ATTACHMENT A

A RESOLUTION RECEIVING A PRELIMINARY UPDATE ON DOWNTOWN TRAFFIC CONDITIONS
Draft Resolution No. 40/2011-12

WHEREAS, *Carrboro Vision 2020* declares that the "safe and adequate flow of bus, auto, bicycle and pedestrian traffic within and around Carrboro is essential", and;

WHEREAS, several approved or proposed development projects, capital projects, and planning processes affecting traffic in downtown Carrboro suggest a need to reflect on conditions for all of these modes;

NOW, THEREFORE BE IT RESOLVED by the Carrboro Board of Aldermen that:

1. The Board receives the preliminary update
2. The Board directs staff to provide a more comprehensive review of downtown traffic to be brought back to the Board;
3. The Board provides the following comments or guidance:
    a. _____
    b. _____
    c. _____

This is the 1st day of November in the year 2011.

APPENDIX A: COMMUNITY GOALS

The Vision 2020 document adopted by the Board of Aldermen embraces the following concepts to preserve and maintain the character and history of downtown Carrboro:

- Balanced growth occurring at a reasonable rate.
- "Double commercial square footage in the downtown from that existing in the year 2000"
- Retain unspoiled areas
- Provide central open space for the public to meet and mingle
- Music, festivals and an outdoor public art gallery
- Central library and a senior center
- Hub of activity with Carrboro Century Center as the downtown focal point
- Activities for all ages including young adults
- Year-round use of the Farmers Market
- Shops that sell everyday goods
- Downtown accessibility by all travel modes
- Network of greenways or shared-use paths away from roadways linking neighborhoods with downtown destinations
- Evening and weekend bus service to UNC Chapel Hill campus
- Multilingual signs and transit information
- Growth-of-way plants along streets and roadways
- "As a general policy, established roads should be widened to accommodate bike lanes and sidewalks, but not to provide additional lanes for automobiles"
- Improve pedestrian comfort and safety
- Consider pedestrian-only spaces
- Improve downtown parking
- Promote perimeter parking lots served by frequent shuttles
- Improve downtown sidewalks
- Improve lighting along sidewalks
- Provide shade along sidewalks
- Medium-rise building heights
- Develop under-utilized property downtown

APPENDIX B: EXISTING CONDITIONS

The downtown transportation system has a variety of functions including but not limited to serving property owners with access by car, truck, emergency vehicle, bus, walking and bicycling. Main Street, Rosemary Street, Greensboro Street, and Jones Ferry Road are all considered thoroughfares by the appropriate levels of state and metropolitan government, so therefore those streets and roads serve a mobility function to move the same cars, trucks, emergency vehicles, buses, bicycles and pedestrians through the downtown. Each of these functions is described below:

Access and Mobility

Humans first sought access. Only after several millennia, as trading and military forces created the need for speed and long-distance travel did higher forms of mobility develop. Following World War II, American engineers created what is known as the functional classification system to define a hierarchy of streets and highways with lower level streets emphasizing access to abutting land and higher level highways, expressways and freeways restricting access in order to increase speeds and facilitate longer distance travel. Today, studies are underway to update and append the functional class system to account for urban context; that is, the buildings, land use and pedestrian activity that comprise urban character. It is expected that adjustments can be made in the future to help blend streets into their environment. For example, major streets serving an historic district would no longer look like expressways.

Pedestrians

Table B.1 lists in rank order intersections with the most pedestrians crossing during peak periods. Table B.2 lists in rank order intersections with the highest combination of pedestrians and vehicles, showing the extent of conflicts on downtown crosswalks.

Table B.1 Intersections with Highest Number of Pedestrians

Rank Order	Intersection	Number of Pedestrians
Most	Main/Weaver/Roberson Streets	384
2	Main/Greensboro Streets	328
3	Weaver/Greensboro Streets	291
4	East Main/Rosemary Streets	289
5	East Main/Lloyd Streets	243
6	East Main/Franklin/Merritt Mill Road	197
7	West Main/Jones Ferry Road	135

Source: Carrboro Mobility Report Card, counts conducted fall 2003

Table B.2 Intersections with Highest Sum of Pedestrians and Conflicting Traffic

Rank Order	Intersection	Combined Volume in Crosswalk (pedestrians plus vehicles)
Most	Main/Weaver/Roberson Streets	1824 (pm peak hour) 1400 (lunch peak hour)
2	Main/Lloyd Streets	1651 (lunch peak hour)
3	Main/Greensboro Streets	1269 (pm peak hour) 969 (lunch peak hour)
4	East Main/Rosemary Streets	1230 (lunch peak hour)
5	East Main/Franklin/Merritt Mill Road	1138 (lunch peak hour) 644 (pm peak hour)
6	Weaver/Greensboro Streets	1118 (am peak hour) 879 (pm peak hour)
7	West Main/Jones Ferry Road	837 (pm peak hour)

Source: Carrboro Mobility Report Card, counts conducted fall 2003

Safety of pedestrians is an important factor in this study. Figure 1 shows the number of crashes involving pedestrians from January 2000 through December 2003. The most crashes (four) occurred at the intersection of Main/Weaver/Roberson Streets. At this intersection, there are 60 potential points of conflict between vehicles making various turning and through movements. Along the crosswalks at this intersection, there are an additional 24 points of potential conflict between pedestrians and vehicles. The quantification of points of potential conflict underscore the general sense felt when one tries to cross any of these streets on foot; that is, it's confusing and scary.

Bicyclists

A large percentage of travel in Carrboro is on bicycles, according to a plan prepared by the Town in 1989. This can be attributed to the fact that parking is scare at the University, and many UNC students and staff live in Carrboro. The Town has included bicycles in all parts of its planning, and the result is a comprehensive bikeway system that is among the best in the State. A good bicycle facility encourages ridership and therefore reduces congestion and pollution. Bikeway systems must be regularly re-evaluated and upgraded to meet future demands.

The Town's major objective is to increase the safety of bicycle riders in town. Crash statistics for the period from January 2000 through December 2003 were obtained from the North Carolina Department of Transportation which compiles police reports from Carrboro Police, the Sheriff and Highway Patrol. Crashes involving bicyclists are shown on Figure 1. The intersection with the most reported crashes involving bicyclists was East Main at Rosemary Street.

According to the Carrboro Bicycle Policy (adopted 1989), bicycle safety is improved in any of three ways:

1. Complete separation of bicycle traffic from motor vehicle traffic. The Libba Cotton Bikepath which runs along the railroad track is an example of a separated facility.

2. Separating bicycles from motor vehicles on the same roadway by use of designated bikelanes. Bikelanes exist on portions of major streets throughout Town (but not necessarily in the downtown study area) including Weaver Street, Jones Ferry Road, Greensboro Street, Main Street, and Hillsborough Road.

3. Automobiles and bicycles using the same roadway. Separation is typically not needed on less traveled residential streets. Bicycles and motor vehicles can share the roadway without major safety problems.

The second major objective is access to major origin-destination points. In building a bikeway system, the Town has three priorities listed in descending order:

1. Connect the existing bicycle system with major community facilities such as schools, Town Hall, and the Downtown, as well as providing access to important points outside the Town, such as the University.

2. The system should expand to connect high density areas. An example of such an area is the apartment communities on Smith Level Road and BPW Road.

3. Lower density developments should be connected with the existing system. Consideration also should be made for safe bicycle facilities for recreational purposes.

Transit Routes

Public transportation service between downtown Carrboro, neighborhoods, the UNC community, Chapel Hill and various park-and-ride lots is provided by Chapel Hill Transit. It is a municipal department within the Town of Chapel Hill that operates fixed route and demand responsive service within approximately a 25 square mile service area. In January 2002, the system became fare-free. Chapel Hill Transit produces over 142,000 annual hours of service, has a budget of over $11 million. At the end of the 2003-2004 fiscal year, fixed route ridership was over 4.5 million.

The Town of Carrboro the University of North Carolina and the Town of Chapel Hill are partners in the operation of the transit system. Each sponsor is interested in providing safe, reliable and efficient transportation services to its constituents. Also each sponsor has an appointed advisory board that provides advice regarding the operation and funding of transit services.

Route CW connects downtown with various neighborhoods in northwest Carrboro, the UNC campus and downtown Chapel Hill. Service through the study area includes bus stops along East Main Street, Weaver Street, and Hillsborough Street. Service is provided twice hourly during

peak periods and hourly during the off-peak. Service is provided between 6 a.m. and 9 p.m. Travel time between Carrboro Century Center and UNC campus is about six minutes.

Route J operates along Main Street and Jones Ferry Road connecting downtown Carrboro with Franklin Street in Chapel Hill, the UNC campus, the Jones Ferry Park and Ride lot, and neighborhoods to the south and southeast of downtown. Travel time between downtown and the UNC campus is about seven minutes. Service is provided every 15 to 20 minutes from 6 a.m. to 7:30 p.m. at which time buses depart hourly. Late-night service is provided to anyone on Friday and Saturday nights in a program called Safe Ride, connecting downtown Carrboro with the Franklin Street corridor from 11:15 p.m. to 2:30 a.m.

Streets

The trip between the UNC campus and northwest Carrboro is important because there are two viable routes to use including downtown Carrboro and the NC 54 bypass. It is debatable whether through traffic (that which does not stop along the way) uses the bypass or downtown. However, travel time comparisons between the signalized intersections of Manning Street/Columbia Street (on the UNC campus) and Main Street/NC 54 Bypass (in northwest Carrboro) during the afternoon peak period show an average of 11 minutes through downtown Carrboro compared with 4 minutes and 30 seconds along the NC 54 bypass. There was very little congestion experienced along either route during the 4:30 to 5:00 p.m. period on Monday, August 30, 2004 when the data were collected.

Level of service is a common term used in municipal government to identify varying levels of benefit received by citizens at varying levels of investment of public funds. In the transportation lexicon, level of service is used to denote different degrees of comfort and convenience experienced by motorists. The term also can be applied to pedestrians, bicyclists and transit patrons.

Level of Service A represents excellent conditions while Level of Service F denotes the worst condition, characterized by streets with no sidewalks, narrow lanes that don't accommodate bicyclists, and traffic congestion that delays motorists and bus patrons. LOS D represents the typical maximum acceptable delay for an intersection as a whole during any one given peak hour in an urban setting. In other words, LOS E and F typically indicate the need for improvements and higher potential for queue spillback. Traffic level of service (LOS) is based on the amount of delay in seconds per vehicle experienced by an individual driver, averaged over all motorists at an intersection.

Due to the shorter-than-average block lengths in downtown Carrboro, the level of service method understates the perceived congestion levels. That is, the recently prepared Carrboro Mobility Report Card suggests all downtown Carrboro study intersections operate at LOS B or better. However, based on observation by KHA the recurring queues on Weaver and Greensboro Streets would suggest LOS F operations at least during portions of the peak hour.

Parking

An August 2002 report of the Town of Carrboro Parking Task Force identifies "Town involvement in expanding parking availability as a critical component in reaching the town's goal of doubling commercial space in the downtown area." The report states that "the most critical immediate shortcoming in the central downtown area was a shortage of convenient short-term public parking in particular areas." This problem may have been addressed with the 2004 opening of a new municipal lot in the middle of the 100 block of Main and Roberson Streets, behind the right-of-way of historic Main Street buildings. A driveway and walkway connect the new parking lot with Main Street.

The Parking Task Force report recommends "collaboration with NCDOT to provide on-street parking on the following streets: Roberson Street, sections of East and West Main Street, East and West Weaver Street, and North Greensboro Street." Additional on-street parking was considered for streets within the study area that are at least 38 feet wide (measured from curb-face to curb-face). This is the critical dimension to provide one 11-foot wide travel lane in each direction and one 8-foot wide bay of on-street parking on each side of the street. The following streets in the study area were considered, as shown in Table B.3.

Table B.3 On-Street Parking Analysis

Street	Section	Existing Width (feet)	Peak Hour Traffic Volume (vehicles per hour)	On-street Parking Recommendations
East-West Streets				
West Main St.	Ashe – Laurel	45	450	Recommended with roundabout and one-lane each direction.
East Main St.	Lloyd – Rosemary	46		Not recommended unless Main Street converted to one lane each direction.
Roberson St.	Greensboro – Maple	38 *	165	Recommended when street is improved.
Weaver St.	Greensboro – Main	30		Recommended with conversion to one-way traffic (woonerf concept)
Rosemary St.	Main – Merritt Mill	36		Consider, if Main/Rosemary intersection converted to "T"
North-South Streets				
Greensboro St.	Shelton Street – Old Pittsboro Rd.	34		Not recommended. Too narrow.
Laurel St.	Main – Jones Ferry	28		Not recommended. Too narrow.
Lloyd St.	Main – Cobb	24 - 32	140	Not recommended. Too narrow.
Merritt Mill Rd.	Main – Rosemary	24		Not recommended. Too narrow.

* denotes future street width of Roberson Street, as adopted by Carrboro Board of Aldermen in 2003.

APPENDIX C: STUDY METHODS AND PRELIMINARY RESULTS

Travel Safety

Table C.1 presents recent crash histories at intersections within the study area. **Table C.2** presents a comparison of street segment crash rates with expected crash rates that are based on statewide averages in North Carolina for similar types of urban streets. In some cases like Weaver Street the street segments are much shorter than those used to calculate statewide averages which could skew the data as evidenced by the much-higher-than-average crash rates on some Carrboro street segments. Nevertheless, this study addresses traffic safety comprehensively and holistically.

At the intersection of Main Street/Weaver Street/Roberson Street/Carr Mill Mall parking lot there are 60 potential points of conflict between vehicles making various turning and through movements. Along the crosswalks at this intersection, there are an additional 24 points of potential conflict between pedestrians and vehicles. Improvements for this intersection (described in the next chapter) would reduce the points of potential conflict to 22 vehicle-to-vehicle conflicts and 13 pedestrian-vehicle conflicts. This represents a 58 percent reduction in conflict points that are likely to have a commensurate decrease in crashes and near crashes. The key to reducing conflict points is the conversion of the 100 block of Weaver Street and the 100 block of Roberson Street to one-way movement and the restriction of left-turn movements from Main Street. The easterly extension of Roberson Street to intersect with a new street built on top of the railroad with full turning movements provided at Brewer Lane and East Main Street will replace lost access created with turn restrictions at Main Street/Weaver Street/Roberson Street/Carr Mill Mall. Further reductions in conflict points are possible, however it would require left-turn restrictions to and from the Carr Mill Mall parking lot that could have deleterious economic hardships on that business. For this reason, left-turn movements to and from the Carr Mill Mall parking lot are retained in Alternative 4.

Table C.1: NCDOT (and Town of Carrboro) Crash Rate Summary by Intersection
Crashes per Million Entering Vehicles, 2000-2003 — 3 years of data

Study ID	Intersection	Total Crash Rate	Injury Crash Rate	# Pedestrian Crashes	# Bicycle Crashes
1	Main Street/Franklin Street at Merritt Mill/Brewer Lane	47.11	14.5	1 (+1)	1
2	Main Street at Rosemary Street	**68.49**	17.12	0	2 (+1)
3	Main Street at Lloyd Street	**100.85**	28.01	0 (+1)	1
4	Main Street at Roberson Street/Weaver Street	64.94	**32.47**	3 (+1)	0 (+1)
5	Main Street at Greensboro Street	55.91	18.64	1 (+1)	0 (+1)
6	Greensboro Street at Weaver Street	50.74	25.37	1	2
7	Main Street at Jones Ferry Road	31.06	0	0	0
8	Main Street at Laurel Avenue/Weaver Street	**88.12**	**32.04**	0	0
9	Greensboro Street at Roberson Street	52.83	**37.74**	0	0
10	Greensboro Street at Carr Street	52.83	15.09	0	0

Note: No fatalities were recorded over the three year period; **Bold** indicates the highest three rates

Table C.2: NCDOT Crash Rate Summary by Roadway Segment
Crashes per 100 Million Vehicle Miles, 2000-2003 (3 years)
Statewide average = 422.44 Total Rate & 142.04 Injury Rate

Roadway Segment	Total Crash Rate	Injury Crash Rate	# Pedestrian Crashes	# Bicycle Crashes
Main Street from Weaver St. to Merritt Mill/Brewer St. (0.7 mi)	**575.22**	**160.11**	2	8
Weaver Street from Main St. to Laurel Ave (0.4 mi)	**2087.41**	**956.73**	2	2
Roberson Street from Greensboro St. to Main St. (0.1 mi)	**3913.89**	**2283.1**	1	0
Greensboro Street from Old Pittsboro Rd to Shelton St. (0.3 mi)	**1144.47**	**443.77**	2	3
Jones Ferry Road from Main St. to Laurel Ave (0.1 mi)	**718.15**	0	0	0
Rosemary Street from Main St. to Merritt Mill Rd (0.1 mi)	**707.94**	88.49	0	2

Note: No fatalities were recorded over the three year period; **Bold** indicates a segment exceeds the statewide average

Transit Level of Service

Rebalancing downtown streets could impact the level of service provided by Chapel Hill Transit if traffic levels of service deteriorate. Increased delays on Carrboro streets would affect buses ability to maintain schedule and reliability of schedule is arguably the primary issue faced by CHT today, an unintended byproduct of the high demand created when the service went fare-free in 2002.

Travel Demand

To ensure wise use of public resources, candidate transportation improvements are typically evaluated to determine effects on existing traffic conditions as well as forecasted conditions 20-years after construction. Based on an assumed completion of construction in 2010, this study includes an evaluation of conditions 20 years hence in 2030. Travel demand forecasts were obtained from the best available forecasting tool, the Triangle Regional Travel Demand Model. Each unit of local government in Orange, Durham and Wake Counties developed population and employment forecasts for their community at a zonal level. The zonal system is finely divided, with downtown Carrboro subdivided into about 15 zones. Growth at UNC and other Triangle institutions also is factored into the travel projections. Planned transportation improvements including Phase I of the Triangle Transit Authority's regional rail system also is included. Weaver Street is not included in the model. Therefore, the model over-forecasts traffic on Main Street. Coincidentally, the omission of Weaver Street in the model network better reflects Alternative 4 which assumes a woonerf on Weaver Street.

Preliminary results for 2030 suggested an average annual increase of 1.3 percent during the morning peak hour and 24-hour daily traffic volumes. Afternoon peak hour traffic projections are higher with an average annual increase of 1.7 percent. Compounded over the 27-year study horizon these projections result in a substantial increase over 2004 conditions. These

percentages were used to factor-up the base traffic counts at each of the 10 study intersections. In mid-November 2004 the consultant was provided with updated traffic projections that are lower than before. The updated projections suggest an average annual increase of 1.1 percent during the morning peak hour and 1.3 percent during the afternoon peak hour. These updated projections will be reflected in the final report.

Rerouted Traffic

Conversion of Weaver Street to a one-way woonerf prompted the need to consider how traffic would be re-routed. Due to the minimal number of interconnected streets around the downtown area, this study assumes nearly all of the diversion to occur on Main Street.

Extension of Roberson Street to Brewer Lane was analyzed assuming a direct re-routing of some traffic along that route.

Capacity Analysis Methods

In theory, streets can accommodate a high number of vehicles, however several factors are typically present that reduce street efficiency. The maximum number of vehicles passing a point on a street, referred to as capacity, is a function of speed and the number of lanes. Providing more than one lane in each direction accommodates more traffic but it also permits speeding and potentially dangerous conflicts with pedestrians whose line of sight is blocked by other cars. A strong argument can be made for downtown streets with only one lane in each direction. At 20 mph, one lane on a street can carry 1800 vehicles in a busy one-hour period. That figure is reduced somewhat if a pedestrian waits beside the road for the cars to pass before crossing. The capacity is reduced further if the pedestrian crosses in front of the vehicles. However, the greatest reduction in capacity occurs if a traffic signal is installed, reducing capacity by at least 50 percent. This explanation is provided as a prelude to discussion of existing and future traffic volumes and lays the groundwork for later discussion of eliminating some traffic signals in downtown Carrboro.

Traffic counts and coordinated traffic signal timings were obtained from the Town of Chapel Hill. Existing pedestrian crossing volumes are shown in ***Figure C.1*** and existing traffic turning movement volumes are shown in ***Figure C.2***. Traffic signal plans were obtained from NCDOT and intersection geometry was obtained from field reviews and aerial mapping. Traffic reroutes were established based on proposed revisions to the network geometry. A one-way pair was analyzed (Alternative 1) between the 100-block of Weaver Street (westbound) and Main Street (eastbound) resulting in the traffic volumes shown in ***Figure C.3***. Year 2030 traffic volumes were based on the existing traffic volumes with growth factors applied. The growth factors were obtained from the Triangle Regional Model and were as follows: 1.3% annually for the AM peak, 1.4% annually for the Mid-Day peak, and 1.7% annually for the PM peak over 27 years of growth to 2030. The existing network with traffic growth to year 2030 is shown in ***Figure C.4***. The one-way pair traffic in year 2030 is shown in ***Figure C.5***. As a result of later analyses, the network was revised to provide an alternative with Weaver Street one-way (westbound) and Main Street maintained as two-way (Alternative 4). The future traffic for the revised alternative scenario is shown in ***Figure C.6***.

The peak hour traffic volumes for each of the three periods were analyzed in "Synchro 6" capacity analysis software using Highway Capacity Manual methodology. Traffic capacity analyses were performed for the ten (10) study intersections in Carrboro for existing year 2003-2004 and future year 2030 conditions. Existing year 2003-2004 analyses were based on traffic counts conducted for the AM, Mid-Day, and PM periods. Future year 2030 analyses were based on the existing traffic volumes with growth factors applied. Sidra software (aaSidra 2.0) was used to evaluate the operation of roundabouts at select locations. Early in the study, roundabouts were considered at seven (7) of the study intersections.

Capacity Analysis Findings

The most up-to-date intersection level of service calculations, performed within the final months of this study (April 2005) are reported in Table 6. The year 2030 traffic projections, provided by MPO staff, were revised prior to re-analyzing the traffic. The columns in Table 6 labeled Redesigned Streets are consistent with Section III of this report.

The ten (10) study intersections were shown to operate with acceptable LOS in the AM, Mid-Day, and PM peak hours under existing traffic for the current geometry with the exception of the Main Street at Merritt Mill intersection. However, it was noted both through field observations and viewing queue results in the analysis that the LOS values were not completely indicative of the actual delay that drivers experience in Carrboro along the primary streets. Short block lengths and inadequate storage lanes create congestion in downtown Carrboro that appears to exceed what the existing LOS indicates, especially along Greensboro Street. Although LOS is one way to compare geometric alternatives, it is not the only measure of traffic congestion. During the study, both the levels of service and the anticipated queuing concerns along the major roadways are considered while keeping in mind the need to maintain and enhance the walkable characteristics of the downtown area.

For the most part, a comparison of existing network geometry and a one-way pair consisting of the 100-block of Weaver Street and Main Street (Alternative 1) shows acceptable operation. ***Table C.3*** shows the existing year traffic comparison. A connector roadway also was provided to remove traffic from Roberson Street at Main Street, diverting those vehicles to Brewer Lane. Main Street and Weaver Street operate in a free-flow condition with the proposed network revisions. With or without the one-way pair in the year 2030, more intersections start to operate unacceptably and queue conditions worsen. ***Table C.4*** shows the future year traffic comparison. Deficiencies of the one-way pair starting in the current year and worsening for future conditions are listed as follows:

- The one-way pair significantly increases traffic on westbound Weaver Street and southbound Greensboro Street, increasing queue lengths and congestion.
- The one-way pair forces a merge to one lane westbound on Main Street past Lloyd Street which will be over-capacity or requires a two-lane section one-way on Weaver Street, which is not preferred due to pedestrian safety concerns.

Based on the results of the traffic analysis comparison with the one-way pair, further review of the geometric constraints, and coordination with the Town of Carrboro staff, an alternative was developed that keeps the one-way roadway on Weaver Street (westbound), but maintains two-way traffic on Main Street (Alternative 4). This revision allows the major traffic movements

westbound along Main Street to continue along the normal path, avoiding the intersection of Greensboro Street at Weaver Street. ***Table C.5*** shows the future year traffic comparison of Alternative 4 to the baseline (existing) network. It should be noted that queuing concerns still exist with or without the proposed changes to the downtown roadways. The Town should seek alternate access roadways, cross connections between parking lots, and seek to discourage through traffic that may have other reasonable alternate routes available. Alternative 4 also included an access roadway to parallel Main Street from west of Merritt Mill Road to connect with Roberson Street. This collector roadway will not divert major movements that are traveling west along Main Street, but it will serve to provide alternate access to businesses and help to facilitate traffic movements between south Greensboro Street and the east side of downtown Carrboro.

Some key features of Alternative 4 are as follows:

- Allows the heaviest movements (westbound in the PM peak) to continue to be split between Weaver Street and Main Street.
- Allows for two through lanes westbound at Lloyd Street while eliminating the merge created with the one-way pair (one lane splits to Weaver Street, and the other stays on Main Street).
- Eliminates the traffic signal at the Main/Roberson/Weaver Street due to the proposed geometry (note that the signal also was eliminated in the one-way pair alternative).
- Reroutes left-turn traffic from northbound Greensboro Street at Weaver Street to Main Street, allowing two full southbound lanes through the intersection to reduce queue spillback north of Weaver Street.

Alternative 4 is shown in ***Figure C.7.***

Table C.3: Existing Year 2003-2004 Peak Hour Level of Service (Delay in seconds per vehicle)
Existing Conditions and Alternatives

#	Intersection	Existing Street Circulation						Weaver/Main Street One-Way Pair Circulation With Roberson/Lloyd Street Connector					
		Signalized/*Unsignalized* (Existing Conditions)			Roundabout Alternative			Signalized/*Unsignalized*			Roundabout Alternative		
		AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM
1	Franklin St. @ Merritt Mill Rd	B (12.4)	**F (86.6)**	D (43.2)	A (6.2)	A (7.6)	A (7.6)	B (12.4)	**F (86.6)**	D (43.4)	A (6.2)	A (7.6)	A (7.6)
2	Main St. @ Rosemary St	C (22.1)	C (24.8)	B (19.9)	A (5.9)	A (6.6)	A (8.0)	C (22.1)	C (24.8)	B (19.9)	A (5.9)	A (6.6)	A (8.0)
3	Main St. @ Lloyd St.	A (7.3)	A (7.7)	A (7.7)	A (3.5)	A (3.9)	A (4.2)	A (7.9)	A (7.9)	A (8.0)	A (4.1)	A (4.2)	A (4.7)
4	Main St. @ Roberson Street/ Weaver St	C (25.6)	C (21.2)	C (24.9)	A (7.9)	A (6.4)	A (7.0)	B (10.9)*	B (13.1)*	C (22.9)*	NA	NA	NA
5	Greensboro St. @ Main St	C (31.7)	C (21.9)	C (25.0)				D (44.6)	C (32.5)	D (49.9)			
6	Weaver Street @ Greensboro St	C (22.9)	C (24.8)	C (32.1)	A (7.9)	A (6.5)	A (8.6)	C (24.2)	C (29.4)	**E (79.4)**	A (7.3)	B (10.7)	**E (63.9)**
7	Main St. @ Jones Ferry Rd	B (14.4)	B (13.4)	B (15.3)	A (5.0)	A (5.0)	A (5.3)	B (18.6)	B (16.4)	B (18.8)	A (6.0)	A (5.9)	A (6.2)
8	Weaver St. @ West Main St	B (16.8)	B (11.0)	B (15.2)	A (5.7)	A (5.4)	A (5.4)	C (23.5)	B (12.5)	C (20.4)	A (4.6)	A (5.4)	A (5.6)
9	Greensboro St. @ Roberson St	*A (0.4)*	*A (0.7)*	*A (2.1)*				*A (0.4)*	*A (0.7)*	*A (2.6)*			
10	Greensboro St. @ Carr St	*A (1.8)*	*A (3.3)*	*A (6.9)*				*A (1.8)*	*A (3.5)*	*A (8.6)*			

Note: Conversion of traffic flow to one-way in the 100 block of Weaver Street affects traffic circulation patterns on parallel and connecting streets.
*Shown as signalized operation for LOS comparison, but free-flow on Weaver/Main Streets anticipated with one-way pair conversion.
NA — not applicable (roundabout not proposed with one-way pair)

Table C.4: Future Baseline Conditions and One-Way Pair Alternative Comparison
Future Year 2030 Peak Hour Level of Service (Delay in seconds per vehicle)

#	Intersection	Existing Street Circulation						Weaver/Main Street One-Way Pair Circulation With Roberson/Lloyd Street Connector					
		Signalized/*Unsignalized* (Existing Geometry)			Roundabout Alternative (No Additional Revisions)			Signalized/*Unsignalized*			Roundabout		
		AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM
1	Franklin St. @ Merritt Mill Rd	C (22.4)	**F (251.0)**	**F (366.7)**	A (7.1)	C (25.3)	C (33.9)	D (38.7)	**F (115.9)**	**F (155.0)**			
2	Main St. @ Rosemary St	**F (84.8)**	C (33.0)	D (51.8)	A (6.3)	B (14.0)	**F (133.3)**				A (6.3)	B (14.0)	**F (133.3)**
3	Main St. @ Lloyd St	A (7.9)	A (8.9)	B (12.5)	A (3.8)	A (5.5)	C (30.9)	***F (954.4)***	***F****	***F****			
4	Main St. @ Roberson Street/ Weaver St	C (34.7)	**E (57.4)**	**F (712.9)**	C (33.0)	B (12.3)	**E (73.6)**	*Free-flow*	*Free-flow*	*Free-flow*			
5	Greensboro St. @ Main St	D (37.3)	C (30.7)	**F (99.5)**				**F (160.0)**	**F (116.1)**	**F (401.4)**			
6	Weaver Street @ Greensboro St	**E (55.1)**	D (38.0)	**F (148.2)**	D (36.1)	B (13.6)	**F (120.3)**	C (26.7)	**F (93.3)**	**F (244.1)**			
7	Main St. @ Jones Ferry Rd	B (17.1)	B (16.7)	C (30.7)	A (5.6)	A (5.8)	A (7.5)	C (28.5)	C (23.3)	C (31.1)			
8	Weaver St. @ West Main St	B (19.4)	B (11.9)	B (16.8)	A (6.1)	A (6.0)	A (6.7)	C (24.3)	D (37.7)	**F (136.4)**			
9	Greensboro St. @ Roberson St	*A (0.8)*	*A (1.7)*	***F (392.9)***				*A (0.8)*	*A (1.8)*	***F (393.7)***			
10	Greensboro St. @ Carr St	*A (6.4)*	***E (43.6)***	***F (958.0)***	A (3.7)	A (4.2)	A (4.7)				A (3.7)	A (4.2)	A (4.7)

*Exceeds HCM calculation methods

Table C.5: Future Baseline Conditions and One-Way Weaver Street [Recommended] Alternative Comparison
Future Year 2030 Peak Hour Level of Service (Delay in seconds per vehicle)

#	Intersection	Existing Street Circulation						Weaver Street 100-Block One-Way Conversion With Roberson/Main Street Connector					
		Signalized/*Unsignalized* (Existing Geometry)			Roundabout Alternative (No Additional Revisions)			Signalized*/*Unsignalized*			Roundabout		
		AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM
1	Franklin St. @ Merritt Mill Rd	C (22.4)	**F (251.0)**	**F (366.7)**	A (7.1)	C (25.3)	C (33.9)	C (26.6)	**F (93.5)**	**F (91.1)**			
2	Main St. @ Rosemary St	**F (84.8)**	C (33.0)	D (51.8)	A (6.3)	B (14.0)	**F (133.3)**	B (16.9)	B (19.0)	D (48.3)			
3	Main St. @ Lloyd St.	A (7.9)	A (8.9)	B (12.5)	A (3.8)	A (5.5)	C (30.9)	A (9.2)	A (9.5)	B (14.1)			
4	Main St. @ Roberson Street/ Weaver St.	C (34.7)	**E (57.4)**	**F (712.9)**	C (33.0)	B (12.3)	**E (73.6)**	*Free-flow*	*Free-flow*	*Free-flow*			
5	Greensboro St. @ Main St.	D (37.3)	C (30.7)	**F (99.5)**				**E (65.2)**	D (53.3)	**F (143.5)**			
6	Weaver Street @ Greensboro St.	**E (55.1)**	D (38.0)	**F (148.2)**	D (36.1)	B (13.6)	**F (120.3)**	B (18.9)	C (22.9)	C (24.4)			
7	Main St. @ Jones Ferry Rd	B (17.1)	B (16.7)	C (30.7)	A (5.6)	A (5.8)	A (7.5)	C (23.5)	C (20.0)	D (51.2)	A (7.7)	A (6.8)	B (10.9)
8	Weaver St. @ West Main St.	B (19.4)	B (11.9)	B (16.8)	A (6.1)	A (6.0)	A (6.7)	C (25.1)	C (25.0)	B (14.3)	A (5.0)	A (5.2)	A (5.8)
9	Greensboro St. @ Roberson St.	*A (0.8)*	*A (1.7)*	***F (392.9)***				*A (1.1)*	*A (2.9)*	***F (395.6)***			
10	Greensboro St. @ Carr St.	*A (6.4)*	***E (43.6)***	***F (958.0)***	A (3.7)	A (4.2)	A (4.7)				A (3.7)	A (4.2)	A (4.7)

*Signal timing was optimized for the network to account for geometric revisions and traffic shifts.

Table C. 6: Existing and Future Year 2030 Conditions with Existing and Projected Volumes
Peak Hour Level of Service (Delay in seconds per vehicle)

#	Intersection	Existing Street Circulation						Future Year					
		Existing Geometry			Redesigned Streets			Existing Geometry			Redesigned Streets		
		AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM	AM	Mid-Day	PM
1	Franklin St. @ Merritt Mill Rd.	B (12.5)	**F (80.0)**	D (49.6)	*A*(3.7)*	*A*(4.9)*	*A*(5.1)*	B (13.8)	**F (122.5)**	**F (139.5)**	*A*(4.4)*	*A*(8.5)*	*B*(10.0)*
2	Main St. @ Rosemary St.	C (23.9)	C (25.8)	C (20.7)	*A (4.5)*	*A (6.8)*	*B (12.0)*	C (27.4)	C (28.8)	C (27.2)	*A (4.6)*	*A (9.7)*	*D (54.1)*
3	Main St. @ Lloyd St.	A (7.6)	A (7.9)	A (8.1)	A (4.8)	B (10.6)	B (13.0)	A (7.8)	A (8.4)	B (12.8)	A (5.3)	B (13.9)	**F (104.9)**
4	Main St. @ Roberson St./ Weaver St.	C (27.2)	C (23.5)	C (30.3)	B (17.7)	C (23.7)	**E (75.4)**	C (27.9)	C (28.7)	**F (83.0)**	C (20.8)	D (38.1)	**F (189.4) ****
5	Greensboro St. @ Main St.	C (30.2)	C (23.0)	**E (57.4)**	C (32.2)	C (27.1)	C (31.2)	C (31.6)	C (26.1)	**F (95.4)**	C (33.3)	D (43.9)	**F (90.6)**
6	Weaver St. @ Greensboro St.	C (21.0)	C (23.6)	C (34.9)	B (17.4)	B (15.7)	B (20.0)	C (24.5)	C (26.8)	**F (151.9)**	B (18.7)	B (18.5)	**F (88.7)**
7	Main St. @ Jones Ferry Rd.	B (15.5)	B (13.8)	B (16.1)	*A*(3.0)*	*A*(2.7)*	*A*(3.2)*	B (16.3)	B (14.2)	B (19.6)	*A*(3.1)*	*A*(3.2)*	*A*(3.9)*
8	Weaver St. @ West Main St	A (9.6)	A (7.1)	A (8.0)	*A*(3.2)*	*A*(3.2)*	*A*(3.3)*	A (9.7)	A (7.5)	A (8.6)	*A*(3.3)*	*A*(3.4)*	*A*(3.9)*
9	Greensboro St. @ Roberson St.	*A (0.4)*	*A (0.6)*	***A (1.5)***	*A (1.6)*	*A (2.1)*	*A (3.6)*	*A (0.4)*	*A (0.8)*	*A (3.4)*	*A (1.7)*	*A (2.8)*	*B (13.1)*
10	Greensboro St. @ Carr St.	*A (1.6)*	***A (3.0)***	***A (4.4)***	*A (1.6)*	*A (3.0)*	*A (4.4)*	*A (1.9)*	*A (4.7)*	*C (20.8)*	*A (1.9)*	*A (4.6)*	*C (21.0)*
11	Arts Center North @Main St.				*A (0.8)*	*A (0.7)*	*A (1.9)*				*A (0.9)*	*A (1.2)*	*B (19.0)*
12	Arts Center East @Main St.				*A (0.8)*	*A (0.7)*	*A (1.0)*				*A (0.9)*	*A (0.8)*	*A (1.3)*

Signalized/*Unsignalized*, * =*Roundabout*
** *LOS F is based on existing traffic signals. A modern roundabout was tested and produced year 2020 pm peak LOS B, however severe right-of-way impacts preclude this as a recommended change.*