Moore County OD Results

July 31,2013

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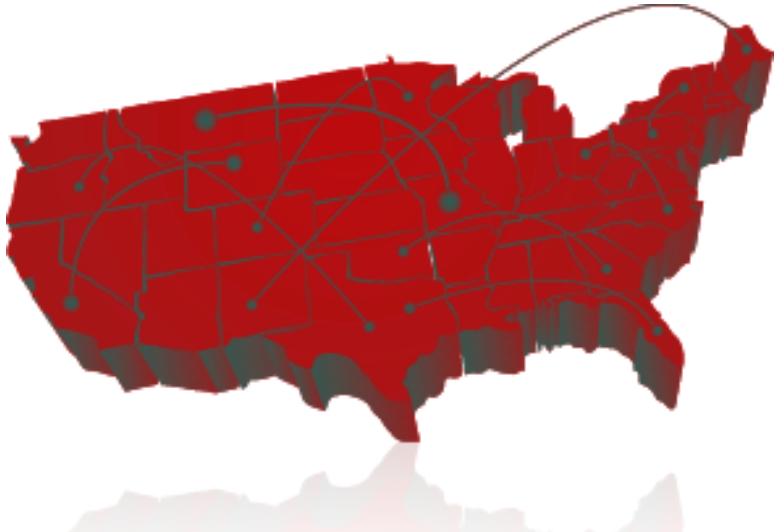
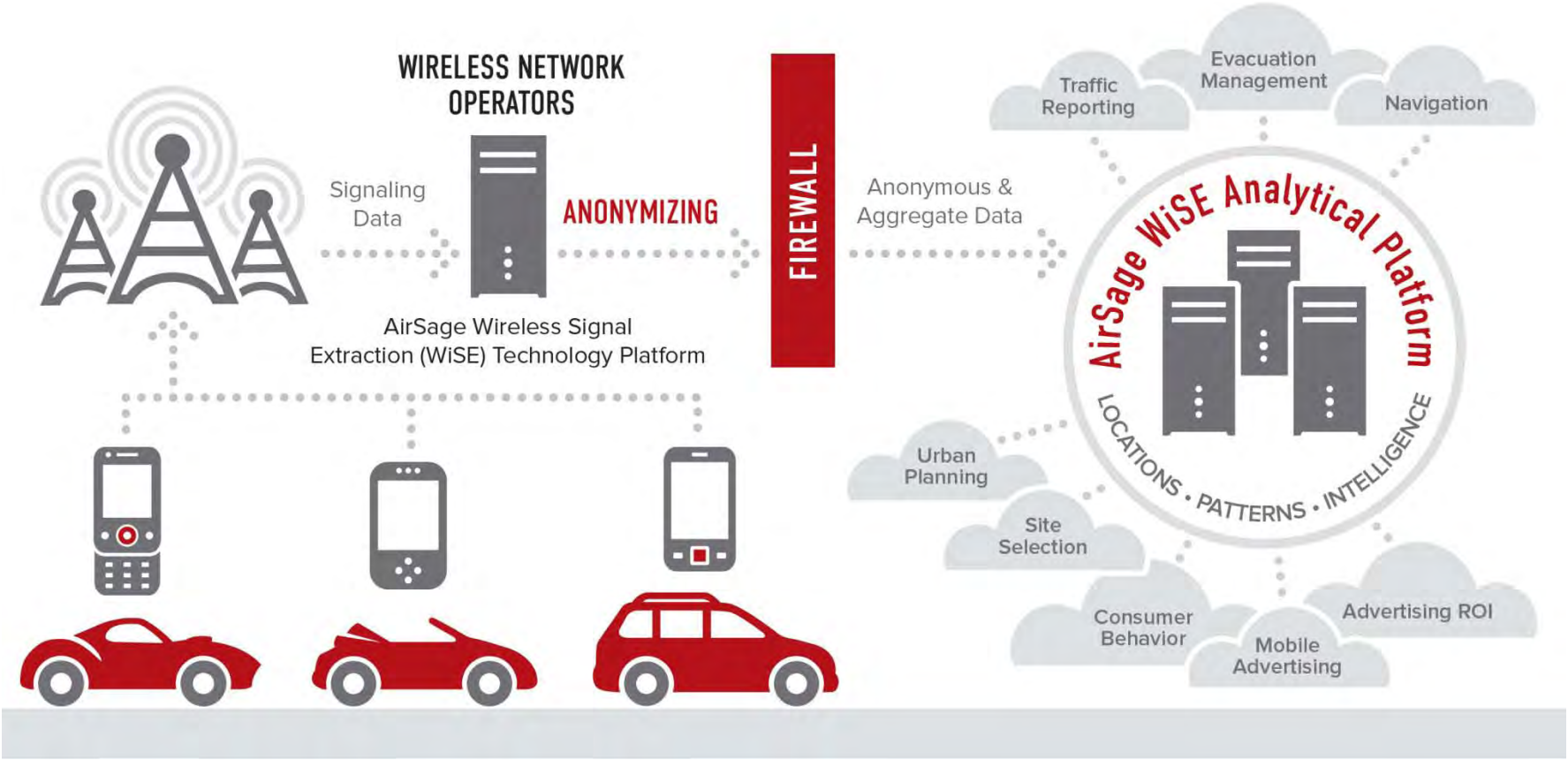
AirSage Company Overview

- Patented ***<u>Population Analytics</u>***
- 15 billion location data points per day
- 125 million mobile devices
- Consumer privacy protection



airsage

AirSage WiSE Platform



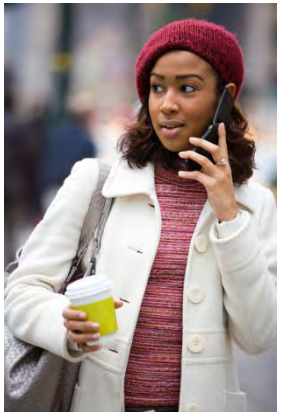
What Does AirSage Do?

AirSage aggregates and analyzes wireless network data to determine the location and movement of cell phones, while maintaining strict user privacy.

- AirSage analyzes signaling data that is continuously generated during normal operation of the wireless network – ***covering mobile devices*** connected to that network.
- AirSage is ***the only company with access to this unique data***, via contracts with major wireless carrier partners.
- The AirSage system ***operates transparently to mobile users*** and the wireless network. There is no user opt-in or handset software (embedded or otherwise) required.
- With current partners , Sprint and Verizon, the AirSage platform supports real-time, network-wide coverage of ***over 125 million mobile devices***.
- These 125 million "mobile sensors" generate about ***12 billion location events per day***.
- The AirSage system ***fully protects user privacy***. AirSage does not have access to subscriber-identifying information, and AirSage data products cannot be used to locate or "track" individual subscribers.

Moore County Study Facts & Figures

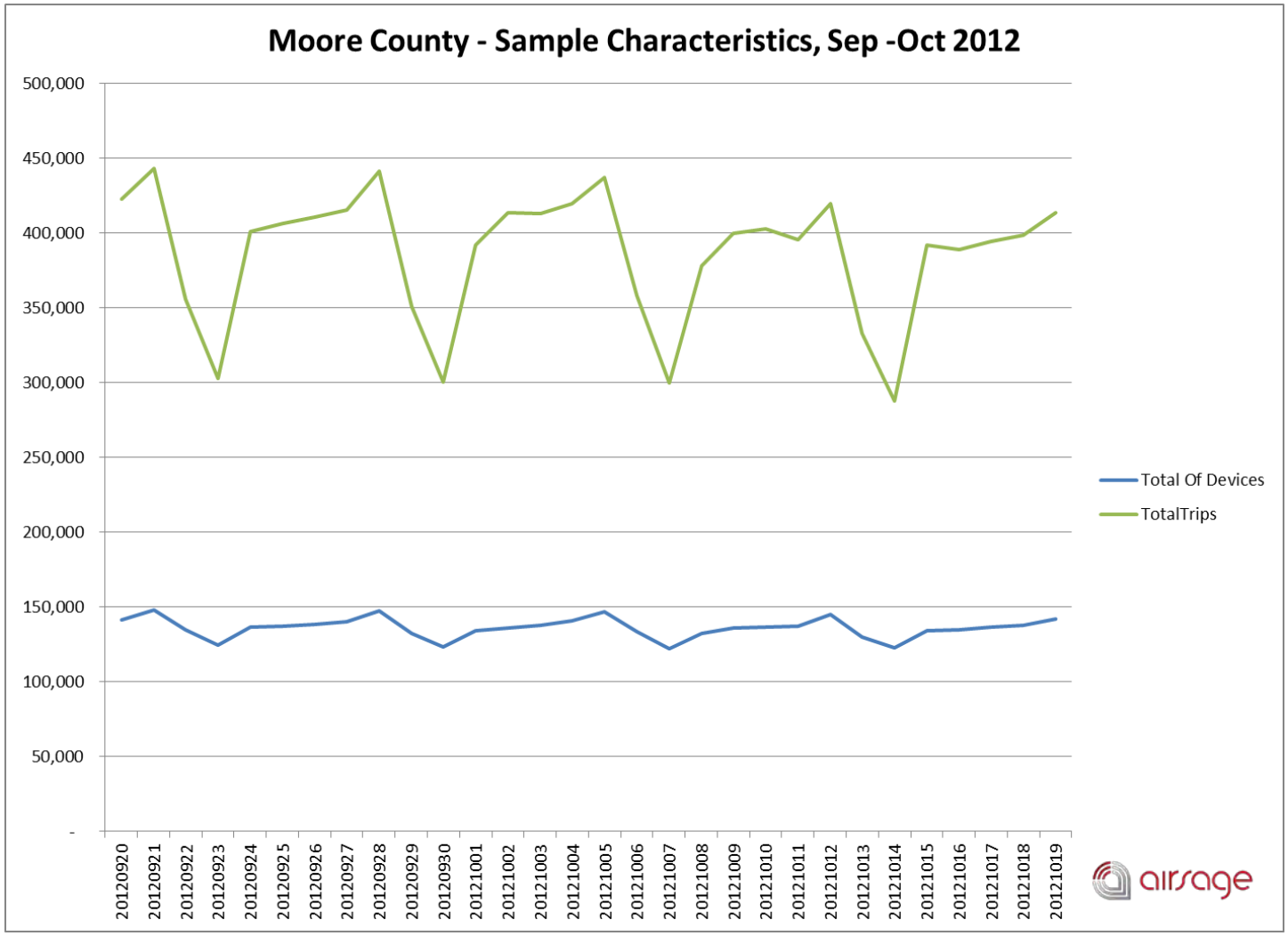
- 1 month of data from Verizon
  (September 20 – October 18, 2012) consists of:
  - 8 weekend days
  - 12 weekdays



- 11,590,819 - Total number of trips recorded

- 3,017,382 Unique mobiles seen at least once in focus study area

Sample Characteristics, By Day



OD Methodology

There are 4 major steps in creating trips between OD pairs:

Step 1 - Prepare study area (defined by Team)

Area Contains:

209 FIPS Code Census Tracts

2011 Census Resident Pop. 89,352

Study Period: September 20-October 18, 2012

OD Methodology

There are 4 major steps in creating trips between OD pairs:

Step 2 - Assign Subscriber Home and Work Locations.

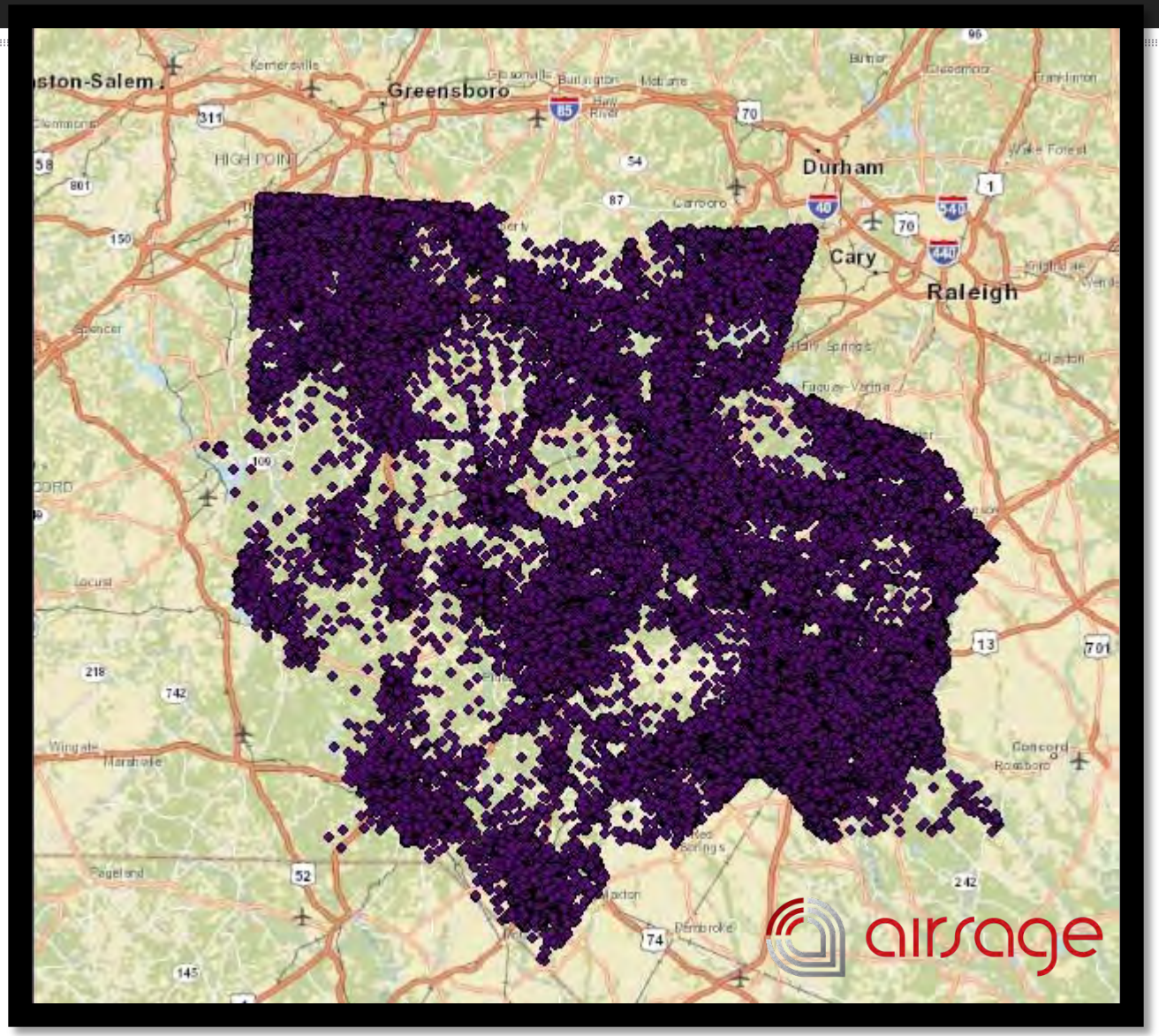
Methodology – Subscriber Classification

- Assign a 'home zone' as being wherever a subscriber was during 'home time' for at least half the weekdays (20 for Moore County) during the study period. 'home time' is from 7 PM to 7 AM.

- Residents are defined as having a 'home zone' in the study area.

- Non-Residents are outside Moore County

Moore County HOME Locations



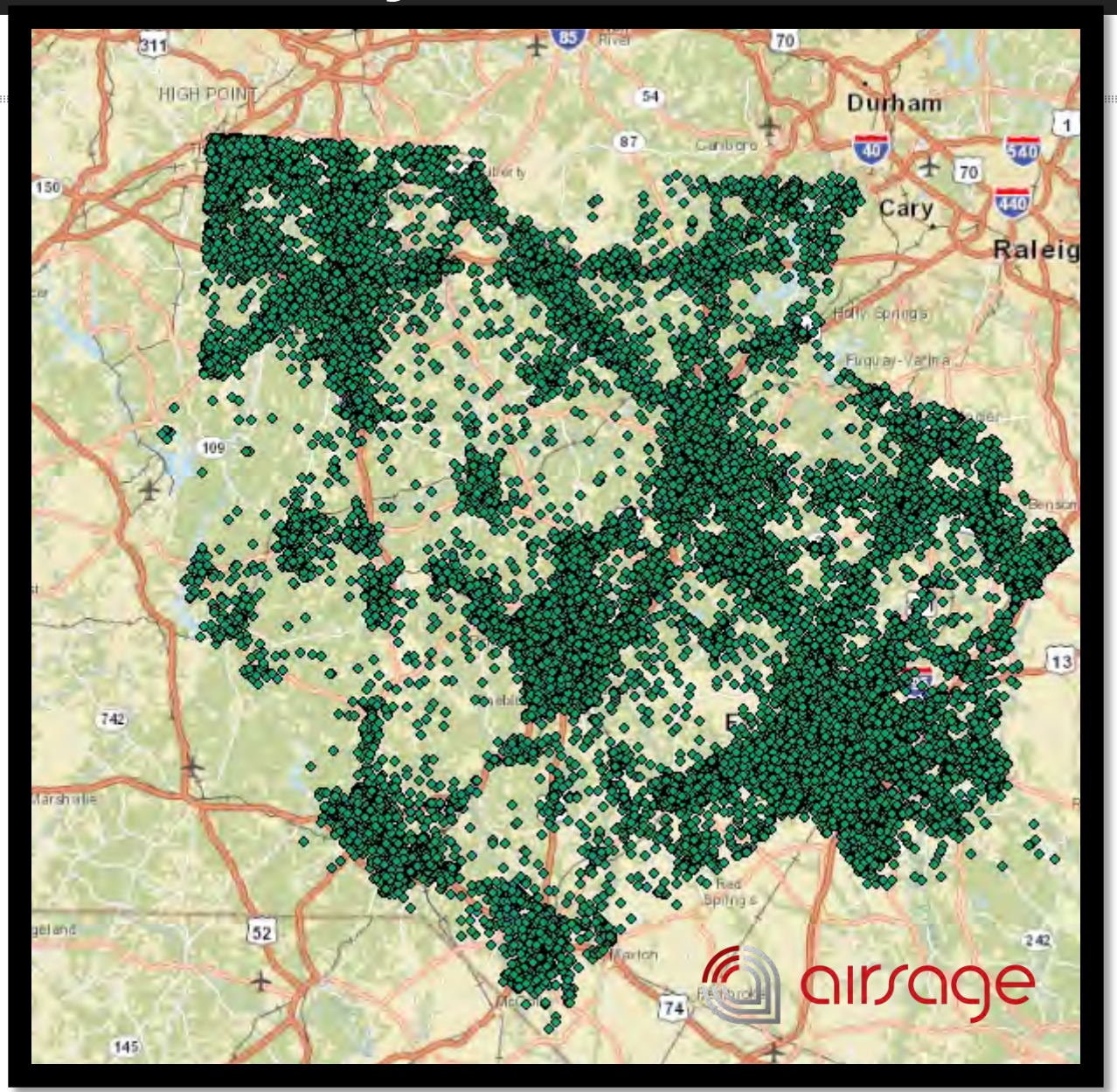
*Based on Airsage Mobile Device Methodology

Methodology – Subscriber Classification

- Assign a 'work zone' as being wherever subscriber was during 'work time' for at least half the weekdays (20 for Moore County) during the study period. 'work time' is from 9 AM to 4:00 PM.

- Assign “Subscriber Classifications” as follows:
  - Resident – lives and works in the study area
  - Non-Residents – those who visited the area and remained shortly (Three days) or traveled through the area entirely

Moore County WORK Locations



*Based on Airsage Mobile Device Methodology

Moore County Study Facts & Figures

Trip Type	Trip	Percentage
Total	378,965	100%
IE_NonResident	6,245	2%
II_NonResident	10,561	3%
II_Resident	274,351	72%
IE_Resident	80,878	21%
EE_Trips	6,930	2%

OD Methodology

There are 4 major steps in creating trips between OD pairs:

Step 3 - Generate trip points & trips based on sightings.

Methodology – Generate Trip Points & Trips

End Points (EP) are Trip Origin and Destination points. They are sightings that meet any of the following tests:

- In same grid cell for >= 3 minutes OR
- In home or work zone OR
- First or last sighting of the study period for subscriber

Methodology – Generate Trip Points & Trips

Trips are created by linking consecutive EP/GHP points.

- Trips are assigned to the day part based on the time of the last sighting seen in the origin grid cell.
- Trips of less than 1km are discarded.

OD Methodology

There are 4 major steps in creating trips between OD pairs:

Step 4 - Extrapolate sighted trips to all trips using Census population data.

Penetration – Methodology Example

Key

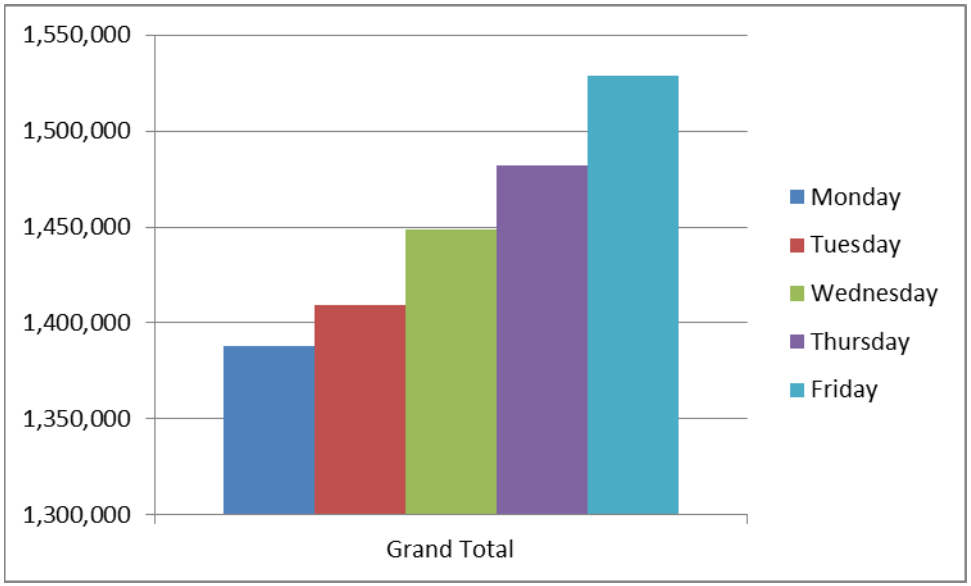
ZOA	Lives in a known census tract in study area, works outside of study area
ZIA	Lives in a known census tract in study area, works inside study area
ZZ	Lives in a known census tract in study area, works in a known census tract in study area
HZW	Lives and works in same known census tract in study area
IAIA	Lives and works in study area
IAZ	Lives in study area, works in a known census tract in study area
IAOA	Lives in study area, works outside of study area

FIPS Code	Pop. 2010	ZOA	ZIA	ZZ	HZW	IAIA	IAZ	IAOA	Penetration
37037020100	14,668	28	10	17	20	3	6	3	0.0059
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
37183054202	24,231	176	117	299	446	39	84	47	0.0498
37183054301	6,339	33	33	37	41	5	12	7	0.0264
37183054302	6,690	38	26	35	59	6	13	7	0.0275
37183054401	9,420	26	38	31	85	7	15	8	0.0222
37183054402	5,420	29	21	52	68	6	14	8	0.0365
Total	1,658,297	12,415	6,932	17,397	31,461	2,538	5,508	3,109	0.0479

Trip Matrix Sample (Only a portion shown)

Origination FIPS	Destination FIPS	Weekday	Trips
37037020100	37037020100	Monday	197
37037020100	37037020100	Tuesday	201
37037020100	37037020100	Wednesday	205
37037020100	37037020100	Thursday	190
37037020100	37037020100	Friday	209
37037020100	37037020200	Monday	28
.			
.			

DOW	Grand Total
Monday	**1,388,133**
Tuesday	**1,409,502**
Wednesday	**1,448,628**
Thursday	**1,482,183**
Friday	**1,529,006**
Grand Total	**7,257,452**



Data Validation

"The estimation of traffic flows using the ***AirSage data compares within 3% of the average daily machine counts*** *for the same period. This is within range of counter error and provides* ***very good correlation with the origin and destination data****."*

Tom Hiles, HDR

Data Validation Example

	No. of Person Trips by Purpose					
Purpose	AirSage 2012		BRAC RTF 2011		TDOT Standard	FDOT Standard
	Trips	Percent	Trips	Percent	Percent	Percent
HBW	52,984	18.6%	62,255	17.3%	18% - 27%	12% - 24%
HBO	136,001	47.8%	195,659	54.3%	47% - 54%	45% - 60%
NHB	95,460	33.6%	102,276	28.4%	22% - 31%	20% - 33%
TOTAL	284,445	*100%*	360,191	100%	100%	100%

BRAC RTF - Base Realignment and Closure (BRAC) Regional Task Force includes Cumberland, Harnett, Hoke, Moore, Lee, Richmond, Robeson, Scotland, Bladen, Sampson and Montgomery Counties

Typical ranges of percent trips by each trip purpose are shown in the following documents:

TDOT Standard – Minimum Travel Demand Model Calibration and Validation Guidelines for State of Tennessee, 2003, page 5

FDOT Standard – FSUTMS-Cube Framework Phase II: Model Calibration and Validation Standards, 2008, page 2-10

- Note: BRAC RTF and current project are entirely different study areas: Only included to seek comparison to closest regional model

Delays -Data Wasn't Just Ready for Prime Time!!!

1. **Needed to upgrade Airsage data system to handle new data**
2. **Challenges with solidifying and implementing AirSage Methodology**
3. **Iterative process defining external zones and rerun with latest version of TAZ system**
4. **Remove Trips Not Really "Through" the region**
5. **Identify IE/EI and EE trips in data set**
6. **Create Trip Matrix**
    1. **TransCAD function to import as matrix**
7. **Convert IE/EI and EE to ADT(to get controls correct)**
    1. **Disaggregate Matrix into our Model Stations**

Why Does it Help Moore County?

- Gives us LOCAL travel data to calibrate model
  - Very unusual to have in smaller modeled areas
- Allows us to determine just where people are going on specific links
- Gives unbiased samples and representative data
- Can choose any time horizon to coincide with model development
- Un-intrusive/easy to collect
- Provides outstanding visual information to decision makers

1 out of every 6
Moore County Residents
captured by Airsage data

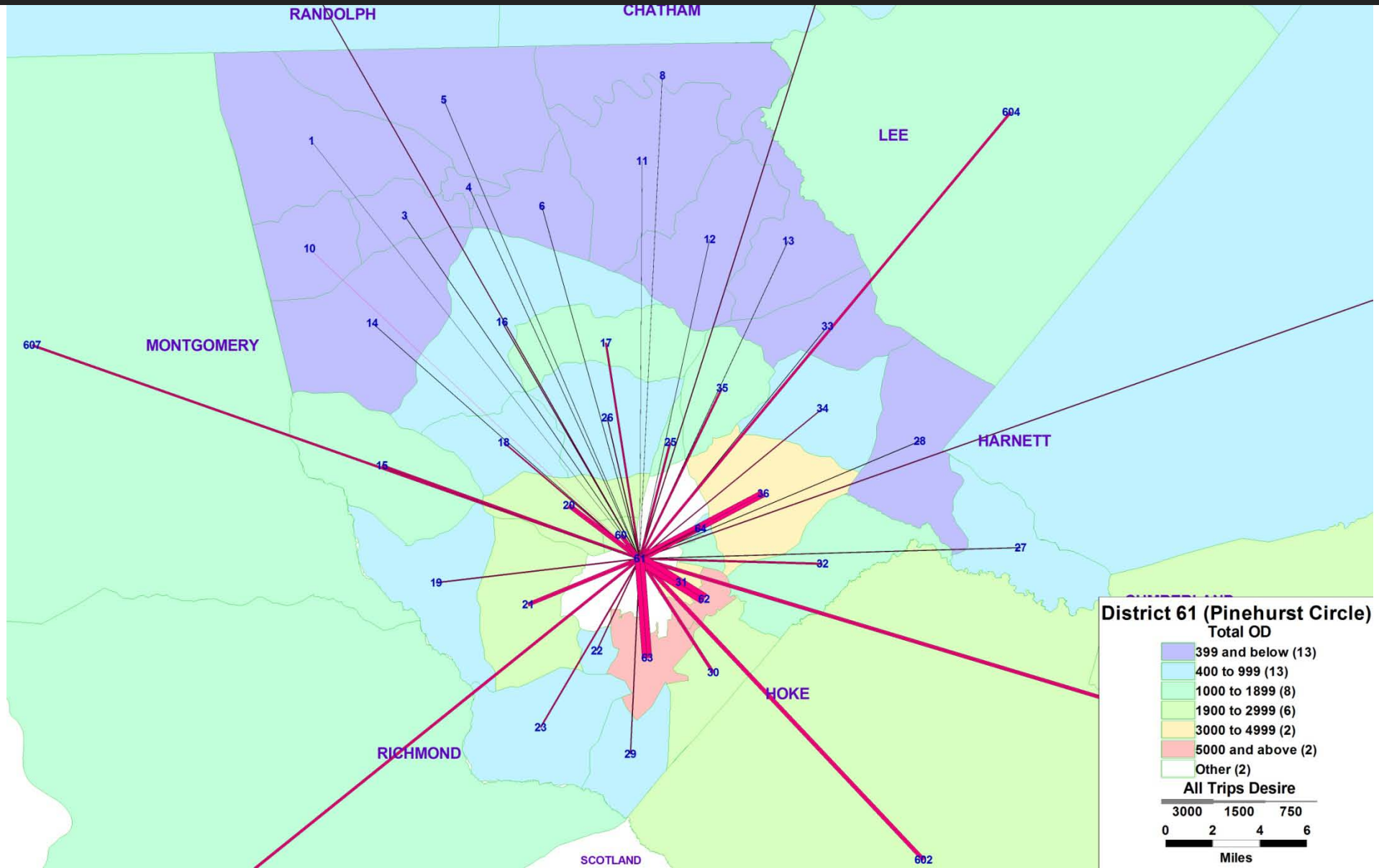
*Typical household survey 1 out of every 100 residents represented

OD Flows

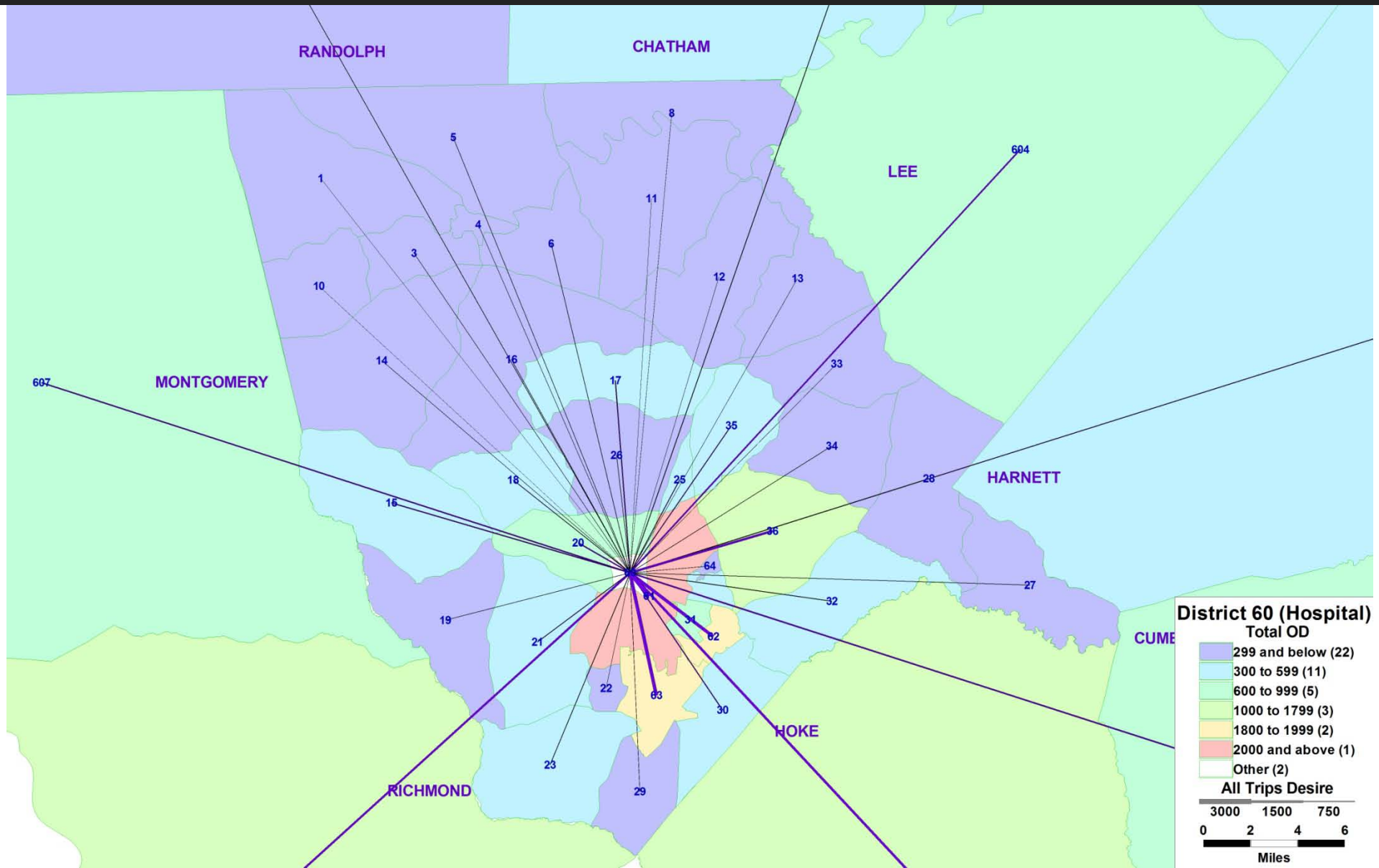
Flows into Groupings of TAZ's

- TAZs grouped into DISTRICTS(larger region)
- Looked a few key locations to understand Moore County Flows
- You will sees "DESIRE LINES"
  - Explains the flows between the main location and all others!
- Shows where people are coming from to get to that area!
  (On a Daily Basis)

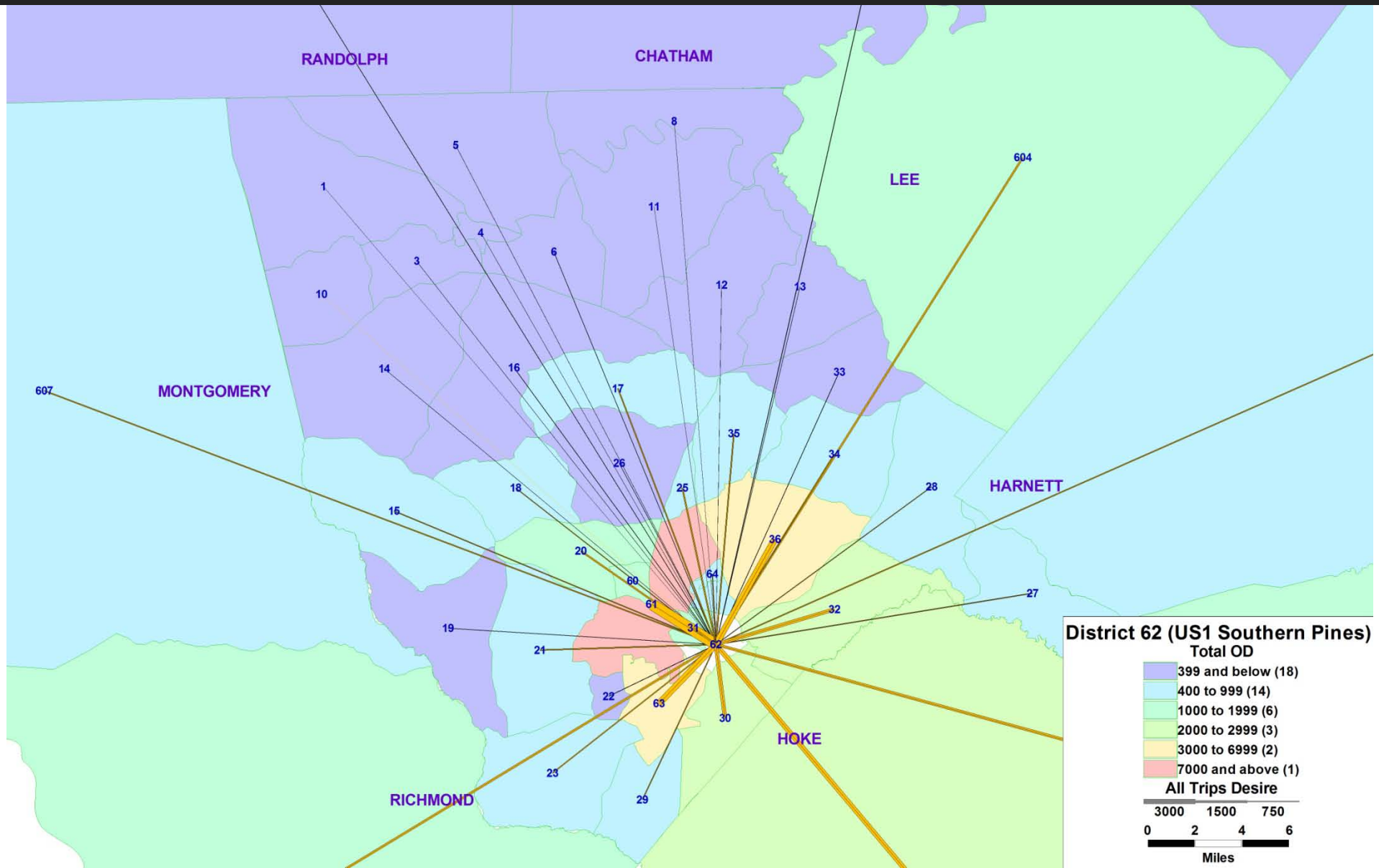
Pinehurst Circle ODs



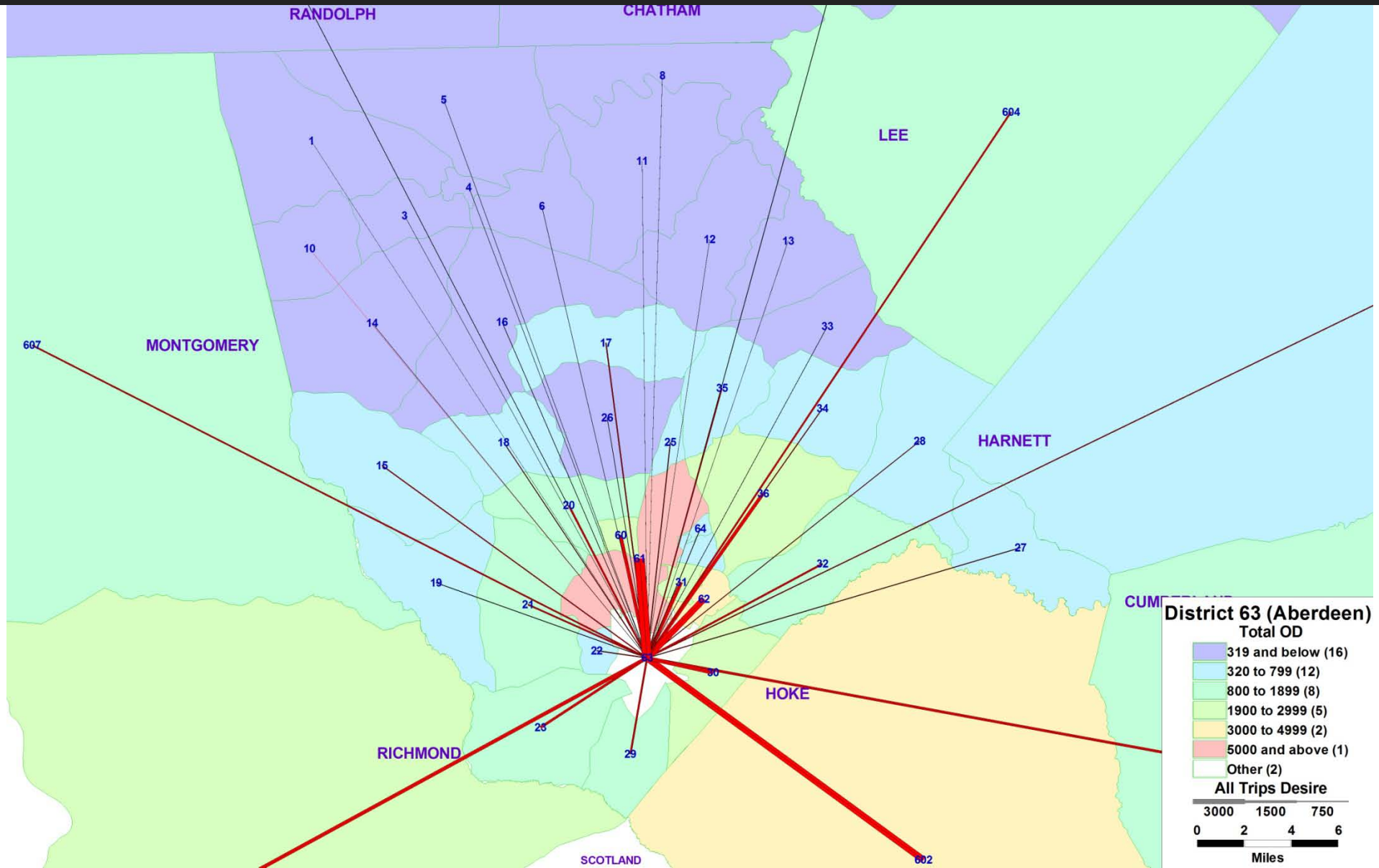
Hospital ODs



US 1 Southern Pines Corridor ODs

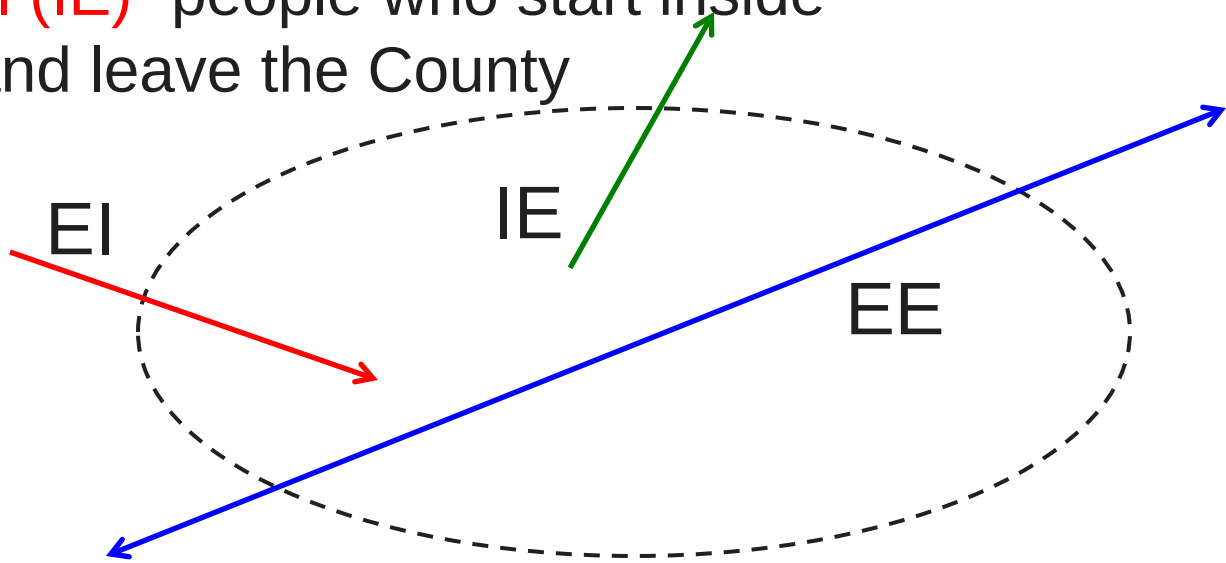


US1 Aberdeen Corridor ODs

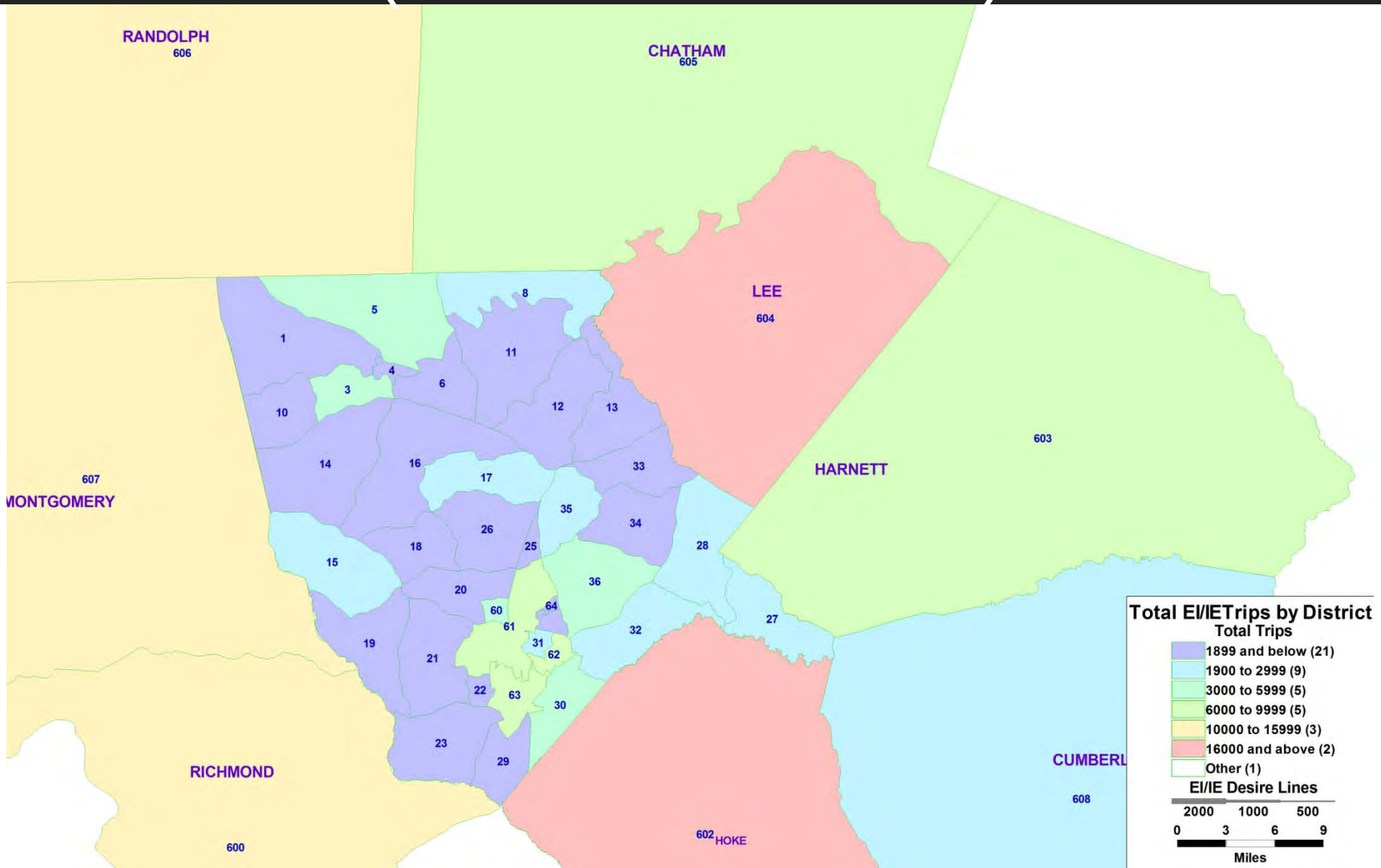


Refresher on Trip types

- Trip Purposes:
  - Through Trips (EE)- People who do not stop inside Moore County
  - External Internal (EI) –people who start outside Moore County and come into the County
  - Internal External (IE)- people who start inside Moore County and leave the County



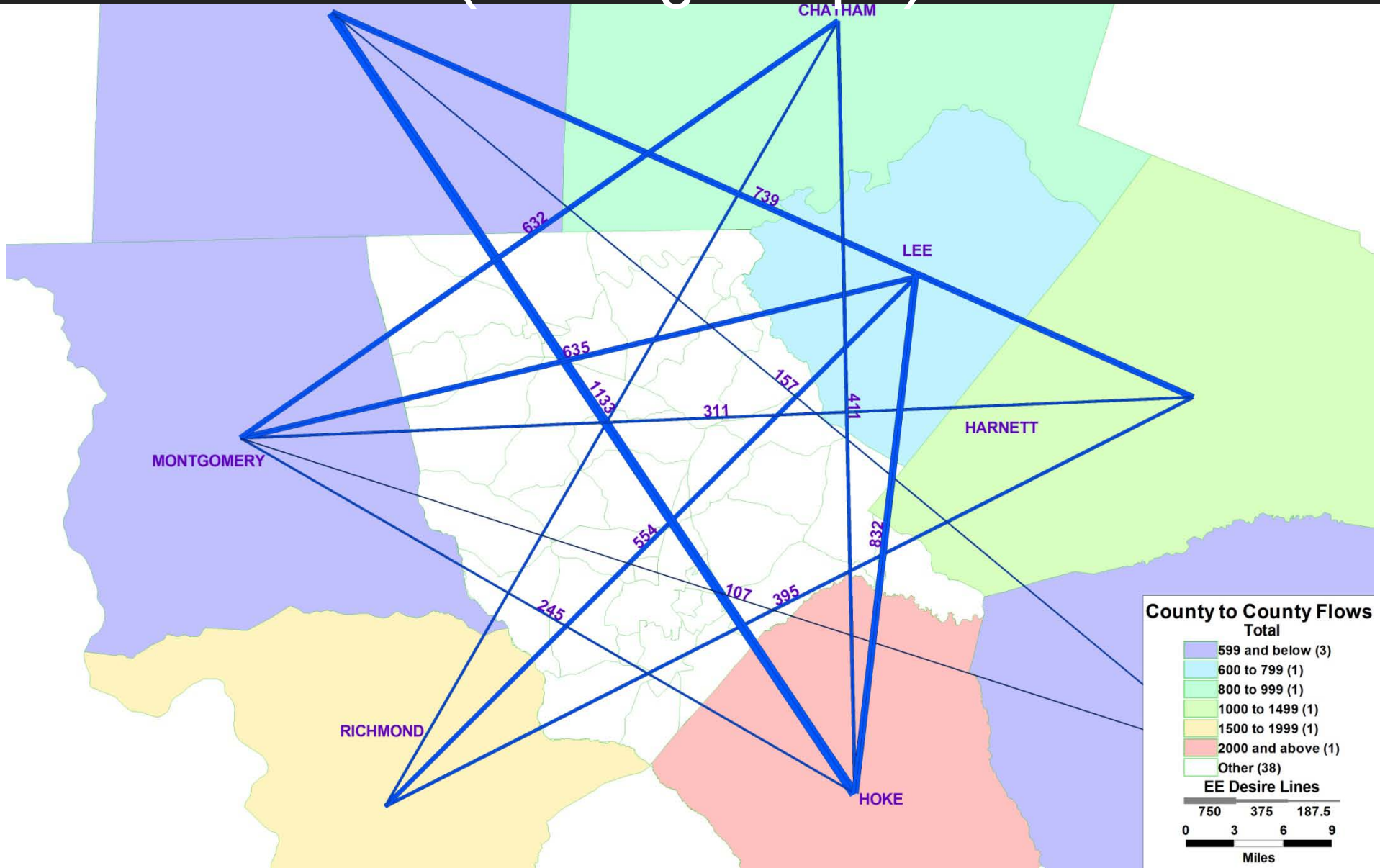
Trips Leaving Moore County Daily
(External to Internal)



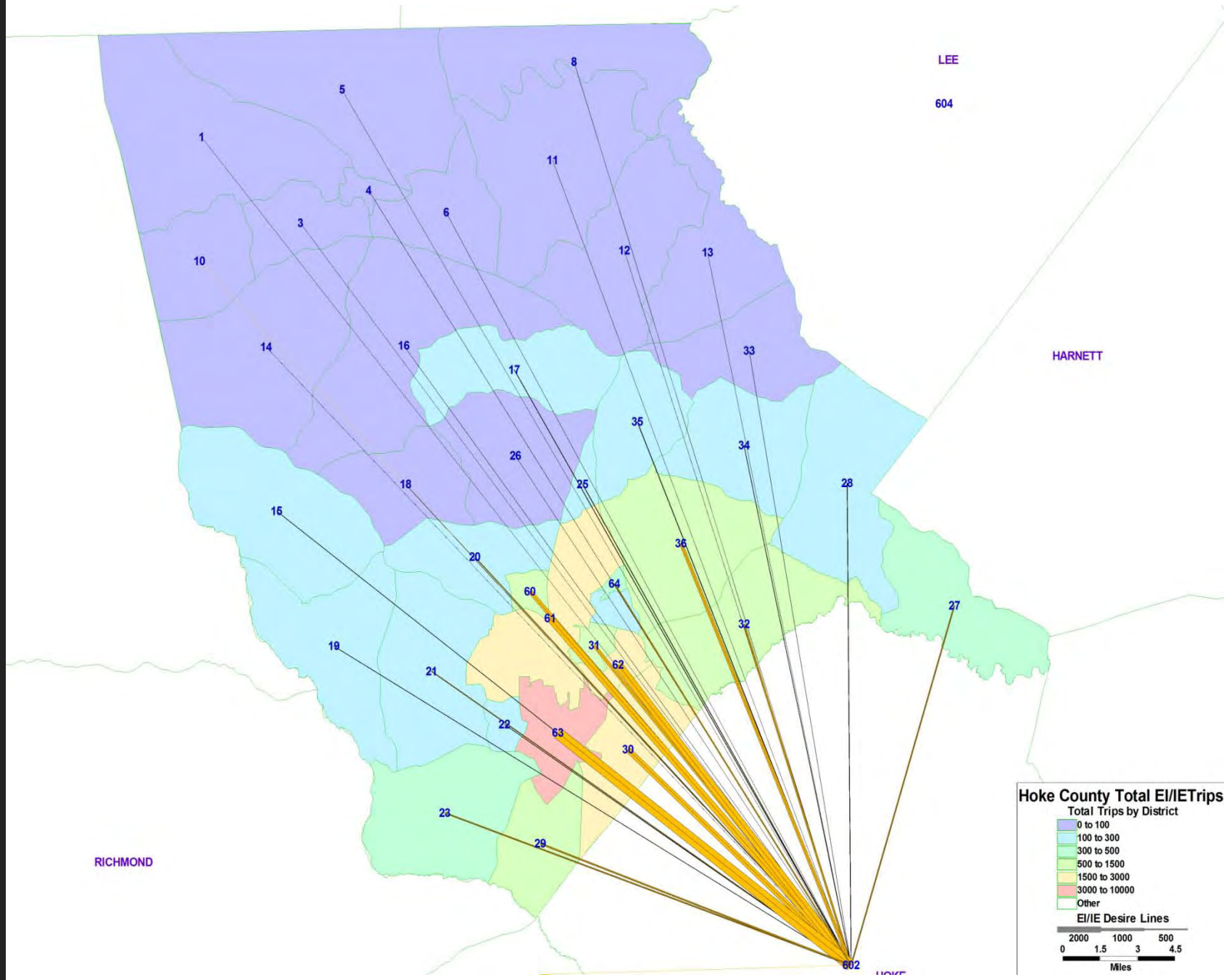
Trips Leaving Moore County Daily
(External to Internal)

County	Total EI/IE Trips	% of EI Trips
Chatham	7,668	9%
Randolph	11,752	13%
Lee	16,852	19%
Montgomery	11,364	13%
Cumberland	2,093	2%
Richmond	10,908	13%
Harnett	6,865	8%
Hoke	19,619	23%
Total	**87,120**	**100%**

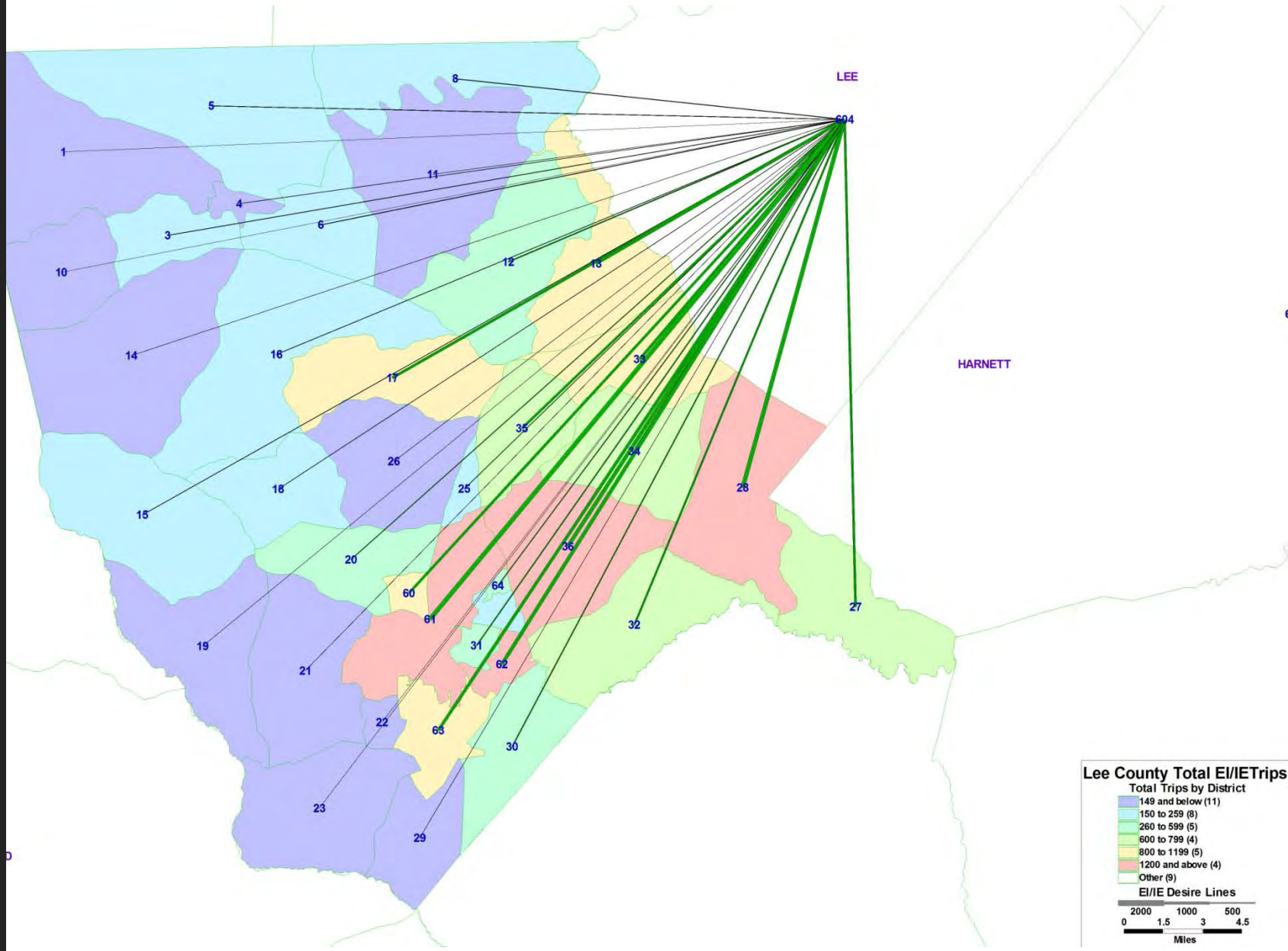
County to County Flows
(Through Trips)



Hoke County Flows to Moore Co



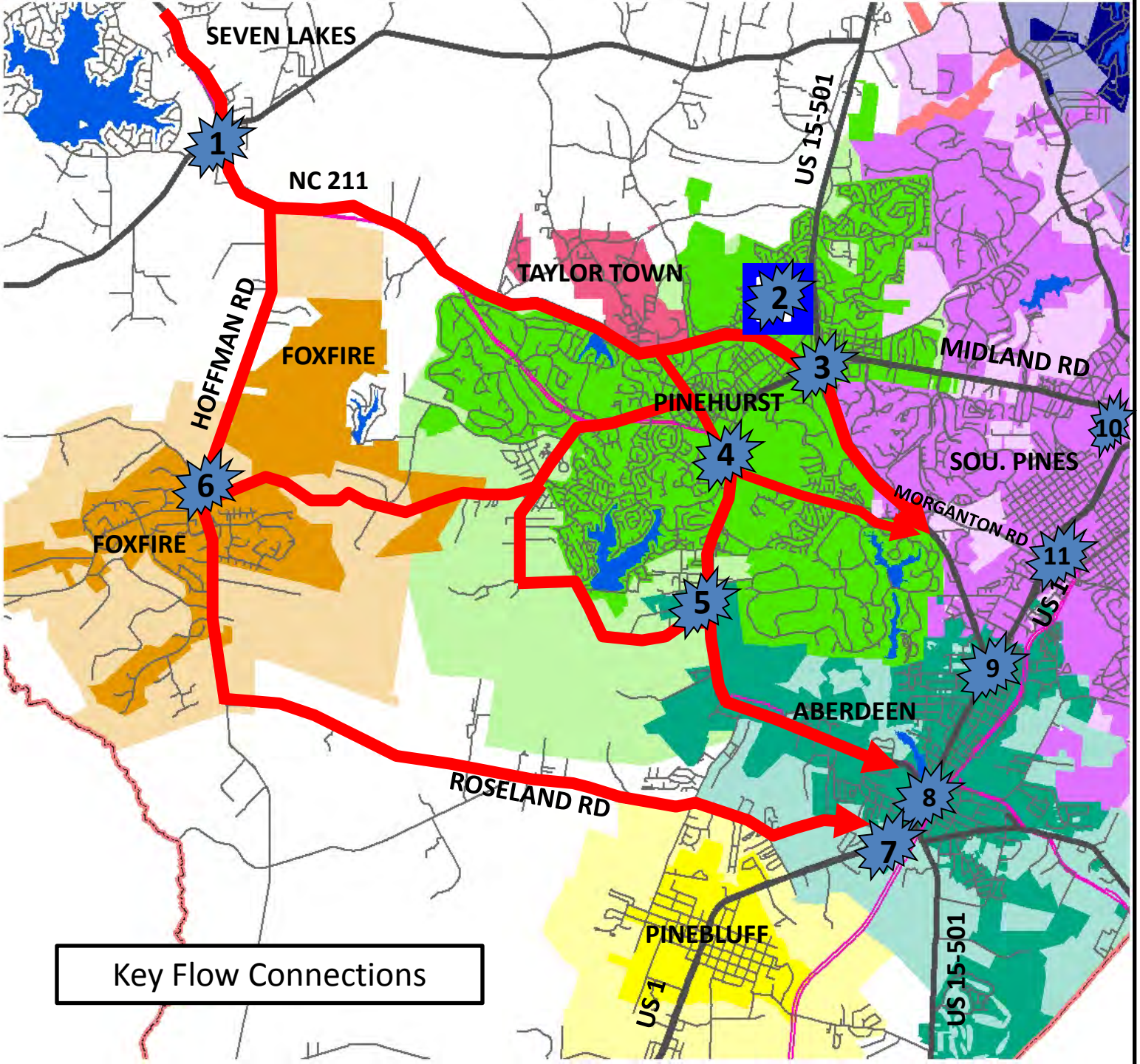
Lee County Flows to Moore Co



OD Select Link

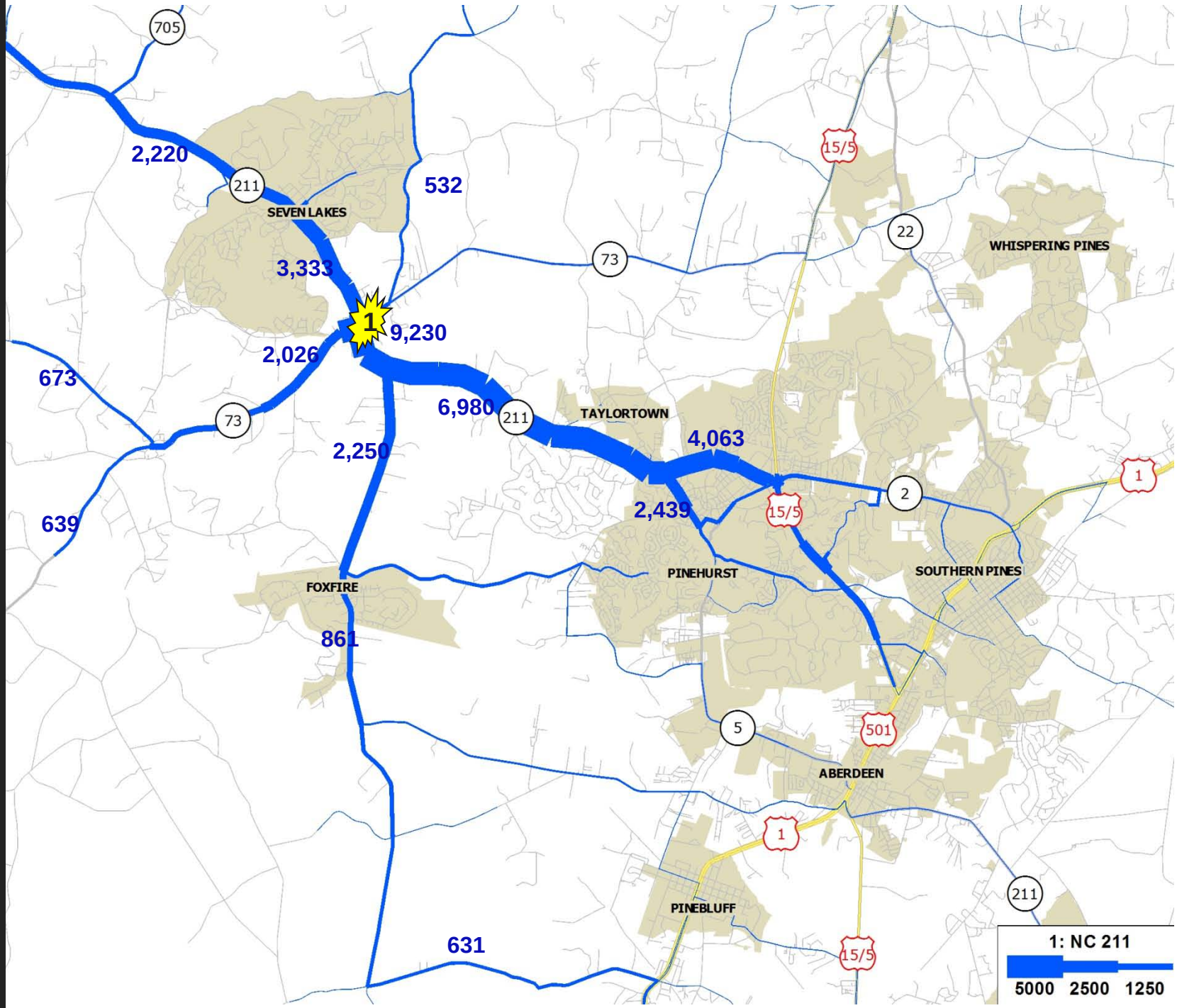
Flows at Critical Locations

- Computer model traces EACH VEHICLE as it moves through network
- Maps show the location of all traffic that passes through the ONE critical point

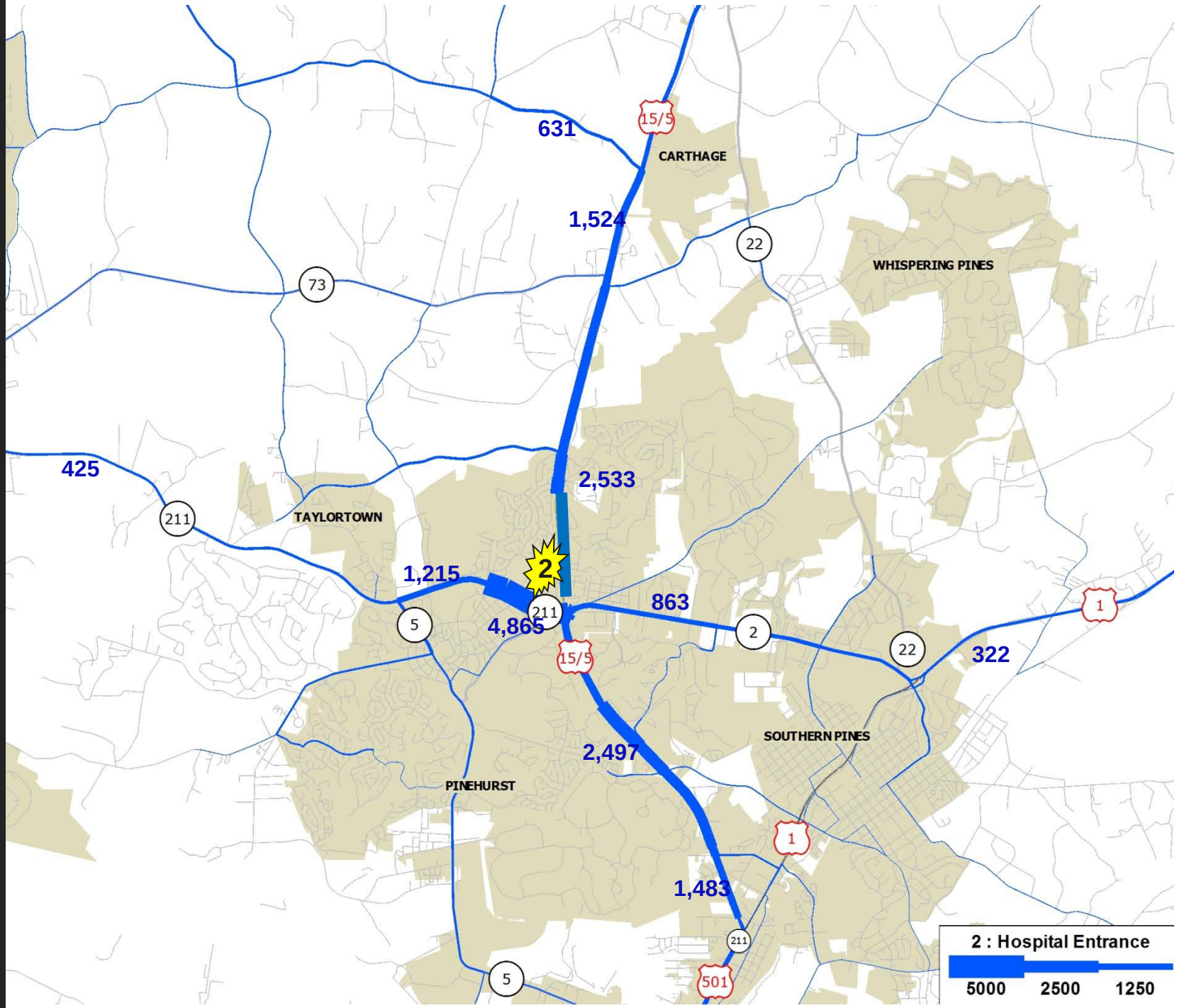


1. HWY 73 & HWY 211
2. HOSPITAL ENTRANCE
3. HWY 211 & PINEHURST TRAFFIC CIRCLE
4. HWY 5 @ Golf Club
5. LINDEN RD. & HWY 5
6. HOFFMAN RD. & FOXFIRE RD.
7. 15/501 & US1 (@Roseland)
8. NC5 @ US1
9. 15/501 @US1
10. MIDLAND Rd @US 1
11. MORGANTON @US1

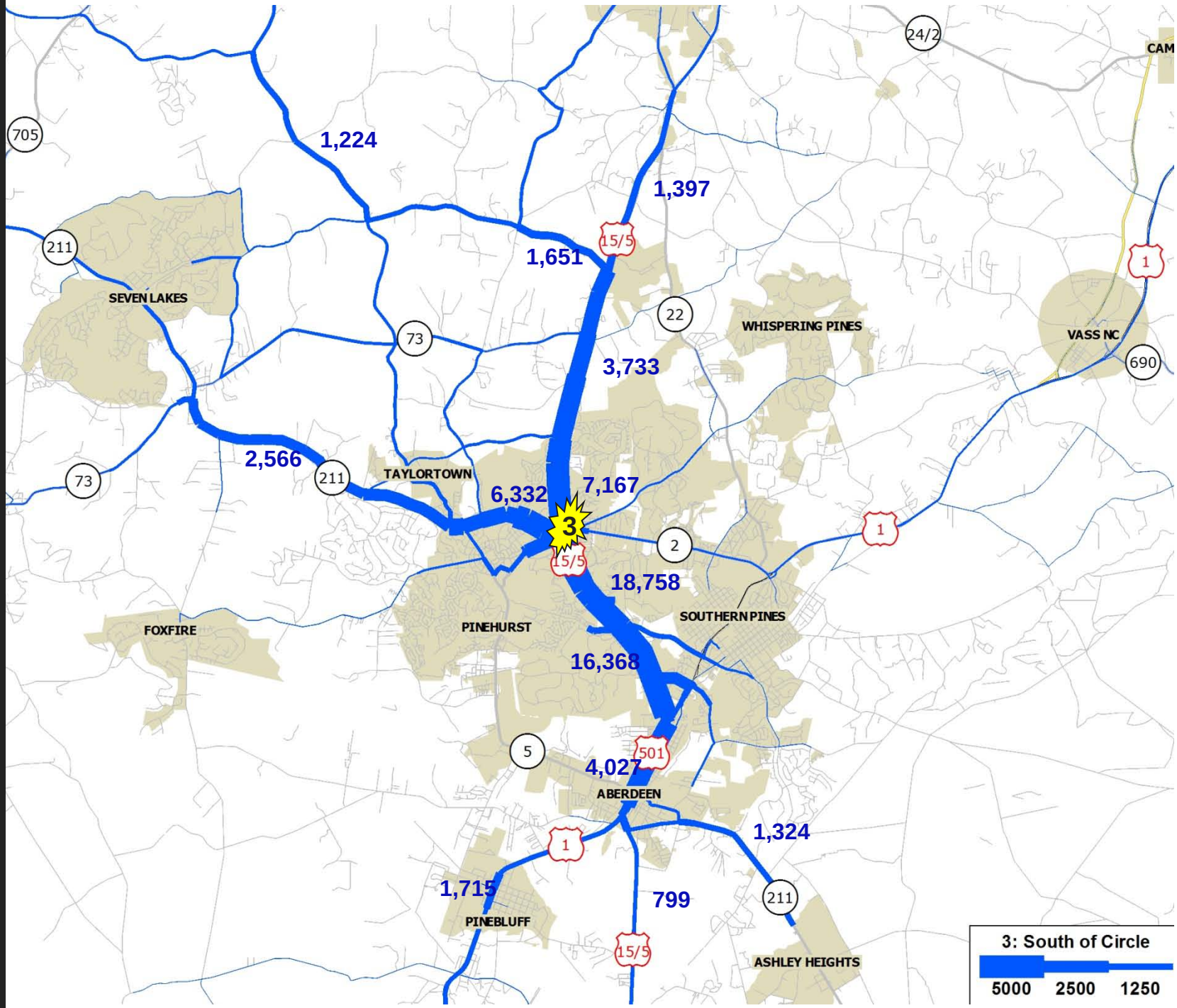
Site 1- HWY 73 & HWY 211



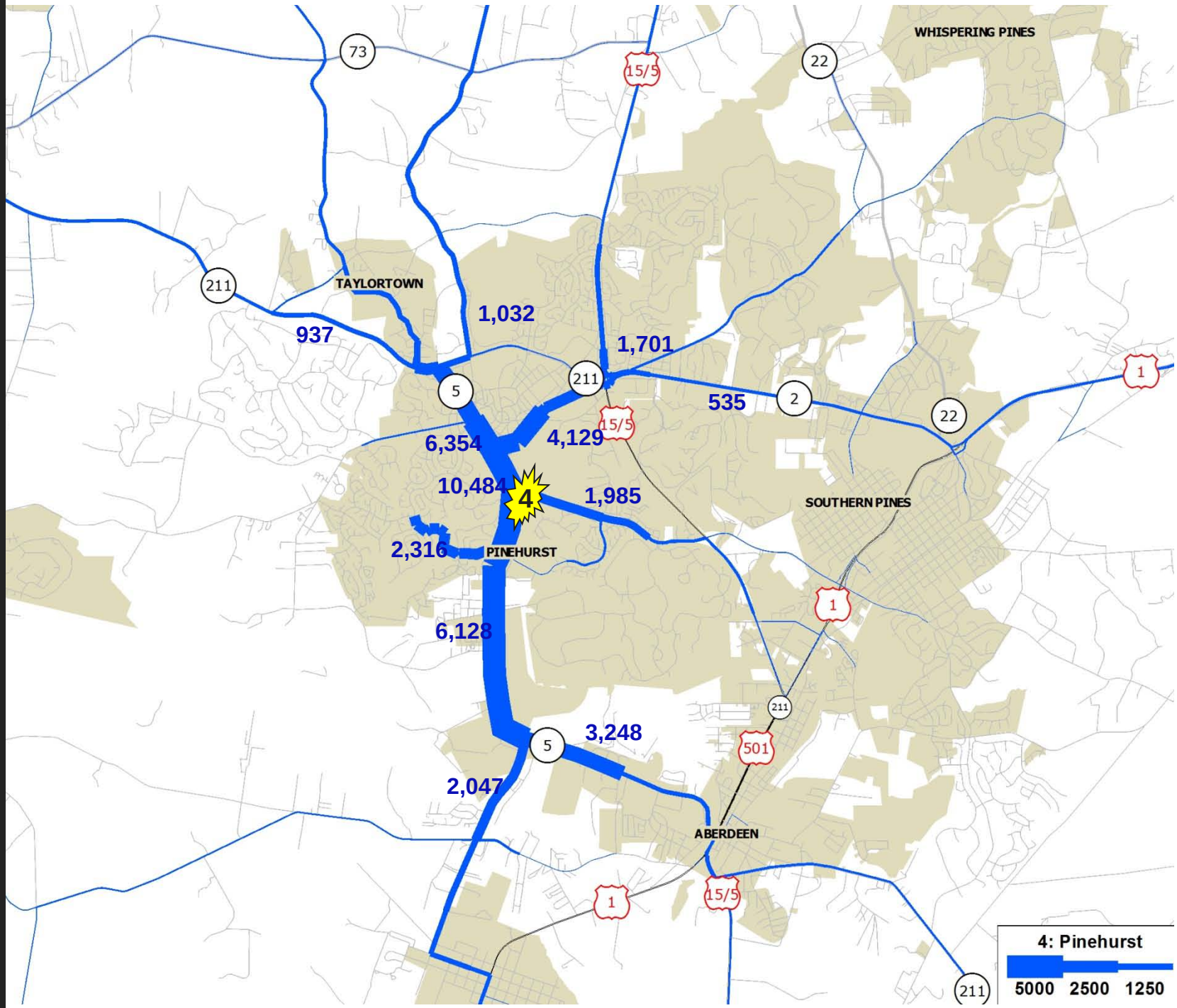
Site 2 - HOSPITAL ENTRANCE



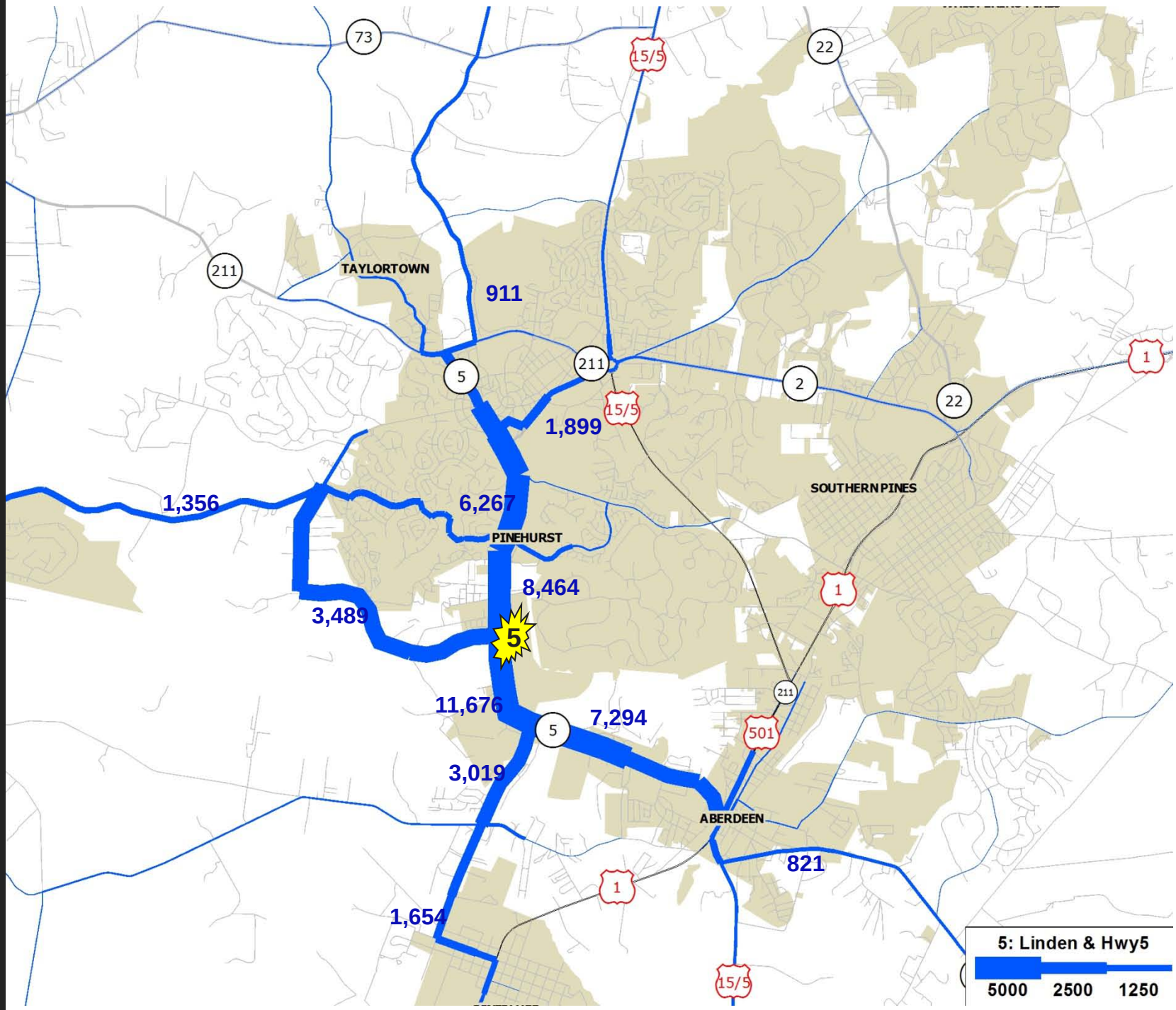
Site 3- PINEHURST TRAFFIC CIRCLE



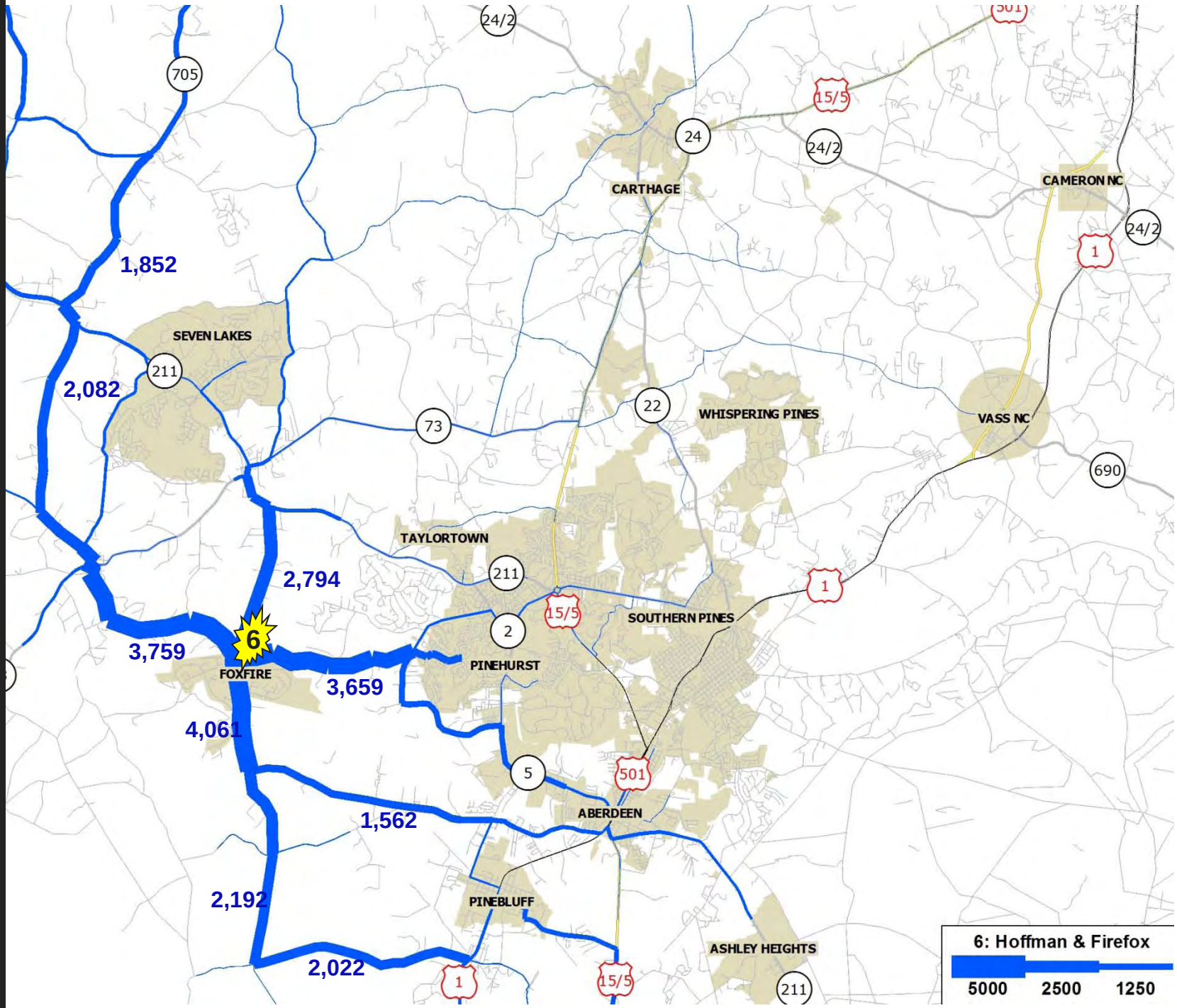
Site 4- HWY 5 @ Golf Club



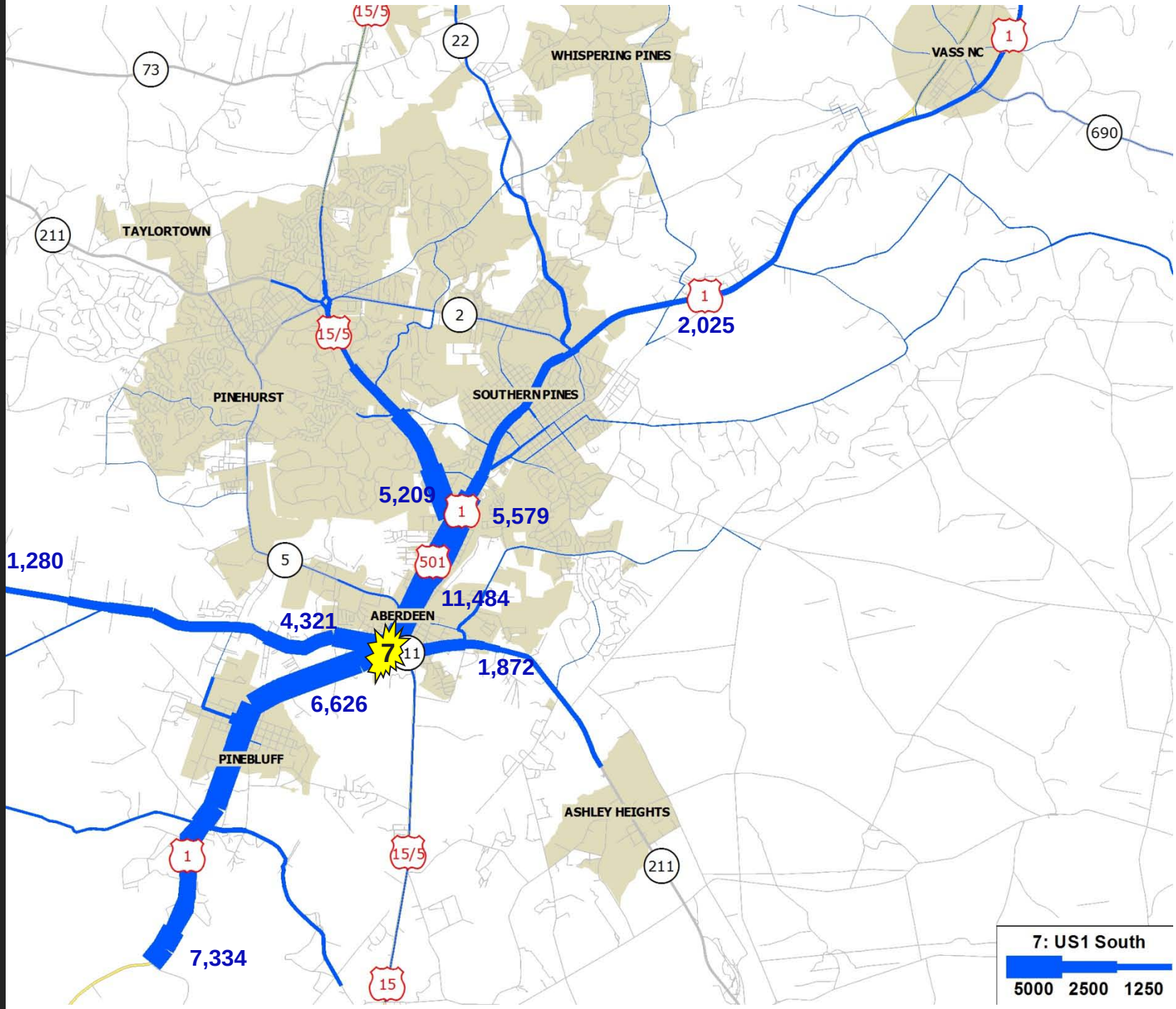
Site 5- LINDEN RD. & HWY 5



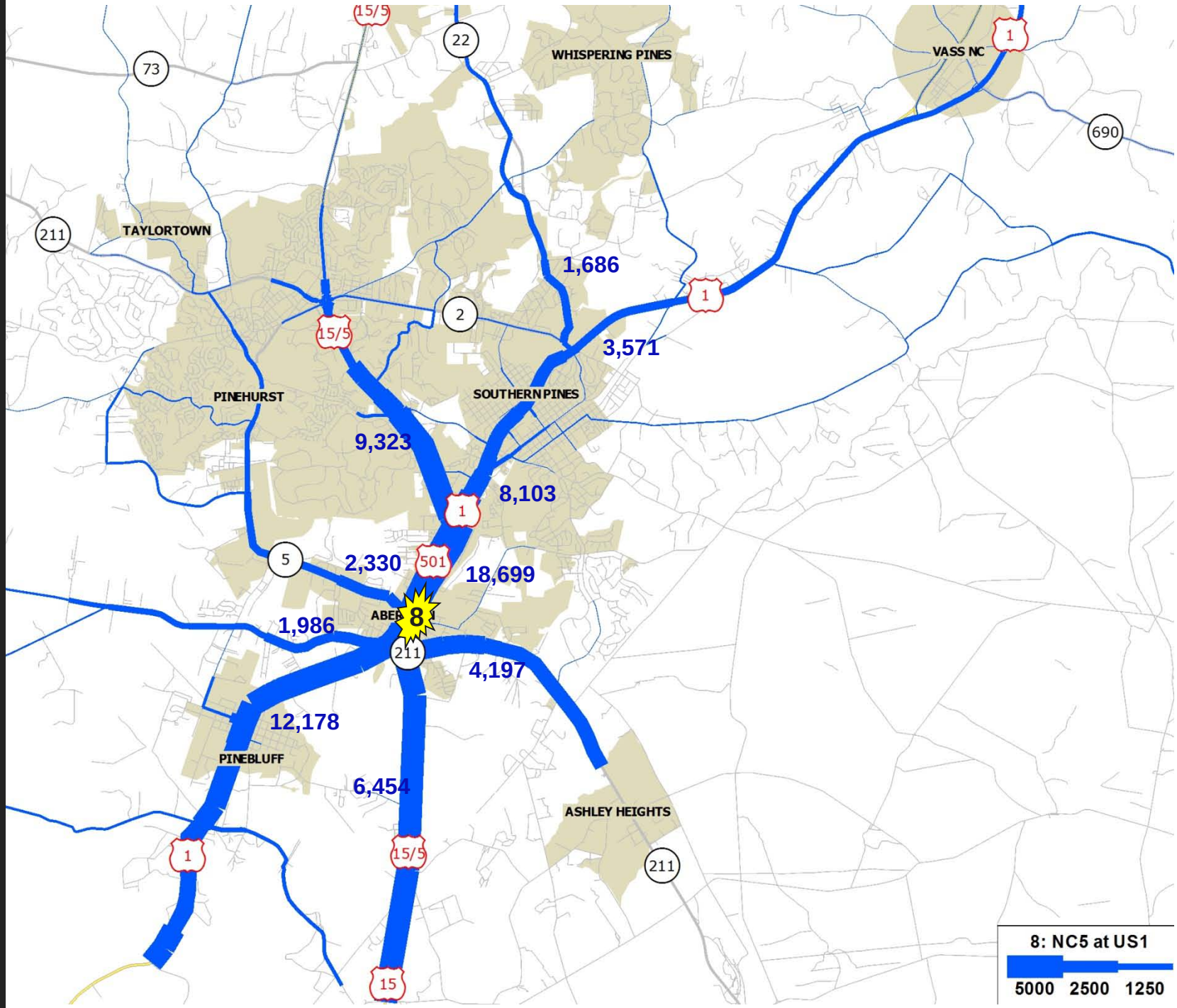
Site 6- HOFFMAN RD. & FOXFIRE RD.



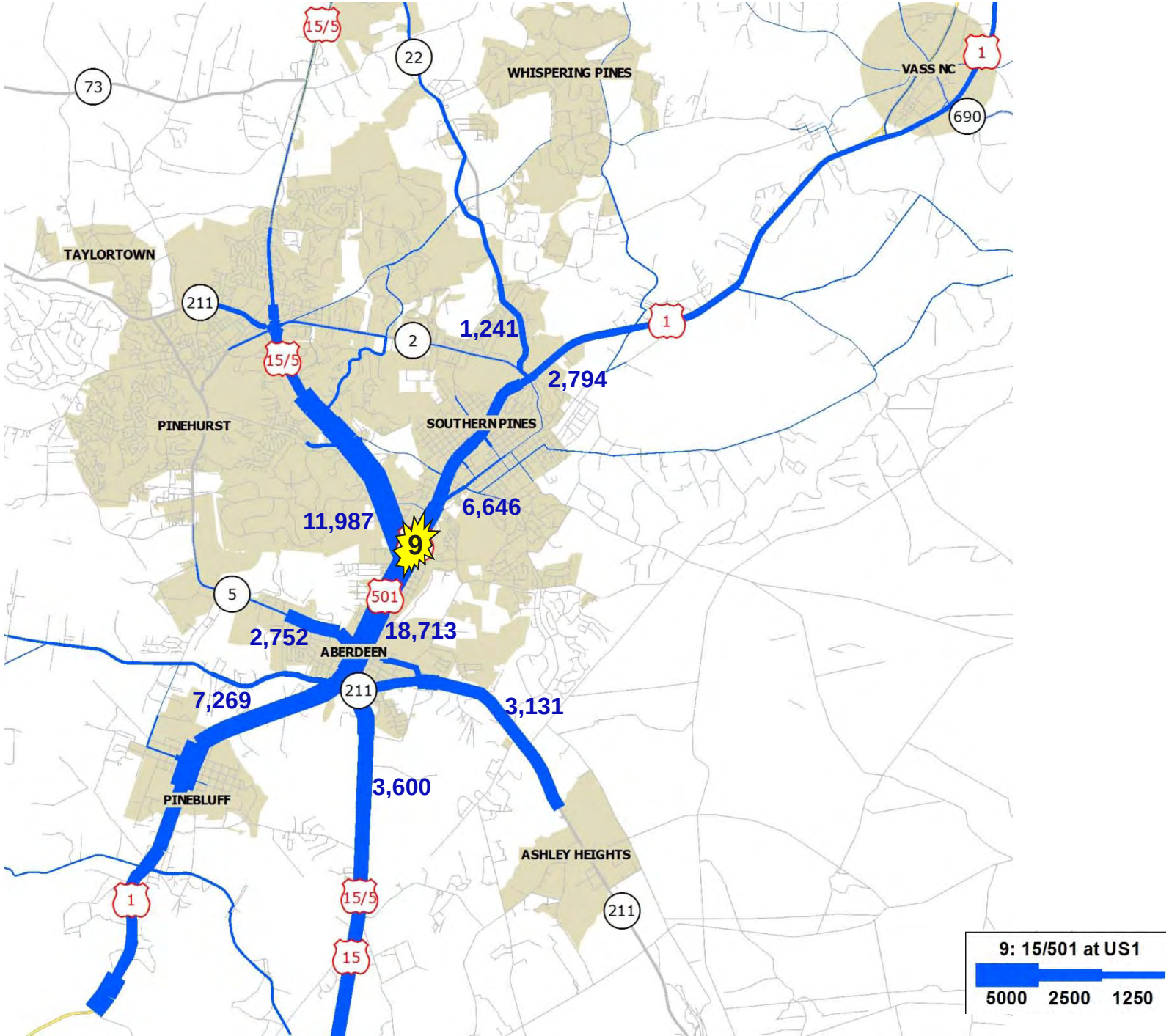
Site 7- 15/501 & US1 (@Roseland)



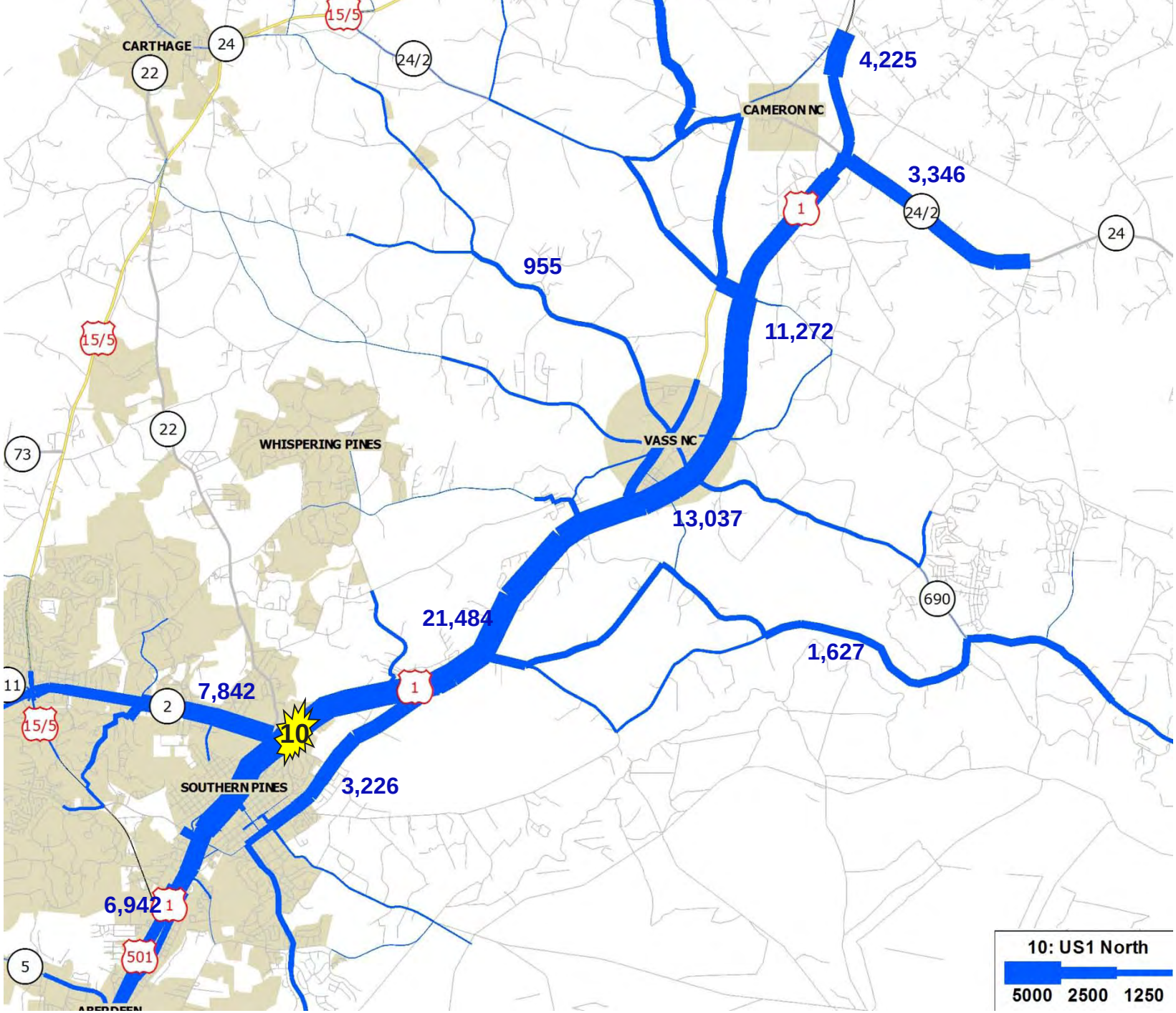
Site 8- NC5 @ US1



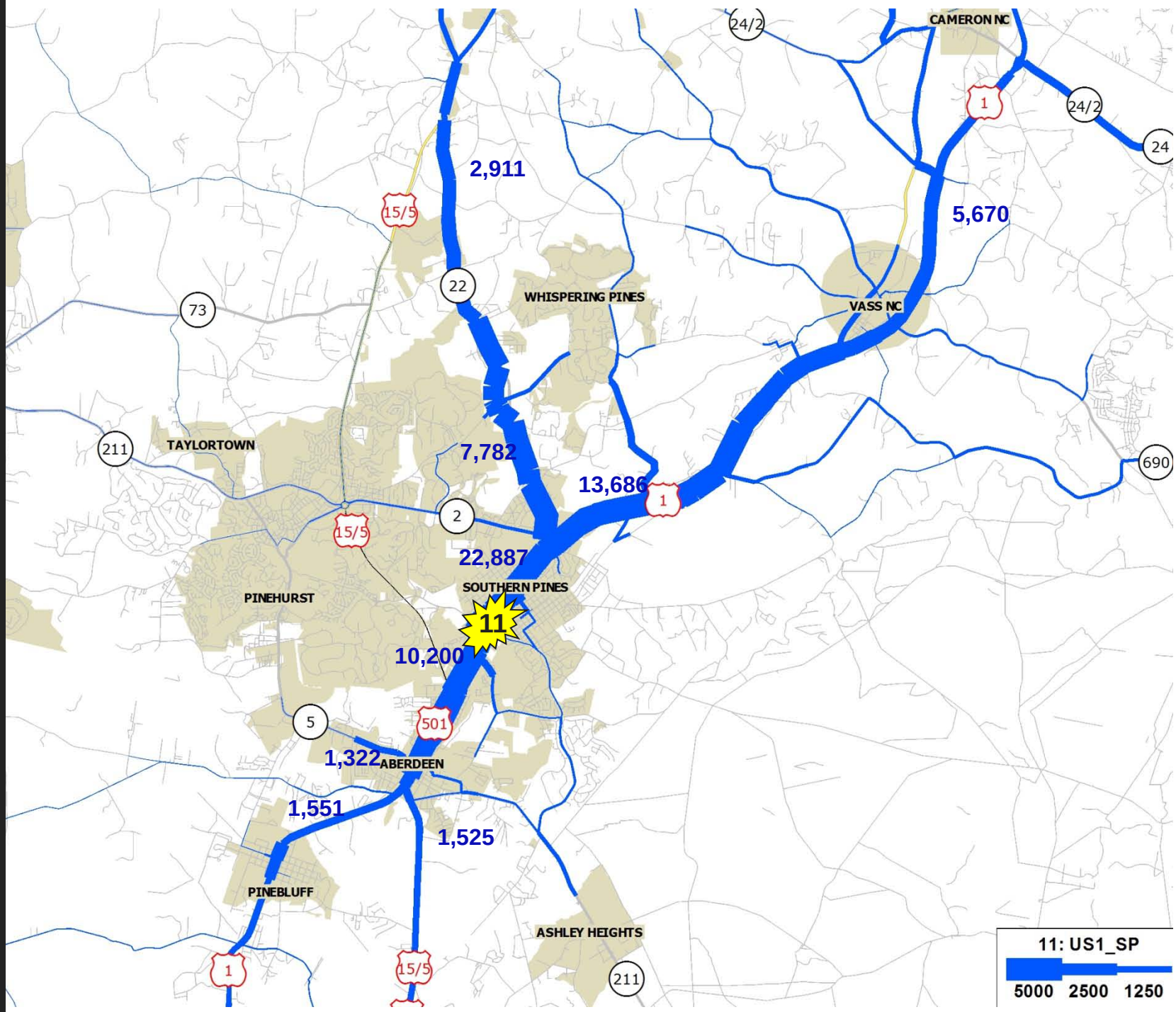
Site 9- 15/501 @US1



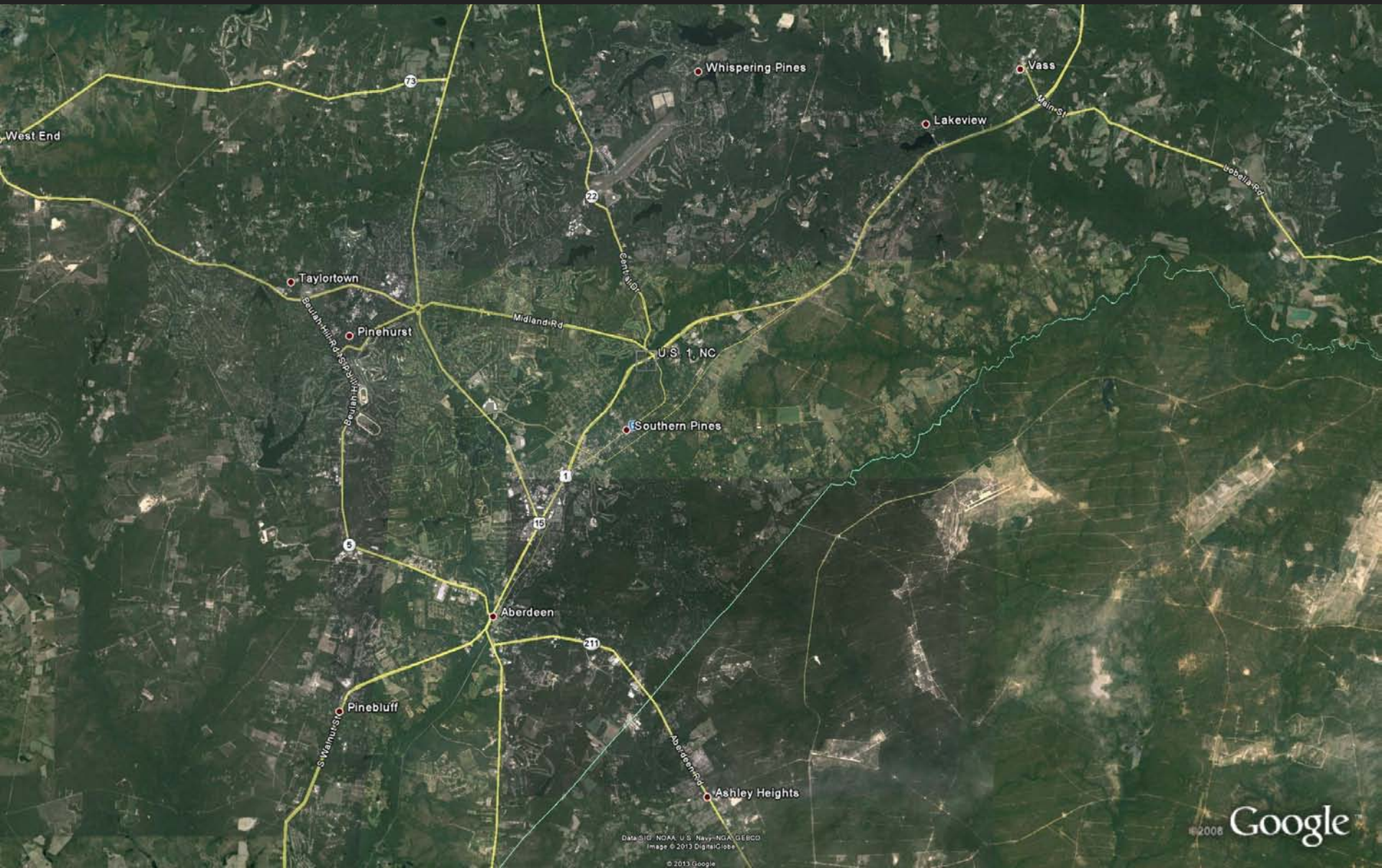
Site 10- MIDLAND Rd @US 1



Site 11- MORGANTON Rd @US1



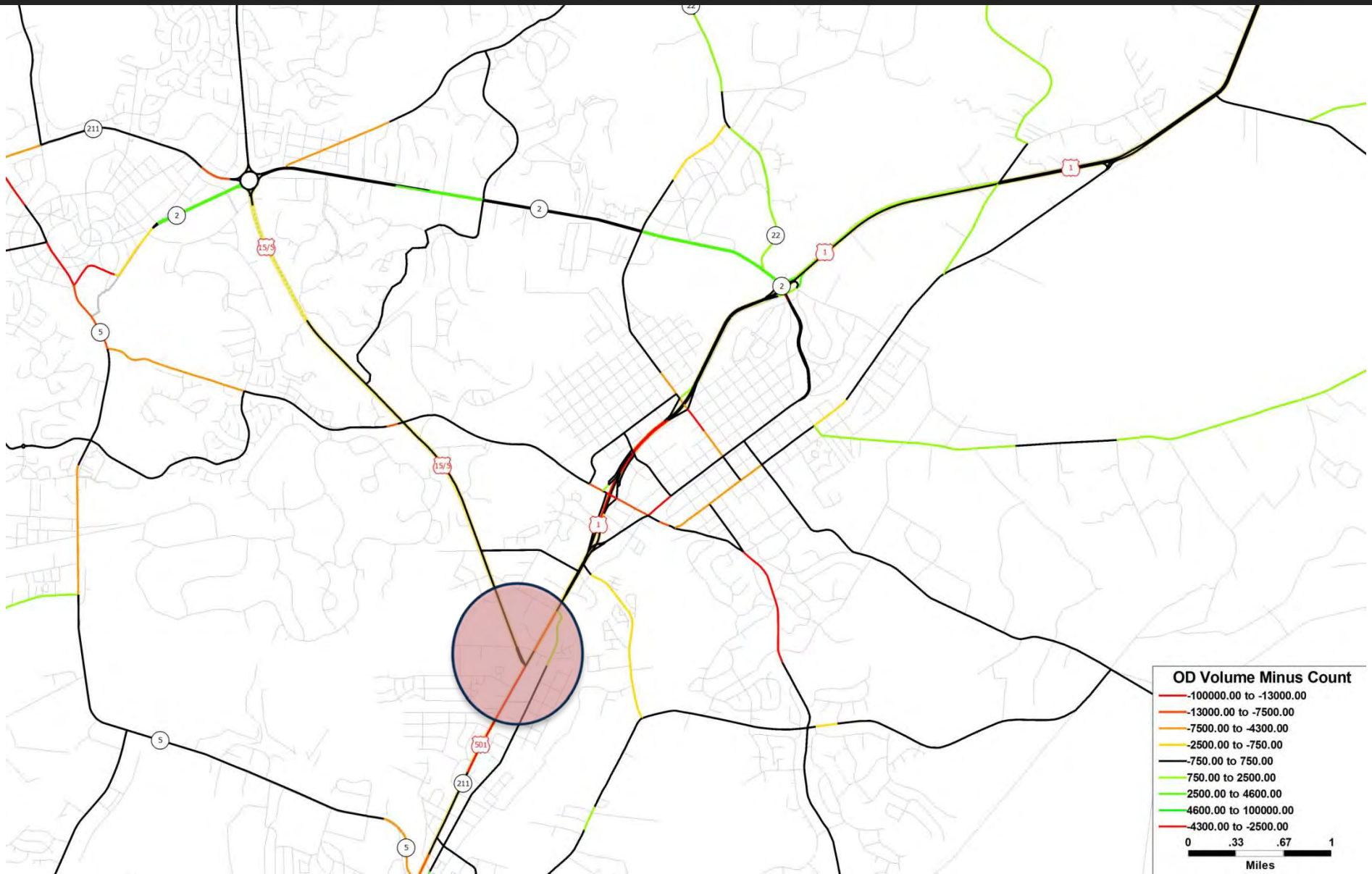
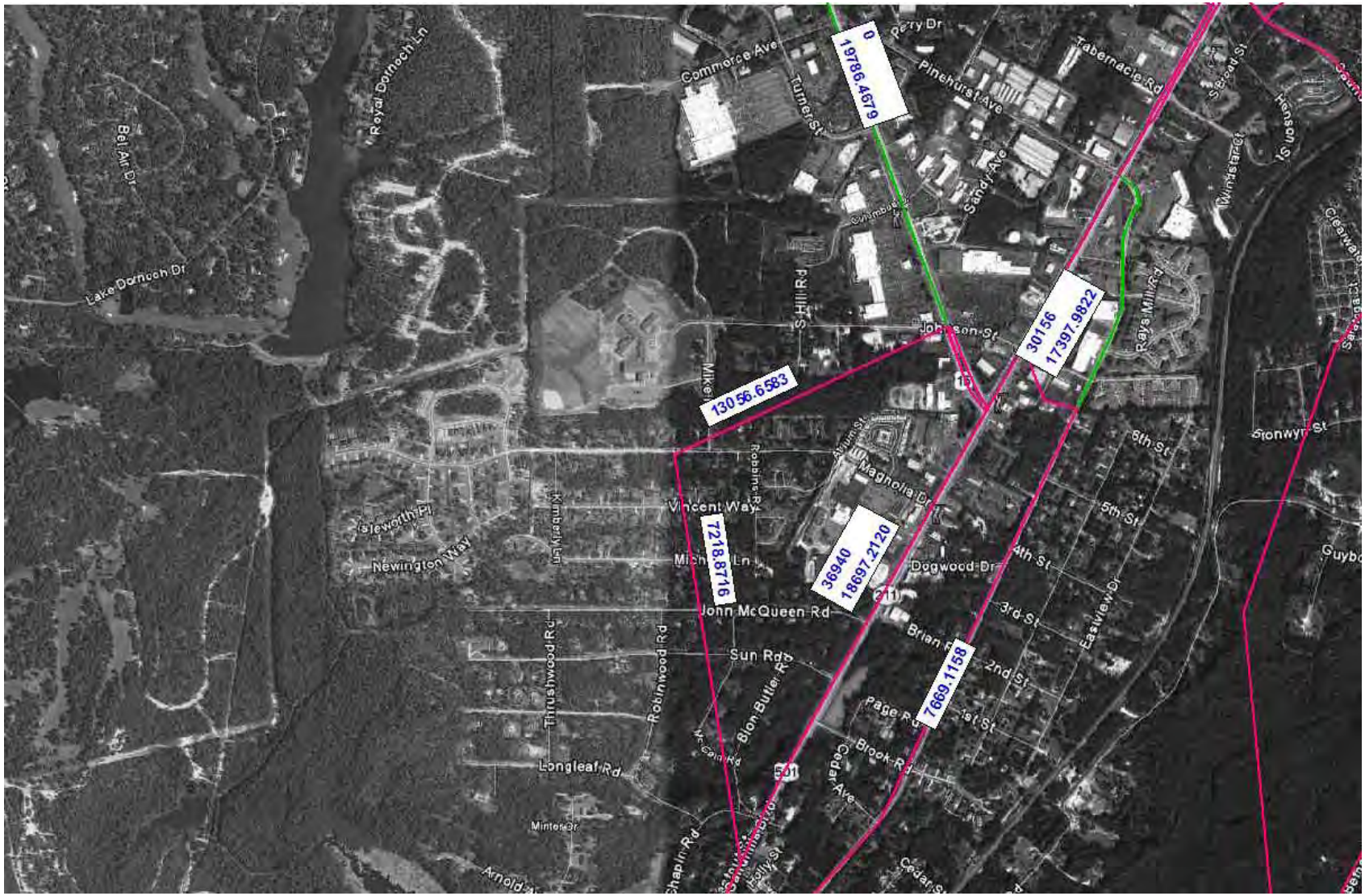
US 1 flows


Whispering Pines
Vass
Lakeview
Main St
West End
Lobella Rd
Taylortown
Pinehurst
Midland Rd
U.S. 1, NC
Southern Pines
Aberdeen
Pinebluff
S Walnut St
Aberdeen Rd
Ashley Heights
Google

US 1(Moore County)
Volume Flows By Trip Type

Location	Description	Internal/External Resident	Internal/External Non-Resident	Through	Internal Resident	Internal Non-Resident	Total Flow
1	US 1 between Cameron and Vass	10,049	760	1,204	582	25	12,620
2	US 1 North of May Street split	13,315	1,135	3,388	9,397	459	27,694
3	US 1 North of Morganton Road	6,669	593	3,233	11,334	463	22,293
4	US 1 South of 211/15-501 Merge	9,912	612	2,358	7,078	229	20,189
5	US 1 at Aberdeen	14,328	951	3,860	8,104	298	27,541
6	US 1 North of Pine Bluff	7,588	535	3,115	3,875	95	15,208

Loaded ODs vs 2012 Counts



Network Loading Example (US 1)