

# Northwest Cary Area Plan

## Background Paper – Transportation Analysis

### 1. Overview

Transportation modeling and analysis was performed as part of the Northwest Cary Area Plan, with assistance from Kimley-Horn and Associates, Inc. (KHA). KHA used the Triangle Regional Traffic Model (developed by NCDOT and CAMPO) to evaluate future roadway network capacity within the regional context, and to identify key facility constraints within the Northwest Area. KHA also used TRAFFIX, a traffic modeling software package marketed by Dowling Associates, Inc., to do the detailed traffic modeling of the traffic impacts likely to result if the Northwest Area is built out according to the recommendations of the plan.

### 2. Traffic Model Runs

Traffic modeling was performed at the following points in the plan development process:

1. Prior to the first design charrette, the Triangle Regional Travel Demand Model was run in order to evaluate transportation system constraints and capacity if the 1996 Land Use Plan were to be followed between now and 2025.
2. At the first design charrette on March 18-19, 2002, a Concept Plan for Northwest Cary was developed. The Concept Plan was translated into GIS map layers, and buildout forecasts were generated based on the GIS version of the Concept Plan. KHA then constructed a TRAFFIX model for the Northwest Area based on the Concept Plan, and ran the model to evaluate traffic impacts and required roadway improvements. The model results were available by April 19, 2002.
3. At the second design charrette on April 23, 2002, a Draft Plan for Northwest Cary was developed, with modifications to the transportation recommendations of the plan based on findings from the run of the TRAFFIX model. Following the charrette, the Draft Plan was translated into GIS map layers, and buildout forecasts were again generated based on the GIS version of the Concept Plan. KHA then modified the TRAFFIX model to reflect the new Draft Plan, and ran the model to evaluate traffic impacts and required roadway improvements.
4. During May-June 2002, Planning Department staff revised the Draft Plan into a Proposed Plan, which went to public hearing on June 27, 2002. The Proposed Plan included some modifications to both land use and transportation recommendations. Once more, KHA used the GIS map layers and buildout forecasts (generated by the Planning Department) for the Proposed Plan to modify and run the TRAFFIX model a final time in July 2002 to evaluate traffic impacts and required roadway improvements.

The traffic model was not run on the version of the Northwest Cary Area Plan adopted by Town Council on September 12, 2002, since the magnitude of the changes made to the plan since the public hearing were negligible in terms of their overall land use and traffic impacts.

### 3. Model Parameters and Assumptions

- a. **Model Horizon Year(s):** The TRAFFIX model was run assuming the total buildout of the Northwest Cary area. Background traffic for the year 2025 was used in this analysis, although it may take longer than 23 years to build out the entire Northwest Cary plan.
- b. **Background Traffic Growth and Regional Traffic Impacts:** Growth in traffic, not attributed to the Northwest Cary area, was accounted for using the 2025 Triangle Regional Model. To understand the contribution of background traffic to overall traffic traveling on streets within to the Northwest Cary area, traffic was identified as being attributed to the Northwest Area or not attributed to the Northwest Cary area.

- c. **Additional Use of Regional Model:** The regional model was used to produce future traffic volumes for the determination of initial holding capacity of the study area, it was used to develop trip distribution from the study area, and it was one tool used to develop background traffic, in addition to comparisons to straight-line growth estimates of background traffic as a check.
- d. **Inclusion of Interchange:** The planning area was modeled both with and without the inclusion of an interchange at I-540 (Western Wake Expressway) and the future Morrisville Parkway. By and large by providing an interchange at the Morrisville Parkway Extension, traffic will be split more evenly between the planned NC 55 and Green Level West Road interchanges, relieving sections of NC 55 and Green Level to Durham Road by shortening trip length to the interchanges. Without the interchange, the plan should still provide adequate levels of service due to the efficient at-grade intersections and recommendations for grade separations at the busiest intersections. However, it should be noted that without the interchange at the Morrisville Parkway Extension, interchanges at Green Level West Road and NC 55 and the Outer Loop will experience increased traffic volumes and levels of delay. Model results in this report assume the presence of the interchange at Morrisville Parkway. The importance and expected traffic volumes at these interchanges will necessitate that traffic signals be installed at the I-540 ramps on both Morrisville Parkway Extension and NC 55.

#### 4. Findings

Traffic modeling of the Proposed Plan (the version of the Northwest Cary Area Plan that went to public hearing on June 27, 2002) yielded the following results:

##### 4.1 Trip Generation

The tables below show overall trip generation (within the entire northwest planning area) for each of the three modeled land use plans.

**Table 1: Trip Generation Comparison – AM Peak Hour**

AM Peak Hour			
Scenario	Proposed Plan	Draft Plan	Concept Plan
Inbound	12,359	12,501	12,768
Outbound	8,180	8,620	7,426
<i>Total</i>	20,541	21,121	20,194
<i>Scenario 2 had the highest overall AM peak hour trip generation</i>			

**Table 2: Trip Generation Comparison – PM Peak Hour**

PM Peak Hour			
Scenario	Proposed Plan	Draft Plan	Concept Plan
Inbound	10,088	10,474	9,449
Outbound	13,216	13,592	13,956
<i>Total</i>	23,306	24,066	23,405
<i>Scenario 2 had the highest overall PM peak hour trip generation</i>			

##### 4.2 Average Daily Traffic Volumes and Cross Section Recommendations

The tables below list the average daily traffic volumes predicted by the TRAFFIX model for various roadway sections in the northwest area. Refer to Map 3 of the Northwest Cary Area Plan for a map of the roadways.

**Table 3: East-West Corridors**

Street	Projected ADT	Recommended Cross Section	Min. Right-of-way Width (in ft.) <sup>1</sup>
<b>Grandale Rd./Wake Road/Kit Creek Parkway</b>			
➤ from Durham County line to Berry Farm Road	14,000	2-lanes with left-turn lanes/bays	60 (=existing)
➤ from Berry Farm Road to NC 55	20,000	4-lanes with a landscaped median east of Berry Farm Road, with reservation for additional dedicated transit lanes (2) or facilities east of Alston Ave.	110 (Berry Farm Rd. to Alston) 124 (east of Alston)
<b>O'Kelly Chapel Road</b>			
➤ from NC 751 and U.S. Army Corps of Engineers land and Chatham County line to Howard Grove Pkwy. (County Line Road)	14,000	4-lanes with a landscaped median <sup>2</sup>	110
➤ from Howard Grove Pkwy. (County Line Road) to NC 55	27,000	4-lanes with a landscaped median	110
<b>Amberly Parkway/McCrimmon Parkway (formerly: "Panther Creek Parkway")</b>			
➤ from Howard Grove Pkwy. (County Line Road) to Green Level to Durham Road	3,500	2-lanes with left-turn lanes/bays (right-of-way reserved for a 4-lane road w/ median) <sup>3</sup>	100
➤ from Green Level to Durham Road to Planned N/S Collector (located east of I-540 and west of NC 55)	22,000	4-lanes with a landscaped median and reservation for dedicated transit lanes (2) or facilities.	124-150 <sup>4</sup>
➤ from Planned N/S Collector (located east of I-540 and west of NC 55) to NC 55	22,000	4-lanes with a landscaped median and reservation for dedicated transit lanes (2) or facilities.	124-150 <sup>4</sup>
➤ from NC 55 to Davis Drive	25,000	4-lanes with a landscaped median and reservation for dedicated transit lanes (2) or facilities.	124-150 <sup>4</sup>
<b>Sowter Drive/Airport Boulevard Extension</b>			
➤ from Morrisville-Carpenter Road to Davis Drive	18,000	40-foot back to back (2 lanes w/ median, or 3 lanes)	60 <sup>5</sup>
➤ from Davis Drive to NC 54	24,000	4-lanes with a landscaped median	110
<b>Yates Store Road/Carpenter Fire Station Road/Morrisville-Carpenter Road</b>			
➤ from New Hope Church Road to Howard Grove Pkwy. (a.k.a. County Line Road)	17,000	4-lanes with a landscaped median	110
➤ from Green Level to Durham Road to NC 55	28,000	4-lanes with a landscaped median	110
➤ from NC 55 to Davis Drive	30,000	4-lanes with a landscaped median	110
<b>Morrisville Parkway Extension</b>			
➤ from Yates Store Road to NC 55	26,000	4-lanes with a landscaped median	110

**Table 4: North-South Corridors**

Street	Projected ADT	Recommended Cross Section	Min. Right-of-way Width (in ft.) <sup>1</sup>
<b>Howard Grove Pkwy. (a.k.a. "County Line Road." formerly: "Amberly Drive.")</b>			
➤ from O'Kelly Chapel Road to Yates Store Road	5,500	2-lanes with a landscaped median (right-of-way reserved for a 4-lane cross section) <sup>6</sup>	110
<b>Alston Avenue/Green Level to Durham Road</b>			
➤ from NC 55 to Kit Creek Parkway	13,000	4-lanes with a landscaped median and reservation for dedicated transit lanes (2) or facilities. (Possibly including intersections with transit priority treatments)	124
➤ from Kit Creek Parkway to O'Kelly Chapel Road	27,000		
➤ from O'Kelly Chapel Road to Carpenter Fire Station Road	29,000		
➤ from Carpenter Fire Station Road to Morrisville Parkway Extension	20,000		
<b>Planned N/S Collector Street (east of I-540 and west of NC55)</b>			
➤ from Louis Stevens Road to Morrisville Parkway	12,000	2-lanes with a landscaped median	75
<b>NC 55</b>			
➤ north of Kit Creek Parkway	42,000	6-lanes with a landscaped median  (and continuing as 6 lanes with a landscaped median all the way south to US 64)	150
➤ from Kit Creek Parkway to O'Kelly Chapel Road	46,000		
➤ from O'Kelly Chapel Road to Carpenter Fire Station Road	55,000		
➤ from Carpenter Fire Station Road to Morrisville Parkway Extension	45,000		
<b>Louis Stevens Road</b>			
➤ from Planned N/S Collector Street to Morrisville-Carpenter Road	24,000	4-lanes with a landscaped median and possible reservation for dedicated transit lanes (2) or facilities.	110-124 <sup>7</sup>
➤ from Morrisville-Carpenter Road to Morrisville Parkway Extension	25,000		
<b>Davis Drive</b>			
➤ north of McCrimmon Parkway	28,000	6-lanes with a landscaped median	150 (existing)
➤ from McCrimmon Parkway to Morrisville-Carpenter Road	33,000		124 <sup>8</sup>
➤ from Morrisville-Carpenter Road to Morrisville Parkway	32,000		102 <sup>8</sup>

**Notes for Tables 3 and 4:**

<sup>1</sup> Right-of-way width is approximate. Actual Town of Cary engineering standards may vary somewhat from this.

<sup>2</sup> Although the TRAFFIX model for the NWCAP predicts a traffic volume sufficient for a 2 lane thoroughfare, four lanes are recommended because (a) this is a major, direct east-west connection between NC 751 and NC 55, which may result in larger traffic volumes in the long term, and (b) to match up with thoroughfare plans for Wake County and the region.

<sup>3</sup> Traffic modeling indicates that a 2-lane median-divided roadway with left-turn lanes/bays is sufficient. A right-of-way of about 75 feet would be sufficient for this. However, the approved Amberly PUD specifies this section as a 4-lane, median-divided roadway in a 100-ft. right-of-way, with 78 ft. back-to-back pavement.

<sup>4</sup> 124 ft. of ROW is the minimum needed to support dedicated transit lanes in this corridor. The figure of 150 ft. can support other dedicated transit technologies, in a median-separated corridor.

<sup>5</sup> The 60 ft. right-of-way is specified in the approved Carpenter Village PUD document. If the PUD did not exist or is revised at some point in the future, a wider right-of-way of about 70 ft. is recommended, with dual sidewalks.

<sup>6</sup> Traffic modeling indicates that a 2-lane median-divided roadway is sufficient. The ADT projection is based on a 2-lane road. However, the Town of Cary's existing Comprehensive Transportation Plan proposes a 4-lane median divided thoroughfare to handle the possibility that this roadway could become a section of a future "County Line Road," continuing northward into Durham County and south towards Apex. In that case, traffic volumes may increase and require a 4-lane roadway. Also, if Howard Grove Pkwy. does become a four-lane road, the wider roadway will have a tendency to draw motorists to it, increasing the ADT. Lastly, the approved Amberly PUD does specify this as a 4-lane, median-divided roadway in a 124 ft. right-of-way. Note: while the TRAFFIX model did study the effect of connecting this road northward as the future County Line Road, the model did not rely on that connection to Grandale/Wake Road, and the ADT and LOS model results cited in this report do not rely on the connection. The impact of making the connection or failing to make the connection did not significantly alter the model results.

<sup>7</sup> The upper range of 124 ft. will support reservation of two dedicated transit lanes. The lower figure of 110 ft. supports just the 4-lane, median-divided roadway.

<sup>8</sup> These right-of-way widths correspond to the cross-sections proposed in Cary's 2001 Comprehensive Transportation Plan, and they also support the Davis Drive widening project.

**Roadway Cross-Section Details:**

Table 5, below, shows how the various recommended minimum roadway rights-of-way (ROW) listed in tables 3 and 4 might translate into the different components of the roadway cross-section: back-to-back pavement (b/b), planting strip, sidewalk (s/w), and utility strip along the outside edge of the sidewalk. If the suggested cross-section components or right-of-way width varies from the implied standard in the 2001 Comprehensive Transportation Plan, the “Comments” column explains the nature of the difference. The suggested cross-sections in table 5 are intended to supplant the recommendations in the 2001 Comprehensive Transportation Plan, which should be amended to reflect the new minimum cross-sections that were adopted with the Northwest Cary Area Plan.

**Table 5: Recommended Roadway Cross-Section Details**

<b>Right of Way Width (in feet) Used in Tables 3 and 4</b>	<b>Suggested Cross-Section</b>	<b>Comments</b>
60	45' b/b (2 lane with center turn lane, no median); s/w on one side only	
75	45' b/b (2 lane with center turn lane, no median); dual 5' s/w with 8' planting strip and 2' utility maint. strip beyond s/w.	Current/old Town standard uses a 5' planting strip and 2.5' maint. strip for a total ROW of 70'.
100	Used in Amberly PUD only (4 lane with median; see PUD plan)	
102	76' b/b (4 lane, w/ median); dual 5' s/w, 5' planting strip, and 3' utility maint. strip ea. side	This study recommends raising this minimum 102' ROW whenever possible to allow at least an 8' planting strip (for a min. ROW of 108')
110	78' b/b (4 lane, w/ median); dual 5' s/w, 8' planting strip, and 3' utility maint. strip ea. side	Replaces existing Town standard of 78' b/b, with dual 5' s/w, 5' planting strip, and 3' utility maint. strip ea. side., with a total ROW of 104'.
124	102' b/b (6 lane, w/ median); dual 5' s/w, 5' planting strip, and 1' utility maint. strip ea. side. Alternatively, the 102' b/b could be used for a 4 lane road with median, saving the extra right-of-way for future dedicated transit facilities/lanes.	This study recommends raising this minimum ROW whenever possible to allow at least an 8' planting strip (min. ROW of 130')
150	Right-of-way for a separated transit facility paralleling a typical 4-lane, median divided roadway, where the roadway might be a 78' b/b with dual 5' s/w, 8' planting strip, and 3' utility maint. strip, allowing the remaining 40' or more for a transit corridor.	

### 4.3 Intersection Level of Service

Table 6 below lists the Level of Service (LOS) predicted by the TRAFFIX model for various intersections within the northwest area. The LOS output from the TRAFFIX model assumes the number of lanes on each roadway as recommended in Tables 3 and 4.

**Table 6: Northwest Cary Area Plan Intersection Summary**

Intersection	Recommended Treatment/Control	Peak Hour LOS	
		AM	PM
<b>Howard Grove Pkwy. (a.k.a. "County Line Road"; formerly: "Amberly Drive") and...</b>			
➤ O'Kelly Chapel Road	unsignalized <sup>9</sup>	B	B
➤ Yates Store Road	unsignalized <sup>9</sup>	B	B
<b>Alston Ave./Green Level to Durham Road and...</b>			
➤ Kit Creek Parkway	traffic signal	D	D
➤ O'Kelly Chapel Road	traffic signal	C	D
➤ Amberly Parkway (formerly known as Panther Creek Pkwy.)	traffic signal	D	D
➤ Carpenter Fire Station Road	traffic signal	C	C
➤ Morrisville Parkway Extension	traffic signal	C	B
<b>Planned N/S Collector Street (east of I-540 and west of NC 55) and...</b>			
➤ Amberly/McCrimmon Parkway	traffic signal	C	C
➤ Carpenter Fire Station Road	traffic signal	C	C
➤ Morrisville Parkway	traffic signal	C	B
<b>NC 55 and...</b>			
➤ [South] Alston Avenue <sup>10</sup>	traffic signal	C <sup>10</sup>	C <sup>10</sup>
➤ Kit Creek Parkway	traffic signal.	D	C
➤ O'Kelly Chapel Road	traffic signal. potential grade-separated [square loop] interchange. <sup>11</sup>	D <sup>12</sup>	E <sup>12</sup>
➤ Planned N/S Collector	traffic signal	C	C/D
➤ Amberly/McCrimmon Parkway	grade-separated square loop interchange <sup>13</sup>	E <sup>13</sup>	F <sup>13</sup>
➤ Carpenter Fire Station Road	grade-separated square loop interchange <sup>13</sup>	F <sup>13</sup>	F <sup>13</sup>
➤ Morrisville Parkway	traffic signal. Potential grade-separated [square loop] interchange. <sup>11,14</sup>	E <sup>12</sup>	B <sup>12</sup>
<b>Louis Stevens Road and...</b>			
➤ Planned N/S Collector Street	traffic signal	B	B
➤ Amberly/McCrimmon Parkway	traffic signal <sup>15</sup>	C	C
➤ Morrisville-Carpenter Road	traffic signal	D	C
➤ Morrisville Parkway Extension	traffic signal	D	B
<b>Davis Drive and...</b>			
➤ McCrimmon Parkway	traffic signal. Potential grade-separated [square loop] interchange. <sup>11,16</sup>	C <sup>12</sup>	E <sup>12</sup>
➤ Sowter Drive/Airport Boulevard Extension	traffic signal	C	D
➤ Morrisville-Carpenter Road	traffic signal. Potential grade-separated [square loop] interchange. <sup>11,17</sup>	E <sup>12</sup>	D <sup>12</sup>

**Notes:**

- <sup>9</sup> These two intersections may need to be signalized if Howard Grove Pkwy. is constructed as a 4-lane median divided roadway. Otherwise, we'd have an unsignalized intersection of two 4-lane median divided roadways, which would create safety and efficiency issues at these intersections. The model LOS results are for a two-lane Howard Grove Pkwy. If Howard Grove Pkwy. were four lanes, it has the potential to attract additional traffic, which could also require signalization and affect the LOS.
- <sup>10</sup> This intersection is actually just over the county line into Durham County. The LOS shown assumes that NC55 is six lanes at this location.
- <sup>11</sup> If at-grade, the intersection may need exclusive (dual) left-turn and (single) right-turn lanes on approaches as well as four through lanes (two in each direction). That, coupled with the width of the roadways at this intersection, will result in very large intersection footprints, with pavement widths of 120-150 feet. These long distances result in long pedestrian crossing times (if pedestrians want to cross at all), long yellow and red times, a significant amount of total lost time per signal cycle, and greater chances for vehicle crashes. Grade separation would significantly improve the LOS shown, as well as consume less land and shorten pedestrian crossing distances (if a square-loop intersection design is used). However, the intersection does not NEED to be grade separated until it fails (i.e., if it reaches LOS F). A more conservative recommendation (less cost) at these intersections for the interim may be to reserve sufficient right-of-way for future intersection improvements, and to monitor the intersections' LOS over time to see if grade-separation becomes warranted.
- <sup>12</sup> The Level of service indicated is for a signalized at-grade intersection. A grade separation would significantly improve the LOS shown. For any intersection where grade separation is suggested as an option, the LOS will become D or better.
- <sup>13</sup> Grade separation is essential at this intersection. This study recommends grade separations when the level of service during the AM and/or the PM peak hour is F and cannot be mitigated by revising signal phasing and timing, providing additional exclusive turn lanes, or providing better signal coordination. Without grade separation, the level of service will be E/F, as shown. Use of a grade-separated [square loop] interchange will improve LOS to D or better. A square loop interchange is a type of grade-separated roadway interchange that preserves the interiors of the on-off ramps for development, and compacts the amount of land needed for the actual interchange. It is a more urban-friendly design. A local example is the Wade Avenue and Oberlin Road intersection in Raleigh.
- <sup>14</sup> This intersection may need a grade separation at any rate in order to deal with the crossing of the nearby CSX Railroad corridor, the proximity of which to this intersection may limit the options for design for an at-grade intersection.
- <sup>15</sup> A grade-separated intersection may be advisable here to support transit service along Amberly/McCrimmon Parkway, to reduce transit service delays at the intersection. However, it is not required to raise the level of service to an acceptable level.
- <sup>16</sup> Two quadrants of this intersection lie in Morrisville's jurisdiction. In order for the intersection to be grade-separated, Morrisville's transportation plan should also reflect that recommendation.
- <sup>17</sup> All four quadrants of this intersection lie in Morrisville's jurisdiction. In order for the intersection to be grade-separated, Morrisville's transportation plan should reflect that recommendation.

**A note on the suggested grade-separated crossings:** This report does not detail any grade-separated crossings that may be required over/under the CSX railroad line. Grade-separated crossings of the railroad corridor should be considered in conjunction with any grade-separations needed at nearby intersections. Other grade-separations over/under the railroad line may depend on the anticipate frequency and volume of rail service in that corridor.