Appendix L

Attainment Test

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1 ATTAINMENT DEMONSTRATION

This Appendix summarizes the procedures that were used to demonstrate attainment of the 8-hour ozone National Ambient Air Quality Standard (NAAQS) in this State Implementation Plan (SIP) package. As described in the US Environmental Protection Agency's (USEPA's) September 2006 draft final Guidance On The Use Of Models And Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze ("*Attainment Guidance*"), an attainment demonstration consists of (a) analyses which estimate whether selected emissions reductions will result in ambient concentrations that meet the NAAQS, and (b) an identified set of control measures which will result in the required emissions reductions. The necessary emission reductions for both of these attainment demonstration components may be determined by relying on results obtained with air quality models.

Section 3.0 of the *Attainment Guidance* recommends applying both a modeled attainment test and a subsequent screening test to the air quality modeling results to determine if the 8-hour ozone NAAQS will be met. Additional technical or corroboratory analyses may also be used as part of a "weight of evidence" determination to supplement the modeled attainment test and to further support a demonstration of attainment of the NAAQS.

The modeled attainment test, additional corroborative analyses and weight of evidence, and unmonitored area analysis are described in further detail in the remaining portions of this Appendix, detailing how the respective test or analysis was performed and applied to the attainment demonstration.

2 MODELED ATTAINMENT TEST

The modeled attainment test is the practice of using an air quality model to simulate baseline (i.e., current) and future air quality. For the 8-hour ozone NAAQS, the baseline and future model estimates are used in a "relative" rather than "absolute" sense. Specifically, the ratio of the air quality model's future to baseline predictions is calculated at each ozone monitoring site. These monitoring site-specific ratios are called relative response factors (RRF). Future ozone design values (DVF) are then estimated at each monitor by multiplying the monitor-specific baseline ozone design value (DVB) by the modeled relative response factor for each monitor. If the resulting predicted site-specific DVFs are < 82 parts per billion (ppb), a clear demonstration of predicted attainment is shown. If the predicted DVFs is $\geq$ 82 ppb and $\leq$ 87 ppb, then a weight of evidence demonstration must be submitted that supports a demonstration of attainment. For DVFs > 87ppb, the *Attainment Guidance* states that more qualitative results are less likely to support a conclusion differing from the outcome of the modeled attainment test. Equation 2-1 presents the modeled attainment test, applied at monitoring site "x" as described in Section 4.0 of the *Attainment Guidance*.

$$(DVF) = (RRF) \times (DVB) \qquad \text{Equation 2-1}$$

Where (DVB) = the baseline design value monitored at site "x", ppb
= the average (of the three) design value periods which include the baseline inventory year (i.e. the average of the 2000-2002, 2001-2003, and 2002-2004 design vales periods for the 2002 baseline inventory year).

(RRF) = the ratio of the future 8-hr daily maximum concentration predicted "nearby" a monitor (averaged over each day of the episode) to the current 8-hr daily maximum concentration predicted "nearby" the monitor (averaged over each day of the episode).

(DVF) = the estimated future design value, ppb.

It is important to consider an array of cells "nearby" a monitor rather than focusing on the individual cell containing the monitor. This allows for variations in the model performance where the peak ozone may not occur in the grid cell that contains the monitor but rather nearby the monitor. Table 2-1 provides the USEPA's recommendations for defining "nearby" cells for grid systems having cells of various sizes. Since the attainment demonstration modeling was performed using a 12-kilometer grid resolution, the size of the array for "nearby" cells was 3 x 3.

Table 2-1 USEPA's Recommendation for Defining "Nearby" Cells

Size of Cell (km)	Size of the Array of "Nearby" Cells
$\leq$5	7 x 7
>5-8	5 x 5
>8-15	3 x 3
>15	1 x 1

The RRF is calculated by taking the ratio of the mean future year modeling 8-hour ozone daily maximum to the mean baseline year modeling 8-hour ozone daily maximum "near" the monitor. (Equations 2-2).

$$RRF = \frac{\text{mean future yr. 8-hr daily max "near" monitor "x"}}{\text{mean baseline yr. 8-hr daily max "near" monitor "x"}} \quad \text{Equation 2-2}$$

Section 14.1.1 of USEPA's *Attainment Guidance* outlines the process for determining which days are used in the RRF calculation. The day selection process starts by identifying all the days in the baseline modeling that has a modeled daily maximum 8-hour average ozone equal to or greater than 85 ppb. If there are 10 or more days greater than 85 ppb, then 85 ppb is used as the cutoff with those days used in the RRF calculation. If there are fewer than 10 days with a modeled daily maximum 8-hour average ozone equal to or greater than 85 ppb, then the threshold is reduced by 1 ppb until there are at least 10 days identified for use. If there are fewer than 10 days with a modeled daily maximum 8-hour average ozone equal to greater than 70 ppb, then all days at 70 ppb and higher are used in the RRF calculation and consideration of modeling another episode should be explored.

The DVB, for purposes of the modeled attainment test, is defined in the *Attainment Guidance* by one of four methods:

1. The design value period (i.e. the average 4th highest value for the 3-yr period used to designate an area "nonattainment", here the period from 2001 to 2003)

2. The average 4th highest value for the 3-yr period straddling the baseline inventory year (e.g., the 2001-2003 design value period for the 2002 baseline inventory year)

3. The highest of the three design value periods which include the baseline inventory year (e.g., the 2000-2002, 2001-2003, 2002-2004 design value periods for a 2002 baseline inventory year)

4. The average of the three design value periods which straddle the baseline inventory year (e.g., the average of the 2000-2002, 2001-2003, and 2002-2004 design value periods for a 2002 baseline inventory year)

The USEPA recommends the fourth method (average of the three design value periods straddling the baseline year), which is the DVB shown in Table 2-2 at each ozone monitoring site in the Metrolina region.

Table 2-2 lists the attainment test results by monitor in the Metrolina area. The first column is the monitoring site, then the county the monitor is located in, followed by the DVB used for the test. The next series of columns are the number of days used in the calculation, the ozone level threshold needed to reach at least 10 days for RRF, the calculated RRF and the resulting DVF for the attainment year, 2009. The bold italicized DVFs are values that fall within the range where additional weight of evidence is needed to demonstrate attainment. Half of the monitors in the

Metrolina nonattainment area have predicted DVFs that fall below 82 ppb and the other half fall between 82 ppb and 87 ppb. Therefore, additional weight of evidence is required to demonstrate attainment. The North Carolina Division of Air Quality (NCDAQ) believes that the weight of evidence presented in Section 3 supports a demonstration of attainment.

Table 2-2 Metrolina Attainment Test Results for 2009

Monitoring Site	County	DVB (ppb)	Number of Days used in RRF	Ozone Threshold (ppb)	RRF	DVF (ppb)
Arrowood	Mecklenburg	84.7	18	85	0.892	75
County Line	Mecklenburg	97.3	13	85	0.874	***85***
Crouse	Lincoln	90.7	10	84	0.868	78
Enochville	Rowan	97.0	13	85	0.870	***84***
Garinger (Plaza)	Mecklenburg	95.3	19	85	0.883	***84***
Monroe	Union	87.0	10	81	0.884	76
Rockwell	Rowan	97.3	10	84	0.862	***83***
York	York, SC	83.0	11	84	0.861	71

3 ADDITIONAL CORROBORATIVE ANALYSES AND WEIGHT OF EVIDENCE DETERMINATION

As part of the weight of evidence determination, the following analyses will be evaluated:

- Alternative DVFs calculations,
- Metrics of air quality modeling results,
- Air quality modeling results from other studies,
- Observed air quality trends and additional reductions in emissions, and
- Local measures not modeled.

The weight of evidence determination is a supplement to the modeled attainment test and further supports that the area will attain the NAAQS for 8-hour ozone by June 15, 2010.

3.1 Alternative DVF Calculatation

The NCDAQ used the USEPA recommended method of calculating the DVB in its modeled attainment test. However, the NCDAQ has commented several times on various draft versions of the attainment guidance that we do not believe that a weighted DVB is appropriate and that a DVB calculated using a straight average minimizes the impacts of any abnormally hot/dry or cool/wet meteorological conditions. As part of the weight of evidence demonstration, the NCDAQ proposes an alternative method to calculate the DVB and presents the modeled attainment test results with this alternative DVB.

The USEPA recommends calculating the DVB by averaging the three design value periods that straddle the baseline inventory year. This methodology results in a center weighting of annual 4th highest ozone concentrations around the baseline inventory year because the three design value periods averaged contain overlapping data. When simplified the recommended DVB calculation for this SIP modeling exercise can be seen in Equation 3.2-1

$$DVB = \frac{1*(2000\ 4^{th}\ \text{Highest}) + 2*(2001\ 4^{th}\ \text{Highest}) + 3*(2002\ 4^{th}\ \text{Highest}) + 2*(2003\ 4^{th}\ \text{Highest}) + 1*(2004\ 4^{th}\ \text{Highest})}{9} \quad \text{Equation 3.2-1}$$

The weighting scheme of annual 4th highest ozone concentrations in the recommended DVB calculation weights the center, or third, year three times more than that of the first or last year and one and half times more than that of the second or forth year. If this third year is an abnormally hot/dry or cool/wet period, the unusual meteorological conditions and resulting air quality conditions will be amplified upward or downward in the modeled attainment exercise.

To minimize potential impacts of any abnormal meteorological conditions while still considering ozone conditions across a 5-year span, an alternative DVB calculation that does not weight any of the years more than another, but is a straight average of annual 4th highest ozone concentrations for the 5-year span centered on the baseline inventory year was considered (Equation 3.2-2).

$$DVB = \frac{2000\ 4^{th}\ \text{Highest} + 2001\ 4^{th}\ \text{Highest} + 2002\ 4^{th}\ \text{Highest}}{2003\ 4^{th}\ \text{Highest} + 2004\ 4^{th}\ \text{Highest}} \quad \text{Equation 3.2-2}$$
$$5$$

When the 5-year straight average DVB is applied to the remainder of the Modeled Attainment Test equations, the resulting DVFs are shown in Table 3.1-1 at each monitoring site in the Metrolina region.

Table 3.1-1 5-Year Average Alternative Attainment Test Results for 2009

Monitoring Site	County	DVB 5-Year Straight Average 2000-2004 (ppb)	RRF	DVF (ppb)
Arrowood	Mecklenburg	83.4	0.892	74
County Line	Mecklenburg	95.6	0.874	**83**
Crouse	Lincoln	89.2	0.868	77
Enochville	Rowan	94.4	0.870	**82**
Garinger (Plaza)	Mecklenburg	93.8	0.883	**82**
Monroe	Union	84.6	0.884	74
Rockwell	Rowan	94.6	0.862	81
York	York, SC	79.8	0.861	68

In comparison to the respective DVF values found in Table 2-2, the DVF values in Table 3.1-1 are slightly lower at each monitoring site. These differences were expected, as 2002 was an abnormally hot and dry year throughout the Southeast resulting ozone concentrations that were higher than in the surrounding years of 2000, 2001, 2003, and 2004. Figure 3.1-1 below illustrates this by charting the number of days with temperatures greater than 90ºF versus the maximum fourth highest 8-hour ozone value for the Metrolina area. Comparing 2002 to the surrounding years used in the DVB (2000, 2001, 2003 and 2004), 2002 had significantly more days with greater than 90ºF temperatures. Similarly, the maximum fourth highest 8-hour ozone value was ~5 ppb higher than the surrounding years used in the DVB.

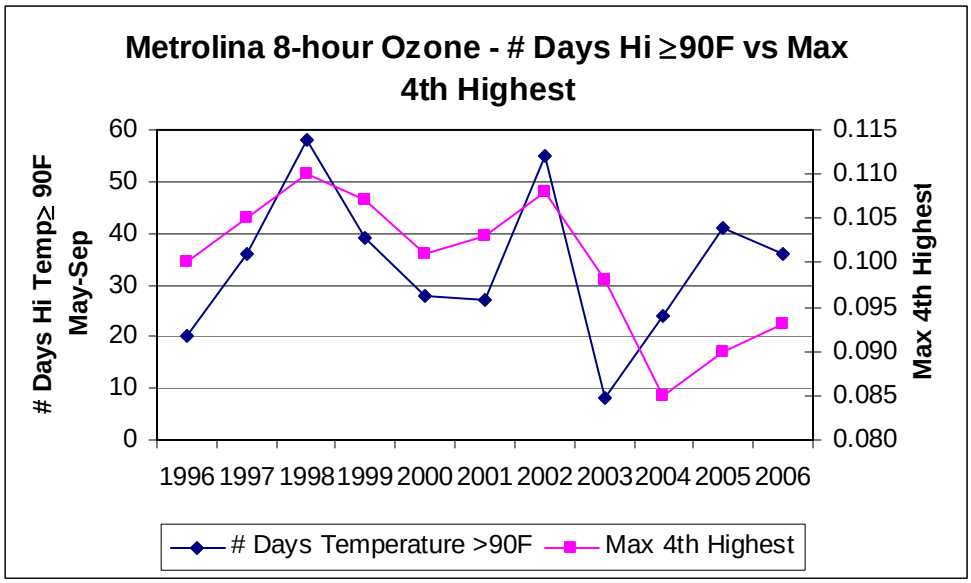

Figure 3.1-1 Charts the number of days greater than 90°F versus the 4th highest 8-hour ozone value for the Metrolina area.

Thus, the recommended DVB calculation weighted the higher air quality conditions several times more than in the NCDAQ alternative DVB calculations. The NCDAQ firmly believes that the non-weighted or straight five-year average approach to the DVB calculation is more appropriate and minimizes dramatic fluctuations in meteorological and air quality conditions from year to year. This would be the case whether the center weighted year was an abnormally hot/dry year or a cool/wet year.

While none of the monitoring sites in the Metrolina region had DVF values at or above 85 ppb in Table 3.1-1 using the NCDAQ alternative DVB calculation, there are still three monitors that have DVFs that fall between 82 ppb and 87 ppb. This continues to indicate that some additional weight of evidence should still be included to demonstrate attainment. These results are not inconsistent with what was concluded using all recommended modeled attainment test calculations.

3.2 Air Quality Modeling Metrics

In Section 7.0 of the *Attainment Guidance*, various aspects of air quality models, modeled performance, and uncertainties associated with the length of modeled episodes and limited observational datasets are described. A series of three additional air quality modeling outputs or metrics is recommended to provide assurance the modeled attainment demonstration indicates attainment. These metrics look at the relative change between the baseline and future years modeling and help to demonstrate how widespread the improvement in air quality is expected in the future. Although the final guidance did not recommend percentage cut points that corresponds to supportive weight of evidence, an earlier draft version of the *Attainment Guidance* recommends that the metrics should be at least 80% or higher.

As described in Section 7.1 of the *Attainment Guidance*, the collected modeling data from the 2002 and 2009 modeling output masks were applied to the following metrics:

1. Relative change in surface grid-hours greater than 84 ppb. This metric is termed Persistence-Hour and is defined as the number of grid-cells in a given region with predicted hourly 8-hour ozone concentrations greater than 84 ppb. The relative change in Persistence-Hour is presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.

2. Relative change in the number of grid cells with predicted 8-hr daily maxima greater than 84 ppb. This metric is termed Persistence-Daily metric and is similar to Persistence-Hr, but uses the modeled daily maximum 8-hour ozone concentrations greater than 84 ppb instead of the hourly 8-hour ozone concentrations. The relative change in Persistence-Daily is also presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.

3. Relative change in the sum of hourly predictions greater than 84 ppb. This metric is termed Severity-Hour and is defined as the sum of all grid-cells with predicted hourly 8-hour ozone concentrations greater than 84 ppb. Given the definition of Persistence, this Severity could be considered as a weighted form of the Persistence metric. The relative change in Severity is also presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.

In addition to the three recommended metrics, two additional metrics were computed to create a comprehensive corroborative analysis. The two additional metrics are:

4. Relative change in the sum of the predicted 8-hr daily maxima greater than 84 ppb. Severity-Daily metric is similar to Severity-Hour, but uses the modeled daily maximum 8-hour ozone concentrations greater than 84 ppb instead of the hourly 8-hour ozone concentrations. The relative change in Severity-Daily is also presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.

5. Air Quality Index (AQI) counts. The AQI Counts metric is a count of the number of grid-cells with predicted maximum 8-hour ozone concentrations sorted within each of the Code Green, Yellow, Orange and Red categories, as defined by the USEPA's AQI Index. As with the persistence and severity metrics, the AQI counts metric can be applied to both hourly and daily maximum 8-hour ozone concentrations. AQI Counts are presented as percentages of the total number of grid-cells within the study region.

The metrics described above were applied to the modeling results for just of the nonattainment area. Below is the region for which this modeling data was extracted for both the 2002 baseline and the 2009 attainment year modeling runs.

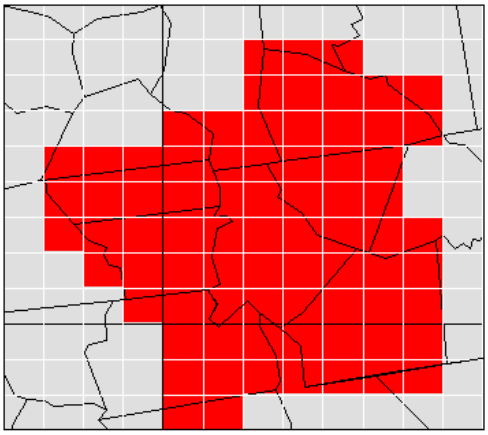

Figure 3.2-1 Area for which the air quality metrics were applied.

The results from each of the five air quality modeling metric calculations demonstrated significant reductions of greater than 85% in the 2009 future year air quality modeling for days that modeled above the NAAQS in the Metrolina nonattainment area. Each metric demonstrated very large relative reductions for 2009. It is important to note that the relative reductions in all metrics well surpassed the draft version of the *Attainment Guidance* recommendation of 80% for these particular calculations.

Figure 3.2-2 presents the relative reductions calculated in the first four metrics described above. The left 2 bars are the Persistence-Hour and Persistence-Daily reductions, and the right 2 bars are the Severity-Hour and Severity-Daily reductions. The results demonstrate a 91.2% reduction in persistence of hourly maximum ozone and 88.7% reduction in persistence of daily maximum ozone. The severity reductions are on a similar scale of 91.6% and 89.1% reduction for hourly and daily maximum ozone, respectively.

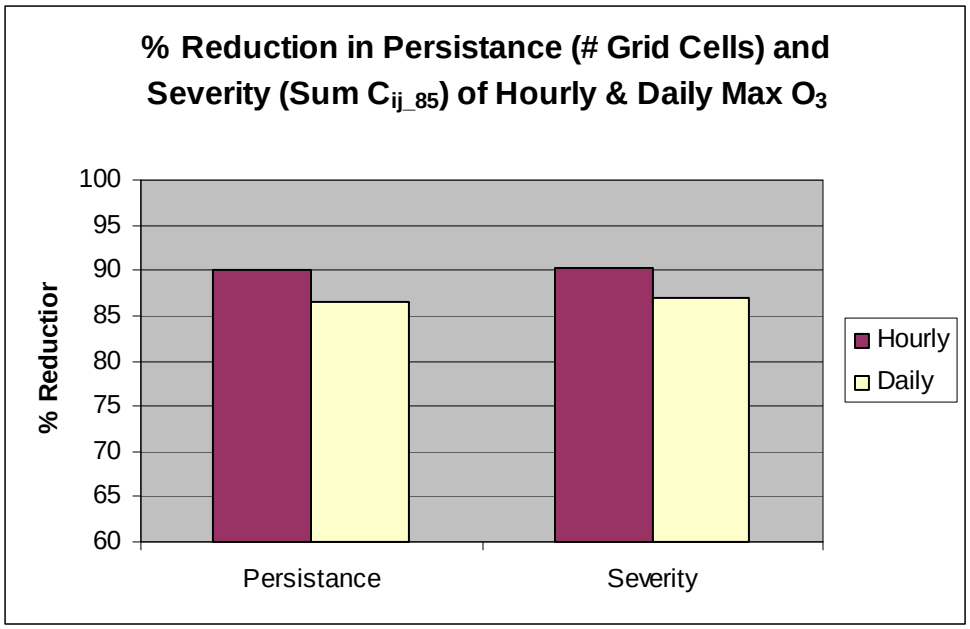

Figure 3.2-2 Persistence and Severity for the Metrolina Area

Equating the 89.1% relative reduction in the daily maximum ozone to AQI counts, Figure 3.2-3 demonstrates a drop from 257 grid cells in the Code Orange and Red levels in the 2002 baseline modeling to only 29 grid cells in the 2009 future modeling. Furthermore, the number of grid cells in the Code Yellow and above (>65 ppb) is reduced by over half, from 3,352 grid cells in 2002 to 1,536 grid cells in 2009.

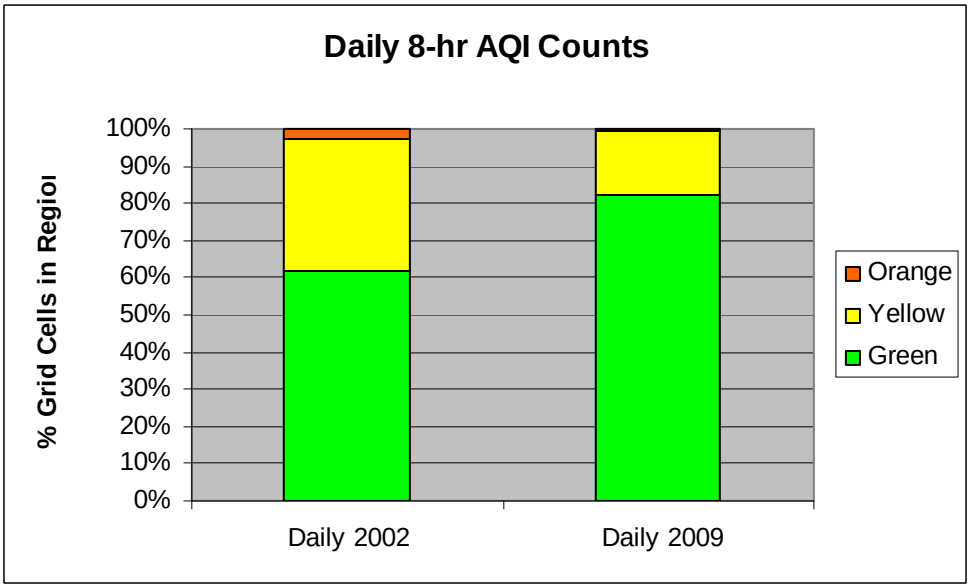

Figure 3.2-3 Daily AQI counts for the Metrolina Area

The hourly AQI counts are equally encouraging. Figure 3.2-4 displays the 91.2% relative reduction in hourly persistence in terms of the AQI counts. It corresponds to a reduction from 988 hourly grid cells in the Code Orange and Red levels in the baseline modeling to only 86 hourly grid cells in the attainment year modeling. Looking at all hourly grid cells Yellow and above, the count is reduced from 25,890 hourly grid cells to 9,140, which translates to a 64.7% reduction. Table 3.2-1 contain all the grid cell counts for both the Hourly and Daily AQI count analysis.

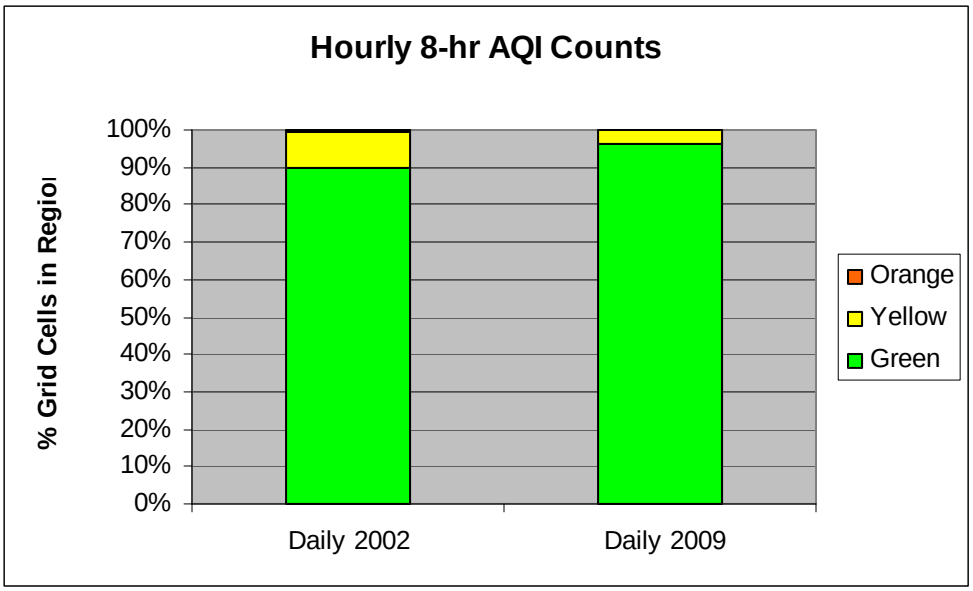

Figure 3.2-4 Hourly AQI Count for the Metrolina Area

Table 3.2-1 Total number of grid cells for the AQI Categories.

	Grid Cells		Grid Cells	
	Daily 2002	Daily 2009	Hourly 2002	Hourly 2009
Green	7181	9543	250856	268576
Yellow	4107	2039	26900	10365
Orange	340	46	1316	131
total	11628	11628	279072	279072

3.3 Air Quality Modeling Results From Other Studies

Another recommended weight of evidence analysis is to review other air quality modeling results that included the Metrolina nonattainment area to determine how other modeling results compare to the attainment demonstration. There are two air quality modeling studies to which results are available for the Metrolina area.

The first is the Early Action Compact (EAC) modeling that the NCDAQ performed for the EAC areas within North Carolina. Since the modeling domain for this analysis covered the majority

of North Carolina, including the Metrolina nonattainment area, the modeling results can be easily compared to the attainment demonstration. There are some differences between the two modeling exercises. One difference is that the EAC modeling was carried out on 4 episodes (one in 1995, two in 1996 and one in 1997) for a total of sixteen days. Another is the DVB is based on the higher of the 1999-2001 or 2001-2003 design values. Finally, the EAC modeling did not model 2009, but there are results for 2007 and 2012. Table 3.3-1 displays the EAC modeling results for the Metrolina monitors for both of these future years.

Table 3.3-1 Metrolina DVFs based on EAC Modeling

Monitoring Site	County	DVB (ppb)	2007		2012	
			RRF	DVF (ppb)	RRF	DVF (ppb)
Arrowood	Mecklenburg	092	0.891	82	0.848	78
County Line	Mecklenburg	101	0.861	**87**	0.802	81
Crouse	Lincoln	92	0.870	80	0.826	76
Enochville	Rowan	99	0.879	**87**	0.818	81
Garinger (Plaza)	Mecklenburg	98	0.888	**87**	0.816	80
Monroe	Union	88	0.852	75	0.795	70
Rockwell	Rowan	100	0.870	**87**	0.800	80

As can be seen from the EAC modeling, although there are still four monitors slightly above the 8-hour ozone standard in 2007, all of the monitors are well below the standard by 2012. It should be noted that for the Greensboro/Winston-Salem/High Point EAC area, the EAC attainment test results predicted the highest monitor in the area to be at 83 ppb in 2007. However the current 2004-2006 design value for that area is 80 ppb, below what was projected and a year earlier.

Another air quality modeling exercise that contained results for the Metrolina nonattainment area is the USEPA's modeling for the Clean Air Interstate Rule (CAIR). The Technical Support Document for the final CAIR, March 2005, provided modeling results with and without the implementation for the CAIR. Differences between the USEPA's modeling and the attainment demonstration are: 1) the meteorology was for 2001, 2) the DVB was the weighted design values the 1999-2003 period and 3) the modeling results were for 2010. These modeling results are listed in the table below.

Table 3.3-2 Metrolina DVFs based on the USEPA's CAIR Modeling

County	DVB (ppb)	DVF (ppb)	
		2010 Base	2010 CAIR
Lincoln	92.3	76.1	74.5
Mecklenburg	100.3	82.5	81.4
Rowan	99.7	81.3	80.1
Union	87.7	71.9	71.1
York, SC	83.3	70.0	68.5

The USEPA's results were for the highest monitor in a county where more than one monitor is located. The USEPA's modeling results predicts that the Metrolina nonattainment area should be below the 8-hour ozone standard by 2010. Although this is one year later than the attainment year for the Metrolina area, the USEPA's 2010 CAIR DVFs are 3 to 4 ppb lower than what the NCDAQ is showing in the attainment demonstration, and supports weight of evidence that the Metrolina area will attain the 8-hour ozone standard by its attainment year of 2009.

3.4 Air Quality Trends and Additional Reductions in Emissions

Since the 8-hour ozone designation for the Metrolina area, the 8-hour ozone design values have improved significantly. The 2001-2003 design value period had values as high as 100 ppb and six out of the seven North Carolina monitors in the area were violating the NAAQS. Each year since, the design values have decreased and/or the number of violating monitors in the region has decreased. With the latest design value period, 2004-2006, the highest violating monitor has a value of 88 ppb and there are only three monitors that exceed the NAAQS (See Table 3.4-1)

Table 3.4-1 Design Values (ppb) for the North Carolina Monitors in the Metrolina Area

Monitoring Site	County	2001-2003	2002-2004	2003-2005	2004-2006
Arrowood	Mecklenburg	84	81	78	80
County Line	Mecklenburg	**98**	**92**	**87**	**88**
Crouse	Lincoln	**92**	**86**	81	79
Enochville	Rowan	**99**	**91**	**85**	**85**
Garinger (Plaza)	Mecklenburg	**96**	**91**	**86**	**88**
Monroe	Union	**88**	**85**	79	78
Rockwell	Rowan	**100**	**94**	**88**	83
York	York, SC	84	81	75	76

The current ozone design values are very close to the predicted attainment year design values, however, there are still significant nitrogen oxides (NOx) emission reductions that are expected between now and the attainment year 2009. Although most of these expected NOx emission reductions have been included in the attainment demonstration modeling, it does not appear the model is responsive enough to expected emission reductions.

The NCDAQ has estimated that there will be approximately 8.5 tons per day of NOx emissions reduced each year from the mobile sector. These reductions are the result of Federal motor vehicle and equipment standards for both highway vehicles and off-road equipment. As the older vehicles in the fleet are retired and replaced with newer vehicles meeting the Federal standards, the NOx emissions continue to decrease, even though vehicle miles traveled continue to increase. Similarly, as newer off-road equipment is purchased and older equipment is retired, the NOx emissions see a downward trend.

Another source of NOx emission reductions that are expected to occur between now and the attainment year are from the electric generating facilities located in and near the Metrolina

nonattainment area. The Clean Smokestacks Act requires the two large North Carolina utilities to meet annual NOx emission budgets for 2007 and a tighter budget for 2009. Several of the Duke Energy units are still expected to have controls installed over the next two years. Figure 3.4-1 displays the location and size of the Duke Energy facilities located in the vicinity of the Metrolina nonattainment area. Table 3.4-2 lists the units that are near the Metrolina area and shows the year the controls are expected to come on line and the estimated amount of NOx emissions reductions for the ozone season.

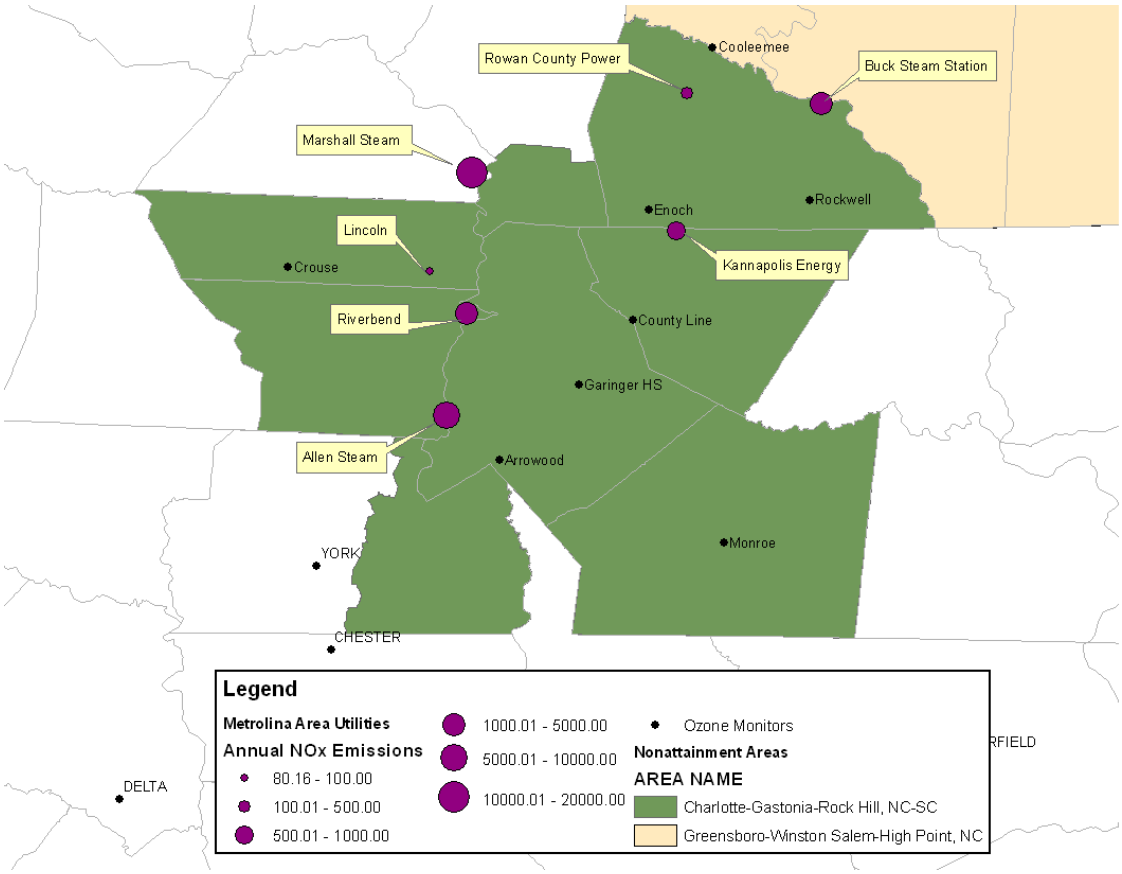

Figure 3.4-1 Location and size of the Duke Energy facilities located in the vicinity of the Metrolina nonattainment area.

Table 3.4-2 Utility NOx Emission Reductions since 2006 Ozone Season

Facility	County	Technology	Operational Date	Ozone Season Reductions (tons/season)
Allen Steam Station Unit 2 Unit 3	Gaston	 SNCR SNCR	 Spring 2007 Fall 2007	~300
Buck Steam Station Units 3 & 4 Units 5 & 6	Rowan	 Low NOx Burners SNCR	 Spring 2007 Fall 2006	~350
Riverbend Unit 4 Unit 5 Unit 6 Unit 7	Gaston	 SNCR SNCR & Burners SNCR & Burners SNCR	 Spring 2007 Spring 2007 Fall 2006 Fall 2006	~325
Marshall Steam Station Unit 2 Unit 3 Unit 4	Catawba	 SNCR SCR SNCR	 Spring 2007 Fall 2008 Fall 2006	~2,300
Total expected reduction = 3,275 tons/ozone season				

SNCR = Selective Non-Catalytic Reduction
SCR = Selective Catalytic Reduction

The combination of the mobile source and utility NOx emission reductions that are expected in the Metrolina area between the end of the 2006 ozone season and before the beginning of the attainment year 2009 is significant. Since the 2004-2006 design values are just above the standard, the additional NOx emission reductions in the area should ensure that the Metrolina area would attain the NAAQS by the prescribed attainment year.

3.5 Local Measures not Modeled

As discussed in Section 1.4 of the Attainment Demonstration Narrative, the Metrolina nonattainment area is a NOx limited area and the largest source of NOx emissions in this region come from mobile sources and electric generating facilities. A significant source of NOx emission reductions that has not been included in the modeling is the addition of a SCR unit at Marshall Unit 3. When the modeling was started, Duke Energy had installed a SNCR unit at Marshall Unit 3. However, since the expected 2009 Duke Energy system-wide NOx emissions is very close to the Clean Smokestack Act annual budget for this company, Duke Energy has announced that they plan to install a SCR unit in order to provide a safety margin in meeting the Clean Smokestack Act NOx budget. As can be seen in Figure 3.4-1 in the previous section, the Marshall Steam Station is located directly north and adjacent to the Metrolina nonattainment area. The additional NOx emission reductions expected at this facility will have an impact on the ozone formation in the Metrolina area on days when the winds are coming from the North/Northwest and on days when there is recirculation occurring. This SCR unit should be installed the Fall of 2008 and will be operational before the beginning of 2009. A copy of the

2007 compliance plan for Duke Energy documenting this planned installation of the SCR at Marshall Unit 3 can be found in Appendix M.

In addition to the Marshall NOx emission reductions, the Metrolina area has a number of groups that work towards decreasing emissions. These measures are voluntary measures that although may not account for large emission reductions, they are directionally correct. A few of the known measures that are under way in the Metrolina area are listed below. A list of known projects going on in North Carolina is attached at the end of this Appendix.

- I-77 High Occupancy Vehicle (HOV) lane in Mecklenburg County. A recent evaluation of the HOV lanes on I-77 through Charlotte, North Carolina reported that there has been an observed increase of use of the HOV lanes since it has opened. It was reported that in November 2005, "…the HOV lane carried nearly 50 percent of the average number of persons who are traveling in a general-purpose lane in the morning peak hour, but in less than 20 percent of the number of vehicles." Additionally, the "Average daily patronage on the [Charlotte Area Transit System] CATS express routes using the I-77 HOV facility increased by 63 percent between October 2004 and 2005 …". This reduction of vehicle miles traveled in this area was not modeled in the attainment demonstration. Having more people carpooling or using the transit system in Mecklenburg will reduce both VOC and NOx emissions. A copy of the North Carolina Department of Transportation (NCDOT) evaluation of the I-77 HOV lane can be found at the end of this Appendix.
- Truck Stop Electrification in Rowan County. In 2006, 50 spaces at a truck stop in Rowan County were converted with Idle Aire technology. This technology provides truckers with electricity and air conditioning, allowing the truckers to turn off their engines while they rest. This results in a reduction of both NOx and VOC emissions.
- Express Bus Route (Cabarrus/Rowan Counties). A new connecting service will be created between Rider and Salisbury Transit. This provided an express route between Kannapolis and Salisbury. Having an express route between these two cities will reduce the number of personal cars on the roadways, which in turn will reduce VOC and NOx emissions. This new express route should be in operation between 2008 and 2010.
- Pedestrian walkways and Bikeways Projects: A number of the communities are creating walkways and bikeways in order to provide safe pathways for pedestrians and bicyclists to move about busy traffic areas. These types of projects provide safe alternatives to driving in the city.
- Idle Reduction Policies. North Carolina Department of Public Instruction has issued a policy that all school bus drivers are to refrain from idling their buses while waiting to pick up children at the school as well as when the buses are at the transportation yard. Additionally, several cities and businesses have issued idle reduction policies for their fleet vehicles. This reduces VOC and NOx emissions as well as fine particulate matter. Some of the partners passing idle reduction policies include: Town of Concord, City of Salisbury, and Duke Power.
- Biodiesel use. A number of cities, counties and businesses have started using biodiesel for their diesel fleet. Most often B-20 is being used. B-20 will reduce VOC emissions as well as fine particulate matter. Some of the partners using biodiesel include: Gaston

County Landfill, Town of Matthews, City of Monroe, Union County, NCDOT, and Duke Power.

- Diesel Retrofits. A number of cities, counties and school districts have installed Diesel Oxidation Catalysts (DOCs) or Diesel Particulate Filters (DPFs) on their diesel equipment. The vehicles that have been retrofitted include schools buses, as well as county fleet trucks for solid waste pickup. Although these types of filters are designed to remove fine particulate matter, when used with ultra low sulfur diesel fuel, NOx and VOC emissions are also reduced. Some of the partners installing DOCs and/or DPFs include: Cabarrus County Schools, Gaston County Schools, Iredell County Schools, Lincoln County Schools, Mecklenburg County Schools, Rowan County Schools, Salisbury Public Schools, City of Charlotte and Mecklenburg County.

3.5 Weight of Evidence Conclusions

The NCDAQ believes that it is better to use a 5-year straight average DVB in the attainment test since it will normalize the effects of meteorology on design values more so than a weighted DVB. Based on the alternative DVF calculated in this section, all of the Metrolina nonattainment area monitors are predicted to be below the 8-hour ozone NAAQS in 2009. Although three of the monitors still fall within the range for weight of evidence requirements, the monitor DVFs are lower than when a weighted DVB is used.

The air quality modeling metric analyses for the Metrolina nonattainment area demonstrates relative reductions well beyond the recommended 80% mark that is considered appropriate for concluding that a proposed strategy would meet the 8-hour ozone NAAQS. Additionally, other air quality modeling studies have found that the Metrolina area should attain the 8-hour ozone NAAQS by the prescribed attainment year.

The observed air quality trends in conjunction with further NOx emission reductions expected in the Metrolina area strengthens the argument that the attainment demonstration is an acceptable demonstration. Finally, given the variety of additional emissions reductions that were not included in the development of this modeling exercise, but will occur throughout the surrounding areas before 2009, it is reasonable to conclude that the short lived events portrayed in the future modeled year by an extremely small number of remaining exceeding grid cells will be below the NAAQS in 2009.

The NCDAQ believes that the weight of evidence provided in this section is strong evidence that the Metrolina nonattainment area will attain the 8-hour ozone NAAQS by 2009.

4 UNMONITORED AREA ANALYSIS

The modeled attainment test does not address future air quality at locations where there is not an ozone monitor nearby. To guard against the possibility that air quality levels could exceed the standard in areas with limited monitoring, Section 3.4 of the *Attainment Guidance* suggest that additional review is "necessary, particularly in nonattainment areas where the ozone or $PM_{2.5}$ monitoring network just meets or minimally exceeds the size of the network required to report data to Air Quality System (AQS)." This review is intended to ensure that a control strategy leads to reductions in ozone at other locations that could have baseline (and future) design values exceeding the NAAQS were a monitor deployed there. The test is called an "unmonitored area analysis". The purpose of the analysis is to use a combination of model output and ambient data to identify areas that might exceed the NAAQS if monitors were located there.

The NCDAQ, along with Local and Tribal Programs, currently operates a network of 41 ozone monitors. Twenty-six of these monitors were established as State and Local Air Monitoring Stations (SLAMS). These SLAMS monitors were selected based on specific monitoring objectives (background concentration, area of highest concentration, high population, source impact, transport, and rural impact) as required by the USEPA and siting scales (micro, middle, neighborhood, urban, and regional) established by the USEPA. Eight of the network monitors were further designated as National Air Monitoring Stations (NAMS) by the USEPA and have the primary objective to provide ozone data from areas of expected highest concentration and population exposure and are used to evaluate trends in national air quality. The remaining 14 monitors are Special Purpose Monitors that were established by NCDAQ to evaluate models, study ozone formation and transport, and obtain a better understanding of ozone in North Carolina. The remaining monitor is a Tribal monitor operated by the Eastern Band of Cherokee Nation.

NCDAQ believes that the density of its' monitoring network relieves the necessity of applying this additional analysis. With an average of one monitor per 3,077 km^2, this is one of the densest statewide ozone monitoring networks in the nation. Additionally, the monitor density across the Metrolina nonattainment area is more than twice that of the statewide monitor density (on average a monitor every 1,278 km^2). A map of each ozone monitor and its NCDAQ/VISTAS 12-km modeling grid is provided in Figure 4-1. As can been seen by the figure, the spatial coverage of the monitors, and their resulting "near by" 3x3 arrays, covers the majority of the urban areas where ozone tends to be higher.

Despite being confident our monitoring network is robust enough to cover the state, NCDAQ has looked at preliminary results from the "beta" (draft) version of the "Modeled Attainment Test Software" (MATS) tool. The MATS tool has been developed by the USEPA to spatially interpolate data, adjust the spatial fields based on model output gradients, and multiply the fields by model calculated RRFs to complete the unmonitored area analysis. The MATS tool is currently being "beta tested" and peer reviewed, with the release of a guidance document for the tool still pending. Once the final version of the MATS tool has been released, after sufficient peer review and proper guidance documentation for the analysis of the results is provided, NCDAQ will evaluate the MATS tool output.

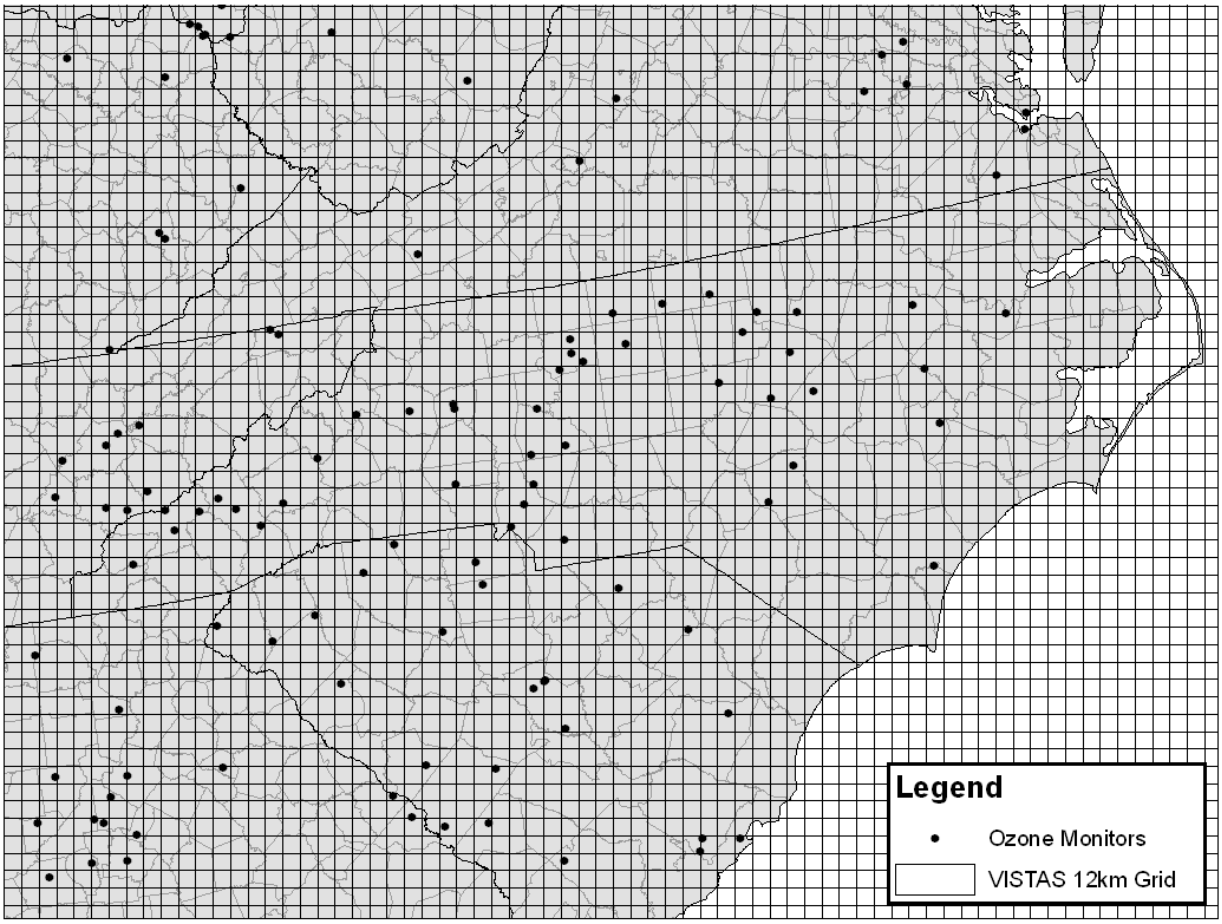

Figure 4-1 Ozone Monitors and with Respect to the VISTAS 12km Grid

5 ATTACHMENTS TO APPENDIX L

Attached to this Appendix is supporting documentation for Section 3. The following documents are attached:

- NCDOT I-77 HOV evaluation report
- Spreadsheet of measures from Cabarrus/Rowan Urban Area Metropolitan Planning Organization
- Spreadsheet of National Diesel Data from the USEPA for North Carolina
- Spreadsheet of Diesel Data from the NCDAQ
- Correspondence from Centralina Council of Governments

ONE YEAR EVALUATION REPORT

January 2006

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List of Figures and Tables

Executive Summary

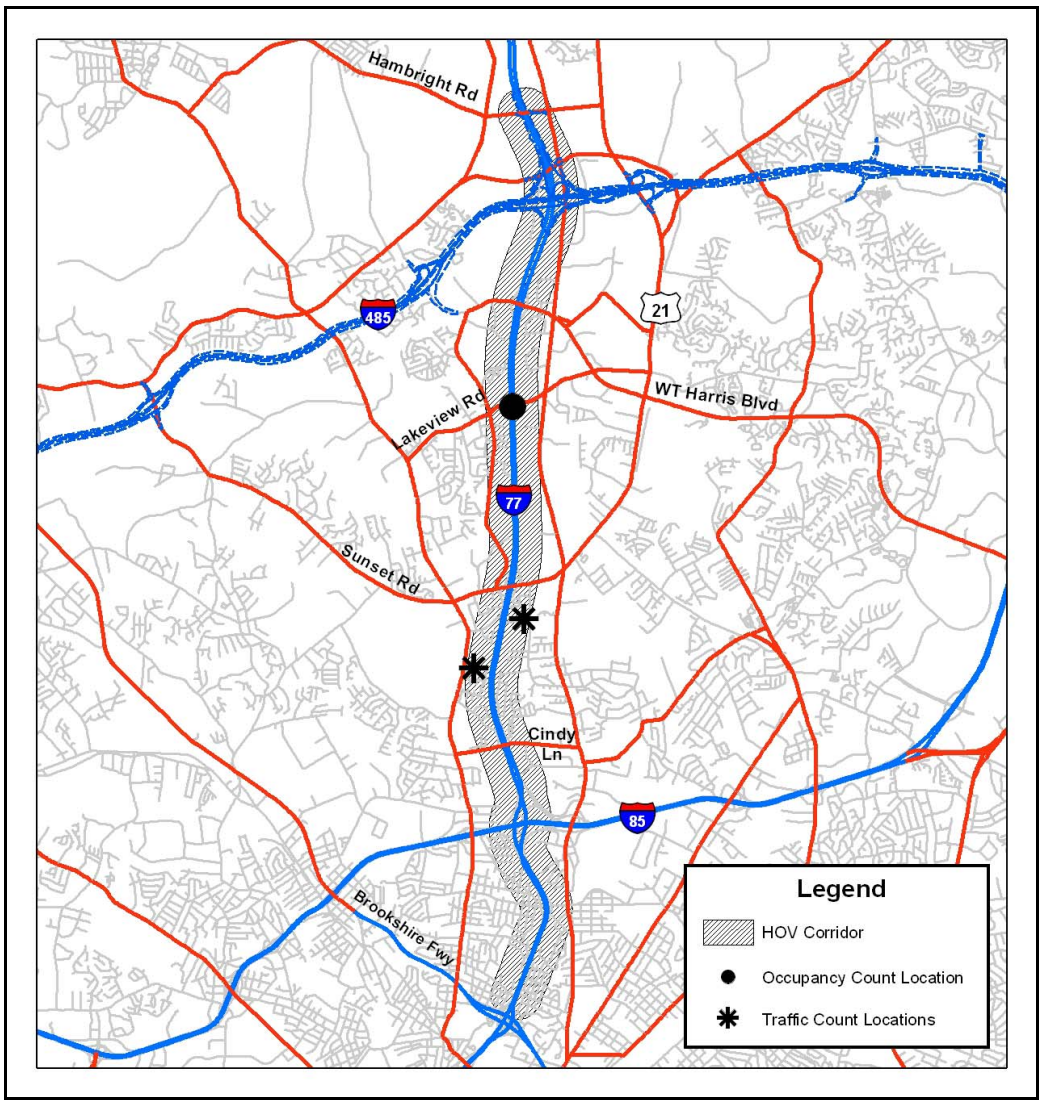
- Daily traffic on I-77 increased by 38 percent between October 2004 and October 2005, 83,498 vehicles to 115,230. This growth reflects completion of the widening project (motorists filling back-in with the added capacity) and the return of motorists using alternative routes to I-77.
- The number of carpooling vehicles observed traveling southbound between 7:00 and 8:00AM increased by over 53 percent between fall 2004 and fall 2005, from 410 to 626.
- Use of the HOV lane between 7:00 and 8:00AM increased by over 25 percent between February and November 2005, illustrating growing acceptance of the facility. The number of persons carried during the AM peak hour increased from 664 to 836 persons.
- In November 2005, the HOV lane carried nearly 50 percent of the average number of persons who are traveling in a general-purpose lane in the morning peak hour, but in less than 20 percent of the number of vehicles. Between 5:00 and 6:00PM, the HOV facility carried nearly two-thirds as many persons as the average general-purpose lane, but in about a quarter of the number of vehicles.
- The travel times in both directions between Gilead Road and Trade Street have improved dramatically over the past 12 months, by over 33 percent. Travel times in the general-purpose lanes have decreased during the last year from approximately 18 minutes to just over 12 minutes. Users of the HOV facility are saving an additional minute or so. The major time savings in the southbound direction in the morning occurs between Lakeview Road and Cindy Lane (5 minutes). In the northbound direction in the PM peak hour, the reduction of the bottleneck between Trade Street and Cindy Lane has improved travel times by over 5 minutes.
- The average number of accidents per month dropped from 42 to 33, a 21 percent improvement, following the addition of general-purpose and HOV lanes in each direction on December 20, 2004.
- Average daily patronage on the CATS express routes using the I-77 HOV facility increased by 63 percent between October 2004 and 2005, from 781 daily riders to 1185 weekday passengers. The increase between November 2004 and 2005 was 53 percent, from 805 weekday riders to 1232 daily users.
- Over 77 percent of respondents to a county-wide telephone survey conducted by UNCC's Urban Institute in November 2005 were familiar with the I-77 HOV facility, up dramatically from the 45 percent of respondents who expressed familiarity with the I-77 HOV lanes in the 2004 survey.
- Nearly 17 percent of respondents to the Urban Institute survey indicated that they regularly use the I-77 HOV facility in a bus, carpool or vanpool.
- When asked in the 2005 survey if building the HOV lanes along I-77 was a good idea, 56 percent of respondents replied yes (compared to 32 percent in 2004). Eighteen percent of those responding to this question in the 2005 survey indicated that constructing HOV lanes along I-77 was a bad idea. Approximately 27 percent of interviewees did not answer this question.

Purpose

This report evaluates the effectiveness and impacts of North Carolina's first High Occupancy Vehicle (HOV) Lanes that were opened to traffic on December 20, 2004. Data was collected by various agencies both before and after the I-77 HOV facility was implemented. Information in this report is compared to baseline data collected in October 2004.

Figure 1 shows the HOV lane corridor as well as traffic count and monitoring locations.

Figure 1. I-77 HOV Lane and Count/Monitoring Locations



HOV Lane Objectives

The objectives of the I-77 HOV Lane Project are:

- Move more people by increasing the number of persons per vehicle.
- Reduce travel time and ensure reliable trip times for HOVs using the I-77 facility.
- Operate a safe HOV facility and not unduly impact the safety of the I-77 general-purpose lanes.
- Maintain or improve public support for the I-77 HOV facility.

Evaluation or Performance Measures

The I-77 HOV Operations, Education & Outreach Committee – an interagency committee established to coordinate HOV activities among various branches of the North Carolina Department of Transportation (NCDOT), the Federal Highway Administration (FHWA), the City of Charlotte, the contractor and designer for I-77 improvements, and enforcement agencies – approved the following performance measures for evaluating the HOV Lane Project:

Operations – total person throughput, travel times for both HOVs and single occupant vehicles, safety, and traffic operations at the beginning and ending transitions.

Modal Impact – HOV lane use, transit ridership, number of persons per vehicle, vanpool use.

Public Perception – Public perceptions of success. This will include survey results, phone calls, internet comments, etc.

This report is the first post-HOV opening evaluation and describes the baseline and post-HOV facility opening conditions for each of these measures.

Operations

Vehicle Volumes

As part of I-77 analysis, the total number of vehicles using the freeway during the AM and PM peak hours on weekdays and for a 24-hour period was monitored. Although the primary emphasis after HOV lane opening is to increase the number of persons in each vehicle on I-77, it also is helpful to track growth in vehicular volumes in both the general-purpose and HOV lanes.

Table 1 lists peak hour and daily volumes from 2000 to 2005 on the I-77 segment between the I-85 and Sunset Road interchanges.

Table 1. Daily and Peak Hour Traffic Volumes for I-77 Measured near Cindy Lane

	Jun 2000	Oct 2004	Oct 2005
Southbound			
AM Peak Hour GP	4,106	3,414	5,403
AM Peak Hour HOV	-----	-----	435
Daily GP	42,149	35,045	57,879
Daily HOV	-----	-----	5,336
Northbound			
PM Peak Hour GP	4,137	3,746	5,255
PM Peak Hour HOV	-----	-----	467
Daily GP	53,510	48,453	57,351
Daily HOV	-----	-----	3,978

Findings

- Daily traffic on I-77 increased by 38 percent over the past year, 83,498 vehicles to 115,230. This growth reflects completion of the widening project (motorists filling back in with the added capacity) and the return of motorists using alternative routes to I-77.
- Daily HOV lane volumes range from 7 to 9 percent of the total volume for the three general-purpose lanes.

Total Person Throughput

This measure is the total number of persons traveling the corridor during both AM and PM peak hours. **Table 2** shows the peak hour mode shares of vehicles along southbound I-77 and estimates the total number of persons by mode based on counts taken in October 2004 and November 2005. **Table 3** shows the peak hour mode shares of vehicles on northbound I-77 and estimates the total number of persons by mode based on counts taken in the same months.

Table 2. AM Peak Hour Mode Shares for Southbound I-77 Measured near Lakeview Road

	2004			2005		
Mode	**No. of Vehicles**	**Total Persons**	**% of Total Persons**	**No. of Vehicles**	**Total Persons**	**% of Total Persons**
Drive alone	2,772	2,772	68.1	4,248	4,248	70.8
Carpool: 2-person	347	694	17.0	587	1174	19.6
Carpool: 3+ person	63	189	4.6	39	117	1.9
Trucks	215	215	5.3	177	177	2.9
Motorcycles	12	12	0.3	6	6	0.1
Buses*	7	190	4.7	8	280	4.7
TOTAL	3,416	4,072	100.0	5,065	6,002	100.0

*Bus data obtained from Charlotte Area Transit System (CATS)

Table 3. PM Peak Hour Mode Shares for Northbound I-77 Measured near Lakeview Road

	2004			2005		
Mode	**No. of Vehicles**	**Total Persons**	**% of Total Persons**	**No. of Vehicles**	**Total Persons**	**% of Total Persons**
Drive alone	2,946	2,946	66.0	3,401	3,401	69.1
Carpool: 2-person	455	910	20.4	497	994	20.2
Carpool: 3+ person	60	180	3.9	10	30	0.6
Trucks	227	227	5.1	237	237	4.8
Motorcycles	12	12	0.3	13	13	0.3
Buses*	7	190	4.3	7	245	5.0
TOTAL	3,707	4,465	100.0	4,165	4,920	100.0

*Bus data obtained from CATS

Table 4 shows the number of persons per lane along I-77, measured near the Lakeview Road overpass, in October 2004, February 2005, and October 2005.

Table 4. Persons Per Lane

	Baseline (October 2004)	**After HOV Opening (February 2005)**		**After HOV Opening (November 2005)**	
Measure	**Each GP Lane**	**HOV Lane**	**Each GP Lane**	**HOV Lane**	**Each GP Lane**
AM Peak Hour	2,036	664	1,583	836	1,722
PM Peak Hour	2,294	881	1,268	864	1,352

Findings

- The number of carpooling vehicles observed traveling southbound between 7:00 and 8:00AM increased by over 53 percent between fall 2004 and fall 2005.
- Use of the HOV lane between 7:00 and 8:00AM increased by over 25 percent between February and November 2005, illustrating growing acceptance of the facility.
- In November 2005, the HOV lane carried nearly 50 percent of the average number of persons who are traveling in a general-purpose lane in the morning peak hour, but in less than 20 percent of the number of vehicles. Between 5:00 and 6:00PM, the HOV facility carried nearly two-thirds as many persons as the average general-purpose lane, but in about a quarter of the number of vehicles.

Travel Times

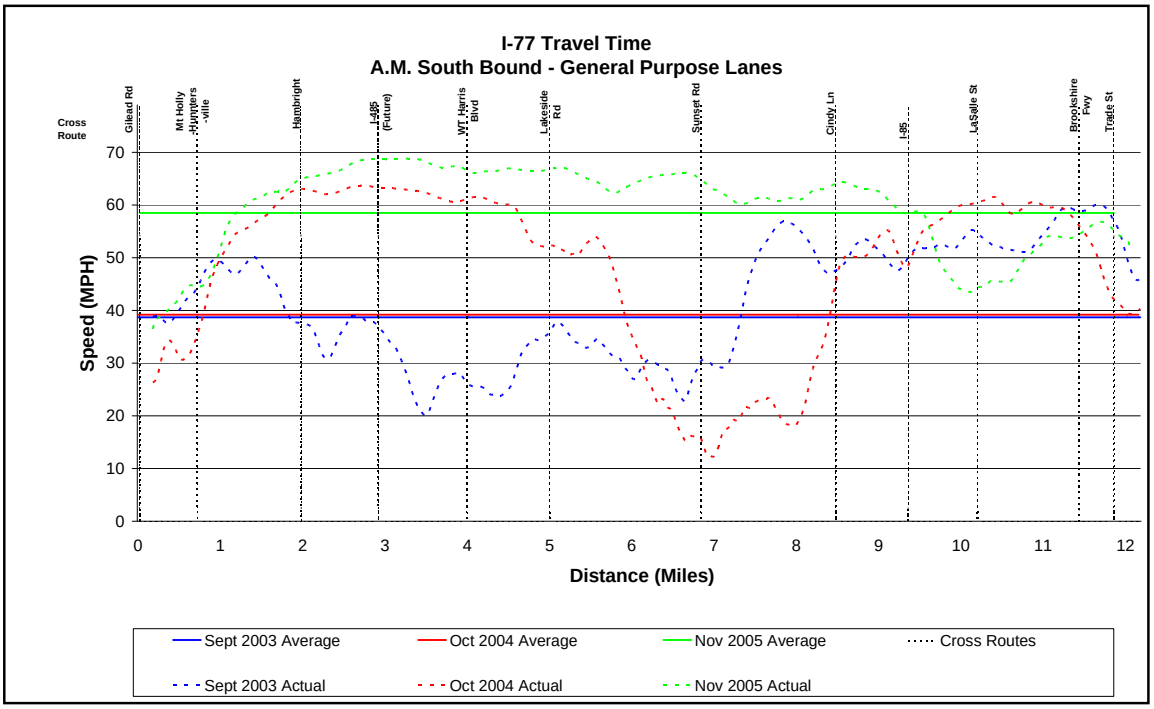
Travel time data was collected using a global positioning system (GPS) for a typical week period in September 2003, October 2004, and December 2005. **Table 5** and **Figure 2** summarize southbound travel times from Gilead Road to Trade Street in the AM peak period. **Table 6** and **Figure 3** provide similar information for northbound travel times from Trade Street to Gilead Road in the PM peak period. Both figures graphically depict travel time data for the general purpose lanes only.

Table 5. I-77 Southbound Travel Times in AM Peak

Segment	Travel Time (Minutes)			
	Sep 2003	Oct 2004	Dec 2005	
			Gen. Purpose	HOV
Gilead to Hambright	2.77	2.78	2.33	2.33*
Hambright to Lakeview	6.19	2.99	2.69	2.61
Lakeview to Cindy	5.93	8.73	3.32	3.13
Cindy to Trade	4.16	4.13	3.81	3.43
TOTAL	19.05	18.63	12.15	11.51

*The HOV lane begins south of Hambright Street.

Figure 2. I-77 Travel Times, AM Southbound – General Purpose Lanes



Findings

During September 2003, there were only two lanes open southbound with delays occurring due to merging traffic from WT Harris Boulevard and Sunset Road. With the opening of the third lane by October 2004, traffic moved more freely until Sunset Road where major delays occur from the combination of merging traffic from the Sunset Road onramp and the reduction to two lanes a mile south of Sunset Road. Despite additional capacity north of Sunset Road, the average southbound travel speed improved only slightly between September 2003 and October 2004.

The November 2005 data represents travel time on I-77 with three general purpose lanes from south of Hambright Road to the four-lane section south of I-85. Data was also collected for the HOV lane, which extends from south of Hambright Road to just north of Trade Street. Travel time in the general purpose lanes improved by 35 percent between October 2004 and November 2005. The HOV lane provided additional travel time savings in the southbound direction particularly near the I-85 interchange and south of I-85.

The northbound travel time became more severe between September 2003 and October 2004 despite the opening of a third travel lane between I-85 and Hambright Road. Although the travel time improved north of I-85, it worsened significantly south of I-85. The major delay occurred because three travel lanes were reduced to two just prior to a short merge from the left for northbound I-85 traffic entering I-77. This created significant delays in the Trade Street to Cindy Lane segment between 2003 and 2004.

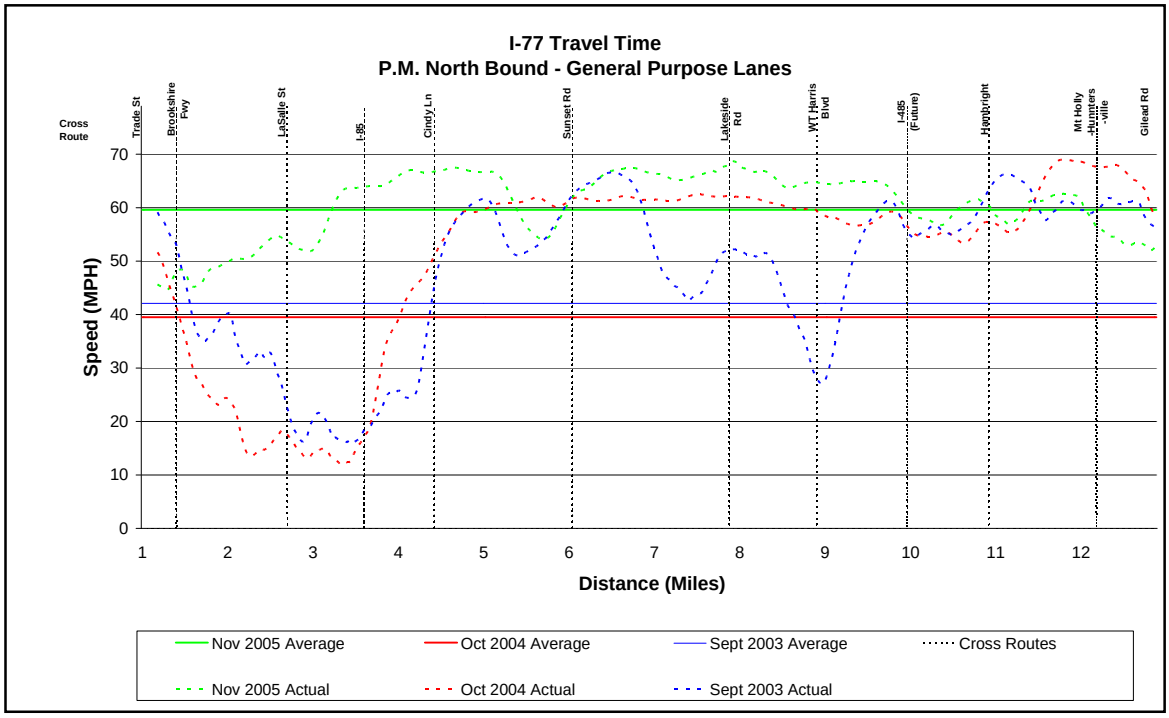
By November 2005, the HOV lane from Cindy Lane to the future I-485 was in place, improvements to the I-85 northbound ramp to northbound I-77 were complete, and the third general purpose lane was extended up to the Gilead Road off ramp. These projects helped improve travel time by 33 percent in the northbound direction compared to October 2004. The graph illustrates that the greatest improvement occurred south of Cindy Lane as a result of the interchange improvements at I-85. There also was notable improvement in travel time north of Sunset Road. This improvement resulted in part from a higher posted speed north of I-85, from 55 MPH to 65 MPH in January 2005. The speed limit in this section of roadway was temporarily reduced to 55 MPH in both directions during freeway construction.

Table 6. I-77 Northbound Travel Times in PM Peak

Segment	Travel Time (Minutes)			
	Sep 2003	Oct 2004	Dec 2005	
			Gen. Purpose	HOV
Trade to Cindy	6.63	8.63	3.76	3.27
Cindy to Lakeview	3.61	4.37	3.27	2.93
Lakeview to Hambright	4.92	3.04	2.92	2.59
Hambright to Gilead	2.38	2.01	2.06	2.06*
TOTAL	17.54	18.05	12.00	10.85

*The HOV lane ends south of Hambright Street

Figure 3. I-77 Travel Times, PM Northbound – General Purpose Lanes



Safety

Safety conditions are typically measured by summing the number of reported collisions. Based on information from NCDOT's Accident Analysis System, 454 crashes occurred along the 7.35-mile section of I-77 between Brookshire Freeway and Harris Boulevard during the most recent 12-month period (June 1, 2004 to May 31, 2005) for which data has been summarized. This period includes data for seven months before the HOV facility was open and five months following opening of the lanes.

Table 7. I-77 Data from NCDOT's Accident Analysis System

Month	Accidents
June 2004	43
July	42
August	36
September	36
October	49
November	49
December (HOV lanes opened on 12/20/04)	36
January 2005	***41***
February	***20***
March	***35***
April	***38***
May	***29***

The Metrolina Regional Transportation Management Center (MRTMC) maintains records of instances in which Incident Management Assistance Program (IMAP) vehicles are dispatched. IMAP staff members are available to assist persons in disabled vehicles, crash scenes, and other incidents. **Table 8** lists the number of IMAP call-outs for I-77 between Gilead Road and Brookshire Freeway for July 2004 through September 2005. This table shows the number of callouts for incidents and accidents for the 15-month period.

Table 8. I-77 Accidents and Incidents, July 2004 – September 2005

Month	Accidents	Incidents
July 2004	21	244
August	31	239
September	30	220
October	16	133
November	11	124
December (HOV lanes opened on 12/20/04)	8	130
January 2005	***31***	***191***
February	***7***	***139***
March	***23***	***155***
April	***22***	***164***
May	***13***	***158***
June	***28***	***161***
July	***18***	***166***
August	***21***	***181***
September	***14***	***135***

Findings

- As shown by **Table 7**, the average number of accidents per month dropped from 42 to 33, a 21 percent improvement, following the addition of general-purpose and HOV lanes in each direction in late December 2004.
- The average number of IMAP callouts for accidents before and after the I-77 HOV lanes opened is unchanged at 20 per month. IMAP responses because of incidents has decreased from 182 per month before the I-77 HOV facility opened to 161 a month for the period after the lanes have been in operation.

MODAL IMPACTS

These measures analyze shifts into carpools, vanpools, or transit.

Transit Ridership and Park-and-Ride Lot Usage

- In October 2005, CATS operated three express bus routes along I-77, up from the two routes operated in October 2004. Route 77X, North Mecklenburg Express, includes 55 trips on weekdays and 12 trips on Saturdays.
- Route 83X, Mooresville Express, includes 12 trips, operated on weekdays only.
- Route 53X, Northlake Express, began on October 3, 2005 and includes eight daily trips operated between Monday and Friday. This new route had 88 daily riders in October 2005 and 105 per day in November 2005.

The following table lists 77X and 83X average weekday patronage by month since November 2003.

Table 9. Route 77X and 83X Weekday Ridership, November 2003 – October 2005

Month	Route 77X		Route 83X	
	2003-04	2004-05	2003-04	2005-05
November	521	667	91	138
December	518	557	91	113
January	526	***707***	98	***143***
February	503	***655***	89	***138***
March	558	***643***	118	***142***
April	532	***667***	124	***166***
May	579	***678***	131	***163***
June	601	***656***	123	***158***
July	584	***706***	133	***168***
August	628	***796***	154	***186***
September	649	***1000***	150	***220***
October	644	***979***	137	***206***

Findings

- Average daily patronage on the CATS express routes using the I-77 HOV facility increased by 63 percent between October 2004 and 2005, from 781 daily riders to 1185 weekday passengers. The increase between November 2004 and 2005 was 53 percent, from 805 weekday riders to 1232 daily users.
- In 2003, CATS completed a 209-space park-and-ride lot in Huntersville at Exit 23 on I-77. From October 2004 to October 2005, the number of vehicles parked in this CATS-owned lot jumped from 128 to 162, a 27 percent increase.
- On October 3, 2005, CATS opened a new park-and-ride facility at Northlake Mall, near Exit 18. This lot includes 212 parking spaces.
- A new 326-space park-and-ride facility near Northcross (Exit 25) is scheduled for opening in March 2006.

Vanpools

CATS operates a vanpool program. A vanpool is a group of people who live and work near each other and share similar commuting schedules. A typical vanpool consists of 9 to 14 persons with one rider agreeing to drive the vehicle and at least one other vanpool passenger agreeing to be the back-up driver. The average round-trip distance for a CATS vanpool is 50 miles.

Findings

- In October 2004, nine vanpools operated weekdays along the I-77 corridor into Center City Charlotte. In October 2005, the number of vanpools using I-77 had increased to 10.
- The total number of vanpool passengers in the I-77 corridor increased from 84 to 88 persons between 2004 and 2005.

Public Opinion Surveys

In 2004 and 2005, the City of Charlotte included six questions about HOV facilities on the annual survey of Mecklenburg County residents administered by UNC Charlotte's Urban Institute. The surveys included sample sizes of about 900 residents, which yield a potential sampling error of plus or minus 4 percent at the 98 percent confidence level. The Urban Institute administered the telephone surveys in October and November of 2004 and 2005.

Findings

- When asked to identify the alternative modes of transportation that could be operated to provide an alternative to congestion along the interstates, 36 percent of respondents in 2005 named HOV lanes, the same percentage as rapid transit. In 2005, express buses using HOV lanes received the most support (17 percent) followed closely by carpools on HOV lanes (16 percent). Respondents mentioned vanpools traveling on HOV lanes as the best alternative to congestion 3 percent of the time in 2005.

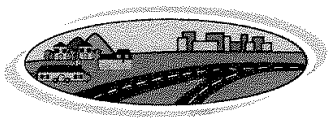
- In 2005, the greatest number of respondents (17 percent) named I-77 North as the route that HOV lanes would be most beneficial. I-77 South of Charlotte was named by 12 percent of respondents while 14 percent indicated that Independence Boulevard should have HOV lanes.
- Over 77 percent of respondents were familiar in 2005 with the I-77 HOV facility, up dramatically from the 45 percent of respondents who expressed familiarity with the I-77 HOV lanes in the 2004 survey.
- Nearly 17 percent of survey respondents indicated that they regularly use the I-77 HOV facility in a bus, carpool or vanpool.
- When asked in 2005 if building the HOV lanes along I-77 was a good idea, 56 percent of respondents replied yes (compared to 32 percent in 2004). Eighteen percent of those responding to this question in the 2005 survey indicated that constructing HOV lanes along I-77 was a bad idea. Approximately 27 percent of interviewees did not answer this question.

Project Name	Description	Reduction in Volative Organic Compounds	Reduction in Nitrogen Oxides	Cost of Implmentation/ Construction (Less Local Match)	NCDOT Project Year
Truck Stop Electrification	Electrification of 50 spaces at Rowan County truck stop.	2,000	33,000	$ 400,000	2006
Horah Street sidewalk project	Construct a sidewalk on Horah Street	8	3	$ 26,400	2010
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO			$ 951,974	2009-2012
Sports complex sidewalk project	Construct sidwalk on Ryan Street and S. Boundary Street	11	4	$ 60,160	2010
East Centerview, Blackwelder, Chapel, and Keller sidewalk project	Construct sidewalks on East Centerview, Blackwelder, Chapel and Keller Streets	19	6	$ 66,880	2010
Free Transit Service during Ozone Action Days	Provide free transit service and marketing during code red and orange ozone action days	65	49	$ 36,000	2007-2009
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO				2009-2012
Express Route between Kannapolis and Salisbury	Provide new connecting service between Rider and Salisbury Transit or downtown Kannapolis to downtown Salisbury	2,184	1,500	$ 360,000	2008-2010
Park, Elizabeth, and Clinton sidewalk project	Construct sidewalks on Park, Elizabeth, and Clinton Streets	4	1	$ 78,768	2010
Salisbury High School sidewalk project	Construct sidwalks around Salisbury High School	25	8	$ 63,136	2010
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO				2009-2012
Bostian Street sidewalk project	Construct a sidewalk on Bostian Street	26	8	$ 69,792	2010
Bringle Ferry Road sidewalk project	Construct a sidewalk on Bringle Ferry Road.	22	7	$ 106,112	2010
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO				2009-2012
Arlington Street sidewalk project	Construct pedestrian connector from bus stop to Walmart Parking lot.	29	9	$ 14,400	2010
Newsome Road sidewalk project	Construct a sidewalk on Newsome Road	16	5	$ 79,632	2010
Statesville Blvd sidewalk project	Construct a sidewalk on Statesville Blvd	57	18	$ 193,520	2010
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO				2009-2012
Stokes and Highland Ridge sidewalk project	Construct sidewalks on Stokes and Highland Ridge Streets	7	2	$ 82,560	2010
W. Vance, Mitchell, Wilson, and Laurel sidewalk project	Construct sidewalks on W. Vance, Mitchell, Wilson, and Laurel Streets	12	4	$ 88,160	2010
Salisbury Traffic Signal System	Improve operations and upgrade equipment for the Salisbury traffic signal system	1,555	517	$ 313,600	2011
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO				2009-2012
Kirk Street sidewalk project	Construct a sidewalk on Kirk Street	7	2	$ 58,464	2010
Salisbury Mall sidwalk project	Construct sidewalk on Jake Alexander Blvd and Statesville Blvd.	196	63	$ 175,680	2010
S. Main Street sidewalk project	Construct a sidewalk on S. Main Street	36	12	$ 67,200	2010
Expansion of the Catawba College Air Quality Outreach Program	Expand the current Air Quality Outreach Program into the rest of the MPO				2009-2012
E. Liberty, Klondale, and E. Washington sidewalk project	Construct sidewalks on E. Liberty, Klondale, and E. Washington Streets	7	2	$ 61,136	2010
	7 Years Totals - Kilograms	7,067	35,480		
ROWAN COUNTY TOTAL			Total Cost	$ 3,353,574	
Biodiesel Fuel Storage System	Purchase infrastructure (tank, manifold piping, and pad) to store and dispense Biodiesel (B20 fuel.	80		$ 40,000	2006
Mt. Olivet Road and Hwy. 3 Intersection	Install turn lanes on Mt. Olivet Road to improve traffic flow.	1	2	$ 256,000	2006-2007
Rider Commuter Hotline and Transit Route Matching Service	Education materials and route matching customer response operating system via phone and internet	456	342	$ 84,000	2009-2011
Expanded Transit Service on Saturdays for Rider Transit System	Provide transit service on Saturdays for Rider Transit System to supplement weekday service	22		$ 480,557	2006-2008
GEM Electric Vehicle for Concord PD	Purchase 2 electic powered vehicles for the Concord Police Department for Parking Enforcement and raceway/greenway patrol.	6	5	$ 19,200	2006
Free Transit Service during Race Weeks at Lowe's Motor Speedway	Provide free transit service for 2 weeks a year during the Charlotte Motor Speedway Race Weeks	26	20	$ 141,348	2007-2009
Dale Earnhardt Blvd Sidewalk	Install 3,379 linear feet of sidewalk on Dale Earnhardt Boulevard from to encourage pedestrian travel to Kannapolis Middle School and various businesses and shopping centers	70	22	$ 211,200	2010
Intersection Improvements to Poplar Tent and US 29	Construct additional turn lanes at the intersection of Poplar Tent Road and US 29	76	66	$ 325,200	2008-2009
Town of Mt. Pleasant sidewalk project	Construct sidewalks to connect neighborhoods and town hall	20	7	$ 56,000	2010
Town of Harrisburg sidewalk project	Construct sidewalks to connect neighborhoods and town center	40	14	$ 300,000	2010
Town of Mt. Pleasant sidewalk project	Construct sidewalks to connect neighborhood and school	20	7	$ 120,000	2010
McEachern Greenway Downtown Connector	Construct a 1/2 mile greenway connector to the downtown Corban Park.	35	7	$ 312,800	2009
Oakwood Avenue Sidewalk	Install 7,000 linear feet of sidewalk fron Windsor Avenue to Shady Brook School to encourage pedestrian travel to school	20	7	$ 232,000	2010
Fisher Street Sidewalk	Install 5,000 linear feet of sidewalk along full length of Fisher Street to encourage pedestrian access to North Cabarrus Park	20	7	$ 200,000	2010
Intersection Improvements to US 601 and NC 3	Construct additional turn lanes at the intersection of US 601 and NC 3	24	19	$ 768,000	2010-2011
	7 Years Totals - Kilograms	916	525		
CABARRUS COUNTY TOTAL				$ 3,546,305	
GRAND TOTAL OF CR MPO CMAQ PROJECT REQUEST			Total Cost	$ 6,899,879	

EPA National Clean Diesel Database
All Projects (Last Modified Date) Report
Wednesday, October 11, 2006 04:51 PM

ID	STATE	PROJECT RECIPIENT	PROJECT DESCRIPTION
75	NC	Western North Carolina Regional Air Quality	Retrofit 349 school buses with DOCs (state grant).
76	NC	Mecklenburg County Schools	At least 21 school buses with DOCs.
89	NC	Iredell County Schools	State grant - DOCs on 58 school buses
90	NC	Greensboro Schools	State grant - DOCs on 100 school buses
91	NC	Wake County Schools	State grant - DOCs on 268 school buses
92	NC	Ft. Bragg Schools	Retrofit 16 buses with DOCs and 26 buses with DOCs and crankcase filters using state grant
93	NC	Mecklenburg County Schools	State grant - DOCs on 90 school buses
94	NC	Eastern Band of Cherokees	Tribal grant - 22 school buses with DOCs
95	NC	Mecklenburg County, Charlotte	Diesel retrofit grant - 58 school buses with DOCs.
97	NC	Rowan County	TSE - 50 spaces
98	NC	Rowan County/Salisbury Public Schools	Retrofit 116 school buses with state grant DOC = 93; DOC + Crank Case = 23
99	NC	Western North Carolina Regional Air Quality	Diesel retrofit grant - DOCs on 88 buses
100	NC	Charlotte	Charlotte Area Transit System (CATS) - DPF and ULSD on 9 transit buses
102	NC	SC Dept of Health and Env Control	Proj in Mebane, NC funded through SC DHEC - Mebane - TSE - 58 spaces
295	NC	Mecklenburg County Schools	retrofit 66 school buses with DOCs
296	NC	Mecklenberg County fleet	retrofit 100 city and county sanitation trucks with DOCs
297	NC	Town of Cary municipal fleet	biodiesel (B20 blend) used in municipal fleet
305	NC	City of Chapel Hill	biodiesel (B20) in municipal fleet
306	NC	North Carolina DOT	Biodiesel (B20) in maintenance fleet
307	NC	Durham Public Schools	Biodiesel (B20) in 325 school buses
308	NC	Town of Garner	Biodiesel (B20) for municipal truck fleet
309	NC	City of Raleigh	Biodiesel (B20) in municipal fleet
310	NC	Wake County	Biodiesel (B20) in county fleet
311	NC	Raleigh-Durham Airport	Biodiesel (B20) in airport vehicles
312	NC	City of Greensboro	Biodiesel (B20) in municipal fleet
313	NC	Town of Carrboro	Biodiesel (B20) in municipal fleet
314	NC	Chatham County Schools	Biodiesel (B20) in school buses
315	NC	Duke University	Biodiesel in University fleet
316	NC	North Carolina State University	Biodiesel (B20) in University fleet
465	NC	Mecklenberg County Air Quality Agency	Retrofit 20 school buses with DOCs
466	NC	Mecklenberg County Schools	Retrofit 40 school buses with DPFs as part of a Federal SEP
467	NC	Charlotte	Purchase 12 new CNG school buses (only 4 in operation now)
468	NC	Guilford County Schools	Retrofit 123 school buses with DOCs
469	NC	Henderson County Schools	Retrofit 65 school buses with DOCs

Project recipient	Project description	Start Date	Completion date
Cabarrus County Schools	48 school buses retrofitted: DOCs & CCV	2006 MSERG (state grant)	
Cabarrus County Schools	Biodiesel equipment: Refueling tanks and pumps	2006 MSERG (state grant)	
City of Salisbury (Cabarrus County)	Anti-Idle Policy for city owned vehicles		
Gaston County Schools	95 school buses retrofitted: DOCs	2006 MSERG (state grant)	
Gaston County Landfill	Biodiesel fuel (B20) in off-road landfill vehicles	biodiesel pilot grant - Started in June 2006	ongoing
Lincoln County Schools	48 school buses retrofitted: DOCs	2006 MSERG (state grant)	
Mecklenburg and Wake County Schools	2 OEM Plug-in Hybrid Electric School Buses,	2005 & 2006 MSERG (state grant)	
Mecklenburg County & City of Charlotte	Install DOCs on city and county solid waste vehicles	2005 MSERG (state grant)	Jun-06
Charlotte/Mecklenburg County Schools	GPS (local, speed, engine status tracking and reporting)	2006 MSERG (state grant)	Jul-07
City of Concord (Mecklenburg County)	No Idle Policy for city owned vehicles		
Town of Matthews (Mecklenburg County)	Biodiesel fuel (B20) used in Municipal fleet	biodiesel pilot grant - Started in June 2005	ongoing
Union County	Biodiesel fuel (B20) used in 11 Public Works vehicles	Started in 2005	ongoing
City of Monroe (Union County)	Biodiesel (B20) in municipal fleet	Started in July 2004	ongoing
NC Department of Transportation	Biodiesel (B20) in maintenance fleet	NA	ongoing
Duke Power	Private fleet use of B20 in 37 vehicles		ongoing
Cumberland County Schools	55 school buses retrofitted: DOCs & CCV	2006 MSERG (state grant)	
TCA Idle Aire-TSE Parking	Greensboro, NC at I-85/I-40 & Hwy 61, Exit 138 (75 spots)	Summer 2006	Sept. 15, 2006
North Carolina Zoo (Randolph County)	Grant used to purchase processor to produce biodiesel.	2005 MSERG (state grant)	
Blue Ridge Biofuels	Tank truck purchase for biodiesel distribution and oil	2005 MSERG (state grant)	Jun-06
Filter Specialty Inc (Sampson County near I-95	Purchase 2 biodiesel storage tanks (8,000 gallons each) and	2005 MSERG (state grant)	Mid 07
Carolina Coastal Railway (Beaufort County)	Idle reduction: APU for locomotive in switchyard	2006 MSERG (state grant)	early 2007
Catawba Valley Heritage Alliance	Biodiesel pump (open 24/7 to public through Bumgarner	2006 MSERG (state grant)	Dec-06
City of Greensboro	Installation of DOCs on trucks.	2006 MSERG (state grant)	Jan-07
High County Biofuels (Watauga County)	Biodiesel Equipment: storage & tank truck	2006 MSERG (state grant)	
Pasquotank County	Biodiesel infrastructure (two B20 pumps) for county	2006 MSERG (state grant)	Spring 2007
City of Greensboro	Biodiesel fuel (B20)	Early 2002	ongoing
Wake Forest University	Consortium of biology and chemistry professors at WFU is building a 300 gallon reactor to process 2,000 gallons of fryer oil fro		
City of Greensboro	No Idle Policy for city owned vehicles		
Buncombe County	Biodiesel (B5 and B2) use in municipal fleet		
Metropolitan Sewerage District	Biodiesel fuel used in municipal fleet	2003	ongoing
Eastern Band of Cherokee	Biodiesel (B20) in Transit Shuttles, 6 School Buses, trucks and tractors		new project
NC A&T (Greensboro, NC)	Biodiesel (B20) use in State University fleet	2002	ongoing
Town of Cary	Biodiesel (B20) in Municipal fleet	2006	ongoing
Town of Chapel Hill	Biodiesel (B20) in Muncipal fleet		ongoing
NC State University	Biodiesel (B20) in University fleet		
Jacksonville	Biodiesel (B20) in municipal fleet	Sep-06	ongoing



Centralina
Council of Governments

May 15, 2007

Ms. Laura Boothe
North Carolina Division of Air Quality
North Carolina Department of Environment and Natural Resources
1641 Mail Service Center
Raleigh, North Carolina 27699-1641

Re: Weight of Evidence Information for the Metrolina Area Attainment State Implementation Plan

Dear Laura:

We wish to write in support of the weight of evidence information assembled by the North Carolina Division of Air Quality to support the demonstration of attainment of the NAAQS for 8-hour ozone for the Metrolina non-attainment area.

Centralina Council of Governments fully concurs in the State's conclusion that there are a number of actions underway which will continue to reduce NOx and other emissions, that are not included in the model. We have been an active participant in stimulating these actions, along with NCDAQ's Air Awareness staff and many other organizations and local governments. We believe that these and additional voluntary actions undertaken in the future will be key in helping us to continue to improve air quality as our region grows.

To enumerate some of the specific non-modeled projects:

- The Cities of Salisbury and Concord have adopted extensive Air Awareness programs for their own employees, including specific actions such as telecommuting, teleconferencing etc. on ozone action days.
- Six county school systems have committed to diesel oxidation catalysts on those school buses that do not already have them and that have a useful life that makes such a step cost-effective. These districts—Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, and Rowan—have retrofitted 620 buses to date.
- Charlotte-Mecklenburg Schools has also installed particulate filters and has made a number of other improvements to their fleet.

Midtown Plaza Building - 1300 Baxter Street, Suite 450
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- Many local governments in the region have purchased hybrid vehicles and many have begun using biodiesel.
- The City of Charlotte has adopted Environment as one of its five City Council Focus Areas and has begun implementation of a massive planning effort to reduce energy consumption and undertake emissions reducing actions.
- A program co-sponsored by Centralina COG and the Carolinas Clean Air Coalition, with funding provided in part by NCDENR, has placed "Turn off your engine—kids breathe here!" signs at each of the region's schools. This "Clear the Air for Kids!" program also provides information for parents to discourage idling in carpool and drive-through lines.
- The "Clean Air Works!" program of the Charlotte Chamber and regional partners engaged business leadership in working to reduce emissions during ozone season in the bi-state airshed.
- Through local land use plans and subsequent ordinance changes, jurisdictions throughout the region are adopting land use policies that promote more compact, walkable development, a mix of uses that promote walking or bicycling as a means of transportation, and that make transit more feasible.
- A significant number of jurisdictions are undertaking specific pedestrian planning initiatives and sidewalk programs to make walking a viable form of transportation—over nine jurisdictions have undertaken or completed pedestrian planning grants alone.
- We are working diligently to electrify a truck stop in Rowan County with ATSE technology, but have run into problems with the vendor. Assuming that these problems can be resolved, this project will reduce NOx and VOC emissions as well as PM2.5 from idling heavy-duty diesel engines. If we are successful in resolving the issues that have arisen, the project will be functional by the attainment date. If we are unsuccessful, these emissions reductions will not be realized.

Through SEQL, our communities in the Metrolina airshed reported undertaking a cumulative total of 389 actions to promote air quality. Centralina continues to seek funding to promote additional emissions-reduction strategies, including promoting energy efficiency through compact fluorescent light bulb use and lawn equipment trade-outs. We also continue to work with partnering agencies on other types of public education and outreach, and on the development of land use patterns that are conducive to reducing the rate of VMT growth.

We commend the NCDAQ staff for their hard work on behalf of air quality, and look forward to continued collaboration.

Sincerely,

Rebecca R. Yarbrough
Assistant Director

cc: A.R. Sharp, Jr., Executive Director
Carol Lewis, Outreach Coordinator
Sheila Holman, Planning Chief