

The University of North Carolina at Chapel Hill

Annual Development Plan Report on Transportation



December 2008

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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 2007 and amended in January 2008. Because the Development Plan TIA has not been updated or modified since January 2008, this edition of the Annual Development Plan Report on Transportation is substantially similar to the January 2008 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 the 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, and
- Williamson Building

In addition, the following projects were completed since the last Annual Report (Jan 2008):

- Genetic Medicine Building,
- Physicians Office Building,
- Manning Steam Plant, and
- Science Complex Phase II – Addition to Sitterson Hall (Frederick Brooks Hall)

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

- Science Complex Phase II – New Venable,
- Addition to Boshamer Stadium,
- North Carolina Cancer Hospital,
- Genome Science Building,
- Dental Science Building,
- Sports Medicine Building,
- Addition to Carmichael Auditorium, and
- Other infrastructure projects.

In total, the Development Plan projects involve about 7.8 million gross square feet of new buildings. This includes about 1.95 million square feet for parking decks and 306,000 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 Figures 1.1a and 1.1b show their locations. The projects can be summarized as follows:

<u>Type of building</u>	<u>Square Footage</u>
Academic	1,965,626
Cultural	127,725
Housing	783,162
Infrastructure	306,000
Office	460,200
Parking	1,950,700
Research	787,400
Student Life	335,300
UNC Health Care	961,350
Athletics	145,000
Total	<u>7,822,463</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 (particularly the growing number of hospital patients). 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 ten-year period of the plan. Employee numbers are forecast to grow by 28%, and student numbers by 17%. 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 about 1,740 employee spaces, about 279 commuting student spaces and about 450 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 about 11,200 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	03/05	02/07
A-2	Academic	73,100	03/05	02/07
A-3	Academic	25,600	03/05	02/07
A-4	Academic	20,000	03/05	02/07
A-5	Academic	55,200	03/05	02/07
A-6	Academic	90,000	07/03	06/05
A-7	Academic	41,000	02/06	08/08
A-8	Academic	154,500	02/06	08/08
A-9	Academic	396,700	02/06	08/08
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	08/07	08/09
A-15	Academic	59,700	03/04	02/06
	Academic	-	03/04	02/06
A-16	Academic	23,100	03/04	02/06
A-17	Academic	53,200	06/02	12/03
A-18	Academic	936	08/04	03/04
A-19	Academic	1,600	03/05	03/06
A-20 *	Academic	200,000	05/08	07/10
A-21	Academic	80,000	01/08	07/10
A-22	Academic	75,000	05/10	05/12
A-23 *	Academic	50,000	05/08	07/10
	Total Academic	1,965,626		
C-1	Cultural	36,000	12/02	05/04
C-2	Cultural	26,400	05/02	11/03
C-3	Cultural	37,325	12/01	01/03
C-4	Cultural	3,000	11/02	02/04
C-5	Cultural	10,000	01/06	06/07
C-6	Cultural	15,000	07/08	07/10
	Total Cultural	127,725		
*	Revised from June 8, 2006 Table 4			
H-1	Housing	13,500	05/03	07/04
H-2	Housing	13,500	05/03	07/04
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	01/04	08/05
H-9	Housing	42,000	01/04	08/05
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
	Total Housing	783,162	*	

Table 1.1: Development Plan Projects (cont.)

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	-		
I-5 Mod	Infrastructure	100,800	01/08	07/10
I-6	Infrastructure	48,000	01/10	01/12
I-7	Infrastructure	N/A	05/10	05/12
	Total Infrastructure	306,000		
O-1	Office	133,200	07/03	05/05
O-2	Office	30,000	11/02	05/06
O-3	Office	105,000	07/04	03/06
O-4	Office	180,000	01/08	07/10
O-5	Office	12,000	05/10	05/12
	Total Office	460,200		
P-1	Parking	115,500	12/04	05/06
P-2	Parking	Deleted	08/05	04/07
P-3	Parking	252,600	05/02	10/04
P-4 Mod	Parking	225,000	12/05	01/07
P-5	Parking	255,500	11/07	03/10
P-6	Parking	134,400	12/02	11/05
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	05/09	05/11
P-12	Parking	96,200	05/09	05/11
	Total Parking	1,950,700		

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

R-1	Research	109,000	07/07	07/10
R-2	Research	49,000	07/07	07/10
R-3	Research	74,400	07/07	07/10
R-4	Research	225,000	08/02	12/04
R-5	Research	330,000	05/08	05/10
	Total Research	787,400		
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	12/05	06/07
	Total Student Life	335,300		
UNCH-1	UNC Health Care	196,280	06/03	12/05
UNCH-2	UNC Health Care	343,180	12/07	12/10
UNCH-3	UNC Health Care	291,890	03/05	02/08
UNCH-4	UNC Health Care	130,000	03/06	07/07
	Total UNC Health Care	961,350		
ATH-1	Athletics	20,000	05/07	01/08
ATH-2	Athletics	125,000	11/08	09/10
	Total UNC Athletics	145,000		
	Campus Total	7,822,463		

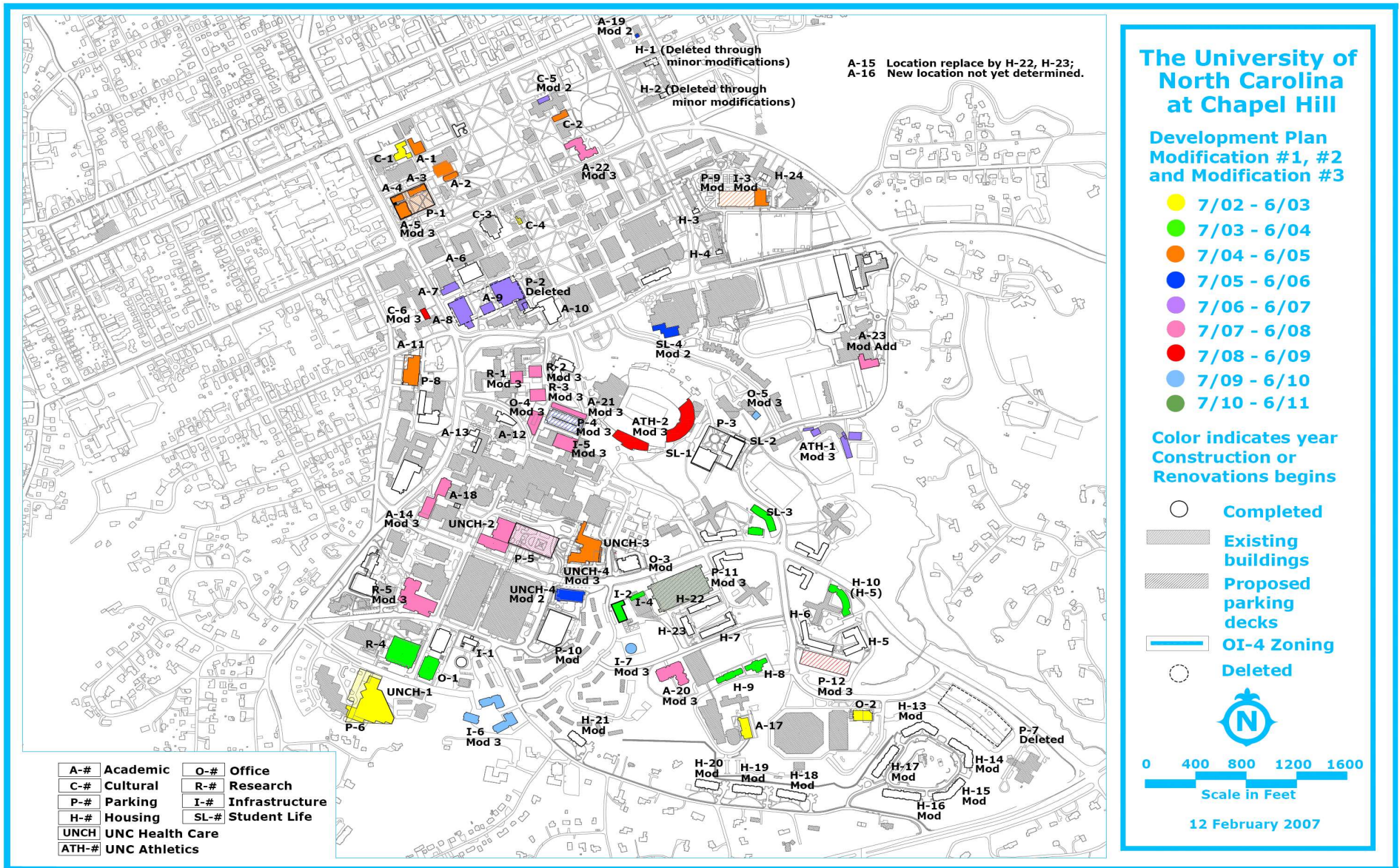


Figure 1.1 – Development Plan Projects

Table 1.2: Parking Space Impacts

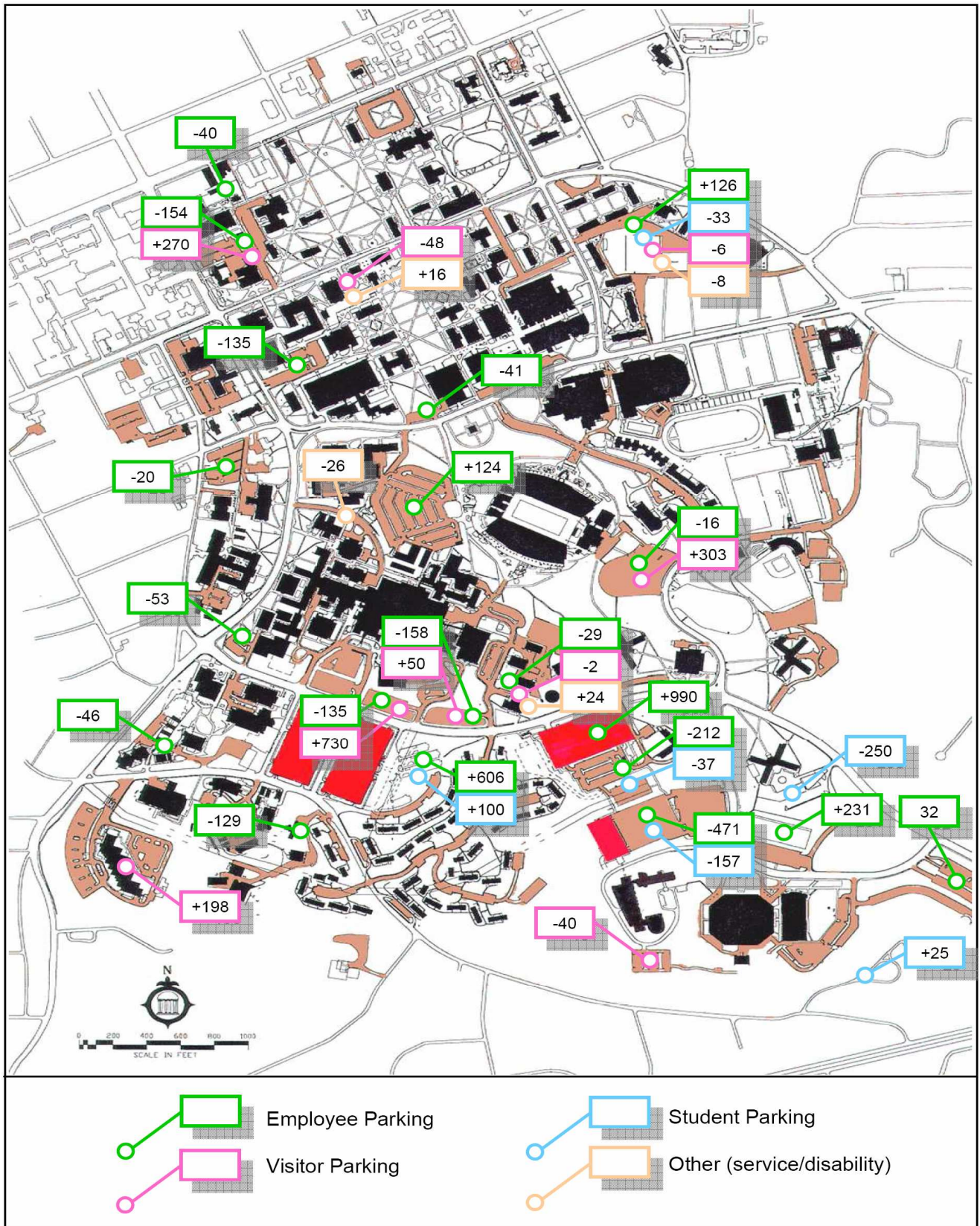
Lot / Project Name	Number of Spaces ^{1,2}							Net Change
	Parking Zone	Employee	Commuting Student	Resident Student	Student in Family Housing	Visitor	Other	
ACC (new structure)						198		198
Bell Tower (new structure)	BG	124						124
Bowles	S11	-471	-157					-628
Cameron/Swain (Arts Common Deck - new 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:

- Numbers are subject to change, depending on the final footprint of each project.
- These numbers represent net changes only. For example, the Rams Head structure has 700 spaces, but 397 were displaced as a result of its construction. The net impact, which is shown in this table, is 303 spaces.
- 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, January 2008

Figure 1-2: Parking Impacts of Development Plan



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 2007);
- No-Build conditions (the forecast conditions in 2010 if the Development Plan projects did not exist); and
- Build conditions (the forecast conditions in 2010 including the effects of the Development Plan projects).

The existing conditions were measured using traffic counts collected in Spring and Fall 2007 on days when the University was in session. Because similar analyses were undertaken in 2001, 2003, and 2005, 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, 2005/2006, and 2007/2008 along with the No-Build and Build forecasts for 2010. Figure 2.1 illustrates the two forecasts for 2010.

Traffic volumes have generally remained stable, or, in some cases, decreased, since the 2005/2006 counts. One possible reason is the ongoing development and implementation of the University's Transportation Demand Management (TDM) program, including fare-free operation of Chapel Hill Transit. 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.

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 particular 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 (2010) Traffic Volumes

Link #	Roadway	2001 ADT	2003 ADT	2005 ADT	2006 ADT	2007 ADT	2001-2010 Annual Growth Rate	Projected 2010 No-Build ADT	Projected 2010 Build ADT	2001-2007 AGR
1	S. Columbia St. (south of Franklin St.)	20,720	19,060	17,530	-	17,530	1.7%	19,000	21,100	-2.7%
2	Raleigh St. (south of Franklin St.) [4]	14,470	10,710	13,080	13,080	11,020	0.6%	11,300	11,400	-4.4%
3	Cameron Ave. (west of Pittsboro St.)	9,820	8,300	8,510	-	7,630	0.9%	8,000	8,800	-4.1%
4	Cameron Ave. (east of S. Columbia St.) [1]	9,070	8,330	6,430	6,430	5,270	1.2%	5,600	6,800	-8.7%
5	Country Club Rd. (north of South Rd.)	13,470	14,080	12,200	12,200	12,990	0.7%	13,400	14,400	-0.6%
6	South Rd. (east of Columbia St.) [2]	10,460	8,840	11,400	-	8,400	1.7%	9,100	10,600	-3.6%
7	South Rd. (east of Raleigh St.) [2]	9,840	10,000	12,890	12,890	7,500	2.0%	8,300	8,700	-4.4%
8	Pittsboro St. (south of McCauley St.)	10,960	10,070	10,920	-	9,550	1.4%	10,200	11,300	-2.3%
9	Manning Dr. (east of Columbia St.)	14,100	13,220	12,480	12,480	11,070	1.4%	11,800	14,300	-4.0%
10	Ridge Rd. (at Manning Dr.)	8,320	7,870	7,300	7,300	7,910	2.0%	8,700	10,900	-0.8%
11	S. Columbia St. (south of Mason Farm Rd.)	18,470	18,250	16,190	-	16,090	1.3%	17,100	19,900	-2.3%
12	Manning Dr. (east of Ridge Rd.) [4]	17,260	14,680	17,880	17,880	15,680	0.9%	16,400	19,800	-1.6%
13	Franklin (west of Raleigh St.) [4]	17,000	19,260	18,850	-	19,320	0.9%	20,100	20,200	2.2%
14	Franklin (east of Boundary St.) [4]	-	23,560	20,190	20,190	24,730	0.9%	25,800	25,900	10.7%
15	Boundary (south of Franklin St.)	-	3,230	2,320	2,320	2,140	0.6%	2,200	2,300	-4.0%
16	Mason Farm Rd. (east of Columbia St.) [3]	7,700	8,230	3,400	3,400	8,390	2.0%	9,200	10,000	1.4%
17	Mason Farm Rd. (north of Fordham Blvd.) [3]	1,360	770	1,830	-	1,820	0.4%	1,900	2,100	5.0%
18	Purefoy Rd. (east of Columbia St.) [3]	970	970	1,130	-	1,360	0.4%	1,400	1,500	5.8%
19	US 15-501 (west of Main St.)	-	-	-	-	17,840	2.0%	19,600	20,400	N/A
20	US 15-501 East of Culbreth Road [4]	30,480	-	30,000	-	30,310	2.0%	33,300	35,000	-0.1%
21	NC 54 west of Hamilton Road	45,400	-	44,000	-	47,940	2.0%	52,700	54,300	0.9%
22	NC 54 east of East Barbee Chapel Hill Road	-	-	-	-	32,100	2.0%	35,300	36,000	N/A

- [1] Swain Lot was closed when data was collected.
 [2] Bell Tower Lot was reduced to only 150 spaces when data was collected.
 [3] Year 2001 ADT estimated using calculated 2005 peak to daily ratio (K-factor).
 [4] Recounted in January 2008

Source: Table 4-9 of Development Plan TIA, January 2008

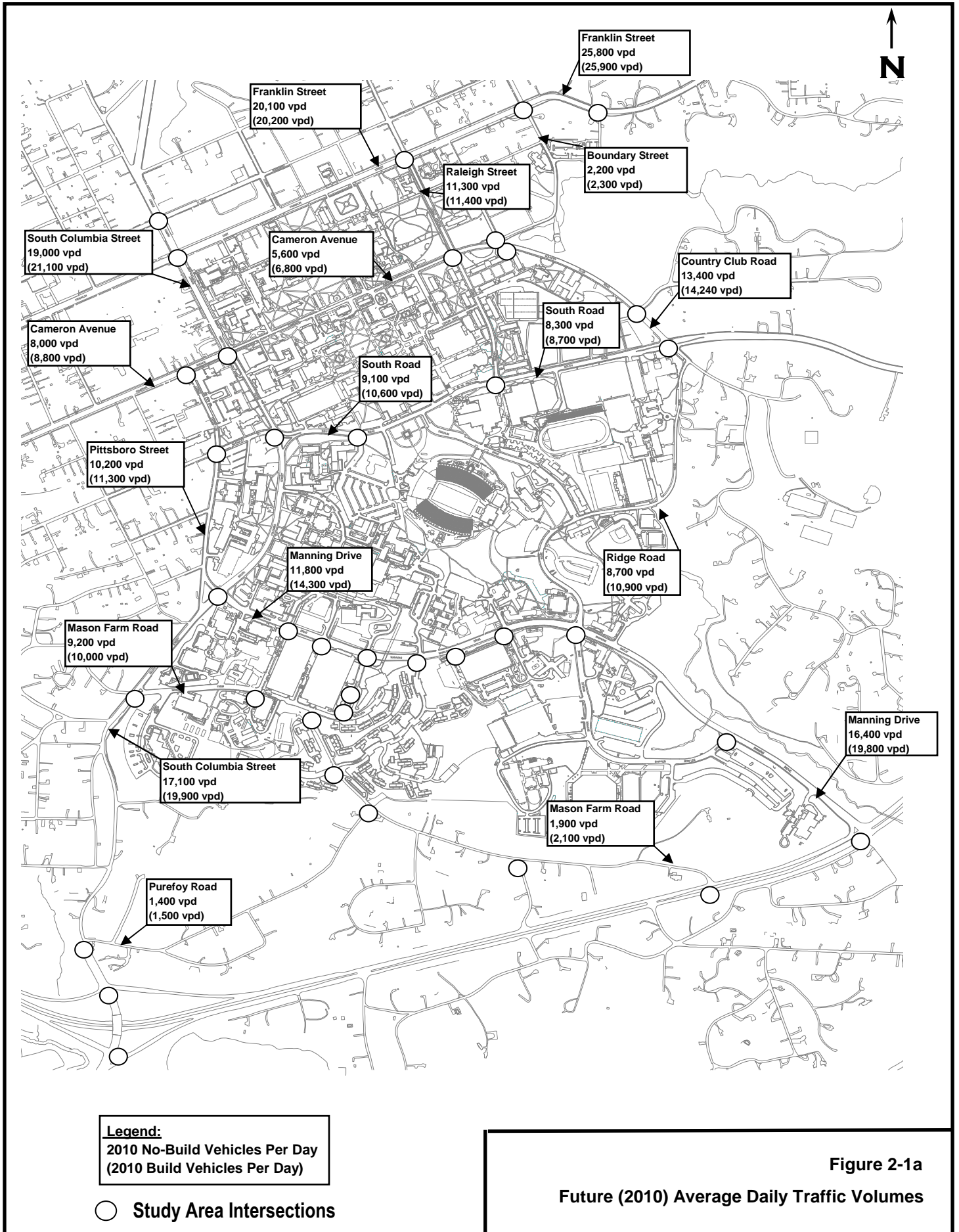
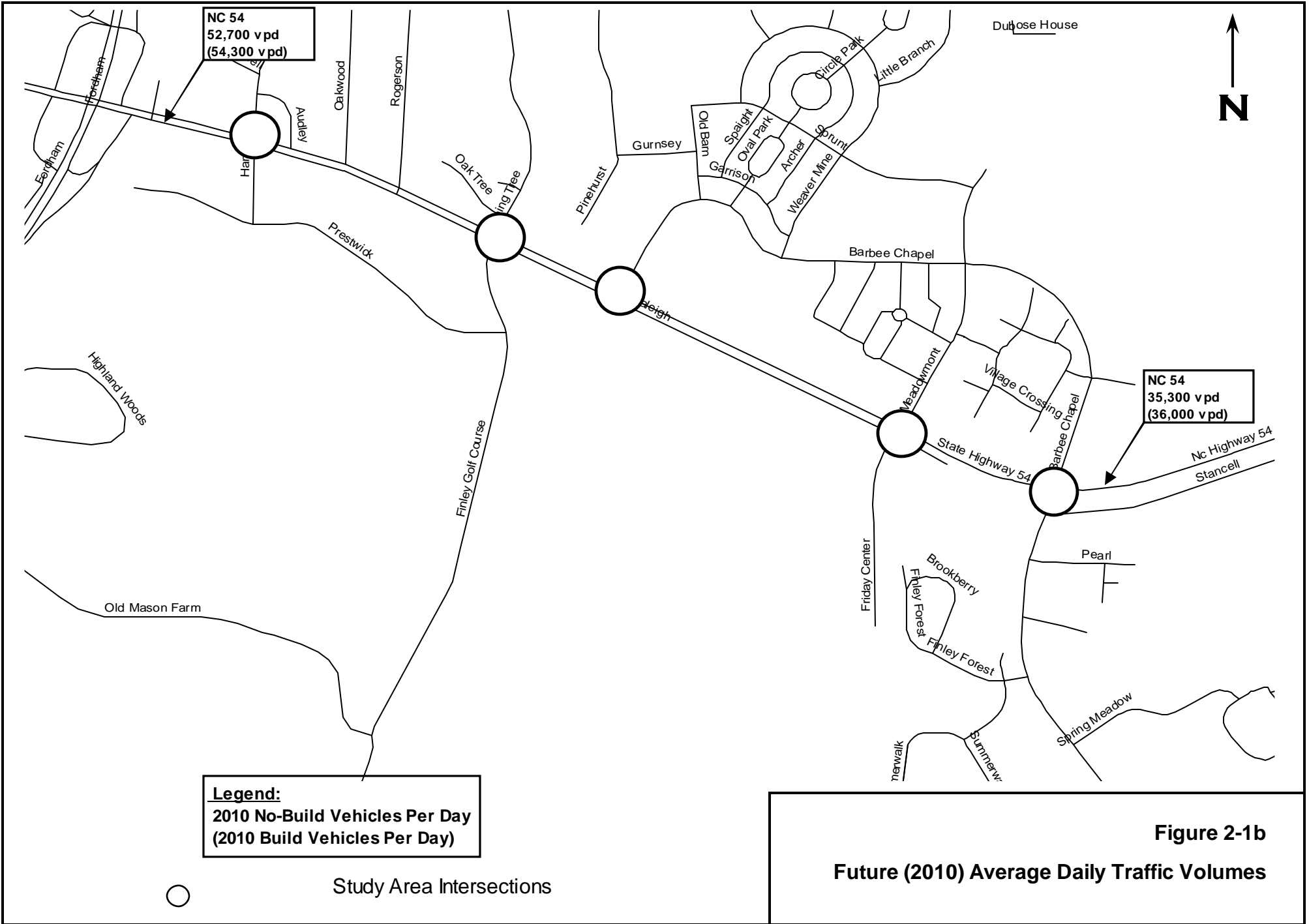
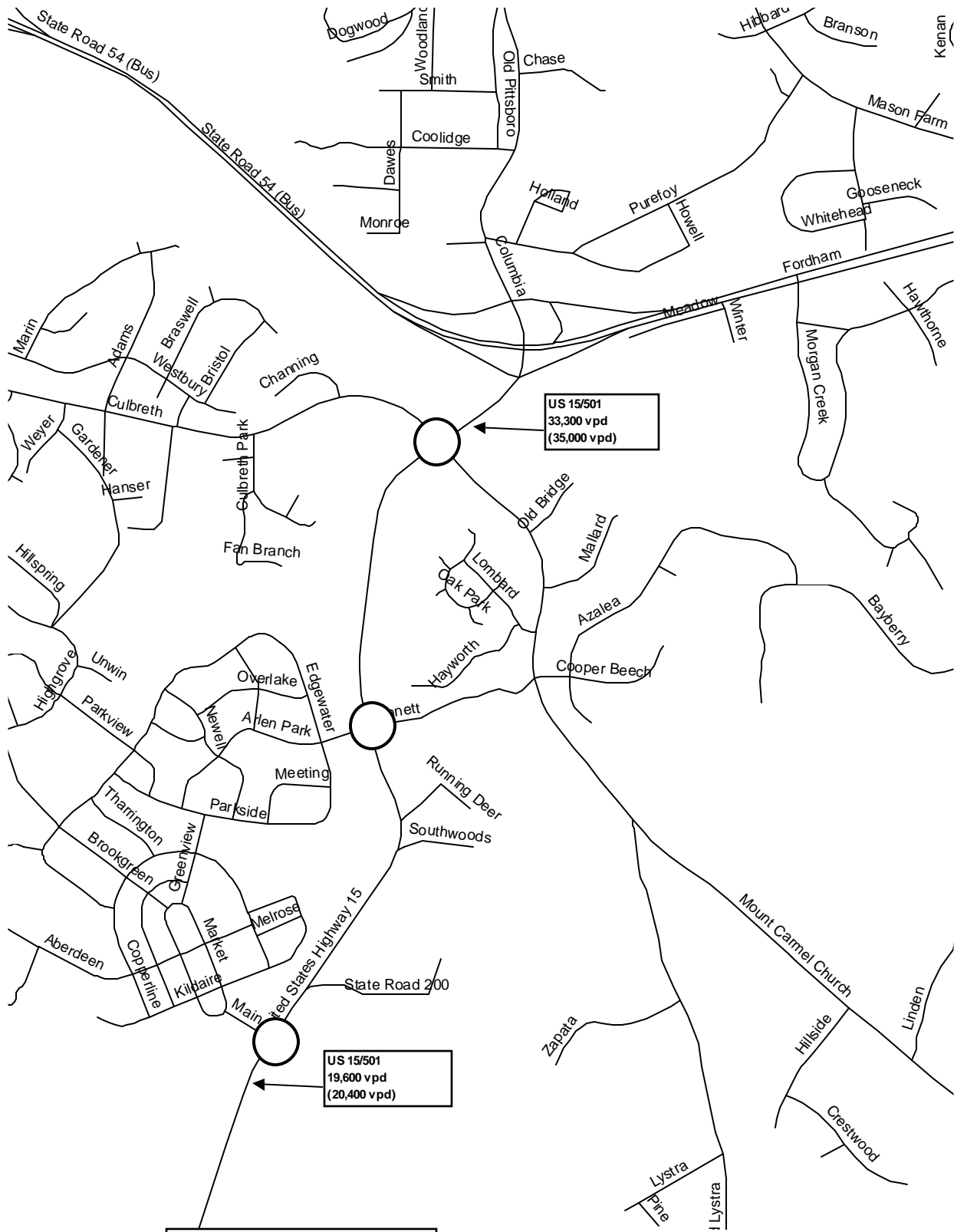


Figure 2-1a
Future (2010) Average Daily Traffic Volumes





Legend:
 2010 No-Build Vehicles Per Day
 (2010 Build Vehicles Per Day)

○ Study Area Intersections

Figure 2-1c
 Future (2010) 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 2005/2006. 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 is working in coordination with staff of the Town of Chapel Hill and NCDOT to design and implement traffic signal upgrades 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.

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. According to NCDOT staff, the resulting overall level of service for the superstreet section of this corridor is in the range of LOS C or D during the peak hours of traffic.

The intersection of US 15-501 at Europa Drive/Erwin Road had reported the worst level of service in the 15-501 corridor prior to the conversion to a superstreet. NCDOT is continuing to adjust the traffic signal timings in this corridor to optimize traffic flow and is planning to perform an “after” study to assess the impacts of the superstreet on traffic operations in the corridor. The schedule and scope of the study have not been established.

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 have recently 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.

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

South Columbia Street at Purefoy Road

Although the analysis indicates long delays for the Purefoy Road approach, the installation of a traffic signal is not recommended. The implementation of a traffic signal at this location would most likely result in increased traffic volumes on Purefoy Road, which is counter to the recently implemented traffic calming measures. A new traffic signal at this intersection would also be detrimental to the traffic operations on South Columbia Street due to the close proximity to the interchange of South Columbia Street and 15-501.

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 preliminary discussions, staff of the Town has expressed a desire to accompany any further upgrades at this intersection with the addition of an exclusive westbound right-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 2007 will continue to perform poorly in 2010. In addition, the background traffic growth will make some other intersections perform poorly. In particular, the following intersections will deteriorate substantially:

- Cameron Avenue / South Columbia Street: deteriorates during the afternoon peak hour to LOS E.
- Manning Drive / Fordham Boulevard: deteriorates during the afternoon peak hour to LOS F.

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), two intersections are expected to degrade further:

- Cameron Avenue at South Columbia Street: deteriorates during the afternoon peak period to LOS F.
- Mason Farm Road / Columbia Street: deteriorates even further in the afternoon peak period to LOS E.

Table 2.3: Existing and Forecast Intersection Levels of Service

ID #	Intersection	Control	Existing (2008)		No-Build (2010)		Build (2010)	
			AM	PM	AM	PM	AM	PM
1	Columbia Street/Rosemary Street	Signalized	C (SB-C)	C (NB-D)	C (WB-C)	C (EB-D)	C (WB-C)	D (EB-D)
2	Columbia Street/Franklin Street	Signalized	D (EB-D)	D (SB-E)	D (EB-D)	D (EB-E)	D (EB-D)	D (EB-E)
3	Franklin Street/Raleigh Street	Signalized	D (NB-F)	D (NB-E)	D (NB-F)	C (NB-E)	D (NB-F)	C (NB-E)
4	Merritt Mill Road/Cameron Avenue	Signalized	B (NB-B)	C (NB-B)	B (NB-C)	C (NB-B)	B (NB-C)	D (NB-B)
5	Cameron Avenue/Pittsboro Street	Signalized	B (EB-D)	B (EB-C)	B (EB-D)	B (WB-B)	B (EB-D)	B (WB-B)
6	Cameron Avenue/Columbia Street	Signalized	D (WB-D)	E (NB-F)	D (WB-D)	E (SB-F)	D (WB-D)	F (SB-F)
7	Cameron Avenue/Raleigh Street	Signalized	B (EB-C)	C (EB-D)	B (EB-C)	C (EB-D)	B (EB-C)	D (EB-F)
8	Pittsboro Street/McCauley Street	Signalized	B (EB-D)	C (WB-C)	B (EB-D)	C (EB-C)	B (EB-C)	C (WB-C)
9	Columbia Street/South Road	Signalized	C (EB-E)	C (EB-E)	C (EB-E)	C (EB-E)	C (EB-E)	C (EB-E)
10	Raleigh Street/South Road	Signalized	B (WB-B)	B (WB-B)	B (WB-B)	B (WB-B)	B (WB-B)	B (WB-C)
11	Country Club Road/South Road	Signalized	C (SB-D)	C (SB-D)	C (SB-D)	C (EB-D)	C (SB-D)	C (EB-D)
12	Columbia Street/Manning Drive	Signalized	C (EB-D)	C (EB-D)	C (EB-C)	C (EB-C)	C (NB-C)	C (NB-C)
13	Manning Drive/West Drive	Signalized	A (SB-E)	A (SB-E)	A (SB-E)	A (SB-E)	A (SB-E)	A (SB-E)
14	Manning Drive/East Drive	Signalized	B (NB-D)	C (NB-D)	B (NB-D)	C (NB-D)	B (NB-D)	C (NB-D)
15	Ridge Road/Manning Drive	Signalized	D (SB-F)	C (SB-E)	C (NB-D)	C (NB-D)	C (NB-D)	C (NB-D)
16	Mason Farm Road/Columbia Street	Signalized	B (WB-D)	D (WB-D)	B (WB-D)	D (NB-D)	B (WB-D)	E (WB-E)
17	Mason Farm Road/West Drive	Signalized	A (SB-C)	A (SB-C)	C (EB-D)	B (SB-B)	C (EB-C)	C (SB-C)
18	Mason Farm Road/East Drive	Signalized	C (EB-D)	B (EB-B)	C (EB-D)	C (EB-D)	C (NB-C)	C (EB-C)
19	Mason Farm Road/Purefoy Road	Unsignalized	A (NB-A)	A (SB-B)	A (NB-A)	A (SB-B)	A (NB-A)	B (SB-B)
20	Manning Drive/Skipper Bowles Drive	Unsignalized	A (NB-B)	A (NB-C)	A (NB-C)	A (NB-C)	A (NB-C)	A (NB-E)
21	Columbia Street/Purefoy Road	Unsignalized	D (WB-F)	A (WB-F)	F (WB-F)	A (WB-F)	F (WB-F)	D (WB-F)
22	Columbia Street/Fordham Boulevard (northern ramp)	Signalized	B (WB-E)	D (WB-D)	B (WB-E)	D (WB-D)	B (WB-E)	D (WB-D)
23	Columbia Street/Fordham Boulevard (southern ramp)	Signalized	C (EB-D)	A (EB-E)	C (EB-D)	A (EB-E)	C (EB-D)	B (EB-E)
24	Mason Farm Road/Fordham Boulevard	Unsignalized	A (SB-C)	A (SB-F)	A (SB-C)	A (SB-F)	A (SB-C)	A (SB-F)
25	Manning Drive/Fordham Boulevard	Signalized	F (NB-F)	F (SB-F)	F (SB-F)	F (NB-F)	F (SB-F)	F (NB-F)
26	Mason Farm Road/Oteys Road	Unsignalized	A (WB-A)	A (EB-A)	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)	B (SB-E)	C (SB-F)
28	Franklin Street/Park Place	Unsignalized	A (NB-B)	A (NB-B)	A (NB-B)	A (NB-B)	A (NB-B)	A (NB-B)
29	Battle Lane/Boundary Street	Unsignalized	A (WB-A)	A (NB-A)	A (WB-A)	A (NB-A)	A (WB-A)	B (NB-B)
30	Country Club Road/Battle Lane	Unsignalized	A (SB-C)	A (SB-F)	A (SB-D)	B (SB-F)	A (SB-D)	D (SB-F)
31	Country Club Road/Gimghoul Road	Signalized	A (WB-E)	A (EB-E)	A (WB-E)	A (EB-E)	A (EB-E)	A (EB-E)
32	Manning Drive/Hibbard Drive	Signalized	A (SB-E)	A (NB-E)	A (SB-E)	A (SB-E)	A (NB-E)	A (SB-E)
33	Manning Drive/Craige Drive	Signalized	A (SB-E)	B (SB-E)	A (SB-E)	B (SB-F)	A (SB-E)	C (NB-D)
34	East Drive/Jackson Circle/Dogwood Deck Entrance	Unsignalized	A (NB-A)	A (WB-B)	A (NB-A)	A (WB-B)	A (WB-D)	A (WB-B)
35	East Drive/Dogwood Deck Exit	Unsignalized	A (EB-B)	A (EB-B)	A (EB-B)	A (EB-B)	A (EB-B)	A (EB-B)
36	Mason Farm Road/Hibbard Drive	Unsignalized	A (WB-E)	B (WB-E)	A (WB-E)	B (WB-E)	A (WB-E)	B (WB-E)
37	South Road/Bell Tower Drive	Signalized	A (EB-A)	A (EB-B)	A (EB-A)	A (EB-B)	A (EB-B)	B (EB-B)
38	Manning Drive/Old East Drive	Signalized	D (EB-D)	B (WB-B)	C (EB-D)	B (WB-B)	D (WB-D)	C (WB-C)
39	Manning Drive/Craige Deck	Signalized	B (EB-C)	B (NB-C)	B (NB-C)	B (NB-C)	B (NB-C)	B (NB-D)
101	US 15-501/Estes Drive	Signalized	C (EB-E)	C (WB-E)	C (EB-F)	C (WB-E)	C (EB-F)	C (EB-E)
102	US 15-501/Willow Drive	Signalized	B (EB-F)	C (EB-F)	B (EB-F)	C (EB-E)	B (EB-F)	C (EB-E)
103	US 15-501/Elliot Road	Signalized	C (SB-C)	B (NB-A)	B (SB-B)	B (NB-A)	B (SB-B)	B (NB-B)
104	US 15-501/Ephesus Church Road	Signalized	D (WB-F)	D (WB-F)	D (EB-F)	D (WB-F)	D (WB-F)	D (EB-F)
1051	US 15-501 SB/Erwin Road	Signalized	C (SB-E)	B (SB-E)	C (SB-E)	C (SB-E)	C (SB-E)	C (SB-E)
1053	US 15-501 NB/South U-Turn	Signalized	C (SB-E)	D (SB-E)	B (SB-E)	C (SB-F)	C (SB-E)	C (SB-F)
1054	US 15-501 NB/Europa Drive	Signalized	B (NB-F)	B (NB-F)	B (NB-F)	B (NB-F)	B (NB-F)	B (NB-F)
1056	US 15-501 SB/North U-turn	Signalized	C (NB-F)	D (NB-E)	C (NB-E)	C (NB-E)	C (NB-F)	C (NB-E)
106	US 15-501/Sage Road	Signalized	D (NB-F)	E (NB-F)	D (NB-F)	D (NB-F)	D (NB-F)	D (NB-F)
107	US 15-501/Eastowne Drive/BCBS	Signalized	B (NB-F)	D (SB-F)	B (NB-F)	B (SB-F)	B (NB-F)	B (SB-F)
108	US 15-501/Eastowne Drive/Lakeview Drive	Signalized	D (SB-F)	D (SB-F)	C (SB-F)	D (SB-F)	D (SB-F)	D (SB-F)
201	NC 54/Hamilton Road	Signalized	B (NB-E)	B (NB-E)	B (NB-E)	B (NB-E)	B (NB-E)	B (NB-E)
202	NC 54/Burning Tree Lane	Signalized	A (SB-E)	B (SB-F)	B (SB-E)	B (SB-F)	B (SB-E)	B (SB-F)
203	NC 54/Barbee Chapel Road Ext	Signalized	B (NB-E)	C (NB-F)	B (NB-E)	B (NB-E)	B (NB-E)	B (NB-E)
204	NC 54/Meadowmont Lane	Signalized	C (NB-D)	D (NB-E)	C (NB-E)	D (NB-E)	C (NB-E)	D (NB-E)
205	NC 54/Barbee Chapel Road (East)	Signalized	E (NB-F)	C (NB-E)	F (NB-F)	C (NB-E)	F (NB-F)	C (SB-E)
301	US 15-501/Culbreth Road/Mt Carmel Church Road	Signalized	D (WB-E)	B (EB-D)	D (WB-F)	B (EB-D)	D (EB-F)	B (EB-D)
302	US 15-501/Bennett Road/Arlen Park Drive	Signalized	A (EB-E)	A (EB-E)	A (EB-E)	A (EB-E)	A (EB-E)	A (EB-E)
303	US 15-501/Main Street	Signalized	B (NB-A)	B (NB-A)	B (NB-A)	B (NB-B)	B (NB-A)	B (NB-B)

Legend: X = overall intersection level of service (X) = worst movement level of service

Source: Table 4-11 of Development Plan TIA, January 2008 (Revised to reflect recent traffic signal timing changes implemented by the Town of Chapel Hill and NCDOT)

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. 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. As discussed in an earlier section of this report, Town staff has indicated the possibility of revisiting the study of this intersection to consider additional 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 the 2007 Annual Report 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 is underway. A new pedestrian activated traffic signal at the intersection of South Columbia Street has not yet been constructed.

- Manning Drive / Fordham Boulevard: Lighting and upgraded signals with pedestrian facilities have been stipulated for this intersection. Original stipulations required that these improvements be completed within 12 months of approval of Modification #3 of the Development Plan. The University has provided funding for the stipulated street lighting. The University is coordinating with the Town and NCDOT to design and construct the stipulated traffic signal upgrades at this intersection to improve pedestrian safety.
- Manning Drive / Old Mason Farm Road: Lighting and upgraded signals with pedestrian facilities have been stipulated for this intersection. Original stipulations required that these improvements be completed within 12 months of approval of Modification #3 of the Development Plan. The University has provided funding for the stipulated street lighting. The University is coordinating with the Town and NCDOT to design and construct the stipulated traffic signal upgrades at this intersection to improve pedestrian safety.
- Mason Farm Road / East Drive: Signal plans have been approved by the Town of Chapel Hill. A decision to award the signal installation at just this intersection or to include others is being evaluated for cost savings. A funding account is being set up for this purpose.
- 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 change due to an adjacent building project. The revised plans have been resubmitted to Town staff for approval.
- Ridge Road: Resurfacing has been stipulated along the length of the road. Other safety improvements have already been made near the Rams Head Center.
- 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.

The following intersection improvement was previously suggested by the University:

- Ridge Road: Prior annual reports suggested additional improvements at a driveway on Ridge Road adjacent to the lacrosse practice field due to limited sight distances. To address this concern the University has removed parking spaces, installed a parabolic mirror, and trimmed landscaping and vegetation on University property. Additional improvements would most likely require significant changes to the alignment of Ridge Road and would have impacts on existing storm water facilities. Such improvements are not being considered at this time.

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 and 2007, plus the current targets for 2010. The latest commuter survey was carried out in Spring 2007. 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 and 2007 commuter surveys provided a snapshot of progress part-way into the Development Plan, and the 2010 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. This 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. 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				Commuting Students			
	2001 Existing Ratio	2004 Existing Ratio	2007 Existing Ratio	Target Ratio	2001 Existing Ratio	2004 Existing Ratio	2007 Existing Ratio	Target Ratio
Drive alone	0.72	0.61	0.56	0.58	0.33	0.19	0.18	0.22
Carpool/vanpool	0.06	0.05	0.06	0.08	0.08	0.07	0.08	0.08
Bus	0.06	0.08	0.10	0.12	0.21	0.34	0.35	0.35
Bicycle	0.03	0.02	0.03	0.03	0.09	0.05	0.06	0.08
Walk	0.02	0.02	0.03	0.02	0.12	0.14	0.14	0.11
Park-and-ride	0.07	0.15	0.16	0.13	0.12	0.16	0.10	0.11
Other	0.04	0.06	0.07	0.04	0.06	0.06	0.09	0.06

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 (NO_x): 25 kg/day (6,220 kg/year)
- Volatile Organic Compounds (VOC): 13 kg/day (3,340 kg/year)
- Carbon Monoxide (CO): 252 kg/day (63,022 kg/year)

Methodology and data analyzed for estimating air quality impacts are explained in more detail in Section 3.5 of the January 2008 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 that may extend the Development Plan period. 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.

Bollards and chains for pedestrian control implemented.

Traffic signal with countdown pedestrian signals.

**Realigned intersection.
Cut-through route eliminated.**

Stamped asphalt crosswalk installed.

Proposed

Realignment of Northbound Right-Turn Lane Realigned

Proposed Narrowing and creation of Bus/Bike Lane

Existing Speed Table

Potential Landscaped Median (On Manning Drive)

Proposed Speed Table

Eastbound left-turn restrictions in place.

Existing Speed Table

	Existing All-Way Stop
	Proposed Pedestrian Countdown Signal Head
	Pedestrian Countdown Signal Head
	New Sidewalk
	Midblock Signalized Pedestrian Crossing
	Striped Midblock Pedestrian Crossing with island and Warning Signs
	Striped Midblock Pedestrian Crossing with Warning Signs
	Midblock Stop Signs
	Speed Bumps
	Pedestrian Overpass

Additional improvements not shown on map:

- Bollards and chains on Manning Dr. near new residence halls and Craige Deck
- Pedestrian bridge from Craige Dorm to Skipper Bowles Dr. and Manning Dr. intersection
- New pedestrian signals with count down at several locations
- Audible pedestrian signals at several locations
- Additional crossing warning signs around campus
- New pedestrian crossing signs with "Yield to Pedestrians" at heavy crossing locations

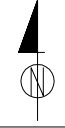
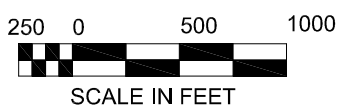


Figure 4 - 12
Traffic Calming and Pedestrian Safety Measures

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 has been working 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.

Town staff has indicated that the responses to the traffic calming devices have been positive and that no further requests for the installation of similar devices have been received.

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	Yes. Plans were completed and submitted to the Town for Implementation.	Complete	All-way stops Improved pavement markings Speed tables
Oteys Road	Yes. Plans were completed and submitted to the Town for Implementation.	Complete	Speed table
Purefoy Road	Yes. Plans were completed and submitted to the Town for Implementation.	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