More Stuff, More Problems…..but also Opportunities: Perspectives on the Supply Chain Crisis

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Freight Movement Task Force

The E-commerce Growth Facts

“More than 10 years ago, e-commerce accounted for 5.1% of total U.S. retail purchases. On-line sales now account for 21% (2020), a striking jump from 16% in 2019.”

“Consumers spent $861B on-line in the U.S. in 2020, up an incredible 44% compared with 2019. That’s the highest annual U.S. e-commerce growth in two decades.”

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Source: www.digitalcommerce360.com

What are the Implications of Next-day Deliveries?

- Strain on supply chains and logistics
- Strain on the multi-modal transportation system (world-wide)
- Bottlenecks in the system

- Need for transportation projects, programs and policies to mitigate the impacts

Other Challenges (to Truck Deliveries)

- Increased demand & not enough trucks
- Semiconductor shortage (tiny silicon chips)
  - Car and truck production stalled/stopped (driver-assistance systems, smartphones, home appliances, etc.)
- Perennial driver shortage
  - Worse now (pandemic)
  - Transportation costs are going up (generally, more dollars chasing fewer goods)
- The battle for the curb….

Curb Management – the battle for the curb

- "Curbside management exists at the nexus of transportation, land use, and economic development" *Institute of Transportation Engineers, Curbside Management Practitioners Guide*

- Curb has tremendously-high value in urban environments….and lots of competition

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The Curb Dilemma(s) & Opportunities

- Competition is fierce along urban curbs, balancing
  - Transportation Network Companies
  - Parking (eliminated in large urban areas–space too valuable)
  - Loading/unloading – deliveries (“fast” and “slow”)
  - Waste collection/removal
  - Other modes – bus, non-motorized
  - Connected/automated vehicles
- How to facilitate curb use for multiple users (and enforce it)?
- The curb clearly has value - how do we value that?
- Curb management is (increasingly) critical

Who is using the curb?

Curb Management – solutions

- Relocate – curb spaces to better use the curb zone
- Conversion – of curb space to different uses to better use the curb zone
- Flexibility – convert curb spaces to flexible time-of-day zones to meet demand-based uses throughout the day

- *Curb Productivity Index* – to measure the amount of passenger activity (number of people using the curb) – per hour, per 20 feet of curb (about the size of one parking space)
  - Puts value on higher number of persons using the curb

Source: Kittelson & Associates

Private-sector Demands/Solutions

- Carriers (and shippers) must make their delivery windows!

- “Next-day delivery” or “same day delivery” means must get product closer to customers before you click “add to cart”
  - Warehouse and/or distribution centers closer to customers
- More trucks to “make their turns”
- Access to the curb

- The retail/grocer dilemma: How to get customers (back) to the store? Then the customer provides the transportation, they pick the products, etc.

Neuro R2 Robot and Pizza Delivery – Woodland Heights (Houston), CA, AZ

- Neuro – founded in 2018 by 2 former Google engineers
- “Select customers” pay online for order and get unique PIN
- First driverless vehicle with regulatory approval from US DOT

- Also - CVS pharmacy store deliveries

Source: https://reporterdoor.com

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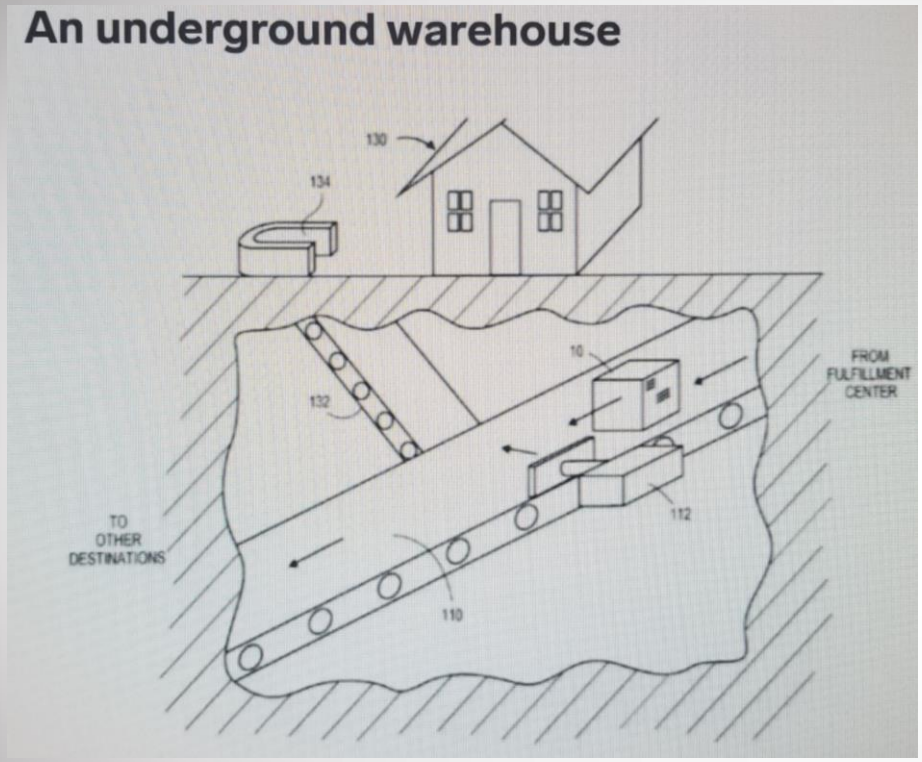
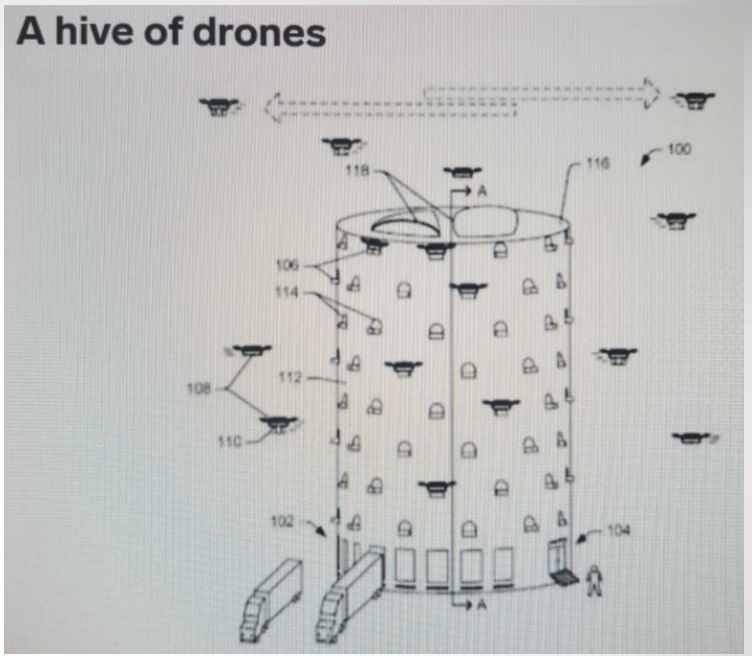
Amazon Patents – a glimpse into the future?





"Multi-level fulfillment center for unmanned aerial vehicles"

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Source: www.businessinsider.com

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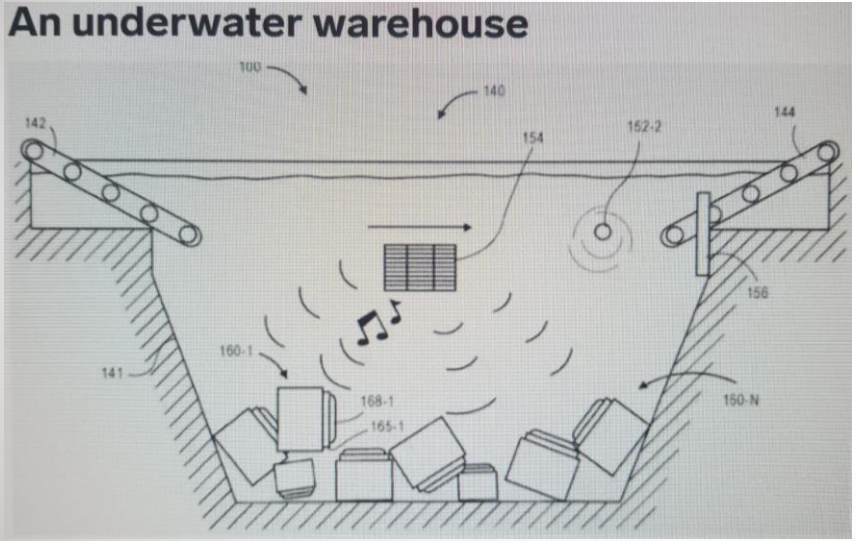

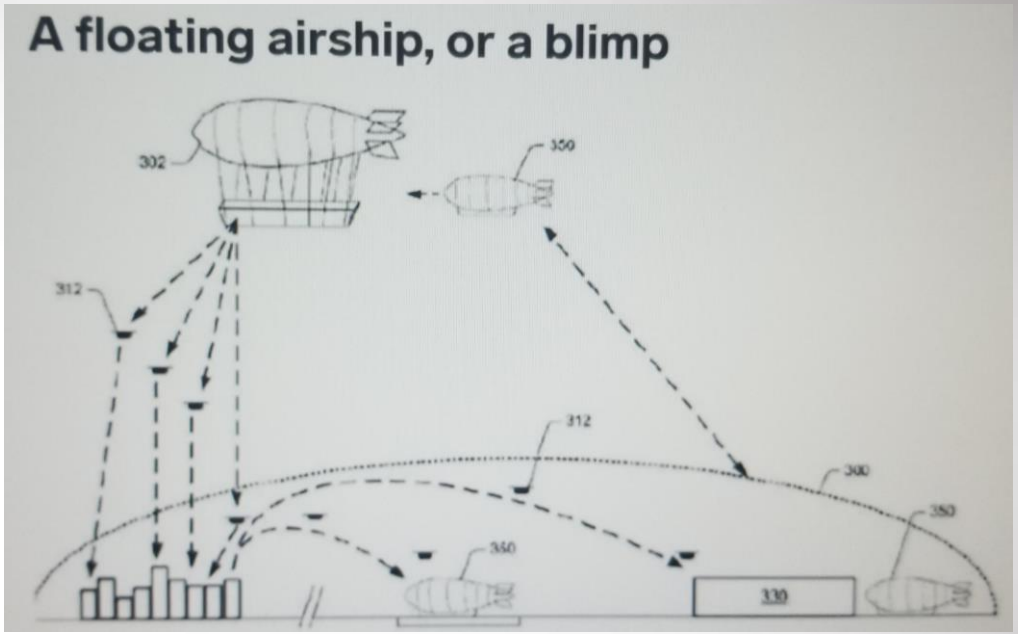

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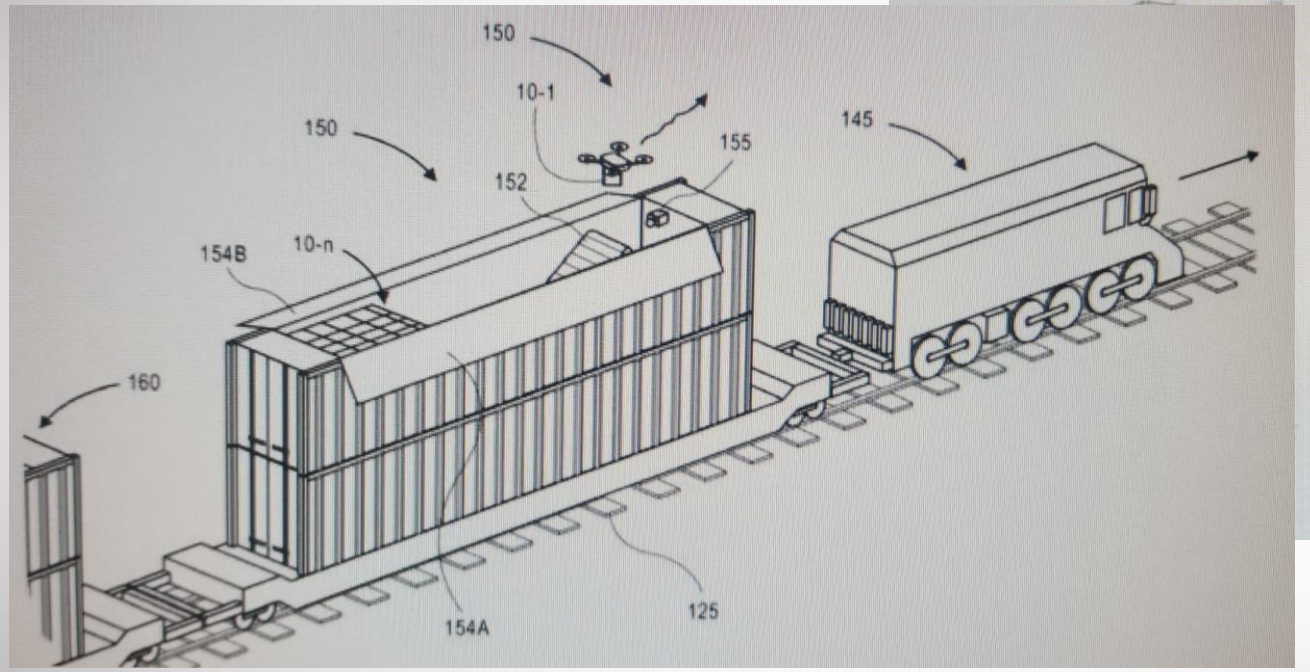
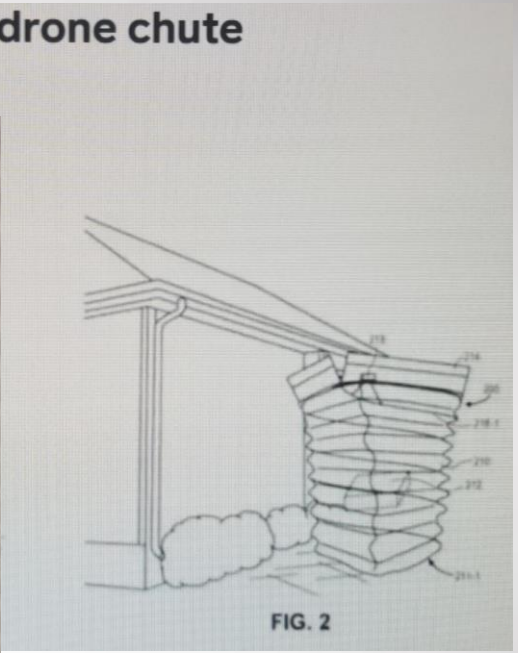
Source: www.businessinsider.com

Amazon Patents – a glimpse into the future?

An accordion-like drone chute





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Source: www.businessinsider.com

Technological Solutions are Coming Here

- Delivery robots
- Autonomous vehicles – beginning in the freight delivery, long-haul being tested (showing promise)
- “Space-age” deliveries

- What about technology xx?...

- …if it reliably and safely helps the private-sector hit delivery windows, it will likely be in the running.

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Taking a Step Back: Understanding System Performance to Improve Planning and Investment Decisions

With improved understanding, we can…

- …identify when, where, and how people and goods are moving
- …identify congested locations & bottlenecks in the system
- …inform policy, program, and project prioritization/selection
- …identify impacts of situations & solutions
- …inform performance management (system monitoring)
- …*and because it's the right thing to do!*
  - Accountability and transparency

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100 Most Congested Roads

Rank	Rank Truck	Roadway	From	To	County	Annual Hrs of Delay per Mile	Annual Hrs of Truck Delay per Mile	TTI	PTI	CSI	Annual Congestion Cost (M)	Annual Truck Congestion Cost (M)
1	2	I 610	IH 10 / US 90	US 59 / IH 69	Harris	1,112,917	68,89	2.45	3.89	3.25	$90.63	$20.99
2	1	I 35	US 290 N	SH71	Travis	1,085,136	108,645	2.71	4.73	3.54	$215.22	$72.33
3	3	U 59	IH 610	SH 288	Harris	870,291	51,604	2.12	3.36	2.17	$105.83	$23.64
4	44	W odall R dgers F y	US 75	N Beckley Ave	Dallas	748,546	14,976	2.03	3.06	2.31	$21.31	$1.81
5	5	IH 10 / US 9	N Eldridge Pkwy	Sam Houston Tollway W	Harris	659,959	48,855	1.95	3.33	2.30	$50.23	$13.43
6	9	I 45	Sam Houston Tollway N	IH 610	Harris	656,582	39,713	1.69	2.33	2.01	$135.37	$31.08
7	4	H 635	IH 35E / US 77	US 75	Dallas	584,661	49,538	1.86	2.58	2.34	$112.58	$33.59
8	14	IH 35E / US 77	SH 183	IH 30	Dallas	555,861	32,302	1.72	2.62	2.14	$67.3	$14.81

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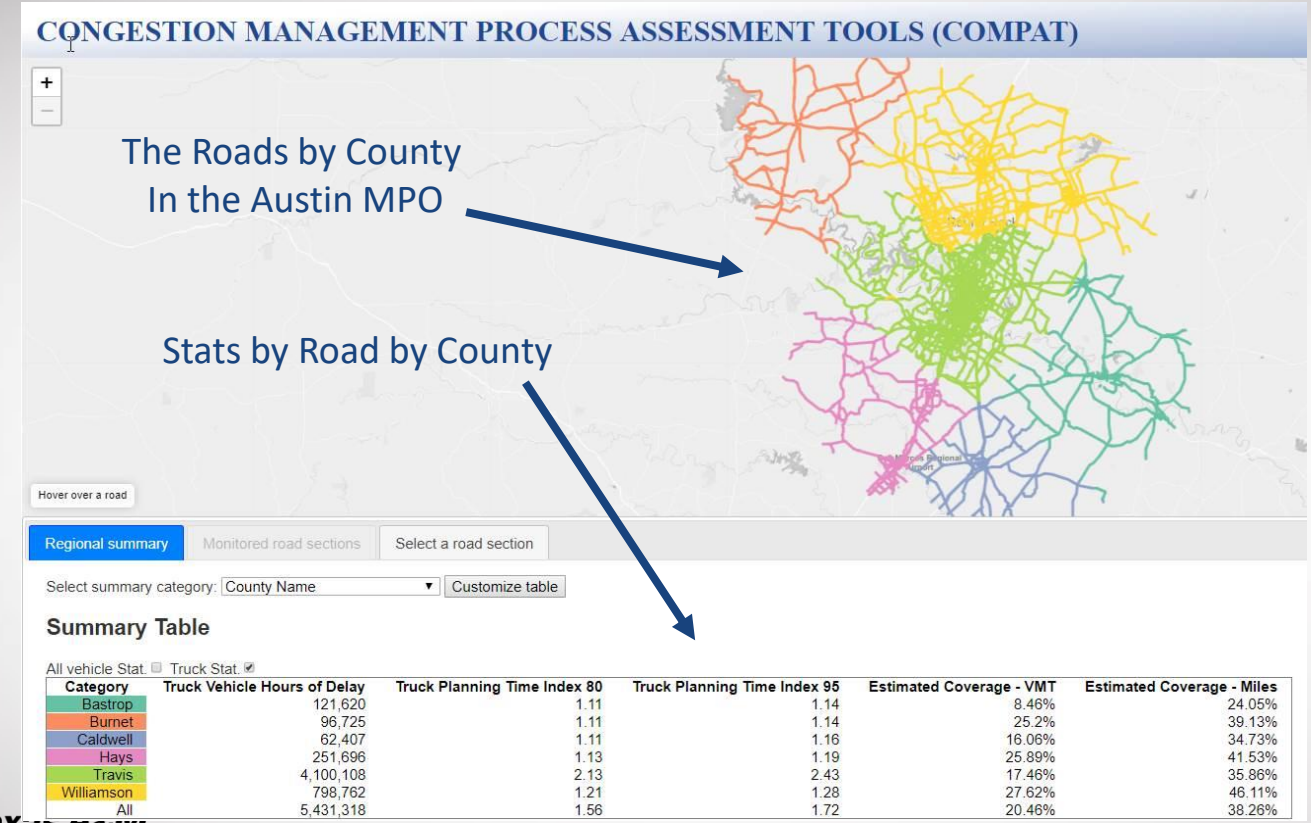
http://www.txdot.gov/inside-txdot/projects/100-congested-roadways.html

Truck Mobility for Metropolitan Planning Organizations (MPOs)



Category	Truck Vehicle Hours of Delay	Truck Planning Time Index 80	Truck Planning Time Index 95	Estimated Coverage - VMT	Estimated Coverage - Miles
Bastrop	121,620	1.11	1.14	8.46%	24.05%
Burnet	96,725	1.11	1.14	25.2%	39.13%
Caldwell	62,407	1.11	1.16	16.06%	34.73%
Hays	251,696	1.13	1.19	25.89%	41.53%
Travis	4,100,108	2.13	2.43	17.46%	35.86%
Williamson	798,762	1.21	1.28	27.62%	46.11%
All	5,431,318	1.56	1.72	20.46%	38.26%

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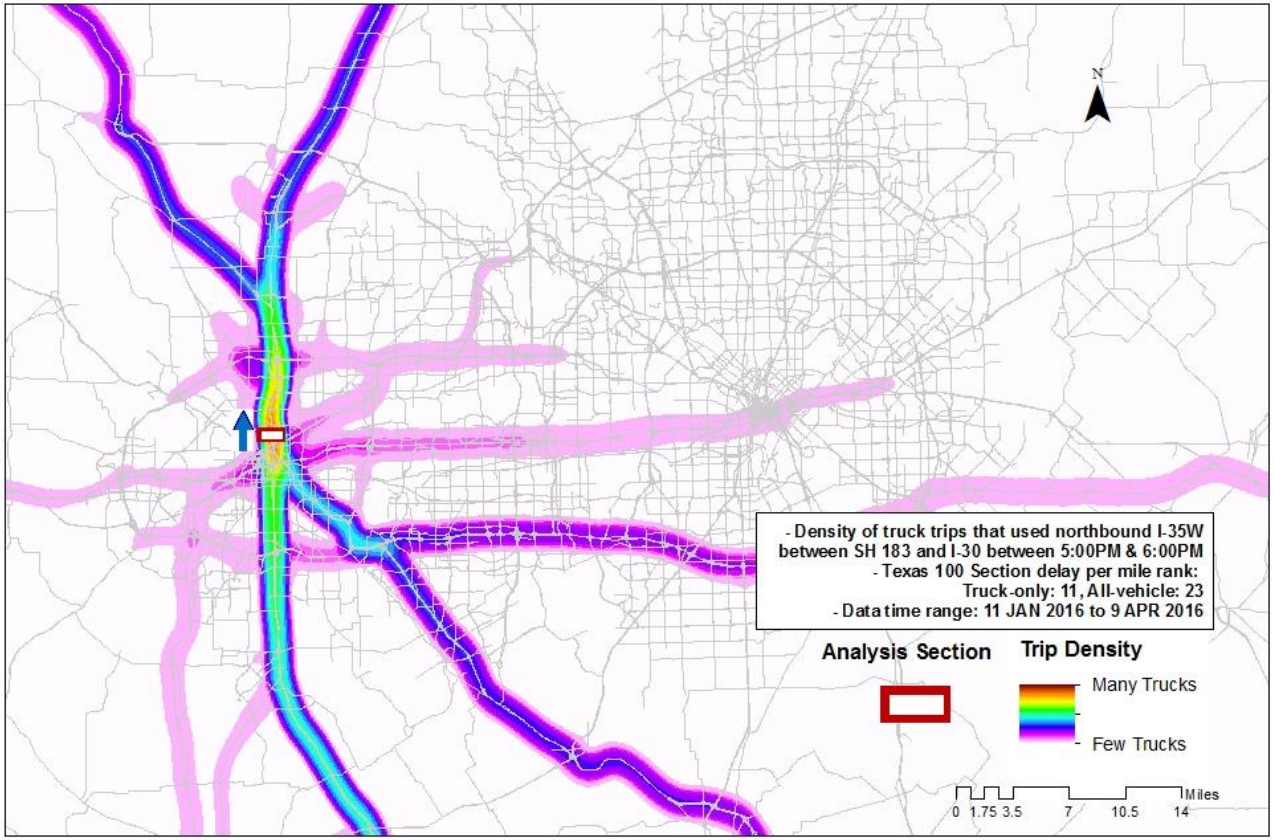
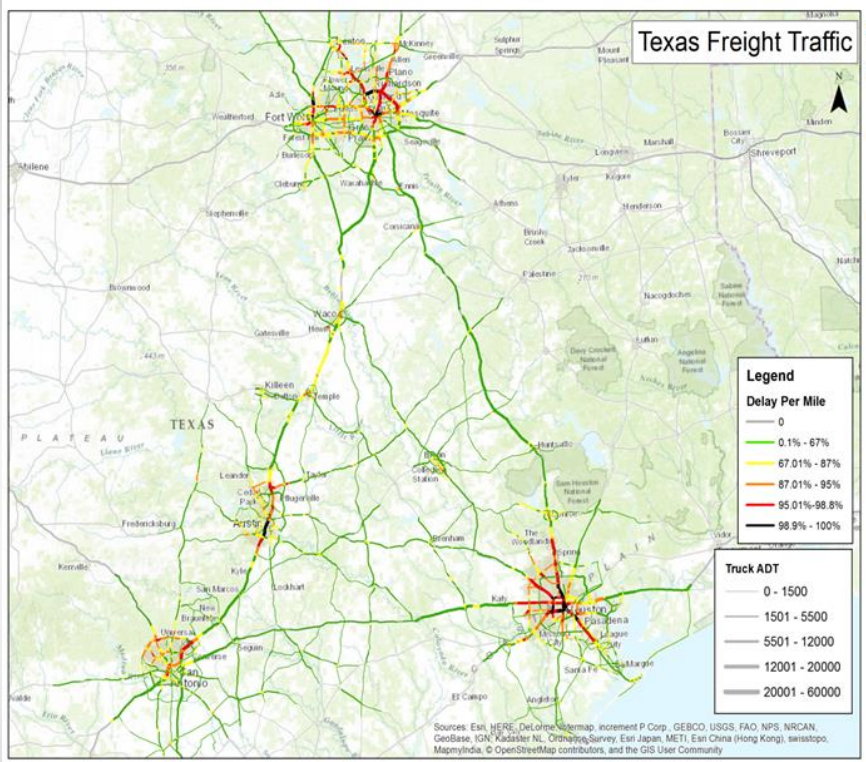
Select Link Analysis - Heat Maps

Truck Trip Patterns (for All Trucks Using I-35W Northbound in Downtown Fort Worth)



Truck Delay in Texas Triangle on Freight Network



Statewide Truck Congestion Map

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

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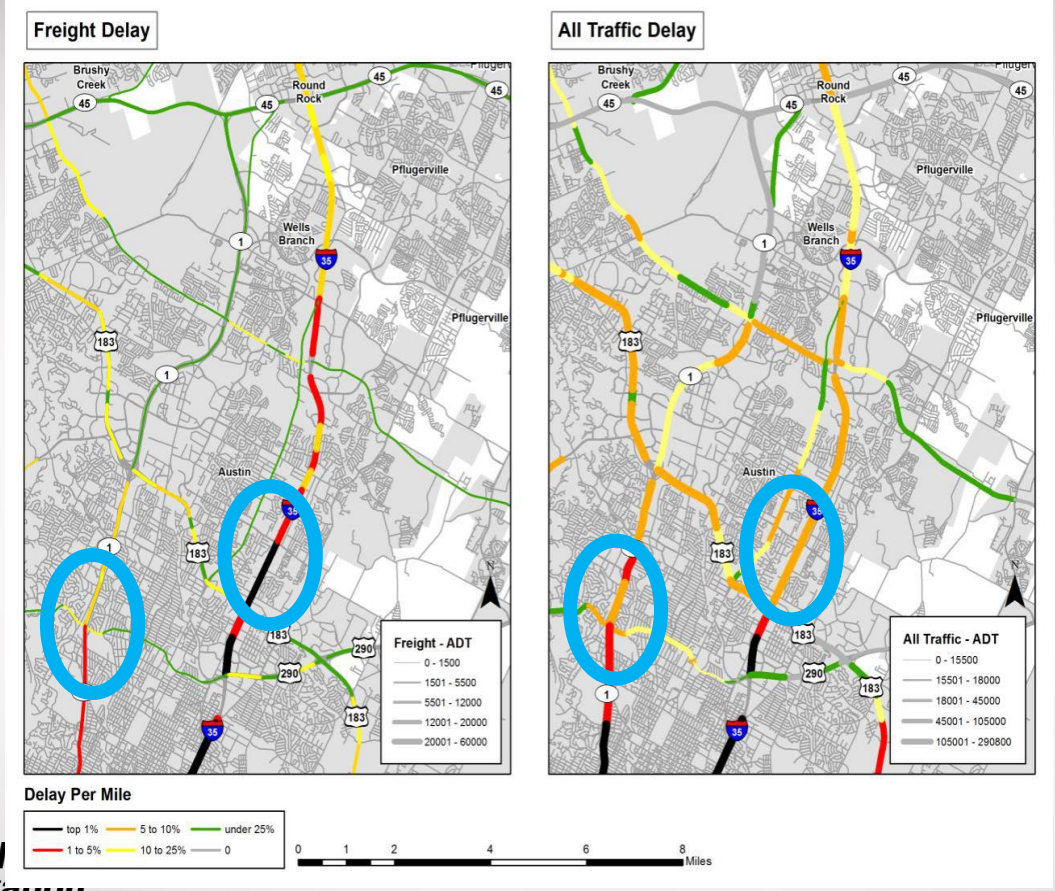
Truck Delay in Austin, Texas



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FHWA Freight Mobility Trends (FMT) Tool

https://ops.fhwa.dot.gov/freight/freight_analysis/mobility_trends/index.htm

U.S. Department of Transportation
Federal Highway Administration

FHWA Home | Feedback

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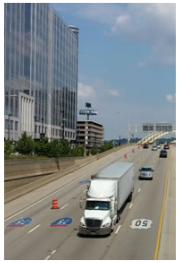
Freight Mobility Trends and Highway Bottlenecks

The Federal Highway Administration's (FHWA) Office of Operations has created a Freight Mobility Trends Analysis Tool to present national freight statistics and identify freight highway bottlenecks on the Interstate System, National Highway System (NHS), National Highway Freight Network (NHFN), and Strategic Highway Network (STRAHNET). This page provides information on Freight Mobility Trends.



Source: FHWA

Freight Mobility Trends Report

The Freight Mobility Trends Report provides high-level, national trends in freight mobility and assesses freight movement over a range of locations based on truck travel data:

- Measures of freight mobility at the National, State, regional, or corridor level.
- Freight mobility around major ports, intermodal facilities, and border crossings.
- Identification of freight highway bottlenecks.

The Freight Mobility Trends Report uses vehicle probe-based travel time data from FHWA's National Performance Management Research Data Set (NPMRDS). The report is produced annually and compares data from the most recent year to the previous year.

Freight Mobility Trends Tool

The FHWA Freight Mobility Trends Analysis Tool is an interactive dashboard that presents National freight statistics and identifies freight highway bottlenecks on the Interstate System, NHS, NHFN, and STRAHNET. This program uses a Freight Mobility Trends dashboard with indicators to assess freight movement based on truck travel data. The three dashboards are as follows:

- National, State, and Urban Area Freight Statistics: This view provides a national overview of freight performance measures, State and urban area/Metropolitan Planning Organization (MPO) performance, and a comparison tool to view State and urban area/MPO trends.
- National Freight Bottlenecks: This view provides a ranked list of specific freight bottlenecks nationally or by state in addition to more detailed information. The visualization also includes a separate view of the freight bottlenecks around airports, border areas, intermodal facilities, and ports.
- National Freight Commodity Corridors: This view provides an overview of national freight corridors.

General instructions are available at: Freight Mobility Trends instructions.

Source: FHWA

Freight Highway Bottlenecks

The Freight Mobility Trends Analysis Tool was used to identify major freight highway bottlenecks and congested corridors based on annual truck-hours of delay per mile. Delay per mile is calculated for each Interstate segment using the NPMRDS travel time data. The delay per mile measure compares performance over the entire Interstate System and across all States for corridors of different lengths.

The following Freight Highway Bottleneck Reports list the top 100 Interstate bottlenecks and congested corridors in the United States. FHWA conducts this analysis on an annual basis to update the list, track trends, and gain insight into successful transportation management techniques to address congestion at major bottlenecks.

2019 National List of Major Freight Highway Bottlenecks and Congested Corridors (HTML, PDF 656KB)

2018 National List of Major Freight Highway Bottlenecks and Congested Corridors (HTML, PDF 510KB)

This analysis uses delay per mile to assess bottlenecks over the entire Interstate System. Individual State Departments of Transportation (DOTs) and MPOs use a variety of bottleneck identification methods based upon their local traffic characteristics, infrastructure constraints, and impediments to efficient freight movement. These methods include congestion, delay,

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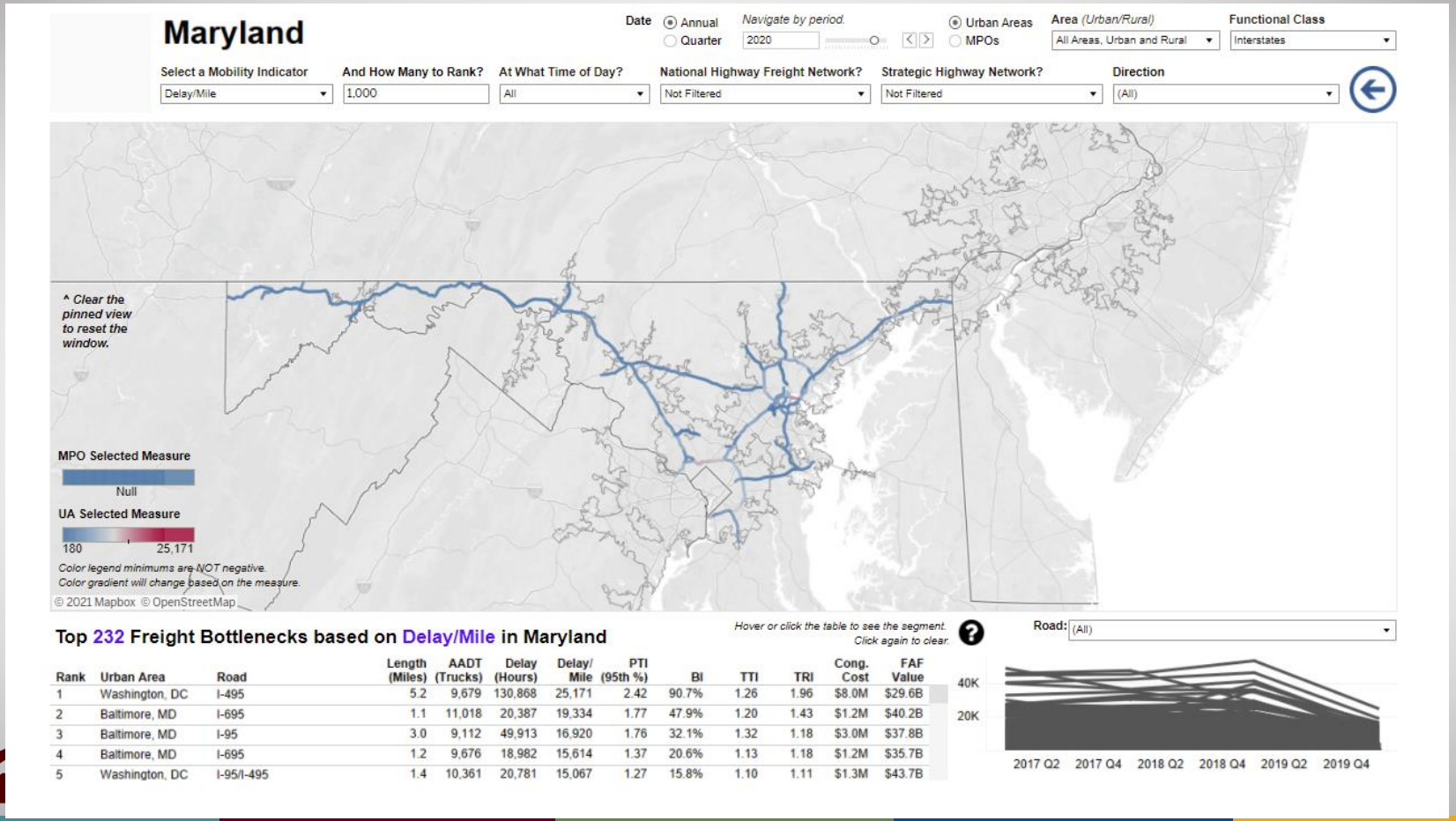
FHWA Freight Mobility Trends (FMT) Tool



Rank	Urban Area	Road	Length (Miles)	AADT (Trucks)	Delay (Hours)	Delay/ Mile	PTI (95th %)	BI	TTI	TRI	Cong. Cost	FAF Value
1	Washington, DC	I-495	5.2	9,679	130,868	25,171	2.42	90.7%	1.26	1.96	$8.0M	$29.6B
2	Baltimore, MD	I-695	1.1	11,018	20,387	19,334	1.77	47.9%	1.20	1.43	$1.2M	$40.2B
3	Baltimore, MD	I-95	3.0	9,112	49,913	16,920	1.76	32.1%	1.32	1.18	$3.0M	$37.8B
4	Baltimore, MD	I-695	1.2	9,676	18,982	15,614	1.37	20.6%	1.13	1.18	$1.2M	$35.7B
5	Washington, DC	I-95/I-495	1.4	10,361	20,781	15,067	1.27	15.8%	1.10	1.11	$1.3M	$43.7B

The Concept of “Freight Fluidity”

Freight Fluidity is the performance of the trips for goods moving in your state or region

- Awareness of **goods moving in the region**
- Understanding of **current economic conditions and supply chain opportunities**
- Use of awareness and economic/supply chain intel to identify **key trip routes for freight**
- Assessment of **freight mobility and bottlenecks along these trip routes**

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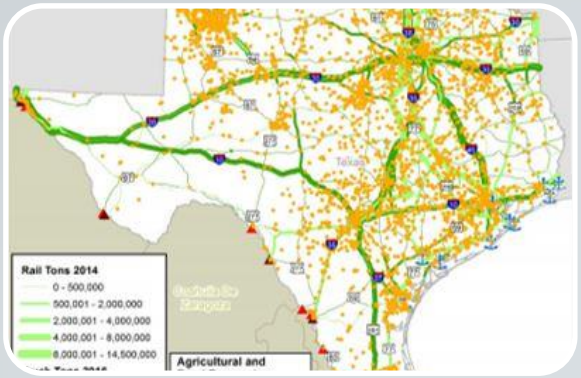
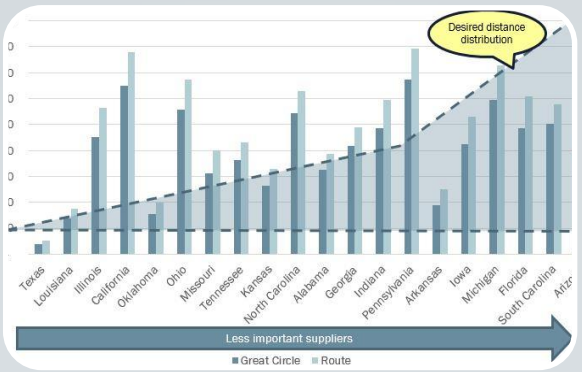
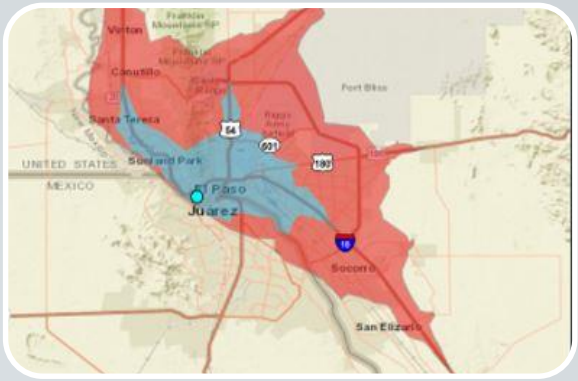
Examples and Resources (Guidebook)







What are the key goods and how are they transported?

-Texas Freight Mobility Plan

-Regional Freight Transportation Plans

-Freight Analysis Framework

Where Is the Economic Opportunity?

-Census Bureau Commodity Flow Survey

-Bureau of Economic Analysis (industries, production, consumption)

How Well Are Freight Corridors Moving Freight?

-"TX100", TCAT, UMR

- In-Depth, Location-Specific Information using NPMRDS

- Multimodal: Port and Border Crossing Analysis

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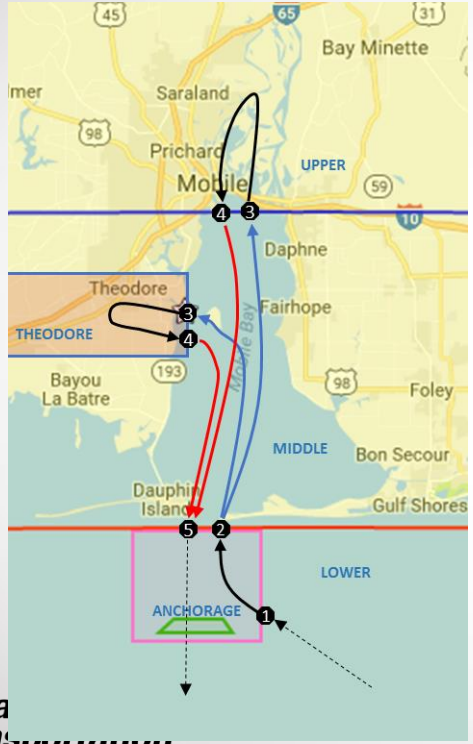
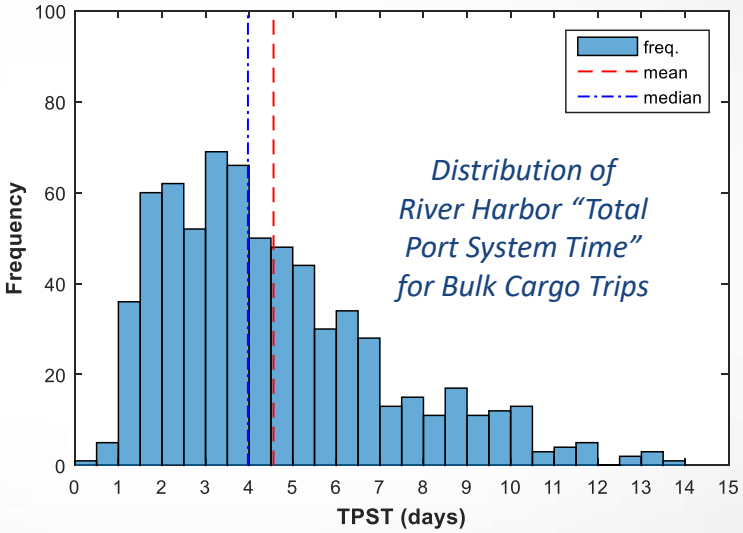
https://mobility.tamu.edu/project/texas-freight-fluidity/

Developing and Implementing a Freight Fluidity Management Framework for U.S. Ports (U.S. Army Corps of Engineers)





Port of Mobile, Alabama

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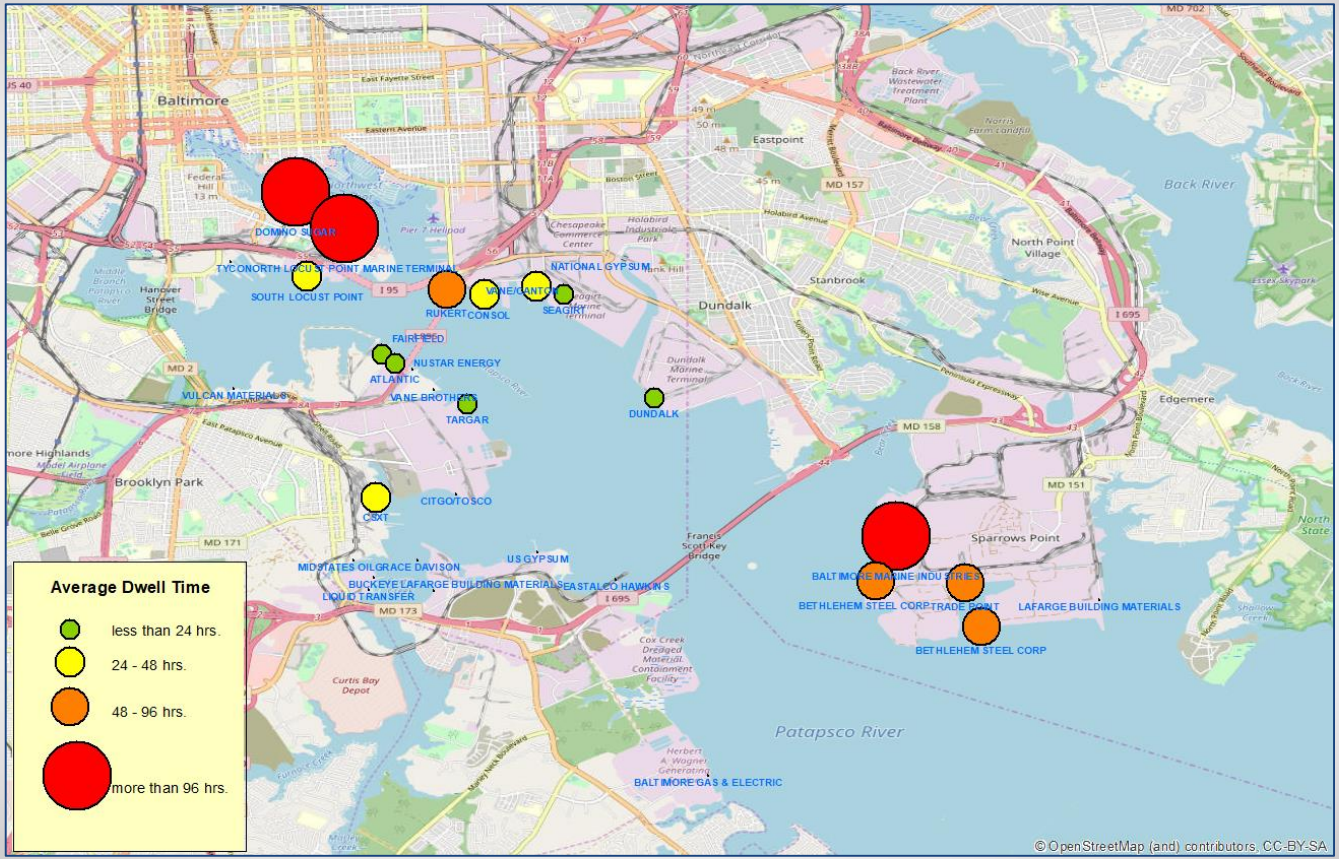
Dwell Time at Terminal Areas *(Port of Baltimore)*



Some Final Thoughts

- There's a tremendously large (and global) supply chain behind the person delivering your package
  - …and a lot of things must go right for it to get to you!
- Clicking "Add to Cart," "Next Day Delivery," "Same Day Delivery" has implications
- Several stakeholders involved (and responsible) as we (all) tackle these transport problems
  - Public agencies (federal, state and local)
  - Private companies (businesses, shippers, carriers, technology, etc.)
  - Non-profits
  - Customers (and general public)
  - ….and anyone else who eats or buys anything
- There are demonstrated methods and measures to define the freight transportation problems – with an eye toward solutions

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Contact Info & Selected Resources

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(find me on LinkedIn)

Texas A&M Transportation Institute Mobility Division

http://mobility.tamu.edu

- Transportation Research Board, Urban Freight Transportation Committee
  - http://urbanfreight.tti.tamu.edu
  - *"Urban Freight Transportation Committee Centennial Paper: Embracing the Future with Insights from the Past"*
- *Curbside Management Practices Guide,* Institute of Transportation Engineers, https://www.ite.org
- TTI 2021 *Urban Mobility Report*, https://mobility.tamu.edu/umr/

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