

7 – Transit

Purpose

The transit supply and demand data will assist planners, citizens and MPO board members in identifying new or improved transit services in the MPO planning area. This data and any subsequent analysis is not intended to supplant the detailed studies and recommendations of the various transit operators for new and modified bus routes, stops and amenities, or the ongoing environmental analysis for light rail. Rather, the purpose of this CTP deficiency analysis is to define more general and long-range transit themes.

Content

- The transit supply information, maps and tables are on pages 7-2 through 7-9.
- The transit demand information and map (based on population and employment densities) are on pages 7-10 through 7-12.
- The transit demand information and map (based on mean income) are on pages 7-13 and 7-14.

7 – Transit

Supply

Method

The transit supply map shows the routes and frequency of current bus transit service in the MPO planning area including service provided by Durham Area Transit Authority (DATA), Chapel Hill Transit (CHT), Triangle Transit (TTA), Orange Public Transit (OPT) and Duke University Transit. The frequency of service shows how many minutes transpire between the arrival of any transit bus along that particular roadway segment. Thus, if four buses that each cover a different route travel up that corridor at the same time every sixty minutes, the frequency will be sixty minutes. The frequency would not be 15 minutes, i.e., sixty minutes divided by four buses.

The two maps show peak and off-peak bus service, and the tables that follow provide the detailed route attributes and the assumed peak and off-peak periods of each transit provider.

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**Public
Transportation Map:
Existing Bus Routes and
Peak Frequency**

**Durham-Chapel Hill-
Carrboro MPO**

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014

Legend

**Peak Frequency, Buses
per hr. (Headway, min.)**

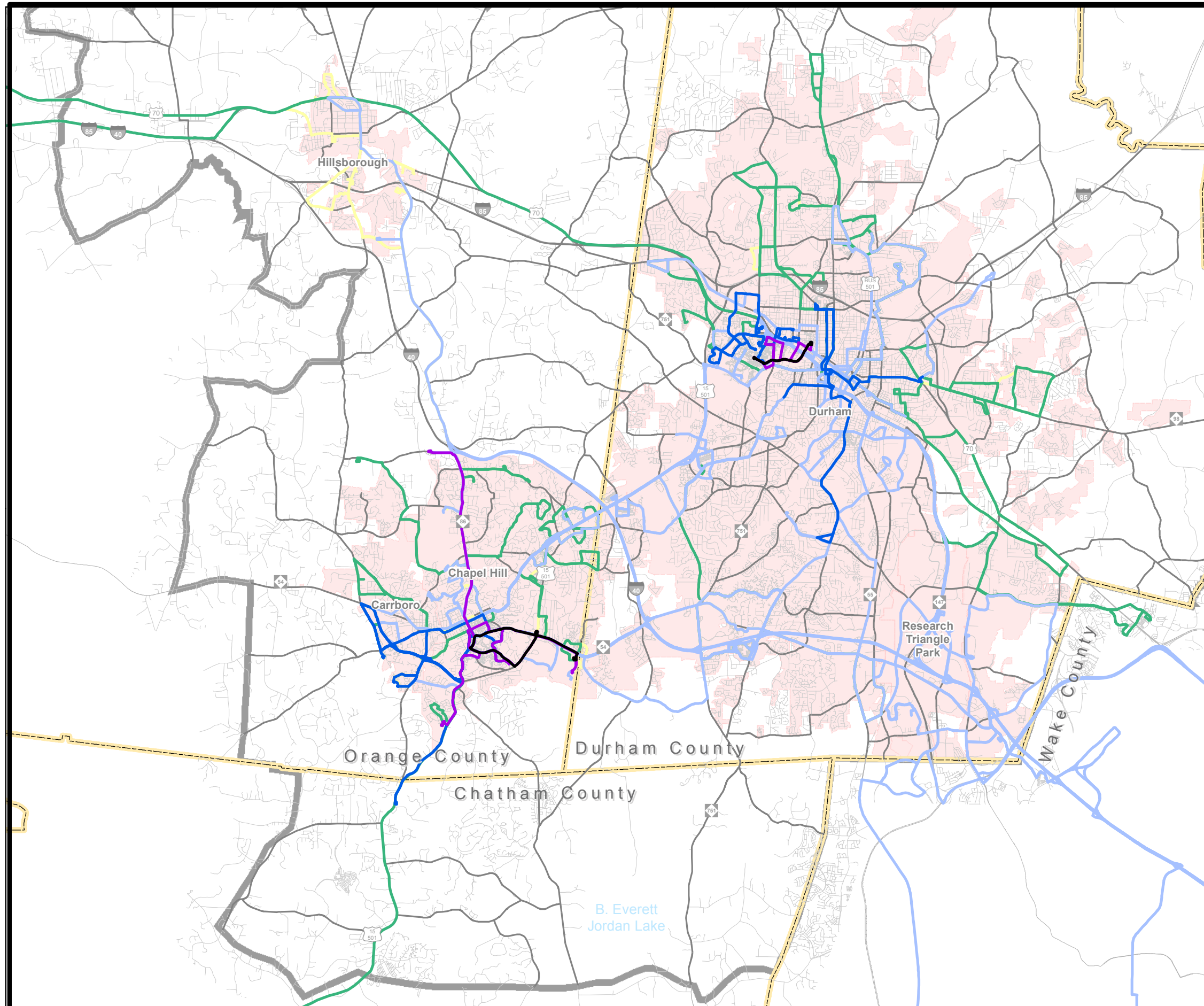
- 12.0 (5 min.)
- 6.0 - 11.9 (6 - 10 min.)
- 4.0 - 5.9 (11 - 15 min.)
- 2.0 - 3.9 (16 - 30 min.)
- 1.0 - 1.9 (31 - 60 min.)
- 0.1 - 0.9 (> 60 min.)
- 0.0 (Non-Peak Service)

- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary

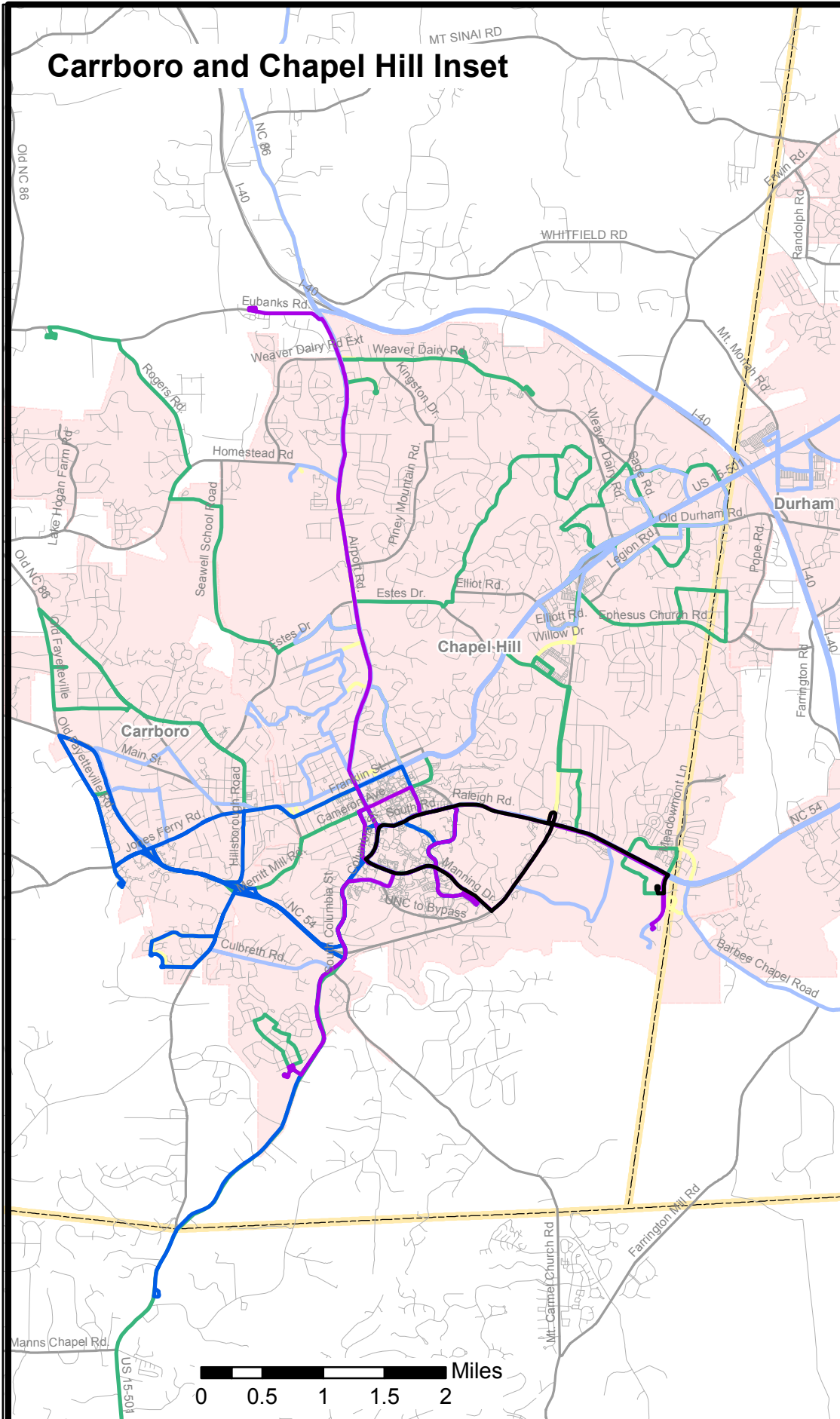
0 1 2 3 4 Miles



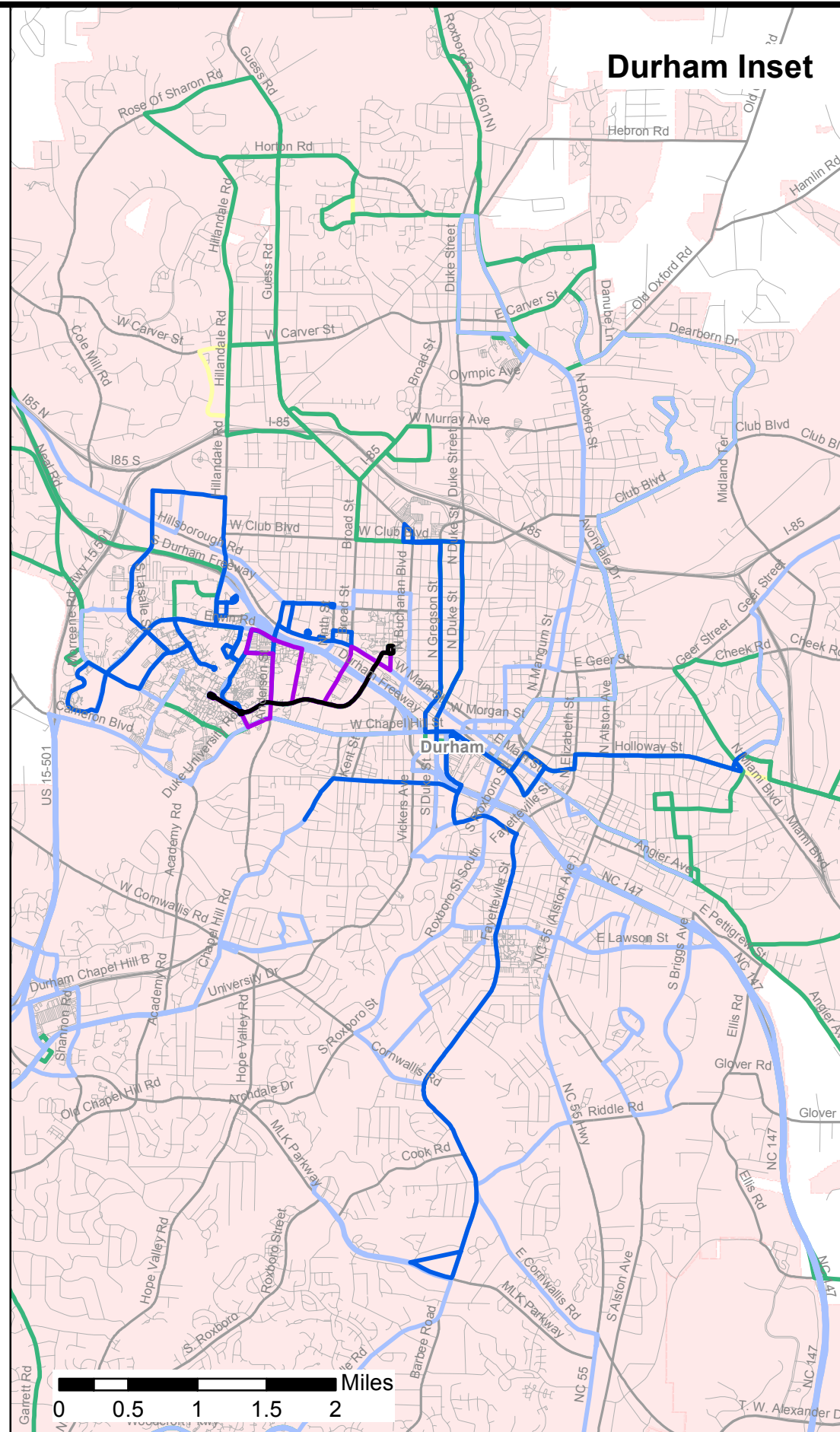
Base map date: September 18, 2009



Carrboro and Chapel Hill Inset



Durham Inset



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Public Transportation Map: Existing Bus Routes and Peak Frequency (Insets)

Durham-Chapel Hill- Carrboro MPO

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014

Legend

Peak Frequency, Buses per hr. (Headway, min.)

- 12.0 (5 min.)
- 6.0 - 11.9 (6 - 10 min.)
- 4.0 - 5.9 (11 - 15 min.)
- 2.0 - 3.9 (16 - 30 min.)
- 1.0 - 1.9 (31 - 60 min.)
- 0.1 - 0.9 (> 60 min.)
- 0.0 (Non-Peak Service)

- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary



Base map date: September 18, 2009

DRAFT
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**Public
Transportation Map:
Existing Bus Routes and
Off-Peak Frequency**

**Durham-Chapel Hill-
Carrboro MPO**

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014

Legend

**Off-Peak Frequency,
Buses per hr. (Headway,
min.)**

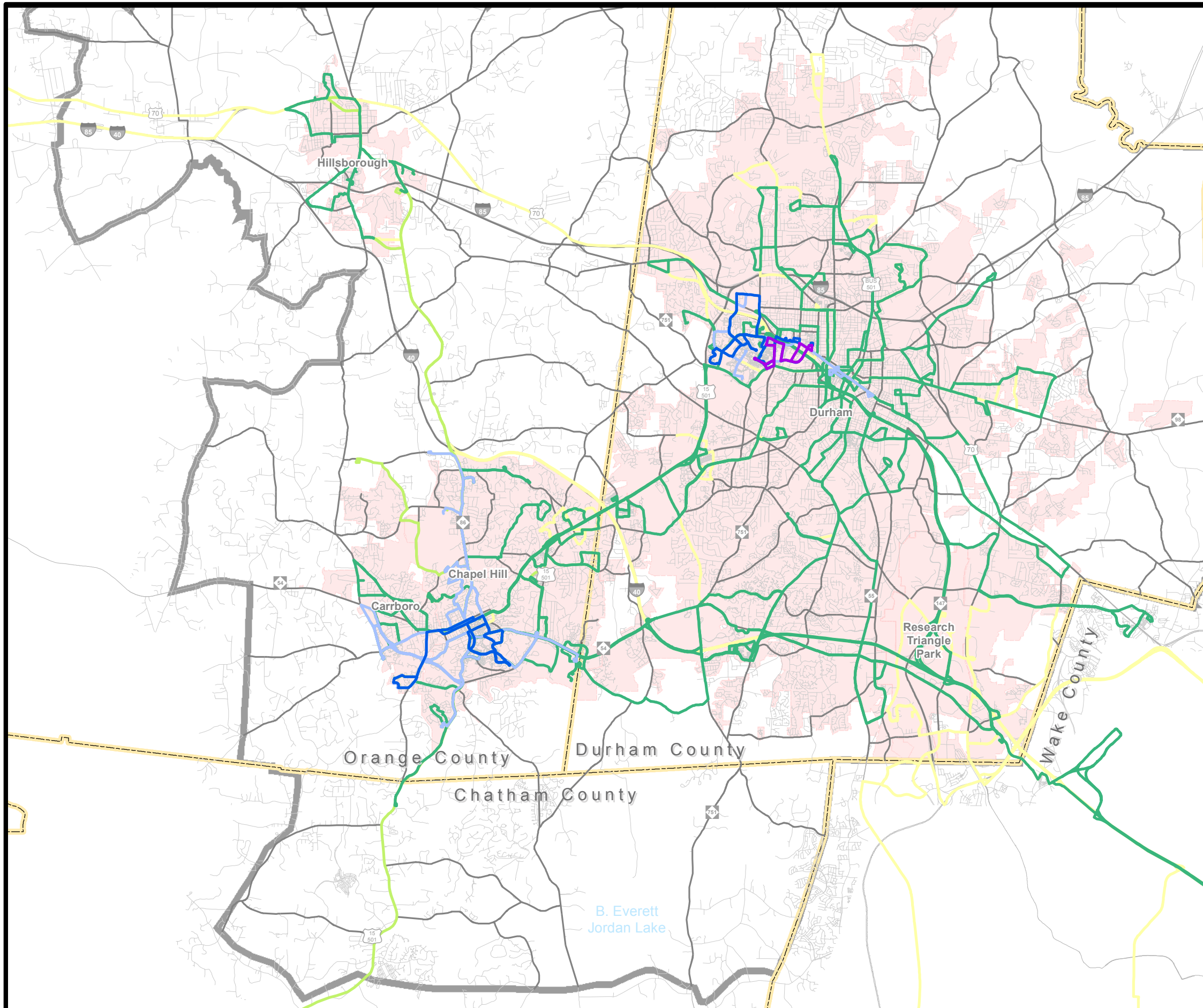
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—	6.0 - 11.9	(6 - 10 min.)
—	4.0 - 5.9	(11 - 15 min.)
—	2.0 - 3.9	(16 - 30 min.)
—	1.0 - 1.9	(31 - 60 min.)
—	0.1 - 0.9	(> 60 min.)
—	0.0	(Peak-Only Service)

- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary

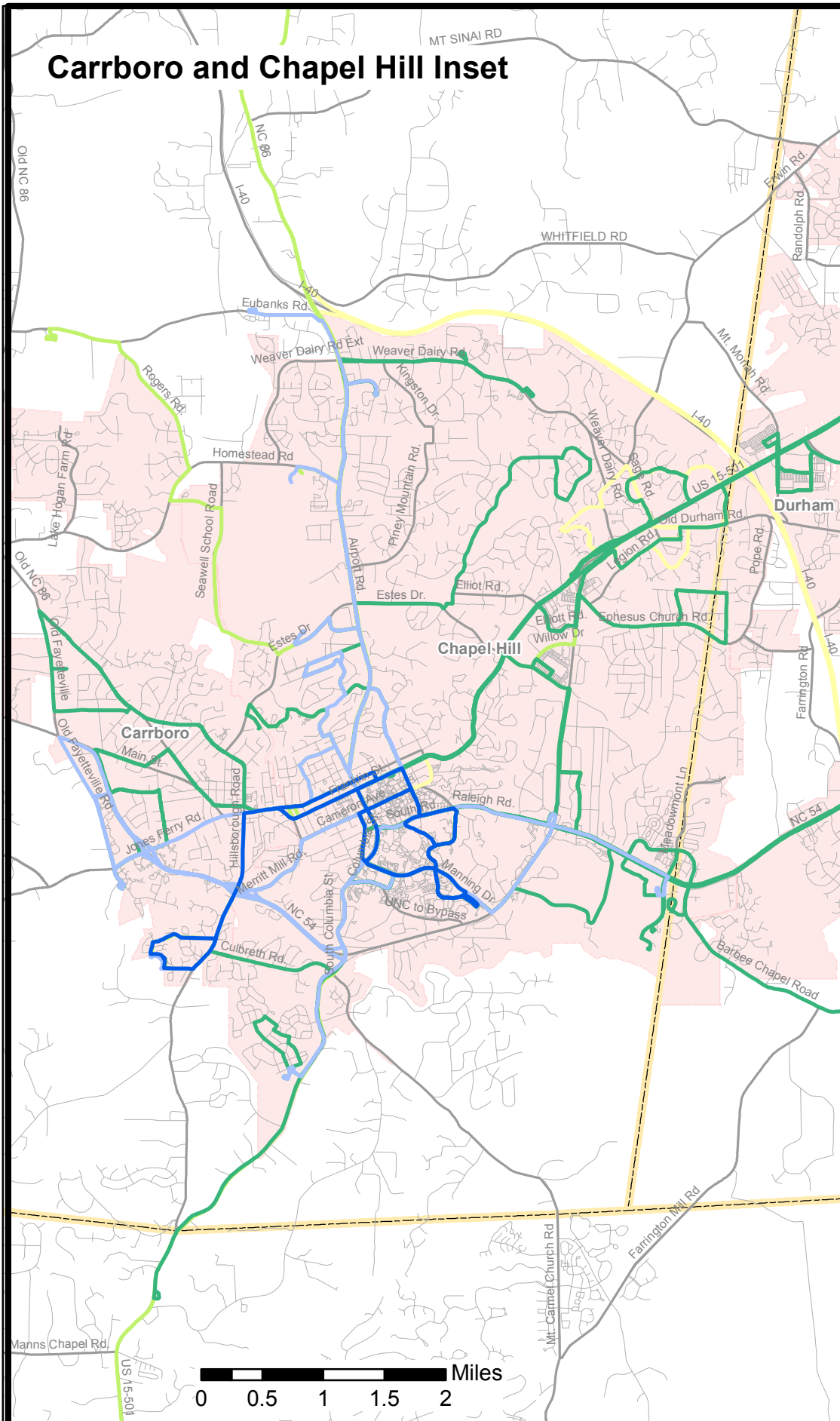
0 1 2 3 4 Miles



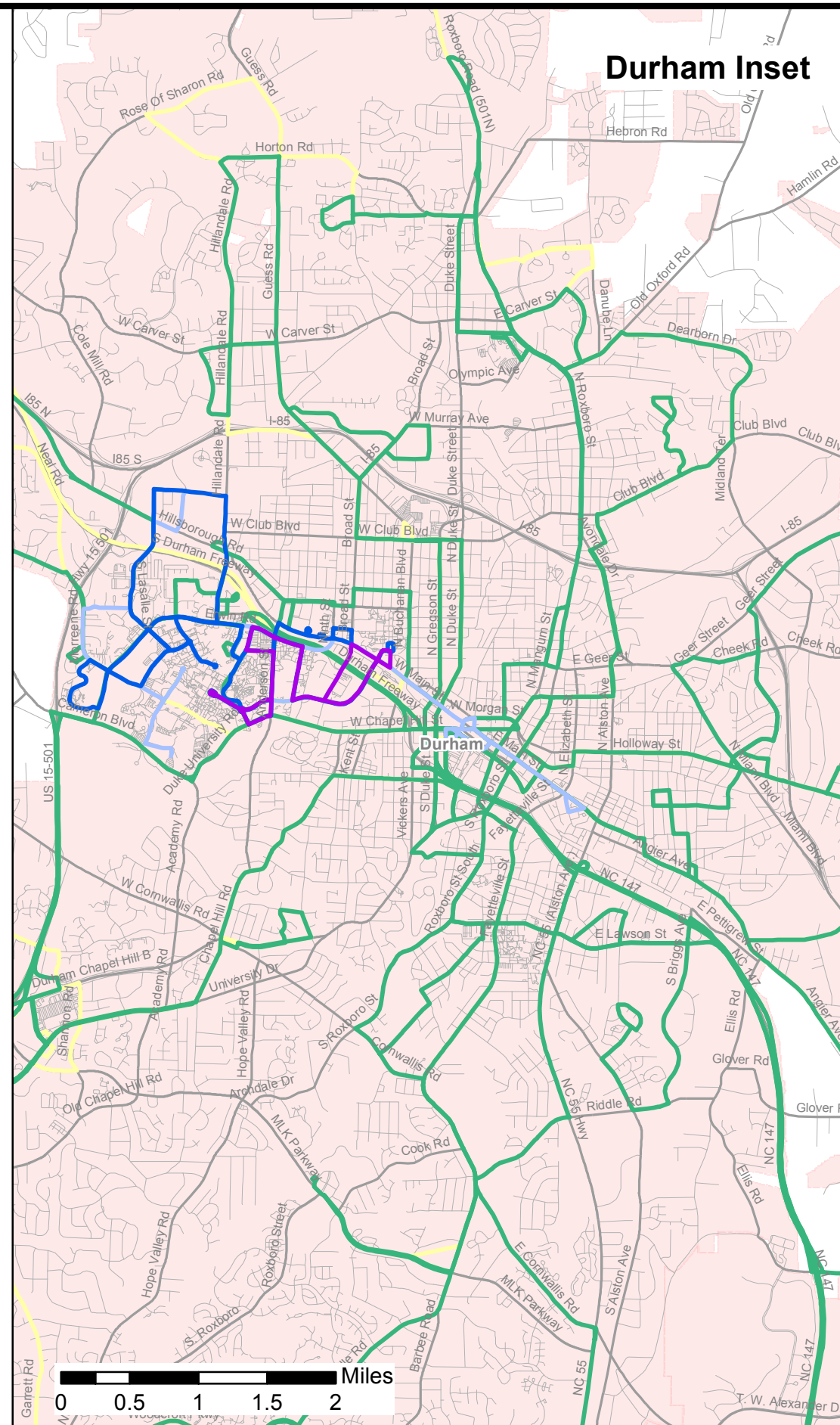
Base map date: September 18, 2009



Carrboro and Chapel Hill Inset



Durham Inset



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Public Transportation Map: Existing Bus Routes and Off-Peak Frequency (Insets)

Durham-Chapel Hill- Carrboro MPO

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014

Legend

Off-Peak Frequency, Buses per hr. (Headway, min.)

- 12.0 (5 min.)
- 6.0 - 11.9 (6 - 10 min.)
- 4.0 - 5.9 (11 - 15 min.)
- 2.0 - 3.9 (16 - 30 min.)
- 1.0 - 1.9 (31 - 60 min.)
- 0.1 - 0.9 (> 60 min.)
- 0.0 (Peak-Only Service)

- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary



Base map date: September 18, 2009

Existing Bus Route Frequency within DCHC MPO

Agency	Route	Route Segment	Service Type	Peak Period	Frequency (Buses/Hr.)		Frequency (Min./Bus)	
					Peak2	Off-Peak	Peak3	Off-Peak4
OPT	H Circ	--	Weekday, Circulator	Off-Peak	0	1	0	60
OPT	420	--	Weekday, Midday	Off-Peak	0	0.333	0	180
Duke	C-1	--	Weekday, Saturday	Peak and Off-Peak	12	3	5	20
Duke	C-1X	--	Weekday, Express	Peak	6	0	10	0
Duke	C-1/Smith (CSW)	--	Weekday	Peak	3	0	20	0
Duke	C-2	--	Weekday, Weekend	Peak and Off-Peak	6	6	10	10
Duke	C-3	--	Weekday	Peak	1.500	0	40	0
Duke	CCX	--	Weekday, Weekend, Express	Off-Peak	0	4	0	15
Duke	H-2	--	Weekday	Peak and Off-Peak	5	1.667	12	36
Duke	H-5	--	Weekday	Peak and Off-Peak	4	4	15	15
Duke	H-6	--	Weekday	Peak and Off-Peak	5	5	12	12
Duke	LL	--	Weekday	Peak and Off-Peak	2	2	30	30
Duke	PR-1	--	Weekday	Peak and Off-Peak	2.069	2.500	29	24
CHT	A	--	Weekday	Peak and Off-Peak	2	2	30	30
CHT	CCX	--	Weekday, Express	Peak and Off-Peak	4	1.500	15	40
CHT	CL	--	Weekday	Peak	1	0	60	0
CHT	CM	--	Weekday	Peak and Off-Peak	1.200	1.200	50	50
CHT	CPX	--	Weekday, Express	Peak	4	0	15	0
CHT	CW	--	Weekday	Peak and Off-Peak	2	1	30	60
CHT	D	--	Weekday	Peak and Off-Peak	3	1.333	20	45
CHT	DX	--	Weekday, Express	Peak	1.333	0	45	0
CHT	F	--	Weekday	Peak and Off-Peak	1.429	1	42	60
CHT	FCX	--	Weekday, Express	Peak and Off-Peak	12	2	5	30
CHT	G	--	Weekday	Peak and Off-Peak	1.200	1.200	50	50
CHT	HS	--	Weekday	Peak and Off-Peak	1.200	0.500	50	120
CHT	HU (Express)	--	Weekday, Express	Peak and Off-Peak	3.333	1.500	18	40
CHT	J	--	Weekday	Peak and Off-Peak	4	3	15	20
CHT	JFX	--	Weekday, Express	Peak and Off-Peak	4	2	15	30
CHT	N	--	Weekday	Peak and Off-Peak	2	1	30	60
CHT	NS	--	Weekday	Peak and Off-Peak	6	3	10	20
CHT	NU	--	Weekday	Peak and Off-Peak	3	2.400	20	25
CHT	PX (part by Chatham Transit)	--	Weekday, Express	Peak	1.395	0.286	43	210
CHT	S	--	Weekday	Peak and Off-Peak	6	1.714	10	35
CHT	T	--	Weekday	Peak and Off-Peak	1.714	1.714	35	35
CHT	U	--	Weekday, Campus Shuttle	Peak and Off-Peak	4	4	15	15
CHT	RU	--	Weekday, Campus Shuttle	Peak and Off-Peak	6	4	10	15
CHT	V	--	Weekday	Peak and Off-Peak	1.538	1.333	39	45
CHT	CM (Saturday)	--	Saturday	Off-Peak	0	2	0	30
CHT	CW (Saturday)	--	Saturday	Off-Peak	0	1	0	60
CHT	D (Saturday) (DM)	--	Saturday	Off-Peak	0	0.923	0	65
CHT	FG (Saturday)	--	Saturday	Off-Peak	0	0.750	0	80
CHT	JN (Saturday)	--	Saturday	Off-Peak	0	0.800	0	75
CHT	NU (Weekend)	--	Weekend	Off-Peak	0	1.333	0	45
CHT	U (Weekend)	--	Weekend	Off-Peak	0	2.400	0	25
CHT	T (Saturday)	--	Saturday	Off-Peak	0	1	0	60
CHT	J (Safe Ride)	--	Thu-Sat, Safe Ride	Off-Peak	0	4	0	15
CHT	G (Safe Ride)	--	Thu-Sat, Safe Ride	Off-Peak	0	1	0	60
CHT	T (Safe Ride)	--	Thu-Sat, Safe Ride	Off-Peak	0	2	0	30
TT	CRX	--	Weekday, Express	Peak	2.400	0	25	0
TT	DRX	--	Weekday, Express	Peak	2	0	30	0
TT	ODX	--	Weekday, Express	Peak	1	0	60	0
TT	ODX (ext2015)	--	Weekday, Express	Peak	1	0	60	0
TT	100	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	105	--	Weekday, Regional	Peak	2	0	30	0

Existing Bus Route Frequency within DCHC MPO

Agency	Route	Route Segment	Service Type	Peak Period	Frequency (Buses/Hr.)		Frequency (Min./Bus)	
					Peak2	Off-Peak	Peak3	Off-Peak4
TT	201	--	Weekday, Regional	Peak	2	0	30	0
TT	301	--	Weekday, Regional	Peak	2	0	30	0
TT	311	--	Weekday, Regional	Peak	2	0	30	0
TT	400	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	405	--	Weekday, Regional	Peak	2	0	30	0
TT	420	--	Weekday, Regional	Peak	2	0	30	0
TT	700	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	800	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	805	--	Weekday, Regional	Peak and Off-Peak	2	1	30	60
TT	42	--	Weekday, Shuttle	Peak	2	0	30	0
TT	46	--	Weekday, Shuttle	Peak	2	0	30	0
TT	47	--	Weekday, Shuttle	Peak	2	0	30	0
TT	49	--	Weekday, Shuttle	Peak	2	0	30	0
DATA	1-1A-1B-1N	1A	Mon-Sat	Peak	1	0	60	0
DATA	1-1A-1B-1N	1B	Mon-Sat	Peak	1	0	60	0
DATA	1-1A-1B-1N	1N	Mon-Sat	Peak	2	0	30	0
DATA	1-1A-1B-1N	1A & 1B & 1N*	Mon-Sat	Peak	4*	0	15*	0
DATA	1-1A-1B-1N	1	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	2-2A-2B	2A	Mon-Sat	Peak	1	0	60	0
DATA	2-2A-2B	2B	Mon-Sat, Sunday	Peak and Off-Peak	1	1	60	60
DATA	2-2A-2B	2A & 2B*	Mon-Sat	Peak	2*	0	30*	0
DATA	2-2A-2B	2	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	4	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	5-5K-14	5	Mon-Sat	Peak and Off-Peak	2	1	30	60
DATA	5-5K-14	5K	Mon-Sat	Peak	2	0	30	0
DATA	5-5K-14	5 & 5K*	Mon-Sat	Peak	4*	0	15*	0
DATA	5-5K-14	14	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	6-6B	6	Mon-Sat, Sunday	Peak and Off-Peak	1	1	60	60
DATA	6-6B	6B	Mon-Sat	Peak	1	0	60	0
DATA	6-6B	6 & 6B*	Mon-Sat	Peak	2*	0	30*	0
DATA	7	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	8	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	9-9A-9B	9A	Mon-Sat	Peak	1	0	60	0
DATA	9-9A-9B	9B	Mon-Sat	Peak	1	0	60	0
DATA	9-9A-9B	9A & 9B*	Mon-Sat	Peak	2*	0	30*	0
DATA	9-9A-9B	9	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	10-10A-10B-10L	10A	Mon-Sat	Peak	2	0	30	0
DATA	10-10A-10B-10L	10B	Mon-Sat	Peak	2	0	30	0
DATA	10-10A-10B-10L	10A & 10B*	Mon-Sat	Peak	4*	0	15*	0
DATA	10-10A-10B-10L	10	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	10-10A-10B-10L	10L	Weekday (school days only)	Peak	1.622	0	37	0
DATA	11	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	12-14	12	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	12-14	14	Mon-Sat	Peak	1	0	60	0
DATA	15	--	Mon-Sat, Sunday	Peak and Off-Peak	1	1	60	60
DATA	16-16A-16B-3	16A	Mon-Sat	Peak	1	0	60	0
DATA	16-16A-16B-3	3	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	16-16A-16B-3	16B	Mon-Sat	Peak	1	0	60	0
DATA	16-16A-16B-3	16A & 16B & 3*	Mon-Sat	Peak	4*	0	15*	0
DATA	16-16A-16B-3	16	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	BCC	--	Mon-Sat	Peak and Off-Peak	3	2.400	20	25
DATA	RSX	--	Weekday, Weekend, Express	Peak and Off-Peak	2	1	30	60

*Some Route Segments align to increase frequency for a few stops along that Route during the Peak hours.

Peak-Hour Periods per Agency

Agency	Route	AM Peak Hours	Off-Peak Hours	PM Peak Hours	Days
OPT	H Circ	n/a	Off Peak ONLY	n/a	Mon-Fri
OPT	420 Midday	n/a	Off Peak ONLY	n/a	Mon-Fri
Duke	C Routes	8am-6pm	n/a	8am-6pm	Mon-Fri
Duke	C Routes	n/a	Off Peak ONLY	n/a	Sat-Sun
Duke	H Routes	6am-9am	9am-3pm	3pm-6pm	Mon-Fri
Duke	LL Route	8:30am-10:30am	10:30am-4pm	4pm-6pm	Mon-Fri
Duke	PR1 Route	7:30am-10:30am	10:30am-3:30pm	3:30pm-6:30pm	Mon-Fri
CHT	all	7am-10am	10am-3pm	3pm-7pm	Mon-Fri
CHT	all	n/a	Off Peak ONLY	n/a	Sat-Sun
DATA	all	5am-6:30pm	6:31pm-midnight	5am-6:30pm	Mon-Sat
DATA	all	n/a	Off Peak ONLY	n/a	Sun
TT	all	5am-9am	9:01am-3:29pm	3:30pm-6:29pm	Mon-Fri
TT	all	n/a	Off Peak ONLY	n/a	Sat-Sun

Frequency Conversion

hrs/bus	minutes/ bus	buses/hr
0.083	5	12.000
0.167	10	6.000
0.200	12	5.000
0.250	15	4.000
0.300	18	3.333
0.333	20	3.000
0.400	24	2.500
0.417	25	2.400
0.483	29	2.069
0.500	30	2.000
0.583	35	1.714
0.600	36	1.667
0.617	37	1.622
0.650	39	1.538
0.667	40	1.500
0.700	42	1.429
0.717	43	1.395
0.750	45	1.333
0.833	50	1.200
0.917	55	1.091
1.000	60	1.000
1.083	65	0.923
1.250	75	0.800
1.333	80	0.750
1.500	90	0.667
2.000	120	0.500
2.500	150	0.400
3.000	180	0.333
3.500	210	0.286

Rhode Island Public Transit Authority Example:

TABLE 1 | POPULATION AND EMPLOYMENT DATA RELATED TO TRANSIT DEMAND

Transit Mode/ Service Frequencies	Population/ Acre	Jobs/ Acre
Flex Bus	0.5	
Community Circulator	2	
Local Bus		
60 minutes	8-16	4-8
30 minutes	16-31	8-16
15 minutes	31-47	16-24
10 minutes	47-92	24-48
<=5 minutes	>92	>48
Bus Rapid Transit	26-52	>13
Light Rail Transit	31-78	>15

- NOTES:
- When the route frequency is entirely irregular, the average within the peak period is used.
 - When the route frequency is inconsistent, the most prevalent or consistent frequency within the peak period is used.
 - If the service is primarily in the Peak periods with only an hour in the Off-Peak, the route is considered "Peak ONLY."
 - If the service is primarily in the Off-Peak periods with only an hour in the Peak periods, the route is considered "Off-Peak ONLY."

7 – Transit

Demand (Density)

Method

The transit demand maps show the total population and jobs per acre thresholds by Traffic Analysis Zone (TAZ) in the year 2040. In the first map, CTP (Bus Transit Demand) the different thresholds suggest the level of fixed-route bus service for a TAZ's density, which is calculated by adding the total population and the doubling of the employment. Thus, a density from one to eight would use some type of circulator or demand-responsive transit, while a fixed-route service with 30-minute headways is suggested for areas with a density from 31 to 47.

In the second map, CTP (Fixed-Guideway Transit Demand), the different thresholds suggests bus rapid transit or light rail transit service based on the TAZ's density, using the same methodology as described above to calculate the density.

The population and employment data provide a rough guide in estimating trip generation (residential location) and trip attraction (job location). However, the reviewer should keep in mind that it does not show high volume travel corridors such as NC 54 and US 15-501 between Durham and Chapel Hill, and I-40, NC 147 and US 70 between Durham, the Research Triangle Park (RTP) and Raleigh.

The maps also show areas of restricted parking in which automobile travelers have to either pay for parking or parking supply is limited in relationship to parking demand. You can assume that transit demand is likely to be higher at these areas given that driving an automobile has increased costs (i.e., parking) or is simply not feasible.

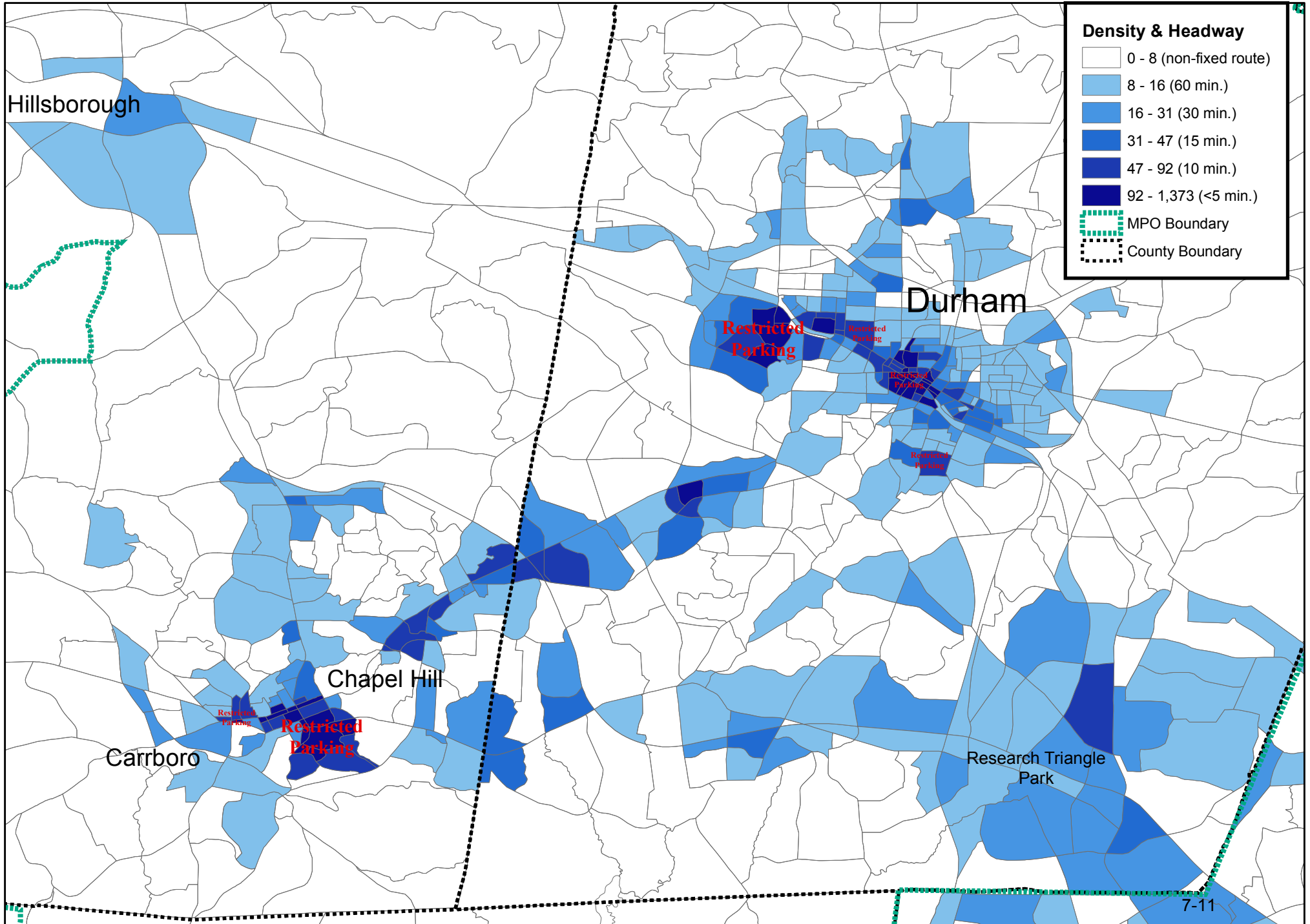
This methodology and the suggested headways are from a Rhode Island Public Transit Authority study. We have used the Rhode Island study because of the simplicity of the methodology and not because these thresholds are some type of commonly accepted transit metrics. We used density because it is a common factor driving transit demand. As an example, a recent transit study connected with Wake County, NC (by HDR Engineering) showed that density was the most important single factor in transit demand, at 37%, followed by zero vehicle housing units at 22%.

CTP (BusTransit Demand)

Based on 2040 projected population and employment.

Population and Employment Density per Acre -- and -- Suggested Transit Service

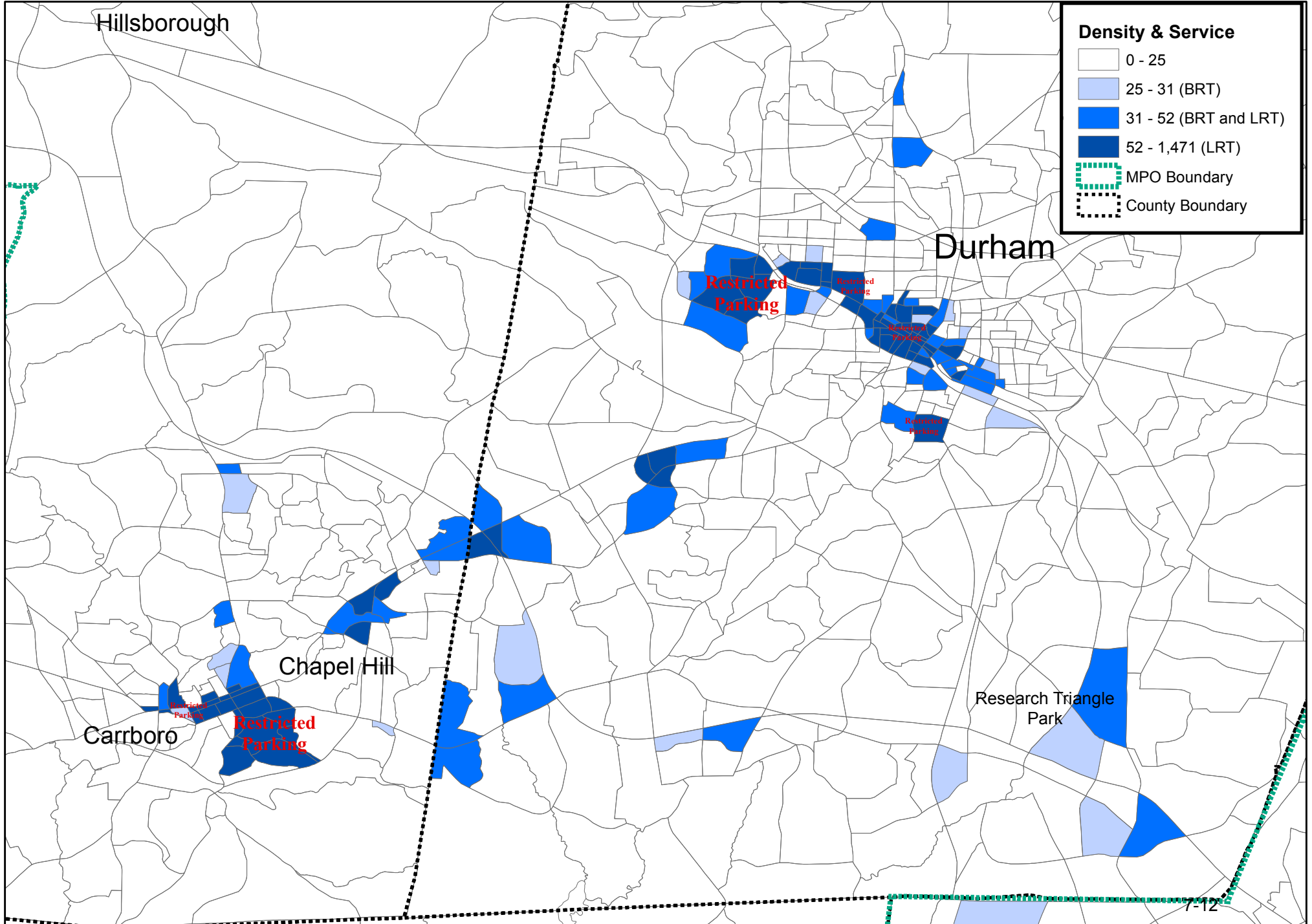
Date: 12/3/2014



CTP (Fixed-Guideway Transit Demand)

Date: 12/3/2014

Pop. and Emp. Density per Acre - and - Suggested Fixed-Guideway Service



7 – Transit

Demand (Income)

Method

The transit demand map shows low-income TAZs. It compares the TAZ's mean income (based on the Census Bureau's American Community Survey – ACS) and different thresholds for the median income (based on Housing and Urban Development income limits for a four-person household in the Durham-Chapel Hill Metropolitan Area). As the percentage of the mean income declines, it is assumed that transit demand will increase given lower levels of vehicle ownership.

CTP Transit

TAZ Mean Income as Percentage of Regional Median Income

Date: 12/4/2014

