Conceptual Framework and Trucking Application to Estimate Impact of Congestion on Freight

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Background

- The Urban Mobility Report
- Mobility Performance in 90 US urban areas
- HPMS is primary data source
- Delay
- Wasted Fuel
- Congestion Cost

- Increased volume of questions about freight mobility

Sponsors

Mobility Measures in Urban Transportation
FHWA pooled fund study:

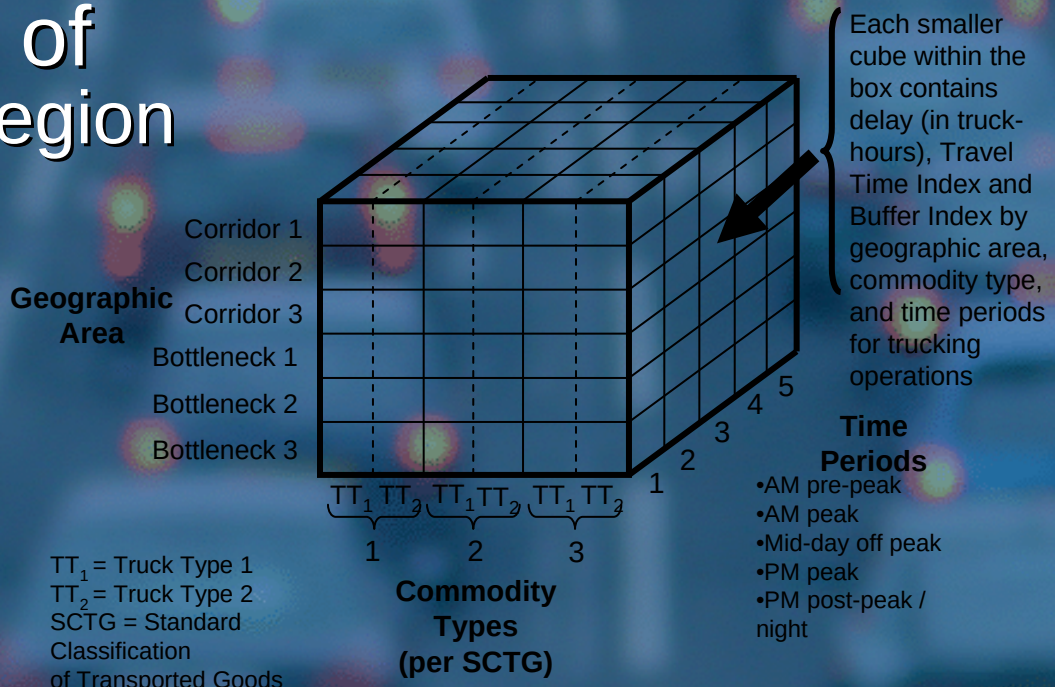
- 12 state DOTs
  - CA, CO, FL, KY, MD, MN, NY, OH, OR, TX, VA, WA
- 2 MPOs
  - Houston-Galveston Area Council, Maricopa Assoc of Governments
- FHWA

Overview

- Discuss the data
- Discuss the methodology
- Show Austin application
- Show a few Austin results
- Goal: Identify the estimated impact of congestion on freight by investigating existing and available data.
- **Critical point: I'm not good with GIS and I'm an Aggie so don't laugh at my ~~artwork~~ ~~graphics~~ coloring.**

Freight "Mobility Box" Concept

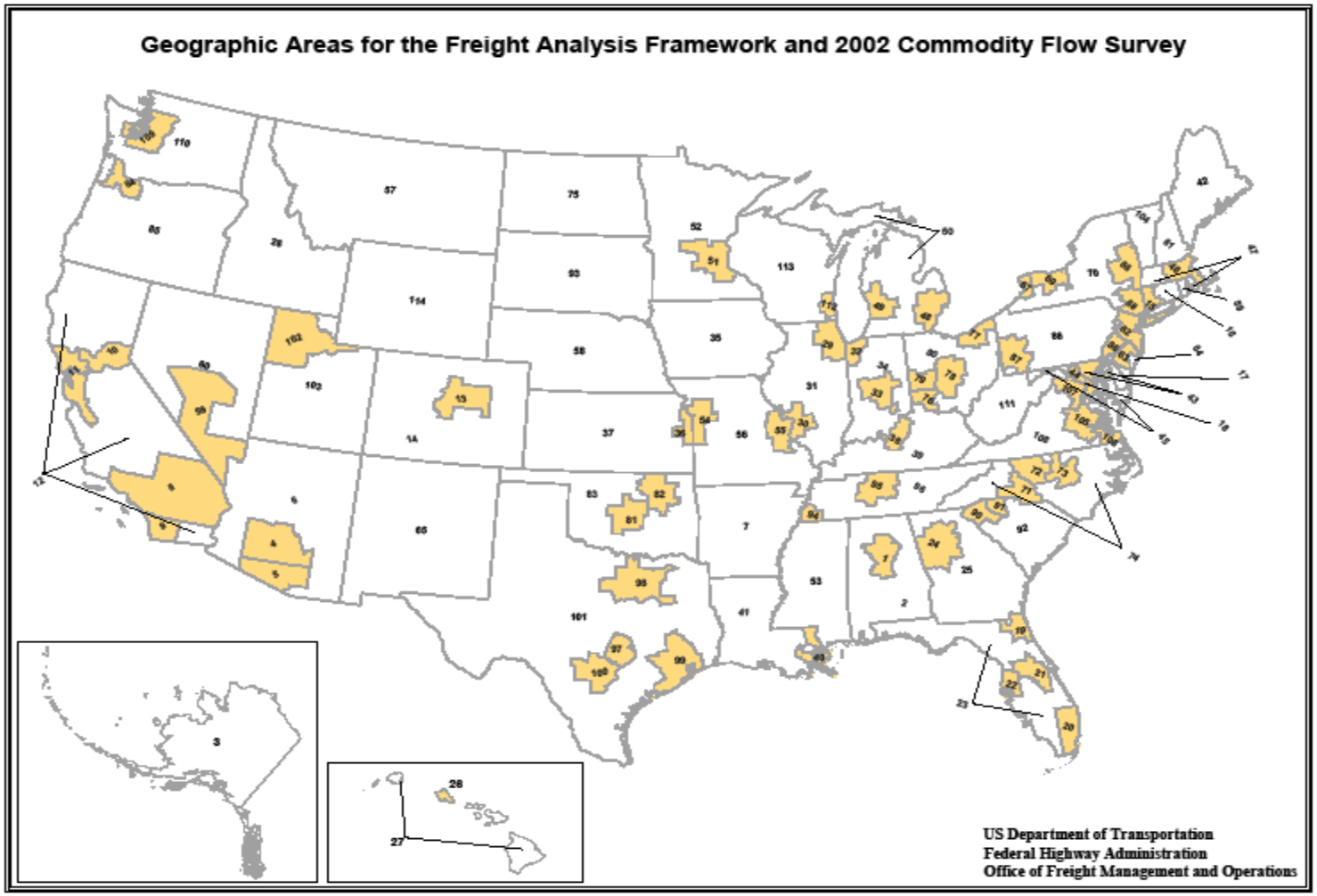
- Combinations of
  - Geographic region
  - Time
  - Commodities



FHWA - Freight Analysis Framework

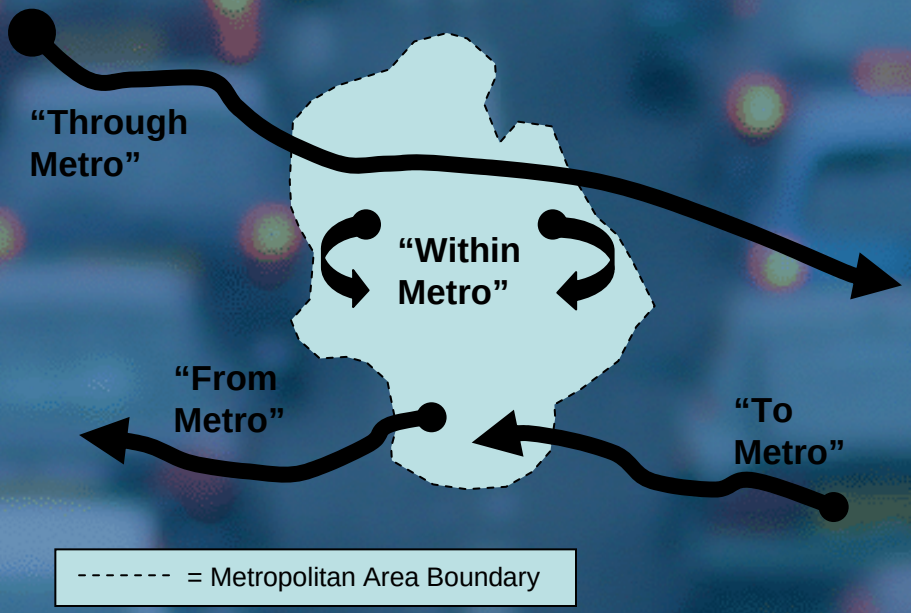
- Contains 114 geographic regions
- Based on 2002 Commodity Flow Survey, currently being updated
- Includes 43 commodity codes defined in SCTG
- Freight movement between and within FAF regions
- Contains future year projections
- Contains ton-movement and $-movement

FAF Geographic Regions



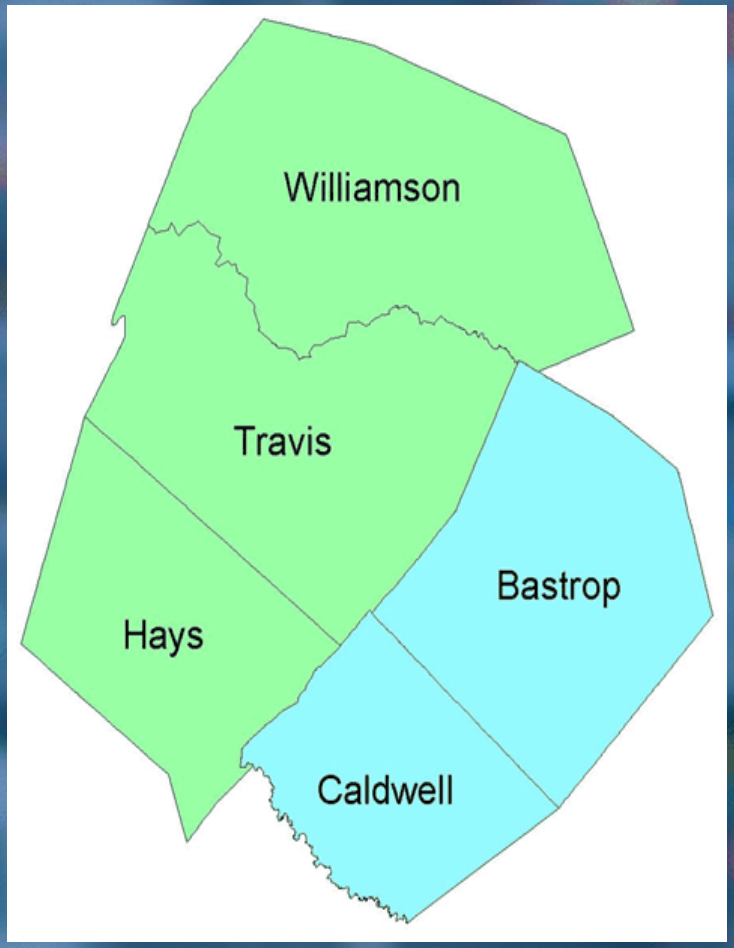
FAF Region Truck Movements

- 4 types of truck trips
  - Through
  - Origins
  - Destinations
  - Within (50 miles)



Application of Methodology-Austin

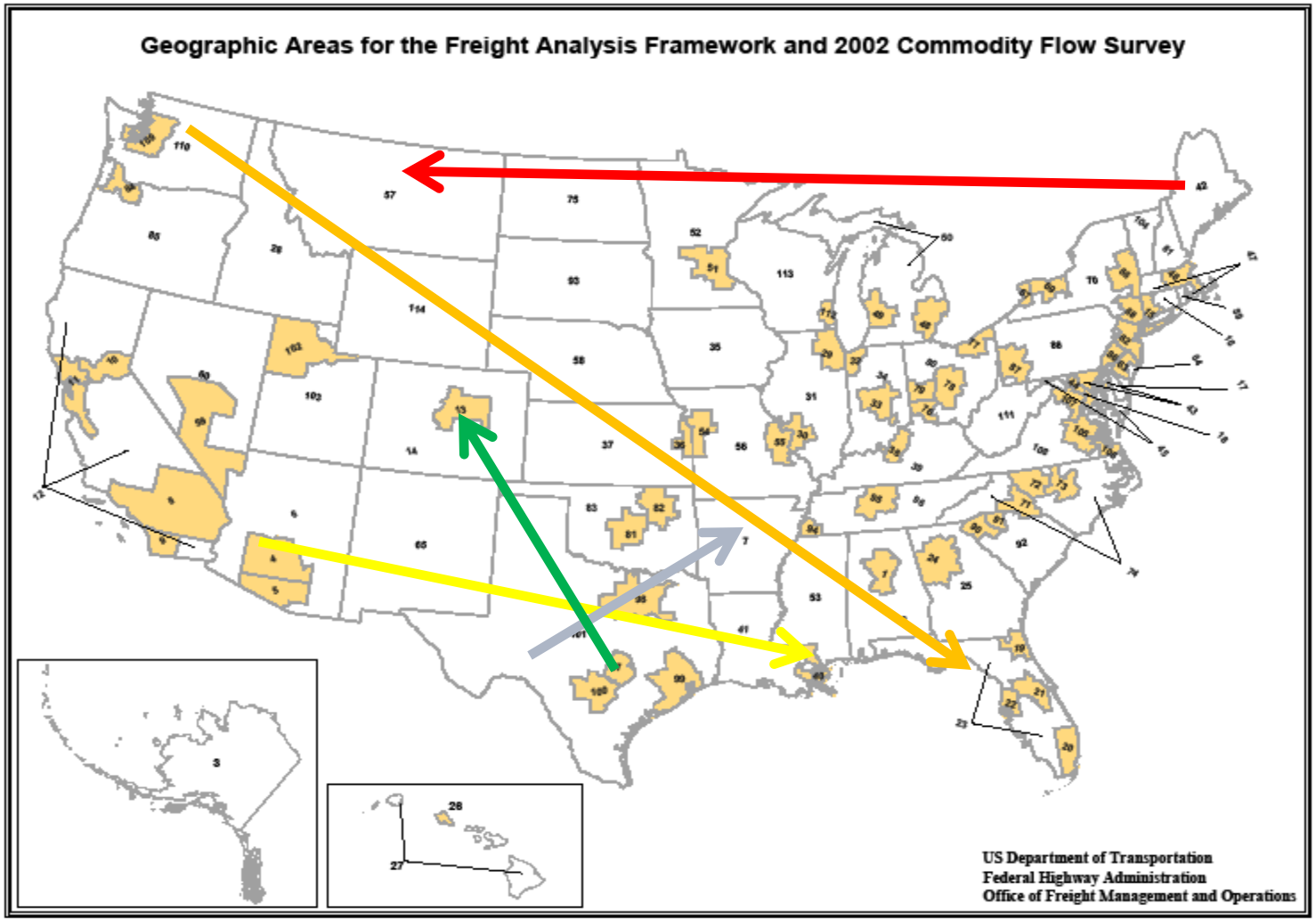
- 3 urban counties
- 2 rapidly developing counties



So What Needed to be Done?

- Eliminate FAF trips that wouldn't possibly go through Austin
- Assign some of the trips that MIGHT go through Austin
- Convert tons of commodities into trips

“Proximity” Matrix



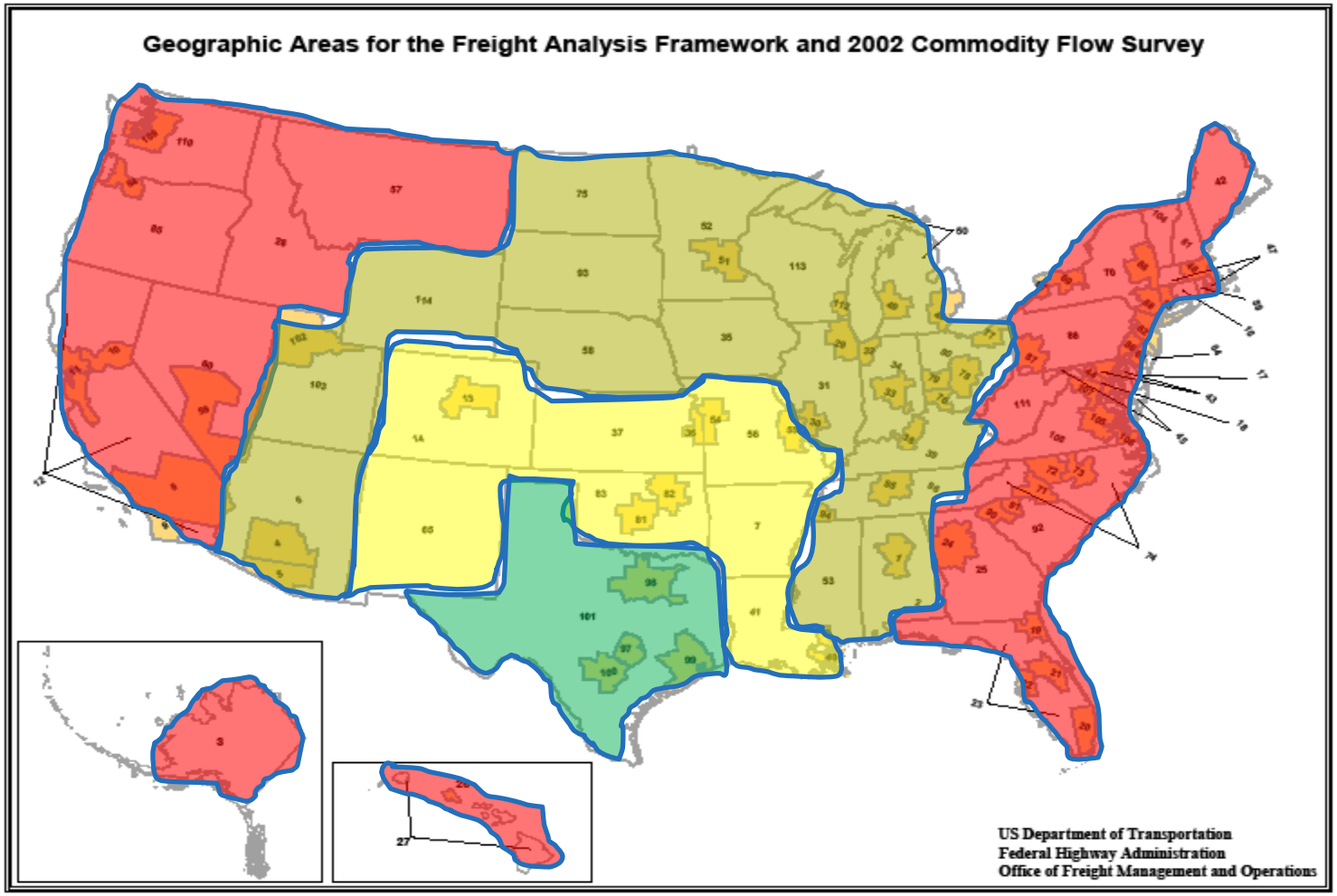
“Proximity” Matrix

Destination

Origin

	Austin TX	Dallas-Ft. Worth TX	Houston TX	San Antonio TX	Texas ROS
Birmingham AL	1	0.50	0.50	0.50	0.50
Alabama ROS	1	0.50	0.50	0.50	0.50
Alaska ROS	1	0.25	0.25	0.25	0.25
Phoenix AZ	1	0.50	0.50	0.50	0.50
Tucson AZ	1	0.50	0.50	0.50	0.50
Arizona ROS	1	0.50	0.50	0.50	0.50
Arkansas ROS	1	0.75	0.75	0.75	0.75

“Likelihood” Matrix



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Phoenix AZ	1	0.50	0.50	0.50	0.50
Tucson AZ	1	0.50	0.50	0.50	0.50
Arizona ROS	1	0.50	0.50	0.50	0.50
Arkansas ROS	1	0.75	0.75	0.75	0.75

Calculated Daily Truck Volumes

• Through Trips:	16,300
• Origins:	3,500
• Destinations:	2,100
• Local:	5,900
• Total estimate:	27,800

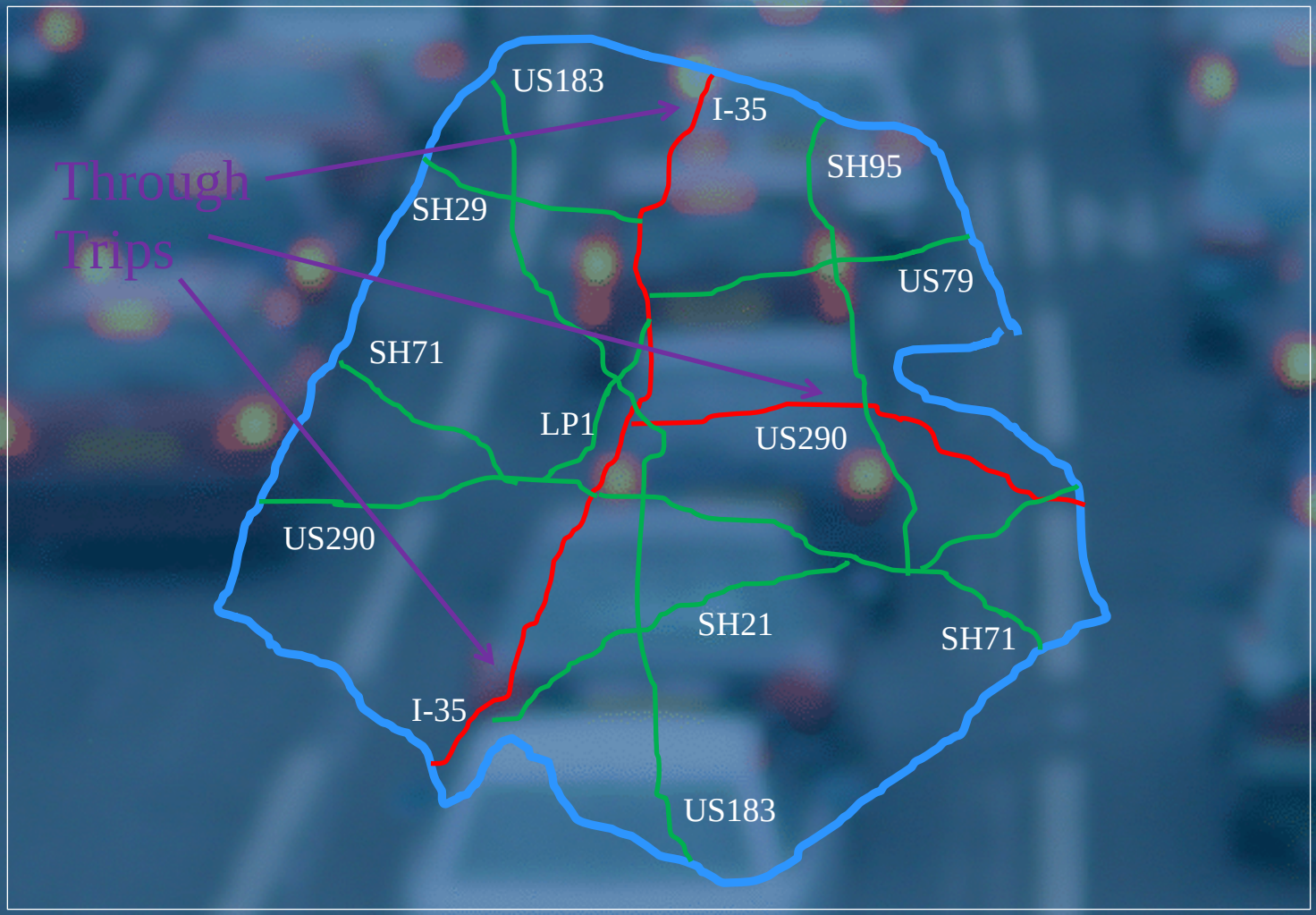
* used average truck weight by commodity to convert tons to trucks

Example of Through Trips–Leading Commodities

- Nonmetal mineral products: 1,493
- Gravel: 1,330
- Waste / scrap: 1,162
- Coal-n.e.c: 1,125
- Gasoline: 880
- Cereal grains: 797
- Natural sands: 742
- Chemical products: 699

Austin Metro Truck Counts

Assigning Trips To Road Network



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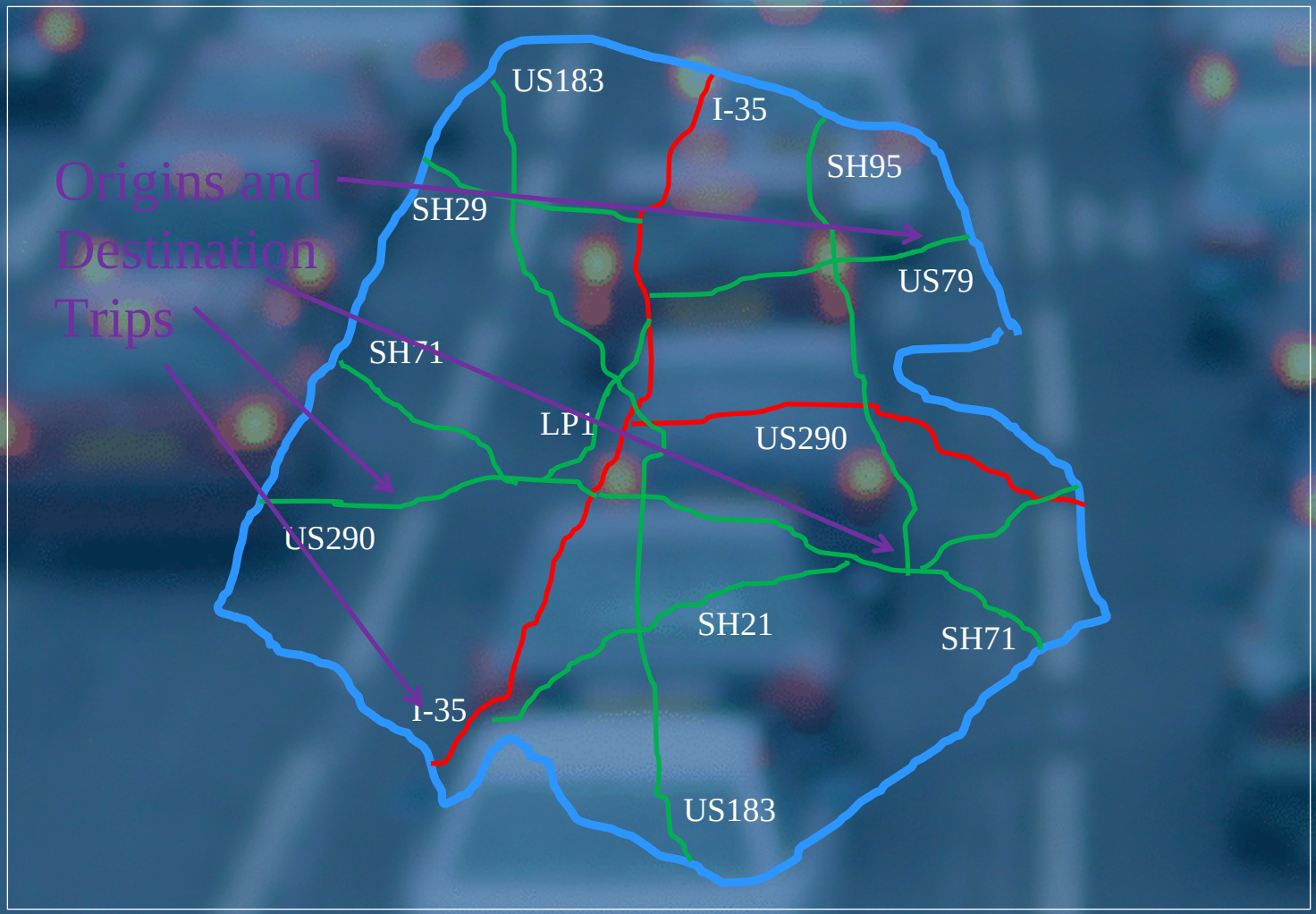

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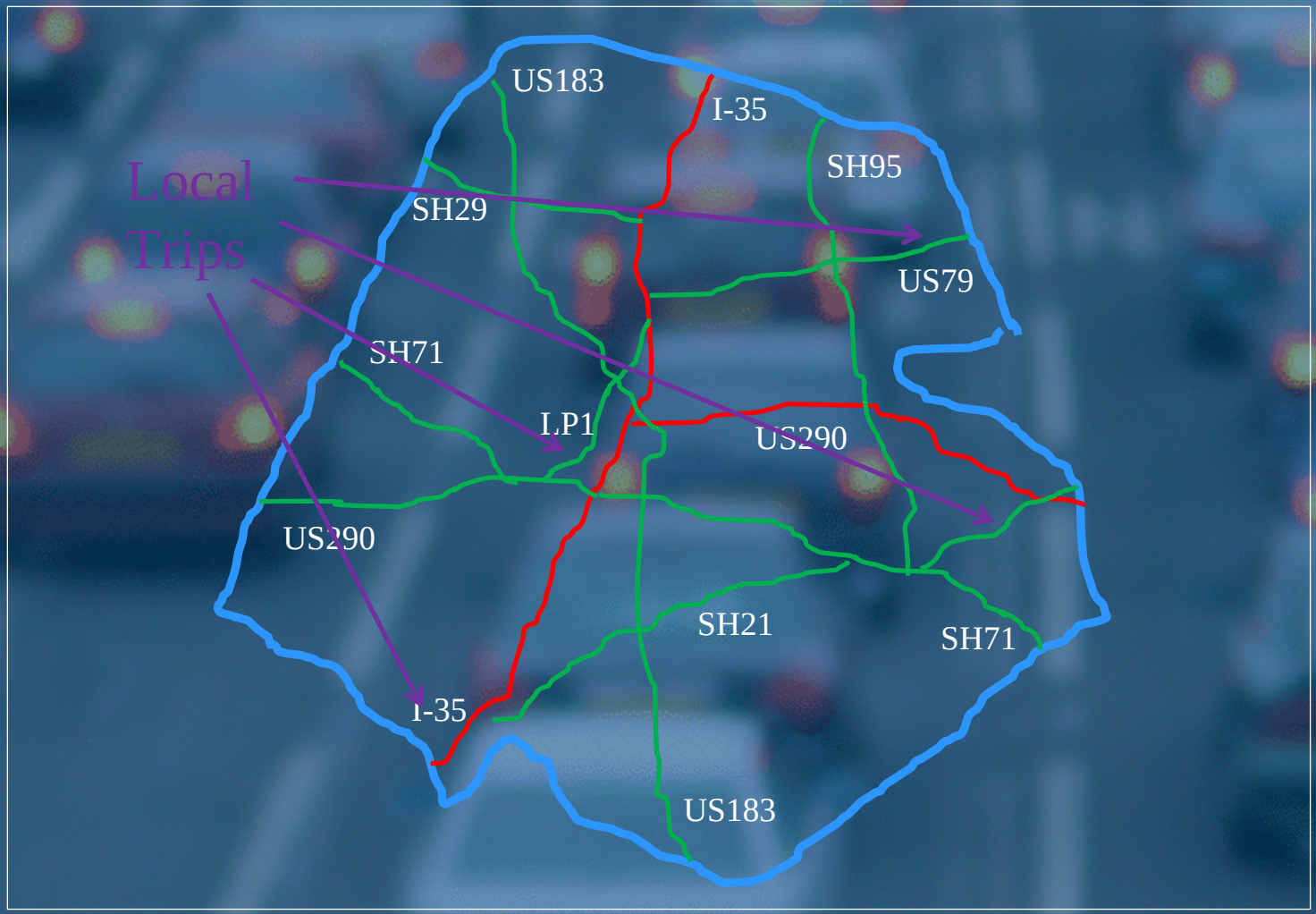

Truck Assignments

- Assign almost all of 27,800 truck trips calculated from FAF to Austin freeway system (some are assigned to arterial streets)
- Know value of goods in trucks so we know the value of the freight movement
- Know peak period truck percentages so we can calculate the number of trucks in congestion on each roadway section – traditional Urban Mobility Report calculation

Travel Delay

- Using the Urban Mobility Report methodology, calculate congestion statistics on each roadway segment.
- Use existing speed-to-density curves to estimate average peak period speed and calculate delay time.
- Also calculate wasted fuel from average speed
- All delay stats will have passenger and commercial vehicle components

Daily Cargo Values from FAF

• Through trips:	16,300	$182.7M
• Origins:	3,500	$45.5M
• Destinations:	2,100	$33.1M
• Local:	5,900	$48.8M
• Total estimate:	27,800	$310.1M

Annual Effects of Delay on Austin Truck Travel

	Congestion Cost ($mil)		Commodity
	Passenger	Truck	Value ($mil)
I-35	296.6	88.2	82,270
US-290E	24.4	7.8	11,362
US-290W	41.4	6.5	16,144
US-79	37.5	18.6	17,582
US-183	30.8	2.9	9,909
Loop1	33.1	2.2	9,914

Conclusions and Next Steps

- Have calculated truck delay on specific roadways in a region
- Have calculated the value of freight carried on specific roadways in a region

- Now we must create a methodology to calculate freight values that can be applied to all 400+ urban areas in the US for inclusion in the Urban Mobility Report
- This current method is a bit too time consuming to repeat 400+ times without some automation.

Mobility Studies Website (http://mobility.tamu.edu)

- **Urban Mobility Report**
  - Annual congestion estimates
  - 90 urban areas intensively studied
- **Mobility Monitoring Program - FHWA**
  - Teamed with Cambridge Systematics
  - Analysis of archived freeway data
  - 30+ cities
- **Urban Transportation Measures**
  - Pooled Fund Study – 15 sponsors
  - Performance measures
  - Corridor & Multimodal analysis