



## APPENDICES

### Appendix A

#### Traffic Analysis of Vehicular Circulation Improvements

##### Purpose and Methodology

The Center City street network's ability to accommodate traffic in the future was evaluated by comparing estimates of the amount of traffic along specific corridors in Center City with the approximate capacity of the streets comprising those corridors.

It was assumed that future commuter traffic volumes will be proportional to the amount of commuter-occupied parking spaces in Center City. In addition, the percentage of commuters who drive to work in Center City in the future will be lower than it is today due to future enhancements in public transportation service and other factors.

To produce these future traffic estimates, the following procedure was followed:

1. The amount of future commuter parking spaces needed in Center City was estimated.
2. The likely location of these spaces were identified.
3. A spreadsheet model was developed to convert these estimates into peak-hour traffic within the various corridors.

These estimates were then compared with the capacities of the corridors at various locations (referred to as "cut-lines") to yield planning-level approximations of the ability of the Center City street network to accommodate future traffic volumes. This technique afforded the opportunity to quickly evaluate different street networks, and can also be adapted to test different assumptions about future parking conditions and transit usage.



### Testing the Model on Existing Conditions

Before applying the model to alternative future scenarios, it was first applied to existing conditions in Center City. This evaluation was performed by comparing the traffic estimates produced by the model to traffic counts that had been conducted by the City at the gateway locations in the street network. These locations were evaluated at an early stage of this project, which determined that, collectively, only about two-thirds of the available capacity is required to accommodate existing traffic volumes in the morning peak hour.

The traffic estimates produced by the model were observed to closely approximate the existing volumes at these locations, and the model was therefore judged to be satisfactory.

### Applying the Model to Future Conditions

Several alternative future scenarios were evaluated. As noted above, the total peak-hour traffic volume in each scenario was defined by applying factors to the number of future parking spaces in Center City. This value in turn was determined by estimating the location of new development and redevelopment within Center City, and adjusting the parking requirements downward to account for transit users (and other commuters who are not auto drivers). The resulting auto volumes were then assigned to the following alternative street networks:

1. **Existing network** (no changes)
2. **Modifications** to the existing network, including:
  - reduction in capacity of Trade Street to two (2) effective lanes;
  - conversion of portions of Caldwell Street, Brevard Street, Poplar Street, and Mint Street to two-way operation;
  - modification of the I-277/South Boulevard interchange, including elimination of the off-ramp east of Caldwell Street; and

- addition of a new Mint Street Ramp
3. **Additional modifications**, beyond those identified above, to include:
    - reduction in capacity of segments of College Street, Church Street and MLK Blvd. by one lane
    - extension of Euclid Street over I-277 between Morehead Street and Stonewall Street to connect to Davidson Street as a two-lane, two-way street.

### Findings

#### Parking

1. Once the effects of future transit usage (and other non-auto commuting) are included, the number of parking spaces required by commuters in the future is estimated to grow to 50,700 spaces, representing a 27 percent increase (10,700 additional occupied spaces) over existing conditions. Throughout this analysis it was assumed that 75 percent of future Center City employees will be auto drivers, 25 percent will commute either by public transportation, car or vanpool, walk or bicycle. This assumption is consistent with results of the various transit corridor studies that have been conducted by the City over the past few years.
2. Most of the *total* future parking will need to be located in central and south-central Center City. The area bounded by Seventh Street, Caldwell Street, I-277 (Belk) and Poplar/Mint Streets will require almost 29,000 parking spaces, representing over 55 percent of the total occupied parking in Center City in the future. Thus, if commuters are discouraged from traversing the “core” of Center City, there will be more demand into Center City from the south than from the other directions. (Currently, about 29 percent of the morning peak-hour traffic into Center City enters the area from gateways on the south.)
3. Most of the *additional* parking spaces will need to be located in three broad areas;
  - south-central Center City (4,100 additional occupied spaces, a 46 percent increase);



- West Trade Street corridor (3,000 additional occupied spaces, 177 percent increase);
- North Tryon area (2,600 additional occupied spaces, 79 percent increase).

**Constraints**

1. One of the objectives of this study is the creation of a more pedestrian-friendly core within Center City, supported by enhanced transit service and improved pedestrian facilities. This area is defined generally as encompassing a two-to-three block area on either side of Tryon and Trade Streets. If commuter traffic is to be encouraged to drive only into Center City rather than traversing this area, commuters must approach their Center City destination from the closest point on the periphery of Center City, using either the I-277/I-77 freeway loop or a surface street loop (referred to as the Circulator Route in this study) comprised of Graham, Stonewall, McDowell, Eleventh and Twelfth Streets, to reach that point.
2. First Ward and Fourth Ward constrain travel to and from Center City from the north because of the lack of thoroughfares through these residential neighborhoods. In conjunction with the goal of discouraging travel through the heart of Center City, it is undesirable to attract vehicles through these residential areas. The greater the congestion entering Center City from the south (and west and east), the greater the likelihood of traffic entering from the north.
3. Another key corridor that will affect the overall distribution of traffic to and from Center City is on the west side. This approach to Center City is served by the fewest roadways (Trade, Fourth and Fifth Streets) and the fewest lanes, and thus has the lowest capacity of all four approaches. The increase in projected parking immediately east of the Norfolk-Southern railroad, coupled with the potential reduction in capacity on Trade Street, will place added pressure on this approach route into Center City. As noted above with respect to First and Fourth Wards, it will be important to ensure that sufficient capacity exists elsewhere to minimize congestion on approach routes to and from the west.

Conclusions: Projected Network Performance

1. **The Center City street network will be able to accommodate projected traffic volumes in the future, even with the street modifications tested in this analysis.**  
The potential modifications reduce the capacity of individual streets, and thus tend to increase the volume/capacity (v/c) ratios in the affected corridors. However, most of these changes occur within Center City (i.e., inside the perimeter defined by the gateway locations). Thus, they have relatively little effect on the performance of the streets at the gateway locations. The cumulative v/c ratio at the gateways in the future is projected to range between 0.85 and 1.0 (theoretical capacity is 1.0), depending on the specific network and the assumptions that have been made regarding vehicular routing. In general, traffic volumes tend to decrease with increasing distance from the freeway loop, as commuters enter parking facilities.
2. **The potential street modifications will have a more significant effect within Center City as the capacity of individual corridors is reduced.**  
This analysis has shown, however, that there will be sufficient capacity to accommodate revised traffic patterns that may result from such changes, albeit in a number of cases at v/c ratios that approach 1.0 across entire corridors at specific “cut-lines.”
3. **If commuter traffic is to be discouraged through the central core of Center City, as well as through First Ward and Fourth Ward, it is essential that alternative routes be provided.**  
Both the I-277/I-77 freeway loop and the surface street loop are critical elements that will help redistribute commuter traffic around Center City, and therefore allow commuters to avoid traversing these sensitive areas.
4. **As peak-hour traffic volumes approach the capacity of the Center City network, it is likely that the percentage of commuters who travel in the single peak hour will decrease.**  
The analysis does not reflect any such spreading of the peak. To the extent that this does occur, network performance will exceed the level expected.





## Assumptions

These conclusions rely on a few key assumptions. They include:

- 1. In the future, the percentage of employees who work in Center City and commute by driving will be significantly lower than it is today.**  
This change will occur primarily as a result of major improvements in public transportation to and within Center City, and increases in the number of employees who both live and work in Center City (and therefore will not need to drive to work).
- 2. This analysis presumes that in the future most drivers will use the I-277/I-77 freeway loop and the internal Circulator Route to approach their ultimate destination in Center City.**  
The Circulator Route consists of Graham, Stonewall, McDowell, Eleventh and Twelfth Streets. The assumption is that drivers will use these alternatives rather than traverse lengthy segments of Center City streets. In particular, most drivers will tend to avoid traveling from one side of Center City to the other, given the planned pedestrian orientation of the Center City core with an emphasis on the Trade and Tryon Street corridors.
- 3. This analysis also presumes most drivers will change their routes to avoid congestion in one corridor if another corridor is relatively less congested.**  
This is particularly likely in a grid system where alternative routes are readily available. Moreover, Charlotte has both a freeway loop in close proximity to Center City, and a surface street loop (the "Circulator Route" above) that will make such route adjustments particularly attractive.

The analysis performed in this study was conducted at a broad corridor level using planning approximations. It has determined that sufficient capacity will exist within the overall street network to accommodate future employment, using the assumptions described above, but it does not represent a detailed analysis of individual roadways or intersections. In particular, more detailed analyses of both the surface loop and of the interface between the surface streets and the freeway loop will be required in order to ensure that localized congestion does not occur.