



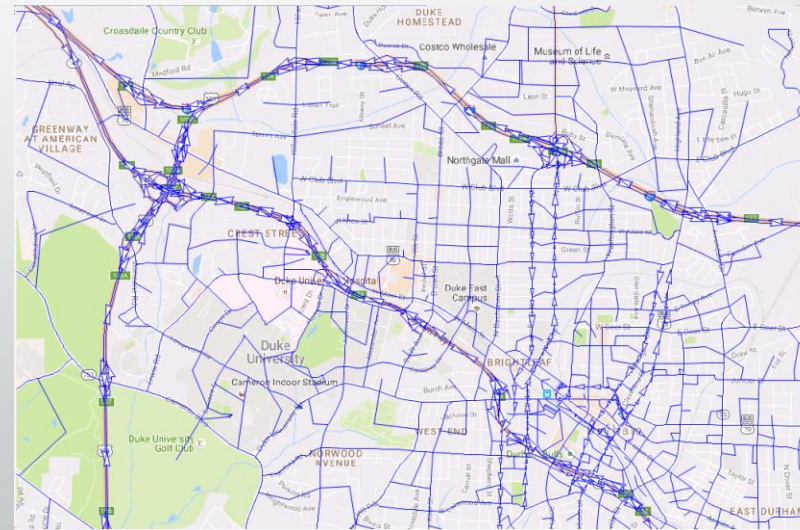
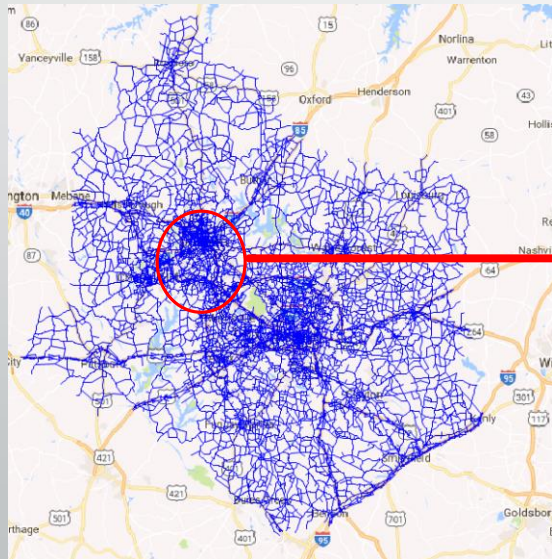
Development of Subarea/Corridor Analysis Guideline & Tool for TRM V6

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NC Model Users Group Meeting – Nov 11, 2016

1. Subarea Analysis

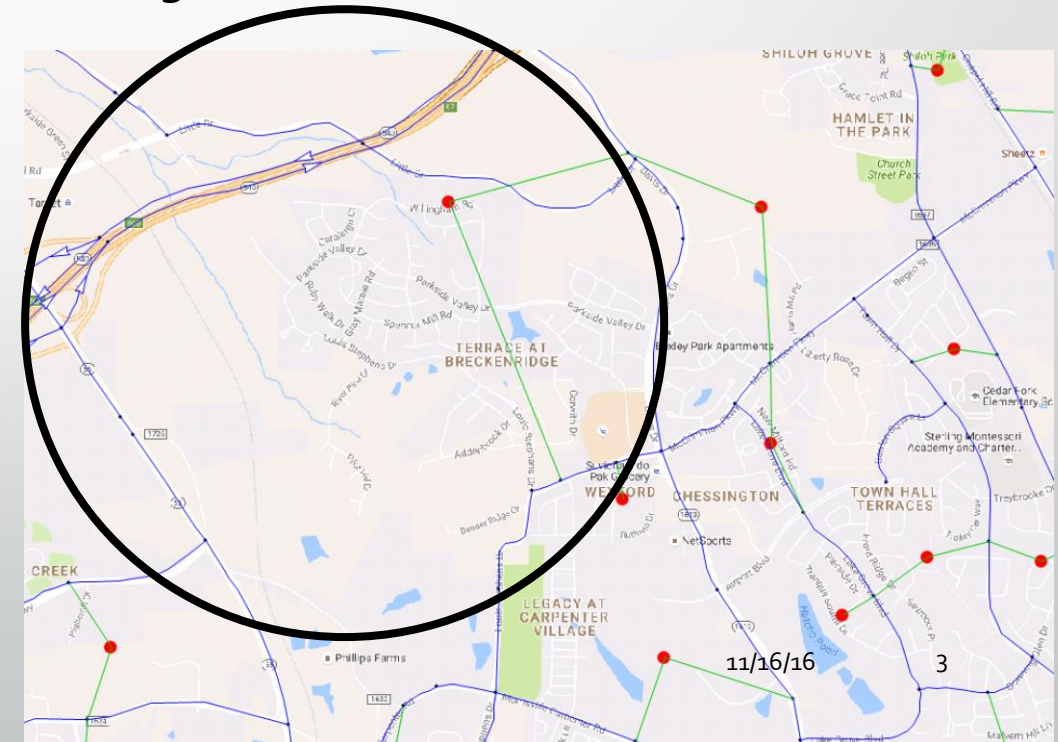
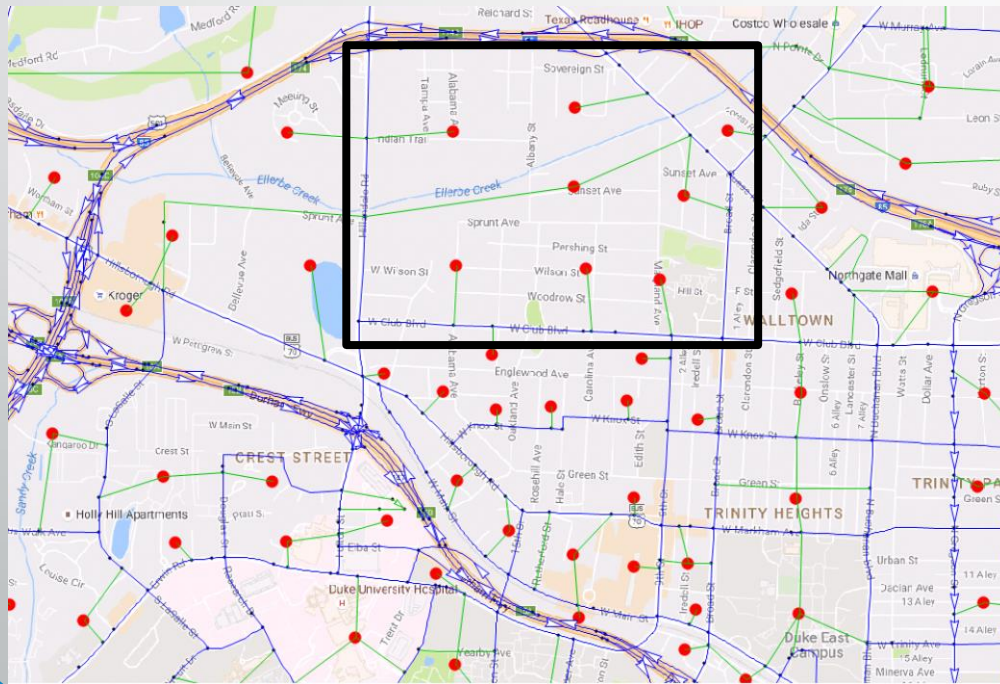
- Why Subarea Analysis:
 - To study a particular sub-region or corridor in great detail
 - Sub-region Examples: Downtowns, Airports, Large scale development projects
 - Corridors along Major Facilities: NC-54



1. Subarea Analysis

□ Why Subarea Analysis:

□ Limitation to large models (sparse networks and large zones)



1. Subarea Analysis

- What does it include?
 - Highway Analysis in detail (as see previously)
 - Transit Analysis ?
 - NO Transit subarea analysis**
 - Challenges in defining transit external stations
 - Most transit lines start and/or end outside the subarea
 - Origins and destinations that involve in transfers to other modes outside the corridor.
 - Transit investments require more detailed studies due to FTA and EPA requirements

1. Subarea Analysis: Before Mechanics

- What important questions to be addressed before the mechanics
 - How to validate subarea
 - What assignment type and closure criteria to use
 - How to compute and transfer the adjustment factors (base vs future)

- Procedures to develop Subarea network and sub-zones.
 - A detailed localized subarea network or regional network with additional streets
 - Sub zones: Same as in the regional model or should contain more smaller zones

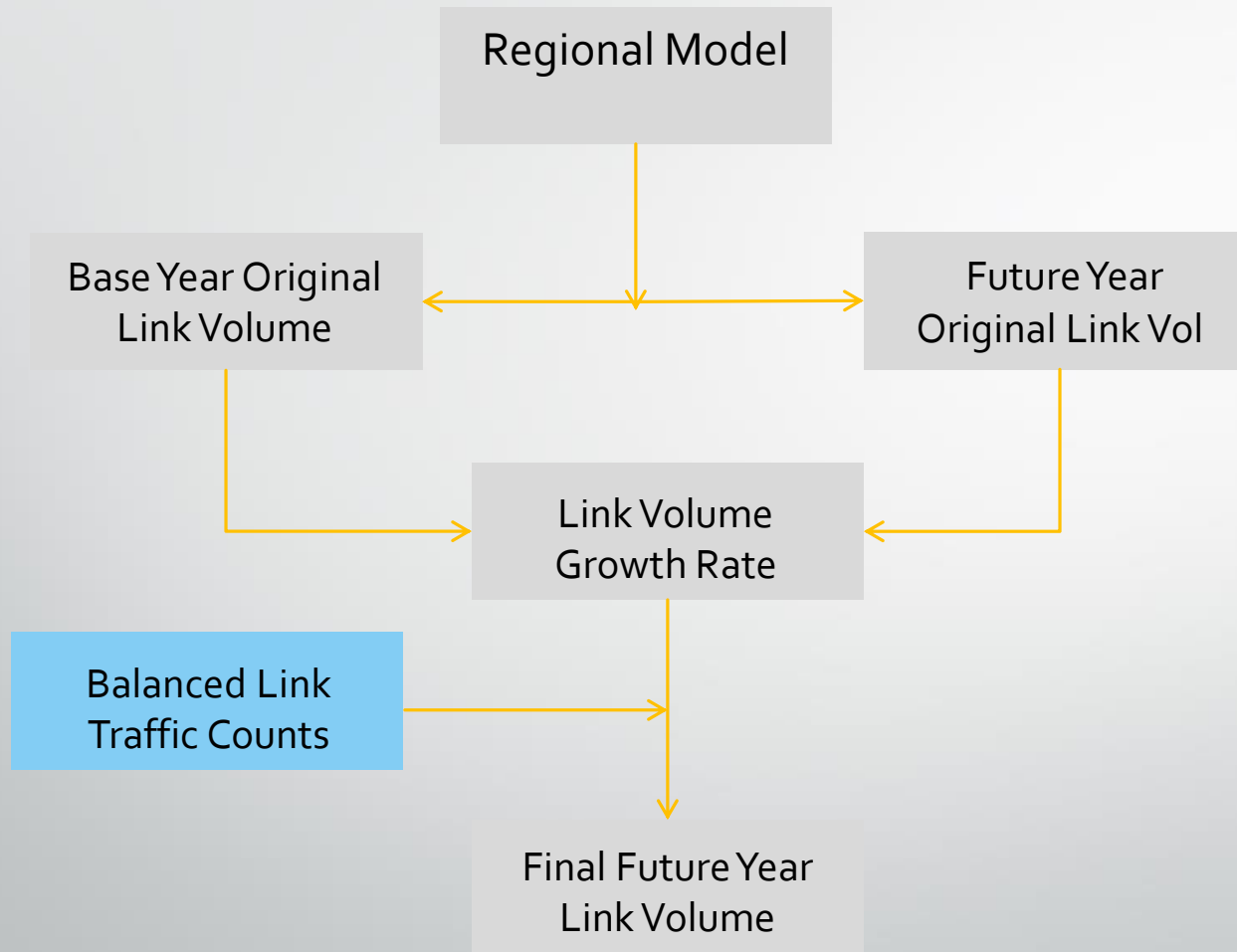
- Procedures to develop sub-zonal matrices.

2. Subarea Approach

Three common approaches

1. Regional Model with link level adjustments
2. A Subarea Model within Regional Model
 1. With minor adjustments
 2. With OD adjustments
3. A Subarea Model with ODME

2. Subarea Approach– Link level adjustment



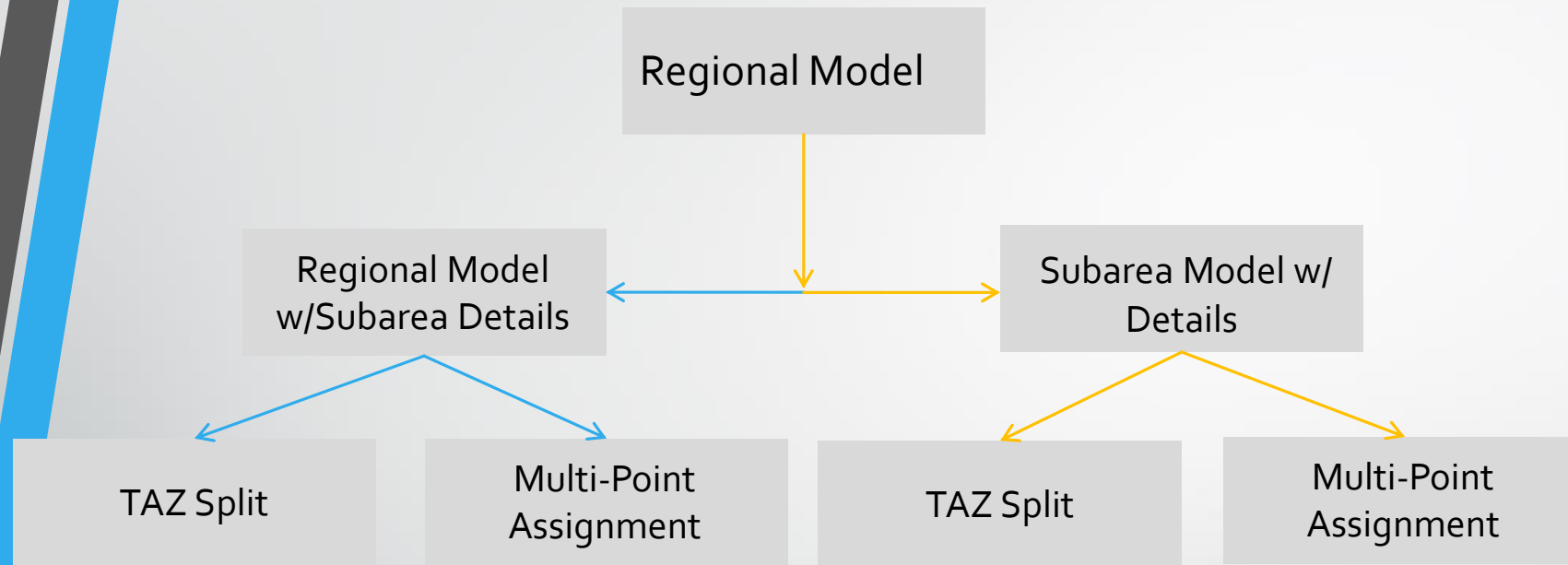
Process:

- Compute link level difference (count vs volume)
- Adjust future year link volumes

Limitations:

- Assignments results between any two horizons vary significantly
- The links volumes from the two different scenarios

2. Subarea Approach– Subarea Model within Regional Model



Regional Model with Subarea:

- Small zone system
- Detailed network

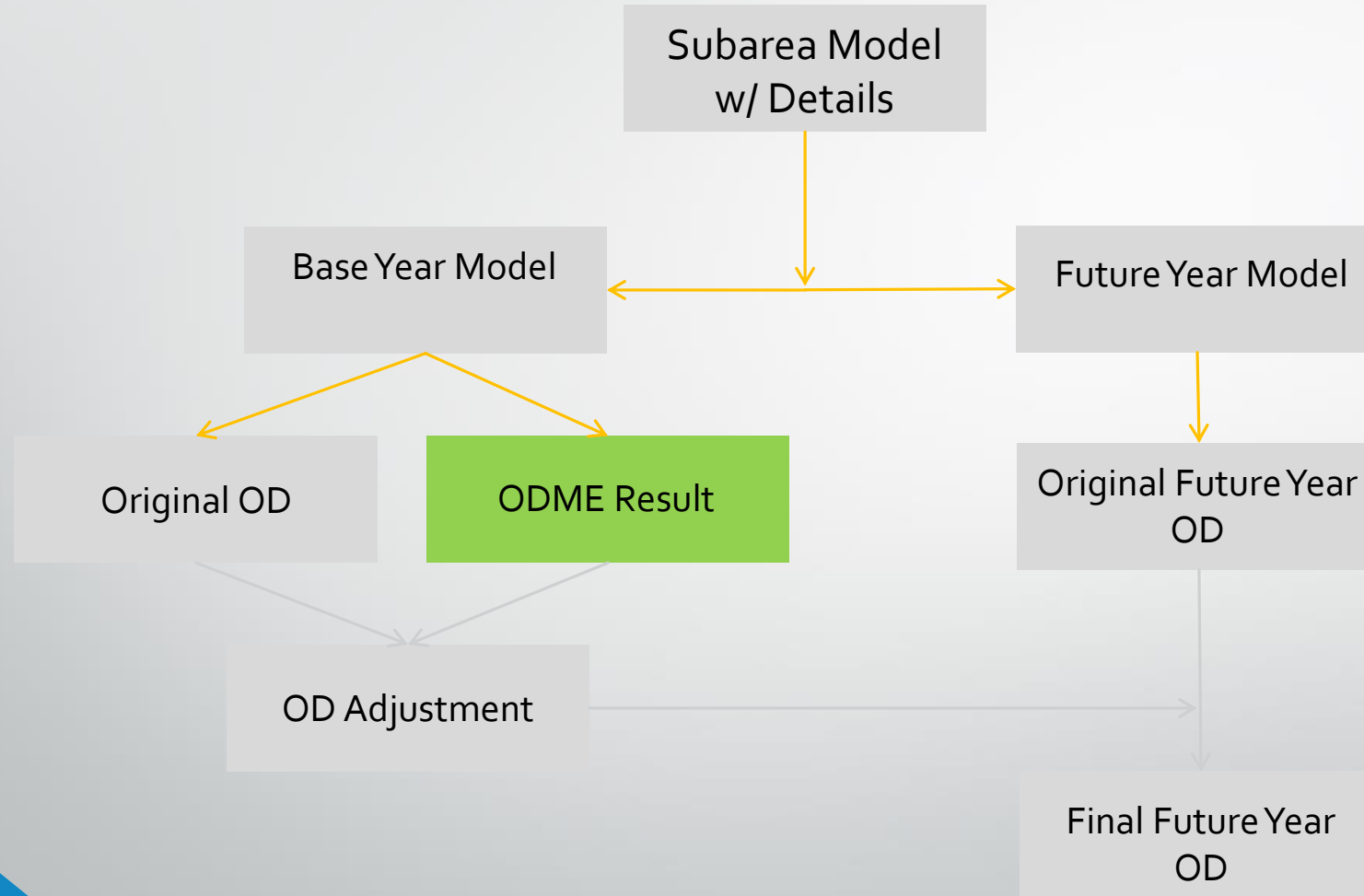
Subarea Model:

- Small zone system with TAZ split
- Detailed network

→ Suggested OD Adjustment Approaches

→ Suggested Small Adjustment Approaches

2. Subarea Approach– ODME



Subarea Model:

- Same zone system
- Subarea assignment
- ODME procedure
- Adjustment factors

What is a
ODME Process

2. Subarea Approach– ODME

1. Counts in the subarea corridor
 - Daily vs time period specific (AM, PM)
 - Vary by vehicle classes vs all traffic
2. ODME Process
 - Should it compute differently by facility types
 - What's should be the assignment convergence
3. ODME Adjustments:
 - Peak period vs peak hour
 - Absolute differences (trip gains)
 - Percent differences ranging between (0.1 and 2.0)

ODME Adjustments

Matrix2 - Sub Area OD (Demand (ALL))

	81	82	83	84	85	86	87	88	Sum
81	0.00	0.70	0.08	0.20	0.01	0.04	0.03	0.03	158.54
82	0.28	0.00	0.24	0.51	0.01	0.02	0.01	0.01	74.62
83	0.07	0.64	0.00	0.21	0.02	0.04	0.03	0.04	151.88
84	0.14	0.87	0.16	0.00	0.03	0.08	0.04	0.05	172.39
85	0.02	0.13	0.03	0.07	0.00	0.03	0.02	0.02	57.42
86	0.02	0.04	0.02	0.07	0.01	0.00	0.34	0.66	352.74
87	0.01	0.02	0.01	0.02	0.00	0.27	0.00	0.87	111.19
88	0.01	0.03	0.01	0.04	0.00	0.62	1.05	0.00	221.54
89	0.00	0.00	0.00	0.01	0.00	0.10	0.15	0.29	33.96
90									
91									
92									
93									
94									
95									
96									
97									
98									
Sum	43.22	135.59	47.90	146.94	2.32	281.34	174.25	187.55	159586.04

Matrix1 - Estimated OD Matrix (Demand (ALL))

	81	82	83	84	85	86	87	88	Sum
81	0.00	0.70	0.00	0.19	0.00	0.00	0.00	0.00	191.19
82	0.28	0.00	1.05	2.22	0.01	0.02	0.00	0.01	86.14
83	0.05	1.16	0.00	0.21	0.00	0.00	0.00	0.00	126.29
84	0.14	1.57	0.16	0.00	0.00	0.00	0.00	0.00	169.34
85	0.37	0.70	0.53	1.08	0.00	0.00	0.00	0.00	292.63
86	0.02	0.04	0.01	0.10	0.00	0.00	0.00	0.25	344.84
87	0.00	0.01	0.00	0.00	0.00	0.33	0.00	0.87	328.45
88	0.00	0.11	0.00	0.01	0.00	0.25	1.05	0.00	256.00
89	0.00	0.00	0.00	0.00	0.00	0.01	0.15	0.10	49.79
90	0.00	0.00	0.00	0.00	0.00	0.21	0.23	0.59	146.05
91	0.00	0.01	0.00	0.00	0.00	0.39	0.63	1.23	274.45
92	0.00	0.00	0.00	0.00	0.00	0.31	0.34	1.02	300.57
93	0.00	0.02	0.00	0.01	0.00	0.08	0.34	0.43	156.91
94	0.00	0.01	0.00	0.00	0.00	0.33	0.61	0.95	261.39
95	0.00	0.00	0.00	0.00	0.00	1.37	0.23	0.68	346.91
96	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	15.50
97	0.00	0.01	0.00	0.01	0.00	0.11	0.16	0.34	102.95
Sum	43.22	135.59	47.90	146.94	2.32	281.34	174.25	187.55	159586.04

Initial Subarea OD Table

Final ODME Table

	Initial	Final	Adjustment	Constraints
OD Flow	0.03	0.53		
Difference			0.5	> 0
Ratio (% Difference)			17.67	0.1 to 2.0

3. Subarea Guidelines

- Refine subarea networks
- Define Subarea
 - Avoid cutting centroid connectors while defining subarea
 - Avoid concave shapes that can lead to excessive crossings of subarea links
- Update counts
- Modify network (move existing and add new centroids connectors)
- Code Screenlines

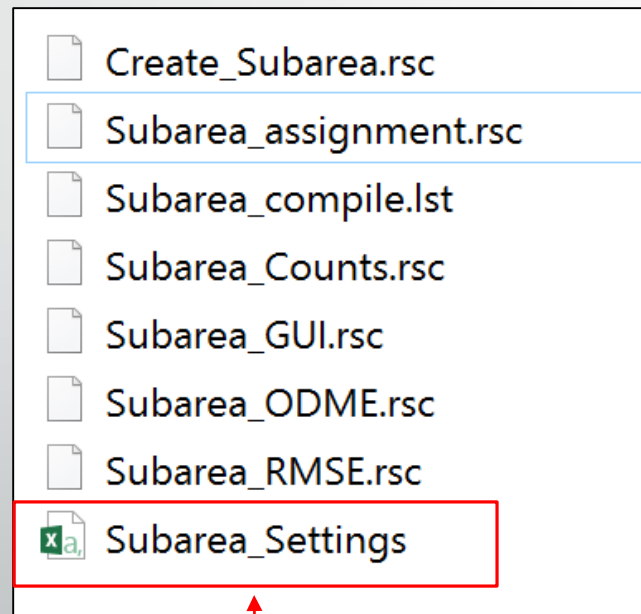
4. TRM Subarea Tool

- Model directory integration
- Subarea GUI
- Facilitates easy integration (when desired)

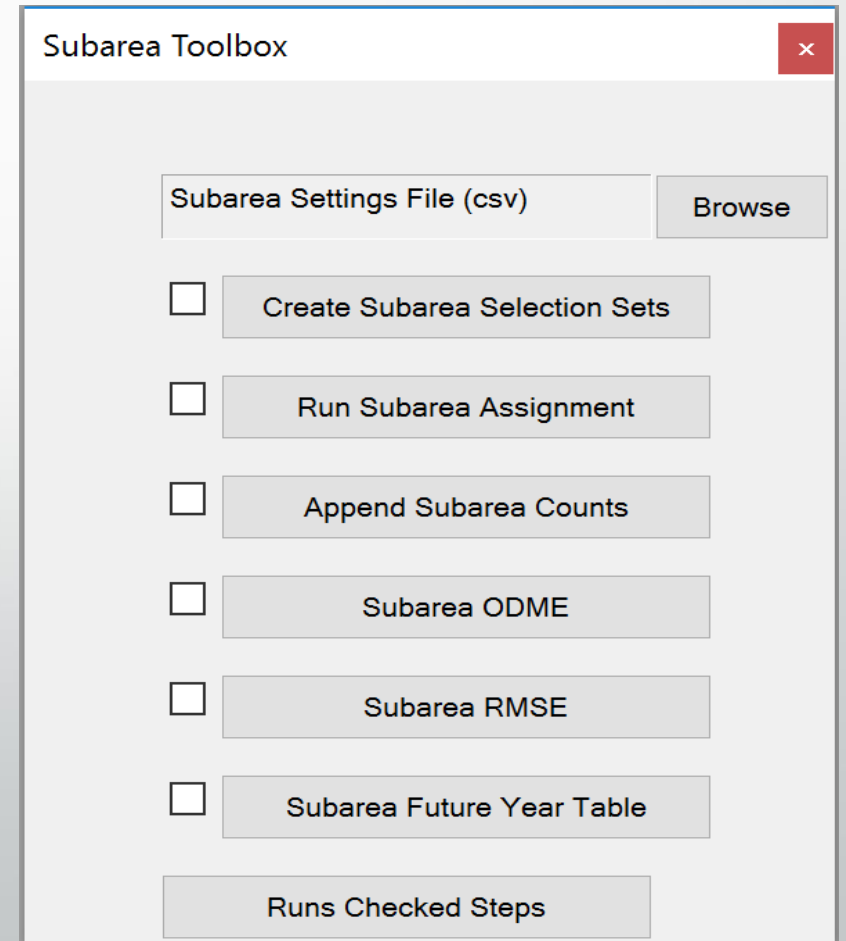
- EvalModule
- Input
- Interim
- Model setup files
- Output
- Subarea
- TRM script and GUI

4. TRM Subarea Tool

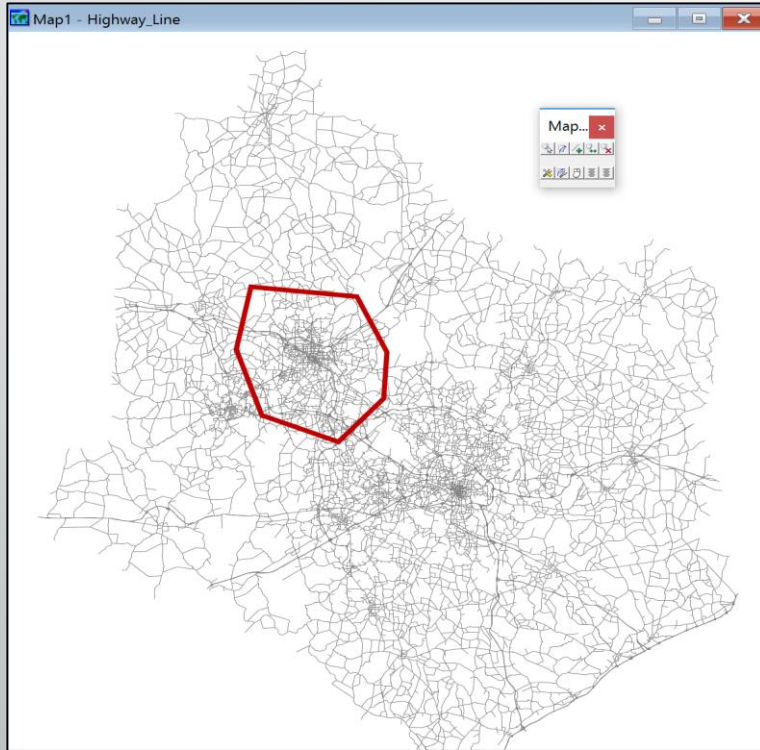
- Separate source code for each step



User controllable settings file



4. TRM Subarea Tool



- User defined subarea
- Subarea is a new polygon layer
- Guidance:
 - Don't cut through one way links – creates external stations with directional volumes
 - Make sure there are enough counts
 - Make sure there are sufficient counts locations for all ranges of volume counts
 - Make sure there are some screenlines
 - Avoid too small or too large areas to accurately capture the OD flows

6. TRM Subarea Tool

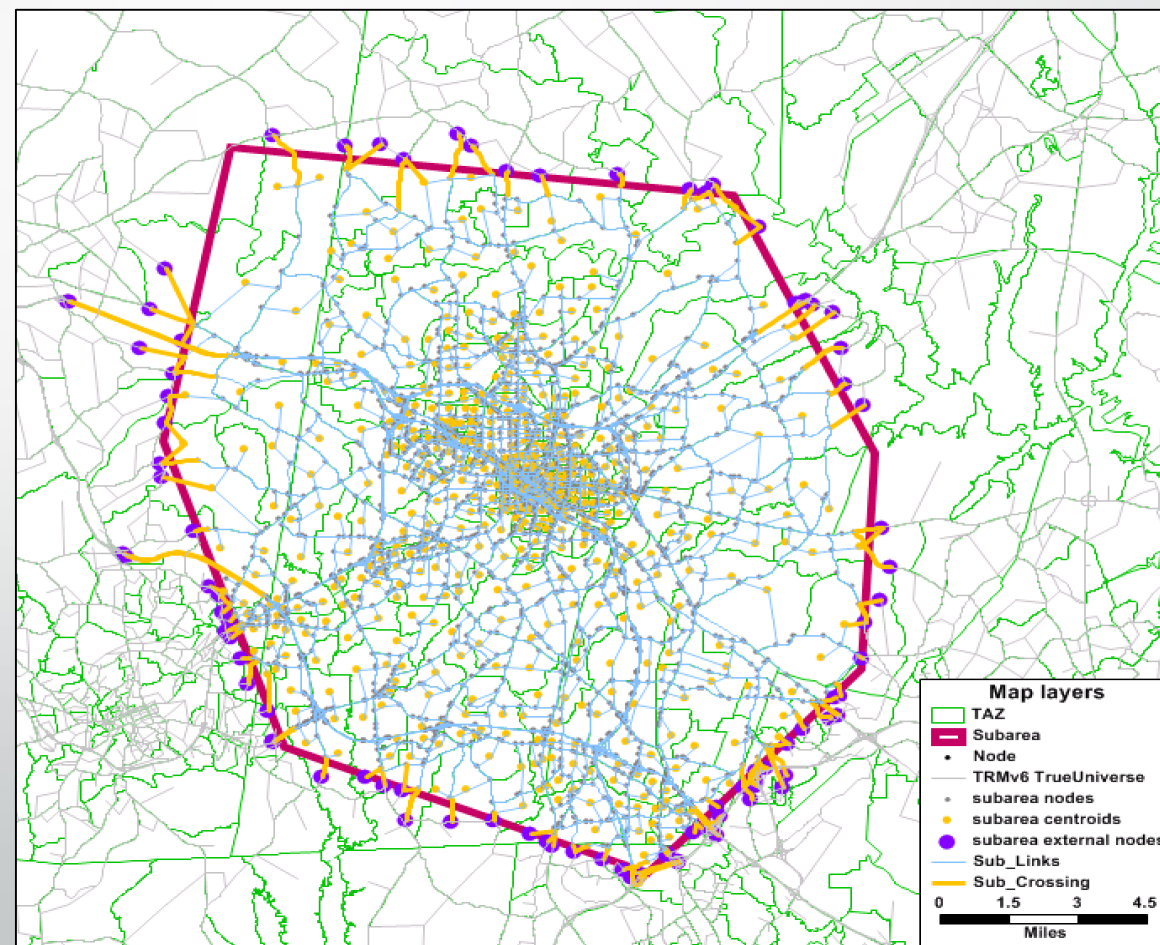


Subarea Toolbox

Subarea Settings File (csv)	Browse	→	Browse for settings file
<input checked="" type="checkbox"/>	Create Subarea Selection Sets	→	Runs Subarea Selections
<input checked="" type="checkbox"/>	Run Subarea Assignment	→	Creates Subarea OD Matrices
<input type="checkbox"/>	Append Subarea Counts	→	Add Subarea Counts
<input type="checkbox"/>	Subarea ODME	→	Runs Subarea ODME
<input type="checkbox"/>	Subarea RMSE	→	Computes Subarea RMSE Stats
<input checked="" type="checkbox"/>	Subarea Future Year Table	→	Computes Future Year Subarea OD Table
Runs Checked Steps		→	Runs All Checked Steps

6. TRM Subarea Tool

- Computed on the fly
 - Subarea External Stations
 - Subarea Internal Zones
 - Subarea Crosslinks

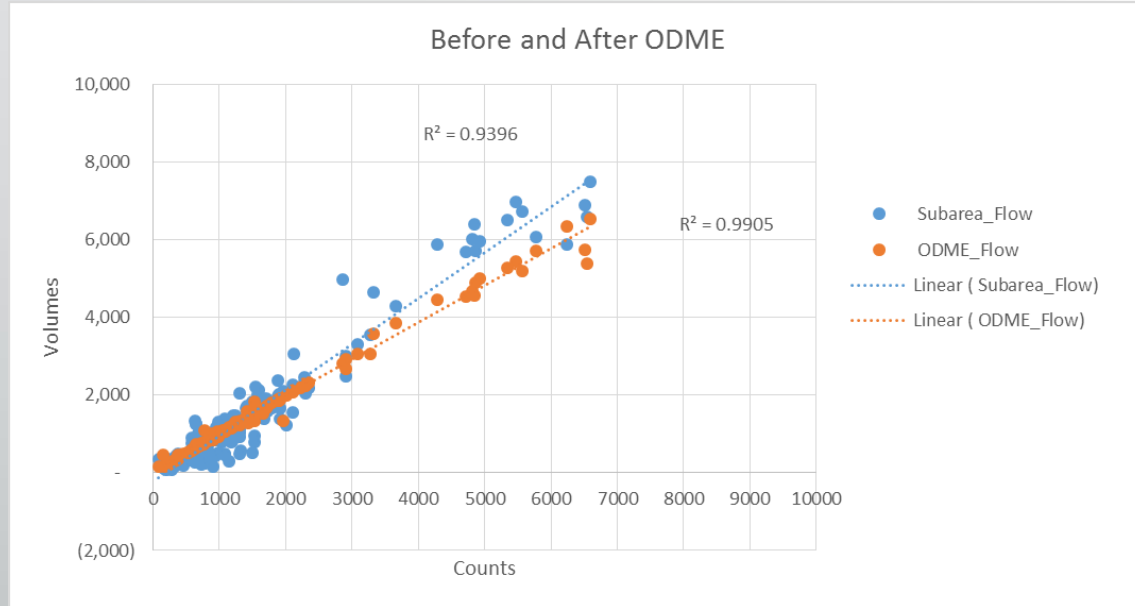


6. TRM Subarea Tool

- User settings in CSV format
- Recommendations
 - Use TRM assignment settings for Subarea assignment (ensures the same output as TRM model)
 - Use tighter ODME closure criteria
 - Run for only peak PM hour (PM₂)
 - Make sure counts exists for that hour
- Current model: ODME for all vehicle classes
 - Can be refined to do ODME for each class if peak hour counts by vehicle classes are available

I/O Files	Key	Value
Input	workDir	C:\projects\TRM-V6
Input	tazFile	Args.workDir + \\Input\Master Geography\TRMv6_TAZ.dbd
Input	hwyFile	Args.workDir + \\Input\Highway\Highway_Line.dbd
Input	turnFile	Args.workDir + \\INPUT\PARAMETERS\TurnPenalties.bin
Input	odFile	Args.workDir + \\Output\TOTPM_OD.mtx
Input	netFile	Args.workDir + \\Output\highway.net
Input	Modified_Conical_VDF	Args.workDir+\\Input\Parameters\conical_md_64.vdf
Input	subareaName	test_subarea
Input	tod	PM
Input	Assignment Iterations	100
Input	SOV VOT	0.2
Input	HOV VOT	0.3
Input	SUT VOT	0.5
Input	MUT VOT	0.5
Input	Time-Dist Trade-off Factor	0
Output	subFlow	Args.workDir + \\Subarea\PM_Subarea_LinkFlow.bin
Output	subOD	Args.workDir + \\Subarea\SUB_OD.mtx
Output	subFile	Args.workDir + \\Subarea\SubArea.dbd
Output	todFile	Args.workDir + \\EvalModule\2013\Count_2013_TOD and Classification.bin
Output	ODMEFlow	Args.workDir + \\Subarea\ODMELinkFlow.bin
Output	ODME_OD	Args.workDir + \\Subarea\ODME_OD.mat

6. TRM Subarea Tool




Most of the subarea links are under 5000

Subarea (Before)	Observations	RMSE	RelRMSE	Sum of Count	Sum of Flows	% Flow/Count
Under 5000	143	469.48	35.12	191,151	194,688	1.85
5K - 10K	8	874.24	14.56	48,050	53,141	10.60
Total	151	499.22	31.51	239,201	247,829	3.61

ODME (After)	Observations	RMSE	RelRMSE	Sum of Count	Sum of Flows	% Flow/Count
Under 5000	143	93.83	7.02	191,151	191,645	0.26
5K - 10K	8	512.82	8.54	48,050	45,650	-4.99
Total	151	149.23	9.42	239,201	237,295	-0.80

Additional Thoughts !!

- What should be the size of a subarea? (# of zones? Area? Pop?)
- How much buffer is need to studied a corridor? (2 Mile?)
- How many minimum counts / locations are required for a good validation ?
- What type of adjustment factors (difference or ratio) should be used for future?



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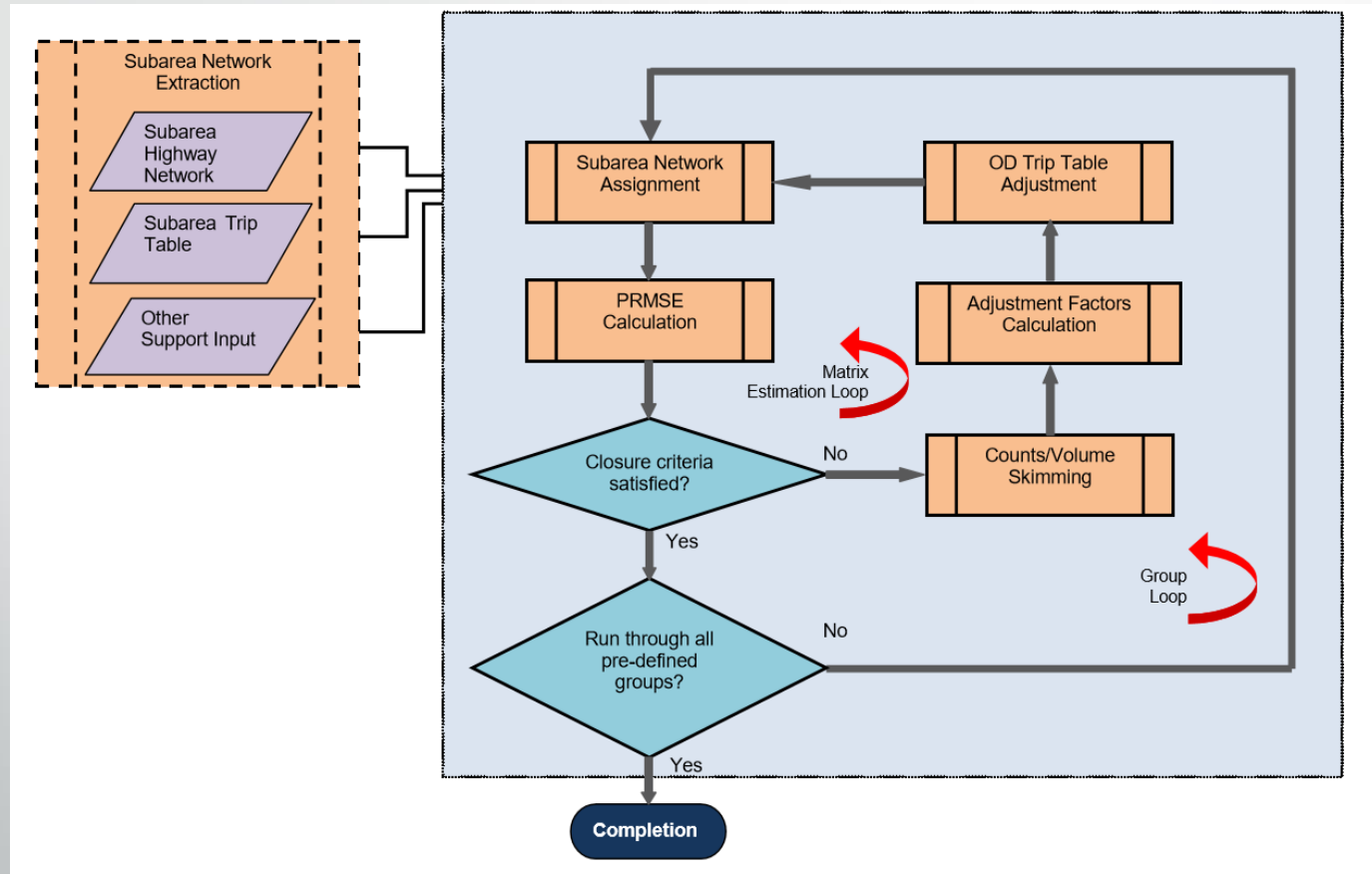
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Thank You

Origin Destination Matrix Estimation (ODME)



- Reverse process to highway assignment
- Complex iterative process to estimate OD table that matches to counts when assigned

[Back to slide](#)