

Emerald Academy - Morning/Evening Bus Routes

Eilish Bennett, Cameron Corsino, Brycen Harris, Andrea Staten, Emerald Academy
The University of Tennessee Knoxville, College of Arts and Sciences, Department of Geography & Sustainability



INTRODUCTION

Emerald Academy is a K-8 charter school in Knoxville, Tennessee. This aim of this project was to use GIS tools to visualize school bus routes for the use of parents. An app was then created using the routes, which allows a parent to input their address and determine the nearest bus stop to them. A cluster analysis of student addresses was also performed to inform the school on where their students were concentrated. This has the potential to be referenced when determining future bus routes or other school programming.

METHODOLOGY

Once our goals were established, we developed a plan which consisted of:

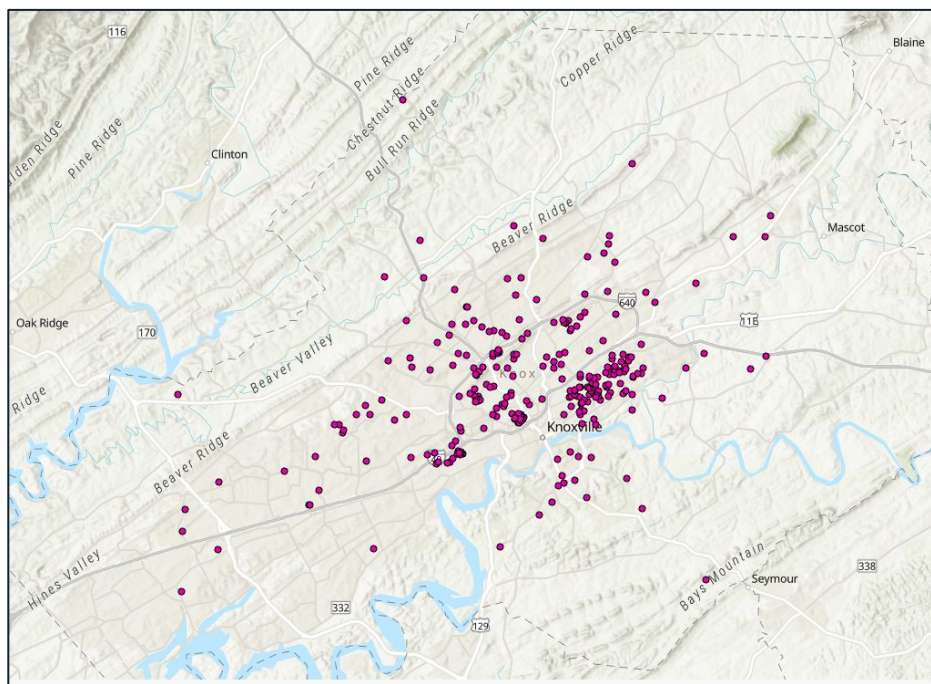
1. Geocoding student addresses
2. Visualizing AM/PM routes
3. Translating those routes into a map on ArcGIS Pro
4. Setting distinctions between routes through color and marker coordination
5. Further analysis of student locations
6. Polishing and final steps

INITIAL DATA

A PDF of the bus routes and schedules were sourced from Emerald Academy's website. There are four routes for both the morning and evening, with a total of eight routes.

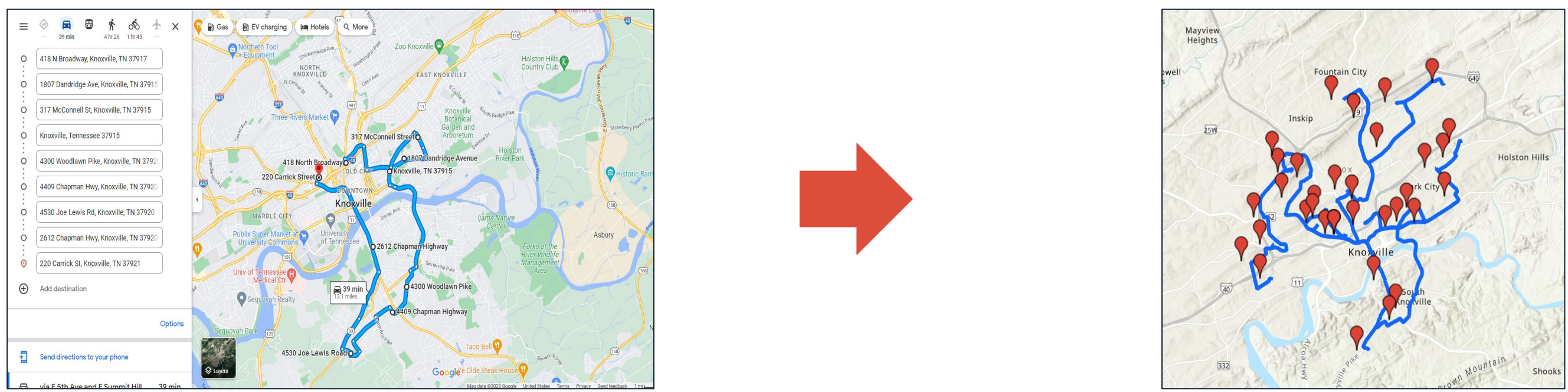
Emerald Bus routes	Revised as of:	12/26/22
Note: AM times listed are when the bus will pull away from the stop.		
Bus E1		
AM Run		
7:03 AM	Security House	
7:05 AM	New Mount Calvary Church Magnolia	
7:08 AM	Boys and Girls Club on McConnell St.	
7:14 AM	Mid Ave. entrance to the Vista Apartments	
7:20 AM	Church at corner of Woodlawn and Young High Pl.	
7:24 AM	Kings on Chapman Highway	
7:30 AM	Boys and Girls Club Montgomery Village	
7:35 AM	Shorey's Chapman Highway	
7:40 AM	Arrive at the School	
PM Run		
3:05 PM	Leave school	
3:15 PM	Directly across from Shorey's Chapman Highway	
3:20 PM	Boys and Girls Club Montgomery Village	
3:25 PM	Kings on Chapman Highway	
3:27 PM	Church at corner of Woodlawn and Young High Pl.	
3:29 PM	800 S. Mid Ave. across from the Vista Apartments	
3:40 PM	Boys and Girls Club on McConnell St.	
3:43 PM	New Mount Calvary Church Magnolia	
3:45 PM	Security House	
3:47 PM	EV Davidson Rec Center	

A comprehensive list of student addresses provided as a CSV file from Emerald Academy. Once uploaded into ArcGIS, they were then Geocoded:

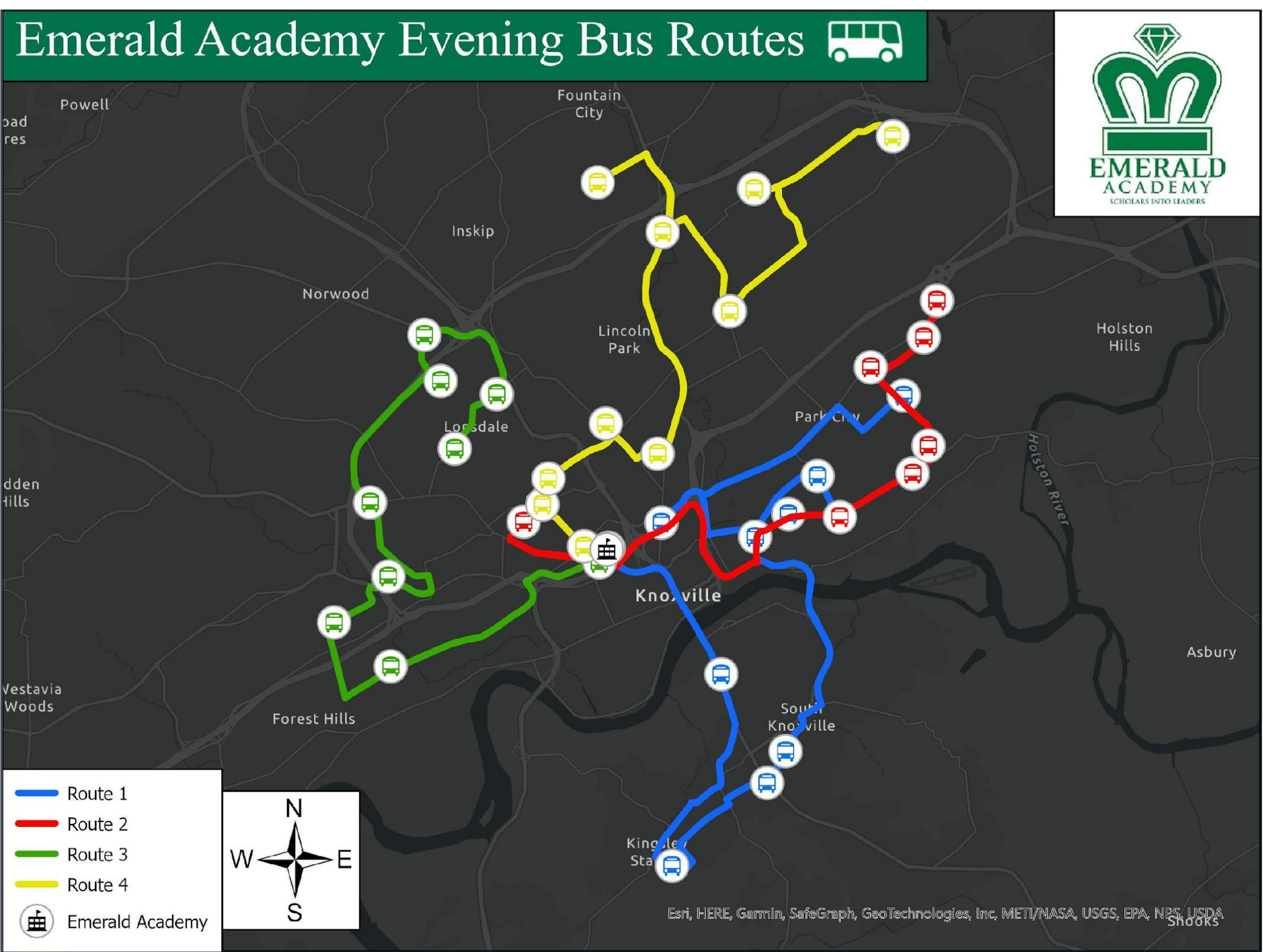
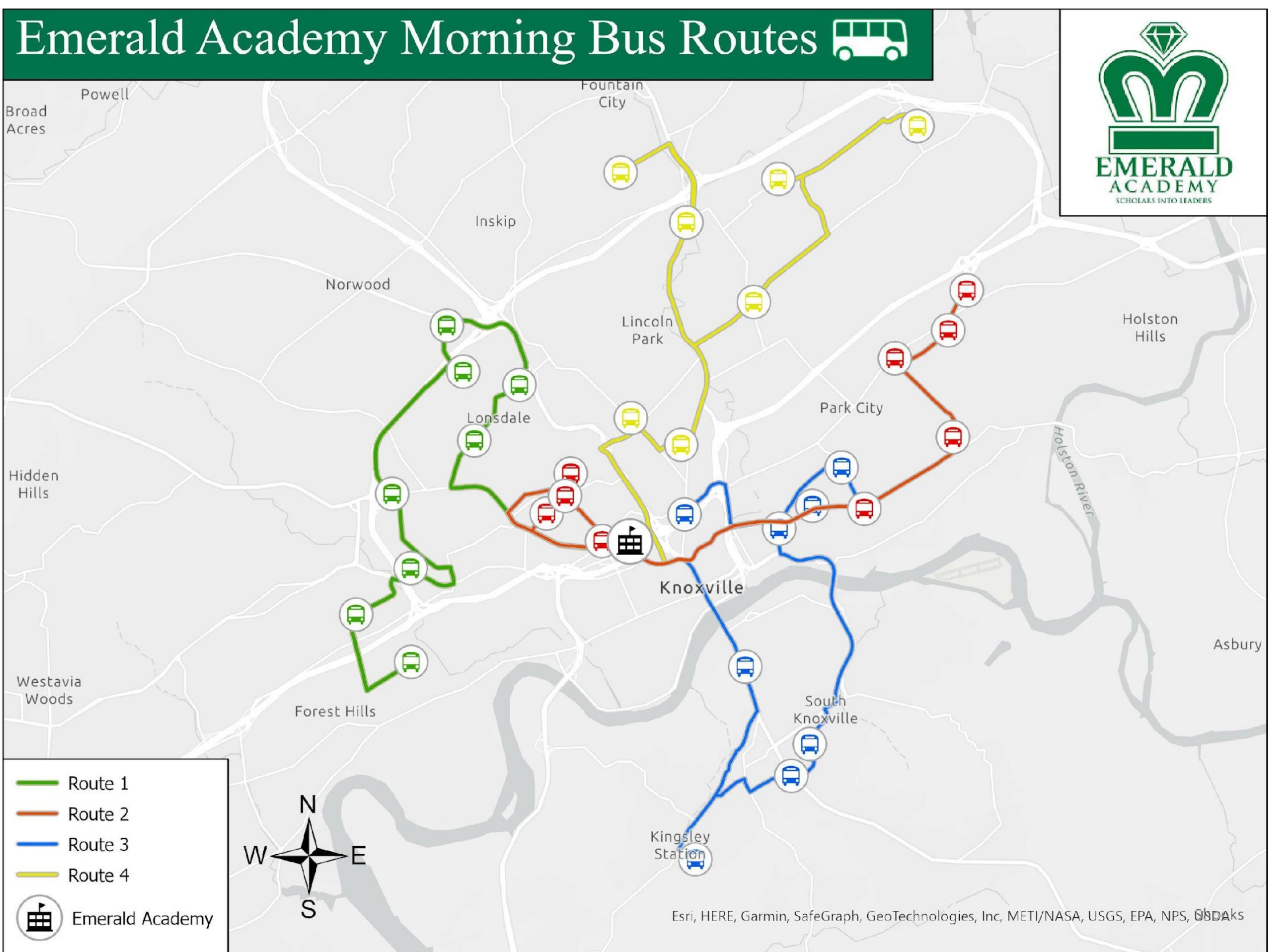


VISUALIZING THE ROUTES

Next, we used the PDF schedule of Emerald Academy's bus routes to map each of the eight bus routes in Google Maps. We then converted the eight routes into KML files, which were uploaded into ArcGIS and converted to features. Below is an example of a route in Google Maps (left) and the converted KML files in ArcGIS Pro (right).

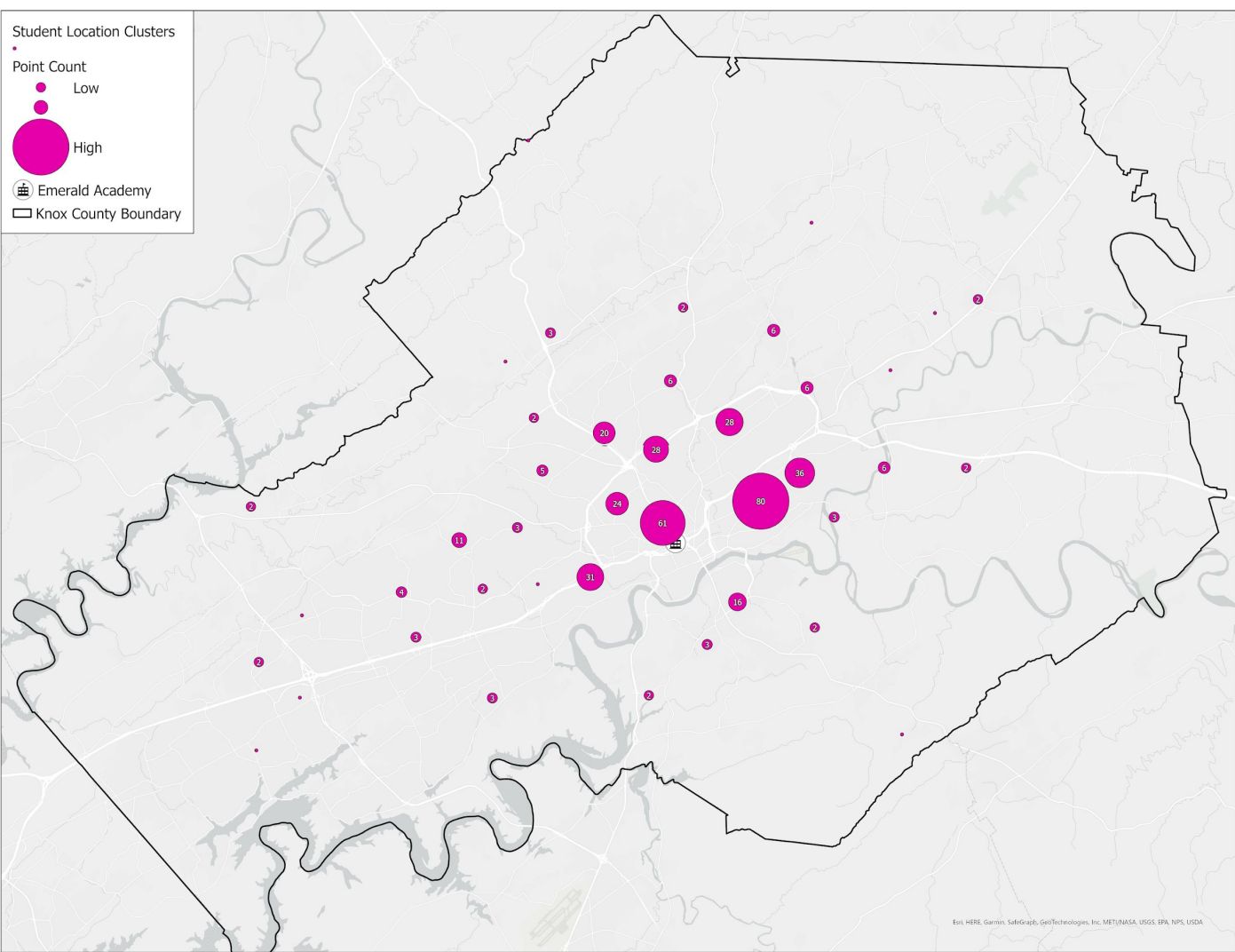


The morning and evening routes, along with their stop markers, were then separated by color-coordinated routes and markers, to make the map easier to read for parents and students. The finalized morning and evening routes are shown below:

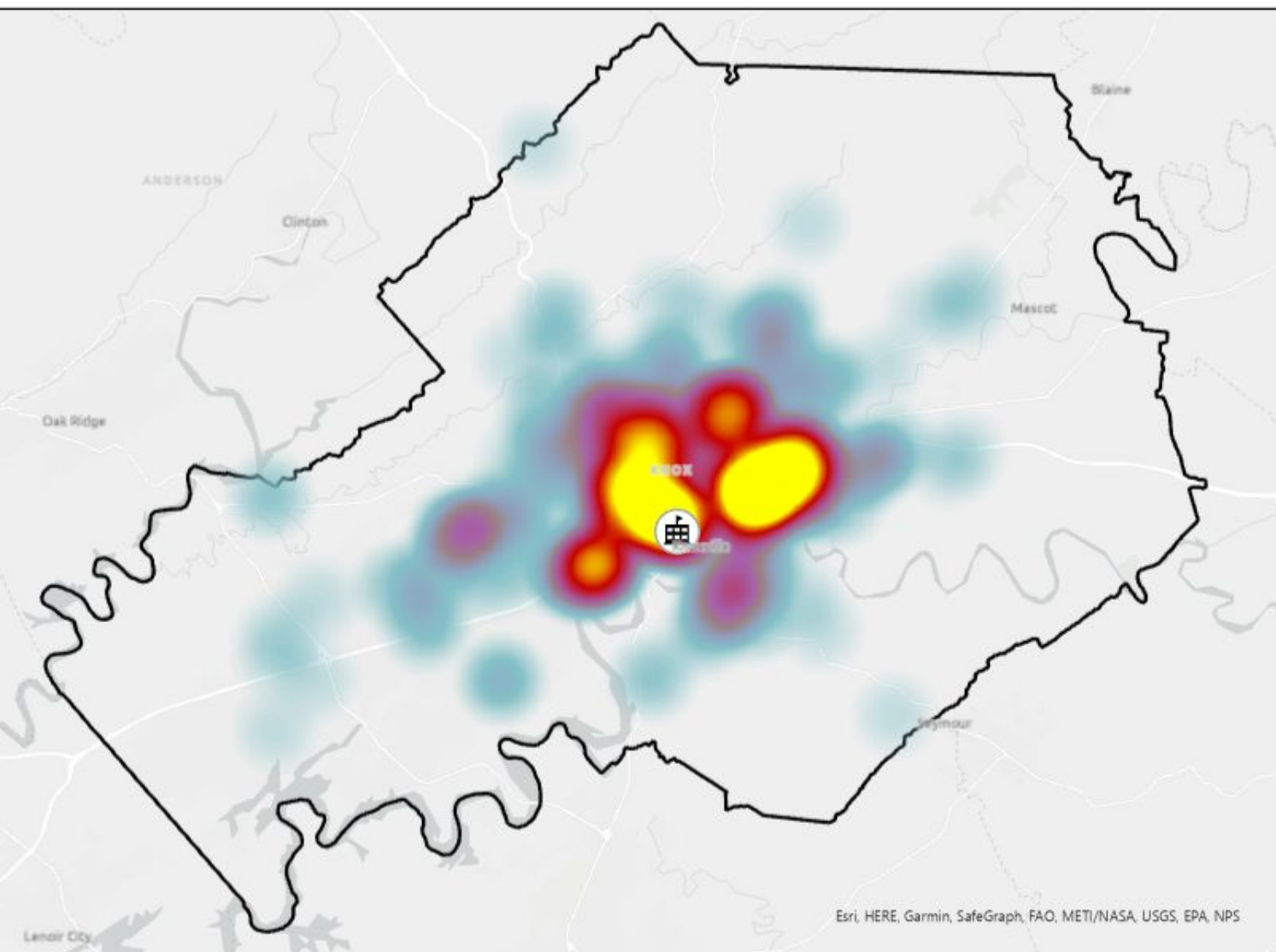


STUDENT LOCATIONS

Once the bus routes were visualized, we then conducted a locational analysis on the home addresses of Emerald Academy students. Below is a cluster analysis and a heatmap of where students live. Results show that many Emerald Academy students live in North and East Knoxville.



The above shows clusters of Emerald Academy student's addresses.



The above shows a heat map of Emerald Academy student's addresses.

CHALLENGES

- KML conversions
- Translating routes into an app that is publicly available
- Google Map stop number limits

FUTURE RESEARCH AND CONCLUSION

As the semester draws to a close, we have gained more experience with ArcGIS through this project, as well as experience working with a community partner. Students in subsequent semesters will be able to pick up where we left off with this project, and we hope the work we have completed to this point will prove useful to the school and families.