RSG
the science of insight

TDOT Statewide Model in Application and Development

July 15, 2015

Agenda

- Introduction to TSTM v2
- Subarea Analysis with TSTM v2: ATRI Truck Trip Tables for MPOs
- ATRI vs. Transearch and What the Differences Mean
- Update on Phase 3

Introduction to TSTM v2

Directory Structure

- Documentation
  - Phase 1 Technical Documentation
  - TSTM V2 Technical Memo & Network Management
  - Data Dictionary
- Model Files
- Scenario
  - Inputs/Outputs generated from model run

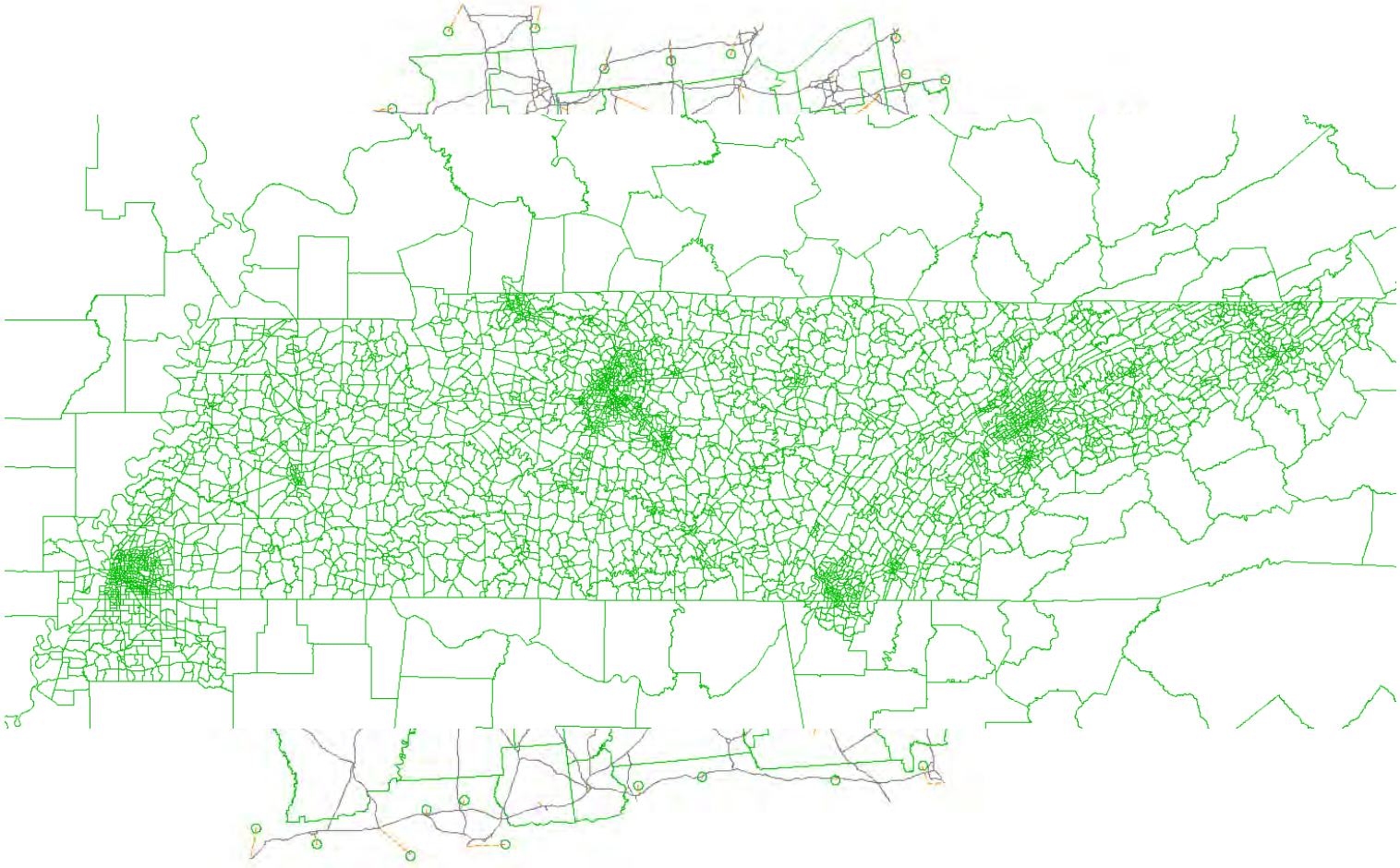
Model Files Directory

- Master Network
  - Contains scenario tables & files
- TAZ
- Pivoting
  - Static files used in pivoting (LEHD, ATRI, ODME)
- Parameters
- Images
- Other
  - Auxiliary files for post processing & reporting

Scenario Directory

- Zones
- Network
- Trip Generation
- Trip Distribution
- Pivoting
- Vehicle Assignment
- Reports

TAZ & Network



Field Standardization

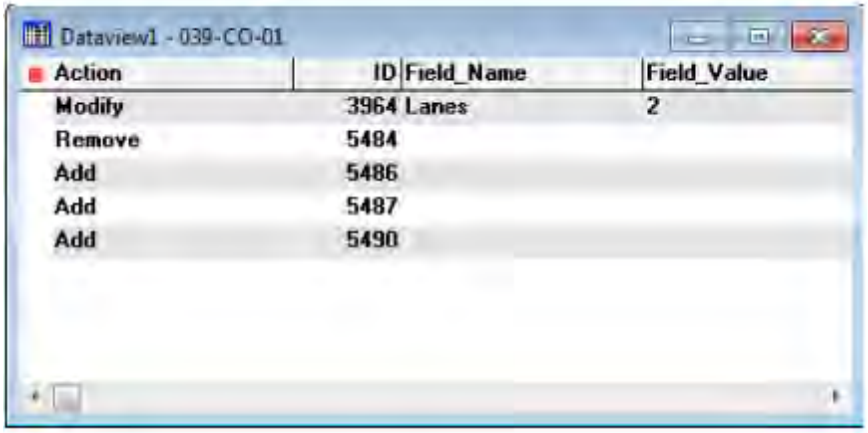
Field	Description
ID	TransCAD identifier
Length	Area in miles
Dir	Directionality
Label	User-defined label for Post-processing
Category	Derived from TAZ category field
Region	Derived from TAZ region field
MPO	Derived from TAZ MPO field
STATE	Two letter state abbreviation
COUNTYID	FIPS County Code
COUNTY	County Name
ADM_SYS	Ownership (TRIMS)
RTE_NME	Route Name (TRIMS)
RAMP	Ramp Identifier
SYSRAMP	System Ramp Identifier
FUNCCLASS	TRIMS Functional Classification Code
SPD_LMT	Speed Limit (TRIMS)
ACCESS	Roadway Access Control 1: None 2: Partial 3: Full
MEDIAN	Median identifier (TRIMS)
DIVIDED	Divided Freeway or Multilane Identifier
NBR_LANES	Number of Lanes (TRIMS)
THRU_LANES	Through Lanes (TRIMS)
LN1DIR	Directional Lanes
HOVAMLN	AM HOV Restriction Lane
HOVPMLN	PM HOV Restriction Lane
REVERSELN	Reversible Lane (TRIMS)
LN_WIDTH	Lane Width (TRIMS)
TWOTURNLN	Two-Way Center Left Turning Lanes (TRIMS)
RS_WIDTH	Right Shoulder Width
WATER_X	Water Crossing Identifier
RAIL_X	Railroad Crossing Identifier
CC	Centroid Connector Identifier
TAZID	Centroid Connector TAZ identification field
FFTIME	Free-Flow Running Time (minutes)
A/B_Control	Approach Control (see node definition)
A/B_Priorty	Node Approach Priority
A/B_Synch	Directional Synchronization
WalkTime	Walk Time (minutes)
FFSpeed	Free-Flow Running Speed (mph)
AB/BA_AFFTime	Adjusted Free-Flow Time with uniform control delay (minutes)
AB/BA_AFFSpd	Adjusted Free-Flow Speed (mph)
AB/BA_UCDelay	Uniform Control Delay (minutes)
PkHrLnCap	Peak-Hour Lane Capacity
AB/BA_DlyCap	Daily Capacity
AB/BA_AMCap	AM Period Capacity

Field	Description
ID	TransCAD identifier
Area	Area in square miles
TAZID	TAZ identifier
MPO	MPO of the area
CATEGORY	1 - Rural counties 2 - Urban counties 3 - MPO areas outside TN 4 - Single Counties outside TN 5 - County Groups outside TN 6 - External Stations
REGION	TN Region Identifier
COUNTYID	FIPS county code
STATEID	FIPS state code
TOTPOP	Total Population
HHPOP	Household Population
GQPOP	Group Quarter Population
HH	Total Households
HHSIZE	Average Household Size
HHINC	Average Household Income
HHWRK	Average Household Workers
HHVEH	Average Household Vehicles
HHSTD	Average Household Students
SENHH	Household Seniors
TOTEMP	Total Employment
EMP11	Employment in NAICS 11
EMP21	Employment in NAICS 21
EMP22	Employment in NAICS 22
EMP23	Employment in NAICS 23
EMP3133	Employment in NAICS 31-33
EMP42	Employment in NAICS 42
EMP4445	Employment in NAICS 44-45
EMP4849	Employment in NAICS 48-49
EMP51	Employment in NAICS 51
EMP52	Employment in NAICS 52
EMP53	Employment in NAICS 53
EMP54	Employment in NAICS 54
EMP55	Employment in NAICS 55
EMP56	Employment in NAICS 56
EMP61	Employment in NAICS 61
EMP62	Employment in NAICS 62
EMP71	Employment in NAICS 71
EMP72	Employment in NAICS 72
EMP81	Employment in NAICS 81
EMP92	Employment in NAICS 92
ACTDIV	Activity Diversity
GenAccess	General Accessibilty Variable
NearAccess	Near Accessibility Variable

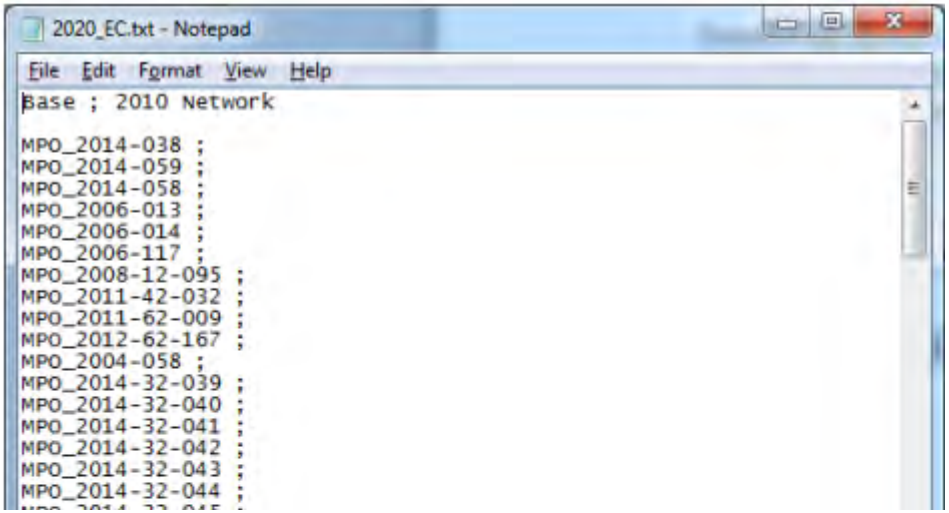
Network Management

Project .bin Files

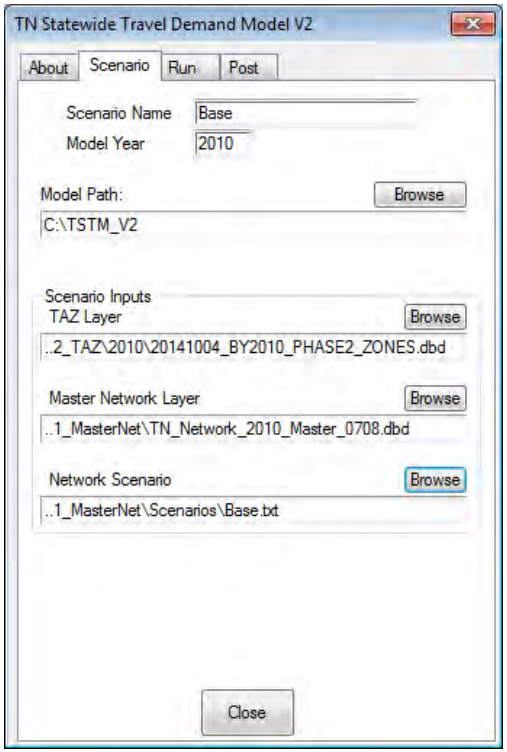
Action	Description
Add	Adds a link to the scenario
Remove	Removes a link from the scenario
Modify	Alters the indicated link field
Node	Alters the indicated node field

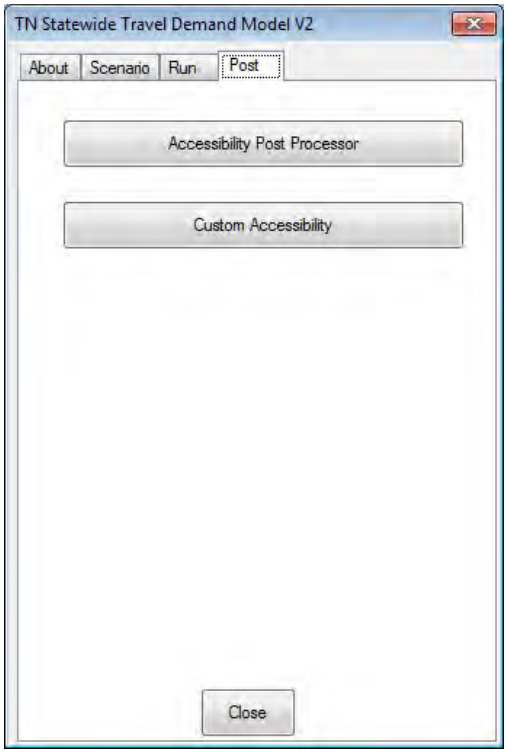


Scenario .txt Files



User Interface





Post-Processing with Pivoting

$$R = \frac{S_f}{S_b}$$

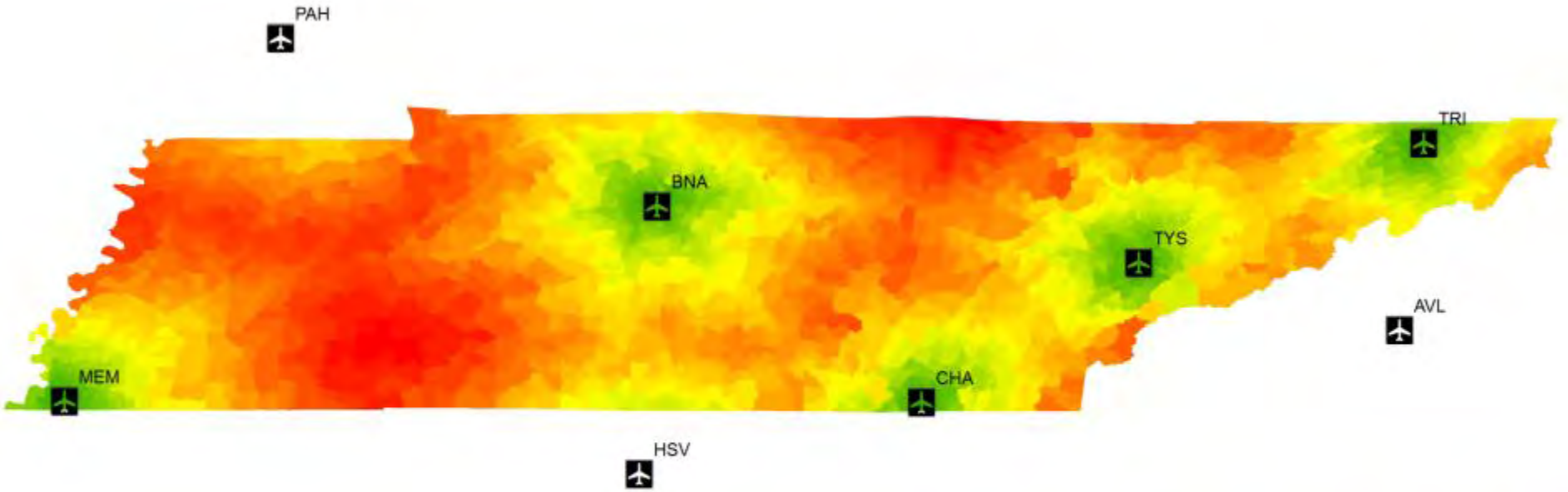
R < 0.5 : $P_1 = B * R$

R > 2 : $P_2 = B + (S_f - S_b)$

R > 0.5 and R < 2 : $P_3 = \frac{P_1 * (2 - R)}{1.5} + \frac{P_2 * (R - 0.5)}{1.5}$

- P is the post-processed pivoted volume
- B is the observed base-year counts
- S_f is the modeled/synthetic future year volume
- S_b is the modeled/synthetic base year volume

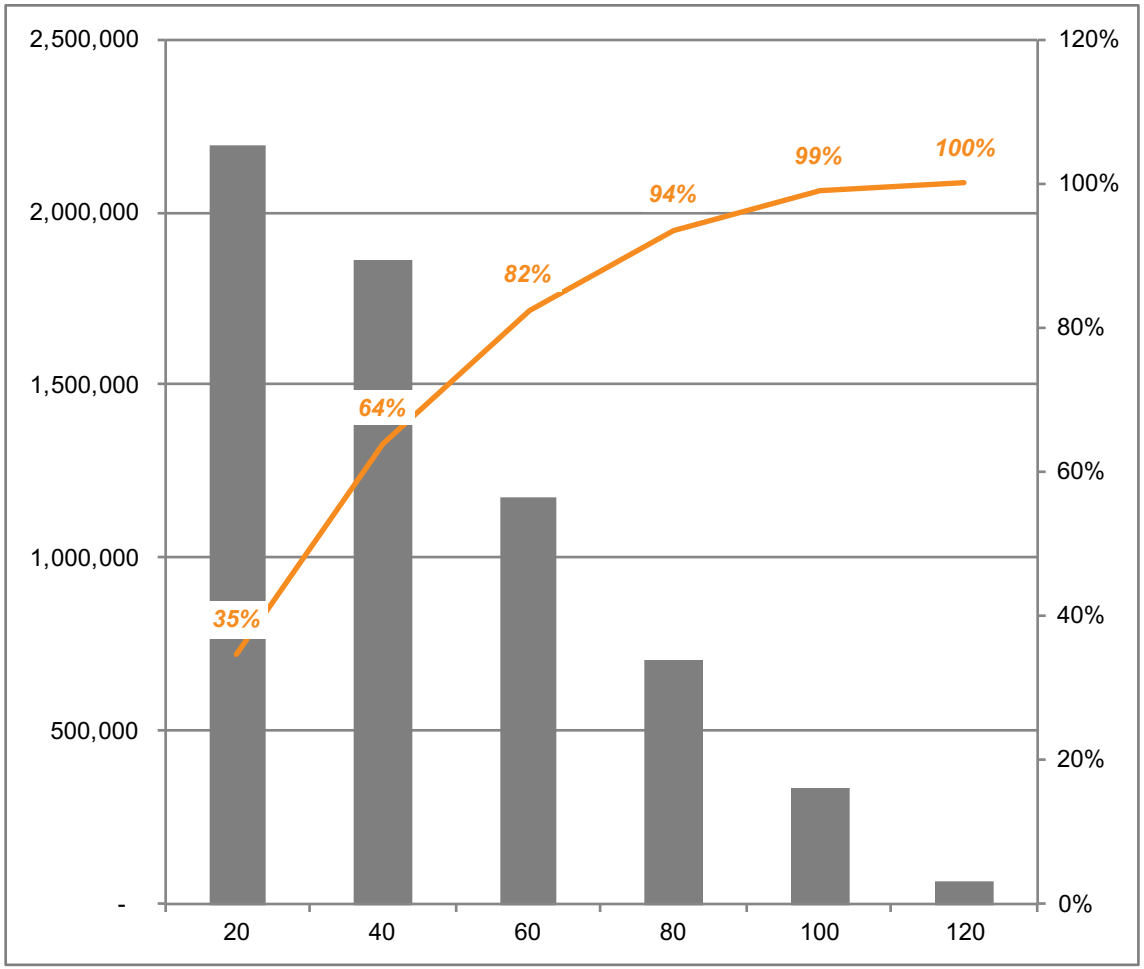
AIRPORT – Accessibility Map



- TRI-CITIES REGIONAL AIRPORT (**TRI**)
- CHATTANOOGA METROPOLITAN AIRPORT (**CHA**)
- MCGHEE TYSON AIRPORT (**TYS**)
- MEMPHIS INTERNATIONAL AIRPORT (**MEM**)
- NASHVILLE INTERNATIONAL AIRPORT (**BNA**)

- HUNTSVILLE INTL-CARL T JONES FIELD (**HSV**)
- BARKLEY REGIONAL AIRPORT (**PAH**)
- ASHEVILLE REGIONAL AIRPORT (**AVL**)

AIRPORT – Population Accessibility



Time Range		Population	% Share	Cum % Share
0	20	2,193,624	35%	35%
20	40	1,864,149	29%	64%
40	60	1,177,527	19%	82%
60	80	705,088	11%	94%
80	100	335,935	5%	99%
100	120	69,249	1%	100%

80% of the state's population is within a 1-hr drive of a major commercial airport

All of the state's population is within a 2-hour drive of a major commercial airport

Validation

- One of the best statewide model base year validations in the country

Volume Range		Number of Count Stations	Percent Error	Correlation Coefficient	MAPE	%RMSE	
						Model	Standard
1	5,000	7,288	10.2	0.69	66.8	**91.1**	**101.4**
5,000	10,000	1,943	5.5	0.61	31.1	**39.6**	**56.3**
10,000	20,000	1,700	0.8	0.79	21.0	**27.8**	**51.4**
20,000	30,000	747	-2.1	0.85	15.9	**21.5**	**35.7**
30,000	40,000	318	0.6	0.85	12.0	**18.1**	**32.0**
40,000	+	661	-0.1	0.94	11.5	**15.6**	**21.6**
Total		**12,645**	**2.1**	**0.97**	**47.9**	**37.0**	**60.0**

Subarea Analysis with TSTM v2: ATRI Truck Trip Tables for MPOs

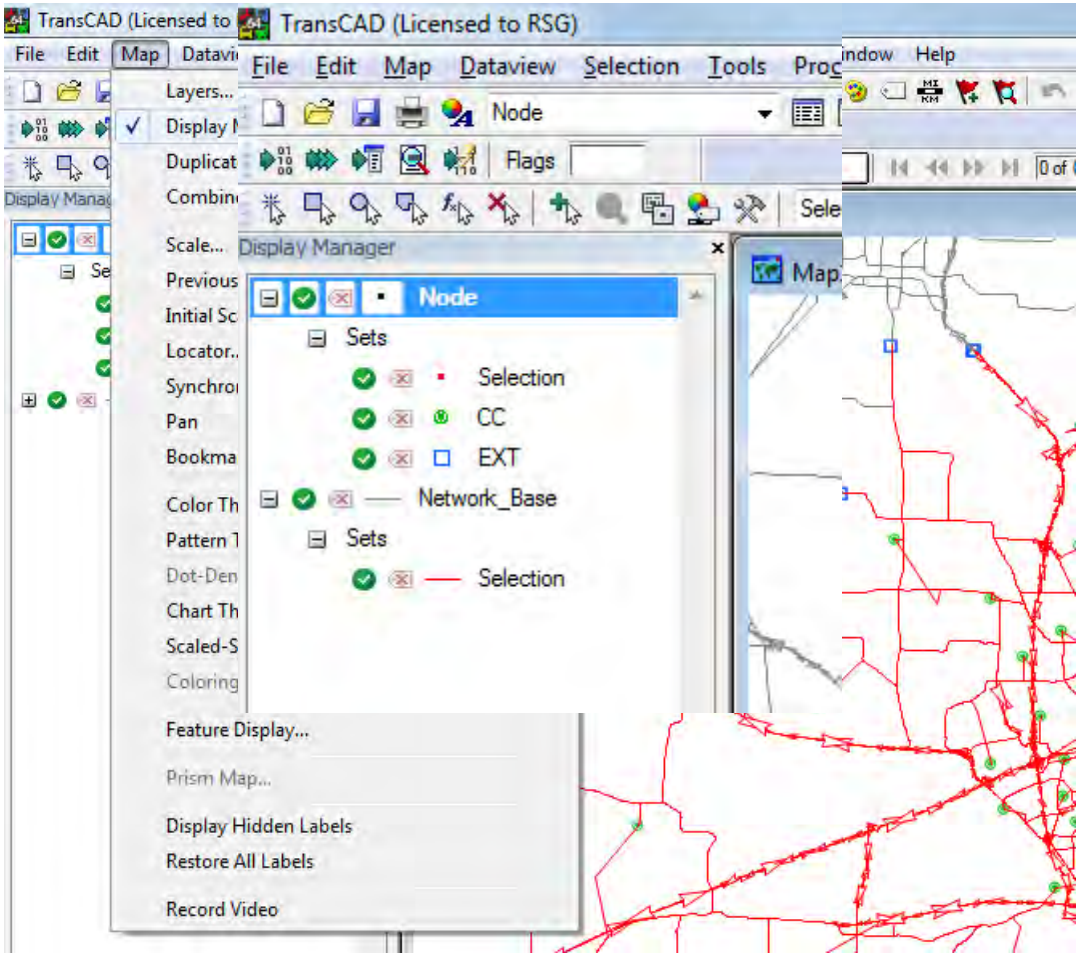
ATRI Development Review

- Truck GPS observations over 8 weeks in 2013
- 235,000 unique trucks
- 6.5 million truck trips (5.7 million after review)
- Final ATRI data 84.1 million VMT
  - Daily average of 1.5 million VMT
- TDOT estimates 14 million multi-unit truck VMT daily
- Represents sample rate of 10.7%
- Expanded based on TDOT truck counts using ODME

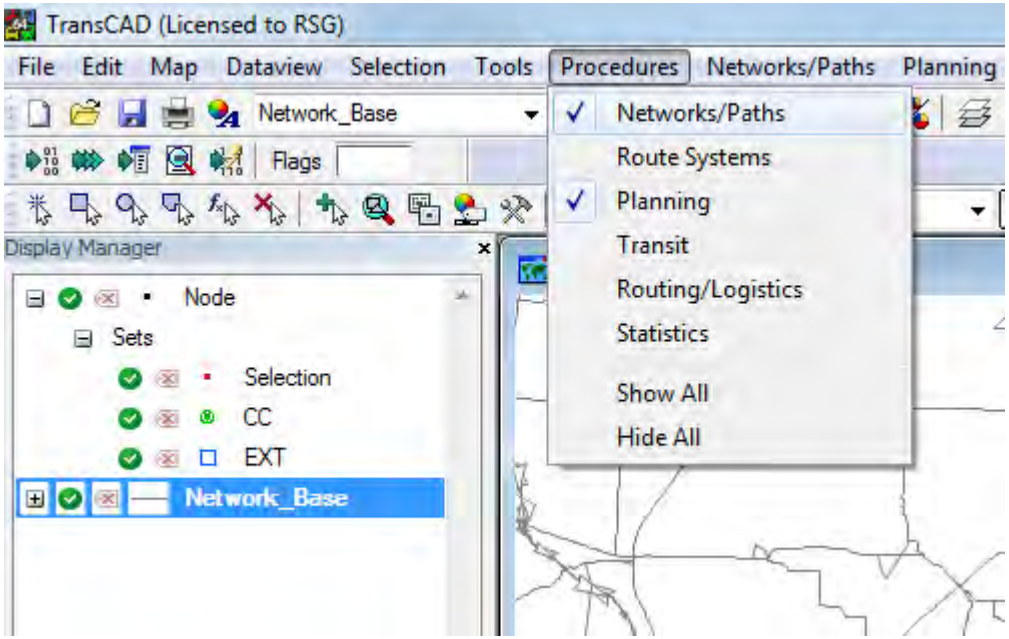
Overview of Subarea Analysis

- Make Subarea Selection Sets
- Create TransCAD Network (.net) File
- Run Subarea Analysis
- Review TransCAD Subarea Selection
- Aggregate & Disaggregate Subarea Matrix

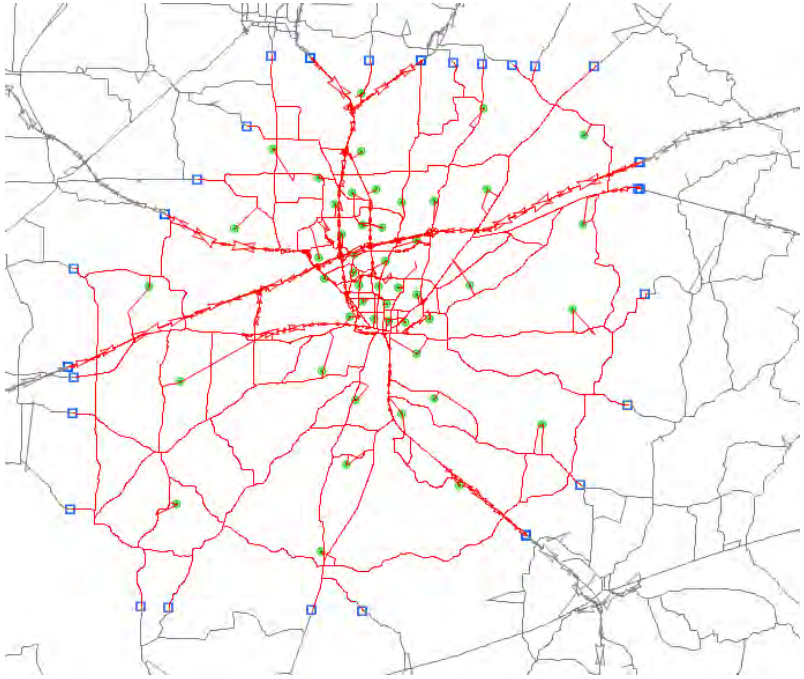
TransCAD Display Manager



Data Preparation



Data Preparation



Selection Sets

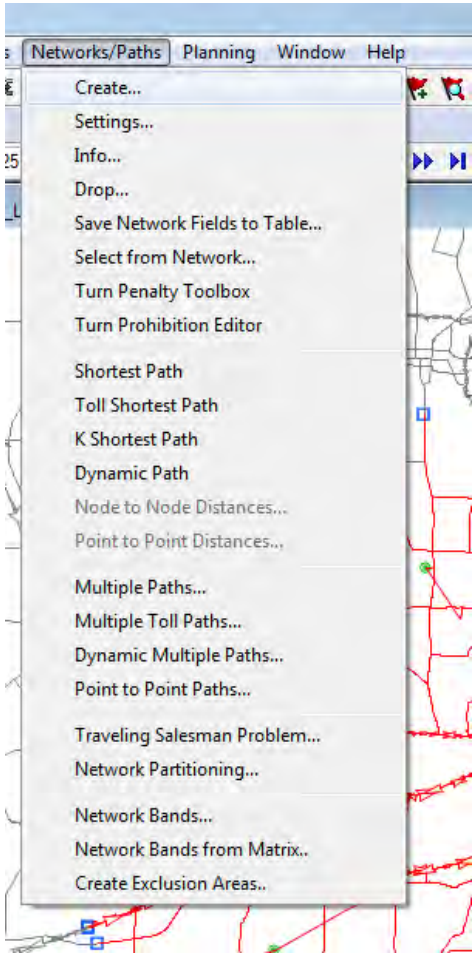
- External Stations
- Internal Centroids
- All links

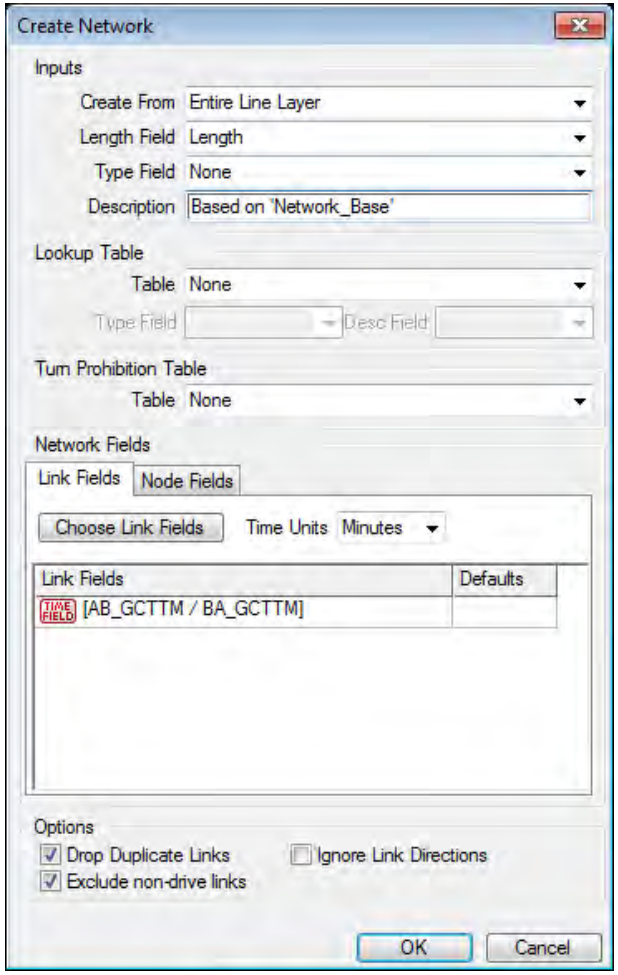
Expanded ATRI Truck Trip Table

Matrix1 - TN ATRI Scaled (Trips)

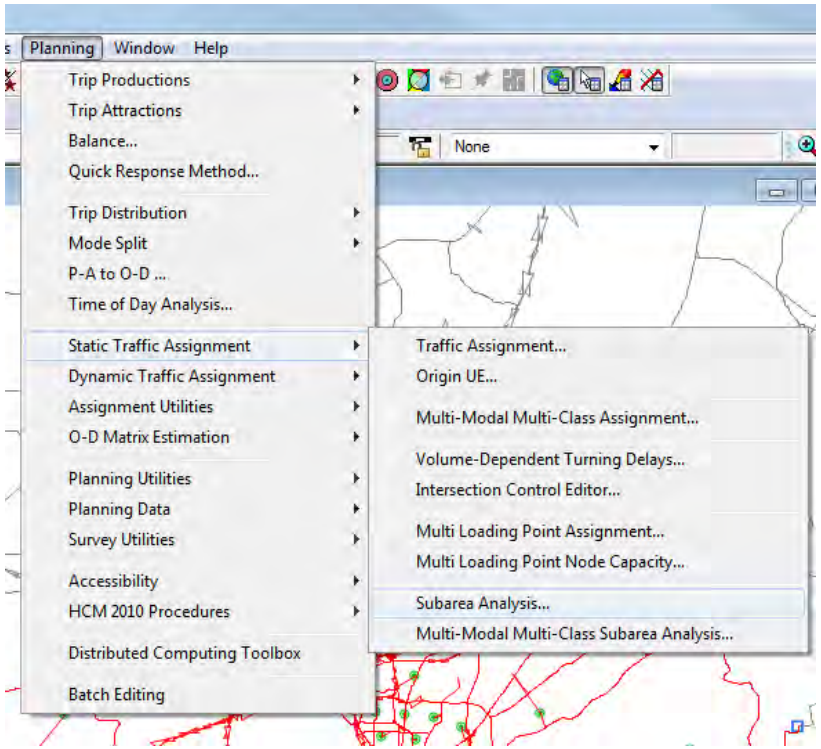
	1000001	1000002	1000003	1000004	1000005	1000006	1000007	1000008	1000009
1000001	0.00	0.00	0.00	1.83	0.00	0.41	0.00	0.00	0.00
1000002	0.00	0.20	0.00	1.83	0.00	0.00	0.00	0.00	0.00
1000003	0.00	0.00	0.20	2.23	0.61	2.23	0.00	0.00	0.20
1000004	0.81	0.41	1.62	64.73	2.03	37.54	0.00	0.20	1.22
1000005	0.00	0.00	0.20	0.81	0.41	0.81	0.00	0.00	0.00
1000006	0.20	0.00	3.25	19.07	0.20	5.48	0.20	0.20	1.01
1000007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000008	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
1000009	0.00	0.00	0.20	2.23	0.00	0.41	0.00	0.00	0.20
1000010	0.00	0.20	0.00	2.84	0.00	0.81	0.00	0.00	0.00
1000011	0.00	0.00	0.81	12.38	0.61	6.70	0.00	0.20	0.41
1000012	0.00	0.00	0.00	2.64	0.00	0.20	0.00	0.00	0.00
1000013	0.00	0.00	3.25	8.12	0.61	2.43	0.00	0.00	0.00
1000014	0.00	0.00	0.00	5.48	0.00	0.00	0.00	0.00	0.00
1000015	0.00	0.00	0.61	10.35	0.00	2.84	0.00	0.20	0.20
1000016	0.00	0.41	0.00	0.81	0.41	0.20	0.00	0.00	0.00
1000017	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
1000018	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
1000019	0.00	0.00	0.00	0.61	0.00	0.20	0.00	0.00	0.00
1000020	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
1000021	0.00	0.00	0.00	1.01	0.00	0.20	0.00	0.00	0.00
1000022	0.00	0.00	0.00	1.62	0.00	0.00	0.00	0.00	0.00
1000023	0.00	0.00	0.61	2.03	0.00	0.41	0.00	0.00	0.00
1000024	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000026	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000027	0.00	0.00	9.33	5.28	0.20	13.19	0.20	0.00	0.20
1000028	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.20
1000029	0.41	0.00	0.00	0.00	0.20	0.20	0.00	0.00	0.00
1000030	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.20
1000031	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000032	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000033	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000034	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000035	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000036	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000037	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00
1000038	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000039	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000041	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000042	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
1000043	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

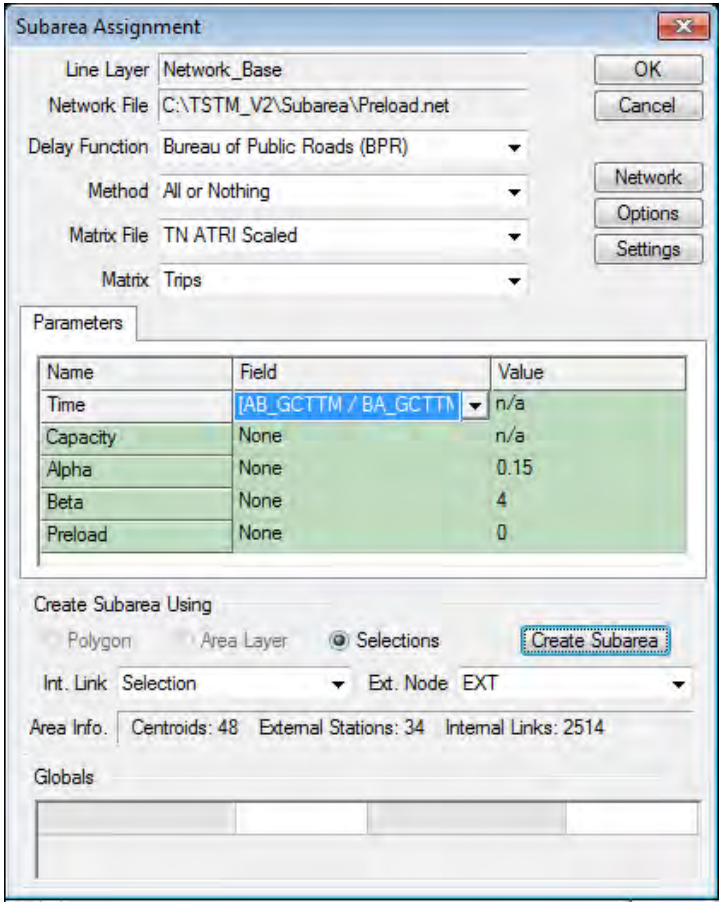
Create Network File



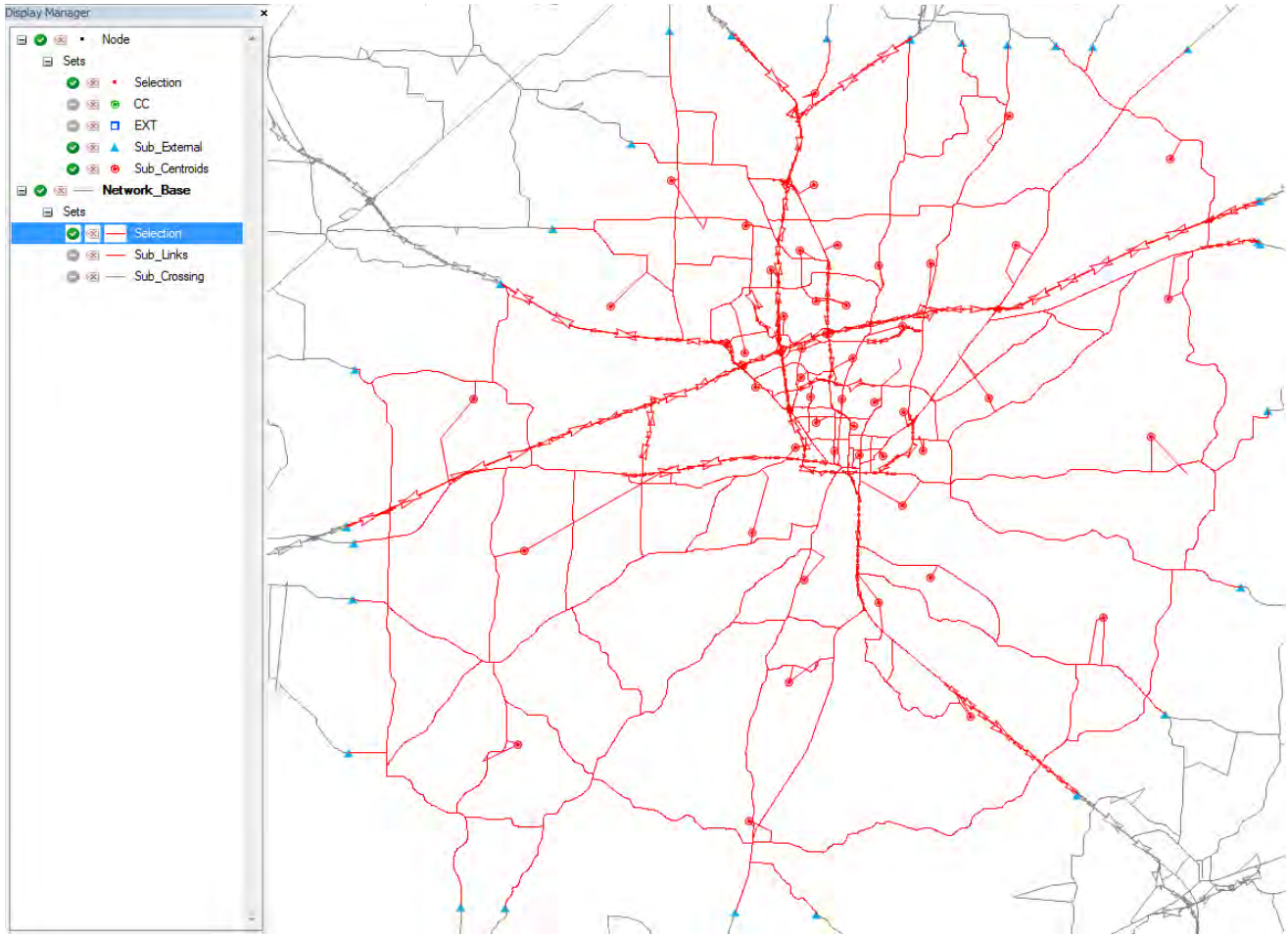


Subarea Analysis



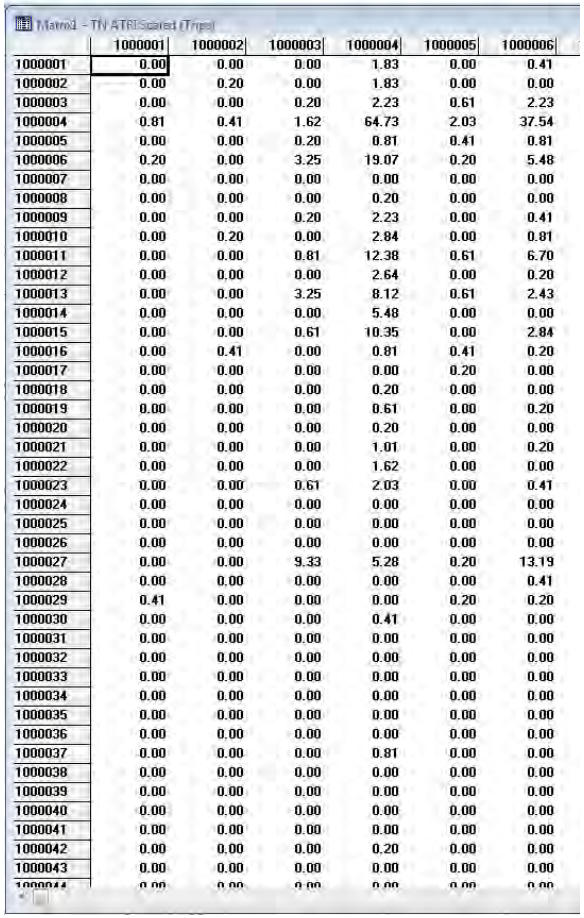


Review TransCAD Selections



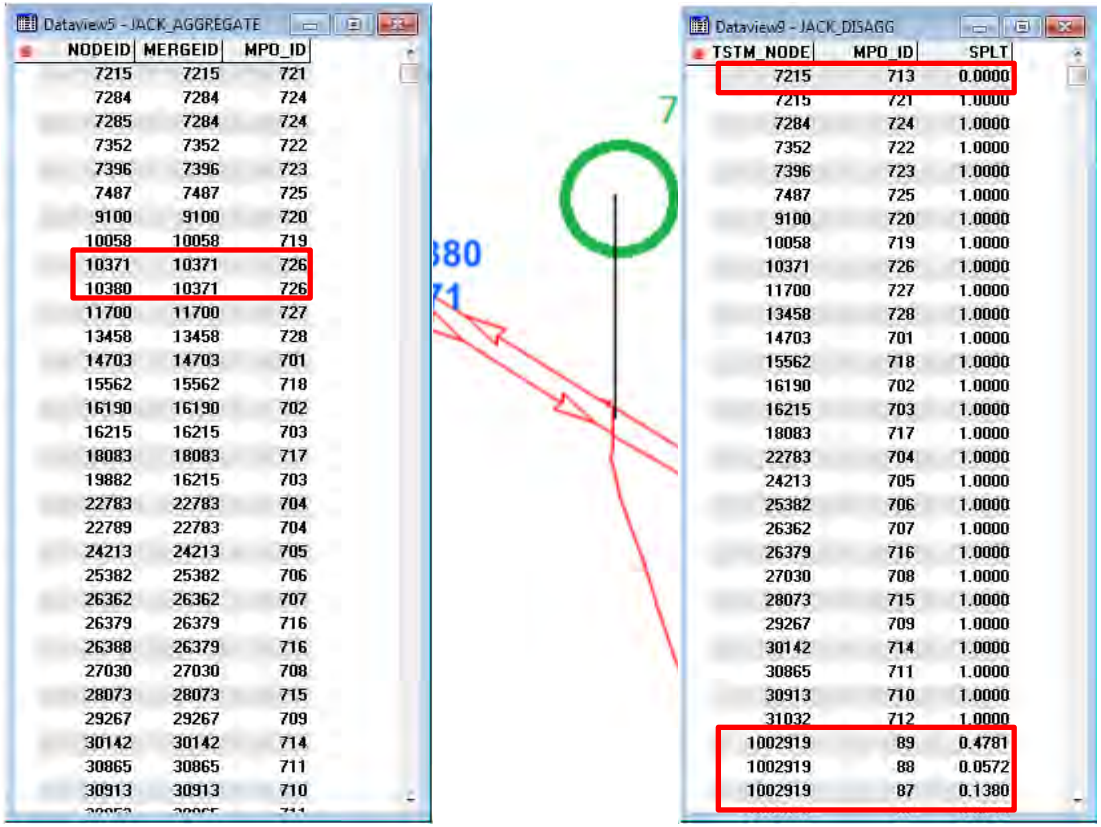
Finalizing Subarea Matrix

- Subarea O-Ds = TSTM Node ID
- Step 1: Aggregate
  - Bidirectional external stations
- Step 2: Disaggregate
  - Unmodeled external stations
  - Zones splits
  - Convert into MPO IDs

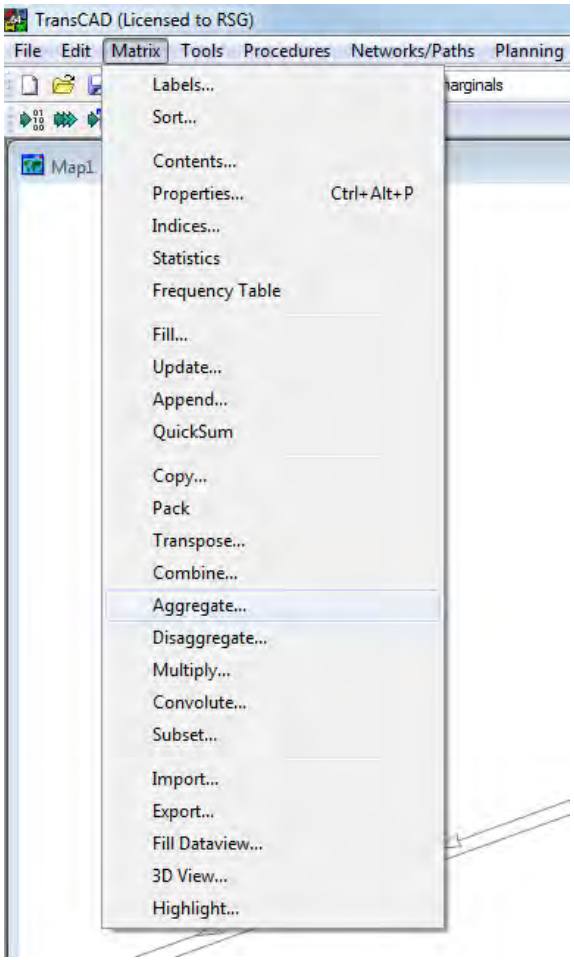


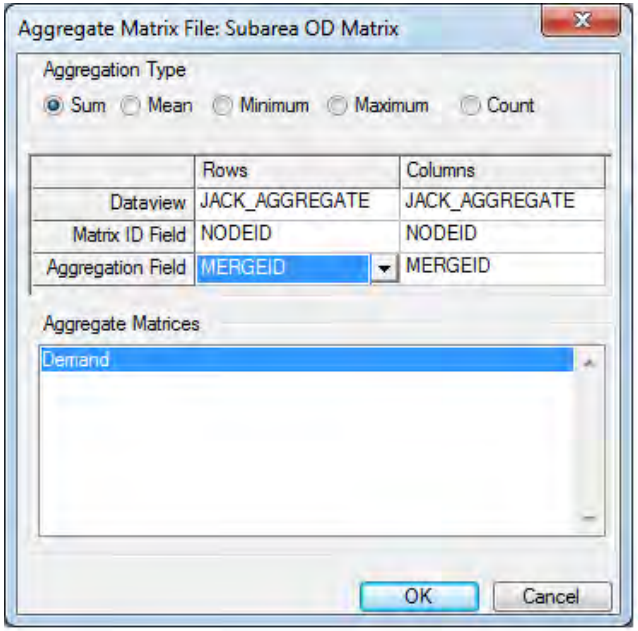
	1000001	1000002	1000003	1000004	1000005	1000006
1000001	0.00	0.00	0.00	1.83	0.00	0.41
1000002	0.00	0.20	0.00	1.83	0.00	0.00
1000003	0.00	0.00	0.20	2.23	0.61	2.23
1000004	0.81	0.41	1.62	64.73	2.03	37.54
1000005	0.00	0.00	0.20	0.81	0.41	0.81
1000006	0.20	0.00	3.25	19.07	0.20	5.48
1000007	0.00	0.00	0.00	0.00	0.00	0.00
1000008	0.00	0.00	0.00	0.20	0.00	0.00
1000009	0.00	0.00	0.20	2.23	0.00	0.41
1000010	0.00	0.20	0.00	2.84	0.00	0.81
1000011	0.00	0.00	0.81	12.38	0.61	6.70
1000012	0.00	0.00	0.00	2.64	0.00	0.20
1000013	0.00	0.00	3.25	8.12	0.61	2.43
1000014	0.00	0.00	0.00	5.48	0.00	0.00
1000015	0.00	0.00	0.61	10.35	0.00	2.84
1000016	0.00	0.41	0.00	0.81	0.41	0.20
1000017	0.00	0.00	0.00	0.00	0.20	0.00
1000018	0.00	0.00	0.00	0.20	0.00	0.00
1000019	0.00	0.00	0.00	0.61	0.00	0.20
1000020	0.00	0.00	0.00	0.20	0.00	0.00
1000021	0.00	0.00	0.00	1.01	0.00	0.20
1000022	0.00	0.00	0.00	1.62	0.00	0.00
1000023	0.00	0.00	0.61	2.03	0.00	0.41
1000024	0.00	0.00	0.00	0.00	0.00	0.00
1000025	0.00	0.00	0.00	0.00	0.00	0.00
1000026	0.00	0.00	0.00	0.00	0.00	0.00
1000027	0.00	0.00	9.33	5.28	0.20	13.19
1000028	0.00	0.00	0.00	0.00	0.00	0.41
1000029	0.41	0.00	0.00	0.00	0.20	0.20
1000030	0.00	0.00	0.00	0.41	0.00	0.00
1000031	0.00	0.00	0.00	0.00	0.00	0.00
1000032	0.00	0.00	0.00	0.00	0.00	0.00
1000033	0.00	0.00	0.00	0.00	0.00	0.00
1000034	0.00	0.00	0.00	0.00	0.00	0.00
1000035	0.00	0.00	0.00	0.00	0.00	0.00
1000036	0.00	0.00	0.00	0.00	0.00	0.00
1000037	0.00	0.00	0.00	0.81	0.00	0.00
1000038	0.00	0.00	0.00	0.00	0.00	0.00
1000039	0.00	0.00	0.00	0.00	0.00	0.00
1000040	0.00	0.00	0.00	0.00	0.00	0.00
1000041	0.00	0.00	0.00	0.00	0.00	0.00
1000042	0.00	0.00	0.00	0.20	0.00	0.00
1000043	0.00	0.00	0.00	0.00	0.00	0.00

Aggregate & Disaggregate Tables

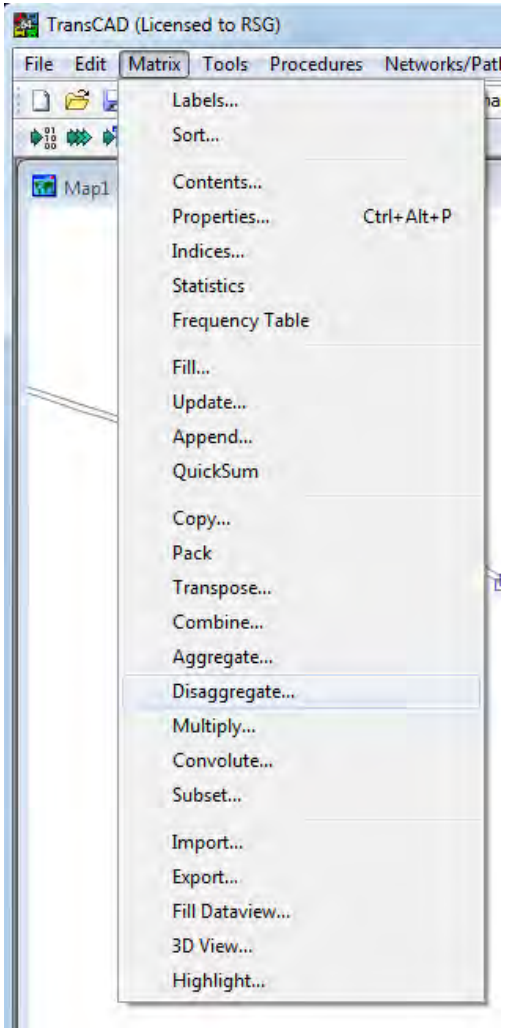


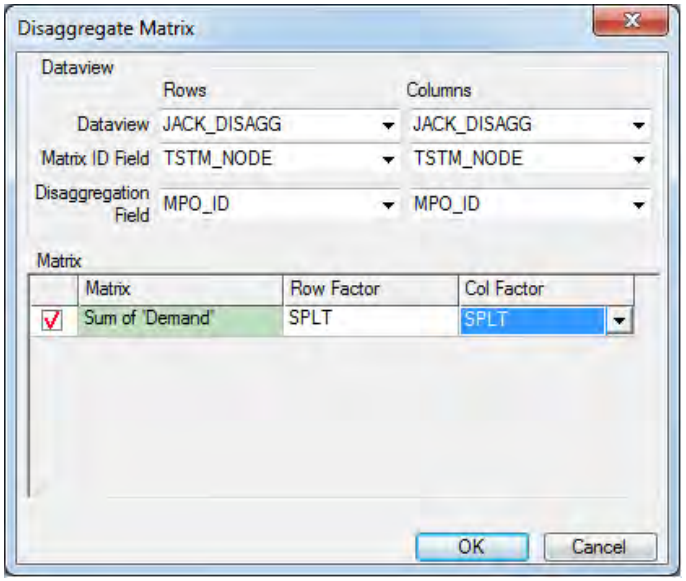
Aggregate Matrix





Disaggregate Matrix





Output ATRI Matrix with MPO IDs

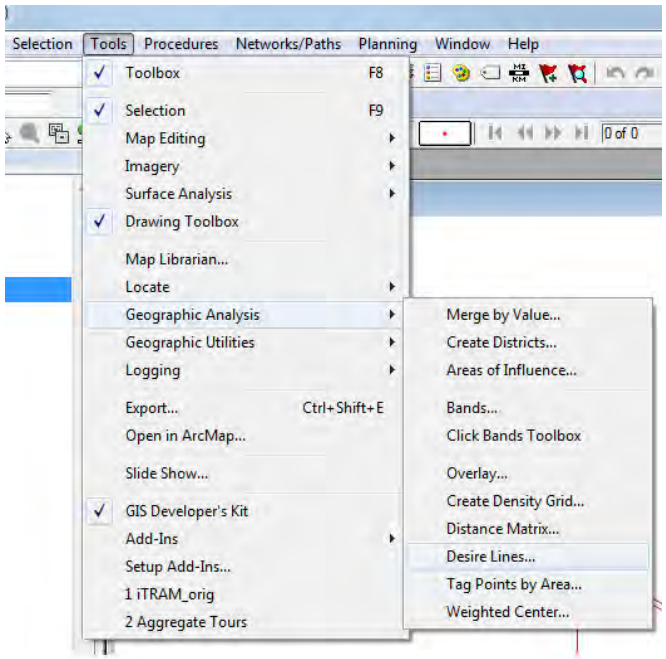
Matrix1 - TSTM Subarea (Demand (ATRI_

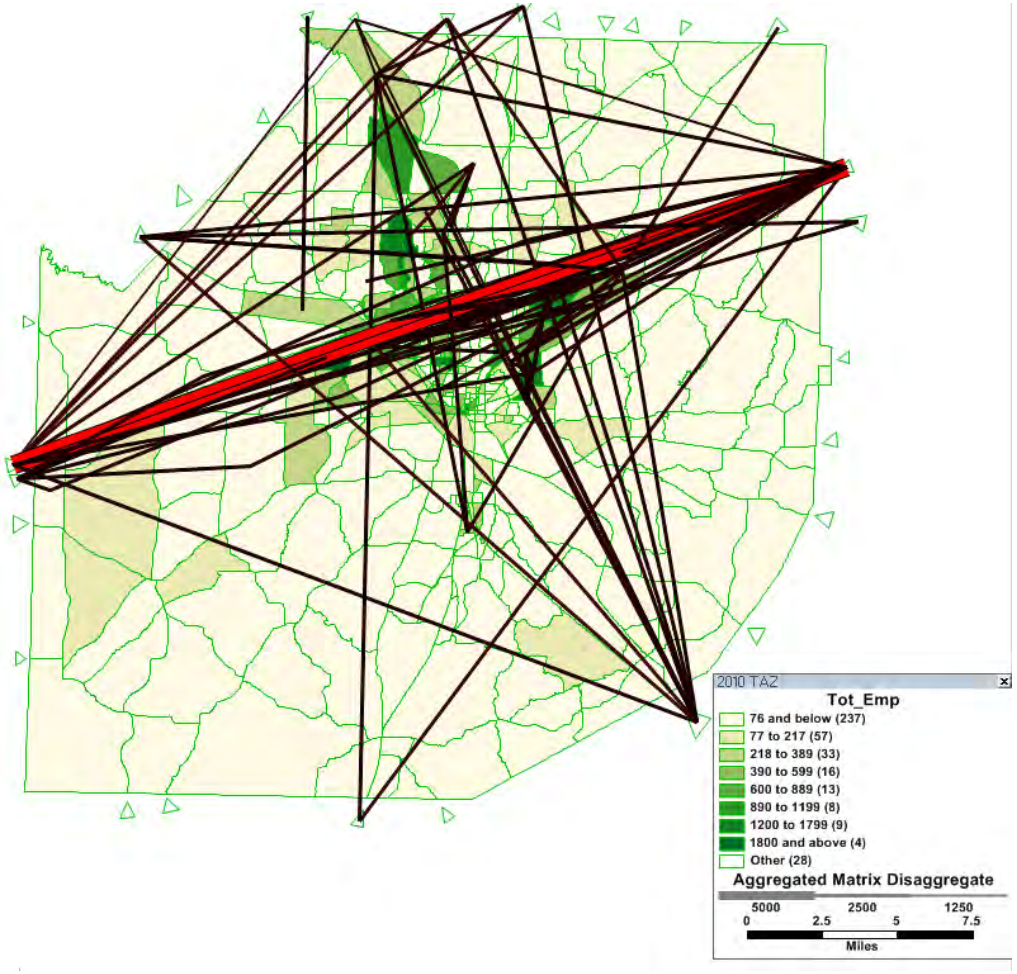
	7215	7284
7215	0.00	0.00
7284	0.00	0.00
7285	0.00	0.00
7352	0.00	0.00
7396	0.00	0.00
7487	0.00	0.00
9100	0.00	0.00
10058	0.00	0.00
10371	0.00	0.00
10380	0.00	0.00
11700	0.00	0.00
13458	0.00	0.00
14703	0.00	0.00
15562	0.00	0.00
16190	0.00	0.00
16215	0.00	0.00
18083	0.00	0.00
19882	0.00	0.00
22783	0.00	0.00
22789	0.00	0.00
24213	0.00	0.00

Matrix2 - Jackson ATRI (Sum of 'Demand

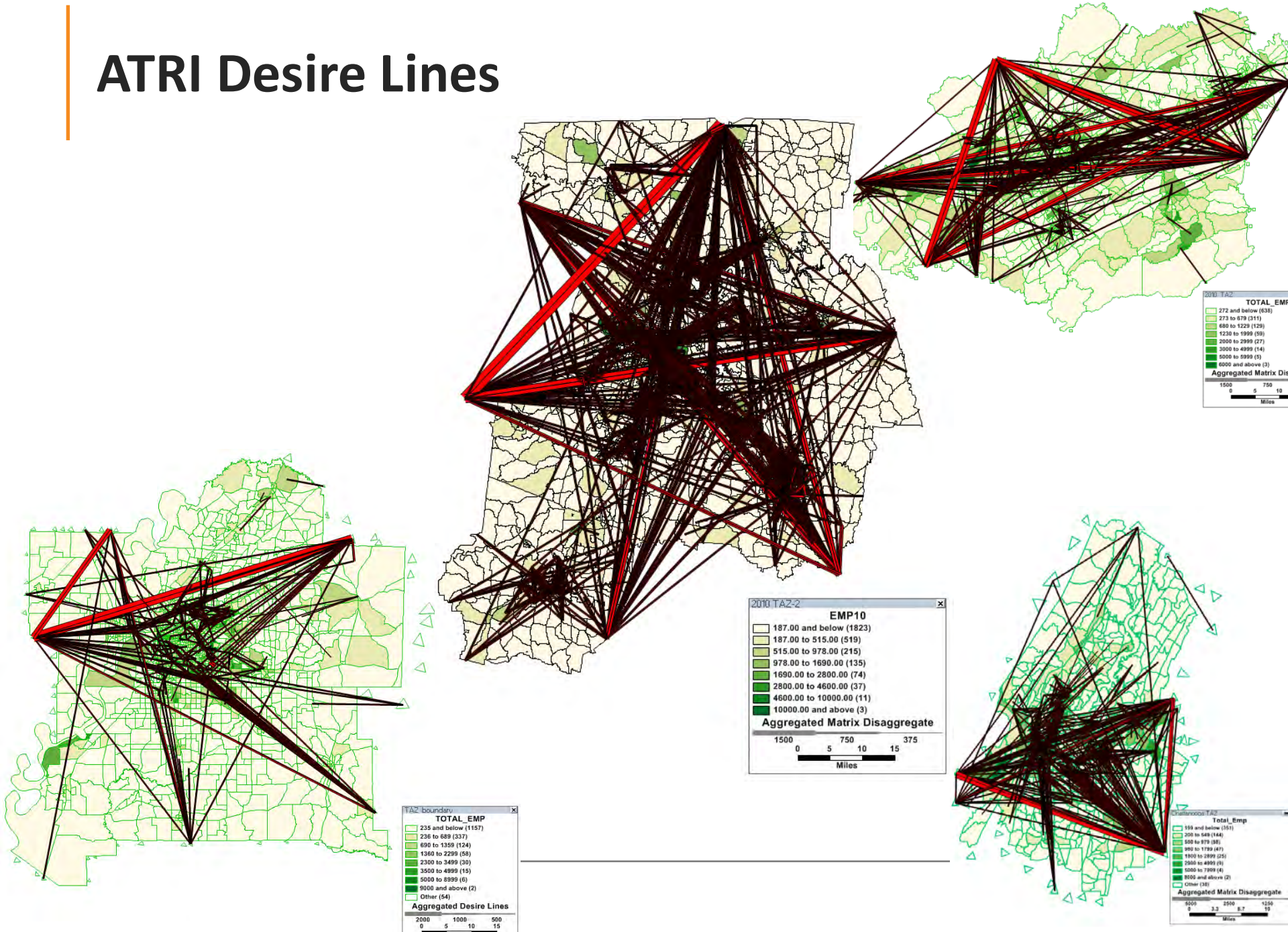
	1	2
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
8	0.00	0.03
9	0.00	0.00
10	0.00	0.02
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00
19	0.00	0.00
21	0.00	0.00
22	0.00	0.03
24	0.00	0.01
25	0.00	0.01

ATRI Desire Lines





ATRI Desire Lines



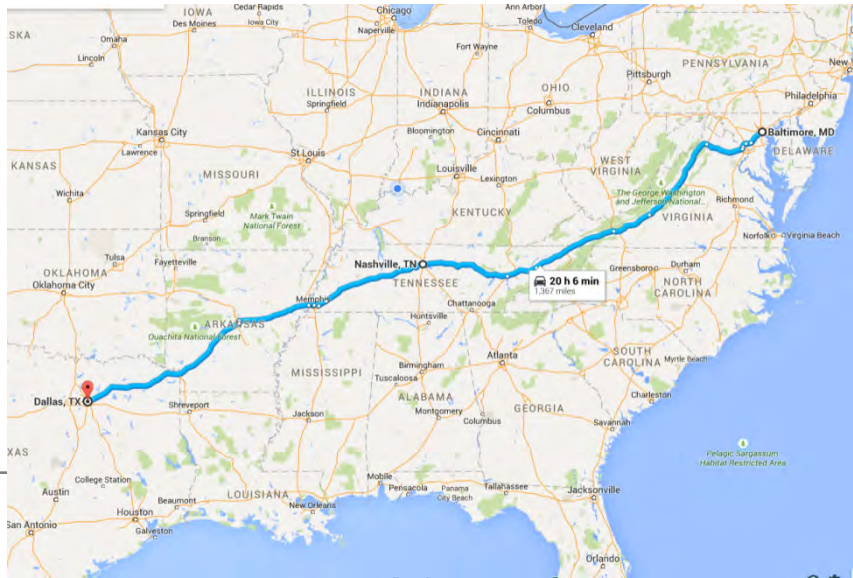
ATRI vs. Transearch and What the Differences Mean

A Trip by Any Other Name…

- Key difference between ATRI & Transearch in how a truck trip is defined
- **Transearch**: truck trip = from where a truck picks up goods to where it delivers them
- **ATRI**: truck trip = from when a truck starts traveling to when it stops for more than a few minutes / at a light

An Example

- A truck picks up goods in Baltimore, drives to Nashville and must take an hours of service break and rest for several hours, then continues on and delivers goods in Dallas
- Transearch sees one trip from Baltimore to Dallas
- ATRI sees two trips, one from Baltimore to Nashville, one from Nashville to Dallas
- For Nashville, this means
  1 EE trip vs. 2 EI/IE trips



Which is right?

- Good News – both trip tables will produce nearly identical truck loadings on the network (assuming the only difference is trip definition)
  - Neither is right / wrong in this sense
- One difference – ATRI will give better (higher) truck volumes on ramps

- Only challenge is using the two together

What it means for you

- If you use static truck trip tables or a truck-based (QFRM style) model for trucks, you can just use the ATRI data directly
  - either as a static truck trip table (frataring for the future) or
  - to update/re-estimate your truck models or
  - use your models to pivot off of the ATRI base year trip table

What it means for you

- If you have a commodity flow-based model you may need to carefully consider how best to wed this with/incorporate ATRI data.
  - You may still be able to use commodity flow-based growth to pivot off a base year ATRI trip table. This should produce reasonable network flows, but the trip table will have trips using both definitions.
  - You could alternatively process your commodity flow trip table to add intermediate stops. This will produce a consistent trip table but would introduce complexity and could introduce error.

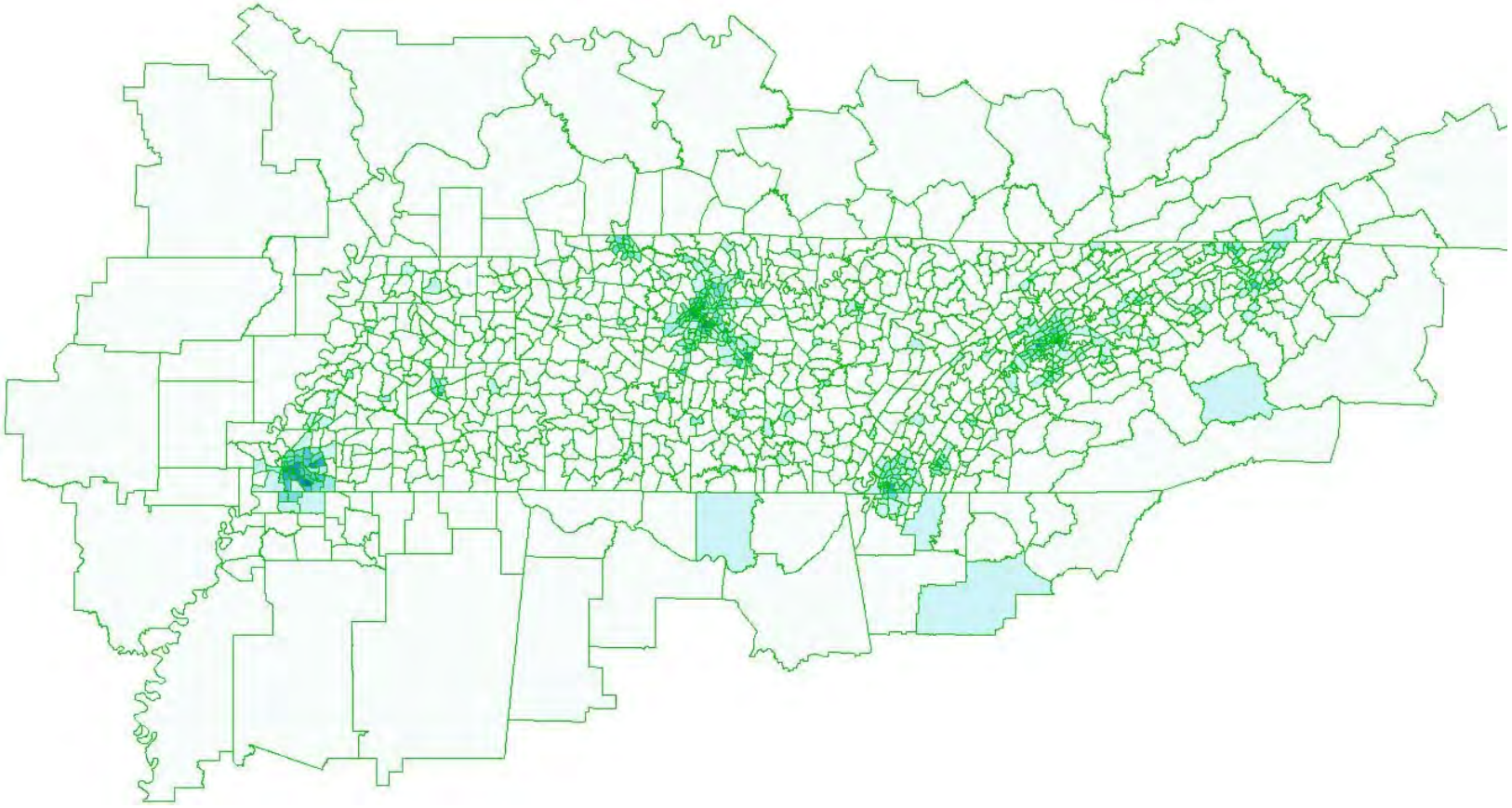
One Other Note – Frataring to Externals

- You may want to fratar your ATRI truck trip table to match your external station truck counts exactly. As delivered the trip table should generally be close but won't match exactly, if there are any significant differences, frataring could produce a likely more accurate trip table and better loadings.

Update on Phase 3

AirSage Districts

- Developed Districts for AirSage data
  - 1223 total, 1092 in TN; ~ 3:1 vs TAZ

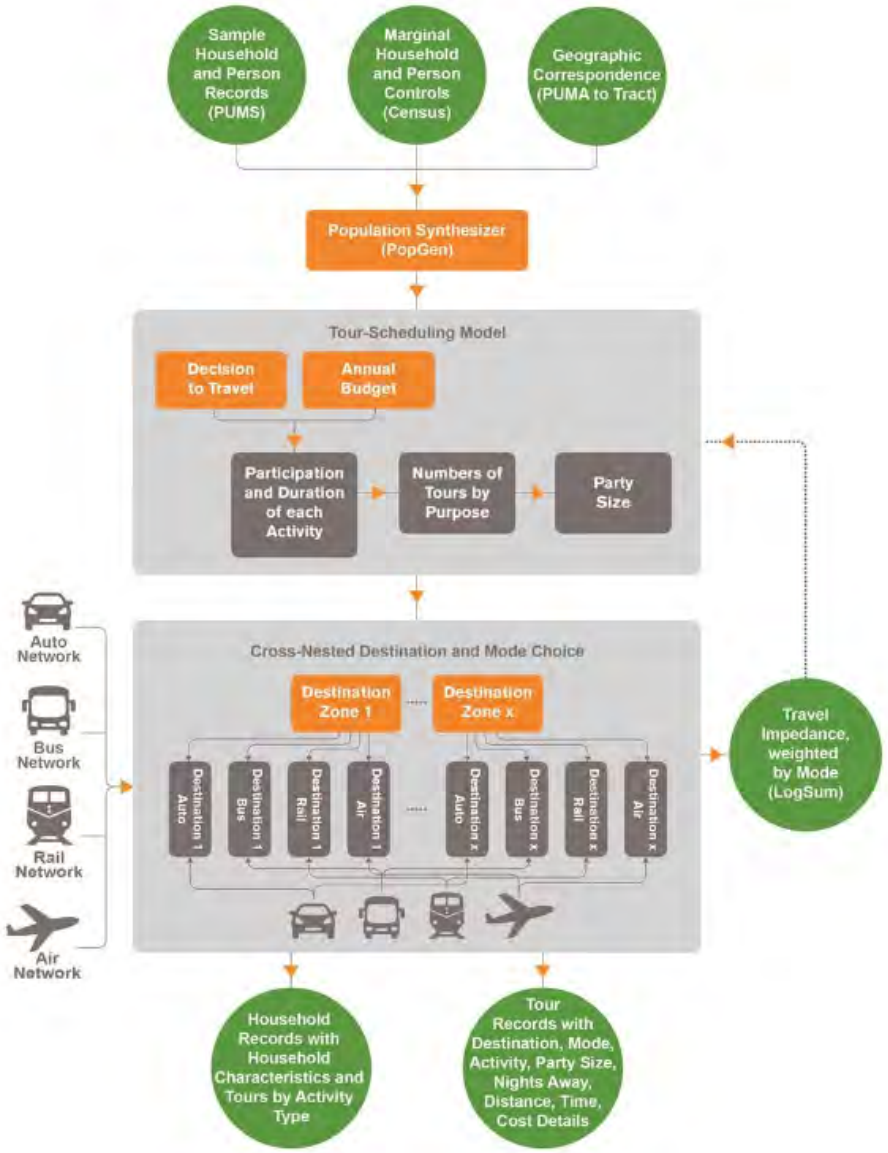


AirSage Evaluation

- Will test AirSage expansion
- Probably August

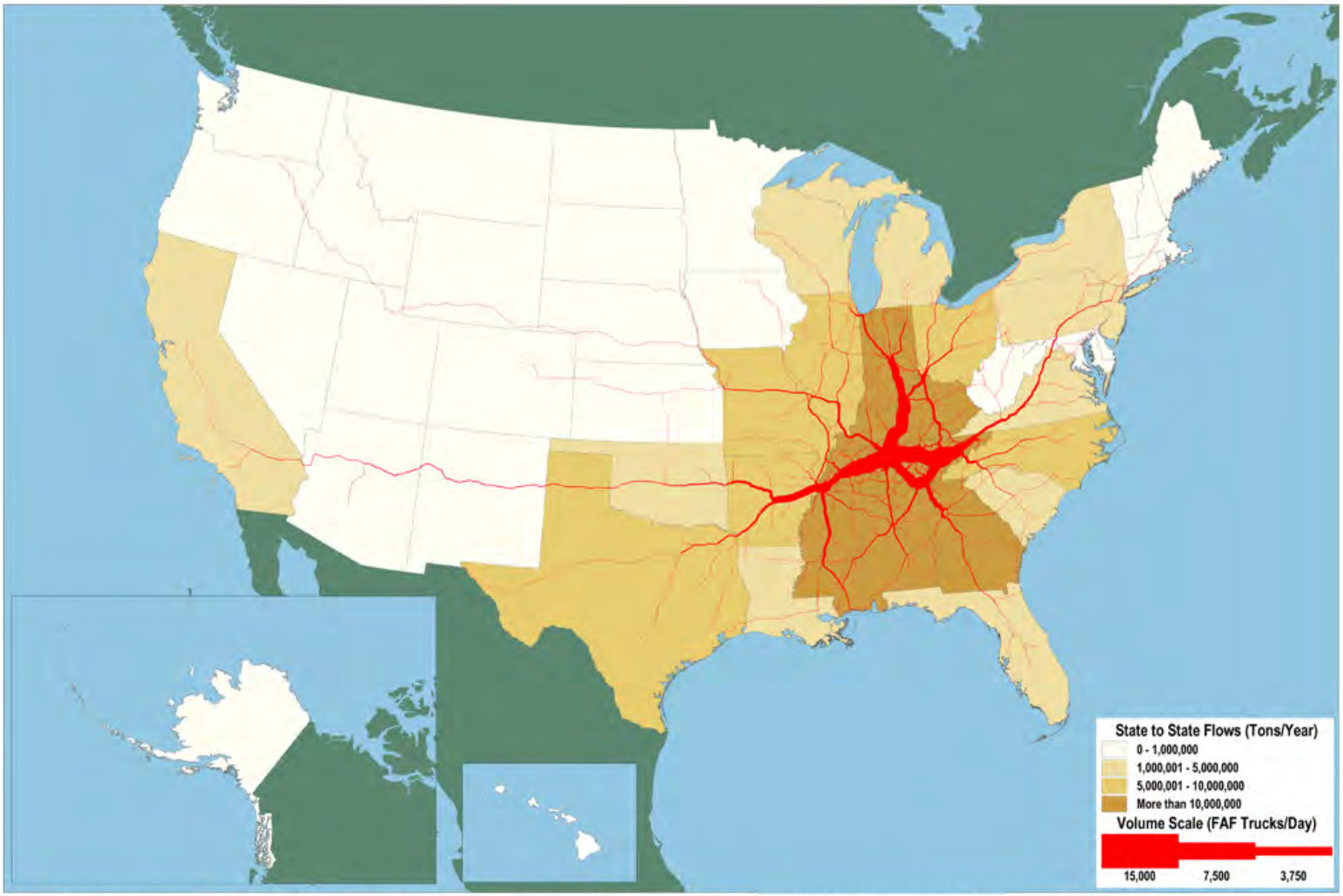
National Long Distance Model Integration

- Pivot off of AirSage-based base year long distance trip table using FHWA's new National Long Distance Passenger Travel Demand Model



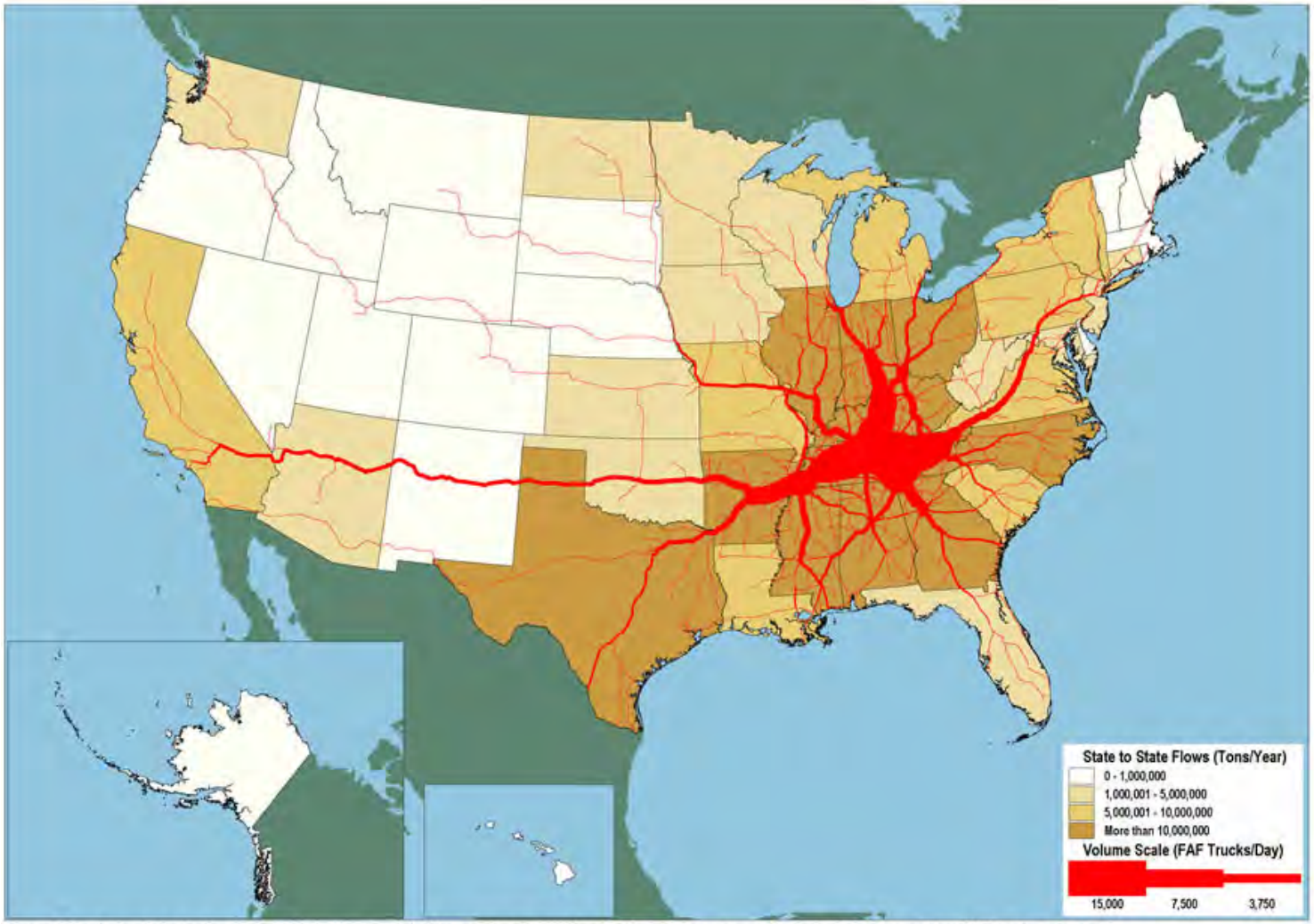
Update on Freight Models

Major Flows by Truck (FAF - to/from/within TN, 2010)



Note: Major flows include domestic and international freight moving by truck on highway segments with more than twenty five FAF trucks per day and between places typically more than fifty miles apart.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 3.4, 2012.

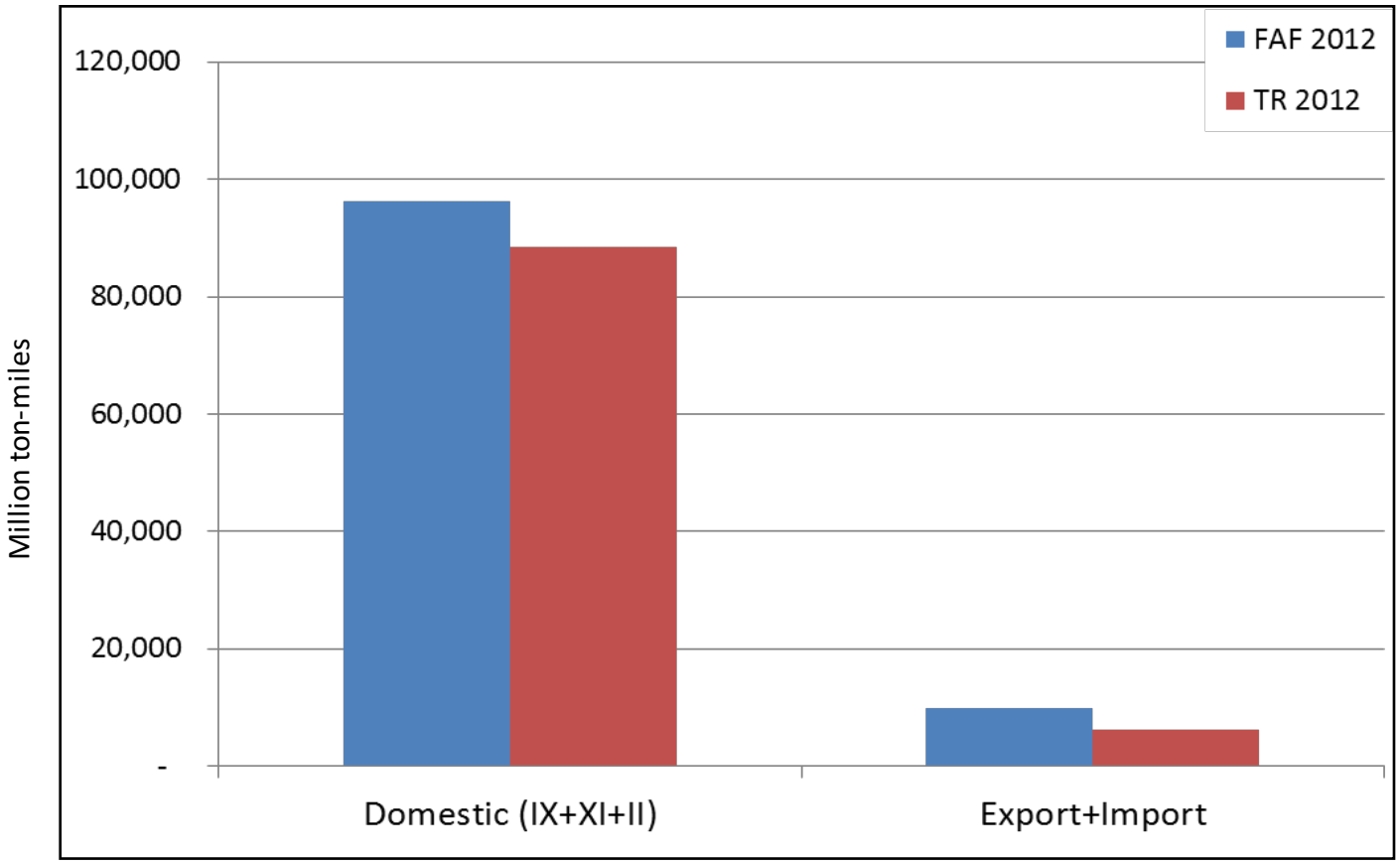
Major Flows by Truck (FAF - to/from/within TN, 2040)



Note: Major flows include domestic and international freight moving by truck on highway segments with more than twenty five FAF trucks per day and between places typically more than fifty miles apart.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 3.1.2, 2011.

Truck Ton-miles, FAF vs. Transearch 2012

domestic vs. foreign movements

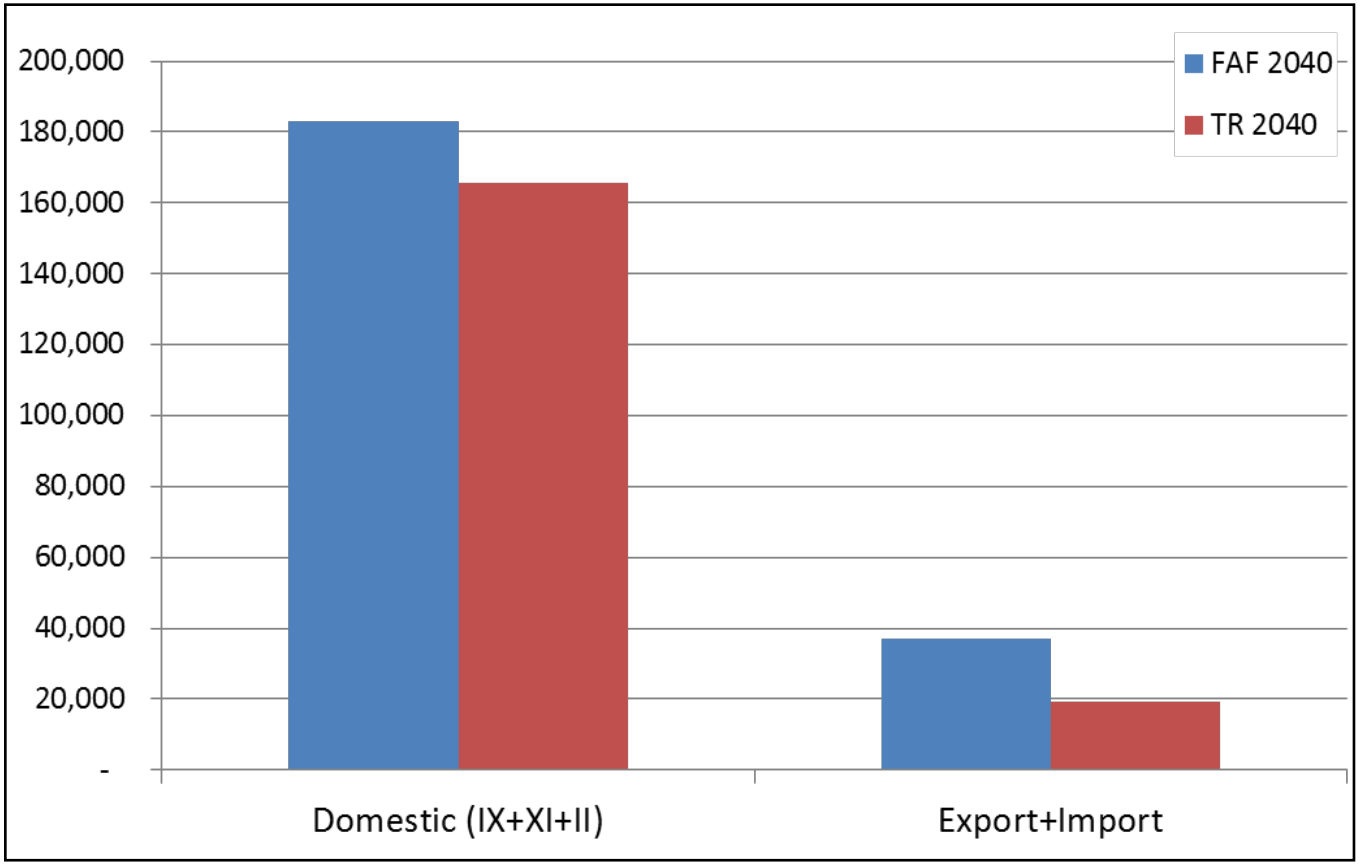


II: Internal – Internal (Domestic)
IXD: Internal – External (Domestic)
XID: External – Internal (Domestic)
Ex: Export
Im: Import

Note: FAF data includes Truck, Rail, Water and Air (excludes "Multiple Modes, Pipeline and Unknown modes) and Transearch includes Truck, Rail, Water and Air

Truck Ton-miles, FAF vs. Transearch 2040

domestic vs. foreign movements



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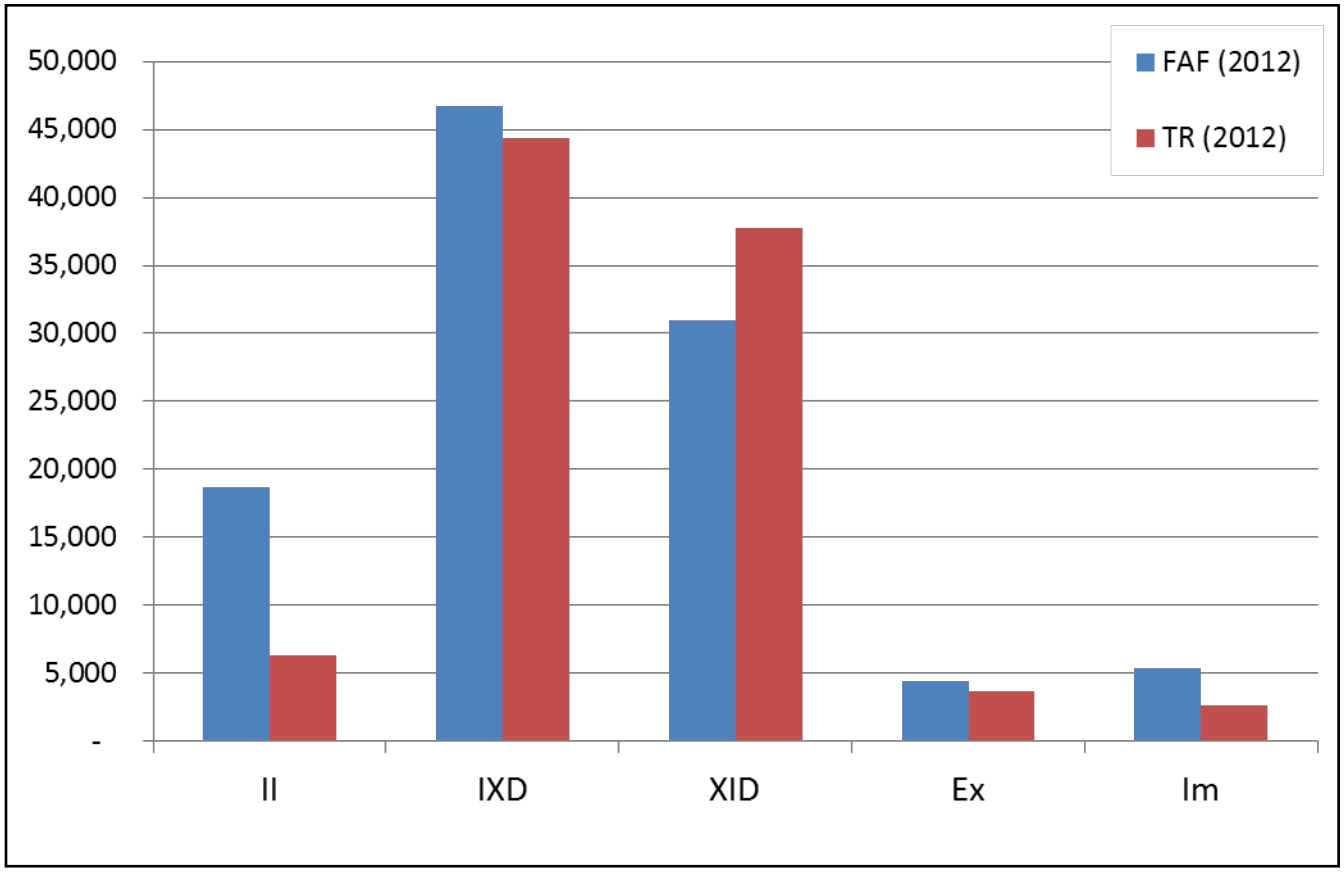
Truck Ton-miles, FAF vs. Transearch 2012

by segment

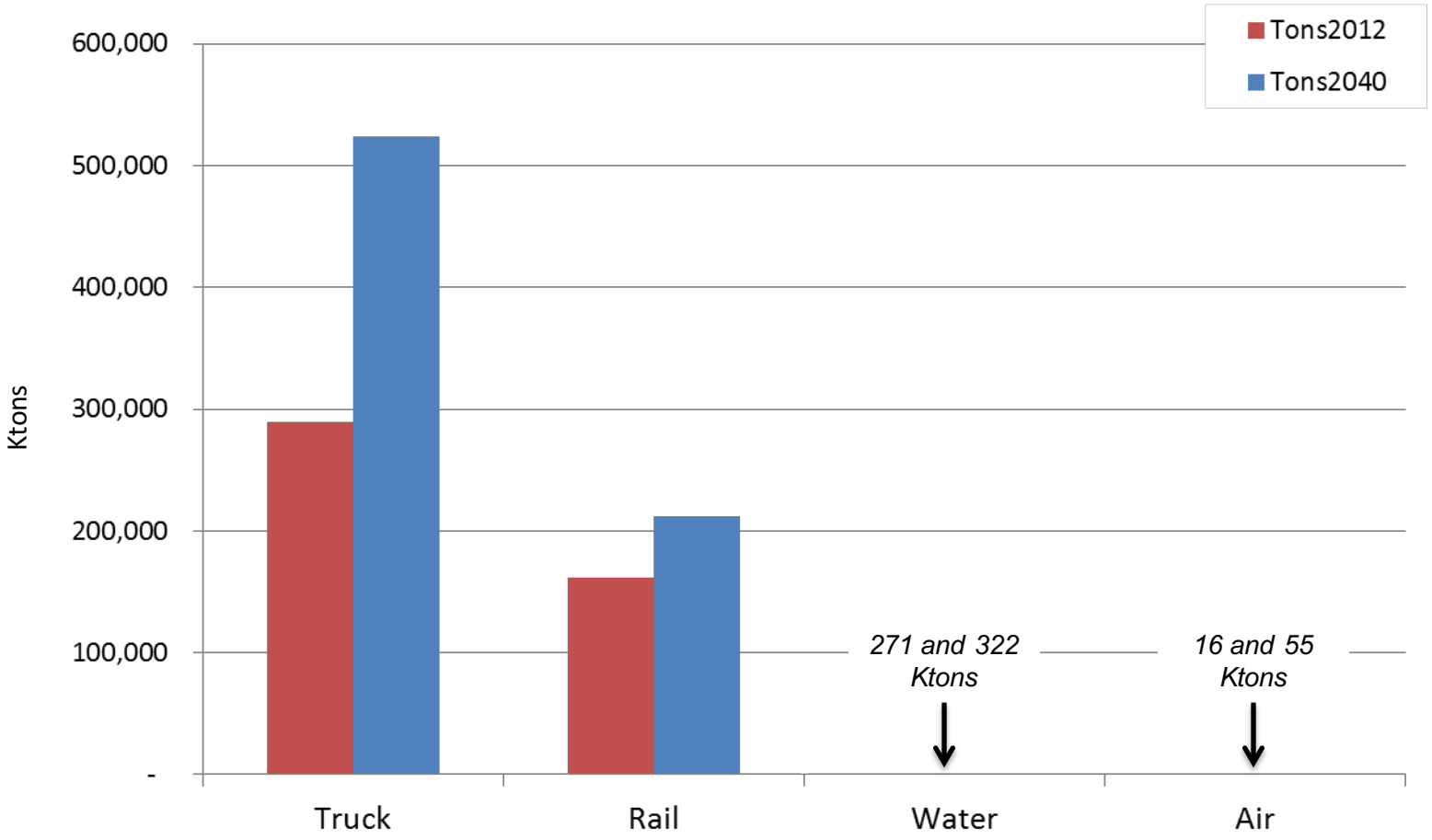


II: Internal – Internal (Domestic)
IXD: Internal – External (Domestic)
XID: External – Internal (Domestic)
Ex: Export
Im: Import

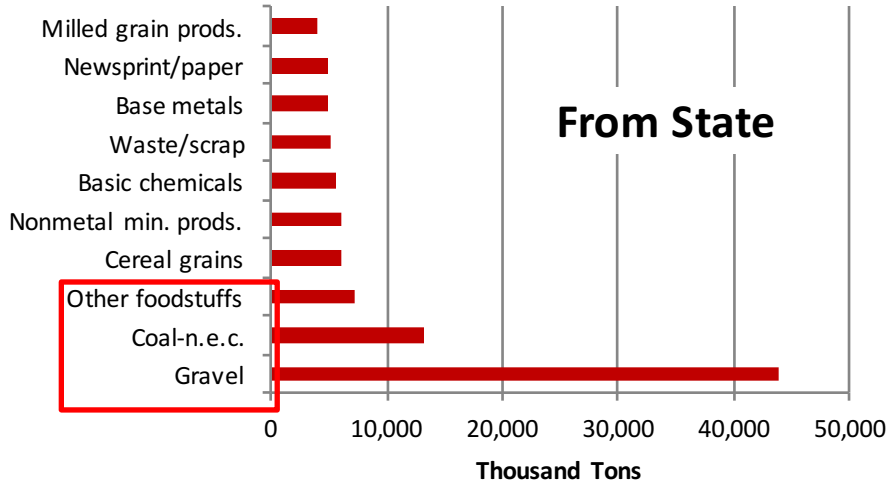
Note: FAF data includes Truck, Rail, Water and Air (excludes "Multiple Modes, Pipeline and Unknown modes) and Transearch includes Truck, Rail, Water and Air

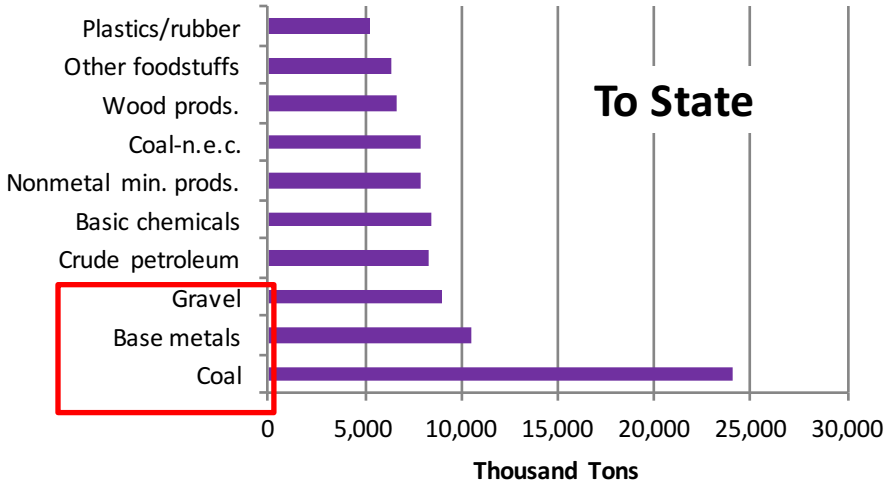
Transearch Through Movements 2012 and 2040

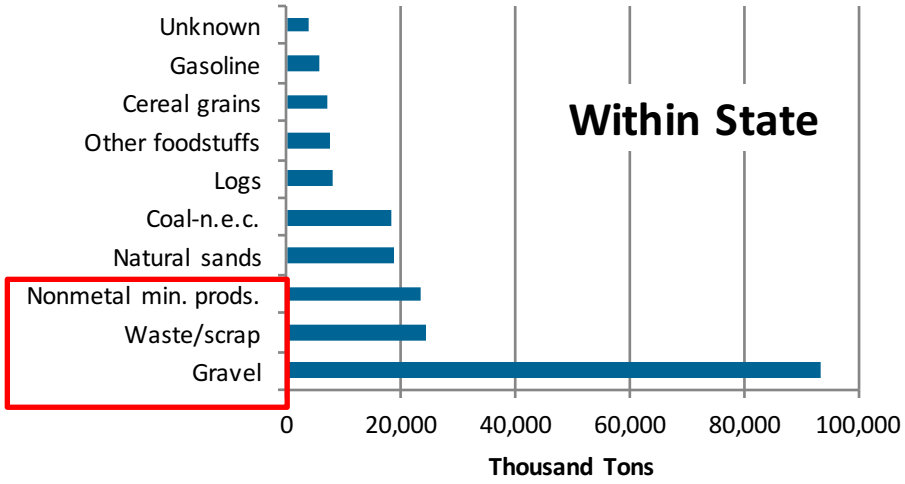
by mode



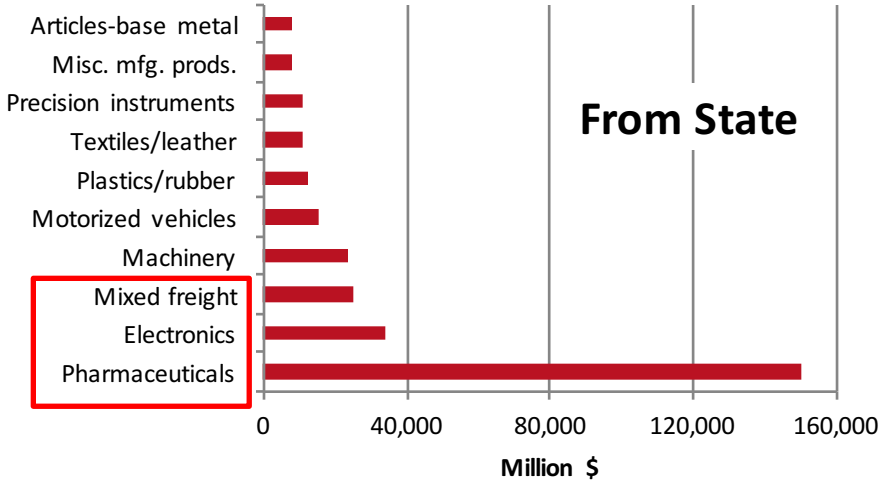
TN State Top Commodities (FAF 2012 by tons)

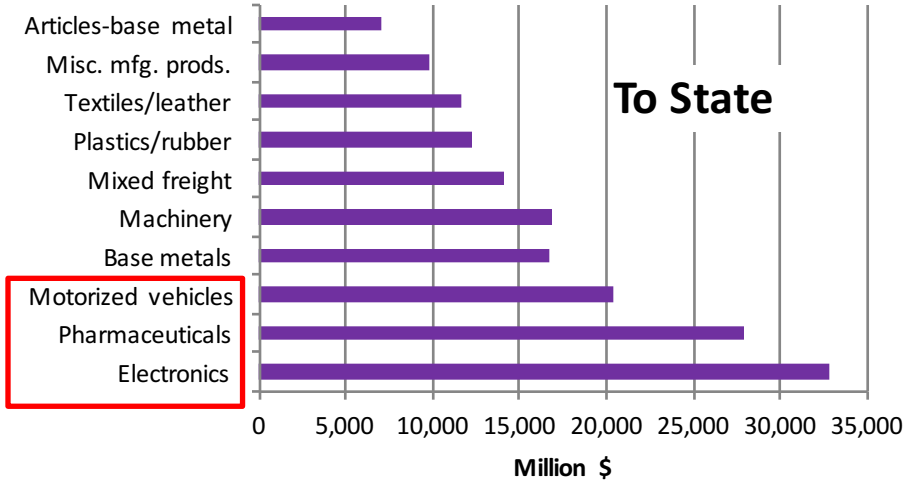


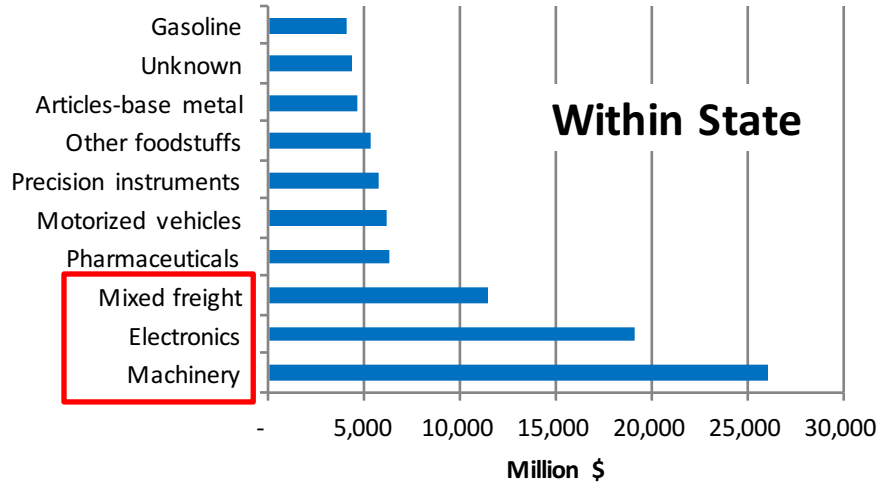




TN State Top Commodities (FAF 2012 by value)





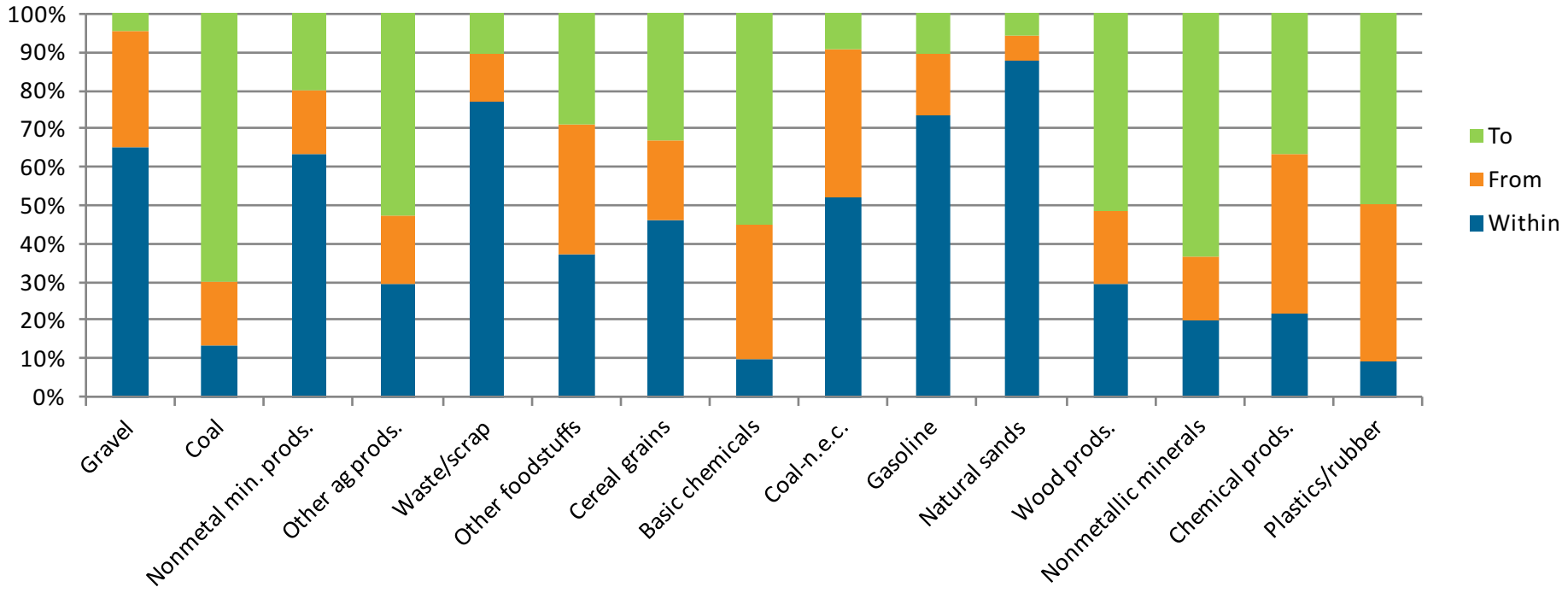


Growth Comparison (2012 – 2040)

Growth (%)	FAF	TR
II	47%	76%
IXD	114%	43%
XID	53%	83%
Ex	274%	187%
Im	227%	113%
avg growth	*143%*	*100%*

Top Commodities Movement (to/from/within TN)

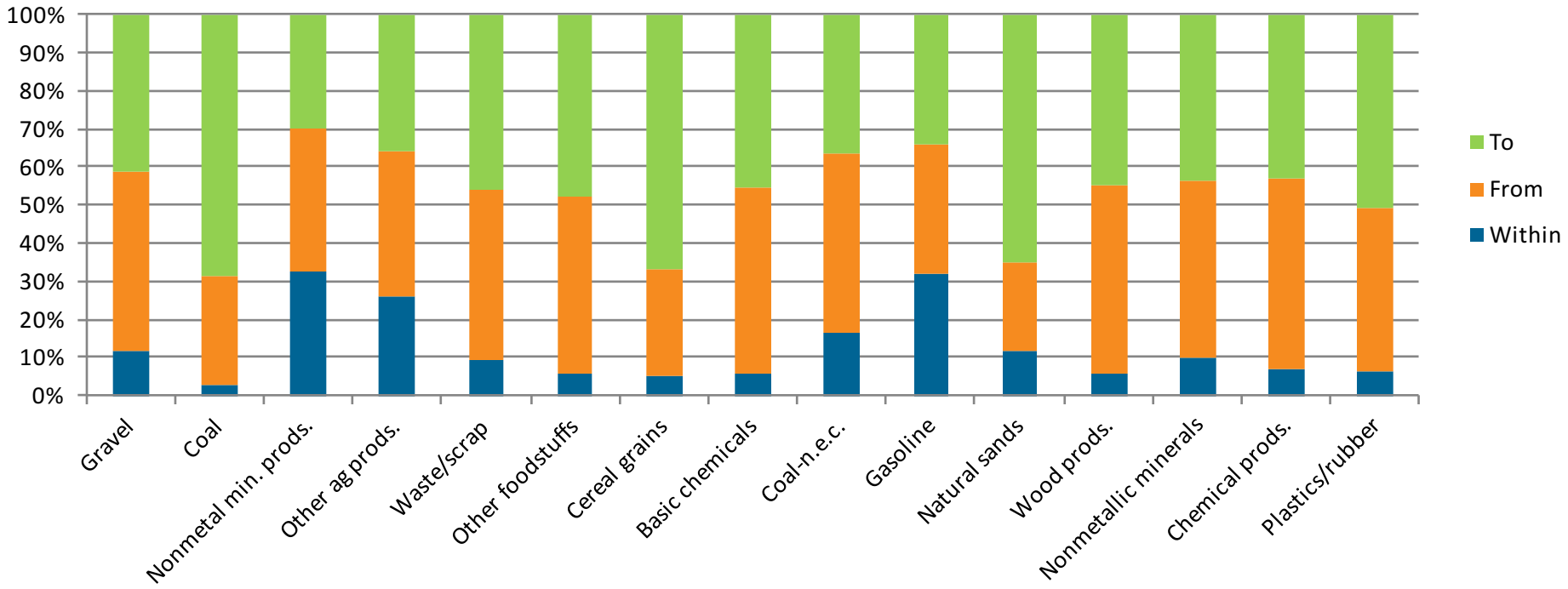
FAF data



- *About %90 of Natural Sands and %65 of Gravel are moving within the state*
- *More than %80 of Waste/scrap move within the state*
- *More than %40 of Chemical Products and Plastic/rubber move from the region*

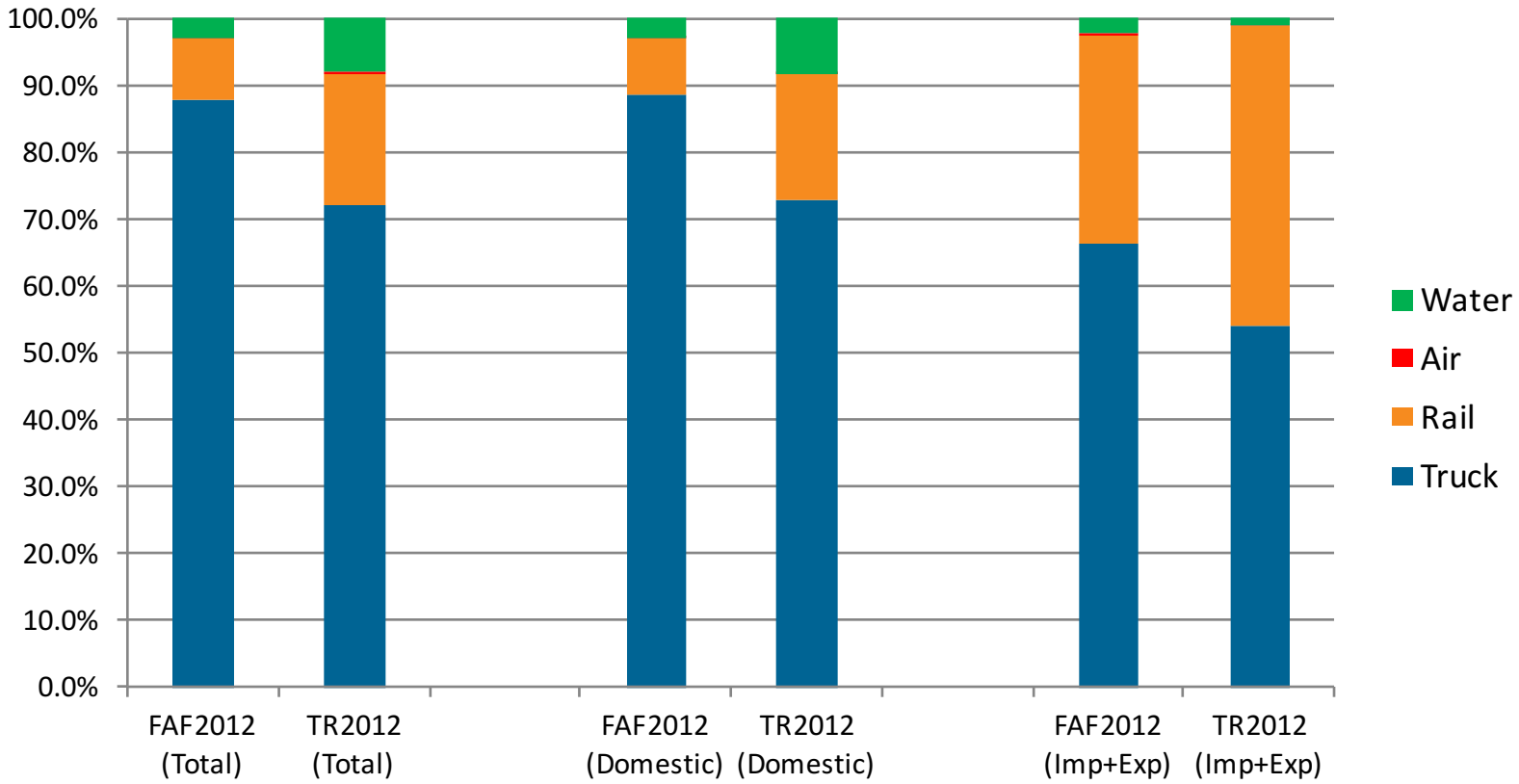
Top Commodities Movement (to/from/within TN)

Transearch data



- *Very different from FAF data distributions*
- *Basic Chemicals, Chemical Products and Gravel mostly move to/from the state (~%50)*
- *About %70 of the Coal, Cereal Grains and Natural Sands are moving to the state*

Mode Shares FAF vs. Transearch (by tons)



Transearch Through Movements 2012

Top commodities by tons

XXD (domestic through movements)

Commodity Group	Tons (Ktons)	Value (million $)
Coal	54,531	1,997
Gravel	48,366	465
Other foodstuffs	20,343	21,406
Other ag prods.	18,103	11,998
Cereal grains	14,941	2,866

XXIE (import/export through movements)

Commodity Group	Tons (Ktons)	Value (million $)
Coal	7,047	258
Other ag prods.	5,943	3,861
Base metals	4,036	14,146
Coal-n.e.c.	3,153	2,341
Plastics/rubber	2,912	9,108

Transearch Through Movements 2040

Top commodities by tons

XXD (domestic through movements)

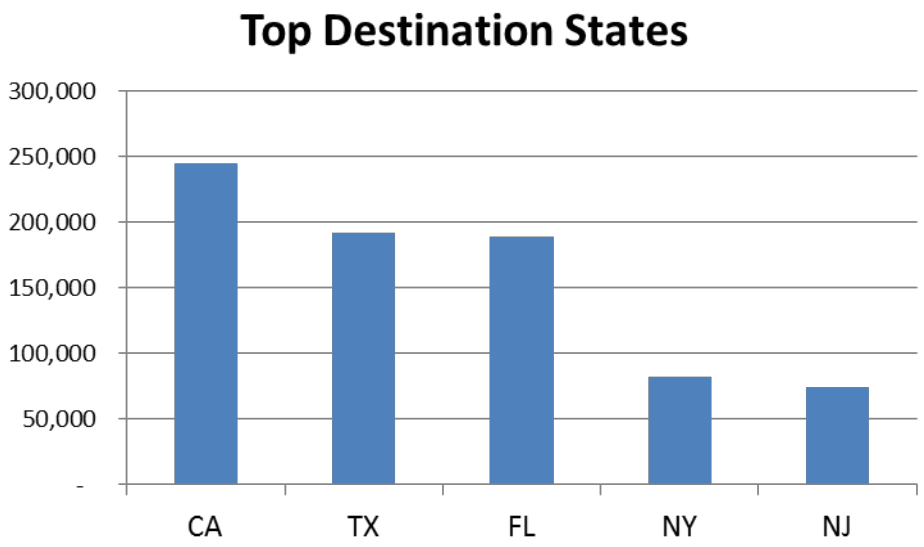
Commodity Group	Tons (Ktons)	Value (million $)
Gravel	83,718	825
Coal	34,671	1,272
Other foodstuffs	31,482	33,354
Plastics/rubber	25,509	76,132
Other ag prods.	24,273	15,190

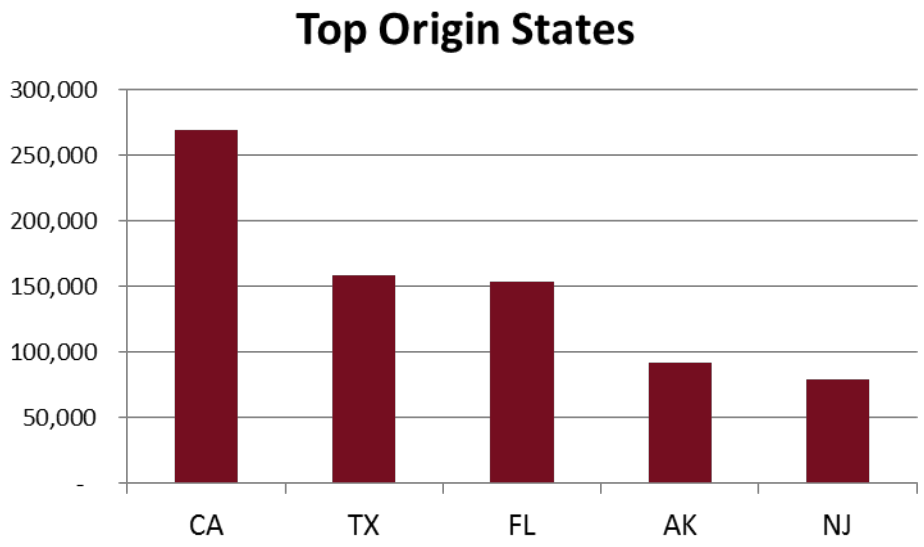
XXIE (import/export through movements)

Commodity Group	Tons (Ktons)	Value (million $)
Other ag prods.	22,194	13,972
Plastics/rubber	10,056	31,907
Coal	8,468	311
Base metals	8,052	21,600
Basic chemicals	7,618	12,983

T-100 Air Data

Air freight tons to and from TN





- *Main destinations for air freight (CA, TX, FL, NY and NJ) accounting for about %35 of all IX tons*
- *Main origins for air freight (CA, TX, FL, AK and NJ) accounting for about %37 of all XI tons*
- *Memphis airport (MEM) handles about 98% of all air freight tons (TYS and BNA each about 1%, and MQY about 1% of foreign tons)*
- *About 45% of MEM international import tons coming in from Asia and about 60% of export tons going to Canada and Mexico*

Commodity Flow Models

- Continue generation model development
  - Equations being estimated for all 43 SCTG commodity for production and consumption using Transearch
  - Using some advanced outlier-detection methods (Cook's Distance) & robust regression
- Assignment test of Transearch/FAF distributions
  - Requires completion & use of generation models
  - Hope to begin early August
  - Will determine form of distribution models and how Transearch and FAF datasets will be used, but will still have to make decision about growth

Update on Passenger Models

Passenger Models

- Continue trip generation model development (July)
- Resume work on destination choice models (late July)
- Begin simple mode choice model development (August)

Highway Network

- Delayed by Steve Trevino's paternity leave & waiting on data (INRIX)
- Status of INRIX data?
- Need to get grade signs & vertical clearance from TRIMS – want to use latest – how to request/obtain?
- Also, need auxiliary lanes from TDOT

Trip Generation Estimation

- Estimating trip generation equations from combined NHTS/MPO HH survey data
- Using discrete regression models

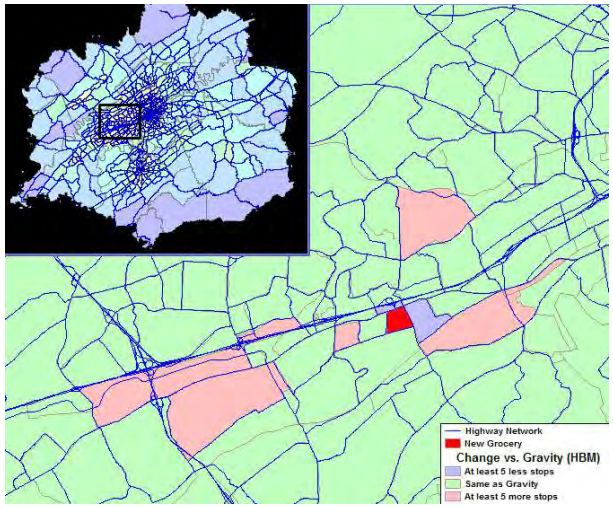
$$T_P = \sum_n \beta_1 x_{1n} + \sum_m \beta_2 x_{2m}$$

- Allows diminishing returns (ln transforms) & interaction terms (joint distributions)
- Avoid aggregation bias & population synthesis
- Modeling distribution of explanatory variables
  - Based on mean/median
  - Testing distributional assumptions – Poisson, negative binomial, etc.

Destination Choice Models

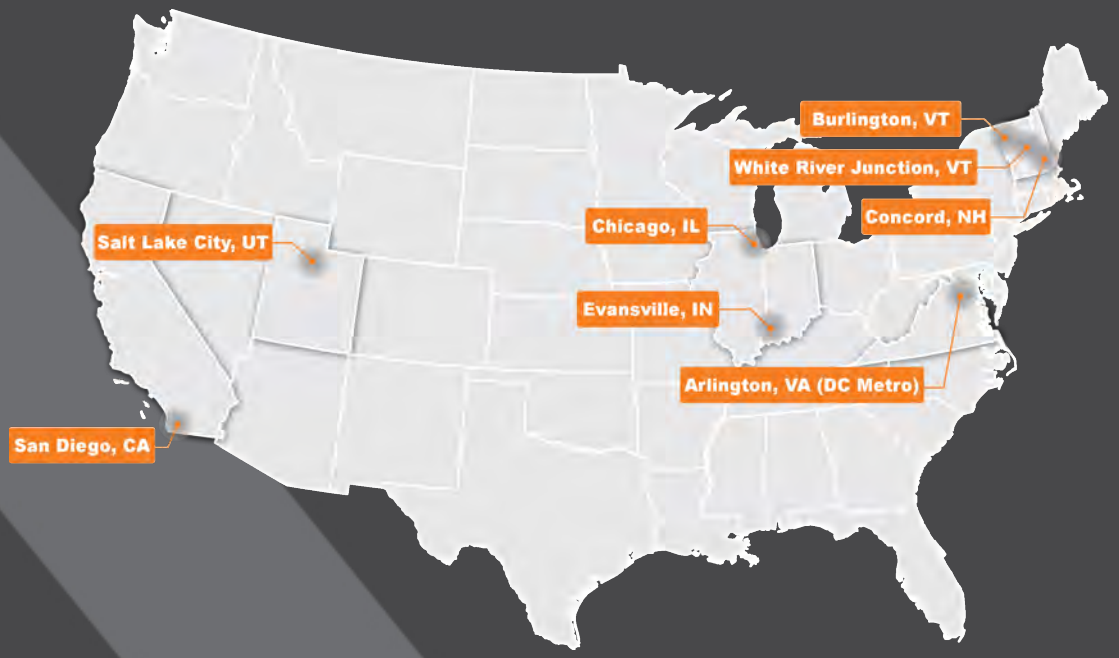
Account for More Factors

- Number of Attractions
- Travel Time / Impedance
- Effect of Residence Location on Willingness to Travel
- Psychological Boundaries
  - River Crossings
  - Ridgeline Crossings
  - Major Highway Crossings
  - State / County Line Crossings
- Walkability of Destination
- Mixture of Land Uses at Destination
- Convenience for Trip-Chaining
- Spatial Auto-correlation Effects



Trip Chaining in Knoxville

Fewer, Longer Rural Trips
More, Shorter Urban Trips



Contact

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Statewide Model Update Project Manager

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812.200.2351

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