
5 Base Condition

The first phase of the US 15-501 planning study was the determination of base conditions. This effort focused on identifying the features of the existing environment, selecting a reasonable set of land use and traffic growth trends, and defining the features US 15-501 would need if single-occupancy vehicles remained the predominant means for meeting travel demand in the corridor.

The determination of base conditions was completed in the following six steps:

1. Definition of setting, including future land use trends, existing environmental features and development of a travel forecasting model.
2. Steering committee meeting to discuss the findings of the first step.
3. Forecasting future travel demand and its roadway capacity requirements. Selection of a future roadway network for use in the model and assessment of the impact of four proposed new developments were also a part of this step.
4. Development of a highway-only alternative for serving future travel demand at an adequate level of service.
5. Steering committee meeting to discuss the findings of the third and fourth steps.
6. A public meeting to discuss the findings of this first phase.

Each of these steps and their results are discussed in the paragraphs that follow.

5.1 SETTING

5.1.1 Existing Traffic Conditions

The US 15-501 corridor is the major transportation link between Durham and Chapel Hill and one of the most heavily traveled and congested thoroughfares in the Durham-Chapel Hill-Carrboro urban area. The four-lane expressway is already over capacity, carrying daily volumes in 1990 of between 36,500 and 45,900. In the afternoon peak-hour period, the facility is operating at Level of Service (LOS) E, with several intersections operating at LOS F (e.g., Garrett Road in Durham and Erwin Road in Chapel Hill). Roadways in urban areas are typically designed to operate at LOS D or better.

5.1.2 Future Land Use

The study team worked with planners from the staffs of the City of Durham and the Town of Chapel Hill to develop corridor land use assumptions for the year 2010. These future land use assumptions were a critical component of US 15-501 corridor travel modeling, serving as the basis for determining the number of additional future dwellings and jobs in the corridor and in turn, the number of trip productions and attractions.

The selected land use assumptions are illustrated in Table 2. In general, they represent the densities and land use types that are included in adopted land use plans of Durham and Chapel Hill. The percent of each land use type in mixed use areas was not, however, specified in detail in the land use plans. Chapel Hill and Durham planners projected the mix that could occur (the adopted plan) and the mix that appeared likely based on recent development proposals (Alternative 1).

**Table 2
Land Use Assumptions**

	<i>Chapel Hill</i>	<i>Durham</i>
Residential Density		
• High	10 units per acre	10 units per acre
• Medium	6 units per acre	6 units per acre
• Low	3 units per acre	3 units per acre
Commercial Building Density		
• Floor Area Ratio (1)	0.264	0.228
• Employees/1,000 square feet (2)	3.5	3.5
Office Building Density		
• Floor Area Ratio (1)	0.264	0.373
• Employees/1,000 square feet (2)	4.0	4.0
Components of Mixed Use Classification (3)		
• Adopted Plan		
–Commercial	20%	25%
–Office	60%	30%
–Residential	<u>20%</u>	<u>45%</u>
TOTAL	100%	100%
• Alternative 1		
–Commercial	40%	60%
–Office	60%	20%
–Residential	<u>0%</u>	<u>20%</u>
TOTAL	100%	100%

NOTE: All values were provided by the Durham and Chapel Hill Planning Departments.

- (1) The floor area ratio (FAR) is used to convert gross land area into building size.
- (2) This represents the number of employees per 1,000 square feet of building.
- (3) "Adopted Plan" refers to the land use mix as specified in adopted land use plans. "Alternative 1" represents the land use mix based on the development proposals that have been made to date. The steering committee recommended that "alternative 1" be assumed in the study's traffic forecasts.

The steering committee approved the use of Alternative 1 for the traffic modeling because it represented the worst case scenario in terms of future traffic.

5.1.3 Environmental Features

Secondary sources were used to identify community and natural environmental features in the US 15-501 study area. The locations of neighborhoods, recreation trails, parks, historic sites, archaeological sites, wetlands, 100-year floodplains, threatened and endangered species, hazardous waste sites, and underground storage tanks were identified. The purpose of this effort was to identify areas that should be avoided, if possible, by the US 15-501 roadway improvement plan. The findings were presented to both the steering committee and at the public meeting for comment. The findings of this environmental screening are fully documented in *Environmental Inventory for US 15-501 Corridor Transportation Master Plan* (Parsons Brinckerhoff Quade & Douglas, Inc. with MA Engineering Consultants, May 1993).

The most environmentally sensitive feature within the corridor is the New Hope Creek area. The New Hope Creek area contains important wildlife and breeding and migratory bird habitats. It contains numerous significant plant communities and sites for rare plant species. Its floodplain and the floodplain for Dry Creek are a part of the open space preservation plan for New Hope Creek and can be considered proposed natural areas. Wetlands in the study area are predominantly along New Hope Creek. The 1985 *Durham Urban Trails and Greenways Master Plan* shows a proposed nature trail along New Hope Creek. A trail is also shown in the *New Hope Corridor Open Space Master Plan*.

The William N. Patterson House, included on the State Study List of historic structures, is between US 15-501 and Watkins Road.

The US 15-501 roadway improvement plan component of the Master Plan does not encroach upon the environmental features identified in the environmental screening except where US 15-501 crosses New Hope Creek. Any widening of US 15-501 would use lands from the New Hope Creek floodplain. The roadway plan, however, includes no new crossings of the creek, nor do the proposed interchanges encroach upon the creek's floodplain.

5.1.4 NCDOT TRANPLAN Model

The North Carolina Department of Transportation (NCDOT), Statewide Planning Branch maintains a TRANPLAN-based travel demand forecasting model for the Durham-Chapel Hill-Carrboro urban area. A review of this model was undertaken to determine its suitability for use in the US 15-501 corridor study.

The NCDOT model was determined to be adequate for regional travel demand forecasting. The network was recently updated for an air quality analysis and is generally consistent with the adopted Durham-Chapel Hill-Carrboro Thoroughfare Plan. One exception, an extension of Laurel Hill Drive is discussed below. The land use data set contained in the model was developed in 1985 and was determined to be adequate for regional modeling. Land use data within the study area did, however, need to be updated based on the latest land use plans of both Durham and Chapel Hill, as described above. NCDOT trip generation rates were determined to be suitable for converting the employment and dwelling unit assumptions presented in Table 2 into trip productions and attractions.

The following improvements were made to the model to make it more applicable to the US 15-501 study area:

- Combining the I-85 and I-40 external trip stations into a single station.

- Refining the model's zone and network structure by breaking the existing zones into smaller zones in the study area.
- Updating the 2010 land use data for the study area.

In addition, the sensitivity of model results to the extension of Laurel Hill Drive south of NC 54 to Jones Ferry Road was tested. The future of this proposed roadway improvement is uncertain. The test found that the removal of Laurel Hill Drive from the model network would have virtually no impact on traffic in the study area (less than one percent increase in traffic on US 15-501). To ensure a conservative analysis, Laurel Hill Drive south of NC 54 to Jones Ferry Road was not included in the study network.

5.2 STEERING COMMITTEE MEETING 1

The steering committee met on February 22, 1993 to discuss the project approach, future land use scenario, environmental information, and the travel model. The team presented their findings to date on these factors. The discussion centered on the planned travel model, including its capabilities and how transit use and future land use would be taken into account. Questions, comments and responses were:

- Question: Does the model have the ability to look at mode split and trace trip origins and destinations?
Response: The model can trace origins and destinations but cannot address mode split. The options charrette and traffic management strategy sensitivity studies were used to address mode split, including transit capture rates.
- Question: Will there be an opportunity to import a mode-split model for use in the charrette.

Response: No, not within the framework of this study.

- Question: Is existing land use programmed separately in the model?

Response: No, the TRANPLAN model used year 2010 land use projections, which included existing land uses.

- Question: Is it relatively easy to make additional runs with differing assumptions using the TRANPLAN model?

Response: It is easy as long as the changed assumptions do not include major network, traffic zone or land use changes.

- Question: Has a short-term reality check been made of the impact of the proposed developments by Eastowne, Homart, Wal-Mart and Sam's, and Chronaki Properties?

Response: The entire development area was the focus of the study, which included these four individual developments. A quick assessment of the impact of these four developments was later completed and is described later in this chapter.

- Question: Is the traffic model capacity constrained?

Response: Yes.

- Comment: The analysis needs to show what would happen if the project were not built to a full urban freeway on the Chapel Hill side of I-40.

Response: Much of the travel demand is inelastic, which means that travelers will want to use US 15-501 despite any limitations on capacity. The compensating factor is a reduction in the level of service and a lengthening of the peak hour. A test of the effect on traffic of improving US 15-501 to expressway

standards (access limited to at-grade intersections at cross streets) was later completed and the results are described in Chapter 7.

- **Question:** What is the impact of the proposed Laurel Hill Drive south of NC 54 on the project volumes within the study area?

Response: Laurel Hill Drive has a minimal influence on the travel demand along US 15-501.

- **Questions:** Could the proposed alignment for Laurel Hill Drive be evaluated? What would be the precision of the design?

Response: The intent of the study was to develop a conceptual footprint for approval by the steering committee. Further design will be done by other parties during later design and environmental impact studies.

5.3 FORECAST TRAVEL DEMAND

5.3.1 Roadway Network

At the request of the NCDOT, the TRANPLAN model was run using a network of roads that included existing roads plus roads listed in the NCDOT's seven-year Transportation Improvement Program (TIP). The model was also run using the existing and proposed roads shown in the Durham-Chapel Hill-Carrboro Urban Area Thoroughfare Plan. Both runs were made using year 2010 dwelling and employment data generated from the selected land use development scenario (Alternative 1).

It was found that total volumes passing through the corridor for the two road networks were similar. Because the Thoroughfare Plan calls for US 15-501 to be improved to a urban freeway to increase its capacity, year 2010 traffic volumes on US 15-501 volumes were found to be higher

assuming implementation of the Thoroughfare Plan:

	<u>2010 Average Daily Traffic</u>	
	<u>Existing + Committed</u>	<u>Thoroughfare Plan</u>
East of I-40	69,000	91,000
West of I-40	82,000	100,000

When only the committed improvements contained in the TIP were assumed, projected volumes on Old Durham-Chapel Hill Road and Erwin Road were higher because of the lower capacity of US 15-501 as an expressway:

	<u>2010 Average Daily Traffic</u>	
	<u>Existing + Committed</u>	<u>Thoroughfare Plan</u>
Durham-Chapel Hill Road	22,000	9,000
Erwin Road	16,000	9,000

A lower US 15-501 capacity forces traffic onto these two adjoining streets. It was recommended by NCDOT that the roadway network presented in the Thoroughfare Plan be used for two reasons:

1. The US 15-501 corridor study should be consistent with the area's adopted long-range transportation goals.
2. It was not considered desirable to transfer transportation improvement needs from US 15-501 to adjoining roads.

5.3.2 Assessment of Traffic Impact of Four Proposed New Developments

As requested at the first steering committee meeting, the impact to US 15-501 traffic volumes that would result from the proposed Wal-Mart/Sam's, Homart, Chronaki Properties and Eastowne developments was evaluated.

The US 15-501 average daily traffic for 1990 was factored up to 1995 using a 3.5 percent annual growth rate. The results were:

	<u>Average Daily Traffic</u>	
	1990	1995
East of I-40	43,000	51,100
West of I-40	48,000	57,000

Daily trips for the four proposed developments were estimated based on the land uses proposed in each development, their size and the traffic generation factors contained in the Institute of Transportation Engineer's *Trip Generation*, 5th Edition.

These trips were then distributed on the study area's roadway network. The affect on US 15-501's 1995 traffic of the four proposed new developments was found to be:

	<u>Average Daily Traffic</u>		
	<u>Existing</u>	<u>New</u>	<u>Total</u>
	<u>Devel-</u>	<u>Devel-</u>	
	<u>opment</u>	<u>opment</u>	
East of I-40	51,100	22,400	73,500
West of I-40	57,000	16,700	73,700

It can be seen that trips generated by these four new developments would make up 30.5 percent of the total 1995 trips east of I-40 and 22.7 percent of the total 1995 trips west of I-40. Figure 10 shows the affect of the trips generated by these four developments on US

15-501's capacity. The following can be observed:

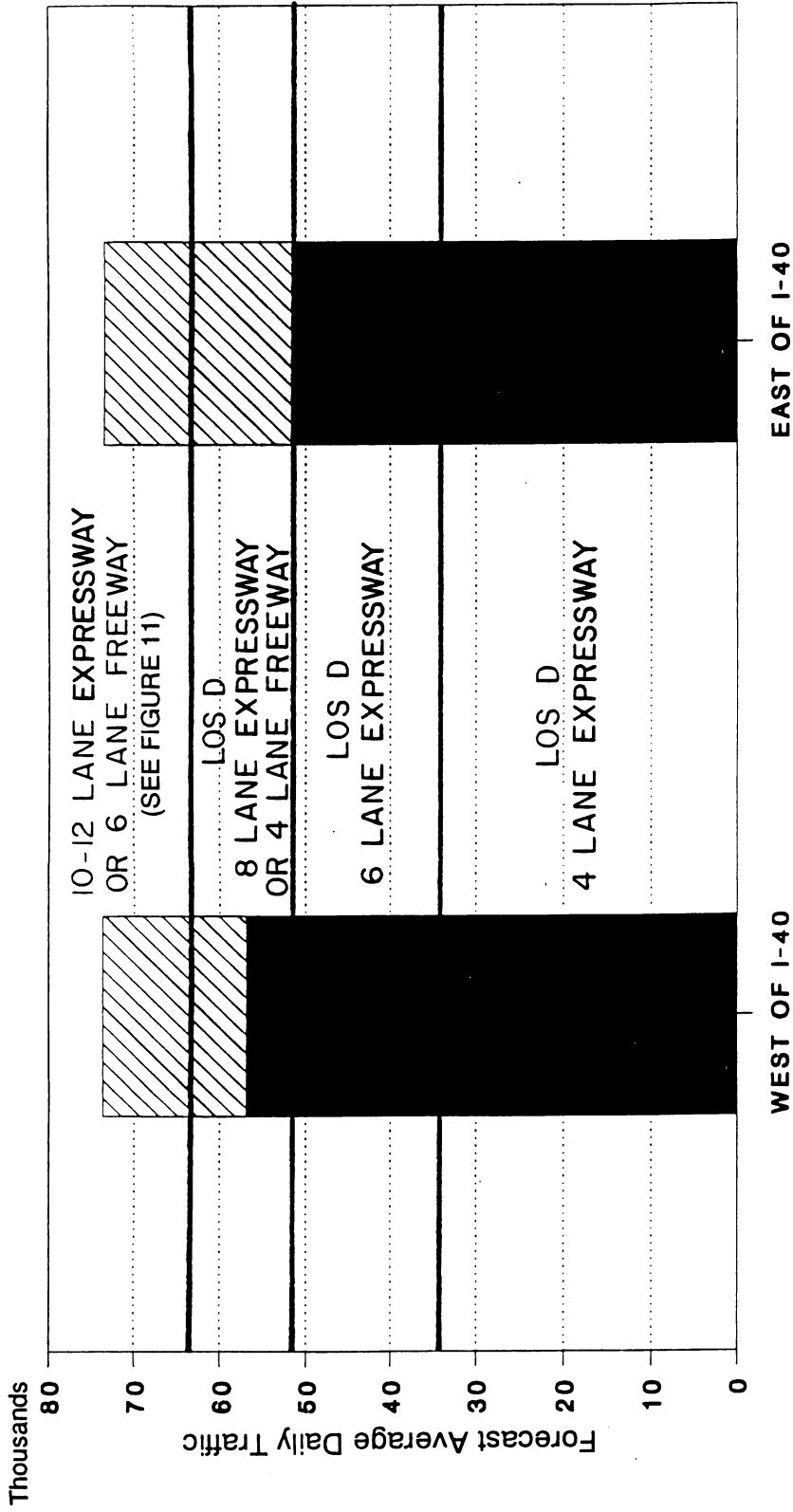
- US 15-501 would need to be widened to a six-lane expressway by 1995 even without the proposed developments.
- Traffic generated by the proposed developments alone would require a four-lane expressway from their driveways to I-40.
- Traffic generated by these four developments is enough to necessitate improving US 15-501 from its present form. Consideration should be given for grade separations at Eastowne Drive (East), Mt. Moriah Road (Laurel Hill Drive), and Garrett Road.

5.3.3 Travel Forecasts and Their Capacity Requirements

Year 2010 traffic on US 15-501 was forecast using the TRANPLAN model and assuming the "Alternative 1" land use scenario and the street network defined in the Durham-Chapel Hill-Carrboro Thoroughfare Plan. Traffic on US 15-501 is projected at 112,000 vehicles per day west of I-40 and 122,000 vehicles per day east of I-40 in 2010. These volumes begin to decrease moving away from the I-40 interchange.

Figure 11 shows the average daily traffic in 2010 in relation to the ability of expressways (access limited to at-grade intersections at cross streets) and freeways (access limited to interchanges with cross streets) of from four to ten lanes to carry traffic at level of service D.

For freeways, level of service D is the point at which traffic movement approaches unstable conditions and passing becomes extremely difficult. It is considered to be an acceptable peak hour level of service for planning purposes. Level of service A is defined as free flowing traffic. A stable flow with few restrictions on operating speed is level of service B. Level of service C is also

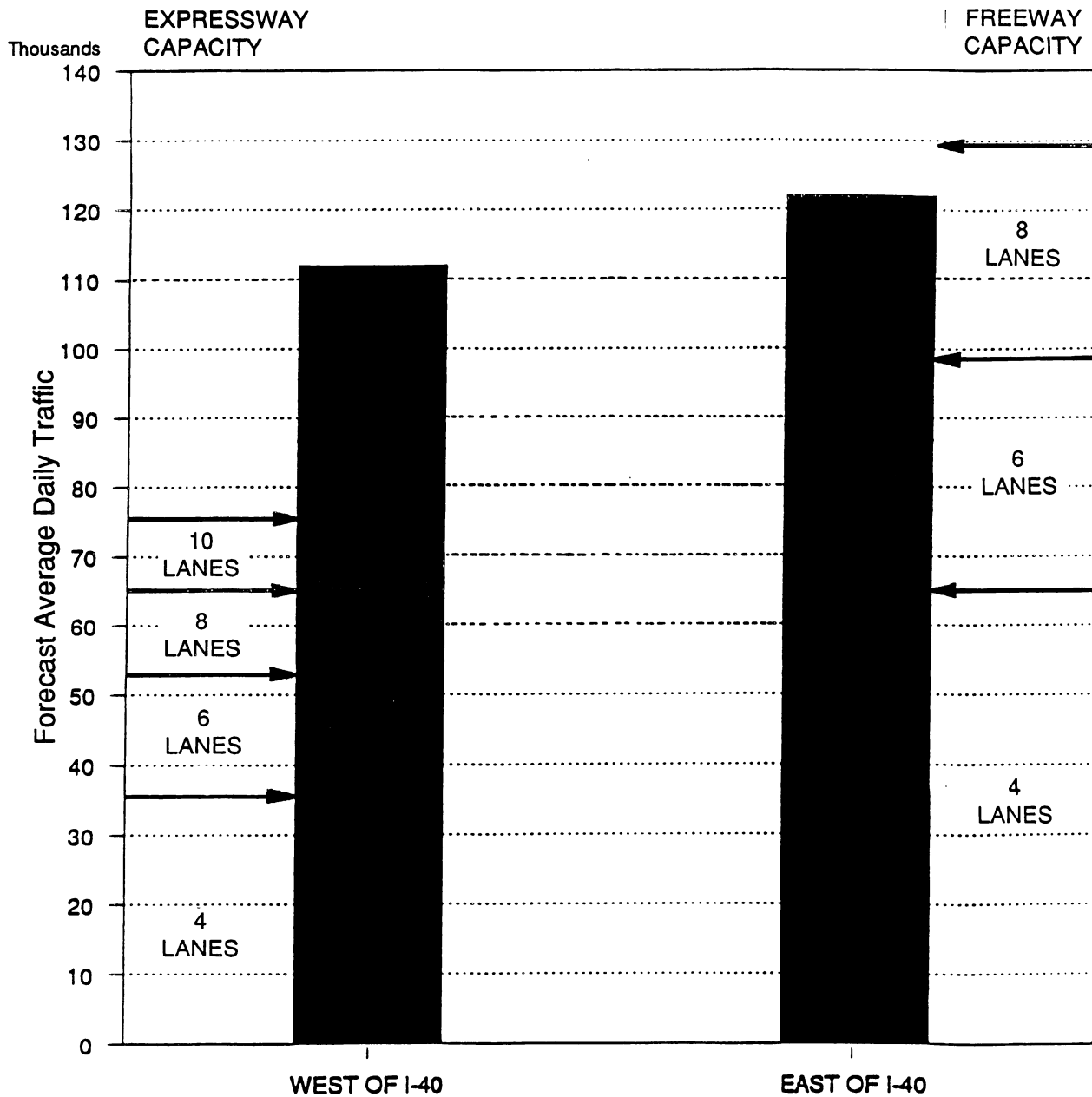


OTHER 1995 TRAFFIC
 DEVELOPMENT TRAFFIC

**PROPOSED DEVELOPMENTS:
HOMART, WALMART/SAMS, EASTOWNE & LOWES**

NOTE:
10 OR 12 LANE EXPRESSWAYS ARE RARELY BUILT BECAUSE THEY ARE NOT PRACTICAL AND CREATE POTENTIAL SAFETY PROBLEMS.

1995 Traffic with and without Four Proposed Developments
Figure 10



NOTE: CAPACITIES SHOWN FOR LEVEL OF SERVICE D.
 ASSUMES ALTERNATIVE 1 LAND USE.

Scale: NTS

considered a stable flow but with more restrictions on speed and lane changing. Level of service E defines the capacity of the highway. Under level of service E conditions, passing is virtually impossible and actual speeds can drop substantially. Heavily congested flow with traffic demand exceeding road capacity is classified as level of service F.

It can be seen in Figure 11 that an eight-lane urban freeway would be required both east and west of I-40 to accommodate year 2010 traffic at level of service D. Traffic volumes would have to drop substantially in order to make an eight-lane expressway a feasible option.

5.4 HIGHWAY-ONLY ALTERNATIVE

A highway-only solution to meeting future travel demand was then prepared. It was prepared as a starting point for discussion of Master Plan components. It was viewed as the most extensive road construction solution and showed the conversion of US 15-501 to a six- to eight-lane urban freeway.

5.5 STEERING COMMITTEE MEETING 2

On April 16, 1993, a second steering committee meeting was held to discuss the traffic forecasts, the number of lanes required to serve the projected volumes and the highway-only alternative. The steering committee affirmed the decision to use the thoroughfare road network for traffic modeling and discussed forecasts and the characteristics of the highway-only alternative. The committee affirmed the direction of the study.

5.6 PUBLIC DISCUSSION OF FINDINGS

A public meeting was held on May 13, 1993; 36 persons registered their presence. The purpose of the meeting was to present the study team's base condition study findings, including the team's highway-only alternative. This alternative included interchange, freeway, frontage road, and circulation concepts that would provide an acceptable level of future travel service.

Handouts, displays and project staff conveyed the message that traffic on US 15-501 is expected to grow significantly and would necessitate the redevelopment of this section of US 15-501 into an urban freeway to accommodate travel demand. Project staff discussed strategies with the public for reducing the need for extensive improvements.

Public comment was requested. The comments received included:

- The internal circulator road proceeding west towards I-40 should be a dedicated public right-of-way street between Laurel Hill Drive and Mt. Moriah Road to guarantee adequate access to properties west of Mt. Moriah Road.
- Is it possible to delete the "Laurel Hill Drive link" from the collector distributor road to Mt. Moriah Road?
- The section of Watkins Road between proposed Laurel Hill Drive and Mt. Moriah Road should be moved to a location near the sewer line.
- Maintain access to the four businesses in the Mt. Moriah, Pope and Watkins Roads area.
- Right-of-way should be reserved for future service roads.
- Future development should be pedestrian friendly and accommodate bicyclists.

- This should include crossings of US 15-501 and I-40.
- The plan should accommodate HOV lanes and a future fixed guideway system with an associated shuttle service.
- The Master Plan should not include too many specific design elements.
- Alternatives to the urban freeway solution should be considered.
- Wildlife passage, and in some cases walkways for pedestrians, should be accommodated at creek crossings.
- The New Hope Corridor Master Plan should not be adversely affected.