

# CH. 4 PHYSICAL ENVIRONMENT



Chapter 4 summarizes the project's impact on the physical environment. Sections within this chapter evaluate the project's impacts with respect to noise, air quality, farmlands, utilities and infrastructure, visual quality, hazardous materials, and floodplains/floodways.

## 4.1 NOISE

This section summarizes the traffic noise assessment performed for the project. Details are documented in the project's *Final Traffic Noise Technical Memorandum for the Gaston East-West Connector* (PBS&J, July 2008), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)). The analysis was performed in accordance with Title 23 of the United States Code of Federal Regulation Part 772 – *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR 772).

### 4.1.1 CHARACTERISTICS OF NOISE

Noise is defined as unwanted sound. Truck and automobile noise is usually comprised of noises from engine exhaust, the drive train, and tire/roadway interaction.

The magnitude of noise is usually described by a common unit of reference called the “decibel” (dB). The A-weighted decibel scale is used almost exclusively when measuring vehicle noise because it places an emphasis on the frequency range to which the human ear is most sensitive (1,000–6,000 Hertz). Sound levels that are measured using the A-weighted decibel scale are written as dBA.

Examples of typical noise levels include 110 dBA for a car horn at 50 feet of distance, 75 dBA for a blender at 3 feet, 55 dBA for a conversation at 10 feet, and 45 dBA for background noise conditions in a rural or suburban area.

#### **Noise Sources**

*Background noise levels in a rural or suburban environment are typically about 45 dBA. A car horn produces about 110 dBA at a 50-foot distance.*

The criteria that the Federal Highway Administration (FHWA), NCTA, and North Carolina Department of Transportation (NCDOT) use to determine noise impacts are based upon hourly average noise levels. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level having the same energy content.

### 4.1.2 NOISE ABATEMENT CRITERIA

The FHWA has established Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways.

The FHWA NAC are presented in **Table 4-1**. As shown in the table, the NAC are divided into Activity Categories depending upon different sensitivities to noise. Most land uses in the Project Study Area are in Activity

#### **Noise Abatement Criteria**

*The FHWA noise abatement criteria are found in 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.*

Categories B and C, and include residences, churches, recreation areas, and businesses. Crowders Mountain State Park is considered Activity Category A.

**TABLE 4-1: Federal Highway Administration Noise Abatement Criteria**

Activity Category	Leq (hour)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A and B above.
D	–	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: 23 CFR Part 772

Noise mitigation measures must be considered when future noise levels either approach or exceed the NAC levels, or if there are substantial increases over existing noise levels. The definitions of approach and substantial increase are left up to each state. NCDOT defines approach as within 1 decibel of the NAC. NCDOT definitions for “substantial increases” are presented in **Table 4-2**. The NCTA follows NCDOT policies, guidance, and procedures regarding noise.

**TABLE 4-2: NCDOT Definition of Substantial Increase in Noise Levels**

Existing Average Noise Level dBA Leq(hour)	Increase (in decibels) from Existing Noise Levels to Future Noise Levels Defined as a Substantial Increase
≥55	10 or more
54	11 or more
53	12 or more
52	13 or more
51	14 or more
≤50	15 or more

Source: *Traffic Noise Abatement Policy* (NCDOT, 2004).

Title 23 CFR Section 772.11(a) states, “In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.”

### 4.1.3 EXISTING NOISE ENVIRONMENT

Noise levels measurements were conducted within the vicinity of the Detailed Study Alternatives (DSAs) to determine the typical existing background (i.e., ambient) noise levels and to provide a basis for assessing the impacts of future traffic noise levels. A sound-level meter was used to

measure existing traffic and background noise at 22 representative locations on October 16, 17, 29, and 30, 2007.

The measurement locations are shown in **Figure 4-1a-b**. They include seven measurements adjacent to area roadways and fifteen locations in areas away from direct traffic noise sources. Noise measurement sites were selected to represent noise-sensitive land uses in communities within the vicinity of the DSAs.

At locations where traffic noise did not dominate the noise environment, the existing noise levels ranged from 39 dBA Leq to 56 dBA Leq. In the seven locations near roadways, noise levels ranged from 51 dBA Leq to 67 dBA Leq. The existing noise levels measured at each location are provided in **Appendix G** (Table G-1).

The majority of receptors adjacent to the DSAs are located in areas away from existing major noise sources, and were estimated to have existing noise levels of approximately 45 dBA Leq.

#### 4.1.4 NOISE IMPACT ANALYSIS METHODOLOGY

The FHWA Traffic Noise Model® (TNM), Version 2.5, was used to predict future toll-scenario traffic noise levels for this project. TNM calculates noise levels at modeled locations using inputs including projected year 2030 peak-hour traffic volumes; vehicle mix (percentages of cars, medium trucks, and heavy trucks); speed; roadway lengths and gradients; distances between sources, barriers, and receptors; and shielding provided by intervening terrain, barriers, and structures.

This analysis used a two-step approach to estimate noise levels. The first step used TNM to develop noise contours and to identify the sensitive receptors (e.g., houses, schools, churches, parks, etc.) potentially impacted by traffic noise from the proposed DSAs. The noise contours do not account for shielding provided by intervening terrain, barriers, or structures. The noise contours are a conservative estimate of noise levels used for preliminary identification of receptors potentially impacted by future traffic noise.

In the second step, TNM was used to perform more detailed analyses in areas where approximately three or more receptors were identified as being potentially impacted based upon the results of the first step. In these areas, called Neighborhood Study Areas, noise barriers were evaluated where the detailed model showed impacts receptors (**Section 4.1.6.4**).

#### 4.1.5 TRAFFIC NOISE IMPACTS

##### 4.1.5.1 Noise Contours

In the first step of the analysis process, TNM was used to develop a conservative estimate of year 2030 noise contours along the mainlines of the DSAs. The 2030 contours provided the basis for a preliminary identification of potentially affected receptors. **Table 4-3** shows the maximum extent of the 72 dBA Leq and 67 dBA Leq 2030 traffic noise contours for the various segments of the DSAs. The 67 dBA Leq and 72 dBA Leq contours correspond to the NAC for Activity Categories B and C, respectively. Distances to these 2030 contour lines are measured from the Gaston East-West Connector centerline. The noise contours are based upon the highest projected 2030 toll traffic volumes for each segment for each DSA. This information should assist local

authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within the local jurisdiction.

As shown in **Table 4-3**, traffic noise increases from west to east, since traffic volumes are highest at the eastern end of the project and lowest at the western end. Maps are included in **Appendix G** showing the highest 2030 noise contours for each Corridor Segment and the receptors within the contours.

**TABLE 4-3: 2030 Noise Contours**

Mainline Segment	Maximum Contour Distances (ft. from Centerline)		Applicable Detailed Study Alternatives
	72 dBA Leq	67 dBA Leq	
I-85 to US 29-74	100	204	4, 5, 9, 22, 23, 27
	95	190	58, 64, 68
	100	200	76, 77, 81
US 29-74 to Linwood Road	135	260	4, 5, 9, 22, 23, 27
	95	190	58, 64, 68
	125	250	76, 77, 81
Linwood Road to US 321	115	235	4, 5, 9, 22, 23, 27
	125	250	76, 77, 81
Linwood Road to Lewis Road	95	190	58, 64, 68
Lewis Road to US 321	130	250	58, 64, 68
US 321 to Robinson Road	135	260	4, 5, 9, 22, 23, 27, 58
	130	250	64, 68
	140	265	76, 77, 81
Robinson Road to Bud Wilson Road	175	305	4, 22, 58, 76
	170	300	5, 9, 23, 27, 77, 81
	165	300	64, 68
Bud Wilson Road to NC 274 (Union Road)	175	305	4, 22, 58, 76
	170	300	5, 9, 23, 27, 77, 81
	165	300	64, 68
NC 274 to NC 279 (S New Hope Road)	175	305	4, 22, 58, 76
	185	315	5, 9, 23, 27, 64, 68, 77, 81
NC 279 to NC 273 (Southpoint Road)	205	335	4, 5, 9, 22, 23, 27, 58, 68, 76, 77, 81
	210	340	64
NC 273 to Dixie River Road	250	375	4, 9, 22, 27, 58, 68, 76, 81
	250	380	23, 77, 5
	250	385	64
Dixie River Road to I-485	250	375	4, 9, 22, 27, 58, 68, 76, 81
	240	365	5, 23, 64, 77
East of I-485	185	315	4, 9, 22, 27, 58, 68, 76, 81
	185	320	5, 23, 77
	190	320	64

Source: *Traffic Noise Technical Memorandum for the Gaston East-West Connector* (PBS&J, July 2008).

**Table 4-4** lists the numbers of receptors in each Activity Category predicted to be impacted by noise, based upon the 2030 traffic noise contours. Impacted receptors are receptors expected to experience traffic noise impacts either by approaching or exceeding the FHWA NAC based upon the 72 dBA Leq (for Category C) and 67 dBA Leq (for Category B) traffic noise contours, or by a substantial increase in exterior noise levels. The numbers of impacted receptors range from 196 impacted Category B receptors for DSA 68, to 301 impacted Category B receptors for DSA 76.

Category B receptors in the vicinity of the DSAs include residences and churches. Relatively few businesses (Category C) would be impacted by noise along the DSAs, with the numbers of impacts ranging from three businesses for DSA 77 to ten businesses for DSA 22. The impacts to Category B receptors are primarily substantial increase impacts. The area is rural and suburban, with relatively few major roadways.

**TABLE 4-4: Impacted Receptors by Detailed Study Alternative Based on 2030 Traffic Noise Contours**

Detailed Study Alternative	Number of Impacted Receptors		
	Category B <sup>1</sup>	Category C <sup>2</sup>	Total
4	293	9	302
5	267	4	271
9	237	8	245
22	288	10	298
23	262	5	267
27	232	9	241
58	263	9	272
64	226	5	231
68	196	8	204
76	301	8	309
77	275	3	278
81	269	7	276

Source: *Final Traffic Noise Technical Memorandum for the Gaston East-West Connector* (PBS&J, July 2008).

Notes: 1. Category B receptors include residences and churches.  
 2. Category C receptors include businesses.

#### 4.1.5.2 Potential Noise Impacts to Churches, Schools, and Other Special Uses

**Churches.** Six churches are located within the year 2030 67 dBA Leq traffic noise contours. These are, from west to east: Broomfield Methodist Church, Pisgah ARP Church, True Vine Church of God, Open Door Ministries, Gaston Christian Church, and Grace Wesleyan Church. Potential noise impacts to these churches are discussed below.

**Broomfield Methodist Church.** This church is located adjacent to Corridor Segment H2A (DSAs 4, 5, 9, 22, 23, and 27) at 909 Shannon Bradley Road. A barrier for this church and adjacent residences was found to be feasible and reasonable (Barrier 1-1) (**Section 4.1.6.4**). With the barrier in place, the church would not be impacted by noise.

Pisgah ARP Church. This church is located adjacent to Corridor Segment H2B (DSAs 22, 23, and 27) at 3600 Linwood Road. The 66 dBA Leq noise contour passes through a wooded area on the church property that is not a frequent outdoor-use area. The area near the church structures and small yard is projected to average about 62–63 dBA Leq in the peak hour based upon the noise contour files. This represents a substantial increase above the estimated existing noise level of 45 dBA Leq, but does not exceed the outdoor use NAC for Category B. It should be noted that in this area, the Gaston East-West Connector mainline is below grade (i.e., depressed below surrounding ground) and noise levels likely would be less than those predicted with the noise contour model. Therefore, a noise impact is not anticipated.

The interior standard of 52 dBA Leq would not be exceeded at the church structures. The structures are masonry, which can achieve 25–35 dBA of exterior to interior noise reduction (*Highway Traffic Noise Analysis and Abatement: Policy and Guidance*, FHWA, June 1995). If the structures were assumed to achieve 25 dBA of exterior to interior noise reduction, and the future outside noise level was 63 dBA Leq, then the interior noise levels would be 38 dBA Leq, which is below the interior NAC.

True Vine Church of God. This church is located adjacent to Corridor Segment H1C (DSAs 58, 64, and 68) at 5348 Lewis Road. The church structures likely would be within the right-of-way limits of the proposed project and would need to be relocated if DSA 58, 64, or 68 is selected as the Preferred Alternative. Based upon aerial photographs, the parcel does not appear to have an area of frequent outdoor use. If the church structures are relocated to another area of the remaining property farther from the project, interior noise levels would not exceed the interior NAC of 52 dBA Leq. At least 20 dBA of exterior to interior noise reduction can be achieved by light frame buildings (*Highway Traffic Noise Analysis and Abatement: Policy and Guidance*, FHWA, June 1995), and the remainder of the parcel would experience noise levels of 66 dBA Leq or less.

Open Door Ministries. This church is located south of Corridor Segment J5B (DSAs 4, 22, 58, and 76) at 783 Union New Hope Road. The 60 dBA Leq noise contour line passes through the northern portion of the parcel that is wooded and undeveloped and is not an area of frequent outdoor use. Therefore, there would be no project-generated traffic noise impacts to this church.

Gaston Christian Church. This church is located south of Corridor Segment K2A (DSAs 4, 22, 58, and 76) at 5339 South New Hope Road (NC 279). The main church building is located on the south side of the parcel and the structure and its surrounding area would not be impacted by project-generated noise.

Grace Wesleyan Church. This church is located north of Corridor Segment K1C (DSAs 5, 23, 64, and 77) at 6014 South New Hope Road. The 60 dBA Leq contour line passes through the southern end of the church property in a wooded, undeveloped area where there is no frequent outdoor use. The church would not be impacted by project-generated noise.

**Schools and Libraries.** There are two schools and a library within the vicinity of the DSAs. Sadler Elementary is located at 3940 West Franklin Boulevard (US 29-74) on the east side of Corridor Segment H1A (DSAs 58, 64, 68, 76, 77, and 81). Forestview High School is located at 5545 Union Road north of Corridor Segment J5a (DSAs 4, 22, 58, and 76). The Union Road Branch Library is located across existing Union Road and slightly to the south of Forestview High School. None of the projected noise contours would be on school or library property and there would be no noise impacts from any of the DSAs.

**Parks and Recreation Areas.** This section discusses potential noise impacts to Crowders Mountain State Park, Linwood Springs Golf Course (a privately-owned golf course open to the public), Duke Energy recreational fields (privately-owned by Duke Energy Corporation), and Berewick District Park (a proposed Mecklenburg County Park). Daniel Stowe Botanical Garden and the Park at Forestview High School were located too far from the proposed DSAs to be potentially impacted by traffic noise.

**Crowders Mountain State Park.** Crowders Mountain State Park is located to the west of the DSAs. Crowders Mountain State Park is a natural forest park offering activities such as hiking and climbing. The park is considered a Category A land use. Category A lands are “lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.” (23 CFR Part 772). Category A lands have a NAC of 57 dBA Leq. As discussed below, no noise impacts to the park are projected to occur.

For comparison purposes, the existing noise levels in the park were assumed to be about 39–40 dBA Leq, which are the lowest noise levels measured within the Project Study Area (**Appendix G** – Table G-1). NCDOT standard practice is to assume 45 dBA Leq for the natural environment, so assuming a lower value is conservative.

The noise contours developed for Corridor Segments H1A and H1B (DSAs 58, 64, 68, 76, 77, and 81), which are closest to the park, were used to estimate the maximum future 2030 project-related traffic noise levels likely to occur at the nearest park boundary and at the nearest point along the hiking trails inside the park. The nearest park boundary is approximately 1,500 feet from the centerline of Corridor Segment H1A. The nearest point on the hiking trails is on the Tower Trail, which is approximately 2,800 feet from the centerline of Corridor Segment H1A.

Based upon the projected 2030 noise contours, maximum 2030 project-generated traffic noise levels at the park boundary nearest the DSAs (1,500 feet away) would be approximately 46 dBA Leq, well below the Category A NAC of 57 dBA Leq, and below being classified as a substantial increase. At the nearest point of the Tower Trail (2,800 feet), maximum 2030 project-generated traffic noise levels would be approximately 42 dBA Leq, also well below the impact thresholds. Actual project-generated noise levels likely would be less due to reductions in noise levels from intervening terrain and vegetation that were not taken into account in developing the noise contours. Therefore, the park is not anticipated to experience traffic noise impacts due to this project.

**Linwood Springs Golf Course.** Linwood Springs Golf Course is located on Linwood Road, just west of Corridor Segment H3 (DSAs 4, 5, and 9). This golf course is privately-owned, but open for public use. Since this is an active-use park, it is a Category B use. Neither the 60 dBA Leq nor the 66 dBA Leq noise contour encroach on the areas of the golf course property used for play. Therefore, no project-generated noise impacts are expected at this golf course.

**Duke Energy Recreational Fields.** These two private recreational fields, owned by Duke Energy Corporation are located northwest of Allen Steam Station on Boat Club Road, just south of Corridor Segment K3B (DSAs 4, 9, 22, 27, 58, 68, 76, and 81). Since these are active uses, they fall under Category B.

Future peak-hour noise levels are projected to average approximately 63 dBA Leq at the baseball field and 58 dBA Leq at the general recreational field. The baseball field would experience a substantial increase in noise levels (18 decibels), but neither field would experience noise levels above the NAC of 66 dBA Leq. A noise barrier was modeled for this area and found not to be cost effective.

*Berewick District Park.* Berewick District Park is a proposed Mecklenburg County park located at the eastern terminus of the project, just south of the DSAs and west of I-485. The 66 dBA Leq noise contour from Corridor Segment K4A (DSAs 5, 23, 64, and 77) is on the northern edge of the park.

No proposed uses are near the northern edge of the park where the project's 66 dBA Leq noise contour for Corridor Segment K4A is located. Project-generated noise would be 60 dBA Leq or less where the proposed park uses are located. Therefore, the park is not anticipated to experience project-generated traffic noise impacts.

#### 4.1.5.3 Construction Noise

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts (such as temporary speech interference for passersby and those individuals living or working near the project) can be expected, particularly from paving operations and from earth-moving equipment during grading operations. Overall, construction noise impacts are expected to be minimal and temporary. Furthermore, the shielding provided by surrounding wooded areas, hills, structures, and other natural and man-made features are considered sufficient to moderate the effects of intrusive construction noise.

#### 4.1.6 NOISE ABATEMENT MEASURES

If traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Types of abatement measures include highway alignment selection, traffic management measures, vegetative buffers, or noise barriers. As described below, due to design constraints, access and space requirements, and cost considerations, noise barriers were found to be the only feasible method of abatement.

**Highway Alignment.** For noise abatement, highway alignment selection involves both the horizontal and vertical orientation of the proposed improvements. Horizontal alignment selection is primarily a matter of placing the roadway sufficiently far from noise sensitive areas. Depressing or raising the highway elevations (vertical alignment) can create cut and fill slopes which may block the line of sight from a receptor to a road and provide shielding from traffic noise. No major alterations in the proposed horizontal or vertical alignment of this project for noise purposes are feasible. The proposed preliminary design alignments fall within the design criteria for the roadway classification and take into account the existing topography of the area, interchanges, existing roads, residences, businesses, and cultural and natural resources.

**Traffic Management.** Traffic management measures that limit vehicle type, speed, volume, and time of operations can be effective noise-abatement measures. For this project, traffic management measures are not considered appropriate for noise abatement due to their effect on the capacity and level of service (LOS) of the proposed roadway.

**Vegetative Buffers.** The use of vegetative buffers for noise mitigation is not considered reasonable for this project, due to the substantial amount of right of way necessary to make vegetative barriers effective. FHWA research has shown that a vegetative buffer should be approximately 200 feet wide to provide a 10 dBA reduction in noise levels (*Highway Traffic Noise Abatement*, FHWA Web site: [www.fhwa.dot.gov/Environment/noise/polguide/abatement.htm](http://www.fhwa.dot.gov/Environment/noise/polguide/abatement.htm)). The cost of the additional right of way, vegetation, and relocations would most likely exceed the maximum cost threshold considered reasonable in the *Traffic Noise Abatement Policy* (NCDOT, 2004).

**Noise Barriers.** Solid barriers reduce noise levels by blocking the sound path between the noise source and noise-sensitive areas. This measure is most often used on high-speed, limited access facilities where noise levels are high and there is adequate space for continuous barriers.

For a noise barrier to provide sufficient noise reduction it must be high enough and long enough to shield the receptor (e.g., house, church, park, school, etc.) from substantial sections of the roadway. The barrier must also be feasible to construct as well as reasonable. *Traffic Noise Abatement Policy* provides guidance on determining the feasibility and reasonableness of providing noise barriers, as discussed below (NCDOT, 2004).

Feasibility of barrier construction considers potential safety and/or drainage problems, whether a barrier can be built upon the site topography, and whether other noise sources are present within the area. Noise reductions of 10 decibels or less are usually attainable, and the barrier should achieve at least 5 decibels of noise reduction for front-row receptors.

Reasonableness factors include the following: barrier cost, support for the barrier from directly adjacent receptors, the degree of noise impact, and required noise barrier height. A reasonable barrier must be cost effective and not more than 25 feet high. The NCDOT and NCTA consider a cost-effective barrier as one that costs no more than \$35,000 per effectively protected site (a site having 5 decibels or more reduction), plus an incremental increase of \$500 per average decibel increase in the predicted exterior noise levels of the impacted receptors within the area. The cost of the noise barrier used in these calculations is \$15.00 per square foot. Also, in general, noise barriers are not considered feasible for businesses or isolated residences.

**Neighborhood Study Areas for Noise Barriers.** The noise-sensitive sites predicted to be impacted directly (i.e., experience noise levels that approach or exceed FHWA NAC or show a substantial increase over existing levels) that were not considered isolated sites were further evaluated in terms of the feasibility and reasonableness of providing noise barriers.

Thirty-four Neighborhood Study Areas were modeled in detail in TNM to determine if barriers would be feasible and reasonable in these locations. **Figure 4-1a–b** shows the locations of Neighborhood Study Areas. The detailed analysis of potential noise barriers within these areas incorporated existing natural terrain and design features such as fill/cut sections.

As the result of the analyses performed for the 34 areas mentioned above, 22 locations were identified where preliminary noise barriers were determined to be feasible and reasonable. These preliminary noise barriers are shown on **Figure 4-1a–b** and listed in **Table 4-5**.

The determination of feasibility and reasonableness is preliminary and subject to change based upon final design, building permits issued as of the Date of Public Knowledge, and the public involvement process. The majority of receptors directly adjacent to the barrier (the front-row receptors) must support the construction of the noise abatement measure (*Traffic Noise Abatement Policy*, NCDOT, 2004).

The preliminary feasible and reasonable barriers reduce noise for single-family residential subdivisions and mobile home communities. Barrier lengths range between 600 feet and 2,640 feet, while barrier heights range between 10 feet and 20 feet. The approximate costs for the preliminary barriers identified in **Table 4-5** are between \$90,000 and \$625,200; and costs per benefited receptor are between \$13,976 and \$44,500.

**Date of Public Knowledge.**  
*The Date of Public Knowledge of the location of the proposed project is the approval date of the Record of Decision (ROD). The Federal/State government is not responsible for providing noise-abatement measures for new development when building permits are issued within the noise impact area of a proposed highway project after the Date of Public Knowledge. For development occurring after this date, local governing bodies are responsible for ensuring that noise-compatible designs are utilized along the proposed route.*

**TABLE 4-5: Preliminary Feasible and Reasonable Noise Barriers**

Prelim. Barriers <sup>1</sup>	Segment DSA	Description	Average dBA Reduction for Benefited Receptors	Number of Benefited Receptors	Barrier		Cost	Cost Per Receptor Allowable Cost per Receptor
					Length (Ft)	Height (Ft) <sup>2</sup>		
1-1	H2A (4, 5, 9, 22, 23, 27)	North of US 29-74, westbound side of alignment. Brookhaven and Spring Valley subdivisions.	9	34	2,640	12	\$475,200	<u>\$13,976</u> \$40,824
3-1	H1A (64, 58, 68)	East of Crowders Mtn, north of Linwood Rd, eastbound side of alignment. Brentwood Mobile Home Park.	10	20	1,400	20	\$420,000	<u>\$21,000</u> \$42,200
	H1A (76, 77, 81)		10	20	1,400	20	\$420,000	<u>\$21,000</u> \$44,500
4-1	H3 (4, 5, 9)	East of Linwood Springs Golf Course, at Linwood Rd, on westbound side of alignment. Lakewood Forest subdivision.	9	16	1,605	20	\$481,500	<u>\$30,094</u> \$41,188
6-1	H2C (22, 23, 27)	East of Chapel Grove Rd, eastbound side of alignment. Fallscree subdivision; includes Donnabrook Rd and Fallsdale Dr.	8	7	1,250	12/ 14	\$252,330	<u>\$36,047</u> \$42,714
7-1	H3 (4, 5, 9)	South of Linwood Rd on the westbound side of alignment. Stablegate Farms subdivision.	8	11	1,500	16	\$360,000	<u>\$32,727</u> \$41,909

TABLE 4-5: Preliminary Feasible and Reasonable Noise Barriers

Prelim. Barriers <sup>1</sup>	Segment DSA	Description	Average dBA Reduction for Benefited Receptors	Number of Benefited Receptors	Barrier		Cost	Cost Per Receptor Allowable Cost per Receptor
					Length (Ft)	Height (Ft) <sup>2</sup>		
8-1	H1C (58, 64, 68)	South of Old Church Rd, the westbound side of alignment. West Palm Acres subdivision.	7	15	1,575	16	\$378,000	<u>\$25,200</u> \$36,500
9-1	HX2 (76, 77, 81)	South of Jake Long Rd, westbound side of alignment. Chapel Grove Rd subdivision.	11	22	2,145	16	\$514,800	<u>\$23,400</u> \$41,600
11-1	H2C (22, 23, 27)	South of Chapel Grove Rd, on the eastbound side of alignment. Forest Estates subdivision.	7	11	1,610	16/ 18	\$415,200	<u>\$37,745</u> \$41,909
12-1	J4A (4, 5, 9)	North of Crowders Creek Rd north of New Haven Dr, westbound side of alignment. Falls Estates subdivision.	5	4	600	10	\$90,000	<u>\$22,500</u> \$40,000
12-2	J4A (4, 5, 9)	North of Crowders Creek Rd, south of New Haven Dr, westbound side of alignment. Falls Estates subdivision.	8	6	1,395	12	\$251,100	<u>\$41,850</u> \$44,000
14-1	H1C (58, 64, 68)	South of Bethany Rd, westbound side of alignment. Jack A. Shell Mobile Home Park and Spring Dr subdivision.	8	13	1,485	14/ 16/ 18	\$371,700	<u>\$28,592</u> \$42,615
17-1	J4A (4, 5, 9, 22, 23, 27)	East of US321, westbound side of alignment. Charleston subdivision.	7	8	1,092	12/ 14	\$224,760	<u>\$28,095</u> \$38,188
	J2A (76, 77, 81)		6	7	1,092	12/ 14	\$224,760	<u>\$32,109</u> \$38,643
17-2	J2C (4, 5, 9, 22, 23, 27)	East of US321, westbound side of alignment. Forbes Cove subdivision.	8	11	1,558	10/ 12/ 16/ 14	\$316,860	<u>\$28,805</u> \$38,818
	J2C (76, 77, 81)		7	11	1,558	10/ 12/ 16/ 14	\$316,860	<u>\$28,805</u> \$38,818
17-3	J2C (4, 5, 9, 22, 23, 27, 76, 77, 81)	East of US321, westbound side of alignment. Wesley Acres subdivision.	7	16	2,306	12/ 14/ 12/ 10	\$393,600	<u>\$24,600</u> \$42,125

**TABLE 4-5: Preliminary Feasible and Reasonable Noise Barriers**

Prelim. Barriers <sup>1</sup>	Segment DSA	Description	Average dBA Reduction for Benefited Receptors	Number of Benefited Receptors	Barrier		Cost	Cost Per Receptor Allowable Cost per Receptor
					Length (Ft)	Height (Ft) <sup>2</sup>		
17-4	J2C, JX1 (4, 5, 9, 22, 23, 27, 58, 76, 77, 81)	West of Robinson Rd, eastbound side of alignment. Pam Dr subdivision.	7	16	1,949	10/ 12/ 14/ 12	\$368,280	<u>\$23,018</u> \$42,969
19-1	J1C (64, 68)	East of Robinson Rd, on westbound side of alignment. Cedar Grove subdivision.	7	16	1,300	18/ 16/ 14	\$323,100	<u>\$20,194</u> \$38,000
25-1	K2A, J5B (4, 22, 58, 76)	North of Union-New Hope Rd, eastbound side of alignment. Rowe St area.	7	17	2,225	16/ 14/ 10/ 8	\$488,280	<u>\$28,722</u> \$42,824
28-1	K4A (5, 23, 64, 77)	East of South Fork Catawba River, eastbound side of alignment. Forest Bay subdivision.	8	19	2,400	16	\$576,000	<u>\$30,316</u> \$44,000
28-3	K4A (5, 23, 64, 77)	Northwest of NC273/Gaston interchange westbound side of alignment. Southpoint Landing subdivision.	7	15	2,175	18	\$587,250	<u>\$39,150</u> \$41,333
29-1	KX1 (4, 22, 58, 76)	Northwest of NC273/Gaston interchange westbound side of alignment. Brook Forest subdivision.	7	25	1,980	14	\$415,800	<u>\$16,632</u> \$42,920
	K3A (9, 27, 68, 81)		6	20	2,605	16	\$625,200	<u>\$31,260</u> \$40,600
29-2	K3C (4, 9, 22, 27, 58, 68, 76, 81)	Northeast of NC273/Gaston interchange westbound side of alignment.	8	9	1,280	20/ 18	\$354,300	<u>\$39,367</u> \$44,500
33-1	K3D (4, 9, 22, 27, 58, 68, 76, 81)	East of Dixie River Rd on eastbound side of alignment. Garrison Rd area.	7	17	2,032	12/ 16/ 14	\$460,590	<u>\$27,094</u> \$38,176

Source: *Final Traffic Noise Technical Memorandum for the Gaston East-West Connector* (PBS&J, July 2008).

1. The determination of feasibility and reasonableness is preliminary and subject to change based on final design, building permits issued as of the Date of Public Knowledge, and the public involvement process.
2. Barrier height varies as indicated. For example, "18/16/14" means that barrier has an 18-ft section, 16-ft section, and 14-ft section.

A summary of the preliminary feasible and reasonable barriers included in each DSA is presented in **Table 4-6**. In general, DSAs closer to the municipal limits (e.g., DSA 4, 5, 9, 22, 27, and 76), particularly on the west side of the Project Study Area, have more noise impacts, a greater number of feasible and reasonable noise barriers, and higher noise-abatement costs. In

order, DSAs 4, 9, and 22 have the longest length of barrier and the highest noise-abatement costs. DSA 64 has the shortest length of barrier and the lowest noise-abatement costs.

A Design Noise Study will be prepared during final design of the Preferred Alternative. The Design Noise Study will update the noise analysis based upon updated traffic forecasts and the final design.

**TABLE 4-6: Summary of Noise Barriers by Detailed Study Alternative**

DSA	Total Number of Feasible and Reasonable Noise Barriers*	Total Length of Noise Barriers (ft)	Total Cost of Noise Barriers	Total Number of Benefited Receptors
4	13	22,162	\$4,680,270	191
5	11	19,220	\$4,124,550	157
9	12	20,562	\$4,401,390	169
22	11	19,922	\$4,165,200	171
23	9	16,980	\$3,609,480	144
27	10	18,322	\$3,886,320	149
58	8	13,926	\$3,256,950	132
64	6	10,335	\$2,656,050	98
68	7	11,677	\$2,932,890	110
76	10	17,967	\$3,957,270	161
77	8	15,025	\$3,401,550	128
81	9	16,367	\$3,678,390	139

Source: *Final Traffic Noise Technical Memorandum for the Gaston East-West Connector* (PBS&J, July 2008).

\*The determination of feasibility and reasonableness is preliminary and subject to change based upon final design, building permits issued as of the Date of Public Knowledge, and the public involvement process.

## 4.2 AIR QUALITY

This section summarizes the air quality assessment performed for the project. Air pollutants evaluated include those with a National Ambient Air Quality Standard (NAAQS), mobile source air toxics, and potential air quality impacts from construction activities. Details are documented in the project’s *Final Air Quality Technical Memorandum for the Gaston East-West Connector* (PBS&J, September 2008), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)). Also included in this section is an assessment of the potential for bridge icing at the Catawba River due to water-vapor emissions from the Duke Energy Allen Steam Station air pollution control equipment. Details of this icing assessment are documented in *Analysis of Potential Icing Impacts Due to Allen Steam Station SO<sub>2</sub> Scrubber – Gaston East-West Connector* (MACTEC, September 2008), incorporated by reference.

### 4.2.1 NATIONAL AMBIENT AIR QUALITY STANDARDS

The federal Clean Air Act of 1970, as amended (42 USC 7401), was enacted for the purposes of protecting and enhancing the quality of the nation’s air resources to benefit public health, welfare, and productivity. The US Environmental Protection

**Criteria Pollutants**

The USEPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO<sub>2</sub>)
- Sulfur dioxide (SO<sub>2</sub>)
- Ozone (O<sub>3</sub>)
- Particulate matter
- Lead

Agency (USEPA) has established primary and secondary NAAQS for six air pollutants: carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter, and lead. These six pollutants are commonly known as “criteria pollutants.”

**Table 4-7** lists the NAAQS. The primary standards are set at a limit intended to “protect the public health with an adequate margin of safety,” and the secondary standards are set at a limit intended to “protect the public welfare from known or anticipated adverse effects (effects to aesthetics, crops, architecture, etc.)” (Federal Clean Air Act 1990: Section 109, 42 USC 7409). The primary standards are established with a margin of safety, considering long-term exposures for the most sensitive groups in the general population (i.e., children, senior citizens, and people with breathing difficulties).

**TABLE 4-7: National Ambient Air Quality Standards**

Criteria Pollutant	Averaging Time	Standard <sup>(5)</sup>	Standard Type
Carbon Monoxide	8-hour Average <sup>(1)</sup>	9 ppm	Primary
	1-hour Average <sup>(1)</sup>	35 ppm	Primary
Nitrogen Dioxide	Annual Arithmetic Mean	0.053 ppm	Primary and Secondary
Ozone	1-hour Average <sup>(8)</sup>	0.12 ppm	Primary and Secondary
	8-hour Average (1997 Standard) <sup>(6)</sup>	0.08 ppm	Primary and Secondary
	8-hour Average (2008 standard) <sup>(7)</sup>	0.075 ppm	Primary and Secondary
Lead	Quarterly Average	1.5 µg/m <sup>3</sup>	Primary and Secondary
	Rolling 3-month Average <sup>(4)</sup>	0.15 µg/m <sup>3</sup> <sup>(2)</sup>	Primary and Secondary
Particulate Matter <10 micrometers (PM10)	24-hour Average <sup>(3)</sup>	150 µg/m <sup>3</sup>	Primary and Secondary
Particulate Matter <2.5 micrometers (PM2.5)	Annual Arithmetic Mean <sup>(4)</sup>	15 µg/m <sup>3</sup>	Primary and Secondary
	24-hour Average <sup>(5)</sup>	35 µg/m <sup>3</sup>	Primary and Secondary
Sulfur Dioxide	Annual Arithmetic Mean	0.03 ppm	Primary
	24-hour Average <sup>(1)</sup>	0.14 ppm	Primary
	3-hour Average <sup>(1)</sup>	0.50 ppm	Secondary

Source: USEPA Web site: [www.epa.gov/air/criteria.html](http://www.epa.gov/air/criteria.html)

1. The 1-hour average only applies to areas participating in an Early Action Compact. The Charlotte (NC)–Gastonia (NC)–Rock Hill (SC) air quality region is not an Early Action Compact area.
2. Not to be exceeded more than once per year.
3. Final rule signed October 15, 2008.
4. Not to be exceeded more than once per year on average over 3 years.
5. To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m<sup>3</sup>.
6. To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m<sup>3</sup> (effective December 17, 2006).
7. To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
8. (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm. (b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as USEPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

Pollutants that have a NAAQS are called criteria pollutants. An area that exceeds the NAAQS for one or more criteria pollutants is said to be in “non-attainment” of the NAAQS enforced under the Clean Air Act. The designation of an area is determined on a pollutant-by-pollutant basis. The USEPA classifies areas as either in attainment or non-attainment. Non-attainment areas for ozone, carbon monoxide, and some particulate matter are further classified based upon the

degree of exceedance(s) over the NAAQS (e.g., marginal, moderate, serious, severe, and extreme). Attainment areas are categorized as either “in attainment” or as a “maintenance area for attainment”, which means that the urban area has exceeded NAAQS levels for one or more pollutants in the past. Efforts in these maintenance areas must be made in order to maintain the status quo and not exceed the NAAQS. (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)).

The following paragraphs include brief descriptions of each of the criteria air pollutants, their standards, and the attainment status of the project region.

**Carbon Monoxide.** Carbon monoxide is a colorless, odorless gas resulting from incomplete fuel combustion from both mobile and stationary sources and is the most commonly occurring air pollutant. Transportation accounts for the majority of carbon monoxide emissions (*2000 Ambient Air Quality Report*, North Carolina Department of Environment and Natural Resources [NCDENR] Division of Air Quality [NCDAQ], 2002).

Except for Mecklenburg County, all other areas within the Charlotte-Gastonia-Rock Hill air quality region are designated as attainment for carbon monoxide. Mecklenburg County is a maintenance area for carbon monoxide (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)).

**Nitrogen Dioxide.** Several gaseous oxides of nitrogen are normally found in the atmosphere. The Charlotte-Gastonia-Rock Hill air quality region is in attainment for the nitrogen dioxide NAAQS (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)).

**Ozone.** Ozone (O<sub>3</sub>) is the main component of smog. Since ozone is formed by chemical interactions with sunlight, ozone concentrations are generally higher during the daytime and in late spring through early fall (*2000 Ambient Air Quality Report*, NCDAQ, 2002).

On April 14, 2006, the Charlotte-Gastonia-Rock Hill air quality region was designated as a moderate non-attainment area for the 1997 8-hour ozone NAAQS (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)). The region includes the following counties in North Carolina: Mecklenburg, Gaston, Lincoln, Cabarrus, Rowan, Union, and the southern portion of Iredell. The urbanized area of eastern York County, South Carolina, also is included.

**Lead.** Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The 1990 Clean Air Act Amendments made the sale, supply, or transport of leaded gasoline or lead additives unlawful after December 31, 1995. As a result, motor vehicle emissions of lead declined sharply during the 1980s and early 1990s (*Latest Findings on National Air Quality – Status and Trends through 2006*, USEPA, January 2008). The Charlotte-Gastonia-Rock Hill air quality region is in attainment for the lead NAAQS (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)).

**Particulate Matter.** Particulate matter is divided into two categories: fine particles (PM<sub>2.5</sub>), which are 2.5 micrometers in diameter and smaller, and coarse particles (PM<sub>10</sub>), which are smaller than 10 micrometers.

The Charlotte-Gastonia-Rock Hill air quality region is in attainment for all currently applicable particulate matter NAAQS under the old (1997) standards (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)). North Carolina has recommended, and USEPA has agreed, that the state is in attainment for the new 2006 PM<sub>2.5</sub> NAAQS (*2006 24-Hour PM<sub>2.5</sub> Standards* —

*Region 4 Recommendations and EPA Responses*, USEPA Web site: [www.epa.gov/pmdesignations/2006standards/rec/letters](http://www.epa.gov/pmdesignations/2006standards/rec/letters)).

**Sulfur Dioxide.** Sulfur oxides contribute to the formation of acid rain and the formation of particles that reduce visibility (*2000 Ambient Air Quality Report*, NCDAQ, 2002). The Charlotte-Gastonia-Rock Hill air quality region is in attainment for the sulfur dioxide NAAQS (USEPA Web site: [www.epa.gov/oar/oaqps/greenbk](http://www.epa.gov/oar/oaqps/greenbk)).

#### 4.2.2 TRANSPORTATION CONFORMITY

**Background.** Section 176(c) of the Clean Air Act Amendments (42 USC 7506(c)) requires that transportation plans, programs, and projects conform to the intent of the State Implementation Plan (SIP). Conformity requirements apply to transportation plans, programs, and projects funded or approved by the FHWA or the Federal Transit Administration (FTA) in areas that do not meet, or previously have not met, NAAQS for ozone, carbon monoxide, particulate matter, or nitrogen dioxide (*Fact Sheets on Highway Provisions*, FHWA Web site: [www.fhwa.dot.gov/safeteal/factsheets/conformity.htm](http://www.fhwa.dot.gov/safeteal/factsheets/conformity.htm)).

##### ***Transportation Conformity***

*The Clean Air Act Amendments require that transportation plans, programs, and projects conform to the intent of the state air quality implementation plan.*

In North Carolina, the NCDAQ develops the SIP, which is the document that describes how North Carolina will maintain or achieve compliance with the NAAQS in non-attainment and maintenance areas.

USEPA has issued regulations implementing the transportation conformity requirements (40 CFR Part 93). The transportation conformity regulations are intended to ensure that a state does not undertake federally funded or approved transportation plans, programs, or projects that are inconsistent with the State's obligation to meet and maintain the NAAQS.

Under the transportation conformity regulations, a transportation conformity determination is required every time a Metropolitan Planning Organization (MPO) approves an update or amendment to its long range transportation plan (LRTP) and transportation improvement program (TIP). Under federal law, an MPO must **"update"** its LRTP and TIP at least once every four years. In addition, an MPO may choose to **"amend"** the LRTP and TIP more frequently. Typically, there are multiple amendments within each four-year update cycle. A **regional conformity determination** is needed for each update and amendment to an LRTP and TIP. The regional conformity determination is based on a region-wide analysis of projected emissions from all existing facilities and projects in the LRTP and TIP.

In addition to the regional conformity determination for LRTPs and TIPs, FHWA also must make a **project-level conformity determination**. For all pollutants, a project-level conformity determination can be made only if the project is included in a conforming LRTP and TIP. In addition, for carbon monoxide (CO) and particulate matter (PM), a project-level conformity finding requires a localized conformity analysis, known as a "hot-spot" analysis.

**Regional Conformity Analysis.** To demonstrate conformity at the regional level, an MPO in a non-attainment or maintenance area must show that expected emissions from their LRTP and TIP are within the mobile vehicle emission budgets in the applicable SIP. If there is no approved SIP, the MPO must apply an "interim emissions test" – which requires, in essence, a finding that

emissions will be no greater with the proposed improvements in the LRTP/TIP than they would be without those improvements.

**Project-Level (“Hot-Spot”) Conformity Analysis.** As noted above, all projects in non-attainment and maintenance areas must come from a conforming LRTP and TIP. In addition, in CO and PM non-attainment and maintenance areas, localized (or microscale) analysis may be necessary to determine project-level transportation conformity for federally funded or approved highway and transit projects. These projects must come from a currently conforming transportation plan/program. This type of analysis is sometimes referred to as “hot-spot analysis” (Transportation Conformity, FHWA Web site: [www.fhwa.dot.gov/environment/conformity/con\\_broc.htm](http://www.fhwa.dot.gov/environment/conformity/con_broc.htm)). For this project, the only hot-spot analysis required is for CO in Mecklenburg County, since Mecklenburg County is a CO maintenance area.

**Conformity Determinations for LRTPs and TIPs in Metrolina Region.** The Gaston East-West Connector project is located in the Charlotte-Gastonia-Rock Hill air quality region (Metrolina region). The Metrolina region includes four MPOs: the Gaston Urban Area MPO (GUAMPO), the Mecklenburg-Union MPO (MUMPO), the Cabarrus-Rowan MPO in North Carolina, and the Rock Hill-Fort Mill MPO in South Carolina. The Gaston East-West Connector is located within the boundaries of two MPOs: the GUAMPO and the MUMPO. Therefore, this section focuses primarily on the conformity status of the GUAMPO and MUMPO areas.

Each of the MPOs in the Metrolina region has its own LRTP and TIP, but air quality emissions analyses are completed for the region as a whole. Therefore, amendments and updates to the LRTPs and TIPs are often approved simultaneously (or close in time to one another) based on a single regional emissions analysis.

For the Gaston East-West Connector project, transportation conformity determinations are required for two pollutants: **ozone** and **carbon monoxide**. The conformity requirements apply to these pollutants because the Metrolina region as a whole is designated as a nonattainment area for the 1997 8-hour ozone standard and Mecklenburg County is designated as a maintenance area for carbon monoxide. See **Section 4.2.1** above.

**Conformity Determinations for LRTPs.** Both GUAMPO and MUMPO currently have approved LRTPs with a horizon year of 2030. The 2030 LRTPs for the GUAMPO and MUMPO were adopted on May 24, 2005 and April 20, 2005, respectively. A conformity determination for these LRTP updates was made on June 8, 2005, and FHWA and FTA issued the conformity finding (approval of the conformity determination) on June 30, 2005.<sup>1</sup> Since that time, there have been two amendments to the 2030 LRTPs for GUAMPO and MUMPO.

- Amendment 1 is dated September 16, 2005, with a FHWA/FTA conformity finding on October 1, 2005 for both GUAMPO and MUMPO.
- Amendment 2, the latest conformity determination, is dated May 25, 2007, with a FHWA/FTA conformity finding on June 29, 2007 for both GUAMPO and MUMPO.

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<sup>1</sup>The June 8, 2005 conformity determination for the Metrolina Region is titled: *Conformity Analysis and Determination Report for the Cabarrus-Rowan MPO, the Gaston Urban Area MPO, and the Mecklenburg-Union MPO 2030 Long Range Transportation Plans and the FY 2007–2013 State Transportation Improvement Programs and for Non-MPO Areas of Lincoln County, Iredell County, Gaston County, and Union County Areas*. A copy of this determination is included in the project file.

Both GUAMPO and MUMPO are required to complete updates to their LRTPs within four years after the most recent update. Therefore, the next update for the GUAMPO LRTP must be approved by June 30, 2009, and the next update for the MUMPO LRTP must be approved by May 3, 2009. Both MPOs are currently conducting travel demand modeling and air quality analyses to demonstrate conformity. Because the region does not have an approved SIP, the conformity analyses for the proposed 2035 GUAMPO LRTP and the 2030 MUMPO LRTP are based on the “interim emissions test” – which, as noted above, requires a demonstration that emissions with the proposed improvements will be no greater than emissions without those improvements. The MPOs are currently exploring a range of options for demonstrating conformity for the LRTPs. These options include adjusting the mix of new projects included in the LRTPs and alternative modeling methods to demonstrate conformity.

**Conformity Determinations for TIPs.** Both GUAMPO and MUMPO currently have approved TIPs covering the years 2009 through 2015. The 2009–2015 TIPs are direct subsets of their respective conforming 2030 LRTPs. The FHWA and FTA approved a conformity determination for the GUAMPO and MUMPO 2009-2015 TIPs on July 11, 2008.<sup>2</sup> The current TIPs are valid for four years. Therefore, updates to GUAMPO’s and MUMPO’s 2009-2015 TIPs are required by 2012.

**Potential for “Conformity Lapse Grace Period”.** As noted above, MPOs are required to update LRTPs and TIPs at least once every four years. GUAMPO and MUMPO are currently working to complete their LRTP updates by the applicable deadlines. The updates can be completed only if conformity findings are made by those deadlines. If the MPOs are not able to demonstrate conformity by the applicable deadlines, they will enter a status known as a “conformity lapse grace period” (CLGP). Specifically, MUMPO would enter a CLGP on May 3, 2009, and GUAMPO would enter a CLGP on June 30, 2009, if the required conformity findings are not made by those dates. During a CLGP, the MPOs would not be allowed to approve any amendments to their LRTPs or TIPs. However, their existing 2009-2015 TIPs would remain in effect during the CLGP. Projects in a conforming TIP are allowed to proceed during the CLGP.

**Potential for a “Conformity Lapse”.** The CLGP would last for one year. If a CLGP occurs and an update to the LRTP has not been approved by the end of that year, the region would enter a status known as a “conformity lapse.” During a conformity lapse, no federal approvals may be granted and the use of federal funds is halted. The only projects that could proceed during this period are projects that are exempt from transportation conformity (e.g., road resurfacing, safety projects, bicycle and pedestrian facilities, etc), transportation control measures that are in an approved SIP, and project phases that were approved prior to the start of the lapse (for example, ongoing studies).

**Implications for Gaston East-West Connector.** Federal and state transportation and environmental agencies are working collaboratively in an effort to avoid a CLGP and a conformity lapse. If those events occur, they would not necessarily prevent NCTA from proceeding with ongoing work in the National Environmental Policy Act (NEPA) process, but they could delay FHWA’s signing of the ROD. FHWA and NCTA will provide an updated

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<sup>2</sup> Conformity findings also are required for the so-called “donut area” of Gaston County, which is outside the MPO boundaries but is included within the ozone nonattainment area. Projects in the Gaston County donut area are included in NCDOT’s 2009–2015 STIP and also have been found to conform. The USDOT made a Transportation Conformity Determination on the *2009–2015 STIP* on July 11, 2008.

summary of the region's conformity status in the Final Environmental Impact Statement (Final EIS).

**Status of State Implementation Plan (SIP) for Metrolina Region.** The Clean Air Act required North Carolina to submit a SIP by June 15, 2007, that describes how the state will attain the ozone standard by June 15, 2010, which is the statutory deadline for achieving attainment. The NC DAQ submitted a proposed SIP for the ozone standard to USEPA on June 15, 2007. On November 17, 2008, USEPA sent a letter to NC DAQ stating that the proposed SIP did not demonstrate that the ozone standard would be achieved by the June 15, 2010 deadline. Therefore, USEPA recommended that North Carolina seek voluntary reclassification of its portion of the region from "moderate" to "serious" nonattainment status, which would extend the attainment deadline. USEPA noted that if North Carolina did not take this action, USEPA would disapprove the SIP (letter included in **Appendix A-8**).

On December 19, 2008, NCDAQ sent a letter to USEPA requesting that the previously submitted SIP be withdrawn and explained that NCDAQ intended to submit an updated SIP by November 2009, demonstrating attainment of the ozone standard by the June 15, 2010 deadline (letter included in **Appendix A-8**). The USEPA responded to NCDAQ in a letter dated January 9, 2009 stating that USEPA was making a "finding of failure to submit" a SIP (letter included in **Appendix A-8**). This action would be effective when published in the Federal Register.

USEPA's finding of "failure to submit" a SIP does not trigger any immediate consequences for this project. However, if NCDAQ does not submit a complete SIP within 24 months from publication of this finding in the Federal Register, then a penalty known as "highway sanctions" would apply in accordance with 40 CFR 52.31. Under highway sanctions, federal transportation funds to the region would be cut off until the required SIP submittal is made. While highway sanctions are possible, it is unlikely that they would occur. NCDAQ has stated that it intends to submit a revised SIP in November 2009 for USEPA approval. NCDAQ has also stated that, if the revised SIP is not approved, the State would seek reclassification of the region to "serious" nonattainment status, which would extend the attainment deadline and avoid the highway sanctions. So, even if the revised SIP is not approved, there are actions that the State can take to avoid highway sanctions.

In conclusion, the Metrolina region continues to face challenges in meeting the complex and stringent requirements of federal air quality laws. These requirements do not prevent ongoing studies from continuing, but they have the potential to delay federal approval of transportation projects in the region. To prevent such delays, federal and state air quality and transportation agencies are continuing to work together to resolve the air quality issues so that planned transportation projects can move forward.

### 4.2.3 MOBILE SOURCE AIR TOXICS

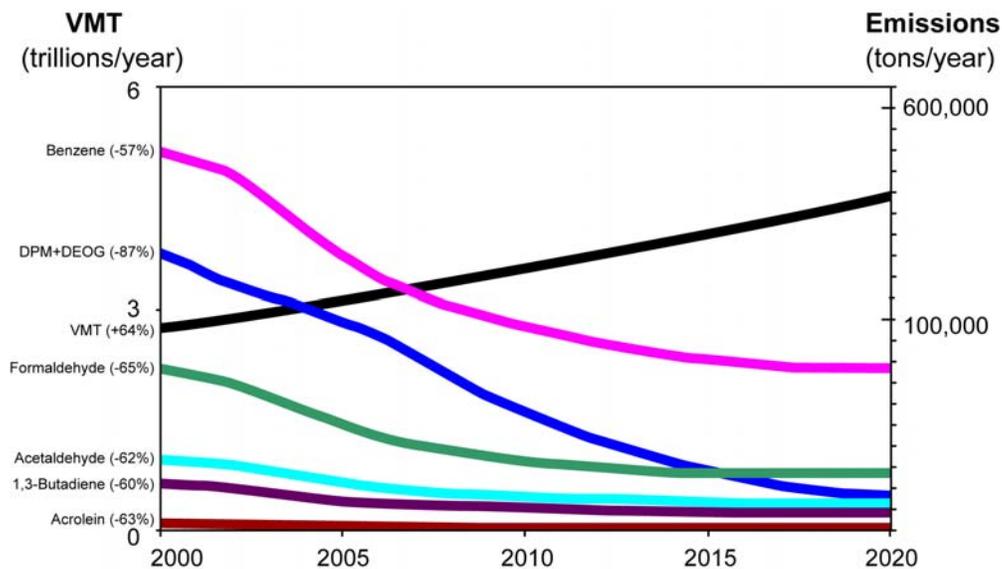
In addition to the criteria air pollutants for which there are NAAQS, USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes

through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The USEPA is the lead federal agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The USEPA issued a Final Rule on *Controlling Emissions of Hazardous Air Pollutants from Mobile Sources* (66 CFR 17229) (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, USEPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, national low emission vehicle standards, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in Vehicle Miles Traveled (VMT), these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in **Exhibit 4-1**.

**Exhibit 4-1: Vehicle Miles Traveled vs. Mobile Source Air Toxics Emissions, 2000–2020**



Source: FHWA Web site: [www.fhwa.gov/environment/airtoxic/vmtmsat2020.htm](http://www.fhwa.gov/environment/airtoxic/vmtmsat2020.htm)

Notes: For on-road mobile sources. Emissions factors were generated using MOBILE 6.2. MTBE proportion of market for oxygenates is held constant, at 50 percent. Gasoline RVP and oxygenate content are held constant. VMT: Highway Statistics 2000, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5 percent. "DPM + DEOG" is based on MOBILE 6.2-generated factors for elemental carbon, organic carbon, and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns. 1 short ton = 907,200,000 mg.

On February 9, 2007, and under authority of CAA Section 202(l), USEPA signed a final rule, *Control of Hazardous Air Pollutants from Mobile Sources*, which sets standards to control MSATs from motor vehicles. Under this rule, USEPA is setting standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. The new standards are estimated to reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of

benzene. Concurrently, total emissions of volatile organic compounds will be reduced by over 1.1 million tons in 2030 as a result of adopting these standards.

#### 4.2.4 LOCAL ORDINANCES

Mecklenburg County has an Air Pollution Control Ordinance (MCAPCO). Sections of the ordinance applicable to transportation sources include:

- Article 1 – Permitting Provisions for Air Pollution Sources, Rules, and Operating Regulations for Acid Rain Sources, Title V, and Toxic Air Pollutants
  - Section 1.5600 – Transportation Facility Procedures
- Article 2 – Air Pollution Control Regulations and Procedures
  - Section 2.2000 – Transportation Conformity
  - Section 2.0800 – Transportation Facilities

Transportation sources subject to permitting as a transportation facility are defined in the ordinance as airport facilities (excluding military airfield) and parking facilities.

Section 2.2000 of the ordinance, addressing transportation conformity, states in Subsection 2003(a) that “Conformity analyses, determinations, and redeterminations for transportation plans, transportation improvement programs, FHWA/FTA projects, and State or local regionally significant projects shall be made according to the requirements of 40 CFR 93.104 and shall comply with the applicable requirements of 40 CFR 93.119, 93.120, 93.124, 93.125, and 93.126.”

The MCAPCO also has applicable general provisions for nuisance dust (Section 1.5108) and open burning (Section 1.5106).

#### 4.2.5 AIR QUALITY IMPACTS

##### 4.2.5.1 Criteria Pollutants and Transportation Conformity

Traffic exhaust is the major point of concern when determining the air quality impacts of a new roadway facility or the improvement of an existing roadway facility. Transportation is a primary contributor to four of the six criteria pollutants: ozone (through emissions of nitrogen oxides and hydrocarbons), carbon monoxide, particulate matter, and nitrogen dioxide (*Air Quality Planning for Transportation Officials*, FHWA Web site: [www.fhwa.dot.gov/environment/aqplan/index.htm](http://www.fhwa.dot.gov/environment/aqplan/index.htm)). The impacts resulting from highway construction can range from intensifying existing air pollution to improving ambient air conditions.

##### **Pollutants of Concern**

*Ozone and carbon monoxide are the criteria pollutants of concern in the Project Study Area, which is part of a moderate non-attainment region for ozone and a maintenance area for carbon monoxide.*

The criteria pollutants of concern in the Project Study Area are ozone and carbon monoxide, since the Charlotte-Gastonia-Rock Hill air quality region (which includes Gaston County and Mecklenburg County) is a moderate non-attainment region for ozone, and Mecklenburg County is a maintenance area for carbon monoxide.

Since ozone takes several hours to form from hydrocarbons and nitrogen oxide, urban areas as a whole are regarded as sources of ozone precursors, and ozone emissions are not modeled at the

level of individual streets and highways. Therefore, compliance of an individual project with the ozone NAAQS is demonstrated if the project is included in a conforming regional transportation plan, which considers the urban area as a whole.

Carbon monoxide is a more stable atmospheric pollutant (meaning it does not react as quickly with other chemicals) that is emitted directly from tailpipes. Therefore, localized concentrations of carbon monoxide can occur, and these can be estimated through modeling. As discussed below, the compliance of a project with the carbon monoxide NAAQS, therefore, is considered at both the localized (or hot-spot) level, and at the regional transportation plan level.

**Localized Carbon Monoxide Hot-Spot Analysis.** In accordance with 40 CFR 93.116, an FHWA project must not cause or contribute to any new localized carbon monoxide violations, or increase the frequency or severity of any existing carbon monoxide violations in carbon monoxide non-attainment and maintenance areas. A quantitative hot-spot analysis is required in the following cases (40 CFR 93.123):

- (i) For projects in or affecting locations, areas, or categories of sites which are identified in the applicable implementation plan as sites of violation or possible violation.
- (ii) For projects affecting intersections that are at Level of Service (LOS) D, E, or F, or those that will change to LOS D, E, or F because of increased traffic volumes related to the project.
- (iii) For any project affecting one or more of the top three intersections in the non-attainment or maintenance area with highest traffic volumes, as identified in the applicable implementation plan.
- (iv) For any project affecting one or more of the top three intersections in the non-attainment or maintenance area with the worst LOS, as identified in the applicable implementation plan.

The portions of the DSAs in Gaston County do not need to be considered for a carbon monoxide hot-spot analysis since Gaston County is classified as an attainment area for carbon monoxide.

The applicable implementation plan (i.e., SIP) does not contain a list of locations or intersections as noted in items i, iii, and iv above. However, there is a list of high-congestion locations in Mecklenburg County available from the Charlotte Department of Transportation (CDOT) (CDOT Web site: [www.charmeck.org/departments/transportation/roads/home.htm](http://www.charmeck.org/departments/transportation/roads/home.htm)). None of these intersections are located within the DSAs.

Regarding item ii above, all the DSAs have two interchanges in Mecklenburg County; a freeway-to-freeway interchange with I-485 and a service interchange with Dixie River Road. The freeway-to-freeway interchange would have no signalized intersections, and item ii would not apply. The Dixie River Road interchange locations would have ramp terminal intersections with Dixie River Road. Based upon the preliminary engineering designs and the 2030 traffic projections for the project as a toll facility, the ramp terminals at Dixie River Road would operate at LOS C or better in 2030 (*Final Toll Traffic Operations Technical Memorandum*, PBS&J, September 2008), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)). In preceding years, traffic volumes are projected to be less, therefore the LOS is expected to be LOS C or better in those years as well.

Based upon the discussion above, it is concluded that the project would not cause or contribute to any new localized carbon monoxide violations or increase the frequency or severity of any existing carbon monoxide violations since none of the DSAs fit the criteria requiring a quantitative carbon monoxide hot-spot analysis. This conformity determination meets all of the applicable Clean Air Act Section 176(c) requirements for federally funded or approved transportation projects. Specifically, the requirements for CO hot-spot analysis are codified at 40 CFR 93.116 and 3.123. By meeting these regulatory requirements as well as other requirements in the conformity regulations, this conformity determination demonstrates compliance with the requirements of CAA Section 176(c)(1).

**Transportation Conformity.** The proposed project (STIP Project U-3321) is included in both the 2030 LRTP for the GUAMPO area and the 2030 LRTP for the MUMPO area, both of which are conforming transportation plans. In addition, in accordance with 40 CFR 93.115(b)(1), for a project identified in a transportation plan, the project's design concept and scope must not have changed significantly from those described in the transportation plan, or in a manner which would significantly impact use of the facility.

The DSAs for the project are generally consistent with the project description (freeway) and project length (about 22 miles—20 miles in Gaston County and 2 miles in Mecklenburg County) included in both LRTPs, but are not consistent with the assumption that the project is a non-toll project and the assumption concerning the number of lanes (four). The project currently is being studied only as a toll facility, and the preliminary engineering designs (January 2008) for the DSAs show a six-lane facility.

However, it should be noted that the decision to design the facility as a six-lane roadway was based upon year 2030 traffic projections for a non-toll facility using the Metrolina Regional Travel Demand Model (*Gaston East-West Connector Traffic Forecasting and System Level Analysis for the Detailed Study Alternatives*, Martin/Alexiou/Bryson, April 2007, incorporated by reference). These were the projections available at the time the designs were started. Subsequent traffic projections generated using the 2030 Metrolina Regional Travel Demand Model for the project as a toll facility show that traffic volumes would be less than the 2030 projections for a non-toll facility (*Gaston East-West Connector (U-3321) Traffic Forecasts for Toll Alternatives*, Martin/Alexiou/Bryson, August 2008), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)).

If one of the DSAs is selected as the Preferred Alternative, traffic projections will be updated again and the number of lanes for the project will be reevaluated for the Final EIS. If the updated traffic projections show that only a four-lane facility is warranted, the two lanes in the center would be removed. The outside construction footprint and right of way would generally be the same for a four-lane facility and a six-lane facility.

The conformity determination for the region will need to be updated prior to the completion of the ROD to change the project to a toll facility with the appropriate number of lanes. The MUMPO and GUAMPO LRTPs are presently being updated to 2035. The updates to the MUMPO and GUAMPO LRTPs must be locally approved and federally reviewed by May 2009 (MUMPO Web site: [www.mumpo.org/2035\\_LRTP.htm](http://www.mumpo.org/2035_LRTP.htm)). The ROD for the project is estimated to be completed in the fall of 2010. Prior to the ROD, the NCTA will coordinate with GUAMPO and MUMPO to ensure the air quality conformity determination for the region includes the project's design concept and scope consistent with the Preferred Alternative. For further information regarding the status of the conformity determination, refer to **Section 4.2.2**.

The selection of the No-Build Alternative would require the GUAMPO and MUMPO LRTPs to be updated to remove the proposed Gaston East-West Connector, and would need to seek other means to meet the region's emissions budget for achieving conformance with the SIP.

#### 4.2.5.2 Mobile Source Air Toxics Impact Analysis

Recently, concerns for air toxics impacts have been more frequent on transportation projects during the NEPA process. Transportation agencies are increasingly expected by the public and other agencies to address MSAT impacts in their environmental documents as the science emerges.

MSAT analysis is a continuing area of research where, while much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health impacts from MSATs are limited. These limitations impede FHWA's ability to evaluate how mobile source health risks should factor into project-level decision-making under NEPA.

Also, USEPA has not established regulatory concentration targets for the six relevant MSAT pollutants appropriate for use in the project development process. FHWA has several research projects underway to more clearly define potential risks from MSAT emissions associated with transportation projects. While this research is ongoing, FHWA requires each NEPA document to qualitatively address MSATs and their relationship to the specific highway project through a tiered approach (*Interim Guidance on Air Toxic Analysis in NEPA Documents* (February 3, 2006), FHWA Web site: [www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm](http://www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm)). The FHWA will continue to monitor the developing research in this emerging field. A qualitative analysis of MSATs for this project appears in its entirety in **Appendix H** and in the *Final Air Quality Technical Memorandum for the Gaston East-West Connector* (PBS&J, September 2008).

#### 4.2.5.3 Construction Air Quality

Provided that local ordinances for open burning and dust are followed, as described below, significant air quality impacts due to construction of the proposed project are not anticipated. The proposed project would be constructed in phases, limiting the overall construction activity occurring at any one location. There would also be emissions related to construction equipment and vehicles. However, these impacts related to construction would be temporary.

**Open Burning.** During construction of any of the DSAs, all materials resulting from clearing and grubbing, demolition, or other operations will be removed from the project site, burned, or otherwise disposed of by the contractor. Any burning will be accomplished in accordance with applicable laws, local ordinances, and regulations of the North Carolina SIP for air quality in compliance with 15A NCAC 02D.1903. For construction in Mecklenburg County, open burning (if allowed) will require a permit from the Mecklenburg County LUESA Department of Air Quality, in accordance with the MCAPCO Section 1.5106.

**Dust.** Also during construction, measures will be taken to reduce dust generated by construction when the control of dust is necessary for the protection and comfort of motorists and area residents. These dust-suppression measures may include watering unpaved work areas,

temporary and permanent seeding and mulching, covering stockpiled materials, and using covered haul trucks.

#### 4.2.6 ROAD AND BRIDGE ICING POTENTIAL FROM ALLEN STEAM STATION AIR POLLUTION CONTROL FACILITY

Duke Energy Corporation's Allen Steam Station, a major coal-fired power plant, is located between Southpoint Road and the Catawba River on the Belmont peninsula (**Figure 2-8a**).

The Allen Steam Station is currently installing air pollution control equipment to comply with the North Carolina Clean Smokestacks Act of 2002. This Act requires companies to reduce their smog and haze forming emissions by approximately 75 percent over the next decade. The Allen Steam Station air pollution control equipment is located north of the main power plant, just south of Corridor Segments K3B/K3C (**Figure 2-9cc**).

The air pollution control equipment includes scrubbers for sulfur dioxide control that will emit steam through a tall stack. In correspondence with NCTA, Duke Energy Corporation raised concerns that the steam emitted from the stack could result in icing on the nearby proposed roadway and the associated bridge crossing of the Catawba River (Telephone Interview with Duke Energy Regional Manager, September 14, 2005).

In response to the concerns, a study was conducted to evaluate the likelihood and extent of potential icing on the proposed roadways and bridge crossings of the Catawba River for Corridor Segments K3B/K3C (DSAs 4, 9, 22, 27, 58, 68, 76, and 81) and Corridor Segment K4A (DSAs 5, 23, 64, and 77) (*Analysis of Potential Icing Impacts Due to Allen Steam Station SO<sub>2</sub> Scrubber – Gaston East-West Connector*, MACTEC, September 2008, incorporated by reference). Corridor Segments K3B/K3C are located approximately 0.4 miles north/northeast of the air pollution control equipment, and Corridor Segment K4A is approximately 1.5 miles south/southeast.

The Seasonal/Annual Cooling Tower Impact (SACTI) model developed by the Electric Power Research Institute was used for the analysis. Data related to the air pollution control equipment used in the analysis was supplied by Duke Energy Corporation. The model predicted a zero probability of occurrence of icing within one mile of the scrubber stack, which is where Corridor Segments K3B/K3C (DSAs 4, 9, 22, 27, 58, 68, 76, and 81) are located. The exhaust gases released from the tall stack (which is 365 feet high) have a high exit velocity, resulting in a large distance between the plume and the ground. While fogging (and, therefore, a visible plume) may occur due to the condensation of water vapor under some atmospheric conditions, such a visible plume is likely to stay aloft within the vicinity of the stack and, consequently, within the vicinity of Corridor Segments K3B/K3C (*Analysis of Potential Icing Impacts Due to Allen Steam Station SO<sub>2</sub> Scrubber – Gaston East-West Connector*, MACTEC, September 2008).

Corridor Segment K4A (DSAs 5, 23, 64, and 77) is 1.5 miles to the south/southeast. Based upon the predominant wind directions in the area (from the southwest), the majority of visible plumes are likely to occur to the northeast of the Allen Steam Station. The exhaust from the scrubber stack is expected to be diluted by drier ambient air as it travels over a longer distance, thereby reducing the potential for condensation. As such, it is not expected that there would be a likelihood of any icing events occurring along Corridor Segment K4A (*Analysis of Potential Icing Impacts Due to Allen Steam Station SO<sub>2</sub> Scrubber – Gaston East-West Connector*, MACTEC, September 2008).

### 4.3 FARMLAND

#### 4.3.1 FARMLAND PROTECTION POLICY ACT

The Farmland Protection Policy Act of 1981 (FPPA) (7 USC 4201), as amended, and its implementing regulations (7 CFR Part 658) are intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. To the extent possible, it assures federal programs are administered to be compatible with state government, local government, and private programs and policies in order to protect farmland.

**Prime Farmland**  
*Land that has the best characteristics for producing food, feed, fiber, forage, oilseed, and other crops with minimum inputs of fuel, fertilizer, pesticides, and labor (Farmland Protection Policy Act).*

**Prime Farmland** is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and is within allowable soil erosion tolerance or excessive soil erosion, as determined by US Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS).

**Unique Farmland** is land other than prime farmland that is used for the production of specific high-value food and fiber crops, as determined by NRCS.

**Local or Statewide Important Farmland** is land other than prime or unique farmland that is determined to be important by the appropriate state, tribal, or unit of local government agency or agencies, with concurrence by the State Conservationist.

These definitions refer to areas where the soils are conducive to agricultural production, not just areas currently or historically used as farmland. According to the FPPA, prime farmland does not include land already in or committed to urban development or water storage.

#### 4.3.2 PRIME AND IMPORTANT FARMLAND SOILS

The NRCS has published soil surveys for Gaston County and Mecklenburg County. Soils within the DSA corridors considered by the NRCS to be prime farmland or farmland of statewide importance are listed in **Table 4-8** and shown in **Figure 4-2**. There are no farmland soils classified as unique or locally important within the vicinity of the DSAs.

**TABLE 4-8: Prime and Important Farmland Soils in the Detailed Study Alternatives**

Soil Symbol	Soil Name	Percent Slope	County
<b>Prime Farmland Soils</b>			
AmB	Alamance Variant gravelly loam	2-8	Gaston
ApB	Appling sand loam	2-8	Mecklenburg
*CH	Chewacla loam – frequently flooded	–	Gaston
CeB2	Cecil sandy clay loam –eroded	2-8	Gaston & Mecklenburg
*Co	Congaree loam – occasionally flooded	–	Gaston
DaB	Davidson sandy clay loam	2-8	Mecklenburg
EnB	Enon fine sandy loam	2-8	Mecklenburg
GaB2	Gaston sandy clay loam – eroded	2-8	Gaston
HeB	Helena sandy loam	1-6	Gaston

**TABLE 4-8: Prime and Important Farmland Soils in the Detailed Study Alternatives**

Soil Symbol	Soil Name	Percent Slope	County
HeB	Helena sandy loam	2-8	Mecklenburg
MaB2	Madison sandy clay loam – eroded	2-8	Gaston
*MO	Monacan soils	–	Mecklenburg
TaB	Tatum gravelly loam	2-8	Gaston
VaB	Vance sandy loam	2-8	Gaston & Mecklenburg
WnB	Winnsboro loam	2-8	Gaston
<b>Statewide Important Farmland Soils</b>			
AmD	Alamance Variant gravelly loam	8-15	Gaston
DaD	Davidson sandy clay loam	8-15	Mecklenburg
GaD2	Gaston sandy clay loam – eroded	8-15	Gaston
LgB	Lignum silt loam	1-6	Gaston
LgB	Lignum gravelly silt loam	2-8	Mecklenburg
MeD	Mecklenburg fine sandy loam	8-15	Mecklenburg
TaD	Tatum gravelly loam	8-15	Gaston
WeD	Wedowee sandy loam	6-15	Gaston
WnD	Winnsboro loam	8-15	Gaston

Sources: Soils Survey of Gaston County, North Carolina (NRCS, May 1989); Soil Survey of Mecklenburg County, North Carolina (NRCS, June 1980); List of North Carolina Important Farmlands, USDA ftp site: <ftp://ftp-fc.sc.egov.usda.gov/NC/NCweb/Programs/soilsurvey>

\*Prime if protected from flooding or not frequently flooded during growing season.

### 4.3.3 EXISTING AGRICULTURE

#### 4.3.3.1 Census Information

A small percentage (approximately 0.1 percent) of Gaston County's employment is agricultural, and for Mecklenburg County the percentage is slightly higher at 0.2 percent (*Employment and Wages by Sector, 2<sup>nd</sup> Quarter 2007*, North Carolina Employment Security Commission).

Approximately 18.3 percent of Gaston County's land consisted of farms in 2002, while in Mecklenburg County the land in farms comprised approximately 7.5 percent. The amount of land consisting of farms in Gaston County increased between 1997 and 2002 (from 37,124 acres to 41,827 acres), while the amount of land consisting of farms in Mecklenburg County decreased (from 32,377 acres to 25,422 acres).

The number of farms in Gaston County increased from 420 to 450 between 1997 and 2002. For Mecklenburg County, the number of farms decreased from 377 to 300 between 1997 and 2002 (*2002 Census of Agriculture*, USDA Agricultural Statistics Service, June 2004).

#### 4.3.3.2 Agricultural Uses in the Detailed Study Alternatives

Approximately 8 to 11 percent of the land within the DSAs is estimated to be currently in agricultural uses and pine plantation, with the exception of DSA 68, which has approximately 16 percent of its land currently within agricultural use and pine plantation (*Natural Resources Technical Report for the Gaston East-West Connector*, Earth Tech, February 2008).

### 4.3.3.3 Local Farmland Programs

In July 2004, Gaston County adopted a Voluntary Agricultural District (VAD) ordinance under the authority of the Agricultural Development and Farmland Preservation Enabling Act (NCGS Chapter 106 Sections 735-743). The Act authorizes counties and cities to undertake a series of programs to encourage the preservation of qualifying farmland and to foster the growth, development, and sustainability of family farms. Mecklenburg County does not have a VAD program.

Gaston County farmers who enroll their farms in the Gaston County VAD program agree to keep their lands dedicated to agricultural uses for 10 years, and they have the right to public hearings in their communities if there are ever land-condemnation proceedings against lands within the districts (*Gaston County Voluntary Agricultural District Ordinance*, Gaston County Web site: [www.co.gaston.nc.us/ordinances/VADOrdinance2004-07-22.pdf](http://www.co.gaston.nc.us/ordinances/VADOrdinance2004-07-22.pdf))

Parcels participating in the VAD program are generally located within the unincorporated areas of Gaston County both north and south of I-85, including several parcels within the vicinity of the DSAs. These parcels are shown in **Figure 4-3**.

### 4.3.4 FARMLAND IMPACTS

#### 4.3.4.1 Prime and Important Farmland Soils

All proposed DSAs would involve the use of prime and statewide important farmland soils. The No-Build Alternative would not directly impact prime and important farmland soils. **Table 4-9** presents the acreages of prime and important farmland soils within the preliminary engineering design right of way for each DSA. The acreages were calculated using GIS by overlaying the preliminary design right of way on the soils GIS layer and subtracting out disturbed land already in urban development.

**TABLE 4-9: Impacts to Prime and Important Farmland Soils**

DSA	Total Acreage in DSA Right of Way	Prime Farmland Soils (Acres in Right of Way)*			Statewide Important Farmland Soils (Acres in Right of Way)*			Total acreage of Prime and Important Farmland Soils in DSA
		Gaston	Mecklenburg	Total Prime	Gaston	Mecklenburg	Total Important	
4	1,901	562	131	693	59	20	79	772
5	1,837	554	79	633	51	7	58	691
9	1,893	586	131	717	70	20	90	807
22	1,940	580	131	711	50	20	70	781
23	1,872	571	79	650	42	7	49	699
27	1,931	603	131	734	61	20	81	815
58	2,009	597	131	728	147	20	167	895
64	1,991	563	79	642	216	7	222	864
68	2,047	595	131	726	234	20	254	980
76	1,901	590	131	721	112	20	132	853
77	1,837	581	79	661	104	7	111	772
81	1,893	614	131	745	123	20	143	888

\* Acreages are calculated for the preliminary engineering design right of way for each DSA. Areas of prime and statewide important soils already in urban development were not included in the totals.

Generally, the alternatives that are farthest west and south have the most prime and important farmland soils, with DSA 68 having the most total acreage (980 acres) and the highest percentage (48 percent). DSA 5 has the least acreage (691 acres – 38 percent), while DSA 23 has the lowest percentage (699 acres – 37 percent).

**4.3.4.2 Farmland Conversion Impact Ratings**

In accordance with the FPPA and *Guidelines for Implementing the Final Rule of the Farmland Protection Policy Act for Highway Projects* (FHWA, May 1989), an NRCS form, “Farmland Conversion Impact Rating for Corridor Type Projects”, was prepared. The NRCS forms are included in **Appendix I**.

The ratings on the forms are comprised of two parts. The Land Evaluation Criterion Value represents the relative value of the farmland to be converted on a scale from 0 to 100 points. The Corridor Assessment, which is rated on a scale of 0 to 160 points, evaluates farmland soil based upon its use in relation to the other land uses and resources in the immediate area. The two ratings are added together for a possible total rating of 260 points. Sites receiving a total score of 160 points or more are given increasingly higher levels of consideration for protection (7 CFR Part 658.4).

**Table 4-10** lists the total points for each DSA. The total point value for each DSA is less than 160 points. According to the FPPA, lands that receive a combined score of less than 160 points are not covered by the FPPA. Since the soils impacts by the DSAs do not meet the threshold of protection based on the evaluation under the FPPA, the impact to prime and statewide important farmland is not considered under the FPPA.

**TABLE 4-10: Farmland Impact Ratings by Detailed Study Alternative**

DSA	Farmland Value		Total Points	
	Gaston	Mecklenburg	Gaston	Mecklenburg
4	62	62	125	122
5	60	56	121	115
9	62	62	124	122
22	61	62	124	122
23	59	56	120	115
27	61	62	123	122
58	63	62	123	120
64	59	56	121	115
68	62	62	122	120
76	62	62	124	122
77	60	56	121	115
81	62	62	124	122

Source: NRCS Farmland Conversion Impact Rating Forms (**Appendix I**).

**4.3.4.3 Local Agricultural Programs and Farm Relocations**

**Local Agricultural Programs.** There are 21 parcels currently participating in the VAD program that would be directly impacted by various DSAs. These parcels total approximately 1,109 acres and are mainly concentrated in the area surrounding the intersection of Union Road and Union New Hope Road. There are additional parcels along Robinson Road near York Road

and north of Lewis Road near Camp Rotary Road. The No-Build Alternative would not directly impact any VAD properties.

As shown in **Table 4-11**, the number of impacted VAD program properties range from 8 to 11, with impacted acreage ranging from 44.7 to 138.4 acres. DSAs 64 and 68 impact the most number and acreage of VAD properties, as these DSAs are located in more rural areas. DSAs 4 and 22 would impact the least number and acreage of VAD properties.

Although all DSAs would impact agricultural lands in Gaston County, the project is consistent with the County’s land use plans, which designate southern Gaston County as an area targeted for more suburban development. Discussion with Gaston County staff and reviews of local planning documents indicate that the area surrounding the proposed project is slated for suburban development.

**TABLE 4-11: Impacts to Voluntary Agricultural District Properties**

DSA	# of VAD Parcels Impacted*	Acreage Impacted by Right of Way*	Total VAD Parcel Acreage*	Impacted Acreage (%) of Total VAD Parcel Acreage
4	8	44.7	301.9	15
5	10	49.2	449.1	11
9	10	49.2	449.1	11
22	8	44.7	301.9	15
23	10	49.2	449.1	11
27	10	49.2	449.1	11
58	10	68.8	586.3	12
64	14	138.4	924.3	15
68	14	138.4	924.3	15
76	9	64.0	555.4	12
77	11	68.5	702.6	10
81	11	68.5	702.6	10

\* Impacts calculated based on preliminary engineering designs and locations of VAD parcels provided by Gaston County GIS.  
 Note: VAD = Voluntary Agricultural District

**Farm Relocations.** The *Relocation Reports for the Gaston East-West Connector* (Carolina Land Acquisitions, Inc., April 2008) for the proposed project (**Appendix F**) note that two farms, described below, would require relocation, depending upon the DSA. Because much of southern Gaston County is still rural, it is anticipated that there would be suitable replacement property available for farm relocation. The No-Build Alternative would not require relocation of farms.

Duck Crossing Farm, located on Robinson Road, is 190.7 acres in size. The proposed right of way of the mainline and the Robinson Road interchange in Corridor Segment J1c (DSAs 64 and 68) would pass through this farm.

White Rock Horse Farm includes 34.4 acres located at the end of Victory Trail, east of Rufus Ratchford Road. The proposed right of way for the project’s mainline in Corridor Segment K1A (DSAs 5, 9, 23, 27, 64, 68, 77, and 81) passes through the middle of this farm.

As discussed in **Section 7.5.1**, future growth in southern Gaston County has the potential to convert farmlands and other agricultural lands. These effects are projected to occur under both the DSAs and the No-Build Alternative, but likely at a faster rate with the DSAs.

## 4.4 UTILITIES AND INFRASTRUCTURE

Information in this section regarding electric power transmission, natural gas, and telecommunications is summarized from the *Utility Impact Report for the Gaston East-West Connector* (TBE Group, Inc., August 2008), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)). Sources for that report included a site investigation, communication with the existing utility owners, North Carolina One-Call, and data on the DSA's preliminary engineering designs provided to the TBE Group. Information regarding water and sewer services is summarized from the *Indirect and Cumulative Effects Assessment for the Gaston East-West Connector* (Louis Berger Group, March 2009), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)).

### 4.4.1 EXISTING CONDITIONS

#### 4.4.1.1 Electric Power

Electric power in the Project Study Area is supplied by Duke Energy Corporation, Rutherford Electric Membership Cooperative (EMC), and the City of Gastonia (*Utility Impact Report for the Gaston East-West Connector*, TBE Group, Inc., August 2008). Duke Energy Corporation provides service in both Gaston and Mecklenburg Counties and has transmission and distribution lines in the Project Study Area. Rutherford EMC services western and southern Gaston County and has local transmission and distribution lines in the Project Study Area. The City of Gastonia provides services in their municipal limits and only has distribution lines.

#### **Transmission Lines vs Distribution Lines**

*Electric power transmission lines transmit power between a power plant and a substation near a populated area. Electric power distribution lines deliver the power from the substation to the consumer. This same concept also applies to other utilities, such as natural gas and water.*

In addition to Duke Energy Corporation's Allen Steam Station (**Section 2.3.2.2** and **Figure 2-8a**), there are major electric power transmission easements in four general locations within and near the DSAs:

- Western end of the DSAs, north of Linwood Road
- Near US 321
- Near Robinson Road
- At the eastern end of the project, radiating out from Duke Energy's Allen Steam Station

Six electric power transmission easements within and near the eastern end of the DSAs originate from the Allen Steam Station. Several of these easements enter and exit the area multiple times. Each easement may contain one to three power transmission lines.

The electric power transmission lines and easements located within and near the DSAs are owned by either Duke Energy Corporation or Rutherford EMC. The locations of these easements are shown on **Figure 4-4**, and in detail on **Figure 2-9a-d, n-r, and y-hh**. Electric power distribution lines also are located throughout the Project Study Area, and are owned by the City of Gastonia, in addition to the above-mentioned electric power transmission line owners.

#### 4.4.1.2 Natural Gas

Natural gas distribution lines are located throughout the Project Study Area and are owned by either PSNC Energy (Gaston County) or Piedmont Natural Gas (Mecklenburg County).

There are three natural gas transmission line easements that cross the DSAs. These are owned by Transcontinental Gas Pipeline Corporation, Plantation Pipeline Company, and Colonial Pipeline Company.

The Transcontinental Gas Pipeline Corporation transmission line easement is located near the western termini of the DSAs. This easement runs southwest-northeast, and crosses I-85 west of the existing Edgewood Road interchange. There are three natural gas transmission pipelines (one 30-inch pipeline and two 36-inch pipelines) in this easement. The Transcontinental Gas Pipeline Corporation gas transmission line is an interstate gas pipeline regulated by the Federal Energy Regulatory Commission (FERC) (FERC Web site: [www.ferc.gov/industries/gas/gen-info/reg-ent.asp](http://www.ferc.gov/industries/gas/gen-info/reg-ent.asp)).

The Plantation Pipeline Company natural gas transmission easement and the Colonial Pipeline Company easement are parallel to each other. They run southwest-northeast, crossing US 321 near its intersection with Crowders Creek Road. The Plantation Pipeline Company easement contains two pipelines (size unknown). The Colonial Pipeline Company easement contains two natural gas transmission pipelines; a 40-inch pipeline and a 36-inch pipeline.

#### 4.4.1.3 Telecommunications

A privately owned communication tower is located just west of US 321 between Superior Stainless Road to the north and Old Depot Road to the south, and a cell tower is located at the intersection of Union New Hope Road and NC 274 (Union Road). Various AT&T (formerly BellSouth) and Time Warner Cable telecommunication lines cross the Project Study Area.

#### 4.4.1.4 Water and Sewer Facilities

The City of Gastonia, City of Bessemer City, City of Belmont, and the Charlotte-Mecklenburg Utilities Division have existing and planned water and sewer facilities within and near the DSAs.

**Figure 4-4** displays the existing and planned water and sewer service areas in relation to the DSAs. As shown in the figure, water and sewer services are provided in the DSA areas from I-85 south to Linwood Road, around US 321, and in Mecklenburg County. Most of the planned expansions are located in southern Gaston County. Areas not provided public water and sewer use private or community wells and septic systems.

The City of Gastonia provides public water and sewer service for a large area and regularly extends lines to meet the needs of new developments, particularly in the southern part of the city. The City's water comes from Mountain Island Lake on the Catawba River (City of Gastonia Web site: [www.cityofgastonia.com/city\\_serv/pwu/utilities/treatment/treatment.cfm](http://www.cityofgastonia.com/city_serv/pwu/utilities/treatment/treatment.cfm)).

The City of Bessemer City provides public water and sewer services within its municipal boundaries. The City's water comes from Long Creek, and is stored in Arrowood Lake (Telephone interview with City of Bessemer City Water Treatment Plant staff, October 15, 2008).

The City of Belmont offers water and sewer services within its municipal boundaries. The City's water comes from Lake Wylie on the Catawba River (City of Belmont Web site: [www.cityofbelmont.org/department-watertreatment.aspx](http://www.cityofbelmont.org/department-watertreatment.aspx)). The City has extended its water facilities south along NC 273 (Southpoint Road) to the end of the peninsula in order to serve new subdivisions. Areas along NC 273 (Southpoint Road) not currently served by city utilities can tap into the new line if annexed into the City.

Charlotte-Mecklenburg Utilities provides water and sewer throughout Mecklenburg County. Charlotte-Mecklenburg Utilities withdraws water from Lake Norman and Mountain Island Lake on the Catawba River (Charlotte-Mecklenburg Utilities Web site: [www.charmeck.org/Departments/Utilities/Divisions/supplyandtreat.htm](http://www.charmeck.org/Departments/Utilities/Divisions/supplyandtreat.htm)). Within Mecklenburg County, part of the Project Study Area is serviced by both water and sewer, and a portion (nearest the Catawba River) is served only by sewer.

#### 4.4.1.5 Railroads

There are three railroad lines within the vicinity of the DSAs. The most active rail line is the Norfolk Southern line shown on **Figure 2-9c** paralleling the east side of NC 274 (Bessemer City Road) as it crosses over I-85. This is the Washington, D.C., to Atlanta, Georgia, mainline. This mainline handles up to 40 freight trains and two passenger trains per day, with maximum train speeds of 79 miles per hour (mph). This track also has been designated as part of the future Southeast High Speed Rail Corridor from Washington, D.C., to Atlanta, Georgia (NCDOT Rail Division Scoping Letter, May 12, 2003, included in **Appendix A-3**).

There is a Norfolk Southern branch line running north-south parallel to the east side of US 321. This line is shown in **Figure 2-9n-p**. This is a lightly used branch line with maximum train speeds of 10 mph (NCDOT Rail Division Scoping Letter, May 12, 2003, included in **Appendix A-3**).

The third line is a spur line that serves Duke Energy Corporation's Allen Steam Station. This line runs along the west side of the Catawba River from the Norfolk Southern mainline south through Belmont to the Allen Steam Station. This spur line can be seen on **Figure 2-9cc**.

#### 4.4.2 IMPACTS TO UTILITIES

**Table 4-12** summarizes the major utility impacts estimated for the DSAs, based upon the preliminary engineering designs. Major utility impacts were defined as utility conflicts estimated to cost \$250,000 or more to relocate or modify (*Utility Impact Report for the Gaston East-West Connector*, TBE Group, Inc., August 2008). The No-Build Alternative would not create utility impacts.

**TABLE 4-12: Major Utility Impacts**

Utility	Detailed Study Alternative											
	4	5	9	22	23	27	58	64	68	76	77	81
Electric Power Transmission Lines – # of Crossings <sup>1</sup>	14	13	14	14	13	14	18	17	17	17	15	17
Natural Gas Transmission Pipelines – # of Crossings <sup>2</sup>	4	4	4	4	4	4	4	4	4	4	4	4
Telecommunications Towers – # of Impacted Towers	0	0	0	0	0	0	0	0	0	0	0	0
Railroads – #of Crossings	2	1	2	2	1	2	2	1	2	2	1	2

Source: *Utility Impact Report for the Gaston East-West Connector* (TBE Group, Inc., August, 2008).

1. There may be one to three individual lines in a power transmission easement. This table reports the numbers of individual transmission line crossings.
2. The four gas transmission pipeline crossings are located in the two easements (two pipelines in each easement) that cross US 321 near Crowders Creek Road and are owned by Plantation Pipeline Company and Colonial Pipeline Company.

**Electrical Power Generation and Transmission.** None of the DSAs would directly impact the Duke Power Corporation’s Allen Steam Station. The number of crossings of electrical power transmission lines varies from a minimum of 13 (DSA 5 and DSA 23) to a maximum of 18 (DSA 58). The DSAs also cross numerous smaller distribution lines.

The preliminary engineering designs for the DSAs minimized impacts to electric power transmission lines to the extent feasible, based upon data available at the time. During final design of the Preferred Alternative, additional opportunities to minimize conflicts with electric power facilities will be investigated.

Any modifications to the high-voltage electric power transmission lines necessary to accommodate the proposed project are not expected to adversely impact the transmission lines or consumer electrical service in the area. Any impacts and relocations of power transmission lines or towers would be coordinated with Duke Energy Corporation and the Rutherford EMC during final design of the Preferred Alternative. Impacts to distribution lines would be coordinated with Duke Energy Corporation, Rutherford EMC, and the City of Gastonia prior to construction.

**Natural Gas.** All DSAs would cross the natural gas transmission easements owned by Plantation Pipeline Company and Colonial Pipeline Company described in **Section 4.4.1.2**. Each easement contains two natural gas transmission pipelines. The preliminary engineering designs in the DSAs do not encroach on the easement owned by the Transcontinental Gas Pipeline Corporation. The DSAs also cross numerous natural gas distribution lines.

Although both natural gas transmission and distribution lines would be crossed by the DSAs, the project is not expected to impact consumer gas service. To avoid disruptions in service and delivery, the NCTA would coordinate any required relocation or modification of transmission lines with Plantation Pipeline Company and Colonial Pipeline Company and any required relocation or modification of distribution lines with area providers, including PSNC Energy and Piedmont Natural Gas.

**Telecommunications.** Neither the communication tower nor the cell tower near the DSAs is anticipated to be impacted by any of the DSAs. During final design of the Preferred Alternative, all telecommunication utility providers will be consulted to ensure that the proposed design and construction of the project would not substantially disrupt service.

**Water Service.** Most of the land in Gaston and Mecklenburg County crossed by the DSAs does not have public water service. Those areas that do have service are located between I-85 and Linwood Road and an area east of US 321. A small area in Belmont crossed by Corridor Segments KX1 and K3A (DSAs 4, 9, 22, 27, 58, 68, 76, and 81) also is served by public water (**Figure 4-4**). The remaining areas crossed by the DSAs are served by private or community wells. Also, all DSAs would cross the public water line installed along Southpoint Road that extends to the end of the peninsula.

In the areas served by public water, the DSAs would cross water lines, but water service is not expected to be disrupted. Prior to project construction, the NCTA will coordinate any water line relocation or reconfiguration with the appropriate municipality or county.

Wells within the Preferred Alternative's right of way would be surveyed prior to project construction. NCTA would purchase these wells and cap and abandon them in accordance with State standards (15A NCAC 2C). Any subsurface contamination would be reported to the regional office of the NCDENR.

**Sewer Service.** Most of the areas crossed by the DSAs do not have public sewer service. Those areas that do are located in the western end of the project, around US 321, and in Mecklenburg County (**Figure 4-4**). The DSAs that use Corridor Segment H3 (DSAs 4, 5, and 9) would cross the most area served by public sewer. The remainder of the Project Study Area is served by private septic tanks or community treatment systems.

None of the DSAs would impact sewage treatment facilities or public sewer service within the Project Study Area. Any sewer line relocation or reconfiguration required for construction of the Preferred Alternative will be coordinated with the affected municipalities or counties, and is not expected to disrupt service.

**Railroads.** The Norfolk Southern mainline that runs east-west through Gaston County would be impacted by DSAs that use Corridor Segment H2A (DSAs 4, 5, 9, 22, 23, and 27). As shown in **Figure 2-9c**, the track is close to, and parallels, the east side of NC 274 (Bessemer City Road). Because the proposed Gaston East-West Connector/I-85 interchange in Corridor Segment H2A is close to the I-85/NC 274 (Bessemer City Road) interchange, the I-85/NC 274 (Bessemer City Road) interchange ramps and the mainline of I-85 need to be modified to accommodate the new interchange to the west. Modifications will require the replacement of the existing railroad bridge over I-85. It is expected that the replacement bridge can be built in the existing bridge location, with a temporary detour bridge constructed immediately to the east during the bridge construction. Substantial disruptions in rail service are not anticipated.

All DSAs cross the Norfolk Southern branch line that runs north-south parallel to the east side of US 321. The interchange design at US 321 for all DSAs has the ramps located on the west side of US 321 to avoid the rail line.

The DSAs that use Corridor Segment K3B (DSAs 4, 9, 22, 27, 58, 68, 76, and 81) would cross the rail spur that serves Duke Energy's Allen Steam Station.

If DSA 4, 5, 9, 22, 23, or 27 is selected as the Preferred Alternative, additional coordination would be conducted regarding the Norfolk Southern mainline near I-85. Final design of the Preferred Alternative will be coordinated with the NCDOT Rail Division and Norfolk Southern to ensure that the grade-separated crossing of the branch rail line near US 321 and the rail spur

incorporates the appropriate horizontal and vertical clearances, in accordance with current standards.

## 4.5 VISUAL RESOURCES

### 4.5.1 INTRODUCTION

The area within the vicinity of the DSAs is characterized by gently rolling to steep hills. Land uses surrounding and within the DSAs are mixed, ranging from agricultural and pasture land to residential, recreational, industrial, and commercial developments. Commercial and retail development is limited primarily to the areas located near I-85, US 29-74, and US 321. The Project Study Area is experiencing growth, including the development of several new housing developments, with much of the area slowly shifting toward a more suburban environment.

People with views **from** the project and those with views **of** the project are addressed in this section, as both types of viewers have the potential to experience impacts. The views **from** the DSAs are comprised of areas that would be visible to travelers on the roadway, including views of the roadway right of way and beyond. Views **of** the DSAs were considered for residential areas and travelers on surrounding roadways, boaters and residents along the South Fork Catawba River and Catawba River, and visitors to Crowders Mountain State Park and Daniel Stowe Botanical Garden.

### 4.5.2 LOCAL ZONING DISTRICTS AND OVERLAY DISTRICTS

The Gaston County Planning Board adopted its Unified Development Ordinance (UDO) in April 2008. The UDO became effective July 1, 2008. The purpose of the UDO is to “raise the standards for development in the County by working with local municipalities to promote quality, uniformity, and consistency in development standards throughout the County.” (UDO Purpose and Acknowledgement section, Gaston County Web site: [www.co.gaston.nc.us/planning/UDO/adoptedUDO/adoptedUDO.htm](http://www.co.gaston.nc.us/planning/UDO/adoptedUDO/adoptedUDO.htm)).

There is one general zoning district and two overlay districts defined in the UDO relevant to the Gaston East-West Connector and visual impacts. These are the Garden Parkway Interchange District, Garden Parkway Overlay District, and Scenic View Overlay District. These regulations supplement those that are found in the underlying general zoning district.” (UDO Section 6.1C).

**Garden Parkway Interchange (GPX) District**, a general zoning district, is intended to accommodate an array of aesthetically pleasing and well-designed mixed-use developments that are located in proximity to the Gaston East-West Connector interchanges (UDO Section G). This district is “not intended to accommodate nor promote typical strip commercial development.” (UDO Section G).

**Garden Parkway (GP) Overlay District** is intended to “maintain an aesthetic viewshed for motorists and landowners along the length of the Garden Parkway. Any GP Overlay District initially established shall...consist of all lots fronting along the Garden Parkway for a depth of five hundred (500) feet on each side of the Garden Parkway as measured from the centerline.” (UDO Section 6.3.12).

The GP Overlay District includes several development restrictions. Special landscaping is required for properties (excluding residential and agricultural uses) that lie adjacent to or are otherwise visible from the Garden Parkway. Building articulation, materials, and colors are restricted for building facades that face the Garden Parkway. In addition, rooftop equipment must not be visible by motorists (UDO Section 7.6.7).

**Scenic View (SV) Overlay District** was established to protect the scenic views from within the Daniel Stowe Botanical Garden. Building heights in this overlay district are limited to 35 feet (excluding single-family and two-family structures), and telecommunication towers and facilities are not permitted.

The Scenic View Overlay District is delineated on the Gaston County Official Zoning Map adopted May 2008 (Gaston County Web site:

[www.co.gaston.nc.us/planning/UDO/adoptedUDO/adoptedUDO.htm](http://www.co.gaston.nc.us/planning/UDO/adoptedUDO/adoptedUDO.htm)). The Scenic View Overlay District in relation to the DSAs is shown on **Figure 4-5**. Several Corridor Segments are located within the Scenic View Overlay District. These are Corridors Segment K3A (DSAs 9, 27, 68, and 81) and Corridors Segments K1B-K1C-K4A (DSAs 5, 23, 64, and 77). Corridor Segment K2A (DSAs 4, 22, 58, and 76) encroaches slightly on the northernmost boundary of the overlay district west of NC 279 (South New Hope Road).

### 4.5.3 VISUAL IMPACTS

**Travelers Using the Gaston East-West Connector.** Each of the DSAs has the potential to offer users of the proposed project visually pleasing views of the project and its surroundings, such as valleys, hills, wooded areas, farmlands, streams, and cultural features. During the final design of the Preferred Alternative, NCTA will incorporate a landscaping plan into the project that will enhance views within the right of way. Gaston County has demonstrated its intention to maintain aesthetic and visually pleasing development immediately surrounding the proposed project through the establishment of the GPX District and the GP Overlay District in the UDO.

**Users of Surrounding Roadways and Residential Areas.** For people in the residential areas and on roadways surrounding the DSAs, the DSAs' fill slopes and structures have the potential to detract from existing views. However, due to natural changes in elevation, the project's cut slopes in areas outside of floodplains, and tall trees within the area, much of the roadway would not be visible from areas outside the project's immediate vicinity.

Overall, visual changes would be intermittent, with some residents subjected to a view of the roadway, and other views shielded by the cut/fill areas, forested areas, and project landscaping. DSAs that have a higher number of neighborhoods exposed to the roadway (i.e., impact a greater number of neighborhoods with residential relocations) (**Section 3.2.4**) were estimated to have a greater degree of visual impacts. Based on these assumptions, it was estimated DSAs 4 and 5 would have the most visual impacts and DSAs 27 and 81 would have the least.

Some areas affected by the DSAs are generally not rural or scenic, so the degree of visual impact would be less in these locations. These areas include more urban development that occurs around I-85 near Bessemer City, and along the major roads that would be served by interchanges (i.e., US 29-74 and US 321). All DSAs pass through these areas.

The project's landscaping plan and the zoning requirements of the Garden Parkway Interchange District and Garden Parkway Overlay District also will enhance and maintain aesthetics for these viewer groups, as well as those using the Gaston East-West Connector.

**Boaters and Residents along the South Fork Catawba River and Catawba River.** All the DSAs would construct bridges over the South Fork Catawba River and Catawba River. Boaters on these rivers, as well as some riverfront and nearby residents would experience a substantial change in those views found within the vicinity of the bridges. During final design for the Preferred Alternative, NCTA will investigate the feasibility and reasonableness of incorporating cost-effective treatments for the bridge sides, piers, and railings in order to enhance aesthetics.

**Visitors to the Daniel Stowe Botanical Garden.** The Daniel Stowe Botanical Garden (DSBG) is located off NC 279 (South New Hope Road) and south of Corridor Segment K1C (DSAs 5, 23, 64, and 77). None of the DSAs are anticipated to adversely impact the Botanical Garden, or be close enough to be visible from the areas of the DSBG open to the public. The general zoning and overlay districts established in the UDO (Scenic View Overlay District, GP Overlay District, and GPX District) will help preserve and enhance views and aesthetics along the routes to the DSBG. No visual impacts to the DSBG are anticipated with any of the DSAs.

**Visitors in Crowders Mountain State Park.** None of the DSAs would directly impact Crowders Mountain State Park—a natural, forested park that offers hiking and other nature-related activities. The nearest corridor is Corridor Segment H1A (DSAs 58, 64, 68, 76, 77, and 81), which is located roughly one straight-line mile from the top of Crowders Mountain. The nearest park boundary is approximately 1,500 feet from the centerline of Corridor Segment H1A. The nearest point on the hiking trails is on the Tower Trail, which is approximately 2,800 feet from the centerline of Corridor Segment H1A.

The park's appeal includes views of the surrounding region, and there are areas of the park that would experience a change in existing viewsheds. The northeast overlook, Summit Tower, Rock Top Trail, and Tower Trail each have the potential to offer full or limited views of the proposed project from locations along the trails and/or summit where views to the east are possible. The most visible DSAs would likely be those nearest the park. However, the existing viewshed in this direction includes both rural and developed suburban landscapes. Although viewers may notice an immediate change with construction of any of the DSAs, it is anticipated that over time, the proposed project would blend with the suburbanizing landscape that is expected to develop with the DSAs or without (No-Build Alternative).

## 4.6 HAZARDOUS MATERIALS

### 4.6.1 EXISTING CONDITIONS

An assessment of the Project Study Area was performed to identify the presence of potentially contaminated sites. The NCDOT Geotechnical Engineering Unit prepared a *GeoEnvironmental Impact Study Hazardous Material Evaluation* in March 2004, to assist in preliminary corridor development. The NCDOT Geotechnical Engineering Unit updated the study and evaluated potential impacts in a memo titled: *GeoEnvironmental Impact Evaluation – EDR Study Area Combined GIE* (January 2008). These two memoranda are incorporated by reference.

The State's geographic information system (GIS) database was used to identify known hazardous materials/waste sites within the vicinity of the proposed project. In addition, a search was conducted by Environmental Data Resources Inc. (EDR), of state and federal databases in December 2007. The results of these GIS and database searches were compared with existing and new development and the Gaston County GIS database to determine the current validity of known contaminated sites. Small, single-incident spills associated with residential heating tanks were not included in this summary.

Forty-six sites were identified within the immediate vicinity of the DSAs. **Figure 4-6** shows the approximate locations of the sites. **Appendix J** (Table J-1) provides general information on each of the sites. The 46 sites include 25 Underground Storage Tanks (UST), twelve manufacturing facilities, three junkyards, two hazardous waste sites, one apparent landfill, and three other contaminated sites.

**Leaking USTs**

*Old USTs at service stations can deteriorate and leak fuels, and are a common source of soil and/or groundwater contamination.*

Additional details on the two hazardous waste sites (Sites 33 and 34 on **Figure 4-6**) are provided below. An additional three sites listed in **Appendix J** are located within the vicinity of Corridor Segment K1D, which was eliminated from detailed study (**Section 2.3.4.2**). These sites were included in the appendix and figure to avoid confusion that may occur due to discontinuous site numbering if they were deleted from the list. The site numbers correspond to those in *GeoEnvironmental Impact Evaluation – EDR Study Area Combined GIE* (NCDOT Geotechnical Engineering Unit, January 2008)

Woody's Tire Fire site is located on the west side of US 321 between James Street and Southside Church Road on the south edge of Corridor Segments J2a/J3/J4a. According to the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) (USEPA Web site: <http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm>), the site was archived in August 2004, and is currently listed as an inactive hazardous waste site. The Archive designation indicates that, based upon available information, the site has no further interest under the Federal Superfund Program.

This former 1.5-acre site of Woody's Tire & Used Cars was being used to store roughly 50,000–100,000 tires at the time of the fire. The fire was discovered on September 12, 1988. Approximately 1 million gallons of water were used in efforts to extinguish the fire, but ultimately 2 to 3 feet of soil cover was needed to extinguish the fire. Drainage ditches excavated to contain the water showed substantial amounts of volatiles and polynuclear aromatics, but no contamination was found in the nearby unnamed creek. Contamination still exists at the site and excavation of the soil cover and burnt-tire residue would require special handling if the site was disturbed during construction of the project.

The AB Carter, Inc. site is located on the east side of US 321, south of the Woody's Tire Fire site. This site is on the south side of DSA Corridor Segments J2A/J3/J4A. AB Carter, Inc. generated, treated, and land-disposed wastewater and sludge from a chroming and nickel plating operation for textile machinery. Soil, groundwater, and surface water contamination may be expected from unlined sludge basins. The site is currently an inactive Superfund site.

The locations for Sites 30, 31, and 36 could not be verified. Site 30 is located on Crowders Creek Road, but no specific address was available in the databases. Bruce's County Landfill (Site 31) is likely located east of US 321 (**Figure 4-6**) within or near DSA Corridor Segments J2b/J3/J4b.

Site 36 is likely east of US 321 and south of Forbes Road. Since the boundaries and exact locations of the landfill and Site 30 are not known at this time, the locations would need to be verified if DSA 4, 5, 9, 22, 23, or 27 is selected as the Preferred Alternative. If DSA 58, 64, or 68 is selected as the Preferred Alternative, the location of Site 36 would need to be verified.

**4.6.2 IMPACTS FROM HAZARDOUS MATERIALS/WASTE SITES**

The NCDOT Geotechnical Engineering Unit evaluated the sites listed in **Appendix J** to determine the magnitude of anticipated impact if the project would directly affect the site.

**Table 4-13** summarizes the impacts of the potentially contaminated sites for each DSA. Those sites listed in **Appendix J** with an anticipated type of impact of “none” were not included in the table. Because there is some uncertainty as to the exact locations of the sites, if the site was mapped as within the DSA corridors, it was assumed to be an impact. The DSAs’ preliminary engineering designs were prepared to avoid known hazardous materials/waste sites to the extent possible. The No-Build Alternative would not impact any sites.

**Table 4-13** includes the potential anticipated impact level and the type of contamination expected to be encountered at each site. Anticipated impacts were rated low, medium, or high, as defined below:

- Low – Little to no impacts to cost or schedule anticipated.
- Medium – Additional costs and time may be incurred due to the handling of contaminated materials, and a need for special construction techniques or products.
- High – Costs and scheduling could overwhelm smaller projects and cause serious delays in larger projects. Liability may fall upon the NCTA to clean up contamination, which could require decades. These sites should be avoided to the extent possible. There were no sites within the DSAs that received a “high” impact rating.

**TABLE 4-13: Impact on Potentially Contaminated Sites by Detailed Study Alternative**

Site Number	Anticipated Type of Impact	Anticipated Impact Severity	Detailed Study Alternative											
			4	5	9	22	23	27	58	64	68	76	77	81
Site 1: UST	Petroleum Contaminated Soils	Low	--	--	--	--	--	--	X	X	X	X	X	X
Site 2: UST	Petroleum Contaminated Soils	Low	--	--	--	--	--	--	X	X	X	X	X	X
Site 3: GWI/Manuf.	Contaminated groundwater	Medium	X	X	X	X	X	X	X	X	X	X	X	X
Site 6: UST	Petroleum Contaminated Soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 7: UST	Petroleum Contaminated Soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 9: UST	Petroleum Contaminated Soils	Low	X	X	X	X	X	X	--	--	--	--	--	--

**TABLE 4-13: Impact on Potentially Contaminated Sites by Detailed Study Alternative**

Site Number	Anticipated Type of Impact	Anticipated Impact Severity	Detailed Study Alternative											
			4	5	9	22	23	27	58	64	68	76	77	81
Site 10: UST	Petroleum Contaminated Soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 11: UST	Petroleum contaminated soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 12: UST	Petroleum contaminated soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 14: UST/Manuf.	Petroleum contaminated soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 16: Manuf.	Chemicals	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 17: UST	Petroleum contaminated soils	Low	X	X	X	X	X	X	--	--	--	--	--	--
Site 18: Junkyard	Petroleum contaminated soils	Low to Medium	X	X	X	X	X	X	--	--	--	--	--	--
Site 19: Junkyard/ UST	Petroleum contaminated soils	Low to Medium	X	X	X	X	X	X	--	--	--	--	--	--
Site 20: Junkyard	Petroleum contaminated soils	Low to Medium	X	X	X	X	X	X	--	--	--	--	--	--
Site 21: UST	Petroleum contaminated soils	Low	--	--	--	--	--	--	X	X	X	X	X	X
Site 22: UST	Petroleum contaminated soils	Low	--	--	--	--	--	--	X	X	X	X	X	X
Site 23: Manuf.	Contaminated groundwater	Low	--	--	--	--	--	--	X	X	X	X	X	X
Site 26: UST	Petroleum contaminated soils	Low	--	--	--	--	--	--	X	X	X	--	--	--
Site 27: UST/Manuf.	Petroleum contaminated soils	Low	X	X	X	--	--	--	--	--	--	--	--	-
Site 28: UST/Manuf.	Petroleum contaminated soils and chemicals	Low to Medium	X	X	X	X	X	X	--	--	--	X	X	X
Site 29: GWI	Contaminated groundwater	Low	X	X	X	X	X	X	--	--	--	X	X	X
Site 30: UST and Manuf.	Petroleum contaminated soils	Low	X	X	X	--	--	--	--	--	--	--	--	--
Site 31: Land Fill	Landfill material	Low	X	X	X	X	X	X	--	--	--	X	X	X
Site 33: Haz Waste Facility	Contaminated soils	Low to Medium	X	X	X	X	X	X	--	--	--	X	X	X

**TABLE 4-13: Impact on Potentially Contaminated Sites by Detailed Study Alternative**

Site Number	Anticipated Type of Impact	Anticipated Impact Severity	Detailed Study Alternative											
			4	5	9	22	23	27	58	64	68	76	77	81
<b>Site 34: Haz Waste Facility</b>	Soil and groundwater contamination	Medium	X	X	X	X	X	X	--	--	--	X	X	X
<b>Site 35: UST/Manuf.</b>	Petroleum contaminated soils and groundwater	Low	--	--	--	--	--	--	X	X	X	--	--	--
<b>Site 36: GWI</b>	Contaminated groundwater	Low	--	--	--	--	--	--	X	X	X	--	--	--
<b>Site 37: UST</b>	Petroleum contaminated soils	Low	--	--	--	--	--	--	X	X	X	--	--	--
<b>Site 38: UST</b>	Petroleum contaminated soils	Low	X	X	X	X	X	X	X	--	--	--	--	--
<b>Site 41: UST</b>	Petroleum contaminated soils	Low	X	--	X	X	--	X	X	--	X	X	--	X
<b>Site 47: UST</b>	Petroleum contaminated soils	Low	X	X	X	X	X	X	X	X	X	X	X	X
<b>Site 48: UST</b>	Petroleum contaminated soils and groundwater	Low	X	X	X	X	X	X	X	X	X	X	X	X
Sites Within DSA Corridor			24	23	24	22	21	22	14	12	13	14	13	14
Sites with Low Impact Severity			17	16	17	15	14	15	13	11	12	10	9	10
Sites with Low -Medium Impact Severity			5	5	5	5	5	5	0	0	0	2	2	2
Sites with Medium Impact Severity			2	2	2	2	2	2	1	1	1	2	2	2

Source: NCDOT Geotechnical Engineering Unit, 2008.

The potentially contaminated sites within the DSA corridors are defined as having a low, low-to-medium, or medium anticipated impact severity, and no sites have an anticipated impact severity of high. Regardless of the DSA, the potentially impacted sites are generally concentrated around I-85, US 29-74, and US 321, and scattered sites in other locations.

Based upon the assessment described above, the DSAs are listed below from the smallest to largest numbers of potentially contaminated sites. Generally, the DSAs closest to the west side of Gastonia had the highest numbers of potentially contaminated sites.

- DSA 64 (12 sites)
- DSAs 68 and 77 (13 sites)
- DSAs 58, 76 and 81 (14 sites)
- DSA 23 (21 sites)
- DSAs 22 and 27 (22 sites)
- DSA 5 (23 sites)
- DSAs 4 and 9 (24 sites)

### 4.6.3 MITIGATION FOR HAZARDOUS MATERIALS/WASTE SITES

Once a Preferred Alternative is selected, a more detailed field reconnaissance will be conducted to include unregulated sites with potential contamination in the assessment. Additional sites not recorded by regulatory agencies and not reasonably discernable during project reconnaissance may occur. Soil and groundwater assessments will be conducted on each of the potentially contaminated properties within the Preferred Alternative before right-of-way acquisition in order that the degree and extent of contamination can be assessed.

## 4.7 FLOODPLAINS AND FLOODWAYS

### 4.7.1 BACKGROUND INFORMATION

Riverine floodplains are low-lying areas adjacent to stream channels that are prone to periodic flooding during heavy or prolonged rains. The 100-year floodplain is the area that has a one percent chance of flooding during any given year.

The floodway is the channel area that needs to be kept free of encroachment so the 100-year flood can be carried without increasing the level and extent of flood elevations. Streams for which detailed hydrological studies have not been conducted do not have defined floodways, so only the 100-year floodplain boundaries are estimated and mapped.

#### ***100-Year Floodplains and Floodways***

*The 100-year floodplain is the area that has a 1 percent chance of flooding during any given year.*

*The floodway is the channel area that needs to be kept free of encroachment so the 100-year flood can be carried without increasing the level and extent of flood elevations.*

A floodplain evaluation was conducted for the project in accordance with Executive Order 11988 – Floodplain Management, and 23 CFR Part 650, Subpart A – Location and Hydraulic Design of Encroachments on Floodplains. Both Gaston and Mecklenburg Counties are participants in the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Administration (FEMA). As part of the NFIP, FEMA determines floodway boundaries as a tool for floodplain management.

FEMA, in cooperation with federal, state and local governments, developed floodplain and floodway boundaries and Flood Insurance Rate Maps (FIRM) for Gaston County in September 2007 (Gaston County Web site: [www.co.gaston.nc.us/planning/maps/firms/firm.htm](http://www.co.gaston.nc.us/planning/maps/firms/firm.htm)), and Mecklenburg County in February 2004 (Charlotte-Mecklenburg Web site: [www.charmeck.org/departments/stormwater/flood+zone/what+are+floodplain+maps+used+for%3f.htm](http://www.charmeck.org/departments/stormwater/flood+zone/what+are+floodplain+maps+used+for%3f.htm)).

### 4.7.2 FLOODPLAINS AND FLOODWAYS IN THE PROJECT STUDY AREA

**Figure 4-7** shows the floodplains and floodways in southern Gaston County and western Mecklenburg County. Named streams with floodplains and floodways include, from west to east: Abernethy Creek, Oates Branch, Bessemer Branch, Crowders Creek, Blackwood Creek, Ferguson Branch (floodplain only), McGill Branch (floodplain only), South Crowders Creek (floodplain only), Catawba Creek, South Fork Catawba River, Catawba River, Beaverdam Creek, and Legion

Lake Stream. Several unnamed tributaries of Crowders Creek and Catawba Creek also have defined floodplains.

Defined floodways generally are located within or near municipal limits. For example, Crowders Creek has a defined floodway from its confluence with Abernethy Creek near US 29-74 downstream to the confluence with Blackwood Creek. South of this point, a detailed study has not been prepared to define the floodway.

### 4.7.3 FLOODWAY/FLOODPLAIN IMPACTS AND MAJOR DRAINAGE STRUCTURES

A preliminary hydraulics analysis was performed to identify the preliminary sizes and locations of major drainage structures along the DSAs that would be needed to adequately carry floodwaters. Major drainage structures are bridges, box culverts, or pipe culverts greater than 72 inches in diameter. The preliminary hydraulic analysis is presented in the *Final Preliminary Hydraulic Technical Memorandum for the Gaston County East-West Connector* (PBS&J, December 2007), incorporated by reference and available on the NCTA Web site ([www.ncturnpike.org/projects/gaston](http://www.ncturnpike.org/projects/gaston)).

For all DSAs together, the preliminary hydraulics analysis identified 122 crossings of streams and drainages for which bridges, box culverts, or pipe culverts greater than 72 inches in diameter would be required from a hydraulics standpoint.

The major drainage structures and crossings were reviewed by the environmental regulatory and resource agencies at Turnpike Environmental Agency Coordination Meetings on February 5, March 4, and April 8, 2008 (**Section 9.2.3.3**). As a result of these meetings, the NCTA agreed to include several bridges in the preliminary engineering designs beyond those required to convey floodwaters. At the following locations, culverts were upgraded to bridges in the preliminary engineering designs for the DSAs to avoid or minimize stream and wetland impacts.

- Corridor Segment H2A (DSAs 4, 5, 9, 22, 23, and 27) – bridge the service road over Bessemer Branch (Stream S25).
- Corridor Segment H2C (DSAs 22, 23, and 27) – lengthen the mainline bridges over Chapel Grove Road to span Stream S70.
- Corridor Segment HX2 (DSAs 76, 77, and 81) – lengthen the mainline bridges over Camp Rotary Road to span Stream S79.
- Corridor Segment H3 (DSAs 4, 5, and 9) – bridge Blackwood Creek (Stream S135).
- Corridor Segments J3 and J2a (DSAs 22, 23, 27, 76, 77, and 81) – lengthen the bridge over Crowders Creek (Stream S14) to span Wetland 103.
- Corridor Segment J1c (DSAs 64 and 68) – bridge Stream S178 (unnamed tributary to Crowders Creek).
- Corridor Segment K3A (DSAs 9, 27, 68, and 81) – lengthen the mainline bridge over Catawba Creek (Stream S259) to span the main body of Wetland W248. This extension also avoids impacts to Catawba River buffer areas on the east side of the creek.

- Corridor Segment K1B (DSAs 5, 23, 64, and 77) – lengthen the mainline bridge over Catawba Creek (Stream S259) to span the main body of Wetland W248. This extension also avoids impacts to Catawba River buffer areas on the east side of the creek.

Figure 4-8 shows the locations of the major drainage structures along the DSAs. Table 4-14 summarizes the numbers of major drainage structures associated with each DSA. Details about the major drainage structures, such as structure size, stream crossed, drainage area, and flow rate, are included as a table in Appendix K. The locations labeled in Figure 4-8 correspond to the labels in the table in Appendix K.

**TABLE 4-14: Summary of Major Drainage Structures and Floodway and Floodplain Crossings**

DSA	Number of Bridge Crossings Over Streams <sup>1</sup>	Number of Major Culverts or Pipes (> 72 inches in diameter) <sup>2</sup>	Number of Floodway Crossings	Number of Floodplain Crossings <sup>3</sup>	Number of Longitudinal Floodplain Encroachments and Total Encroachment Area <sup>4</sup>
4	7	47	10	12	1 (5 acres)
5	7	43	10	13	1 (5 acres)
9	7	45	10	13	1 (5 acres)
22	8	45	9	12	0
23	8	41	9	13	0
27	8	43	9	13	0
58	6	47	7	11	0
64	7	42	7	12	0
68	7	44	7	12	0
76	7	42	7	10	0
77	7	39	7	11	0
81	7	40	7	11	0

Sources: *Final Preliminary Hydraulic Technical Memorandum for the Gaston County East-West Connector* (PBS&J, December 2007) and the meeting minutes from the Turnpike Environmental Agency Coordination Meeting held April 8, 2008.

1. For DSAs 4, 5, 9, 22, 23, and 27, bridge crossings include the service road bridge over Bessemer Branch. For DSAs 4, 5, and 9, bridge crossings include a bridge for the realignment of Linwood Road over Crowders Creek.
2. The numbers for major culverts and pipes include all of the multiple culverts/pipes required at interchanges.
3. The preliminary engineering designs for all the DSAs would involve floodplain encroachments at all floodplain crossings except those of the South Fork Catawba River and the Catawba River.
4. The longitudinal floodplain encroachment is along Crowders Creek north of New Haven Drive. The preliminary engineering designs construction limits encroach on an area approximately 1,400 feet long and 5 acres in size.

As shown in Table 4-14, DSAs 22, 23, and 27 would have the most numbers of bridges (8 bridges), and DSA 58 would have the least (6 bridges). DSAs 4 and 58 would have the greatest number of major culverts and pipes (47 culverts and pipes), while DSA 77 would have the fewest (39 culverts and pipes).

The preliminary engineering designs for all the DSAs would involve floodplain encroachments at all floodplain crossings except those of the South Fork Catawba River and the Catawba River. At these locations, the proposed bridges would span both the floodway and the floodplain.

Floodway limits in Gaston County have only been defined for areas within and near municipal limits within the county. DSAs closer to the municipal limits of Gastonia and Belmont (DSAs 4, 5, and 9) would cross the most numbers of floodways. The preliminary engineering designs for all

the DSAs propose bridges at all new floodway crossings. These bridges would span the floodways.

DSAs that are closer to Crowders Creek (DSAs 4, 5, 9, 22, 23, and 27) have the most total combined floodway and floodplain crossings (21-23 crossings).

The preliminary engineering designs for DSAs that use Corridor Segment J4a (DSAs 4, 5, and 9) would involve a longitudinal encroachment on the Crowders Creek floodplain just north of New Haven Drive. This longitudinal encroachment would be approximately 1,400 feet in length and include an area of approximately 5 acres.

The DSAs for the project have been located in floodplains and/or floodways only in locations where existing residential and business development and other human and natural environment constraints have left no reasonable alternatives to the use of floodplains and/or floodways.

Once a Preferred Alternative is selected, a detailed hydrologic and hydraulic analysis will be performed for each crossing location to determine the actual size and configuration of each structure. Also, for all new location crossings on FEMA-regulated streams (streams where a floodway and/or floodplain has been identified), a Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) will be submitted to the NC Flood Mapping Program for streams in Gaston County and to Charlotte-Mecklenburg Storm Water Services for streams in Mecklenburg County.

In NFIP flood hazard areas, the final hydraulic designs for the Preferred Alternative will ensure that the floodway will carry the 100-year flood without adversely affecting floodplain elevations. The effect of all the DSAs can be mitigated effectively through proper sizing and design of hydraulic structures (culverts, bridges, and channel stabilization).

A LOMR is FEMA's modification to an effective FIRM, or Flood Boundary and Floodway Map (FBFM), or both. LOMRs are generally based upon the implementation of physical measures affecting the hydrologic or hydraulic characteristics of a flooding source, and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). The LOMR officially revises the FIRM or Flood Boundary and FBFM, and sometimes the Flood Insurance Study (FIS) report, and when appropriate, includes a description of the modifications (FEMA Web site: [www.fema.gov/plan/prevent/floodplain/nfipkeywords/lomr.shtm](http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/lomr.shtm)).