# FINAL
# TRAFFIC NOISE TECHNICAL MEMORANDUM

**For**

**ADMINISTRATIVE ACTION**
**ENVIRONMENTAL IMPACT STATEMENT**

**Gaston East-West Connector**
**Gaston and Mecklenburg Counties**

STIP Project No. U-3321
State Project No. 8.2812501
Federal Aid Project No. STP-1213(6)

**Prepared for:**

NORTH CAROLINA Turnpike Authority

**Prepared by:**

PBSJ

1616 East Millbrook Road
Raleigh, NC 27609

**July 21, 2008**

# TABLE OF CONTENTS

Gaston East-West Connector
Traffic Noise Technical Memorandum
STIP Project No. U-3321
Gaston and Mecklenburg Counties


1.0 Project Description and Background ..... 1

1.1 Proposed Action and Project Purpose ..... 1
1.2 Purpose of This Technical Memorandum ..... 1
1.3 Detailed Study Alternatives ..... 1

2.0 Characteristics of Noise ..... 2

3.0 Noise Abatement Criteria ..... 4

4.0 Analysis Methodology ..... 5

4.1 Measurements of Existing Noise Levels ..... 5
4.2 Procedure for Predicting Future Noise Levels ..... 6

5.0 Existing Noise Environment ..... 8

6.0 Projected Traffic Volumes ..... 10

7.0 Future Traffic Noise Impact Analysis ..... 13

7.1 Noise Contour Model ..... 13
7.2 Potential Noise Impacts to Churches, Schools and Other Special Uses ..... 26
7.2.1 Potential Noise Impacts to Churches ..... 26
7.2.2 Potential Noise Impacts to Schools and Libraries ..... 27
7.2.3 Potential Noise Impacts to Parks and Recreation Areas ..... 27
7.2.4 Potential Noise Impacts to Crowder's Mountain State Park ..... 28
7.3 Detailed Noise Modeling ..... 29

8.0 Noise Abatement Measures ..... 29

8.1 Highway Alignment Selection ..... 30
8.2 Traffic System Management Measures ..... 30
8.3 Vegetative Screening and Property Acquisition ..... 30
8.4 Noise Barriers ..... 31
8.4.1 Barrier Evaluation Areas ..... 31
8.4.2 Noise Barriers by Alternative ..... 51

9.0 Construction Noise ..... 57

10.0 Summary ..... 58

11.0 References ..... 60

# TABLE OF CONTENTS

Gaston East-West Connector
Traffic Noise Technical Memorandum
STIP Project No. U-3321
Gaston and Mecklenburg Counties

## LIST OF TABLES


1. Detailed Study Alternatives ..... 2
2. Typical Noise Sources ..... 3
3. FHWA Noise Abatement Criteria ..... 4
4. NCDOT Definition of Substantial Increase in Noise Levels ..... 5
5. Existing Noise Measurements ..... 8

6a. Projected Traffic Volumes Along Mainline ..... 11
   a. Alternative 4
   b. Alternative 64
   c. Alternative 77

7a-l. Noise Contours and Impact Summary ..... 14
   a. Alternative 4
   b. Alternative 5
   c. Alternative 9
   d. Alternative 22
   e. Alternative 23
   f. Alternative 27
   g. Alternative 58
   h. Alternative 64
   i. Alternative 68
   j. Alternative 76
   k. Alternative 77
   l. Alternative 81

8. Summary of Feasible and Reasonable Noise Barriers ..... 33

9. Barriers by Alternative ..... 51
   a. Alternative 4
   b. Alternative 5
   c. Alternative 9
   d. Alternative 22
   e. Alternative 23
   f. Alternative 27
   g. Alternative 58
   h. Alternative 64
   i. Alternative 68
   j. Alternative 76
   k. Alternative 77
   l. Alternative 81

# TABLE OF CONTENTS

Gaston East-West Connector
Traffic Noise Technical Memorandum
STIP Project No. U-3321
Gaston and Mecklenburg Counties

## LIST OF FIGURES
## (Figures Follow Text)


Figure 1. Project Location
Figure 2. Recommended Detailed Study Alternatives
Figure 3. Noise Measurement Locations and Barrier Evaluation Areas
Figure 4-1 thru 35 2030 Noise Contours and Sensitive Receptor Locations
Figure 5. Feasible and Reasonable Noise Barriers
Figure 6. Barrier Evaluation Area – Barrier 1-1
Figure 7. Barrier Evaluation Area – Barrier 2-1
Figure 8. Barrier Evaluation Area – Barrier 3-1
Figure 9. Barrier Evaluation Area – Barrier 4-1
Figure 10. Barrier Evaluation Area – Barrier 6-1
Figure 11. Barrier Evaluation Area – Barrier 7-1
Figure 12. Barrier Evaluation Area - Barrier 8-1
Figure 13. Barrier Evaluation Area – Barriers 9-1
Figure 14. Barrier Evaluation Area – Barrier 11-1
Figure 15. Barrier Evaluation Area – Barriers 12-1 & 12-2
Figure 16. Barrier Evaluation Area – Barrier 14-1
Figure 17. Barrier Evaluation Area – Barrier 15-1
Figure 18a. Barrier Evaluation Area – Barrier 17-1
Figure 18b. Barrier Evaluation Area – Barrier 17-2
Figure 18c. Barrier Evaluation Area – Barrier 17-3
Figure 18d. Barrier Evaluation Area – Barrier 17-4
Figure 19. Barrier Evaluation Area – Barrier 19-1
Figure 20. Barrier Evaluation Area – Barrier 25-1
Figure 21a. Barrier Evaluation Area – Barriers 28-1
Figure 21b. Barrier Evaluation Area – Barrier 28-2
Figure 21c. Barrier Evaluation Area – Barrier 28-3
Figure 22a. Barrier Evaluation Area – Barrier 29-1 KX1
Figure 22b. Barrier Evaluation Area – Barrier 29-1 K3A
Figure 22c. Barrier Evaluation Area – Barrier 29-2
Figure 23. Barrier Evaluation Area – Barrier 30-1
Figure 24. Barrier Evaluation Area – Barrier 33-1

# TABLE OF CONTENTS

Gaston East-West Connector
Traffic Noise Technical Memorandum
STIP Project No. U-3321
Gaston and Mecklenburg Counties

## APPENDICES


Appendix A. Master List of Modeled Receptors
Appendix B. Traffic Forecasts and Peak Hour Traffic Volumes Used in TNM®
Appendix C. Existing Noise Measurement Data Forms
Appendix D. Existing Noise Measurements – Noise Meter Printouts
Appendix E Noise Contours
1. Summary Spreadsheets
2. TNM® Files (CD only)
Appendix F. Barrier Evaluation Area Runs
1. Summary Spreadsheets
2. TNM® Files (CD only)
3. Planimetric Map for Each BEA (CD only)
Appendix G. Berewick District Park Master Plan
Crowders Mountain State Park – Park Map

# 1 PROJECT DESCRIPTION AND BACKGROUND

## 1.1 PROPOSED ACTION AND PROJECT PURPOSE

The North Carolina Turnpike Authority (NCTA) proposes to improve east-west travel between I-85 west of Gastonia in Gaston County and I-485/NC 160 in Mecklenburg County. The Gaston East-West Connector, a candidate toll project, is designated as STIP Project No. U-3321 in the NCDOT's *2009-2015 State Transportation Improvement Program* (STIP). **Figure 1** shows the general project location.

The purpose of the proposed action is to improve east-west transportation mobility in the area around the City of Gastonia, between Gastonia and the Charlotte metropolitan area, and particularly to establish direct access between the rapidly growing areas of southeast Gaston County and west Mecklenburg County.

The proposed project would be a new location controlled-access toll facility.

## 1.2 PURPOSE OF THIS TECHNICAL MEMORANDUM

The purpose of this memorandum is to present an analysis of the traffic noise impacts predicted to occur in 2030 along the proposed Detailed Study Alternatives for the Gaston East-West Connector. The analysis is based on the Preliminary Roadway Design Plans (January 2008). Completion and approval of the Final Roadway Design Plans may require modifications to the roadway alignments or locations of cut and fill slopes which may, in turn, require changes to the noise walls presented in this report. Updates to traffic projections may also change the results described in this report.

## 1.3 DETAILED STUDY ALTERNATIVES

There are twelve new location Detailed Study Alternatives (DSA) under consideration for the proposed project. The corridor segments comprising these twelve DSAs are shown in **Table 1** and **Figure 2**. Generally, there are two to four corridor options at any one location. Combinations of these options add up to the twelve DSAs. These DSAs are being studied as candidate toll facilities only.

**Table 1. Corridor Segments Comprising Each Detailed Study Alternative**

| Detailed Study Alternative # | West Area - generally west of US 321 | Central Area – Generally east of US 321 and west of NC 279 or the South Fork Catawba River | East Area – generally east of NC 279 or the South Fork Catawba River |
|---|---|---|---|
| | H Segments | J Segments | K Segments |
| 4 | H2A-H3 | J4a-J4b-J2c-J2d-J5a-J5b | K2A-KX1-K3B-K3C |
| 5 | H2A-H3 | J4a-J2b-J2c-J2d-JX4-J1e-J1f | K1A-K1B-K1C-K4A |
| 9 | H2A-H3 | J4a-J2b-J2c-J2d-JX4-J1e-J1f | K1A-K3A-K3B-K3C |
| 22 | H2A-H2B-H2C | J3-J2c-J2d-J5a-J5b | K2A-KX1-K3B-K3C |
| 23 | H2A-H2B-H2C | J3-J2c-J2d-JX4-JIe-J1f | K1A-K1B-K1C-K4A |
| 27 | H2A-H2B-H2C | J3-J2c-J2d-JX4-JIe-J1f | K1A-K3A-K3B-K3C |
| 58 | H1A-H1B-H1C | J1a-JX1-J2d-J5a-J5b | K2A-KX1-K3B-K3C |
| 64 | H1A-H1B-H1C | J1a-J1b-J1c-J1d-J1e-J1f | K1A-K1B-K1C-K4A |
| 68 | H1A-H1B-H1C | J1a-J1b-J1c-J1d-J1e-J1f | K1A-K3A-K3B-K3C |
| 76 | H1A-HX2 | J2a-J2b-J2c-J2d-J5a-J5b | K2A-KX1-K3B-K3C |
| 77 | H1A-HX2 | J2a-J2b-J2c-J2d-JX4-J1e-J1f | K1A-K1B-K1C-K4A |
| 81 | H1A-HX2 | J2a-J2b-J2c-J2d-JX4-J1e-J1f | K1A-K3A-K3B-K3C |

See **Figure 2** for a map of the Detailed Study Alternatives and their corridor segments.

# 2 CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It can be emitted from numerous sources, including airplanes, factories, railroads, power generation plants, trucks, and automobiles. Automobile noise is usually comprised of noises from engine exhaust, drive train, and tire/roadway interaction.

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly from object to object, a logarithmic scale is used to relate sound pressures to a common reference level, usually the decibel (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency weighted scales (A, B, C, or D).

The A-weighted decibel scale is used almost exclusively when measuring vehicle noise because it places a stronger emphasis on the frequency range to which the human ear is most sensitive (1,000 to 6,000 Hertz). Sound levels that are measured using the A-weighed decibel scale are often expressed as dBA. Throughout this noise report, all noise levels will be expressed in dBAs. Several examples of noise pressure levels in dBA are listed in **Table 2.**

The hourly Leq(h), or equivalent sound level, is the level of constant sound that over an hour time interval would contain the same acoustic energy as the time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

A review of **Table 2** indicates that most individuals in urbanized areas are exposed to fairly high noise levels from different sources as they go about their daily activities. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

1.) The amount and nature of the intruding noise.
2.) The relationship between background noise and the intruding noise.
3.) The type of activity occurring when the noise is heard.

**Table 2. Typical Noise Sources**

| Noise Level (dBA) | Description | Transportation Sources | Other Sources |
|---|---|---|---|
| 130 | Painfully loud | | |
| 120 | | Jet takeoff (200 feet) | |
| 110 | Maximum vocal effort | Car horn (3 feet) | |
| 100 | | | Shout (.5 feet) |
| 90 | Very annoying; loss of hearing with prolonged exposure | Heavy truck (50 feet) | Jack hammer (50 feet)<br>Home shop tools (3 feet) |
| 85 | | Freight train on a structure (50 feet) | Backhoe (50 feet) |
| 80 | Annoying | City bus (50 feet) | Bulldozer (50 feet)<br>Vacuum cleaner (3 feet) |
| 75 | | Freight train (50 feet)<br>City bus at stop (50 feet) | Blender (3 feet) |
| 70 | | Freeway traffic (50 feet) | Lawn mower (50 feet)<br>Large office |
| 65 | Intrusive | Freight train in station (50 feet) | Washing machine (3 feet) |
| 60 | | | TV (10 feet) |
| 55 | | Light traffic (50 feet) | Talking (10 feet) |
| 50 | Quiet | Light traffic (100 feet) | |
| 45 | | | Refrigerator (3 feet) |
| 40 | | | Library |
| 30 | Very quiet | | Soft whisper (15 feet) |

Sources: FTA, 1995; U.S. EPA, 1971; U.S. EPA, 1974.

In considering the first of these three factors, it is important to note that individuals have different sensitivities to noise. Loud noises bother some more than others and some individuals become upset if an unwanted noise persists. The time patterns of noise also enter into an individual's judgment of whether or not a noise is offensive. For example, noises that occur during sleeping hours are usually considered to be more offensive than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). The honking of a car horn at night (when background noise levels are approximately 45 dBA) would generally be more objectionable than the honking of a car horn during the daytime when background noises might be 55 dBA.

The third factor is related to the interference of noise with activities of individuals. In a 60 dBA environment, normal conversation would be possible, while sleep might be difficult. Work activities requiring high levels of concentration may be interrupted by loud noises, while activities requiring manual effort may not be interrupted to the same degree.

Over time, individuals tend to accept the noises which intrude into their daily lives, particularly if the noises are steady or occur at regular known intervals. Many of these noises are subject to regulations, including airplane noise, factory noise, railroad noise, and highway traffic noise.

# 3 NOISE ABATEMENT CRITERIA

In order to determine whether highway noise levels are or are not compatible with surrounding land uses, the Federal Highway Administration (FHWA) has developed noise abatement criteria (NAC) and procedures to be used in the planning and design of highways. These NAC and procedures are in accordance with Title 23 of the Code of Federal Regulations (CFR), Part 772, US Department of Transportation, FHWA, Procedures for Abatement of Highway Traffic Noise and Construction Noise. A summary of the FHWA NAC for various land uses is presented in **Table 3**.

**Table 3. FHWA 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, 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. |

Noise mitigation measures must be considered when future noise levels either approach or exceed the criteria levels, or if there are substantial increases over the ambient noise levels. NCDOT definitions for "substantial increases" are presented in **Table 4**. 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." For this project, identified receptors were commercial uses, residences, churches, and recreation areas.

**Table 4. 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: NCDOT Traffic Noise Abatement Policy, 2004.

# 4 ANALYSIS METHODOLOGY

## 4.1 MEASUREMENTS OF EXISTING NOISE LEVELS

Noise level measurements were taken in the vicinity of the project to determine the typical existing background (ambient) noise levels and to provide a basis for assessing the impacts of future traffic noise levels. Ambient noise levels are defined as "the composite of airborne sound from many sources near and far associated within a given environment. No particular sound is singled out for interest" (American Society for Testing and Materials [ASTM] Standard C634-89).

Existing noise measurements were conducted following the guidance contained in FHWA's publication "Highway Traffic Noise Analysis and Abatement: Policy and Guidance" (June 1995) (available at http://www.fhwa.dot.gov/environment/noise/polguide/polguid.pdf).

Existing noise measurements were performed in the project study area at twenty-two representative locations in the vicinity of the Detailed Study Alternatives. Existing noise measurement locations are shown in **Figure 3a-b**. Seven measurement locations were adjacent to roadways and fifteen locations were in areas away from direct traffic noise sources.

Noise measurements were performed on average for 15-20 minute periods using a CEL 430 (Type I) sound level meter during approximate peak travel periods (7:30- 9:30 am and 3:30- 6:30 pm). The sound level meter microphone was placed approximately 5 feet above the ground. The meter was calibrated before and after each day of the noise level survey. Where a roadway was adjacent to the

field measurement site, traffic volumes and traffic mixes (numbers of cars, medium-sized trucks, and large trucks) also were recorded.

## 4.2 PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

In general, the traffic situation is composed of a large number of variables, including vehicles driving at different speeds through a continually changing highway configuration and surrounding terrain. Due to the complexity of the problem, certain assumptions and simplifications must be made to predict highway traffic noise. The model used to predict future noise levels was the FHWA's Traffic Noise Model® (TNM), Version 2.5, released 2004.

TNM® calculates noise levels at selected receptor locations using input parameter estimates such as projected hourly average 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. All data was input to the model in English units.

This analysis used a two-step approach to estimate noise levels and to minimize the numbers of receptors to be modeled with a detailed three-dimensional TNM® model in the second step. The first step used the TNM® model to develop noise contours and to identify the sensitive receptors potentially impacted by the proposed Detailed Study Corridors. The basic approach was to select receptor locations at various distances from the proposed alternatives to estimate future noise levels, then to determine the distances at which the predicted peak hour noise levels would be at 60 dBA Leq (would represent a substantial increase for receptors with existing noise levels of 45 dBA Leq), or approaching 67 dBA Leq and 72 dBA Leq. Activity Category B (which includes residences, churches, libraries, etc.) has a noise abatement criterion of 67 dBA Leq and Activity Category C (which includes businesses) has a noise abatement criterion of 72 dBA Leq. Terrain features and shielding were not included in these model runs. The noise contours represent worst-case noise levels valid only for preliminary identification of receptors potentially impacted by future traffic noise.

The noise contours were overlaid onto base mapping, and sensitive receptors within the contours were identified and numbered. Sensitive receptors generally west of Crowders Creek have labels beginning with "W". Sensitive receptors generally between Crowders Creek and Rufus Ratchford Road have labels beginning with "M", and sensitive receptors generally east of Rufus Ratchford Road have labels beginning with "E". There were 1,118 unique receptors identified. **Appendix A** is a master list of the receptors, receptor types, addresses, and parcel PIN numbers.

For all of these receptors described above, predicted noise levels were computed using a spreadsheet (designated by NCDOT as "Table N4") developed by NCDOT for this purpose based on the results of the noise contour TNM® runs.

In the second step, the TNM® model was used to perform more detailed analyses in areas where approximately three or more receptors were identified as being potentially impacted. In these barrier evaluation areas (BEAs), a three-dimensional TNM® model was developed. For receptors that would be impacted, noise barriers were developed. These barriers were then evaluated based on the NCDOT Traffic Noise Abatement Policy, 2004 (NCDOT Noise Policy) to determine if they would be feasible and reasonable. Feasibility and reasonableness determinations presented in this summary are preliminary. Feasibility and reasonableness of potential barriers will be reassessed during final design.

The following data and assumptions were used in the TNM® computer model.

**Roadways**. The profiles and horizontal alignments of the preliminary engineering designs within the Detailed Study Alternatives were included in the TNM® model. The typical roadway section used for analysis included a six-lane divided highway with 12-foot shoulders and a 46-foot wide median. Completion and approval of the Final Roadway Design Plans may include modifications to the roadway alignments and/or locations of cut and fill slopes.

**Traffic**. Future traffic projections for the Detailed Study Alternatives were prepared by Martin/Alexiou/Bryson for the NC Turnpike Authority. **Appendix B** includes the traffic projections, which assume the new roadway is a toll facility. Traffic forecasts were prepared for three representative DSAs: DSAs 4, 64, and 77. Traffic projections for the other DSAs were a mix of segments of these three representative DSAs (See Chapter 6). Speeds were assumed to be 65 miles per hour (mph) for the DSA mainlines, 45 mph for ramps, 55 mph for major cross streets, and 45 mph for minor cross streets.

Peak hour traffic volumes are estimated to be 10 to 11 percent of the daily volumes. In accordance with NCDOT Congestion Management Unit standard practice, peak hour traffic mixes are assumed to include one-half the truck percentages estimated for the daily traffic mixes. For example, if the traffic forecast estimated 25,000 ADT with a mix of 92 percent cars, 2 percent medium trucks and 6 percent heavy trucks, the peak hour volumes would be 2,500 vehicles per hour with 96 percent cars, 1 percent medium trucks, and 3 percent heavy trucks.

The NCTA is evaluating different options available for toll collection, but none include cash lanes. An open road (highway speed) transponder-based system will likely be used as the primary means of collection. This would allow drivers to open an account and drive through the toll collection points unobstructed at highway speeds. Therefore, no adjustments to traffic speeds or other traffic factors (other than projected volumes) were made due to the project being a toll facility.

**Receptors**. Receptors modeled in this study represent residences, businesses, churches, and recreation areas. Receptors generally were located at building/house corners or areas of the lots that were closest to the proposed roadway. Receptor elevations were input as 5 feet above the ground elevation. Existing noise-sensitive receptors or noise-sensitive receptors under construction at the time of this analysis were included. In addition, residential subdivisions that have been platted and shown in the Gaston County GIS databases were included, as they were assumed to be constructed prior to the Date of Public Knowledge (Note: there were no situations like this in Mecklenburg County). Receptors on undeveloped, platted lots are noted as such where applicable. Existing noise levels were individually assigned to each receptor using the results of the existing noise measurements in the locations most similar in land use type and nearby noise sources.

**Barriers**. Within the noise mitigation study area models, terrain features such as hills, fill slopes, and cut slopes were input, where appropriate, to model actual conditions as closely as possible.

# 5 EXISTING NOISE ENVIRONMENT

Noise levels were measured at eight locations on October 16, 2007, four locations on October 17, 2007, four locations on October 29, 2007, and six locations on October 30, 2007. The sampling period at each location was 15-20 minutes. Noise measurement data sheets were completed at each existing noise level measurement location. **Appendix D** contains the *Noise Measurement Data Sheets* with the collected field survey information.

Existing noise level measurements were downloaded from the noise level meter into the supporting dB30 software, then imported into an excel spreadsheet. **Appendix C** contains data downloaded from the noise level meter/dB30 software.

**Table 5** shows the results of the noise measurements at each of the locations shown on **Figures 3a and 3b.**

At locations where traffic noise did not dominate the noise environment, the existing noise levels ranged from 38.7 dBA Leq to 56.1 dBA Leq. In the seven locations near roadways, noise levels ranged from 50.6 dBA Leq to 66.9 dBA Leq.

**Table 5. Existing Noise Level Measurements**

| Site Number | Date and Time | Location | Description | Measured Avg. Noise Level (dBA Leq) |
|---|---|---|---|---|
| **Mecklenburg County** | | | | |
| 1 | 10/16/07 7:49 - 8:09 am | Buckland Road Area (west of I-485 and off of Dixie River Road (SR 1155)); includes homes along Buckland Road. | Measurement of background noise levels away from traffic. | 47.5 |
| 2 | 10/16/07 8:28 - 8:45 am | Garrison Road Area (west of I-485 and east of Dixie River Road (SR 1155)); includes homes along Garrison Road. | Measurement of background noise levels away from traffic. | 49.8 |
| **Gaston County** | | | | |
| 3 | 10/16/07 9:20 - 9:35 am | Brook Forest Neighborhood (neighborhood located off of Southpoint Road (NC 273)); neighborhood streets include Brook Forest Drive, Forest Lane, and Singing Brook Trail. | Measurement of background noise levels away from traffic. | 41.3 |
| 4 | 10/16/07 3:06 - 3:23 pm | Area off Wildlife Road (community east of Armstrong Road (NC 273)); neighborhood streets include Midwood Lane, Wildlife Road (SR 2527), and Idlewood Lane. | Measurement of background noise levels away from traffic. | 44.7 |

**Table 5. Existing Noise Level Measurements**

| Site Number | Date and Time | Location | Description | Measured Avg. Noise Level (dBA Leq) |
|---|---|---|---|---|
| 5 | 10/16/07 3:37 - 3:57 pm | Misty Waters Neighborhood (east of and/or homes on the Catawba River and west of Southpoint Road (SR 2525); streets within the neighborhood include Wing Point Drive, Shorewood Place, and Egret Ridge. | Measurement of background noise levels away from traffic. | 41.8 |
| 6 | 10/16/07 4:22 - 4:22 pm | Along New Hope Road (NC 279) between Teakwood Lane and Dixon Road near Daniel Stowe Botanical Garden. | 50 ft. from road – measurement of traffic noise on New Hope Road (NC 279). | 60.4 |
| 7 | 10/16/07 4:59 - 5:14 pm | Farmwood Neighborhood (between Union New Hope Road (SR 2435) and New Hope Road (NC 279); neighborhood streets include Hughey Drive; Lakhany Drive, and Ogden Drive). | Measurement of background noise levels away from traffic. | 40.9 |
| 8 | 10/16/07 5:26 - 5:46 pm | Vacant/Undeveloped Area on Union New Hope Road (SR 2435) between Glover Road and Rufus Ratchford Road (SR 2432). | 50 ft. from road – measurement of traffic noise on Union New Hope Road (SR 2435). | 58.6 |
| 9 | 10/17/07 7:58 - 8:18 am | Union Road Branch Library fronted by Union Road (NC 274) and accessed by Double Oaks Road. | 50 ft. from road – measurement of traffic noise on Union Road. | 66.9 |
| 10 | 10/17/07 8:32 - 8:47 am | Fox Run/Governor's Square Community (west of Union Road (NC 274) south of Gastonia Municipal Airport; neighborhood streets include Coachwood Lane, and Knightwood Drive. | Measurement of background noise levels away from traffic. | 46.0 |
| 11 | 10/17/07 8:54 - 9:14 am | Along Bud Wilson Road (SR 2423) south/off of Union Road (NC 274) and Wilmot Trail. | 50 ft. from road – measurement of traffic noise on Bud Wilson Road. | 51.9 |
| 12 | 10/17/07 9:27 - 9:42 am | Saddlewood Neighborhood (west of and off of Robinson Road (SR 2416); neighborhood streets include Saddlewood Drive, Pam Drive, and Stockwood Drive. | Measurement of background noise levels away from traffic. | 45.0 |
| 13 | 10/29/07 7:55 - 8:15 am | Along US 321 just south of Crowder's Creek Road (SR 1103) at Hoyle Circle. | 50 ft. from road – measurement of traffic noise on US 321. | 63.5 |
| 14 | 10/29/07 8:26 - 8:41am | Bethany Acres Mobile Home Park; major streets nearby include Crowder's Creek Road (SR 1103) and Chapel Grove School Road; neighborhood streets include Queensberry Drive and Showshoe Court. | Measurement of background noise levels away from traffic. | 50.1 |

**Table 5. Existing Noise Level Measurements**

| Site Number | Date and Time | Location | Description | Measured Avg. Noise Level (dBA Leq) |
|---|---|---|---|---|
| 15 | 10/29/07 8:53 - 9:10 am | Binwhe Community (Oakley Park) west of/off of Freedom Mill Road (SR 1106); neighborhood streets include Bimwhe Lane, King Crowder Drive, and Tekoa Drive. | Measurement of background noise levels away from traffic. | 38.7 |
| 16 | 10/29/07 9:21 - 9:36 am | West Palm Acres east of/off of Freedom Mill Road (SR 1106); neighborhood streets include Ralphs Boulevard, Branding Iron Drive, and Buckskin Drive. | Measurement of background noise levels away from traffic. | 44.4 |
| 17 | 10/30/07 7:56 - 8:16 am | Along Linwood Road (SR 1133) between Silver Creek Drive and Silverstone Drive west of Chapel Grove Road (SR 1126). | 50 ft. from road – measurement of traffic noise on Linwood Road (SR 1133). | 50.6 |
| 18 | 10/30/07 8:33 -8:49 am | Near Forest Heights Elementary School and Linwood Springs Golf Course west of Myrtle School Road (SR 1136) and off of Linwood Road (SR 1133). | Measurement of background noise levels away from traffic. | 56.1 |
| 19 | 10/30/07 9:05 – 9:27 am | Fallscrest Neighborhood west of/off of Chapel Grove Road (SR 1131); neighborhood streets include Maplewood Drive, Woodleaf Drive, and Greenleaf Drive. | Measurement of background noise levels away from traffic. | 45.0 |
| 20 | 10/30/07 3:33 - 3:52 pm | School off of US 29-74 (Dr. Edward Sadler Jr. Elementary) west of Edgewood Road (SR 1307). | Measurement of background noise levels away from traffic. | 47.5 |
| 21 | 10/30/07 4:04 - 4:24 pm | Along US 29-74 (Franklin Boulevard) west of Shannon Bradley Road (SR 1135) and east of Sante Circle. | 50 ft. from road – measurement of traffic noise on US 29-74. | 66.5 |
| 22 | 10/30/07 4:40 - 4:56 pm | Minority/Low-income neighborhood north of US 29-74 east of/off Shannon Bradley Road (SR 1135); Spring Valley Apartments; streets include Spring Valley Drive and Winston Drive. | Measurement of background noise levels away from traffic. | 43.5 |

Note: All measurements taken with a CEL 430 (Type I) sound level meter, which was calibrated before and after the survey.

# 6 PROJECTED TRAFFIC VOLUMES

As mentioned in **Section 4.2**, projected 2030 traffic volumes for representative DSAs 4, 64, and 77 were prepared by Martin/Alexiou/Bryson for the NC Turnpike Authority. These forecasts, which include ADTs, peak hour factors, traffic mixes, and peak hour directional distribution, are included in **Appendix B**. DSAs 4, 64, and 77 are representative of the twelve DSAs.

The forecasts were used to develop peak hour traffic volumes for the TNM® input files. The peak hour traffic volumes between interchanges along the Gaston East-West Connector mainlines are shown in **Table 6a** for DSA 4, **Table 6b** for DSA 64, and **Table 6c** for DSA 77. The other DSAs applicable to each segment are also listed in each table. **Appendix B** includes a complete listing of the peak hour traffic volumes for the mainline segments, cross-street segments, and ramps used in the various TNM® models developed for this project.

**Table 6a. Projected Traffic Volumes Along Mainline - Detailed Study Alternative 4**

| Mainline Segment | Average Daily Traffic Volume | Traffic Mix[1] | Peak Hour Volumes[2] | | | Other Applicable DSAs |
|---|---|---|---|---|---|---|
| | | | Cars | Medium Trucks | Heavy Trucks | |
| I-85 to US 29/74 | 12,800 | 95/1.5/3.5 | 730<br>486 | 12<br>8 | 27<br>18 | 5,9,22,23,27 |
| US 29/74 to Linwood Rd | 20,800 | 95/1.5/3.5 | 1,186<br>790 | 19<br>12 | 44<br>29 | 5,9,22,23,27 |
| Linwood Rd to US 321 | 15,400 | 94.5/1.5/4 | 873<br>582 | 14<br>9 | 37<br>25 | 5,9,22,23,27 |
| US 321 to Robinson Rd | 20,000 | 94.5/1.5/4 | 1,134<br>756 | 18<br>12 | 48<br>32 | 5,9,22,23,27 |
| Robinson Rd to Bud Wilson Rd | 29,200 | 95.5/1/3.5 | 1,673<br>1,115 | 18<br>12 | 61<br>41 | 22,27,58,76,81 |
| Bud Wilson Rd to NC 274 (Union Rd) | 28,000 | 95/1.5/3.5 | 1,596<br>1,064 | 25<br>17 | 59<br>39 | 22,27,58,76,81 |
| NC 274 to NC 279 (S. New Hope Rd) | 31,600 | 95/1.5/3.5 | 1,801<br>1,201 | 28<br>19 | 66<br>44 | 22,27,58,76,81 |
| NC 279 to NC 273 (Southpoint Rd) | 42,200 | 96/1/3 | 2,431<br>1,620 | 25<br>17 | 76<br>51 | 22,27,58,68,76,81 |
| NC 273 to Dixie River Rd | 58,400 | 96/1/3 | 3,364<br>2,243 | 35<br>23 | 105<br>70 | 9,22,27,58, 68,76,81 |
| Dixie River Rd to I-485 | 55,400 | 96/1/3 | 3,191<br>2,127 | 33<br>22 | 100<br>66 | 9,22,27,58, 68,76,81 |
| East of I-485 | 36,400 | 95.5/1.5/3 | 2,086<br>1,390 | 33<br>22 | 66<br>44 | 9,22,27,58, 68,76,81 |

1. Traffic mix is percent cars/medium trucks/heavy trucks. The percentages medium trucks and heavy trucks during the peak hours are assumed to be half of what they are projected on a daily basis.
2. Peak hour volumes are provided for each direction of travel, with the heavier volume direction provided first. The directional split is 60%/40% during the peak hours. The heaviest volumes are eastbound in the morning and westbound in the evening.

**Table 6b. Projected Traffic Volumes Along Mainline - Detailed Study Alternative 64**

| Mainline Segment | Average Daily Traffic Volume | Traffic Mix[1] | Peak Hour Volumes[2] | | | Other Applicable DSAs |
|---|---|---|---|---|---|---|
| | | | Cars | Medium Trucks | Heavy Trucks | |
| I-85 to US 29/74 | 10,000 | 94.0/1.5/4.5 | 564<br>376 | 9<br>6 | 27<br>18 | 58,68 |
| US 29/74 to Linwood Rd | 11,400 | 94.5/1.5/4 | 646<br>431 | 10<br>7 | 27<br>18 | 58,68 |
| Linwood Rd to Lewis Rd | 9,600 | 94.5/1.5/4 | 544<br>363 | 9<br>6 | 23<br>15 | 58,68 |
| Lewis Rd to US 321 | 14,200 | 94.0/1.5/4.5 | 801<br>534 | 13<br>9 | 38<br>26 | 58,68 |
| US 321 to Robinson Rd | 18,800 | 94.5/1.5/4 | 1,066<br>711 | 17<br>11 | 45<br>30 | 58,68 |
| Robinson Rd to Bud Wilson Rd | 29,400 | 95/1.5/3.5 | 1,676<br>1,117 | 26<br>18 | 62<br>41 | 27,68 |
| Bud Wilson Rd to NC 274 (Union Rd) | 28,600 | 94.5/1.5/4 | 1,622<br>1,081 | 26<br>17 | 69<br>46 | 27,68 |
| NC 274 to NC 279 (S. New Hope Rd) | 35,000 | 95.5/1/3.5 | 2,006<br>1,337 | 21<br>14 | 74<br>49 | 68 |
| NC 279 to NC 273 (Southpoint Rd) | 44,200 | 96/1/3 | 2,546<br>1,697 | 27<br>18 | 80<br>53 | -- |
| NC 273 to Dixie River Rd | 61,800 | 96/1/3 | 3,560<br>2,373 | 37<br>25 | 111<br>74 | -- |
| Dixie River Rd to I-485 | 54,400 | 96/1/3 | 3,133<br>2,089 | 33<br>22 | 98<br>65 | -- |
| East of I-485 | 37,200 | 95.5/1.5/3 | 2,132<br>1,421 | 33<br>22 | 67<br>45 | -- |

1. Traffic mix is percent cars/medium trucks/heavy trucks. The percentages medium trucks and heavy trucks during the peak hours are assumed to be half of what they are projected on a daily basis.
2. Peak hour volumes are provided for each direction of travel, with the heavier volume direction provided first. The directional split is 60%/40% during the peak hours. The heaviest volumes are eastbound in the morning and westbound in the evening.

**Table 6c. Projected Traffic Volumes Along Mainline - Detailed Study Alternative 77**

| Mainline Segment | Average Daily Traffic Volume | Traffic Mix[1] | Peak Hour Volumes[2] | | | Other Applicable DSAs |
|---|---|---|---|---|---|---|
| | | | Cars | Medium Trucks | Heavy Trucks | |
| I-85 to US 29/74 | 12,200 | 94.5/1.5/4 | 692<br>461 | 11<br>7 | 29<br>20 | 76,81 |
| US 29/74 to Linwood Rd | 18,000 | 94.5/1.5/4 | 1,021<br>680 | 16<br>11 | 43<br>29 | 76,81 |
| Linwood Rd to US 321 | 17,400 | 94.5/1.5/4 | 987<br>658 | 16<br>10 | 42<br>28 | 76,81 |
| US 321 to Robinson Rd | 21,400 | 94.5/1.5/4 | 1,213<br>809 | 18<br>12 | 49<br>32 | 76,81 |
| Robinson Rd to Bud Wilson Rd | 30,400 | 95/1.5/3.5 | 1,733<br>1,155 | 27<br>18 | 64<br>43 | 5,9,23 |
| Bud Wilson Rd to NC 274 (Union Rd) | 28,200 | 94.5/1.5/4 | 1,599<br>1,066 | 25<br>17 | 68<br>45 | 5,9,23 |
| NC 274 to NC 279 (S. New Hope Rd) | 34,800 | 95/1.5/3.5 | 1,984<br>1,322 | 31<br>21 | 73<br>49 | 5,9,23 |
| NC 279 to NC 273 (Southpoint Rd) | 43,400 | 96/1/3 | 2,500<br>1,667 | 26<br>17 | 78<br>52 | 5,9,23 |
| NC 273 to Dixie River Rd | 60,600 | 96/1/3 | 3,491<br>2,327 | 36<br>24 | 109<br>73 | 5,23 |
| Dixie River Rd to I-485 | 53,000 | 96/1/3 | 3,053<br>2,035 | 32<br>21 | 95<br>64 | 5,23 |
| East of I-485 | 36,400 | 95.5/1.5/3 | 2,086<br>1,390 | 33<br>22 | 66<br>44 | 5,23 |

1. Traffic mix is percent cars/medium trucks/heavy trucks. The percentages medium trucks and heavy trucks during the peak hours are assumed to be half of what they are projected on a daily basis.
2. Peak hour volumes are provided for each direction of travel, with the heavier volume direction provided first. The directional split is 60%/40% during the peak hours. The heaviest volumes are eastbound in the morning and westbound in the evening.

# 7 FUTURE TRAFFIC NOISE IMPACT ANALYSIS

## 7.1 NOISE CONTOUR MODEL

Traffic noise impacts occur when the predicted noise levels either: [a] approach or exceed the FHWA NAC (within "approach" meaning within 1 dBA of the **Table 3** value), or [b] substantially exceed the existing noise levels (see **Table 4** for NCDOT definition of "substantial increase"). Consideration for noise abatement measures must be given to receptors that fall in either category.

In accordance with NCDOT Traffic Noise Abatement Policy, the Federal/State government is no longer 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". The "Date of Public Knowledge" of the location of the proposed highway will be the approval date of the Record of Decision (ROD) (NCDOT, 2004). For development occurring after this Date of Public

Knowledge, local governing bodies are responsible to insure that noise compatible designs are utilized along the proposed route.

The maximum numbers of receptors in each activity category by roadway section predicted to be impacted by future 2030 traffic noise are shown for each DSA in **Tables 7a through 7l**. **Appendix E** includes the summary spreadsheets and TNM® input/output files for each noise contour model.

The total maximum numbers of receptors predicted to be impacted by DSAs associated with the Gaston East-West Connector range from 196 impacted Category B receptors for DSA 68, to 301 impacted Category B receptors for DSA 76. Category B receptors in the project area are mostly residential, with some churches. Few businesses are impacted by noise along the DSAs, with the numbers of impacts ranging from 3 businesses for DSA 77 to 10 businesses for DSA 22. Impacted receptors are noted in terms of those receptors expected to experience traffic noise impacts either by approaching or exceeding the FHWA NAC, or by a substantial increase in exterior noise levels.

**Table 7a. 2030 Noise Contours and Impact Summary – Alternative 4**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 204 | 0 | 31 | 1 | 0 | 0 |
| US 29-74 to Linwood Rd | 75 | 72 | 68 | 135 | 260 | 0 | 11 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 67 | 115 | 235 | 0 | 48 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 26 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 74 | 70 | 175 | 305 | 0 | 6 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 74 | 70 | 175 | 305 | 0 | 15 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 175 | 305 | 0 | 46 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 77 | 75 | 71 | 205 | 335 | 0 | 55 | 1 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 293 | 9 | 0 | 0 |

* Distances are from the roadway centerline.

**Tables 7a through 7l** also show the maximum extent of the 72 and 67 dBA Leq 2030 traffic noise level contours. Distances to these worst-case contour lines are measured from the Gaston East-West Connector centerline. This information should assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within the local jurisdiction. For example, with proper information on noise, the local authorities can prevent further development of incompatible activities and land uses with the predicted noise levels of an adjacent highway. The maximum worst-case contour distances along each Corridor Segment are shown in **Figure 4**.

**Table 7b. 2030 Noise Contours and Impact Summary – Alternative 5**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 204 | 0 | 31 | 1 | 0 | 0 |
| US 29-74 to Linwood Rd | 75 | 72 | 68 | 135 | 260 | 0 | 11 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 67 | 115 | 235 | 0 | 48 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 26 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 73 | 70 | 170 | 300 | 0 | 4 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 73 | 70 | 170 | 300 | 0 | 21 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 6 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 59 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 380 | 0 | 50 | 2 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 240 | 365 | 0 | 7 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 320 | 0 | 4 | 1 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 267 | 4 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7c. 2030 Noise Contours and Impact Summary – Alternative 9**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 204 | 0 | 31 | 1 | 0 | 0 |
| US 29-74 to Linwood Rd | 75 | 72 | 68 | 135 | 260 | 0 | 11 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 67 | 115 | 235 | 0 | 48 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 26 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 73 | 70 | 170 | 300 | 0 | 4 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 73 | 70 | 170 | 300 | 0 | 21 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 6 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 35 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 237 | 8 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7d. 2030 Noise Contours and Impact Summary – Alternative 22**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 204 | 0 | 31 | 1 | 0 | 0 |
| US 29-74 to Linwood Rd | 75 | 72 | 68 | 135 | 260 | 0 | 37 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 67 | 115 | 235 | 0 | 17 | 1 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 26 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 74 | 70 | 175 | 305 | 0 | 6 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 74 | 70 | 175 | 305 | 0 | 15 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 175 | 305 | 0 | 46 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 77 | 75 | 71 | 205 | 335 | 0 | 55 | 1 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 288 | 10 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7e. 2030 Noise Contours and Impact Summary – Alternative 23**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 204 | 0 | 31 | 1 | 0 | 0 |
| US 29-74 to Linwood Rd | 75 | 72 | 68 | 135 | 260 | 0 | 37 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 67 | 115 | 235 | 0 | 17 | 1 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 26 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 73 | 70 | 170 | 300 | 0 | 4 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 73 | 70 | 170 | 300 | 0 | 21 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 6 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 59 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 380 | 0 | 50 | 2 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 240 | 365 | 0 | 7 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 320 | 0 | 4 | 1 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 262 | 5 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7f. 2030 Noise Contours and Impact Summary – Alternative 27**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 204 | 0 | 31 | 1 | 0 | 0 |
| US 29-74 to Linwood Rd | 75 | 72 | 68 | 135 | 260 | 0 | 37 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 67 | 115 | 235 | 0 | 17 | 1 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 26 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 73 | 70 | 170 | 300 | 0 | 4 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 73 | 70 | 170 | 300 | 0 | 21 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 6 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 35 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 232 | 9 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7g. 2030 Noise Contours and Impact Summary – Alternative 58**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 72 | 69 | 66 | 95 | 190 | 0 | 2 | 0 | 0 | 0 |
| US 29-74 to Linwood Rd | 72 | 69 | 66 | 95 | 190 | 0 | 9 | 0 | 0 | 0 |
| Linwood Rd to Lewis Rd | 72 | 69 | 66 | 95 | 190 | 0 | 20 | 1 | 0 | 0 |
| Lewis Rd to US 321 | 75 | 71 | 68 | 130 | 250 | 0 | 38 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 135 | 260 | 0 | 17 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 74 | 70 | 175 | 305 | 0 | 6 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 74 | 70 | 175 | 305 | 0 | 15 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 175 | 305 | 0 | 46 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 77 | 75 | 71 | 205 | 335 | 0 | 55 | 1 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 263 | 9 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7h. 2030 Noise Contours and Impact Summary – Alternative 64**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 72 | 69 | 66 | 95 | 190 | 0 | 2 | 0 | 0 | 0 |
| US 29-74 to Linwood Rd | 72 | 69 | 66 | 95 | 190 | 0 | 9 | 0 | 0 | 0 |
| Linwood Rd to Lewis Rd | 72 | 69 | 66 | 95 | 190 | 0 | 20 | 1 | 0 | 0 |
| Lewis Rd to US 321 | 75 | 71 | 68 | 130 | 250 | 0 | 38 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 71 | 68 | 130 | 250 | 0 | 0 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 76 | 73 | 70 | 165 | 300 | 0 | 9 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 76 | 73 | 70 | 165 | 300 | 0 | 20 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 8 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 210 | 340 | 0 | 60 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 73 | 250 | 385 | 0 | 49 | 3 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 240 | 365 | 0 | 7 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 190 | 320 | 0 | 4 | 1 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 226 | 5 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7i. 2030 Noise Contours and Impact Summary – Alternative 68**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 72 | 69 | 66 | 95 | 190 | 0 | 2 | 0 | 0 | 0 |
| US 29-74 to Linwood Rd | 72 | 69 | 66 | 95 | 190 | 0 | 9 | 0 | 0 | 0 |
| Linwood Rd to Lewis Rd | 72 | 69 | 66 | 95 | 190 | 0 | 20 | 1 | 0 | 0 |
| Lewis Rd to US 321 | 75 | 71 | 68 | 130 | 250 | 0 | 38 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 71 | 68 | 130 | 250 | 0 | 0 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 76 | 73 | 70 | 165 | 300 | 0 | 9 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 76 | 73 | 70 | 165 | 300 | 0 | 20 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 8 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 35 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 196 | 8 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7j. 2030 Noise Contours and Impact Summary – Alternative 76**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 200 | 0 | 2 | 0 | 0 | 0 |
| US 29-74 to Linwood Rd | 74 | 71 | 68 | 125 | 250 | 0 | 14 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 68 | 125 | 250 | 0 | 71 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 140 | 265 | 0 | 37 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 74 | 70 | 175 | 305 | 0 | 6 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 74 | 70 | 175 | 305 | 0 | 15 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 175 | 305 | 0 | 46 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 77 | 75 | 71 | 205 | 335 | 0 | 55 | 1 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 301 | 8 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7k. 2030 Noise Contours and Impact Summary – Alternative 77**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 200 | 0 | 2 | 0 | 0 | 0 |
| US 29-74 to Linwood Rd | 74 | 71 | 68 | 125 | 250 | 0 | 14 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 68 | 125 | 250 | 0 | 71 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 140 | 265 | 0 | 37 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 73 | 70 | 170 | 300 | 0 | 4 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 73 | 70 | 170 | 300 | 0 | 21 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 6 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 59 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 380 | 0 | 50 | 2 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 240 | 365 | 0 | 7 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 320 | 0 | 4 | 1 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 275 | 3 | 0 | 0 |

* Distances are from the roadway centerline.

**Table 7l. 2030 Noise Contours and Impact Summary – Alternative 81**

| Mainline Segment | Leq Noise Levels (dBA) (distance from center of nearest travel lanes) | | | Maximum Contour Distances (ft)* | | Approximate Number of Impacted Receptors By Category | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50ft | 100ft | 200ft | 72 dBA | 67 dBA | A | B | C | D | E |
| I-85 to US 29-74 | 73 | 70 | 66 | 100 | 200 | 0 | 2 | 0 | 0 | 0 |
| US 29-74 to Linwood Rd | 74 | 71 | 68 | 125 | 250 | 0 | 14 | 0 | 0 | 0 |
| Linwood Rd to US 321 | 74 | 71 | 68 | 125 | 250 | 0 | 71 | 0 | 0 | 0 |
| US 321 to Robinson Rd | 75 | 72 | 68 | 140 | 265 | 0 | 37 | 0 | 0 | 0 |
| Robinson Rd to Bud Wilson Rd | 77 | 73 | 70 | 170 | 300 | 0 | 4 | 0 | 0 | 0 |
| Bud Wilson Rd to Union Rd (NC 274) | 77 | 73 | 70 | 170 | 300 | 0 | 21 | 0 | 0 | 0 |
| Union Rd (NC 274) to S. New Hope Rd (NC 279) | 77 | 74 | 70 | 185 | 315 | 0 | 6 | 0 | 0 | 0 |
| S. New Hope Rd (NC 279) to Southpoint Rd (NC 273) | 78 | 75 | 71 | 205 | 335 | 0 | 59 | 0 | 0 | 0 |
| Southpoint Rd (NC 273) to Dixie River Rd | 79 | 76 | 72 | 250 | 375 | 0 | 43 | 7 | 0 | 0 |
| Dixie River Rd to I-485 | 79 | 76 | 72 | 250 | 375 | 0 | 8 | 0 | 0 | 0 |
| East of I-485 | 77 | 74 | 70 | 185 | 315 | 0 | 4 | 0 | 0 | 0 |
| | | | | | **TOTALS** | 0 | 269 | 7 | 0 | 0 |

* Distances are from the roadway centerline.

## 7.2 POTENTIAL NOISE IMPACTS TO CHURCHES, SCHOOLS, AND OTHER SPECIAL USES

### 7.2.1 Potential Noise Impacts to Churches

Churches that are within the noise contours shown in **Figure 4** are discussed below. There are six churches, listed in order of their location from west to east.

**Broomfield Methodist Church**. This church is located adjacent to Corridor Segment H2A (DSAs 4, 5, 9, 22, 23, and 27) at 937 Shannon Bradley Road, and is represented by Receptor W426 (**Figure 4-2**). This church was included in the detailed model for BEA 1 (**Section 8.4.1**). A barrier for this church and adjacent residences was found to be feasible and reasonable. 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 1000 Carson Road, and is represented by Receptor W298 (**Figure 4-6**). 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 on 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 the Gaston East-West Connector mainline is in a large cut slope in this area 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 (**Table 3**) would not be exceeded at the church structures. The structures are masonry, which can achieve 25-35 dBA of exterior to interior noise reduction (FHWA, Highway Traffic Noise Analysis and Abatement: Policy and Guidance," 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, and is represented by Receptor W369 (**Figure 4-10**). The church structures likely will be under the right-of-way limits of the proposed project and would need to be relocated if Corridor Segment H1C is part of the Preferred Alternative. Based on 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 (FHWA, Highway Traffic Noise Analysis and Abatement: Policy and Guidance," June 1995), and the remainder of the parcel would be at 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 parcel is shown with a purple dot on **Figure 4-23**. It was not given a receptor number because the structure is located near 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, the proposed project would not have 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 parcel is shown with a purple dot on **Figure 4-25** in the southeast quadrant of the proposed interchange. Two of three structures would be within the right-of-way limits of the proposed project. 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 parcel is shown with a purple dot on **Figure 4-28** on Grace Church 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.

### 7.2.2 Potential Noise Impacts to Schools and Libraries

There are two schools and a library in the vicinity of the DSAs. As described below, project-generated noise impacts are not anticipated at these resources.

Sadler Elementary School is located at 3940 West Franklin Boulevard (US 29-74) on the east side of Corridor Segment H1A (**Figure 4-4**). As shown in **Figure 4-4**, none of the project's noise contours would be on school property. Therefore, Sadler Elementary School would not be impacted by project-generated noise.

Forest View High School is located at 5545 Union Road. It is near DSA Segment J5a (DSAs 4, 22, 58, and 76) (**Figure 4-21**). In this location, Union Road (NC 274) would be rerouted around the south side of the school to line up with a project interchange. This area of the school is the parking lot and not considered an area of frequent outdoor use. Therefore, no noise impacts from the rerouted Union Road traffic are anticipated. The project mainline noise contours are not near the high school.

The Union Road Branch Library is located across existing Union Road and slightly to the south of Forest View High School. None of the project's noise contours would be on library property. Therefore, the library would not be impacted by project-generated noise.

### 7.2.3 Potential Noise Impacts to Parks and Recreation Areas

This section discusses potential impacts to Berewick District Park (a Mecklenburg County Park), Linwood Springs Golf Course (a privately-owned golf course open to the public), and the Duke Energy recreational fields (privately-owned by Duke Energy). Potential impacts to Crowders Mountain State Park are discussed in **Section 7.2.4**. There are two publicly-owned parks evaluated for noise impacts, Berewick District Park and Crowders Mountain State Park.

**Berewick District Park**. Berewick District Park is a Mecklenburg County park located at the eastern terminus of the project, just south of the DSAs and west of I-485 (**Figure 4-34**). The 60 dBA Leq and 66 dBA Leq noise contour from Corridor Segment K4A (DSAs 5, 23, 64, and 77) are on the northern edge of the park.

In a meeting with the NCTA on April 28, 2008, Mecklenburg County Park and Recreation Department (MCPR) stated that Berewick District Park is envisioned to be a multi-use park with tournament quality soccer and baseball fields, passive uses, and a dog park. The MCPR also has joined with the Charlotte-Mecklenburg Schools to co-locate an elementary school on the site. The school's recreational facilities, such as their gym, will be sized so that they can be used after school hours for park activities. A master plan for the park is included in **Appendix G**.

Phase 1 of the park development will include the elementary school and three adjacent baseball fields on the southern half of the park. Phase 1 construction is expected to be complete in December 2009. There is currently no funding for any additional phases of park construction.

No proposed uses are near the northern edge of the park where the project's 66 dBA Leq noise contour and the 60 dBA Leq noise contours for Corridor Segment K4A are located. Based on the locations of the proposed uses and the low noise levels projected from the project within the park (60 dBA Leq or less), the park is not anticipated to experience project-generated traffic noise impacts.

**Linwood Springs Golf Course**. Linwood Springs Golf Course is on Linwood Road just west of Corridor Segment H3 (**Figure 4-7**) (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. As shown on **Figure 4-7**, neither the 60 dBA Leq nor the 66 dBA Leq noise contour encroach on the golf course property. Therefore, no project-generated noise impacts are expected at this golf course.

**Duke Energy Recreational Fields**. These private recreational fields, owned by Duke Power, 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.

These fields were included in the detailed model for BEA 29 (**Section 8.4.1**) and are represented by Receptors E410 and E411 on **Figure 4-29**. Receptor E410 is on a baseball field and Receptor E411 is on a general recreational field. Based on the detailed TNM® noise model, future peak-hour noise levels are projected to average about 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 of BEA 29 and found to be not cost effective (**Appendix F – Tables 38.1 and 39.1**).

### 7.2.4 Potential Noise Impacts to Crowders Mountain State Park

Crowders Mountain State Park is located to the west of the Detailed Study Alternatives (See **Figure 2**). Crowders Mountain State Park is a natural forest park with activities that include hiking and climbing. **Appendix G** includes a map of the park. The park is a Category A land use for noise abatement (See **Table 3**). 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.

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 in the project area (**Table 5**). This is

representative of rural areas away from major sources of noise (**Table 2**). NCDOT's standard practice is to assume 45 dBA Leq for the natural environment, so assuming a lower value is conservative.

The noise contours developed for the Corridor Segments 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 DSA Segment H1A (See **Figure 2**). The nearest point on the hiking trails is on the Tower Trail, which is approximately 2,800 feet from the centerline of DSA Segment H1A.

DSA Segment H1A is common to representative DSAs 64 and 77; two of the DSAs for which travel demand forecasts were prepared. Representative DSA 77 is projected to carry higher traffic volumes in the Linwood Road interchange area than representative DSA 64 (**Tables 6b and 6c**). Therefore, the noise contours estimated for Alternative 77 were used in this discussion.

Based on 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 about 46 dBA Leq, well below the Category A NAC of 57 dBA Leq, and below a substantial increase. At the nearest point of the Tower Trail (2,800 feet), maximum 2030 project-generated traffic noise levels would be about 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.

## 7.3 DETAILED NOISE MODELING

The results of the noise contour modeling were mapped with the preliminary engineering designs and the GIS database information to identify those areas where there were non-isolated receptors requiring a three-dimensional TNM® model (Step 2 from **Section 4.2**). Thirty-four areas, called Barrier Evaluation Areas (BEAs) were identified, as shown in **Figure 3a-b**. The results of this detailed modeling are discussed in **Chapter 8.**

Detailed models were prepared for a No Barrier case, and when warranted, for a With Barrier case. Some of the BEAs were modeled more than once. Modeling was done more than once if there were more than one preliminary engineering design passing near the BEA or different DSAs had different traffic volumes near the BEA.

# 8 NOISE ABATEMENT MEASURES

According to NCDOT Traffic Noise Abatement Policy, if traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. Types of abatement measures include highway alignment selection, traffic system management measures, land acquisition, vegetative barriers, or noise barriers. As described below, the only appropriate measure to analyze in detail is the construction of noise barriers.

## 8.1 HIGHWAY ALIGNMENT SELECTION

Highway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of siting the roadway at a sufficient distance from noise sensitive areas.

Changes in vertical alignment can be effective in limiting noise impacts of certain roadway facilities. Depressing or raising the highway elevations 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.

## 8.2 TRAFFIC SYSTEM MANAGEMENT MEASURES

Traffic management measures that limit vehicle type, speed, volume and time of operations are often 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 on the proposed roadway.

Modeling has shown a reduction in the speed limit of 10 mph would result in a noise level reduction of approximately 1 to 2 decibels (Bolt, Beranek, and Newman, Inc., 1972:1-20). Because most people cannot detect a noise reduction of 3 decibels (Bolt, Beranek, and Newman, INC., 1972:1-20), and because reducing the speed limit would reduce roadway capacity, it is not considered a viable noise abatement measure. This and other traffic system management measures, including the prohibition of truck operations, are not considered to be consistent with the project's purpose and need.

## 8.3 VEGETATIVE SCREENING AND PROPERTY ACQUISITION

The use of vegetation 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 barrier should be approximately 100 feet wide to provide a 3 dBA reduction in noise levels. In order to provide a 5 dBA reduction, substantial amounts of additional right of way would be required. The cost of the additional right of way and vegetation would most likely exceed the minimum abatement threshold of $35,000 per benefited receptor plus the adjustment factor. This cost threshold is adjusted upwards by $500 increments for each average decibel increase in noise from existing levels.

The acquisition of property in order to provide buffer zones to minimize noise impacts is not considered to be a reasonable noise mitigation measure for this project. The cost to acquire impacted receptors for buffer zones would exceed the minimum abatement threshold of $35,000 per benefited receptor (plus the adjustment for average decibel increase). The use of buffer zones to minimize impacts to future sensitive areas is not recommended because this could be accomplished by local officials through land use control.

## 8.4 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. Noise barriers may be constructed of a variety of materials either individually or combined, including concrete, wood, metal, earth, and vegetation.

For a noise barrier to provide sufficient noise reduction it must be high enough and long enough to shield the receptor from significant sections of the roadway. The barrier must also be feasible to construct as well as economically reasonable. The NCDOT Traffic Noise Abatement Policy (2004) provides guidance on determining the feasibility and reasonableness of providing noise barriers.

Several factors must be examined to determine if construction of sound barriers is feasible and reasonable. These factors include benefits to those impacted by noise, the cost of abatement, and overall social, economical and environmental effects of sound barrier construction. Also, 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 outdoor human use occurs and a lowered noise level would be of benefit."

Feasibility considers source/receptor relationships and the engineering aspects of constructing a barrier at impacted sites, including potential safety and/or drainage problems. Determination of feasibility includes consideration of whether a barrier can be built on the site topography, and whether other noise sources are present in 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. Access openings in barriers severely reduce the noise reduction provided by barriers, making barriers along roadways that lack access control generally infeasible to construct.

An evaluation of reasonableness should include the following criteria: barrier cost, public support, the degree of noise impact, and required sound barrier height. A reasonable barrier must be cost effective. The NCDOT considers a cost-effective barrier as one that is no more than $35,000 per effectively protected site (a site having 5 db or more reduction), plus an incremental increase of $500 per dBA average increase in the predicted exterior noise levels of the impacted receptors in the area. The cost of the barrier used in these calculations is $15.00 per square foot. Also, in general, barriers are not considered feasible for businesses or isolated residences (NCDOT, 2004).

### 8.4.1 Barrier Evaluation Areas

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 barrier evaluation areas (BEAs) were modeled in TNM® with three-dimensional models to determine if barriers would be feasible and reasonable in these locations. **Figure 3a-b** shows the locations of the BEAs. BEAs are a subset of the Neighborhood Study Areas (NSAs) identified on **Figures 3a-b**. BEAs were identified within the NSAs at locations where further study was warranted.

The detailed analysis of potential noise barriers incorporated existing natural terrain and design features such as fill/cut sections. Barrier heights of up to a maximum of 25 feet were evaluated for the receptors impacted under each DSA at each location.

**Appendix F** includes the TNM® input/output files for each detailed model.

As the result of the analyses performed for the thirty-four BEAs mentioned above, 22 locations were identified where noise barriers were determined to be feasible and reasonable. There were four additional locations identified where noise barriers were determined to be feasible but conditionally reasonable, where the cost effectiveness of the barrier depends on whether undeveloped lots are built upon or have building permits by the Date of Public Knowledge.

The majority of the barriers are located in the more intensively developed western portions of the study area. Barriers are primarily proposed to reduce noise for single-family residential subdivisions and mobile home communities.

Most noise impacted neighborhoods would warrant a barrier on one side or the other of the alignment. Barrier lengths range between 600 feet and 2,640 feet, while barrier heights range between 8 feet and 20 feet. Barrier costs for the barriers identified in **Table 8** are between $90,000 and $625,200; and costs per benefited receptors are between $13,976 and $44,440.

A summary of the feasible and reasonable barriers along the DSAs is shown in **Figure 5** and described in **Table 8**. The results of the detailed noise model for each BEA are described below. Receptor locations are shown in **Figure 4**. **Figures 6 through 23** show the individual feasible and reasonable barriers.

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.

## Barrier Evaluation Area 1

This area is located along DSA Segment H2A between I-85 and US 29-74. Modeled receptors include rows of existing single-family houses in the subdivisions west of Shannon Bradley Road. The alignment passes between Colebrook Road on the west and Belfast Drive on the east. Only one modeled receptor (W249 – 601 Colebrook Dr) is currently an undeveloped lot.

The detailed three-dimensional model showed that receptors to the west along Colebrook Road would not experience noise levels meeting or exceeding the NAC. Therefore, a barrier was not modeled for the west side of the mainline.

A barrier was found to be feasible and reasonable for the east side of the mainline (Barrier 1-1). **Figure 6** shows Barrier 1-1.

**Table 8. Feasible and Reasonable Noise Barriers**

| Proposed Barriers* | Segment | Description | Modeled Receptor #'s | Average dB Reduction for Benefited Receptors | Benefited Receptors | Barrier Length (ft) | Barrier Height (ft) | Approximate Cost | Cost Per Receptor / Allowable Cost per Receptor |
|---|---|---|---|---|---|---|---|---|---|
| BEA1-1 | H2A | North of US29-74, westbound side of the alignment. | W1 to W3, W20 to W51, W426 | 9 | 34 | 2,640 | 12 | $ 475,200 | $13,976<br>$40,824 |
| BEA2-1 (Cond.) | H2B | West of Forest Heights Elementary, eastbound side of the alignment. | W296, W297, W375-W423 | 7 | 6 | 2,070 | 8/10 | $ 257,400 | $42,900<br>$44,000 |
| BEA3-1 | H1A Alts 64, 58, 68 | East of Crowders Mtn., north of Linwood Road, eastbound side of the alignment. | W273 - W294 | 10 | 20 | 1,400 | 20 | $ 420,000 | $21,000<br>$42,200 |
| BEA3-1 | H1A Alts 76, 77, 81 | East of Crowders Mtn., north of Linwood Road, eastbound side of the alignment. | W273 - W294 | 10 | 20 | 1,400 | 20 | $ 420,000 | $21,000<br>$44,500 |
| BEA4-1 | H3 | East of Linwood Springs Golf Course, at Linwood Rd, on westbound side of the alignment. | W4-W19 | 9 | 16 | 1,605 | 20 | $ 481,500 | $30,094<br>$41,188 |

**Table 8. Feasible and Reasonable Noise Barriers**

| Proposed Barriers* | Segment | Description | Modeled Receptor #'s | Average dB Reduction for Benefited Receptors | Benefited Receptors | Barrier Length (ft) | Barrier Height (ft) | Approximate Cost | Cost Per Receptor / Allowable Cost per Receptor |
|---|---|---|---|---|---|---|---|---|---|
| BEA6-1 | H2C | East of Chapel Grove Rd, neighborhood includes Donnabrook Rd and Fallsdale Dr | W87-W89, W90 (4-unit apt), W92 | 8 | 7 | 1,250 | 12/14 | $252,330 | $36,047<br>$42,714 |
| BEA7-1 | H3 | East of Stable Gate Farms neighborhood, south of Linwood Rd on the westbound side of the alignment. | W58, W62-W71 | 8 | 11 | 1,500 | 16 | $ 360,000 | $32,727<br>$41,909 |
| BEA8-1 | H1C | South of Old Church Rd, east of the westbound side of the alignment. | W316-W331, W338, W340, W343 | 7 | 15 | 1,575 | 16 | $ 378,000 | $25,200<br>$36,500 |
| BEA9-1 | HX2 | South of Jake Long Rd, westbound side of the alignment. | W83, W85-W86, W94-W97, W103-W115, W122-W129, W368 | 11 | 22 | 2,145 | 16 | $ 514,800 | $23,400<br>$41,600 |
| BEA11-1 | H2C | South of Chapel Grove Rd, west of Stable Gate Farms neighborhood on the eastbound side of the alignment. | W143-W152, W163-W166, W428-W430 | 7 | 11 | 1,610 | 16-18 | $ 415,200 | $37,745<br>$41,909 |

**Table 8. Feasible and Reasonable Noise Barriers**

| Proposed Barriers* | Segment | Description | Modeled Receptor #'s | Average dB Reduction for Benefited Receptors | Benefited Receptors | Barrier Length (ft) | Barrier Height (ft) | Approximate Cost | Cost Per Receptor / Allowable Cost per Receptor |
|---|---|---|---|---|---|---|---|---|---|
| BEA12-1 | J4A | North of Crowder's Creek Rd, Falls Estates neighborhood, westbound side of the alignment. | M171, M202-M205 | 5 | 4 | 600 | 10 | $ 90,000 | $22,500<br>$40,000 |
| BEA12-2 | J4A | North of Crowder's Creek Road, Falls Estates neighborhood, westbound side of the alignment. | M172-M178 | 8 | 6 | 1,395 | 12 | $ 251,100 | $41,850<br>$44,000 |
| BEA14-1 | H1C | South of Bethany Rd, westbound side of the alignment. | W170-W187 | 8 | 13 | 1,485 | 14/16/18 | $ 371,700 | $28,592<br>$42,615 |
| BEA15-1 (Cond) | H1C | South of Bethany Rd, eastbound side of the alignment. | W356-W358, W361-W366 | 8 | 9 | 1,460 | 14/16/10 | $ 306,450 | $34,050<br>$43,000 |
| BEA17-1 | J4A Alts 4, 5, 9, 22, 23, 27 | East of US321, westbound side of the alignment. | M179-M184, M215-M219 | 7 | 8 | 1,092 | 12/14 | $ 224,760 | $28,095<br>$38,188 |
| BEA17-1 | J2A Alts 76, 77, 81 | East of US321, westbound side of the alignment. | M179-M184, M215-M219 | 6 | 7 | 1,092 | 12/14 | $ 224,760 | $32,109<br>$38,643 |
| BEA17-2 | J2C Alts 4, 5, 9, 22, 23, 27 | East of US321, westbound side of the alignment. | M230-M243 | 8 | 11 | 1,558 | 10/12/16/14 | $ 316,860 | $28,805<br>$38,818 |

**Table 8. Feasible and Reasonable Noise Barriers**

| Proposed Barriers* | Segment | Description | Modeled Receptor #'s | Average dB Reduction for Benefited Receptors | Benefited Receptors | Barrier Length (ft) | Barrier Height (ft) | Approximate Cost | Cost Per Receptor / Allowable Cost per Receptor |
|---|---|---|---|---|---|---|---|---|---|
| BEA17-2 | J2C Alts 76, 77, 81 | East of US321, westbound side of the alignment. | M230-M243 | 7 | 11 | 1,558 | 10/12/ 16/14 | $ 316,860 | $28,805 $38,818 |
| BEA17-3 | J2C | East of US321, westbound side of the alignment. | M247-M274, M286 | 7 | 16 | 2,306 | 12/14/ 12/10 | $ 393,600 | $24,600 $42,125 |
| BEA17-4 | J2C | West of Robinson Rd, eastbound side of the alignment. | M3-M23, M159 | 7 | 16 | 1,949 | 10/12/ 14/12 | $ 368,280 | $23,018 $42,969 |
| BEA19-1 | J1C | Cedar Grove subdivision east of Robinson Rd, on westbound side of the alignment. | M55-M70 | 7 | 16 | 1,300 | 18/16/ 14 | $ 323,100 | $20,194 $38,000 |
| BEA25-1 | K2A/J5B | North of Union-New Hope Rd, eastbound side of the alignment. | E156-E177 | 7 | 17 | 2,225 | 16/14/ 10/8 | $ 488,280 | $28,722 $42,824 |
| BEA28-1 | K4A | East of South Fork Catawba River, eastbound side of the alignment. | E276-E282, E306-E310, E311-E316, E319-E324,E386, E352- E353 | 8 | 19 | 2,400 | 16 | $ 576,000 | $30,316 $44,000 |
| BEA28-2 (Cond) | K4A Alts 5, 23, 64 | Southwest of NC273/Gaston interchange eastbound side of the alignment. | E304, E331-E345, E407 | 9 | 16 | 2,250 | 16 | $ 540,000 | $33,750 $41,375 |

**Table 8. Feasible and Reasonable Noise Barriers**

| Proposed Barriers* | Segment | Description | Modeled Receptor #'s | Average dB Reduction for Benefited Receptors | Benefited Receptors | Barrier Length (ft) | Barrier Height (ft) | Approximate Cost | Cost Per Receptor / Allowable Cost per Receptor |
|---|---|---|---|---|---|---|---|---|---|
| BEA28-2 (Cond) | K4A Alt 77 | Southwest of NC273/Gaston interchange eastbound side of the alignment. | E304, E331-E345, E407 | 9 | 16 | 2,250 | 16 | $ 540,000 | $33,750 $40,844 |
| BEA28-3 | K4A | Northwest of NC273/Gaston interchange westbound side of the alignment. | E286-E303 | 7 | 15 | 2,175 | 18 | $ 587,250 | $39,150 $41,333 |
| BEA29-1 | KX1 Alts 4, 22, 58, 76 | Northwest of NC273/Gaston interchange westbound side of the alignment. | E79-106 | 7 | 25 | 1,980 | 14 | $ 415,800 | $16,632 $42,920 |
| BEA29-1 | K3A Alts 9, 27, 68, 81 | Northwest of NC273/Gaston interchange westbound side of the alignment. | E79-106 | 6 | 20 | 2,605 | 16 | $ 625,200 | $31,260 $40,600 |
| BEA29-2 | K3C | Northeast of NC273/Gaston interchange westbound side of the alignment. | E75-E78, E107-E122, E347- E348, E354-E355, E382 | 8 | 9 | 1,280 | 20/18 | $ 354,300 | $39,367 $44,500 |
| BEA30-1 (Cond) | K4A | East of Catawba River on the eastbound side of the alignment. | E11, E12, E55, E56 | 7 | 3 | 808 | 12/14 | $ 133,320 | $44,440 $45,000 |

**Table 8. Feasible and Reasonable Noise Barriers**

| Proposed Barriers* | Segment | Description | Modeled Receptor #'s | Average dB Reduction for Benefited Receptors | Benefited Receptors | Barrier Length (ft) | Barrier Height (ft) | Approximate Cost | Cost Per Receptor / Allowable Cost per Receptor |
|---|---|---|---|---|---|---|---|---|---|
| BEA33-1 | K3D | East of Dixie Road on eastbound side of alignment. | E28-E35, E38, E58-E67 | 7 | 17 | 2,032 | 12/16/14 | $ 460,590 | $27,094<br>$38,176 |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must have building permits issued by the Date of Public Knowledge for this barrier to be cost effective.

## Barrier Evaluation Area 2

This area is located along DSA Segment H2B north of Linwood Road and west of the mainline. Modeled receptors in this BEA include residential lots in the newer section of the Crowder's View subdivision along streets including Pikes Peak and Pocono. This section of the neighborhood is being built out now, with some parcels having structures dating to 2007 (Gaston County GIS) and some still not developed. It was assumed that each parcel would be built out by the project's Date of Public Knowledge.

A barrier was found to be feasible but conditionally reasonable for this BEA (Barrier 2-1), assuming that the lots would be built upon or have building permits issued prior to the Date of Public Knowledge. The actual construction of a barrier will depend upon the number of homes present, or having a building permit, in the neighborhood during final barrier design. Barrier 2-1 is shown in **Figure 7**.

## Barrier Evaluation Area 3

This area is located along DSA Segment H1A north of Linwood Road and west of the mainline. Modeled receptors in this BEA include existing homes in the Brentwood mobile home park on Brentwood Drive. A barrier was found to be feasible and reasonable for this BEA (Barrier 3-1). Barrier 3-1 is shown in **Figure 8**.

## Barrier Evaluation Area 4

This area is located along DSA Segment H3 in the Lakewood subdivision south of existing Linwood Road and east of the mainline. Modeled receptors in this BEA are located on roads that include Castle Hill Road, Penn Circle, and Lakewood Drive. Three of the sixteen modeled receptors are on undeveloped residential lots (W6 – Lakewood Drive, W7 – Providence Drive, and W12 – Castle Hill Road). A barrier was found to be feasible and reasonable for this BEA (Barrier 4-1), both including and excluding the three undeveloped parcels. Barrier 4-1 is shown in **Figure 9.**

## Barrier Evaluation Area 5

This area is located along DSA Segment HX1/H1B south of Linwood Road, where the two segments join to connect to Segment H1A. The area was modeled with DSA 64 and DSA 77 traffic. Modeled receptors in this area are on either side of the mainline, with their access from Camp Rotary Road. Of the sixteen modeled receptors, six are undeveloped lots (Receptors W374 and W404-407 on Wrens Song Way and W367 on Dove Meadows Drive) on the east side of the mainline. The remaining ten are existing residences on the west side of the mainline.

For the six receptors modeled on the east side of the mainline, the detailed model results showed that only one receptor would be impacted. Since it was an isolated receptor, a barrier was not modeled on the east side.

Ten receptors (existing residences) were modeled on the west side. A barrier 8-12 feet high was modeled along the cut/fill of the mainline, but was determined to be not cost effective.

## Barrier Evaluation Area 6

This area is located along DSA Segment H2C, south of Linwood Road and east of Chapel Grove Road. The modeled receptors are located west of the mainline, along the eastern edge of a neighborhood east of Chapel Grove Road that includes Donnabrook Road and Fallsdale Drive. Four existing single-family homes (Receptors W87, W88, W89, and W92) and one 4-unit apartment building (Receptor W90) were included in the detailed model.

A barrier 12-14 feet high was modeled along the cut/fill of the mainline, and was determined feasible and reasonable for these receptors (Barrier 6-1). Barrier 6-1 is shown in **Figure 10**.

## Barrier Evaluation Area 7

This area is located along DSA Segment H3 well south of Linwood Road. The 26 modeled receptors are spread out, located east and west of the mainline, in the Stablegate Farms area west of Davis Road. Modeled receptors are existing homes located on Grassy Court, Cricket Lane, Skyland Drive, Penny Park Drive, and Stablegate Drive. Of the 26 modeled receptors, two are undeveloped residential parcels; Receptor W74 – 3030 Stablegate Drive, and Receptor W354 – 2433 Cricket Lane.

There were five clusters of homes in this BEA. From north to south, the first cluster is receptors W59, W427, W60, W61, and W354 on Cricket Lane and Grassy Court west of the mainline. The detailed modeled results (without barriers) showed that W59, W60 and W61 would experience noise increases but would not result in NAC or NCDOT noise impacts.

The second cluster consists of eleven homes on Cricket Lane and Skyland Drive east of the mainline (W58, W62-71). A16-foot barrier was determined feasible and reasonable for these receptors (Barrier 7-1). Barrier 7-1 is shown in **Figure 11**.

The third cluster consists of two homes north of Penny Park Drive and west of the mainline (W72 and W78). Detailed modeling showed that neither would experience significant noise impacts.

The fourth cluster consists of four homes on Penny Park Drive east of the mainline (W79-W82). Detailed modeling showed that only one of these homes would experience a significant noise impact. Since it was an isolated receptor, a barrier was not modeled for this area.

The fifth cluster consists of five homes on Stablegate Drive west of the mainline (W73-77). Detailed modeling showed that none of these homes would experience a significant noise impact, so no barriers were modeled.

## Barrier Evaluation Area 8

This area is located along DSA Segment H1C north of Lewis Road. The 34 modeled receptors are spread out in three clusters, located east and west of the mainline, in the West Palm Acres area. Modeled receptors are existing homes located on Old Church Road, Buckskin Drive, Ralphs Boulevard, and Sunflower Court. All are existing residences.

The first cluster consists of six homes on Old Church Road (W333-335, W337, W341, and W342) west of the mainline. Detailed modeling showed that none would experience significant noise impacts.

The second cluster consists of seven homes on Sunflower Court (W344-W350) west of the mainline. Detailed modeling showed that none would experience significant noise impacts.

The third cluster consists of 19 homes on Old Church Road and Buckskin Drive (W316-W331, W338, W340, W343) west of the mainline. A 16-foot barrier was determined feasible and reasonable for this location (Barrier 8-1). Barrier 8-1 is shown in **Figure 12.**

## Barrier Evaluation Area 9

This area is located along DSA Segment HX2 south of the Camp Rotary Road/Chapel Grove Road intersection. The modeled receptors are located in the Fallscrest subdivision and along the south side of Jake Long Road. There are 30 receptors modeled on the northeast side and 23 receptors modeled on the southwest side.

Barriers were modeled on both sides of the mainline. Barrier 9-1 (16 feet high) on the northeast side was found to be feasible and reasonable. Barrier 9-2 on the southwest side was found to be marginally feasible and reasonable (meaning many of the receptors achieved the minimum goal of 5-6 decibels of noise reduction). However, these two barriers are parallel to each other on either side of the mainline. Parallel barriers can degrade the performance of each barrier by reducing the noise reduction achieved by the barriers. Sound waves reflecting off the opposite barrier increase noise levels behind the near barrier, reducing the predicted amount of noise reduction. Taking into consideration this parallel barrier effect, described in more detail below, Barrier 9-1 was still found to be feasible and reasonable, but Barrier 9-2 was not. Barrier 9-1 is shown in **Figure 13**.

In situations where barriers are located on either side of a roadway, and their separation distance/height ratio is between 10:1 and 20:1, reflected sound waves off the opposite barrier can reduce the noise reduction of a barrier by up to 3 decibels. Separation distance/height ratios less than 10:1 can result in degradation of barrier performance by 3 decibels or greater. When the separation distance/height ratio is greater than 20:1, no degradation in performance due to a parallel barrier effect would occur. (FHWA, TNM® User's Guide Chapter 11).

In BEA 9, Barriers 9-1 and 9-2 would have a separation distance/height ratio of between 10:1 and 20:1, so degradation in barrier performance could be expected to be about 2-3 decibels. With this amount of degradation, a barrier should achieve 7-8 decibels of noise reduction in the detailed TNM model to still meet the minimum noise reduction goals set by NCDOT. Under these assumptions, Barrier 9-2 could not be designed to be cost effective.

## Barrier Evaluation Area 10

This area is located along DSA Segment HX2 well north of Crowders Creek Road. The 30 modeled receptors are located in the Ferguson Estates subdivision on Courtney Cove Court, Sara Court, Stacy Ridge Road, and Cove Road on both sides of the mainline. All are existing residences.

East of the mainline, the impacted receptors were isolated, so a barrier was not modeled. West of the mainline, a 12-14 foot barrier was modeled, and was found to be not cost effective.

## Barrier Evaluation Area 11

This area is located along DSA Segment H2C in the same area as BEA 10, well north of Crowders Creek Road. The 16 modeled receptors are all existing residences located in the Ferguson Estates subdivision on Courtney Cove Court, Sara Court, Stacy Ridge Road, and Cove Road on the west side of the mainline. A 16-18 foot barrier was found to be feasible and reasonable (Barrier 11-1). Barrier 11-1 is shown in **Figure 14.**

## Barrier Evaluation Area 12

This area is located along DSA Segment J4a north of Crowders Creek Road. The modeled receptors are on both sides of the mainline, located in a subdivision north of Crowders Creek Road on New Haven Drive and in a mobile home park off Crowders Creek Road (Fox Court, Northwestern Drive, Accent Lane, and Angler Way). All modeled receptors are existing residences. There are 29 receptors west of the mainline and 12 receptors east of the mainline.

Barriers were found to be feasible and reasonable along the east side of the mainline (Barriers 12-1 and 12-2). Barrier 12-1 is north of New Haven Drive and Barrier 12-2 is south of New Haven Drive. Barriers 12-1 (10 feet high) and 12-2 (12 feet high) are shown in **Figure 15**.

West of the mainline, the topography provides enough shielding such that there are only two receptors (Receptors M166 and M167 on New Haven Drive) that would be impacted by noise in this area. A 25-foot barrier was modeled, and was found to be not cost effective.

## Barrier Evaluation Area 13

This area is located along DSA Segments J3 and J2a east of Crowders Creek Road. There is a cluster of four homes on Jasper Trail south of the mainline (Receptors M211, M222, M223, and M225) and one business (M214). The business is a service garage with no apparent frequent outdoor use area. An 8-12 foot barrier was modeled for both DSA Segments (J3 and J2a) and found to be not cost effective.

## Barrier Evaluation Area 14

This area is located along DSA Segment H1C south of Bethany Road. It is a mixed residential area north of the mainline. There are existing mobile homes on Ramsey Circle and Archie Drive, with existing single family homes on Spring Drive in between.

A 14-18 foot barrier (Barrier 14-1) that would provide noise reduction to the 18 homes on Ramsey Drive and Spring Drive was found to be feasible and reasonable. Barrier 14-1 is shown in **Figure 16**.

The eleven mobile homes on Archie Drive (Receptors M189-199) were not impacted by noise based on the detailed three-dimensional TNM® model, so a noise barrier was not modeled for those homes.

## Barrier Evaluation Area 15

This area is located along DSA Segment H1C south of Bethany Road, just east of BEA 14 and south of the mainline. This area is a small undeveloped subdivision along Hannaford Place, with most of the lots still owned by the Hanna family as of the date of this report. A 10-16 foot noise barrier (Barrier 15-1) was found to be feasible and conditionally reasonable if these homes are built prior to the Date of Public Knowledge. Barrier 15-1 is shown in **Figure 17.**

## Barrier Evaluation Area 16

This area is located along DSA Segment H1C west of Crowders Creek. This area includes three clusters of existing residences, all accessed from Grissom Road. One includes three residences south of Grissom Road, south of the mainline (W202, W216, and W217). Another includes four mobile homes on Lingerfeld Drive north of the mainline (W204-206, and W425). The third includes six residences on Badger Drive (W207-212). There is also one isolated residence (W203) north of Grissom Road that was included in the detailed model.

Two of the three residences south of Grissom Road (W202, W216, and W217) were predicted to be impacted by noise using the detailed model. These residences were considered isolated and a noise barrier was not modeled.

A barrier 8-16 feet high was modeled along the north side of the mainline for the remaining residences and was found to be not cost effective.

## Barrier Evaluation Area 17

This BEA includes several neighborhoods along DSA Segment (J4a/J4b/J2a/J2b) between US 321 and Robinson Road. These neighborhood areas are described from west to east.

a. Five existing residences in the Charleston neighborhood on April Drive and Plaza Road (M215-219) north of the mainline. A barrier 12-14 feet high (Barrier 17-1) for this neighborhood and Amy Acres was found to be feasible and reasonable. Barrier 17-1 is shown in **Figure 18A**.

b. Residences in the Amy Acres subdivision: six existing homes on Longbriar Drive (M179-184) north of the mainline as well as M215-M217 on Plaza Road.

c. Two existing homes on Benfield Road (M226-M227) north of the mainline and one on Benfield Road south of the mainline (M228). These residences are isolated and not included in a detailed noise model.

d. Twelve existing residences (M232-243, M237-M243) and two undeveloped lots (M231 and M236) in Forbes Cove off Greenpack Parkway north of the mainline. A 10-16 foot high barrier was found to be feasible and reasonable (Barrier 17-2). This barrier is feasible and reasonable both including and excluding the two undeveloped lots. Barrier 17-2 is shown in **Figure 18B**.

e. Seven residences in Verde View on Verde View Drive (M229, M248-M254) south of the mainline. The detailed TNM® model results indicated these receptors would not be impacted by DSA Segment J4a/J4b/J2a/J2b.

f. Six residences off McCarver Road (M244-247, M257-258) north of the mainline. A 10-14 foot high barrier for this neighborhood and Wesley Acres was found to be feasible and reasonable (Barrier 17-3). Barrier 17-3 is shown in **Figure 18C**.

g. Sixteen existing residences (M259-M264, M266-M274) and one undeveloped residential lot (M265) in the Wesley Acres subdivision on Wesley Drive and Ferncliff Drive north of the mainline. Barrier 17-3 also benefits receptors in this neighborhood, both including and excluding the one undeveloped lot.

h. Twenty-two residences in the Pam Drive neighborhood on Pam Drive (M3-23, M159) south of the mainline. A barrier 10-14 feet high was found to be feasible and reasonable (Barrier 17-4). Barrier 17-4 is shown in **Figure 18D**.

## Barrier Evaluation Area 18

This area is located along DSA Segment JX1 east of US 321. This area includes the southern end of the Verde View neighborhood on Verde View Drive. Included in the detailed TNM® model were six existing homes on Verde View Drive north of the mainline (M1-2, M255-257, and M276) and three existing homes south of the mainline (M27-29).

South of the mainline, the detailed TNM® model results indicated only one residence (M29) would be impacted by noise, so it was considered an isolated impact and no barriers were modeled.

North of the mainline, a barrier 23 feet high was modeled and found to be not cost effective.

## Barrier Evaluation Area 19

This area is located along DSA Segment J1C east of Sparrow Dairy Road. This area includes the southern end of the Cedar Grove subdivision. Included in the detailed TNM® model were fifteen existing residences (M56-M58, M60-M71) and one undeveloped residential lot (M59) on Redbird Lane and Birchwood Court. A 14-18 foot high barrier was found to be feasible and reasonable (Barrier 19-1), both including and excluding the undeveloped lot. Barrier 19-1 is shown in **Figure 19**.

## Barrier Evaluation Area 20

This area is located along DSA Segments J2d-JX4 (representative DSA 77) and J2d-J5a (representative DSA 4) in the vicinity of Patrick Road. There are several clusters of receptors included in this BEA, as described below.

a. Four existing residences (M42, M44, M161-162) and one existing business (M157) just west of Patrick Road north of the J2d mainline. A barrier 24 feet in height was modeled but did not achieve the noise reduction goal of at least 5 dBA for the impacted receptors (M44, M161, and M162).

b. Existing residences in the White Oaks neighborhood on Dorchester Road south of both mainlines. For DSA Segments J2d-JX4, seven residences were modeled (M79-80, M87-91). For DSA Segments J2d-J5a, thirteen residences (the entire neighborhood) were modeled (M79-91). For DSA Segments J2d-J4a, an 8-14 foot barrier was modeled and found to be not cost effective. For DSA Segments J2d-JX4, a barrier 10-16 feet high was modeled and found to be not cost effective.

c. Existing residences on Double Oaks Road (M103-106, M160). These residences are north of the DSA Segments J2d-JX4 mainline and south of the DSA Segments J2d-J5a mainline. For DSA Segments J2d-JX4, none of these receptors would be impacted, based on the detailed TNM® model. For Segments J2d-J5a, three receptors would be impacted (M103, M104 and M160), but these were too far apart and isolated to model a noise barrier.

## Barrier Evaluation Area 21

This area is located along DSA Segment J5a east of NC 274 (Union Road). This BEA includes two small clusters of existing residences on NC 274. The first is north of the mainline and consists of five residences (M48-49, M153-155) east of NC 274. The second is south of the mainline and consists of three residences (M108-110) west of NC 274. Based on the detailed TNM® model, only one of these receptors would be impacted by noise (M110), so a barrier was not modeled for this BEA.

## Barrier Evaluation Area 22

This area is located along DSA Segment J1d (representative DSA 64) and DSA Segment JX4 (representative DSA 77) in the vicinity of Patrick Road. For DSA Segment JX4, only one cluster of residences was close enough to be included in the detailed TNM® model. For DSA Segment J1d, several residential areas were modeled in the BEA.

For DSA Segment JX4, six existing residences/mobile homes were modeled in the Gatewood neighborhood on Gatewood Drive (M126-130, M107).

For DSA Segment J1d, eight existing residences/mobile homes (M107, M123, M124, M126-M130) and one undeveloped residential lot (M125) were modeled in the Gatewood neighborhood on Gatewood Drive. The detailed model for DSA Segment J1d also included seven existing homes along the east side of Patrick Road (M92, M95-98, M150-151), three existing homes on Leland Drive north of the mainline (M72-74), two existing homes on Leland Drive south of the mainline (M75, M78) and two existing homes on Meek Road (M76-77).

Based on the detailed TNM® model for DSA Segment JX4, none of the modeled receptors would be impacted by noise.

Based on the detailed TNM® model for DSA Segment J1d, the receptors on Leland Drive and Meek Road would not be impacted by noise. For the receptors on Patrick Road and in the Gatewood neighborhood, a barrier 14-16 feet high was modeled and found to be not cost effective.

## Barrier Evaluation Area 22A

This BEA is located along DSA Segment J1e (representative DSAs 64 and 77) west of Wilson Farm Road. It includes existing homes in the Forest Point subdivision on Stone Pine Drive and White Cedar Drive (M111-M113, M119-M122, M142-M148) and three undeveloped residential lots (M122, M142, and M163). All receptors were modeled using both representative DSAs.

For both representative DSAs, only receptor M111 was predicted to experience noise impacts (substantial increase impact), so noise barriers were not modeled.

## Barrier Evaluation Area 23

This BEA is located along DSA Segment J5a (representative DSA 4) north of Union New Hope Road and east of NC 274 (Union Road). It includes eight existing homes and one undeveloped lot (M41) in the Keltic Meadows subdivision on Ingonish Drive and Grovont Court. This area is north of the mainline. In this area, an 8-12 foot high barrier was modeled and found to be not cost effective.

## Barrier Evaluation Area 24

This BEA is located along DSA Segment K1A (representative DSAs 64 and 77) on Rufus Ratchford Road. The BEA includes seven residences on either side of Rufus Ratchford Road (E250-254, E257-258) south of the mainline. An 18-foot high barrier was modeled for both representative DSAs and found to be not cost effective.

## Barrier Evaluation Area 25

This BEA is located along DSA Segment K2A (representative DSA 4) between Union New Hope Road and NC 279 (South New Hope Road). This BEA includes residences in four areas: Rowe Street south of the mainline off of Union New Hope Road, Farmwood north of the mainline off of Union New Hope Road, Cameron Pointe north of the mainline off of NC 279 (South New Hope Road), and a cluster of residences south of Cameron Pointe on McCullough Drive.

The residences modeled in the Rowe Street neighborhood include 22 existing homes on Rowe Street and Eller Road (E156-177). The residences modeled in the Farmwood subdivision, which is directly adjacent to the Cameron Pointe subdivision, include 11 existing homes (E145-E155) and one undeveloped residential lot (E144) on Ogden Drive and Wood Duck Court. The residences modeled in the Cameron Pointe subdivision include nine existing homes on Country Lane (E178-186). Eight existing residences on McCullough Drive were modeled (M187-194).

An 8-16 foot high barrier was found to be feasible and reasonable for the receptors in the Rowe Street neighborhood (Barrier 25-1). Barrier 25-1 is shown in **Figure 20**.

An 8-18 foot high barrier was modeled for the Farmwood/Cameron Pointe/McCullough Drive area and found to be not cost effective.

## Barrier Evaluation Area 26

This BEA is located along DSA Segment K2A (representative DSA 4) on either side of South Fork Catawba River. This BEA includes residences on the west and east banks of South Fork Catawba River. On the west bank, existing residences and undeveloped lots are located on Lake Wylie Road north and south of the mainline (Existing: E126, E127, E129-E132, E135, E137-138, E223, E224, E228 and Undeveloped: E128, E134, E141, and E222), and on Fisherman Cove Road south of the mainline (E219-221, E226). On the east bank, existing residences (E125, E136, E210, E211) and one undeveloped lot (E133) are located on Riverfront Drive south of the mainline and on River Lake Way north of the mainline (E123-124).

Due to intervening topography and shielding provided by the jersey barriers on the bridge over the South Fork Catawba River, none of these receptors would be impacted by noise based on the detailed TNM® model.

## Barrier Evaluation Area 27

This BEA is located along DSA Segment K3A on either side of South Fork Catawba River, just south of BEA 26. This BEA includes residences on the west and east banks of South Fork Catawba River. On the west bank, existing residences and undeveloped residential lots are located on Lake Wylie Road north of the mainline (Existing E216 and E217) and in the Paradise Point subdivision (riverfront and non-riverfront) on Edgewater Road (Existing: E195, E196-E202, E204-E209, E215, and Undeveloped: E197 and E203) south of the mainline. On the east bank, existing residences and undeveloped residential lots are located on Gaither Road north and south of the mainline (Existing: E212-E214, and Undeveloped: E227).

Barriers were modeled on both the eastbound and westbound sides of the mainline. The eastbound barrier was 10-18 feet high and was found to be not cost effective. The westbound barrier was 16 feet high and also found to be not cost effective.

## Barrier Evaluation Area 28

This BEA is located along DSA Segment K4A on either side of South Fork Catawba River between NC 279 (South New Hope Road) and NC 273 (Southpoint Road). This BEA includes three areas west of the river and four areas east of the river, as described below.

a. Four existing residences on Bayshore Drive (E242, E383, E349, E350) north of the mainline west of the South Fork Catawba River.

b. Eleven existing residences on Bayshore Drive (E263-E273) and one undeveloped lot on Bayshore Drive (E274) on the west bank of the South Fork Catawba River south of the mainline.

c. Six existing residences on Lakefront Drive (E243-E248) on the west bank of the South Fork Catawba River north of the mainline.

d. Area north of the mainline and west of Armstrong Road. This area includes two existing residences and 22 undeveloped residential lots in River Lakes subdivision on Bay View Lane, Water View Road, and Ellington Road (Existing: E363 and E378, and Undeveloped: E358-E362, E364, E365, E367-E377, E379-E381), One existing residence on Old Spring (E285), two existing residences in Forest Bay on Quiet Waters Drive (E317, E318), and three existing residences on Armstrong Road (E404-E406).

e. Area south of the mainline and west of Armstrong Road. This area includes 11 existing residences and six undeveloped residential lots in Forest Bay (Existing: E307, E310-E313, E314-E316, E321-E324, and Undeveloped: E308, E309, E313, E319, E320, and E386), seven existing residences in the Ellington Mobile Home Park on Gordon Road (E276-282), and two residences and one undeveloped lot on Armstrong Road (Existing: E306 and E352, and Undeveloped: E353).

f. Area north of the mainline and just west of NC 273 (Southpoint Road). This area includes 18 existing residences in Southpoint Landing on Lake Hill Court and Woodbend Drive (E286-E303).

g. Area south of the mainline and east of Armstrong Road. This area includes one residence on Armstrong Road (E304) and residences in the Misty Waters subdivision. In Misty Waters, 16 parcels were included in the detailed model. Of these, eight are undeveloped lots (E332, E334-E337, E339, E344, E345), six are existing residences (E331, E333, E338, E340, E341, E407), one is the community clubhouse (E342), and one is a common area (E343).

For the receptors east of the South Fork Catawba River, two barriers were found to be feasible and reasonable and one barrier was found to be feasible and conditionally reasonable (depending on build out of undeveloped lots). A fourth barrier was considered and withdrawn due to analysis performed for a parallel barrier effect. This barrier was considered for the area north of the mainline near the River Lakes subdivision.

- A barrier 16 feet high (Barrier 28-1) would reduce projected traffic noise levels in BEA area "e". Barrier 28-1 is shown in **Figure 21A.**
- A barrier 16 feet high (Barrier 28-2) would reduce projected traffic noise levels in BEA area "g". This barrier is feasible and conditionally reasonable, depending on whether the undeveloped lots are built upon or have building permits by the Date of Public Knowledge. Barrier 28-2 is shown in **Figure 21B.**
- A barrier 18 feet high (Barrier 28-3) would reduce projected traffic noise levels in BEA area "f". Barrier 28-3 is shown in **Figure 21C.**

For BEA 28 area "a", a 12-foot high barrier was modeled but determined to be not cost effective.

For BEA 28 area “b”, topography would shield these receptors from the mainline and they would not be impacted by traffic noise.

For BEA 28 area “c”, a 10-foot high barrier was modeled but determined to be not cost effective.

For BEA 28 area “d” a 16-14 feet high barrier was modeled but determined not to be cost effective when considering the higher insertion loss required for a parallel barrier.

## Barrier Evaluation Area 29

This BEA is located along DSA Segment KX1 and DSA Segment K3A on either side of NC 273 (Southpoint Road). Segments KX1 and K3A are on slightly different alignments in the area of BEA 29, with DSA Segment K3A located to the south. This BEA includes one area west of NC 273 and two areas east of NC 273.

For both DSA Segment KX1 and K3A, the area west of NC 273 and north of the mainline includes 26 existing residences (E79-E98, E101-E106) and two undeveloped residential lots (E99 and E100) in the Brook Forest subdivision on Brook Forest Drive and South Forest Lane (E79-106).

For DSA Segment K3A, the area west of NC 273 and north of the mainline also includes the previously mentioned 26 existing residences (E79-E98, E101-E106) and two undeveloped residential lots (E99 and E100) in the Brook Forest subdivision on Brook Forest Drive and South Forest Lane (E79-106).

The area east of NC 273 and north of the mainline includes twelve residences on Boat Club Road (E107-110, E118-122, E354-355, E382), five residences on Drennan Horne Drive (E75-77, E347-348), one industrial business on Drennan Horne Drive (E78), and seven residences in the Joye Mobile Home Park on Joye Lane (E111-117). DSA Segments KX1 and K3A are on the same alignment east of NC 273.

The area east of NC 273 and south of the mainline includes six existing residences and two undeveloped residential lots in the Wilson/Allen neighborhood on Allison Street and Sunderland Road (Existing: E232-E234, E384, E388-389, and Undeveloped: E235 and E346), four existing residences on Boat Club Road (E236-238, E387), and a private recreation area owned by Duke Power that includes a baseball field (E410) and a recreation field (E411).

Barriers were found to be feasible and reasonable for the Brook Forest subdivision (Barrier 29-1), both including and excluding the undeveloped lots, and for the residences east of NC 273 and north of the mainline (Barrier 29-2). Barrier 29-1 is shown in **Figure 22A**, and Barrier 29-2 is shown in **Figure 22C**.

Barrier 29-1 K3A, as shown in **Figure 22B**, would be 16 feet high to reduce noise for the Brook Forest subdivision.

For the area east of NC 273 and south of the mainline, the eight residences in the Wilson/Allison neighborhood were not impacted by noise based on the detailed model, so a barrier was not modeled for this neighborhood. A 14-18 foot high barrier was modeled for the residences on Boat Club Road and the Duke Power recreation fields, but it was determined to be not cost effective.

## Barrier Evaluation Area 30

This BEA is located along DSA Segment K4A on either side of NC 273 (Southpoint Road). This BEA includes one area east of the Catawba River and two areas on the west bank of the Catawba River.

East of the Catawba River, the detailed TNM® model included fifteen undeveloped residential lots in the Woodend neighborhood on Nutall Oak Lane and Sawtooth Oak Lane (E390-403, E409) and seven other existing residences on Reese Wilson Road (E325-330, E408). A barrier 22 feet high was modeled and found to be not cost effective, including or excluding the undeveloped lots.

East of the Catawba River and south of the mainline, the detailed TNM® model included five existing residences (E1, E11, E55-E57) and one undeveloped lot (E12) in the Buckland Road neighborhood on Kilpeck Court. A barrier was found to be feasible and conditionally reasonable (Barrier 30-1), depending on build out or issuance of building permits for E12 prior to the Date of Public Knowledge. Barrier 30-1 is shown in **Figure 23.**

West of the Catawba River and north of the mainline, the receptors included two existing homes in the Buckland Road neighborhood (E51-52) and one home at the end of Bracebridge Court (E50). A barrier 22 feet high was modeled and found to be not cost effective.

## Barrier Evaluation Area 31

This BEA is located along DSA Segment K3C on either side of the Catawba River. On the west bank of the Catawba River are two existing residences (E240, E351) on Oakcrest Trail. East of the Catawba River, on and near the bank, nine existing residences and thirteen undeveloped residential lots were modeled on Tuffy Lane and Lochfoot Drive (Existing: E2-E5, E7, E8, E13. E14, E25, and Undeveloped: E6, E9, E10, E15-24).

A 14-foot high barrier was modeled for the two receptors on the west bank of the Catawba River and found to be not cost effective.

A 14-foot high barrier was modeled for the receptors east of the Catawba River and found to be not cost effective, including or excluding the undeveloped lots.

## Barrier Evaluation Area 32

This BEA is located along DSA Segment K4A west of I-485. This BEA includes 25 residences in the Garrison Road community north of the mainline (E28-35, E38, E58-66) and south of the mainline (E68-69, E70-74). Due to shielding provided by topography, only receptor E70 was predicted to be impacted by noise based on the detailed TNM® model. No barrier was modeled.

## Barrier Evaluation Area 33

This BEA is located along DSA Segment K3C just west of I-485. This BEA includes 19 residences in the Garrison Road community south of the mainline (E28-35, E38, E58-66, E69). A barrier 12-16 feet high was determined feasible and reasonable (Barrier 33-1). Barrier 33-1 is shown in **Figure 24**.

### 8.4.2 Noise Barriers By Alternative

**Tables 9a through 9l** below summarize the results of modeling performed to design noise barriers that are feasible and reasonable (or conditionally reasonable) to mitigate noise levels for project alternatives. Noise barriers were developed to be consistent with FHWA and NCDOT NAC for noise abatement. These tables identify the noise barriers for each alternative as well as the barrier lengths, costs, numbers of impacted receptors with and without a barrier, and numbers of benefited receptors. Note that the numbers of impacted receptors are counts only for the receptors included in the detailed noise models for BEAs having feasible and reasonable barriers.

**Table 9a. Alternative 4 Barriers**

| Feasible and Reasonable Barriers* | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 1-1 | 2,640 | $475,200 | 22 | 0 | 34 |
| BEA 4-1 | 1,605 | $481,500 | 11 | 0 | 16 |
| BEA 7-1 | 1,500 | $360,000 | 8 | 0 | 11 |
| BEA 12-1 | 600 | $90,000 | 2 | 0 | 4 |
| BEA 12-2 | 1,395 | $251,100 | 7 | 1 | 7 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA 17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 25-1 | 2,225 | $488,280 | 15 | 3 | 17 |
| BEA 29-1 KX1 | 1,980 | $415,800 | 22 | 0 | 25 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Totals** | **22,162** | **$4,680,270** | **--** | **--** | **191** |

**Table 9b Alternative 5 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 1-1 | 2,640 | $475,200 | 22 | 0 | 34 |
| BEA 4-1 | 1,605 | $481,500 | 11 | 0 | 16 |
| BEA 7-1 | 1,500 | $360,000 | 8 | 0 | 11 |
| BEA 12-1 | 600 | $90,000 | 2 | 0 | 4 |
| BEA 12-2 | 1,395 | $251,100 | 7 | 1 | 7 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA 17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 28-1 | 2,400 | $576,000 | 19 | 1 | 19 |
| BEA 28-2 (Cond) | 2,250 | $540,000 | 12 | 0 | 16 |
| BEA 28-3 | 2,175 | $587,250 | 10 | 0 | 15 |
| BEA 30-1 (Cond) | 808 | $133,320 | 4 | 1 | 3 |
| **Totals** | **22,278** | **$4,797,870** | **--** | **--** | **176** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9c. Alternative 9 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 1-1 | 2,640 | $475,200 | 22 | 0 | 34 |
| BEA 4-1 | 1,605 | $481,500 | 11 | 0 | 16 |
| BEA 7-1 | 1,500 | $360,000 | 8 | 0 | 11 |
| BEA 12-1 | 600 | $90,000 | 2 | 0 | 4 |
| BEA 12-2 | 1,395 | $251,100 | 7 | 1 | 7 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA 17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA29-1 K3A | 2,605 | $625,200 | 14 | 0 | 20 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Totals** | **20,562** | **$4,401,390** | **--** | **--** | **169** |

**Table 9d Alternative 22 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 1-1 | 2,640 | $475,200 | 22 | 0 | 34 |
| BEA 2-1 (Cond) | 2,070 | $257,400 | 6 | 0 | 6 |
| BEA 6-1 | 1,250 | $252,330 | 6 | 0 | 7 |
| BEA 11-1 | 1,610 | $415,200 | 8 | 0 | 11 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA 17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 25-1 | 2,225 | $488,280 | 15 | 3 | 17 |
| BEA 29-1 KX1 | 1,980 | $415,800 | 22 | 0 | 25 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Totals** | **21,992** | **$4,422,600** | **--** | **--** | **177** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9e Alternative 23 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 1-1 | 2,640 | $475,200 | 22 | 0 | 41 |
| BEA 2-1 (Cond) | 2,070 | $257,400 | 6 | 0 | 6 |
| BEA 6-1 | 1,250 | $252,330 | 6 | 0 | 7 |
| BEA 11-1 | 1,610 | $415,200 | 8 | 0 | 11 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA 17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 28-1 | 2,400 | $576,000 | 19 | 1 | 19 |
| BEA 28-2 (Cond) | 2,250 | $540,000 | 12 | 0 | 16 |
| BEA 28-3 | 2,175 | $587,250 | 10 | 0 | 15 |
| BEA 30-1 (Cond) | 808 | $133,320 | 4 | 1 | 3 |
| **Total** | **22,108** | **$4,540,200** | **--** | **--** | **169** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9f Alternative 27 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 1-1 | 2,640 | $475,200 | 22 | 0 | 34 |
| BEA 2-1 (Cond) | 2,070 | $257,400 | 6 | 0 | 6 |
| BEA 6-1 | 1,250 | $252,330 | 6 | 0 | 7 |
| BEA 11-1 | 1,610 | $415,200 | 8 | 0 | 11 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA29-1 K3A | 2,605 | $625,200 | 14 | 0 | 20 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Total** | **20,392** | **$4,143,720** | **--** | **--** | **155** |

**Table 9g Alternative 58 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 3-1 | 1,400 | $420,000 | 16 | 0 | 20 |
| BEA 8-1 | 1,575 | $378,000 | 3 | 0 | 15 |
| BEA 14-1 | 1,485 | $371,700 | 11 | 0 | 13 |
| BEA 15-1 (Cond) | 1,460 | $306,450 | 8 | 0 | 9 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 25-1 | 2,225 | $488,280 | 15 | 3 | 17 |
| BEA 29-1 KX1 | 1,980 | $415,800 | 22 | 0 | 25 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Total** | **15,386** | **$3,563,400** | **--** | **--** | **141** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9h Alternative 64 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 3-1 | 1,400 | $420,000 | 16 | 0 | 20 |
| BEA 8-1 | 1,575 | $378,000 | 3 | 0 | 15 |
| BEA 14-1 | 1,485 | $371,700 | 11 | 0 | 13 |
| BEA 15-1 (Cond) | 1,460 | $306,450 | 8 | 0 | 9 |
| BEA 19-1 | 1,300 | $323,100 | 6 | 0 | 16 |
| BEA 28-1 | 2,400 | $576,000 | 19 | 1 | 19 |
| BEA 28-2 (Cond) | 2,250 | $540,000 | 12 | 0 | 16 |
| BEA 28-3 | 2,175 | $587,250 | 10 | 0 | 15 |
| BEA 30-1 (Cond) | 808 | $133,320 | 4 | 1 | 3 |
| **Totals** | **14,853** | **$3,635,820** | **--** | **--** | **126** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9i Alternative 68 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 3-1 | 1,400 | $420,000 | 16 | 0 | 20 |
| BEA 8-1 | 1,575 | $378,000 | 3 | 0 | 15 |
| BEA 14-1 | 1,485 | $371,700 | 11 | 0 | 13 |
| BEA 15-1 (Cond) | 1,460 | $306,450 | 8 | 0 | 9 |
| BEA 19-1 | 1,300 | $323,100 | 6 | 0 | 16 |
| BEA29-1 K3A | 2,605 | $625,200 | 14 | 0 | 20 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Totals** | **13,137** | **$3,239,340** | **--** | **--** | **119** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9j Alternative 76 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 3-1 | 1,400 | $420,000 | 19 | 0 | 20 |
| BEA 9-1 | 2,145 | $514,800 | 14 | 3 | 22 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 25-1 | 2,225 | $488,280 | 15 | 3 | 17 |
| BEA 29-1 | 1,980 | $415,800 | 22 | 0 | 25 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Total** | **17,967** | **$3,957,270** | **--** | **--** | **161** |

**Table 9k Alternative 77 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 3-1 | 1,400 | $420,000 | 19 | 0 | 20 |
| BEA 9-1 | 2,145 | $514,800 | 14 | 3 | 23 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA 28-1 | 2,400 | $576,000 | 19 | 2 | 19 |
| BEA 28-2 (Cond) | 2,250 | $540,000 | 12 | 0 | 16 |
| BEA 28-3 | 2,175 | $587,250 | 10 | 0 | 15 |
| BEA 30-1 (Cond) | 808 | $133,320 | 4 | 1 | 3 |
| **Total** | **18,083** | **$4,074,870** | **--** | **--** | **147** |

* Cond – Means barriers is feasible and conditionally reasonable. Undeveloped lots in the BEA must be developed or have a building permit by the Date of Public Knowledge for this barrier to be cost effective.

**Table 9I Alternative 81 Barriers**

| Feasible and Reasonable Barriers | Barrier Length (feet) | Barrier Cost | Number of Impacted Receptors in BEA | | Number of Benefited Receptors |
|---|---|---|---|---|---|
| | | | Without Barrier | With Barrier | |
| BEA 3-1 | 1,400 | $420,000 | 19 | 0 | 20 |
| BEA 9-1 | 2,145 | $514,800 | 14 | 3 | 22 |
| BEA 17-1 | 1,092 | $224,760 | 4 | 1 | 8 |
| BEA17-2 | 1,558 | $316,860 | 4 | 0 | 11 |
| BEA 17-3 | 2,306 | $393,600 | 13 | 1 | 16 |
| BEA 17-4 | 1,949 | $368,280 | 15 | 1 | 16 |
| BEA29-1 K3A | 2,605 | $625,200 | 14 | 0 | 20 |
| BEA 29-2 | 1,280 | $354,300 | 16 | 7 | 9 |
| BEA 33-1 | 2,032 | $460,590 | 6 | 0 | 17 |
| **Total** | **16,367** | **$3,678,390** | **--** | **--** | **139** |

# 9 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 the earth moving equipment during grading operations. Overall, construction noise impacts are expected to be minimal, since the construction noise is relatively short in duration and is generally restricted to daytime hours. Furthermore, the transmission loss characteristics of surrounding wooded areas and other natural and man-made features are considered sufficient to moderate the effects of intrusive construction noise.

# 10 SUMMARY

This section summarizes the work performed to analyze the potential traffic noise impacts associated with Gaston East-West Connector Detailed Study Alternatives (DSAs). There are twelve new location DSAs under consideration for the proposed project, with two to four corridor options at any one location.

**Noise Abatement Procedures** - According to FHWA policy, noise mitigation measures must be considered when future noise levels either approach or exceed NAC levels, or if there are substantial increases over existing noise levels. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit." For this project, identified receptors were commercial uses, residences, churches, and recreation areas.

**Noise Measurements** - A total of twenty-two noise level measurements were taken in the vicinity of the project to determine typical existing background (ambient) noise levels and to provide a basis for assessing the impacts of future traffic noise levels. Seven measurement locations were adjacent to roadways and fifteen locations were in areas away from direct traffic noise sources.

**Noise Modeling** - Noise modeling was conducted with FHWA's Traffic Noise Model® (TNM). The analysis procedure consisted of a two-step approach to estimate noise levels and to minimize the numbers of receptors to be modeled during the second step of detailed modeling. The first step used the TNM® model to develop noise contours and to identify the sensitive receptors potentially impacted by the proposed DSAs. The noise contours were overlaid onto base mapping, and sensitive receptors within the contours were identified and numbered. There were 1,118 unique receptors identified.

In the second step, the TNM® model was used to perform more detailed analyses in areas where approximately three or more receptors were identified as being potentially impacted. For receptors that would be impacted, noise barriers were developed. These barriers were then evaluated based on the NCDOT Traffic Noise Abatement Policy (2004) to determine if they would be feasible and reasonable.

The total maximum numbers of receptors predicted to be impacted by DSAs range from 196 impacted Category B receptors for DSA 68, to 301 impacted Category B receptors for DSA 76. Category B receptors in the project area are mostly residential, with some churches. Few businesses are impacted by traffic noise along the DSAs, with the numbers of impacts ranging from 3 businesses for DSA 77 to 10 businesses for DSA 22.

**Noise Abatement Measures** - According to NCDOT Traffic Noise Abatement Policy, if traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. Types of abatement measures include highway alignment selection, traffic system management measures, land acquisition, vegetative barriers, or noise barriers.

**Highway Alignment Selection** - Changes in vertical alignment can be effective in limiting noise impacts of certain roadway facilities. Depressing or raising the highway elevations 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.

**Traffic System Management** - Traffic management measures that limit vehicle type, speed, volume and time of operations are often 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 on the proposed roadway.

**Vegetative Screening and Property Acquisition** – Neither the use of vegetative screening nor property acquisition were considered reasonable for this project, due to the substantial cost of acquiring additional right of way or property necessary for effectiveness.

**Noise Barriers** - Thirty-four barrier evaluation areas (BEAs) were modeled in TNM® with three-dimensional models to determine if barriers would be feasible and reasonable in these locations. The detailed analysis of potential noise barriers incorporated existing natural terrain and design features such as fill/cut sections.

As the result of the analyses performed for the thirty-four BEAs mentioned above, 22 locations were identified along all the DSAs combined where noise barriers were determined to be potentially feasible and reasonable. There were four additional locations identified where noise barriers were determined to be feasible but conditionally reasonable, where the cost effectiveness of the barrier depends on whether undeveloped lots have building permits by the Date of Public Knowledge.

Barrier lengths range between 600 feet and 2,640 feet, while barrier heights range between 8 feet and 20 feet. Costs for the individual barriers range between $90,000 and $625,200; and costs per benefited receptors are between $13,976 and $44,440.

For each DSA, the numbers of feasible and reasonable barriers range from 8 for DSA 68 to 13 for DSA 4. Total barrier costs for each DSA range from $4,797,870 for DSA 5 (11 barriers) to $3,239,340 for DSA 68.

**Construction Noise -** The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. Overall, construction noise impacts are expected to be minimal, since the construction noise is relatively short in duration and is generally restricted to daytime hours. Furthermore, the transmission loss characteristics of surrounding wooded areas and other natural and man-made features are considered sufficient to moderate the effects of intrusive construction noise.

# 11 REFERENCES AND SUPPORTING DOCUMENTATION

## REFERENCES

**Bolt, Beranek, and Newman**

Fundamentals and Abatement of Highway Traffic Noise. June 1973. Prepared for FHWA. Report No. PB-222 703.

**Federal Highway Administration**

23 CFR 772 - Procedures for Abatement of Highway Traffic Noise and Construction Noise.

Traffic Noise Model (TNM) Version 2.5 and User's Guide.

Highway Traffic Noise Analysis and Abatement: Policy and Guidance. June 1995 available at http://www.fhwa.dot.gov/environment/noise/polguide/polguid.pdf.

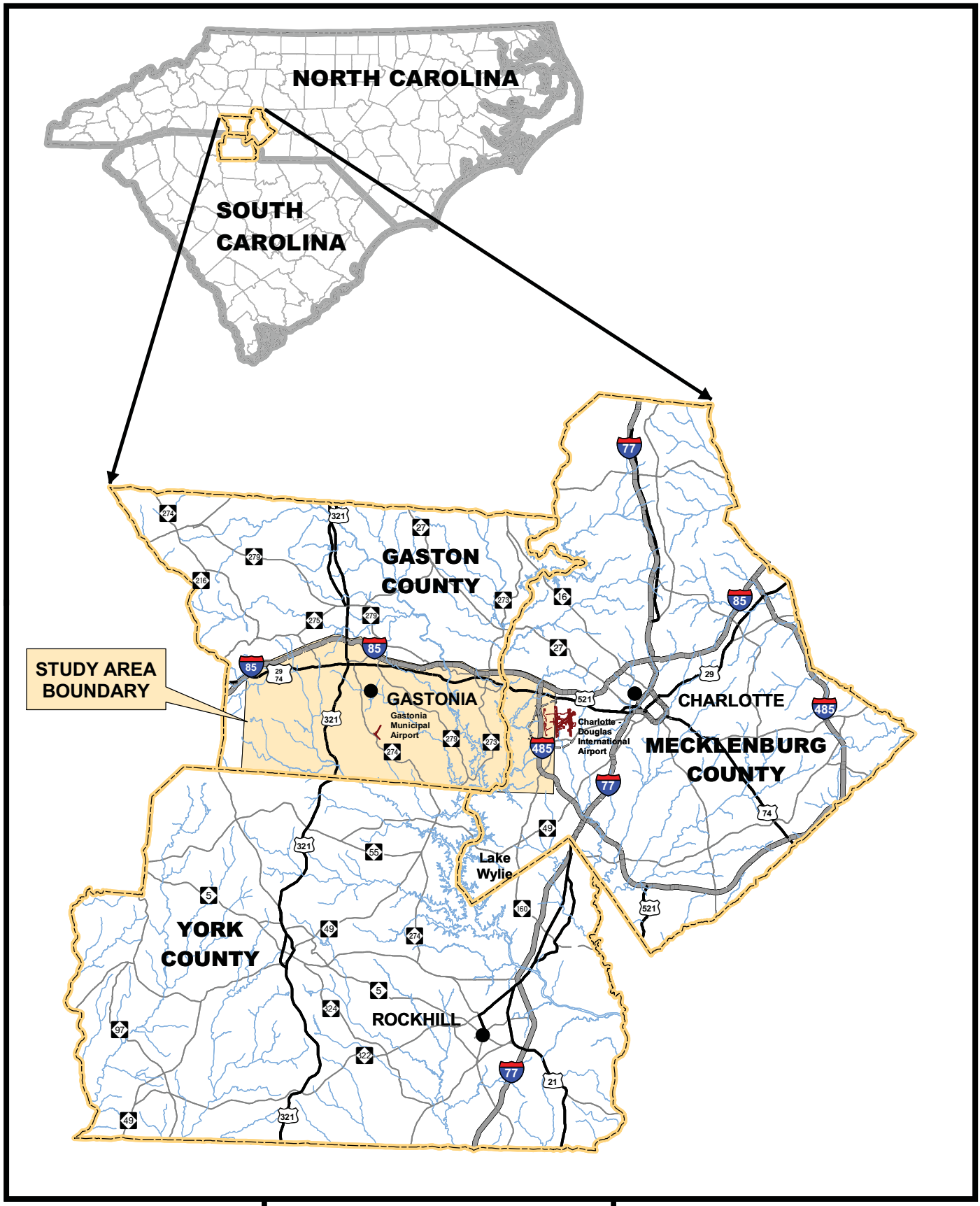
**North Carolina Department of Transportation**

NCDOT Traffic Noise Abatement Policy, 2004.

## SUPPORTING DOCUMENTATION

Preliminary Engineering Designs for the Gaston East-West Connector Detailed Study Alternatives. Design Plans prepared by PBS&J and Gibson Engineers. January 2008.

Year 2030 Travel Demand Forecasts for the Gaston East-West Connector Detailed Study Alternatives 4, 64, and 77. Prepared by Martin/Alexiou/Bryson. November 2007.




NORTH CAROLINA Turnpike Authority

GASTON EAST-WEST CONNECTOR

STIP PROJECT NO. U-3321

Gaston and Mecklenburg Counties

0 4.25 8.5

Miles

N

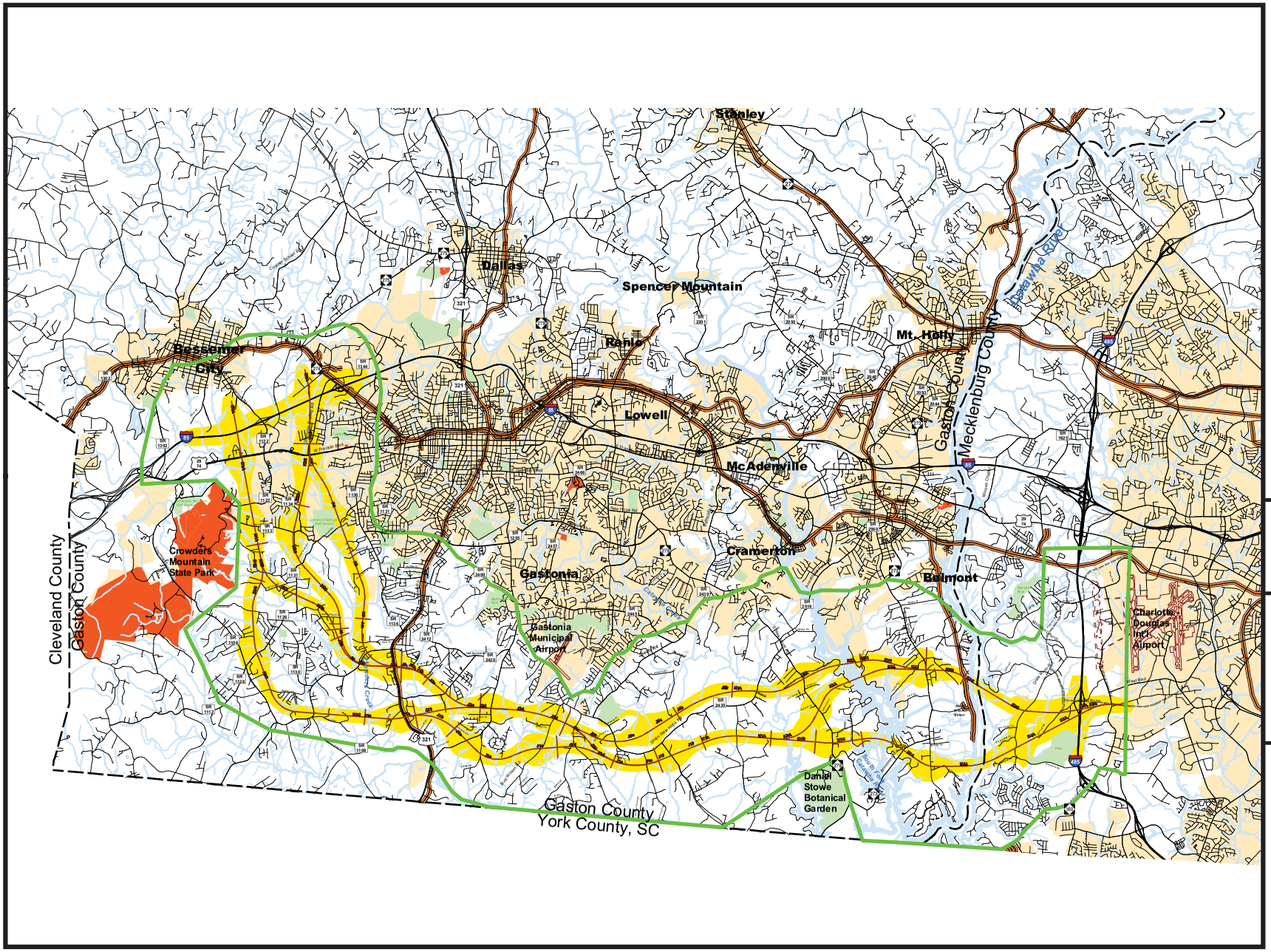
Source: Gaston, York, and Mecklenburg Counties GIS.

Map Printed On 3-12-08.

## PROJECT LOCATION IN REGION

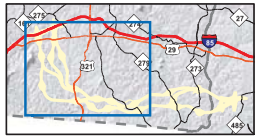
**Figure 1**

DEIS_Proj_Local_Regional.mxd 3-12-08 JNL




Legend

- Centerline of Corridors
- Refined Study Area for New Location Alternatives
- County Lines
- Corridor Segment Break Lines
- Hydrology
- Roads
- Railroads
- Interstates
- Parks/Recreation Areas
- Recommended Corridors for Detailed Study
- State Complexes



Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

N

0 5,000 10,000 Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT NO. U-3321

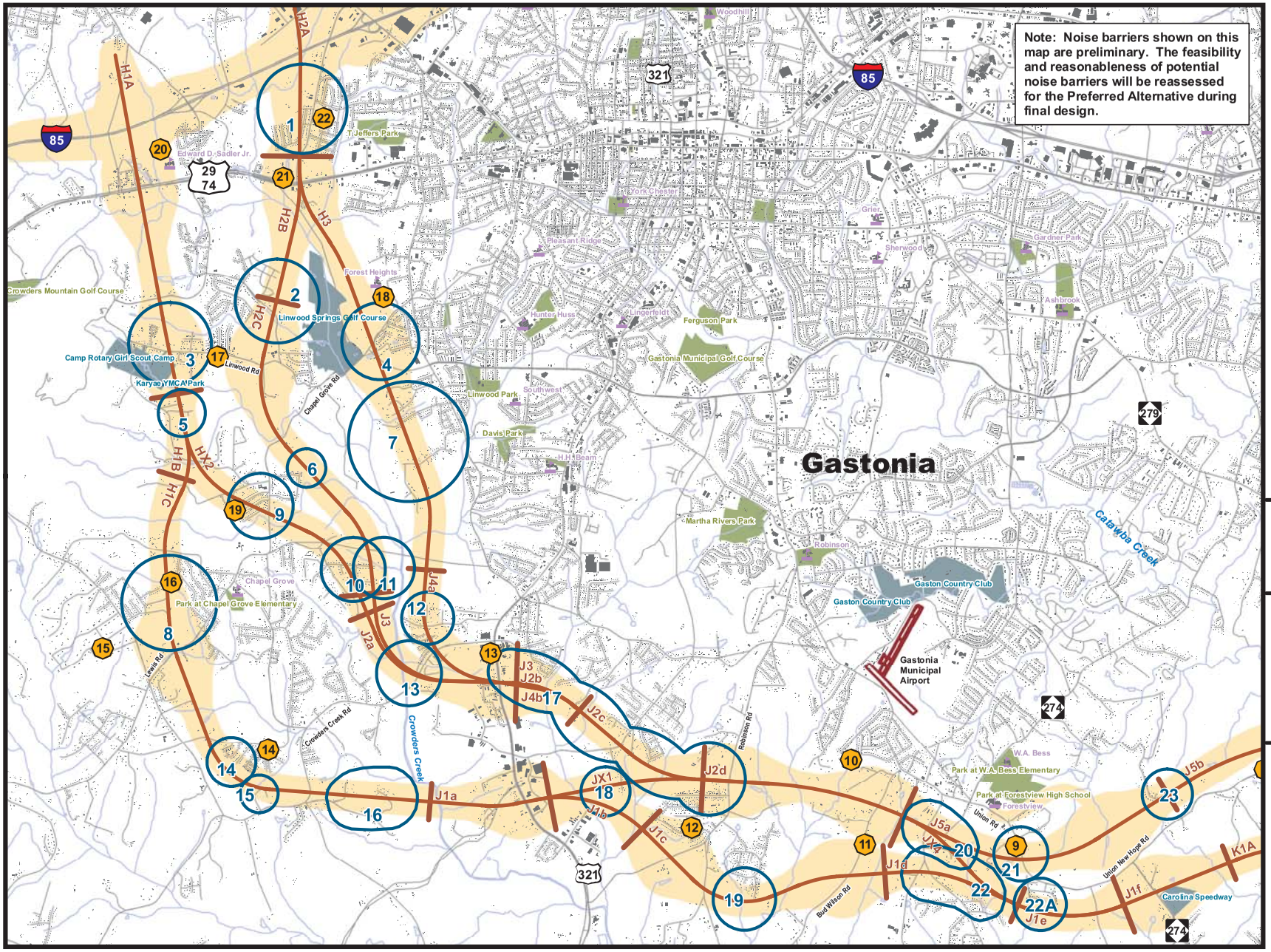
Gaston County and Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

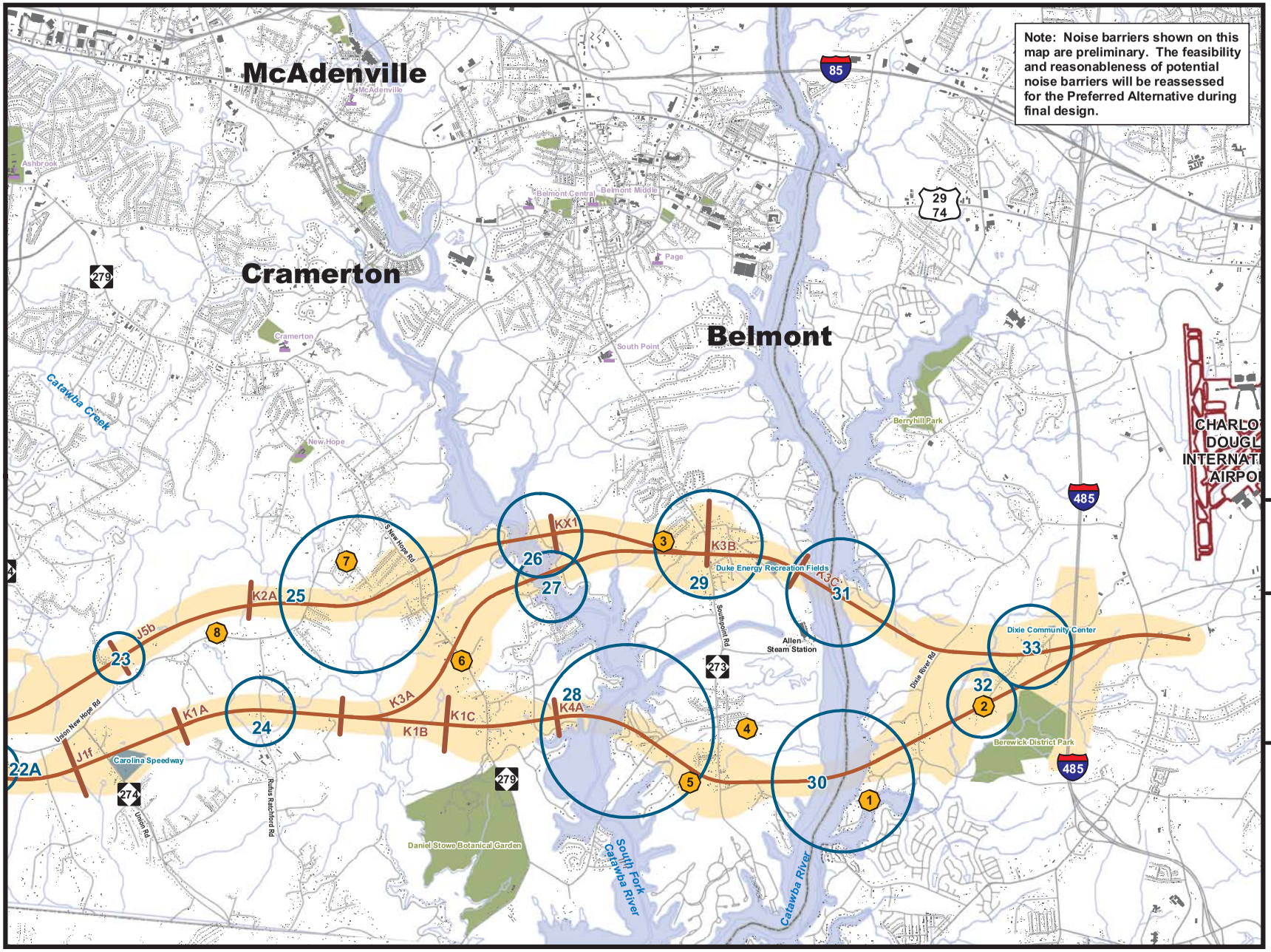
**RECOMMENDED DETAILED STUDY ALTERNATIVES**

**Figure 2**

DEIS_DSA.mxd 3/4/08




NoiseMeasLoc&BarrierEvalAreas.mxd




Legend

- Noise Measurement Sites
- Neighborhood Study Area
- Design Centerline
- Segment Break Lines
- Schools
- Structures
- County Line
- Streets
- Hydrology
- Parks
- Private Recreation Facilities
- Detailed Study Corridor
- K3A Segment Name

*Barriers only reasonable if the undeveloped lots are built on or have a building permit issued prior to date of public knowledge.

Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

N

0 0.5 1
Miles

NORTH CAROLINA Turnpike Authority

STIP PROJECT NO. U-3321

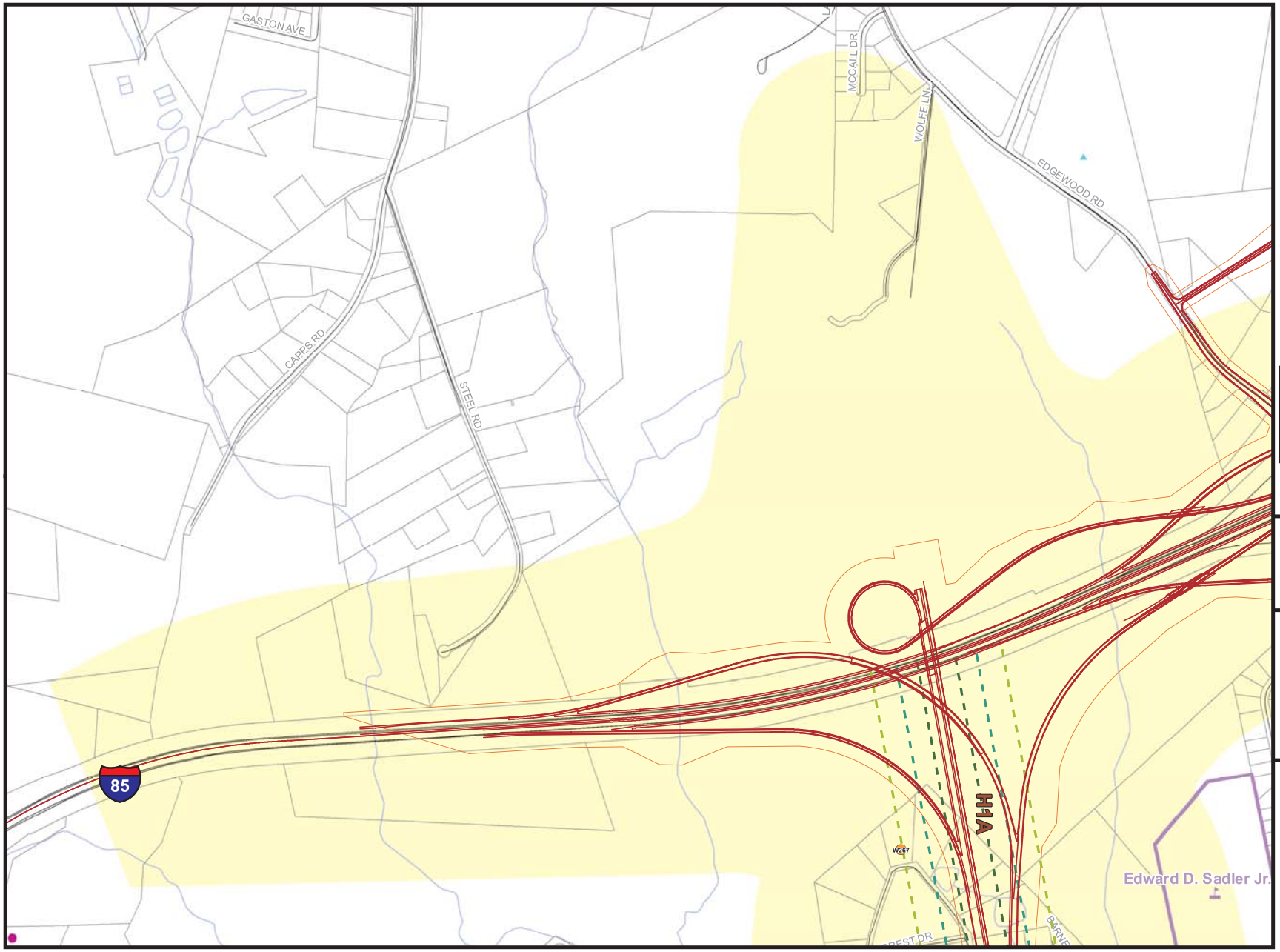
Gaston County and Mecklenburg County

GASTON EAST-WEST CONNECTOR

NOISE MEASUREMENT LOCATIONS and BARRIER EVALUATION AREAS

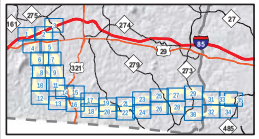
Figure 3b

NoiseMeasLoc&BarrierEvalAreas.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

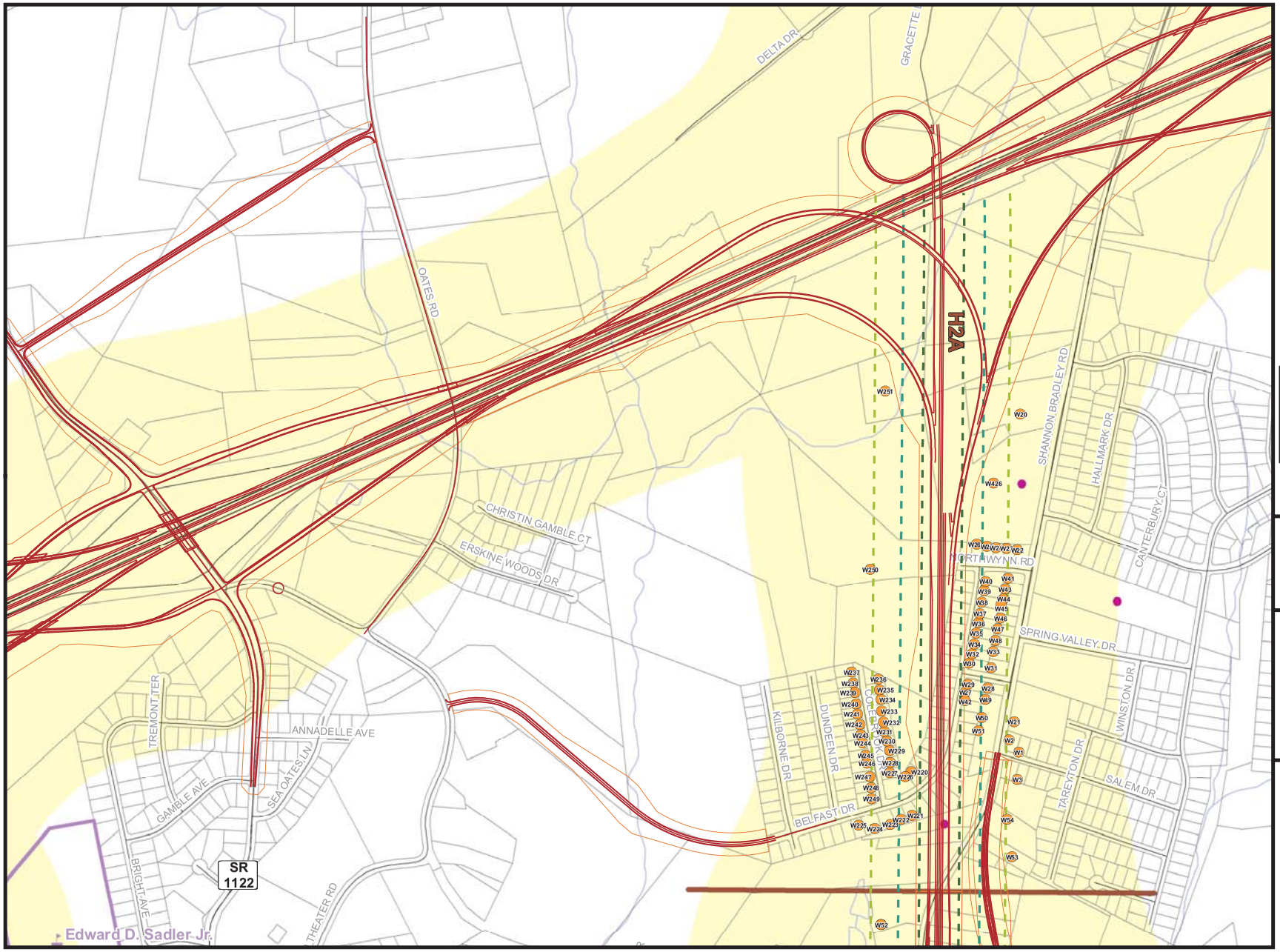
STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

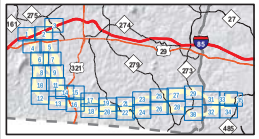
**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-1**




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

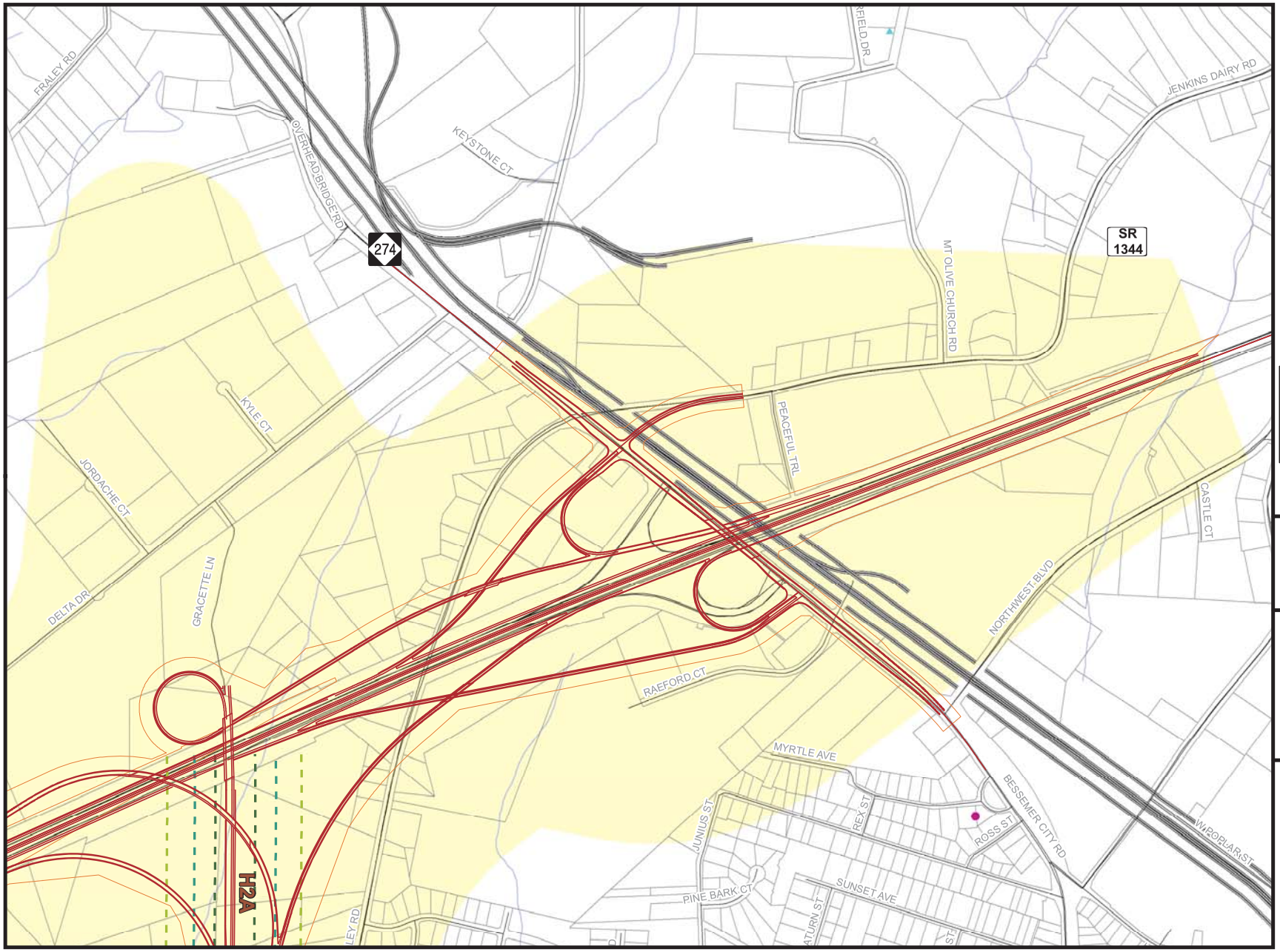
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

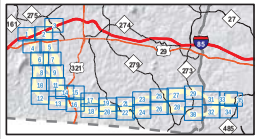
**Figure 4-2**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

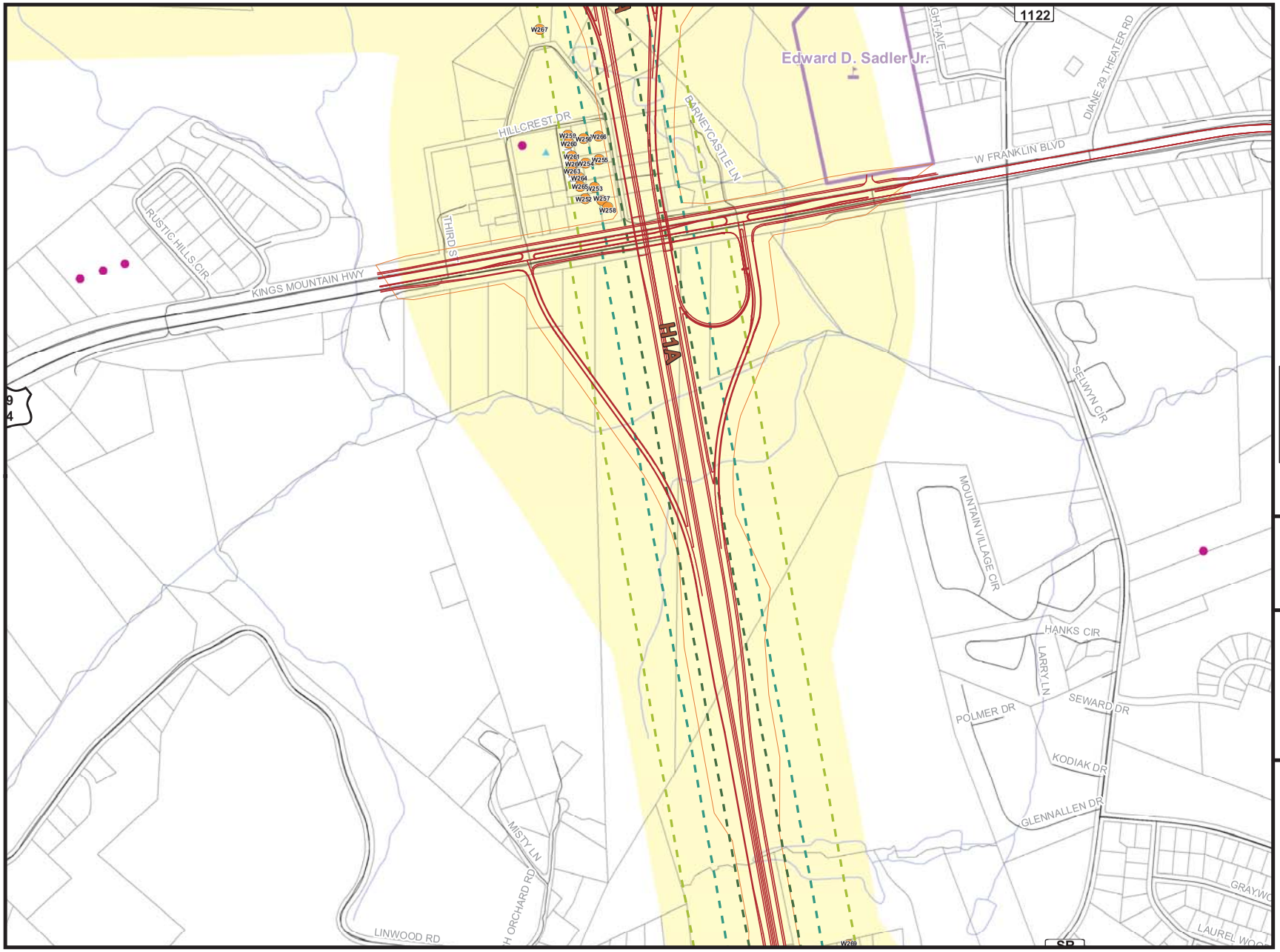
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

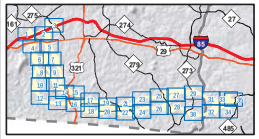
**Figure 4-3**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

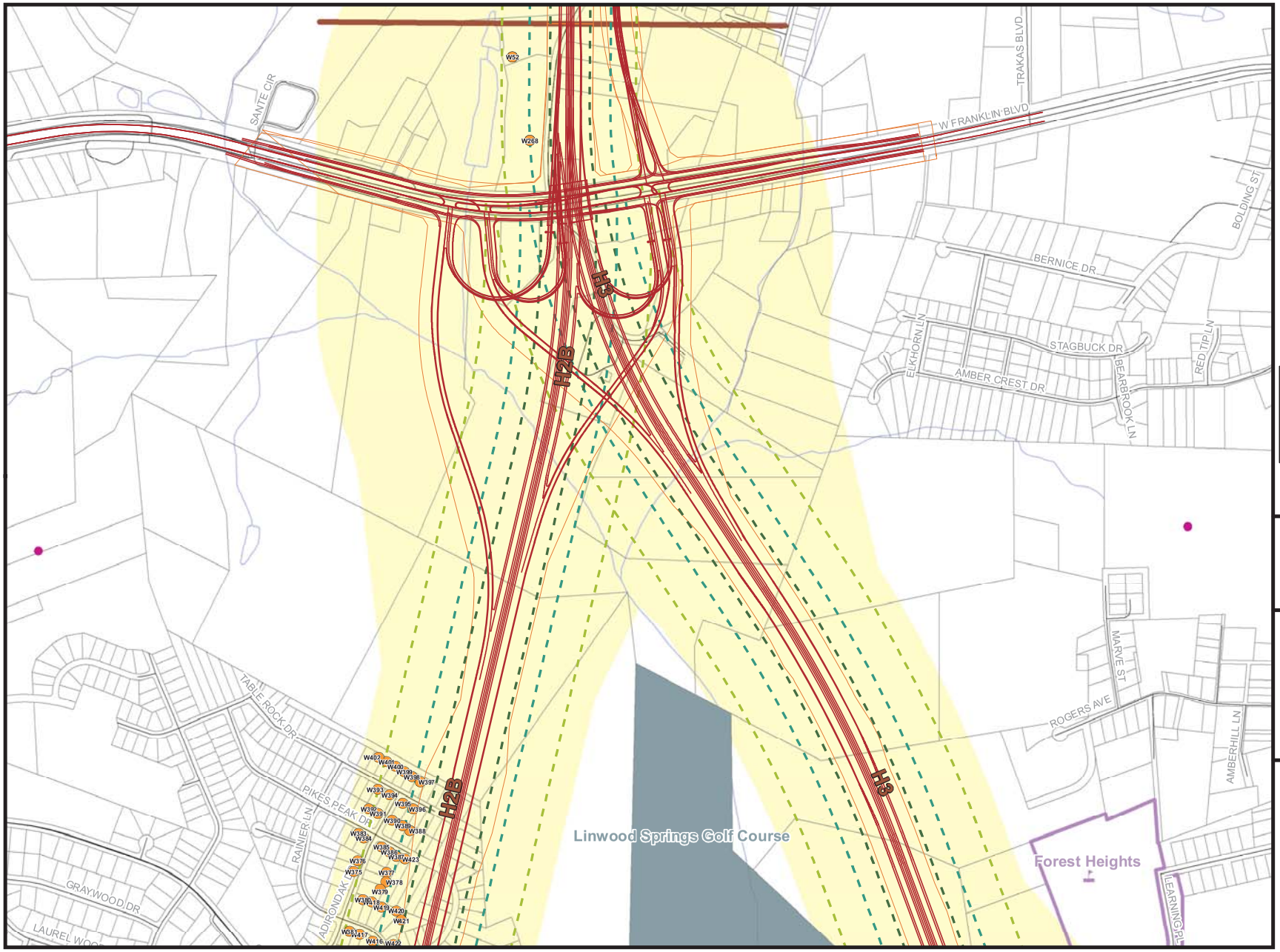
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-4**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

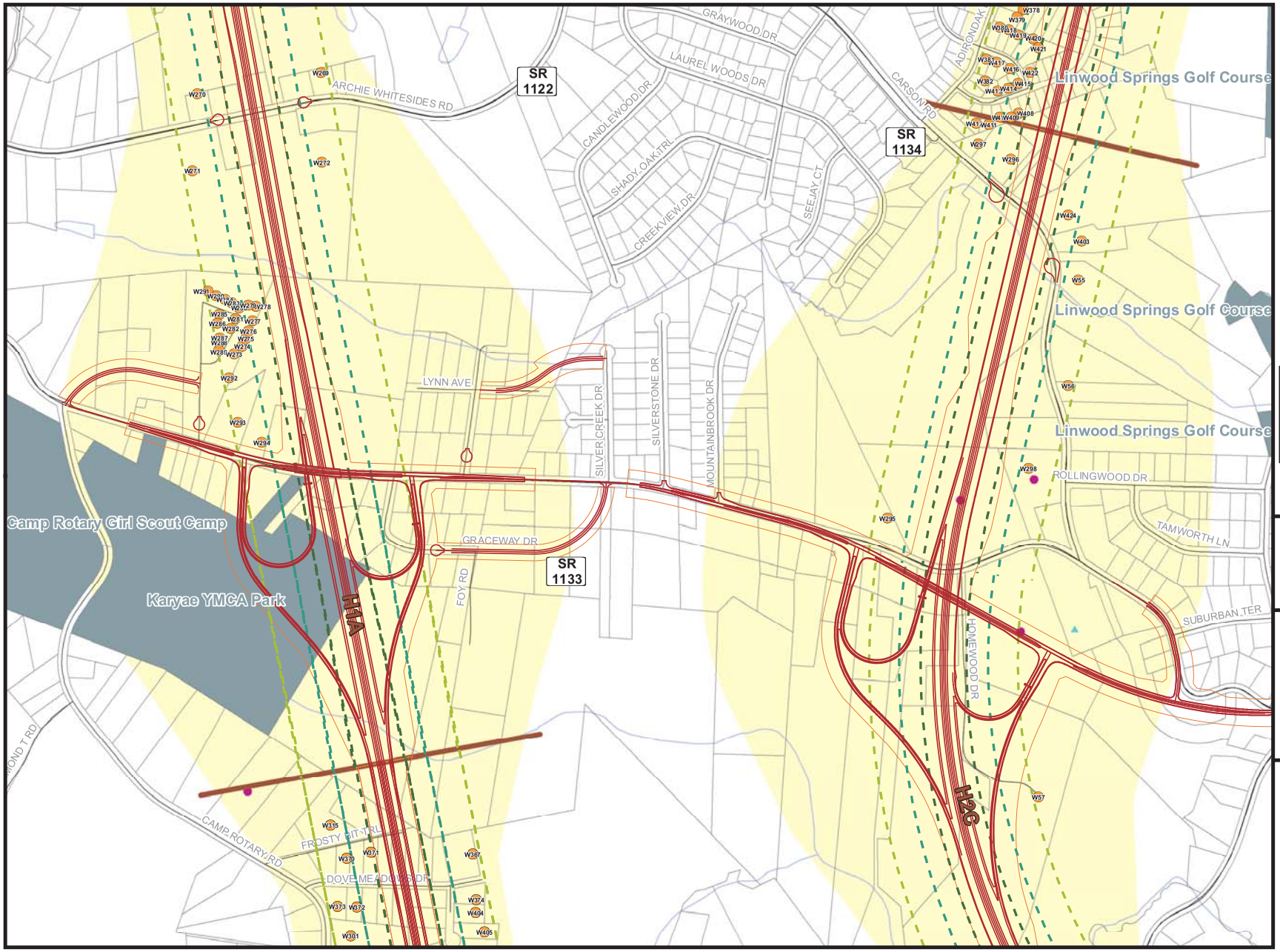
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-5**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

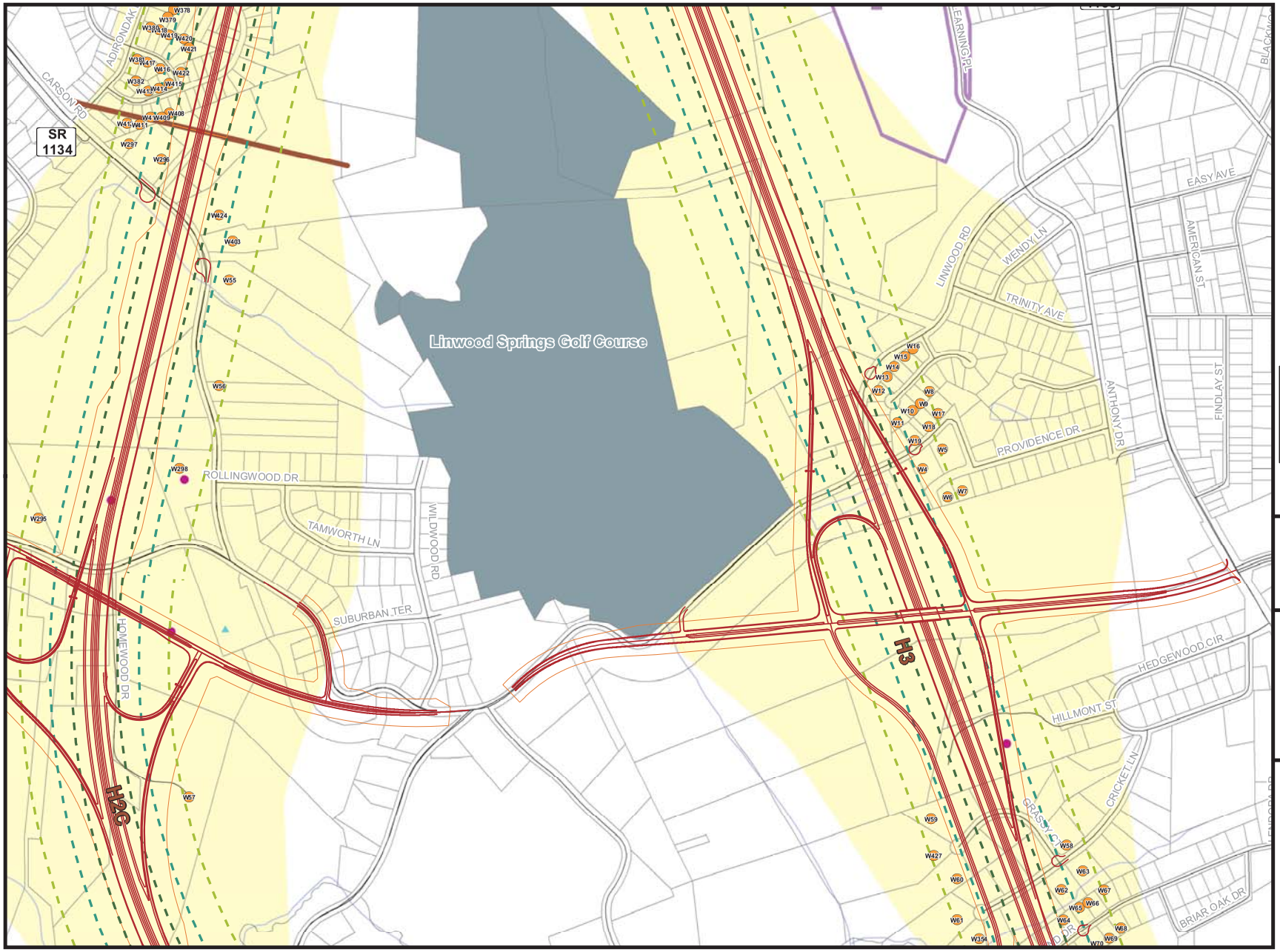
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

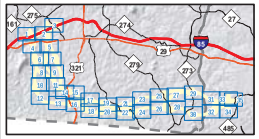
**Figure 4-6**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

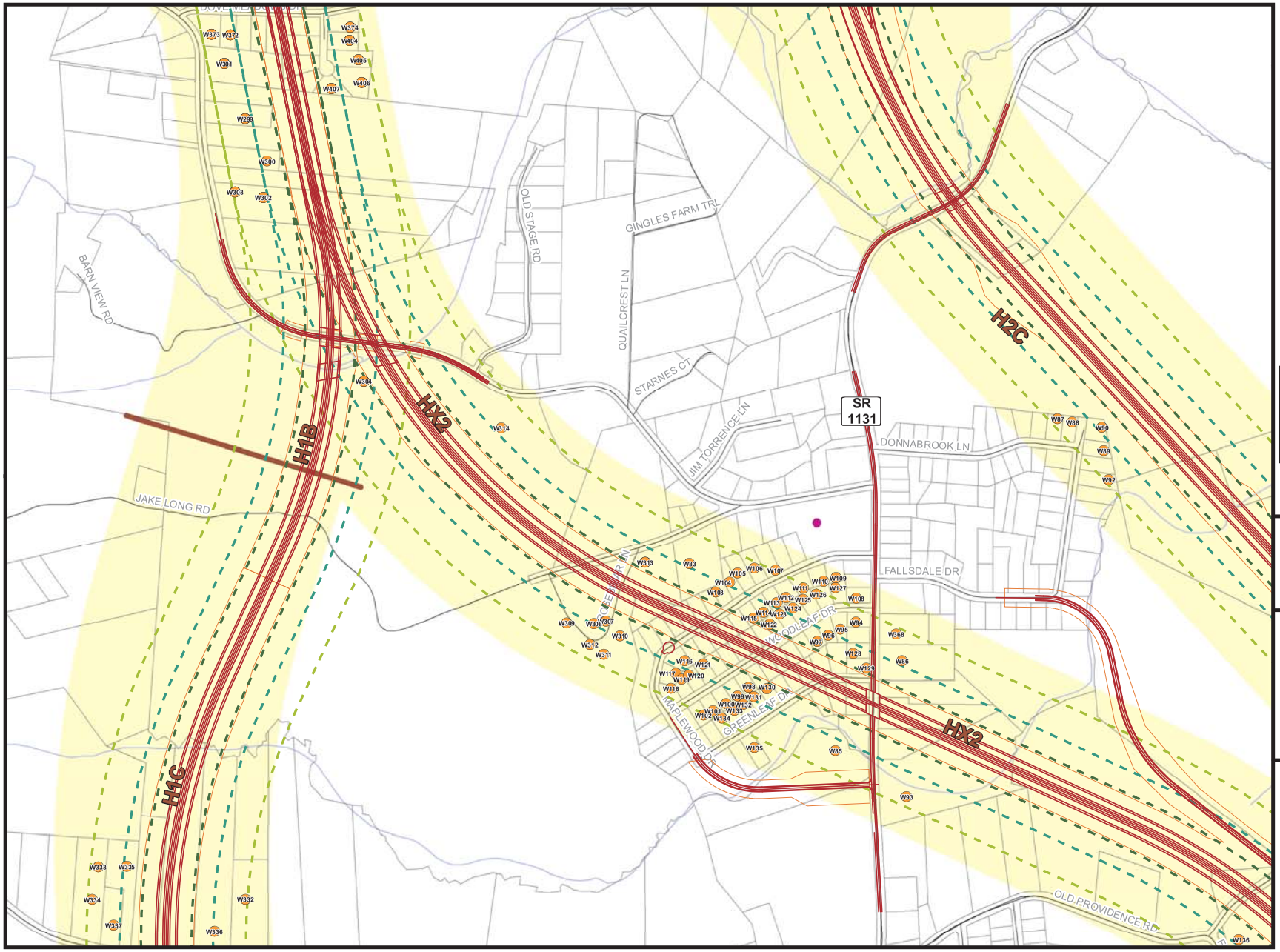
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

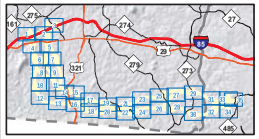
**Figure 4-7**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

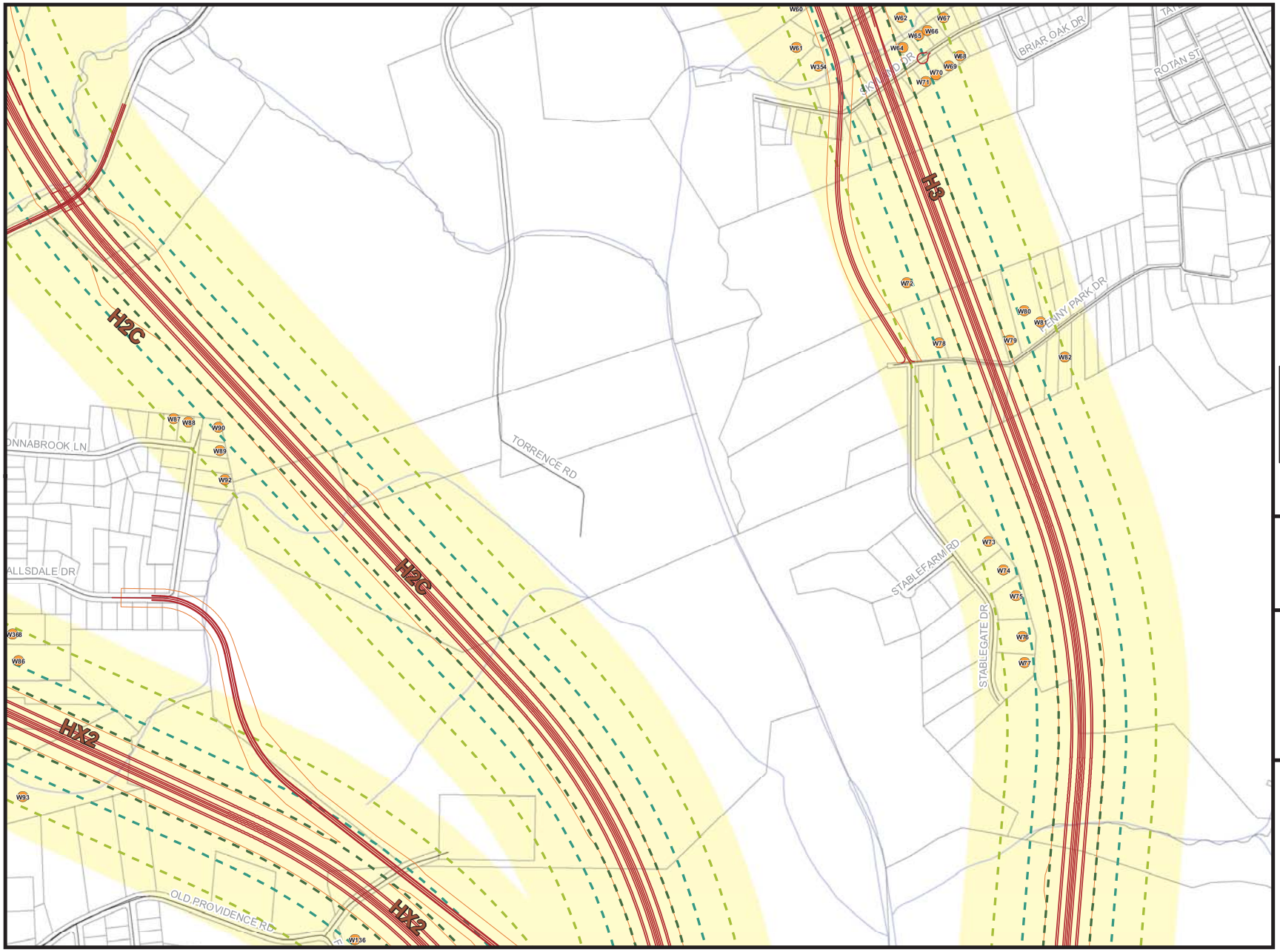
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

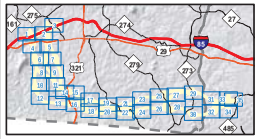
**Figure 4-8**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

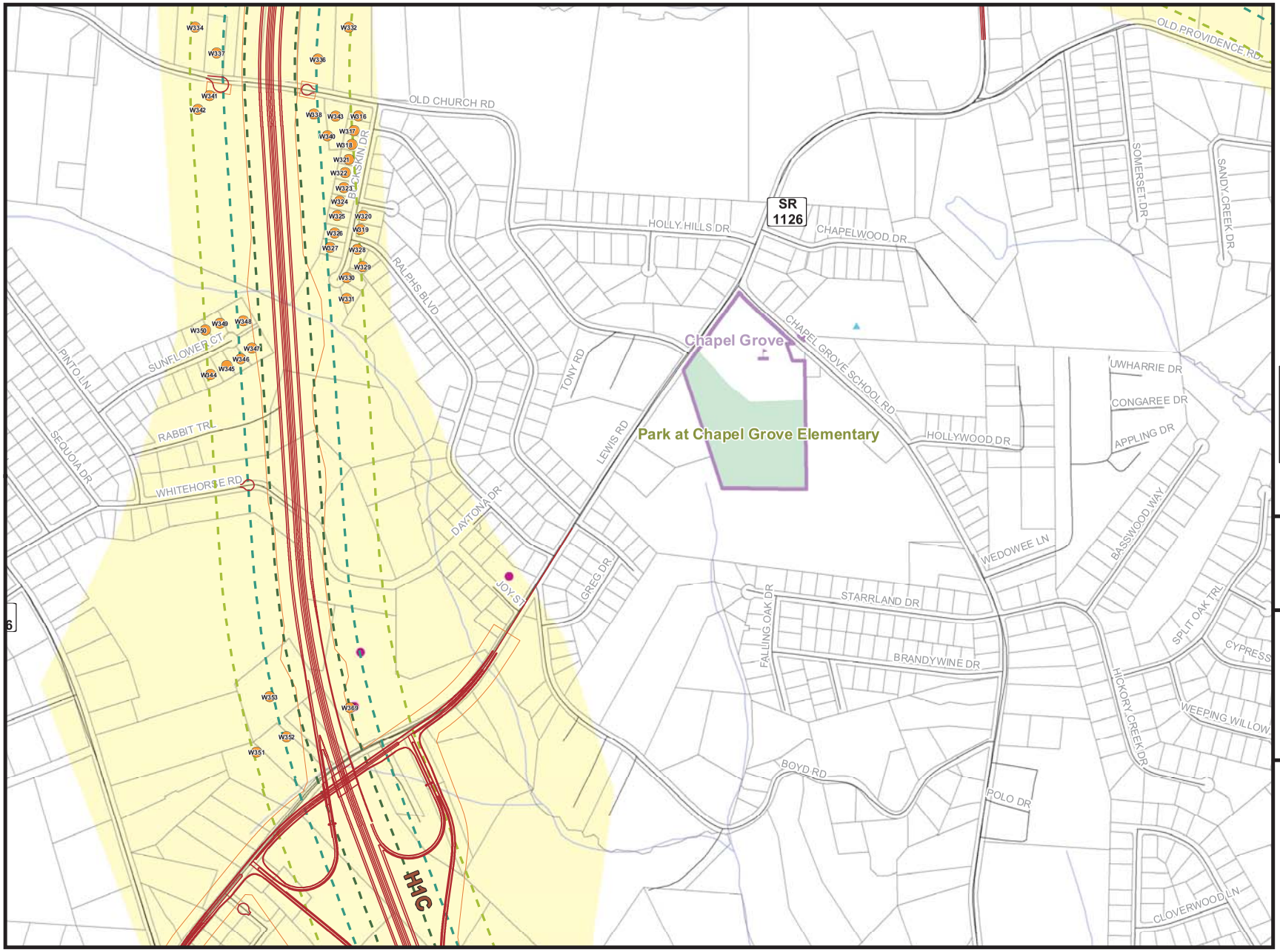
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

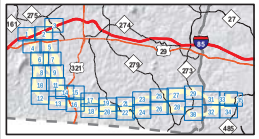
**Figure 4-9**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

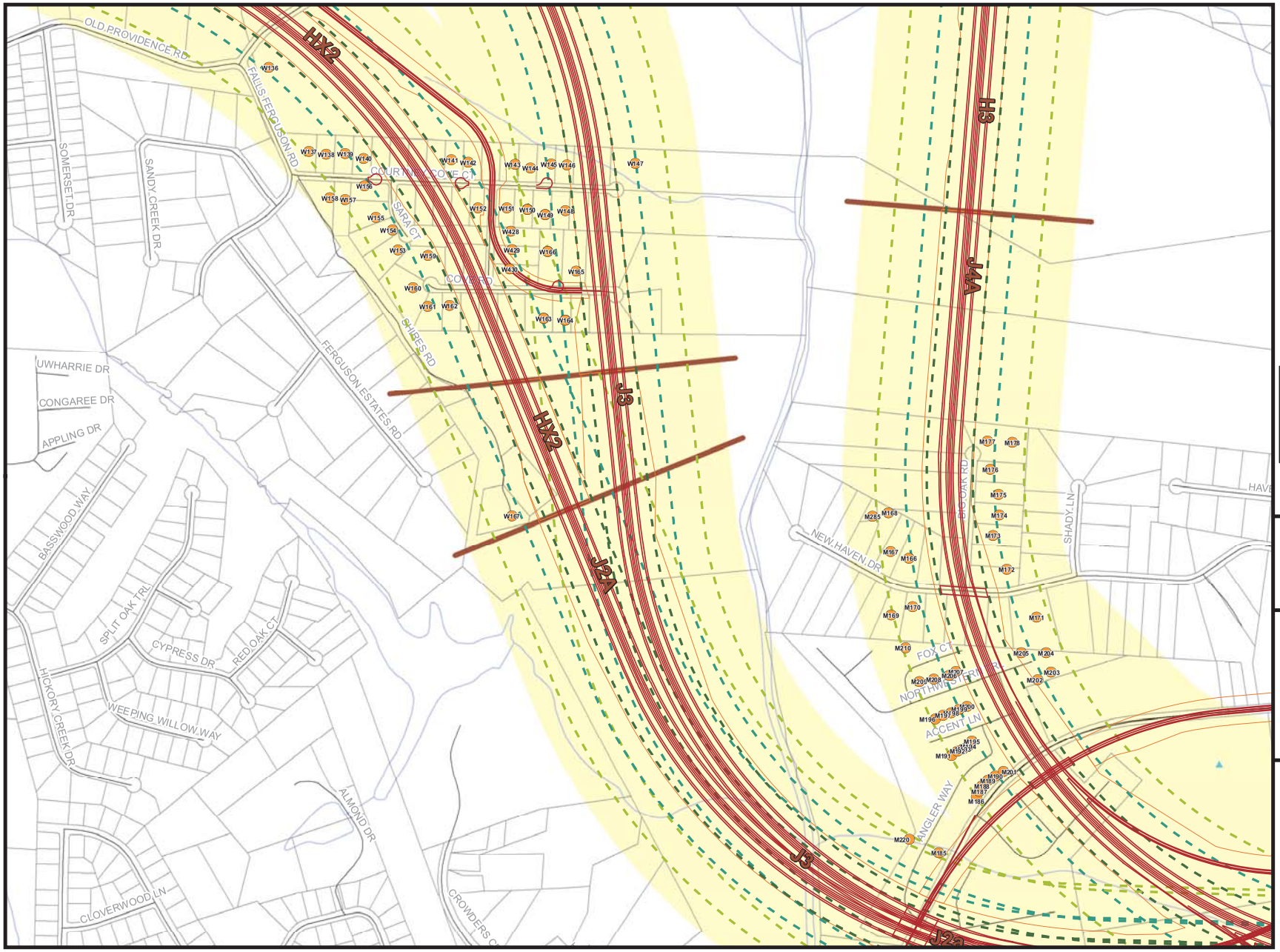
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

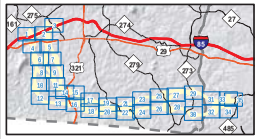
**Figure 4-10**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

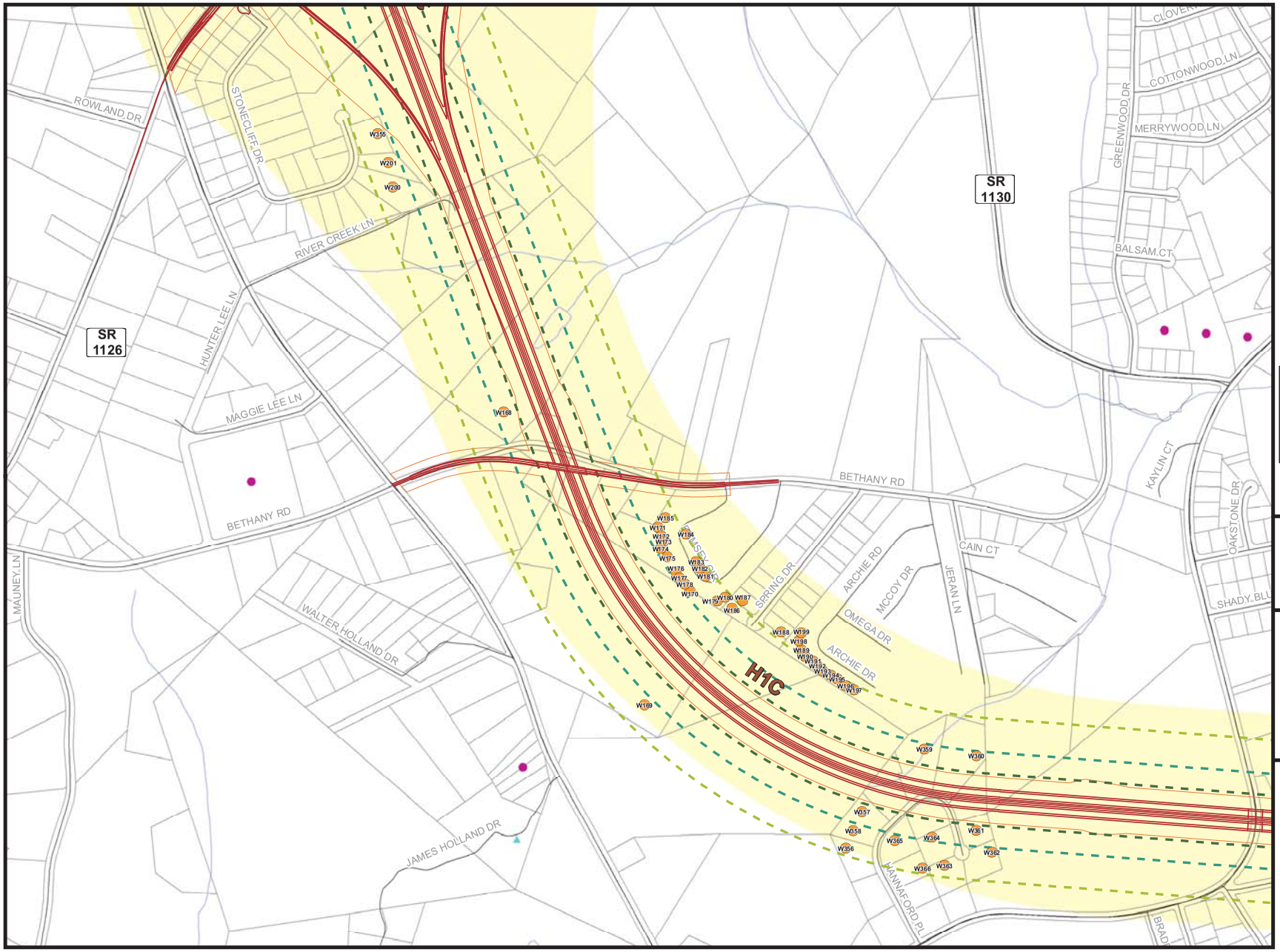
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

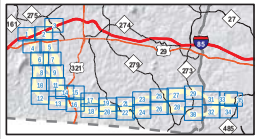
**Figure 4-11**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

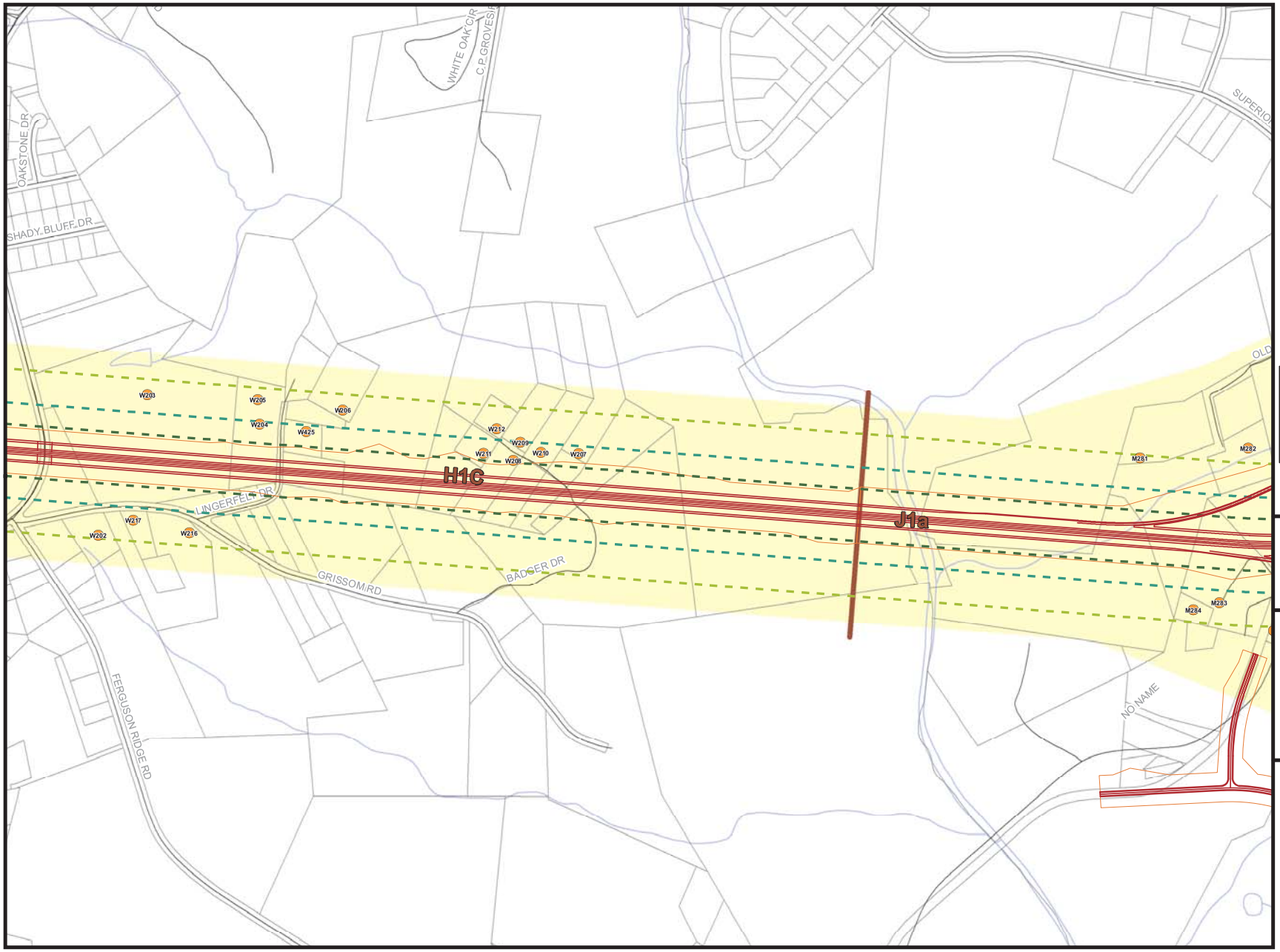
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

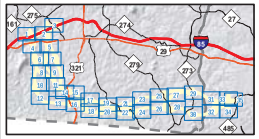
**Figure 4-12**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

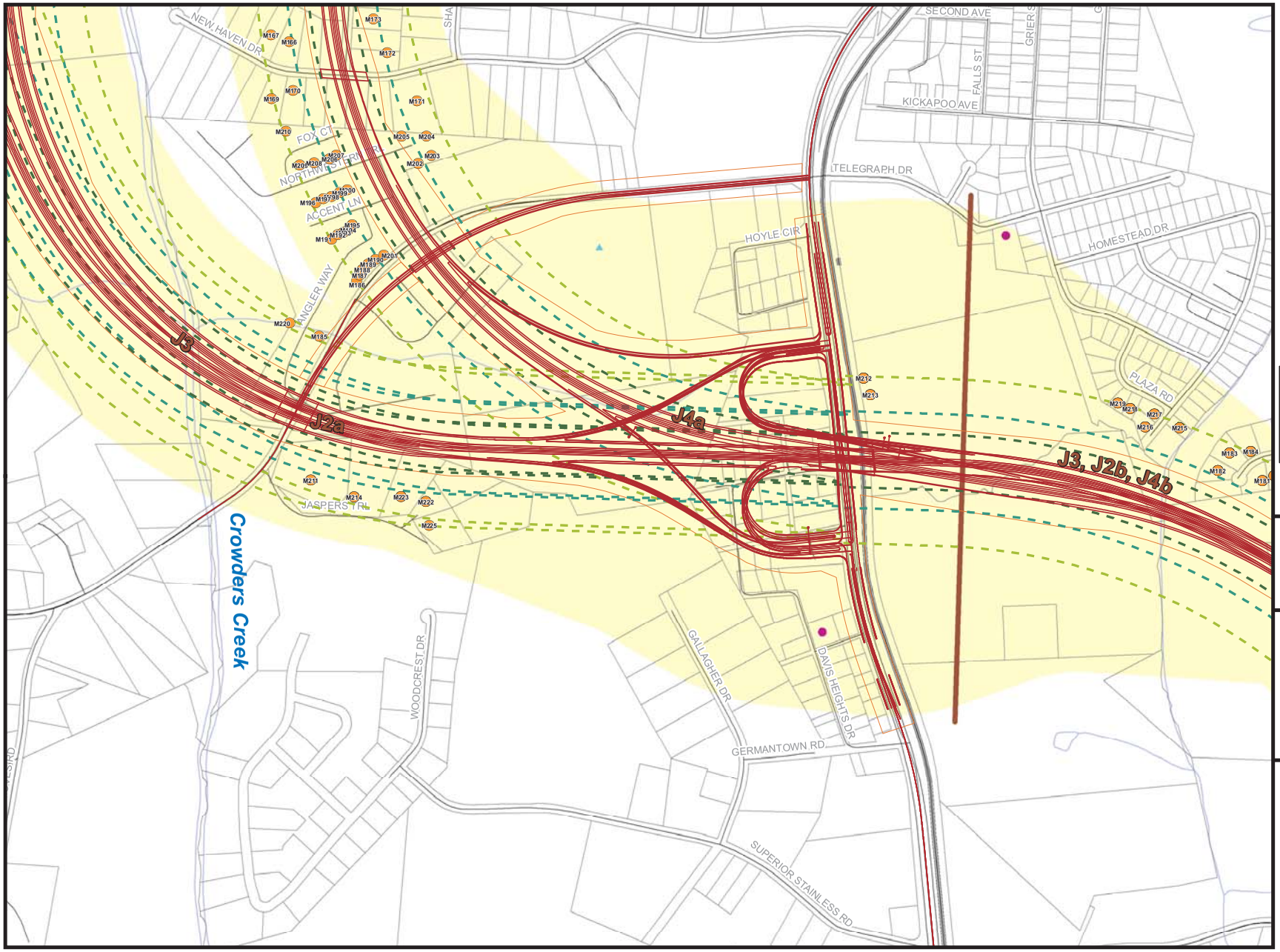
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

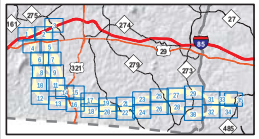
**Figure 4-13**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

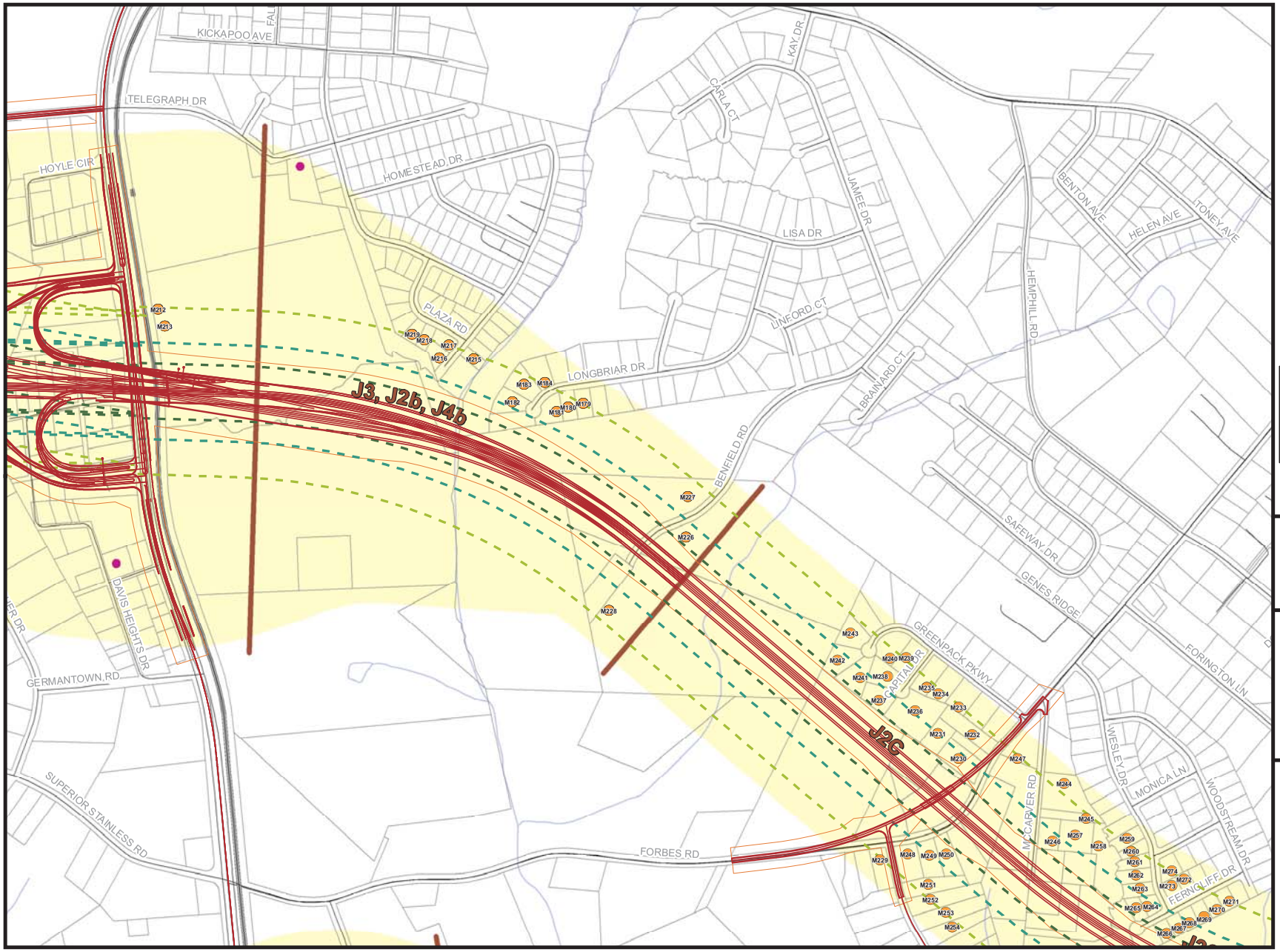
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

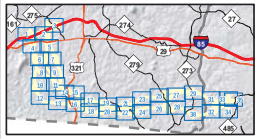
**Figure 4-14**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

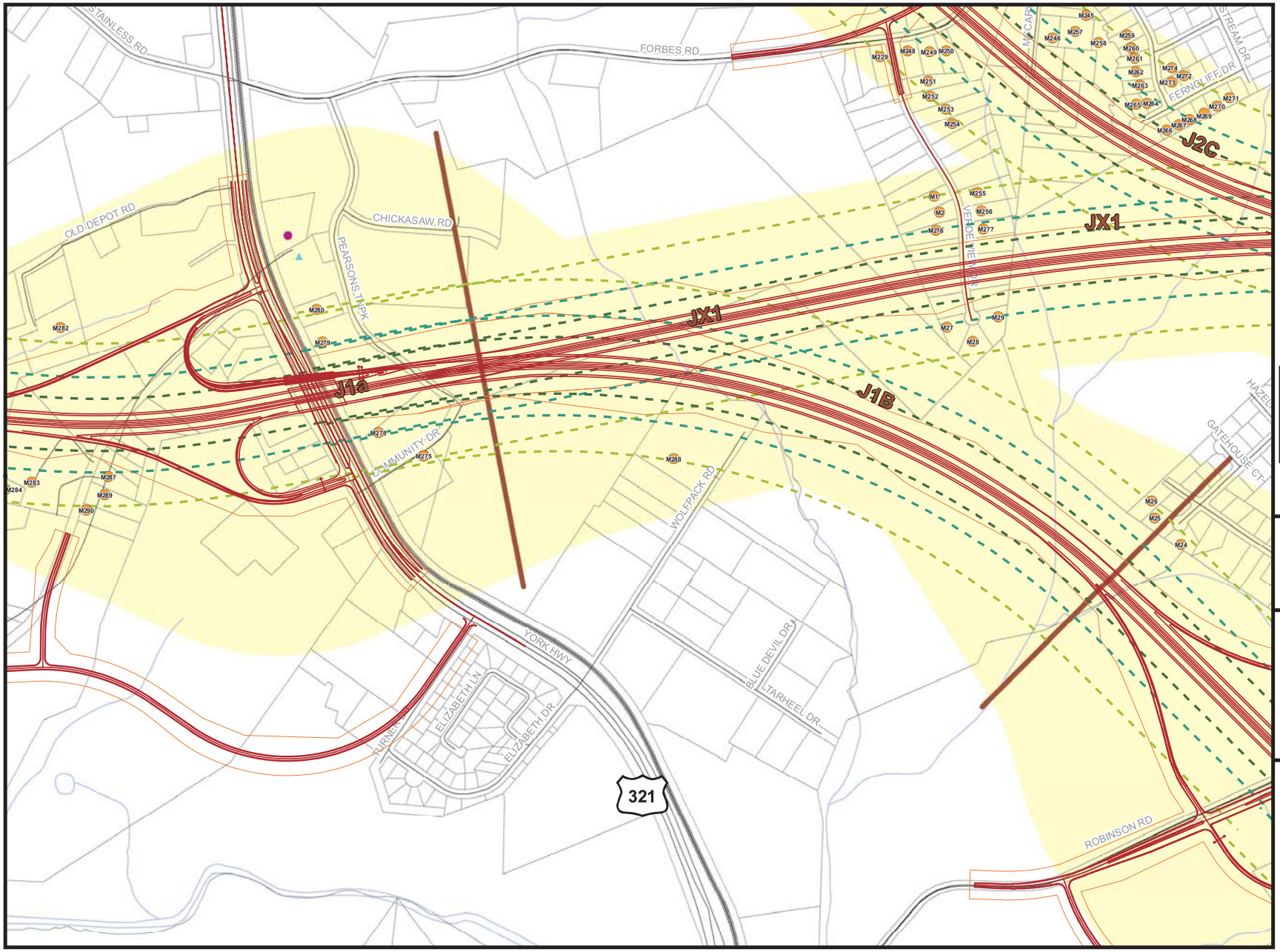
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

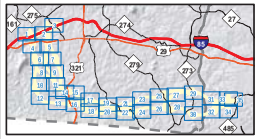
**Figure 4-15**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

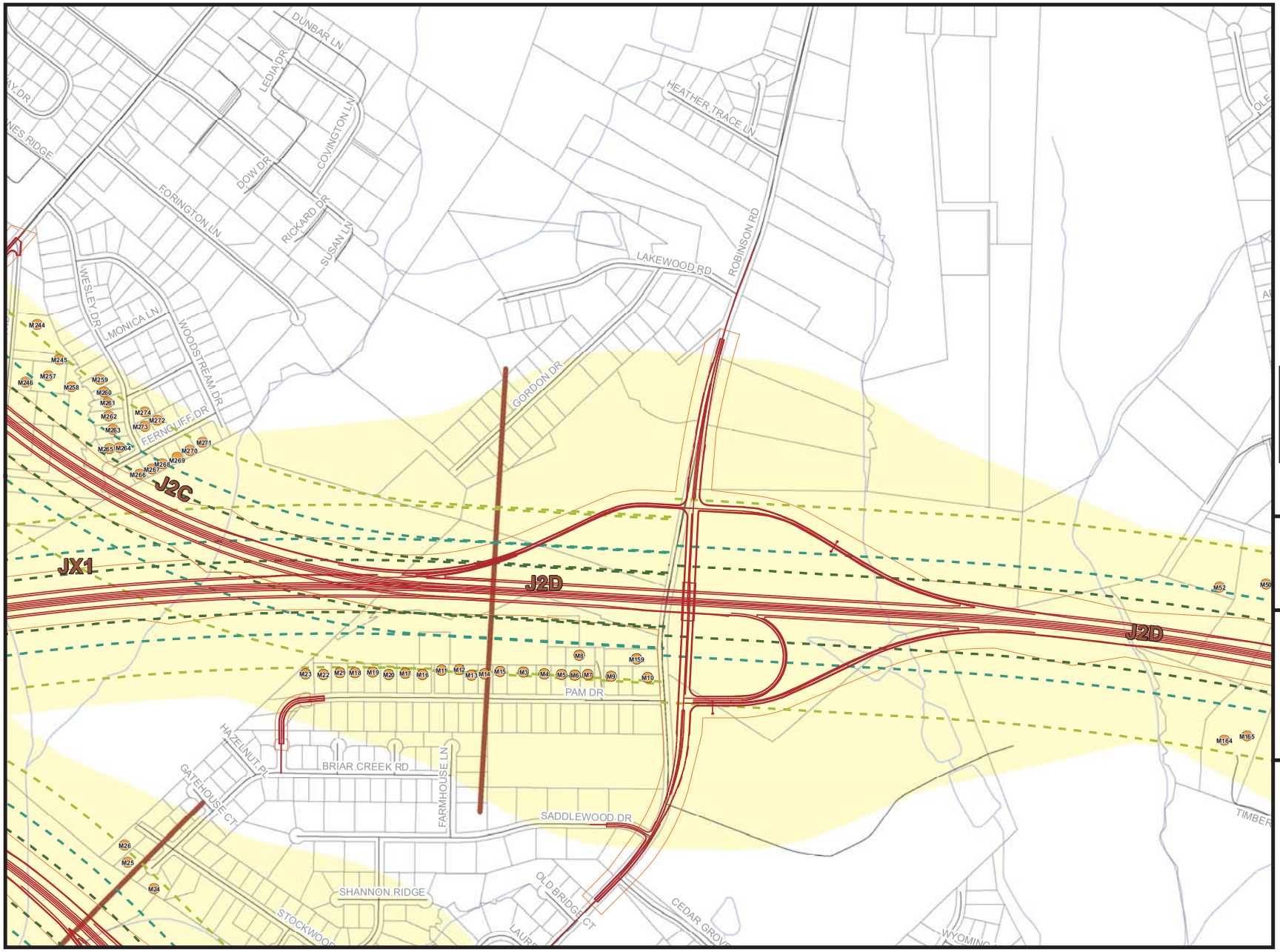
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

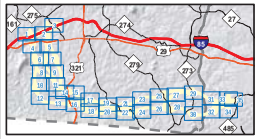
**Figure 4-16**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

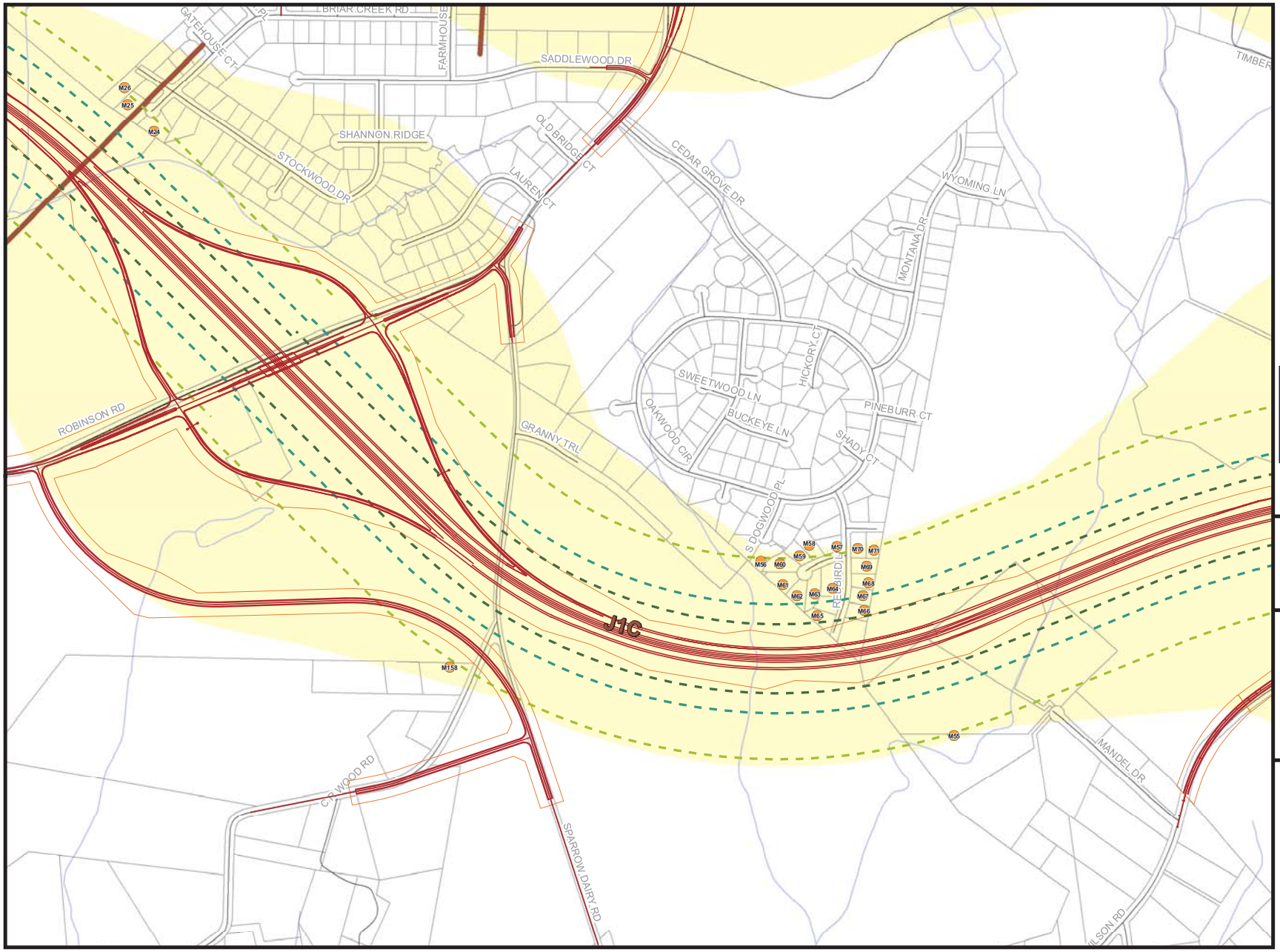
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

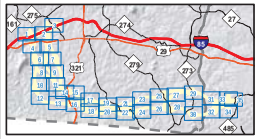
**Figure 4-17**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

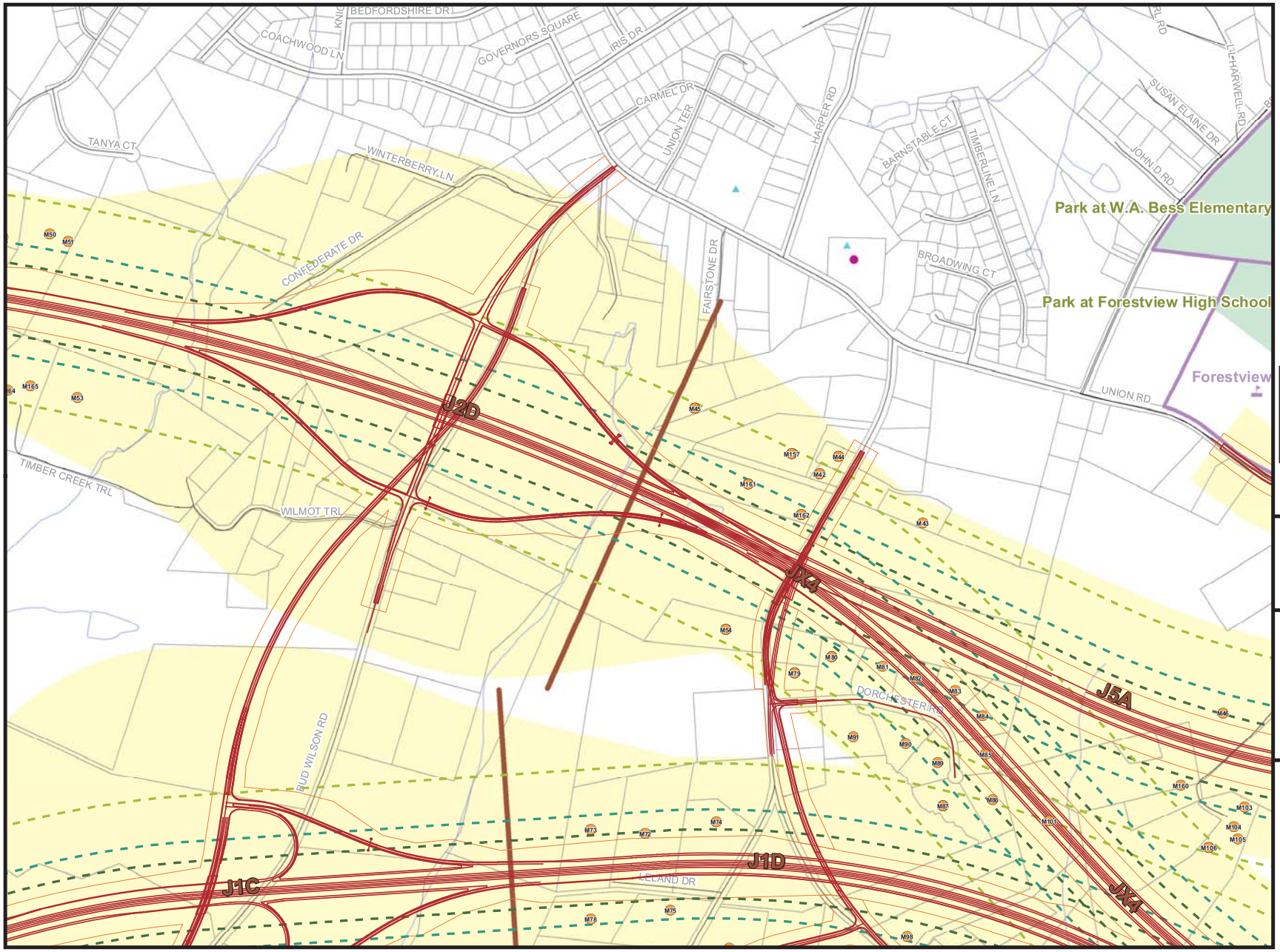
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

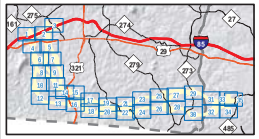
**Figure 4-18**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

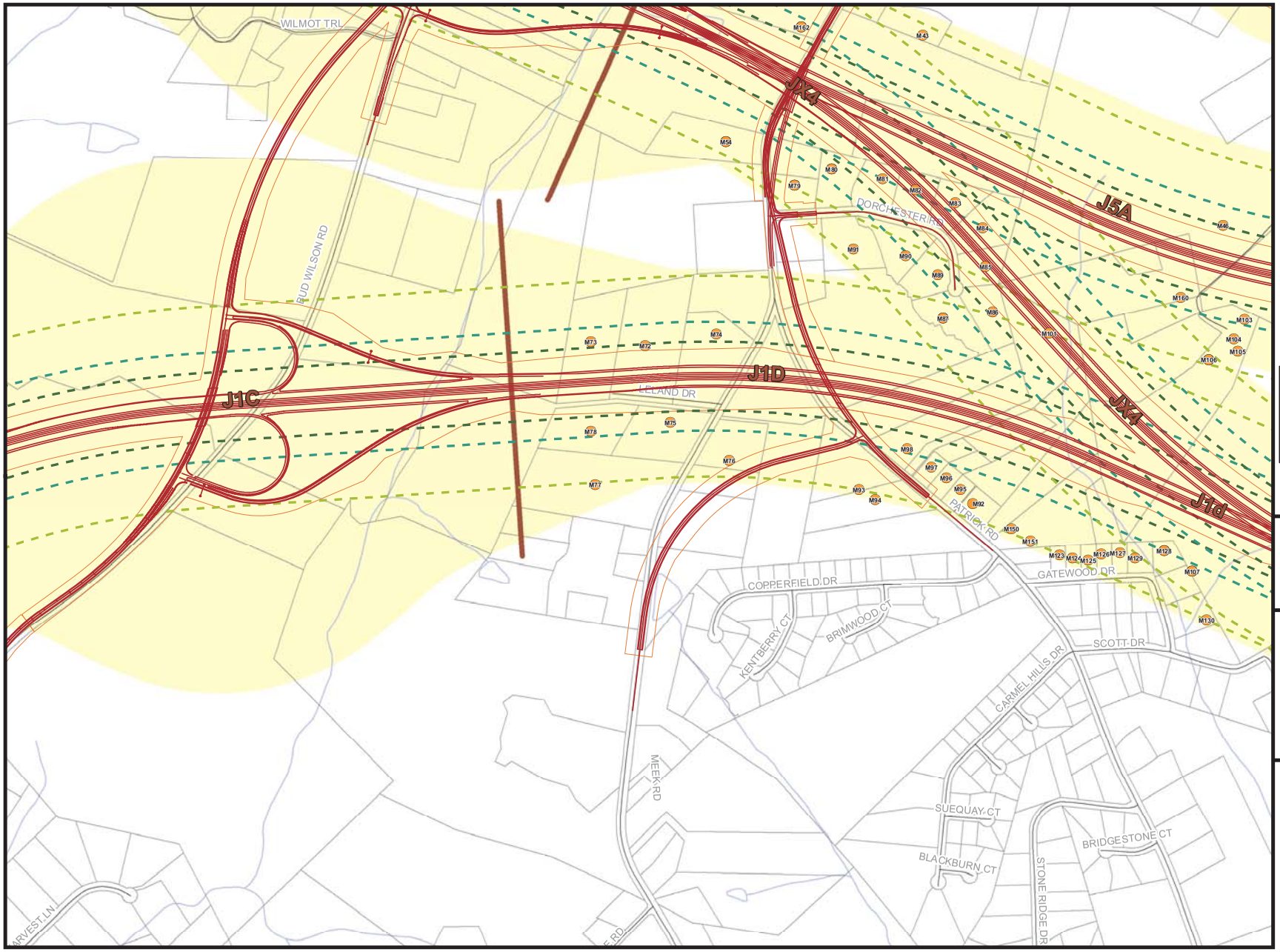
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

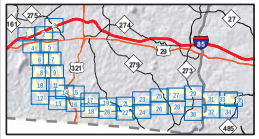
**Figure 4-19**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

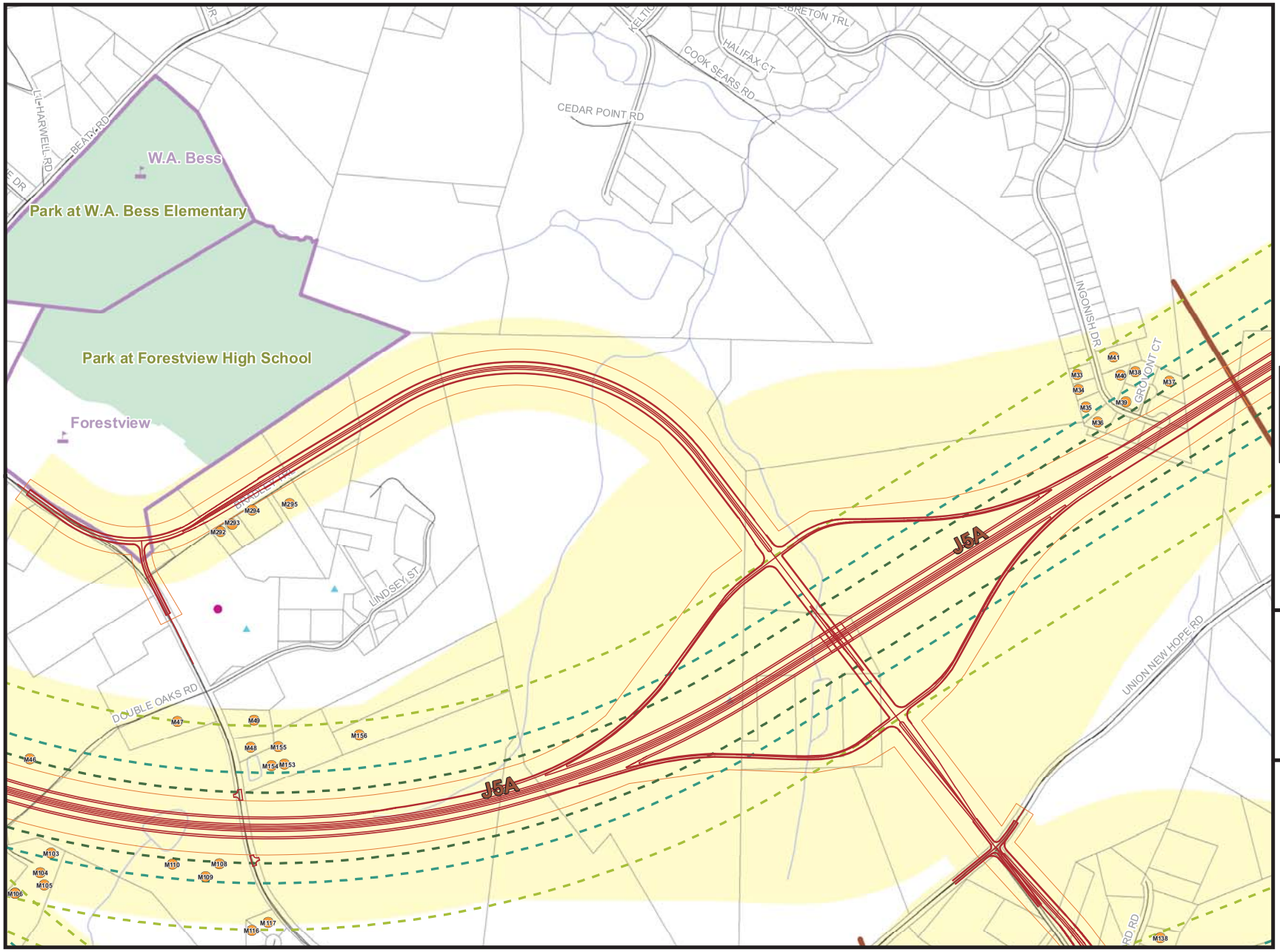
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-20**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

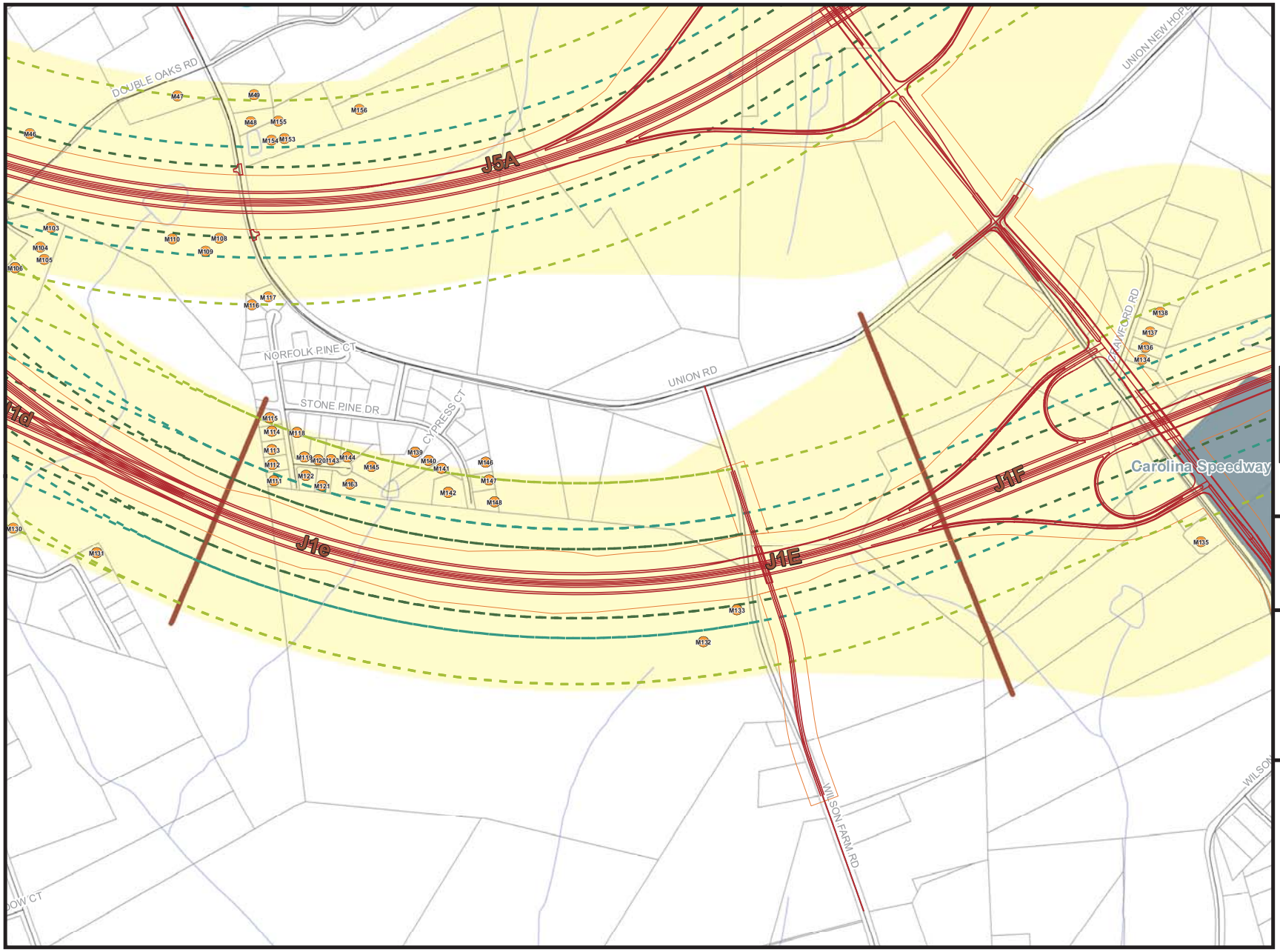
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

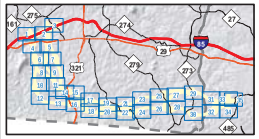
**Figure 4-21**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

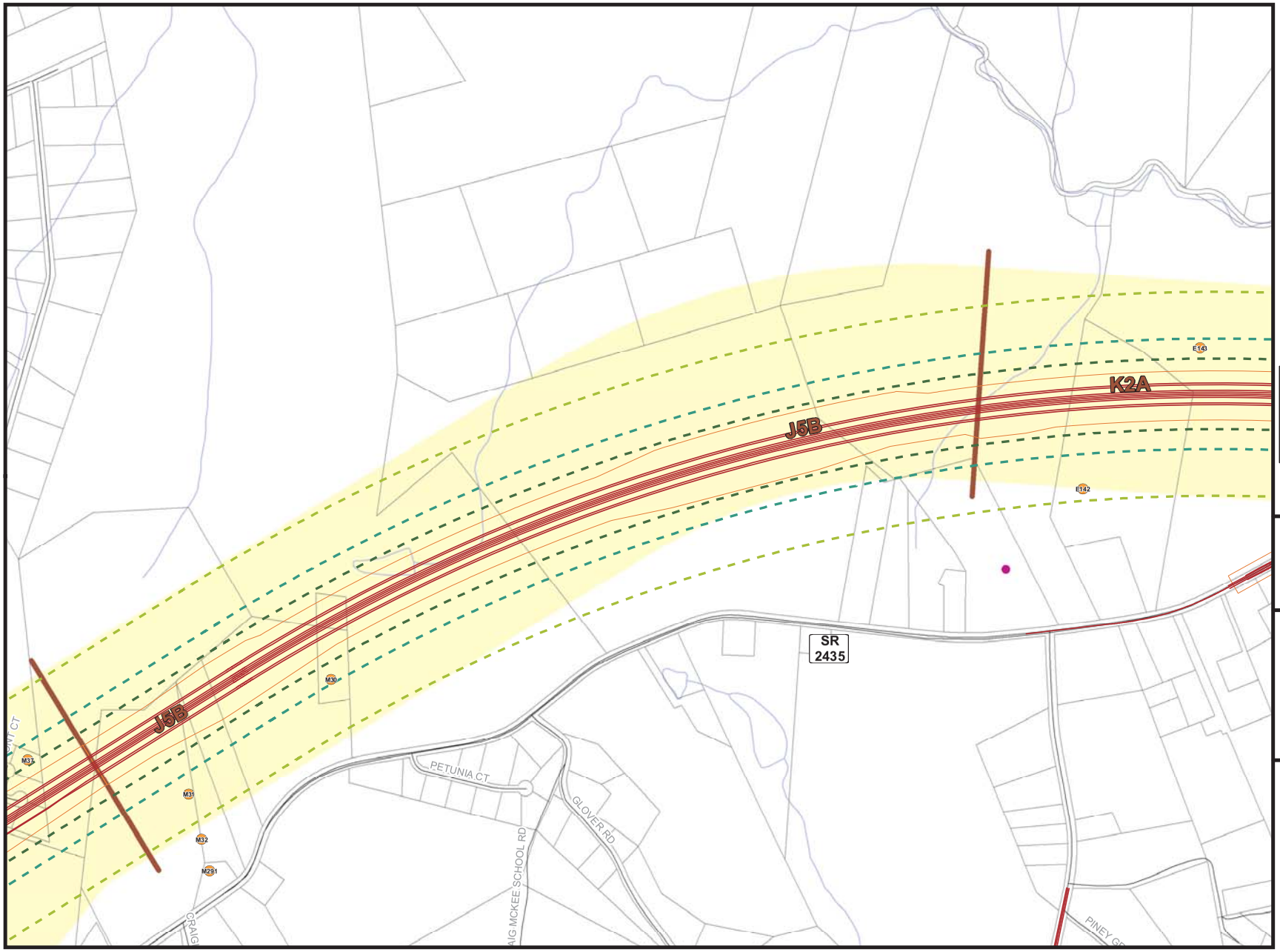
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-22**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K2A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

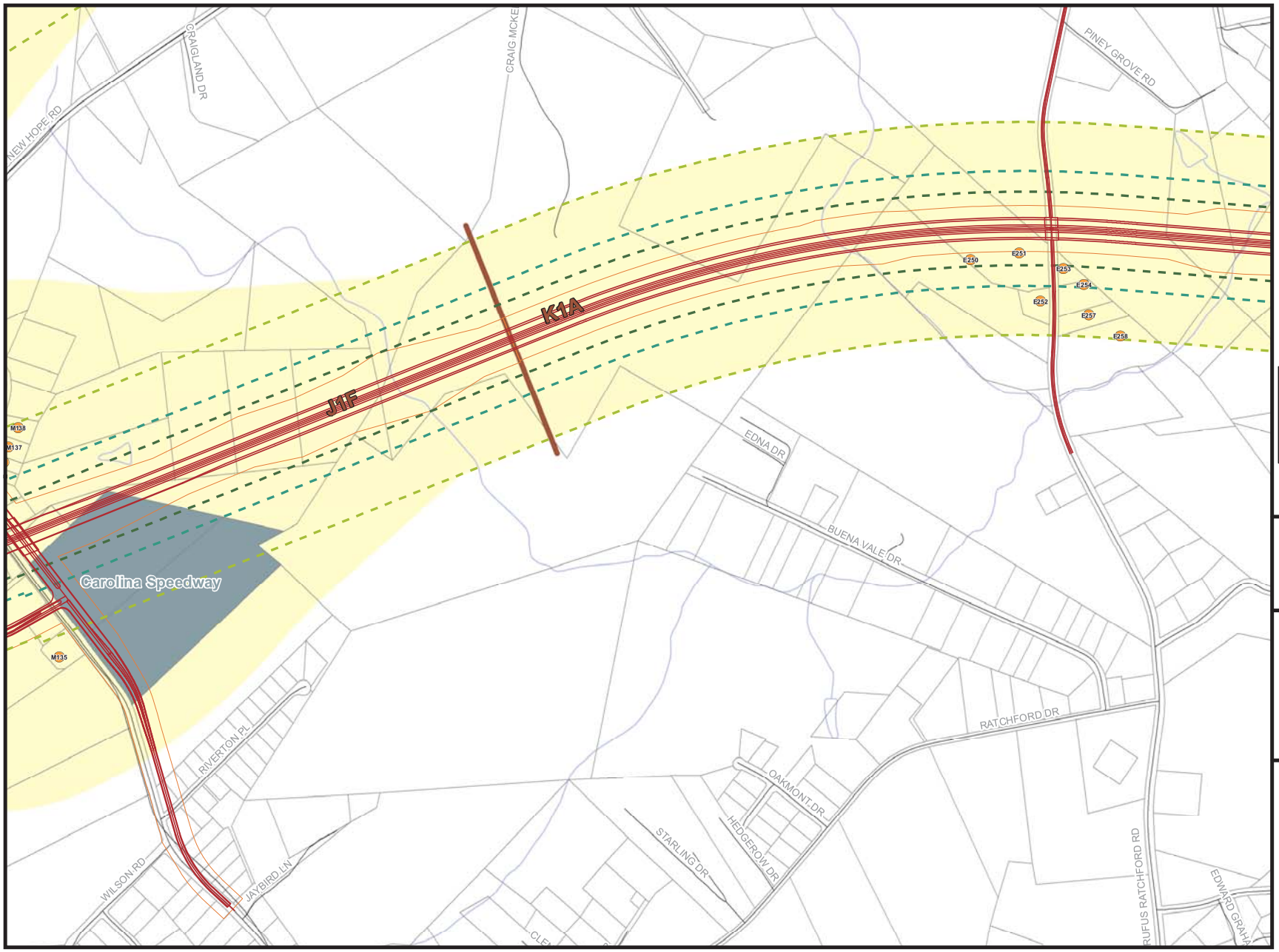
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

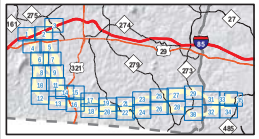
**Figure 4-23**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

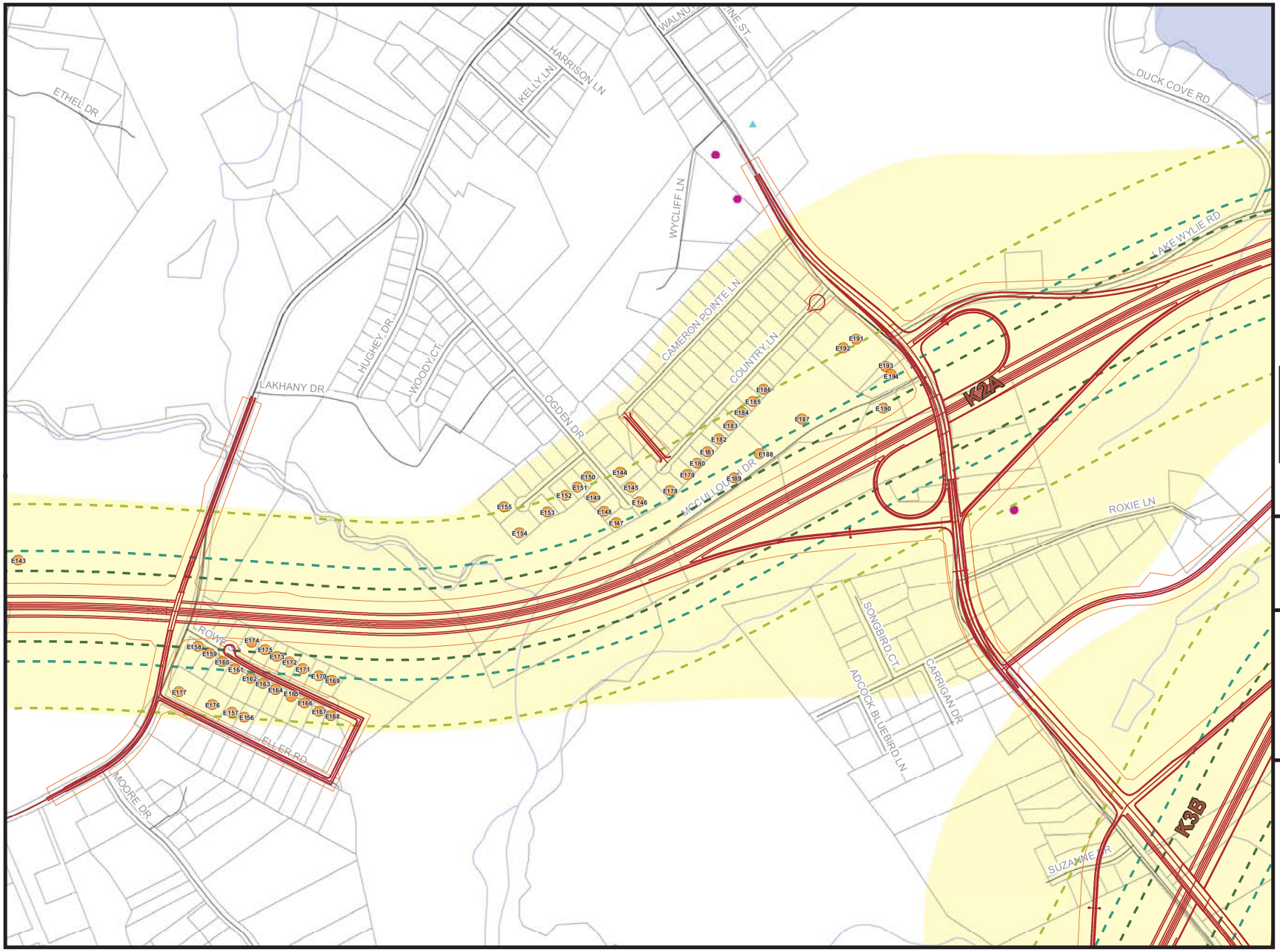
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-24**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

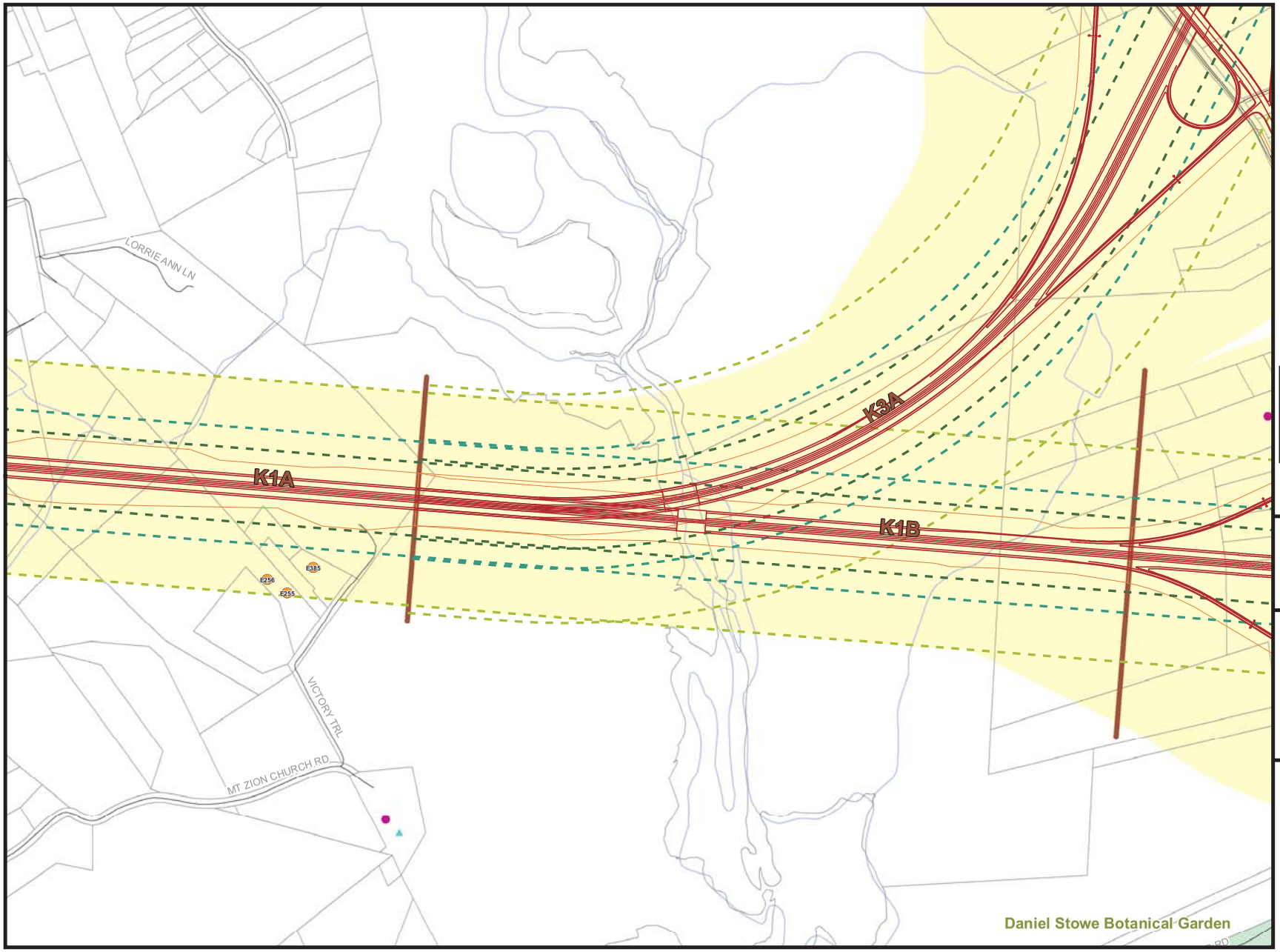
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

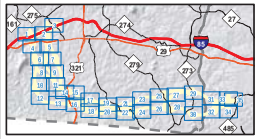
**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-25**

2030NoiseContours&ReceptorsRev.mxd




Legend
- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

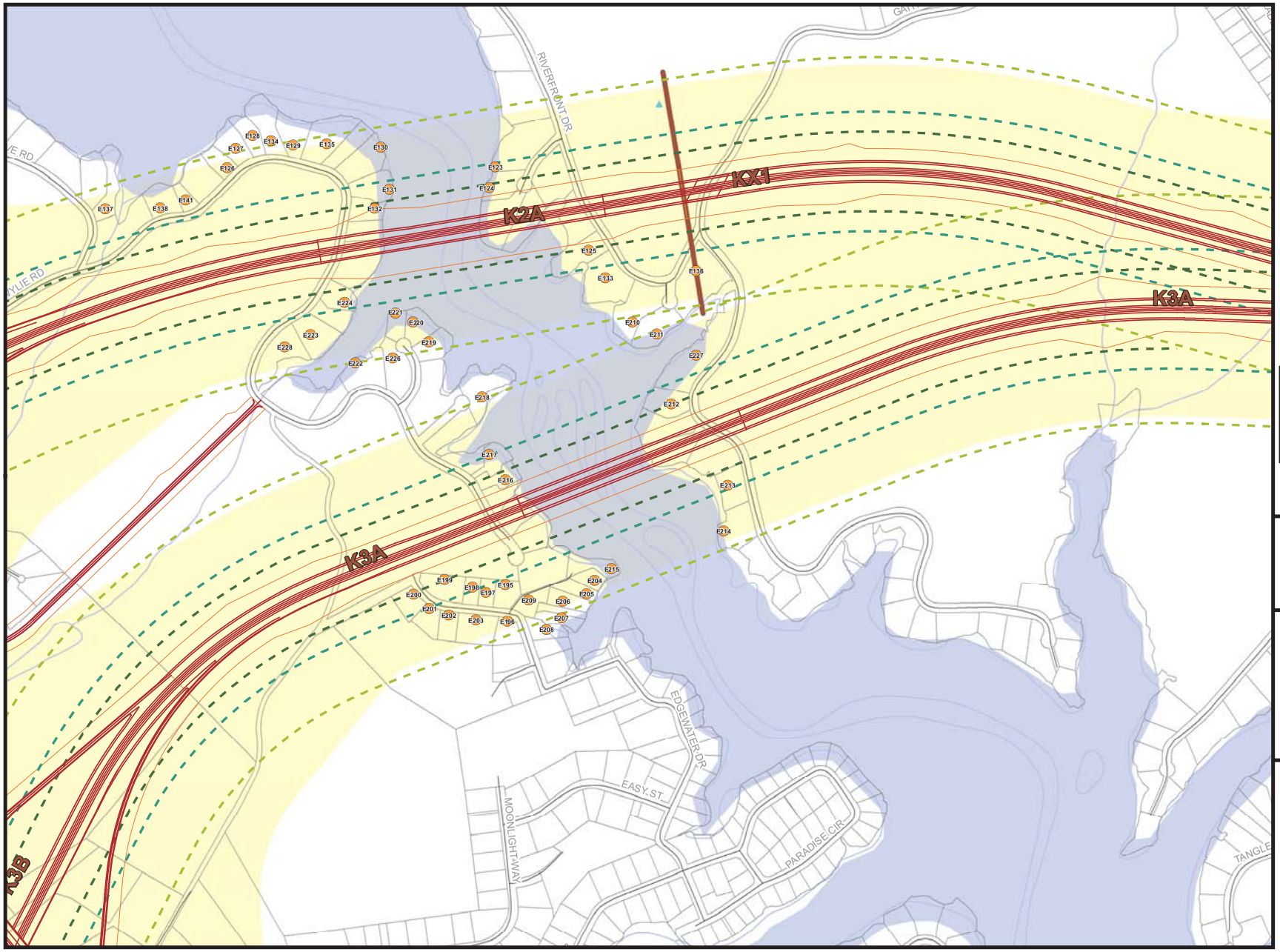
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

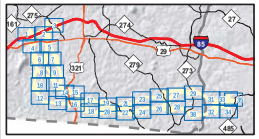
**Figure 4-26**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

N

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

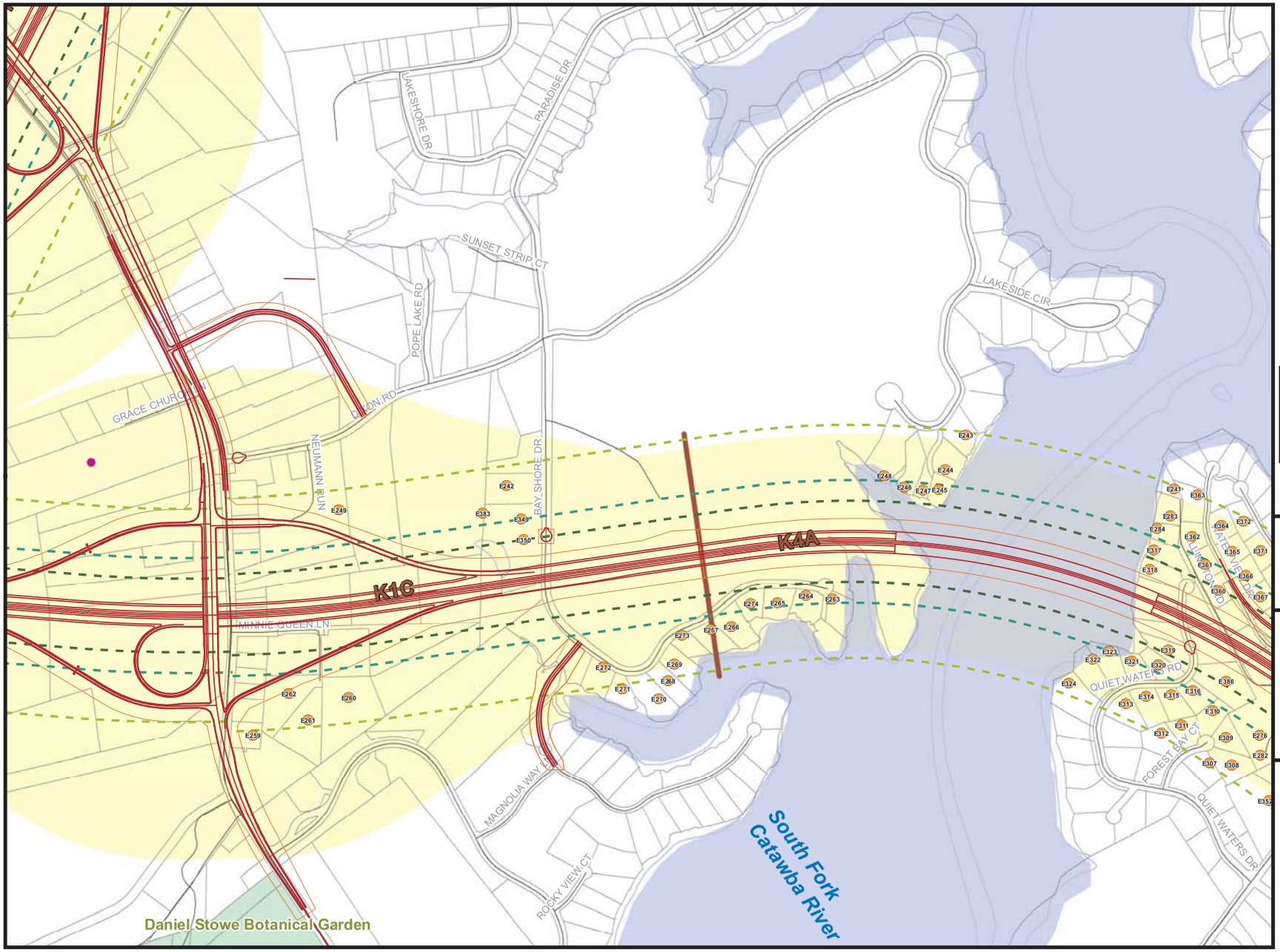
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-27**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

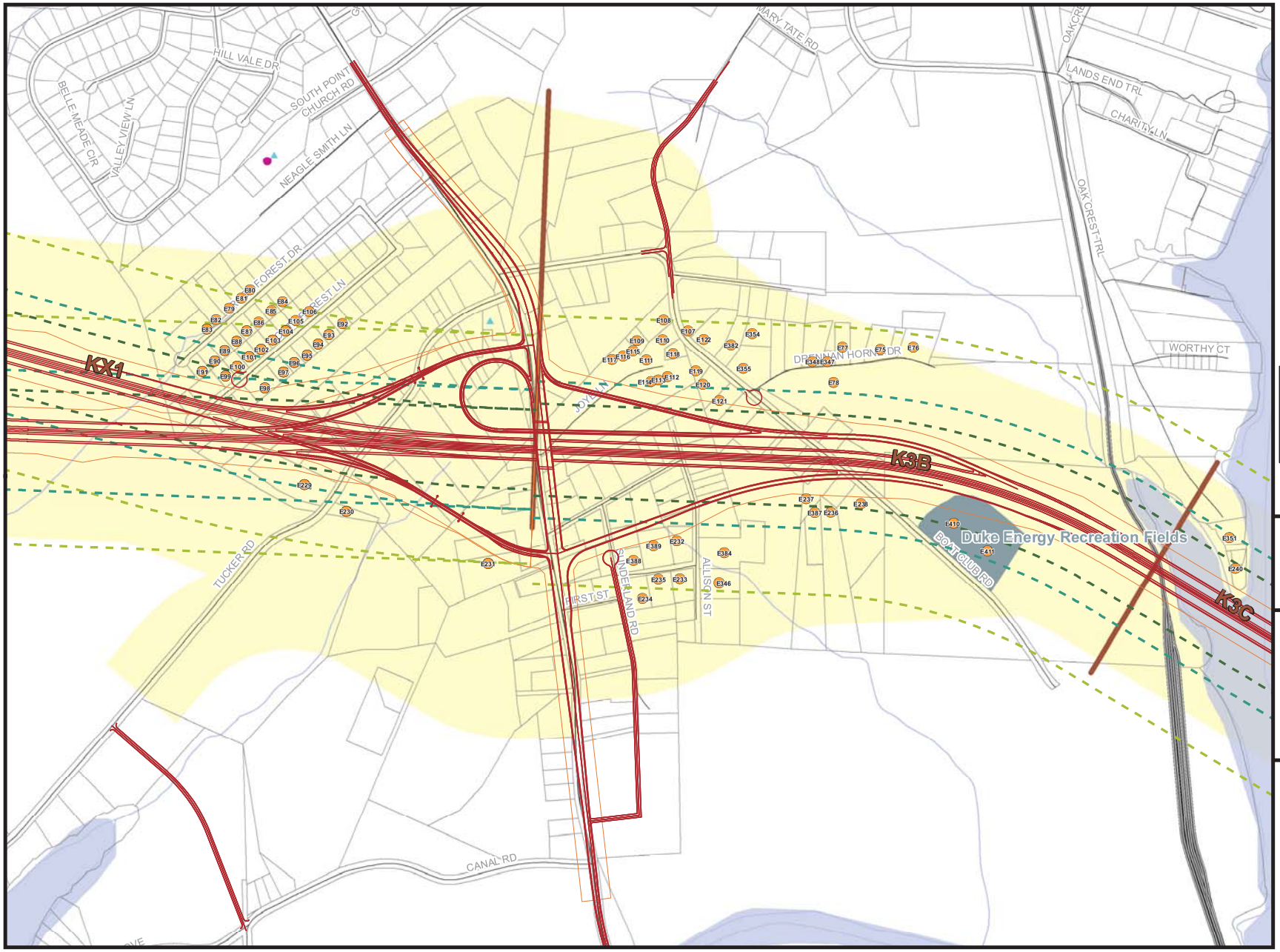
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

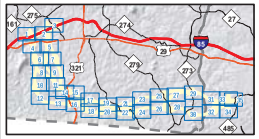
**Figure 4-28**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

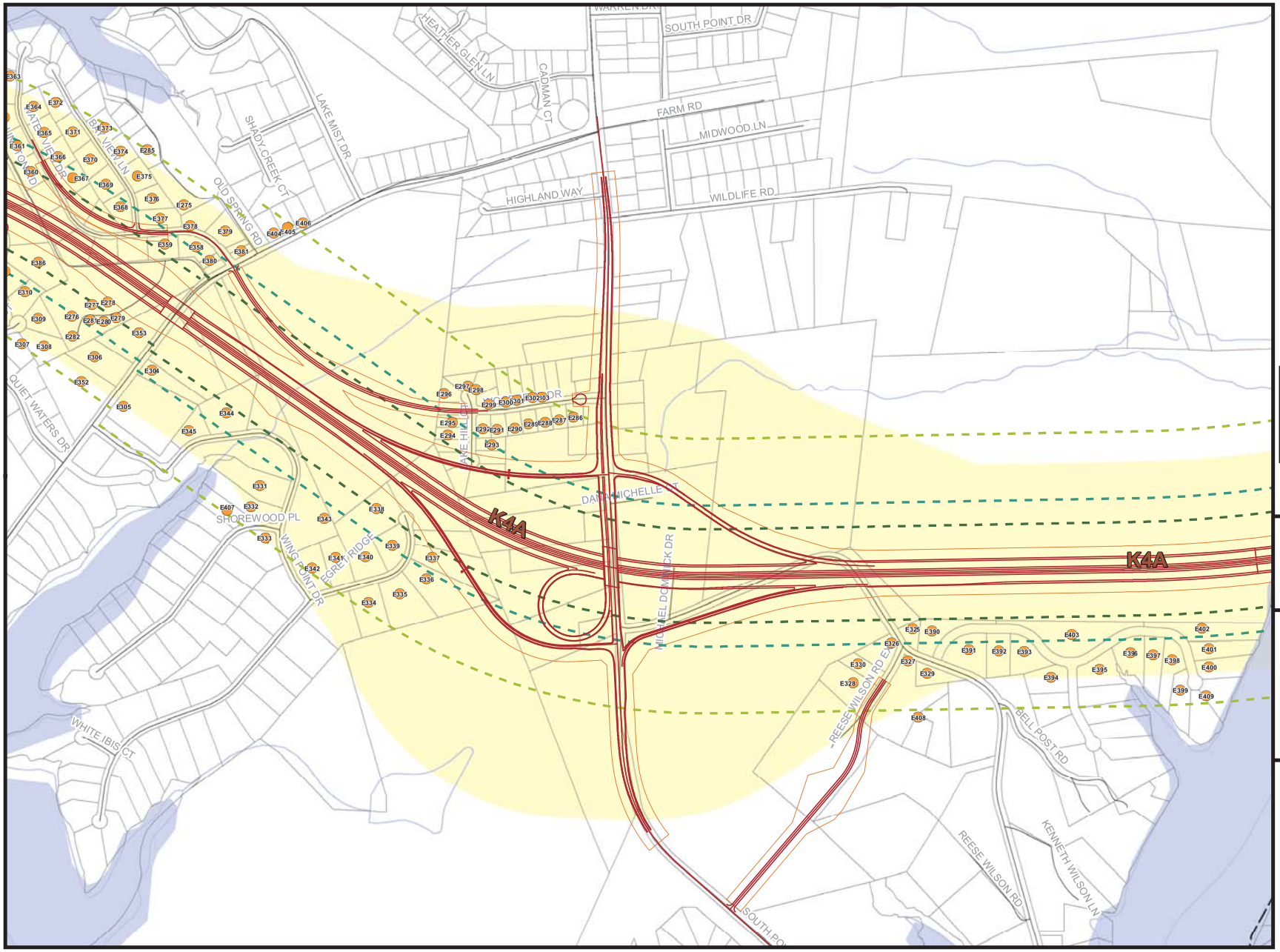
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-29**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name

Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

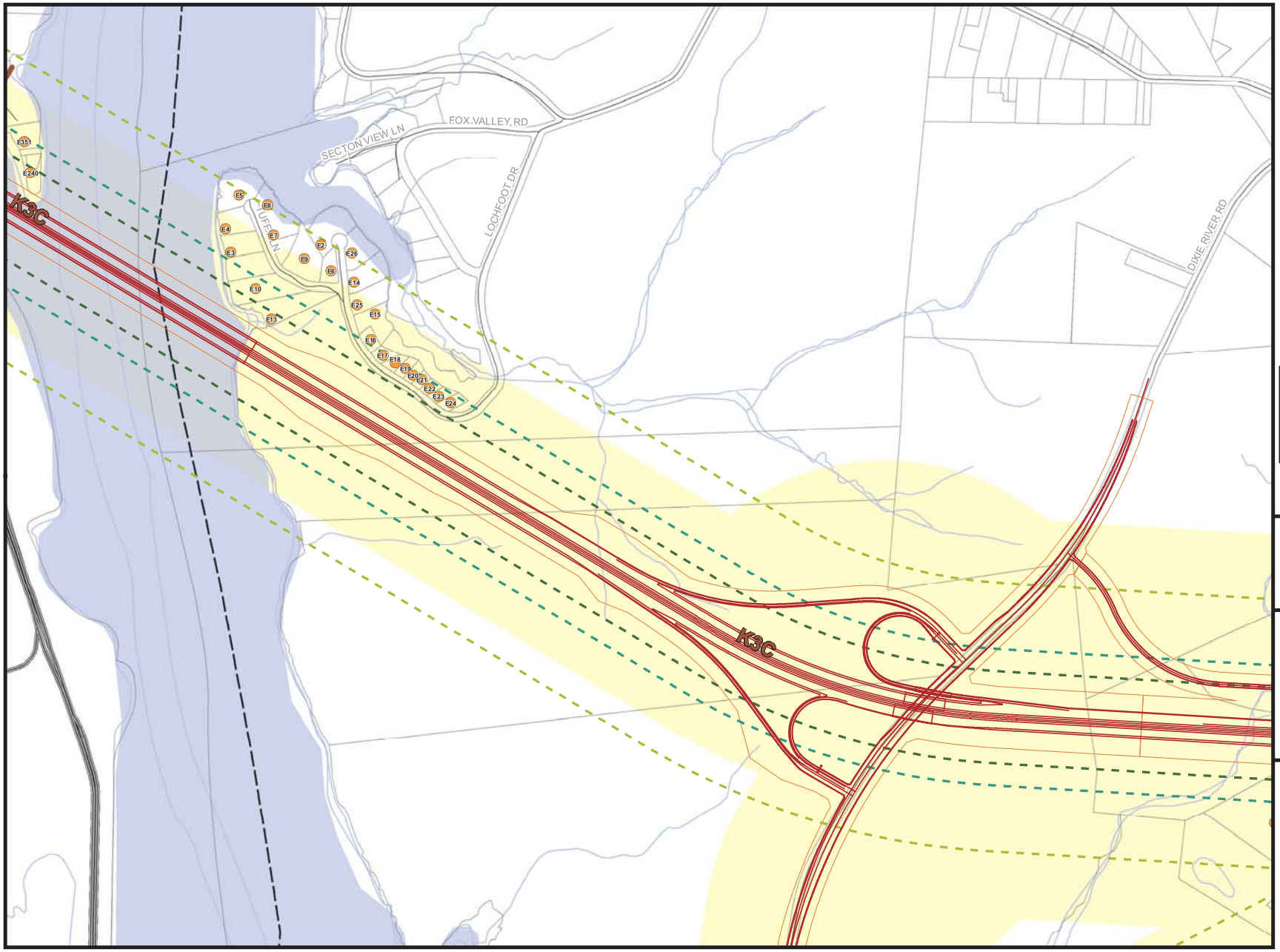
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

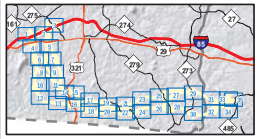
**Figure 4-30**

2030NoiseContours&ReceptorsRev.mxd




**Legend**

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

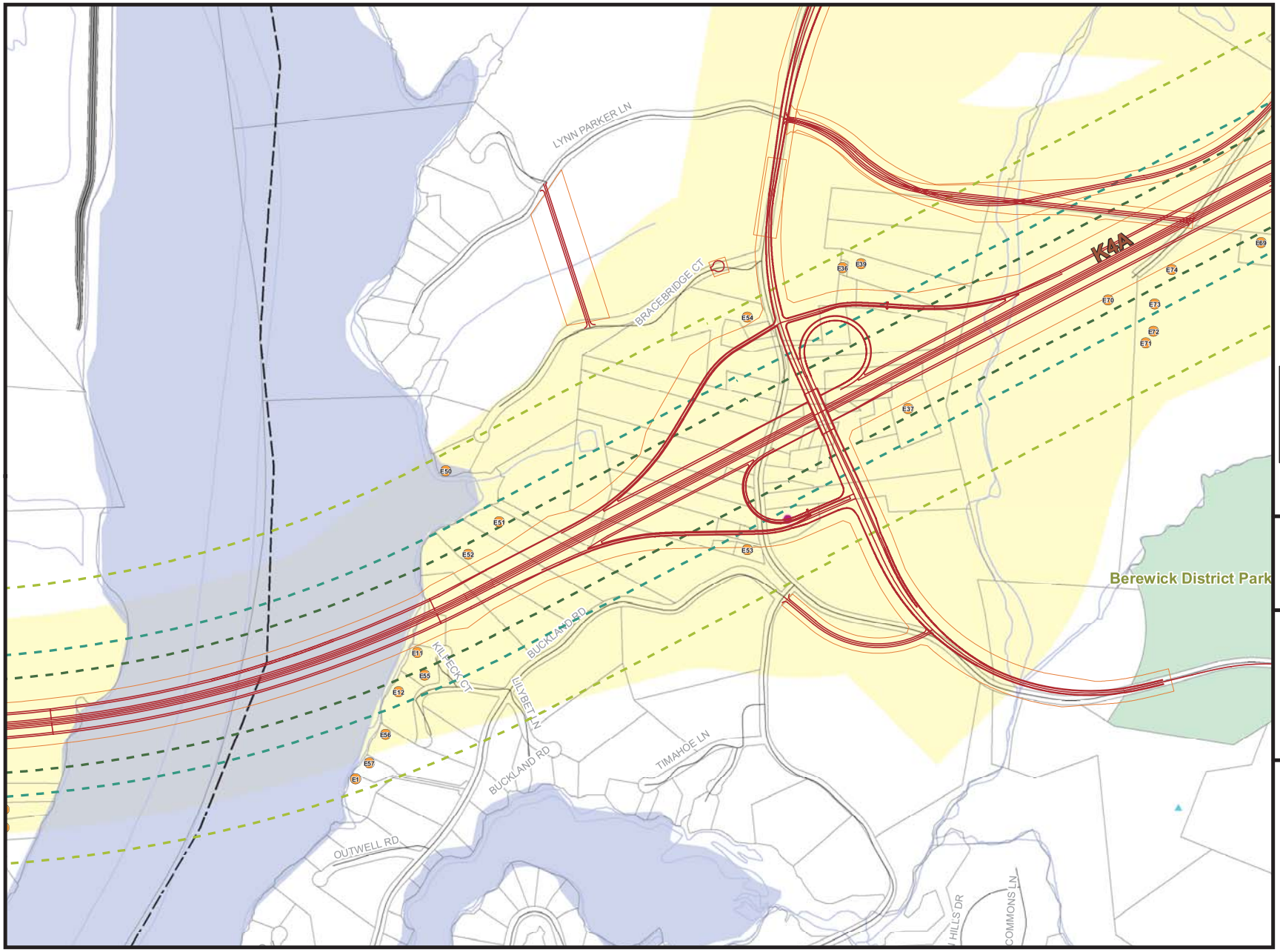
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

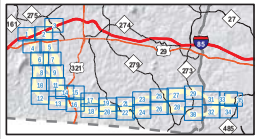
**Figure 4-31**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

N

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

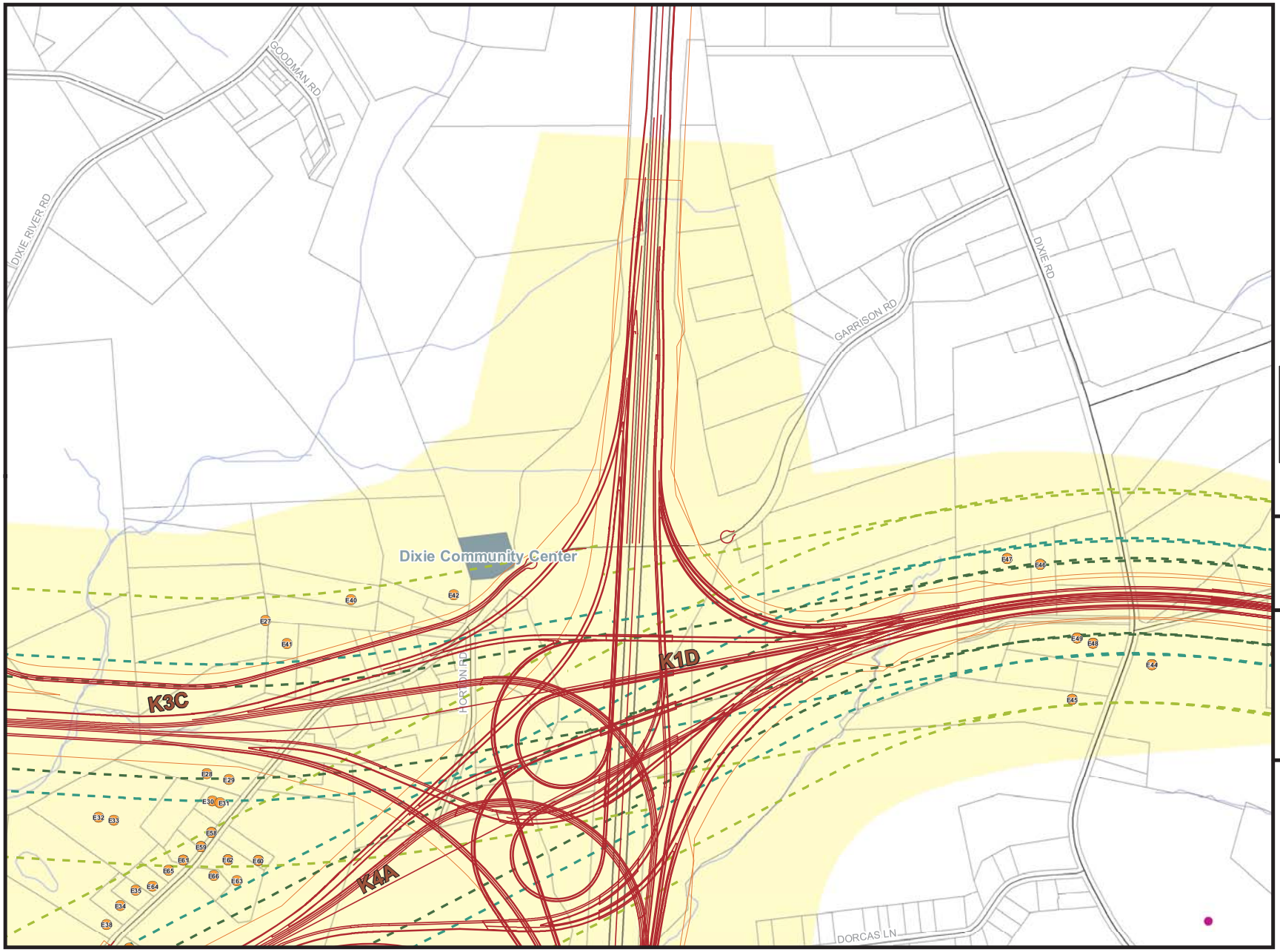
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

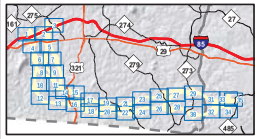
**Figure 4-32**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

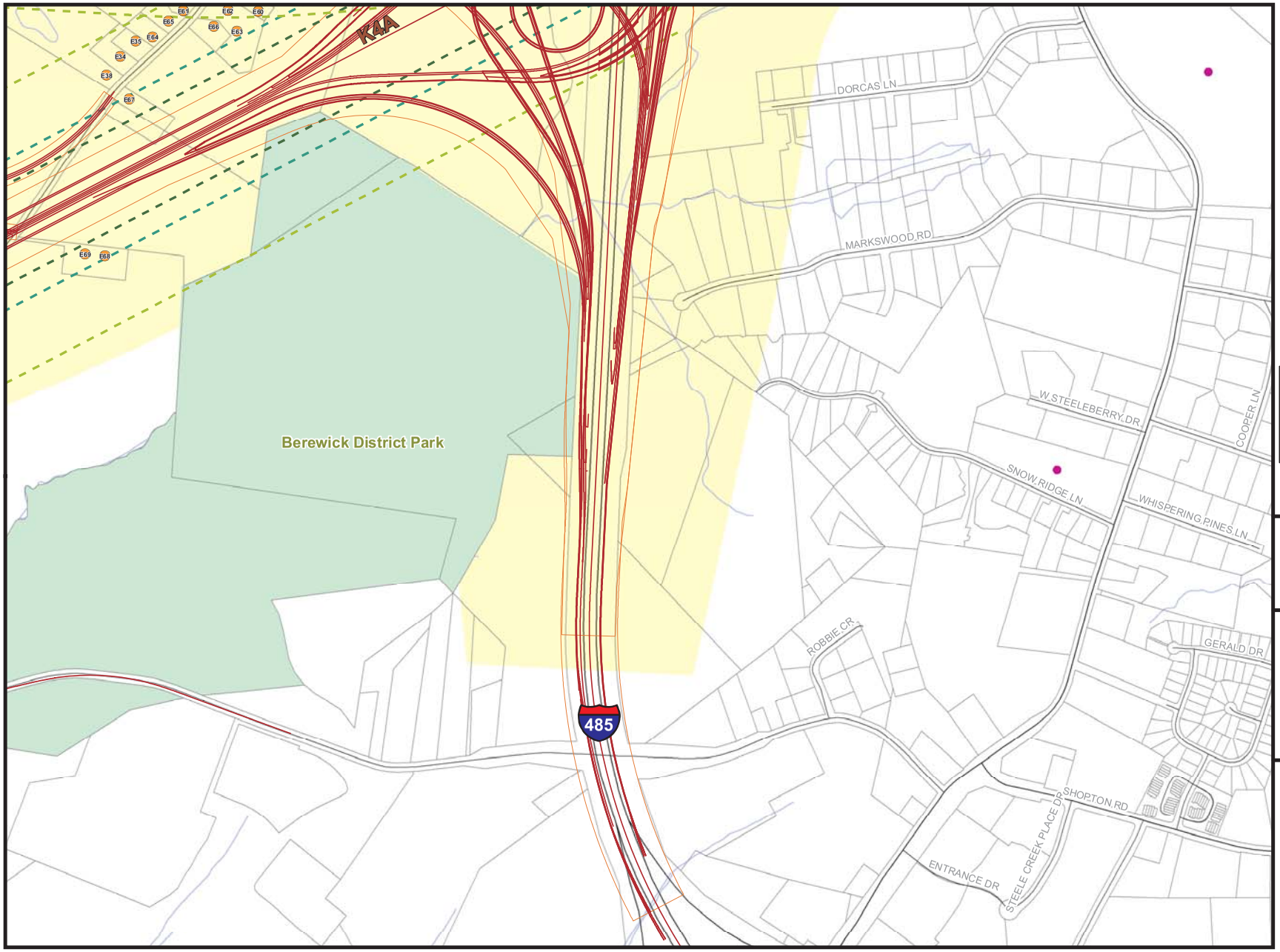
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

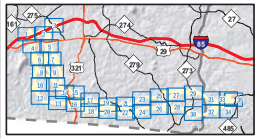
**Figure 4-33**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

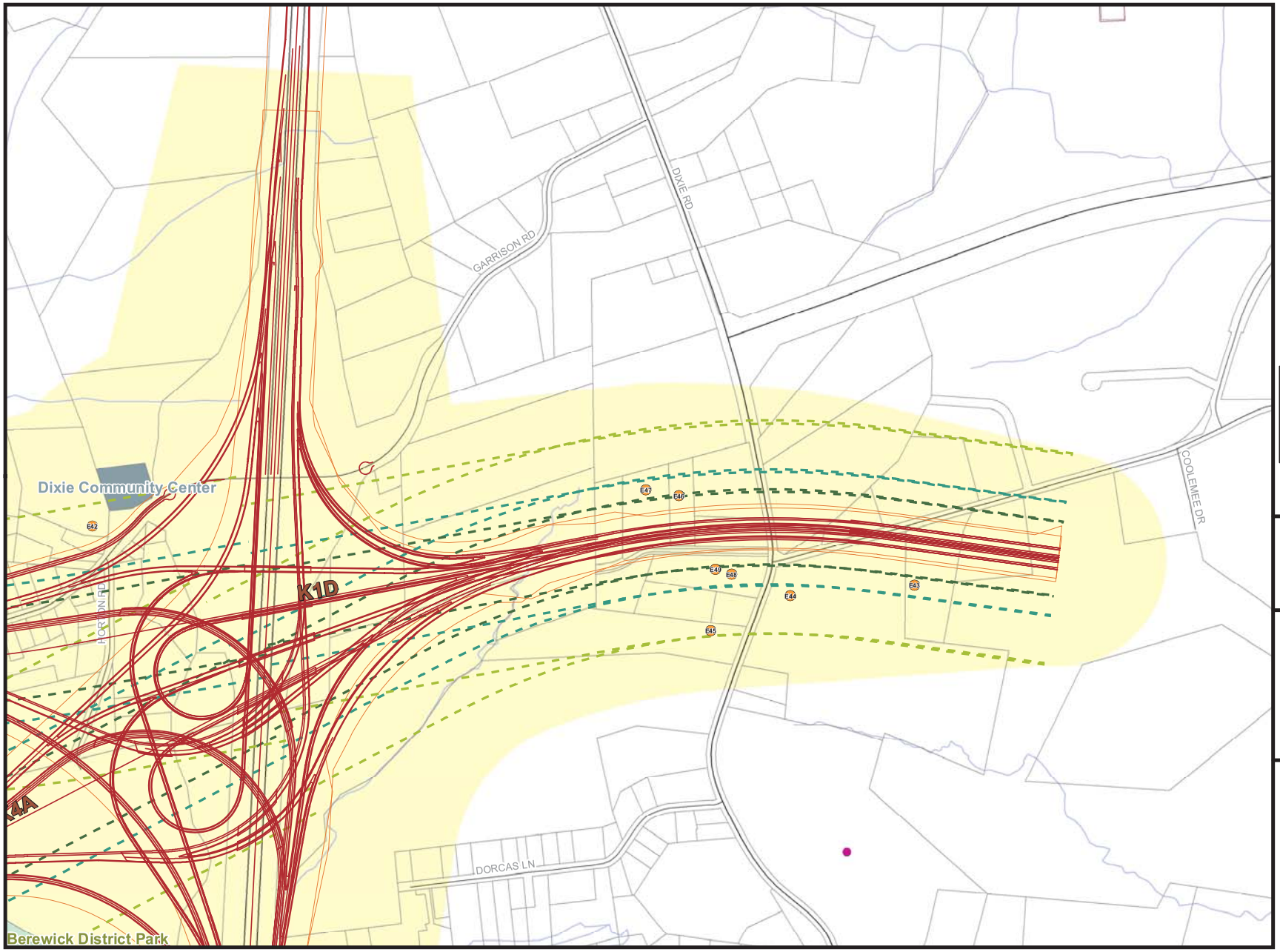
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

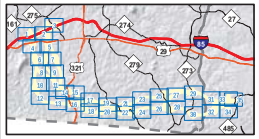
**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-34**

2030NoiseContours&ReceptorsRev.mxd




Legend
- Receptor Points
- Preliminary Road Design
- 60 dBA Leq
- 66 dBA Leq
- 71 dBA Leq
- Right of Way
- Libraries
- Churches
- Cemeteries
- Schools
- School Property
- Streets
- Railroads
- Parcels
- Parks
- Private Recreation Facilities
- Hydrology
- Detailed Study Area
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed August 2008.

0 400 800
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

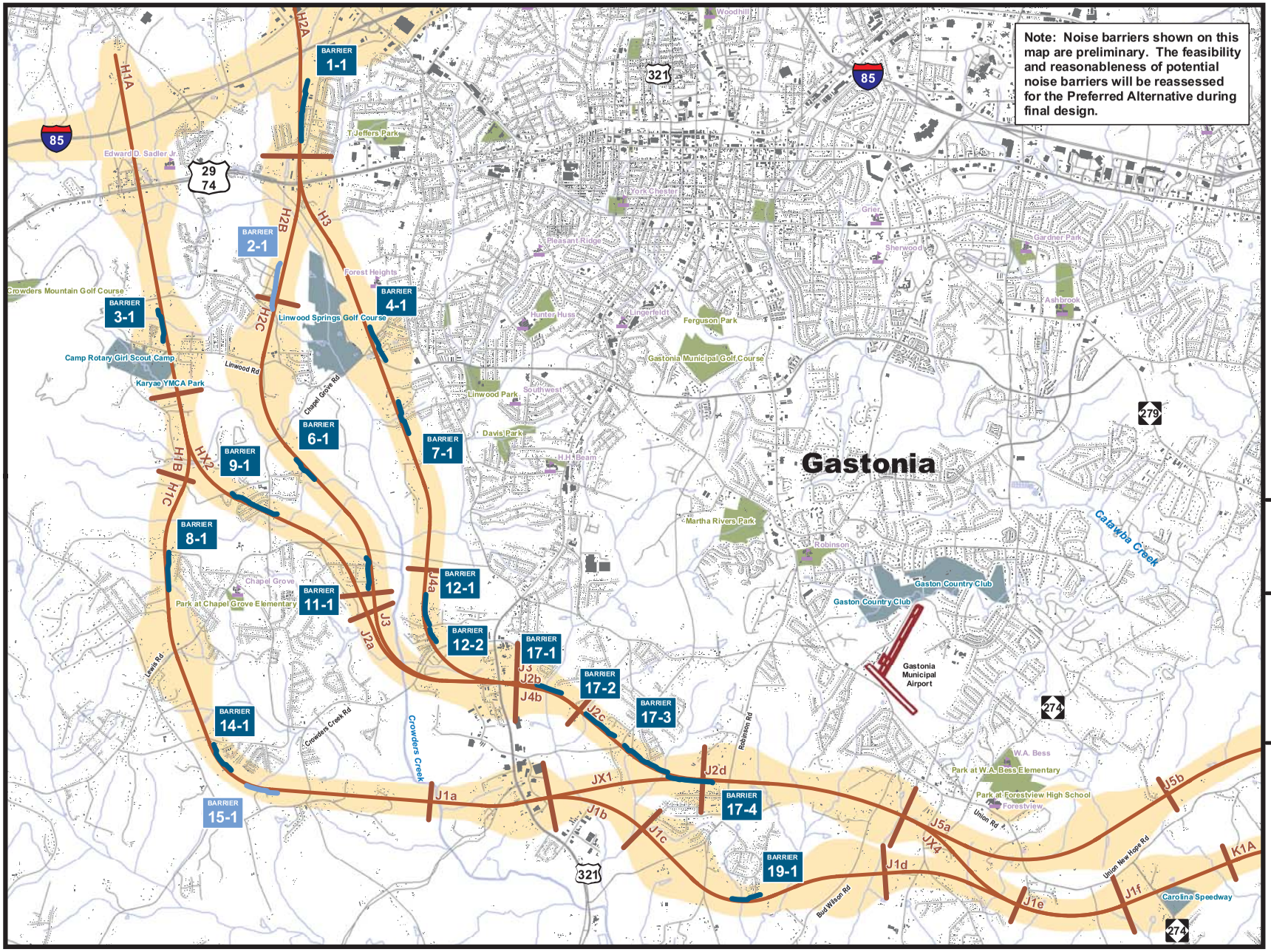
Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**2030 NOISE CONTOURS and SENSITIVE RECEPTOR LOCATIONS**

**Figure 4-35**

2030NoiseContours&ReceptorsRev.mxd




Legend

- Conditional Noise Barriers*
- Noise Barriers
- Design Centerline
- Segment Break Lines
- Schools
- Structures
- County Line
- Streets
- Hydrology
- Parks
- Private Recreation Facilities
- Detailed Study Corridor
- K3A Segment Name

*Barriers only reasonable if the undeveloped lots are built on or have a building permit issued prior to date of public knowledge.

Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

NORTH CAROLINA Turnpike Authority

STIP PROJECT NO. U-3321

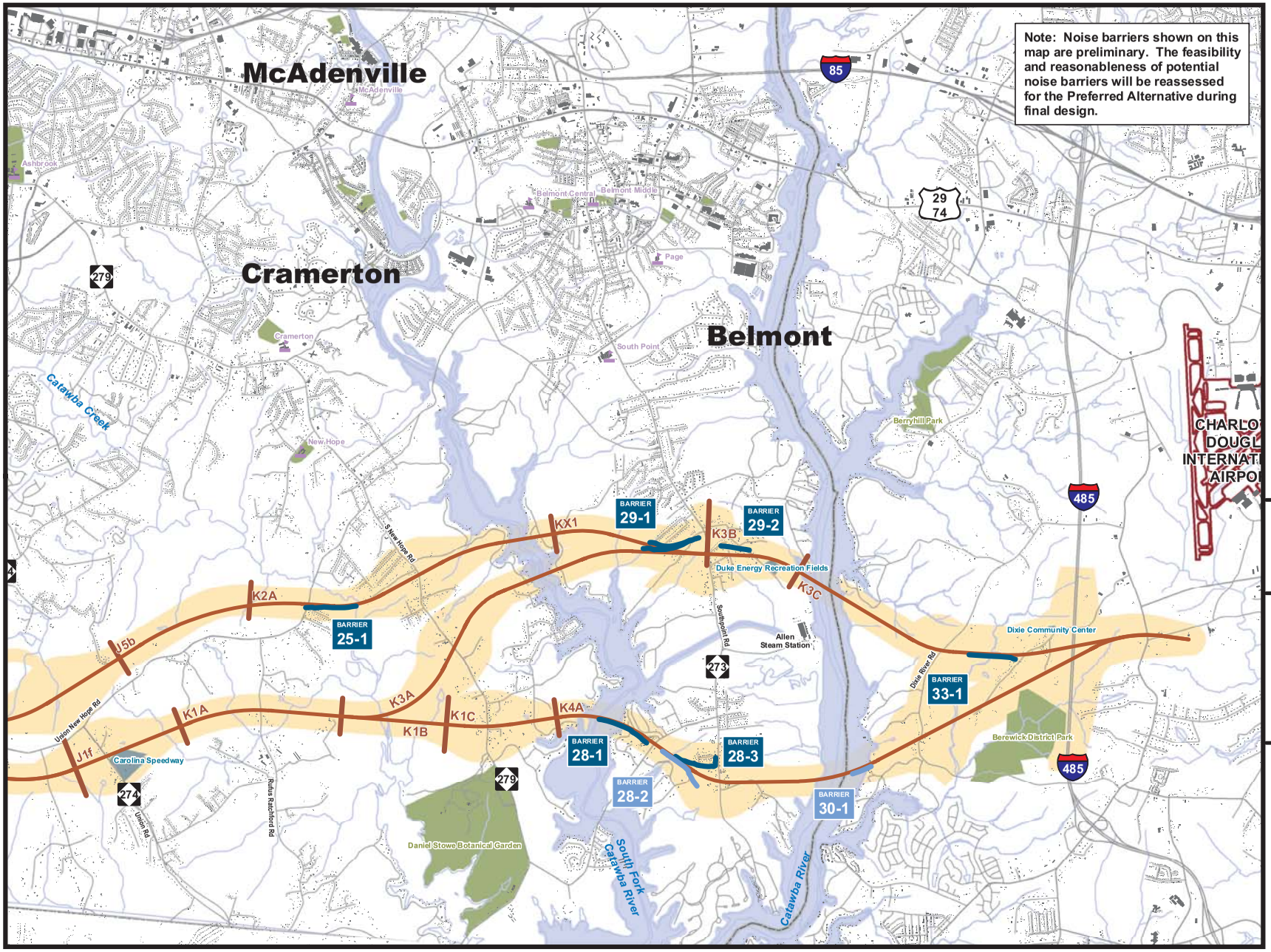
Gaston County and Mecklenburg County

GASTON EAST-WEST CONNECTOR

FEASIBLE and REASONABLE NOISE BARRIERS

Figure 5a

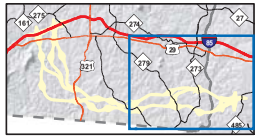
Feas&ReasNoiseBarriersRev.mxd




Legend

- Conditional Noise Barriers*
- Noise Barriers
- Design Centerline
- Segment Break Lines
- Schools
- Structures
- County Line
- Streets
- Hydrology
- Parks
- Private Recreation Facilities
- Detailed Study Corridor
- K3A Segment Name

*Barriers only reasonable if the undeveloped lots are built on or have a building permit issued prior to date of public knowledge.



Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

N

0 0.5 1
Miles

NORTH CAROLINA Turnpike Authority

STIP PROJECT NO. U-3321

Gaston County and Mecklenburg County

GASTON EAST-WEST CONNECTOR

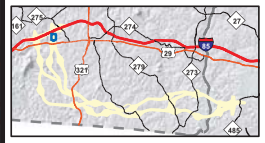
**FEASIBLE and REASONABLE NOISE BARRIERS**

**Figure 5b**

Feas&ReasNoiseBarriersRev.mxd

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- H2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

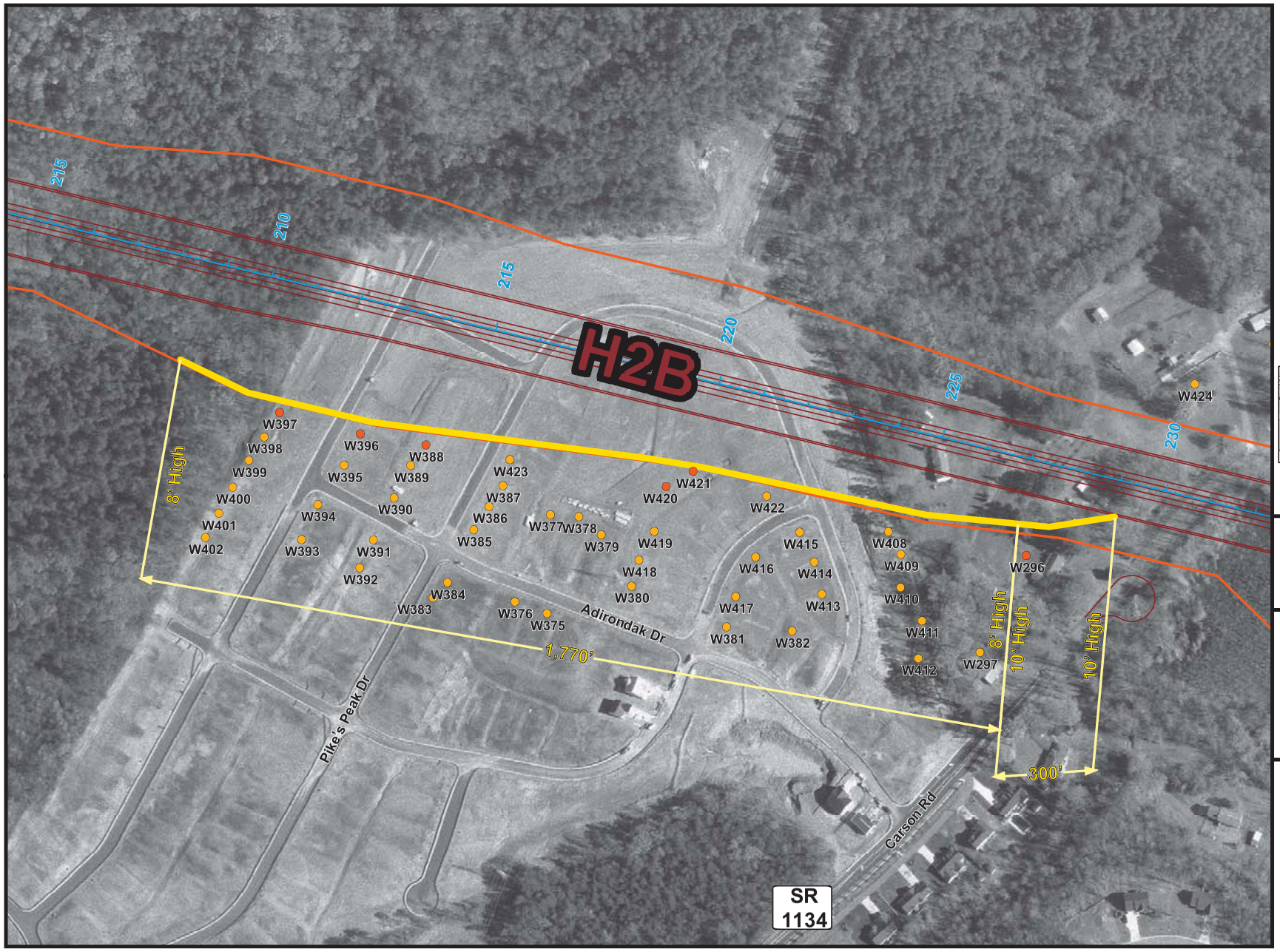
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 1-1**

**Figure 6**

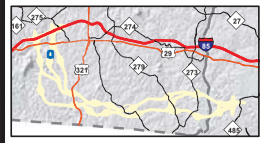
NoiseBarrierEvaluationAreas.mxd 3-24-08




**Legend**

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name

**Barriers only reasonable if the undeveloped lots have a building permit issued prior to Date of Public Knowledge.**



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

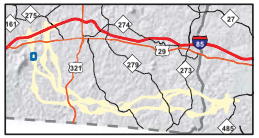
**CONDITIONAL BARRIER 2-1**

**Figure 7**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 3-1**

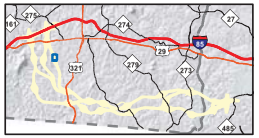
**Figure 8**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name

Barriers only reasonable if the undeveloped lots have a building permit issued prior to Date of Public Knowledge.



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

1:2 0 100 200 Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

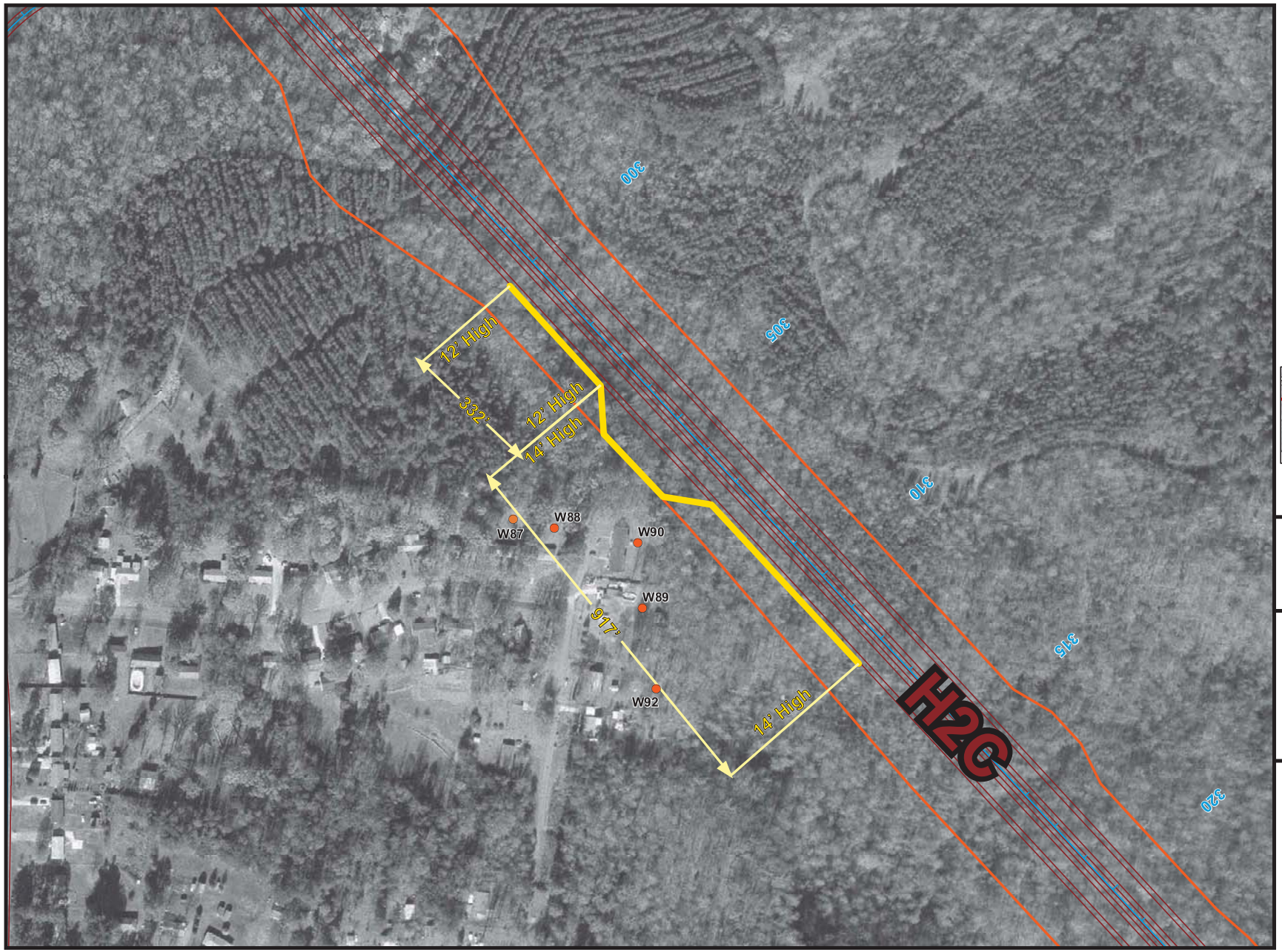
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**CONDITIONAL BARRIER 4-1**

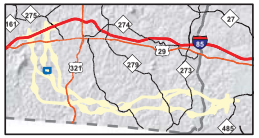
**Figure 9**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- H2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

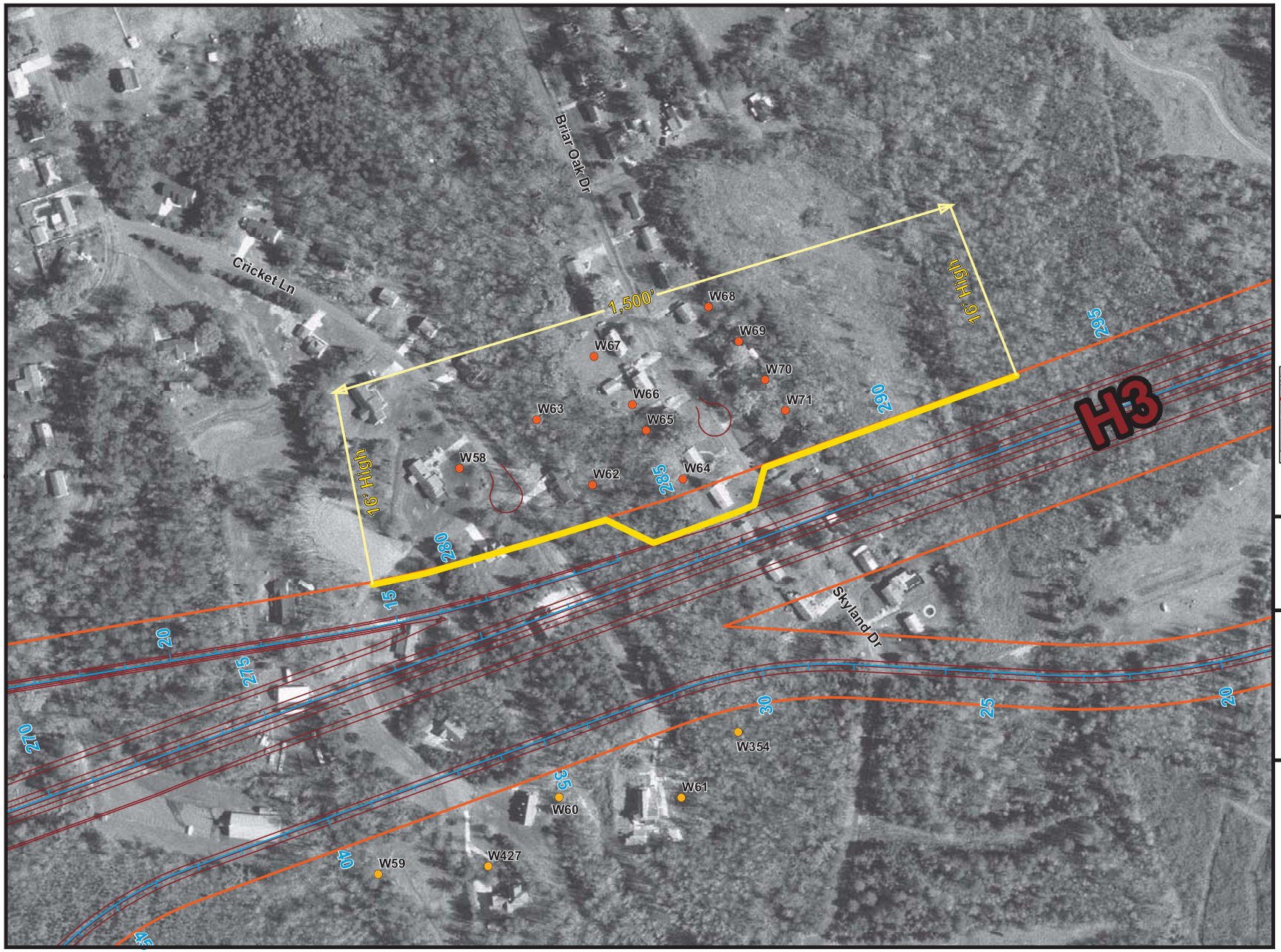
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 6-1**

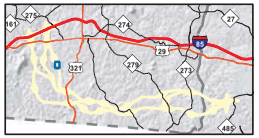
**Figure 10**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

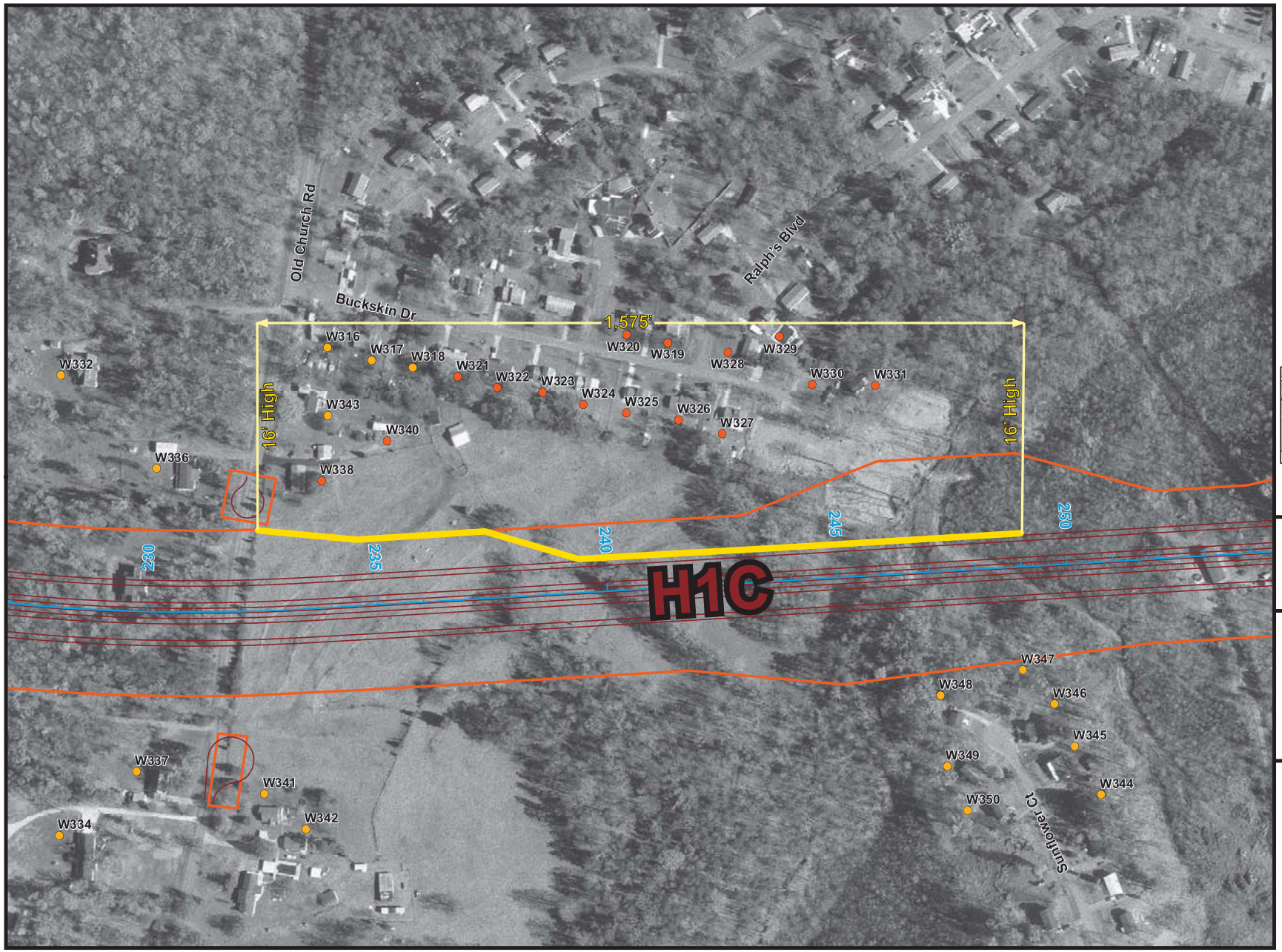
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 7-1**

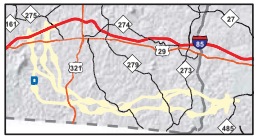
**Figure 11**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

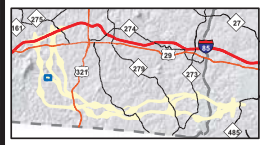
**BARRIER 8-1**

**Figure 12**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

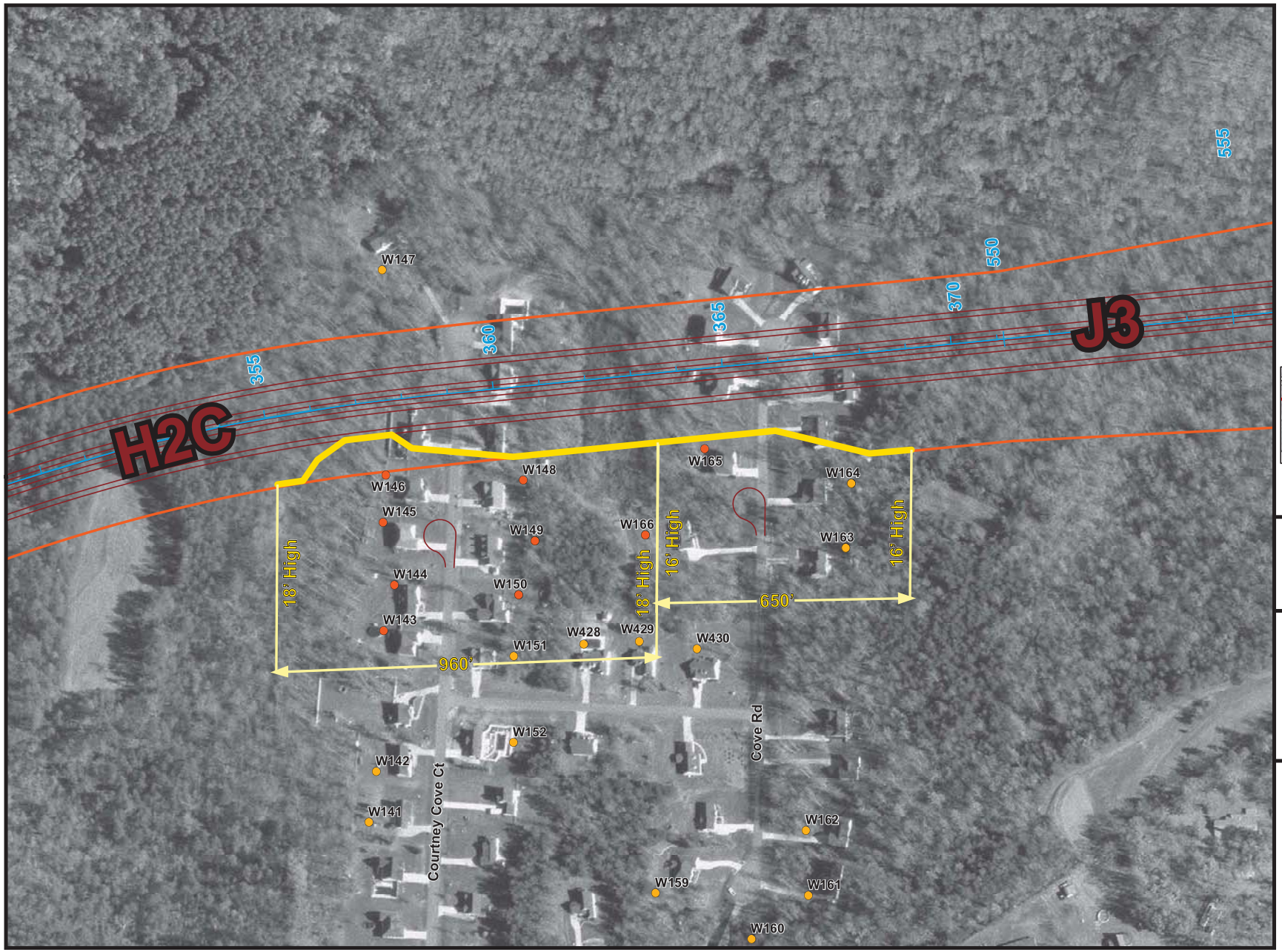
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 9-1**

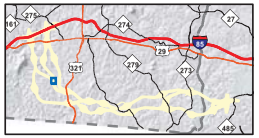
**Figure 13**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

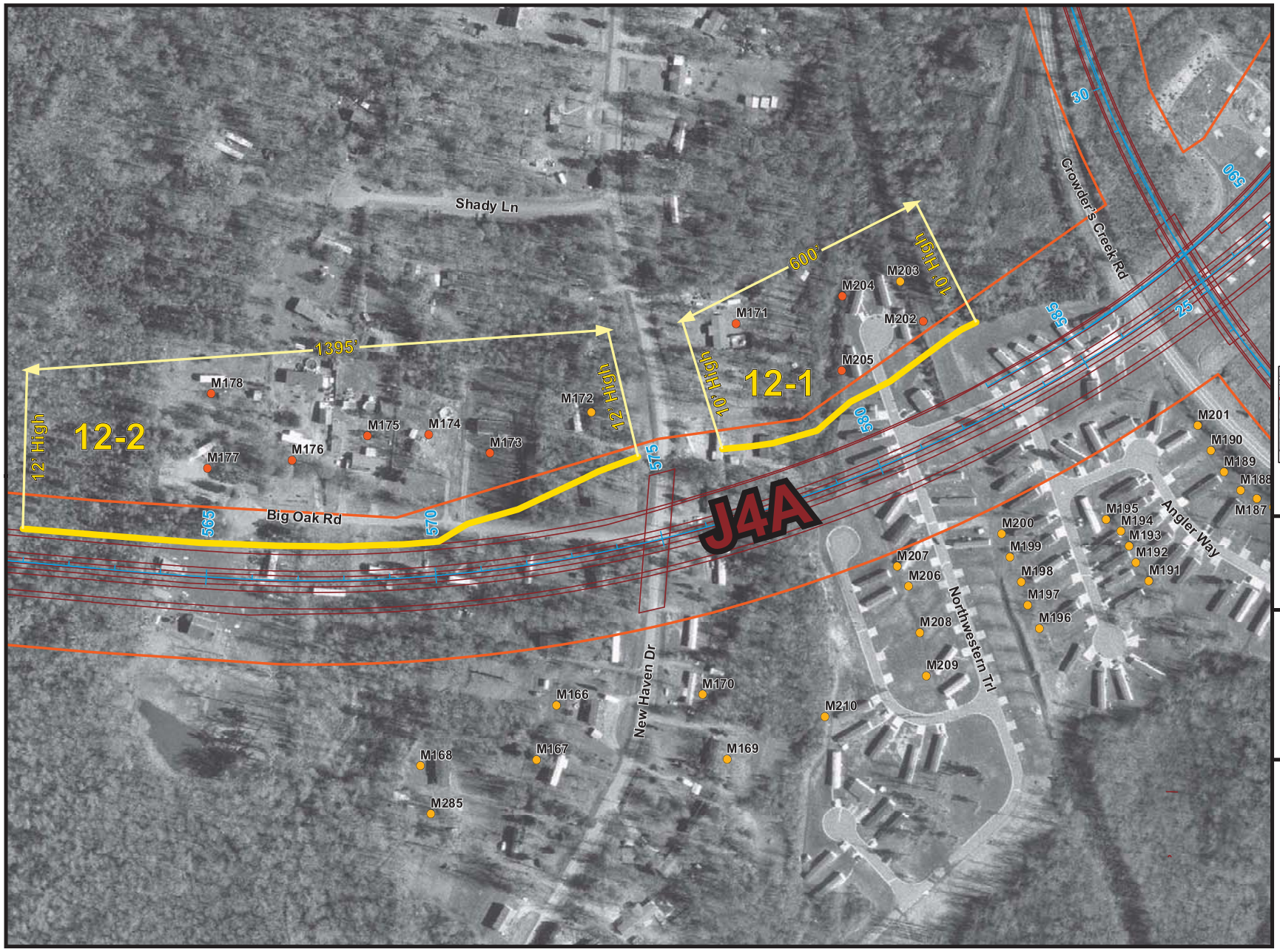
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 11-1**

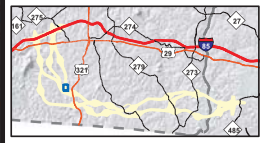
**Figure 14**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

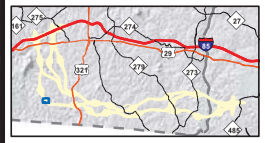
**BARRIERS 12-1 & 12-2**

**Figure 15**

NoiseBarrierEvaluationAreas.mxd 3-24-08

**Legend**

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

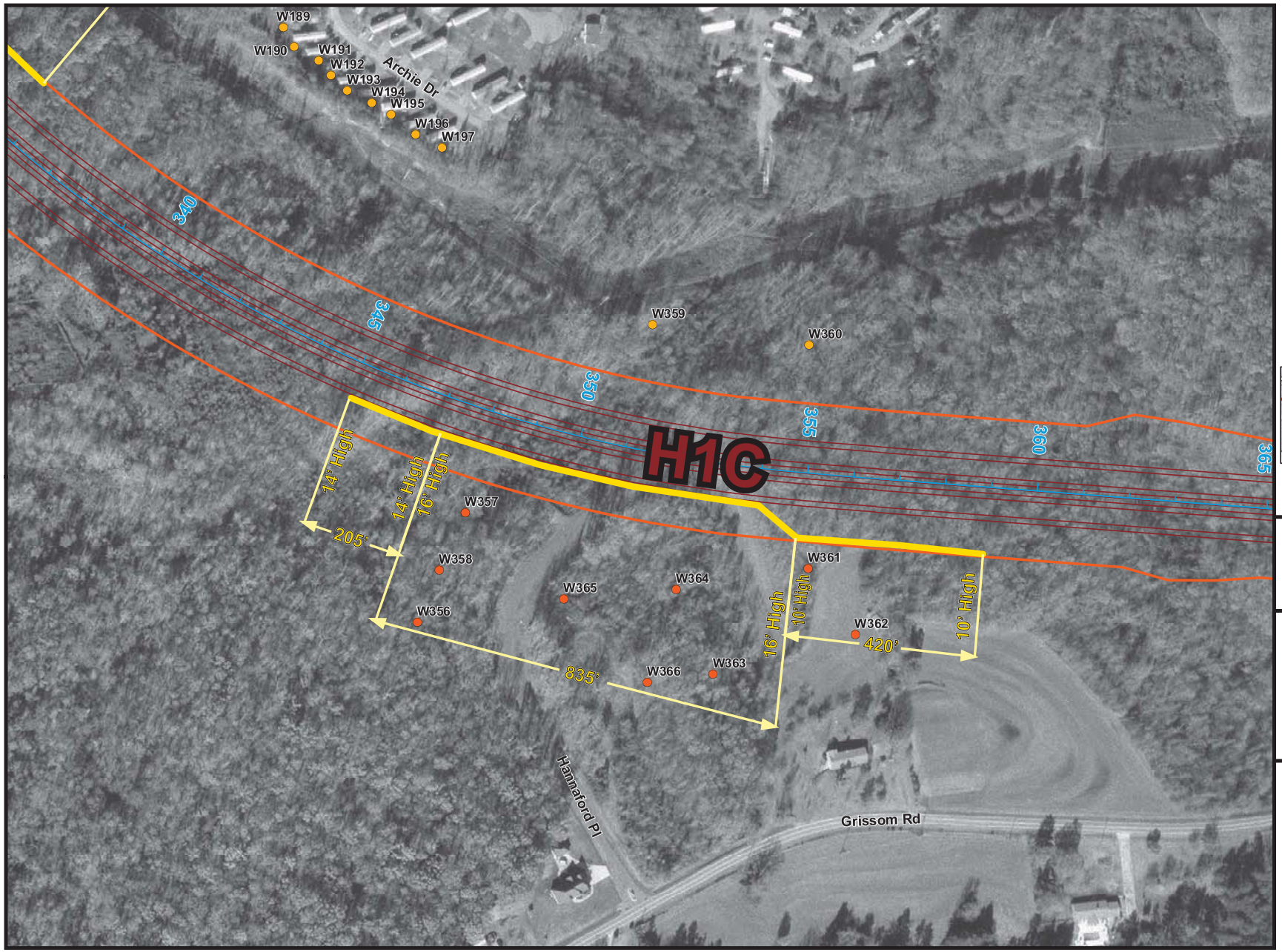
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 14-1**

**Figure 16**

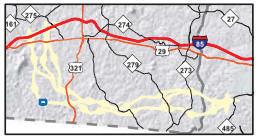
NoiseBarrierEvaluationAreas.mxd 3-24-08




**Legend**

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K3A Segment Name

Barriers only reasonable if the undeveloped lots have a building permit issued prior to Date of Public Knowledge.



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

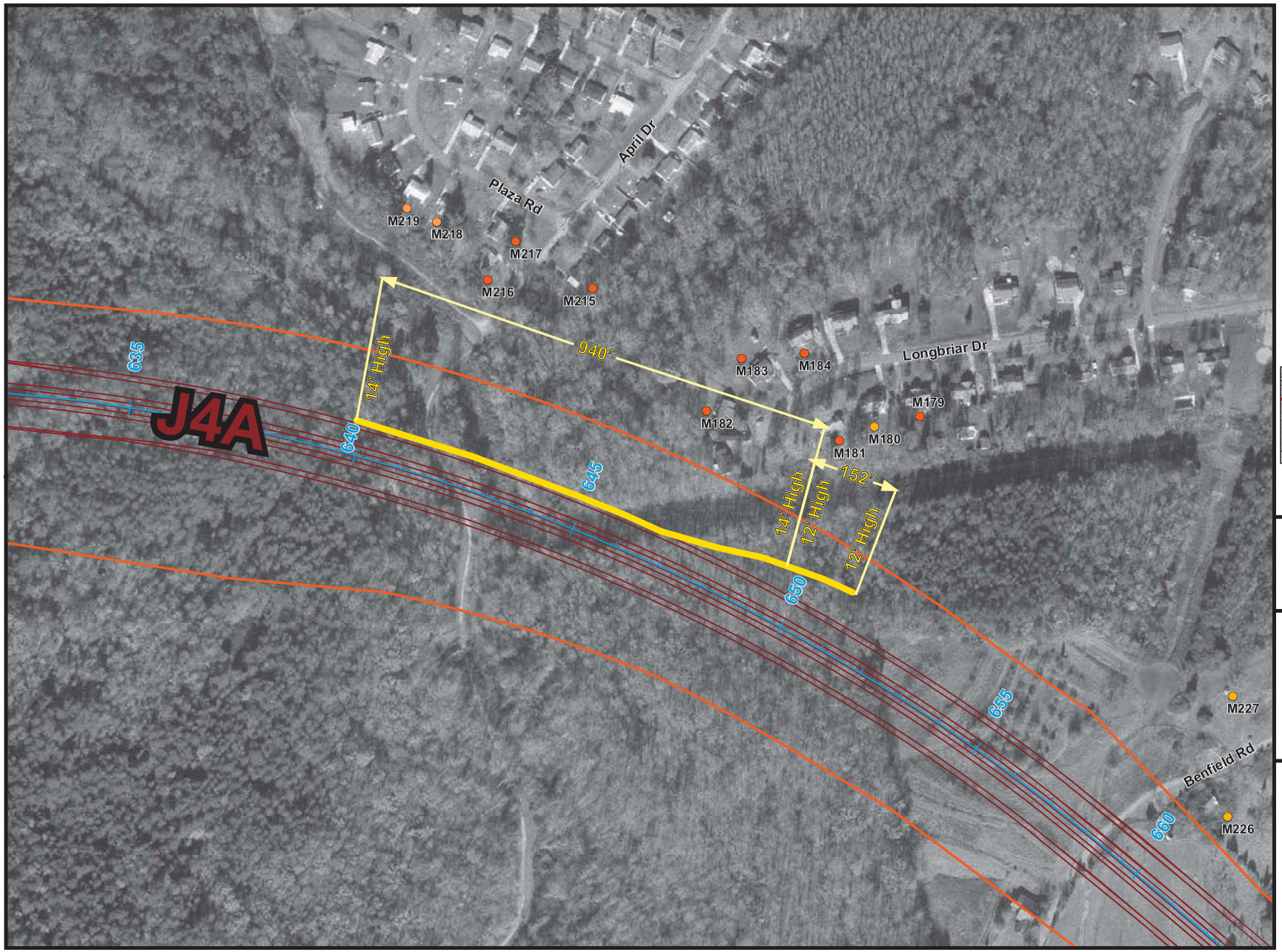
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**CONDITIONAL BARRIER 15-1**

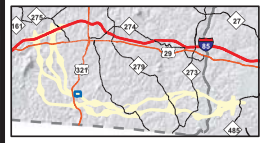
**Figure 17**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed on June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

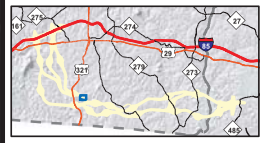
**BARRIER 17-1**

**Figure 18A**

NoiseBarrierEvaluationAreas.mxd 3-24-08

**Legend**

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

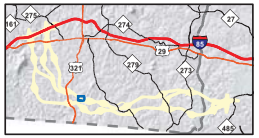
**BARRIER 17-2**

**Figure 18B**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

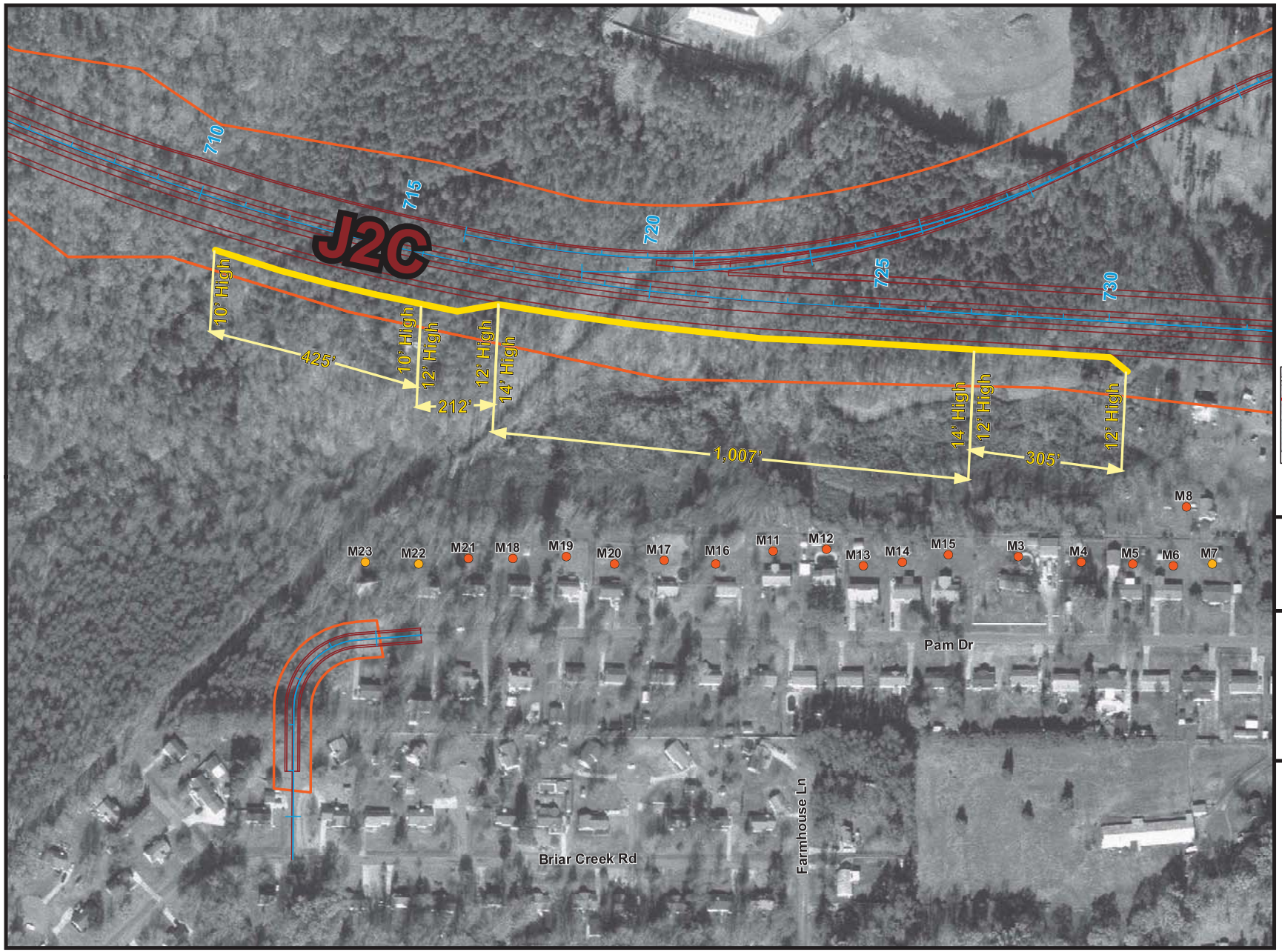
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 17-3**

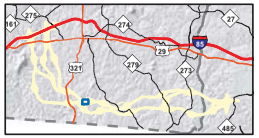
**Figure 18C**

NoiseBarrierEvaluationAreas.mxd 3-24-08




**Legend**

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

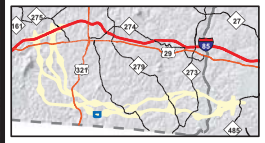
**BARRIER 17-4**

**Figure 18D**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

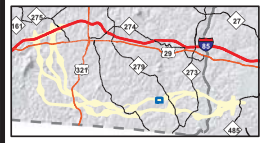
**BARRIER 19-1**

**Figure 19**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

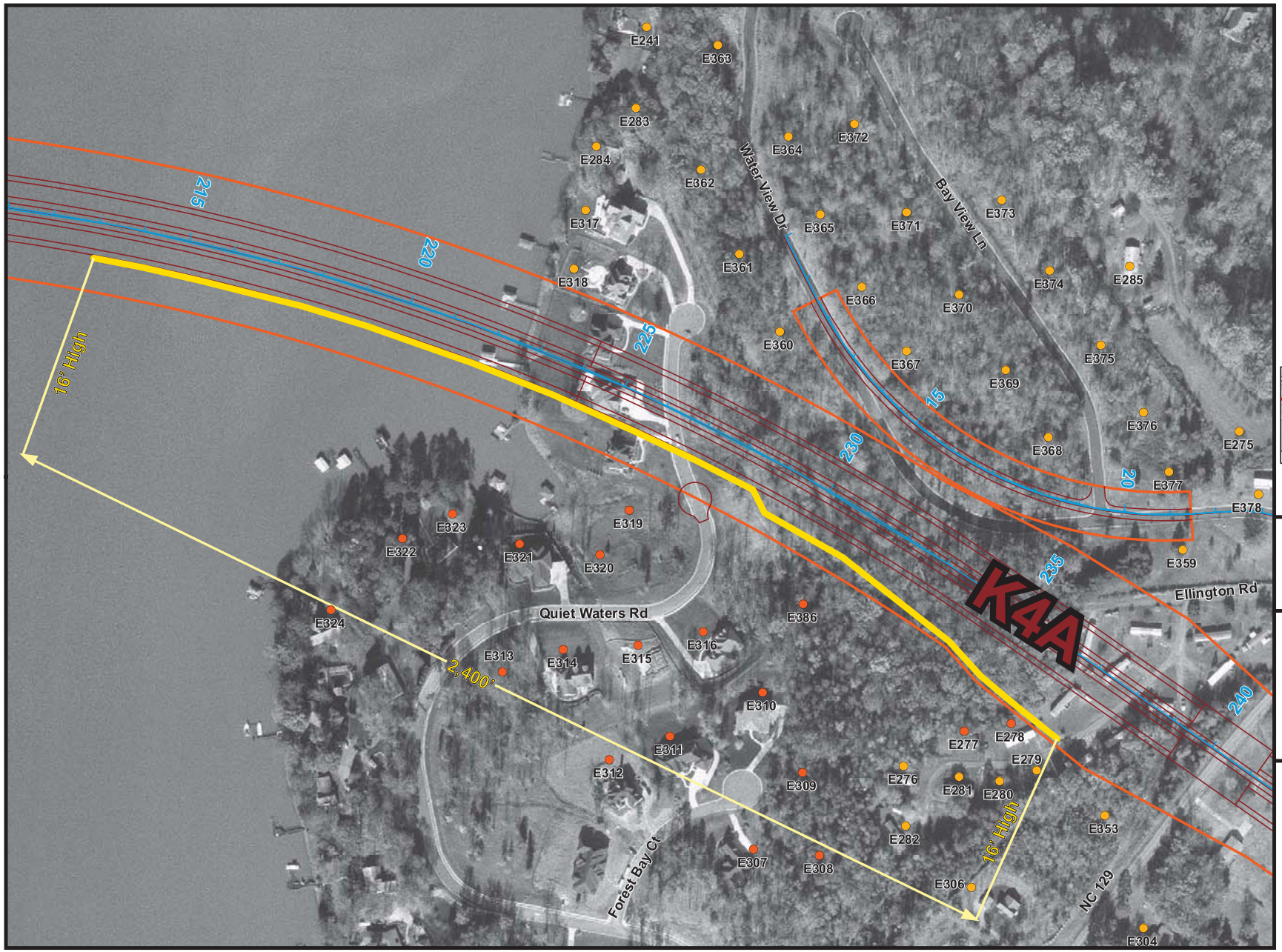
**GASTON EAST-WEST CONNECTOR**

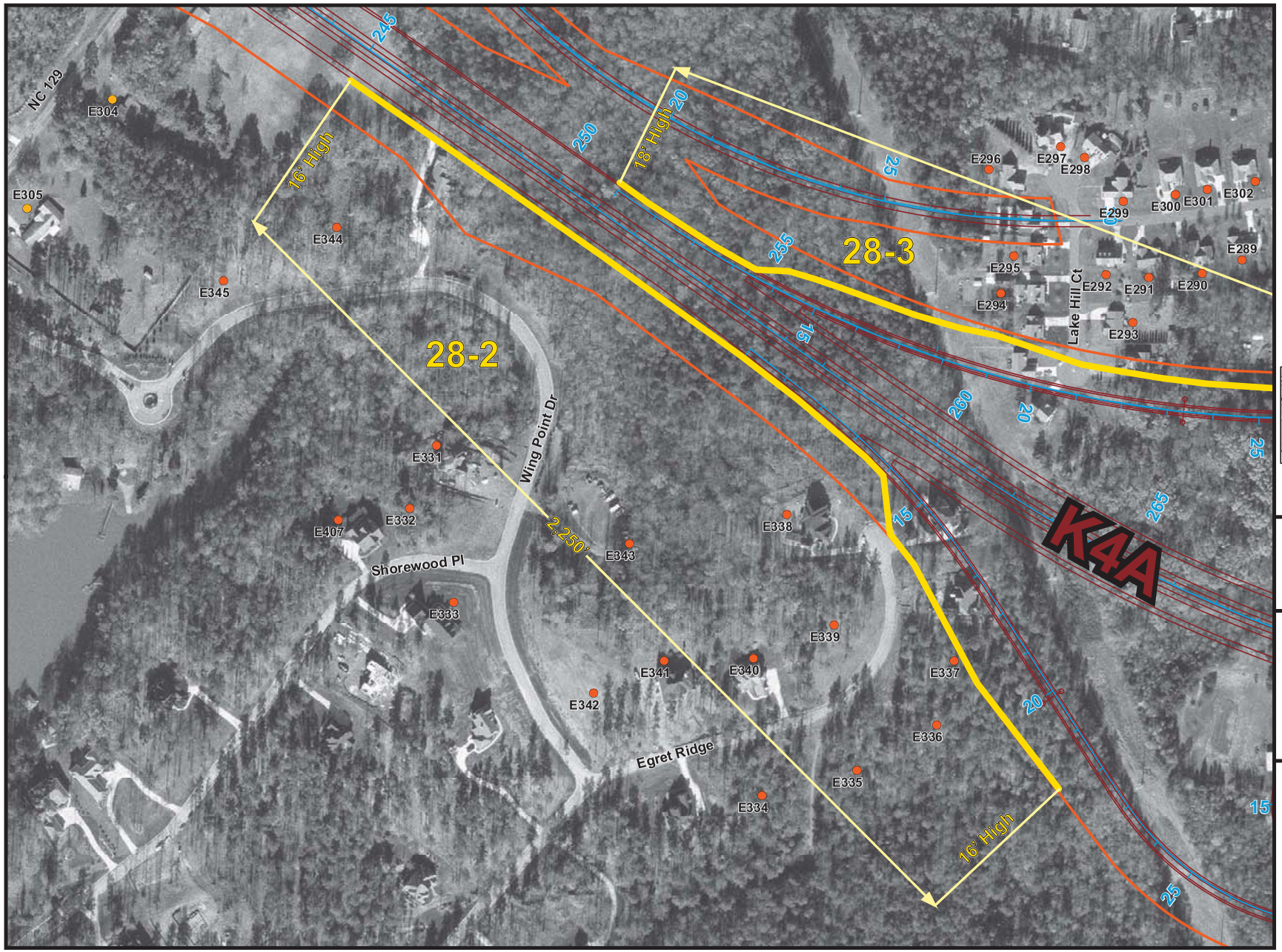
**BARRIER EVALUATION AREA**

**BARRIER 25-1**

**Figure 20**

NoiseBarrierEvaluationAreas.mxd 3-24-08

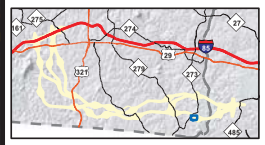

E241
E363
E283
E284
E362
E364
E372
Water View Dr
Bay View Ln
E373
E317
E365
E371
E361
E318
E366
E370
E374
E285
E360
E367
E369
E375
E376
E368
E275
E377
E378
E359
E323
E322
E321
E319
E320
E324
Quiet Waters Rd
E386
E316
E313
E314
E315
E310
E311
E312
E309
E277
E278
E279
E276
E281
E280
E282
E353
E307
E308
E306
E304
Forest Bay Ct
NC 129
Ellington Rd
K4A
2,400'
16' High
16' High
215
220
225
230
235
240
15
20
Legend
Benefited Receptor Points
Receptor Points
Noise Barriers
Stationing
Preliminary Road Design
Right of Way
K2A Segment Name
Source: Gaston County and Mecklenburg County Map Printed June 2008.
N
0 100 200
Feet
NORTH CAROLINA Turnpike Authority
STIP PROJECT NO. U-3321
Gaston County and Mecklenburg County
GASTON EAST-WEST CONNECTOR
BARRIER EVALUATION AREA
BARRIER 28-1
Figure 21A
NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K3A Segment Name

Barrier 28-2 only reasonable if the undeveloped lots have a building permit issued prior to Date of Public Knowledge.



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

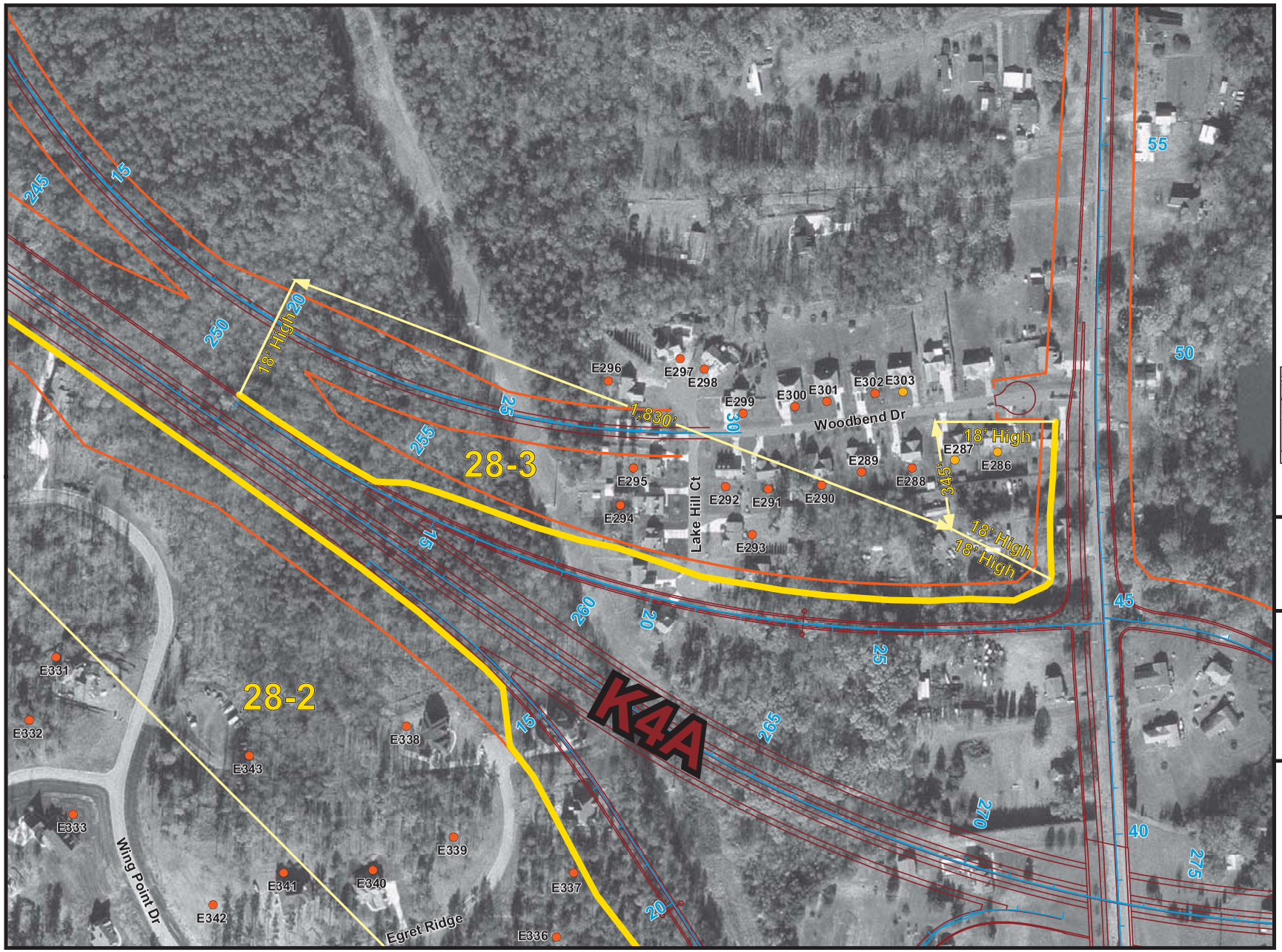
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**CONDITIONAL BARRIER 28-2**

**Figure 21B**

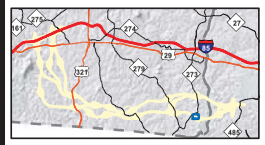
NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K2A Segment Name

Barrier 28-2 only reasonable if the undeveloped lots have a building permit issued prior to Date of Public Knowledge.



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

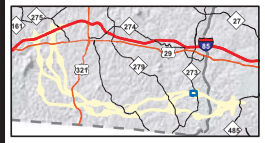
**BARRIER 28-3**

**Figure 21C**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- KX1 Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

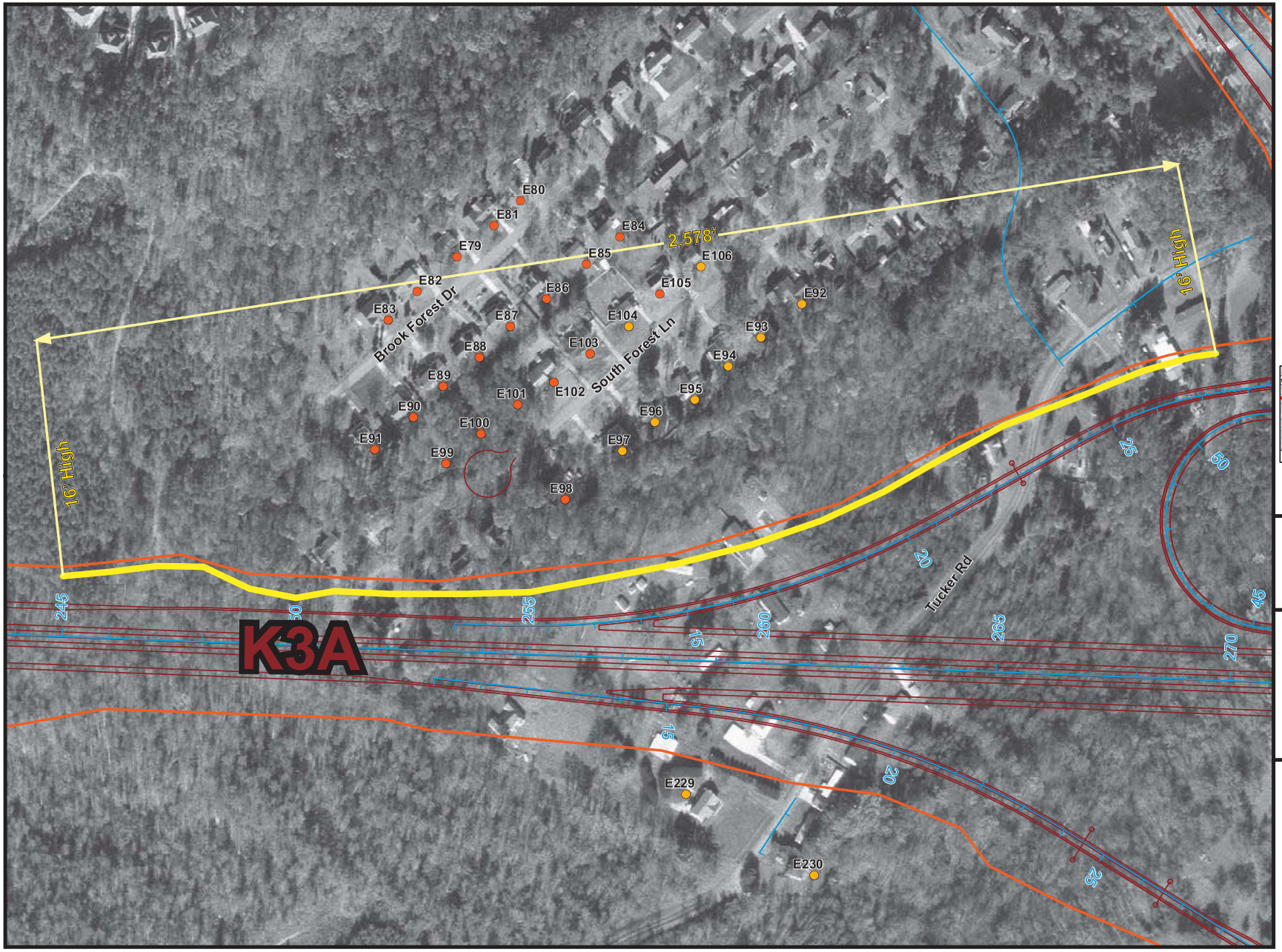
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 29-1 KX1**

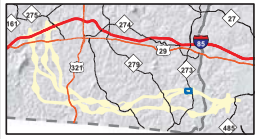
**Figure 22A**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

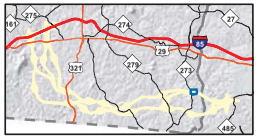
**BARRIER 29-1 K3A**

**Figure 22B**

NoiseBarrierEvaluationAreas.mxd 3-24-08

Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

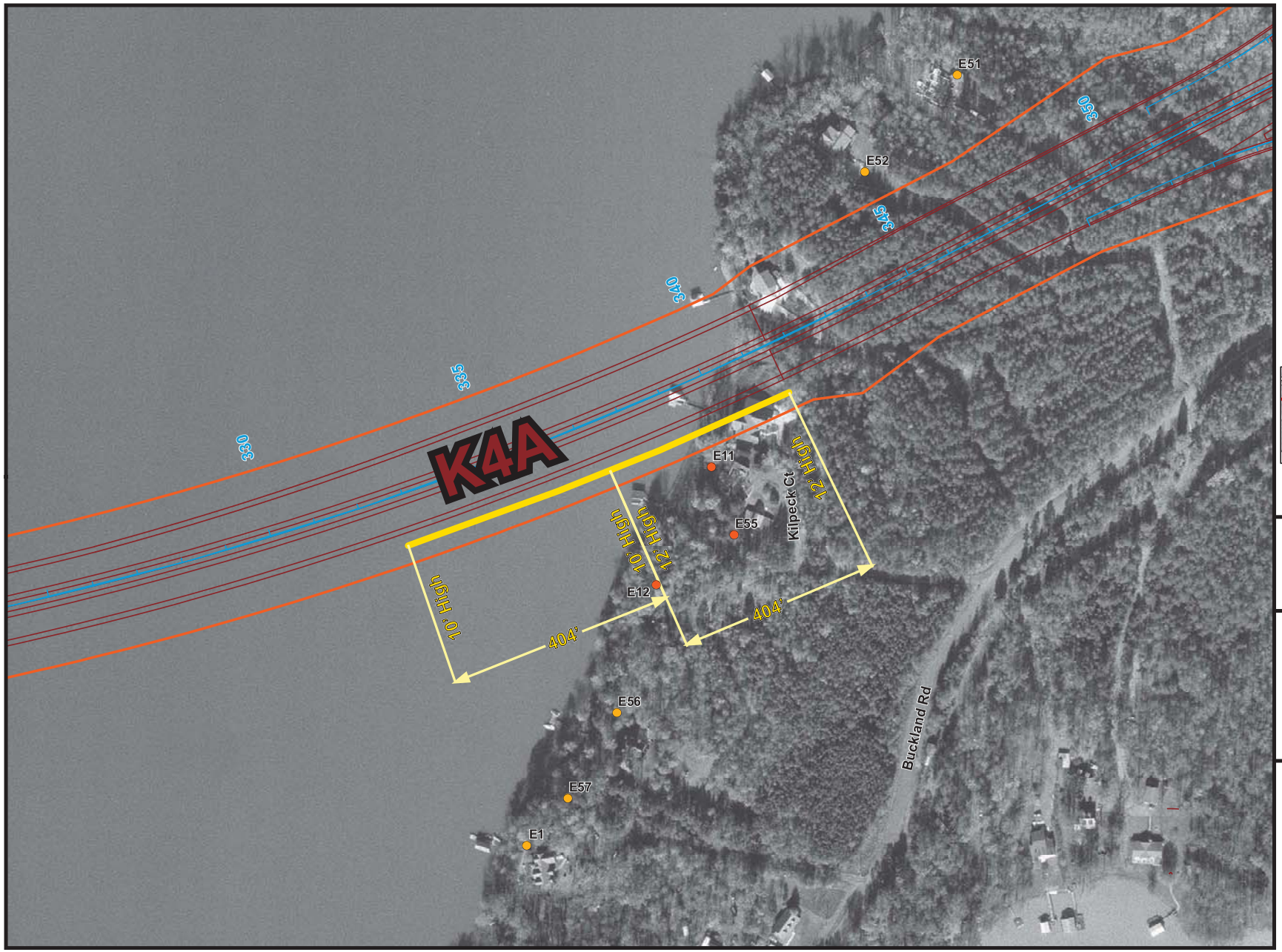
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 29-2**

**Figure 22C**

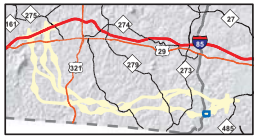
NoiseBarrierEvaluationAreas.mxd 3-24-08




**Legend**

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K4A Segment Name

**Barriers only reasonable if the undeveloped lots have a building permit issued prior to Date of Public Knowledge.**



Source: Gaston County and Mecklenburg County
Map Printed June 2008.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

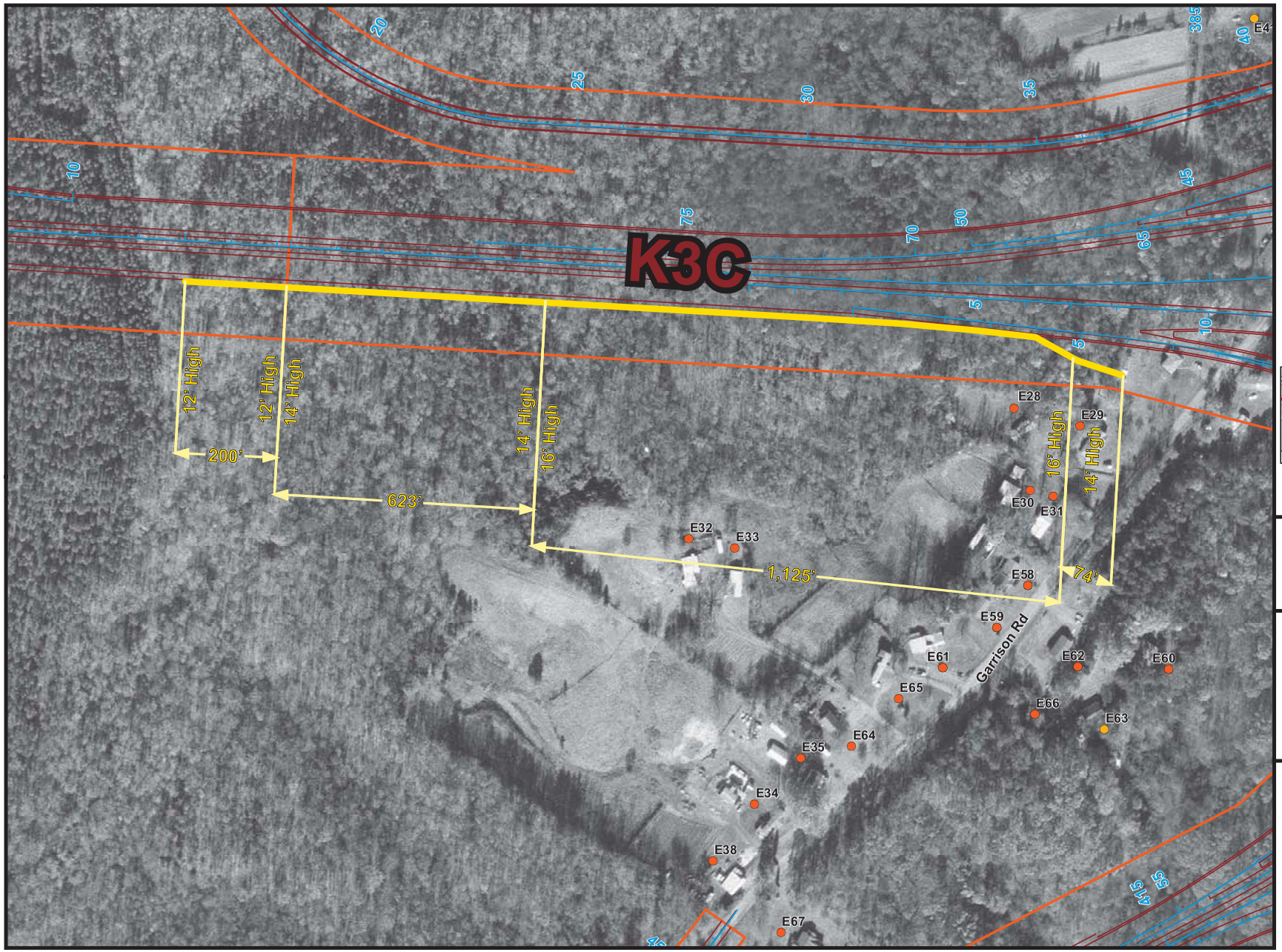
**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**CONDITIONAL BARRIER 30-1**

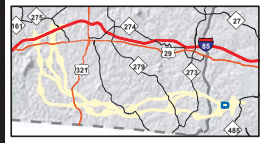
**Figure 23**

NoiseBarrierEvaluationAreas.mxd 3-24-08




Legend

- Benefited Receptor Points
- Receptor Points
- Noise Barriers
- Stationing
- Preliminary Road Design
- Right of Way
- K3A Segment Name



Source: Gaston County and Mecklenburg County
Map Printed on 10-01-07.

N

0 100 200
Feet

NORTH CAROLINA Turnpike Authority

STIP PROJECT
NO. U-3321

Gaston County and
Mecklenburg County

**GASTON EAST-WEST CONNECTOR**

**BARRIER EVALUATION AREA**

**BARRIER 33-1**

**Figure 24**

NoiseBarrierEvaluationAreas.mxd 3-24-08

# APPENDICES

# APPENDIX A
# MASTER LIST OF MODELED RECEPTORS

# APPENDIX B
# TRAFFIC FORECASTS AND PEAK HOUR TRAFFIC VOLUMES

# APPENDIX C
# EXISTING NOISE MEASUREMENT DATA FORMS

# APPENDIX D
# EXISTING NOISE MEASUREMENTS – NOISE METER PRINTOUTS

# APPENDIX E
# NOISE CONTOURS

# APPENDIX F
# BARRIER EVALUATION AREA RUNS

# APPENDIX G
# CROWDERS MOUNTAIN STATE PARK
# BEREWICK DISTRICT PARK
# PARK MAPS