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# Chapel Hill BRT Study

*Transit Planning using FTA STOPS Model*

*presented to*

*North Carolina Model User Group Meeting*

*presented by*

*Cambridge Systematics, Inc.*

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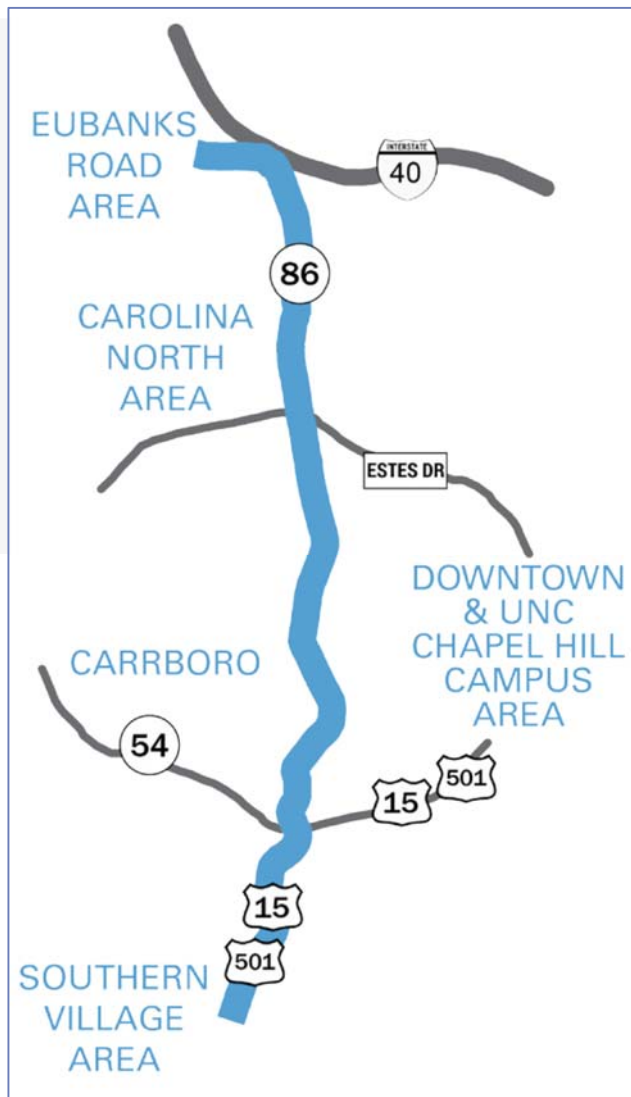
04/26/2017

# Presentation Outline

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- Overview of the Project
- Ridership Forecasting –
  - » Overview of Federal Transit Administration (FTA) Simplified Trips-on-Project Software (STOPS)
  - » Key Inputs and Approaches
  - » Results and Sensitivities
- Next Steps

# Project Overview – Study Area



- 8-mile long corridor
- Runs along Martin Luther King Jr. Blvd./ Columbia St./ US 15-501 South from Eubanks Road park-and-ride lot to the Southern Village park-and-ride lot
- Direct Connections to UNC Hospitals campus and planned Durham-Orange LRT
- Substantial growth is forecast in the corridor (e.g., +54% in employment from 2010 to 2040)

# Project Overview – Partners

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- North-South Corridor Study is a 30-month project
- Led by Chapel Hill Transit Partners, which includes:
  - » Town of Chapel Hill
  - » Town of Carrboro
  - » University of North Carolina – Chapel Hill
- Funded through combination of Federal (FTA) and local funds
- CS part of a consultant team led by AECOM

# Project Overview – Goals

- Make transit more efficient and attractive
- Support planned land uses
- Contribute to regional equity, sustainability, and quality of life
- Improve connectivity along the corridor
- Improve connectivity of the corridor to the region
- Develop a community-supported project



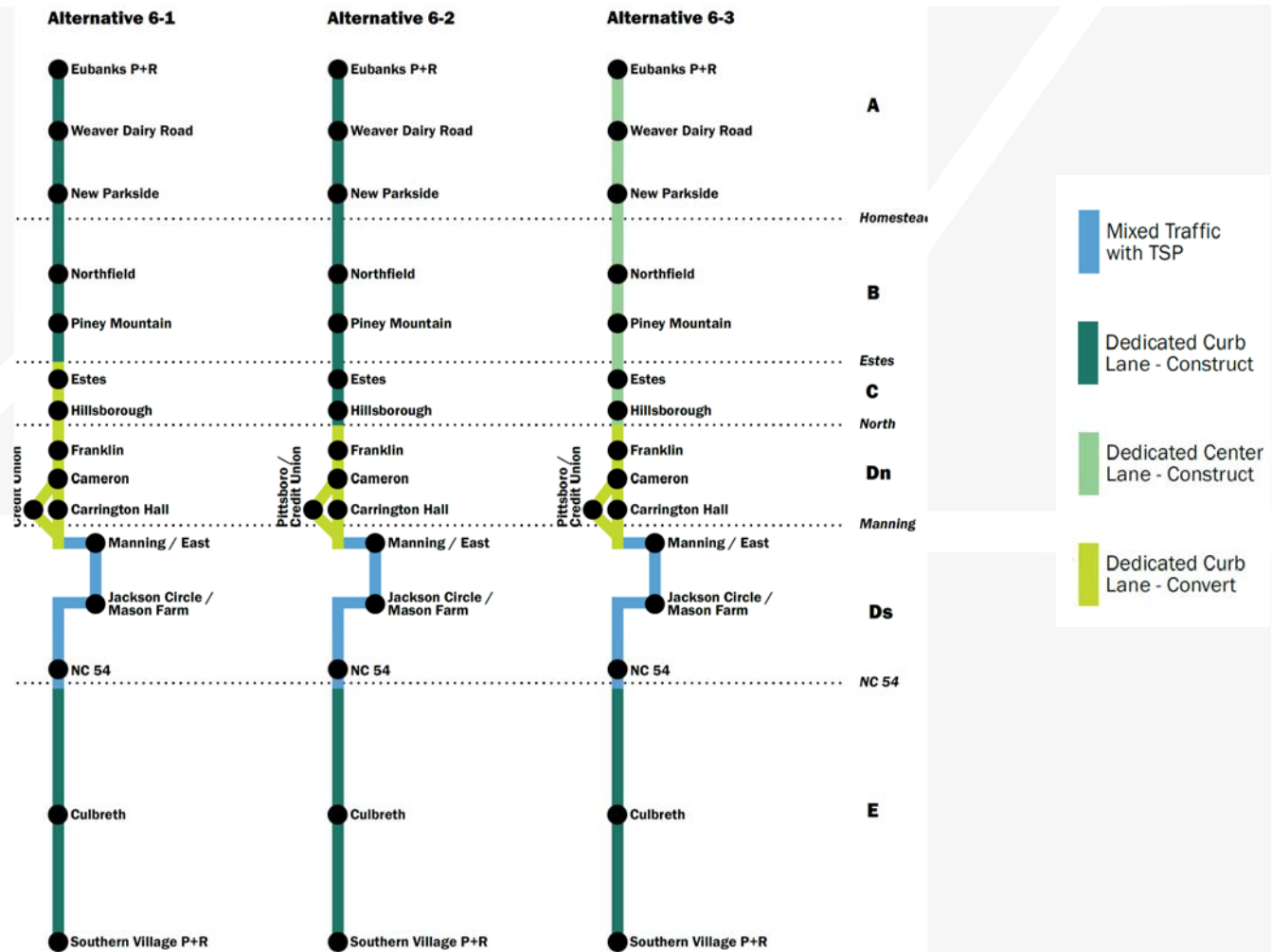
Photo Source: Chapel Hill Transit: <http://nscstudy.org/>

# Project Overview – Evaluation

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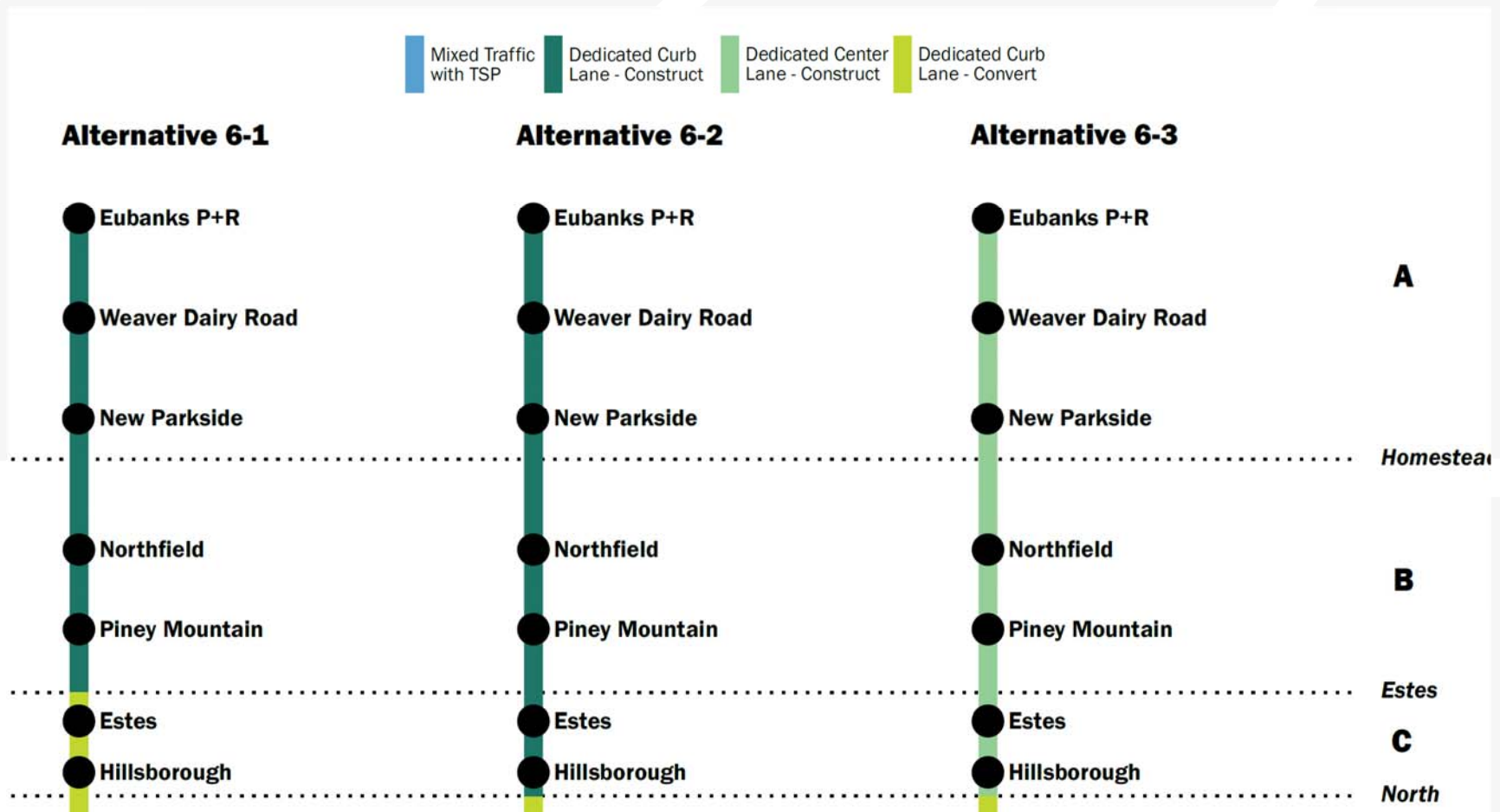
- A multi-step alternative development and evaluation process was used
- Included input from project advisory committees and members of the public over the course of the study
- The recommended Bus Rapid Transit (BRT) project (called the Locally-Preferred Alternative, or LPA) includes three possible combinations of running way types along the northern end of the corridor.

# Project Overview – Locally-Preferred Alternative



Source: *North-South Corridor Study: Executive Summary*

# Project Overview – LPA – Key Differences



Source: North-South Corridor Study: Executive Summary



# Project Overview – LPA Characteristics

- Service frequency
  - » 7.5 min (peak); 10-20 min (off-peak)
- End-to-end travel time
  - » 33 min
- Hours of Operation
  - » 7 days a week
  - » 5:00 am – 11:00 pm during the week
  - » 8:00 am – 11:00 pm on the weekend

# Ridership Forecasting – STOPS Overview

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- Quantifies FTA's trips-on-project evaluation measures for FTA major capital funding
- Takes advantage of data that are generally available “off the shelf” to permit a user to develop transit project demand forecasts with relatively modest effort
- Produces reporting which permits straightforward review and interpretation of the likely beneficiaries of the proposed transit improvement

# Ridership Forecasting – STOPS Overview (continued)

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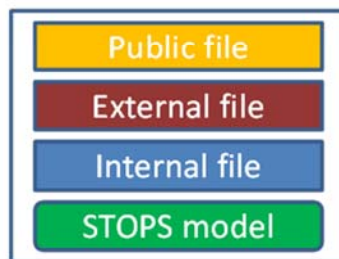
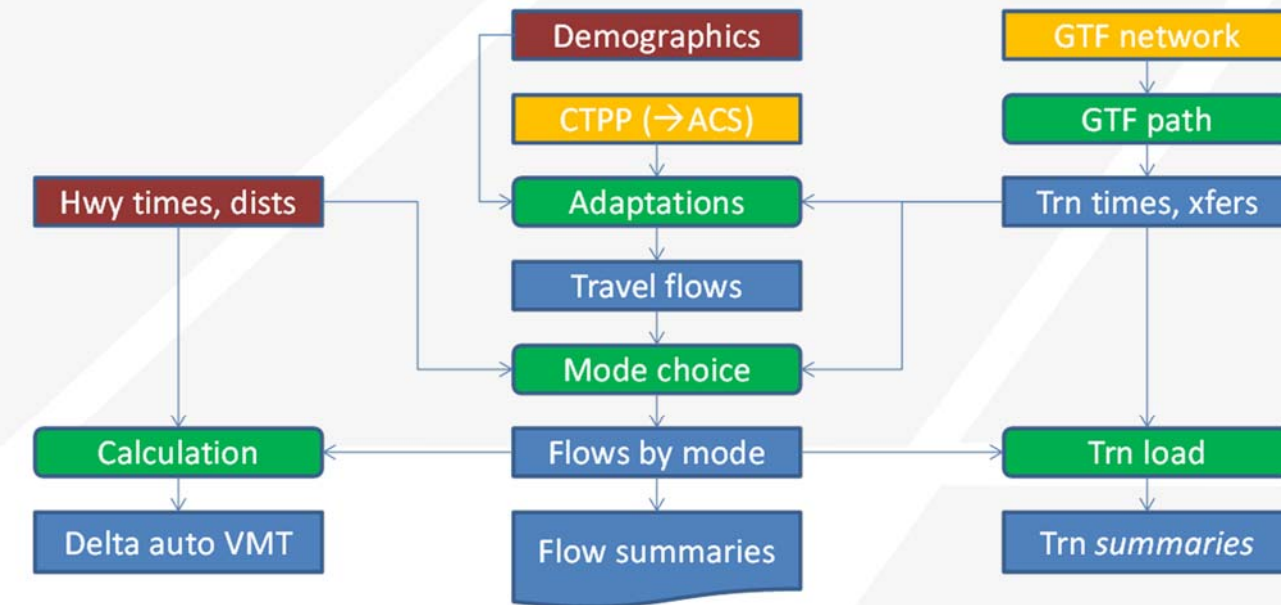
- Simplified implementation of a conventional “four-step” trip-based model
- Major focus is forecasting trips on major-capital fixed guideway projects (e.g., BRT, streetcar, light rail)
- Nationally calibrated, with adjustments made for local transit and fixed guideway systems

# Ridership Forecasting – STOPS Components

## Highway Supply

## Demand

## Transit Supply



### Notes:

- Demographics, travel flows, and travel times are zone-to-zone
- Networks and loaded volumes are link-based
- "Adaptations" include translation to the year of the forecast plus:
  - Conversion of worker flows to Home-Based-Work trip flows
  - Scaling of HBW flows to represent Home-Based-Other flows
  - Development of Non-Home-Based flows from HB transit trip ends

Source: FTA STOPS Workshop

# Ridership Forecasting – Inputs for STOPS, Generally

- State-specific census shape file and 2010 block-boundary file
- CTPP 2000 Parts I, II, & III files
- General Transit Feed Specification (GTFS) time tables to represent current and project transit services
- Locations of project stations
- Definition of planning districts for the project corridor
- MPO data
  - » Year 2000 population and employment by TAZ
  - » Current year (2013) and horizon (2040) year population and employment by TAZ
  - » TAZ-to-TAZ peak period highway impedances from the regional travel model for current and horizon years

# Ridership Forecasting – STOPS User Interface

STOPS Main Menu-v1.50 - 04/28/2015

**Initial STOPS Set-up Steps**

ArcMap GIS  
 Select GIS Executable: C:\Program Files (x86)\ArcGIS\Desktop10.2\bin\  
 Select Python Executable\*: C:\Python27\ArcGIS10.2\pythonw.exe  
 \* - Only used for ArcGIS

**Scenario Set-up Steps**

1. Select/Create Parameter File	Files Not Found
2. Specify Station Locations	Files Not Found
3. Edit Parameter File	Files Not Found
4. List and Check TAZ and CTPP Files	Files Not Found
5. List and Check GTFS Files	Files Not Found
5a. EXST GTFS Test   5b. NOBL GTFS Test   5c. BLD GTFS Test	Optional
6. Define Forecast Years	Files Not Found
<b>Data Preparation Steps</b>	
7. Create Station Buffers	Files Not Found
8. Define Districts and Zonal Data	Files Not Found
9. Create MPO-TAZ Equivalency and Generate Zonal SE Forecasts	Files Not Found
10. Prepare Pedestrian Environment Data	Files Not Found

**STOPS Batch Steps**

Current Year  
  Opening Year  
  10 Year  
  20 Year  
 Not Defined   Not Defined   Not Defined   Not Defined

11. Run Batch Steps	Not Complete
<input checked="" type="checkbox"/> CTPP Extract .....	Not Complete
<input checked="" type="checkbox"/> GTF Path .....	Not Complete
<input checked="" type="checkbox"/> GTF Post .....	Not Complete
<input checked="" type="checkbox"/> Prepare Forecast Years .....	Not Complete
<input checked="" type="checkbox"/> STOPS .....	Not Complete

**STOPS Reporting**

12. Report STOPS Results

13. Map STOPS Results

14. ZZZ Query From Zone [ ] To [ ]

**Manual Steps** (points to Scenario Set-up Steps)

**Automatic Steps** (points to STOPS Batch Steps)

Update File Status   Exit

# Ridership Forecasting – STOPS 1.5 Visibility Factor

- “Visibility factor” influenced mode-specific constants that determine the choice of path-type and access mode and nesting constants
- In STOPS version 1.5 only those BRTs that exclusively operate on dedicated right-of-way can use a maximum visibility factor of 1.0
- BRTs that at least partially operate in mixed traffic are coded with a visibility factor less than 1.0
- After sensitivity testing runs and consultation with FTA, the **visibility factor = 0.25** was used
- Since the project completion date, newer STOPS versions 2.0 and 2.01 were released that incorporate an updated approach for setting visibility factors

# Ridership Forecasting – Inputs for STOPS, North-South Corridor

## ➤ General Inputs

- » Automobile travel time skims from the Triangle Regional Model
- » 2000, 2013 and 2040 MPO socioeconomic data files

## ➤ Transit Inputs

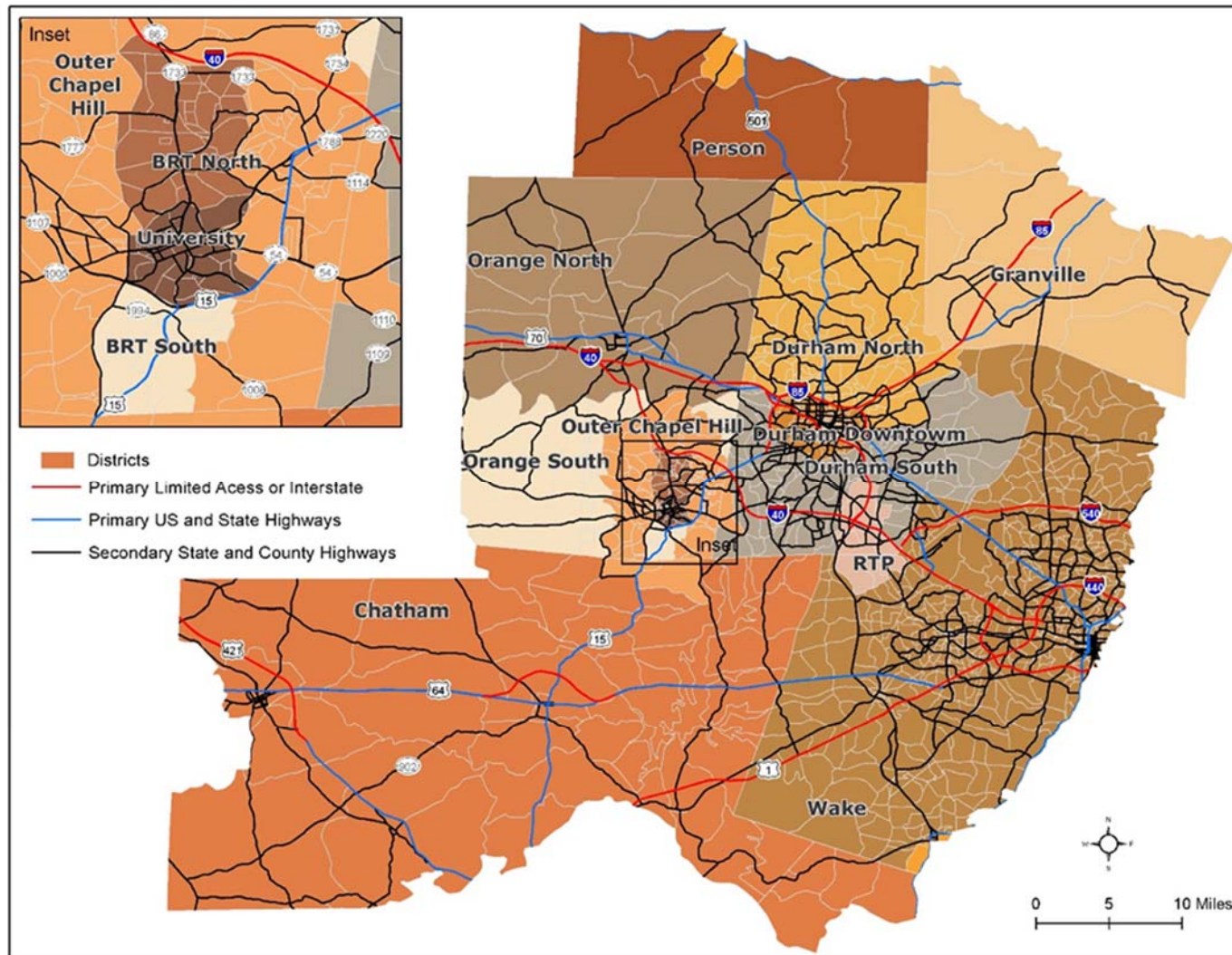
- » GTFS data for transit agencies in Chapel Hill area
- » Locally reported region-wide ridership

## ➤ Project Inputs

- » Detailed coding information about the proposed project
- » Custom planning district system
- » Visibility factor set to represent type of service = 0.25
- » Route type set to represent type of service “3” - for bus/premium bus, route type “0” – for fixed guideway



# Ridership Forecasting – Districts Developed for Project Modeling



# Ridership Forecasting – STOPS Outputs, Generally

- Main STOPS Report
  - » Calibration Summary
  - » District-to-district and station-to-station flows
    - Total linked transit trips
    - Incremental linked transit trips: Build minus No-build
    - Linked transit trips that use the Project (BRT)
  - » Station Volumes
    - By mode of access at the production end of the trip
  - » District-to-district changes in person-miles of travel

# Ridership Forecasting – Project Outputs

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- Ridership was forecast for several different alternative combinations of dedicated right of way segments.
- The three final LPA variations do not differ in terms of project travel time.
- We developed the report ridership forecast of 8,575 daily riders based on a blending of project forecasts using more and less conservative assumptions about likely market perceptions of the quality of the service.

# Ridership Forecasts – Key Sensitivities

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- Incorporating dedicated lanes tended to attract the highest ridership levels and produce the greatest VMT reductions
- The proportion of trips by different trip purpose, accessibility, and market share were consistent among the alternatives
- The majority of riders across all the evaluated alternatives used the project for commuter purposes. The second-most prevalent trip purpose was home-based other.
- Stations with PnR facilities, as well as stations near the University area had the highest boardings on the route

# Some Lessons Learned from STOPS Application

- Written guidance on STOPS is limited – largely because the model and the guidelines are still emerging
- STOPS users must be experienced enough to recognize anomalies as potential problems
- STOPS applications need understanding and care with key inputs:
  - Classification of the project – BRT versus Bus
  - Regional Unlinked Trips
  - Station Groupings
  - District Definitions
  - Visibility Factor

# Next Steps

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- In November 2016, FTA notified Chapel Hill Transit that the North-South Corridor BRT Project was formally accepted into the FTA's Small Starts Project Development program.
- This acceptance into the FTA program will mean that the BRT project can move forward into further engineering analysis and environmental impact review.

# Acknowledgments

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  - » Project Manager: Mila Vega
- AECOM
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