

**A RESOLUTION RECEIVING A REPORT ON  
THE CARRBORO MOBILITY REPORT CARD  
Resolution No. 35/2004-05**

WHEREAS, a Mobility Report Card has been prepared for the Town of Carrboro as a means to monitor and evaluate progress toward town-wide mobility goals.

NOW, THEREFORE BE IT RESOLVED by the Carrboro Board of Aldermen that the Aldermen has received the report on the Carrboro Mobility Report Card and releases the report to the Town's advisory boards for review and discussion.

October 2004



# Carrboro

## 2003 MOBILITY REPORT CARD



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# Introduction

The first Mobility Report Card for the Town of Chapel Hill was conducted in 2001. In 2003, it was decided to update that report card. At that time, it was also determined to create a mobility report card for the Town of Carrboro in order to present a better picture of the region's mobility as a whole. This document is a result of that work.

The 2003 Mobility Report Card represents a snapshot of mobility in Carrboro during the fall of 2003. Future updates to the Carrboro Mobility Report Card will be a means to monitor and evaluate progress towards Town-wide mobility goals.

This report card focuses on nine indicators to best balance the cost of data collection with the value of the resulting data in order to describe the current state of mobility within the Town and provide a meaningful baseline for future comparison. The indicators analyzed here are:

1. Vehicular Activity and Arterial Level of Service
2. Peak Hour Intersection Operations
3. Vehicular Travel Time
4. Pedestrian Facilities
5. Pedestrian Activity
6. Bicycle Facilities
7. Bicycle Activity
8. Transit Service
9. Transit Ridership

This Mobility Report Card will provide a baseline for progress evaluation. Each of the nine indicators comprises a separate section of this document. Each indicator discussion includes three descriptions as follows:

**Why and How:** This section briefly highlights the purpose of the information and what type of data was collected.

**Results:** This section of the indicator description will present the collected data. This information is presented in simple, easy to understand and read maps, tables and charts.

**Findings and Conclusions:** For each indicator, key findings and conclusions are highlighted for both current conditions and for future comparisons.

A mobility report focusing on the Town of Chapel Hill is also available. Some of the Chapel Hill data that is essential to understanding mobility issues in the Town of Carrboro are presented here, most notably in the travel time and transit sections. Further data on mobility issues in the Town of Chapel Hill is available in the Town of Chapel Hill Mobility Report Card Update. A technical appendix has been provided to Town staff that includes detailed data collection methodologies, much of the supporting data, and electronic data files and analyses.



## Indicator:

### VEHICULAR ACTIVITY AND ARTERIAL LEVEL OF SERVICE

Measurement: Roadway Traffic Volumes and Volume/Capacity Ratio

Data: 24-Hour Machine Counts

#### Why and How

Daily 24-hour traffic counts are one of the most common ways of presenting vehicular traffic activity. These counts are obtained through placement of a pneumatic tube or sensor across the whole street. These tubes or sensors send information to the machine counter on the roadside. Counts are only done on weekdays.

For purposes of this study, 31 North Carolina Department of Transportation (NCDOT) roadway count locations were analyzed. The locations where 24-hour vehicle traffic counts were collected are presented in Figure 2.

The daily traffic counts can also be used to determine level of service. Level of service (LOS) is a measurement system that assesses how well a particular roadway or intersection operates. Level of service uses letter grades similar to grades at school. An LOS of “A” indicates a relatively low volume of traffic in relation to a roadway’s capacity meaning vehicles can move freely down the roadway with few other automobiles on the road. The LOS system moves steadily down to an LOS of “F” indicating that traffic volume is above the roadway’s capacity. A higher letter grade is not necessarily better than a lower one, as a roadway with high capacity and low volume is not being used efficiently. Figure 1 presents general relationships for maneuverability, driver comfort, and average travel speed compared to the speed limit by level of service.

Figure 1 – Level of Service Characteristics

	A	B	C	D	E	F
Intersection Delay (control delay per vehicle, sec)	< 10	> 10 and < 20	> 20 and < 35	> 35 and < 55	> 55 and < 80	> 80
Arterial Volume/Capacity Ratio	< 0.6	0.6–0.7	0.7–0.8	0.8–0.9	0.9–1.0	> 1.0
Maneuverability	Almost Completely Unimpeded	Only Slightly Restricted	Noticeably Restricted	Severely Limited	Extremely Unstable	Almost None
Driver Comfort	High	High	Some Tension	Poor	Extremely Poor	The Lowest
Average Traveling Speed	Speed Limit	Close to Speed Limit	Close to Speed Limit	Some Slowing	Significantly Slower than Speed Limit	Significantly Slower than Speed Limit

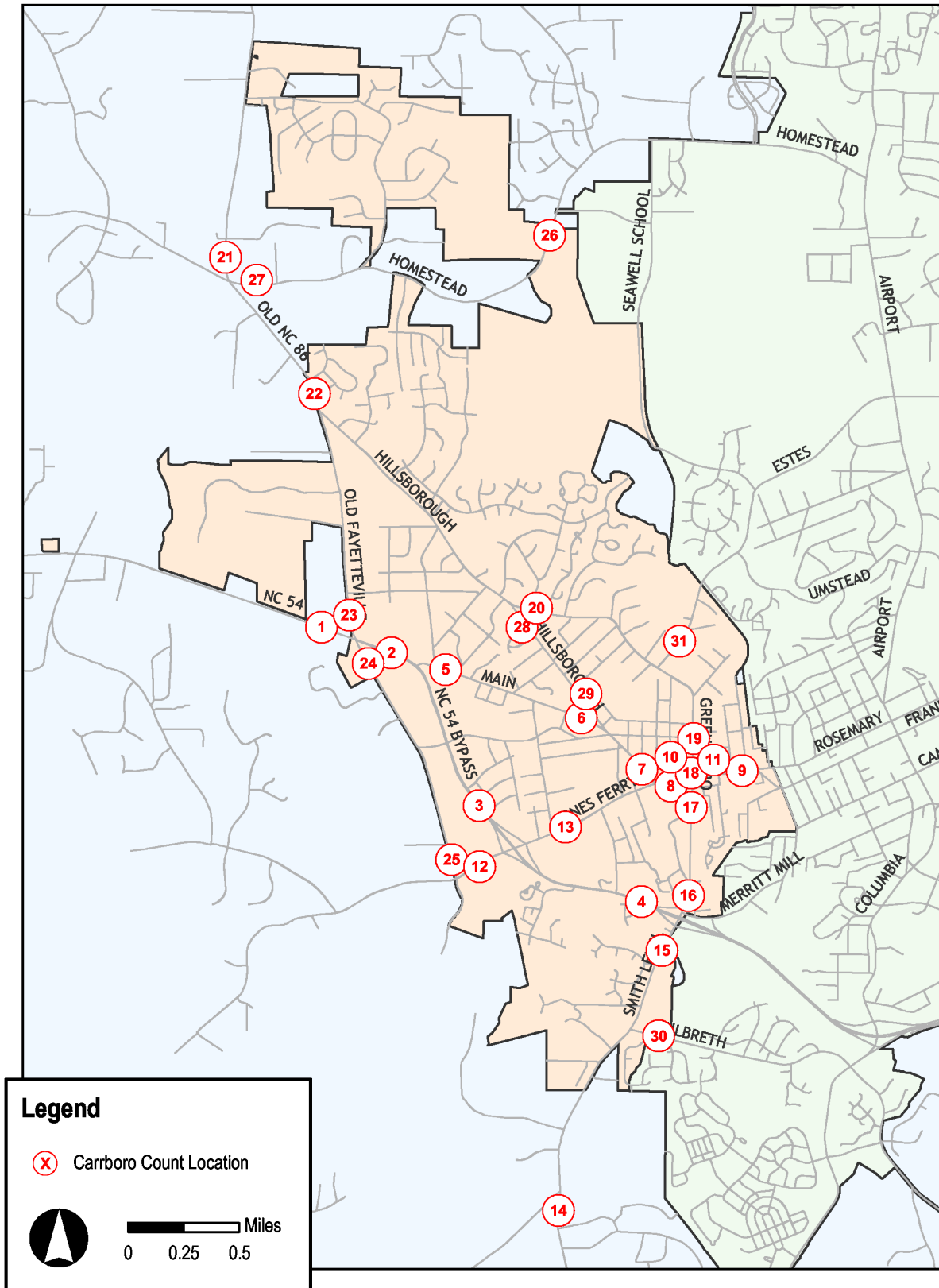
Level of service for roadways is based on a concept referred to as a volume-to-capacity (V/C) ratio, which simply is the daily volume divided by the facility's theoretical capacity. When the estimated or forecast daily traffic volume exceeds the theoretical capacity, then the ratio is greater than one and would experience an "F" level of service. Volume-to-capacity ratios for the other levels of service are depicted in Figure 1.

## Results

As indicated previously, 31 locations throughout the Town were counted for 24-hour daily volumes. This information is presented in Figure 3 and Table A. The map presents two items of information: the first is the traffic volumes, where the higher the volumes, the wider the band and the second item of information is the level of service. This information is color coded in a form similar to a traffic signal: uncongested conditions (LOS A, B and C) are green, moderate congestion (LOS D) is yellow, and congested conditions (LOS E and F) are red.

Included in the table is the resulting daily volume-to-capacity ratio and level of service for each location. The count locations in this and future tables are grouped by corridor, with the corridors with the highest traffic volumes being listed first. Within each corridor section, count locations are listed from the outer edge of Town towards the downtown core.

Figure 2 – 24-hour Auto Count Locations

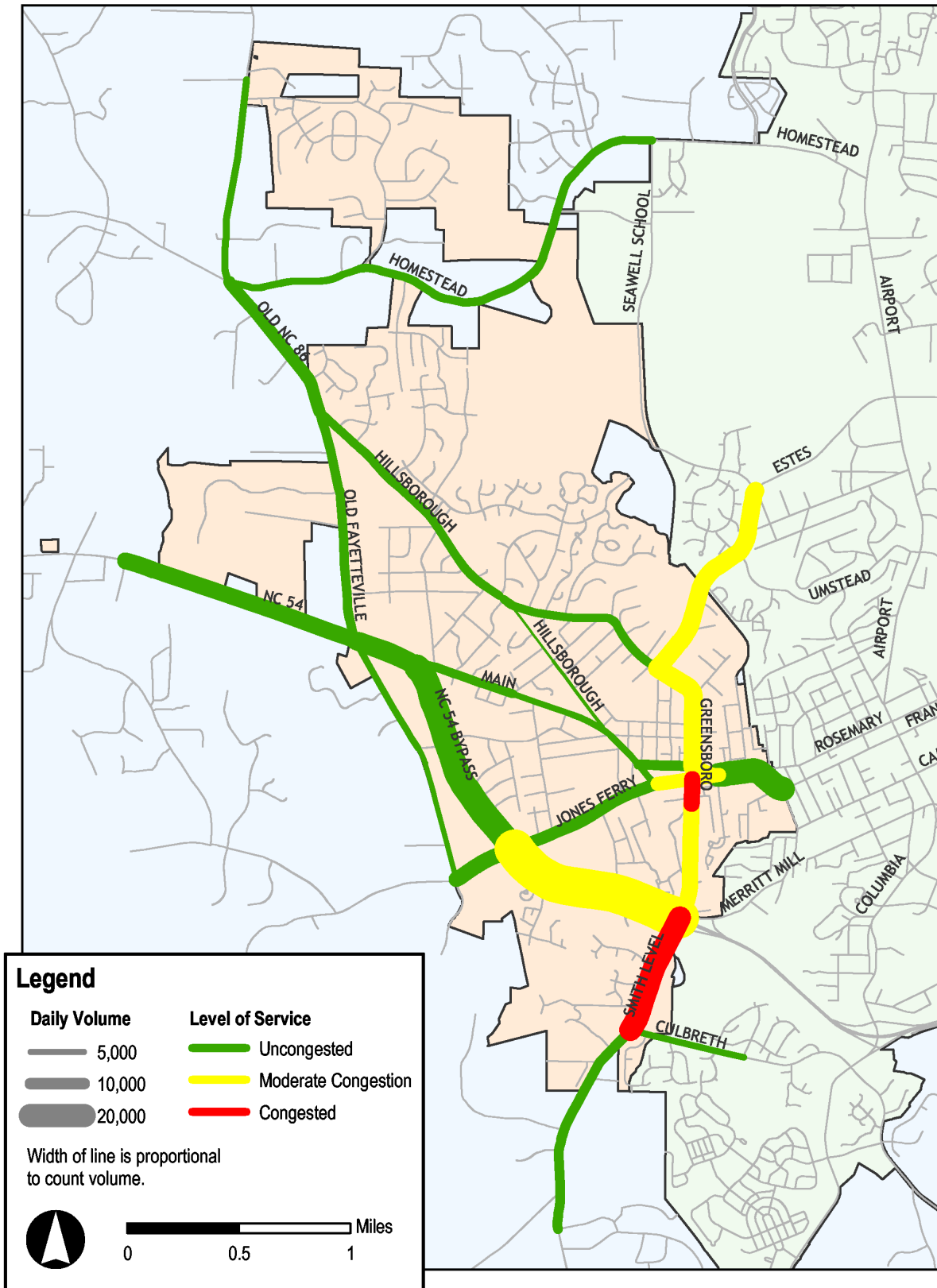




**Table A – Roadway Daily Traffic Volumes and Level of Service**

	Count Location	Daily Two Way Capacity	2003		LOS
			24-Hour Two Way Volume	Daily V/C	
NC 54	1 NC 54 b/w Old Fayetteville Rd and Anderson Park	37,200	14,000	0.38	A
	2 NC 54 b/w Main St and Old Fayetteville Rd	37,200	16,000	0.43	A
	3 NC 54 Bypass b/w Jones Ferry Rd and Oleander Rd	37,200	21,000	0.56	A
	4 NC 54 Bypass b/w Smith Level Rd and Abbey Ct	37,200	33,000	0.89	D
Main St/Weaver St	5 Main St b/w James St and Simpson St	12,900	7,200	0.56	A
	6 Main St b/w Blackwood Dr and Fidelity St	18,300	4,800	0.26	A
	7 Main St b/w Weaver St and Jones Ferry Rd	13,700	5,200	0.38	A
	8 Main St b/w Jones Ferry Rd and Greensboro St	13,700	12,000	0.88	D
	9 Main St b/w Lloyd St and Rosemary St	27,400	21,000	0.77	C
	10 Weaver St b/w Oak Ave and Greensboro St	13,700	8,700	0.64	B
	11 Weaver St b/w Greensboro St and Main St/Roberson St	13,700	12,000	0.88	D
Jones Ferry Rd	12 Jones Ferry Rd b/w Old Fayetteville Rd and Willow Creek	17,200	13,000	0.76	C
	13 Jones Ferry Rd b/w Barnes St and Davie Rd	17,200	10,000	0.58	A
Smith Level Rd/Greensboro Rd	14 Smith Level Rd b/w Northside Dr and Damascus Church Rd	14,000	8,000	0.57	A
	15 Smith Level Rd b/w Willow Oak Ln and Public Works Dr	18,600	19,000	1.02	F
	16 Greensboro St b/w NC 54 Bypass and Rand Rd	17,200	14,000	0.81	D
	17 Greensboro St b/w Old Pittsboro Rd (north) and Carr St	13,700	14,000	1.02	F
	18 Greensboro St b/w Main St and Weaver St	13,700	12,000	0.88	D
	19 Greensboro St b/w Short St and Poplar Ave	18,300	16,000	0.87	D
Old NC 86/Old Fayetteville Rd	20 Greensboro St b/w Hillsborough Rd and Robert Hunt Dr	17,200	7,000	0.41	A
	21 Old NC 86 b/w Homestead Rd and Stony Hill Rd	14,000	5,900	0.42	A
	22 Old NC 86 b/w Hillsborough Rd and Farm House Dr	18,600	10,000	0.54	A
	23 Old Fayetteville Rd b/w NC 54 and Carol St	14,000	7,900	0.56	A
	24 Old Fayetteville Rd b/w Swansea Ln and NC 54	14,000	5,400	0.39	A
Home- stead Rd	25 Old Fayetteville Rd b/w Jones Ferry Rd and Crabtree Dr	14,000	4,200	0.30	A
	26 Homestead Rd south of High School Rd	13,700	7,000	0.51	A
	27 Homestead Rd b/w Old NC 86 and Hardee Ln	12,900	5,800	0.45	A
Hills- boroug h Rd	28 Hillsborough Rd b/w Bel Arbor Ln and Dillard St	12,900	1,700	0.13	A
	29 Hillsborough Rd in front of Carrboro Elementary School	12,900	2,400	0.19	A
Other	30 Culbreth Rd b/w Rossum Wy and Cobble Ridge Dr	17,200	5,200	0.30	A
	31 Estes Dr b/w Greensboro St and Hillcrest Ave	17,200	15,000	0.87	D

Figure 3 – 2003 Daily Traffic Volumes and Level of Service



## Findings and Conclusions

There are significant variations in daily traffic volumes throughout the Town of Carrboro. Daily volumes range from less than 2,000 to over 30,000. Daily volume ranges along major facilities include the following:

- NC 54 Bypass – 14,000 to 33,000
- Main Street – 4,800 to 21,000
- Jones Ferry Road – 10,000 to 13,000
- Smith Level Road/Greensboro Street – 7,000 to 19,000
- Old NC 86/Old Fayetteville Road – 4,200 to 10,000

As can be seen in the figures and tables, principal arterials in the north and west operate in an uncongested state of LOS C or better. The downtown area and east side of town, however, have worse daily levels of service. Two locations in the Town of Carrboro, both on the Smith Level Road/Greensboro Street corridor, have LOS F. In fact, all count locations taken on Smith Level Road and Greensboro Street between Culbreth Road and Estes Drive operate at daily LOS D or worse. Estes Drive, NC 54 Bypass between Jones Ferry Road and Smith Level Road/Greensboro Street, Main Street between Jones Ferry Road and Weaver Street, and Weaver Street between Greensboro Street and Main Street/Roberson Street all experienced a moderately congested state of LOS D. All other daily roadway count locations in Carrboro operated in an uncongested state of LOS C or better.



## *Indicator:*

### **VEHICLE PEAK HOUR INTERSECTION OPERATIONS**

**Measurement: Peak Hour Intersection Level of Service (LOS)**

**Data: Turn Movement Counts, Signal Timing Plans**

#### **Why and How**

Whereas daily traffic volumes are often a common measurement used to compare one roadway with another, actual traffic engineering performance of the roadway system is based on how the intersections operate. This process is referred to as intersection level of service. As presented in the previous section, level of service is a universal measurement of operational performance by an intersection or corridor, utilizing a simple grading scale from "A" to "F."

Critical to the evaluation of peak hour intersection level of service is the collection of AM and PM peak hour intersection turn movement counts. These counts are manually recorded for the left turn movement, the through movement, and the right turn movements for each intersection approach direction. In addition, these counts are recorded in 15-minute increments over a 2-hour AM peak period and a 2½- to 3-hour PM peak period from which the respective peak hour is derived as the maximum of four consecutive 15-minute counts.

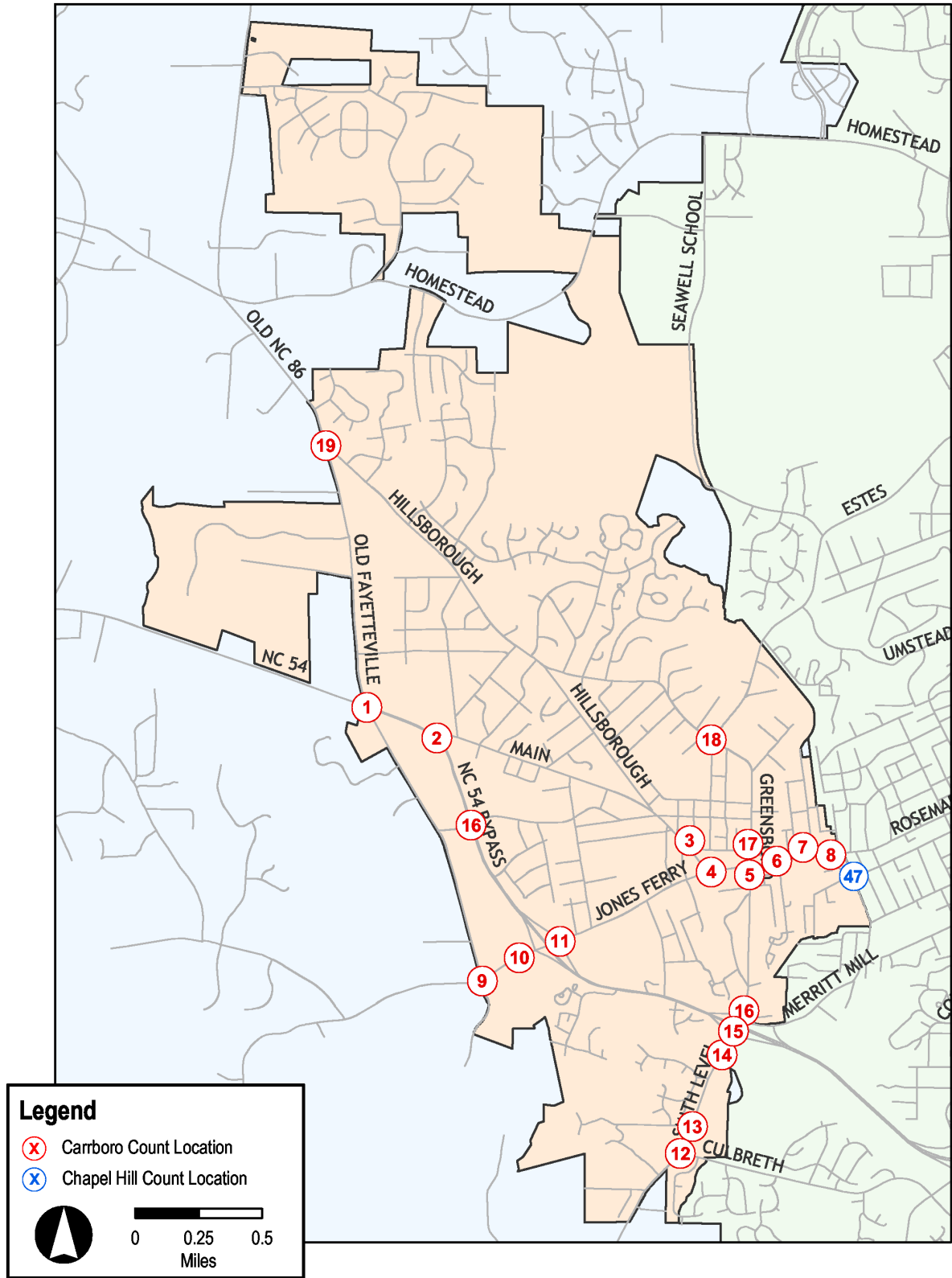
#### **Results**

Morning, noon, and evening peak hour turn movements counts (TMCs) were collected for 20 intersections throughout Carrboro which are presented graphically in Figure 4.

As part of this assessment process, a Synchro Database was developed for the Town of Carrboro. Synchro is software that is dedicated to evaluate the ebb and flow of traffic throughout a signal system and calculate average intersection delay and corresponding level of service. This database development required input of all signal timing plans by period of the day and required the actual geographic distribution of signalized intersections to calculate the relationships between speed, distance, and progression. These count data, coupled with the timing of the signal phases at the intersection, determine the level of service for each signalized intersection.

The results of this analysis are presented in Table B and in Figures 5, 6, and 7 for the AM, noon, and PM peak hours, respectively. Figures 5, 6, and 7 show the level of service. Green circles are used to indicate an uncongested condition (LOS A, B or C), orange squares are used to indicate a moderate level of congestion (LOS D), and red triangles indicate a congested intersection (LOS E or F).

Figure 4 – Auto Turning Movement Count Locations



**Table B – Intersection Level of Service**

Dates Recorded: 10/7/03 – 11/20/03

Intersection		AM Peak	Mid-Day	PM Peak
		2003	Peak 2003	2003
Main St	1 NC 54/Old Fayetteville Rd	B	A	B
	2 Main St/NC 54 Bypass	B	B	B
	3 Main St/Weaver St	A	A	A
	4 Main St/Jones Ferry Rd	B	A	B
	5 Main St/Greensboro St	B	B	C
	6 Main St/Weaver St/Roberson St	A	A	A
	7 Main St/Lloyd St	A	A	A
	8 Main St/Rosemary St	B	B	B
	47 Franklin St/Merritt Mill Rd/Brewer Lane	A	A	A
Jones Ferry Rd	9 Jones Ferry Rd/Old Fayetteville Rd	B	A	A
	10 Jones Ferry Rd/Willow Creek Shopping Center	A	A	A
	11 Jones Ferry Rd/NC 54	A	A	B
Smith Level Rd/ Greensboro St	12 Smith Level Rd/Culbreth Rd	D	A	B
	13 Smith Level Rd/BPW Club Rd	B	A	C
	14 Smith Level Rd/Public Works	B	A	A
	15 Smith Level Rd/NC 54 Ramps C/D	C	B	C
	16 Greensboro St/Merritt Mill Rd	A	B	C
	5 Greensboro St/Main St	B	B	C
	17 Greensboro St/Weaver St	C	C	C
	18 Greensboro St/Estes Dr	B	B	E
	19 Hillsborough Rd/Old Fayetteville Rd/Old NC 86	C	A	B

Figure 5 –AM Peak Hour Signalized Intersection Level of Service

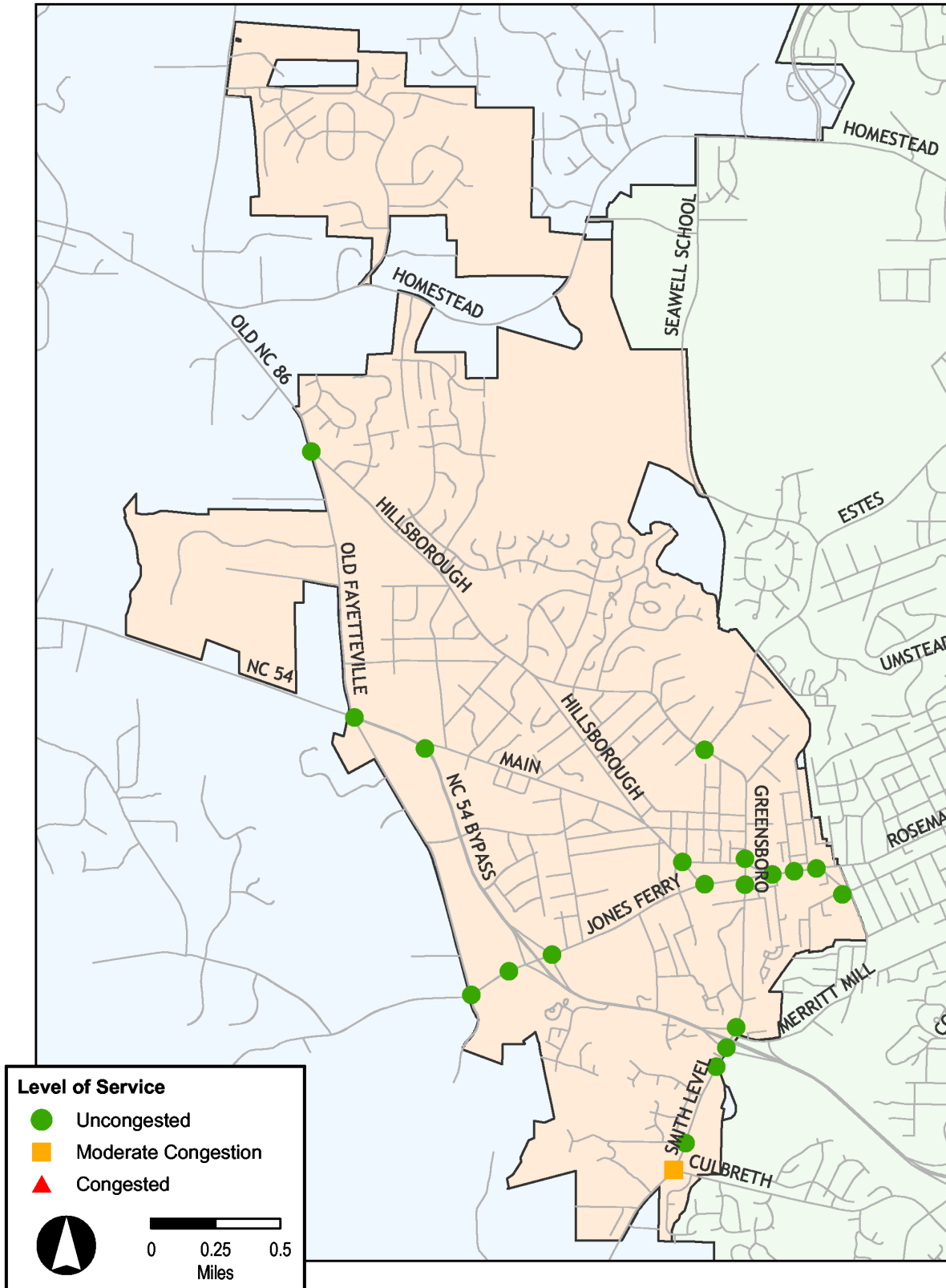


Figure 6 – Mid-Day Peak Hour Signalized Intersection Level of Service

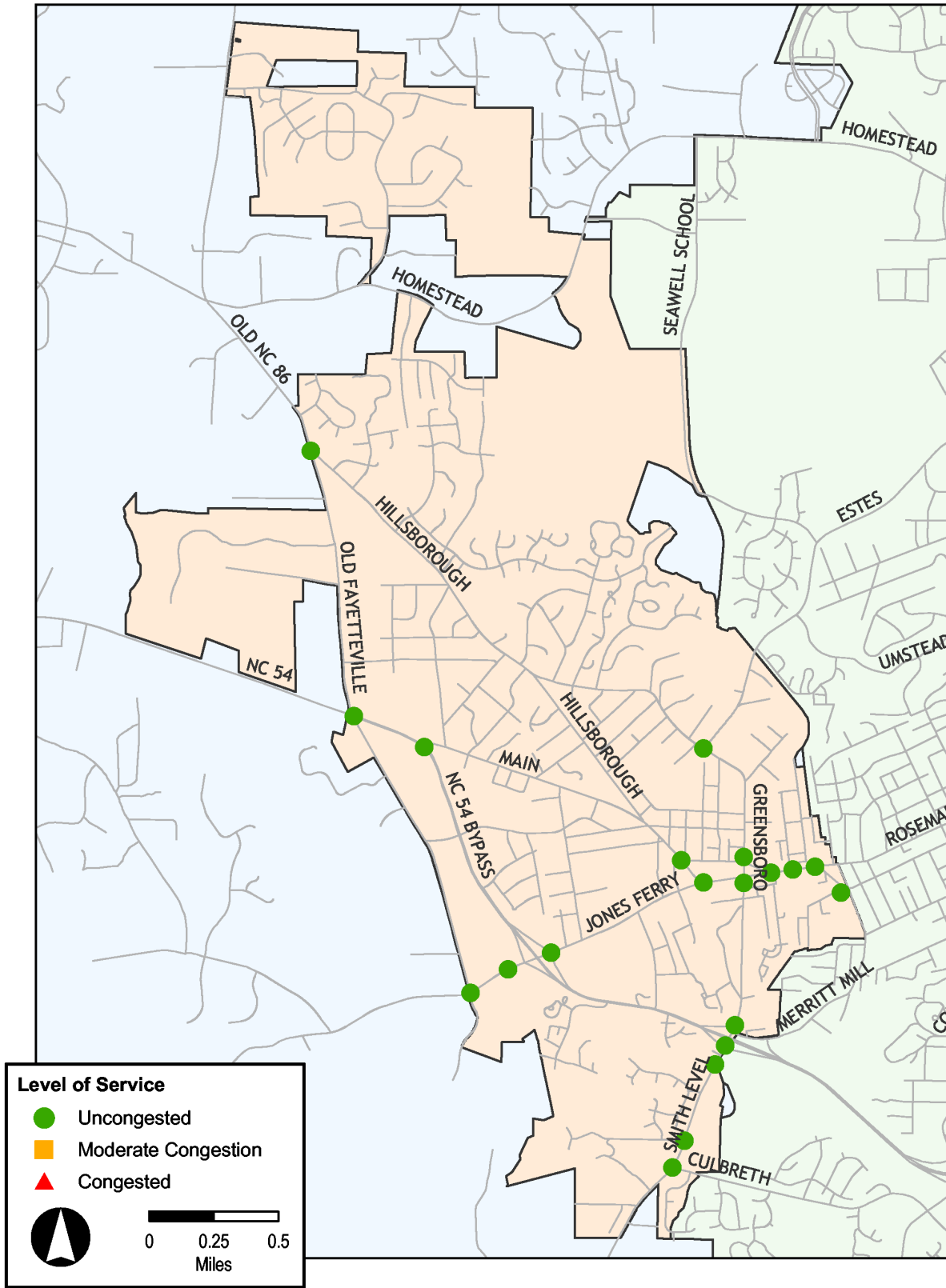
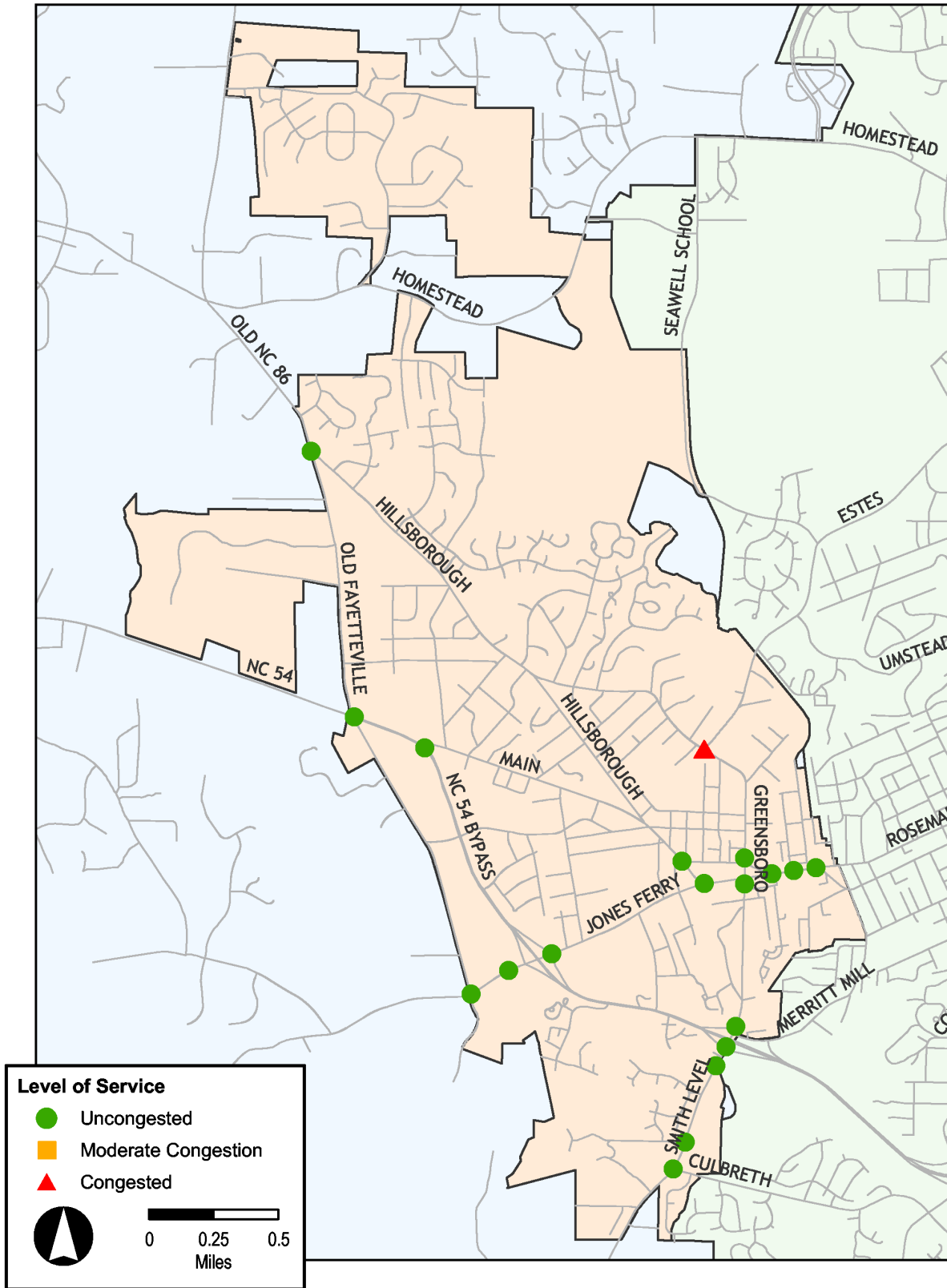




Figure 7 – PM Peak Hour Signalized Intersection Level of Service





## Findings and Conclusions

Almost all of the intersections in the Town of Carrboro operate in an uncongested condition during all time periods. Only one intersection in the morning peak-hour, Smith Level Road and Culbreth Road, operated at LOS D. No intersections in the morning peak-hour operated in a congested state (LOS E or F).

Similarly, only one intersection in the afternoon peak-hour, Greensboro Street and Estes Drive, operated at worse than LOS C. That intersection operates in a congested state of LOS E. No intersections in the mid-day peak-hour operated at worse than LOS C.

Overall, there is a very high level of service for all signalized intersections in Carrboro. All of the intersections operate in an uncongested state for at least two time periods.



## *Indicator:*

### **VEHICULAR TRAVEL TIME**

**Measurement:** In-Flow Vehicle Travel Time

**Data:** Travel Time Surveys on Major Travel Corridors

#### **Why and How**

Travel time analysis describes the amount of time it takes to get from one point to the next. Travel time is a measurement that is easy to understand by the typical citizen and is an effective way to assess the overall travel along a corridor. Traffic volumes, traffic control devices, signal timing, and delay are all elements that affect actual travel time. Vehicular travel time is measured by driving a particular route with the regular flow of traffic and timing the duration of the trip.

#### **Results**

Travel times were collected for fifteen major travel corridors throughout the Carrboro and Chapel Hill area. The five corridors which are completely or almost completely within Carrboro are Hillsborough Road, Jones Ferry Road, Main Street, Old NC 86/Old Fayetteville Road, and Smith Level Road/Greensboro Street. Large portions of the NC 54 Bypass and Homestead Road are within Carrboro, and a small part of the Estes Drive Corridor is within the Town. The Town is also served by the Eubanks Road corridor between Old NC 86 and Airport Road.

These routes were driven during the morning, mid-day, and afternoon peak hours. Each route had multiple segments and was driven in each direction to capture inbound and outbound differences in the peak conditions. The corridors in which travel times were collected and the average travel speed by direction for the morning and afternoon peak time periods are presented in Tables C and D. It should be noted that these travel speeds include delays associated with the signals along the corridor.

Figures 8 and 9 summarize the travel time for direction and time period for each roadway corridor segment. Time is shown as minutes:seconds (e.g., 4:20 is 4 minutes and 20 seconds). Figure 8 shows this information for the Town of Carrboro and Figure 9 shows the segments in the Town of Chapel Hill.

Figures 10, 11, 12, 13, 14, and 15 show two pieces of information for each time period in which travel time was measured (morning peak hour, mid-day peak hour, and afternoon peak hour) and for each direction (inbound and outbound). The width of the line indicates the relative average speed of the corridors as measured in 2003 and the color of the line shows the comparison of the corridor speed with the corridor speed limit. The average speed calculated includes time spent at signals, so the travel speed will be slightly higher than the average speed. Red corridors indicate that the average corridor segment speed is more than 5 mph below that segment's speed limit. Segments with average speeds within 5 mph of the speed limit are shown in yellow, and segments with average speeds over 5 mph over the speed limit are shown in green. For a more

complete picture of the region's conditions, travel time for the Town of Chapel Hill is also included on these maps.

Figure 16 shows roadway segments that had average travel times significantly higher than the speed limit (equal to or above 15 mph over speed limit) for any time period or direction. Segments with average travel time significantly higher than the speed limit for one time period/direction are shown in orange and segments that significantly exceeded the speed limit for two time periods/directions are shown in red.

**Table C – AM Corridor Travel Speeds**

Dates Recorded: 2/4/04 – 2/12/04

Corridor	From	To	Length (miles)	Speed Limit (mph)	Inbound		Outbound	
					Travel Time (m:s)	Avg Speed (mph)	Travel Time (m:s)	Avg Speed (mph)
Estes Dr	Greensboro St	Airport Rd	1.71	35	2:45	37.3	3:28	29.6
Eubanks Rd	Airport Rd	Old NC 86	2.63	45	3:46	41.9	3:45	42.1
Hillsborough Rd	Old NC 86	Main St	1.94	35	3:26	33.9	3:31	33.1
Homestead Rd	Airport Rd	Old NC 86	3.33	40 - 45	5:42	35.1	4:56	40.5
Jones Ferry Rd	Old Fayetteville Rd	Main St	1.01	35	1:48	33.5	1:59	30.4
Main St	NC 54	Merritt Mill Rd	1.83	20 - 35	6:12	17.7	6:12	17.7
NC 54 Bypass	Old Fayetteville Rd	Smith Level Rd	2.06	45	3:13	38.4	2:58	41.6
Old NC 86/Old Fayetteville Rd	Homestead Rd	Jones Ferry Rd	2.93	35 - 45	5:21	32.9	7:30	23.5
Smith Level Rd/Greensboro St	US 15/501	Hillsborough Rd	4.98	20 - 45	10:42	27.9	9:00	33.2

**Table D – PM Corridor Travel Speeds**

Dates Recorded: 2/4/04 – 2/12/04

Corridor	From	To	Length (miles)	Speed Limit (mph)	Inbound		Outbound	
					Travel Time (m:s)	Avg Speed (mph)	Travel Time (m:s)	Avg Speed (mph)
Estes Dr	Greensboro St	Airport Rd	1.71	35	3:00	34.2	3:23	30.3
Eubanks Rd	Airport Rd	Old NC 86	2.63	45	3:43	42.5	3:53	40.7
Hillsborough Rd	Old NC 86	Main St	1.94	35	3:13	36.2	3:35	32.5
Homestead Rd	Airport Rd	Old NC 86	3.33	40 - 45	5:15	38.1	5:31	36.2
Jones Ferry Rd	Old Fayetteville Rd	Main St	1.01	35	2:01	29.9	1:54	31.7
Main St	NC 54	Merritt Mill Rd	1.83	20 - 35	5:53	18.7	5:27	20.2
NC 54 Bypass	Old Fayetteville Rd	Smith Level Rd	2.06	45	3:39	33.8	2:51	43.3
Old NC 86/Old Fayetteville Rd	Homestead Rd	Jones Ferry Rd	2.93	35 - 45	5:04	34.7	5:05	34.6
Smith Level Rd/Greensboro St	US 15/501	Hillsborough Rd	4.98	20 - 45	10:39	28.1	11:18	26.5

Figure 8 – Carrboro Auto Travel Time

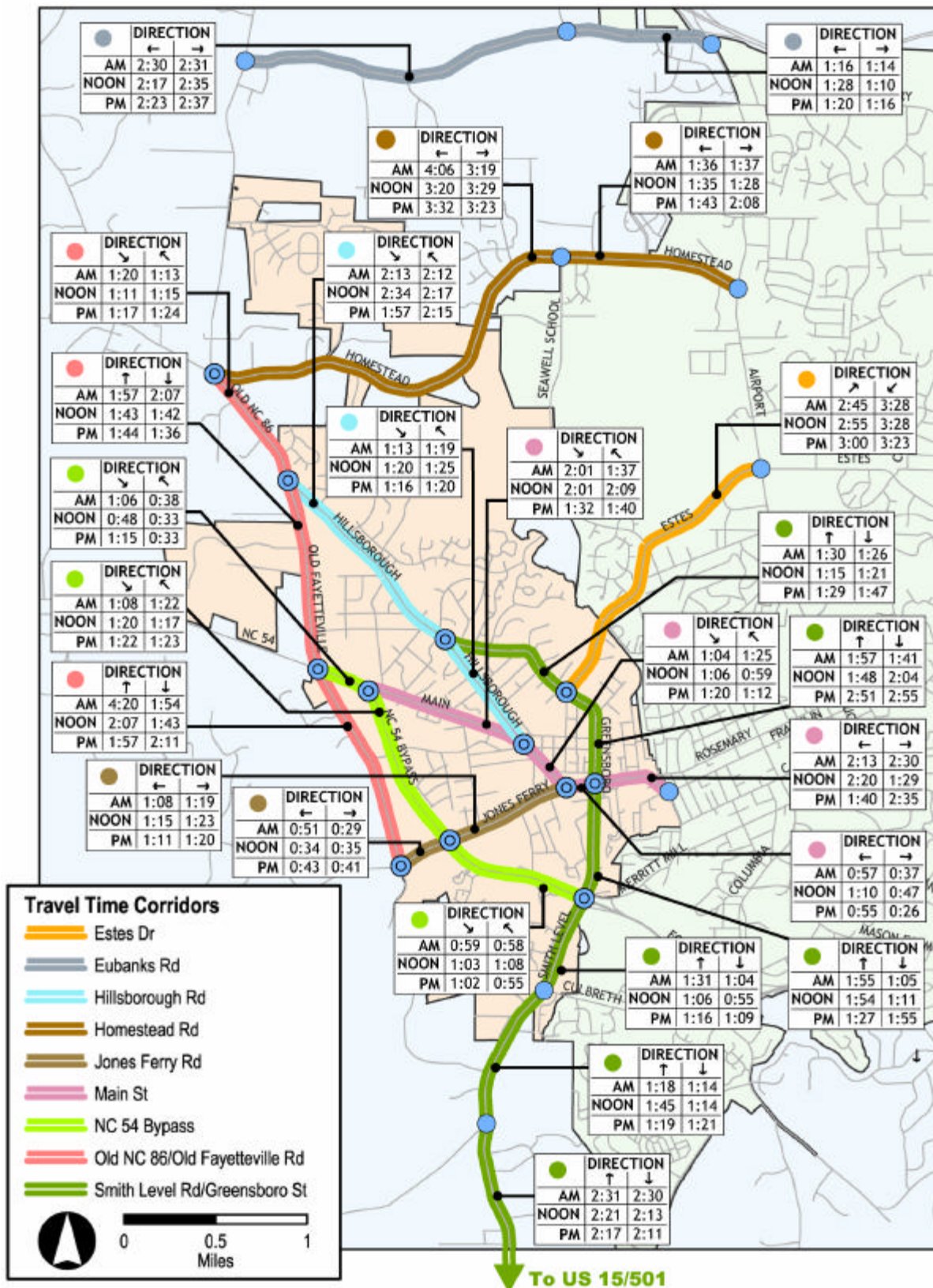


Figure 9 – Chapel Hill Auto Travel Time

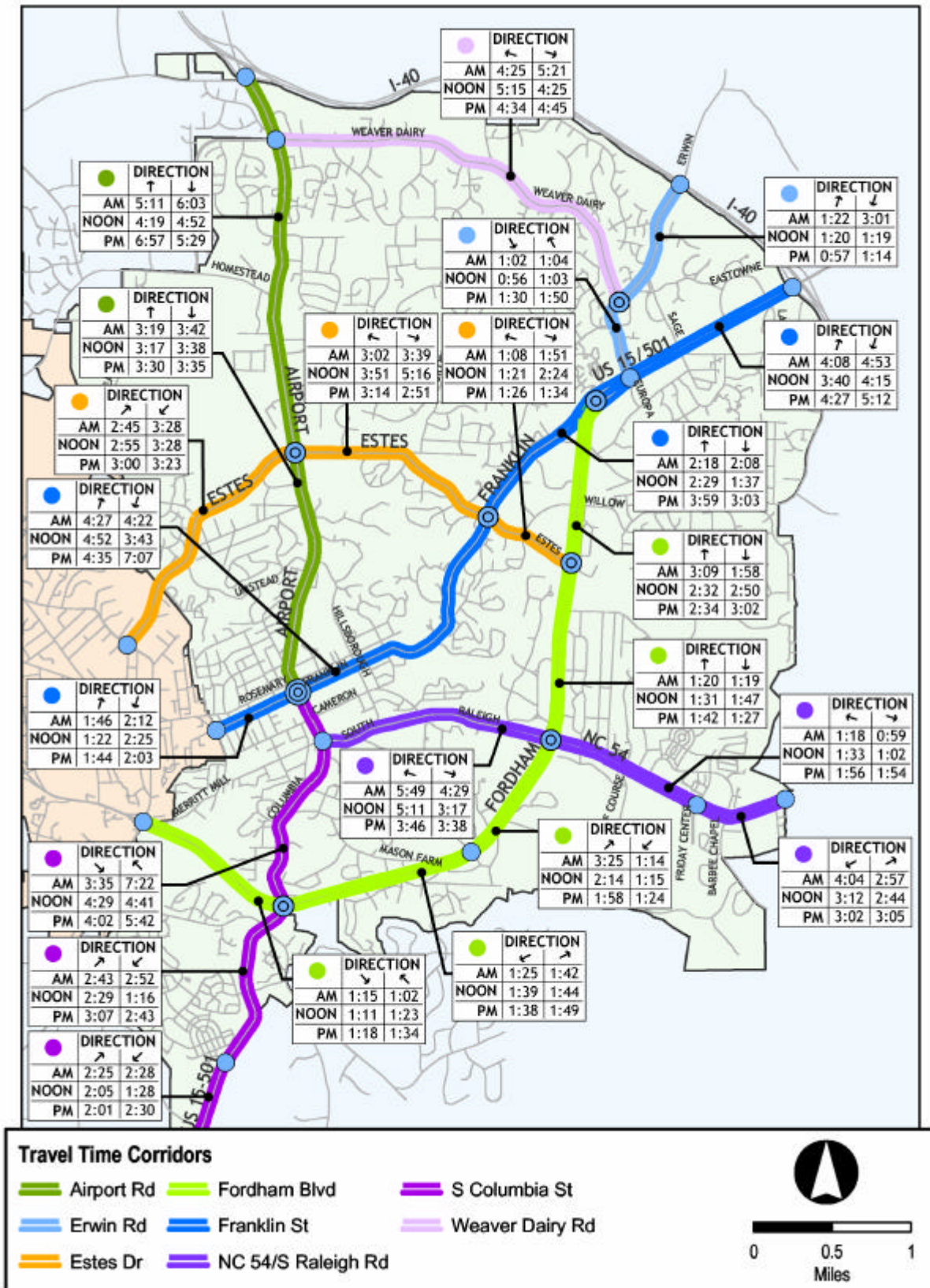
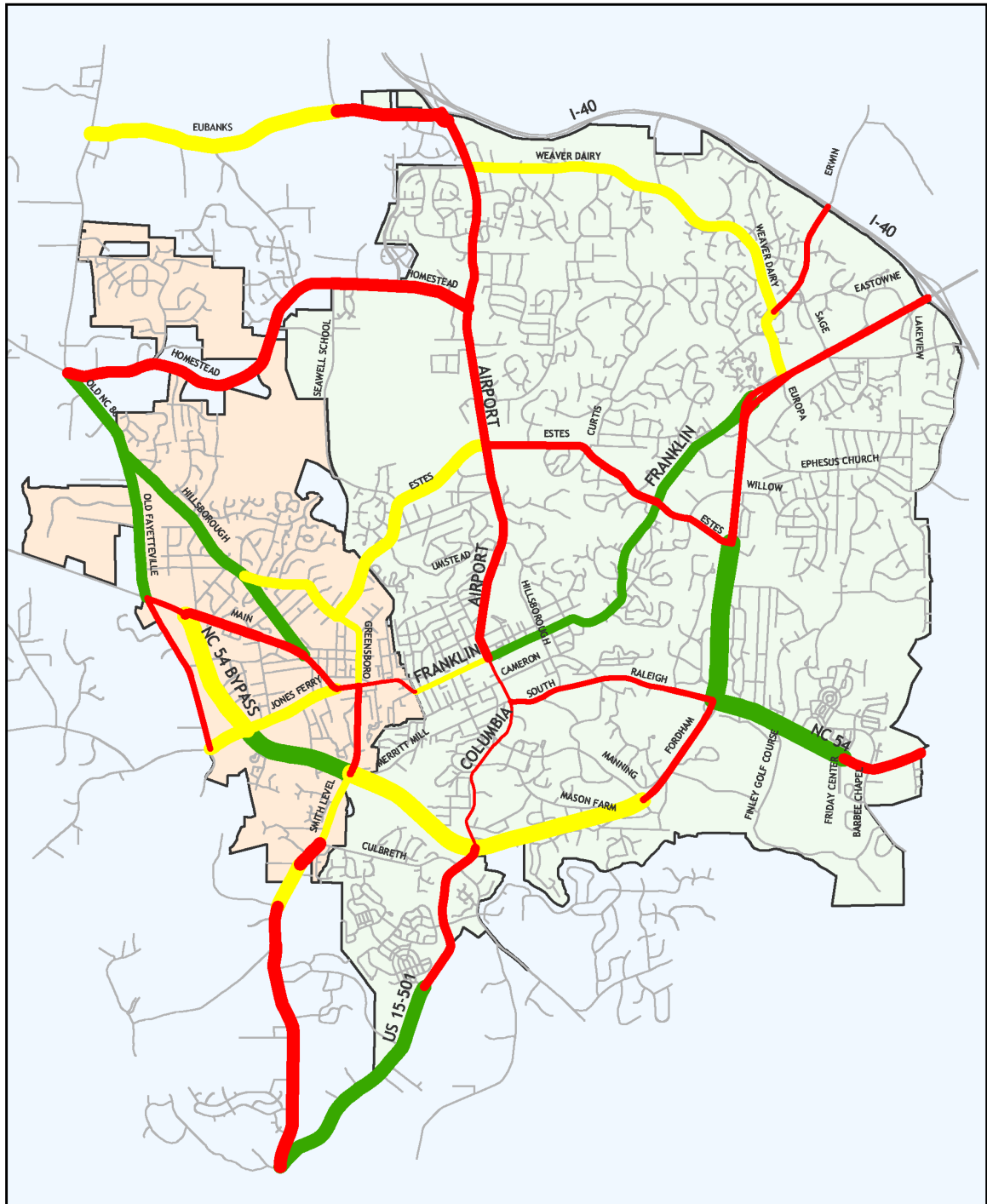

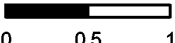


Figure 10 – Average AM Inbound Speed Compared with Speed Limit

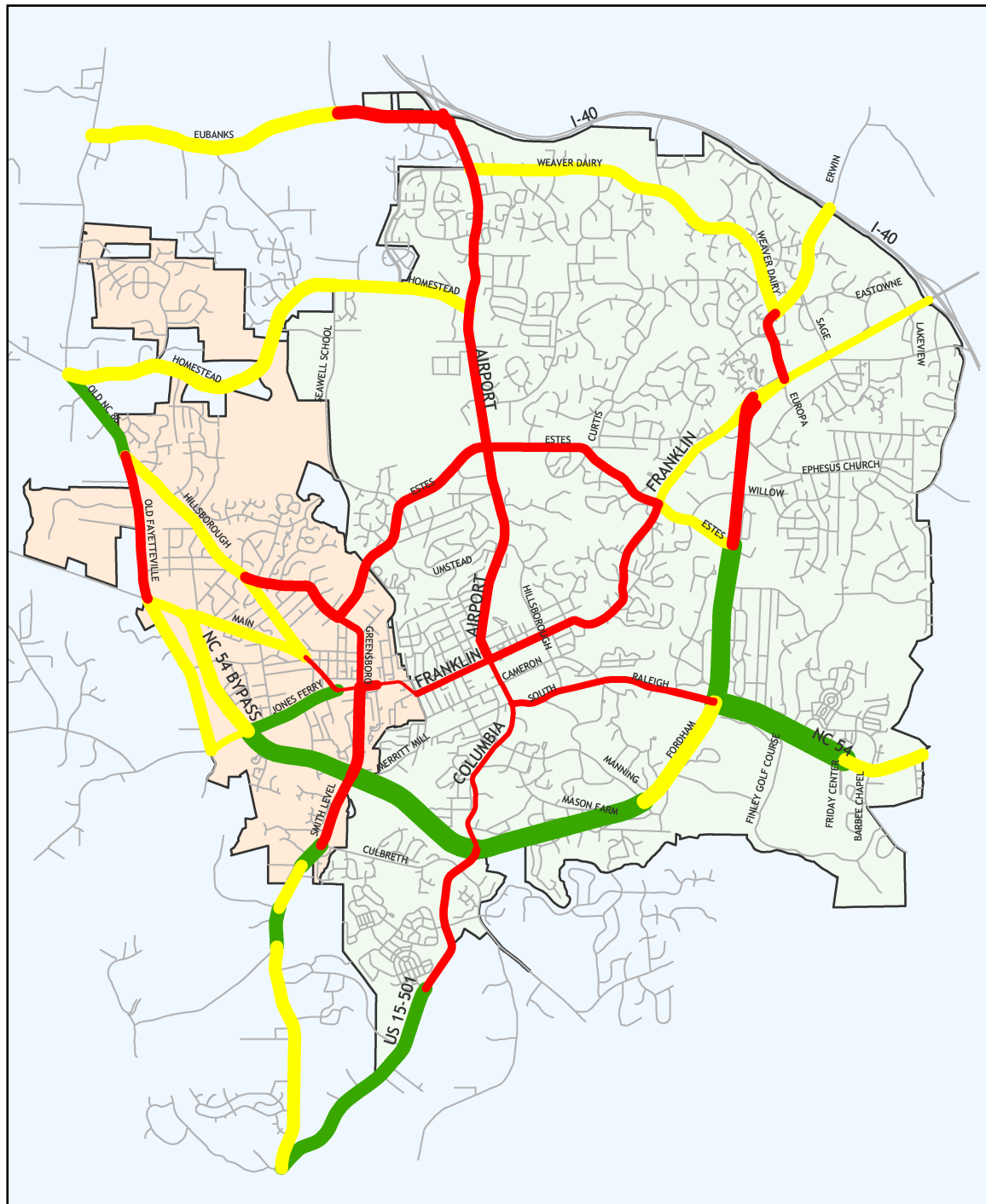


Average Travel Speed	Comparison with Speed Limit
15 mph	Faster than 5 mph over speed limit
30 mph	Within 5 mph of speed limit
45 mph	Slower than 5 mph below speed limit


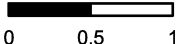

  


0 0.5 1  
Miles

**Figure 11 – Average AM Outbound Speed Compared with Speed Limit**



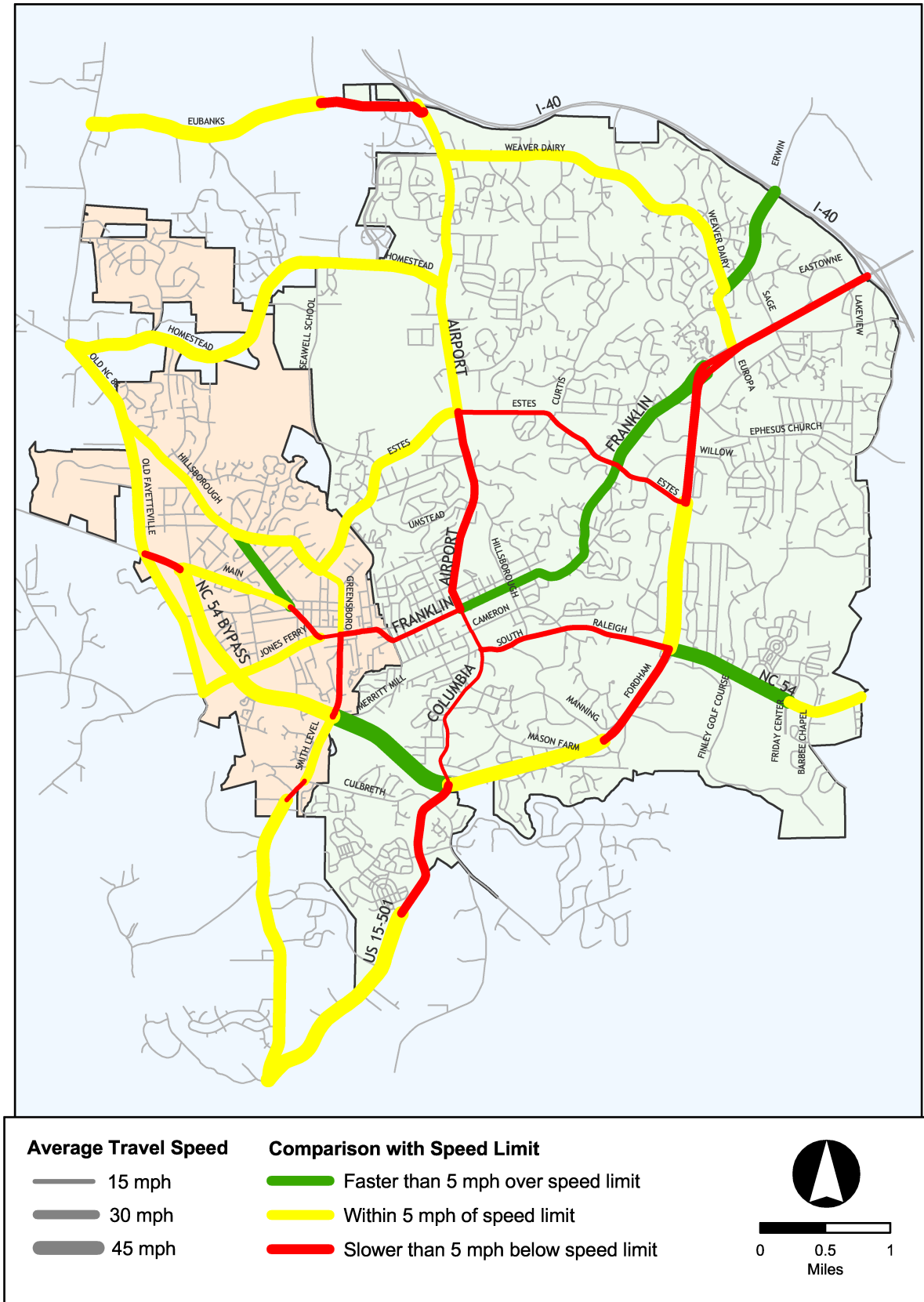
Average Travel Speed	Comparison with Speed Limit
15 mph	Faster than 5 mph over speed limit
30 mph	Within 5 mph of speed limit
45 mph	Slower than 5 mph below speed limit

0 0.5 1  
Miles



Figure 12 – Average Mid-Day Inbound Speed Compared with Speed Limit



**Figure 13 – Average Mid-Day Outbound Speed Compared with Speed Limit**

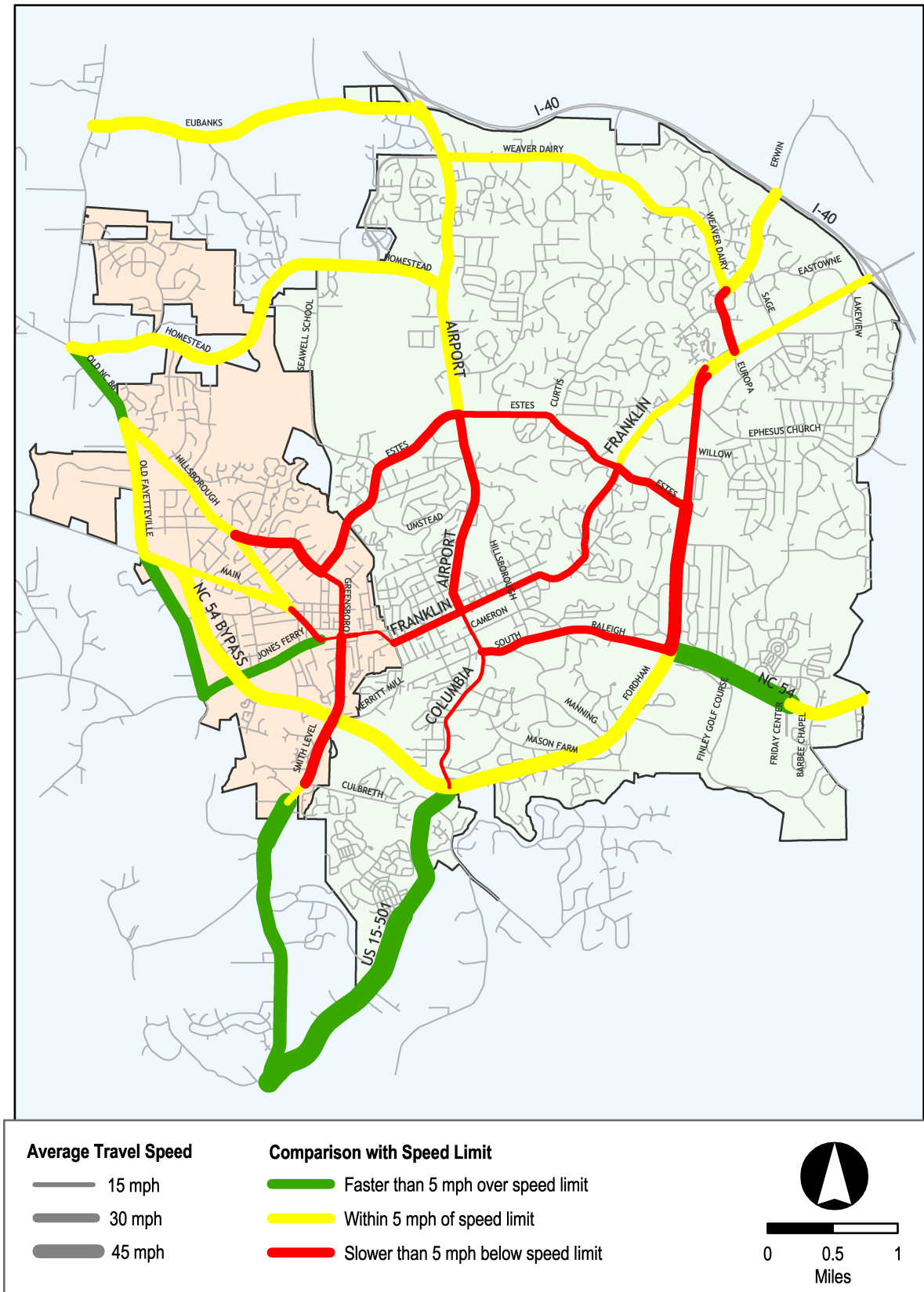
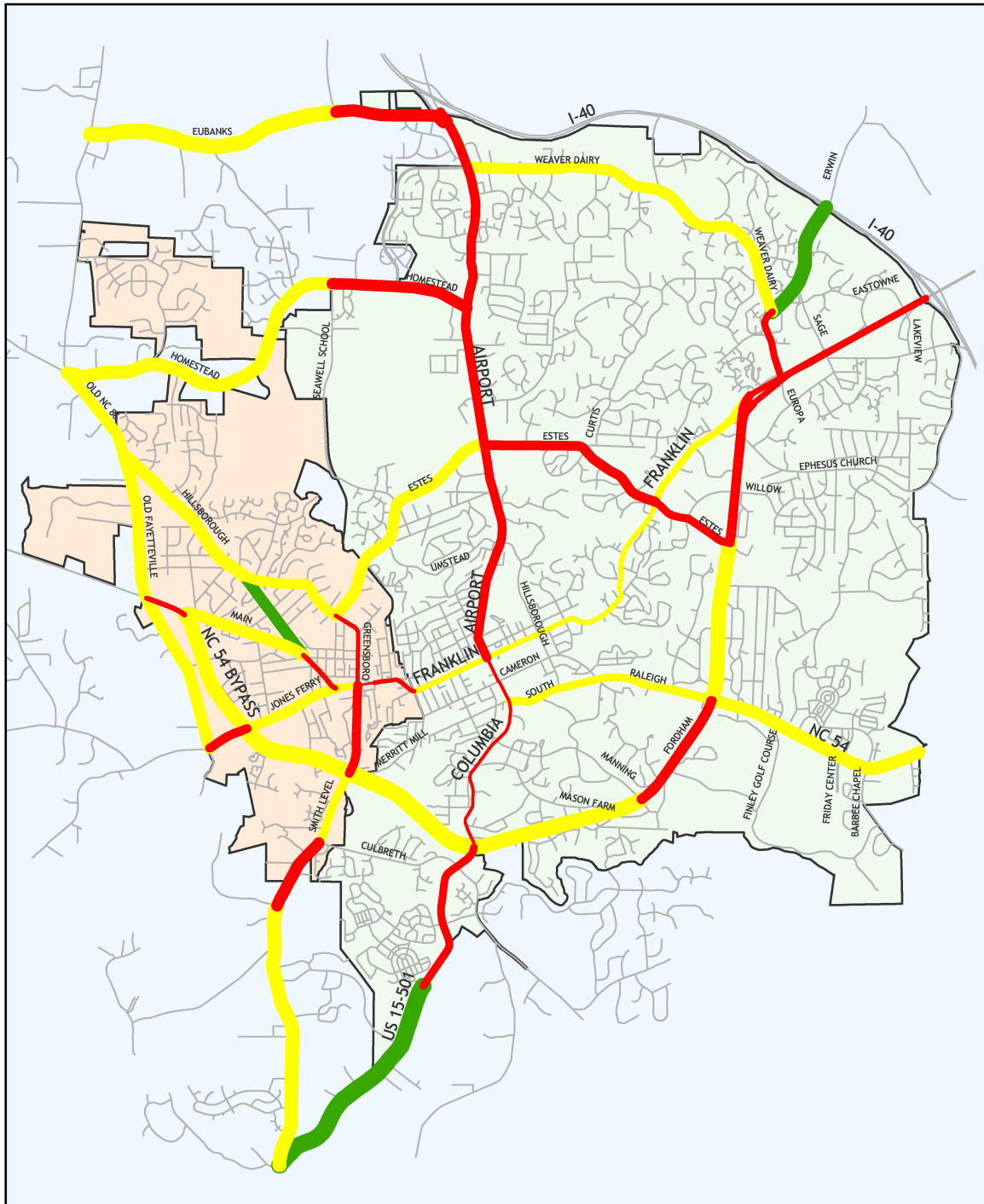


Figure 14 – Average PM Inbound Speed Compared with Speed Limit



Average Travel Speed	Comparison with Speed Limit
15 mph	Faster than 5 mph over speed limit
30 mph	Within 5 mph of speed limit
45 mph	Slower than 5 mph below speed limit


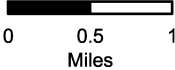
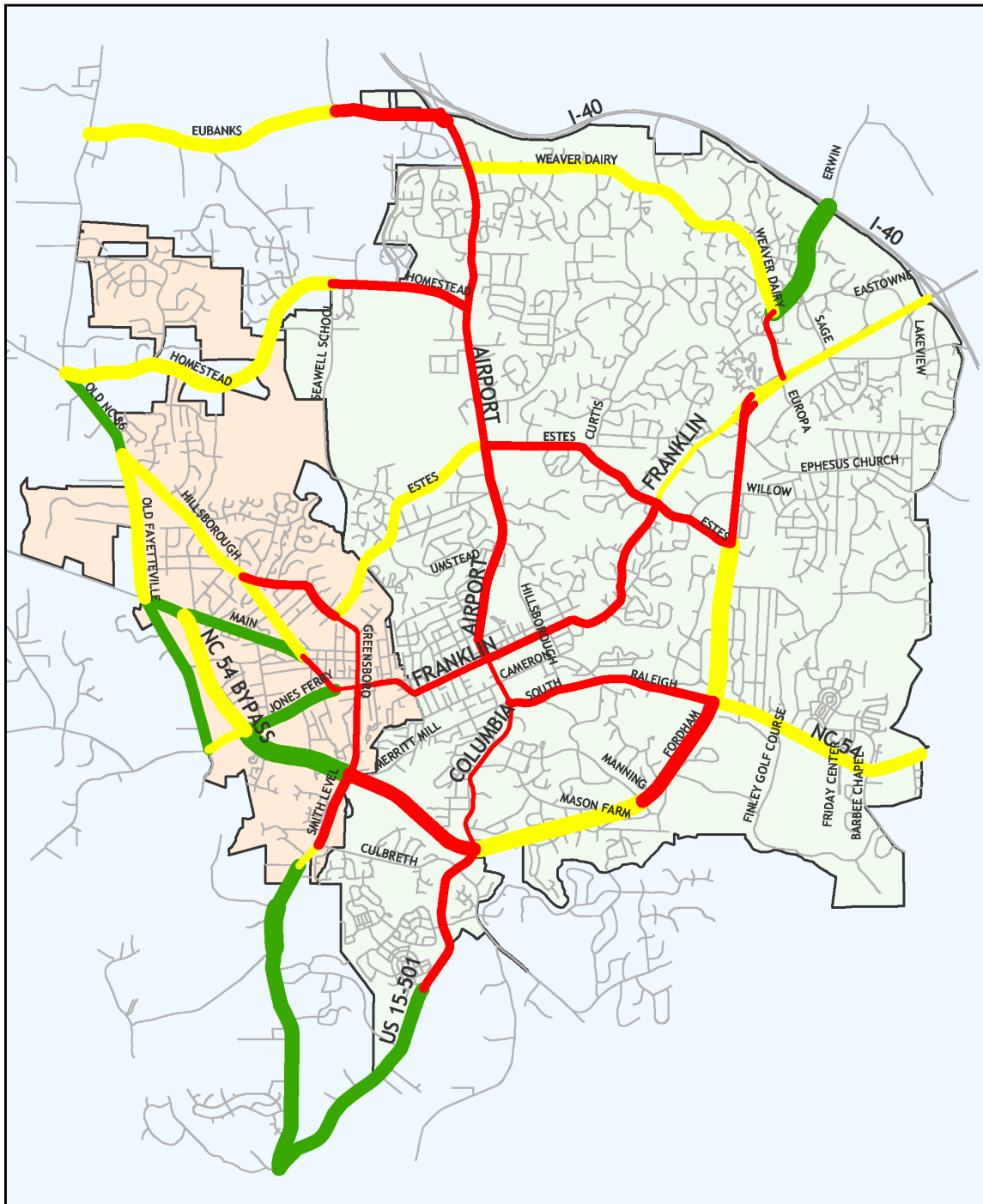

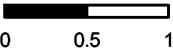
  


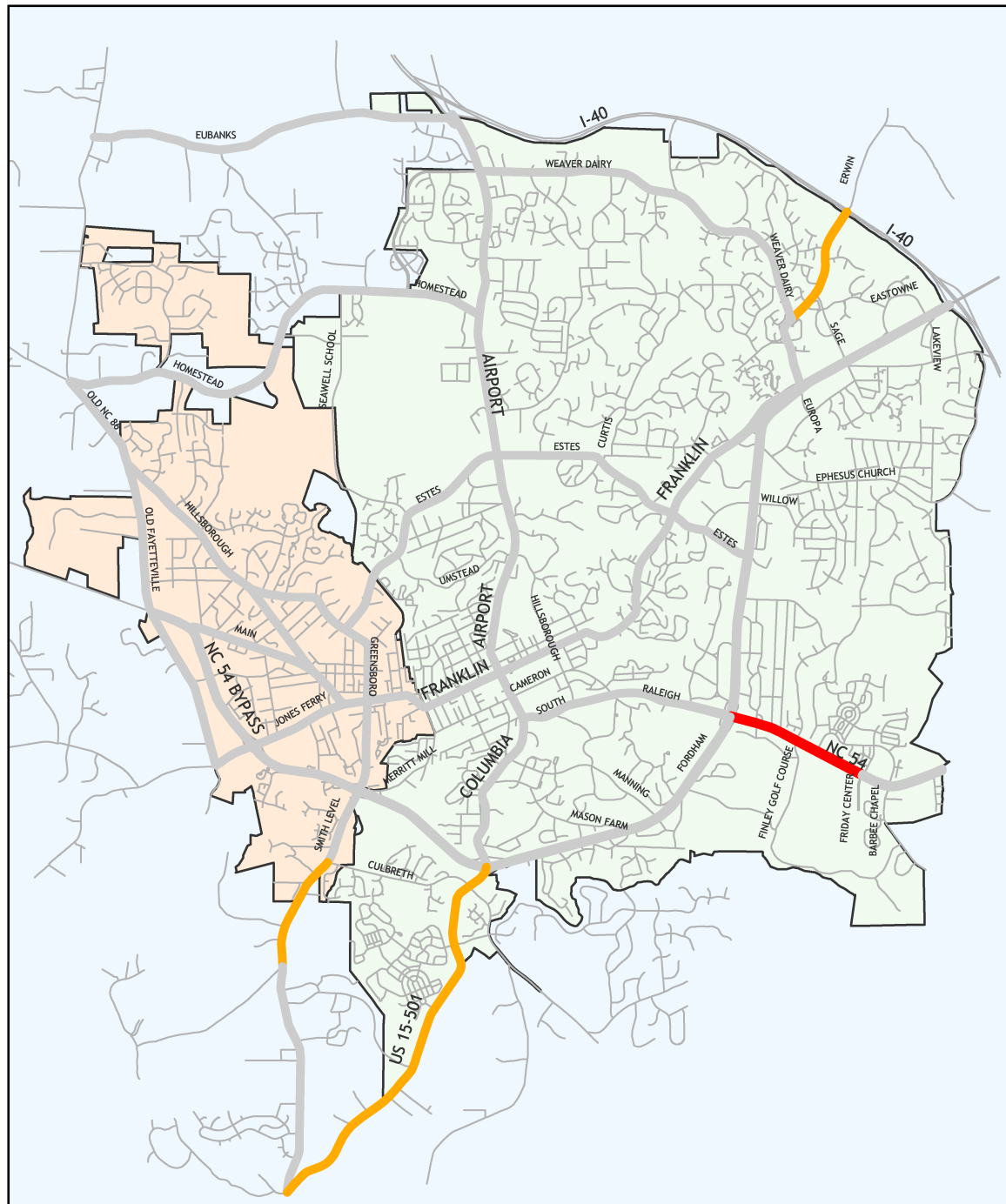
Figure 15 – Average PM Outbound Speed Compared with Speed Limit



Average Travel Speed	Comparison with Speed Limit
15 mph	Faster than 5 mph over speed limit
30 mph	Within 5 mph of speed limit
45 mph	Slower than 5 mph below speed limit

  
  
 0 0.5 1  
 Miles

**Figure 16 – Average Travel Speed in Excess of 15 mph over Speed Limit**



**Legend**

**Average Travel Speed Greater than 15mph over Speed Limit**

- For 1 Time Period/Direction
- For 2 Time Periods/Directions

0 0.5 1  
Miles



## Findings and Conclusions

The morning peak average speed of the 27 Carrboro roadway segments was 28 mph in the inbound direction and 32 mph in the outbound direction. Average speed along the corridors ranged from 10 mph to 50 mph in the inbound direction and from 10 mph to 51 mph in the outbound direction.

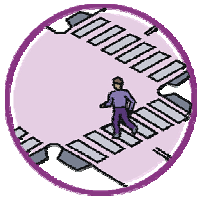
The mid-day peak inbound and outbound average speeds were both 31 mph. Average speeds ranged from 12 mph to 47 mph inbound, and from 8mph to 62 mph outbound.

The afternoon peak had an average speed of 30 mph in both the inbound and outbound directions. Average speeds ranged from 6 mph to 48 mph inbound and from 10 mph to 56 mph outbound.

Looking at the sum of travel time in both directions for all segments shows very close numbers for both morning and afternoon. The total travel time of all segments in the morning is 1 hour and 14 minutes and in the afternoon the total is 1 hour and 13 minutes. The mid-day period is also very similar, with a total time of 1 hour and 10 minutes.

For the most part, the Town of Carrboro experiences average travel time within 5 mph of the speed limit for most corridors except for the Town center. Main Street and Greensboro Street in the town's core generally experience average travel speed more than 5 mph lower than the speed limit allows. Other than those roads, the two other roads experiencing slower average travel speeds for more than just isolated instances are Old Fayetteville Road and Smith Level Road.

The only roadway within the Town of Carrboro that exhibited average travel speeds well in excess of the posted speed limit in any time period/direction was Smith Level Road, from Ray Road to Rock Haven Road, which had an average travel speed over 15 mph over the posted speed limit in the mid-day outbound direction. US 15/501 South and NC 54 from Fordham Boulevard to Friday Center Drive in Chapel Hill experienced excessive average travel speeds for one or more time periods/directions. The excessive speed along these stretches of road is particularly concerning, not only because of the implications to automobile safety, but the excessively high travel speeds highly discourage bicycle and pedestrian use of the roadways and also have a significant impact on pedestrian and bicycle safety.



## *Indicator:*

### **PEDESTRIAN FACILITIES**

**Measurement:** Miles of Sidewalk

**Data:** GIS-Based Sidewalk Inventory

#### **Why and How**

Sidewalks have a direct effect on both pedestrian and transit mobility. Obviously, sidewalks make it easy for pedestrians to get around, but since almost every transit trip begins and ends with a walk trip, pedestrian facilities are very important for transit mobility.

The inventory of pedestrian facilities is maintained by Town staff and updated as conditions change with new sidewalk construction or other pedestrian facility improvements. This information was collected, summarized, and mapped to understand the extent and distribution of facilities for pedestrians within the Town limits of Carrboro.

#### **Results**

Locations of sidewalks within Carrboro are presented in Figure 17. Figure 18 shows pedestrian facilities along transit corridors. This map also includes a ¼ mile buffer around existing transit stops to show a typical transit walking area.

#### **Findings and Conclusions**

Approximately 28 miles of sidewalk exist in the Town. Sidewalk coverage throughout the Town is best in the downtown and rather sparse in the outlying areas. For the most part, major streets in the Town's center have sidewalks. Sidewalks are present along Greensboro Street, Hillsborough Road, Jones Ferry Road, Main Street, and Weaver Street in the downtown area. There are also sidewalks along most streets within more recently constructed areas.

Pedestrian facilities and transit service go hand in hand. An extensive sidewalk network, especially within close proximity to transit stops, makes access to transit much easier for people. As presented in Figure 18, much of the Town's residential area that is within a typical ¼-mile transit walking area is not served by sidewalks. However, most of the sidewalks that do exist are within ¼ mile of a transit stop. Approximately 23 miles, or 82%, of sidewalks in Carrboro are within ¼ mile of a transit stop.

Figure 17 – Pedestrian Facilities

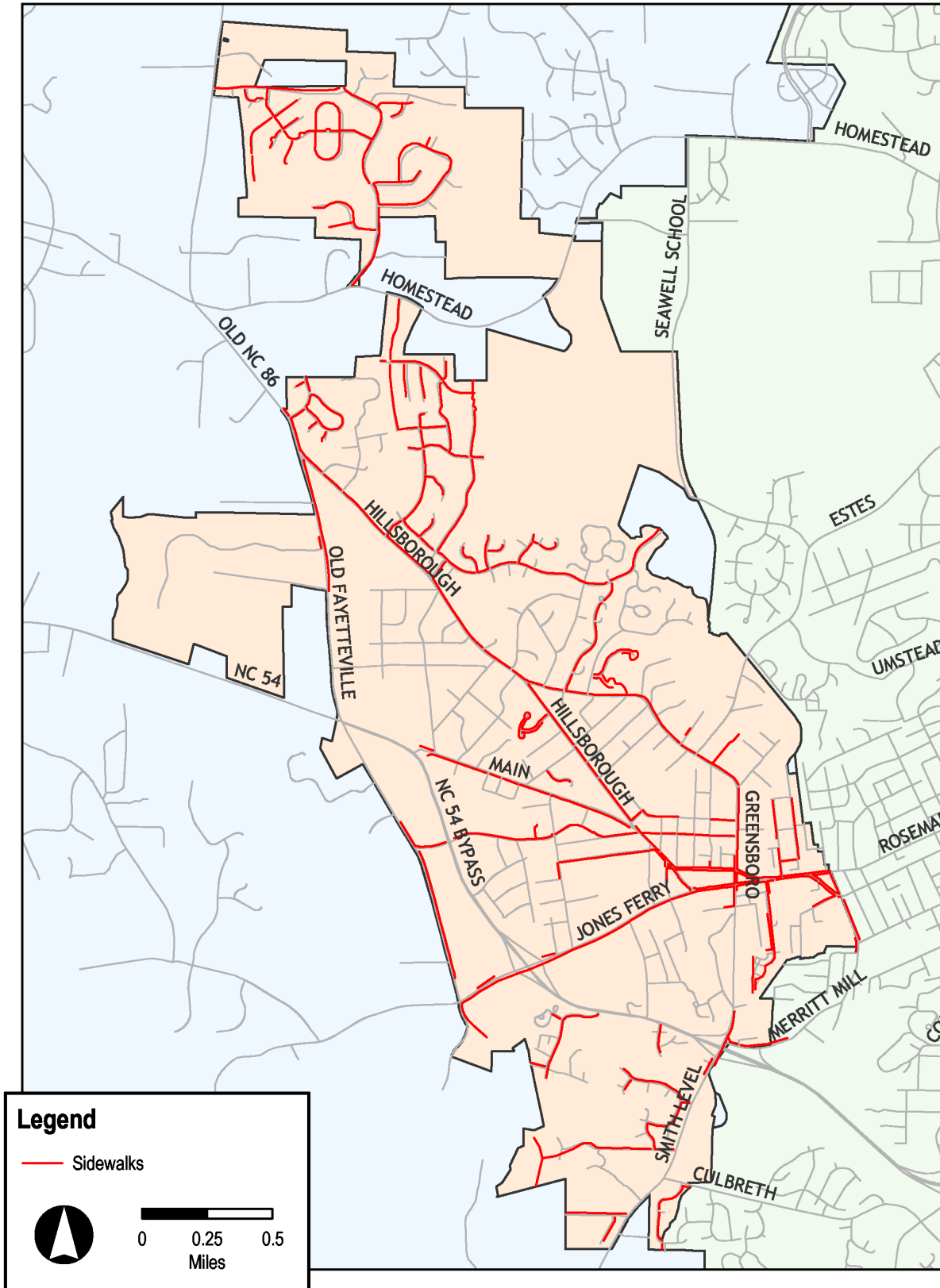
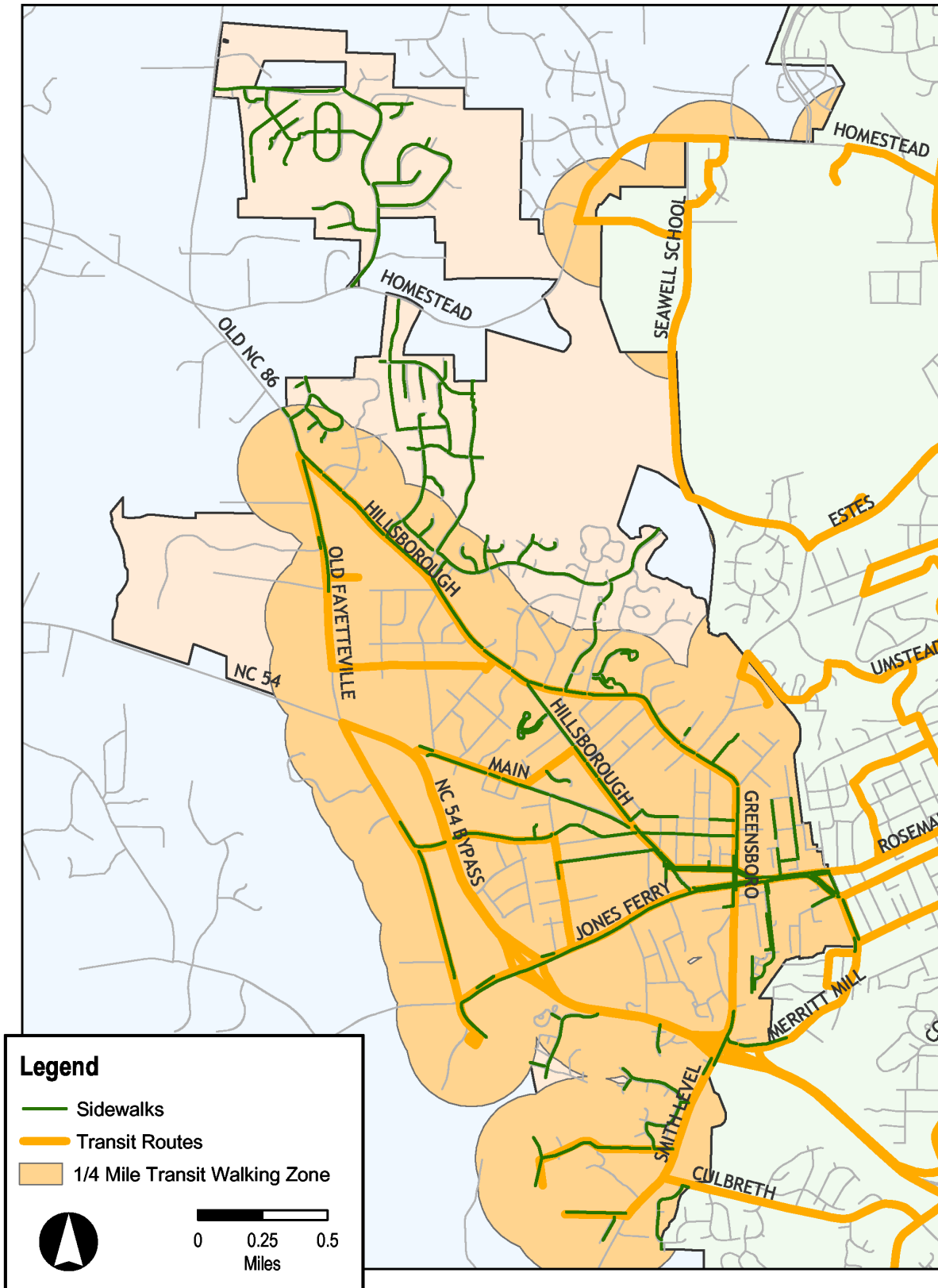




Figure 18 – Pedestrian Facilities Within ¼ Mile of Transit Service





## *Indicator:*

### **PEDESTRIAN ACTIVITY**

**Measurement: Pedestrian Counts**

**Data: 12-Hour Directional Counts**

#### **Why and How**

In order to assess the condition of its pedestrian system, the Town of Carrboro needs to know what level of pedestrian activity is being experienced. It is also important to know where that pedestrian activity is in order to better understand the reasons why there may or may not be pedestrian activity.

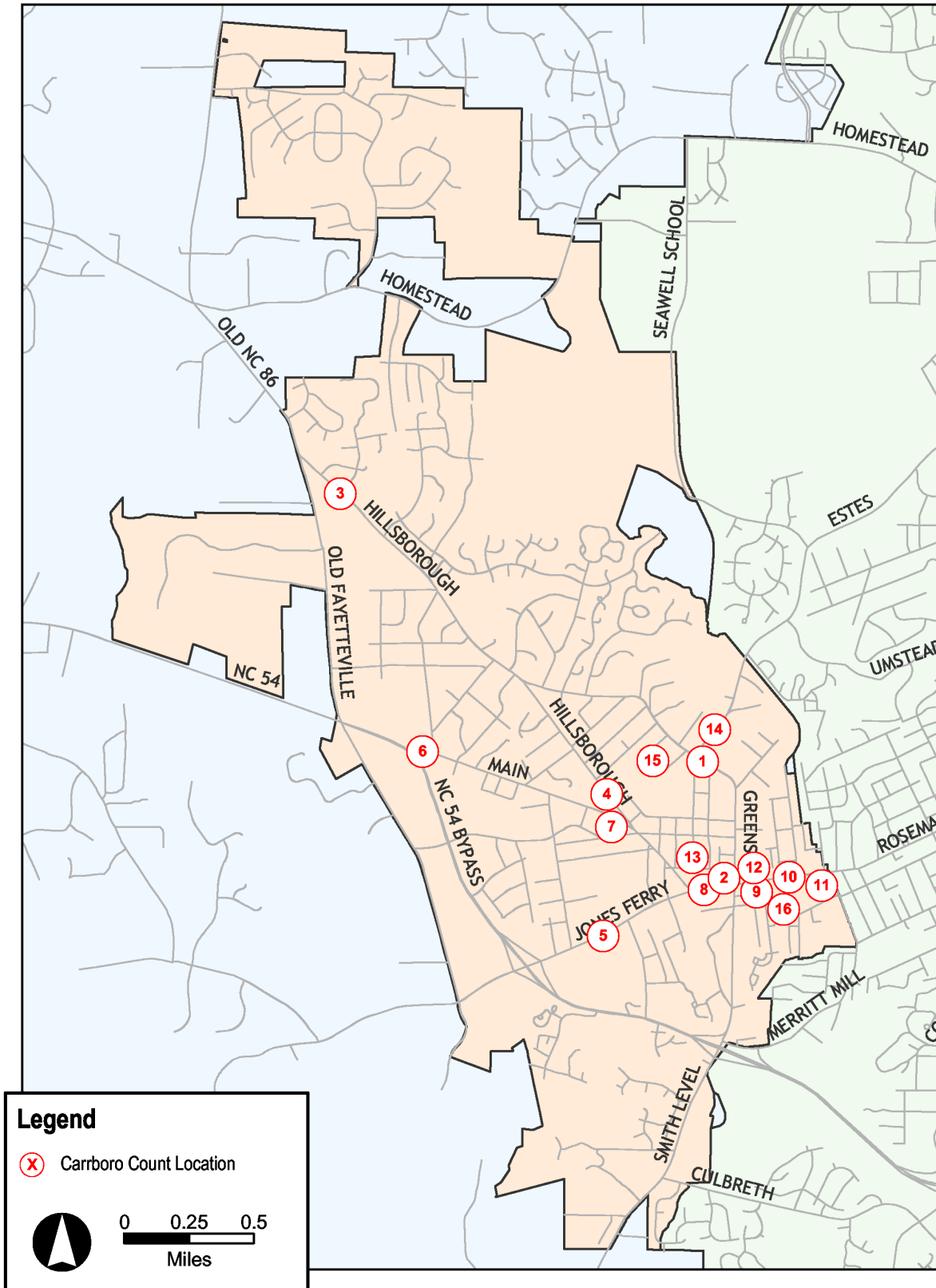
In general, there are three ingredients necessary to promote pedestrian activity: land use, presence of facilities, and design of facilities. A mix of land use types and activities in close proximity to one another encourages walking. For people to walk, there needs to be sidewalk facilities and the design of those facilities can have a great impact on the desirability of walking and allow for the integration of the facilities into developments and other transportation modes.

Pedestrian activity is measured by the number of pedestrians observed at various locations throughout the Town. Wheelchair users, skateboarders, and rollerbladers are all counted as pedestrians. Counts were collected at 16 locations throughout the Town. These locations are presented in Figure 19. The counts were collected manually over a 12-hour period from 7:00 AM to 7:00 PM to understand the relative activity throughout the day.

#### **Results**

The 12-hour pedestrian counts for the 16 counts ranged from a low of 24 (Estes Drive between Greensboro Street and Hillcrest Drive) to a high of 1,936 (Greensboro Street between Main Street and Weaver Street). These counts are presented graphically in Figure 20. The size of the circle is proportional to the 12-hour count volume. The pedestrian counts are also presented in Table E and in chart form in Figure 21.

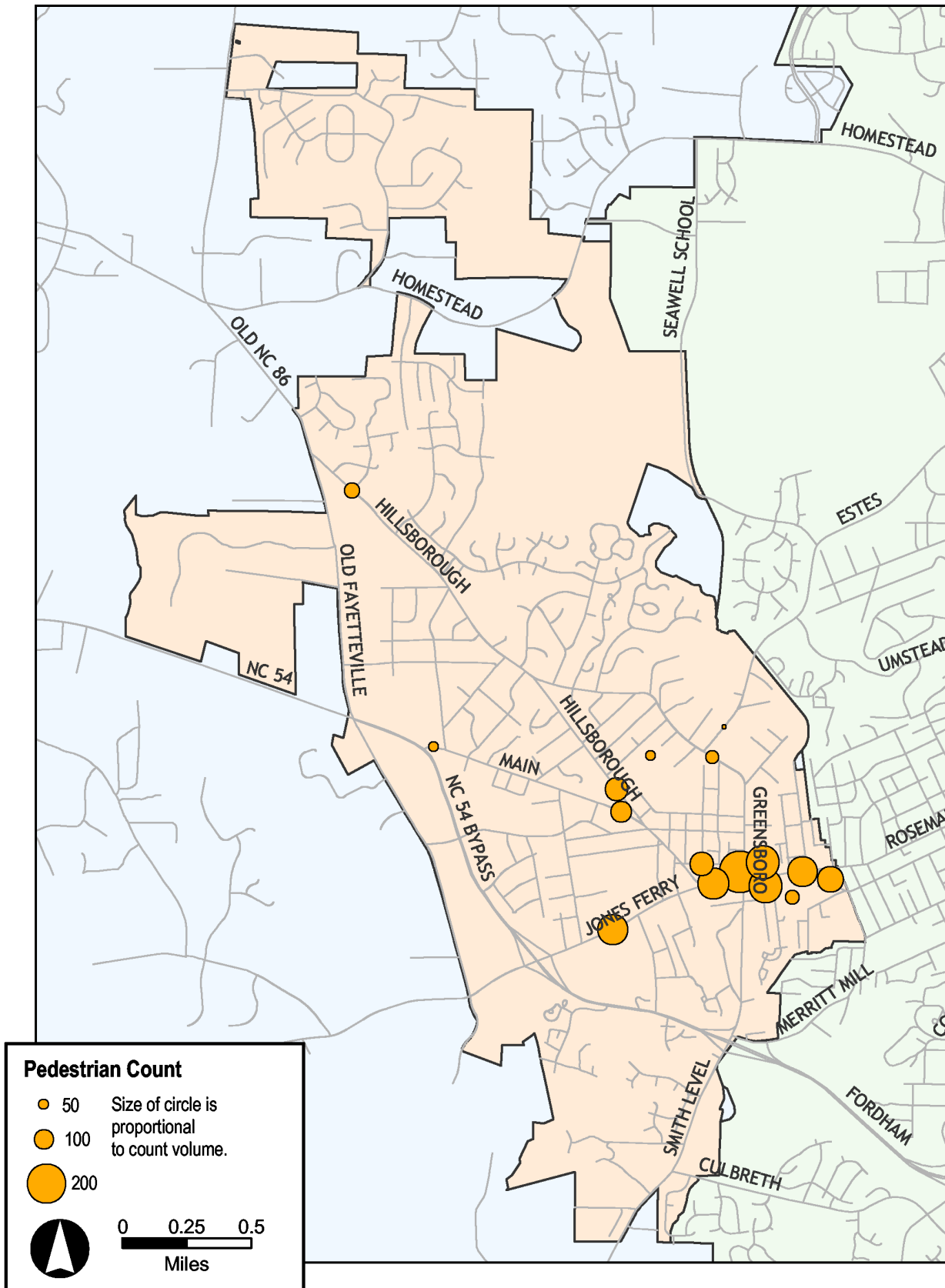
Figure 19 – Pedestrian Count Locations



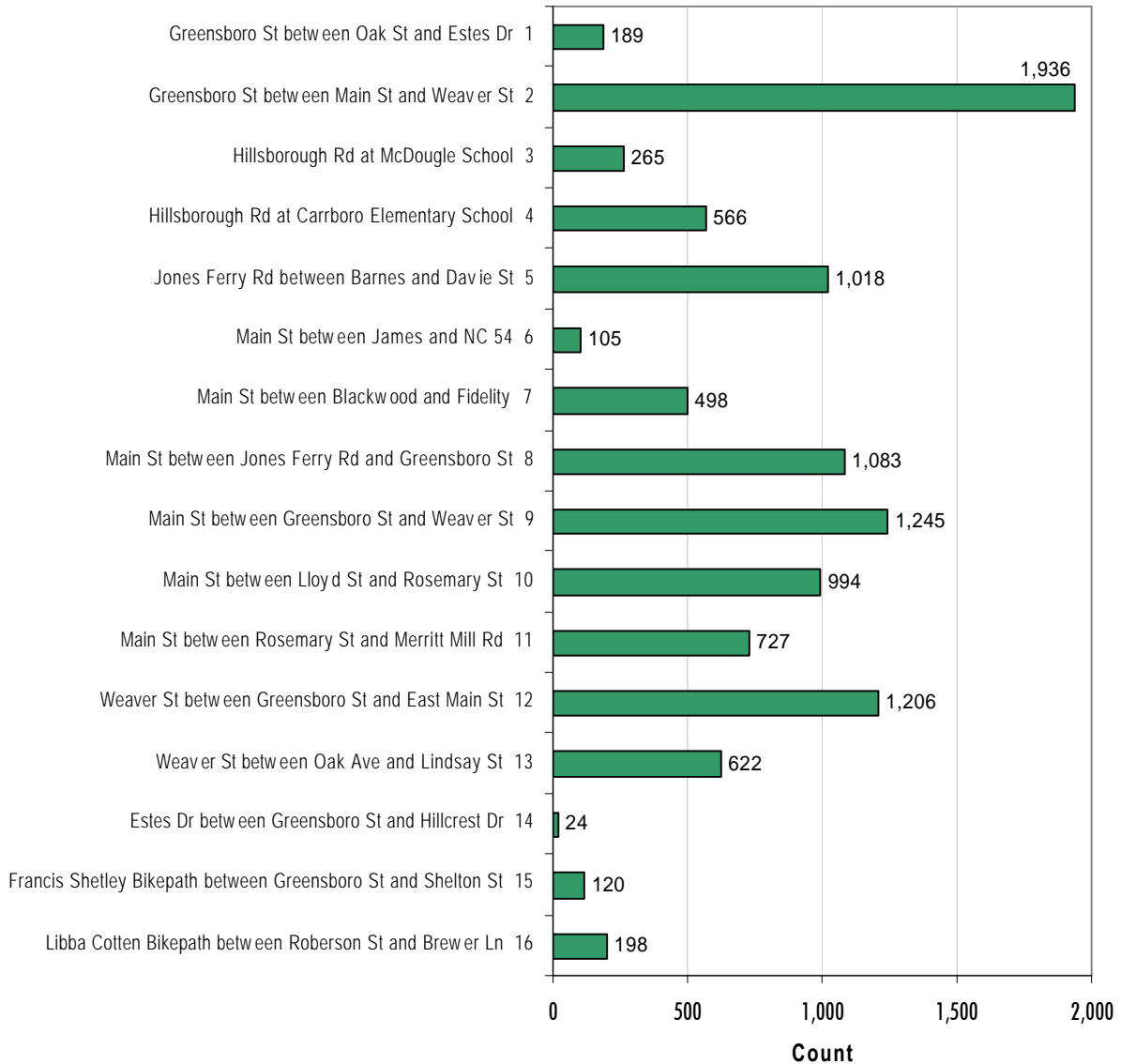
**Table E – 12-Hour Pedestrian Counts**

	<b>Location</b>	<b>Pedestrian 12-Hour Count</b>
1	Greensboro St between Oak St and Estes Dr	189
2	Greensboro St between Main St and Weaver St	1,936
3	Hillsborough Rd at McDougle School	265
4	Hillsborough Rd at Carrboro Elementary School	566
5	Jones Ferry Rd between Barnes and Davie St	1,018
6	Main St between James and NC 54	105
7	Main St between Blackwood and Fidelity	498
8	Main St between Jones Ferry Rd and Greensboro St	1,083
9	Main St between Greensboro St and Weaver St	1,245
10	Main St between Lloyd St and Rosemary St	994
11	Main St between Rosemary St and Merritt Mill Rd	727
12	Weaver St between Greensboro St and East Main St	1,206
13	Weaver St between Oak Ave and Lindsay St	622
14	Estes Dr between Greensboro St and Hillcrest Dr	24
15	Francis Shetley Bikepath between Greensboro St and Shelton St	120
16	Libba Cotten Bikepath between Roberson St and Brewer Ln	198

Figure 20 – 12-Hour Pedestrian Counts



**Figure 21 – 12-Hour Pedestrian Activity**



The range of 12-hour pedestrian counts along key travel corridors include:

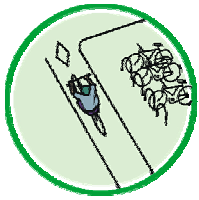
- Main Street – 105 to 1,245
- Greensboro Street – 189 to 1,936
- Hillsborough Road – 265 to 566
- Weaver Street – 622 to 1,206

Highest daily volume locations were along Main Street and Greensboro Street. Five locations in the town of Carrboro, four of which are in the downtown core, had 12-hour pedestrian volumes over 1,000. These locations included Greensboro Street between Main Street and Weaver Street (1,936), Main Street between Weaver Street and Greensboro Street (1,245), Weaver Street between Greensboro Street and Main Street (1,206), Main Street between Jones Ferry Road and Greensboro Street (1,083), and Jones Ferry Road between Barnes Street and Davie Street (1,018).

The peak hour for all Town counts occurred between 2:00 pm and 3:00 pm. Over 11% of all counts (1,228 out of 10,796) occurred during this time period, with the following hours quite high, as well. The hours between 4:00 pm and 6:00 pm were the second and third highest hours (1,140 and 1,191, respectively) for pedestrian activity in the Town. The early morning peak was relatively low, with only 761 pedestrians counted at all locations between 7:00 am and 8:00 am. The highest count taking place before noon was actually the 11:00 am to noon hour, with 822 pedestrians. Except for the 1:00 pm to 2:00 pm time period, every hour between noon and 6:00 pm saw at least 1,000 pedestrians counted across the Town.

## **Findings and Conclusions**

As would be expected, the downtown core experiences the highest pedestrian volumes in the Town. Pedestrian activity outside the downtown is generally low. The expected pattern is for pedestrian activity in cities is to peak in the morning before work, in the middle of the day around lunch time and in the afternoon after work. However, in the Town of Carrboro, pedestrian activity generally rises throughout the morning, and is fairly constant throughout the afternoon.



## Indicator:

### BICYCLE FACILITIES

Measurement: Miles of Bicycle Routes, Paths, and Lanes

Data: GIS-Based Bicycle Facility Inventory

#### Why and How

In a community with a major university nearby and a favorable climate, such as Carrboro, there is a major opportunity to promote bicycle mobility if a comprehensive system of bicycle trails, lanes, and routes exists.

The objective of this inventory is to determine the extent of the bicycle network in Carrboro. The inventory of bicycle facilities is maintained by Town staff and is updated as conditions change with new development or bicycle lane and path improvements. This information was collected, summarized, and mapped to understand the extent and distribution of facilities for bicyclists in the Town limits of Carrboro.

Also of importance to bicycle facilities is the speed and traffic volume of the adjacent roadway for on-street bicycle facilities. Generally, a road with slower traffic and lower traffic volumes will be a more attractive route for bicyclists than other roadways.

#### Results

The existing bicycle facilities available to the Town of Carrboro are presented in Figure 22. Table F shows the length of each type of bicycle facility in the Town of Carrboro. The table shows centerline distance for bicycle paths and one-way distance for bicycle lanes and wide outside lanes. Thus, one mile of bicycle lane on each side of a section of road would show up as two miles of bicycle lanes in the table.

**Table F – Bicycle Facilities Length**

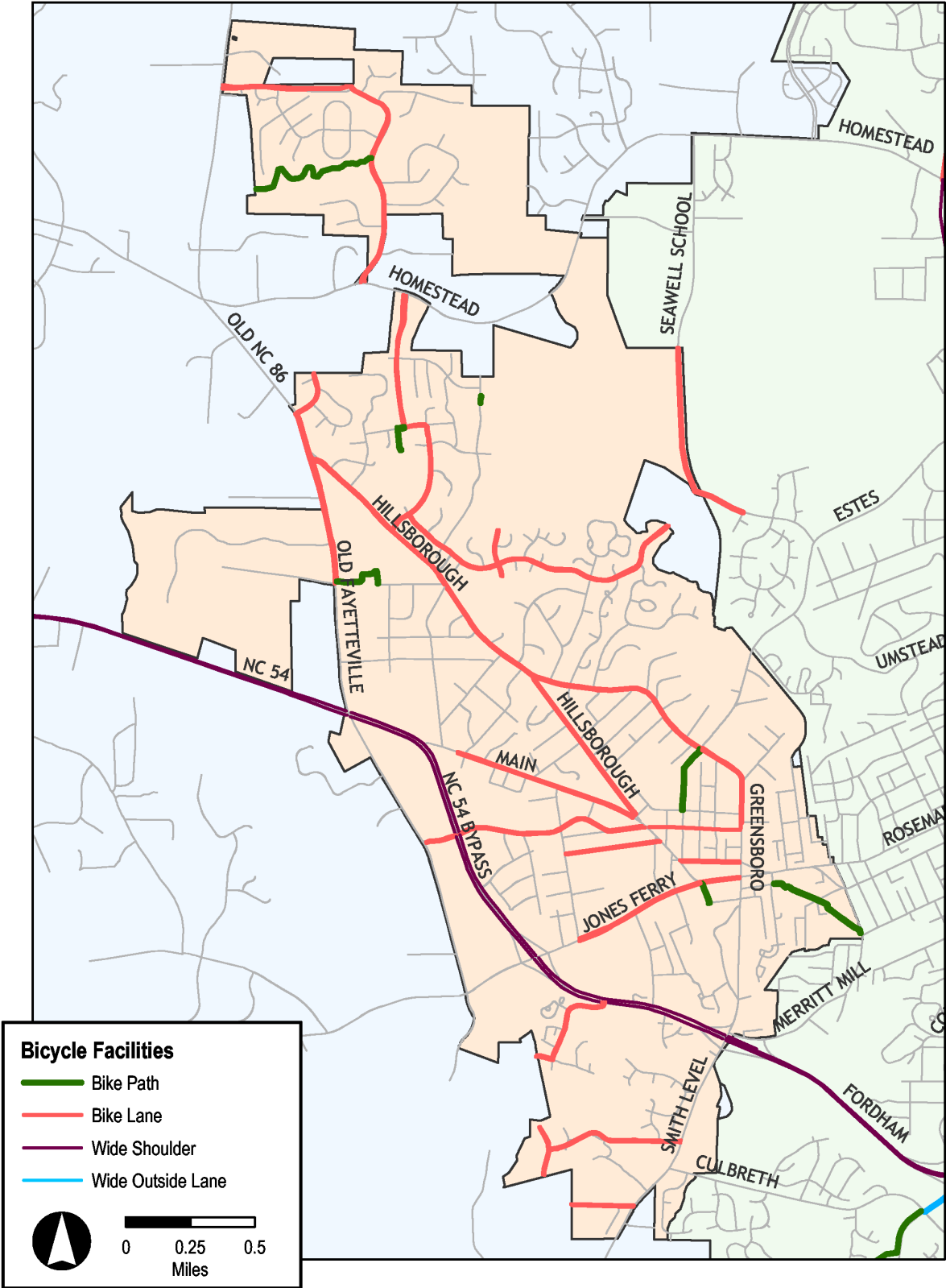
Facility Type	Facility Length (miles)	Percent
Bicycle Path	1.7	5.0%
Bicycle Lane	24.1	71.1%
Wide Shoulder	8.1	23.9%
<b>All Facilities</b>	<b>33.9</b>	

#### Findings and Conclusions

Overall, there are approximately 34 miles of various types of bicycle facilities in the Town of Carrboro ranging from wide shoulders/outside lanes to bicycle lanes to bicycle paths. Most of the facilities in the Town are the “high level” facilities of bicycle lanes (71%) and bicycle paths (5%).



Figure 22 – Bicycle Facilities





## *Indicator:*

### **BICYCLE ACTIVITY**

**Measurement: Bicycle Counts**

**Data: 12-Hour Directional Counts**

#### **Why and How**

Bicycle activity is measured by the number of cyclists observed at various locations throughout the Town. Counts were collected at 16 locations and were collected over a 12-hour period from 7:00 AM to 7:00 PM to understand the relative activity throughout the day. These locations are shown in Figure 23.

#### **Results**

The observed counts are presented graphically in Figure 24. The size of the circle is proportional to the 12-hour count volume. The 2003 bicycle counts are also presented in tabular form in Table G and in chart form in Figure 25. As can be seen in these figures and the table, bicycle activity is high around the downtown area.

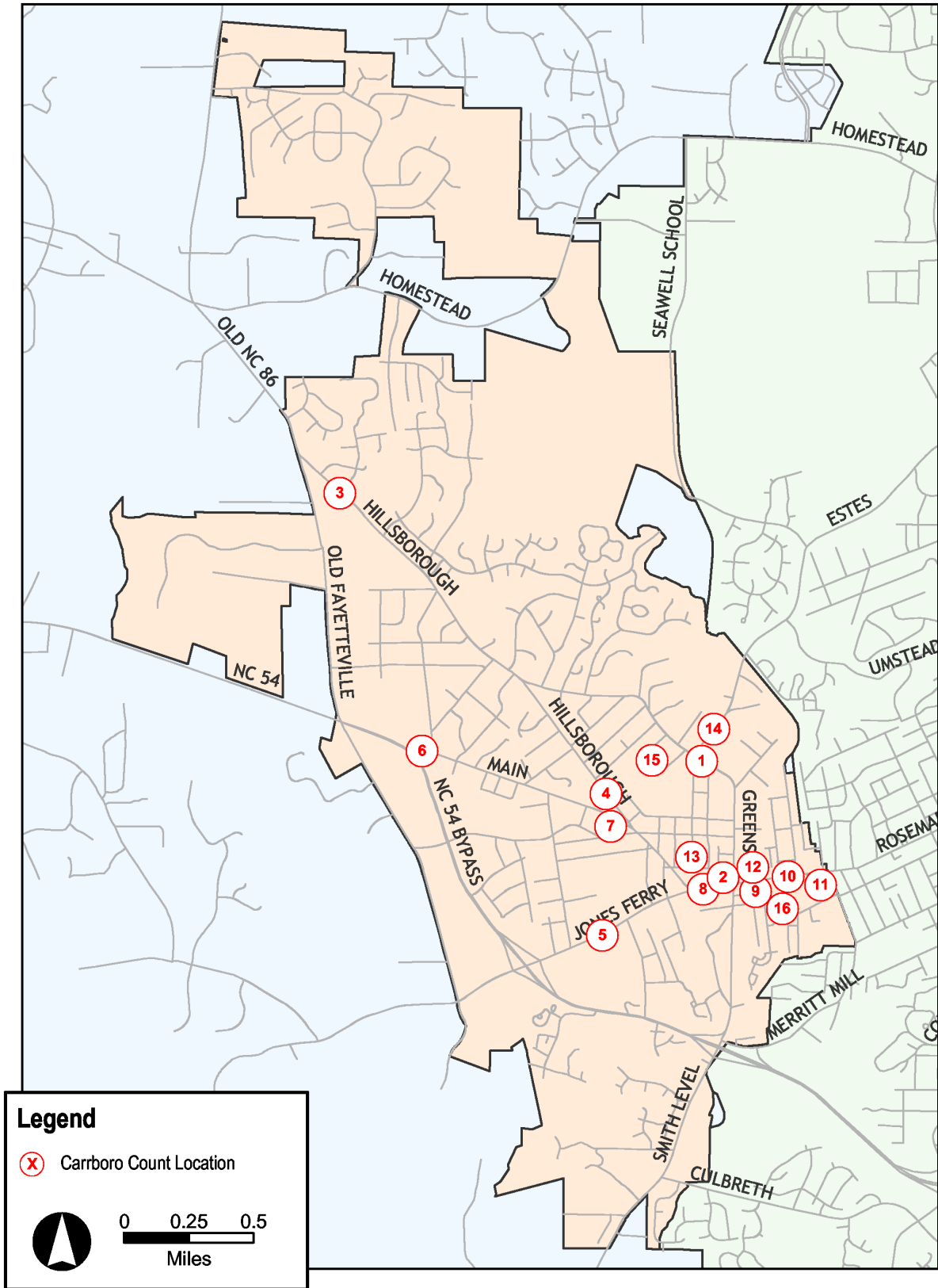
All of the highest bicycle volumes were observed in the downtown area. The highest count was taken on the Libba Cotten Bikepath, with 412. Other downtown locations with high bicycle activity were Main Street between Jones Ferry Road and Greensboro Street (315), Greensboro Street between Main Street and Weaver Street (282), and Main Street between Lloyd Street and Rosemary Street (281). The Francis Shetley Bikepath experienced the lowest bicycle activity, with only 8 bicyclists counted over a 12-hour period.

When looking at counts for the entire town, 12% of the bicycle activity occurred in the afternoon peak hour (4:00 PM to 5:00 PM) and 10% occurred in the morning peak hour (8:00 AM to 9:00 AM). However, the afternoon peak was relatively long in duration, with over 30% of all bicycle activity occurring between 3:00 PM and 6:00 PM.

Daily volume ranges along key bicycle travel corridors include:

- Main Street – 14 to 315
- Greensboro Street – 156 to 282
- Hillsborough Road – 59 to 301
- Weaver Street – 161 to 172

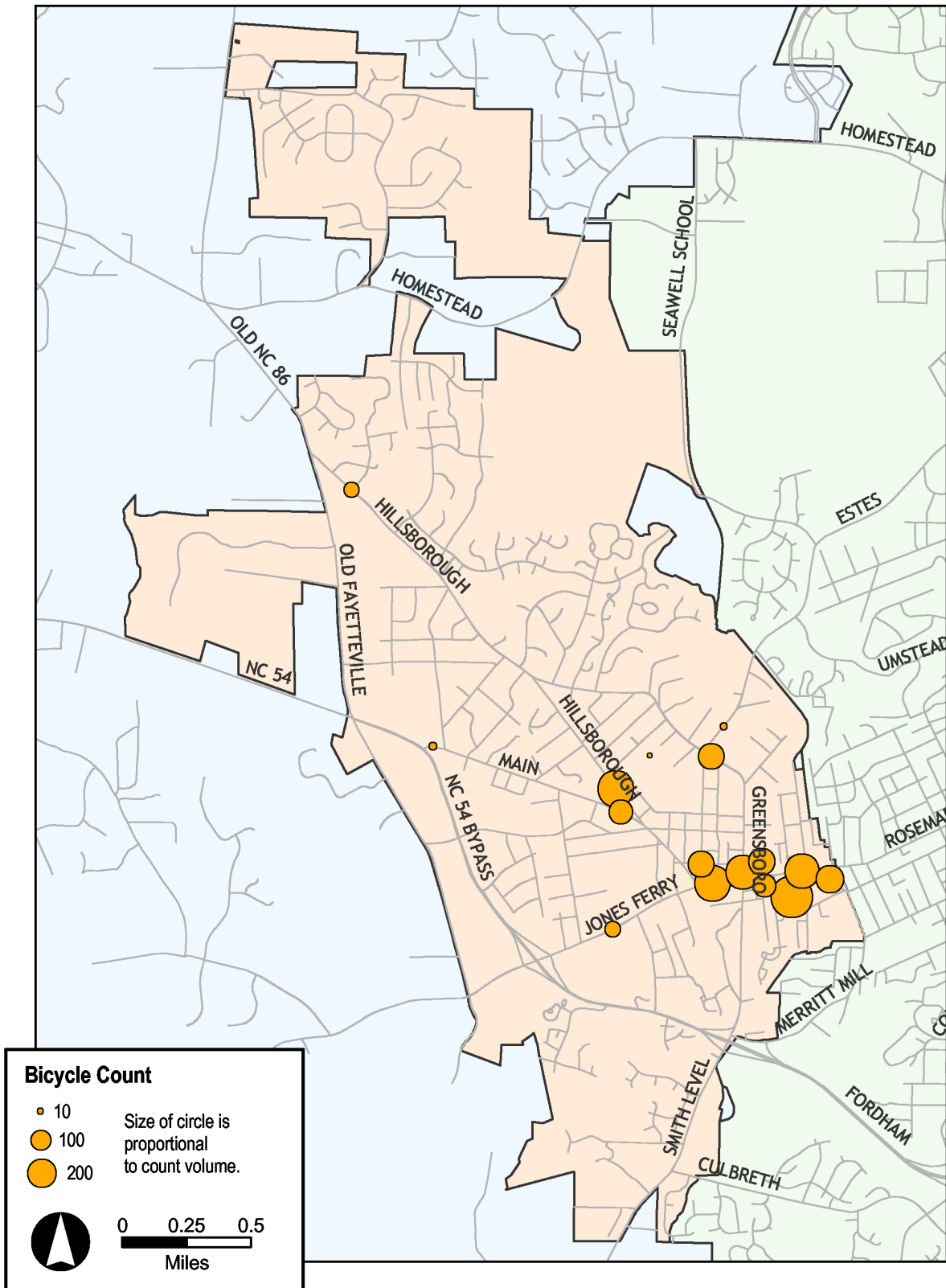
Figure 23 – Bicycle Count Locations



**Table G – 12-Hour Bicycle Counts**

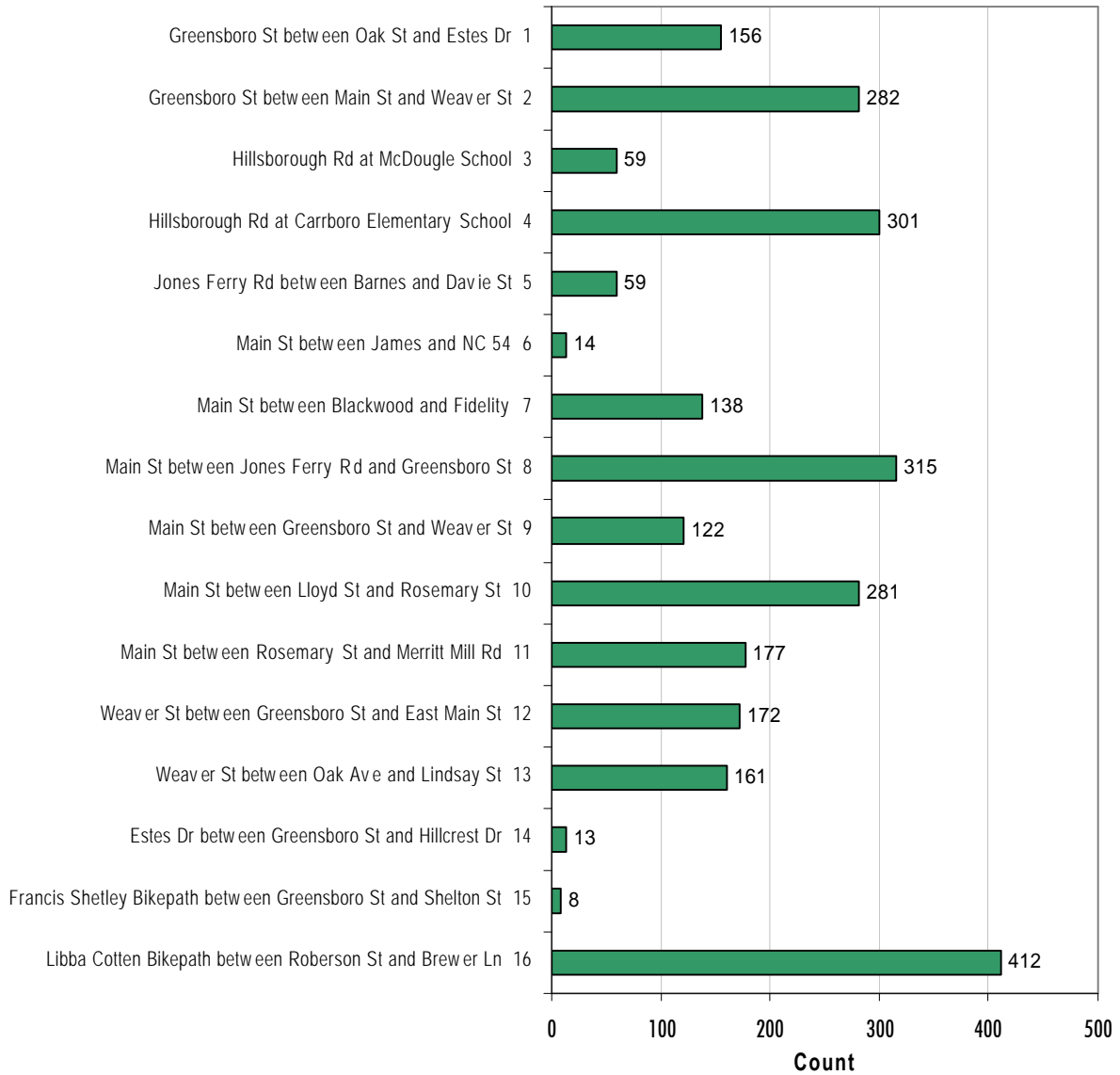
	<b>Location</b>	<b>Bicycle 12-Hour Count</b>
1	Greensboro St between Oak St and Estes Dr	156
2	Greensboro St between Main St and Weaver St	282
3	Hillsborough Rd at McDougle School	59
4	Hillsborough Rd at Carrboro Elementary School	301
5	Jones Ferry Rd between Barnes and Davie St	59
6	Main St between James and NC 54	14
7	Main St between Blackwood and Fidelity	138
8	Main St between Jones Ferry Rd and Greensboro St	315
9	Main St between Greensboro St and Weaver St	122
10	Main St between Lloyd St and Rosemary St	281
11	Main St between Rosemary St and Merritt Mill Rd	177
12	Weaver St between Greensboro St and East Main St	172
13	Weaver St between Oak Ave and Lindsay St	161
14	Estes Dr between Greensboro St and Hillcrest Dr	13
15	Francis Shetley Bikepath between Greensboro St and Shelton St	8
16	Libba Cotten Bikepath between Roberson St and Brewer Ln	412

Figure 24 – Bicycle Volumes





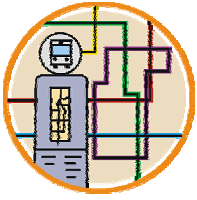
**Figure 25 – 12-Hour Bicycle Activity**



## Findings and Conclusions

The highest bicycle activity in the Town of Carrboro is within the downtown core. Several counts near Carrboro Elementary School were also fairly high, as was Greensboro Street between Oak Street and Estes Drive. The remaining counts were considerably lower, with the lowest count actually occurring on a bicycle path (Francis Shetley Bikepath).

The highest bicycle activity levels occurred in the downtown area, where there are also the most complete bicycle facilities in the town. This is a very good sign as it indicates that the bicycle facilities are being used. Future mobility report cards will be able to better address the issue, but it is likely that bicycle mobility will be enhanced with the addition of even more high level bicycle facilities (bicycle lanes and bicycle paths).



## *Indicator:*

### **TRANSIT SERVICE**

**Measurement: Frequency, Coverage, and Capacity**

**Data: Route Coverage, Headways, Number and Capacity of Buses**

### **Why and How**

Transit service refers to the character and amount of transit service available throughout the Town. Factors that effect this measurement are the geographic extent of the coverage, frequency of the service, and the actual capacities of the buses that are in service. All local transit service provided by Chapel Hill Transit (CHT) is examined for this measure, not just the area of the Town of Carrboro. A typical measurement of transit service is annual service hours of operation.

### **Results**

Chapel Hill Transit provides public transit service within the Carrboro, Chapel Hill, and UNC area, serving approximately 25 square miles.

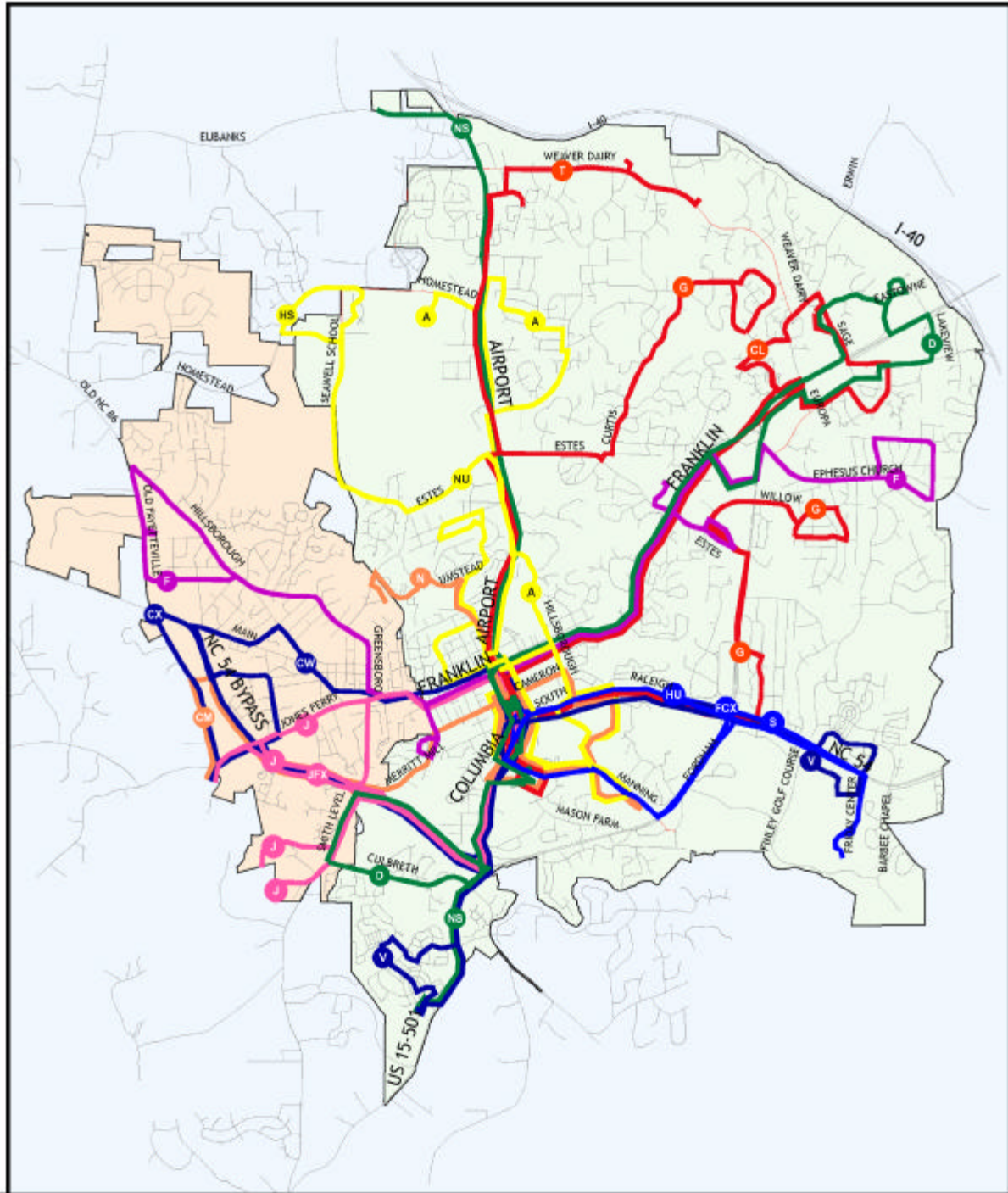
It should be noted that the transit service data is for the July 1, 2002 to June 30, 2003 service year. The route maps, however, depict transit service for March 2004. It should further be noted that CHT converted to free service effective January 2002.

March 2004 service included 22 fixed routes with weekday, evening, and weekend service. CHT also provided an EZ Rider service for mobility-impaired patrons and a demand-responsive Shared Ride service for areas outside of the fixed-route coverage. Weekday fixed-route service is presented graphically in Figure 26


Fixed-route hours of operation are generally from 6:30 AM to 8:00 PM. In addition to the one evening route operating from 7:00 PM to midnight, eleven of the routes operate past 8:00 PM and four routes operate past 10:00 PM. The last regular route completes service at 12:56 AM. Two routes have a “safe ride” service, operating from 11:30 PM to 2:30 AM on most Friday and Saturday nights.

Shared Ride Evening and Sunday services are used on weekday evenings and Sundays when there is not enough demand to warrant a fixed route. This service is available for a fee. Shared Ride feeder service is used for areas that do not receive regular bus service. Patrons are transported to the nearest fixed route. This free service operates from 6:45 AM to 6:15 PM.

Figure 26 – Weekday Transit Service



Transit Routes		
<span style="color: purple;">—</span> F; M	<span style="color: yellow;">—</span> A, HS, N, NU	<span style="color: lightblue;">—</span> FCX; S
<span style="color: blue;">—</span> CPX, W, V	<span style="color: green;">—</span> D; NS	<span style="color: blue;">—</span> HS, NU, T, G
<span style="color: red;">—</span> CL, G, T	<span style="color: orange;">—</span> CM, N, RU	<span style="color: blue;">—</span> NSX



0 0.5 1  
Miles



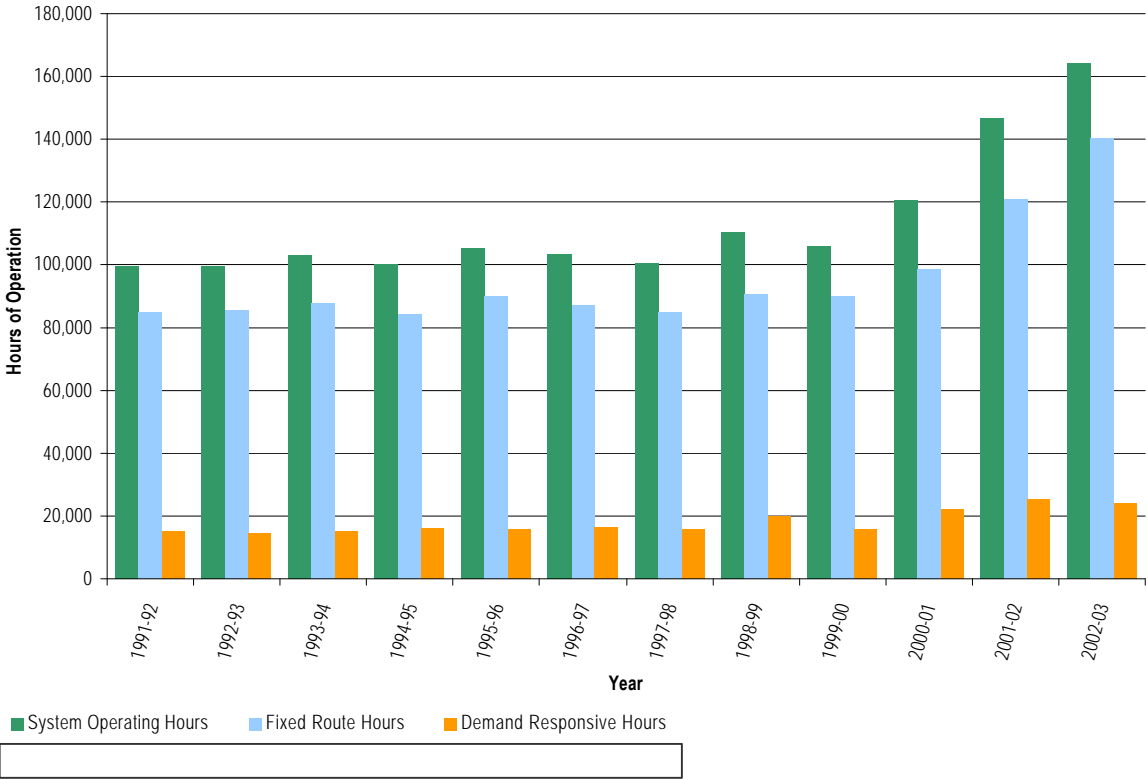
The EZ Rider service is available to Carrboro and Chapel Hill residents who are mobility impaired and are certified to use the service by a medical doctor. The service operates from 6:15 AM to 6:15 PM on weekdays and from 8:30 AM to 7:00 PM on Saturdays. This service is also free.

### Findings and Conclusions

Approximately 60% of the Town of Carrboro is within one-quarter mile of transit. However, the areas that are not served by transit are primarily the recently annexed areas on the north side of town.

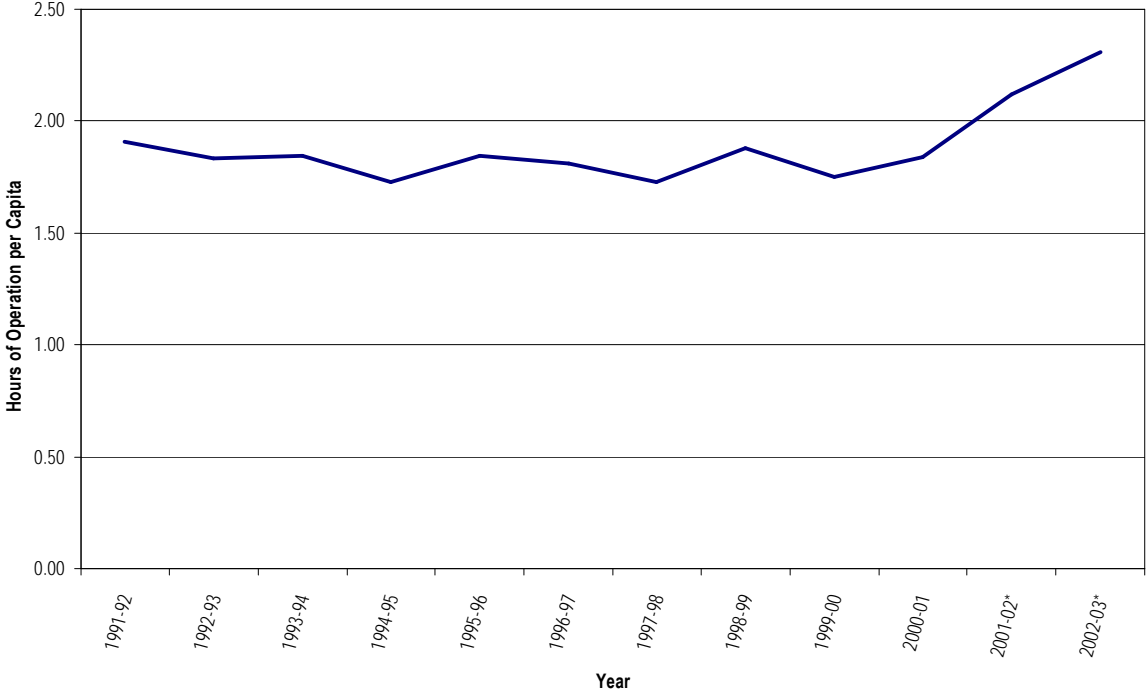
As can be seen in Figure 27, CHT increased transit service hours by approximately 16% between 1991 and 2001. However, in the two years between 2001 and 2003, fixed route transit service hours increased by over 42% and total system operating hours increased by 36%. Much of this increase is due to the conversion of the fixed route system to fare-free service and associated service changes. In anticipation of increased demand, service hours were increased when the system was converted to fare-free. Additional service hours were also added to accommodate further increases in ridership.

**Figure 27 – Transit Operating Hours**

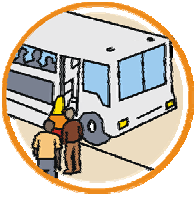


Even when the hours of operation are standardized by the population of the service area, a sharp increase is still evident in 2001-2002 and 2002-2003, most likely due to the fare-free conversion and resultant increase in operating hours. As can be seen in Figure 28, the hours of operation per capita were relatively stable between 1991 and 2001. A sharp increase occurred in the 2001-2002 year when the system was converted to fare-free. This increase in hours of operation per capita continued through the 2002-2003 year.

**Figure 28 – Transit Operating Hours per Capita**



\* Effective January 2002, all standard CHT routes became fare-free.



## *Indicator:*

### **TRANSIT RIDERSHIP**

**Measurement: Transit Boardings and Exits**

**Data: Transit Boardings and Exits**

### **Why and How**

Transit ridership is the direct measurement of how well a transit system is operating. Typically, these measurements are annual in order to average out various daily and weekday variations. Transit ridership is measured by the number of boardings at each stop along each bus route. This information is collected and maintained by Chapel Hill Transit. All local transit service provided by Chapel Hill Transit is examined for this measure, not just the Town of Carrboro.

This information is important when considering the type of service to provide. Because of limited funds, most communities must address whether they want to focus on coverage or productivity. An emphasis on coverage attempts to provide transit service to the majority of the residences and businesses within the community. Often, however, this coverage comes with sacrifices such as longer wait times for a bus. The alternative, productivity, uses the same limited resources, but increases the frequency of service for those routes that have higher ridership. Whereas this method improves statistics such as riders per mile or service hour, the area of Town without transit service increases.

Another important reason for this time series study of ridership is to analyze the effect on ridership of Chapel Hill Transit's conversion of the fixed route system to a fare-free system in January 2002. It is expected that a fare-free system would generate significantly more ridership than a system that charges patrons.

### **Results**

Transit ridership statistics are presented in Tables H and Figure 29. Table I shows average daily ridership and service hours for a typical month for both 2001 and 2003. As can be seen in the figure, transit ridership per year has steadily increased between 1991 and 2001. Since conversion to a fare-free system, ridership has sharply increased since 2001. As can be seen in Table H, ridership per service hour and ridership per capita has also increased accordingly since 2001, even though it had been relatively stable for the previous decade.

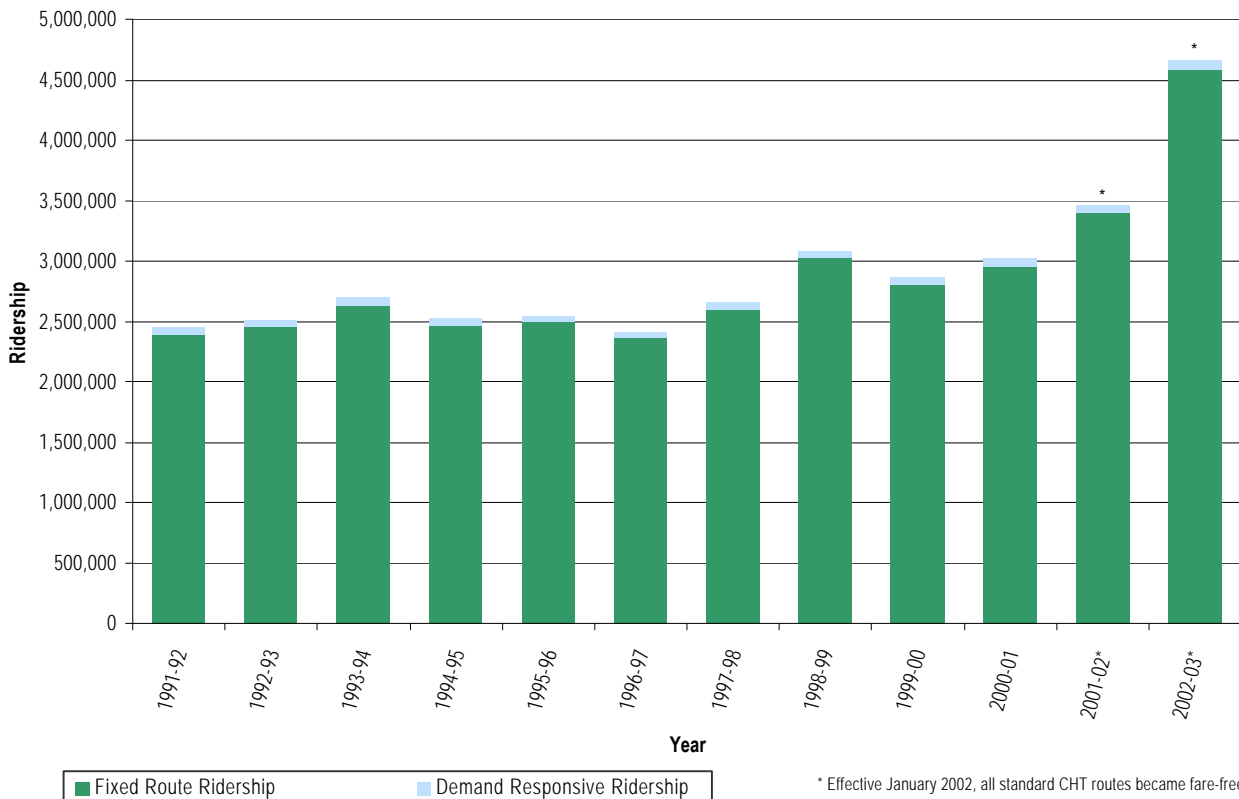
**Table H – Transit Ridership Statistics**

	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002*	2002-2003*
<b>Population</b>												
Chapel Hill Population	39,765	41,524	42,918	44,470	43,549	43,429	43,977	44,015	44,343	48,715	51,598	52,440
Carrboro Population	12,552	12,740	12,931	13,465	13,633	13,784	14,274	14,733	16,012	16,782	17,460	17,585
Combined Service Area Population	52,317	54,264	55,849	57,935	57,182	57,213	58,251	58,748	60,355	65,497	69,058	70,025
<b>System</b>												
System Ridership (thousands)	2,565	2,644	2,852	2,651	2,670	2,522	2,857	3,243	2,976	3,017	3,459	4,662
System Operating Hours	99,805	99,675	103,065	100,110	105,407	103,540	100,735	110,463	105,753	120,486	146,708	164,282
System Riders/Hour	25.70	26.53	27.68	26.48	25.34	24.36	28.36	29.36	28.15	25.04	23.58	28.38
System Riders/Capita	49.03	48.73	51.07	45.76	46.71	44.09	49.05	55.20	49.32	46.07	50.09	66.58
<b>Fixed Route</b>												
Fixed Route Ridership (thousands)	2,391	2,450	2,630	2,463	2,493	2,357	2,592	3,024	2,809	2,957	3,398	4,589
Fixed Route Hours	84,836	85,288	87,700	84,142	89,969	87,088	85,091	90,516	90,203	98,649	121,114	140,391
Fixed Route Riders/Hour	28.18	28.73	29.99	29.27	27.71	27.08	30.46	33.41	31.15	29.98	28.06	32.69
Fixed Route Riders/Capita	45.70	45.16	47.09	42.51	43.60	41.21	44.50	51.48	46.56	45.15	49.22	65.54
<b>Demand Responsive</b>												
Demand Responsive Ridership	58,336	58,056	67,496	60,690	51,528	51,861	56,077	57,605	60,314	59,835	60,333	72,559
Demand Responsive Hours	14,969	14,387	15,365	15,968	15,438	16,452	15,644	19,947	15,550	21,837	25,594	23,891
Demand Responsive Riders/Hour	3.90	4.04	4.39	3.80	3.34	3.15	3.58	2.89	3.88	2.74	2.36	3.04
Demand Responsive Riders/Capita	1.12	1.07	1.21	1.05	0.90	0.91	0.96	0.98	1.00	0.91	0.87	1.04

\* Effective January 2002, all standard CHT routes became fare-free.

Sources: Chapel Hill Data Book, Town of Carrboro, U.S. Census

**Figure 29 – Transit Ridership**



\* Effective January 2002, all standard CHT routes became fare-free.

**Table I – October Transit Statistics**

	October		Percent Increase
	2001	2003	
Average Daily Weekday	14,273	23,001	61.2%
Average Daily Weekend	535	828	54.8%
Daily Service Hours Weekday	428.4	540.1	26.1%
Daily Service Hours Weekend	62.0	82.2	32.5%

## Findings and Conclusions

For the 2002–2003 service year, annual service hours totaled over 164,000 hours (140,000 fixed route hours and 22,000 demand response hours). Annual ridership reached over 4.6 million passengers (almost 4.6 million fixed route passengers and 72,000 demand response passengers). This equates to over 28 passengers per service hour.

For the example month of October, average daily weekday ridership increased by 61% from 2001 to 2003 (14,273 to 23,001). This increase is much higher than the 26% increase in service hours, so it is safe to assume that other factors are contributing to the ridership increase other than just a service increase. While both weekend average daily ridership and service hours increased also, the difference was not as great. Average daily weekend ridership increased by 55%, with average daily weekend service hours increasing by 33%.

According to the Town of Chapel Hill 2003 On-Board Rider Profile Survey, access between home and UNC is the primary purpose of transit system usage. Over 80% of trip origins and 70% of trip destinations are either home or UNC, and almost two-thirds of passengers surveyed ride the bus five or more times per week. Most of the passengers utilizing Chapel Hill Transit (CHT) are students, with two-thirds of all passengers full-time college students. Overall, 89% of passengers either work or go to school on the UNC campus.

It is also important to note that many of the trips being made are choice trips: 57% of passengers had a vehicle available to them to use. However, parking concerns (39%) were the primary reason for riding the bus, implying that parking supply on the UNC campus is driving a large portion of the CHT ridership. Over 60% of riders that lived in Chapel Hill or were UNC students before 2002 used the system before it became fare-free.

It also appears that since the last on-board survey done in 1997, CHT is enhancing its service to the transportation-disadvantaged population. Significantly fewer people in 2003 had a vehicle available to make their trip and the number of passengers with zero vehicles and the number of passengers with a valid driver's license were significantly lower in 2003 than in 1997. CHT is increasing ridership among the higher income group, with significantly more passengers in 2003 than 1997 with a household income of \$75,000 or more. It also appears that CHT is broadening its ability to address more than just the

home to work trip. From 1997 to 2003, there are significantly lower percentage of work trip destinations and origins and higher eat-a-meal trip origins and destinations.

Chapel Hill Transit's conversion to almost an entirely fare-free system has had a dramatic effect on the transit system. Between 2001 and 2003:

- System-wide ridership increased by 55% (3.0 to 4.7 million)
- System-wide riders per capita increased by 45% (46.1 to 66.6)
- System-wide riders per hour increased by 13% (25.0 to 28.4)

Fixed route ridership saw similar increases to the system-wide performance. Between 2001 and 2003:

- Fixed-route ridership increased by 55% (3.0 to 4.6 million)
- Fixed-route riders per capita increased by 45% (45.2 to 65.5)
- Fixed-route riders per hour increased by 9% (30.0 to 32.7)

Since the conversion to a fare-free system took place in January 2002, in the middle of the 2001-2002 reporting year, ridership increased much more between 2002 and 2003 than in the 2001 to 2002 reporting year. The 2001-02 year only included a partial year with free fares, while the free fares were in place for the entire 2002-03 reporting year.

The ridership increases seen between 2001 and 2003 resulted in part from the conversion to fare-free, but also from the increase in service hours and other service changes that were made over the same time period. Transit fares and service both impact ridership. A decrease in fares will increase ridership, as will an increase in transit service hours and an increase in duration of service. By combining free fares, more service hours, and longer service, ridership was sure to increase. CHT was able to increase ridership by 55% between 2001 and 2003 and still maintain productivity (as evidenced by a 9% increase in route riders per hour).