

Utilizing GPS Truck Data in Transportation Planning and Engineering

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Department of
Civil Engineering



**The Intermodal Freight Transportation
Institute (IFTI)**
Herff College of Engineering

Introduction

- Multi-Institutional Research Project
 - University of Memphis (M. Golias, J. Karafa, Z. Johnson)
 - American Transportation Research Institute (J. Short)
 - Vanderbilt University (J. Dobbins)



Goals of Analysis

- Test capabilities of data
 - Facility MOEs and turn time model
 - Determine truck stops and rest area demand
 - Validate bridge restrictions
 - Truck flow analysis
 - MOEs for LTRP and Operational Analysis

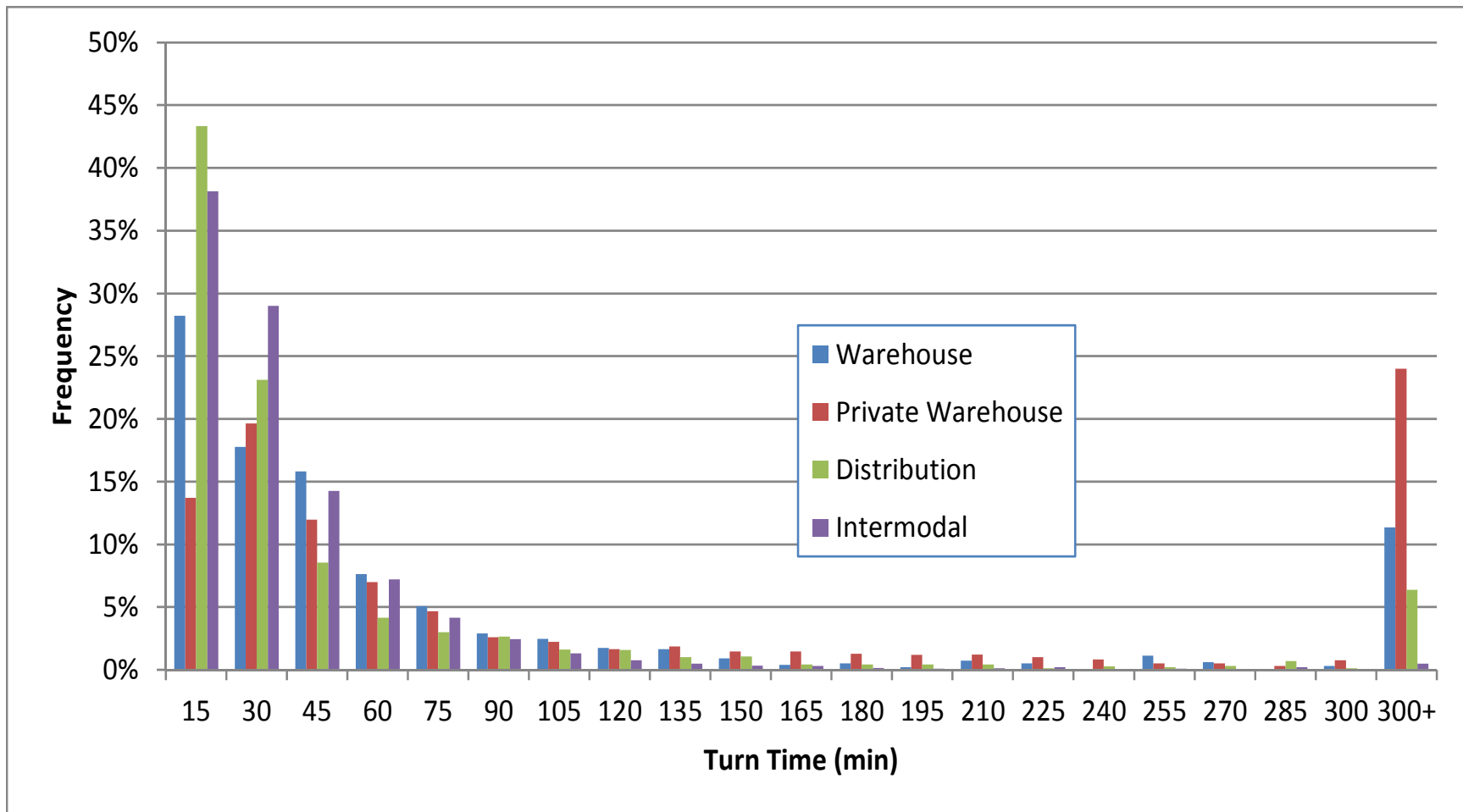


Facility Turn Time Model Development

- Analyzed four types of truck facilities in the Memphis area
 - Intermodal
 - Distribution
 - Public Warehouses
 - Private Warehouse



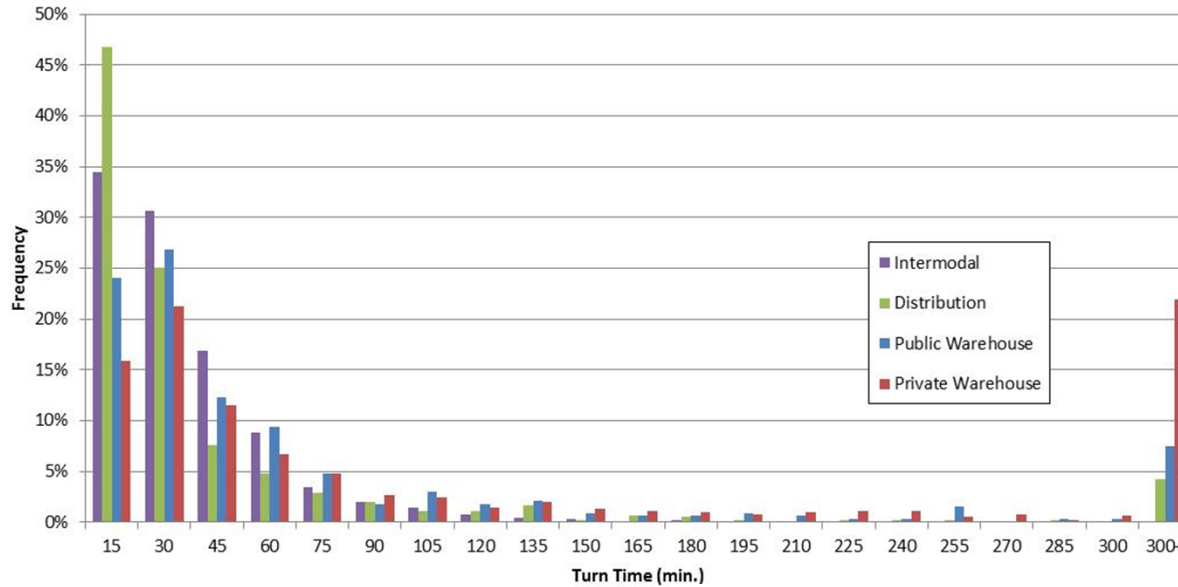
Turn Times Weekly Average



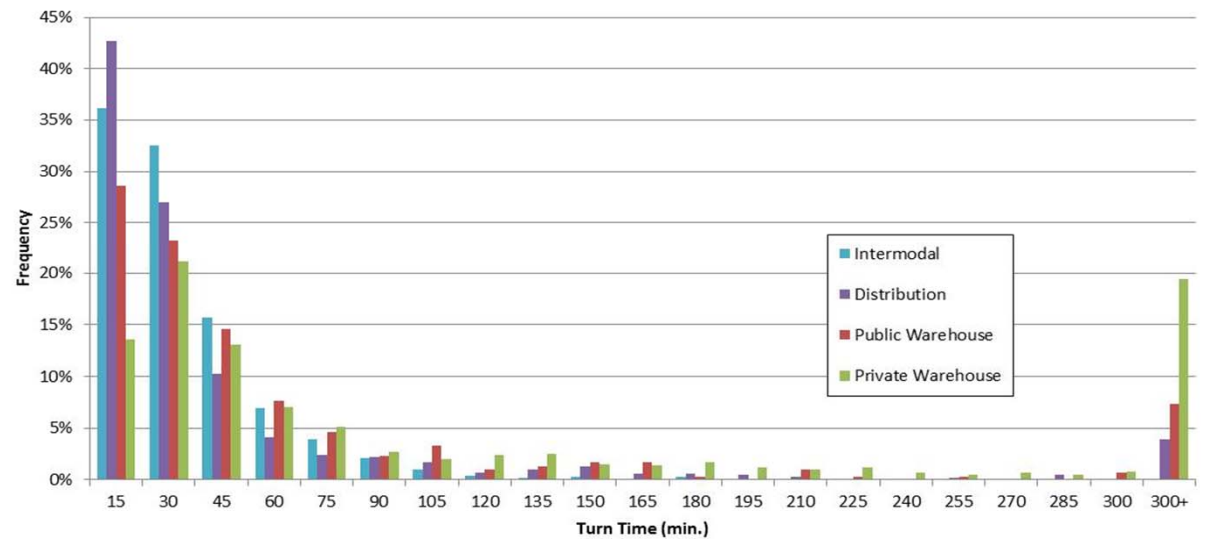
Turn Times

Daily Average

Monday Turn Time Percentage



Wednesday Turn Time Percentage



Turn Times Model

Intermodal Facilities (R²=0.24)

$$Y = 20 + 275x_1 + (-390)x_2$$

Distribution Facilities (R²=0.18)

$$Y = 11 + 993x_1 + (-576)x_2$$

Private Warehouse Facilities (R²=0.01)

$$Y = 137 + 1x_1 + (-259)x_2$$

Public Warehouse Facilities (R²=0.06)

$$Y = 52 + (-155)x_1 + 1266x_2$$

Y = turn time

x₁ = % daily volume per 15 min. interval

x₂ = % daily entrance volume per 15 min. interval

Data not adequate to develop turn times model

Cross – validation with a 10 hold out sample was used to calculate accuracy of models

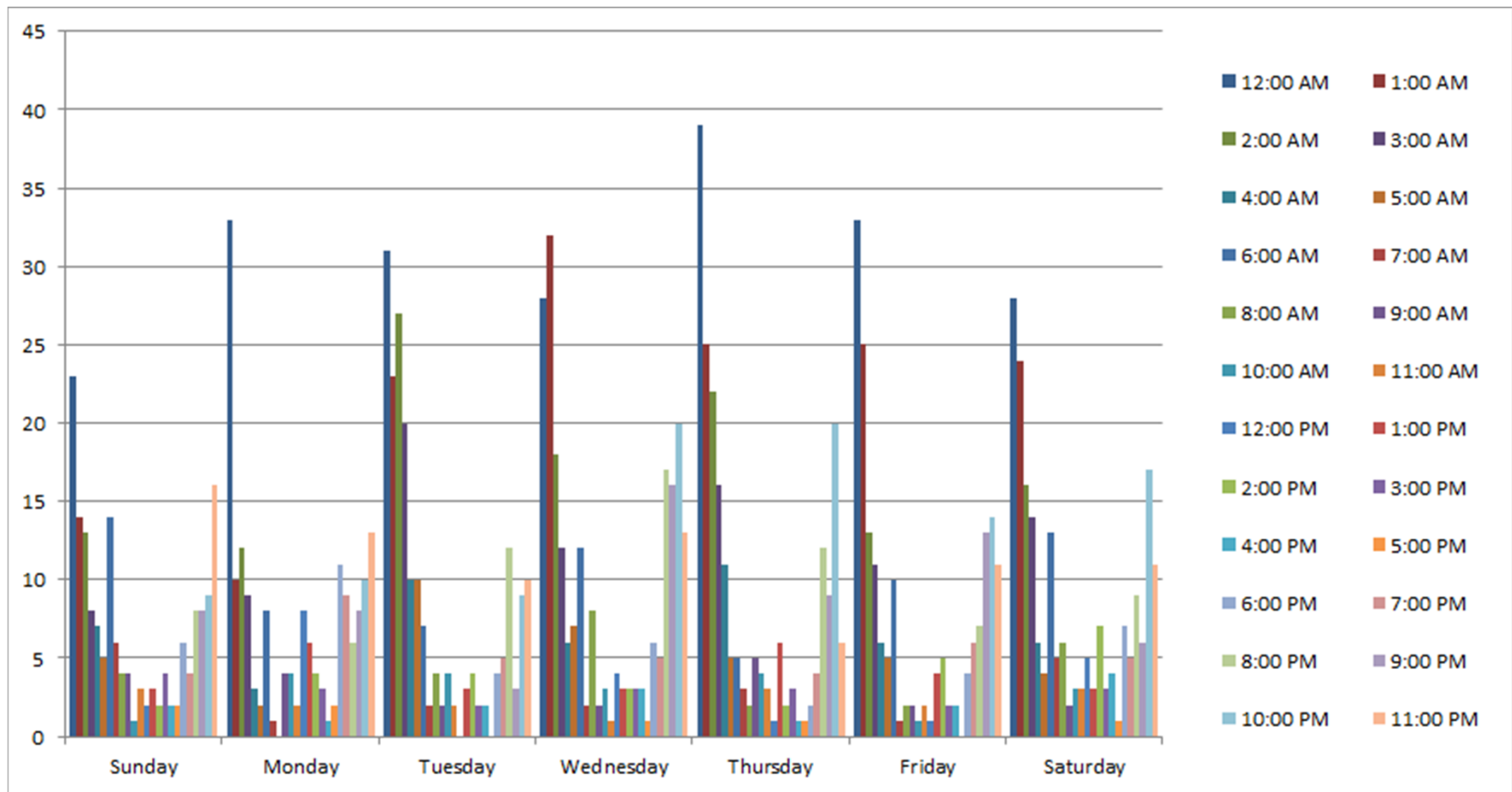


Truck Stop and Rest Area Demand

- Procedures were developed using ATRI GPS data to analyze the truck rest areas.
- This data was compiled to determine rest area demand patterns

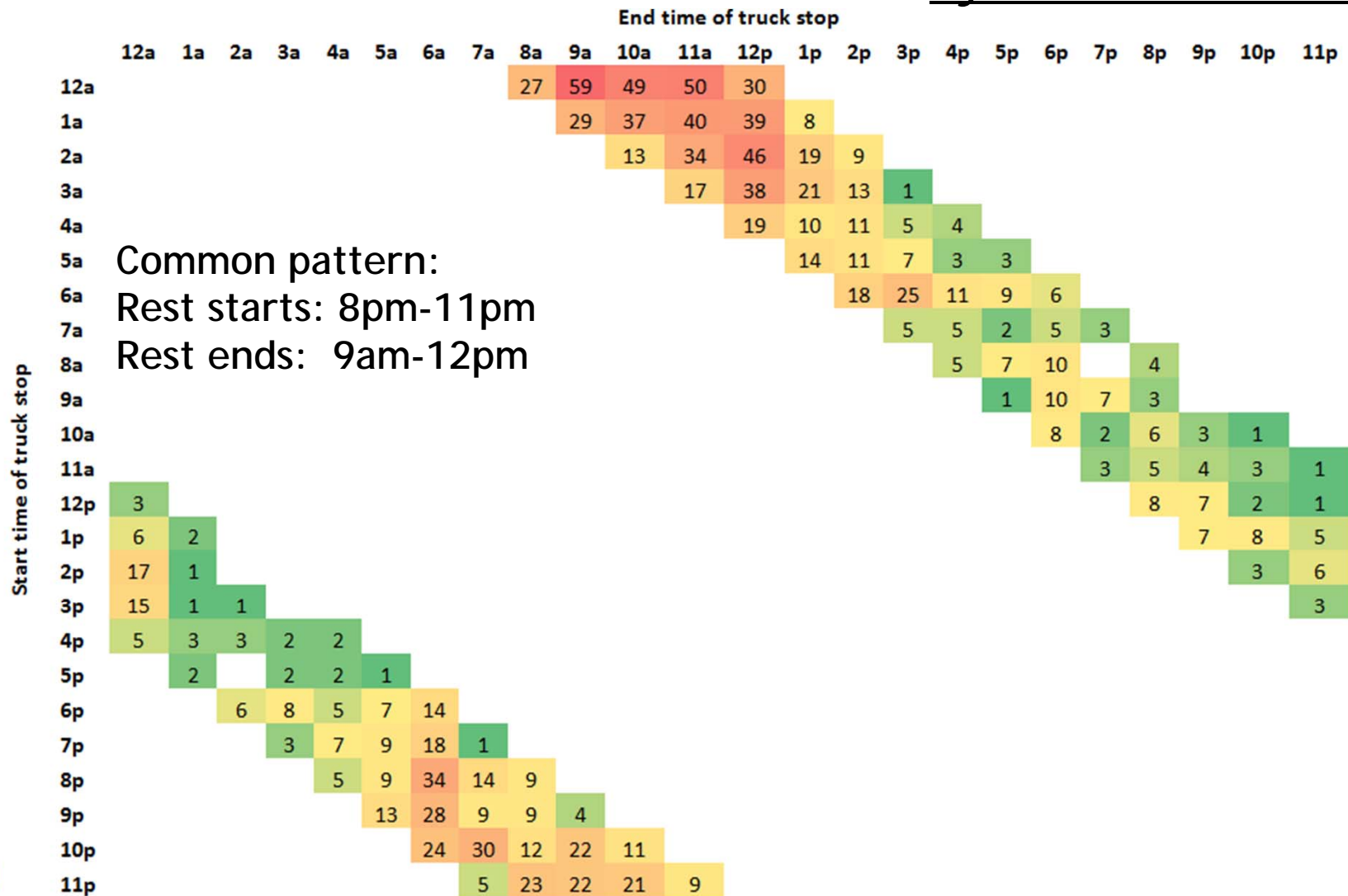


Truck Stop and Rest Area Demand



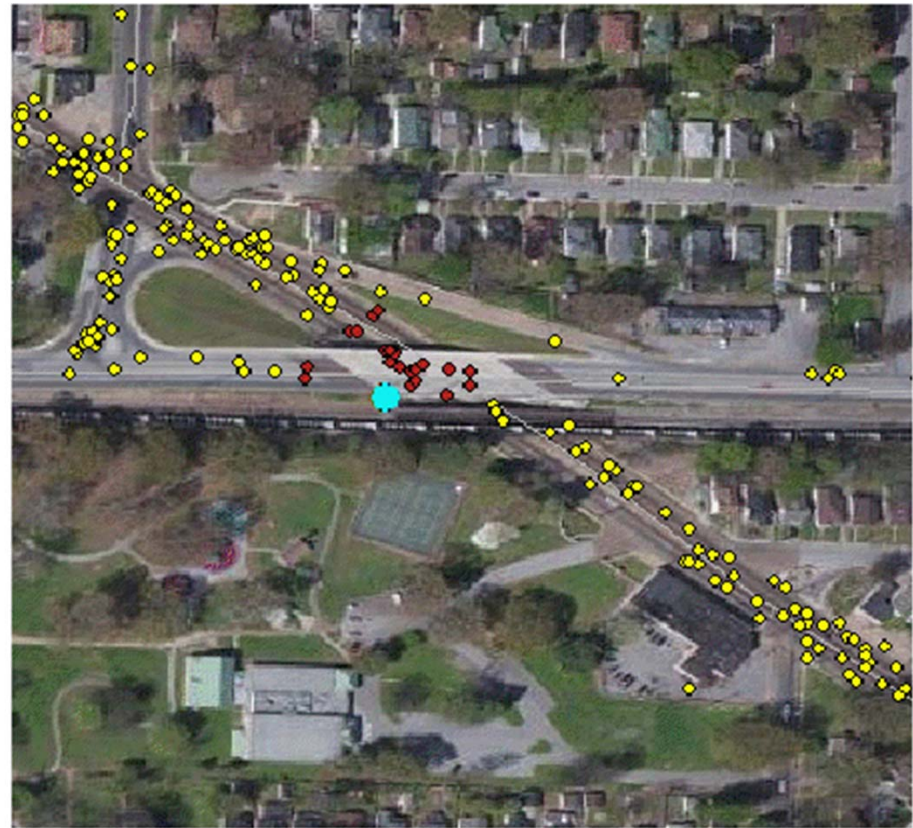
Number of truck stops

By start and end times

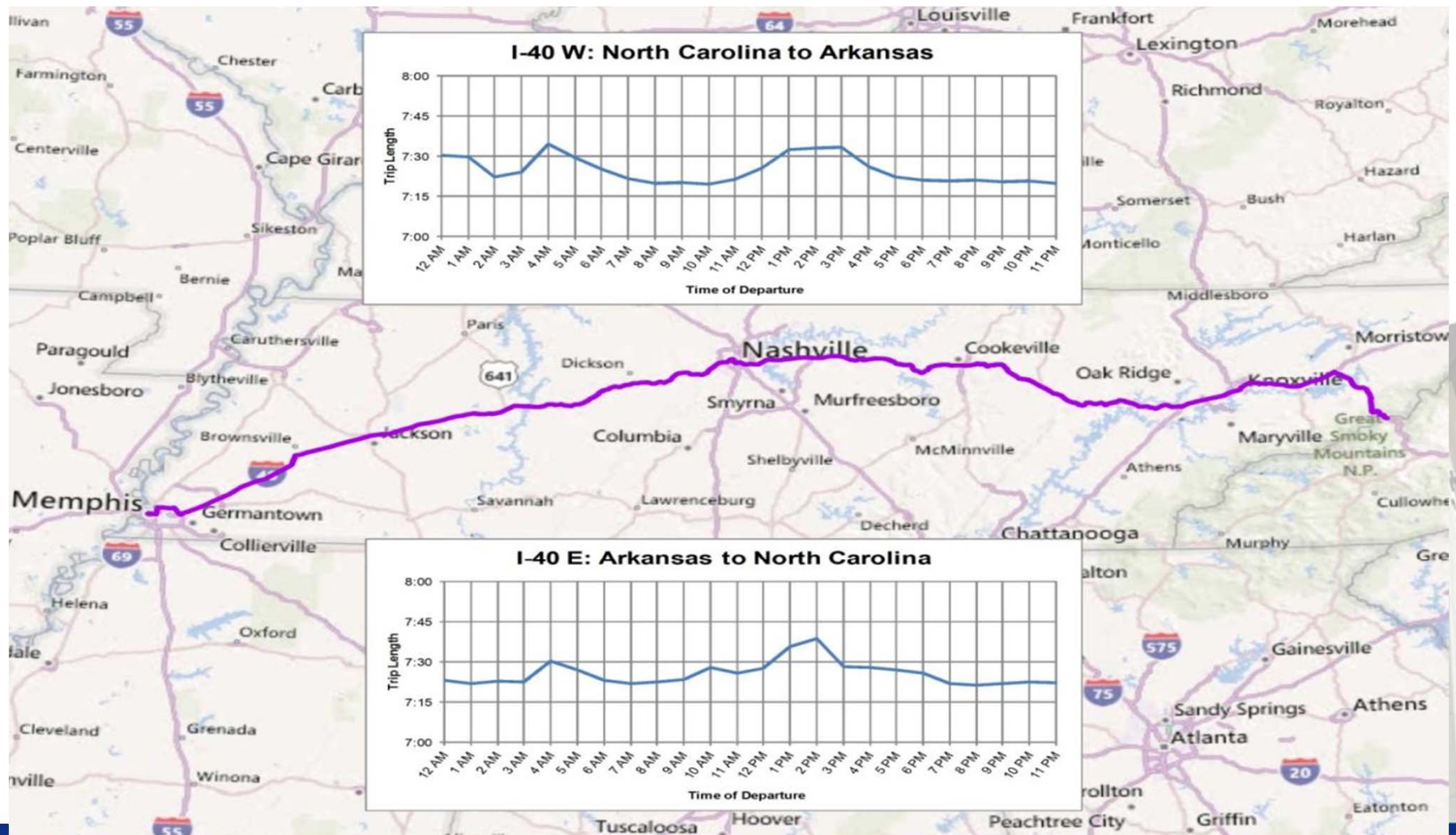


Validation of Truck-prohibitive Geometrics: Bridges

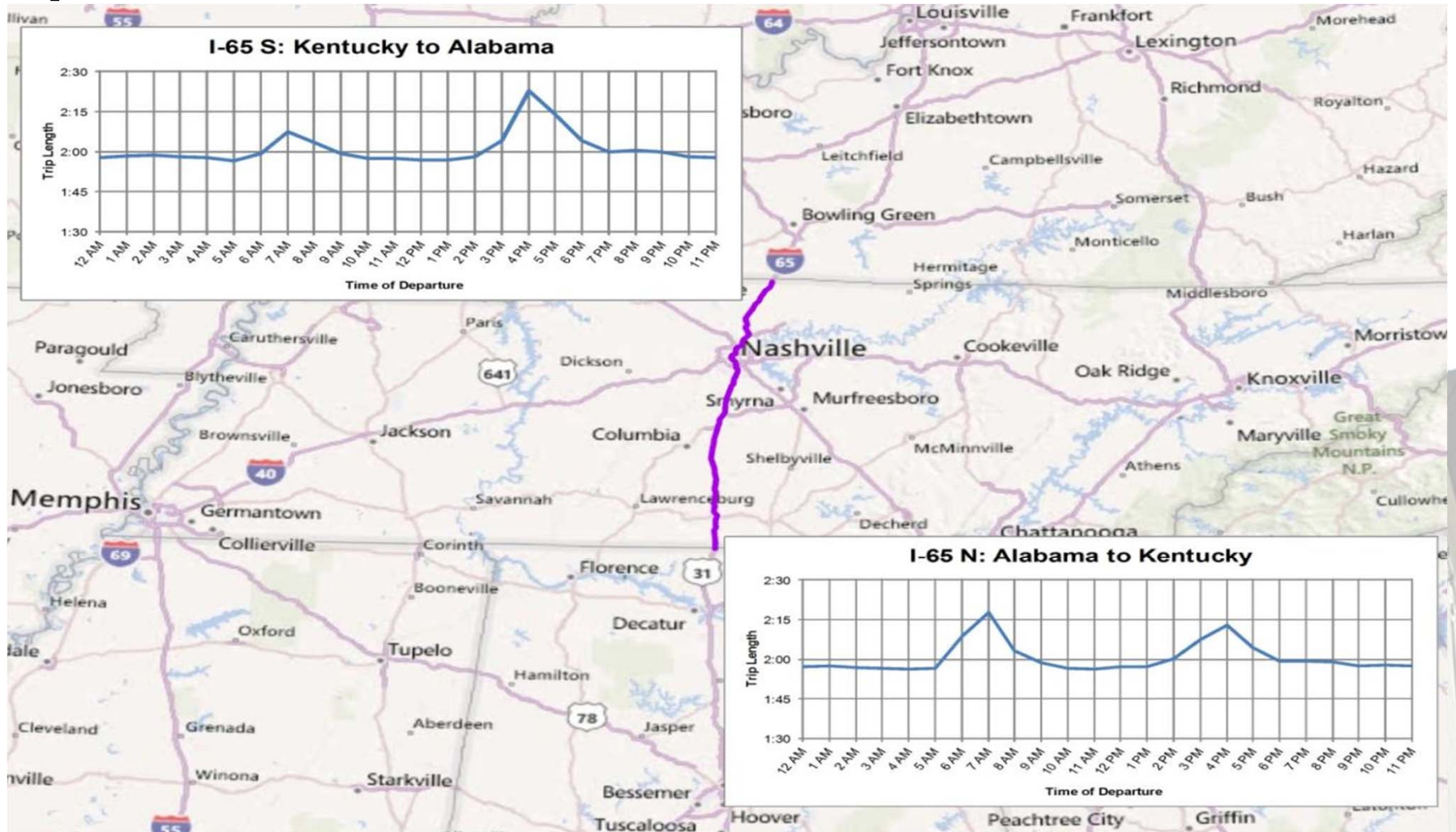
- Analyzed 64 low clearance bridges categorized as impassable by truck TDOT (vertical clearances of less than 14ft).
- Based on truck movement the vertical clearance should be 13ft and 4 inches



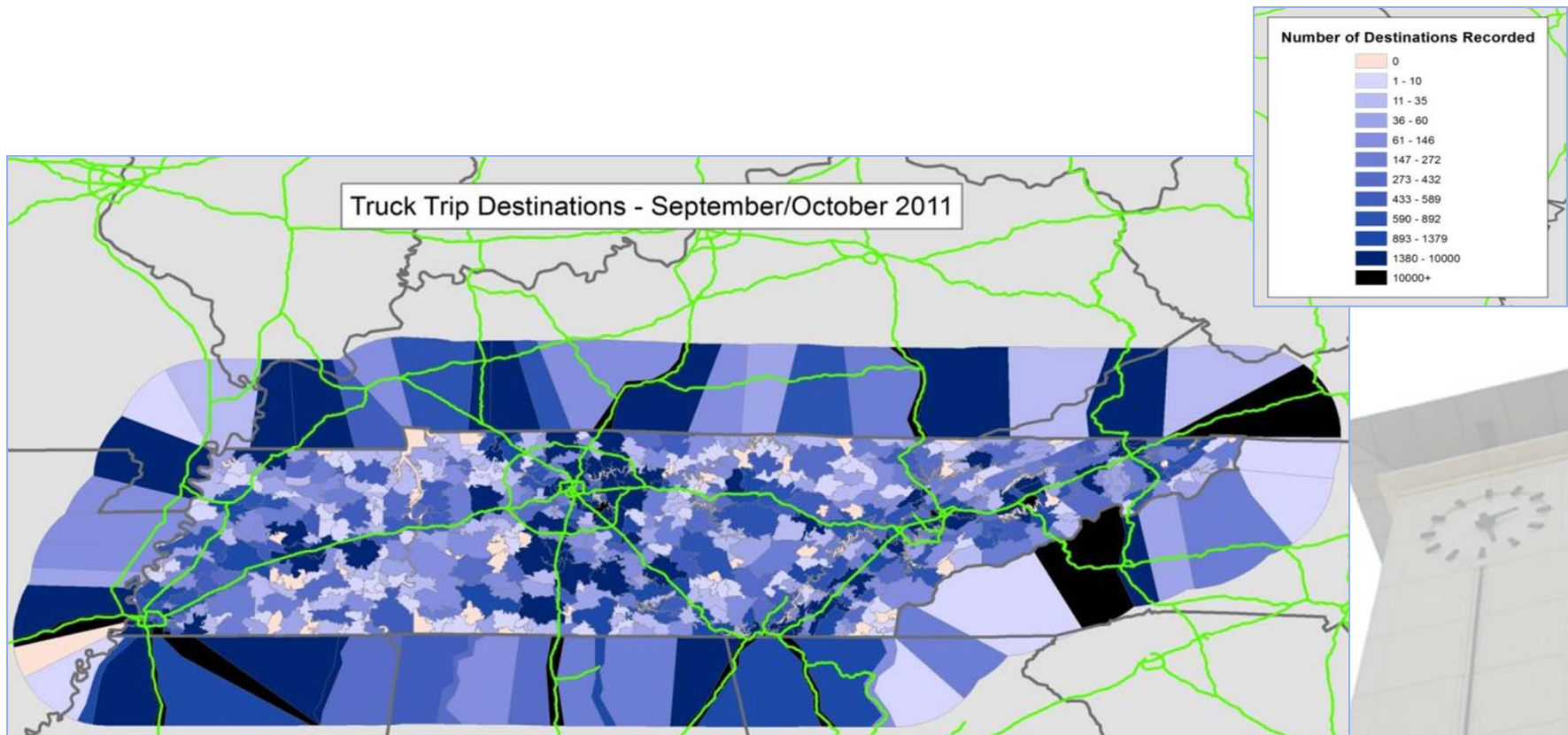
Departure Time Effects on Travel Time



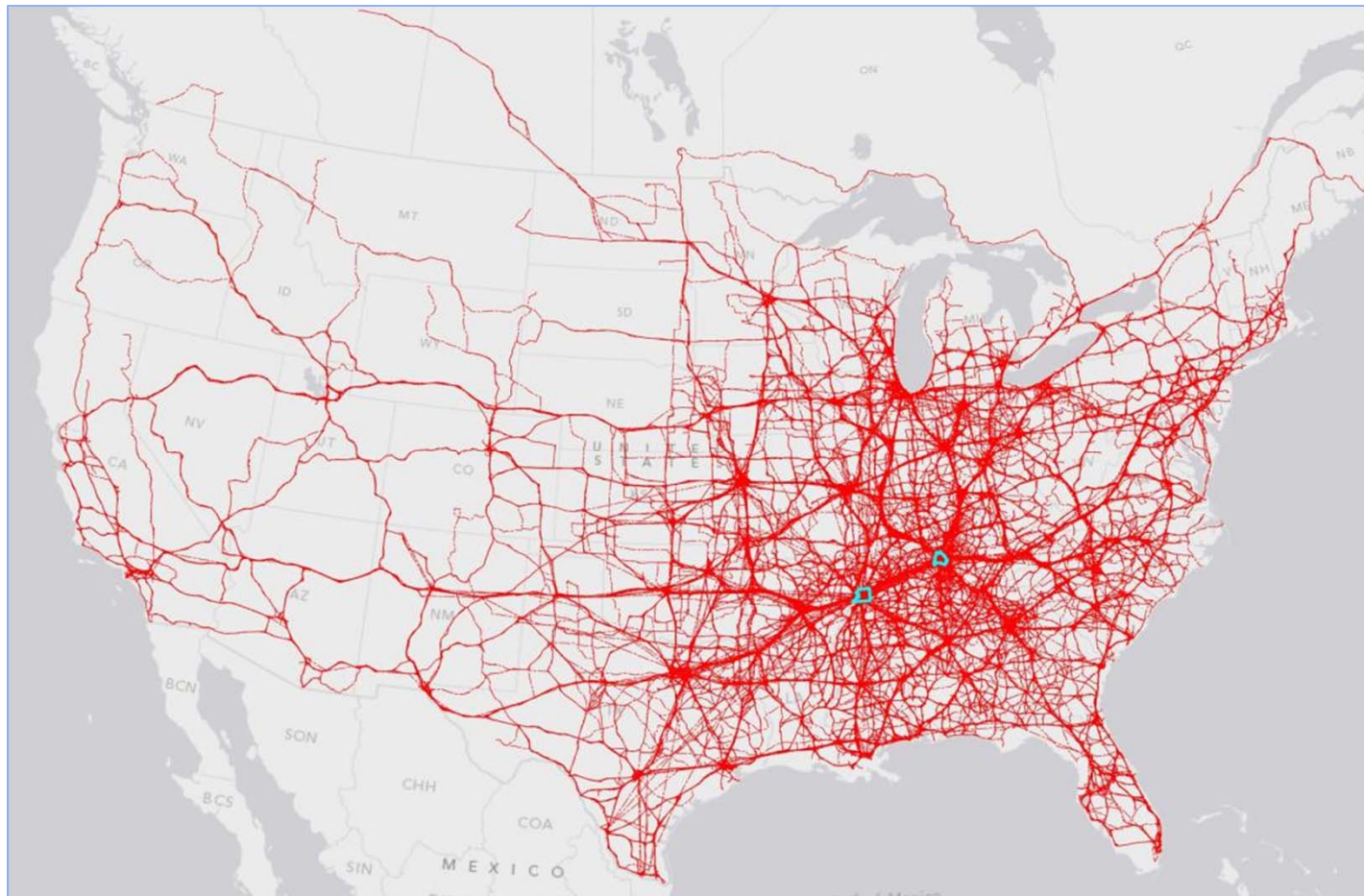
Departure Time Effects on Travel Time



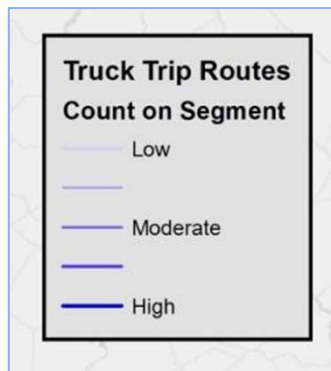
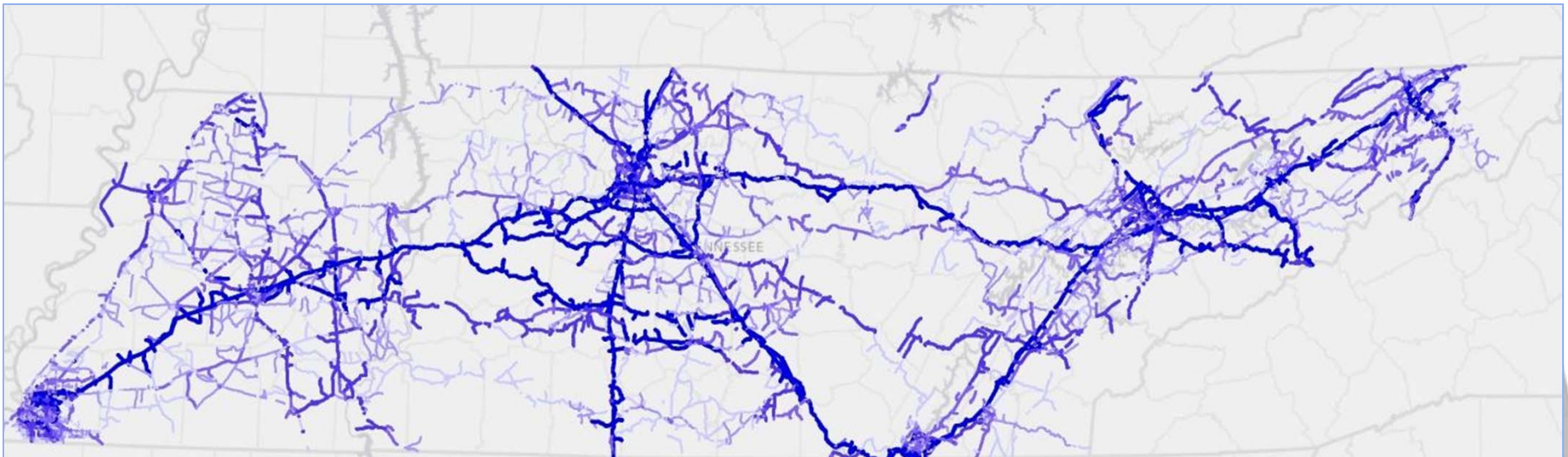
Destination by Zip Code



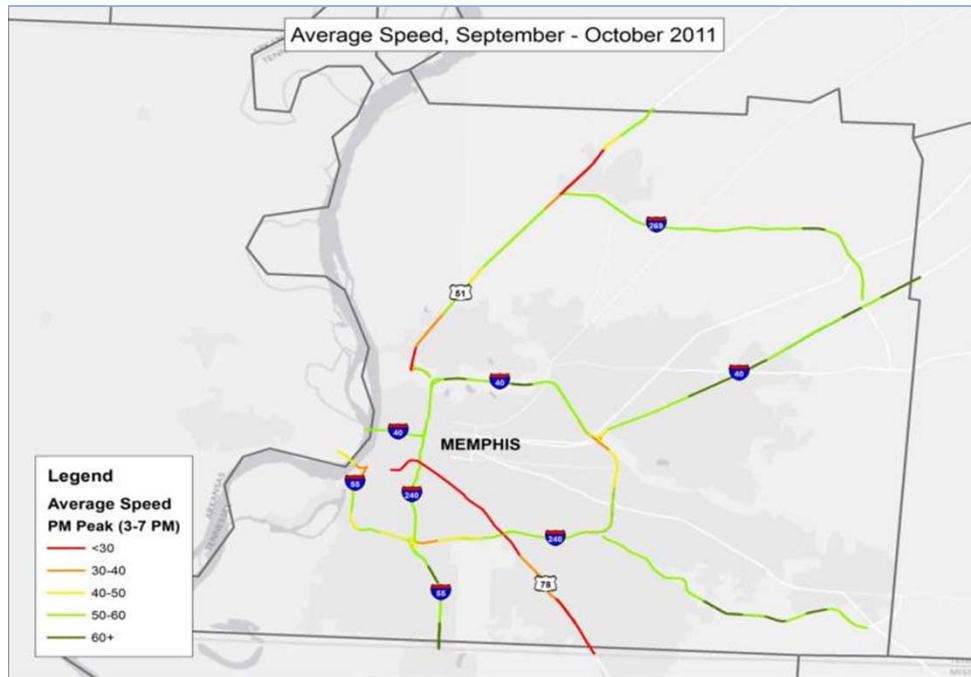
Truck flows from Shelby and Davidson



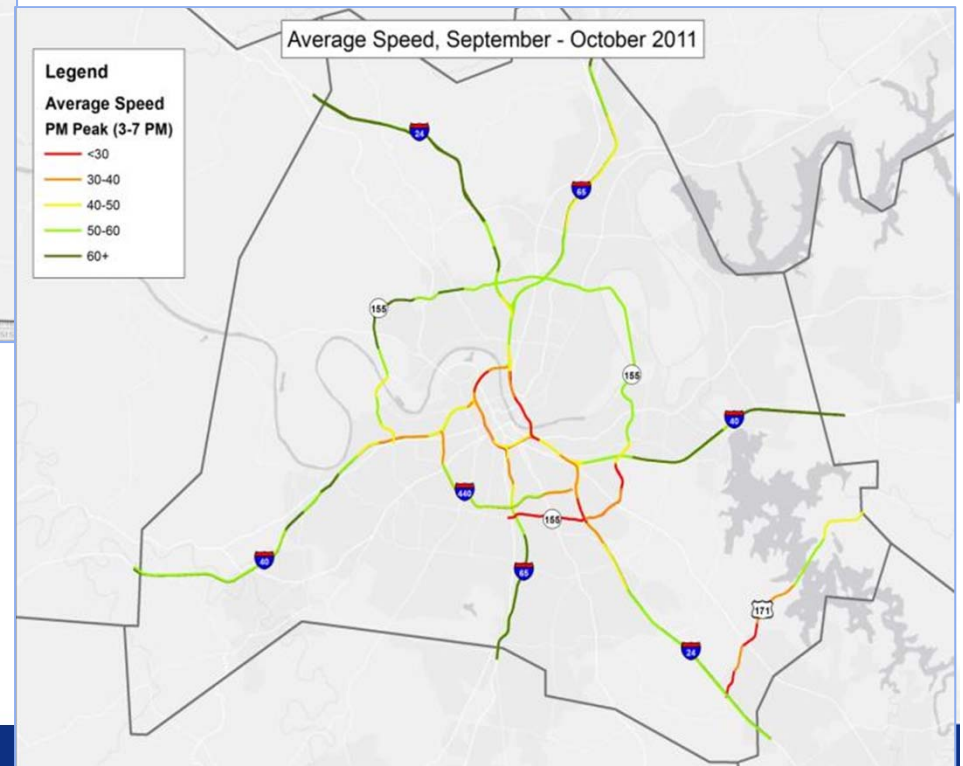
Truck Routes



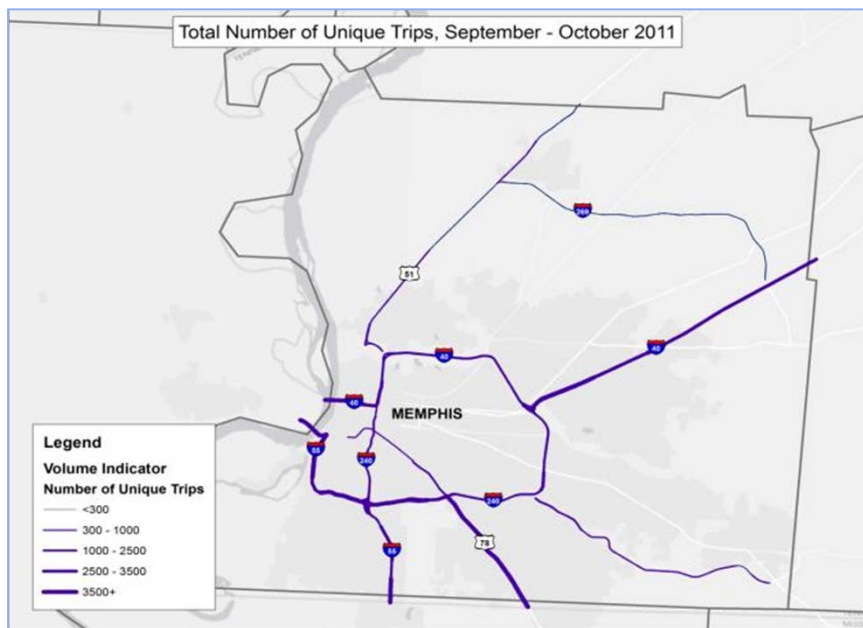
MOES: Average Speed



Shelby County

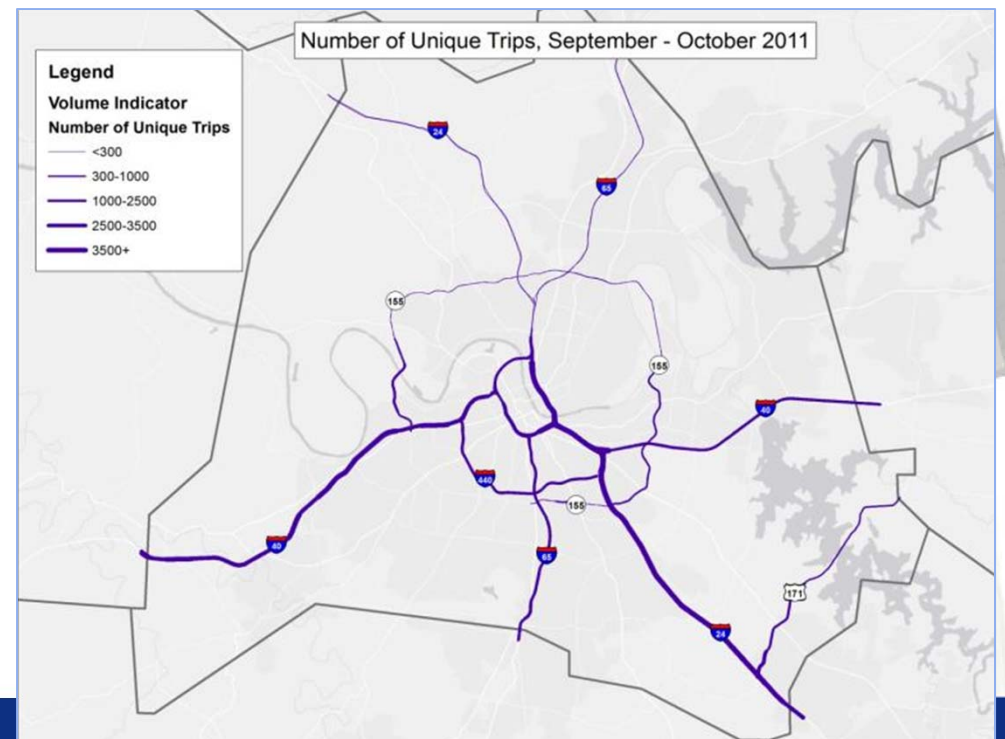


Number of trips (by direction & by time of day)



Shelby County

Davidson County



Further Research

- Establish methodology for accurate turn times with partial data
- Establish a guidebook of how the data and procedures can be incorporated into LRTP and Operations Planning



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