
The University of North Carolina at Chapel Hill

Annual Development Plan Report on Transportation



December 2013

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Introduction

This is the annual brief summary report of the transportation impacts of the University's Development Plan. It has been prepared in accordance with the June 27, 2005 guidelines issued by the Town of Chapel Hill. It is based on the results of the most recent Transportation Impact Analysis (TIA), which was the TIA submitted to the Town of Chapel Hill in December 2013. Because the Development Plan TIA has not been updated or modified since December 2012, this edition of the Annual Development Plan Report on Transportation is substantially similar to the December 2012 edition. Minor revisions and additions have been made to clarify certain issues and to provide an update on the status of transportation improvement projects on campus.

1: Development Plan Overview

Overview of Development Plan Projects

The Development Plan projects continue to be implemented, with some now completed, some under construction and some in design. The main projects completed so far include:

- Rams Head Center
- Student Family Housing buildings
- Addition to Carrington Hall
- Addition to Cobb Residence Hall
- Additions to Memorial Hall
- Additions to Alexander, Connor, and Winston Residence Halls
- Jackson Circle Parking Deck
- North East Chiller and Parking Deck
- Science Complex Phase 1 (Caudill Laboratories and Chapman Hall)
- Residence Halls Phase II (Ram Village)
- Addition to the Medical Science Research Building (Bondurant Hall)
- Tomkins Chiller Plant and Thermal Storage Facility
- Student Academic Services Building
- Arts Common Phase 1
- FedEx Global Education Building
- ITS-Manning
- Renovation to Morrison Hall
- Williamson Building
- Genetic Medicine Building
- Physicians Office Building

- Manning Steam Plant
- Science Complex Phase II – Addition to Sitterson Hall (Frederick Brooks Hall)
- Addition to Boshamer Stadium
- North Carolina Cancer Hospital
- Addition to Carmichael Auditorium
- Bell Tower Parking Deck
- Sports Medicine Building
- Science Complex Phase II – New Venable/Murray Hall
- Genome Science Building
- Dental Science Building

Construction continues at a number of locations throughout the campus, including:

- Imaging Research Building
- Other infrastructure projects

In total, the Development Plan projects involve about 7.9 million gross square feet of new buildings. This includes about 1.95 million square feet for parking decks and 312,382 square feet for infrastructure projects. About 235,000 gross square feet of existing buildings will be demolished. This means the net increase in occupiable floor area is about 5.6 million square feet.

Projects by Location

Table 1.1 lists the projects in detail, and Figure 1.1 shows their locations. The projects can be summarized as follows:

<u>Type of building</u>	<u>Square</u>
Academic	1,818,486
Cultural	140,629
Housing	923,163
Infrastructure	312,382
Office	460,200
Parking	1,950,700
Research	800,923
Student Life	339,699
UNC Health Care	257,159
Athletics	961,350
Total	<u>7,964,691</u>

Parking Space Impacts

Existing Parking

In 2000-2001, there were about 14,200 parking spaces on the main campus. Then, like now, this was not enough for all the employees or students wanting to park on campus. There were about 8,000 spaces for about 13,000 Main Campus employees, or 0.61 spaces per Main Campus employee. The rate for students was much lower - less than 10 percent for both resident students and commuting students. No freshman is eligible

for a permit on Main Campus, and no student living off-campus within a 2-mile radius of the Bell Tower is eligible.

Parking Changes

The Development Plan involves extensive changes to the parking supply. Around 4,061 existing spaces will be permanently closed, and around 5,640 new spaces will be provided, mostly in new structures. Some other spaces will be temporarily used for construction staging at various times.

The net effect is an approved increase of 1,579 spaces on campus when all the projects are completed. Table 1.2 and Figure 1.2 show these net changes. In some cases, the number of parking spaces by lot and user are estimates, as the final design of buildings and landscaping will determine how many surface spaces, if any, could be retained (particularly for service and disability spaces).

Visitor parking accounts for most of the net increase, reflecting the importance of accommodating visitors. However, there is expected to be a net increase of about 380 commuter spaces and a decrease of about 287 resident student spaces.

Impacts

The increase in commuter spaces is very low compared with expected population growth over the period of the plan. Employee numbers are forecast to grow by 31%, and student numbers by 18%. If resident and commuter parking were to continue to be provided at the existing (2000-2001) level, the overall increase would have been much greater than the approved 1,579.

The 'shortfall' (i.e. the difference between the amount of parking that would be required if parking continued to be provided at existing rates, and the amount that will actually be provided) is estimated to be 2,045 employee spaces, 309 commuting student spaces and 451 resident student spaces. The shortfall in commuter parking will be met by alternative modes, and the Development Plan includes a range of transportation initiatives to accommodate this. The shortfall in resident student parking will be met in storage lots off-campus. The needs of visitors will continue to be satisfied on-campus.

The amount of traffic that will be generated by the Development Plan is a function of the amount of parking that will be provided. The limited increase in parking will therefore limit the traffic impact. The increased parking (net increase of 1,579 spaces) is estimated to generate 11,487 vehicle trips daily. A typical campus development of similar size, with unlimited parking and little or no transportation alternatives, would generate more than 34,000 trips daily. This means that the Development Plan projects will only generate about one-third of the trips that would be expected from a typical campus development of this size.

Table 1.1: Development Plan Projects

Building	Building Type	Gross Square Footage	Anticipated Construction Start Date	Anticipated Construction Completion
A-1	Academic	31,800	01/15	01/17
A-2	Academic	73,100	01/15	01/17
A-3	Academic	25,600	03/05	02/07
A-4	Academic	20,000	03/05	02/07
A-5	Academic	55,200	01/15	01/17
A-6	Academic	90,000	07/03	06/05
A-7	Academic	41,000	02/06	08/08
A-8	Academic	154,500	01/15	01/17
A-9	Academic	396,700	02/06	10/10
A-10	Academic	112,500	07/03	06/05
A-11	Academic	82,000	03/04	02/06
A-12	Academic	69,500	11/01	10/03
A-13	Academic	10,200	08/02	07/04
A-14 Mod	Academic	259,990	06/08	05/12
A-15	Deleted			
A-16	Deleted			
A-17	Academic	53,200	01/15	01/17
A-18	Academic	936	08/04	03/04
A-19	Academic	1,600	03/05	03/06
A-20 *	Academic	125,000	01/15	01/17
A-21	Academic	80,000	01/15	01/17
A-22	Academic	75,000	01/15	01/17
A-23 *	Academic	50,000	01/15	01/17
A-24	Academic	5,580	06/08	02/10
A-25	Academic	3,308	10/08	01/10
A-26	Academic	1,772	01/09	02/10
	Total Academic	1,818,486		
C-1	Cultural	36,000	01/15	01/17
C-2	Cultural	26,400	01/15	01/17
C-3	Cultural	37,325	12/01	01/03
C-4	Cultural	3,000	01/15	01/17
C-5 Mod	Cultural	22,904	01/15	06/17
C-6	Cultural	15,000	01/15	01/17
	Total Cultural	140,629		
H-1	Housing	Deleted		
H-2	Housing	Deleted		
H-3	Housing	6,656	05/02	07/03
H-4	Housing	6,656	05/02	07/03
H-5	Housing	68,400	01/04	08/05
H-6	Housing	60,000	01/04	08/05
H-7	Housing	74,800	01/04	08/05
H-8	Housing	43,200	01/15	01/17
H-9	Housing	42,000	01/15	01/17
H-10	Housing	Deleted		
H-11	Housing	Deleted		
H-12	Housing	Deleted		
H-13	Housing	60,500	08/03	08/04
H-14	Housing	60,500	08/03	08/04
H-15	Housing	58,200	08/03	08/04
H-16	Housing	59,400	08/03	08/04
H-17	Housing	59,400	08/03	08/04
H-18	Housing	44,400	08/03	08/04
H-19	Housing	44,400	08/03	08/04
H-20	Housing	37,600	08/03	08/04
H-21	Housing	30,050	08/03	08/04
H-22	Housing	79,601	01/04	08/05
H-23	Housing	79,600	01/04	08/05
H-24	Housing	7,800	01/04	08/05
	Total Housing	923,163 *		

Table 1.1: Development Plan Projects (cont.)

Building	Building Type	Gross Square Footage	Anticipated Construction Start Date	Anticipated Construction Completion
I-1	Infrastructure	20,000	07/03	12/04
I-2	Infrastructure	115,600	08/03	12/05
I-3	Infrastructure	21,600	03/04	03/06
I-4	Infrastructure	6,382	06/04	12/05
I-5 Mod	Infrastructure	100,800	01/08	07/10
I-6	Infrastructure	48,000	01/15	01/17
I-7	Infrastructure	N/A	01/15	01/17
	Total Infrastructure	312,382		
O-1	Office	133,200	01/15	01/17
O-2	Office	30,000	11/02	05/06
O-3	Office	105,000	07/04	03/06
O-4	Office	180,000	01/15	01/17
O-5	Office	12,000	01/15	01/17
	Total Office	460,200		
P-1	Parking	115,500	01/15	01/17
P-2	Parking	Deleted		
P-3	Parking	252,600	05/02	10/04
P-4 Mod	Parking	225,000	03/07	08/10
P-5	Parking	255,500	01/15	01/17
P-6	Parking	134,400	01/15	01/17
P-7	Parking	Deleted		
P-8	Parking	42,000	03/04	07/06
P-9	Parking	191,500	03/03	03/06
P-10	Parking	350,000	04/04	12/05
P-11	Parking	288,000	09/12	06/14
P-12	Parking	96,200	01/15	01/17
	Total Parking	1,950,700		

*This represents relocation of planned surface parking to spaces beneath the buildings.

R-1	Research	109,000	07/07	03/12
R-2	Research	49,000	07/07	03/12
R-3	Research	74,400	07/07	03/12
R-4	Research	225,000	08/02	12/04
R-4 MM	Research	523	09/11	12/11
R-5	Research	343,000	06/09	01/14
	Total Research	800,923		
SL-1	Student Life	54,400	06/02	07/04
SL-2	Student Life	126,900	06/02	07/04
SL-3	Student Life	126,000	06/04	08/05
SL-4	Student Life	28,000	01/15	01/17
MM	Student Life	4,399	06/05	03/06
	Total Student Life	339,699		
UNCH-1	UNC Health Care	196,280	01/15	01/17
UNCH-2	UNC Health Care	343,180	01/15	01/17
UNCH-3	UNC Health Care	291,890	03/05	02/08
UNCH-4	UNC Health Care	130,000	03/06	07/07
UNCH-5	UNC Health Care	(53,546)	12/11	06/12
UNCH-6	UNC Health Care	1,066	01/12	03/12
	Total UNC Health Care	961,350		
ATH-1	Athletics	41,181	05/07	01/08
ATH-2	Athletics	170,189	04/10	09/11
ATH-3	Athletics	15,059	05/08	02/10
ATH-4	Athletics	19,194	01/08	08/09
ATH-4 MM	Athletics	1,000	06/10	08/10
ATH-5	Athletics	6,467	03/10	01/11
ATH-6	Athletics	4,069	01/10	10/10
	Total UNC Athletics	257,159		

Campus Total 7,964,691

Figure 1.1: Development Plan Projects Map

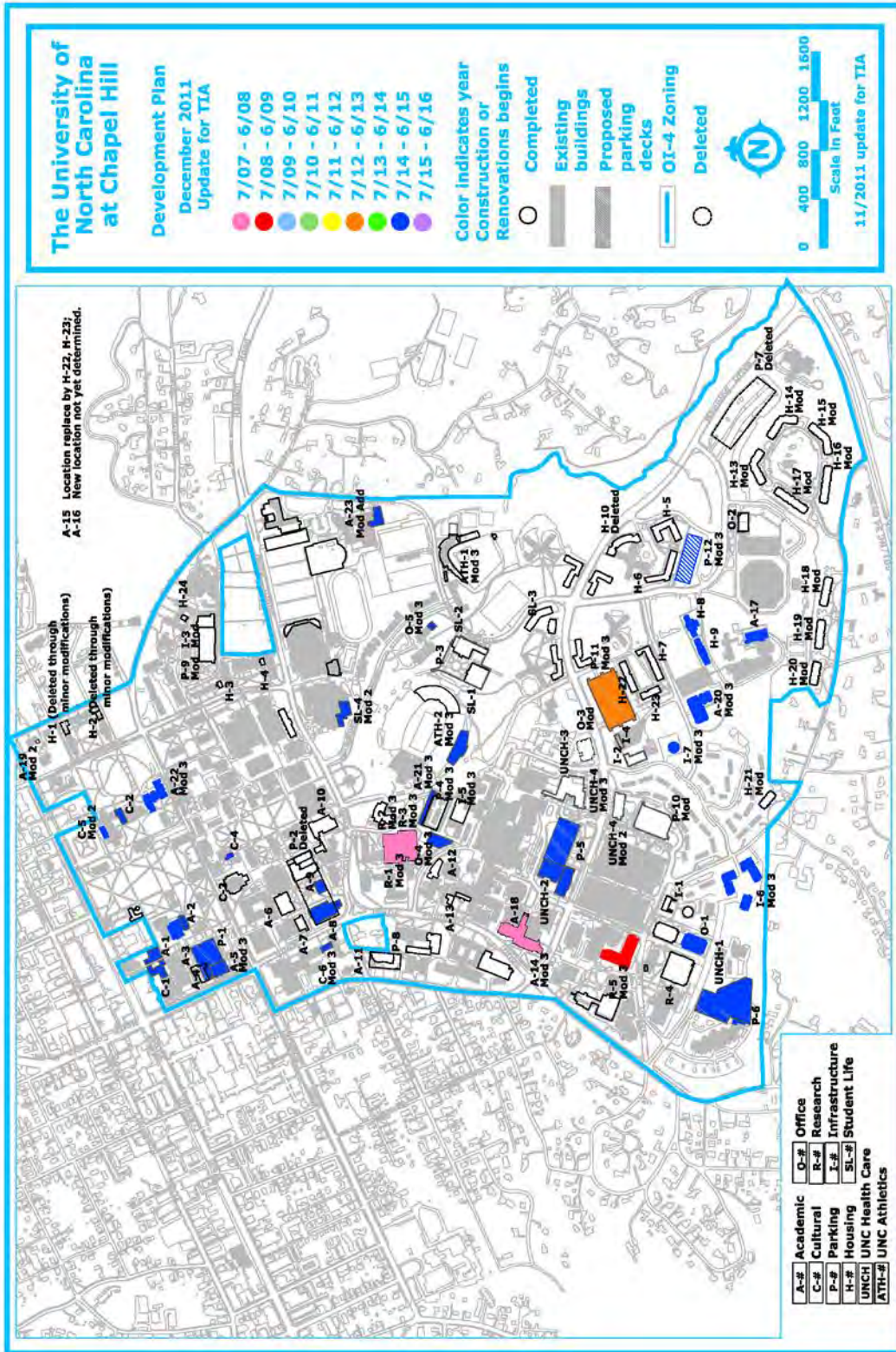


Table 1.2: Parking Space Impacts

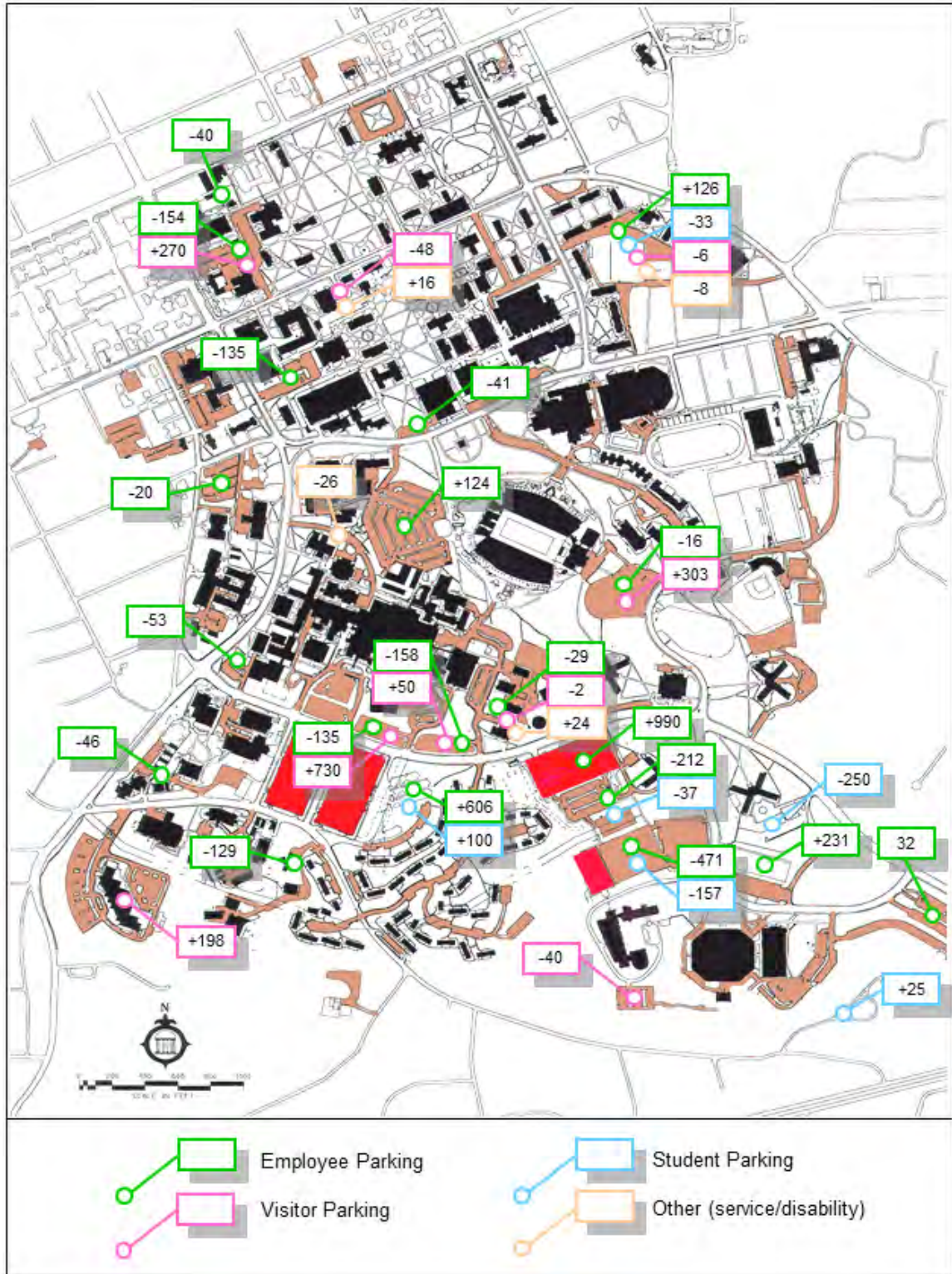
Lot / Project Name	Number of Spaces ^{1,2}							Net Change
	Parking Zone	Employee	Commuting Student	Resident Student	Student in Family Housing	Visitor	Other	
ACC (new structure)						198		198
Bell Tower (new structure)	BG	124						124
Bowles	S11	-471	-157					-628
Cameron/Swain (Arts Common Deck - new structure)	ND1/NG1	-154				270		116
Cobb/Joyner (new structure and surface parking)		126	-33			-6	-8	79
Craige Surface	CD	-212		-37				-249
Craige Deck Expansion	CD	990						990
Dental School	S6	-53						-53
Glaxo / Housing Support / MFM / MRI	S6	-46						-46
Gravelly (NC H&C) (new structure)	CG	-135				730		595
Hanes						-48	16	-32
Hinton James	M			-250				-250
ITS		-29				-2	24	-7
Jackson Deck (new structure)		606	100		-54			652
Kenan/McColl Visitor Parking						-40		-40
McCauley Street (Global Education Deck - new structure)	W	-20						-20
Neurosciences	CG	-158				50		-108
North Medical Drive							-26	-26
Porthole	N2	-40						-40
Rams Head (new structure)	S5	-16				303		287
Stadium Drive	S4							0
Sitterson	NG2	-135						-135
South Chiller	S6	-129						-129
Student Family Housing	MR/MR2				79			79
Tennis Court Deck (new structure)		231						231
Wilson Library	N8	-41						-41
Subtotal		438	-90	-287	25	1,455	6	1,547
Unassigned spaces ³		32						32
Total								1,579

Notes:

1. Numbers are subject to change, depending on the final footprint of each project.
2. These numbers represent net changes only. For example, the Rams Head structure has 700 spaces, but 413 were displaced as a result of its construction. The net impact, which is shown in this table, is 287 spaces.
3. Spaces not assigned to a specific location on the campus and whose location(s) will be determined in future development plan modification requests. The total net change in parking is 32 spaces less than the approved 1,579 space increase, but the traffic assessment accounts for the entire 1,579 space net increase.

Source: Table 2-4 of Development Plan TIA, December 2013

Figure 1.2: Parking Impacts Map



2: Development Plan Transportation Changes

Overview of Traffic Analysis

The Development Plan's impact on roads on or near the campus, including 55 intersections, was analyzed using standard techniques for Traffic Impact Analysis. Three scenarios are considered:

- Existing conditions (the traffic levels in 2013);
- No-Build conditions (the forecast conditions in 2015 if the Development Plan projects did not exist); and
- Build conditions (the forecast conditions in 2015 including the effects of the Development Plan projects).

The existing conditions were measured using traffic counts collected in fall 2013 on days when the University was in session. Because similar analyses were undertaken in 2001, 2003, 2005, 2007, 2009, and 2011 changes in traffic levels can be tracked.

The No-Build conditions are forecast by applying annual growth rates to the existing traffic levels. The Build conditions are forecast by taking the No-Build traffic levels and adding the trips due to Development Plan projects. These trips are estimated from the forecast parking changes (described above), using known trip rates per parking space.

Changes in Traffic Volumes

Table 2-1 shows the average daily traffic volumes (ADTs) in 2001, 2003, 2005, 2006, 2007, 2009, 2011, and 2013 along with the No-Build and Build forecasts for 2015. Figure 2.1 illustrates the two forecasts for 2015.

Traffic volumes have generally remained stable, or, in some cases, decreased, since the 2007 counts. One possible reason is the ongoing development and implementation of the University's Transportation Demand Management (TDM) program, including full subsidy of ridership on Triangle Transit, doubling of the vanpool subsidy, and adding new transit routes such as the Pittsboro Express. Construction on campus is another possible explanation for the downward trend in daily traffic volumes. Construction on campus has disrupted traffic patterns and has also resulted in a net loss in on-campus parking since 2001. Another possible explanation is the increase in on-campus housing for students. Yet another possible explanation is the economic downturn and the effect that has had on average daily traffic volumes.

In the No-Build scenario, background traffic growth is expected to produce increased volumes. This is normal for growing areas such as Chapel Hill.

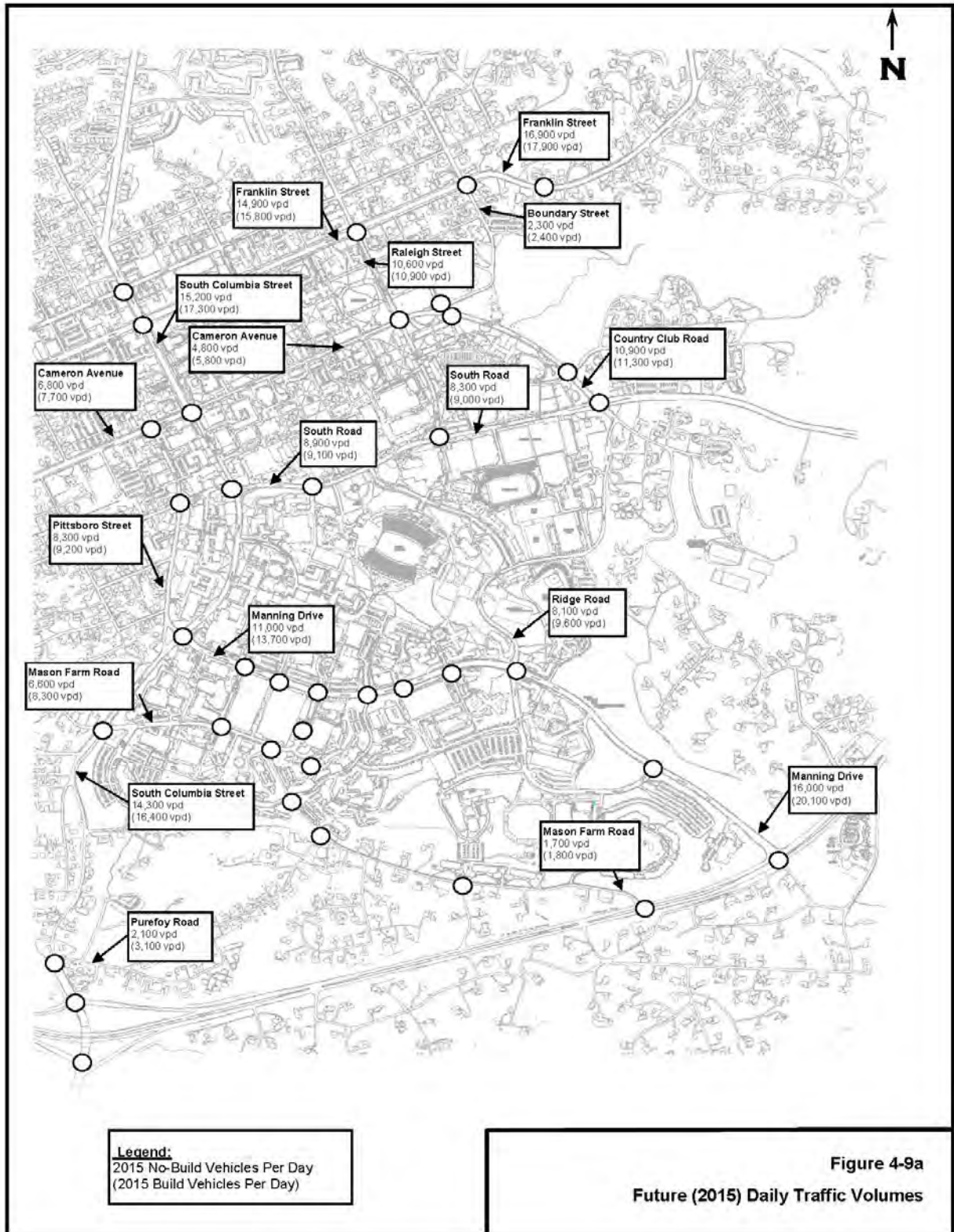
In the Build scenario, the further increase in traffic along most campus roads is expected to be minimal, although some intersections near proposed parking facilities will see specific turning movements increase noticeably. In some areas where parking is being eliminated, some turning movements will decrease compared to the No-Build scenario. The largest increase in traffic volumes will be on Manning Drive.

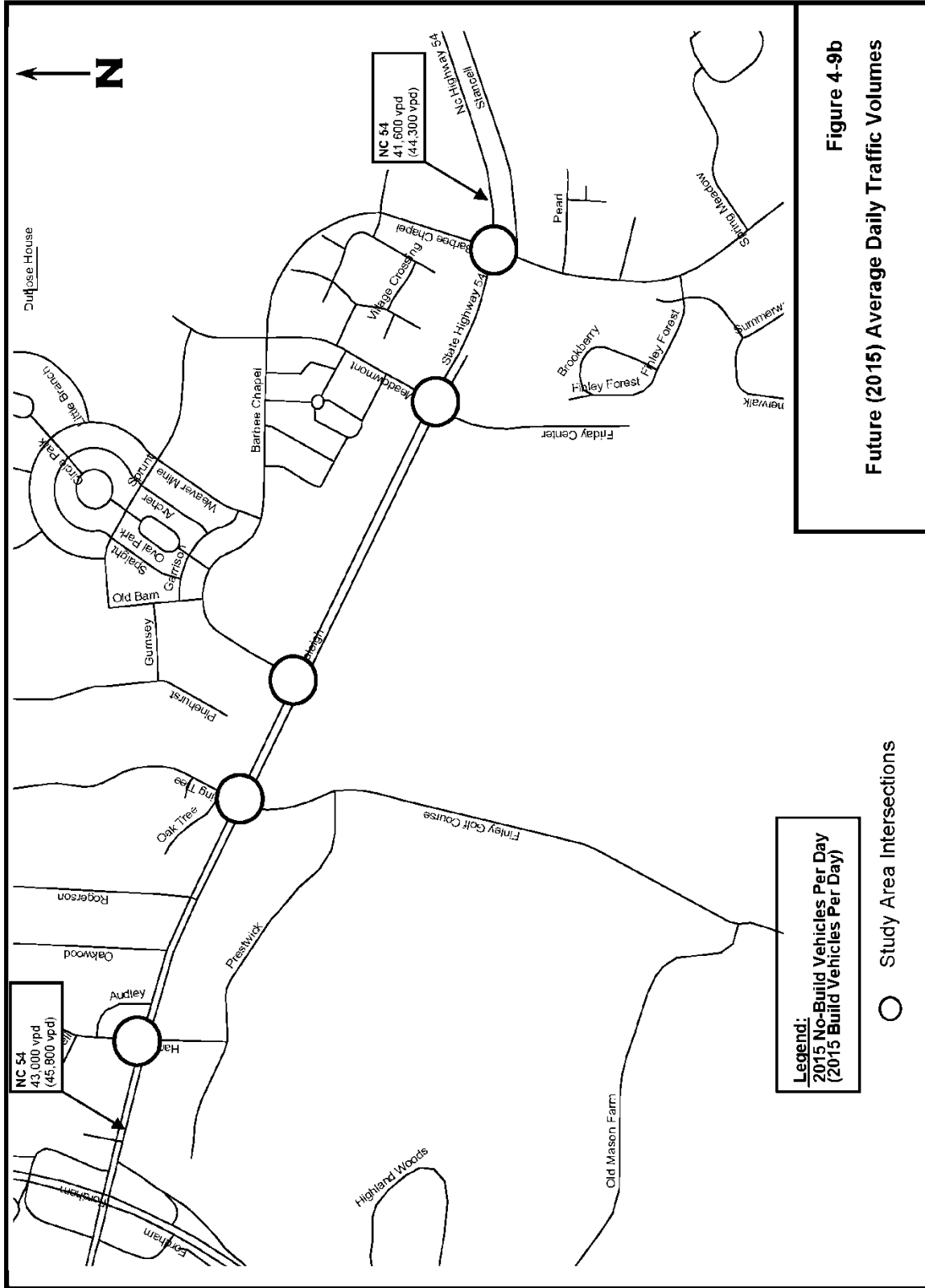
Table 2.1: Existing and Future (2015) Traffic Volumes

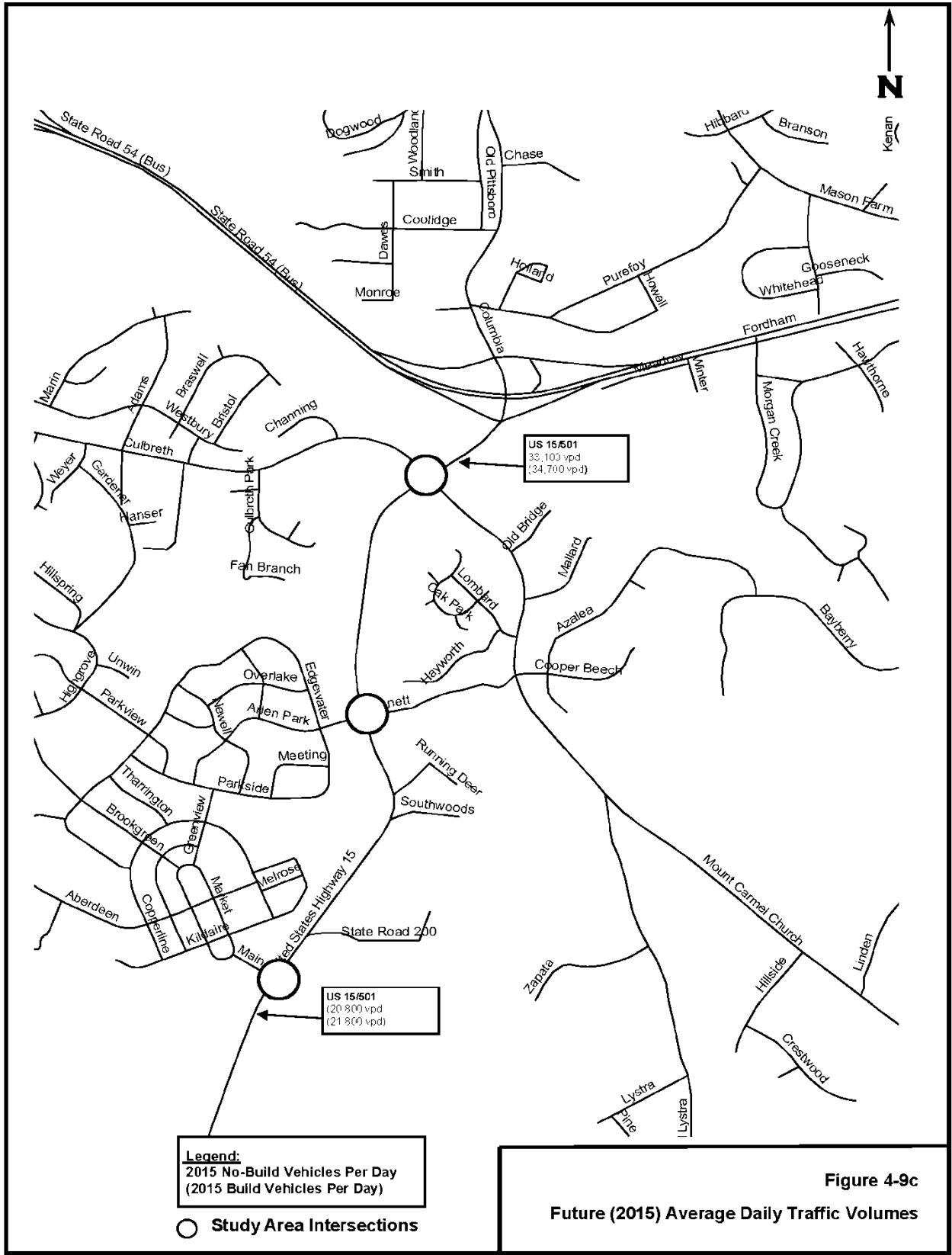
Link #	Roadway	2001 ADT	2003 ADT	2005 ADT	2006 ADT	2007 ADT	2009 ADT	2011 ADT	2013 ADT	2001-2015 Annual Growth Rate	Projected 2015 No-Build ADT	Projected 2015 Build ADT
1	S. Columbia St. (south of Franklin St.)	20,720	19,060	17,530	-	17,530	15,410	14,380	14,663	1.7%	15,200	17,300
2	Raleigh St. (south of Franklin St.)	14,470	10,710	13,080	13,080	11,020	11,710	9,910	10,514	0.6%	10,600	10,900
3	Cameron Ave. (west of Pittsboro St.)	9,820	8,300	8,510	-	7,630	9,260	7,220	6,693	0.9%	6,800	7,700
4	Cameron Ave. (east of S. Columbia St.)	9,070	8,330	6,430	6,430	5,270	5,540	5,910	4,679	1.2%	4,800	5,800
5	Country Club Rd. (north of South Rd.)	13,470	14,080	12,200	12,200	12,990	11,960	11,260	10,726	0.7%	10,900	11,300
6	South Rd. (east of Columbia St.)	10,460	8,840	11,400	-	8,400	7,430	8,370	8,593	1.7%	8,900	9,100
7	South Rd. (east of Raleigh St.)	9,840	10,000	12,890	12,890	7,500	7,510	7,730	7,944	2.0%	8,300	9,000
8	Pittsboro St. (south of McCauley St.)	10,960	10,070	10,920	-	9,550	9,750	8,810	8,061	1.4%	8,300	9,200
9	Manning Dr. (east of Columbia St.)	14,100	13,220	12,480	12,480	11,070	11,060	10,020	10,713	1.4%	11,000	13,700
10	Ridge Rd. (north of Manning Dr.)	8,320	7,870	7,300	7,300	7,910	8,730	8,110	7,819	2.0%	8,100	9,600
11	S. Columbia St. (south of Mason Farm Rd.)	18,470	18,250	16,190	-	16,090	15,430	14,760	13,982	1.3%	14,300	16,400
12	Manning Dr. (east of Ridge Rd.)	17,260	14,680	17,880	17,880	15,680	16,150	14,660	15,734	0.9%	16,000	20,100
13	Franklin St. (west of Raleigh St.)	17,000	19,260	18,850	-	19,320	16,250	14,370	14,605	0.9%	14,900	15,800
14	Franklin St. (east of Boundary St.)	-	23,560	20,190	20,190	24,730	17,390	16,770	16,614	0.9%	16,900	17,900
15	Boundary St. (south of Franklin St.)	-	3,230	2,320	2,320	2,140	2,230	2,400	2,225	0.6%	2,300	2,400
16	Mason Farm Rd. (east of S. Columbia St.)	7,700	8,230	3,400	3,400	8,390	7,330	6,910	6,314	2.0%	6,600	8,300
17	Mason Farm Rd. (north of Fordham Blvd.)	1,360	770	1,830	-	1,820	1,770	1,730	1,720	0.4%	1,700	1,800
18	Purefoy Rd. (east of Columbia St.)*	970	970	1,130	-	1,360	1,450	2,070	1,705	0.4%	1,700	2,500
19	US 15-501 (west of Main St.)	-	-	-	-	17,840	17,080	16,770	19,993	2.0%	20,800	21,800
20	US 15-501 (east of Culbreth Rd.)	30,480	-	30,000	-	30,310	30,570	28,390	31,867	2.0%	33,100	34,700
21	NC 54 (west of Hamilton Rd.)	45,400	-	44,000	-	47,940	43,470	41,230	41,388	2.0%	43,000	45,800
22	NC 54 (east of East Barbee Chapel Hill Rd.)	-	-	-	-	32,100	37,390	36,320	39,967	2.0%	41,600	44,300

Source: Table 4-9 of Development Plan TIA, December 2013

Figure 2.1: Future (2015) Average Daily Traffic Volumes







Intersection Level of Service Analysis

Delays at intersections are measured in terms of the Level of Service (LOS) in the peak hour. LOS ranges from A through F, based on the average control delay (the delay due to signals, stop signs, etc.). Table 2-2 explains the LOS categories. In urban areas, level D or above is generally regarded as acceptable for signalized intersections. At unsignalized intersections, level E or above on the side street is generally regarded as acceptable, although it is recognized that side streets typically function at level F because the traffic volumes often do not warrant a traffic signal to assist the side street traffic.

Table 2-2: Level of Service Descriptions for Intersections

Level of Service	Description	Delay at a Signalized Intersection	Delay at an Unsignalized Intersection
A	Little or no delay	10 seconds or less	10 seconds or less
B	Short traffic delay	10-20 seconds	10-15 seconds
C	Average traffic delay	20-35 seconds	15-25 seconds
D	Long traffic delay	35-55 seconds	25-35 seconds
E	Very long traffic delay	55-80 seconds	35-50 seconds
F	Unacceptable delay	More than 80 seconds	More than 50 seconds

Table 2.3 summarizes the LOS at each intersection for each scenario. Each cell includes the overall LOS at the intersection and the LOS for the worst-performing approach.

Existing conditions

The levels of service at most intersections have remained the same or even improved since 2011. At most intersections, the overall level of service is acceptable, although some minor street approaches are suffering some longer delays.

The following sections discuss some of the intersections that are shown to be experiencing long peak period delays or that have been identified by the Town of Chapel Hill and/or the North Carolina Department of Transportation for pedestrian safety concerns.

Manning Drive at Fordham Boulevard

The University has provided new traffic signal timings for this intersection, yet this intersection continues to experience the worst delays of the intersections immediately adjacent to the campus. The University prepared traffic signal plans in coordination with staff of the Town of Chapel Hill and NCDOT to upgrade at this intersection as well as at the adjacent intersection of Old Mason Farm Road at Fordham Boulevard. The proposed upgrades include crosswalk markings, wheelchair ramps, countdown pedestrian signals, pedestrian push-buttons, a new, larger pedestrian refuge island, and warning signs with flashing beacons for approaching drivers on Fordham Boulevard. The intent of these improvements is to provide a safer environment for pedestrians crossing the streets at each intersection. The improvements have been completed.

US 15-501 at Europa Drive/Erwin Road

At the time of data collection for the 2007 TIA Update, the intersection of US 15-501 at Europa Drive / Erwin Road was still operating as a conventional intersection. However, during January 2008, this intersection was converted to a superstreet, which, according to the staff of NCDOT, has improved traffic flow on 15-501. The superstreet section of US 15-501 at Europa Drive and Erwin Road was fully operational when traffic data was collected in the fall of 2013.

The superstreet section is reporting improved levels of service. All of the individual intersections that make up the superstreet section are operating at LOS C or better.

Although the superstreet at this location has improved traffic flow in this section of the corridor, a Major Investment Study (MIS) concluded that the size of the problem along 15-501 requires a large-scale integrated multimodal solution.

South Columbia Street at Cameron Avenue

This intersection marks the north end of the South Columbia Street-Pittsboro Street one-way pair. It experiences a high volume of pedestrian and bicycle traffic and results in traffic queues along Cameron Avenue to Raleigh Street and South Columbia Street). The Town and NCDOT coordinated on a project to implement special traffic signal phasing at this intersection which includes a pedestrians-only phase. The intent of the new traffic signal phasing is to provide a safer environment for pedestrians crossing the streets at this intersection. The new phasing for this intersection was in operation during the collection of traffic data.

A couple of unsignalized intersections are experiencing long delays on the minor approaches. These intersections are discussed below:

Country Club Road at Battle Lane/Boundary Street

This intersection was the subject of a special study during the analysis for Modification No. 1 of the UNC Development Plan. An outcome of that study was the implementation of measures to control the movement of pedestrians in the vicinity of this unsignalized intersection. Town staff has indicated that Town may wish to coordinate with the University to revisit the study of this intersection to determine the need for further upgrades. During discussions prior to the 2011 TIA update, staff of the Town expressed a desire to assess if peak period conditions merit additional improvements. Although some movements have experienced increased volume since 2007, no additional improvements are recommended at this time. The University will continue to monitor conditions at this intersection. In the past, staff of the Town of Chapel Hill has suggested the addition of an exclusive westbound left turn lane at the intersection of Country Club Road at Raleigh Street. Due to the complexity and constraints of this improvement (impacts on existing stone walls, adjacent property, and trees) it was determined that the assessment of these options be postponed.

No-Build conditions

In the No-Build scenario (that is, without the Development Plan projects), the intersections with poor LOS performance in 2013 will continue to perform poorly in 2015. In addition, the background traffic growth will make some other intersections perform poorly. In particular, the following intersections will deteriorate substantially:

- The intersection of US 15-501 at Sage Road is currently operating at LOS D during the PM peak hour but is expected to operate at LOS E during the PM peak hour in the No-Build (2015) scenario.
- The intersection of US 15-501 at Eastowne Drive/Lakeview Drive is currently operating at LOS D during the PM peak hour but is expected to operate at LOS E during the PM peak hour in the No-Build (2015) scenario.

Build conditions

Although the Development Plan has minimized the increase in parking, there will be traffic increases at some intersections. Under the Build conditions (that is, with the Development Plan projects), some intersections are expected to degrade further:

- The intersection of Manning Drive at Fordham Boulevard currently operates at LOS F during PM peak hour. This intersection is expected to continue to operate at LOS E in the PM peak hour under the No-Build and Build conditions.
- The intersection of US 15-501 at Sage Road is expected to operate at LOS D during the AM peak hour in the No-Build scenario but is expected to operate at LOS E in the Build (2015) scenario.
- The intersections of US 15-501 at Culbreth Road/Mt Carmel Church Road degrade from a LOS D during the AM peak period in the No-Build scenario to LOS E in the Build scenario.

Table 2.3: Existing and Forecast Intersection Levels of Service

ID #	Intersection	Control	No-Build (2015)		Build (2015)	
			AM	PM	AM	PM
1	Columbia Street/Rosemary Street	Signalized	C (WB-E)	C (WB-E)	C (WB-E)	C (WB-E)
2	Columbia Street/Franklin Street	Signalized	C (SB-D)	D (NB-D)	C (SB-D)	C (EB-D)
3	Franklin Street/Raleigh Street	Signalized	C (NB-E)	C (NB-E)	C (SB-D)	C (NB-E)
4	Merritt Mill Road/Cameron Avenue	Signalized	A (WB-D)	C (WB-D)	B (WB-D)	C (WB-D)
5	Cameron Avenue/Pittsboro Street	Signalized	B (EB-C)	B (EB-B)	B (EB-C)	B (EB-B)
6	Cameron Avenue/Columbia Street	Signalized	C (WB-E)	C (WB-F)	C (WB-F)	D (WB-F)
7	Cameron Avenue/Raleigh Street	Signalized	C (NB-D)	C (NB-D)	C (NB-D)	C (NB-E)
8	Pittsboro Street/McCauley Street	Signalized	B (EB-D)	B (EB-C)	B (EB-D)	B (EB-C)
9	Columbia Street/South Road	Signalized	C (EB-E)	D (EB-E)	C (EB-E)	D (EB-E)
10	Raleigh Street/South Road	Signalized	B (SB-D)	B (SB-D)	B (SB-D)	B (SB-D)
11	Country Club Road/South Road	Signalized	C (NB-D)	C (NB-E)	D (SB-E)	D (NB-F)
12	Columbia Street/Manning Drive	Signalized	C (WB-D)	D (WB-E)	C (WB-C)	E (WB-F)
13	Manning Drive/West Drive	Signalized	A (SB-D)	A (SB-D)	A (SB-E)	A (SB-D)
14	Manning Drive/East Drive	Signalized	B (NB-D)	C (NB-D)	B (NB-E)	C (NB-D)
15	Ridge Road/Manning Drive	Signalized	C (NB-D)	C (NB-E)	C (NB-E)	B (NB-D)
16	Mason Farm Road/Columbia Street	Signalized	B (EB-E)	C (EB-E)	B (EB-E)	C (WB-E)
17	Mason Farm Road/West Drive	Signalized	A (SB-D)	A (SB-E)	B (SB-C)	B (SB-E)
18	Mason Farm Road/East Drive	Signalized	C (NB-E)	B (NB-D)	C (NB-E)	B (NB-D)
19	Mason Farm Road/Purefoy Road	Unsignalized	A (EB-A)	A (SB-A)	A (EB-B)	A (SB-A)
20	Manning Drive/Skipper Bowles Drive	Unsignalized	A (NB-B)	A (NB-D)	A (NB-B)	C (NB-F)
21	Columbia Street/Purefoy Road	Unsignalized	A (WB-F)	A (WB-F)	B (WB-F)	A (WB-F)
22	Columbia Street/Fordham Boulevard (northern ramp)	Signalized	B (WB-D)	D (WB-D)	B (WB-D)	D (WB-D)
23	Columbia Street/Fordham Boulevard (southern ramp)	Signalized	B (EB-D)	B (EB-D)	B (EB-D)	B (EB-D)
24	Mason Farm Road/Fordham Boulevard	Unsignalized	A (SB-C)	A (SB-F)	A (SB-C)	A (SB-F)
25	Manning Drive/Fordham Boulevard	Signalized	D (NB-E)	E (SB-F)	D (NB-E)	E (SB-F)
26	Mason Farm Road/Oteys Road	Unsignalized	A (WB-A)	A (EB-A)	A (WB-A)	A (EB-A)
27	Franklin Street/Boundary Street	Signalized	B (SB-E)	C (SB-F)	B (SB-E)	C (SB-F)
28	Franklin Street/Park Place	Unsignalized	A (NB-A)	A (NB-B)	A (NB-B)	A (NB-B)
29	Battle Lane/Boundary Street	Unsignalized	A (WB-A)	B (NB-B)	A (WB-A)	C (NB-C)
30	Country Club Road/Battle Lane	Unsignalized	A (SB-D)	C (SB-F)	A (SB-E)	E (SB-F)
307	Country Club Road & Boundary Street	Unsignalized	A (SB-B)	A (SB-B)	A (SB-B)	A (SB-B)
31	Country Club Road/Gimghoul Road	Signalized	A (WB-E)	A (EB-D)	A (WB-E)	A (EB-D)
32	Manning Drive/Hibbard Drive	Signalized	A (SB-E)	B (SB-E)	A (SB-E)	A (SB-E)
33	Manning Drive/Craige Drive	Signalized	A (SB-E)	B (SB-E)	A (SB-E)	C (NB-E)
34	East Drive/Jackson Circle/Dogwood Deck Entrance	Unsignalized	A (WB-B)	A (WB-C)	A (WB-B)	A (WB-C)
35	East Drive/Dogwood Deck Exit	Unsignalized	A (EB-B)	A (EB-C)	A (EB-B)	B (EB-D)
36	Mason Farm Road/Hibbard Drive	Signalized	A (WB-B)	A (WB-B)	A (WB-B)	A (WB-B)
37	South Road/Bell Tower Drive	Signalized	A (NB-E)	B (NB-D)	A (NB-E)	C (NB-D)
38	Manning Drive/Old East Drive	Signalized	B (SB-D)	B (SB-D)	B (SB-E)	B (SB-D)
39	Manning Drive/Craige Deck	Unsignalized	A (NB-B)	A (NB-C)	A (NB-D)	A (NB-E)
101	US 15-501/Estes Drive	Signalized	C (WB-E)	C (WB-E)	C (WB-E)	C (WB-E)
102	US 15-501/Willow Drive	Signalized	B (WB-E)	C (WB-E)	B (WB-E)	C (WB-E)
103	US 15-501/Elliott Road	Signalized	A (EB-E)	B (EB-E)	A (EB-E)	B (EB-E)
104	US 15-501/Ephesus Church Road	Signalized	C (EB-E)	D (EB-F)	C (EB-F)	D (EB-F)
105	US 15-501/Erwin Road	Signalized	A (WB-A)	A (WB-A)	A (WB-A)	A (WB-A)
106	US 15-501/Europa Drive	Signalized	A (NB-E)	B (NB-E)	B (NB-F)	B (NB-E)
107	US 15-501/Superstreet NB U-Turn	Signalized	B (NB-E)	B (NB-E)	B (NB-F)	B (NB-E)
108	US 15-501/Superstreet SB U-Turn	Signalized	A (SB-D)	B (SB-E)	A (SB-E)	C (SB-E)
109	US 15-501/Sage Road	Signalized	D (SB-F)	E (SB-F)	E (SB-F)	E (SB-F)
110	US 15-501/Eastowne Drive/BCBS	Signalized	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)
111	US 15-501/Eastowne Drive/Lakeview Drive	Signalized	C (SB-F)	E (SB-F)	C (SB-F)	E (SB-F)
201	NC 54/Hamilton Street	Signalized	B (NB-D)	B (NB-D)	B (NB-D)	C (NB-D)
202	NC 54/Burning Tree Lane	Signalized	A (SB-D)	A (SB-D)	A (SB-E)	A (SB-D)
203	NC 54/Barbee Chapel Road Ext	Signalized	A (NB-D)	B (NB-E)	A (NB-E)	B (NB-F)
204	NC 54/Meadowmont Lane	Signalized	C (SB-D)	C (NB-E)	C (SB-D)	C (NB-E)
205	NC 54/Barbee Chapel Road (East)	Signalized	D (NB-F)	C (SB-E)	D (NB-F)	C (SB-E)
301	US 15-501/Culbreth Road/Mt Carmel Church Road	Signalized	D (WB-F)	B (EB-D)	E (WB-F)	C (EB-D)
302	US 15-501/Bennett Road/Arlen Park Drive	Signalized	B (EB-D)	A (EB-D)	B (EB-D)	A (EB-D)
303	US 15-501/Market Street	Signalized	B (EB-D)	B (EB-D)	B (EB-D)	B (EB-D)
305	Park Place & Boundary Street	Unsignalized	A (WB-A)	A (WB-B)	A (WB-B)	A (WB-B)

Legend: X = overall intersection level of service (X) = worst movement level of service
 Source: Table 4-11 of Development Plan TIA, December 2013

3: Development Plan Transportation Mitigation Measures and Recommendations

Overview of Mitigation Strategies and Measures

As the No-Build scenario showed, geometric improvements could be considered at several intersections even without the Development Plan. The list below describes the intersection improvements that have been approved and/or stipulated by the Town of Chapel Hill. Some of these have already been implemented.

- Columbia Street / South Road / McCauley Street: Improvements at this intersection are complete. The improvements included remodeling to improve pedestrian safety, as well as an exclusive left-turn lane on the McCauley Street approach that was accomplished through pavement marking changes without widening the road.
- South Road / Country Club Road: Improvements have already been made here without widening the road. A northbound right-turn lane has been added, and the southbound shared through-right lane has been converted to a shared left-through-right lane. In addition, realignment of the Ridge Road / County Club Road intersection, to give priority to Ridge Road, has been recommended as a long term option.
- Cameron Avenue / Raleigh Street: Signal phasing changes have been implemented to improve traffic flow. As discussed earlier, the Town has indicated the possibility of revisiting this intersection and considering the implementation of an exclusive westbound right-turn lane on Country Club Road.
- Country Club Road / Battle Lane / Boundary Street: Bollards and chains have been strategically provided to control pedestrians in and around this intersection, and a stamped asphalt pedestrian crossing was installed. If the Town and University determine that other improvements are necessary, the University will coordinate with the Town to design and implement the agreed upon improvements.
- Country Club Road / Gimghoul Road / Paul Green Theater Drive: A traffic signal including pedestrian countdown heads has been provided.
- Manning Drive / Skipper Bowles Drive: Based on peak period counts and the accident history at this location, turn restrictions have been implemented to prevent eastbound left-turns from Skipper Bowles Drive onto northbound Manning Drive during special events. Recent changes in the parking allocation of the Development Plan indicated the potential for an increase in the number of parking spaces accessible via Skipper Bowles Drive. It was noted in past Annual Reports that the University would collect additional traffic volume data at this intersection to perform a more thorough analysis to determine if applicable warrants for the installation of a traffic signal are met. The proposed changes to the parking allocation, while still included in the Development Plan, have not been constructed therefore the additional signal warrant analysis has not been performed.
- South Columbia Street, between Manning Drive and South Road: The cross-section of this portion of South Columbia Street has been altered as stipulated to remove a vehicular travel lane and to add an exclusive bike lane and an exclusive bus lane. Construction of the accompanying streetscape features north of the midblock crossing is complete and the construction work on the southern

section is scheduled to be complete in 2013. A new pedestrian activated traffic signal at the intersection of South Columbia Street and Medical Drive was also constructed as part of the streetscaping project.

- Manning Drive / Fordham Boulevard: Stipulated improvements for this intersection have been completed. The University provided funding for the stipulated street lighting. The University also prepared traffic signal upgrade plans in coordination with the Town and NCDOT for the stipulated traffic signal upgrades at this intersection to improve pedestrian safety. The Town of Chapel Hill utilized contractor services to complete the intersection upgrades.
- Manning Drive / Old Mason Farm Road: Stipulated improvements for this intersection have been completed. The University has provided funding for the stipulated street lighting. The University also prepared traffic signal upgrade plans in coordination with the Town and NCDOT for the stipulated traffic signal upgrades at this intersection to improve pedestrian safety. The Town of Chapel Hill utilized contractor services to complete the intersection upgrades.
- Mason Farm Road / East Drive: A stipulated traffic signal for this intersection has been constructed. The University prepared the necessary traffic signal plans and provided those plans to the Town of Chapel Hill. The Town utilized contractor services to construct the new traffic signal.
- Mason Farm Road / West Drive: Signal plans were approved by the Town of Chapel Hill; however, the plans required revision to incorporate a geometric roadway changes due to an adjacent building project. A temporary traffic signal has been constructed at this intersection due to the impacts of the adjacent building construction. The plans for the final signal installation, which includes metal poles with mastarms, will be constructed following the completion of the construction of the adjacent building.
- Ridge Road: Resurfacing has been stipulated along the length of the road. Other safety improvements have already been made near the Rams Head Center and other pedestrian safety enhancements have been constructed adjacent to Boshamer Stadium and were completed in 2010.
- Manning Drive / Ridge Road: Although traffic delays are not an egregious problem here, there are speed and appearance issues. Measures to reduce and calm traffic and to enhance pedestrian safety should be studied. Measures to encourage pedestrians to cross at the intersection have been implemented.

Impacts to Date and Target Mode Splits

Table 3.1 shows the proportions of employees and students traveling to campus by each mode of transportation ('mode splits') in 2001, 2004, 2007, 2009, 2011, and 2013 plus the current targets for 2015. The latest commuter survey was carried out in spring 2013. In 2001, the University was already performing well, with 28% of employees and 67% of students using alternative modes to reach the campus. The 2004, 2007, 2009, 2011, and 2013 commuter surveys provided a snapshot of progress part-way into the Development Plan, and the 2015 targets have been updated in light of this experience.

As expected, the proportion of both employees and students driving alone has fallen further since 2001, with the exception of an increase in employees driving alone

between 2009 and 2011 (likely due to ongoing parking deck construction and the associated loss of surface parking). This general decrease in employees and students driving alone is because (a) construction to date has resulted in a net loss of over 1,000 employee spaces, (b) the employee and student populations have increased, and (c) the University has invested heavily in improvements to alternative modes. Park-and-ride has been particularly popular for employees, and Chapel Hill Transit (CHT) has been particularly popular for students. This is a successful result of investment in extensive park-and-ride lots with frequent shuttle services, and in fare-free transit and other service enhancements.

It appears that some employees living in Chapel Hill and Carrboro are choosing to drive to a park-and-ride lot rather than walk to a local CHT stop, in order to take advantage of the more frequent transit service. This may not be as big a problem as in the past because of the new park-and-ride fees which have reduced use at park-and-ride lots. Also, geocoding data show that University employees are living further away from campus than in previous years, increasing the value of park-and-ride compared to CHT.

Table 3.1: Baseline, Current and Target Mode Splits

Mode	Employees						New Projections
	2001 Existing Ratio	2004 Existing Ratio	2007 Existing Ratio	2009 Existing Ratio	2011 Existing Ratio	2013 Existing Ratio	
Drive alone	0.72	0.61	0.56	0.49	0.57	0.51	0.56
Carpool/vanpool	0.06	0.05	0.06	0.07	0.05	0.05	0.08
Bus	0.06	0.08	0.10	0.13	0.10	0.15	0.16
Bicycle	0.03	0.02	0.03	0.04	0.02	0.04	0.03
Walk	0.02	0.02	0.03	0.03	0.02	0.03	0.02
Park-and-ride	0.07	0.15	0.16	0.17	0.18	0.16	0.11
Other	0.04	0.06	0.07	0.07	0.05	0.07	0.04
	1.00	0.99	1.01	1.00	0.99	1.01	1.00

Mode	Commuting Students						New Projections
	2001 Existing Ratio	2004 Existing Ratio	2007 Existing Ratio	2009 Existing Ratio	2011 Existing Ratio	2013 Existing Ratio	
Drive alone	0.33	0.19	0.18	0.17	0.14	0.16	0.17
Carpool/vanpool	0.08	0.07	0.08	0.03	0.04	0.04	0.08
Bus	0.21	0.34	0.35	0.39	0.42	0.37	0.40
Bicycle	0.09	0.05	0.06	0.11	0.10	0.08	0.08
Walk	0.12	0.14	0.14	0.12	0.11	0.15	0.11
Park-and-ride	0.12	0.16	0.10	0.14	0.15	0.12	0.11
Other	0.06	0.06	0.09	0.05	0.05	0.08	0.06
	1.01	1.01	1.00	1.01	1.01	1.00	1.01

Notes

1. "Carpool/vanpool" includes drivers and passengers.
2. "Bus" includes Chapel Hill Transit and Regional Transit.
3. "Other" includes motorcycles, dropped off, work from home, etc.

Estimated Air Quality Impacts

The strong use of alternative modes, compared to a typical development of this size, also has a benefit for air quality. The emission reductions, compared to a typical development, are estimated to be:

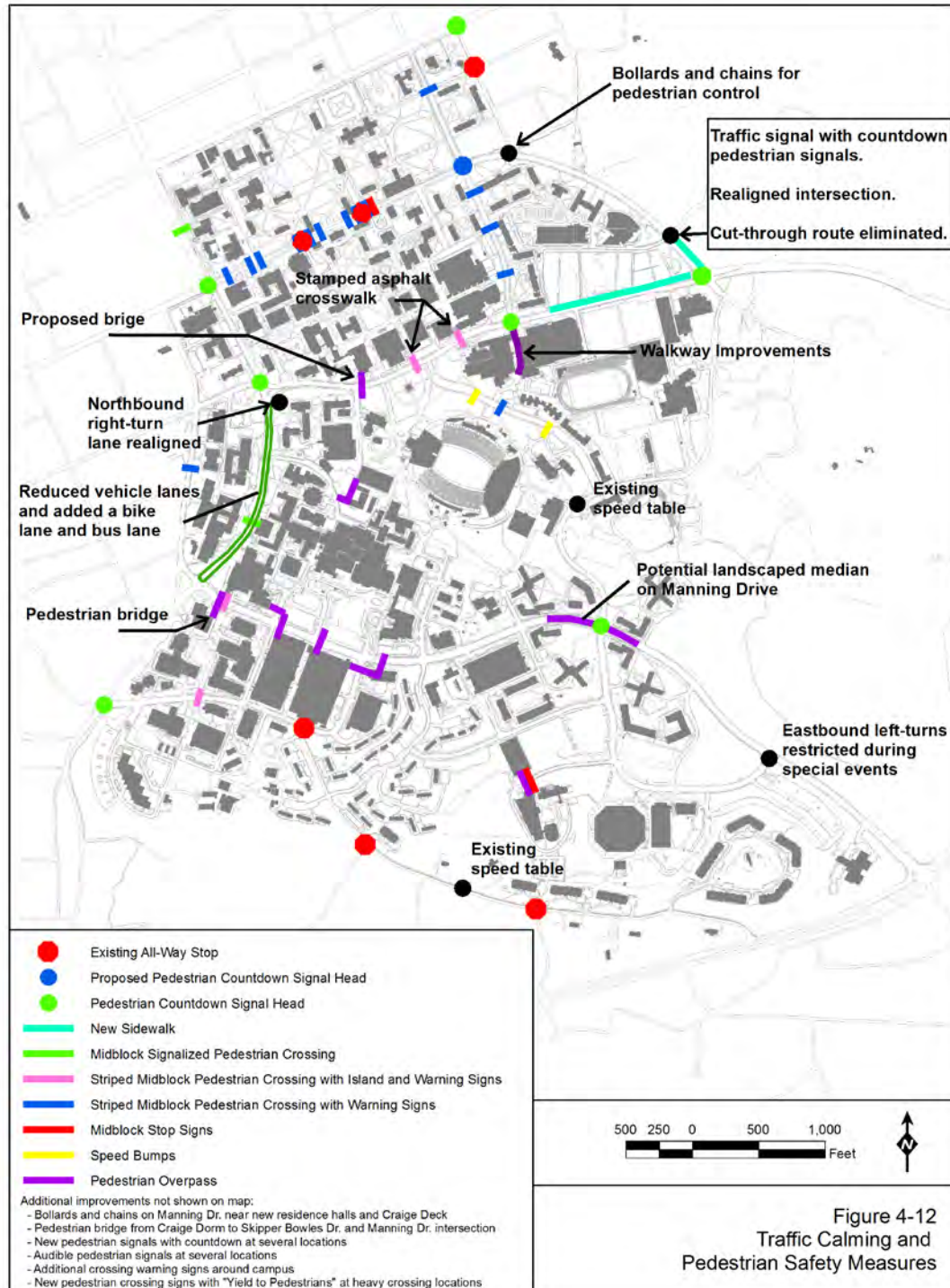
- Nitrous Oxides (NOx): 19 kg/day (4,730 kg/year)
- Volatile Organic Compounds (VOC): 15 kg/day (873 kg/year)
- Carbon Monoxide (CO): 353 kg/day (88,281 kg/year)

Methodology and data analyzed for estimating air quality impacts are explained in more detail in Section 3.5 of the December 2013 Development Plan TIA report.

Existing and Proposed Traffic Calming Measures On Campus

Figure 3.1 shows the recent traffic calming measures implemented on campus, as well as some potential long term projects. Some of the potential long term measures may include pedestrian and bicycle improvements. Recent improvements include new pedestrian countdown signal heads at several intersections, new sidewalks, and new mid-block pedestrian crossings using a variety of engineering treatments.

Figure 3.1: Traffic Calming and Pedestrian Improvements On Campus



Existing and Proposed Traffic Calming Measures in Adjacent Neighborhoods

The Transportation Impact Analysis (TIA) guidelines agreed to by the Town of Chapel Hill and the University in 2001 do not require the TIA to analyze traffic calming in adjacent neighborhoods. However, the University maintains an ongoing dialog with the Town about possible impacts and potential mitigation measures. Not only has the University agreed to provide traffic calming measures on campus, but the University has also agreed to provide traffic calming measures on streets in neighborhoods immediately adjacent to the campus. As part of this process, the University worked with the Town's traffic engineering staff and with neighborhood residents.

Table 3.2 shows the streets that were considered for possible impacts and potential mitigation measures. The measures that were agreed upon have all been implemented as indicated in Table 3.2. The measures were designed and implemented at no cost to the Town. The Town will maintain the traffic calming devices on Town streets.

In 2011 Town staff indicated some neighborhood residents had applied to the Town to consider additional traffic calming to be implemented. The University gathered daily traffic volume and vehicle speed data at three locations on streets where traffic calming measures had been constructed. The data was provided to the Town staff for use in their assessment of the resident's application. To date, the Town of Chapel Hill has not taken action to modify the traffic calming measures that were designed and constructed by the University.

Table 3.2: Neighborhood Streets Considered for Traffic Calming Measures

Street	Identified for Implementation?	Traffic Calming Measures	
		Status	Element
Westwood Drive, Ransom Street, McCauley Street, and Vance Street	No. Traffic calming measures have already been implemented.	Complete	All-way stops Improved pavement markings Speed tables
Oteys Road	No. Traffic calming measures have already been implemented.	Complete	Speed table
Purefoy Road	No. Traffic calming measures have already been implemented.	Complete	Speed tables and all-way stops
Mason Farm Road	No. Traffic calming measures have already been implemented.	N/A	N/A
Ridge Road	No. Traffic calming measures have already been implemented.	N/A	N/A
Laurel Hill Road	No. Alignment and cross-section of road is already a calming measure prohibiting high travel speeds and creating longer travel times than competing routes.	N/A	N/A
Gimghoul Road	No. Church property was sold and will be redeveloped as residential units. As a result, the cut-through route connecting to South Road (NC 54) was eliminated. The intersection of Gimghoul Road and Country Club Road has been signalized. Paul Green Theater Drive was relocated to align with Gimghoul Road.	Complete	New traffic signal Decreased corner radii at intersection with Country Club Road Stamped asphalt crosswalks Audible, countdown pedestrian signals
Raleigh Street	No. Traffic calming measures have already been implemented.	N/A	N/A
Cameron Avenue	No. Traffic calming measures have already been implemented.	N/A	N/A
Battle Lane	No. Traffic calming measures have already been implemented.	N/A	N/A
Boundary Street	Yes. Plans were completed and submitted to Town for implementation.	Complete	Speed table
Park Place	No. Traffic calming devices were deemed not feasible on this street.	N/A	N/A