

# Creating an Electric Vehicle Ecosystem: Recommendations for New Charging Stations in Greenville

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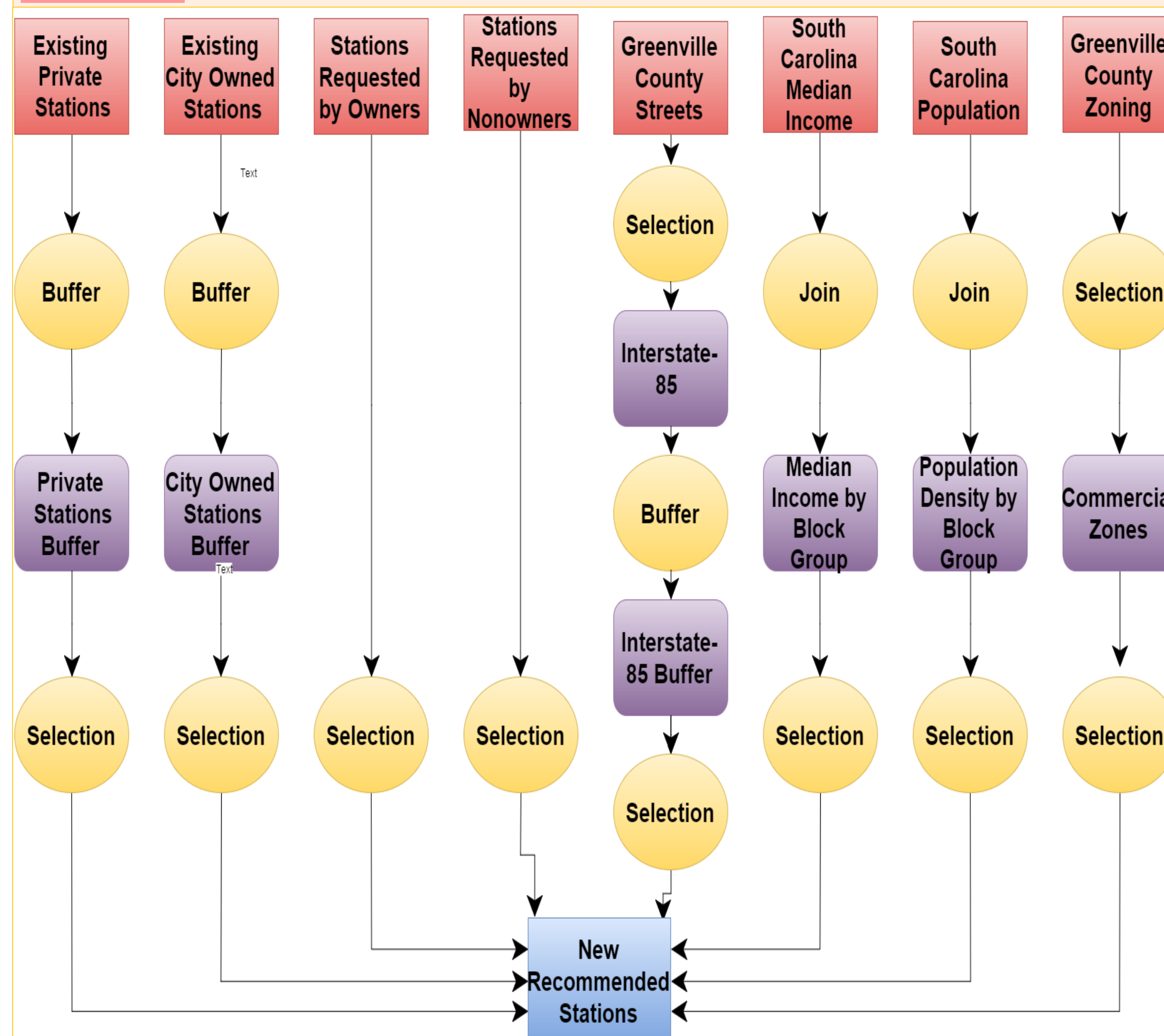
## Project Summary and Goals

The purpose of this project was to identify locations at which the City of Greenville should construct additional electric vehicle charging stations. The addition of new electric vehicle charging stations was identified as a priority of the City in order to promote environmentally friendly forms of transportation, improve air quality and health, facilitate efficient transportation along I-85 between Charlotte and Atlanta, improve ease of transportation by electric vehicle within Greenville, and encourage increased economic activity in commercial zones. To determine where additional charging stations in Greenville should be located, I created maps showing existing and requested electric vehicle charging station locations. I then created maps showing factors such as income, population, commercial zones, and proximity of requested charging stations to existing charging stations and I-85. Analysis to determine the location of future electric vehicle charging stations was conducted by assigning point values to requested charging stations based off of the above criteria. Requested charging stations with the highest points were recommended as the location for future electric vehicle charging stations. It was found that the corridor along I-85 in the western most corner of Greenville is the most desirable location for additional electric vehicle charging stations.

## Introduction

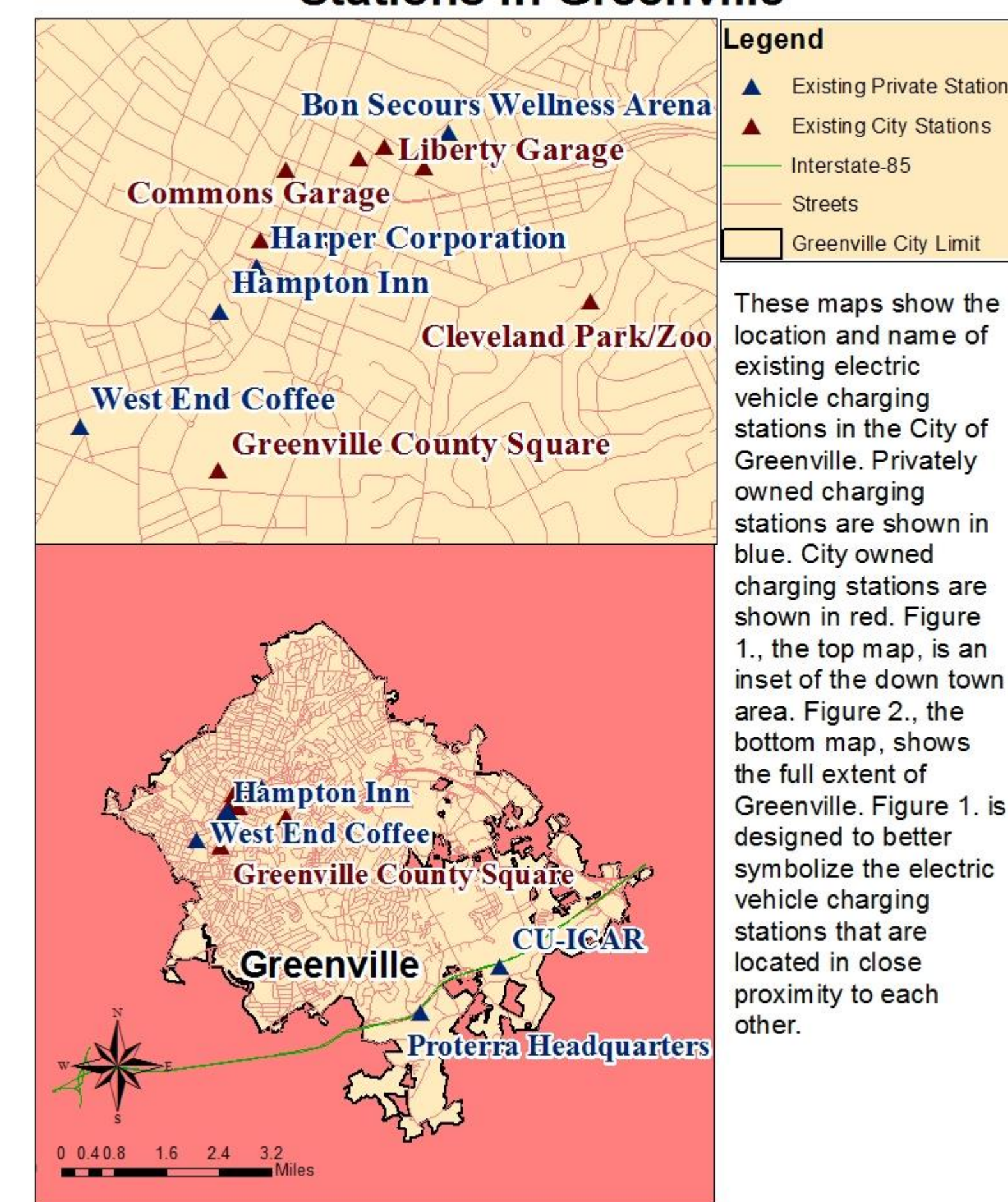
The prevalence of electric vehicle ownership and transportation in Greenville has increased in recent years. As a consequence, demand for electric vehicle charging stations outside of the home has also risen. Therefore, it has been identified as a priority of the City of Greenville to help better facilitate electric vehicle transportation within and through Greenville by constructing additional electric vehicle charging stations. This is a priority because of the benefits for citizens of Greenville, visitors, and the City. These benefits include more convenient transportation for electric vehicle owners, improved air quality and health due to decreased vehicle emissions, and increased economic activity in commercial zones. Greenville must use caution in determining the location of these charging stations, however, due to the uncertainty of the electric vehicle market and factors such as how many people will own electric vehicles in the future, what will these charging stations look like, and how long will these vehicles be able to go between charges. Consequently, it is important that the City of Greenville is strategic, and takes into account many factors, in determining the location of additional charging stations.

## Methods

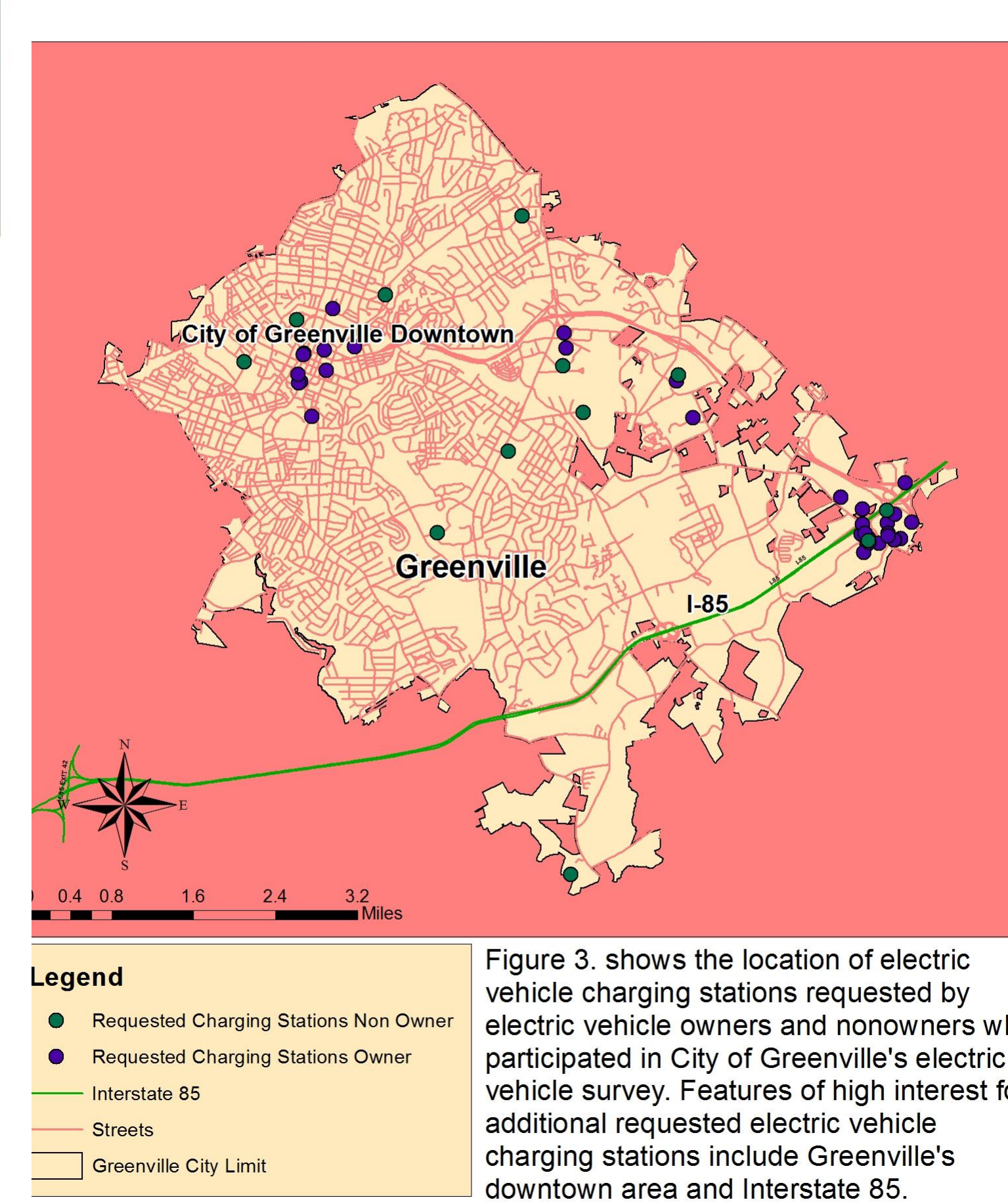


## Results and Discussion

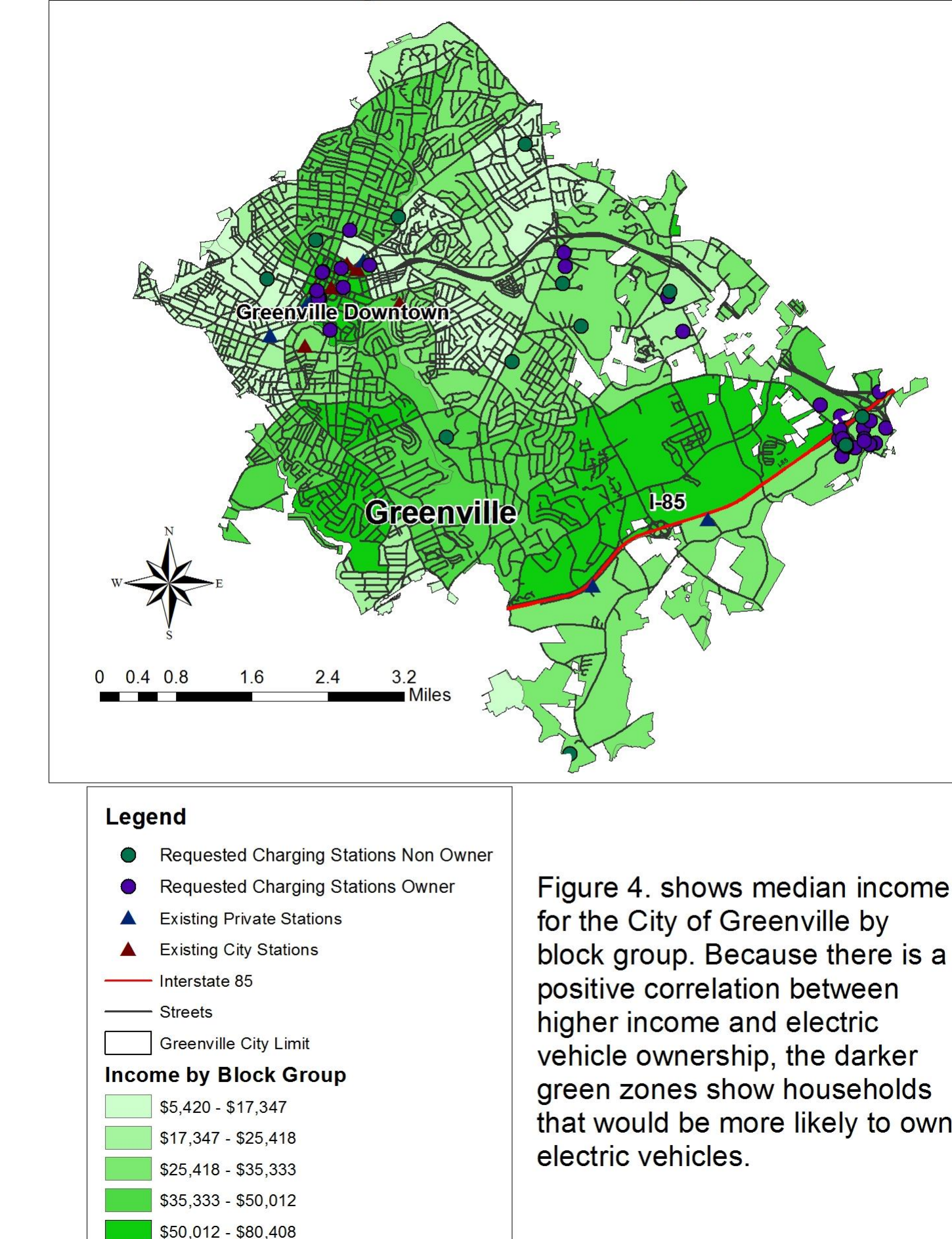
### Existing Electric Vehicle Charging Stations in Greenville



### Requested Electric Vehicle Charging Stations in Greenville



### Median Income Distribution for Greenville by Block Group



The maps to the left and below show the distribution of existing, owner and nonowner requested, and analysis recommended additional electric vehicle charging stations in Greenville. In order to determine the location of recommended additional charging stations. Criteria including median income, population density, distance to I-85, zone type, and whether an electric vehicle owner or nonowner had requested the location, were considered, as represented in **Figures 1-7**. One point was given for every charging station within a high income grouping zone, high population density zone, commercial zone, within 0.1 miles of I-85, not within 0.5 miles of an existing charging station, and requested by a nonowner. Two points were given for every charging station requested by an owner. The results of these criteria, the owner/nonowner requested charging stations with the highest point values, is shown in **Figure 8**, below.

## Conclusion

Based off of the criteria and point values assigned to determine the location of additional electric vehicle charging stations, new stations should be located along I-85. This is largely due to the desire for charging stations for commuters who use this highway to get from Charlotte to Atlanta, as well as the presence of high income zones, high population density zones, and commercial zones in this area.

## References and Data Sources

Kandukuri, Yudhveer. "A Dynamic GIS Model for Optimum Location Identification of Plug in Electric Vehicle (Per) Charging Station." Akron, Ohio: University of Akron, 2013. OhioLink. Web. 29 Sept. 2015.

Lindblad, Lisolette. "Deployment Methods for Electric Vehicle Infrastructure." Uppsala, Sweden: Uppsala University, 2012. DiVA portal. 29 Sept. 2015.

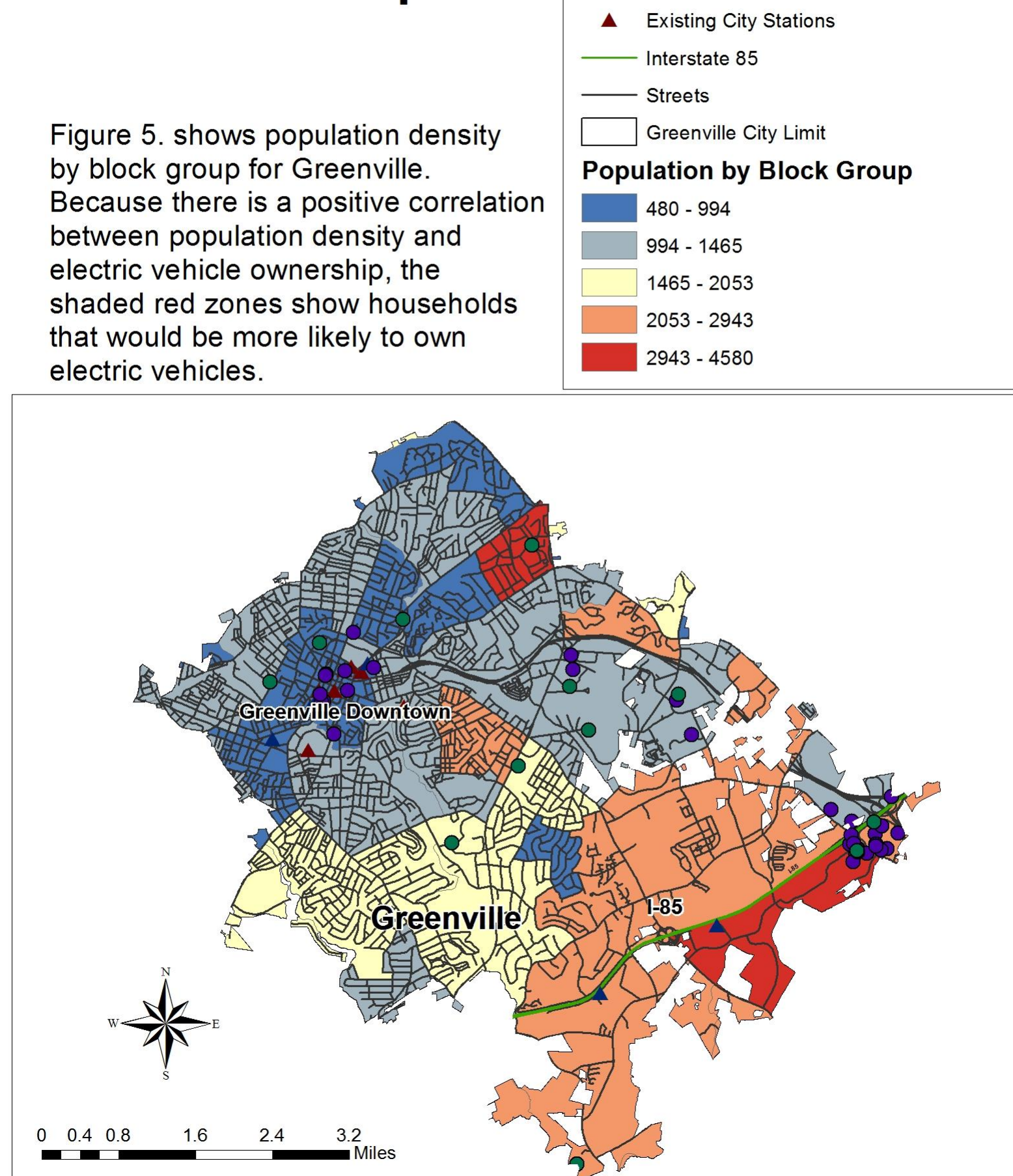
Wirges, Johannes, Susanne Linder, and Alois Kessler. "Modelling the Development of a Regional Charging Infrastructure for Electric Vehicles in Time and Space." *EJTIR* 12.4 (2012): 391-416. Web. 29 Sept. 2015.

City of Greenville data: Existing EV Charging Stations (2015), Requested EV Charging Stations (2015)

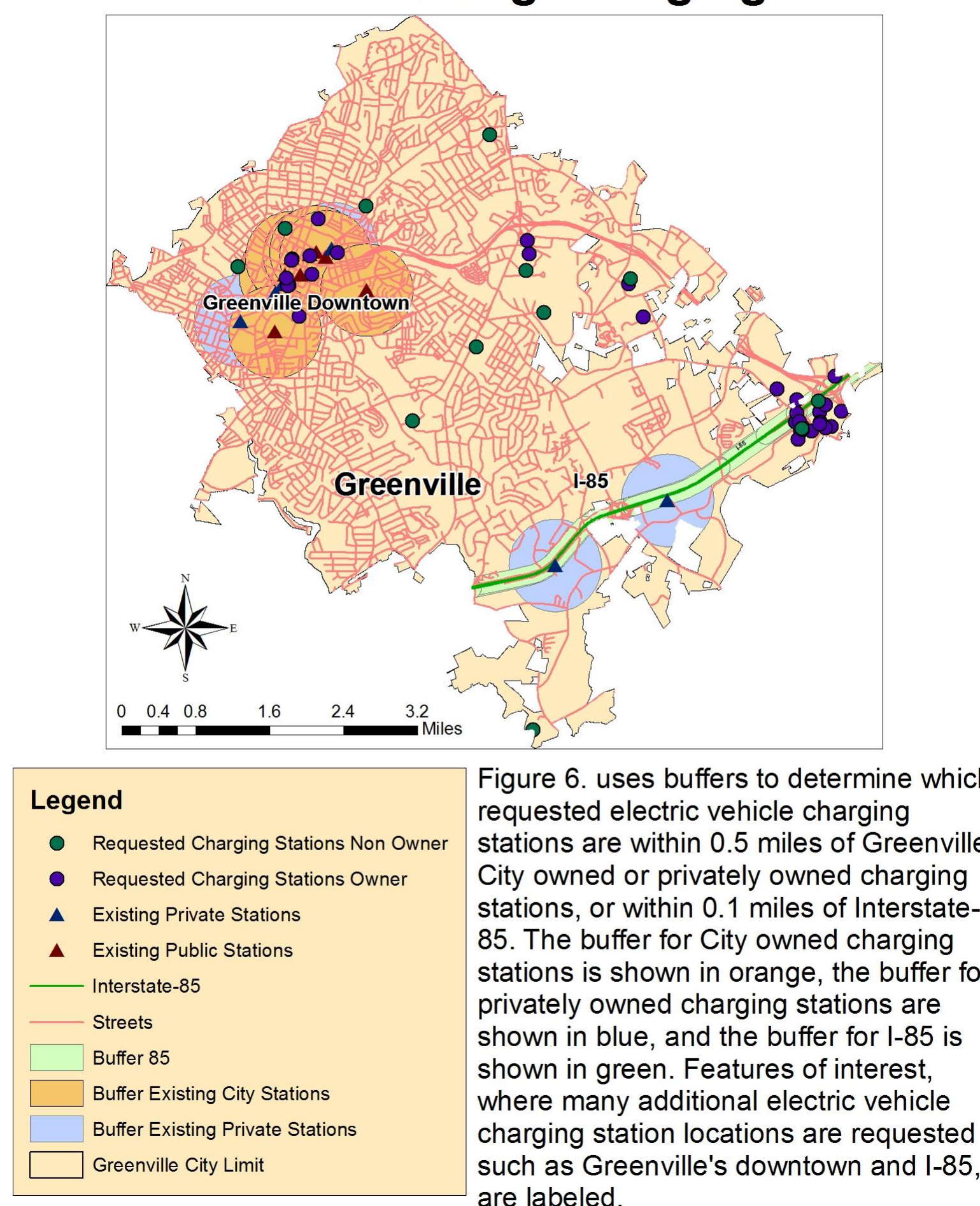
Greenville County data: Greenville City Limit (2013), Parking (2013), Streets (2013), Zoning (2010)

NHGIS data: SC Block Groups (2013), SC Per Capita Income by Block Group (2013), SC Population by Block Group (2013)

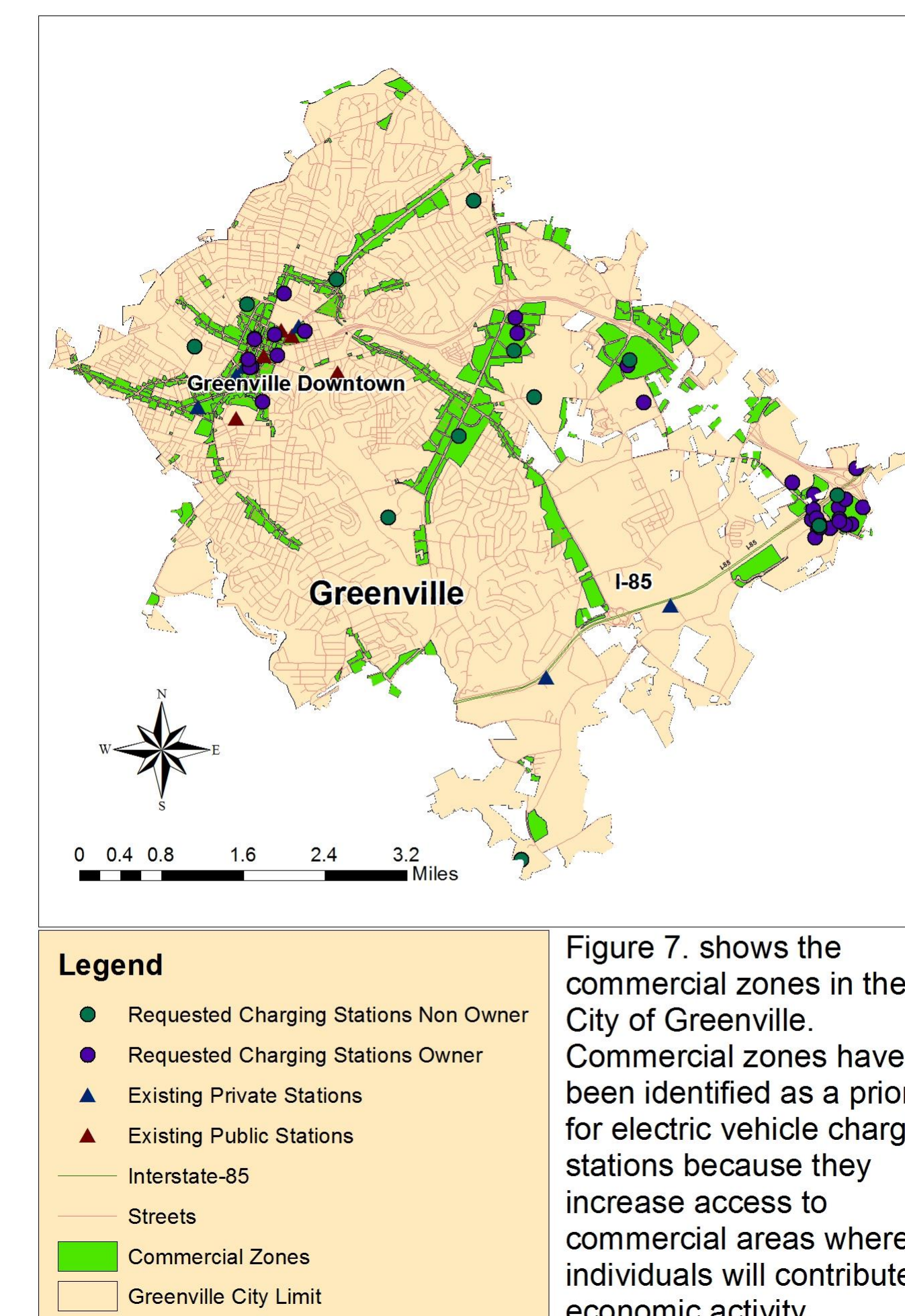
### Population Density for Greenville by Block Group



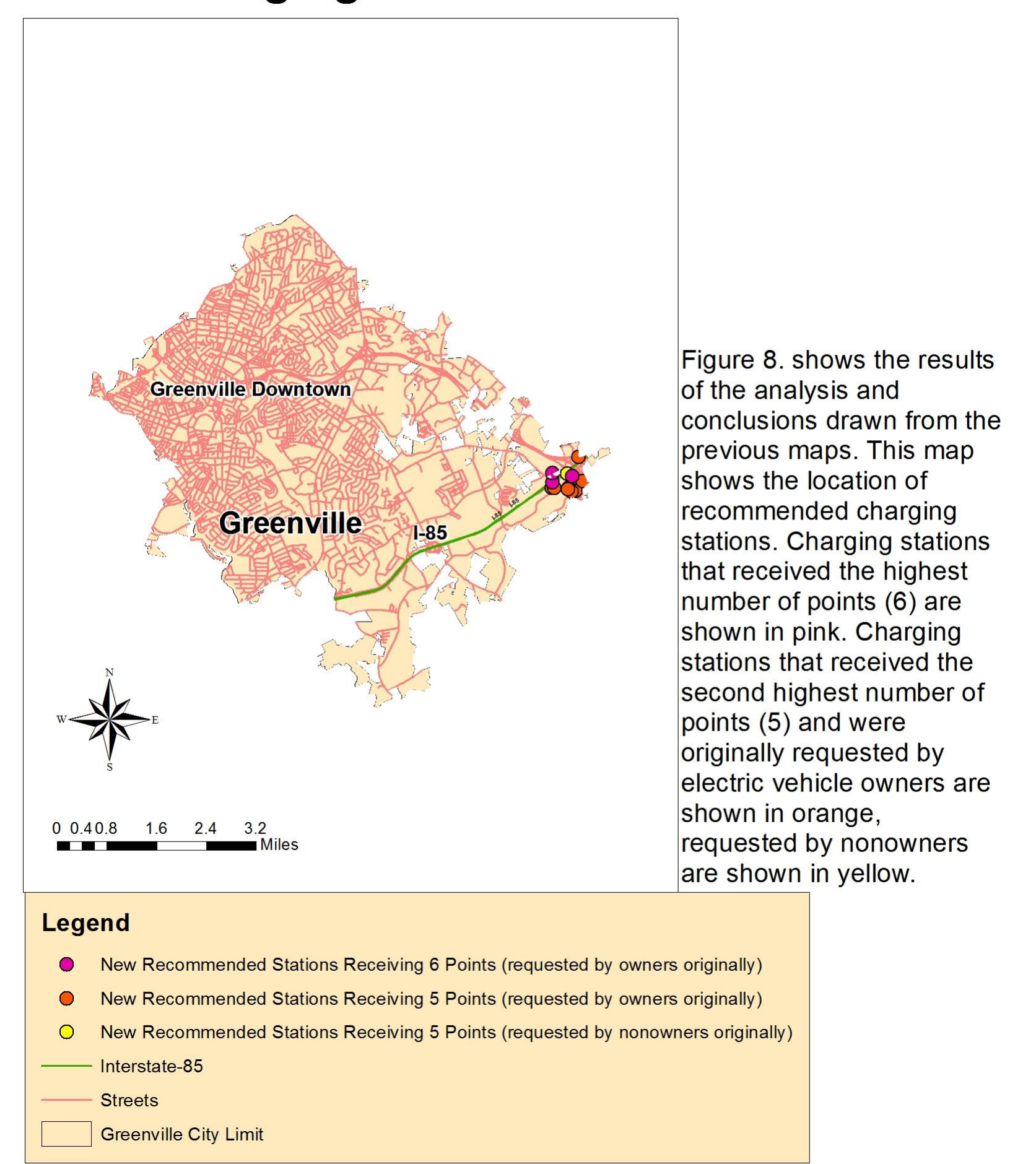
### Buffers Showing Requested Stations near I-85 and Existing Charging Stations



### Commercial Zones in Greenville



### New Recommended Electric Vehicle Charging Stations for Greenville



## Recommended Further Research

In this analysis, the best new locations for electric vehicle charging stations were determined. However, further research could explore what type of electric vehicle charging stations should be used. In addition, a similar method could be followed in order to determine where additional privately owned electric vehicle charging stations should be constructed.

## Acknowledgements

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