Sub-Area Analysis Using TransCAD

A summary of recent applications and the techniques employed

Kentucky Model Users Group

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BERNARDIN · LOCHMUELLER & ASSOCIATES, INC.

Sub-Area Analysis Using TransCAD

- *When is Sub-Area Modeling Required?*
- *Sub-Area Analysis Options*
- *Review of Some Recent TransCAD Sub-Area Projects*
- *TAZ and Network Considerations*
- *Trip Table Disaggregation*
- *Sub-Area Validation*
- *Forecasting Options*

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When ?

When is a sub-area model required?

- *Detailed answers needed (turning movements, etc.)*
- *Main model's structure is too coarse*
- *Main model is not validated for time of day*
- *Validation of main model is poor in the sub-area*
- *Involves a peripheral area in the main model*

Sub-Area Analysis Options

Which way to go ?

- *Existing metro/regional model – Just add detail*
- *Stand-Alone Sub-Area Model*
- *Nested Sub-Area Model*

- *Simulation – a special case*
  - *May or may not need detailed sub-area model to get to a reliable simulation*

Sub-Area Analysis Options

Every study has unique requirements …

- *Consider the available modeling resources*
  - *Is the metro/regional model accurate and up-to-date?*
  - *Do its outputs match your study's needs?*
    - ✓ *Do you need time-of-day assignments?*
    - ✓ *Do you need truck loadings?*

Sub-Area Analysis Options

Every study has unique requirements …

- *Consider how the model outputs will be used …*
  - *Simple traffic forecasts*
  - *Detailed hourly intersection analysis*
  - *Other performance measures to be generated*
  - *Additional analysis (e.g., benefit-cost)*
  - *Planning issues to be addressed …*
    - ✓ *Land use changes?*
    - ✓ *Network changes?*
    - ✓ *Both?*
- *Consider the schedule and budget*
- *Choose the approach that meets the study's needs*

Recent Projects

- *I-69 Tier 2 EIS Corridor Model*
- *Akron, Ohio Seasons Rd Interchange*
- *Angola, Indiana US 20*
- *LaPorte, Economic Development Corridor Feasibility Study*
- *North Vernon, Indiana US 50*
- *Nashville, Tennessee Whitehouse Rd Interchange*
- *King City, California Annexation Study*
- *Gonzales, California General Plan Update*
- *Del Rey Oaks, California Development Impact Study*
- *Bentonville, Arkansas, 8th Street Corridor & Interchange*
- *Memphis RPO, Tennessee, SR 206 Extension*

Recent Projects: The Option Taken

Study Name		Add Detail to Existing Model	Separate Sub-Area Model	Nested Sub-Area Model	Microsimulation
I-69 Tier 2 EIS	Indiana			X	X
Akron, Seasons Rd. Interchange (1)	Ohio		X		
US 20 Angola	Indiana		X		
Laporte (2)	Indiana			X	
US 50 North Vernon	Indiana			X	
Nashville, Whitehouse Rd. Interchange	Tennessee		X		
King City, Annexation and Growth Study	California	X			
Gonzales, General Plan Update	California	X			
Del Rey Oaks, Regional Traffic Impact Study	California	X			
8th Street Corridor and Interchange, Bentonville	Arkansas	X			
SR 206 Extension, Memphis RPO	Tennessee			X	

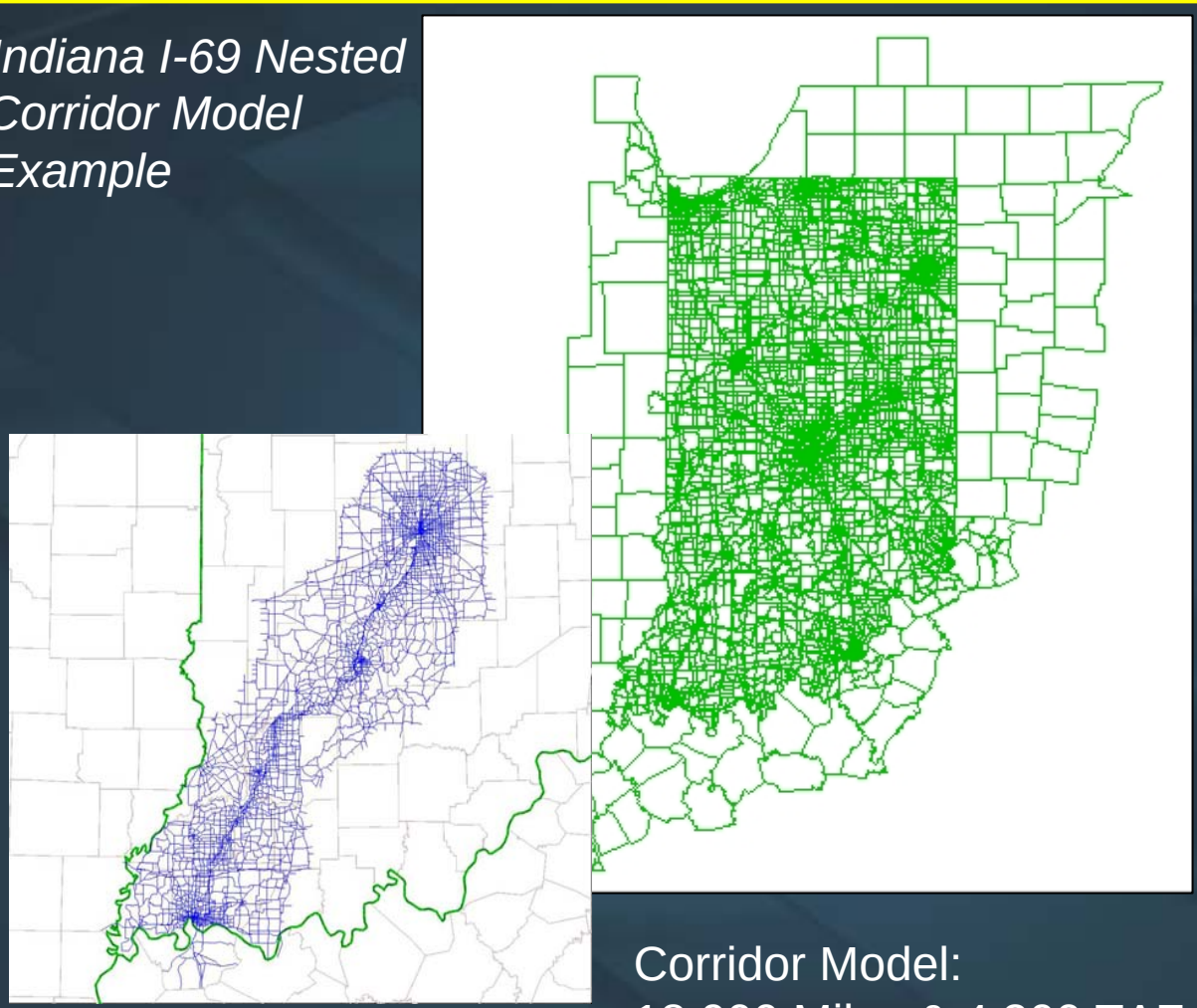
(1) Model networks and trip tables converted from MINUTP to TransCAD
(2) Some model networks and trip tables converted from EMME2 to TransCAD

TAZ and Network Considerations

- *Define the Study Area Carefully*
  - *Cover areas that are relevant to the planning issues*
  - *Include areas where alternatives will have some effects*
- *Consider the Available Data*
  - *GIS data for roadways and required attributes*
  - *Land use data (parcels, imagery, ES202 data, Census, etc.)*
  - *Obtain and review the traffic data*
- *Network Considerations*
  - *Include everything if practical*
  - *Avoid unrealistic collector intersection turning movements*
  - *Consider using the TransCAD's new Multi-Point Assignment*
- *TAZ Considerations*
  - *Design with traffic loading in mind*
  - *Design with knowledge of the land use types*

TAZ and Network Considerations

- *Indiana I-69 Nested Corridor Model Example*

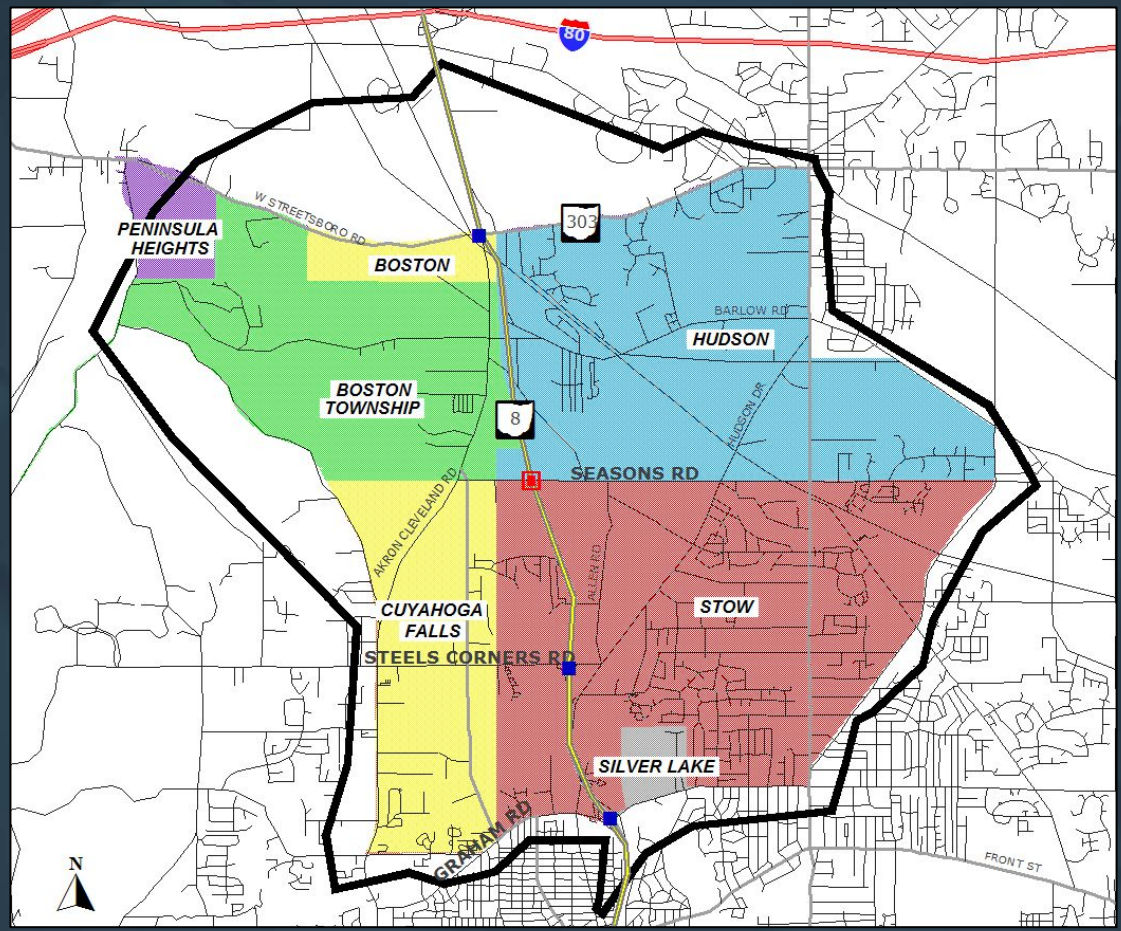


Statewide Model:
32,000 Miles &
4,700 TAZs

Corridor Model:
18,000 Miles & 4,300 TAZs

TAZ and Network Considerations

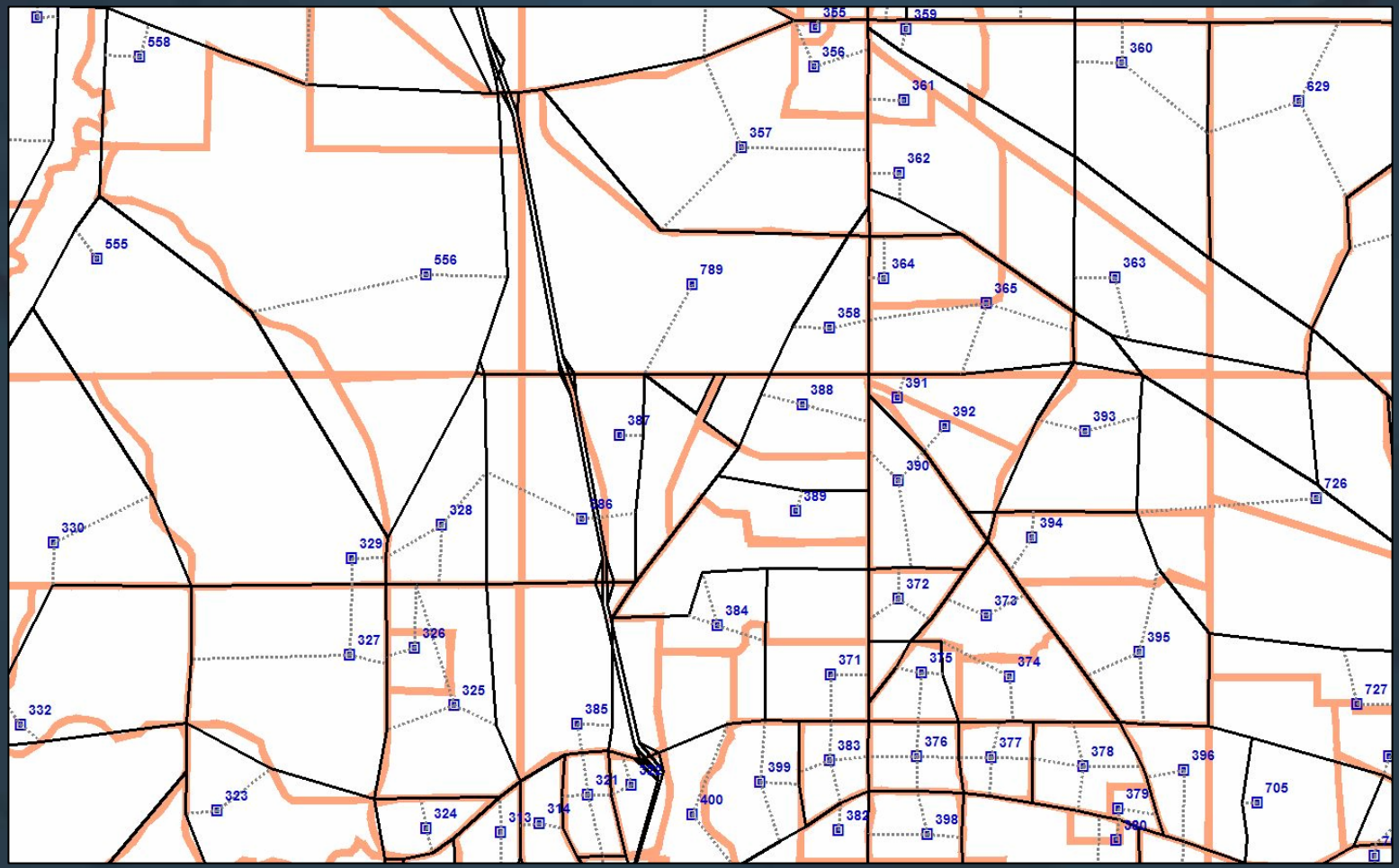
- *Akron Example*



TAZ and Network Considerations

Akron Example

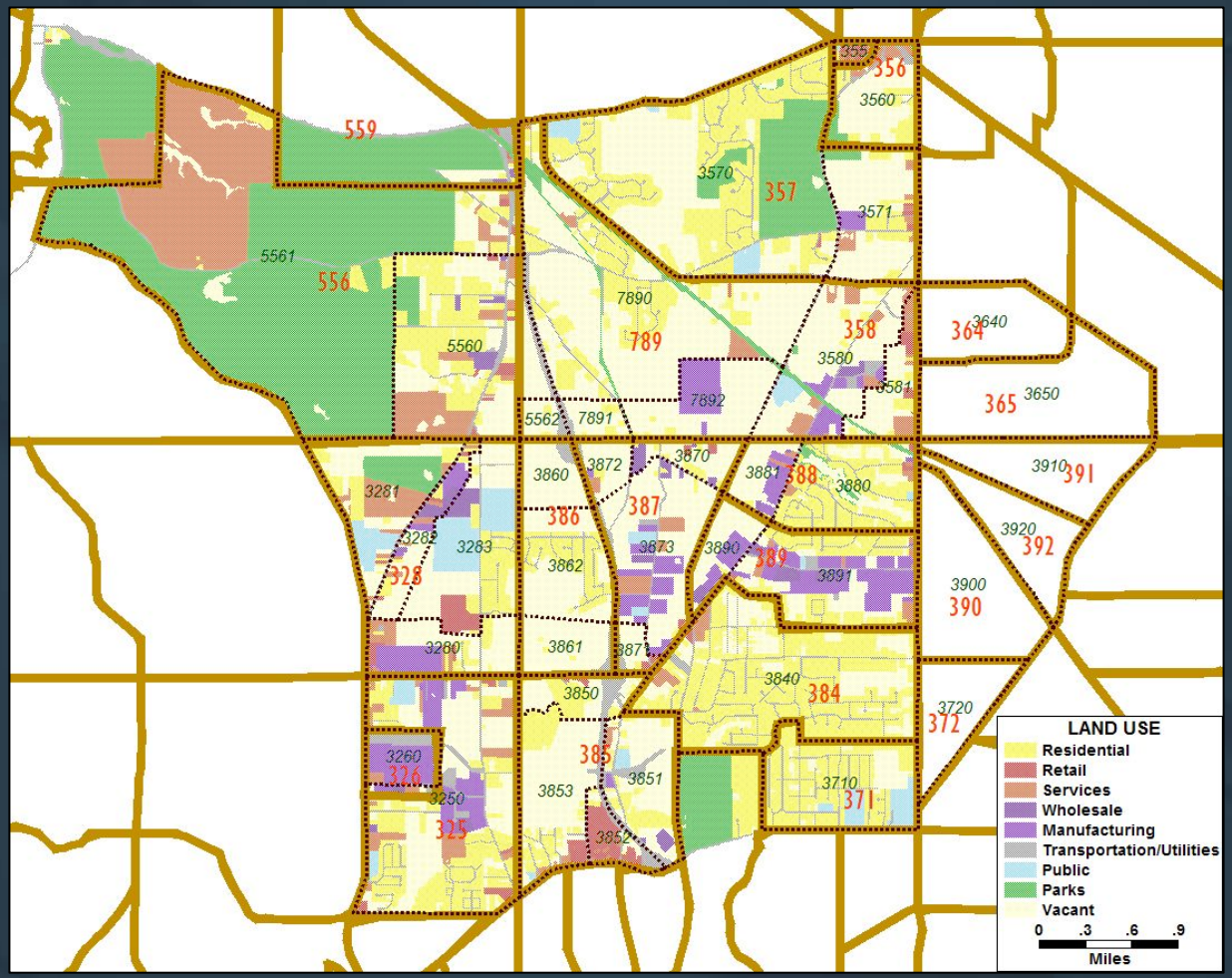
Original Model's Zone System



TAZ and Network Considerations

Akron Example

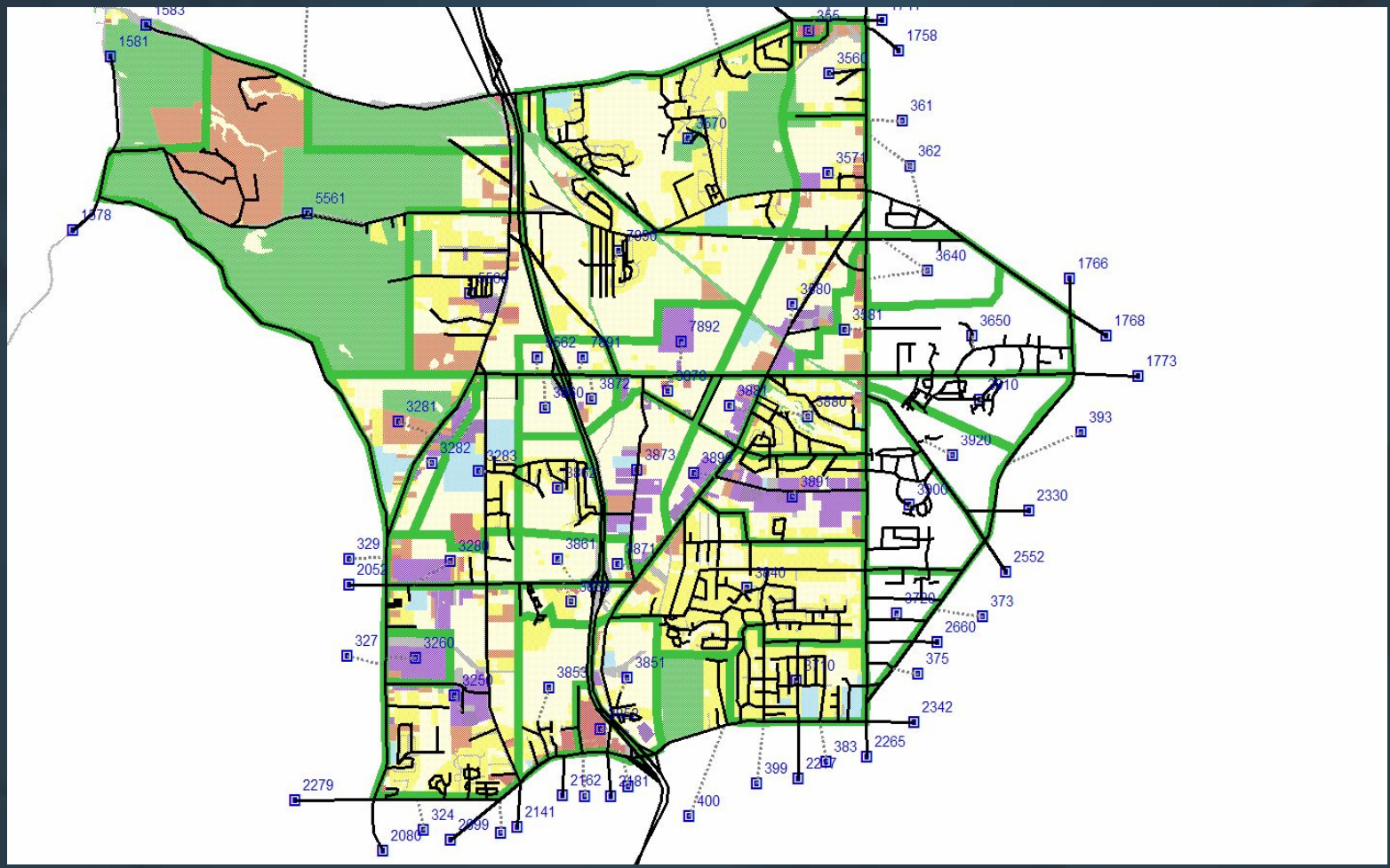
Sub-area Model's Zone System



TAZ and Network Considerations

Akron Example

Sub-area Model's Network, all roads were included



TAZ and Network Considerations

Why include all roads?

- *Because you can! Almost unlimited GIS mapping capabilities are available.*
- *Improves visualization / mapping quality.*
- *Captures the subtle, but very real shortcuts through the maze.*
- *Improves the realism of turning movements; traffic is diffused through local roads realistically. Should avoid unrealistically "blowing out" turning movements.*
- *Potential set-up for simulation.*

Trip Table Disaggregation

- *Use TransCAD sub-area tool*
  - *Via user interface, for separate sub-area model*
    - ✓*Be leery. It works, but not practical for a serious study of multiple alternatives*
  - *Via GISDK language, for nested sub-area model*
- *Generate sub-area TAZ trips*
  - *Duplicate main model's trip generation equations*
  - *Use ITE trip rates*
- *Trip disaggregation methods*
  - *Control to main model's O-D trip totals is possible*
  - *Or, use new trip totals but distribute using main model trips*
- *Or, Incorporate Sub-Area TAZs into main model*
  - *Trips are generated and distributed with main model*

Trip Disaggregation

Akron Example

ITE Trip Generation used for Sub-Area Zones to disaggregate main model's O-D flows

TAZ 556 TRIP DISAGGREGATION

2030 Build Seasons Road

AMATS TAZ	SUB AREA TAZ	DWELLING UNITS	NON RETAIL SQFT	RETAIL SQFT	ITE PEAK TRIPS*	PERCENTAGE OF TRIPS
556	5560	515	189,680	29,440	994	73.6%
556	5561	57	47,420	7,360	175	13.0%
556	5562	2	79,150	10,607	181	13.4%
TOTAL		574	316,250	47,407	1,351	100.0%

2030 No Build

AMATS TAZ	SUB AREA TAZ	DWELLING UNITS	NON RETAIL SQFT	RETAIL SQFT	ITE PEAK TRIPS*	PERCENTAGE OF TRIPS
556	5560	400	189,680	29,440	877	71.1%
556	5561	57	47,420	7,360	175	14.2%
556	5562	2	79,150	10,607	181	14.7%
TOTAL		459	316,250	47,407	1,233	100.0%

* ITE Peak Hour trips are only used to create the percentage of trips by sub area traffic zone to disaggregate AMATS TAZ to TAZ trips

Sub-Area Validation

- *Option 1: Manually validate the sub-area model*
  - *adjust centroid connectors*
  - *adjust link attributes (capacity, speed, BPR parameters)*
  - *adjust time of day factors*
  - *incorporate special generators*
- *Option 2: Create a synthetic validation using ODME*
  - *start with a disaggregated sub-area base trip table*
  - *run TransCAD's ODME to estimate a new base trip table*
- *Option 3: Add detail to main model and validate*
  - *same process as general model validation*

Forecasting Options

- *When adding detail to existing model*
  - *simply run the model*
- *When using a nested model*
  - *model run will automatically run the main model, disaggregate the future trip table to the sub area zones, and assign flows*
- *When using an ODME base trip table*
  - *Option 1: for each O-D pair take difference between base trips and future trips and add to ODME base trips*
  - *Option 2: for each O-D pair take factor between base and future and multiply by ODME base trips*
  - *Option 3: for each O-D pair take factor between base and ODME base and multiply by future trips*
  - *Option 4: use an assumed growth factor*

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  - *Option 4: use an assumed growth factor*

Forecasting Options

ODME - Option 1: Modeled Growth Difference Method

Model Base = 10 trips

Model Future = 100 trips

ODME Base = 15 trips

ODME Future:

(100-10) + 15 = 105 trips

Forecasting Options

- *When adding detail to existing model*
  - *simply run the model*
- *When using a nested model*
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  - *Option 3: for each O-D pair take factor between base and ODME base and multiply by future trips*
  - *Option 4: use an assumed growth factor*

Forecasting Options

ODME - Option 2: Modeled Growth Factor Method

Model Base = 10 trips

Model Future = 100 trips

ODME Base = 15 trips

ODME Future:

*(100/10) * 15 = 150 trips*

Forecasting Options

- *When adding detail to existing model*
  - *simply run the model*
- *When using a nested model*
  - *model run will automatically run the main model, disaggregate the future trip table to the sub area zones, and assign flows*
- *When using an ODME base trip table*
  - *Option 1: for each O-D pair take difference between base trips and future trips and add to ODME base trips*
  - *Option 2: for each O-D pair take factor between base and future and multiply by ODME base trips*
  - *Option 3: for each O-D pair take factor between base and ODME base and multiply by future trips*
  - *Option 4: use an assumed growth factor*

Forecasting Options

ODME - Option 3: Redistribution Factor Method

Model Base = 10 trips

Model Future = 100 trips

ODME Base = 15 trips

ODME Future:

*(15/10) * 100 = 150 trips*

Forecasting Options

- *When adding detail to existing model*
  - *simply run the model*
- *When using a nested model*
  - *model run will automatically run the main model, disaggregate the future trip table to the sub area zones, and assign flows*
- *When using an ODME base trip table*
  - *Option 1: for each O-D pair take difference between base trips and future trips and add to ODME base trips*
  - *Option 2: for each O-D pair take factor between base and future and multiply by ODME base trips*
  - *Option 3: for each O-D pair take factor between base and ODME base and multiply by future trips*
  - *Option 4: use an assumed growth factor*

Forecasting Options

ODME - Option 4: Simple Growth Factor Method

Model Base = 10 trips

Model Future = n/a

ODME Base = 15 trips

ODME Future:

*15 * 2.0 = 30 trips*

many thanks!

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