NRPC Travel Demand Model

NRPC Commission Meeting

March 2010

What is “the model”?

- *Travel demand forecasting and planning tool*
- *Representation of the region*
- *TransCad – model software with GIS components*
- *Data-intensive*
- *Uses*
  - *State transportation planning process*
  - *Air quality analysis*
  - *Local and regional projects*
  - *Innovative planning ideas*

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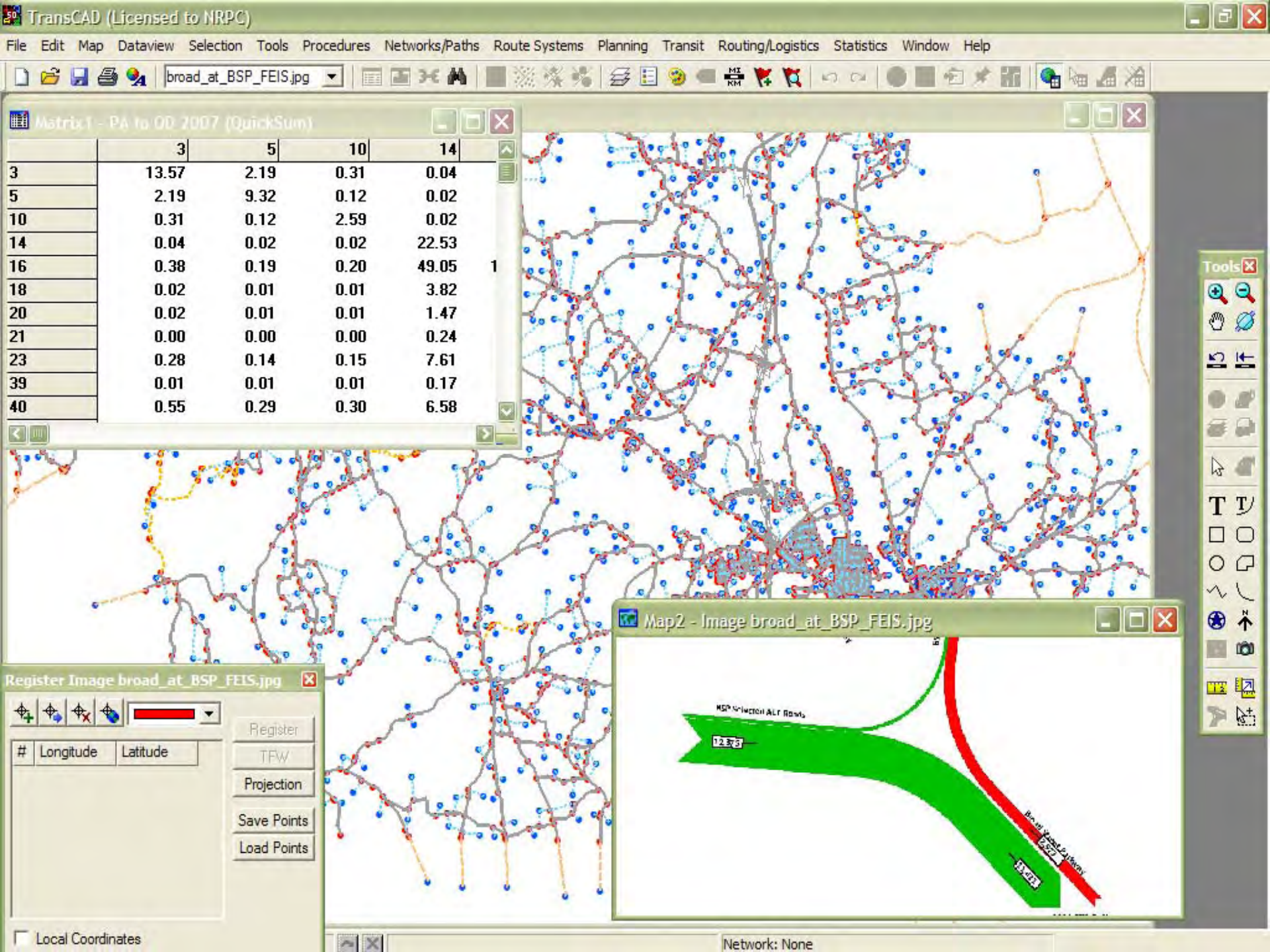
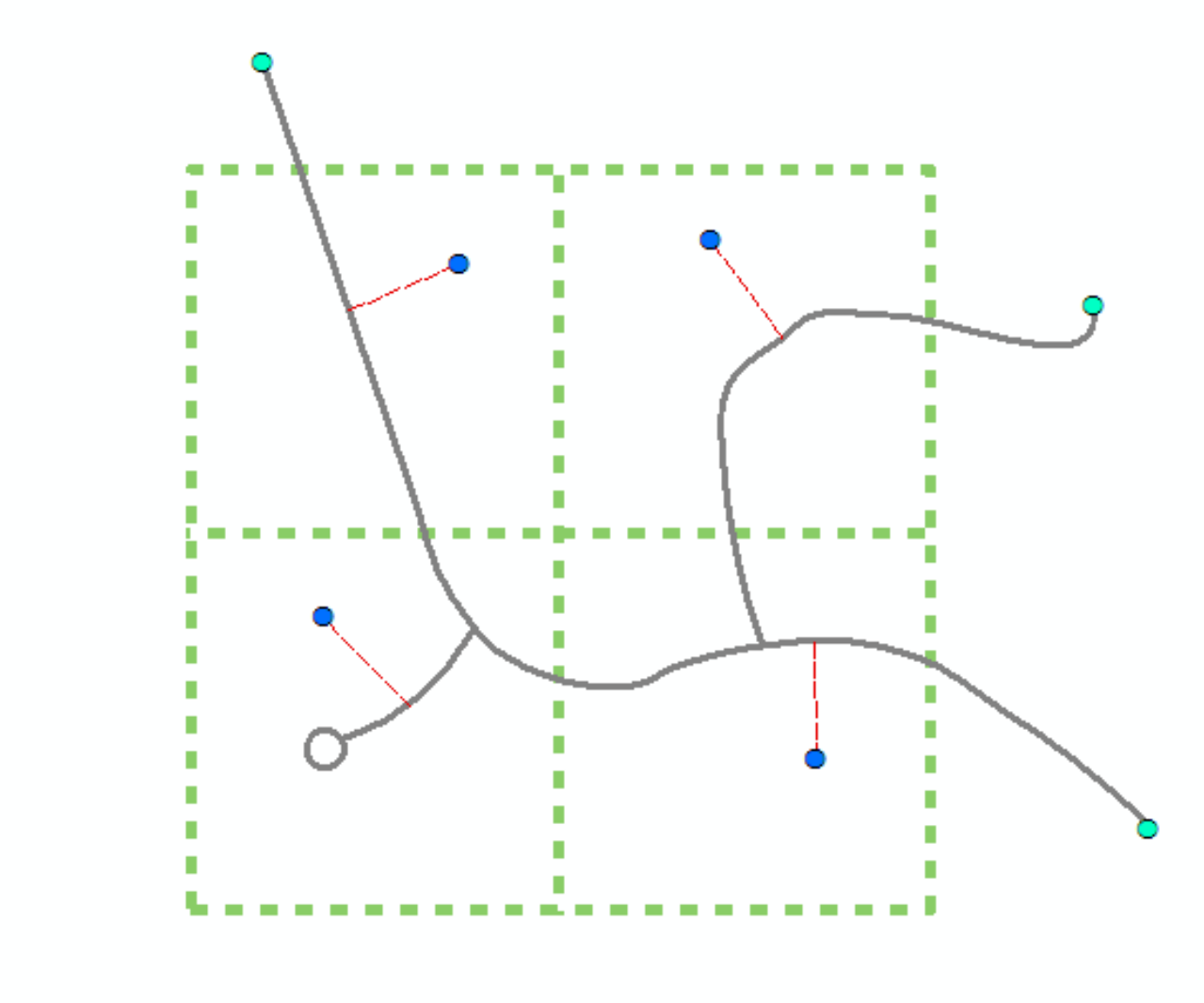

TransCAD (Licensed to NRPC)
File Edit Map Dataview Selection Tools Procedures Networks/Paths Route Systems Planning Transit Routing/Logistics Statistics Window Help
broad_at_BSP_FEIS.jpg
Matrix1 - PA to OD 2007 (QuickSum)
3 5 10 14
3 13.57 2.19 0.31 0.04
5 2.19 9.32 0.12 0.02
10 0.31 0.12 2.59 0.02
14 0.04 0.02 0.02 22.53
16 0.38 0.19 0.20 49.05
18 0.02 0.01 0.01 3.82
20 0.02 0.01 0.01 1.47
21 0.00 0.00 0.00 0.24
23 0.28 0.14 0.15 7.61
39 0.01 0.01 0.01 0.17
40 0.55 0.29 0.30 6.58
Tools
Map2 - Image broad_at_BSP_FEIS.jpg
Register Image broad_at_BSP_FEIS.jpg
Register
TFW
Projection
Save Points
Load Points
Longitude Latitude
Local Coordinates
Network: None

Basic Model Components

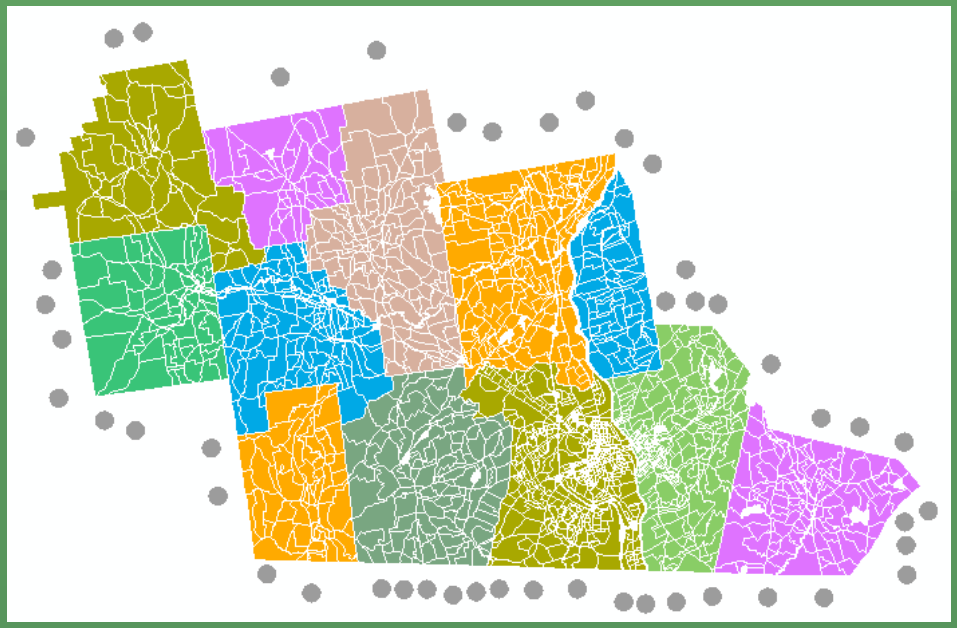
- *Traffic Analysis Zones (TAZs)*
- *Road network*
- *Input data*

Basic Model Components



NRPC's Model

- *TAZs*
  - *2,034 total zones*
  - *Extremely detailed in most non-rural areas*
  - *Homogenous land uses and road access*
  - *Built from disaggregated census geography*
  - *Special zones for certain uses*



NRPC's Model

- *Road Network*
  - *834 miles of public roads*
  - *Nearly every thru-road in region*
  - *Important driveways*
  - *Future connections*

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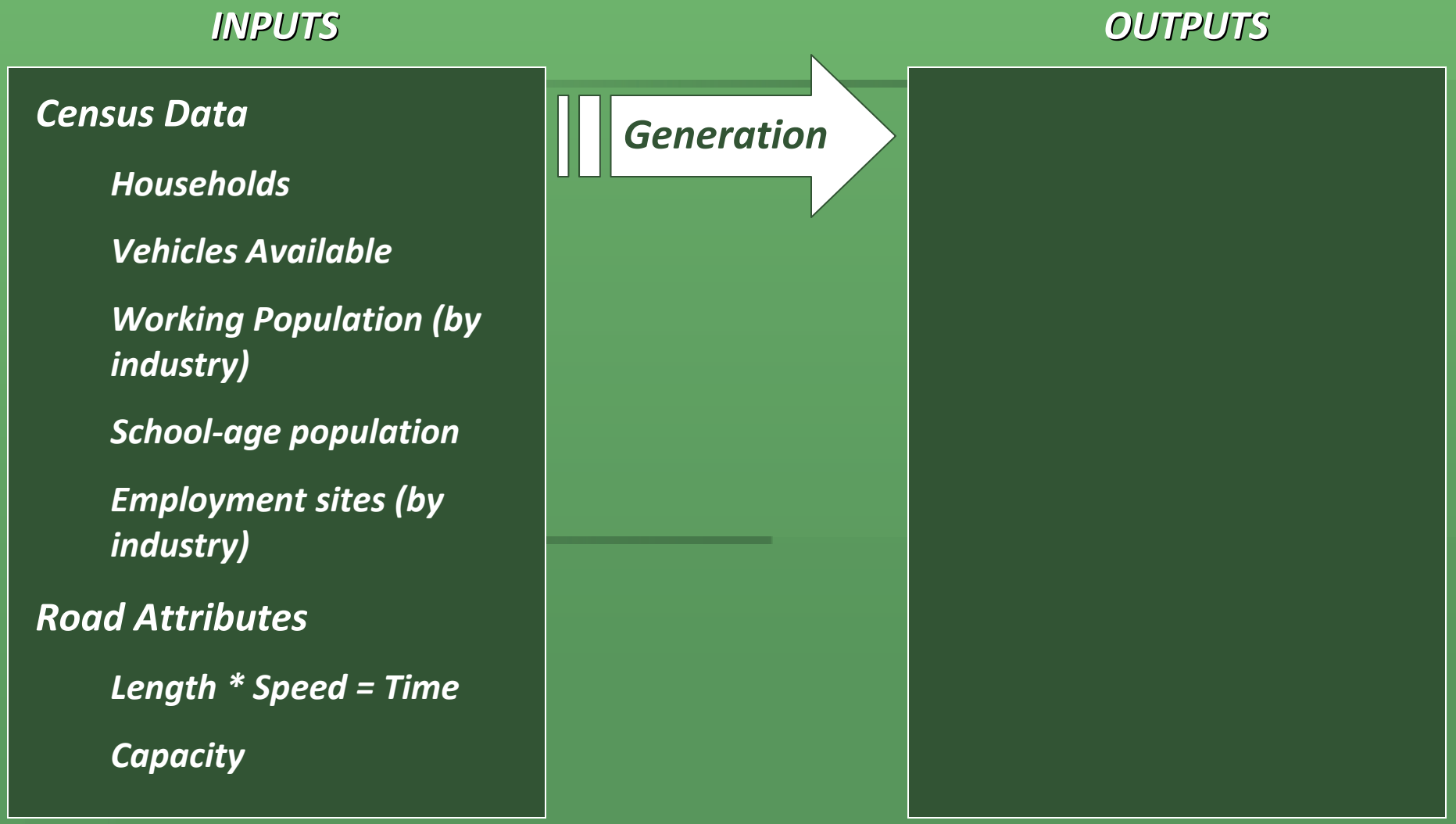
NRPC's Model – Road Attributes

- *Length*
- *Speed*
- *Capacity*
  - *Lanes*
  - *Median*
  - *Access Control*
  - *Environment*

Level of Service D, 24 Hour Capacity Table

	Rural	Suburban	Urban	CBD
Access Controlled				
Two Lane (no median)	17400	17400	15000	15000
Two Lane (median)	22500	22500	19550	19550
Four Lane	70000	70000	70000	70000
Six Lane	109000	109000	109000	109000
Eight Lane	144250	144250	144250	144250
Ramp (one lane)	26000	26000	25800	22500
Ramp (two lane)	32900	32900	32000	30000
Non-Access Controlled (median)				
Six Lane	51600	50800	47500	40000
Four Lane	35000	34100	31600	27500
Two Lane	17500	17000	15800	13500
Non-Access Controlled (no median)				
Six Lane	50800	49100	46500	38000
Four Lane	34100	33300	30000	25800
Two Lane	17000	16600	15000	12500
Non-Access Controlled (center lane)				
Six Lane	53800	51900	49000	40000
Four Lane	37200	36250	30000	27000
Two Lane	20200	19500	15000	15000
One Way				
Three Lanes	25400	24600	24500	20500
Two Lanes	17000	16600	15000	14000
One Lane	8500	8300	7500	7000
Unbalanced				
Three lanes	25400	25000	22500	19000

Modeling Process



Running the Model – Trip Generation

- *How many trips produced or attracted in each zone?*
- *Based on standard equations, rates, and surveys*
- *3 trip purposes*
  - *Home-Based Work (HBW)*
  - *Home-Based Other (HBO)*
  - *Non-Home-Based (NHB)*
- *End result – total trips in and out of each zone*

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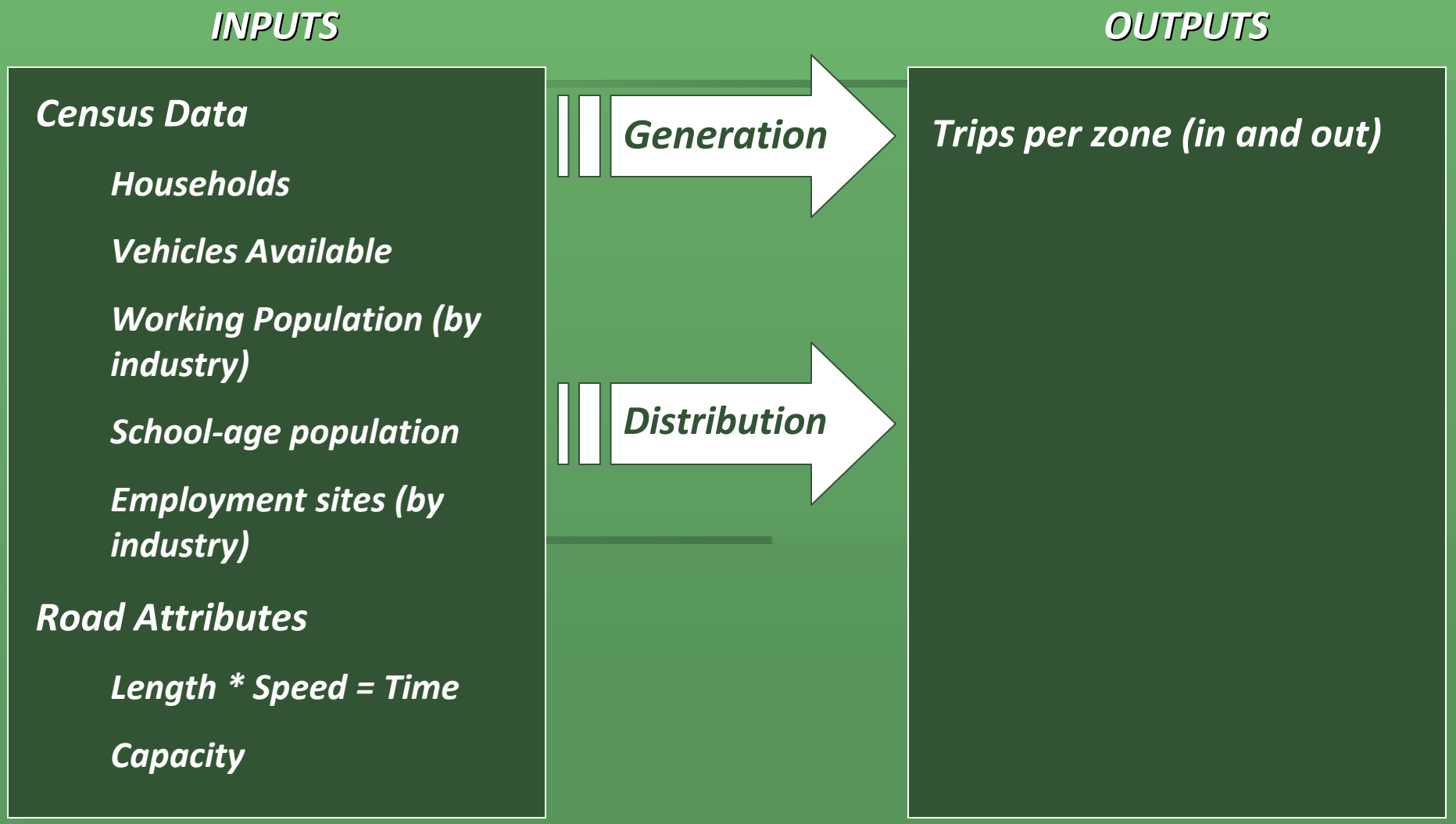
Modeling Process



Running the Model – Trip Distribution

- *Where is each trip most likely to go?*
- *Matching up trips by purpose*
- *"Friction factor" tables*
- *Convert person trips to vehicle trips*
- *Separate method for schools*

- *End result – total zone-to-zone trip matrix*

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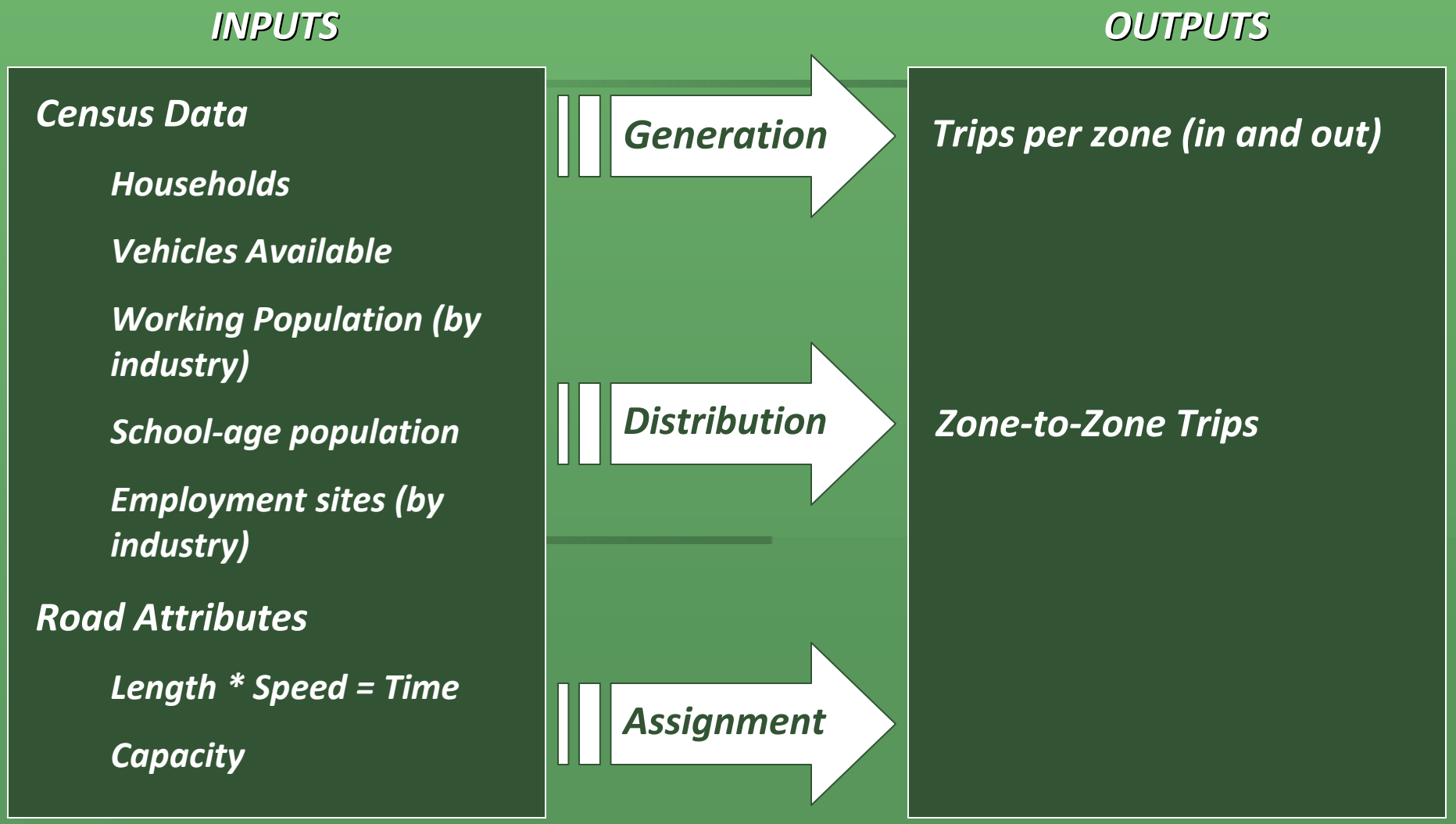
Matrix1 - Gravity Matrix (QuickSum)

	3372	3373	3375	3377	3383	3388	3390	3393	3398	3400	3401
3370	3.32	21.82	1.04	0.05	21.00	23.95	2.18	2.55	0.26	11.78	6.89
3372	4.74	2.88	0.31	0.02	17.42	20.22	1.92	2.24	0.21	10.45	5.70
3373	4.67	12.55	1.46	0.04	28.29	33.63	3.43	4.04	0.36	11.43	5.91
3375	0.90	2.73	5.97	0.03	11.92	9.53	0.83	1.46	0.10	4.37	2.89
3377	0.03	0.05	0.01	0.83	2.99	3.70	0.29	0.33	0.07	1.61	1.00
3383	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3388	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3390	0.02	0.01	0.00	0.00	20.76	22.91	1.55	1.72	0.26	8.55	5.94
3393	0.00	0.00	0.00	0.00	1.89	0.47	0.13	0.15	0.01	0.72	0.17
3398	0.01	0.01	0.00	0.00	4.81	5.13	1.48	1.69	0.26	1.82	0.65
3400	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3401	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3403	0.12	0.17	0.02	0.07	43.65	49.36	7.64	3.61	5.90	17.11	7.37
3406	0.19	0.18	0.03	0.07	38.33	43.71	12.57	6.04	2.30	27.86	12.37
3409	0.34	0.56	0.16	1.36	35.85	28.40	3.92	2.94	0.68	13.62	8.41
3411	0.06	0.10	0.02	0.31	8.05	9.06	0.89	0.67	0.26	3.04	1.88
3419	0.27	0.26	0.05	0.23	49.19	55.80	6.74	7.68	2.82	19.26	15.81
3422	0.05	0.05	0.01	0.06	13.61	9.49	1.85	1.13	0.33	5.26	2.69
3424	0.08	0.09	0.02	0.10	20.96	14.75	2.94	1.76	0.49	8.67	4.16
3431	0.40	0.56	0.60	0.10	9.42	8.17	0.86	1.00	0.15	3.52	2.42
3432	0.06	0.12	0.03	0.02	1.70	1.88	0.17	0.21	0.05	0.66	0.61
3436	1.04	1.52	2.60	0.25	16.23	20.13	1.62	1.90	0.39	6.58	3.67
3442	0.08	0.13	0.33	0.01	1.41	1.15	0.10	0.16	0.02	0.52	0.35
3444	0.29	0.42	0.72	0.07	4.41	4.31	0.44	0.52	0.08	1.80	1.00
3445	0.41	0.53	0.61	0.14	10.79	10.08	1.02	0.93	0.17	4.43	2.84
3446	0.02	0.03	0.02	0.00	0.64	0.88	0.06	0.07	0.01	0.30	0.20
3447	0.31	0.37	0.30	0.07	7.67	8.06	0.69	0.78	0.11	3.63	2.48
3448	0.49	0.61	0.42	0.13	10.17	12.31	0.95	1.13	0.20	4.31	2.90
3449	0.08	0.09	0.07	0.02	1.69	2.03	0.16	0.19	0.03	0.92	0.63
3450	0.03	0.04	0.03	0.01	1.44	1.49	0.13	0.15	0.03	0.52	0.48

Modeling Process



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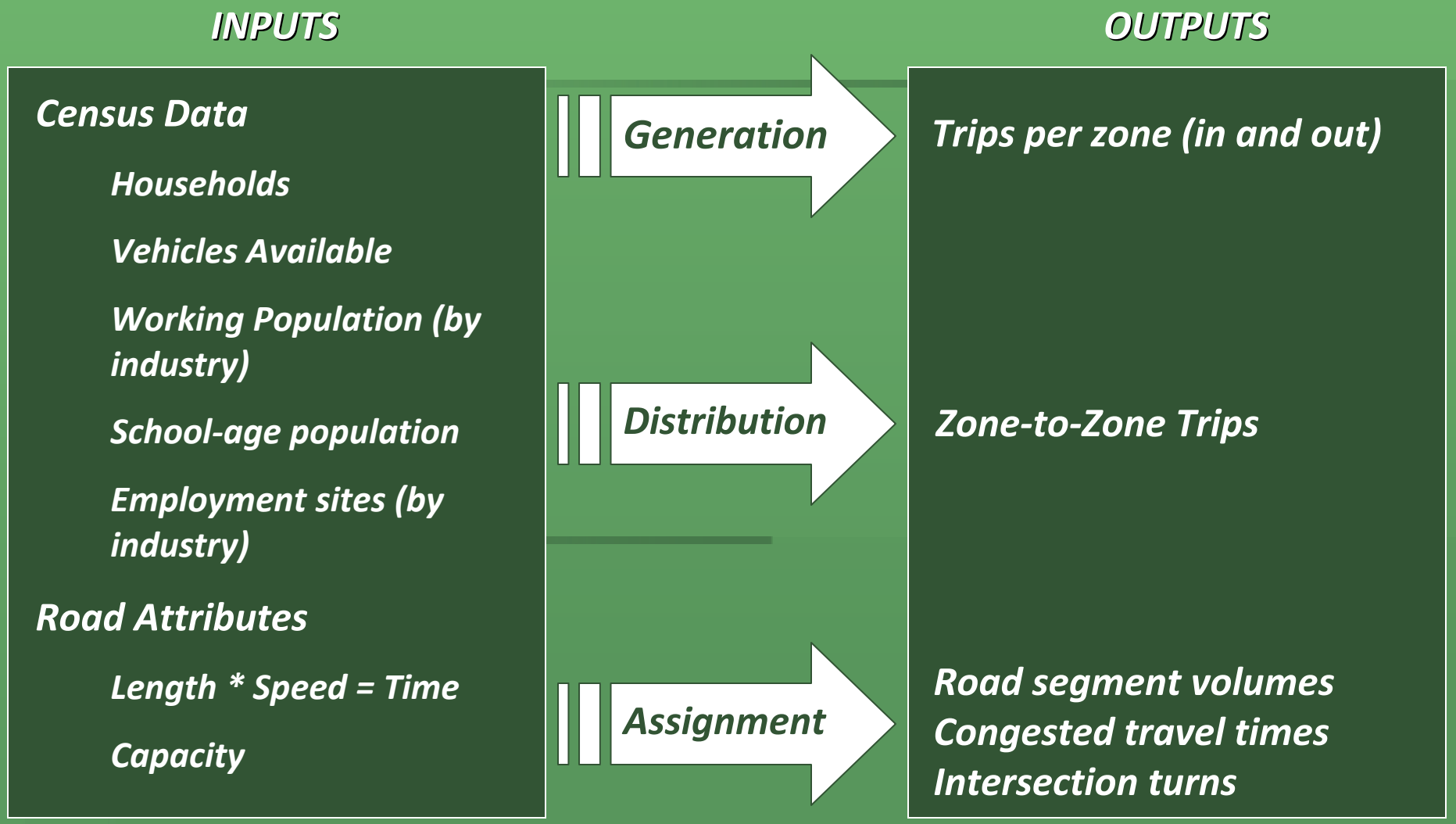
Running the Model – Trip Assignment

- *How does each trip get to its intended destination?*
- *Uses attributes of road network*
- *Iterative process to find quickest route*

Modeling Process



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Calibrating the Model

- *Establish a base year condition*
- *Calibrated to daily traffic counts*
- *Numerous model runs*
- *Aim for certain validation standards*
  - *R^2 (coefficient of determination)*
  - *88% regionwide recommended*
  - *NRPC model at 96.2%*

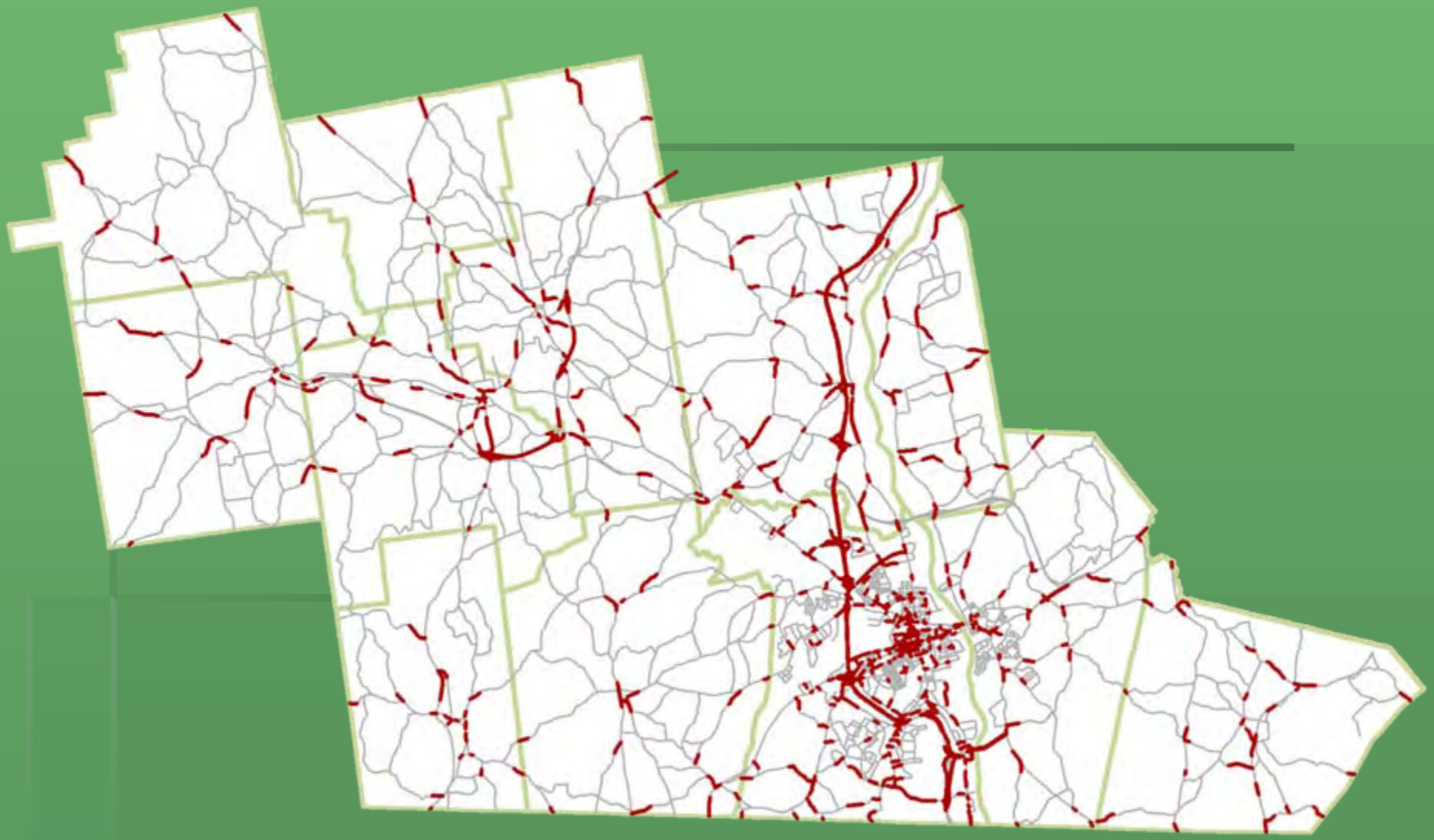
Validating Calibration

Table 7-8
Percent Difference Targets for Daily Volumes for Individual Links

Average Annual Daily Traffic	Desirable Percent Deviation	
	MDOT	FHWA
<1,000	200	60
1,000-2,500	100	47
2,500-5,000	50	36
5,000-10,000	25	29
10,000-25,000	20	25
25,000-50,000	15	22
>50,000	10	21

Source: MDOT, *Urban Model Calibration Targets*, June 10, 1993

751 counted links



Model Analysis

- *Future Year Forecasts*
  - *Changes made to roads and/or zones*
    - *Buildout methodology*
  - *Same run procedure*
  - *Compare final output to base year*
  - *Importance of traffic count links*

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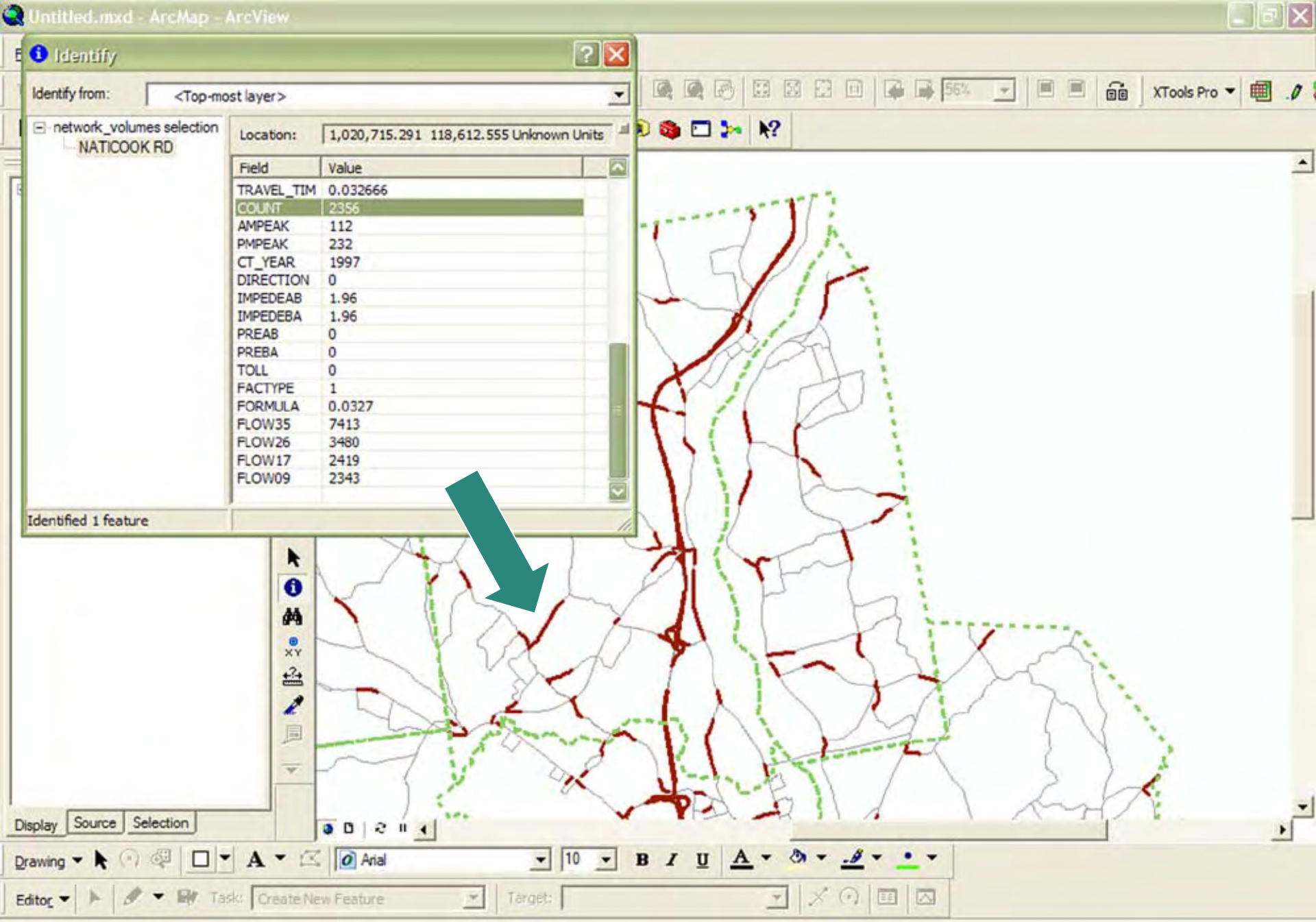
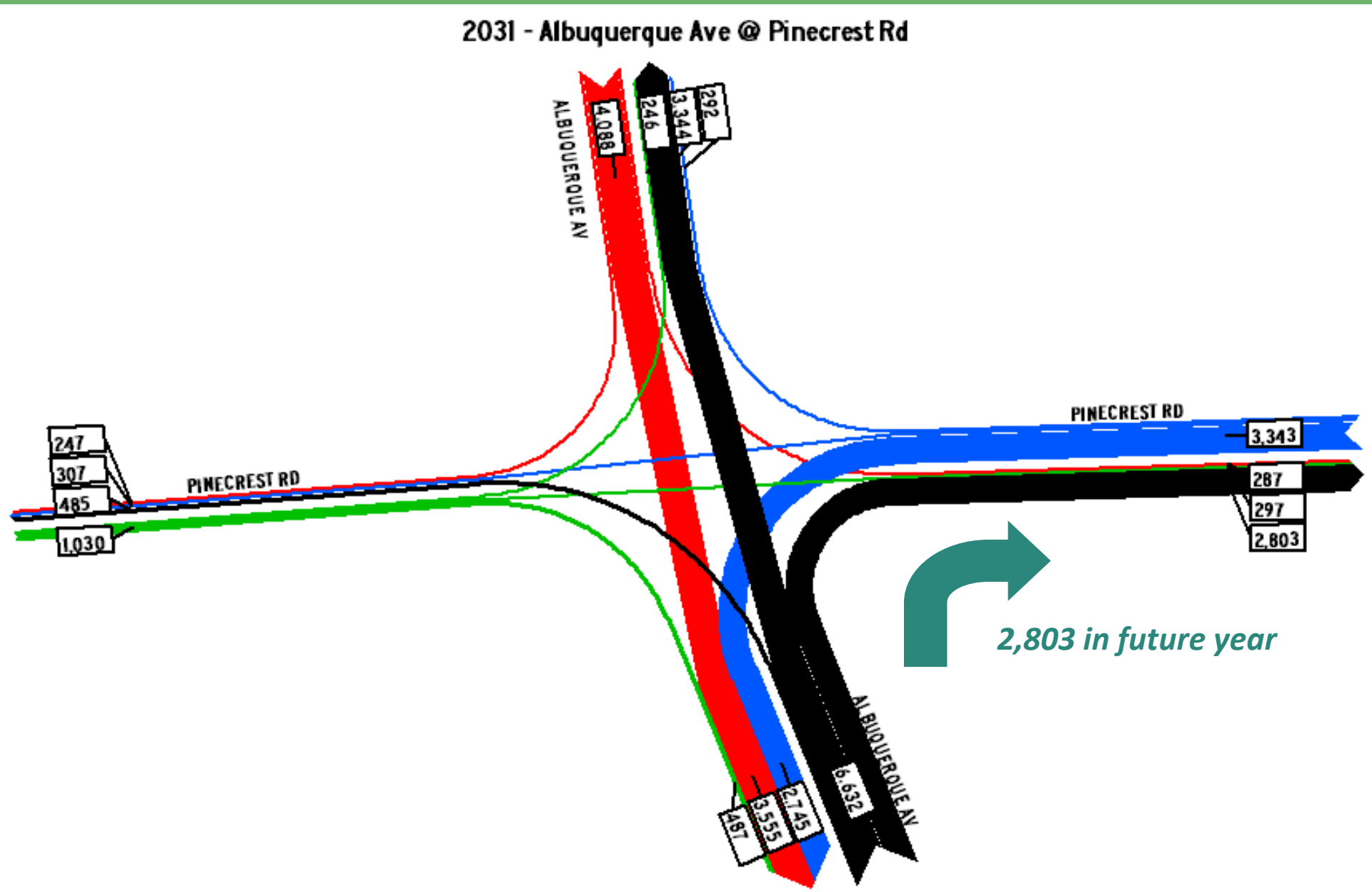

Untitled.mxd - ArcMap - ArcView
Identify
Identify from:
<Top-most layer>
network_volumes selection
NATICOOK RD
Location:
1,020,715.291 118,612.555 Unknown Units
Field
Value
TRAVEL_TIM 0.032666
COUNT 2356
AMPEAK 112
PMPEAK 232
CT_YEAR 1997
DIRECTION 0
IMPEDEAB 1.96
IMPEDEBA 1.96
PREAB 0
PREBA 0
TOLL 0
FACTYPE 1
FORMULA 0.0327
FLOW35 7413
FLOW26 3480
FLOW17 2419
FLOW09 2343
Identified 1 feature
XTools Pro
Display
Source
Selection
Drawing
Arial
10
Editor
Task:
Create New Feature
Target:

Model Analysis

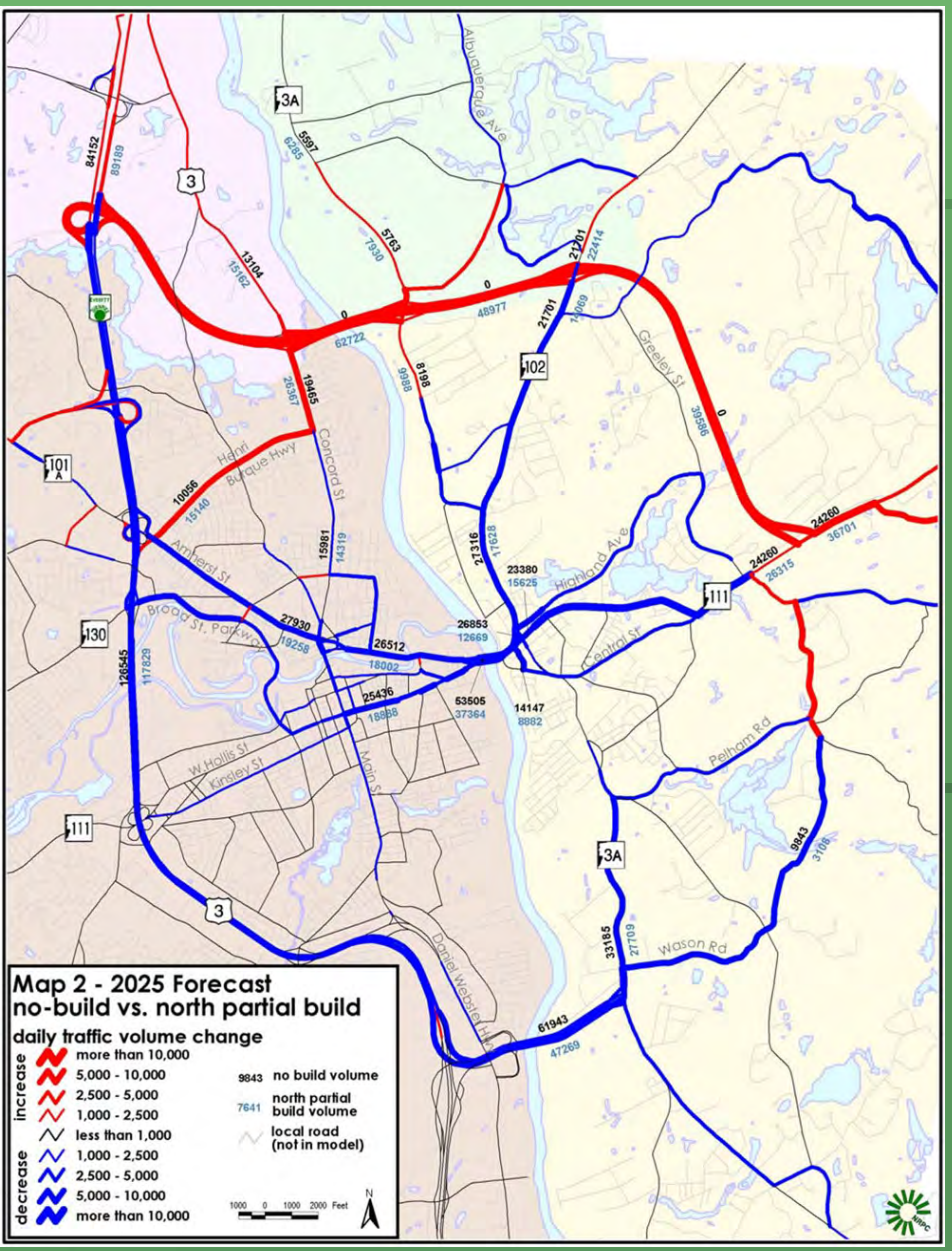
	2000	2007	2017	2025
Model Flow	5,000	5,360	5,970	7,900
	+20%	+20%	+20%	+20%
Count	6,000	**6,432**	**7,164**	**9,480**

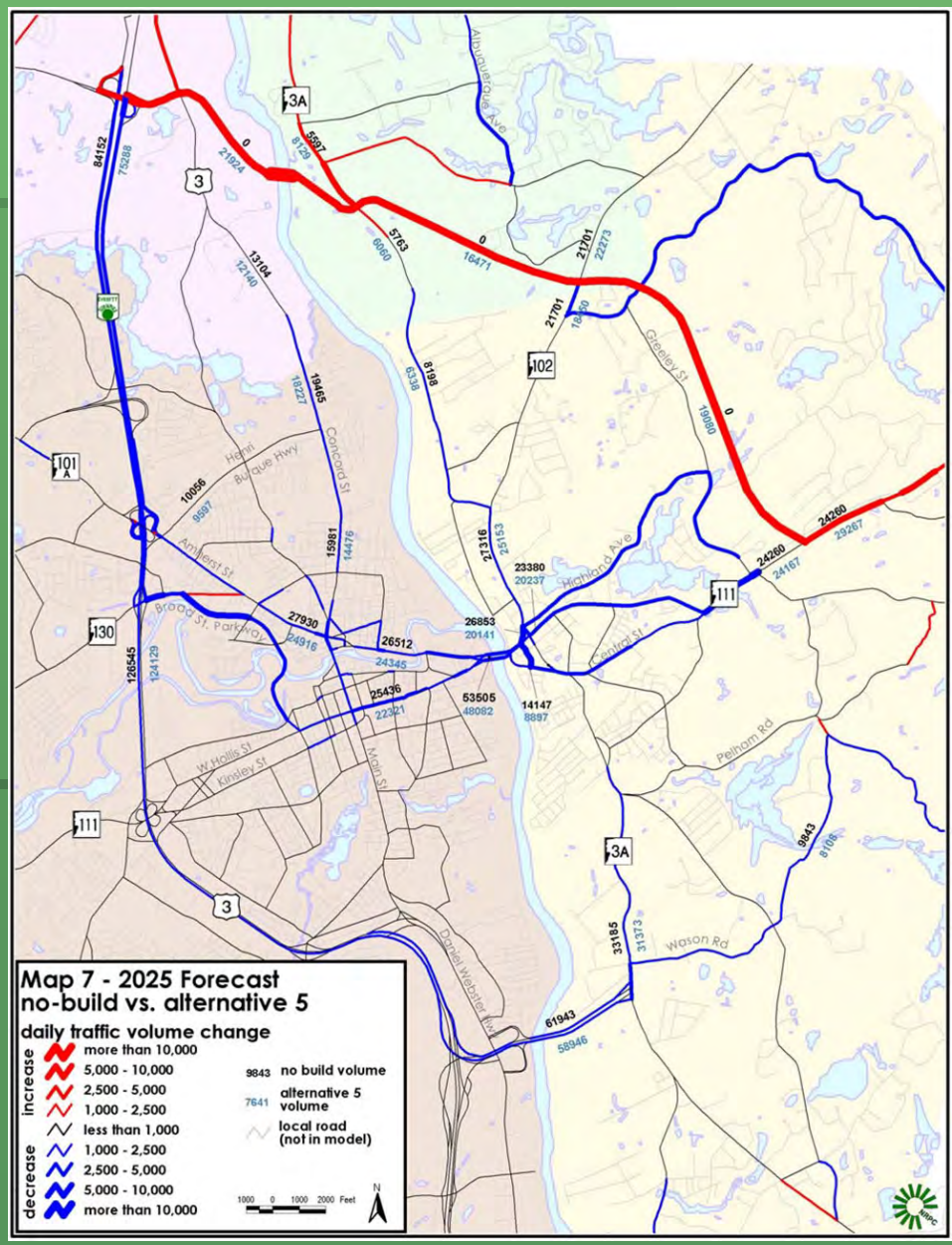
Model Analysis

- *Intersection Operations*
  - *Base year turning movement counts*
  - *Daily turn numbers from model*
  - *Percentages applied to base counts for forecasted peak turns*
  - *Level of service*


2031 - Albuquerque Ave @ Pinecrest Rd
ALBUQUERQUE AV
4,088
246
3,344
292
PINECREST RD
247
307
485
1,030
PINECREST RD
3,343
287
297
2,803
2,803 in future year
ALBUQUERQUE AV
6,632
2,745
3,555
487

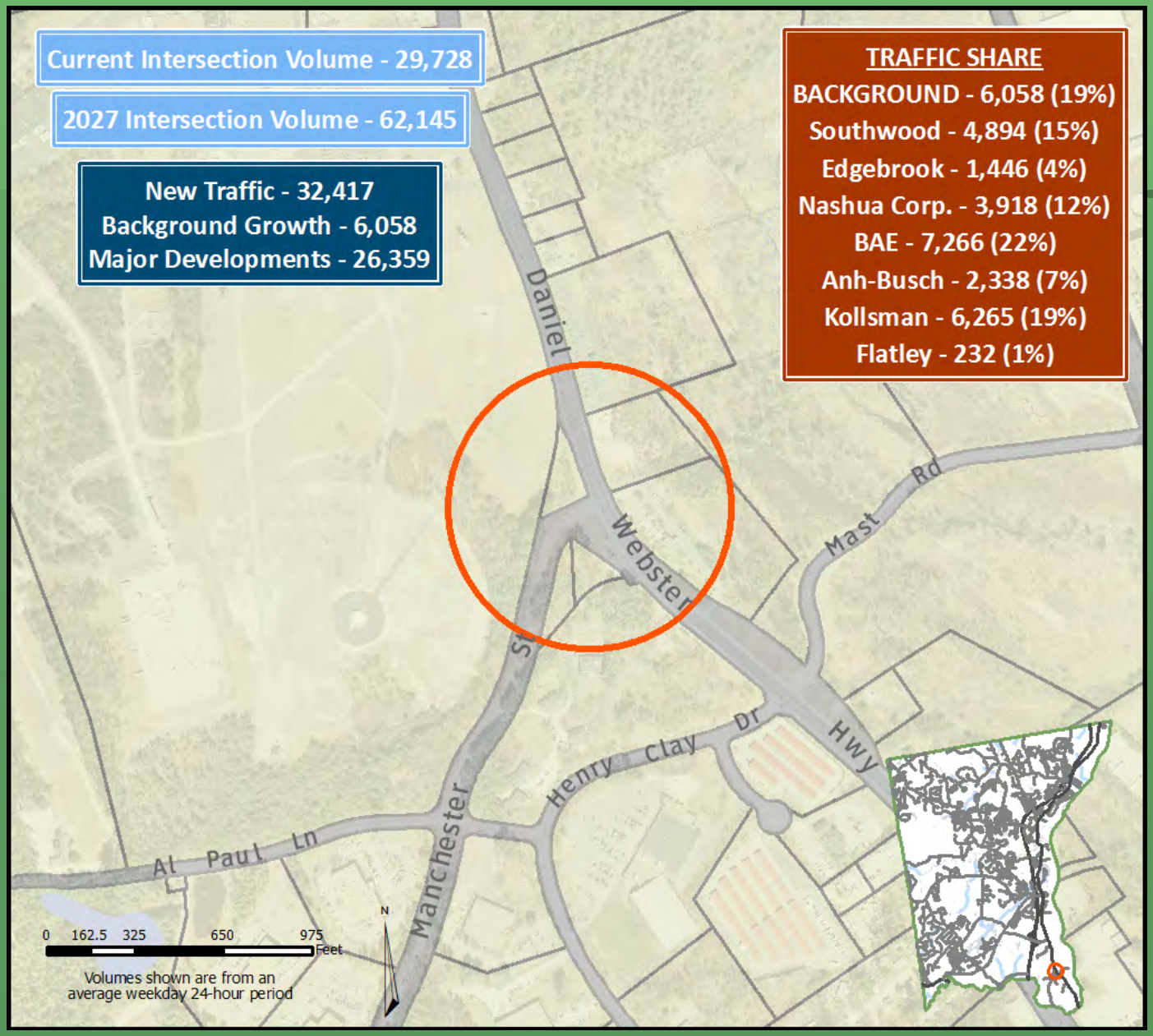
Project Examples – Circumferential Hwy





Project Examples – Broad Street Parkway

Project Examples – Merrimack Townwide



Project Examples – Emergency Planning

Questions…?