
Camden
County
Freight Trip Generation
High: 749
Low
Data Source: DVRPC analysis based on 2011
National Establishment Time Series database
City of Philadelphia GIS Services Group


Freight Trip Generation
distribution of daily freight trip generation
Philadelphia City Planning Commission Commercial Corridors
Camden County
Freight Trip Generation
High: 749
Low
Data Source: DVRPC analysis based on 2011 National Establishment Time Series database
City of Philadelphia GIS Services Group


PCPC Commercial Corridors
daily freight trip generation
Camden
County
Daily Freight Trips
0 - 120
121 - 327
328 - 728
729 - 1,543
1,544 - 4,820
Data Source: DVRPC analysis based on 2011
National Establishment Time Series database

PCPC Corridor Profiles

understanding issues at corridor level



University Southwest

Medium intensity delivery zone

484 employers

36,500 employees

446 daily freight trips

15 parcel delivery access points

10 loading zones

Inventory of Loading Zone Supply

- Critical to understand conflicts
- Analysis will include identification of gaps
- Temporal factors are critical and existing data fails to capture

dvrpc

Data collection

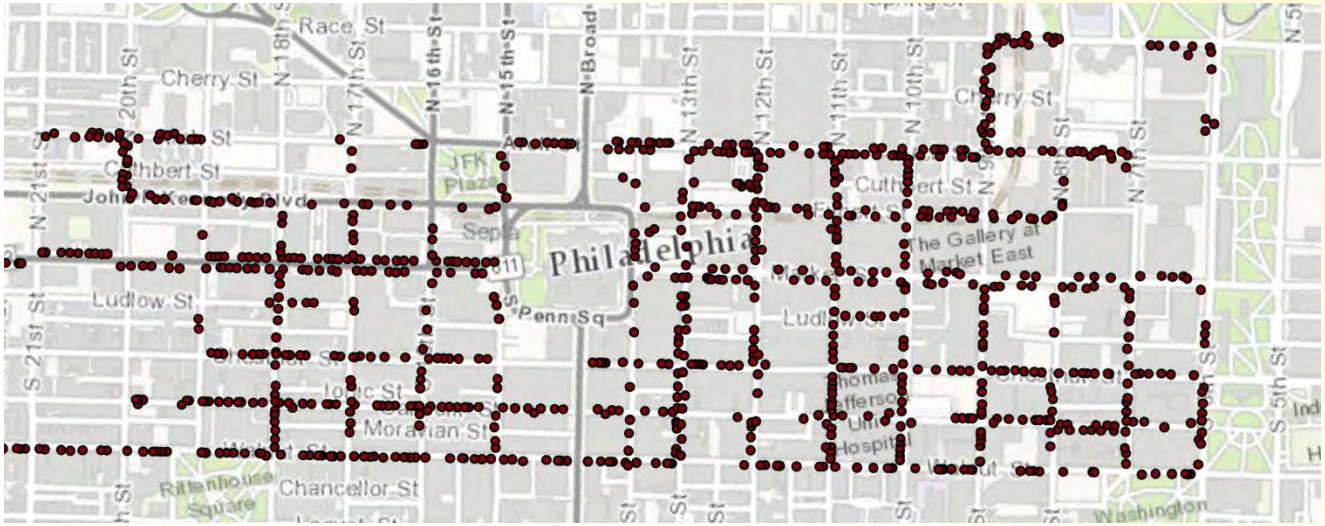
- Geographic locations
  - Including signs for: No parking/stopping, truck loading, passenger loading, loading zones, no truck parking
- Photos
  - To capture parking regulations and available parking times

Current State of Parking Signs

dvrpc

Database development

- Management system for signage and regulations
  - All regulations mapped by curb segment
  - Temporal changes built-in



- Requires ongoing management if used for more than a snapshot

dvrpc

dvrpc PHILLY FREIGHT FINDER FREIGHT MAPPING & DATA PLATFORM FOR THE DELAWARE VALLEY

Home | Our Region | About | View Map

Delivery Zone Finder

Tell us about your delivery:

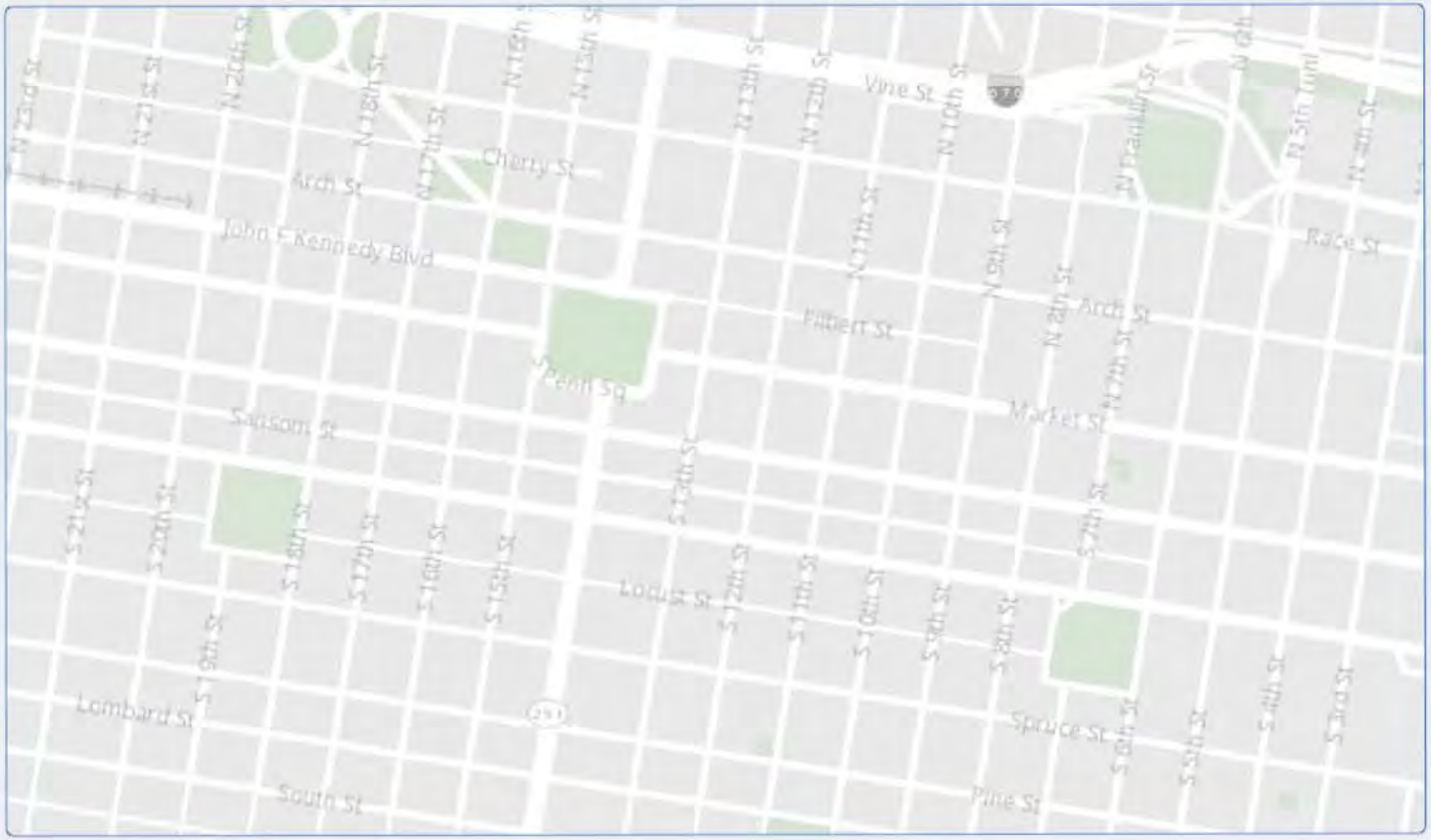
Delivery destination: 1120 Chestnut Street

Estimated delivery time:

Day of week: weekday

Time of day: 9:00 - 9:30 AM

FIND DELIVERY PARKING

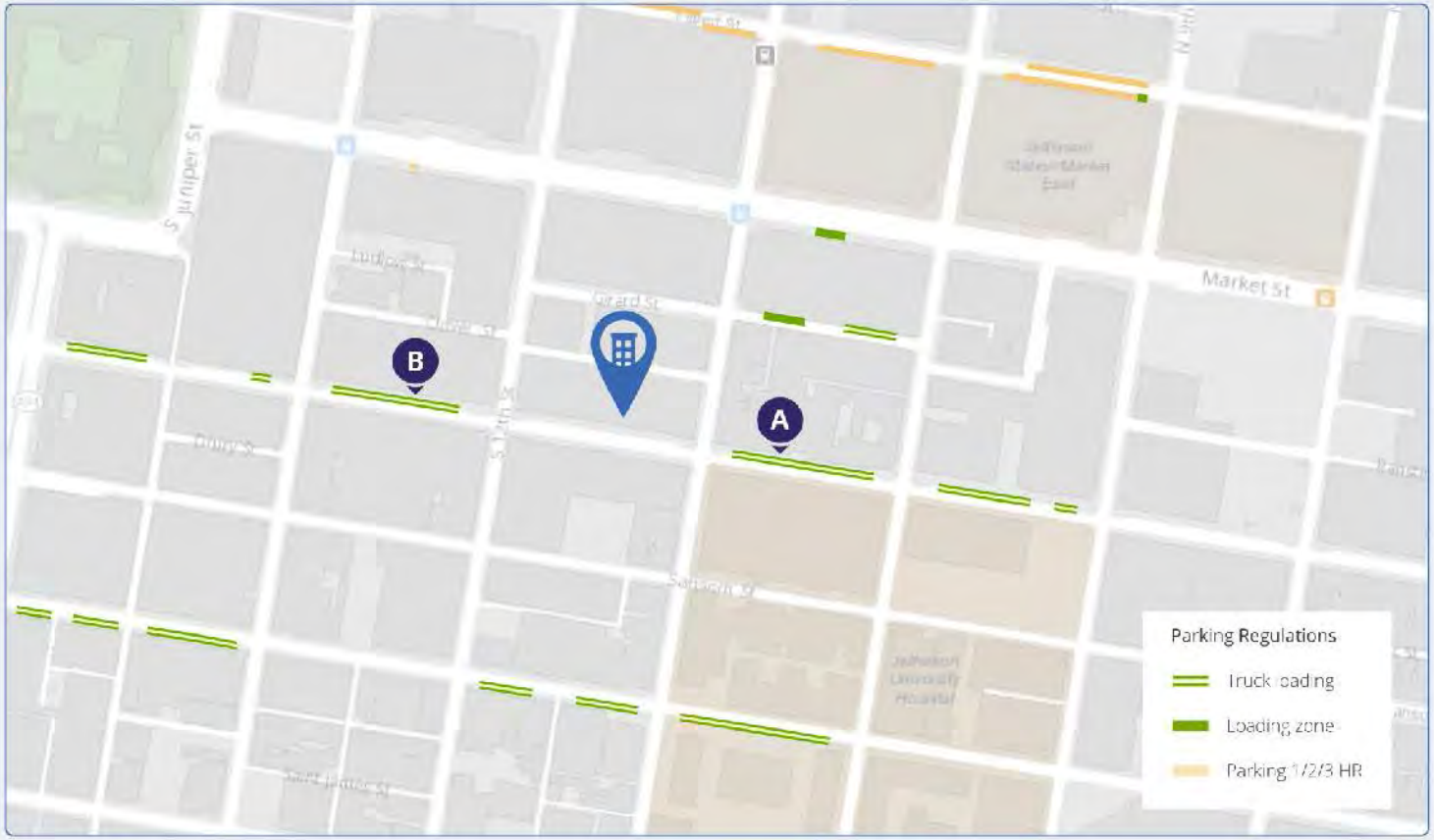


Delivery Zone Finder

Here is what we found near your destination

2 RESULTS FOUND

A	Truck Loading Only - 1000 Chestnut Street	343 ft
B	Truck Loading Only - 1200 Chestnut Street	409 ft



Crash Data Results

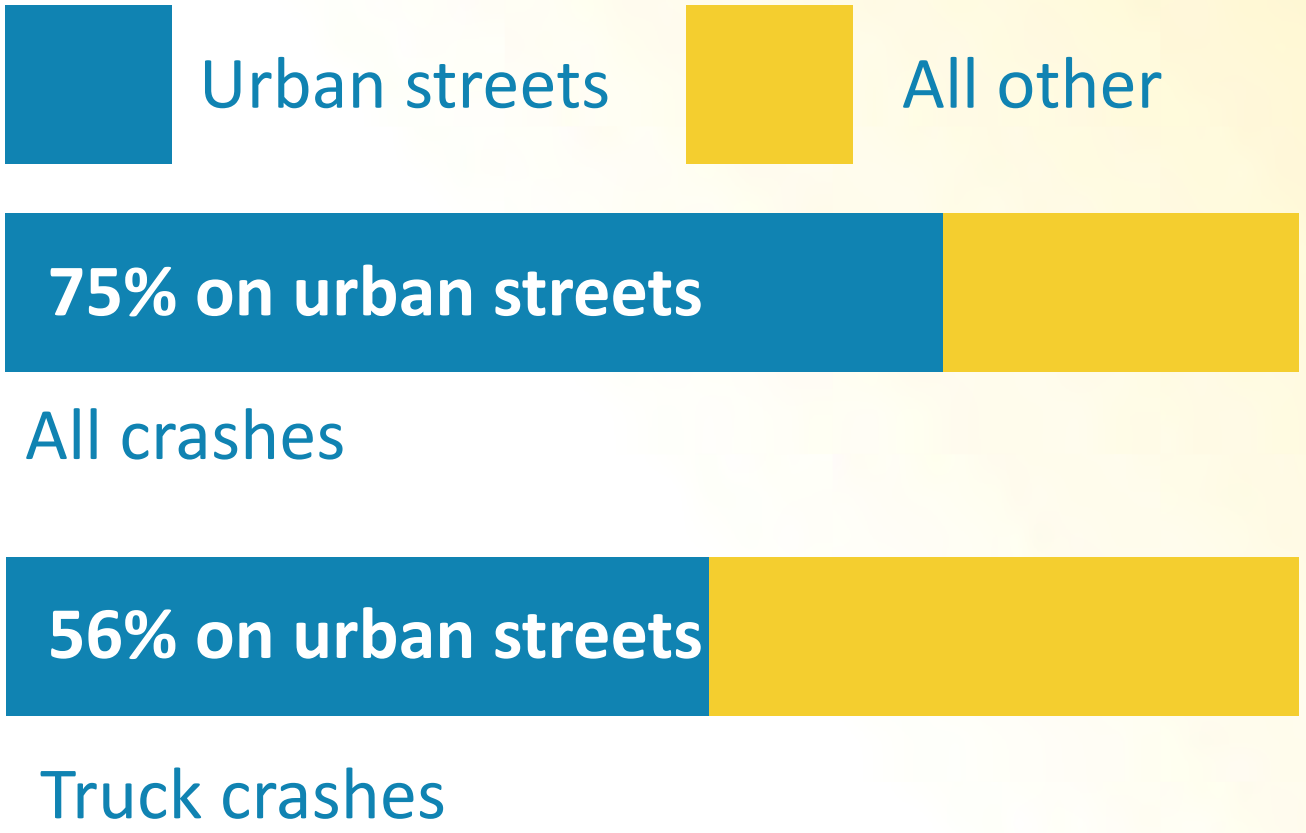
dvrpc

Truck Crashes

- Crash = involves an injury and/or vehicle requires towing
- Time period: 2010-2014
- Source: PennDOT
- Truck category includes large trucks, small trucks, and commercial vans
- Inconsistent records discarded

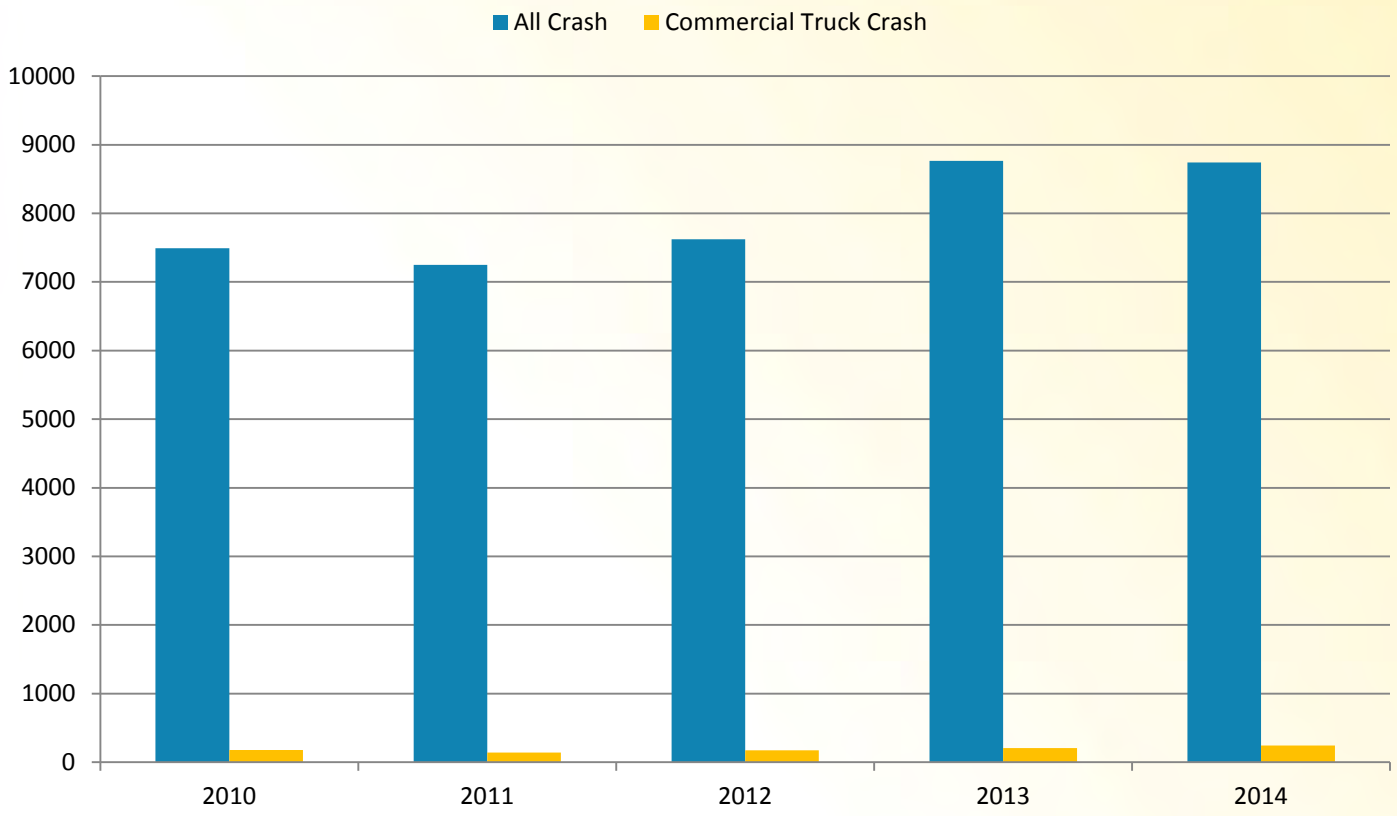
Urban Street Focus

- All non-limited access highways



dvrpc

All crashes vs. truck involved



39.9k
all crashes

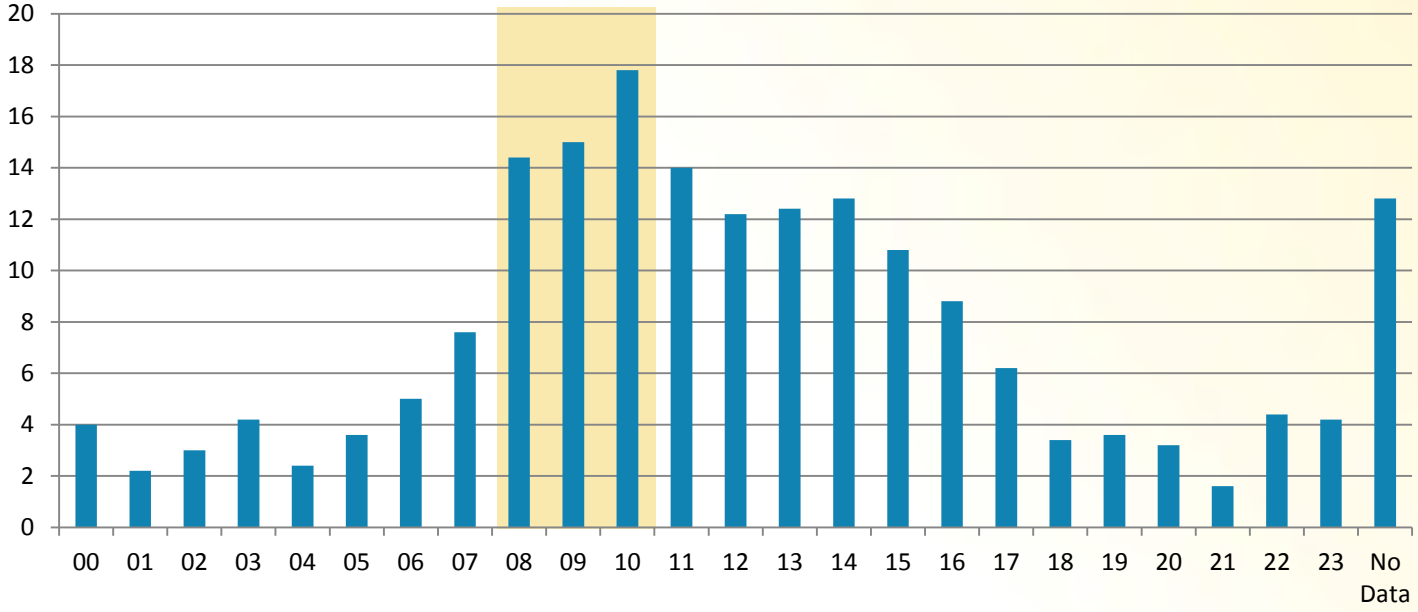
948
commercial truck

dvrpc

Time and Conditions

- Weekdays at morning peak highest level
- Daylight hours, dry, clear conditions

Incidents by time of day

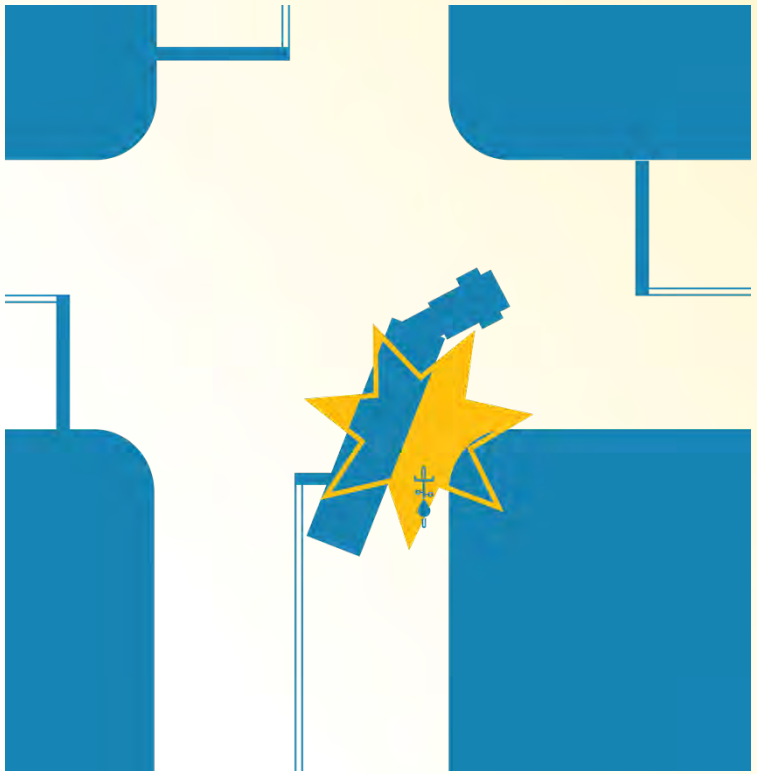


dvrpc

Bike/Pedestrian Incidents

- 14 pedestrian involved accidents / year
- 5 bicycle involved accidents / year

> 65% involve truck making right turn



dvrpc

Next Steps

- Refine supply/demand profiles for corridors
- Complete inventory of loading zones for CC
- Outreach to private sector on utility of loading zones finder

dvrpc

July 25–28, 2016

Delaware Valley Goods Movement Task Force: Downtown Delivery Symposium II Meeting

Delaware Valley Regional Planning Commission

Philadelphia, PA

July 13, 2016

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

DNC EVENT LOCATIONS

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

OVERVIEW – TRAFFIC RESTRICTIONS / CLOSURES

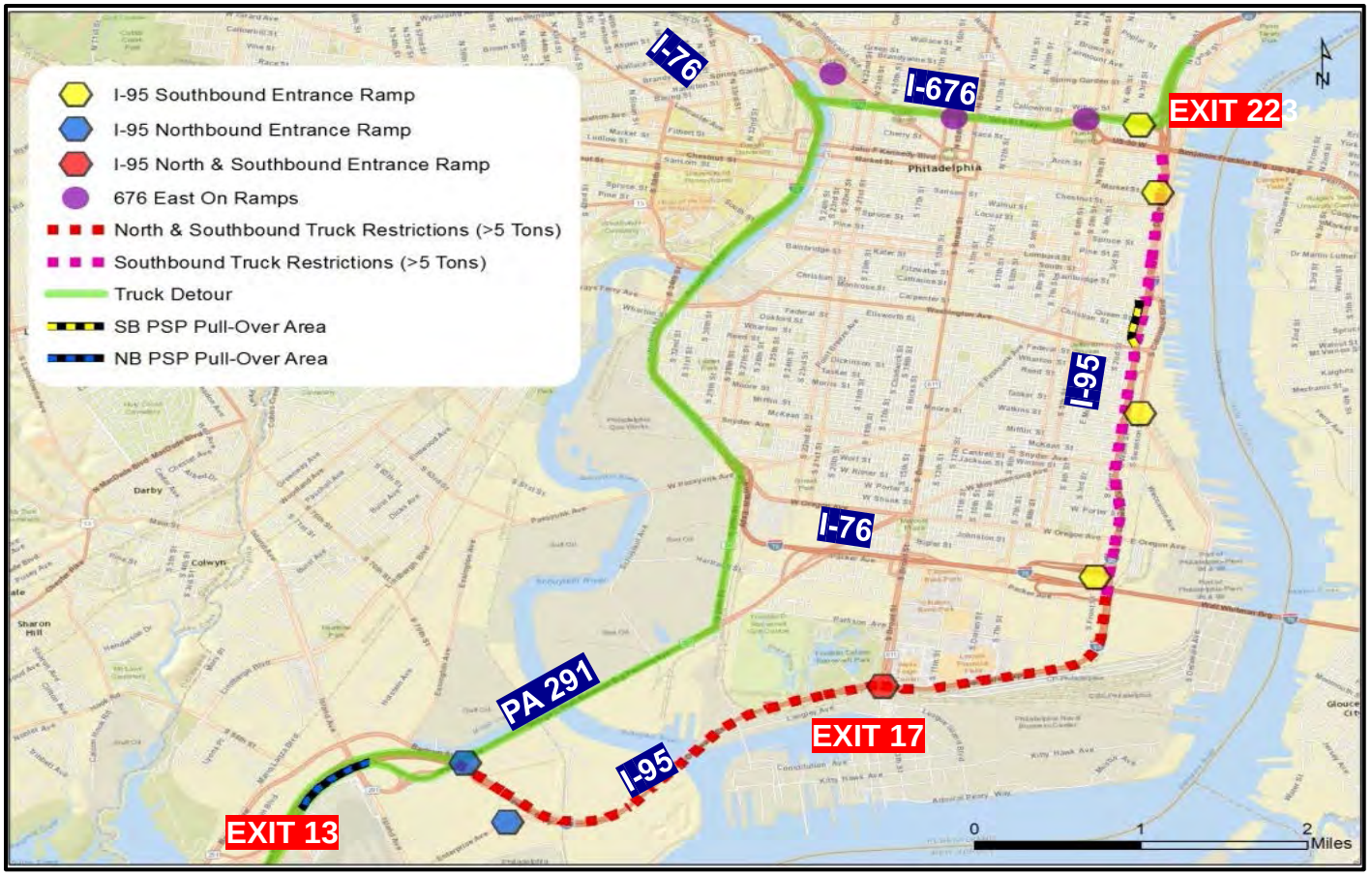
- **All Vehicles over 5 Tons are prohibited on I-95 -**
  - Between Exit 13 (to I-76W / VF / 291) and Exit 22 (I-676 / BF Bridge)
- **I-95 Exit 17 Ramps (Broad Street / 611) affected during Convention Week (Fri July 22 (8PM) to Midday Fri July 29).**
  - I-95 NB Off Ramp and I-95 SB On Ramp to close;
  - For Navy Yard access only:
    - I-95 SB Off Ramp to remain open Sat, Sun, and from 2AM to 2PM (Mon-Fri).
    - I-95 NB On Ramp to remain open (no trucks).
- **I-76 EB Exit 350 (Packer Ave) Off Ramp to close from 2PM to 2AM between Mon July 25 – Fri July 29.**
- **I-76 Exit 349 Ramp(s) to remain open - but subject to closure for public safety if / when protestors are on Broad Street.**

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

OVERVIEW – TRAFFIC RESTRICTIONS / CLOSURES

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

OVERVIEW – CONTROL POINTS, RESTRICTIONS, DETOUR AND PULL-OVER AREAS



pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

OVERVIEW – 5 TON VEHICLE DETOUR ROUTES

- **For I-95 North**
  - **Route 291 (Penrose Avenue) East, to 26th Street, to I-76 West to I-676 East**
- **For I-95 South**
  - **I-676 West, to I-76 East, to 26th Street, to Route 291 (Penrose Avenue) West**
- **For I-95 NB & SB On Ramps between Exit 13 and Exit 22 that provide access to I-95 past the sports complex**
- **For I-676 EB Mainline & On Ramps that provide access to I-95 SB past the sports complex**

OVERIVEW - KEY RESTRICTION/CLOSURE TIMELINE

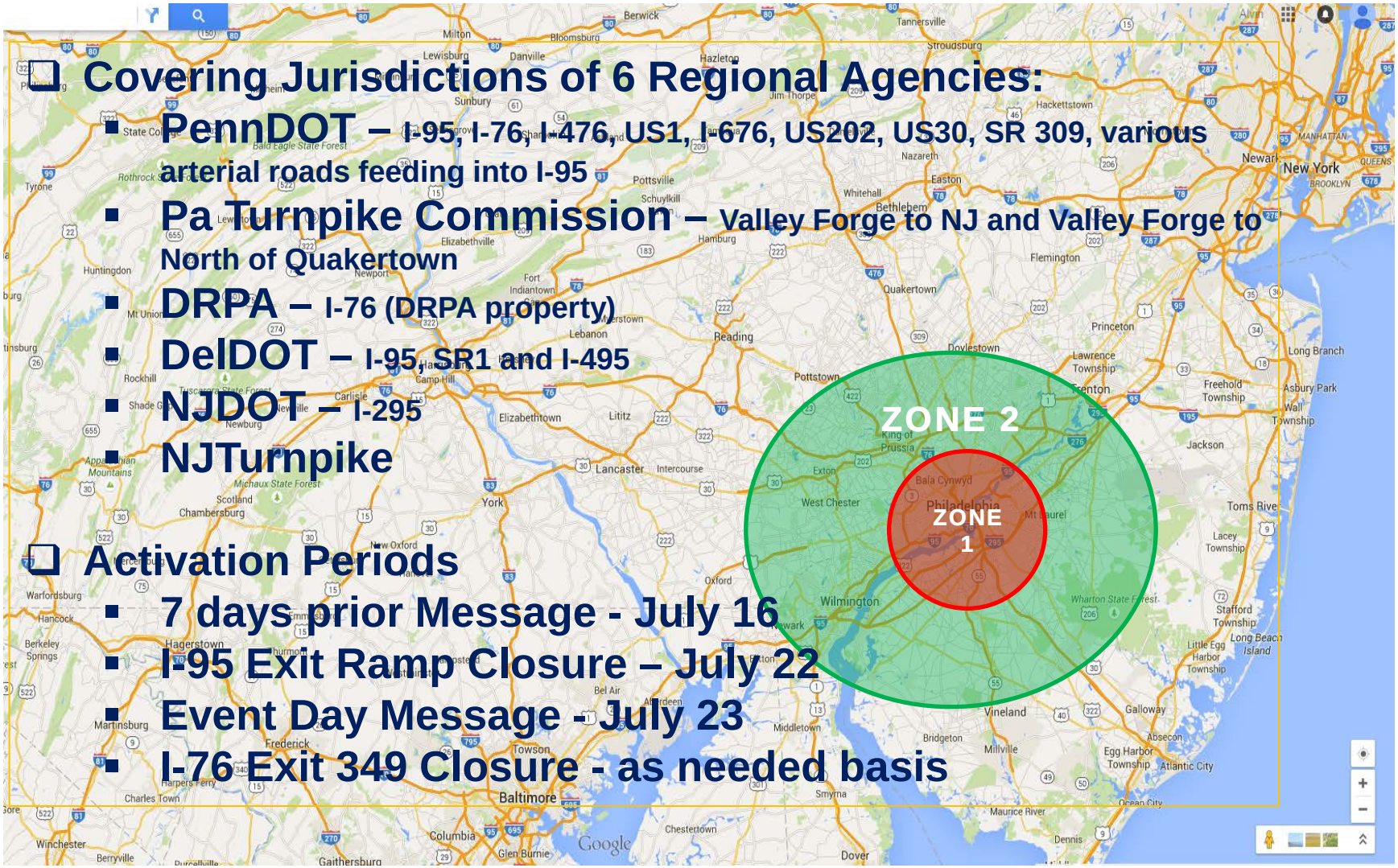
- **Friday, July 22, 8 PM**
  - Initiate Closure of I-95 Exit 17 to Broad Street
- **Saturday, July 23, Noon to Friday Midday, July 29**
  - Prohibit Vehicles over 5 Tons from Traveling on I-95 between Exit 13 (to I-76 / VF / 291) to Exit 22 (I-676 Ben Franklin Bridge)
- **Saturday, July 23, Noon to Friday Midday, July 29**
  - Oversize Load Restrictions in Effect
- **Friday, July 29 @ 2 AM**
  - Begin Reopening Sequence
  - Begin Covering / Removal of Static Signs
- **Friday July 29 - Midday**
  - Estimated timeframe of complete reopening
  - I-95 Exit 17 (Broad St) ramps may take longer

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

OVERVIEW - Access Routes to Philadelphia Port Areas

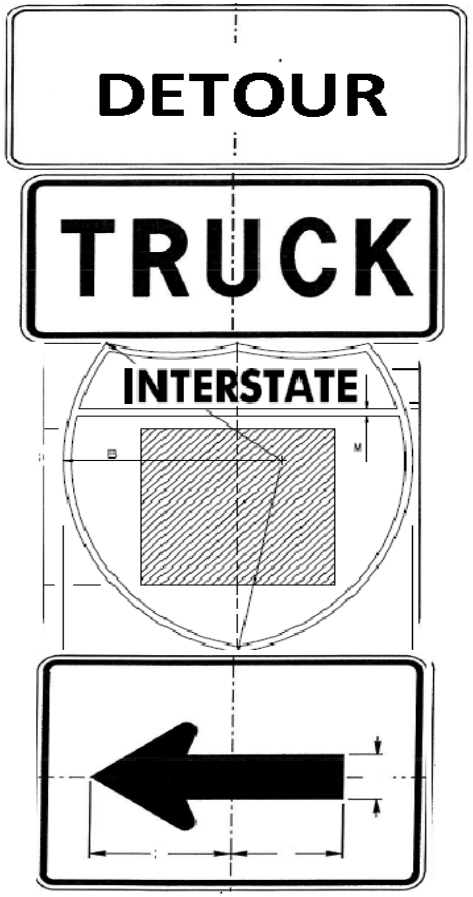
- **ROUTE #1: NB I-95 TO I-295**
  - **I-95 N, US322 E, CBB, NJ RT130 N, I-295 N, I-76 W, WWB, EXIT 351, FRONT ST, OREGON AVE, C COLUMBUS BLVD.**
- **ROUTE #2: EB I-76**
  - **I-76 E, EXIT 347B, OREGON AVE, C COLUMBUS BLVD**
- **ROUTE #3: EB I-76**
  - **I-76 E, EXIT 344, I-676 E, BEN FRANKLIN PARKWAY & 23RD ST, 22ND STREET, SPRING GARDEN ST, C COLUMBUS BLVD**
- **ROUTE #4: NB I-95**
  - **I-95 N, EXIT 13, I-76 W, 291 E, W MOYAMENSING AVE, OREGON AVE, C COLUMBUS BLVD**
- **ROUTE #5: NB I-95**
  - **I-95 N, EXIT 13, I-76 W, 291 E, PACKER AVE, FRONT ST, OREGON AVE, C COLUMBUS BLVD**
- **ROUTE #6: SB I95**
  - **I-95 S, EXIT 22, I-676 E/30 E CALLOWHILL ST, C COLUMBUS BLVD**
- **ROUTE #7: SB I-95**
  - **I-95 S, EXIT 22, DEL AVE, ARAMINGO AVE, DELAWARE AVE, C COLUMBUS BLVD**
- **ROUTE #8: WB I-676**
  - **BFB WB, 8TH ST S/CHINATOWN, 8TH ST, RACE ST, C COLUMBUS BLVD**

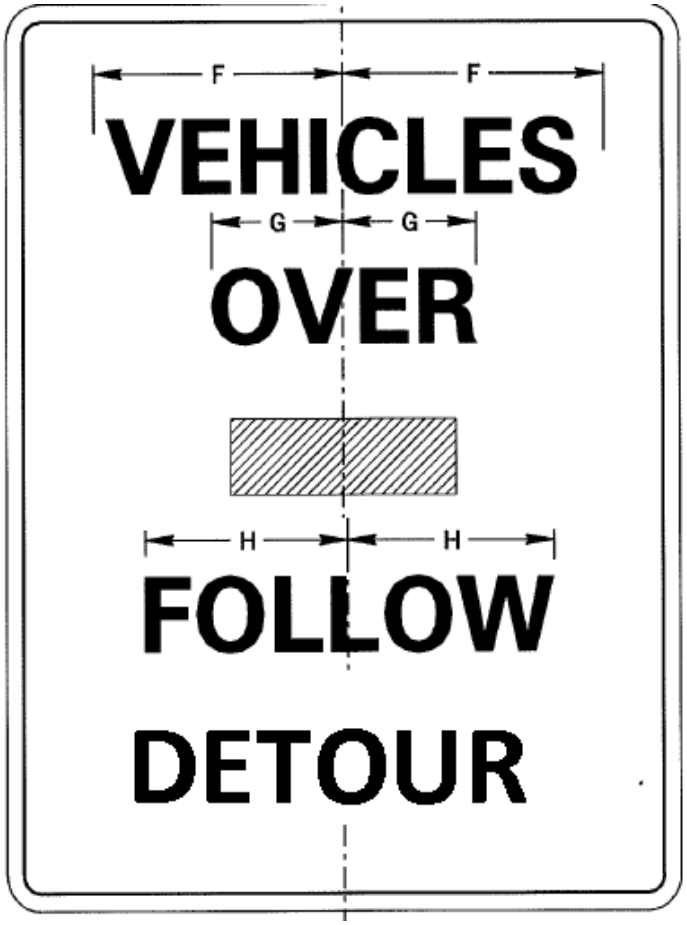
OVERVIEW - DMS Roadside Messaging

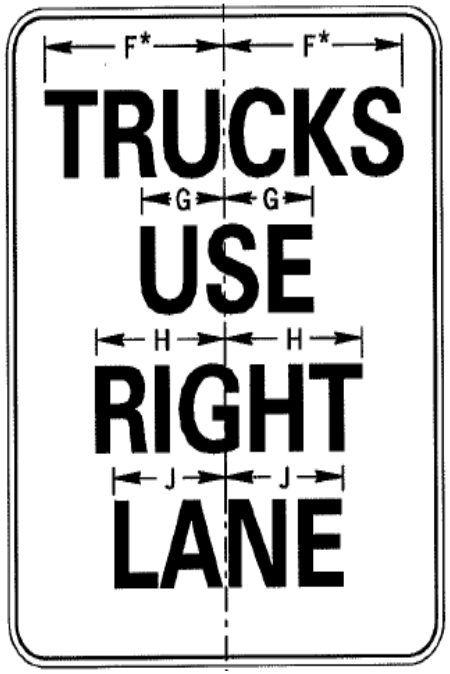


- Covering Jurisdictions of 6 Regional Agencies:
  - PennDOT – I-95, I-76, I-476, US1, I-676, US202, US30, SR 309, various arterial roads feeding into I-95
  - Pa Turnpike Commission – Valley Forge to NJ and Valley Forge to North of Quakertown
  - DRPA – I-76 (DRPA property)
  - DelDOT – I-95, SR1 and I-495
  - NJDOT – I-295
  - NJTurnpike
- Activation Periods
  - 7 days prior Message - July 16
  - I-95 Exit Ramp Closure – July 22
  - Event Day Message - July 23
  - I-76 Exit 349 Closure - as needed basis

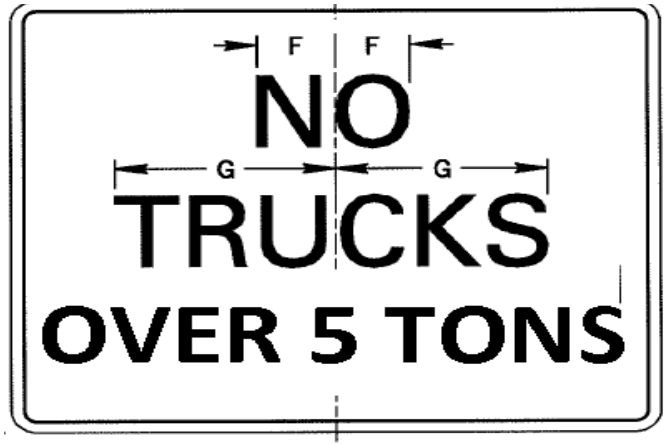
Regulatory Signing - Expressway

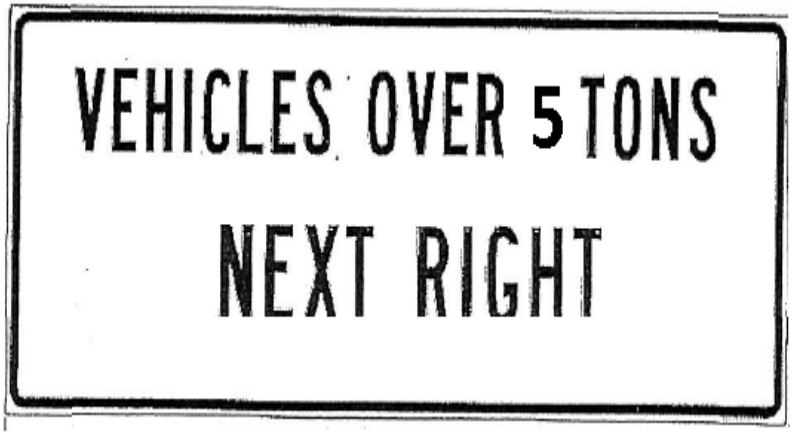






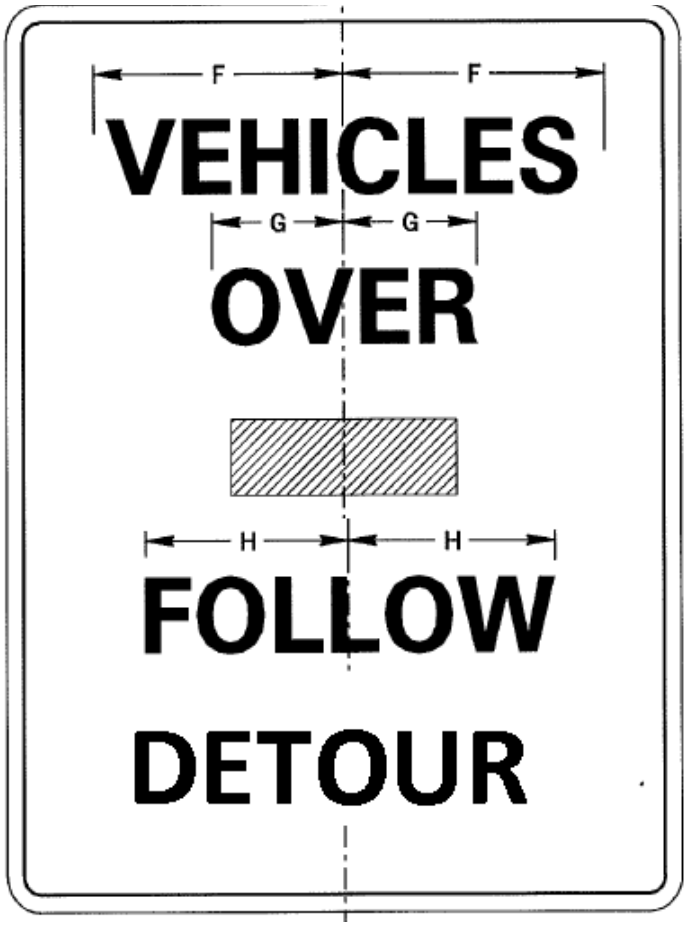
Regulatory Signing - Expressway

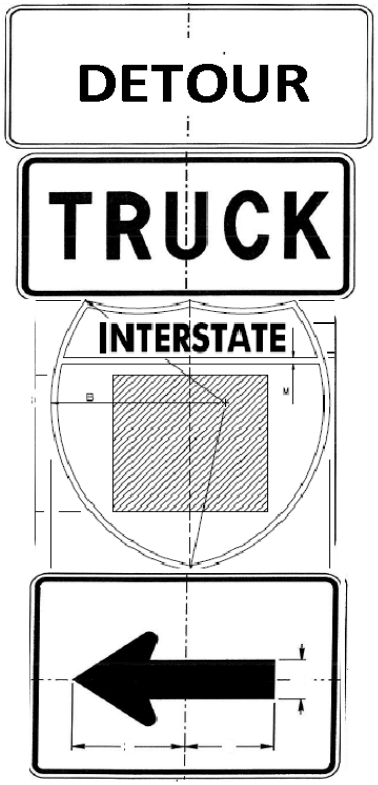


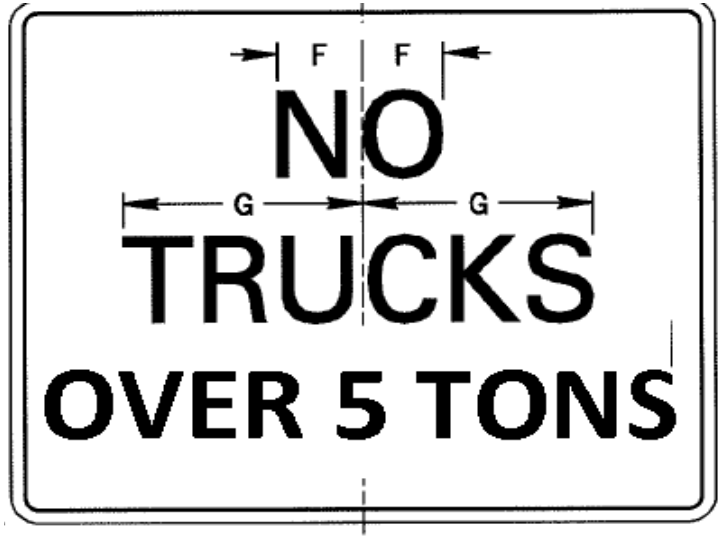


pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

Regulatory signing - Arterials / Ramps







pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

MAIN LINE CHECK POINTS

SIGN SUMMARY			
SERIES NUMBER	SIZE	DESCRIPTION	QTY
W6-3R	48X48	PAVEMENT WIDTH TRANSITION — RIGHT LANE ENDS	2
W20-1	48X48	ROAD WORK AHEAD	54
W20-5R	48X48	RIGHT LANE CLOSED 1 MILE	2
W20-5R	48X48	RIGHT LANE CLOSED 1/2 MILE	2
W21-5	48X48	SHOULDER WORK	2
W21-5bR	48X48	RIGHT SHOULDER CLOSED 1/2 MILE	2
W21-5bR	48X48	RIGHT SHOULDER CLOSED 1000 FT	2

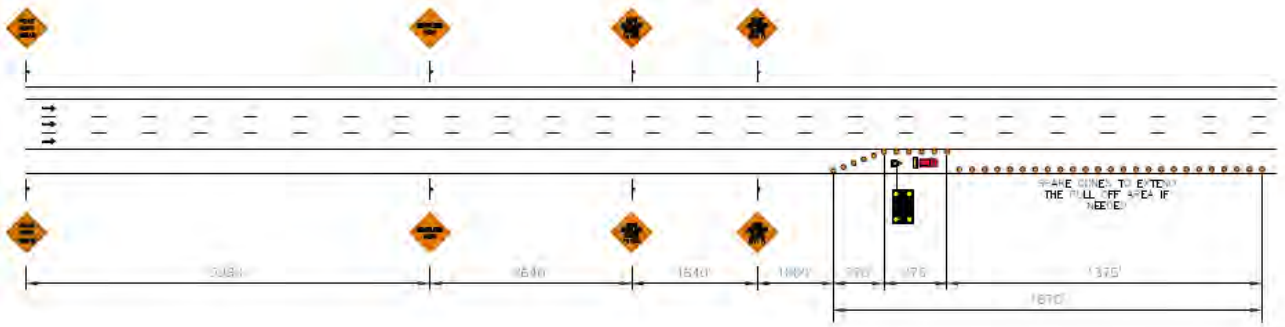
ADDITIONAL ROAD WORK AHEAD SIGN TO BE PLACED ON MARKET STREET ON-RAMP FOR SB PULL OVER AREA

ROUTE I-95
POLICE PULL OVER
TYPICAL FIGURE

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
			—	17 OF 20
CITY OF PHILADELPHIA				

REVISION #	REMARKS	DATE	BY

STAGE 1



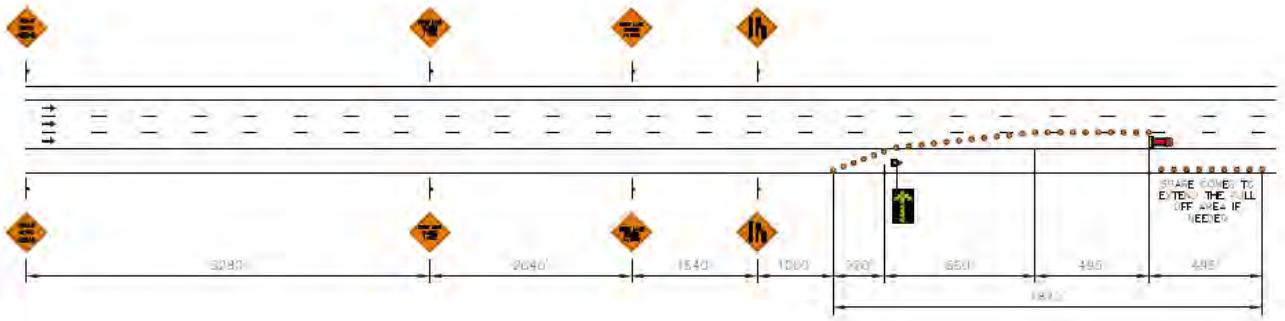
GENERAL NOTE:

1. INSTALL SIGNS FOR BOTH STAGE 1 AND STAGE 2 IN SAME LOCATION. DISPLAY APPROPRIATE SIGN BASED ON ACTIVE STAGE.

STAGE 1 NOTES:

1. FLASHING ARROW PANEL TO BE IN CAUTION MODE.
2. ROAD WORK AHEAD SIGNS TO BE FACING TOWARDS TRAFFIC.
3. LANE CLOSURE SIGNS TO BE FACING AWAY FROM TRAFFIC.
4. SHOULDER WORK SIGNS TO BE FACING TOWARDS TRAFFIC.
5. PLACE CHANNELIZING CONES ALONG THE EDGE OF THE SHOULDER LINE.
6. PLACE SPARE CONES ALONG THE EDGE OF THE ROADWAY.
7. SHADOW VEHICLE EQUIPPED WITH A TRUCK MOUNTED ATTENUATOR AND A FLASHING YELLOW LIGHT TO BE PARKED AT THE END OF THE TAPER.

STAGE 2



STAGE 2 NOTES:

1. FLASHING ARROW PANEL TO BE CHANGED TO MERGE MODE.
2. MAINTAIN ROAD WORK AHEAD SIGNS FACING TOWARDS TRAFFIC.
3. LANE CLOSURE SIGNS TO BE FACED TOWARDS TRAFFIC.
4. SHOULDER WORK SIGNS TO BE FACED AWAY FROM TRAFFIC.
5. CONES TO BE RELOCATED OFF THE SHOULDER LINE AND INTO THE OUTER TRAVEL LANE AS NECESSARY.
6. SHADOW VEHICLE EQUIPPED WITH A TRUCK MOUNTED ATTENUATOR AND A FLASHING YELLOW LIGHT TO RELOCATED AS PULL OFF AREA IS EXTENDED.

LEGEND

- SIGN
- TRAFFIC CONE
- VEHICULAR FLOW
- SHADOW VEHICLE
- FLASHING ARROW PANEL (CAUTION MODE)
- FLASHING ARROW PANEL (MERGE MODE)

DRAWING NOT TO SCALE