Modeling Land Use for a Rural CTP

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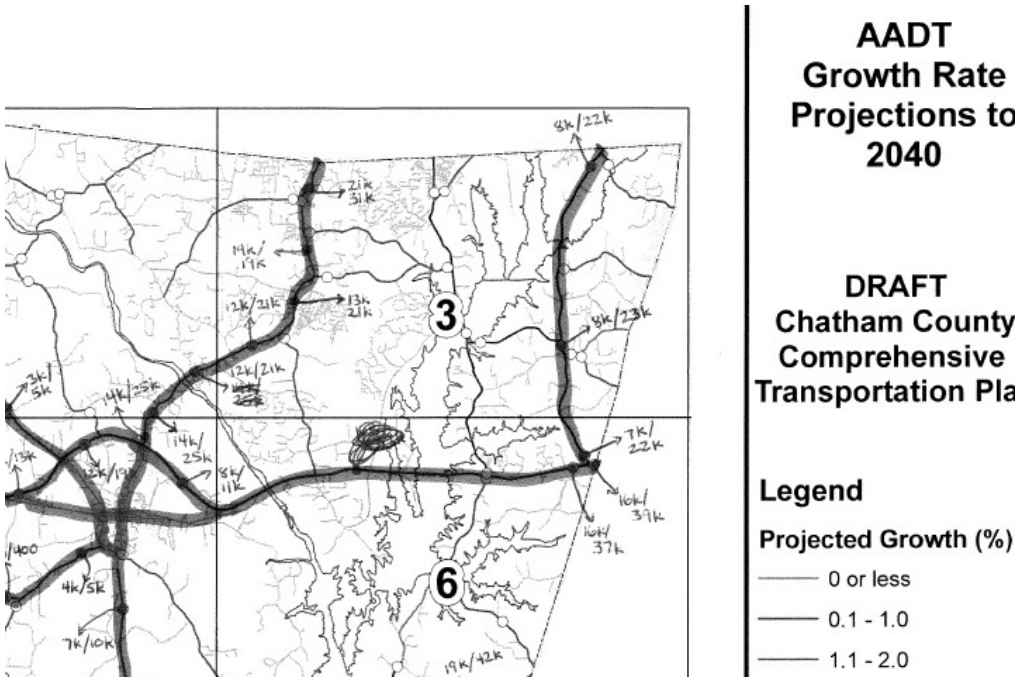
Triangle Area Rural Planning Organization
A Program of the Triangle J Council of Governments

Presentation Objectives

- Provide an overview of typical rural CTP process for forecasting growth
- Explain background factors affecting decision to use CommunityViz model in Lee County
- Explain data needs and general steps in process to use CommunityViz as part of growth forecast
- Highlight the challenges and lessons learned from the pilot test with Lee County
- Provide helpful hints regarding whether or not this type of analysis tool might be useful in *your* circumstances

How is Growth Typically Forecast for Rural Areas?



If your CTP study area does not have a travel demand model and is relatively rural (no large/major towns) then you will probably just do a trendline analysis of past AADTs to forecast future traffic growth.

- A "fancier" version of this type of trendline projection is to modify the growth rates on certain roads where land use changes are expected (for example, a road with flat historic traffic levels, but where a new development is planned).
- This is a relatively simple but unsophisticated method, and is best suited to less built-up and lower-growth areas.

How is Growth Typically Forecast for Rural Areas?

If you are working with a more developed area, then you will likely be developing a travel demand model for the CTP analysis. Sometimes this might cover the whole study area (such as a county), or it might only cover a portion of the study area (such as a large town).

- As part of the Travel Demand Modeling process, it is necessary to develop base year and future year socioeconomic data for each zone within the model.
- At its most basic, this consists of the total number of households within each zone now and in the future, and the total number of employees (broken into various categories) in each zone now and in the future.
- There are several different ways this data is often generated…

Usual Methods of Forecasting SE Data

Documenting Known Development Projects

This involves creating a list of known (or speculative) development projects within the study area and assigning the appropriate amount of growth to each zone in the model *(example: South Park Village is in TAZ 58 and is expected to have 500 homes and 100 retail employees)*

Designating Areas of High/Medium/Low Growth

Another method is to categorize each zone in the model as either high, medium, or low growth; then use a formula to spread growth accordingly across all zones *(example: assign 60% of growth proportionally to high growth zones, 30% to medium growth zones, and 10% to low growth zones)*

Assigning Growth to Similar Existing Areas

In this method, you assume that future housing and employment growth will happen in similar areas to where it has happened in the past *(example: the study area has 1000 existing retail jobs located in two zones; the projected 100 future new jobs will be located in the same areas)*

Making an Educated Guess

Sometimes this is the best option for a community. But it can be difficult to document and defend.

Why Do a CommunityViz Model?

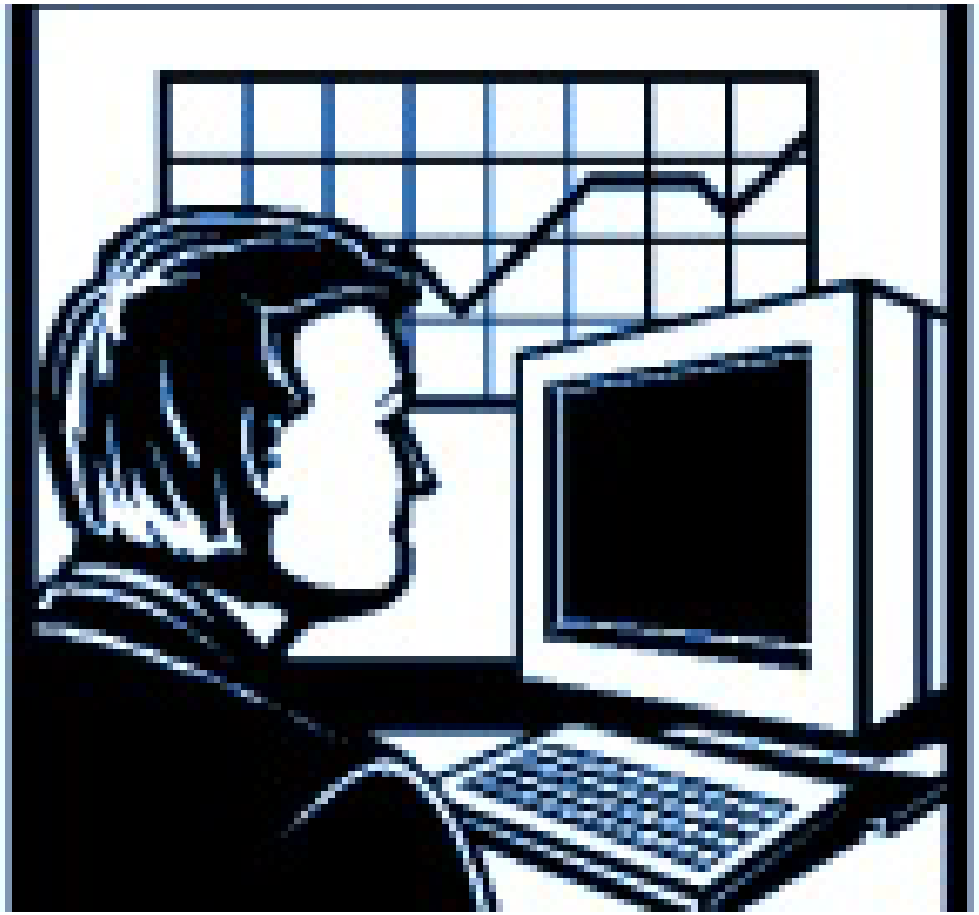
When starting the Lee County CTP, we faced a few common issues:

- Anticipation of future growth in a county with relatively flat growth in the past
- A larger town (Sanford), with a relatively complex street network, necessitating use of a travel demand model
- No existing models covering the area (either from past CTPs or from nearby MPOs/regional models)

And we had a few items in our favor:

- The Triangle Regional Model (nearby) had recently gone through a CommunityViz modeling process that we could borrow elements from
- Lee County, Sanford, and Broadway had recently completed a new land use plan with land use categories that matched well with the placetypes used in the Triangle CommunityViz model

The Basics of the CommunityViz Model



There are three main steps in the CommunityViz modeling process:

1. **Land Capacity** – *the amount of growth (housing or employment) that any particular parcel of land can accommodate*

   Constraints + Place Types + Development Status

2. **Site Suitability** – *the attractiveness of a location for development*

   Transport Access + Activity Centers + Environmental Features + Utility Services

3. **Growth Allocation** – *the modeled location of growth, as calculated by CommunityViz*

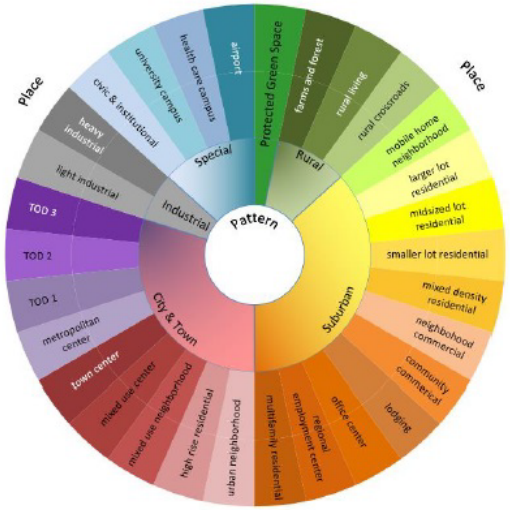
   Control Total + Committed/Asserted Development + Randomness

Land Capacity

Placetype from Plan San Lee	Most Similar Placetype in CommunityViz
Countryside	Rural Living
Crossroads	Rural Crossroads
Village Neighborhood	Midsized Lot Residential Neighborhood
Village Center	Town Center*
Suburban Neighborhood	Smaller Lot Residential Neighborhood
Urban Neighborhood	Urban Neighborhood
Neighborhood Transition Area	Mixed Use Neighborhood
Neighborhood Center	Neighborhood-scale Commercial Center
Commercial Corridor	Community-scale Commercial Center
Downtown	Town Center*
Mixed Use Activity Center	Mixed Use Center
Professional and Institutional Campus	Civic and Institutional
Maker District	Light Industrial Center
Industrial Center	Heavy Industrial Center

**Town Center was most similar for both the Village Center and Downtown placetypes from Plan San Lee. For the initial model run, we believe it is reasonable to treat these both the same in CommunityViz, but we could modify this in the future if necessary.*

The CommunityViz model includes a number of other potential placetype categories that were not used in Lee County, as seen in the graphic at right. The next page lists the characteristics of the placetypes that *are* being used for Lee County.



Development Constraints

- In Lee County, this was primarily undevelopable park land

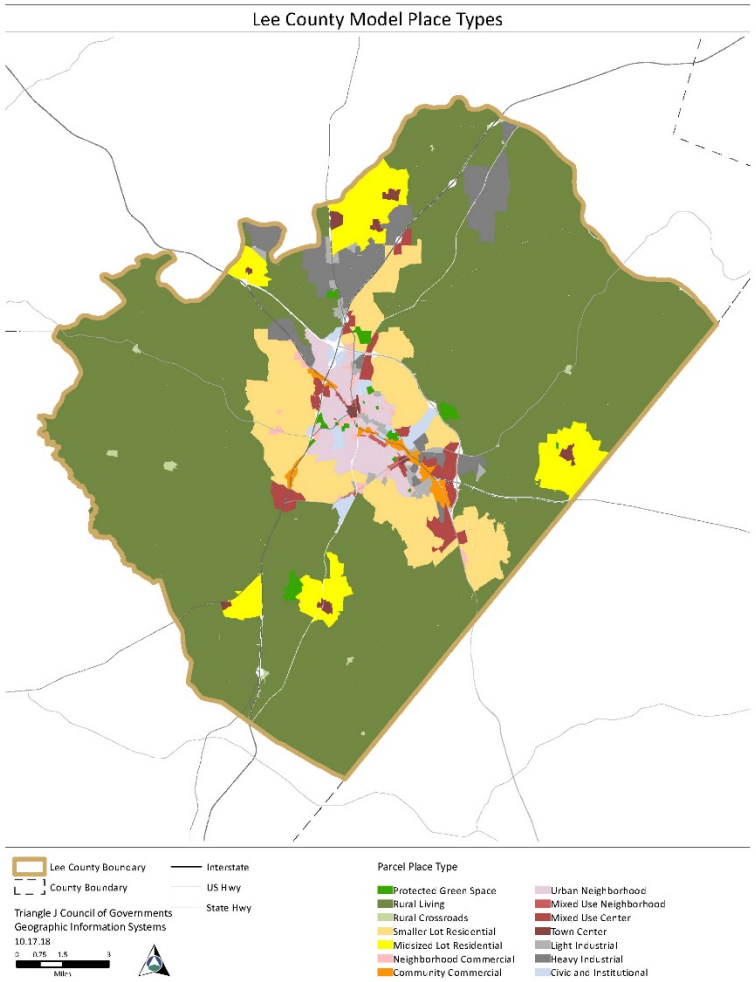
Parcel Place Types

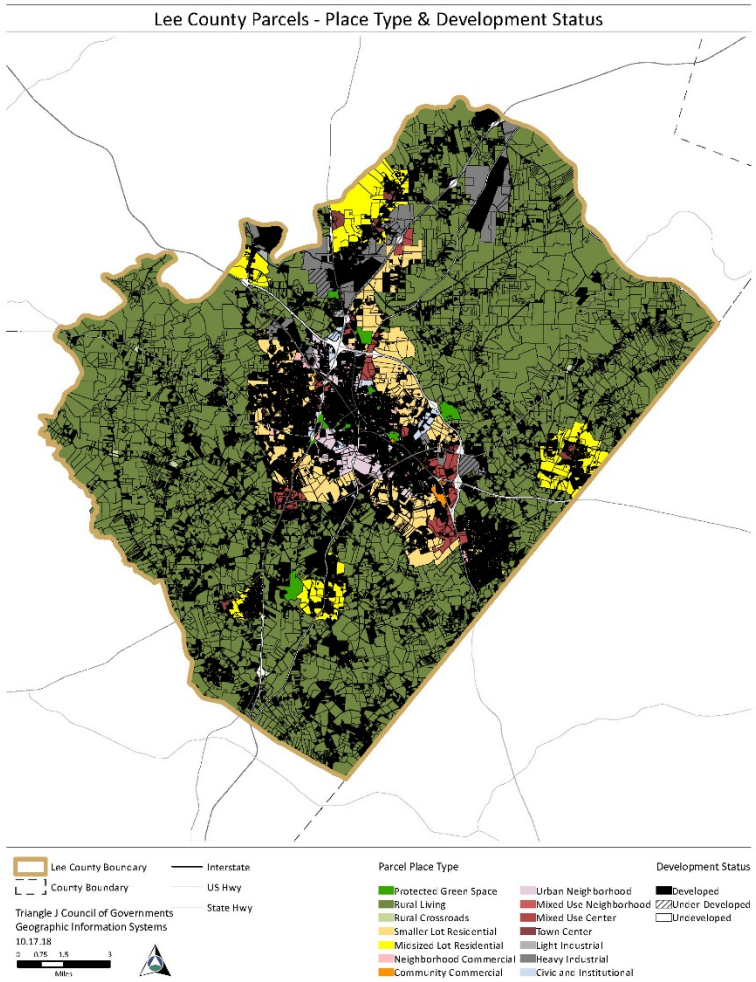
- Crosswalk between place types in land use plan and those in Triangle CommunityViz framework; good matches in most cases
- Tried to match to the place type that was best fit for land use type and density, without making major changes to the place type categories

Development Status

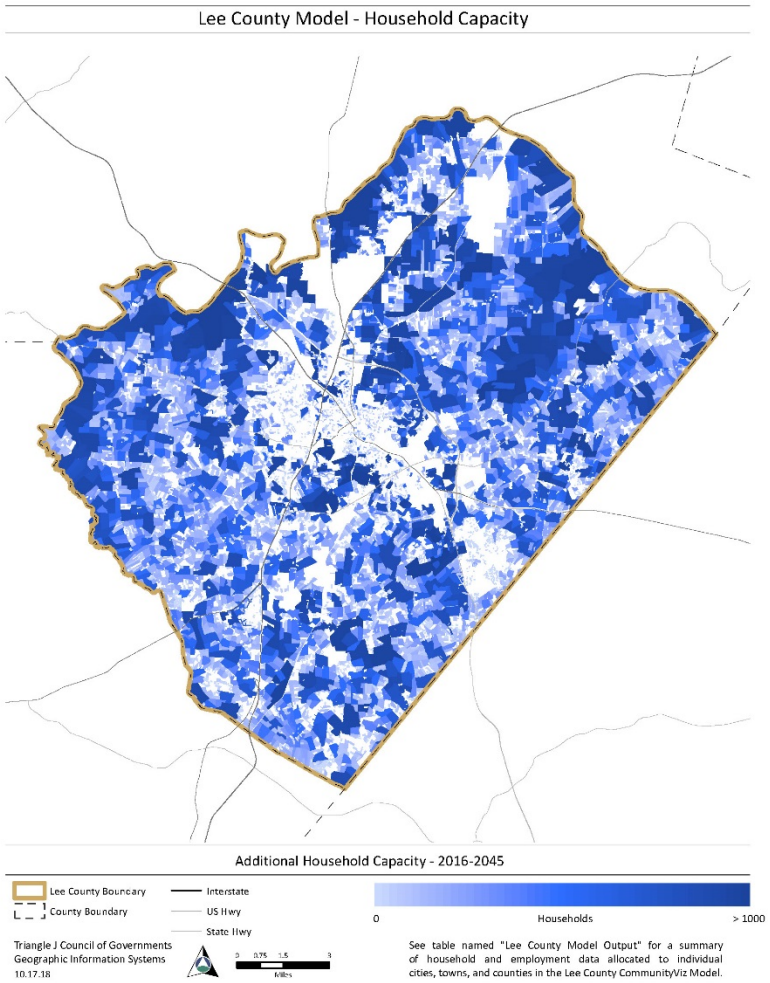
- Marked parcels as ‘Developed’, ‘Undeveloped’ or ‘Underdeveloped’
- Based on combination of parcel GIS data (for example, residential parcels under 10 acres with structures on them were tagged as developed) and confirmation using aerial photos

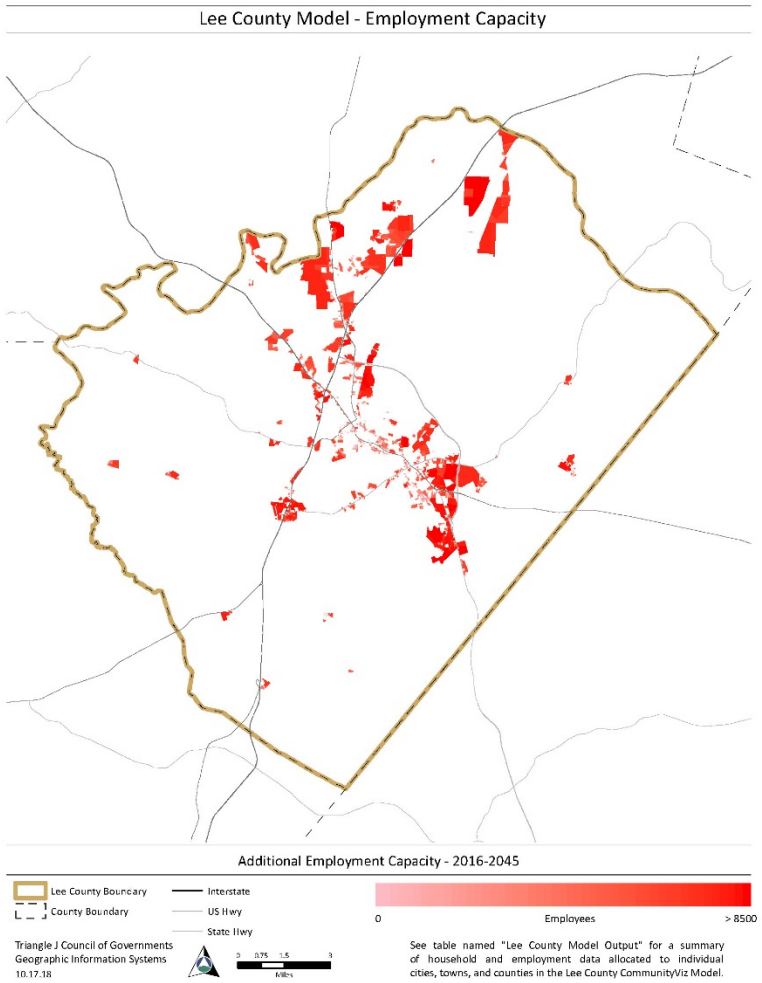
Parcel Place Types & Development Status





Parcel Capacity for Growth





Site Suitability

Table of Suitability Measures used in CommunityViz Model

Attribute Name	Description	Measurement	Correlation	Preferred Scenario Score	File Name In Model
SUITABILIT / CP_LSA	Suitability score normalized on a scale of 1-100				
Raw_	Prefix or suffix in attribute name indicating score is not normalized				
	Highway System				
CUR_MR	Current Major Roadways	Proximity	Positive	4	Lee_County_Major_Roadways
INTER	Interchange Locations	Proximity	Positive	6	Lee_County_Interchange_Locations
MAJ_INT	Major Intersections	Proximity	Positive	5	Lee_County_Major_Intersections
	Development Activity Centers				
TCAC	Town Center & CBD Activity Centers	Proximity	Positive	7	Lee_County_Town_Centers
RCAC	Regional & Community Activity Centers	Proximity	Positive	7	Lee_County_Regional_and_Community_Activity_Centers
ANCHOR	Anchor Institutions	Proximity	Positive	7	Lee_County_Anchor_Institutions
	Environmental Features				
FLOOD	100-Year Floodplain Protection Areas	Overlap	Negative	3	Lee_County_Flood_Hazard_Areas
VAD	VAD	Overlap	Negative	3	Lee_County_VAD
	Utility & Service Area Footprint				
EEGA	Emerging Growth Areas (Extra Territorial Jurisdiction Boundaries)	Overlap	Positive	4	Lee_County_Existing_and_Emerging_Growth_Areas
SEWER	Public Sewer Service Area	Overlap	Positive	7	Lee_County_Sewer_Service_Areas

Notes:
1 Suitability interacts with other parts of the model, including development constraints (such as natural areas like stream buffers that removes land from potential development) and place types, which affect the type and intensity of development (such as only permitting very low density residential development in certain watershed areas or areas without public water service).

Proximity indicates that score is based on distance from feature. Overlap indicates that score is based on whether parcel overlaps with feature or not (yes/no).

For the proximity-based factors, features both inside and outside Lee County were considered.

Anchor Institutions were considered as a potential input, but no major anchor institutions (such as major universities) were identified in Lee County, so this was not a factor in the final analysis.

Positive correlation indicates that proximity or overlap with the feature will increase the suitability score. Negative correlation indicates that proximity or overlap with the feature will decrease the suitability score.

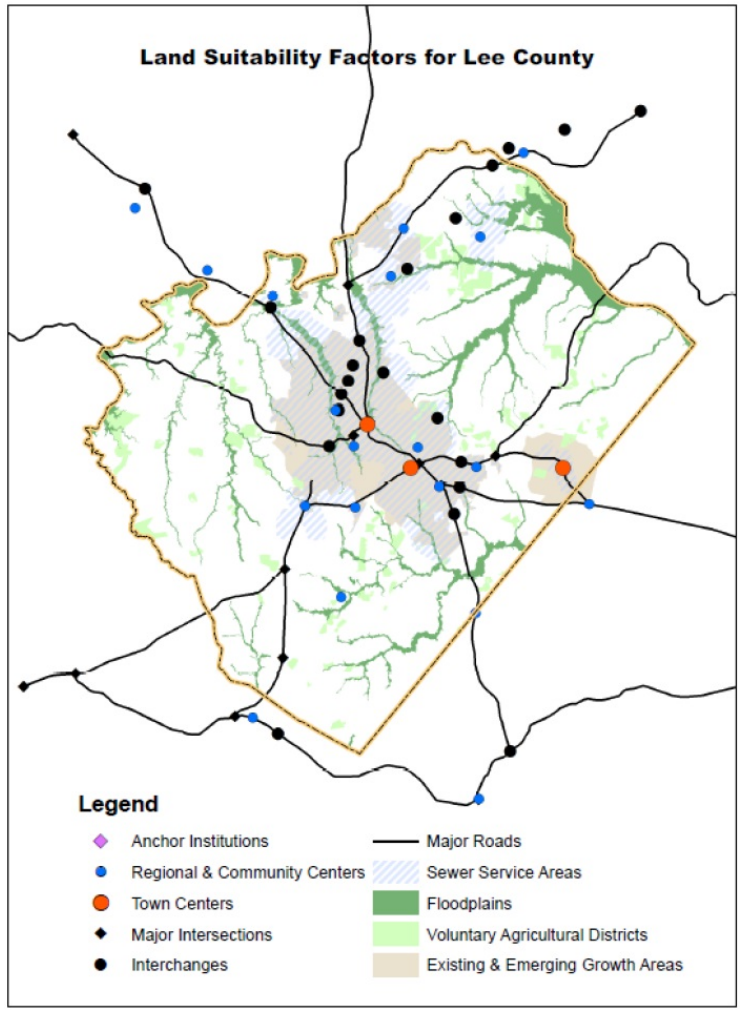
Preferred Scenario Score indicates the amount of weight this feature receives within the suitability model (on a scale of 1-10, with a higher score carrying higher weight).

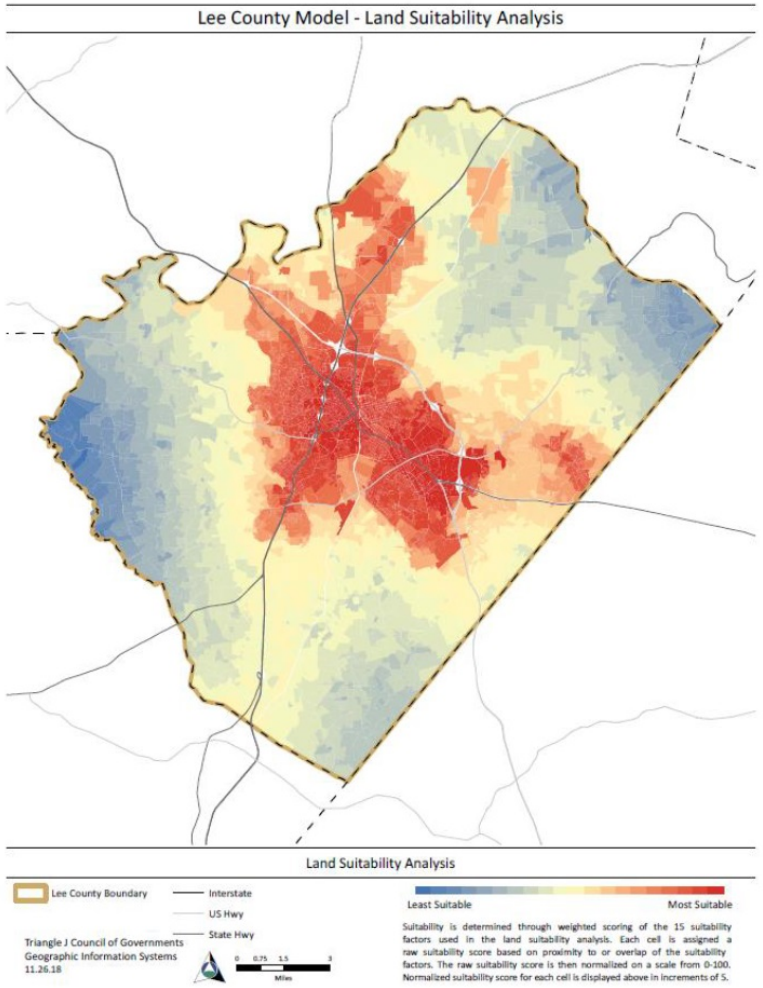
We borrowed the suitability factor/weight model from the next-door Triangle region

Developed data layers of:

- Regional & Community Centers (proximity to point)
- Town Centers (proximity to point)
- Major Intersections (proximity to point)
- Interchanges (proximity to point)
- Major Roads (proximity to line)
- Sewer Service Areas (overlap to polygon)
- Floodplains (overlap to polygon)
- Voluntary Agricultural Districts (overlap to polygon)
- City Limits & ETJ (overlap to polygon)

Site Suitability

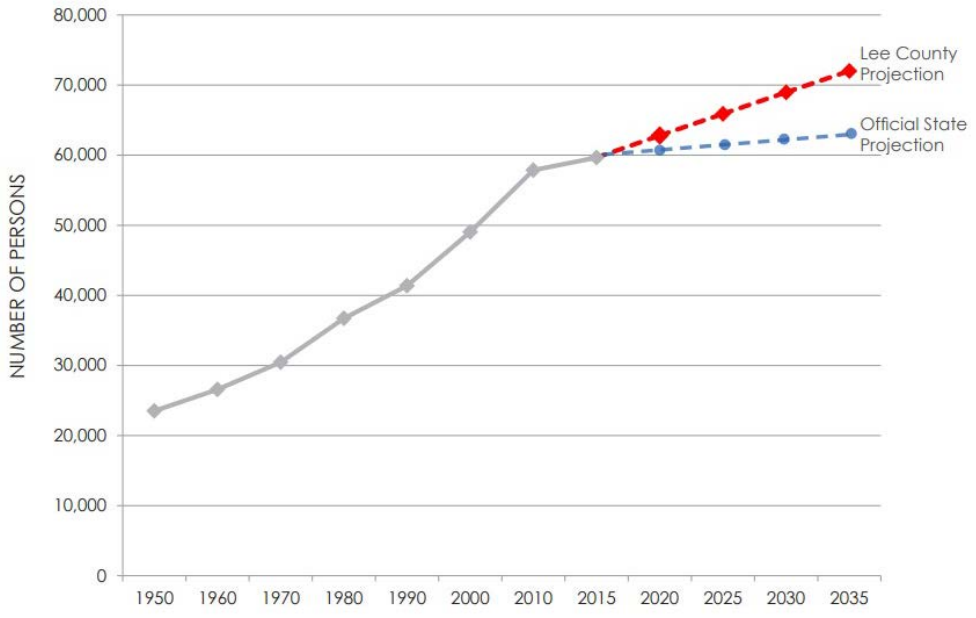




Growth Allocation – Control Totals

FIGURE 1.3 PROJECTED POPULATION GROWTH - LEE COUNTY

Source: U.S. Census Bureau & NC Office of State Budget & Management; Lee County Projections (shown in red) are calculated using a constant share method based on NC projections provided by the NC OSBM. The line displayed in blue reflects the population growth projected by the State.



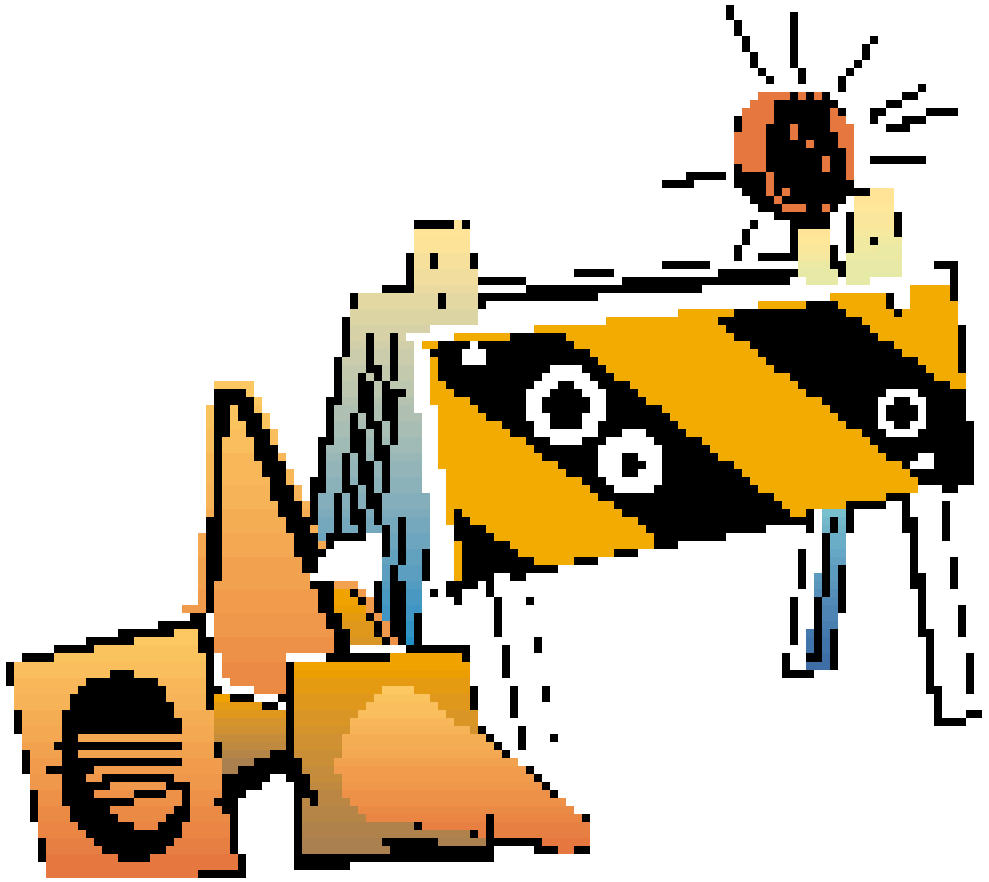
It starts with an expected control total for growth:

- We often use the state demographer's county growth estimates for this purpose, but these historically tend to underestimate growth in Lee County
- We chose to use the projection method that the local area had used for its land use plan, and extrapolated that line out to the horizon year for the CTP
- For employment growth, we chose to use the percentage growth rate for Lee County forecast by Woods & Poole through the horizon year, and applied this growth rate to the base year data

<u>Growth Forecast (2016-2045):</u>

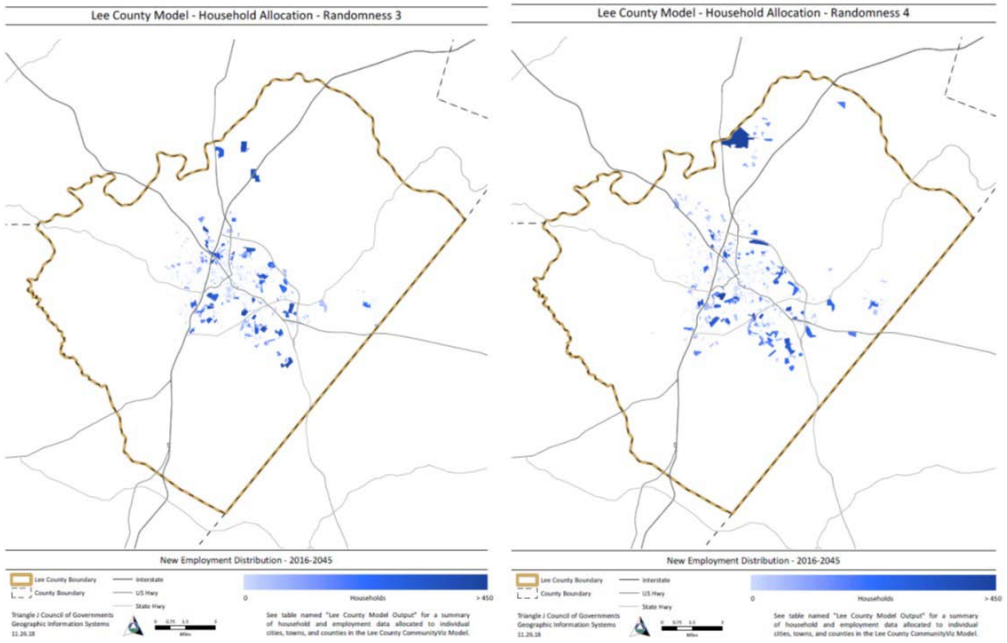
- 15,941 added people (6,009 added households)
- 7,940 added jobs

Growth Allocation – Committed/Asserted



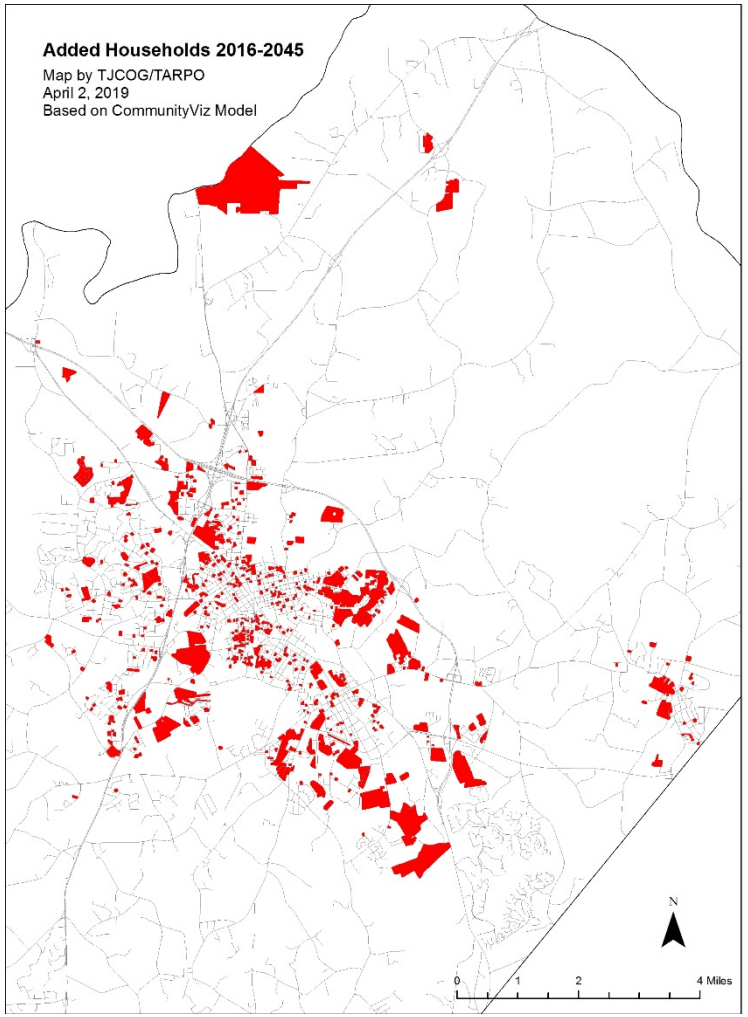
- We account for development that is already known and/or underway by “hard-coding” this growth into the model as committed or asserted growth
- This growth is then subtracted from the growth total that will be allocated by the CommunityViz model, and is subtracted from the available growth capacity of individual parcels
- For Lee County, we hard-coded:
  - 18 proposed or underway housing developments
  - 1,653 single-family homes & 728 multi-family homes (2,381 total)
- This left 3,628 households to be allocated by the CommunityViz model

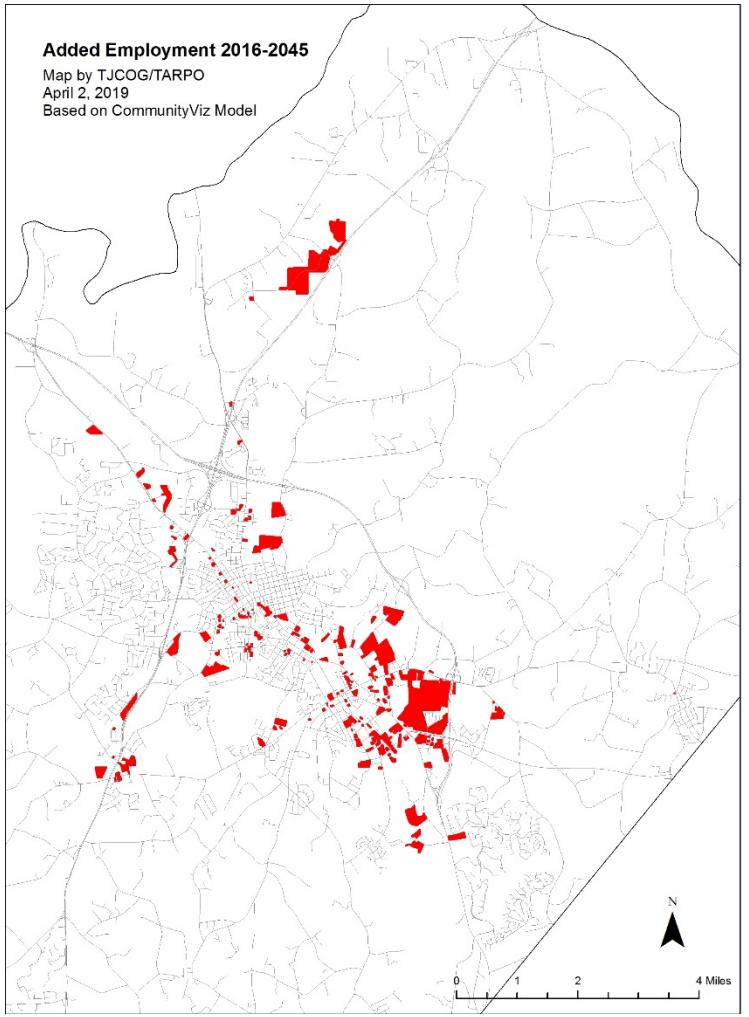
Growth Allocation - Randomness



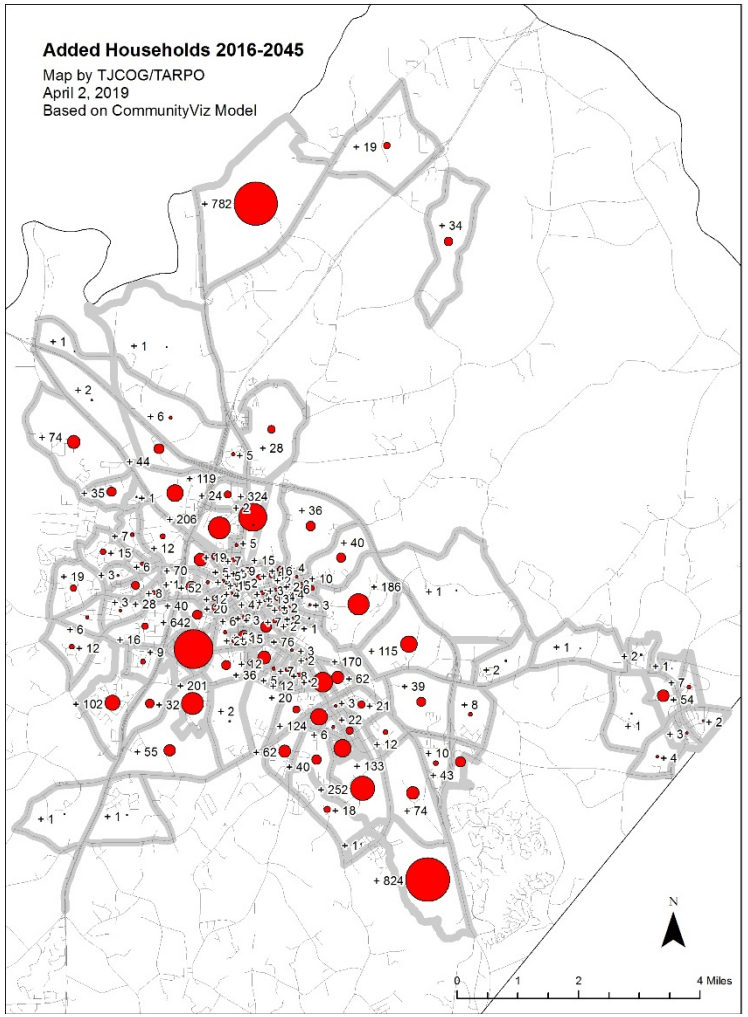
- The CommunityViz model for growth allocation includes a setting that allows for randomness, so that it will not just be based entirely on the suitability score
- The setting ranges from 0 (entirely based on suitability) to 10 (entirely random)
- Randomness modifies the parcel suitability scores by adding or subtracting a random number between 0 and the randomization setting squared
- Setting the randomness too low results in clustering the growth in a few pockets with the highest suitability scores – setting the randomness too high results in disregarding the suitability analysis and makes it very difficult to replicate results
- Lee County explored settings of both 3 & 4, but ultimately selected 3 since it matched practice with the Triangle region and seemed reasonable

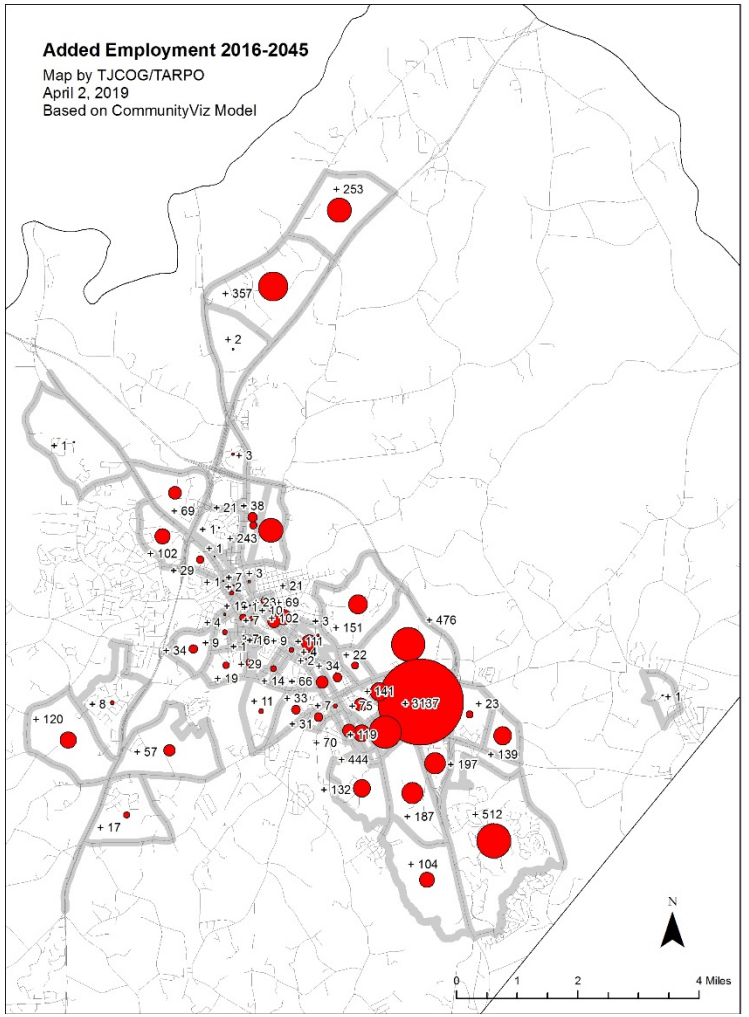
Growth Allocation





Growth Allocation





Growth Allocation

TAZ	Households			Industrial Jobs			Retail Jobs			Highway Retail Jobs			Service Jobs			Office Jobs		
	2016	Growth	2045	2016	Growth	2045	2016	Growth	2045	2016	Growth	2045	2016	Growth	2045	2016	Growth	2045
52	105	0	105	5	0	5	4	0	4	0	0	0	6	0	6	5	0	5
53	49	0	49	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0
54	68	0	68	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7
55	29	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	125	0	125	4	0	4	0	0	0	0	0	0	8	0	8	0	0	0
57	153	0	153	7	0	7	0	0	0	0	0	0	0	0	0	3	0	3
58	86	824	910	0	0	0	0	1	1	0	0	0	0	103	103	0	0	0
59	301	74	375	130	113	243	659	12	671	399	0	399	274	62	336	103	0	103
60	506	0	506	9	0	9	7	0	7	0	0	0	22	0	22	29	0	29
61	979	0	979	52	0	52	0	512	512	6	0	6	88	0	88	39	0	39
62	56	43	99	4	0	4	0	0	0	0	0	0	4	0	4	0	0	0
63	20	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	70	0	70	8	0	8	1	0	1	0	0	0	0	0	0	2	0	2
65	15	0	15	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0
66	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	72	3	75	0	0	0	0	0	0	0	0	0	100	0	100	2	0	2
68	13	0	13	0	0	0	0	0	0	0	0	0	10	0	10	0	0	0
69	17	4	21	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
70	72	54	126	17	0	17	8	0	8	2	1	3	11	0	11	31	0	31
71	72	1	73	3	0	3	0	0	0	0	0	0	0	0	0	2	0	2
72	70	0	70	6	0	6	0	0	0	0	0	0	1	0	1	0	0	0
73	93	0	93	2	0	2	1	0	1	0	0	0	2	0	2	3	0	3
74	39	0	39	0	139	139	0	0	0	0	0	0	0	0	0	0	0	0
75	122	8	130	914	23	937	0	0	0	0	0	0	11	0	11	3	0	3
76	114	1	115	3	0	3	2	0	2	0	0	0	0	0	0	0	0	0
77	75	2	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	12	0	12	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
79	59	1	60	0	0	0	3	0	3	40	0	40	11	0	11	3	0	3
80	97	7	104	22	0	22	3	0	3	0	0	0	5	0	5	3	0	3
81	79	2	81	0	0	0	4	0	4	0	0	0	5	0	5	0	0	0
82	96	0	96	18	0	18	16	0	16	0	0	0	5	0	5	0	0	0
83	33	0	33	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
84	71	0	71	6	0	6	0	0	0	0	0	0	3	0	3	5	0	5
85	74	0	74	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
86	37	0	37	3	0	3	1	0	1	0	0	0	4	0	4	5	0	5

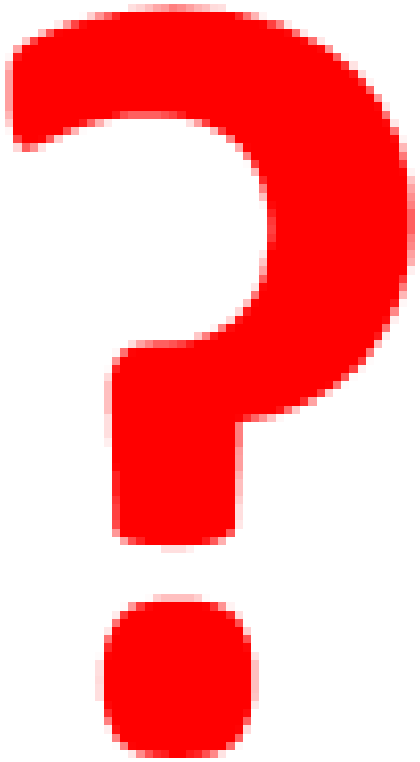
Challenges & Lessons Learned

- Need to account for suitability factors located outside/beyond your study area
- Timing questions related to committed and/or asserted development – what counts, and when?
- Understanding that the results ***will*** change every time you re-run the model – resisting the urge to continuously tinker

Need to set expectations up front about:

- Timing/deadlines and number of re-runs
- Important projects that locals believe need to be reflected in results (should consider hard-coding these in order to avoid re-do loops) – creates believability issues with results

Might This be Right for My Area?



Do you…

- Have (or expect to have) a travel demand model for your CTP study?
- Have access to GIS data showing future land uses (that you could use for determining parcel place types)?
- Anticipate a fair bit of growth in the community?
- Want to avoid disagreements among stakeholders about the proper way to manually forecast growth?
- Have decent GIS skills?

Then the answer may be **YES!**

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Questions at End of Session
Thanks for Listening!

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