# TRAFFIC NOISE REPORT

Corridor K Improvements
Appalachian Highway Development System

Graham County

NCDOT STIP Project No. A-0009C
WBS Element No. 32572.1.FS1
FA No. APD-0074(178)

Prepared by:

North Carolina Department of Transportation
Environmental Analysis Unit
Traffic Noise & Air Quality Group

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**ACCEPTED BY:**

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|---|---|
| NCDOT Environmental Analysis Unit,<br>Traffic Noise and Air Quality Group | 4/21/2020<br>Date |
| Teak Keun Kim, PhD, PE<br>Traffic Noise Reviewer | 4/21/2020<br>Date |
| Nidhi Sheth<br>Traffic Noise Modeler | 4/21/2020<br>Date |

# Executive Summary

The North Carolina Department of Transportation (NCDOT) proposes improvements being studied include both new location and improve-existing options from US 129 in Robbinsville to NC 28 in Stecoah (Corridor K Improvements) in Graham County. The State Transportation Improvement Program (STIP) identifies this portion of the proposed project as A-0009C. There are five alternatives and they are described below including the length of each. The proposed project including the five preliminary alternatives is shown in Figure 1. The primary purpose of the proposed project is to provide the transportation infrastructure necessary for the well-being of residents by improving mobility and reliability between the existing four-lane section on NC 28 at Stecoah and US 129 in Robbinsville. The need to be addressed by the proposed project is improved access to employment, medical facilities, commercial centers, and educational facilities.

The typical section for all alternatives includes two 12-foot lanes with 8-foot shoulders which include 4-foot paved shoulders. The alternatives include passing/climbing lanes where suitable.

The alternatives include:

- Alternative R1E Intersections: New location – Includes realigning Five Point Road and adding turn lanes at the intersections of Five Point Road at US 129 and Five Point Road at NC 143. Approximate length is 0.54 miles;

- Alternative R1E Roundabouts: New location – Includes realigning Five Point Road and adding roundabouts at the intersections of Five Point Road at US 129 and Five Point Road at NC 143. Approximate length is 0.54 miles;

- Alternative 3R: Upgrade Existing NC 143 and Existing NC 28 – Includes adding passing and climbing lanes along the existing alignment. Approximate length is 11.5;

- Alternative S2: Includes adding a tunnel from NC 143 west of the mountain to NC 28, then bridge over NC 28 with a new alignment north of the existing NC 28. The new alignment ties back to NC 28 just west of the existing two-lane section. Approximate length is 3.4 miles;

- Alternative SW1A: Includes adding passing lanes on NC 143 and NC 28 and a tunnel from NC 143 west of the mountain to the relocated NC 28. Approximate length is 2 miles.

The design speed will be 50 miles per hour on the mainline and 40 miles per hour on new location connection along Five Points Road to US 129/NC 143 intersection.

Per FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR 772) and NCDOT Traffic Noise Policy (NCDOT Policy), the project is a “Type I” project.

Projects with a Date of Public Knowledge on or after October 6, 2016 shall comply with the criteria of the 2016 Traffic Noise Policy. Therefore, this Traffic Noise Report (TNR) based on **the October 17, 2019 (provided by Stantec) design plans** has been prepared in accordance with 23 CFR 772, the NCDOT Traffic Noise Policy (Policy) effective October 6, 2016, and the accompanying NCDOT Traffic Noise Manual (Manual).

A federal Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) are currently being prepared in accordance with the National Environmental Policy Act for the project. The project location is shown in Figure 1.

After the Date of Public Knowledge occurs, federal and state governments are no longer responsible for providing noise abatement measures for new development within the noise impact area of the proposed project. It will then be the responsibility of local governments and private landowners to ensure noise compatible designs are used for development with an approved building permit issued after the Date of Public Knowledge. The Date of Public Knowledge will be the date that the FONSI is approved and signed. NCDOT advocates the use of local government authority to regulate land development, planning, design, and construction in such a way that noise impacts are minimized.

Traffic noise impacts and construction noise impacts can be a consequence of transportation projects. Loudest-hourly equivalent noise levels were assessed for 239 residential land use receptors, one cemetery, two school baseball fields, two trails, five places of worship, and one funeral home, in the vicinity of the proposed project (STIP A-0009C). Although several commercial properties exist in the vicinity of the proposed project, none had exterior areas of frequent human use to constitute noise-sensitive receptors per NCDOT Policy.

Design Year 2045 all Build Alternatives (i.e., R1E Intersections, R1E Roundabouts, 3R, S2, and SW1A) are not predicted to impact any receptors in the project vicinity due to low traffic volumes. Since there are no noise impacts within the project area, noise abatement is not warranted in all Build Alternatives.

Construction noise impacts – some of them potentially substantial – may occur due to the close proximity of noise-sensitive receptors to project construction activities. It is the recommendation of this TNR that all reasonable efforts should be made to minimize exposure of noise-sensitive areas to construction noise impacts.

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## 1.0 PROJECT LOCATION & DESCRIPTION

The North Carolina Department of Transportation (NCDOT) proposes improvements being studied include both new location and improve-existing options from US 129 in Robbinsville to NC 28 in Stecoah in Graham County. The State Transportation Improvement Program (STIP) identifies this portion of the proposed project as A-0009C. There are five alternatives and they are described below including the length of each. The proposed project including the five preliminary alternatives is described below. The primary purpose of the proposed project is to provide the transportation infrastructure necessary for the well-being of residents by improving mobility and reliability between the existing four-lane section on NC 28 at Stecoah and US 129 in Robbinsville. The need to be addressed by the proposed project is improved access to employment, medical facilities, commercial centers, and educational facilities.

The typical section for all alternatives includes two 12-foot lanes with 8-foot shoulders which include 4-foot paved shoulders. The alternatives include passing/climbing lanes where suitable.

The alternatives include:

- Alternative R1E Intersections: New location – Includes realigning Five Point Road and adding turn lanes at the intersections of Five Point Road at US 129 and Five Point Road at NC 143. Approximate length is 0.54 miles;

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- Alternative SW1A: Includes adding passing lanes on NC 143 and NC 28 and a tunnel from NC 143 west of the mountain to the relocated NC 28. Approximate length is 2 miles.

The design speed will be 50 miles per hour on the mainline and 40 miles per hour on new location connection along the Five Points Road to US 129/NC 143 intersection.

Per FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR 772) and NCDOT Traffic Noise Policy (NCDOT Policy), the project is a "Type I" project. Projects with a Date of Public Knowledge on or after October 6, 2016 shall comply with the criteria of the 2016 Traffic Noise Policy. Therefore, this Traffic Noise Report (TNR) based on the October 17, 2019 (provided by Stantec) design plans has been prepared in accordance with 23 CFR 772, the NCDOT Traffic Noise Policy (Policy) effective October 6, 2016, and the accompanying NCDOT Traffic Noise Manual (Manual).

## 2.0 PROCEDURE

This Traffic Noise Report represents the detailed analysis of likely traffic noise impact abatement measures in the vicinity of the project (STIP A-0009C).

In accordance with 2016 NCDOT Traffic Noise Policy and Manual, this Traffic Noise Report utilized computer models created with the FHWA Traffic Noise Model software (TNM 2.5), validated to field-obtained traffic noise measurement data, to predict future noise levels, impacted receptors, and assess noise level reductions for the recommended traffic noise abatement measures along the proposed Corridor K (refer to Figure 2-1 through 2-26).

In addition to reporting, the procedure by which this TNR was conducted was as follows:

*Initial project scoping:* Obtain project design; prepare field maps; review project mapping, GIS data, aerial photography, traffic data, and other available pertinent information. The base mapping used for the TNR was controlled aerial photography with elevations from CADD data and LiDAR data.

*Monitoring / fieldwork:* Identify all land uses, addresses, and locations of all noise-sensitive receptors within the project corridor; obtain ambient noise monitoring data; obtain weather data for ambient noise monitoring sessions; create field data logs and site sketches; photograph noise monitoring locations and other relevant visual data; process ambient noise monitoring data (refer to Appendix A).

*Baseline TNM model:* Create a comprehensive but efficient TNM model representation of the existing condition project corridor utilizing receptors, roadways, terrain lines, ground zones, and barriers (to represent structures); validate the baseline TNM model at all ambient noise monitoring locations for which traffic noise was dominant; process traffic data into five TNM-designated vehicle classifications; add the project design to the baseline TNM model. Refer to Appendix C for general descriptions of the TNM model(s), and to section 5.1 for description of the TNM model validation process.

*Impact assessment:* Input Base Year 2019 Existing and Design Year 2045 Build condition TNM traffic volumes and speeds into the validated baseline TNM model(s); calculate and document

TNM-predicted traffic noise levels; evaluate loudest hourly-equivalent noise levels by comparing TNM-predicted traffic noise levels against ambient noise monitoring data; assess predicted traffic noise NAC and Substantial Increase impacts (refer to section 6.0 and Appendix B).

## 3.0 CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It is emitted from many natural and man-made sources. Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by a ratio of its sound pressure to a reference sound pressure, usually twenty micro-Pascals (20μPa). Since the range of sound pressure ratios varies greatly – over many orders of magnitude, a base-10 logarithmic scale is used to express sound levels in dimensionless units of decibels (dB). The commonly accepted limits of detectable human hearing sound magnitudes are between the threshold of hearing at 0 decibels and the threshold of pain at 140 decibels.

Sound frequencies are reported in units of Hertz (Hz), which correspond to the number of vibrations per second of a given tone. A cumulative 'sound level' is equivalent to ten times the base-10 logarithm of the ratio of the sum of the sound pressures of all frequencies to the reference sound pressure. To simplify the mathematical process of determining sound levels, sound frequencies are grouped into ranges, or 'bands.' Sound levels are then calculated by adding the cumulative sound pressure levels within each band – which are typically defined as one 'octave' or '1/3 octave' of the sound frequency spectrum.

The commonly accepted limitation of human hearing to detect sound frequencies is between 20 Hz and 20,000 Hz, and human hearing is most sensitive to the frequencies between 1,000 Hz – 6,000 Hz. Although people are generally not as sensitive to lower-frequency sounds as they are to higher frequencies, most people lose the ability to hear high-frequency sounds as they age. To accommodate varying receptor sensitivities, frequency sound levels are commonly adjusted, or 'filtered', before being logarithmically added and reported as a single 'sound level' magnitude of that filtering scale. The A-weighted decibel filtering scale applies numerical adjustments to sound frequencies to emphasize the frequencies at which human hearing is sensitive, and to minimize the frequencies to which human hearing is not as sensitive (refer to Table 1).

Several examples of common indoor and outdoor noise levels expressed in dB(A) are listed in Table 2. As shown in Table 2, most individuals are exposed to fairly high noise levels from many sources on a regular basis. In order to perceive sounds of greatly varying pressure levels, human hearing has a non-linear sensitivity to sound pressure exposure. For example, doubling the sound pressure results in a three decibel change in the noise level; however, variations of three decibels (3 dB(A)) or less are commonly considered "barely perceptible" to normal human hearing. A five decibel (5 dB(A)) change is more readily noticeable. By definition, a ten-fold increase in the sound pressure level correlates to a 10 decibel (10 dB(A)) noise level increase;

however, it is judged by most people as only a doubling of the loudness – sounding "twice as loud".

The degree of disturbance or annoyance from exposure to unwanted sound – noise – depends upon three factors:

1. The amount, nature, and duration of the intruding noise

2. The relationship between the intruding noise and the existing (ambient) sound environment; and

3. The situation in which the disturbing noise is heard

**Table 1: Comparison: Flat vs. A-Weighted Frequency Scaling**

| Octave-Band Center Frequency (Hz) | A-Weighted Adjustment[1] | Sample Frequency Sound Levels (Flat) | Sample Frequency Sound Levels (A-Weighted) |
|---|---|---|---|
| **31** | -39.53 | 90.00 | 50.47 |
| **63** | -26.22 | 80.00 | 53.78 |
| **125** | -16.19 | 70.00 | 53.81 |
| **250** | -8.68 | 65.00 | 56.32 |
| **500** | -3.25 | 60.00 | 56.75 |
| **1000** | 0.00 | 60.00 | 60.00 |
| **2000** | +1.20 | 60.00 | 61.20 |
| **4000** | +0.96 | 55.00 | 55.96 |
| **8000** | -1.14 | 50.00 | 48.86 |
| **16000** | -6.7 | 45.00 | 38.30 |
| | **Overall Sound Levels:** | **90.48 dB[2]** | **66.32 dB(A)[2]** |

1. Based on the ISO 226:2003 standard for normal equal-loudness contours, the A-weighted decibel network filtering scale is defined for a frequency, f, by the equation: $20 \times \log_{10} (A(f) / A (1000))$, where $A(f) = [12{,}200^2 \times f^4] / [(f^2 + 20.6^2) \times (f^2 + 12{,}200^2) \times (f^2 + 107.7^2)^{0.5} \times (f^2 + 737.9^2)^{0.5}]$.
2. Although the energy in the flat sound source would create an *actual* sound level = 90.48 dB, it would be *perceived* as a sound level of 66.32 dB(A) by human hearing due to the decreased sensitivity of human hearing to lower sound frequencies.

In considering the first of these factors, it is important to note that individuals have varying sensitivity to noise. Loud noises bother some people more than other people. The time patterns and durations of noise(s) also affect perception as to whether or not it is offensive. For example, noises that occur during nighttime (sleeping) hours are typically 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 (typical ambient sounds). A car horn blowing at night when otherwise ambient noise levels are low would generally be more

objectionable than one blowing in the afternoon when ambient noise levels are typically higher. The response to noise stimulus is analogous to the response to turning on an interior light. During the daytime an illuminated bulb simply adds to the ambient light, but when eyes are conditioned to the dark of night, a suddenly illuminated bulb can be temporarily blinding.

The third factor – situational noise – is related to the interference of noise with activities of individuals. In a 60 dB(A) environment such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

**Table 2: Common Indoor and Outdoor Noise Levels**

| Common Outdoor Noise Levels | Noise Level (dB(A)) | Common Indoor Noise Levels |
|---|---|---|
| | 110 | Rock Band |
| Jet Flyover at 1,000 feet | 100 | Inside Subway Train (NY) |
| Gas Lawn Mower at 3 feet | | |
| Diesel Truck at 50 feet | 90 | Food Blender at 3 feet |
| Noisy Urban Daytime | 80 | Garbage Disposal at 3 feet |
| Gas Lawn Mower at 100 feet | 70 | Vacuum Cleaner at 10 feet |
| Commercial Area | | Normal Speech at 3 feet |
| | 60 | |
| | | Large Business Office |
| Quiet Urban Daytime | 50 | Dishwasher Next Room |
| Quiet Urban Nighttime | 40 | Small Theater, Large Conference Room (Background) |
| Quiet Suburban Nighttime | | Library |
| | 30 | |
| Quiet Rural Nighttime | | Bedroom at Night, Concert Hall (Background) |
| | 20 | |
| | | Broadcast and Recording Studio |
| | 10 | |
| | 0 | Threshold of Hearing |

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, American Association of State Highway and Transportation Officials (AASHTO). 1974 (revised 1993).

Over time, individuals tend to accept the noises that intrude into their lives on a regular basis. However, exposure to prolonged and/or extremely loud noise(s) can prevent use of exterior and interior spaces, and has been theorized to pose health risks. Appropriately, regulations exist for noise control or mitigation from many particularly offensive sources, including airplanes, factories, railroads, and highways. For all "Type I" federal, state, or federal-aid highway projects in the State of North Carolina, traffic and construction noise impact analysis and mitigation assessment is dictated by the applicable North Carolina Department of Transportation Traffic Noise Abatement Policy.

## 4.0 NOISE ABATEMENT CRITERIA

### 4.1 Title 23 Code of Federal Regulations, Part 772 (23 CFR 772)

The Federal Highway Administration (FHWA) has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. The purpose of 23 CFR, Part 772 is:

> "…To provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to Title 23 United States Code (U.S.C.).

The abatement criteria and procedures are set forth in Title 23 CFR Part 772, which also states:

> In determining traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs.

A summary of the NAC for various land uses is presented in Table 3: Noise Abatement Criteria. The $L_{eq}$, or equivalent sound level, is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as a time-varying sound level during the same period. With regard to traffic noise, fluctuating sound levels of traffic noise are represented in terms of $L_{eq}$, the steady, or 'equivalent', noise level with the same energy.

### 4.2 North Carolina Department of Transportation Traffic Noise Policy

The North Carolina Department of Transportation Traffic Noise Policy effective October 6, 2016 established official policy on highway noise. This policy sets guidelines for noise barrier construction, as well as general criteria and specific factors that determine feasibility and reasonableness of noise abatement measures on all major highway projects. This policy is included as Appendix F of this report.

### 4.3 Noise Abatement Criteria

The two categories of traffic noise impacts are defined as 1) those that "approach" or exceed the FHWA Noise Abatement Criteria (NAC), as shown in Table 3, and 2) those that represent

a "substantial increase" over existing noise levels as defined by NCDOT. A "substantial increase" is when the predicted worst noise hour Leq for the design year exceeds the existing worst noise hour levels by 10 dBA or more.

**Table 3: Noise Abatement Criteria**

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))

| Activity Category | Activity Criteria[1] $L_{eq(h)}$[2] | Evaluation Location | Activity Description |
|---|---|---|---|
| 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 [3] | 67 | Exterior | Residential |
| C [3] | 67 | Exterior | Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(f) sites, schools, television studios, trails, and trail crossings |
| D | 52 | Interior | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios |
| E [3] | 72 | Exterior | Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F |
| F | -- | -- | Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing |
| G | -- | -- | Undeveloped lands that are not permitted |

[1] The $L_{eq(h)}$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2] The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq(h)}$ being the hourly value of $L_{eq}$.

[3] Includes undeveloped lands permitted for this activity category.

## 5.0 AMBIENT NOISE LEVELS

Ambient noise is that noise which is all around us caused by natural and manmade events. It includes the wind, rain, thunder, birds chirping, insects, household appliances, commercial operations, lawn mowers, airplanes, automobiles, etc. It is all noise that is present in a particular area.

Existing traffic noise exposure varies in the noise-sensitive areas in the vicinity of the proposed project. Some areas are presently exposed to steady-state highway traffic noise such as from existing roadways; some areas are presently exposed to intermittent highway traffic noise; and some areas are not exposed to much, if any, existing traffic noise sources.

Ambient noise level data was obtained in the vicinity of the project to determine existing noise levels for identified receptors. A minimum existing ambient hourly equivalent noise level threshold of 52 dB(A) was used in areas where noise sources were not evident or determinable during the ambient data collection process. The purpose of the ambient noise level data is to quantify the existing acoustic environment and to provide a basis for assessing the impact of increased noise levels by the future project. Refer to Tables B-1 through B-5 for a list of the hourly-equivalent ambient noise levels, Leq(h), obtained in conjunction with the proposed Corridor K project.

Ambient noise measurement data was collected at fifteen (15) short-term locations along the project corridor and one two long-term locations, in conjunction with this Traffic Noise Report. Measurement locations are shown on Figure 2. For this Traffic Noise Report, loudest-hour existing noise levels were assessed as the TNM-predicted noise levels based on existing loudest-hour traffic estimates, or the ambient noise levels obtained at representative locations in the field. Refer to Appendix A for comprehensive information of noise measurement work efforts.

## 5.1 NOISE MODEL VALIDATION

TNM model validation is the process by which the precision of the modeled relationship between traffic and equivalent noise levels is refined and/or confirmed. The validation process is the basis upon which the traffic noise models for predicting existing year and design year traffic noise levels is founded.

If the TNM model is well-constituted, it should generate predicted traffic noise levels that are similar to the ambient noise levels obtained in the field. If the tolerance between TNM predicted and ambient noise monitored noise levels at locations for which traffic noise dominant are not within ±3.0 dB(A), then the model must be refined, as appropriate. Fourteen of the short-term measurement locations were validated within NCDOT tolerances. Only one measurement location that did not meet NCDOT's standards the ±3.0 dB(A) tolerance due to possibly a tree and signboards (refer to Table C-1 in Appendix C).

## 6.0 PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

Traffic noise emission is composed of several variables, including the number, types, and travel speeds of the vehicles, as well as the geometry of the roadway(s) on which the vehicles travel. Additionally, variables such as weather and intervening topography affect the transmission of traffic noise from the vehicle(s) to noise sensitive receptors.

In accordance with industry standards and accepted best-practices, detailed computer models were created using the Federal Highway Administration Traffic Noise Model® (FHWA TNM v.2.5). The computer models were validated to within acceptable tolerances of field-measured traffic noise data, and were used to predict traffic noise levels for receptor locations in the vicinity of the Corridor K Improvements project. Traffic noise consists of three primary parts: tire/pavement noise, engine noise, and exhaust noise. Of these sources, tire/pavement noise is typically the most offensive at unimpeded travel speeds. Sporadic traffic noises such as horns, squealing brakes, screeching tires, etc. are considered aberrant and are not included within the predictive model algorithm. Traffic noise is not constant; it varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receptor. Furthermore, since traffic noise emissions are different for various types of vehicles, the TNM algorithm distinguishes between the source emissions from the following vehicle types: automobiles, medium trucks, heavy trucks, buses, and motorcycles, as shown in Table 4. The computer traffic noise prediction model uses the number and type of vehicles on the planned roadway, vehicle speeds, the physical characteristics of the road (curves, hills, depressions, elevations, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier segment top elevations.

**Table 4: Traffic Noise Model (TNM) Vehicle Classification Types**

| TNM Vehicle Type | Description |
|---|---|
| Autos | All vehicles with two axles and four tires, including passenger cars and light trucks, weighing 9,900 pounds or less |
| Medium Trucks | All vehicles having two axles and six tires, weighing between 9,900 and 26,400 pounds |
| Heavy Trucks | All vehicles having three or more axles, weighing more than 26,400 pounds |
| Buses | All vehicles designed to carry more than nine passengers |
| Motorcycles | All vehicles with two or three tires and an open-air driver / passenger compartment |

Sources: FHWA Measurement of Highway-Related Noise, § 5.1.3 Vehicle Types.
FHWA Traffic Monitoring Guide, § 4.1 Classification Schemes

The project plans of the five Build Alternatives were used for this Traffic Noise Report. Per FHWA guidance, the predictions documented in this report are based upon the Design Year 2045 Build condition traffic forecasts resulting in the loudest predicted hourly-equivalent traffic noise levels for each receptor. Refer to Appendix B for a comprehensive list of traffic noise level receptors, and existing and predicted Design Year 2045 hourly equivalent traffic noise levels.

## 7.0 TRAFFIC NOISE IMPACTS

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dB(A) of the NAC values listed in Table 3), or [b] substantially exceed the existing noise levels in the design year by 10 dB(A) or greater.

As shown in Table 5, all Build Alternatives are not predicted to result in any noise impacts, either by NAC or substantial increase.

**Table 5: Traffic Noise Impact Summary[1]**

| ALT. DESC. | APPROXIMATE # OF IMPACTED RECEPTORS APPROACHING OR EXCEEDING FHWA NAC[2] | | | | | | | SUBST'L NOISE LEVEL INCR.[3] | IMPACTS DUE TO BOTH CRITERIA[4] | TOTAL IMPACTS PER 23 CFR 772[5] |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | | | |
| R1E Intersections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0[5] |
| R1E Roundabouts | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0[5] |
| 3R | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0[5] |
| S2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0[5] |
| SW1A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0[5] |

1. This table presents the number of Build condition traffic noise impacts as predicted for the Design Year 2045. Refer to Appendix B for a detailed analysis of traffic noise impacts at each noise sensitive receptor location.
2. Predicted traffic noise level impact due to approaching or exceeding NAC.
3. Predicted "substantial increase" traffic noise level impact.
4. Predicted traffic noise level impact due to exceeding NAC *and* "substantial increase" in Build condition noise levels.
5. The total number of predicted impacts is not duplicated if receptors are predicted to be impacted by more than one criterion.

## 7.1 TRAFFIC NOISE CONTOURS

Per 23 CFR 772.9(c) and NCDOT Policy, noise contour lines shall not be used for determining highway traffic noise impacts. However, the 71 dB(A) and 66 dB(A) noise level contour information should assist local authorities in exercising land use control over the remaining undeveloped lands, so as to minimize development of incompatible activities adjacent to the roadways within local jurisdiction.

Per 23 CFR 772.9(c) and NCDOT Policy, noise contour lines shall not be used for determining highway traffic noise impacts. However, the 71 dB(A) and 66 dB(A) noise level contour information should assist local authorities in exercising land use control over the remaining undeveloped lands (NAC "G") to avoid development of lands for use by incompatible activities adjacent to the roadways within local jurisdiction. NCDOT advocates the use of local government authority to regulate land development, planning, design, and construction in such a way that noise impacts are minimized.

A 71 dB(A) hourly-equivalent noise level correlates to the NCDOT impact threshold for a NAC "E" land use. An hourly-equivalent noise level of 66 dB(A) correlates to the NCDOT impact threshold for NAC "B" and "C" land uses. Due to low traffic volumes on NC 143, noise levels would not exceed the thresholds even at the edge of the project nearest travel lane (i.e., <10 feet = 10 feet). Refer to Table 6 for the distances from the edge of the project nearest travel lane at which 71 dB(A) and 66 dB(A) hourly-equivalent traffic noise levels are predicted to occur.

**Table 6: Predicted Traffic Noise Contour Distances**

| Roadway Segment | Contour Distances (feet) | |
|---|---|---|
| | 66 dB(A) | 71 dB(A) |
| Along US 129, South of Five Point Road | 65 | 25 |
| Along NC 143 between Denton Farm Road and Sweeten Creek | 40 | 10 |
| Along NC 143 between Sams Hill Road and Nathan Garland Road | 40 | 10 |
| Along NC 143 between Bill Crisp Road and Lower Stecoah Road | 45 | 10 |

It should be noted that this contour information is only general information purpose. Therefore, detailed traffic noise studies should be performed based on specific project locations and proposed development grading plan) to determine more finite results.

## 8.0 POTENTIAL TRAFFIC NOISE ABATEMENT MEASURES

FHWA and NCDOT require that feasible and reasonable noise abatement measures be considered and evaluated for the benefit of all predicted Build condition traffic noise impacts. Feasibility and reasonableness are distinct and separate considerations. Feasibility is the consideration as to whether noise abatement measures can be implemented. Reasonableness is the consideration as to whether noise abatement measures should be implemented.

The determination of feasibility is the combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure, including, but not limited to the following:

- A noise reduction of 5 dB(A) must be achieved for at least two impacted receptors;

- Engineering feasibility shall consider adverse impacts created by or upon property access, drainage, topography, utilities, safety, and maintenance requirements; and

- The effects of secondary traffic noise (e.g., non-project traffic noise) and non-traffic noise sources on attainable Noise Level Reduction shall be considered when developing effective noise abatement measures.

Reasonableness is the consideration as to whether noise abatement measures should be implemented, and is determined based on the combination of social, economic, and environmental factors, including, but not limited to the following:

- Preferences of property owners and tenants;

- Cost reasonableness of abatement measures;

- Noise reduction design goal of 7 dB(A) for at least one benefited receptor; and noise level reduction at impacted receptors.

Per NCDOT Policy, acceptable noise abatement measures include highway alignment selection, traffic system management measures, establishment of buffer zones, building insulation of NAC category D land use facilities, and noise barriers.

Design Year 2045 all Build Alternatives (i.e., R1E Intersections, R1E Roundabouts, 3R, S2, and SW1A) are not predicted to impact any receptors in the project vicinity due to low traffic volumes. Since there are no noise impacts within the project area, noise abatement is not warranted in all Build Alternatives.

## 9.0 CONSTRUCTION NOISE

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, pile-drivers and paving. Temporary and localized construction noise impacts may occur as a result of these activities (refer to Table 7). During daytime hours, the predicted effects of these impacts will be temporary speech interference for passers-by and those individuals living, working, or attending day care near the project. During evening and nighttime hours, steady-state construction noise emissions such as from paving operations will be audible, and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise emissions such as from backup alarms, lift gate closures ("slamming" of dump truck gates), etc., will be perceived as distinctly louder than the steady-state acoustic environment, and will likely cause severe impacts to the general peace and usage of noise-sensitive areas – particularly residences and day care.

Extremely loud construction noise activities such as usage of pile-drivers and impact-hammers (jack hammer, hoe-ram) will provide sporadic and temporary construction noise impacts in the

near vicinity of those activities (refer to Table 7). It is the recommendation of this Traffic Noise Report that construction activities that will produce extremely loud noises be scheduled during times of the day when such noises will create as minimal disturbance as possible.

**Table 7: Construction Equipment Typical Noise Level Emissions[1]**

| Equipment | Noise Level Emissions (dB(A)) at 50 Feet From Equipment[2] |
|---|---|
| | 70 80 90 100 |
| Pile Driver[3] | |
| Jack Hammer | |
| Tractor | |
| Road Grader | |
| Backhoe | |
| Truck | |
| Paver | |
| Pneumatic Wrench | |
| Crane | |
| Concrete Mixer | |
| Compressor | |
| Front-End Loader | |
| Generator | |
| Saws | |
| Roller (Compactor) | |

1. Adapted from *Noise Construction Equipment and Operations, Building Equipment, and Home Appliances*. U.S. Environmental Protection Agency. Washington D.C. 1971.
2. Cited noise level ranges are typical for the respective equipment. For "point sources" such as the construction equipment listed above, noise levels generally dissipate at a rate of -6 dB(A) for every doubling of distance. For example, if the noise level from a pile driver at a distance of 50 feet = 100 decibels (dB(A)), then at 400 feet, it might be 82 decibels (dB(A)) or less.
3. Due to project safety and potential construction noise concerns, pile driving activities are typically limited to daytime hours.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications. These measures include, but are not limited to, work-hour limits, equipment exhaust muffler requirements, haul-road locations, elimination of "tail gate banging", ambient-sensitive backup alarms, construction noise complaint mechanisms, and consistent and transparent community communication.

While discrete construction noise level prediction is difficult for a particular receptor or group of receptors, it can be assessed in a general capacity with respect to distance from known or likely project activities. For this project, earth removal, grading, hauling, and paving is anticipated to occur in the proposed Corridor K Improvements project. Pile-driving is anticipated to occur in the vicinity of the project. Although construction noise impact abatement should not place an undue burden upon the financial cost of the project or the project construction schedule, pursuant to the requirements of 23 CFR 772.19, it is the recommendation of this Traffic Noise Report that:

- Earth removal, grading, hauling, and paving activities in the vicinity of noise-sensitive areas should be limited to weekday daytime hours.

- If meeting the project schedule requires that earth removal, grading, hauling and / or paving must occur during evening, nighttime and / or weekend hours in the vicinity of residences, the Contractor shall notify NCDOT as soon as possible. In such instance(s), all reasonable attempts shall be made to notify and to make appropriate arrangements for the abatement of the predicted construction noise impacts upon the affected property owners and / or residents.

- If construction noise activities must occur during context-sensitive hours in the vicinity of noise-sensitive areas, discrete construction noise abatement measures including, but not limited to portable noise barriers and / or other equipment-quieting devices shall be considered.

For additional information on construction noise, please refer to the FHWA Construction Noise Handbook (FHWA-HEP-06-015) and the Roadway Construction Noise Model (RCNM), available online at:
https://www.fhwa.dot.gov/environment/noise/construction_noise/index.cfm.

## 10.0 NOISE-COMPATIBLE LAND USE

One of the most effective means to prevent future traffic noise impacts is noise-sensitive land-use development. The compatibility of highways and neighboring local areas is essential for continued growth, and can be achieved if local governments and developers require and practice noise-sensitive land-use planning.

Although regulation of land use is not within the purview of FHWA or NCDOT, some widely accepted techniques for noise-sensitive land use planning in the vicinity of existing and proposed highway facilities include:

- Locating retail, industrial, manufacturing, and other noise-compatible land-uses adjacent to highways

- Incorporating effective traffic noise mitigating features, such as earth berms and solid-mass noise walls, as part of residential developments

- Utilization of noise-sensitive architectural design and site planning, such as the orientation of quiet spaces away from roadways

- Required use of sound insulating building materials and construction methods

As indicated in the October 6, 2016 NCDOT Traffic Noise Policy, local jurisdictions with zoning control should use the information contained in this report to develop policies and/or ordinances to limit the growth of noise-sensitive land uses located adjacent to roadways. Furthermore, NCDOT encourages the dissemination of this information to all people who may be affected by, or who might influence others affected by, traffic noise.

## 11.0 CONCLUSION

Traffic noise and temporary construction noise impacts can be a consequence of transportation projects. This DNR utilized computer models created with the FHWA Traffic Noise Model software (TNM 2.5) to predict future noise levels and define impacted receptors.

Design Year 2045 all Build Alternatives (i.e., R1E Intersections, R1E Roundabouts, 3R, S2, and SW1A) are not predicted to impact any receptors in the project vicinity due to low traffic volumes. Since there are no noise impacts within the project area, noise abatement is not warranted in all Build Alternatives.

Construction noise impacts – some of them potentially substantial – may occur due to the close proximity of noise-sensitive receptors to project construction activities. It is the recommendation of this TNR that all reasonable efforts should be made to minimize exposure of noise-sensitive areas to construction noise impacts.

## 12.0 REFERENCES

Federal Highway Administration. CFR 23 Part 772 – Procedures for Abatement of Highway Traffic Noise and Construction Noise. [75 FR 39820-39838, July 13, 2010].

Federal Highway Administration. *Highway Traffic Noise: Analysis and Abatement Policy and Guidance*. 2016.

RSG *Noise Measurement Handbook.* FHWA-HEP-18-065 U.S. Department of Transportation, Federal Highway Administration, Washington, D.C. June 2018.

North Carolina Department of Transportation. *Traffic Noise Policy*. October 6, 2016.

North Carolina Department of Transportation. *Traffic Noise Manual*. October 6, 2016.

U.S. Environmental Protection Agency. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances.* Washington, D.C. 1971.

# FIGURES


**Figure 1**

Vicinity Map
Created: March 2020
Corridor K Improvements
Graham County, STIP A-0009C

N

Alt R1E Intersections
Alt R1E Roundabouts
Alt 3R
Alt S2
Alt SW1A

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of Transportation
Environmental Analysis Unit
Traffic Noise & Air Quality Group


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

Created: March 2020
Source: NCDOT
Roadway Design Unit

North Carolina Department
of Transportation
Environmental Analysis Unit
Traffic Noise & Air Quality Group


Figure 2-1
***Receptor Locations***
***STIP#: A0009C***
***Corridor K Improvements***
***Graham County***


Created: March 2020
Source: NCDOT
Roadway Design Unit

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Environmental Analysis Unit
Traffic Noise & Air Quality Group


Figure 2-2
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

Created: March 2020
Source: NCDOT
Roadway Design Unit

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-3
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

Created: March 2020
Source: NCDOT
Roadway Design Unit

North Carolina Department
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Environmental Analysis Unit
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Figure 2-4
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

Created: March 2020
Source: NCDOT
Roadway Design Unit

North Carolina Department
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Environmental Analysis Unit
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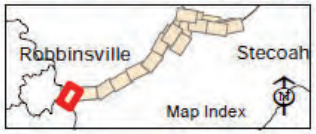


Figure 2-5
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Figure 2-6
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Created: March 2020
Source: NCDOT
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LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-7
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Figure 2-8
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Figure 2-9
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-10
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Figure 2-11
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

LEGEND

Impacted Receptor
Not Impacted Receptor
Acquired ROW

Long-Term
Short-Term

Alt R1E Intersections
Alt R1E Roundabouts
Alt 3R
Right Of Way

Alt S2
Alt SW1A
Parcel

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Figure 2-12
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Figure 2-13
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

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Source: NCDOT
Roadway Design Unit

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-14
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


Created: March 2020
Source: NCDOT
Roadway Design Unit

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-15
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


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Source: NCDOT
Roadway Design Unit

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-16
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-17
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-18
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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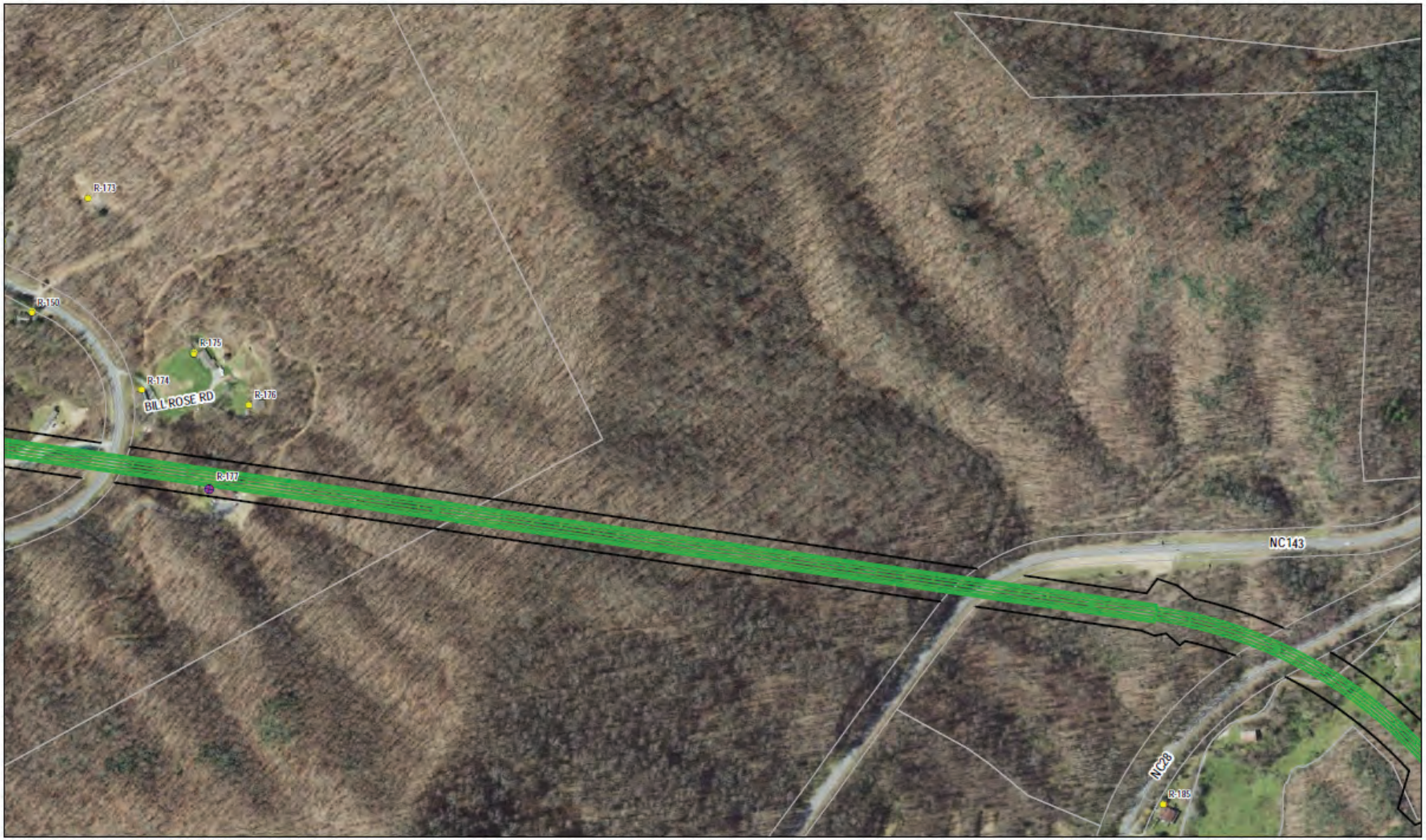
Figure 2-19
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*

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Created: March 2020
Source: NCDOT
Roadway Design Unit

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-20
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


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LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-21
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-22
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

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LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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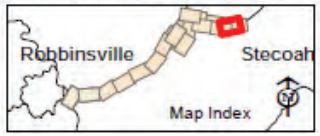


Figure 2-23
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-24
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-25
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*


0 100 200 FEET

Created: March 2020
Source: NCDOT
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LEGEND

- Impacted Receptor
- Not Impacted Receptor
- Acquired ROW
- Long-Term
- Short-Term
- Alt R1E Intersections
- Alt R1E Roundabouts
- Alt 3R
- Right Of Way
- Alt S2
- Alt SW1A
- Parcel

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Figure 2-26
*Receptor Locations*
*STIP#: A0009C*
*Corridor K Improvements*
*Graham County*

# Appendix A

# AMBIENT NOISE LEVEL MONITORING

**Table A-1: Project**
**Ambient Hourly-Equivalent Sound Levels, $L_{eq(h)}$[1]**

| Setup | Receptor | Land Use | Roadway Noise Source(s)[2] | Start / Stop Time | $L_{eq(h)}$ (dB(A)) |
|---|---|---|---|---|---|
| ST-1[3] | 1.1 | Residential | US 129 | 3:20 PM to 3:40 PM (09/24/2019) | 59 |
| | 1.2 | Residential | US 129 | | 52 |
| ST-3 | 3.1 | Residential | NC 143 | 4:58 PM to 5:28 PM (09/24/2019) | 60 |
| ST-5 | 5.1 | Residential | NC 143 | 1:30 PM to 1:50 PM (09/24/2019) | 56 |
| | 5.2 | Residential | NC 143 | | 50 |
| ST-7 | 7.1 | Residential | NC 143 | 12:27 PM to 12:47 PM (09/24/2019) | 56 |
| | 7.2 | Residential | NC 143 | | 51 |
| ST-9 | 9.1 | Residential | NC 143 | 5:50 PM to 6:10 PM (09/24/2019) | 58 |
| | 9.2 | Residential | NC 143 | | 52 |
| ST-10[4] | 10.1 | Residential | NC 143 | 9:19 AM to 9:49 AM (09/24/2019) | 56 |
| ST-11 | 11.1 | Residential | NC 143 | 10:17 AM to 10:37 AM (09/24/2019) | 61 |
| | 11.2 | Residential | NC 143 | | 52 |
| ST-12 | 12.1 | Residential | US 28 | 6:09 PM to 6:29 PM (09/23/2019) | 58 |
| | 12.2 | Residential | US 28 | | 51 |
| ST-13 | 13.1 | Residential | US 28 | 5:16 PM to 5:36 PM (09/24/2019) | 63 |
| | 13.2 | Residential | US 28 | | 58 |
| LT-2 | 2.1 | Residential | N/A | 11:23 AM (09/23/2019) to 10:08 AM (09/24/2019) | 48 |
| LT-3 | 3.1 | Residential | N/A | 4:26 PM (09/23/2019) to 10:59 AM (09/24/2019) | 51 |

1. In accordance with FHWA guidance and accepted industry standards, hourly equivalent sound levels, $L_{eq(h)}$, were extrapolated from short-term data collection monitoring sessions, and are expressed in units of A-weighted decibels (dB(A)) rounded to the nearest whole number. Data was obtained on Monday, September 23, 2013, and Tuesday, September 24, 2019.
2. For each Setup, noise meters were located at logical locations for the assessment of existing highway traffic noise or for the prediction of noise level increase(s) due to future highway traffic noise.
3. The monitoring locations are beyond the project limits.
4. Traffic count was not obtained during the measurement.

Note 1: The proposed sites for ST-2, ST-4, ST-6, and ST-8 were not available. Also, the proposed long-term site, LT-1 was not available.

| Table A-2 (a) : Project Noise Monitoring Sessions Weather Data | | | | | |
|---|---|---|---|---|---|
| **Setup** | **Temperature ($^0$F)** | **Avg. Wind Speed (mph)** | **Max. Wind Speed (mph)** | **Relative Humidity (%)** | **Condition** |
| ST-1 | 86.1 | 2.2 | 6.6 | 45.2 | Fair |
| ST-3 | 80.7 | 1.3 | 1.8 | 49.5 | Fair |
| ST-5 | 80.3 | 2.4 | 7.3 | 54.6 | Fair |
| ST-7 | 82.1 | 1.2 | 3.1 | 60 | Fair |
| ST-9 | 72.1 | 0 | 2.3 | 66.1 | Fair |
| ST-11 | 73 | 1.3 | 1.6 | 70.8 | Fair |
| ST-12 | 74.8 | 0.6 | 1.1 | 72.9 | Fair |
| ST-13 | 74.8 | 0.6 | 1.1 | 72.9 | Fair |
| LT-2 | 76.1 | 0.6 | 1.9 | 69.8 | Fair |
| LT-3 | 74 | 0.6 | 1.1 | 57.7 | Fair |

**Table A-3: Project Noise Monitoring Sessions Weather Data**

September 23, 2019

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6:03 AM | 54 °F | 52 °F | 93 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Cloudy |
| 6:16 AM | 53 °F | 51 °F | 93 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Fog |
| 6:23 AM | 53 °F | 51 °F | 93 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Fog |
| 6:39 AM | 53 °F | 51 °F | 93 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Fog |
| 6:43 AM | 53 °F | 51 °F | 93 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Fog |
| 6:46 AM | 53 °F | 52 °F | 96 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Fog |
| 6:49 AM | 54 °F | 52 °F | 94 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Partly Cloudy |
| 6:54 AM | 54 °F | 52 °F | 93 % | CALM | 0 mph | 0 mph | 27.90 in | 0.0 in | Partly Cloudy |
| 7:54 AM | 58 °F | 54 °F | 87 % | CALM | 0 mph | 0 mph | 27.89 in | 0.0 in | Fair |
| 8:54 AM | 66 °F | 56 °F | 70 % | CALM | 0 mph | 0 mph | 27.89 in | 0.0 in | Fair |
| 9:54 AM | 74 °F | 56 °F | 53 % | N | 6 mph | 0 mph | 27.88 in | 0.0 in | Fair |
| 10:54 AM | 79 °F | 54 °F | 42 % | N | 8 mph | 0 mph | 27.88 in | 0.0 in | Fair |
| 11:54 AM | 81 °F | 55 °F | 41 % | N | 8 mph | 0 mph | 27.86 in | 0.0 in | Fair |
| 12:54 PM | 83 °F | 54 °F | 37 % | N | 12 mph | 18 mph | 27.83 in | 0.0 in | Fair |
| 1:54 PM | 84 °F | 56 °F | 38 % | VAR | 5 mph | 0 mph | 27.80 in | 0.0 in | Fair |
| 2:54 PM | 86 °F | 56 °F | 36 % | WNW | 7 mph | 0 mph | 27.79 in | 0.0 in | Fair |
| 3:54 PM | 86 °F | 56 °F | 36 % | NNW | 9 mph | 0 mph | 27.77 in | 0.0 in | Mostly Cloudy |
| 4:54 PM | 83 °F | 57 °F | 41 % | NNW | 8 mph | 0 mph | 27.77 in | 0.0 in | Mostly Cloudy |
| 5:54 PM | 80 °F | 56 °F | 43 % | NNW | 9 mph | 0 mph | 27.78 in | 0.0 in | Cloudy |
| 6:54 PM | 78 °F | 56 °F | 46 % | NNW | 9 mph | 0 mph | 27.78 in | 0.0 in | Cloudy |
| 7:54 PM | 77 °F | 57 °F | 50 % | N | 7 mph | 0 mph | 27.78 in | 0.0 in | Cloudy |
| 8:54 PM | 75 °F | 59 °F | 57 % | NNW | 12 mph | 0 mph | 27.78 in | 0.0 in | Cloudy |

September 24, 2019

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6:01 AM | 64 °F | 61 °F | 90 % | CALM | 0 mph | 0 mph | 27.76 in | 0.0 in | Partly Cloudy |
| 6:54 AM | 66 °F | 61 °F | 84 % | CALM | 0 mph | 0 mph | 27.76 in | 0.0 in | Fair |
| 7:33 AM | 69 °F | 63 °F | 81 % | CALM | 0 mph | 0 mph | 27.76 in | 0.0 in | Mostly Cloudy |
| 7:44 AM | 70 °F | 63 °F | 78 % | NNW | 6 mph | 0 mph | 27.76 in | 0.0 in | Partly Cloudy |
| 7:54 AM | 70 °F | 63 °F | 78 % | N | 6 mph | 0 mph | 27.77 in | 0.0 in | Partly Cloudy |
| 8:54 AM | 72 °F | 62 °F | 71 % | NNW | 9 mph | 0 mph | 27.77 in | 0.0 in | Fair |
| 9:54 AM | 76 °F | 62 °F | 62 % | N | 7 mph | 0 mph | 27.77 in | 0.0 in | Fair |
| 10:54 AM | 78 °F | 59 °F | 52 % | NNW | 8 mph | 0 mph | 27.76 in | 0.0 in | Fair |
| 11:54 AM | 80 °F | 57 °F | 45 % | N | 12 mph | 18 mph | 27.75 in | 0.0 in | Fair |
| 12:54 PM | 80 °F | 53 °F | 39 % | N | 6 mph | 0 mph | 27.72 in | 0.0 in | Fair |
| 1:54 PM | 81 °F | 54 °F | 39 % | CALM | 0 mph | 0 mph | 27.70 in | 0.0 in | Mostly Cloudy |
| 2:54 PM | 83 °F | 54 °F | 37 % | CALM | 0 mph | 0 mph | 27.69 in | 0.0 in | Cloudy |
| 3:54 PM | 84 °F | 54 °F | 35 % | NNW | 7 mph | 0 mph | 27.68 in | 0.0 in | Cloudy |
| 4:54 PM | 80 °F | 54 °F | 40 % | NNW | 12 mph | 0 mph | 27.69 in | 0.0 in | Mostly Cloudy |
| 5:54 PM | 78 °F | 54 °F | 43 % | NNW | 8 mph | 0 mph | 27.69 in | 0.0 in | Partly Cloudy |
| 6:54 PM | 73 °F | 54 °F | 51 % | N | 5 mph | 0 mph | 27.70 in | 0.0 in | Fair |
| 7:54 PM | 70 °F | 55 °F | 59 % | NNW | 3 mph | 0 mph | 27.71 in | 0.0 in | Fair |
| 8:54 PM | 67 °F | 56 °F | 68 % | NNW | 6 mph | 0 mph | 27.72 in | 0.0 in | Fair |

Weather Underground (http://www.wunderground.com) for the local weather station at Fletcher, North Carolina.

**Table A-4: Project Noise Monitoring Sessions Traffic Flow Data**

| | 20-Minute Traffic Count (09/23/2019 & 09/24/2019) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Site No.** | **Roadway Name** | ***Posted Speed (mph)*** | ***Observed Speed (mph)*** | **Auto (Veh/ hr)** | **MT (Veh/ hr)** | **HT (Veh/ hr)** | **Motercycle (Veh/hr)** | **Buses (Veh/ hr)** |
| ST-1 | Tallulah Rd (US129), NB | 55 | 45 | 78 | 5 | 0 | 5 | 0 |
| | Tallulah Rd (US129), SB | 55 | 45 | 100 | 7 | 2 | 15 | 2 |
| ST-3 (30 min) | Sweetwater Rd (NC143), EB | 55 | 50 | 102 | 3 | 0 | 1 | 0 |
| | Sweetwater Rd (NC143), WB | 55 | 50 | 83 | 5 | 0 | 5 | 0 |
| ST-5 | Sweetwater Rd (NC143), EB | 55 | N/A | 28 | 0 | 1 | 5 | 0 |
| | Sweetwater Rd (NC143), WB | 55 | N/A | 34 | 2 | 2 | 1 | 0 |
| ST-7 | Sweetwater Rd (NC143), EB | 55 | 53 | 19 | 2 | 0 | 3 | 0 |
| | Sweetwater Rd (NC143), WB | 55 | 53 | 28 | 2 | 2 | 0 | 0 |
| ST-9 | Sweetwater Rd (NC143), EB | 55 | N/A | 38 | 0 | 1 | 15 | 0 |
| | Sweetwater Rd (NC143), WB | 55 | N/A | 43 | 2 | 0 | 6 | 0 |
| ST-11 | Sweetwater Rd | 55 | 51 | 22 | 0 | 0 | 1 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (NC143), EB | | | | | | | |
| | Sweetwater Rd (NC143), WB | 55 | 51 | 22 | 1 | 1 | 2 | 0 |
| ST-12 | Hwy 28, NB | 55 | 54 | 29 | 0 | 1 | 6 | 0 |
| | Hwy 28, SB | 55 | 54 | 20 | 0 | 0 | 4 | 0 |
| ST-13 | Hwy 28, NB | 55 | 48 | 23 | 1 | 1 | 23 | 0 |
| | Hwy 28, SB | 55 | 48 | 53 | 1 | 0 | 8 | 0 |
| | Stecoah Rd | 30 | 30 | 14 | 0 | 0 | 0 | 0 |

**Table A.5: Project Noise Monitoring Sessions Traffic Flow Data (Volume / Hour)**

| Hourly Normalized Traffic Count (09/23/2019 & 09/24/2019) | | | | | | |
|---|---|---|---|---|---|---|
| **Site No.** | **Roadway Name** | **Auto (Veh/hr)** | **MT (Veh/hr)** | **HT (Veh/hr)** | **Motercycle (Veh/hr)** | **Buses (Veh/hr)** |
| ST-1 | Tallulah Rd (US129), NB | 234 | 15 | 0 | 15 | 0 |
| | Tallulah Rd (US129), SB | 300 | 21 | 6 | 45 | 6 |
| ST-3 | Sweetwater Rd (NC143), EB | 204 | 6 | 0 | 2 | 0 |
| | Sweetwater Rd (NC143), WB | 166 | 10 | 0 | 10 | 0 |
| ST-5 | Sweetwater Rd (NC143), EB | 84 | 0 | 3 | 15 | 0 |
| | Sweetwater Rd (NC143), WB | 102 | 6 | 6 | 3 | 0 |
| ST-7 | Sweetwater Rd (NC143), EB | 57 | 6 | 0 | 9 | 0 |
| | Sweetwater Rd (NC143), WB | 84 | 6 | 6 | 0 | 0 |
| ST-9 | Sweetwater Rd (NC143), EB | 114 | 0 | 3 | 45 | 0 |
| | Sweetwater Rd (NC143), WB | 129 | 6 | 0 | 18 | 0 |
| ST-11 | Sweetwater Rd (NC143), EB | 66 | 0 | 0 | 3 | 0 |
| | Sweetwater Rd (NC143), WB | 66 | 3 | 3 | 6 | 0 |
| ST-12 | Hwy 28, NB | 87 | 0 | 3 | 18 | 0 |
| | Hwy 28, SB | 60 | 0 | 0 | 12 | 0 |
| ST-13 | Hwy 28, NB | 69 | 3 | 3 | 69 | 0 |
| | Hwy 28, SB | 159 | 3 | 0 | 24 | 0 |
| | Stecoah Rd | 42 | 0 | 0 | 0 | 0 |

Short-Term Monitoring Setup 1 (ST-1.1)

Short-Term Monitoring Setup 1 (ST-1.2)

Short-Term Monitoring Setup 3 (ST-3.1)

Short-Term Monitoring Setup 5 (ST-5.1)

Short-Term Monitoring Setup 5 (ST-5.2)

Short-Term Monitoring Setup 7 (ST-7.1)

Short-Term Monitoring Setup 7 (ST-7.2)

Short-Term Monitoring Setup 9 (ST-9.1)

Short-Term Monitoring Setup 9 (ST-9.2)

Short-Term Monitoring Setup 10 (ST-10.1)

Short-Term Monitoring Setup 11 (ST- 11.1)

Short-Term Monitoring Setup 11 (ST-11.2)

Short-Term Monitoring Setup 12 (ST-12.1)

Short-Term Monitoring Setup 12 (ST-12.2)

Short-Term Monitoring Setup 13 (ST-13.1)

Short-Term Monitoring Setup 13 (ST-13.2)

Long-Term Monitoring Setup 2

Long-Term Monitoring Setup 3

# Noise Measurement Data Sheet

Site ST-1

Project: Corridor K Improvements

Date: 09/24/2019

STIP #: A 00100 Operator(s): NDS, LMH, RC, MK

Location: 689 Tallwash Rd. (009) 1.1 :- 35.312520, -83.796437
693 Tallwash Rd (008) 1.2 :- 35.312861, -83.796135

Roadway Cross Section: 3 lane (middle turn lane) Roadway Width 42 ft

Posted Speed Limit: 55 mph Estimated Speed: 45 mph

| TRAFFIC DATA (US 19) | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | 78 | 100 | 178 |
| MT | 5 | 7 | 12 |
| HT | 0 | 2 | 2 |
| MC | 5 | 15 | 20 |
| Bus | 0 | 2 | 2 |
| Total | 88 | 126 | |

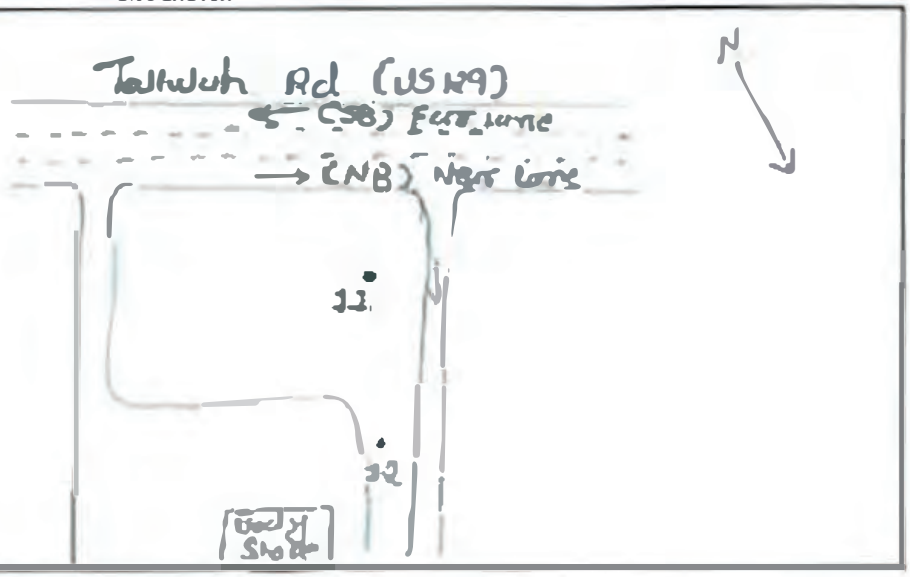
Sample Time Begin: 3:20 PM (20 min)
End: 3:40 PM.

Leq Noise Level 1.1 58.4 dB(A)
1.2 52.3 dB(A)
.3
4

Calibration Begin: 114 dB(A)
End: 114 dB(A)
Drift: 0

Site Sketch

Temp: 86°F
Avg Wind: 2.2 mph
Max Wind: 6.6 mph
RH: 45.2%




Major Noise Source: 3:35, 3:36 PM truck entered to Road shop parking lot

Comments: 3:36 PM EMS behind second noise

# Noise Measurement Data Sheet

Site # ST-3

Project : Corridor K Improvements

Date : 09/24/2019

STIP # : A-0009 Operator (s) : NDS, LMIII, RC, MB

Location : 30 George Millsaps Rd (010) : 3.1 :- 35.325063, -83.775251

Roadway Cross Section : 2-Lane Roadway Width 12-ft

Posted Speed Limit : 55 mph Esitmated Speed : 50 mph (50-55)

| TRAFFIC DATA (NC 143) | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | 102 | 83 | 185 |
| MT | 3 | 5 | 8 |
| HT | 0 | 0 | 0 |
| MC | 1 | 5 | 6 |
| Total | 106 | 93 | |

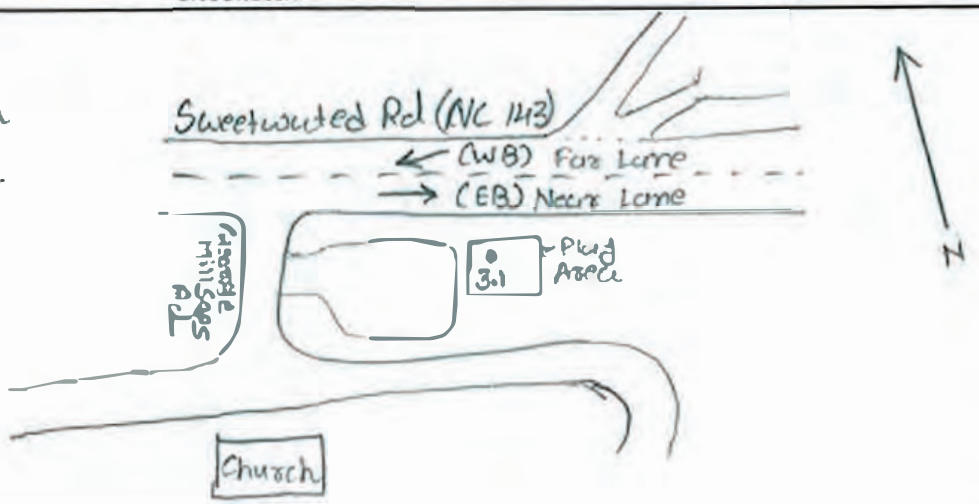
Sample Time Begin : 4:58 PM (30 min)
End: 5:28 PM

Leq Noise Leve 3 .1 60.4 dB(A)
.2
.3
.4

Calibration Begin : 114 dB(A)
End: 114 dB(A)
Drift : 0

Site Sketch:

Temp: 80.7°F
Avg Wind: 1.3mph
Max Wind: 1.8mph
R.H: 49.5%




Major Noise Source: 5:15 PM tractor Noise

Comments :

# Noise Measurement Data Sheet

Site # ST-5

Project: Corridor K Improvements

Date: 09/24/2019

STIP #: A-0009 Operator (s): NDS, LM III, RC, MP

Location: 166 Queen Hollow Rd (008) S.1 :- 35.330788, -83.765684
(007) S.2 :- 35.330543, -83.765457

Roadway Cross Section: 2-Lane Roadway Width 22-ft

Posted Speed Limit: 55 mph Esitmated Speed:

TRAFFIC DATA (NC 143)

| Class | Near Lane | Far Lane | Total |
|---|---|---|---|
| Auto | 28 | 34 | 62 |
| MT | 0 | 2 | 2 |
| HT | 1 | 2 | 3 |
| MC | 5 | 1 | 6 |
| Total | 34 | 39 | |

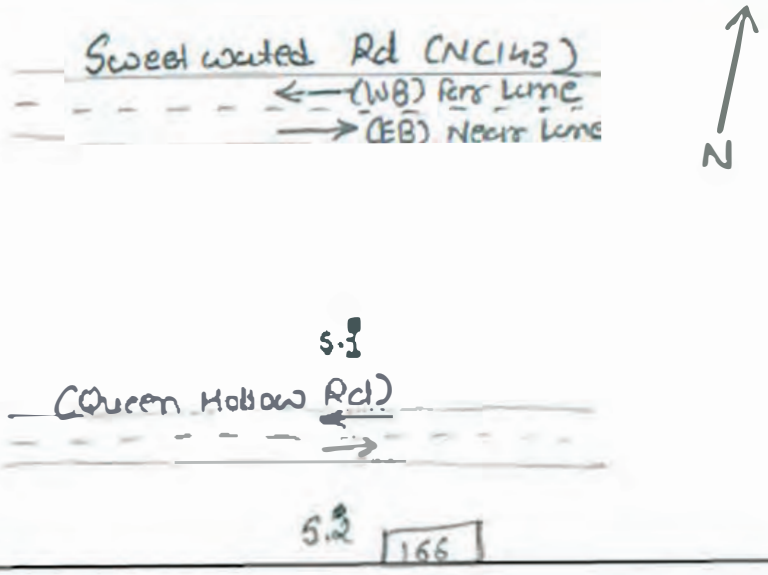
Sample Time Begin: 1:30 PM (20 min)
End: 1:50 PM

Leq Noise Level S.1 55.9 dB(A)
S.2 49.9 dB(A)
.3
.4

Calibration Begin: 114 dB(A)
End: 114 dB(A)
Drift: 0

Site Sketch

Temp: 80.3°F
Avg Wind: 2.4 mph
Max Wind: 7.3 mph
R.H: 54.6 %




Major Noise Source: 1:32 PM 1 car Pass on Queen Hollow Rd

Comments:

# Noise Measurement Data Sheet

Site # ST-7

Project: Corridor K Improvements

Date: 09/24/2019

STIP #: A-0009 Operator (s): NDS, LM III, RC, MP

Location: 253 Earnest Phillips Rd (007) 7.1 :- 35.3416967, -83.7430897
228 Earnest Phillips Rd (006) 7.2 :- 35.3415725, -83.7428161

Roadway Cross Section: 2-Lane Roadway Width 12-ft

Posted Speed Limit: 55 mph Esitmated Speed: 53 mph (50-56)

| TRAFFIC DATA (NC 143) | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | 19 | 28 | 47 |
| MT | 2 | 2 | 4 |
| HT | 0 | 2 | 2 |
| MC | 3 | 0 | 3 |
| Total | 24 | 32 | |

Sample Time Begin: 12:27 pm (20 min)
End: 12:47 PM

Leq Noise Level
7.1 56.3 dB(A)
7.2 50.8 dB(A)
3
4

Calibration Begin: 114 dB(A)
End: 114 dB(A)
Drift: 0

Site Sketch

Temp: 82.1°F
Avg Wind: 1.2mph
Max Wind: 3.1mph
R.H: 60%


Major Noise Source:

Comments:

# Noise Measurement Data Sheet

Site # ST-9

Project : Corridor K Improvements

Date : 09/24/2019

STIP # : A-0009 Operator (s) : NDS, LMIII, RC, MP

Location : 53 Sams Hill Rd (011) 9.1 :- 35.353865, -83.7313969
106 Sams Hill Rd (009) 9.2 :- 35.3536763, -83.7308682

Roadway Cross Section : 2-Lane Roadway Width 12 ft

Posted Speed Limit : 55 mph Esitmated Speed :

| TRAFFIC DATA (NC143) | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | 38 | 43 | 81 |
| MT | 0 | 2 | 2 |
| HT | 1 | 0 | 1 |
| MC | 15 | 6 | 21 |
| Total | 54 | 51 | |

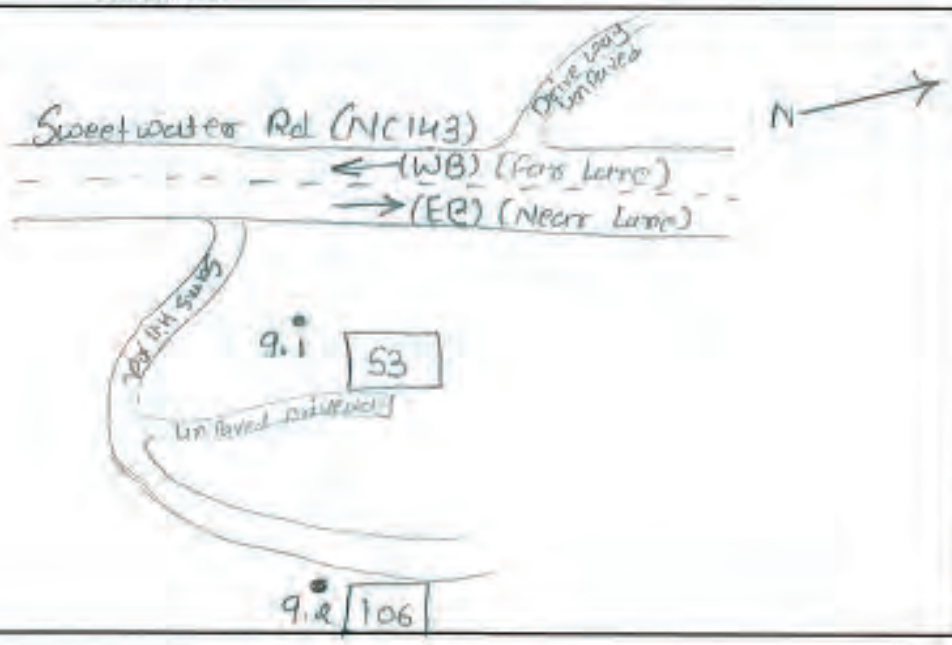
Sample Time Begin : 5:50 PM
End : 6:10 PM

Leq Noise Leve
9.1 57.5 dB(A)
9.2 52.4 dB(A)
.3
.4

Calibration Begin : 114 dB(A)
End : 114 dB(A)
Drift : 0

Site Sketch

Temp : 72.1°F
Avg Wind : 0.0 mph
Max Wind : 2.5 mph
R.H : 66.1 %




Major Noise Source:

Comments : 6:07 PM Loud motorcycle engine Noise.

# Noise Measurement Data Sheet

Site # ST-11

Project : CorridorK Improvements

Date : 09/24/2019

STIP # : A-0009 Operator (s) : NDS, LMM, RC, MP

Location : 5840 Sweetwater Rd (004) 11.1 35.364356, -83.725518
(003) 11.2 35.364293, -83.725197

Roadway Cross Section : 2-Lane Roadway Width 12 ft

Posted Speed Limit : 55 mph Esitmated Speed : 51 mph (48 to 52)

TRAFFIC DATA (NC 143)

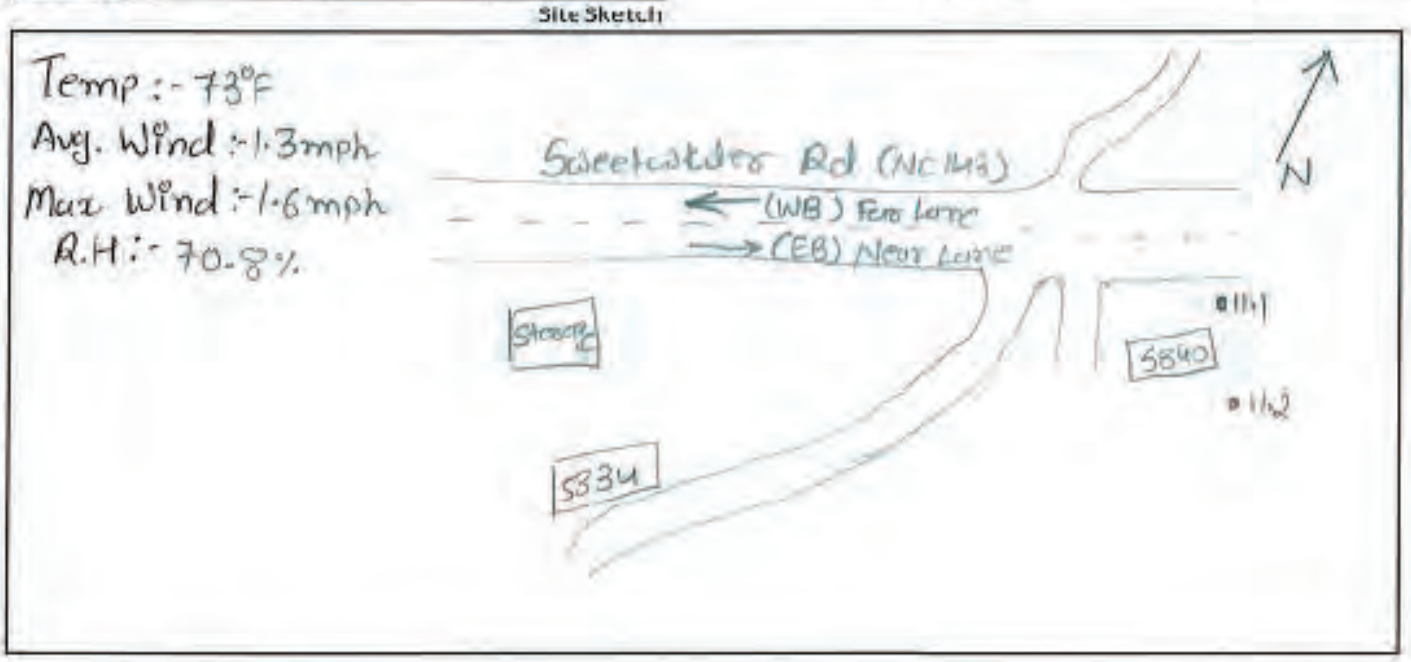
| Class | Near Lane | Far Lane | Total |
|---|---|---|---|
| Auto | 22 | 22 | 44 |
| MT | 0 | 1 | 1 |
| HT | 0 | 1 | 1 |
| MC | 1 | 2 | 3 |
| Total | 23 | 26 | |

Sample Time Begin : 10:17 AM
End: 10:37 AM

Leq Noise Level 11.1 60.6 dBCA)
11.2 52.0 dBCA)
.3
.4

Calibration Begin : 114 dBCA)
End : 114 dBCA)
Drift :

Site Sketch




Major Noise Source:

Comments :

# Noise Measurement Data Sheet

Site # ST-12

Project : Corridor K Improvements

Date : 09/23/2019

STIP # : A-0009 Operator (s) : NDS, LMIII, RC, MP

Location : 861 Hwy 28 (002) 12.1 :- 35.373320, -83.6996757
(002) 12.2 :- 35.3736439, -83.6996127

Roadway Cross Section : 2-Lane Roadway Width 12 ft

Posted Speed Limit : 55 mph Esitmated Speed : 54 mph

| TRAFFIC DATA | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | 29 | 20 | 49 |
| MT | 0 | 0 | 0 |
| HT | 1 | 0 | 1 |
| MC | 6 | 4 | 10 |
| Total | 36 | 24 | |

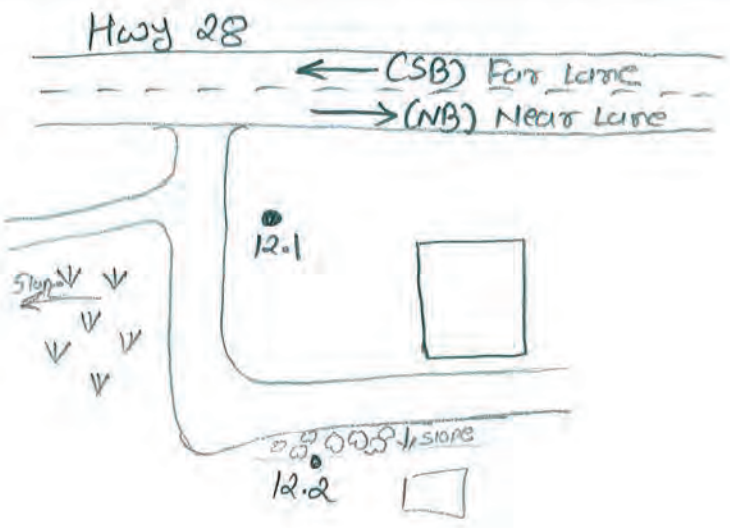
Sample Time Begin : 6:09 PM
End: 6:29 PM

Leq Noise Level
12.1 58.1 dB(A)
12.2 51.2 dB(A)
.3
.4

Calibration Begin : 114 dB(A)
End : 114 dB(A)
Drift : 0

Site Sketch

Temp :- 74.8°F
Avg. Wind :- 0 mph
Max. Wind :- 0 mph
R.H. :- 72.9 %




Major Noise Source:

Comments :

# Noise Measurement Data Sheet

Site # ST-13

Project : Corridor K Improvements

Date : 09/23/2019

STIP # : A-0009

Operator (s) : NDS, LMIII, RC, MP

Location : 621 Stecoah Rd (001) 13.1 :- 35.3706134, -83.6919309
(001) 13.2 :- 35.370340, -83.691915

Roadway Cross Section : 2-Lane

Roadway Width 12 ft

Posted Speed Limit : 55 mph (Hwy 28)
30 mph (Stecoah Rd)

Esitmated Speed : 48 mph (45-50)

TRAFFIC DATA (Hwy 28)

| Class | Near Lane | Far Lane | Total |
|---|---|---|---|
| Auto | 23 | 53 | 76 |
| MT | 1 | 1 | 2 |
| HT | 1 | 0 | 1 |
| MC | 23 | 8 | 31 |
| Total | 48 | 62 | |

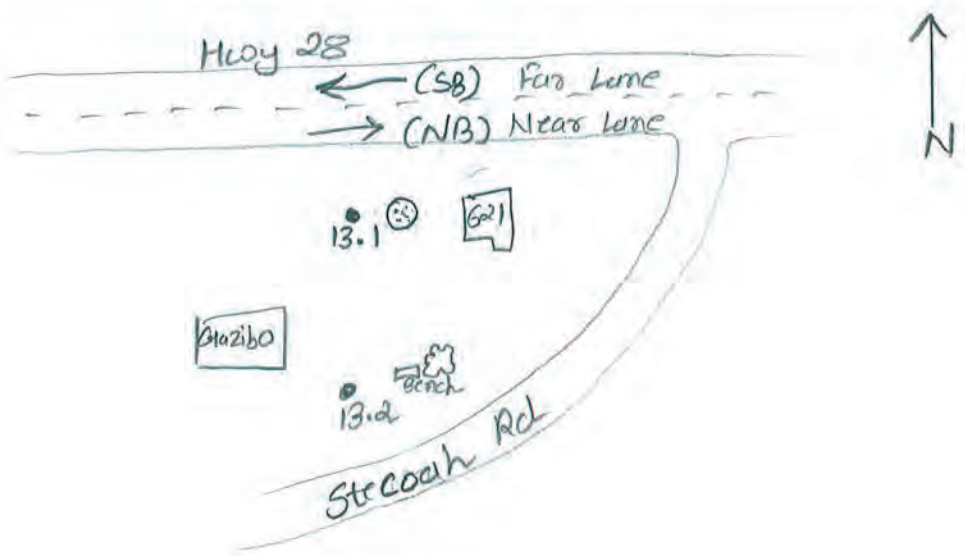
Sample Time Begin : 5:16 PM
End: 5:36 PM

Leq Noise Level
13.1 63.4 dBCA)
13.2 58.1 dBCA)
.3
.4

Calibration Begin : 114 dBCA)
End : 114 dBCA)
Drift : 0

Site Sketch

Temp :
Avg. Wind :
Max. wind :
R.H :




Major Noise Source: Minor: Dogs barking continuously back side of 13.2 meter from 5:20 to 5:33

Comments :

Stecoah Rd → 14 Auto

# Noise Measurement Data Sheet

Site # ST-10 trail

Project : Corridor K Improvements

Date : 09/24/2019

STIP # : A-0009 Operator (s) : NDS, LMIII, RC, MP

Location : Stecoah trail (003) 35.358017, -83.717668

Roadway Cross Section : 2-Lane Roadway Width 12 ft

Posted Speed Limit : 55 mph Esitmated Speed : 37-45 mph

| TRAFFIC DATA | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | | | |
| MT | | | |
| HT | | | |
| Total | | | |

Sample Time Begin : 9:19 AM 30 min

End: 9:49 am

Leq Noise Level .1 56.0 dB(A)

.2

.3

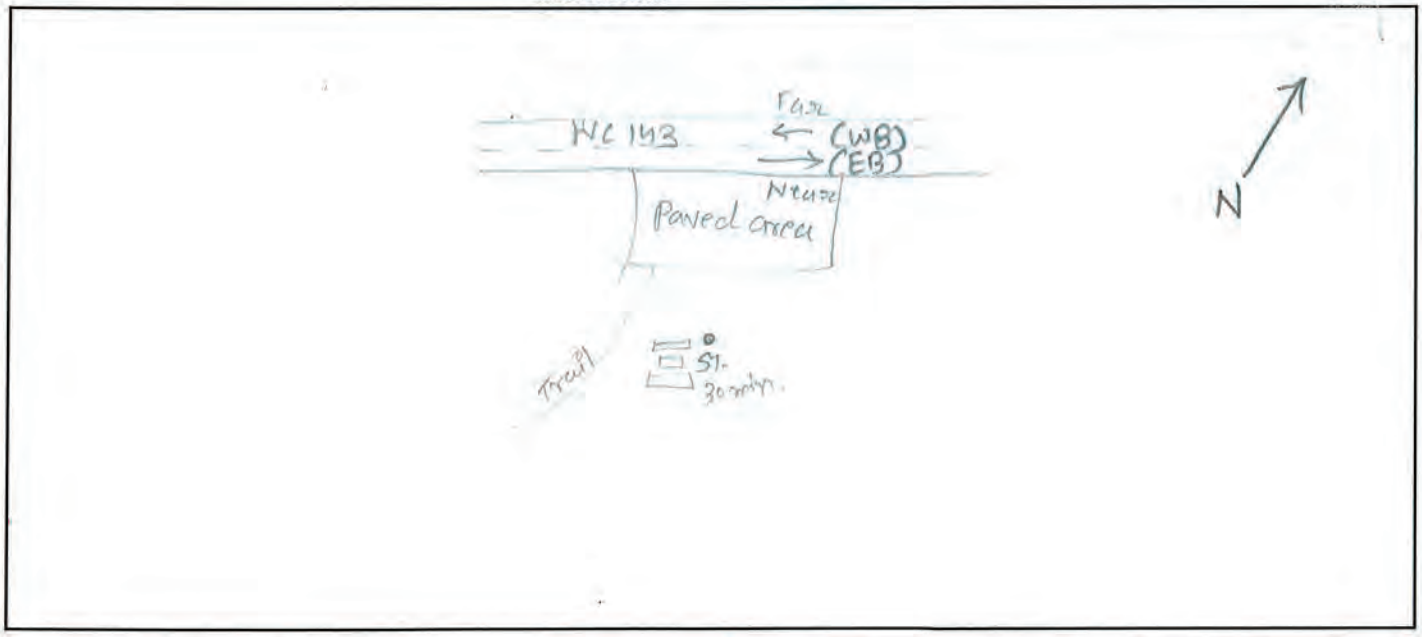
.4

Calibration Begin : 114 dB(A)

End : 114 dB(A)

Drift : 0

Site Sketch




Major Noise Source:

Comments :

# Noise Measurement Data Sheet

Site # LT-2

Project : Corridor K Improvements

Date : 09/24/2019

STIP # : A-0009 Operator (s) : NDS, LMIII, RC, MP

Location : 35.3587063, -83.7105675 Between 1345 Cody Branch Rd 1392 Cody Branch Rd.

Roadway Cross Section : _____ Roadway Width _____

Posted Speed Limit : _____ Esitmated Speed : _____

| TRAFFIC DATA | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | | | |
| MT | | | |
| HT | | | |
| Total | | | |

Sample Time Begin : 11:23 am

End: 10:08 am

Leq Noise Level .1 48.1

.2 _____

.3 _____

.4 _____

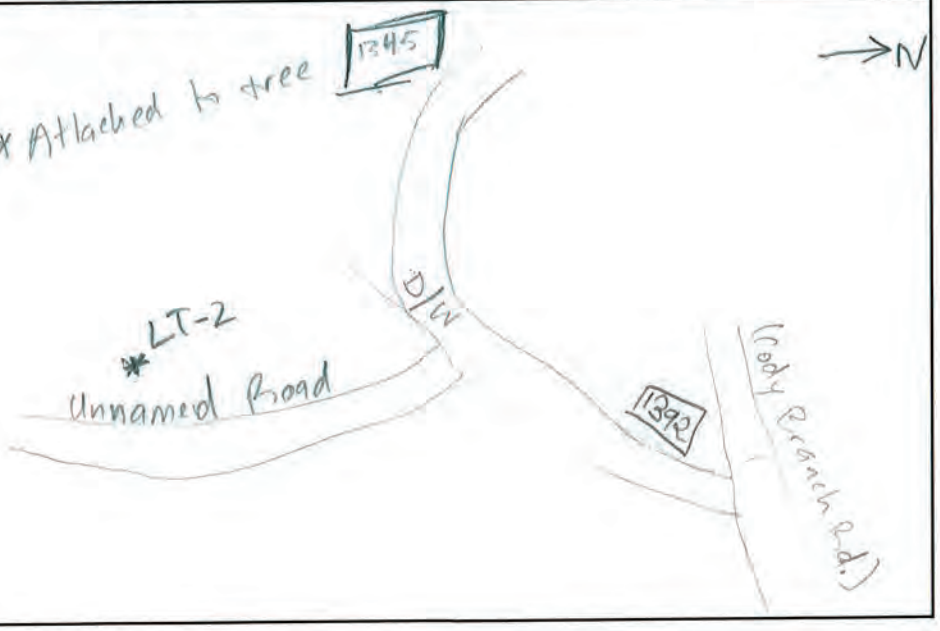
Calibration Begin : 114 dB(A)

End : _____

Drift : _____

Site Sketch

Temp : 76.1°F
Avg. wind: 0.6 mph
Max. wind: 1.9 mph
R.H : 69.8%




Major Noise Source: _____

Comments : _____

# Noise Measurement Data Sheet

Site # LT-3

Project : Corridor K Improvements

Date : 09/23/2019

STIP # : A-0009 Operator (s) : NDS, LMIII, RC, MP

Location : 29 Patriot Rd (35.373902, -83.692374)

Roadway Cross Section : 2-Lane. Roadway Width

Posted Speed Limit : 55 Esitmated Speed :

| TRAFFIC DATA | | | |
|---|---|---|---|
| Class | Near Lane | Far Lane | Total |
| Auto | | | |
| MT | | | |
| HT | | | |
| Total | | | |

Sample Time Begin : 4:26 PM

End: 10:59 am

Leq Noise Level .1 50.9

.2

.3

.4

Calibration Begin : 114

End : 114

Drift : 0

Site Sketch

Max Windspeed: 1.1 mph

T.h = 57.7

HI = 82.3


Major Noise Source:

Comments :

**Scantek, Inc.**
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

# Calibration Certificate No.41698

*Instrument:* **Sound Level Meter**
*Model:* **NL52**
*Manufacturer:* **Rion**
*Serial number:* **00375623**
*Tested with:* **Microphone UC-59 s/n 11098**
**Preamplifier NH25 s/n 65750**
*Type (class):* **1**
*Customer:* **Scantek, Inc.**
*Tel/Fax:* **410-290-7726 / 410-290-9167**

*Date Calibrated:* **10/31/2018** *Cal Due:* **10/31/2019**

| *Status:* | Received | Sent |
|---|---|---|
| *In tolerance:* | X | X |
| *Out of tolerance:* | | |
| *See comments:* | | |

*Contains non-accredited tests:* __Yes X No
*Calibration service:* __ Basic X Standard
*Address:* **6430 Dobbin Road, Suite C, Columbia, MD 21045**

**Tested in accordance with the following procedures and standards:**
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

**Instrumentation used for calibration:** Nor-1504 Norsonic Test System:

| Instrument - Manufacturer | Description | S/N | Cal. Date | Traceability evidence Cal. Lab / Accreditation | Cal. Due |
|---|---|---|---|---|---|
| 483B-Norsonic | SME Cal Unit | 31061 | Jul 30, 2018 | Scantek, Inc./ NVLAP | Jul 30, 2019 |
| DS-360-SRS | Function Generator | 61646 | Sep 7, 2018 | ACR Env./ A2LA | Sep 7, 2020 |
| 34401A-Agilent Technologies | Digital Voltmeter | MY47022043 | Sep 17, 2018 | ACR Env./ A2LA | Sep 17, 2019 |
| HM30-Thommen | Meteo Station | 1040170/39633 | Oct 25, 2017 | ACR Env./ A2LA | Nov 25, 2018 |
| PC Program 1019 Norsonic | Calibration software | v.6.1T | Validated Nov 2014 | Scantek, Inc. | - |
| 1251-Norsonic | Calibrator | 30878 | Nov 10, 2017 | Scantek, Inc./ NVLAP | Nov 10, 2018 |

**Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).**

**Environmental conditions:**

| Temperature (°C) | Barometric pressure (kPa) | Relative Humidity (%) |
|---|---|---|
| 23.1 | 100.20 | 51.8 |

| **Calibrated by:** | Lydon Dawkins | **Authorized signatory:** | Steven E. Marshall |
|---|---|---|---|
| Signature | Lydon Dawkins | Signature | Steven E Marshall |
| Date | 10/31/2018 | Date | 10/31/2018 |

**Scantek, Inc.**
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

# Calibration Certificate No.41844

*Instrument:* **Sound Level Meter**
*Model:* **NL52**
*Manufacturer:* **Rion**
*Serial number:* **00253710**
*Tested with:* **Microphone UC-59 s/n 07520**
**Preamplifier NH25 s/n 43740**
*Type (class):* **1**
*Customer:* **Scantek, Inc.**
*Tel/Fax:* **410-290-7726 / 410-290-9167**

*Date Calibrated:* **11/19/2018** *Cal Due:* **11/19/2019**

| *Status:* | Received | Sent |
|---|---|---|
| *In tolerance:* | X | X |
| *Out of tolerance:* | | |
| *See comments:* | | |

*Contains non-accredited tests:* __Yes X No
*Calibration service:* __ Basic X Standard
*Address:* **6430 Dobbin Road, Suite C**
**Columbia, MD 21045**

**Tested in accordance with the following procedures and standards:**
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

**Instrumentation used for calibration:** Nor-1504 Norsonic Test System:

| Instrument - Manufacturer | Description | S/N | Cal. Date | Traceability evidence Cal. Lab / Accreditation | Cal. Due |
|---|---|---|---|---|---|
| 483B-Norsonic | SME Cal Unit | 31061 | Jul 30, 2018 | Scantek, Inc./ NVLAP | Jul 30, 2019 |
| DS-360-SRS | Function Generator | 61646 | Sep 7, 2018 | ACR Env./ A2LA | Sep 7, 2020 |
| 34401A-Agilent Technologies | Digital Voltmeter | MY47022043 | Sep 17, 2018 | ACR Env./ A2LA | Sep 17, 2019 |
| HMP233 - Valsala Oyj | Humidity & Temp. Transmitter | V3820001 | Apr 19, 2017 | ACR Env. / A2LA | Apr 19, 2019 |
| DPI 141 - Druck | Pressure Indicator | 790/00-04 | Dec 22, 2016 | ACR Env. / A2LA | Dec 22, 2018 |
| PC Program 1019 Norsonic | Calibration software | v.6.1T | Validated Nov 2014 | Scantek, Inc. | - |
| 1251-Norsonic | Calibrator | 30878 | Nov 11, 2018 | Scantek, Inc./ NVLAP | Nov 11, 2019 |

**Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).**

**Environmental conditions:**

| Temperature (°C) | Barometric pressure (kPa) | Relative Humidity (%) |
|---|---|---|
| 22.6 | 100.18 | 42.1 |

| **Calibrated by:** | Jeremy Gotwalt | **Authorized signatory:** | Steven E. Marshall |
|---|---|---|---|
| Signature | | Signature | |
| Date | 11/19/18 | Date | 11/20/2018 |

**Scantek, Inc.**
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

# Calibration Certificate No.41856

*Instrument:* **Sound Level Meter**
*Model:* **NL52**
*Manufacturer:* **Rion**
*Serial number:* **00410018**
*Tested with:* **Microphone UC-59 s/n 04609**
**Preamplifier NH25 s/n 10011**
*Type (class):* **1**
*Customer:* **Scantek, Inc.**
*Tel/Fax:* **410-290-7726 / 410-290-9167**

*Date Calibrated:* **11/20/2018** *Cal Due:* **11/20/2019**

| *Status:* | Received | Sent |
|---|---|---|
| *In tolerance:* | X | X |
| *Out of tolerance:* | | |
| *See comments:* | | |

*Contains non-accredited tests:* __Yes X No
*Calibration service:* __ Basic X Standard
*Address:* **6430 Dobbin Road, Suite C**
**Columbia, MD 21045**

**Tested in accordance with the following procedures and standards:**
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

**Instrumentation used for calibration:** Nor-1504 Norsonic Test System:

| Instrument - Manufacturer | Description | S/N | Cal. Date | Traceability evidence Cal. Lab / Accreditation | Cal. Due |
|---|---|---|---|---|---|
| 483B-Norsonic | SME Cal Unit | 31061 | Jul 30, 2018 | Scantek, Inc./ NVLAP | Jul 30, 2019 |
| DS-360-SRS | Function Generator | 61646 | Sep 7, 2018 | ACR Env./ A2LA | Sep 7, 2020 |
| 34401A-Agilent Technologies | Digital Voltmeter | MY47022043 | Sep 17, 2018 | ACR Env./ A2LA | Sep 17, 2019 |
| HM30-Thommen | Meteo Station | 1040170/39633 | Nov 13, 2018 | ACR Env./ A2LA | Nov 13, 2019 |
| PC Program 1019 Norsonic | Calibration software | v.6.1T | Validated Nov 2014 | Scantek, Inc. | - |
| 1251-Norsonic | Calibrator | 30878 | Nov 11, 2018 | Scantek, Inc./ NVLAP | Nov 11, 2019 |

**Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).**

**Environmental conditions:**

| Temperature (°C) | Barometric pressure (kPa) | Relative Humidity (%) |
|---|---|---|
| 23.3 | 100.00 | 40.0 |

| **Calibrated by:** | Jeremy Gotwalt | **Authorized signatory:** | Steven E. Marshall |
|---|---|---|---|
| Signature | | Signature | |
| Date | 11/20/18 | Date | 11/20/2018 |


Document stored Z:\Calibration Lab\SLM 2018\RIONL52_00410018_M1.doc

# Appendix B

# HOURLY EQUIVALENT TRAFFIC NOISE LEVEL TABLES

Table B-1: Noise Sensitive Receptors and Hourly Equivalent Noise Levels — A-0009C

Existing, No-Build, Build Alternative R1E Intersections — Graham County

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-001 | Res | B | 1 | 271 Old Tallulah Rd | 52 | 52 | 52 | 0 |
| R-002 | Res | B | 1 | 240 Old Tallulah Rd | 52 | 52 | 52 | 0 |
| R-003 | Res | B | 1 | 173 State Shed Rd | 52 | 52 | 52 | 0 |
| R-004 | Res | B | 1 | 153 State Shed Rd | 52 | 52 | 52 | 0 |
| R-005 | Res | B | 1 | 77 Tallulah Rd | 63 | 64 | 63 | 0 |
| R-006 | Res | B | 1 | 112 State Shed Rd | 52 | 52 | 53 | 1 |
| R-007 | Res | B | 1 | 85 Tallulah Rd | 62 | 63 | 63 | 1 |
| R-008 | Res | B | 1 | 238 Tallulah Rd | 61 | 62 | 62 | 1 |
| R-009 | Apt | B | 1 | 246 Tallulah Rd | 53 | 54 | 54 | 1 |
| R-010 | Apt | B | 1 | 242 Tallulah Rd | 56 | 57 | 57 | 1 |
| R-011 | Res | B | 1 | 228 Tallulah Rd | 59 | 60 | 60 | 1 |
| R-012 | Res | B | 1 | 88 Tallulah Rd | 59 | 60 | 59 | 0 |
| R-013 | Res | B | 1 | 31 Five Point Rd-1 | 60 | 61 | 63 | 3 |
| R-014 | Res | B | 1 | 31 Five Point Rd-2 | 53 | 55 | 54 | 1 |
| R-015 | Res | B | 1 | 77 Five Point Rd | 55 | 56 | 55 | 0 |
| R-016 | Res | B | 1 | 79 Five Point Rd | 55 | 57 | 56 | 1 |
| R-017 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-018 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-019 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-020 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-021 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-022 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-023 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-024 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-025 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-026 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-027 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-028 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-029 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-030 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-031 | Res | B | 1 | 201 Five Point Rd | 59 | 60 | R/W | N/A |
| R-032 | Funeral Home | D[1] | 1 | 160 Five Point Rd | 52 | 52 | 53 | 1 |
| R-033 | Res | B | 1 | 349 Five Point Rd | 52 | 52 | 53 | 1 |
| R-034 | Place of Worship | D | 1 | 300 Five Point Rd | 52 | 52 | R/W | N/A |
| R-035 | Res | B | 1 | 326 Five Point Rd | 52 | 52 | 56 | 4 |
| R-036 | Res | B | 1 | 328 Five Point Rd | 52 | 52 | 53 | 1 |
| R-063 | Res | B | 1 | 150 Church St | 58 | 59 | R/W | N/A |
| R-064 | Res | B | 1 | 101 Church St | 54 | 55 | 55 | 1 |
| R-065 | Res | B | 1 | 324 Ford St | 64 | 66 | 65 | 1 |
| R-066 | Res | B | 1 | 302 Ford St | 59 | 60 | 60 | 1 |
| R-067 | Res | B | 1 | 290 Ford St | 55 | 57 | 57 | 2 |
| R-068 | Res | B | 1 | 253 Rodney Orr Bypass | 52 | 52 | 52 | 0 |
| R-069 | Res | B | 1 | 253 Rodney Orr Bypass | 52 | 52 | 52 | 0 |
| R-070 | Place of Worship | C/D | 1 | 253 Rodney Orr Bypass | 52 | 52 | 52 | 0 |
| R-071 | Res | B | 1 | 68 Jordan St | 54 | 55 | 55 | 1 |
| R-072 | Res | B | 1 | 88 Jordan St | 52 | 53 | 54 | 2 |
| R-073 | Res | B | 1 | 251 Sweetwater Rd | 56 | 56 | 55 | -1 |
| R-074 | Res | B | 1 | 215 Sweetwater Rd | 52 | 52 | 52 | 0 |

**Table B-1: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009C**

**Existing, No-Build, Build Alternative R1E Intersections** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-075 | Res | B | 1 | 215 Sweetwater Rd | 52 | 52 | 52 | 0 |
| | | | | Predicted "Build (Design Year 2045)" Traffic Noise Impacts: | | | **0** | **0** |

1. Predicted traffic noise level impact due to approaching or exceeding FHWA Noise Abatement Criteria (NAC) (see Table 3).
2. Predicted "substantial increase" traffic noise level impact (10 dB or more).
3. Exterior noise levels are already too low. Threfore, building reduction factors were not applied.

Note 1: Receptor showing a decrease in noise levels is due to the relocation of existing road.

Note 2: Established by non-traffic dominant 52 dB(A) ambient hourly equivalent noise level obtained at long-term monitoring location LT-2.

**Impact=** **ROW=**

**Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009C**

**Existing, No-Build, Build Alternative R1E Roundabouts** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-001 | Res | B | 1 | 271 Old Tallulah Rd | 52 | 52 | 52 | 0 |
| R-002 | Res | B | 1 | 240 Old Tallulah Rd | 52 | 52 | 52 | 0 |
| R-003 | Res | B | 1 | 173 State Shed Rd | 52 | 52 | 52 | 0 |
| R-004 | Res | B | 1 | 153 State Shed Rd | 52 | 52 | 52 | 0 |
| R-005 | Res | B | 1 | 77 Tallulah Rd | 63 | 64 | 63 | 0 |
| R-006 | Res | B | 1 | 112 State Shed Rd | 52 | 52 | 53 | 1 |
| R-007 | Res | B | 1 | 85 Tallulah Rd | 62 | 63 | 62 | 0 |
| R-008 | Res | B | 1 | 238 Tallulah Rd | 61 | 62 | 62 | 1 |
| R-009 | Apt | B | 1 | 246 Tallulah Rd | 53 | 54 | 54 | 1 |
| R-010 | Apt | B | 1 | 242 Tallulah Rd | 56 | 57 | 52 | -4 |
| R-011 | Res | B | 1 | 228 Tallulah Rd | 59 | 60 | 60 | 1 |
| R-012 | Res | B | 1 | 88 Tallulah Rd | 59 | 60 | 58 | -1 |
| R-013 | Res | B | 1 | 31 Five Point Rd-1 | 60 | 61 | 63 | 3 |
| R-014 | Res | B | 1 | 31 Five Point Rd-2 | 53 | 55 | 55 | 2 |
| R-015 | Res | B | 1 | 77 Five Point Rd | 55 | 56 | 56 | 1 |
| R-016 | Res | B | 1 | 79 Five Point Rd | 55 | 57 | 56 | 1 |
| R-017 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-018 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-019 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-020 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-021 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-022 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-023 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-024 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-025 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-026 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-027 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-028 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-029 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-030 | Res | B | 1 | 163 Five Point Rd | 52 | 52 | 52 | 0 |
| R-031 | Res | B | 1 | 201 Five Point Rd | 59 | 60 | R/W | N/A |
| R-032 | Funeral Home | D[3] | | 160 Five Point Rd | 52 | 52 | 53 | 1 |
| R-033 | Res | B | 1 | 349 Five Point Rd | 52 | 52 | 53 | 1 |
| R-034 | Place of Worship | D | 1 | 300 Five Point Rd | 52 | 52 | R/W | N/A |
| R-035 | Res | B | 1 | 326 Five Point Rd | 52 | 52 | 56 | 4 |
| R-036 | Res | B | 1 | 328 Five Point Rd | 52 | 52 | 54 | 2 |
| R-063 | Res | B | 1 | 150 Church St | 58 | 59 | R/W | N/A |
| R-064 | Res | B | 1 | 101 Church St | 54 | 55 | 55 | 1 |
| R-065 | Res | B | 1 | 324 Ford St | 64 | 66 | 65 | 1 |
| R-066 | Res | B | 1 | 302 Ford St | 59 | 60 | 60 | 1 |
| R-067 | Res | B | 1 | 290 Ford St | 55 | 57 | 57 | 2 |
| R-068 | Res | B | 1 | 253 Rodney Orr Bypass | 52 | 52 | 52 | 0 |
| R-069 | Res | B | 1 | 253 Rodney Orr Bypass | 52 | 52 | 52 | 0 |
| R-070 | Place of Worship | C/D | 1 | 253 Rodney Orr Bypass | 52 | 52 | 52 | 0 |
| R-071 | Res | B | 1 | 68 Jordan St | 54 | 55 | 54 | 0 |
| R-072 | Res | B | 1 | 88 Jordan St | 52 | 53 | 53 | 1 |
| R-073 | Res | B | 1 | 251 Sweetwater Rd | 56 | 56 | 56 | 0 |
| R-074 | Res | B | 1 | 215 Sweetwater Rd | 52 | 52 | 52 | 0 |

**Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009C**

**Existing, No-Build, Build Alternative R1E Roundabouts** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-075 | Res | B | 1 | 215 Sweetwater Rd | 52 | 52 | 52 | 0 |
| | | | | Predicted "Build (Design Year 2045)" Traffic Noise Impacts: | | | **0** | **0** |

1. Predicted traffic noise level impact due to approaching or exceeding FHWA Noise Abatement Criteria (NAC) (see Table 3).
2. Predicted "substantial increase" traffic noise level impact (10 dB or more).
3. Exterior noise levels are already too low. Threfore, building reduction factors were not applied.

Note 1: Receptor showing a decrease in noise levels is due to the relocation of existing road.

Note 2: Established by non-traffic dominant 52 dB(A) ambient hourly equivalent noise level obtained at long-term monitoring

**Impact=** **ROW=**

**Table B-3: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative 3R** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-035 | Res | B | 1 | 326 Five Point Rd | 52 | 52 | 52 | 0 |
| R-036 | Res | B | 1 | 328 Five Point Rd | 52 | 52 | 52 | 0 |
| R-037 | Res | B | 1 | 236 E Fort Hill Rd | 52 | 52 | 52 | 0 |
| R-038 | Res | B | 1 | 68 Old Sweetwater Rd | 66 | 67 | R/W | N/A |
| R-039 | Res | B | 1 | 90 Paul Millsaps Dr | 58 | 60 | 60 | 2 |
| R-040 | Res | B | 1 | 39 Paul Millsaps Dr | 52 | 53 | 53 | 1 |
| R-041 | Res | B | 1 | 66 Old Sweetwater Rd | 64 | 65 | 65 | 1 |
| R-042 | Res | B | 1 | 62 Paul Millsaps Dr | 54 | 55 | 55 | 1 |
| R-043 | Res | B | 1 | 20 Paul Millsaps Dr | 52 | 52 | 52 | 0 |
| R-044 | Res | B | 1 | 107 Old Sweetwater Rd | 52 | 52 | 53 | 1 |
| R-045 | Res | B | 1 | 26 E Fort Hill Rd | 52 | 52 | 52 | 0 |
| R-046 | Res | B | 1 | 201 Old Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-047 | Res | B | 1 | 92 Tommy Queen Rd | 52 | 52 | 52 | 0 |
| R-048 | Res | B | 1 | 87 Tommy Queen Rd | 52 | 54 | 54 | 2 |
| R-049 | Res | B | 1 | 115 Tommy Queen Rd | 52 | 52 | 52 | 0 |
| R-050 | Res | B | 1 | 145 Tommy Queen Rd | 52 | 54 | 55 | 3 |
| R-051 | Res | B | 1 | 940 Sweetwater Rd | 54 | 55 | 56 | 2 |
| R-052 | Res | B | 1 | 39 Paul Millsaps Dr | 52 | 53 | 56 | 4 |
| R-053 | Res | B | 1 | 28 George Millsaps Rd | 52 | 52 | 53 | 1 |
| R-054 | Place of Worship | C/D | 1 | 30 George Millsaps Rd | 56 | 57 | 59 | 3 |
| R-055 | Res | B | 1 | 112 George Millsaps Rd | 52 | 52 | 52 | 0 |
| R-056 | Res | B | 1 | 105 George Millsaps Rd | 54 | 55 | 53 | -1 |
| R-057 | Res | B | 1 | 149 George Millsaps Rd | 52 | 52 | 52 | 0 |
| R-058 | Res | B | 1 | 8 T J Wilson Rd | 53 | 54 | R/W | N/A |
| R-059 | Res | B | 1 | 8 T J Wilson Rd | 53 | 55 | R/W | N/A |
| R-060 | Res | B | 1 | 92 T J Wilson Rd | 52 | 53 | 52 | 0 |
| R-061 | Res | B | 1 | 1696 Sweetwater Rd | 57 | 58 | 59 | 2 |
| R-062 | Res | B | 1 | 164 T J Wilson Rd | 52 | 52 | 52 | 0 |
| R-073 | Res | B | 1 | 251 Sweetwater Rd | 56 | 56 | 56 | 0 |
| R-074 | School Baseball field | C | 1 | 215 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-075 | School Baseball field | C | 1 | 215 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-076 | Res | B | 1 | 67 Mountain Creek Rd | 52 | 52 | 53 | 1 |
| R-077 | Res | B | 1 | 62 Mills Williams Rd | 56 | 58 | 57 | 1 |
| R-078 | Res | B | 1 | 154 Milt Williams Rd | 55 | 56 | 56 | 1 |
| R-079 | Res | B | 1 | 1151 Sweetwater Rd | 61 | 63 | 65 | 4 |
| R-080 | Res | B | 1 | 118 Tatham Rd | 52 | 52 | 52 | 0 |
| R-081 | Res | B | 1 | 72 Tatham Rd | 52 | 52 | 52 | 0 |
| R-082 | Res | B | 1 | 74 Tatham Rd | 52 | 52 | 52 | 0 |
| R-083 | Res | B | 1 | 78 Tatham Rd | 52 | 52 | 52 | 0 |
| R-084 | Res | B | 1 | 91 SlayBacon Rd | 52 | 52 | 52 | 0 |
| R-085 | Res | B | 1 | 1882 Old Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-086 | Res | B | 1 | 2232 Sweetwater Rd | 52 | 53 | 54 | 2 |
| R-087 | Res | B | 1 | 166 Queen Holw | 54 | 56 | 57 | 3 |
| R-088 | Res | B | 1 | 33 Queen Holw | 55 | 56 | 59 | 4 |
| R-089 | Res | B | 1 | 20 Denton Farm Rd | 58 | 59 | 62 | 4 |
| R-090 | Res | B | 1 | 48 Denton Farm Rd | 52 | 53 | 56 | 4 |
| R-091 | Res | B | 1 | 2888 Sweetwater Rd | 61 | 63 | 64 | 3 |
| R-092 | Res | B | 1 | 2954 Sweetwater Rd | 53 | 55 | 56 | 3 |

**Table B-3: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative 3R** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-093 | Res | B | 1 | 2988 Sweetwater Rd | 60 | 61 | 62 | 2 |
| R-094 | Res | B | 1 | 3132 Sweetwater Rd | 62 | 63 | R/W | N/A |
| R-095 | Res | B | 1 | 3254 Sweetwater Rd | 53 | 54 | 55 | 2 |
| R-096 | Res | B | 1 | 3256 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-097 | Res | B | 1 | 2305 Sweetwater Rd | 61 | 62 | 63 | 2 |
| R-098 | Res | B | 1 | 2565 Sweetwater Rd | 52 | 53 | 52 | 0 |
| R-099 | Res | B | 1 | 3217 Sweetwater Rd | 55 | 56 | 55 | 0 |
| R-100 | Res | B | 1 | 54 Pin Hook Rd | 53 | 55 | 55 | 2 |
| R-101 | Res | B | 1 | 3634 Sweetwater Rd | 52 | 54 | 55 | 3 |
| R-102 | Res | B | 1 | 66 Beech Creek Rd | 52 | 52 | 52 | 0 |
| R-103 | Res | B | 1 | 102 Beech Creek Rd | 52 | 52 | 52 | 0 |
| R-104 | Res | B | 1 | 96 Beech Creek Rd | 52 | 52 | 52 | 0 |
| R-105 | Res | B | 1 | 106 Earnest Phillips Rd | 52 | 52 | 52 | 0 |
| R-106 | Res | B | 1 | 3866 Sweetwater Rd | 56 | 57 | 58 | 2 |
| R-107 | Res | B | 1 | 253 Earnest Phillips Rd | 62 | 63 | 64 | 2 |
| R-108 | Res | B | 1 | 228 Earnest Phillips Rd | 53 | 54 | 55 | 2 |
| R-109 | Res | B | 1 | 284 Earnest Phillips Rd | 57 | 58 | 59 | 2 |
| R-110 | Res | B | 1 | 286 Earnest Phillips Rd | 52 | 52 | 52 | 0 |
| R-111 | Res | B | 1 | 4058 Sweetwater Rd | 63 | 64 | R/W | N/A |
| R-112 | Res | B | 1 | 4268 Sweetwater Rd | 60 | 61 | 63 | 3 |
| R-113 | Res | B | 1 | 4268 Sweetwater Rd | 61 | 62 | 63 | 2 |
| R-114 | Res | B | 1 | 4272 Sweetwater Rd | 54 | 55 | 56 | 2 |
| R-115 | Res | B | 1 | 4480 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-116 | Res | B | 1 | 4486 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-117 | Res | B | 1 | 4568 Sweetwater Rd | 62 | 64 | 64 | 2 |
| R-118 | Res | B | 1 | 4494 Sweetwater Rd | 52 | 52 | 53 | 1 |
| R-119 | Res | B | 1 | 4482 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-120 | Res | B | 1 | 46 SAMS HILL RD | 52 | 52 | 52 | 0 |
| R-121 | Res | B | 1 | 53 Sams Hill Rd | 55 | 57 | 58 | 3 |
| R-122 | Res | B | 1 | 106 Sams Hill Rd | 52 | 52 | 52 | 0 |
| R-123 | Res | B | 1 | 5058 Sweetwater Rd | 54 | 55 | 56 | 2 |
| R-124 | Res | B | 1 | 5060 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-125 | Res | B | 1 | 5070 Sweetwater Rd | 58 | 60 | 61 | 3 |
| R-126 | Res | B | 1 | 28 Nathan Garland Rd | 58 | 59 | 60 | 2 |
| R-127 | Res | B | 1 | 40 Shadys Ln | 52 | 53 | 54 | 2 |
| R-128 | Res | B | 1 | 110 Shadys Ln | 52 | 52 | 52 | 0 |
| R-129 | Res | B | 1 | 112 Shadys Ln | 52 | 52 | 52 | 0 |
| R-130 | Res | B | 1 | 26 Reunion Ln | 52 | 53 | 55 | 3 |
| R-131 | Res | B | 1 | 106 Nathan Garland Rd | 54 | 55 | 56 | 2 |
| R-132 | Res | B | 1 | 75 Reunion Ln | 52 | 52 | 54 | 2 |
| R-133 | Res | B | 1 | 176 Nathan Garland Rd | 53 | 55 | 55 | 2 |
| R-134 | Res | B | 1 | 121 Reunion Ln | 52 | 52 | 52 | 0 |
| R-135 | Res | B | 1 | 199 Shadys Ln | 52 | 52 | 52 | 0 |
| R-136 | Res | B | 1 | 218 Shadys Ln | 52 | 52 | 52 | 0 |
| R-137 | Res | B | 1 | 254 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-138 | Res | B | 1 | 252 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-139 | Res | B | 1 | 370 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-140 | Res | B | 1 | 366 Nathan Garland Rd | 52 | 52 | 52 | 0 |

**Table B-3: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative 3R** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-141 | Res | B | 1 | 380 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-142 | Res | B | 1 | 378 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-143 | Res | B | 1 | 376 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-144 | Res | B | 1 | 5834 Sweetwater Rd | 54 | 55 | 57 | 3 |
| R-145 | Res | B | 1 | 5840 Sweetwater Rd | 63 | 65 | R/W | N/A |
| R-146 | Res | B | 1 | 6084 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-147 | Res | B | 1 | 6080 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-148 | Res | B | 1 | 6104 Sweetwater Rd | 55 | 56 | 55 | 0 |
| R-149 | Res | B | 1 | Unknown | 66 | 67 | R/W | N/A |
| R-150 | Res | B | 1 | 6208 Sweetwater Rd | 64 | 65 | R/W | N/A |
| R-151 | Res | B | 1 | 3763 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-152 | Res | B | 1 | 3839 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-153 | Res | B | 1 | 4031 Sweetwater Rd | 66 | 67 | R/W | N/A |
| R-154 | Res | B | 1 | 4343 Sweetwater Rd | 52 | 53 | 54 | 2 |
| R-155 | Res | B | 1 | 4361 Sweetwater Rd | 54 | 55 | 56 | 2 |
| R-156 | Res | B | 1 | 4405 Sweetwater Rd | 53 | 54 | 55 | 2 |
| R-157 | Res | B | 1 | 4711 Sweetwater Rd | 59 | 60 | 61 | 2 |
| R-158 | Res | B | 1 | 4709 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-159 | Res | B | 1 | 46 Sams Hill Rd | 61 | 62 | 63 | 2 |
| R-160 | Res | B | 1 | 4995 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-161 | Res | B | 1 | 5127 Sweetwater Rd | 59 | 60 | 61 | 2 |
| R-162 | Res | B | 1 | 4993 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-163 | Res | B | 1 | 23 Orr Branch Rd | 52 | 52 | 52 | 0 |
| R-164 | Res | B | 1 | 21 Orr Branch Rd | 52 | 52 | 52 | 0 |
| R-165 | Res | B | 1 | 157 Orr Branch Rd | 52 | 52 | 52 | 0 |
| R-166 | Res | B | 1 | 5365 Sweetwater Rd | 61 | 62 | 63 | 2 |
| R-167 | Res | B | 1 | 5541 Sweetwater Rd | 56 | 57 | 58 | 2 |
| R-168 | Res | B | 1 | 5565 Sweetwater Rd | 61 | 62 | 63 | 2 |
| R-169 | Res | B | 1 | 5785 Sweetwater Rd | 55 | 56 | 57 | 2 |
| R-170 | Res | B | 1 | 167 Green Gap Rd | 52 | 52 | 52 | 0 |
| R-171 | Res | B | 1 | 6117 Sweetwater Rd | 54 | 55 | 56 | 2 |
| R-172 | Res | B | 1 | 6173 Sweetwater Rd | 58 | 59 | 59 | 1 |
| R-173 | Res | B | 1 | 6207 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-174 | Res | B | 1 | 64 Bill Rose Rd | 60 | 61 | 62 | 2 |
| R-175 | Res | B | 1 | 73 Bill Rose Rd | 52 | 52 | 53 | 1 |
| R-176 | Res | B | 1 | 72 Bill Rose Rd | 52 | 52 | 52 | 0 |
| R-177 | Trail | C | 1 | 6375 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-178 | Trail | C | 1 | 7130 Sweetwater Rd | 58 | 59 | 61 | 3 |
| R-179 | Place of Worship | C/D | 1 | 7130 Sweetwater Rd | 56 | 57 | 59 | 3 |
| R-180 | Res | B | 1 | 7782 Sweetwater Rd | 57 | 58 | 58 | 1 |
| R-181 | Res | B | 1 | 170 knoll Top | 52 | 52 | 52 | 0 |
| R-182 | Res | B | 1 | 81 knoll Top | 52 | 52 | 52 | 0 |
| R-183 | Res | B | 1 | 42 Fontana Rd | 58 | 60 | 62 | 4 |
| R-184 | Res | B | 1 | 311 Hwy 28 | 52 | 52 | 52 | 0 |
| R-185 | Res | B | 1 | 307 Hwy 28 | 57 | 58 | R/W | N/A |
| R-186 | Res | B | 1 | 345 Hwy 28 | 60 | 61 | 62 | 2 |
| R-187 | Res | B | 1 | 120 Martin Jenkins Rd | 55 | 56 | 56 | 1 |
| R-188 | Res | B | 1 | 101 Martin Jenkins Rd | 52 | 52 | 52 | 0 |

**Table B-3: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative 3R** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-189 | Res | B | 1 | 42 Martin Jenkins Rd | 52 | 52 | 53 | 1 |
| R-190 | Res | B | 1 | 461 Stecoah Rd | 52 | 52 | 52 | 0 |
| R-191 | Res | B | 1 | 559 Stecoah Rd | 55 | 57 | 58 | 3 |
| R-192 | Res | B | 1 | 621 Stecoah Rd | 63 | 64 | 65 | 2 |
| R-193 | Res | B | 1 | 20 Hyde Town Rd | 53 | 54 | 56 | 3 |
| R-194 | Res | B | 1 | 54 Hyde Town Rd | 52 | 52 | 52 | 0 |
| R-195 | Res | B | 1 | 49 Hyde Town Rd | 55 | 57 | 57 | 2 |
| R-196 | Place of Worship | C/D | 1 | 89 Hyde Town Rd | 57 | 58 | 58 | 1 |
| R-197 | Res | B | 1 | 105 Hyde Town Rd | 52 | 52 | 52 | 0 |
| R-198 | Res | B | 1 | 1566 Hwy 28 | 61 | 62 | 62 | 1 |
| R-199 | Res | B | 1 | 1584 Hwy 28 | 61 | 63 | 62 | 1 |
| R-200 | Res | B | 1 | 121 Hyde Town Rd | 52 | 52 | 52 | 0 |
| R-201 | Res | B | 1 | 634 Hyde Town Rd | 52 | 52 | 52 | 0 |
| R-202 | Res | B | 1 | 750 Hyde Town Rd | 52 | 54 | 55 | 3 |
| R-203 | Res | B | 1 | 22 Red Barn Hollow | 52 | 52 | 52 | 0 |
| R-204 | Res | B | 1 | 171 Red Barn Hollow | 52 | 52 | 52 | 0 |
| R-205 | Res | B | 1 | 172 Carver Branch Ln | 52 | 52 | 52 | 0 |
| R-206 | Res | B | 1 | 386 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-207 | Res | B | 1 | 326 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-208 | Res | B | 1 | 258 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-209 | Res | B | 1 | 34 Carver Branch Ln | 52 | 52 | 52 | 0 |
| R-210 | Res | B | 1 | 146 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-211 | Res | B | 1 | 693 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-212 | Res | B | 1 | 861 HWY 28 | 62 | 63 | 62 | 0 |
| R-213 | Res | B | 1 | 139 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-214 | Res | B | 1 | 202 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-215 | Res | B | 1 | 271 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-216 | Res | B | 1 | 245 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-217 | Res | B | 1 | 27 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-218 | Res | B | 1 | 84 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-219 | Res | B | 1 | 887 Hwy 28 | 56 | 58 | 60 | 4 |
| R-220 | Res | B | 1 | 180 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-221 | Res | B | 1 | 246 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-222 | Res | B | 1 | 28 E Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-223 | Res | B | 1 | 351 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-224 | Res | B | 1 | 411 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-225 | Res | B | 1 | 488 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-226 | Res | B | 1 | 484 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-227 | Res | B | 1 | 71 E Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-228 | Res | B | 1 | 301 E Stecoah Hts | 52 | 52 | 52 | 0 |
| R-229 | Res | B | 1 | 1233 Hwy 28 | 58 | 60 | 60 | 2 |
| R-230 | Res | B | 1 | 1031 Hwy 28 | 52 | 52 | 52 | 0 |
| R-231 | Res | B | 1 | 365 Bill Crisp Rd | 52 | 52 | 52 | 0 |
| R-232 | Res | B | 1 | 235 Bill Crisp Rd | 52 | 52 | 52 | 0 |
| R-233 | Res | B | 1 | 29 Patriot Rd | 52 | 52 | 52 | 0 |
| R-234 | Res | B | 1 | 246 Bill Crisp Rd | 52 | 52 | 52 | 0 |
| R-235 | Res | B | 1 | 20 Patriot Rd | 52 | 52 | 52 | 0 |
| R-236 | Res | B | 1 | 105 Patriot Rd | 52 | 52 | 52 | 0 |

**Table B-3: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative 3R** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-237 | Res | B | 1 | 152 Patriot Rd | 52 | 52 | 52 | 0 |
| R-238 | Res | B | 1 | 1677 Hwy 28 | 52 | 52 | 52 | 0 |
| R-239 | Res | B | 1 | 1635 Hwy 28 | 59 | 61 | 61 | 2 |
| R-240 | Res | B | 1 | 1635 Hwy 28 (A) | 54 | 56 | 56 | 2 |
| R-241 | Res | B | 1 | 1679 Hwy 28 | 52 | 52 | 52 | 0 |
| R-242 | Res | B | 1 | 1689 Hwy 28 | 54 | 56 | 56 | 2 |
| R-243 | Res | B | 1 | 1693 Hwy 28 | 53 | 54 | 55 | 2 |
| R-244 | Res | B | 1 | 81 Lower Stecoah Rd | 56 | 58 | 58 | 2 |
| R-245 | Res | B | 1 | 62 Lower Stecoah Rd | 52 | 54 | 54 | 2 |
| R-246 | Res | B | 1 | 1971 Hwy 28 | 58 | 60 | 59 | 1 |
| R-247 | Commercial | E | 1 | 2097 Hwy 28 | 56 | 58 | 57 | 1 |
| R-248 | Res | B | 1 | 2285 Hwy 28 | 54 | 55 | R/W | N/A |
| R-249 | Res | B | 1 | 35 Gunter Gap Rd | 52 | 53 | 52 | 0 |
| Predicted “Build (Design Year 2045)" Traffic Noise Impacts: | | | | | | | **0** | **0** |

1. Predicted traffic noise level impact due to approaching or exceeding FHWA Noise Abatement Criteria (NAC) (see Table 3).
2. Predicted "substantial increase" traffic noise level impact (10 dB or more).

Note 1: Receptor showing a decrease in noise levels is due to the relocation of existing road.

Note 2: Established by non-traffic dominant 52 dB(A) ambient hourly equivalent noise level obtained at long-term monitoring location LT-2.

**Impact=** **ROW=**

**Table B-4: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative S2** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-140 | Res | B | 1 | 366 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-142 | Res | B | 1 | 378 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-143 | Res | B | 1 | 376 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-144 | Res | B | 1 | 5834 Sweetwater Rd | 54 | 55 | 55 | 1 |
| R-145 | Res | B | 1 | 5840 Sweetwater Rd | 63 | 52 | 52 | -11 |
| R-146 | Res | B | 1 | 6084 Sweetwater Rd | 52 | 54 | 54 | 2 |
| R-147 | Res | B | 1 | 6080 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-148 | Res | B | 1 | 6104 Sweetwater Rd | 55 | 52 | 52 | -3 |
| R-149 | Res | B | 1 | | 66 | 52 | 52 | -14 |
| R-150 | Res | B | 1 | 6208 Sweetwater Rd | 64 | 52 | 52 | -12 |
| R-167 | Apt | B | 1 | 5541 Sweetwater Rd | 56 | 54 | 54 | -2 |
| R-168 | Apt | B | 1 | 5565 Sweetwater Rd | 61 | 53 | 53 | -8 |
| R-169 | Res | B | 1 | 5785 Sweetwater Rd | 55 | 52 | 52 | -3 |
| R-170 | Res | B | 1 | 167 Green Gap Rd | 52 | 52 | 52 | 0 |
| R-171 | Res | B | 1 | 6117 Sweetwater Rd | 54 | 52 | 52 | -2 |
| R-172 | Res | B | 1 | 6173 Sweetwater Rd | 58 | 52 | 52 | -6 |
| R-173 | Res | B | 1 | 6207 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-174 | Res | B | 1 | 64 Bill Rose Rd | 60 | 52 | 52 | -8 |
| R-175 | Res | B | 1 | 73 Bill Rose Rd | 52 | 52 | 52 | 0 |
| R-176 | Res | B | 1 | 72 Bill Rose Rd | 52 | 52 | 52 | 0 |
| R-177 | Res | B | 1 | 6375 Sweetwater Rd | 52 | 52 | R/W | N/A |
| R-184 | Res | B | 1 | 311 Hwy 28 | 52 | 53 | 53 | 1 |
| R-185 | Trail | C | 1 | 307 Hwy 28 | 57 | 52 | 52 | -5 |
| R-201 | Res | B | 1 | 634 Hyde Town Rd | 52 | 52 | 52 | 0 |
| R-202 | Res | B | 1 | 750 Hyde Town Rd | 52 | 56 | 56 | 4 |
| R-206 | Res | B | 1 | 386 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-207 | Res | B | 1 | 326 W Stecoah Hts Rd | 52 | 55 | R/W | N/A |
| R-208 | Res | B | 1 | 258 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-210 | Res | B | 1 | 146 W Stecoah Hts Rd | 52 | 57 | R/W | N/A |
| R-211 | Res | B | 1 | 693 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-214 | Res | B | 1 | 202 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-215 | Res | B | 1 | 271 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-216 | Res | B | 1 | 245 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-217 | Res | B | 1 | 27 W Stecoah Hts Rd | 52 | 54 | 54 | 2 |
| R-218 | Res | B | 1 | 84 W Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-219 | Res | B | 1 | 887 Hwy 28 | 56 | 52 | 52 | -4 |
| R-220 | Res | B | 1 | 180 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-221 | Res | B | 1 | 246 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-222 | Res | B | 1 | 28 E Stecoah Hts Rd | 52 | 57 | 57 | 5 |
| R-223 | Res | B | 1 | 351 Stecoah Hts Rd | 52 | 53 | 53 | 1 |
| R-224 | Res | B | 1 | 411 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-225 | Res | B | 1 | 488 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-226 | Res | B | 1 | 484 Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-227 | Res | B | 1 | 71 E Stecoah Hts Rd | 52 | 52 | 52 | 0 |
| R-228 | Res | B | 1 | 301 E Stecoah Hts | 52 | 52 | 52 | 0 |
| R-230 | Res | B | 1 | 1031 Hwy 28 | 52 | 53 | 53 | 1 |
| R-231 | Res | B | 1 | 365 Bill Crisp Rd | 52 | 52 | 52 | 0 |
| R-232 | Res | B | 1 | 235 Bill Crisp Rd | 52 | 52 | R/W | N/A |

**Table B-4: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative S2** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-233 | Res | B | 1 | 29 Patriot Rd | 52 | 53 | 53 | 1 |
| R-234 | Res | B | 1 | 246 Bill Crisp Rd | 52 | 52 | 52 | 0 |
| R-235 | Res | B | 1 | 20 Patriot Rd | 52 | 55 | R/W | N/A |
| R-236 | Res | B | 1 | 105 Patriot Rd | 52 | 52 | 52 | 0 |
| R-237 | Res | B | 1 | 152 Patriot Rd | 52 | 62 | R/W | N/A |
| R-238 | Res | B | 1 | 1677 Hwy 28 | 52 | 52 | 52 | 0 |
| R-239 | Res | B | 1 | 1635 Hwy 28 | 59 | 52 | 52 | -7 |
| R-240 | Res | B | 1 | 1635 Hwy 28 (A) | 54 | 52 | 52 | -2 |
| R-241 | Res | B | 1 | 1679 Hwy 28 | 52 | 52 | 52 | 0 |
| R-242 | Res | B | 1 | 1689 Hwy 28 | 54 | 52 | 52 | -2 |
| R-243 | Res | B | 1 | 1693 Hwy 28 | 53 | 52 | 52 | -1 |
| R-244 | Res | B | 1 | 81 Lower Stecoah Rd | 56 | 52 | 52 | -4 |
| R-245 | Res | B | 1 | 62 Lower Stecoah Rd | 52 | 53 | 53 | 1 |
| R-246 | Res | B | 1 | 1971 Hwy 28 | 58 | 59 | 59 | 1 |
| R-247 | Res | B | 1 | 2097 Hwy 28 | 56 | 57 | 57 | 1 |
| | | | | Predicted “Build (Design Year 2045)" Traffic Noise Impacts: | | | **0** | **0** |

1. Predicted traffic noise level impact due to approaching or exceeding FHWA Noise Abatement Criteria (NAC) (see Table 3).
2. Predicted "substantial increase" traffic noise level impact (10 dB or more).

Note 1: Receptors showing a decrease in noise levels is due to the relocation of existing road and the proposed tunnel section.

Note 2: Established by non-traffic dominant 52 dB(A) ambient hourly equivalent noise level obtained at long-term monitoring location LT-2.

**Impact=** **ROW=**

**Table B-5: Noise Sensitive Receptors and Hourly Equivalent Noise Levels** **A-0009**

**Existing, No-Build, Build Alternative SW1A** **Graham County**

| ID# | Use | NAC | E.R.s | Address/Receptor ID | Predicted Noise Levels, Leq(h) (dB(A)) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | No-Build | Build[1] | Increase[2] |
| R-140 | Res | B | 1 | 366 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-142 | Res | B | 1 | 378 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-143 | Res | B | 1 | 376 Nathan Garland Rd | 52 | 52 | 52 | 0 |
| R-144 | Res | B | 1 | 5834 Sweetwater Rd | 54 | 55 | 55 | 1 |
| R-145 | Res | B | 1 | 5840 Sweetwater Rd | 63 | 65 | 52 | -11 |
| R-146 | Res | B | 1 | 6084 Sweetwater Rd | 52 | 52 | 54 | 2 |
| R-147 | Res | B | 1 | 6080 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-148 | Res | B | 1 | 6104 Sweetwater Rd | 55 | 56 | 52 | -3 |
| R-149 | Apt | B | 1 | | 66 | 67 | 52 | -14 |
| R-150 | Apt | B | 1 | 6208 Sweetwater Rd | 64 | 65 | 52 | -12 |
| R-167 | Res | B | 1 | 5541 Sweetwater Rd | 56 | 57 | 54 | -2 |
| R-168 | Res | B | 1 | 5565 Sweetwater Rd | 61 | 62 | 53 | -8 |
| R-169 | Res | B | 1 | 5785 Sweetwater Rd | 55 | 56 | 52 | -3 |
| R-170 | Res | B | 1 | 167 Green Gap Rd | 52 | 52 | 52 | 0 |
| R-171 | Res | B | 1 | 6117 Sweetwater Rd | 54 | 55 | 52 | -2 |
| R-172 | Res | B | 1 | 6173 Sweetwater Rd | 58 | 59 | 52 | -6 |
| R-173 | Res | B | 1 | 6207 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-174 | Res | B | 1 | 64 Bill Rose Rd | 60 | 61 | 52 | -8 |
| R-175 | Res | B | 1 | 73 Bill Rose Rd | 52 | 52 | 52 | 0 |
| R-176 | Res | B | 1 | 72 Bill Rose Rd | 52 | 52 | 52 | 0 |
| R-177 | Trail | C | 1 | 6375 Sweetwater Rd | 52 | 52 | 52 | 0 |
| R-183 | Res | B | 1 | 42 Fontana Rd | 58 | 60 | 61 | 3 |
| | | | | Predicted “Build (Design Year 2045)" Traffic Noise Impacts: | | | **0** | **0** |

1. Predicted traffic noise level impact due to approaching or exceeding FHWA Noise Abatement Criteria (NAC) (see Table 3).
2. Predicted "substantial increase" traffic noise level impact (10 dB or more).

Note 1: Receptors showing a decrease in noise levels is due to the relocation of existing road and the proposed tunnel section.

Note 2: Established by non-traffic dominant 52 dB(A) ambient hourly equivalent noise level obtained at long-term monitoring location LT-2.

**Impact=** **ROW=**

# Appendix C

# TRAFFIC NOISE MODELS

**General**
This appendix documents the TNM Model Input used in this traffic noise analysis. The TNM Models utilized four TNM object types to approximate the New connector road from NC 28 to US 74-section of corridor K project Traffic Noise Report:

Roadways
Receptors
Terrain Lines
Ground Zones

Due to the large study area, the baseline TNM model was broken into six sub-models to reduce computer run-times. For each of the six sub-models, separate TNM model iterations were run for build conditions. A total of 21 TNM model iterations including Existing, No Build, and Build conditions and were utilized to complete the NC 28 to US 74-section of corridor K Traffic Noise Report.

**Coordinate System**
Each of the TNM Objects was modeled using the North American Datum 1983 (NAD83) horizontal coordinate system.

**Modeling Procedure**
Roadways:
TNM Roadway Element widths were selected based upon representation of one (1) or two (2) lanes of traffic per TNM roadway element. For the proposed highway facility, TNM Roadway vertices were selected to represent interval lengths that appropriately represent fluctuations in the horizontal and vertical roadway geometry. For highways in which more than one parallel TNM roadway element were modeled, the modeled roadway lane widths were set to ensure horizontal overlapping of adjacent modeled roadway elements. Overlapping TNM roadway elements is necessary to accurately represent the contiguous paved surface. TNM roadway elements of various widths were also modeled to represent the existing local roadways.

Terrain Lines (Elevation Contours):
Elevations (vertical, "Z" coordinates) were input into TNM by typing the English coordinate values of vertices that define significant changes in grades and/or slopes throughout the study areas.

Receivers (Receptors):
TNM Receiver Elements were modeled by assigning a point location to the most sensitive likely 'area of frequent human use' for each residence within the Project limits. All receivers in the TNM models were assigned a height of 4.92 feet. Given the non-homogeneous terrain and resulting inconsistent intervening source-to-receptor topography throughout the project vicinity, noise levels at each discrete receptor were determined by means of modeling an individual TNM receiver at all representative locations for 'worst noise condition with predicted traffic for Traffic Year 2045 Build condition.

round ones

TNM ground ones were used to define the type and acoustical characteristics of intervening ground, wherever the ground differed from the default ground type. Specifically, ground ones were used to differentiate ground types for roadway intersections and parking lots, where applicable.

**TNM Mo e Traffic Noise Le e Assessment**

The TNM model traffic noise level assessment is divided into four tasks

1. Creation of alidated TNM Computer Model(s)
2. Assessment of Existing Loudest- our Traffic Noise Levels
3. Assessment of No-Build Loudest- our Traffic Noise Levels
. Assessment of Build Loudest- our Traffic Noise Levels

**Va i ation**

Detailed computer models were created using the Federal ighway Administration Traffic Noise Model (F A TNM v.2.5). The F A accepted tolerance for TNM model validation is ±3.0 dB(A). The NCDOT goal for TNM model validation is ±3.0 dB(A).

Fourteen of the short-term measurement locations were validated within NCDOT tolerances. Only one measurement location that did not meet NCDOT's standards the ±3.0 dB(A) tolerance due to possibly a tree and signboards (refer to Table C-1).

**Ta e C-1 Corri or Impro ement ro ect TNM Va i ation Ta e**

| Receptor | Measured $L_{eq(h)}$ dB(A)[1] | TNM- redicted $L_{eq(h)}$ dB(A) [1] | Meas. - red. [1] |
|---|---|---|---|
| ST-1.1 (0 /2 /201 ) | 5 . | 2. | -3.5[2] |
| ST-1.2 (0 /2 /201 ) | 52.3 | 53. | -1. |
| ST-3.1 (30 min) (0 /2 /201 ) | 0. | 2. | -2.2 |
| ST-5.1 (0 /2 /201 ) | 55. | 5 .5 | 1. |
| ST-5.2 (0 /2 /201 ) | . | 51. | -2.0 |
| ST- .1 (0 /2 /201 ) | 5 .3 | 5 . | -1.1 |
| ST- .2 (0 /2 /201 ) | 50.8 | 51.1 | -0.3 |
| ST- .1 (0 /2 /201 ) | 5 .5 | 5 .1 | -1. |
| ST- .2 (0 /2 /201 ) | 52. | 53. | -1.2 |
| ST-11.1 (0 /2 /201 ) | 0. | 3.5 | -2. |
| ST-11.2 (0 /2 /201 ) | 52.0 | 53.0 | -1.0 |
| ST-12.1 (0 /23/201 ) | 58.1 | 1.0 | -2. |
| ST-12.2 (0 /23/201 ) | 51.2 | 51. | -0. |
| ST-13.1 (0 /23/201 ) | 3. | 3.2 | 0.2 |
| ST-13.2 (0 /23/201 ) | 58.1 | 5 . | 1.5 |

1. ourly equivalent noise levels, $L_{eq(h)}$, are expressed to the nearest one-tenth decibels to ensure that TNM-predicted noise levels validate to within ±3.0 dB(A) of measured noise levels without the benefits of rounding.
2. There is a tree and a few signboards. This can affect the measurement levels.

**Figure C-1:** US 129 and NC 143 sections of corridor K (STIP#: A-0009C) Existing/No-Build TNM

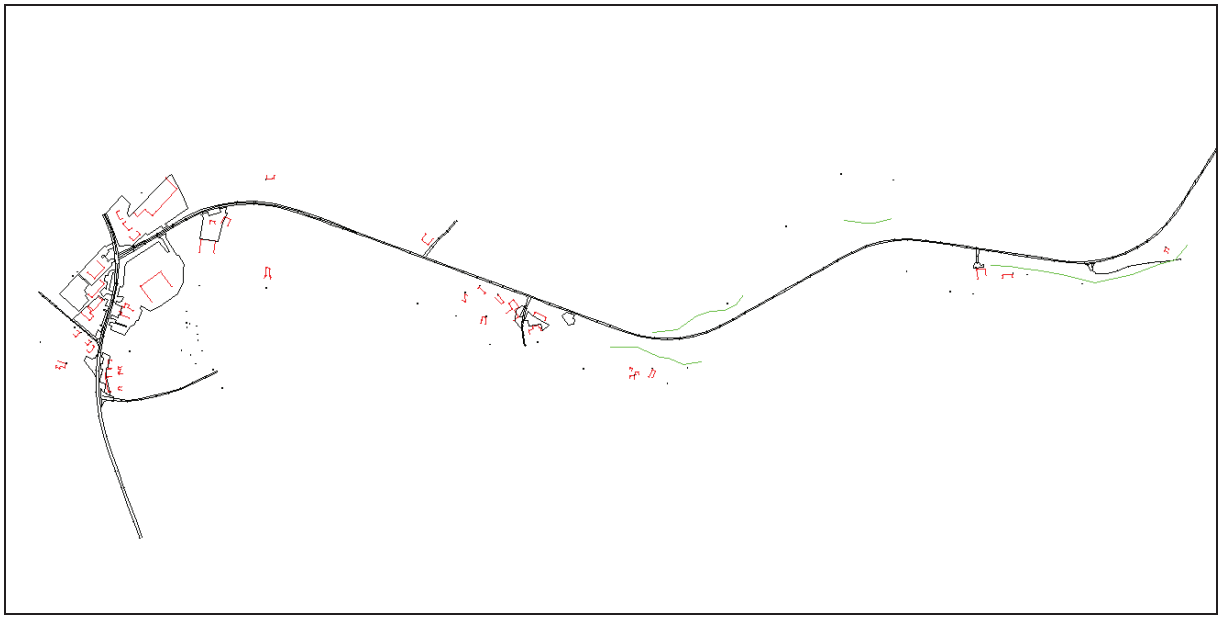


**Figure C-2:** NC 28 section of corridor K (STIP#: A-0009C) Existing/No-Build TNM

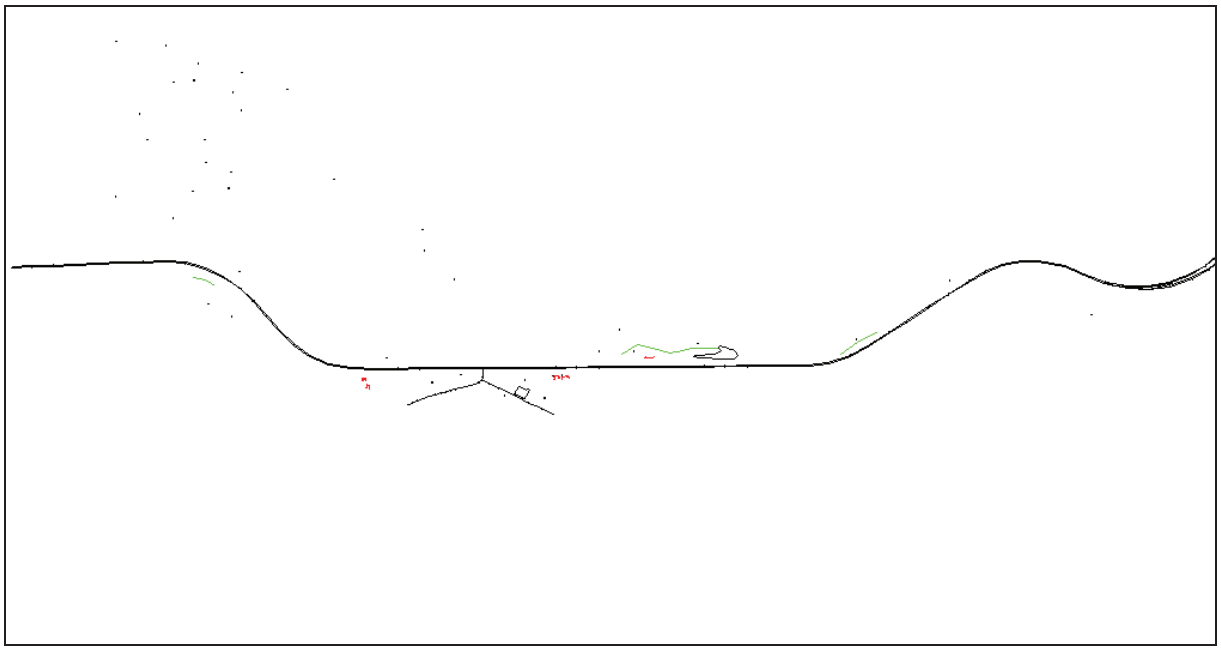


**Figure C-3:** US 129 and NC 143 section of corridor K project (STIP#: A-0009C) Build TNM (Alt R1E INT)

**Figure C-4:** US 129 and NC 143 section of corridor K project (STIP#: A-0009C) Build TNM (Alt R1E RDB)

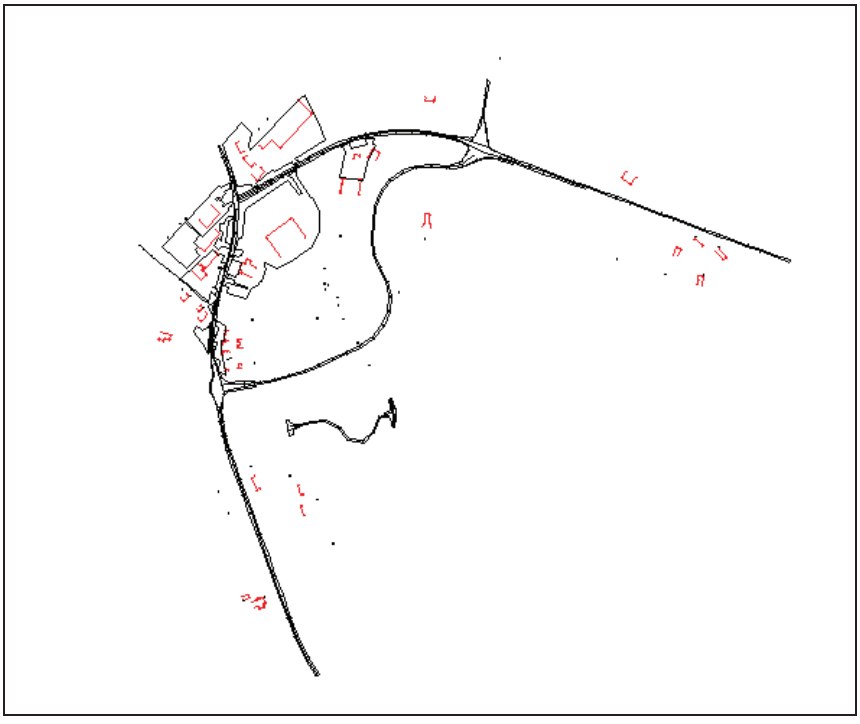


**Figure C-5:** US 129 and NC 143 sections of corridor K project (STIP#: A-0009C) Build TNM (Alt 3R)

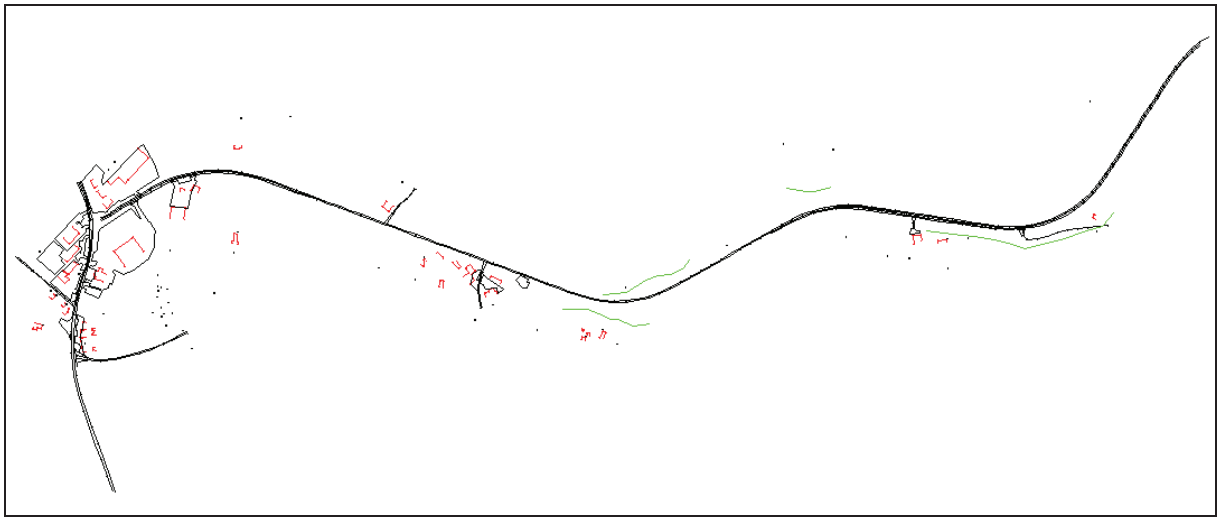


**Figure C-6:** NC 28 of corridor K project (STIP#: A-0009C) Build TNM (Alt 3R)

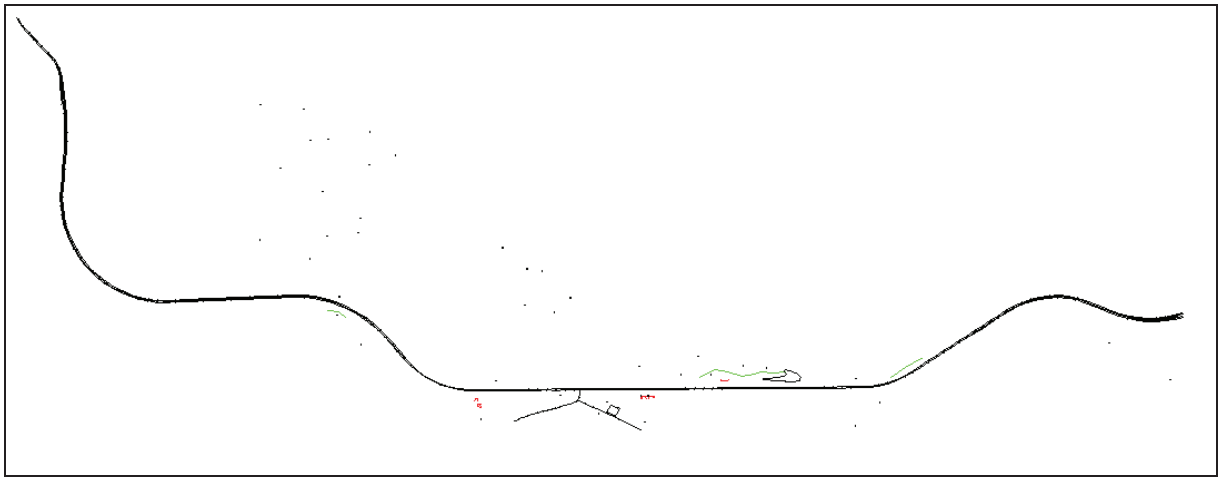


**Figure C-7:** New Location of corridor K project (STIP#: A-0009C) Build TNM (Alt S2)

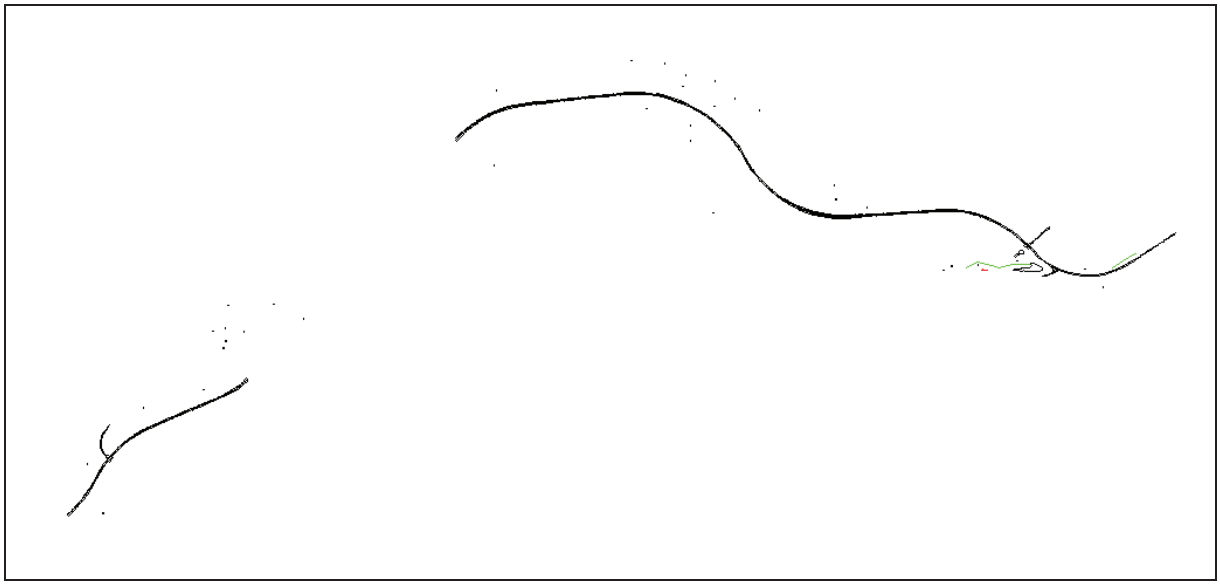
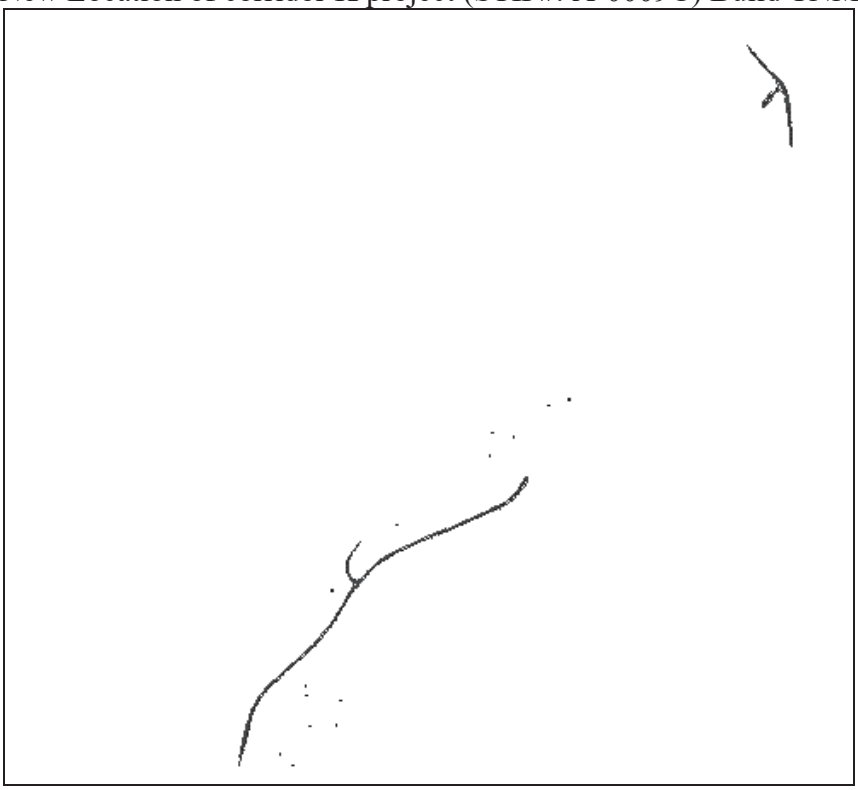


**Figure C-8:** New Location of corridor K project (STIP#: A-0009C) Build TNM (Alt SW1A)



# Appendix D

# PREDICTED TRAFFIC VOLUME

| 2019 Existing | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | | | | | |
| US 129 | Lower Mill Creek Rd to Airport Rd | | Airport Rd to Woodland Heights Rd | | Woodland Heights Rd to 5 Point Rd | | 5 Point Rd to E Main St | | E Main St to NC 143 | | NC 143 to N Main St | |
| Speed (mph) | 50 | | 50 | | 50 | | 50 | | 50 | | 50 | |
| VPD (Vehicle per Day) | 4900 | | 6000 | | 7400 | | 8200 | | 9600 | | 9500 | |
| K (Design Hour Factor) % | 10% | | 10% | | 10% | | 10% | | 10% | | 10% | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | | 50% | | 50% | |
| Duals % | 4% | | 4% | | 4% | | 4% | | 4% | | 4% | |
| TTSTs % | 1% | | 1% | | 1% | | 1% | | 1% | | 1% | |
| AADT | 490 | | 600 | | 740 | | 820 | | 960 | | 950 | |
| VPH/Direction | 245 | | 300 | | 370 | | 410 | | 480 | | 475 | |
| | NB | SB | NB | SB | NB | SB | NB | SB | NB | SB | NB | SB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LOS C (Veh/ln/hr) | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 930 | 930 | 930 | 930 |
| VPH/Lane | 245 | 245 | 300 | 300 | 370 | 370 | 410 | 410 | 480 | 480 | 475 | 475 |
| Auto (Veh/hr) | 233 | 233 | 285 | 285 | 352 | 352 | 390 | 390 | 456 | 456 | 451 | 451 |
| MT (Veh/hr) | 10 | 10 | 12 | 12 | 15 | 15 | 16 | 16 | 19 | 19 | 19 | 19 |
| HT (Veh/hr) | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |

| 2019 Existing | | | | |
|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | |
| Main Road Name | Airport Rd | | 5 Point Rd | |
| Speed (mph) | 35 | | 35 | |
| VPD (Vehicle per Day) | 1500 | | 1600 | |
| K (Design Hour Factor) % | 0.09 | | 0.11 | |
| Directional Split (D) % | 0.5 | | 0.5 | |
| Duals % | 0.02 | | 0.07 | |
| TTSTs % | 0.01 | | 0.01 | |
| AADT | 135 | | 176 | |
| VPH/Direction | 67.5 | | 88 | |
| | EB | WB | EB | WB |
| No. of Lanes | 1 | 1 | 1 | 1 |
| VPH/Lane | 68 | 68 | 88 | 88 |
| Auto (Veh/hr) | 64 | 64 | 84 | 84 |
| MT (Veh/hr) | 3 | 3 | 4 | 4 |
| HT (Veh/hr) | 1 | 1 | 1 | 1 |

| 2019 Existing | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | | | | | |
| NC 143 | US 129 to 5 Point Rd | | 5 Point Rd to Mountain Creek Rd | | Mountain Creek Rd to Old Sweetwater Rd | | Old Sweetwater Rd to Old Sweetwater Rd | | Old Sweetwater Rd to Beech Creek Rd | | Beech Creek Rd to NC 28 | |
| Speed (mph) | 50 | | 50 | | 50 | | 50 | | 50 | | 50 | |
| VPD (Vehicle per Day) | 7200 | | 6300 | | 5900 | | 5100 | | 3400 | | 3200 | |
| K (Design Hour Factor) % | 10% | | 11% | | 11% | | 11% | | 11% | | 11% | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | | 50% | | 50% | |
| Duals % | 5% | | 5% | | 5% | | 5% | | 5% | | 5% | |
| TTSTs % | 1% | | 1% | | 1% | | 2% | | 2% | | 2% | |
| AADT | 720 | | 693 | | 649 | | 561 | | 374 | | 352 | |
| VPH/Direction | 360 | | 346.5 | | 324.5 | | 280.5 | | 187 | | 176 | |
| | EB | WB | EB | WB | EB | WB | EB | WB | EB | WB | EB | WB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LOS C (Veh/ln/hr) | 930 | 930 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 |
| VPH/Lane | 360 | 360 | 347 | 347 | 325 | 325 | 281 | 281 | 187 | 187 | 176 | 176 |
| Auto (Veh/hr) | 342 | 342 | 329 | 329 | 308 | 308 | 266 | 266 | 178 | 178 | 167 | 167 |
| MT (Veh/hr) | 14 | 14 | 14 | 14 | 13 | 13 | 11 | 11 | 7 | 7 | 7 | 7 |
| HT (Veh/hr) | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |

| 2019 Existing | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | | | |
| NC 28 | N of NC 143 | | NC 143 to Stecoah Rd | | Stecoah Rd to Lower Steacoah Rd | | Lower Stecoah Rd to Tobacco Branch Rd | | South of Tobacco Branch Rd | |
| Speed (mph) | 50 | | 50 | | 50 | | 50 | | 50 | |
| VPD (Vehicle per Day) | 1800 | | 3600 | | 3600 | | 3400 | | 3300 | |
| K (Design Hour Factor) % | 11% | | 11% | | 11% | | 11% | | 11% | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | | 50% | |
| Duals % | 4% | | 5% | | 5% | | 5% | | 5% | |
| TTSTs % | 1% | | 2% | | 2% | | 2% | | 2% | |
| AADT | 198 | | 396 | | 396 | | 374 | | 363 | |
| VPH/Direction | 99 | | 198 | | 198 | | 187 | | 181.5 | |
| | NB | SB | NB | SB | NB | SB | NB | SB | NB | SB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LOS C (Veh/ln/hr) | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 |
| VPH/Lane | 99 | 99 | 198 | 198 | 198 | 198 | 187 | 187 | 182 | 182 |
| Auto (Veh/hr) | 94 | 94 | 188 | 188 | 188 | 188 | 178 | 178 | 172 | 172 |
| MT (Veh/hr) | 4 | 4 | 8 | 8 | 8 | 8 | 7 | 7 | 7 | 7 |
| HT (Veh/hr) | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

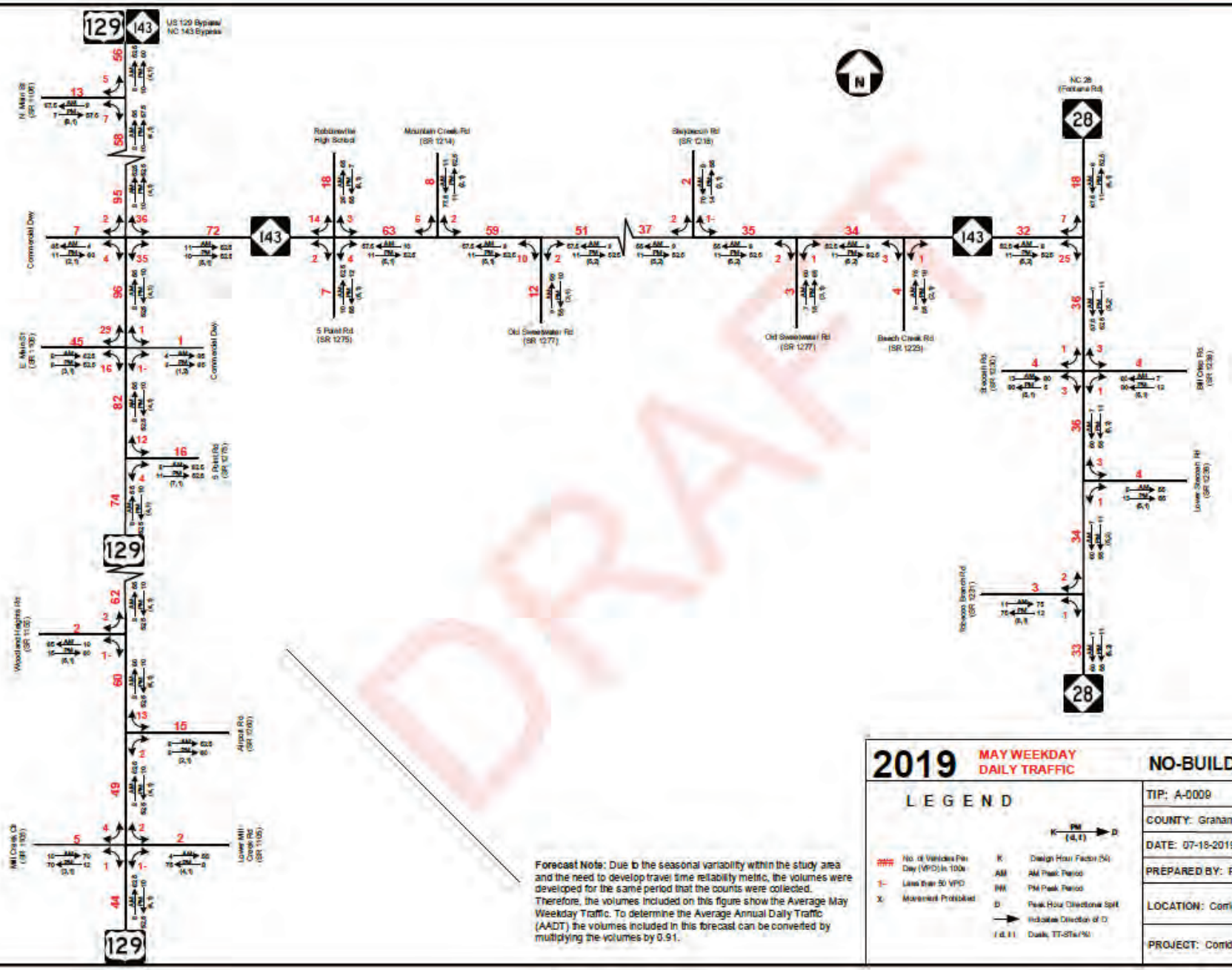
| 2045 No-Build & Build | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | | | | | |
| US 129 | Lower Mill Creek Rd to Airport Rd | | Airport Rd to Woodland Heights Rd | | Woodland Heights Rd to 5 Point Rd | | 5 Point Rd to E Main St | | E Main St to NC 143 | | NC 143 to N Main St | |
| Speed (mph) | 50 | | 50 | | 50 | | 50 | | 50 | | 50 | |
| VPD (Vehicle per Day) | 6300 | | 77 | | 9800 | | 10900 | | 12900 | | 12900 | |
| K (Design Hour Factor) % | 10% | | 10% | | 10% | | 10% | | 10% | | 10% | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | | 50% | | 50% | |
| Duals % | 4% | | 4% | | 4% | | 4% | | 4% | | 4% | |
| TTSTs % | 1% | | 1% | | 1% | | 1% | | 1% | | 1% | |
| AADT | 630 | | 7.7 | | 980 | | 1090 | | 1290 | | 1290 | |
| VPH/Direction | 315 | | 3.85 | | 490 | | 545 | | 645 | | 645 | |
| | NB | SB | NB | SB | NB | SB | NB | SB | NB | SB | NB | SB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LOS C (Veh/ln/hr) | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 930 | 930 | 930 | 930 |
| VPH/Lane | 315 | 315 | 4 | 4 | 490 | 490 | 545 | 545 | 645 | 645 | 645 | 645 |
| Auto (Veh/hr) | 299 | 299 | 4 | 4 | 466 | 466 | 518 | 518 | 613 | 613 | 613 | 613 |
| MT (Veh/hr) | 13 | 13 | 0 | 0 | 20 | 20 | 22 | 22 | 26 | 26 | 26 | 26 |
| HT (Veh/hr) | 3 | 3 | 0 | 0 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 |

| 2045 No-Build & Build | | | | |
|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | |
| Main Road Name | Airport Rd | | 5 Point Rd | |
| Speed (mph) | 35 | | 40 | |
| VPD (Vehicle per Day) | 2000 | | 2100 | |
| K (Design Hour Factor) % | 9% | | 11% | |
| Directional Split (D) % | 50% | | 50% | |
| Duals % | 2% | | 7% | |
| TTSTs % | 1% | | 1% | |
| AADT | 180 | | 231 | |
| VPH/Direction | 90 | | 115.5 | |
| | EB | WB | EB | WB |
| No. of Lanes | 1 | 1 | 1 | 1 |
| VPH/Lane | 90 | 90 | 116 | 116 |
| Auto (Veh/hr) | 86 | 86 | 110 | 110 |
| MT (Veh/hr) | 4 | 4 | 5 | 5 |
| HT (Veh/hr) | 1 | 1 | 1 | 1 |

| 2045 No-Build & Build | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | | | | | |
| NC 143 | US 129 to 5 Point Rd | | 5 Point Rd to Mountain Creek Rd | | Mountain Creek Rd to Old Sweetwater Rd | | Old Sweetwater Rd to Old Sweetwater Rd | | Old Sweetwater Rd to Beech Creek Rd | | Beech Creek Rd to NC 28 | |
| Speed (mph) | 50 | | 50 | | 50 | | 50 | | 50 | | 50 | |
| VPD (Vehicle per Day) | 8500 | | 8800 | | 8100 | | 7100 | | 4600 | | 4300 | |
| K (Design Hour Factor) % | 10% | | 11% | | 11% | | 11% | | 11% | | 11% | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | | 50% | | 50% | |
| Duals % | 5% | | 5% | | 5% | | 5% | | 5% | | 5% | |
| TTSTs % | 1% | | 1% | | 1% | | 2% | | 2% | | 2% | |
| AADT | 850 | | 968 | | 891 | | 781 | | 506 | | 473 | |
| VPH/Direction | 425 | | 484 | | 445.5 | | 390.5 | | 253 | | 236.5 | |
| | EB | WB | EB | WB | EB | WB | EB | WB | EB | WB | EB | WB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LOS C (Veh/ln/hr) | 930 | 930 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 |
| VPH/Lane | 425 | 425 | 484 | 484 | 446 | 446 | 391 | 391 | 253 | 253 | 237 | 237 |
| Auto (Veh/hr) | 404 | 404 | 460 | 460 | 423 | 423 | 371 | 371 | 240 | 240 | 225 | 225 |
| MT (Veh/hr) | 17 | 17 | 19 | 19 | 18 | 18 | 16 | 16 | 10 | 10 | 9 | 9 |
| HT (Veh/hr) | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 2 | 2 |

| 2045 No-Build & Build | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | | | |
| NC 28 | N of NC 143 | | NC 143 to Stecoah Rd | | Stecoah Rd to Lower Steacoah Rd | | Lower Stecoah Rd to Tobacco Branch Rd | | South of Tobacco Branch Rd | |
| Speed (mph) | 50 | | 50 | | 50 | | 50 | | 50 | |
| VPD (Vehicle per Day) | 2900 | | 5200 | | 5200 | | 4900 | | 4700 | |
| K (Design Hour Factor) % | 11% | | 11% | | 11% | | 11% | | 11% | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | | 50% | |
| Duals % | 4% | | 5% | | 5% | | 5% | | 5% | |
| TTSTs % | 1% | | 2% | | 2% | | 2% | | 2% | |
| AADT | 319 | | 572 | | 572 | | 536 | | 517 | |
| VPH/Direction | 159.5 | | 286 | | 286 | | 269.5 | | 258.5 | |
| | NB | SB | NB | SB | NB | SB | NB | SB | NB | SB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LOS C (Veh/ln/hr) | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 |
| VPH/Lane | 160 | 160 | 286 | 286 | 286 | 286 | 270 | 270 | 259 | 259 |
| Auto (Veh/hr) | 152 | 152 | 272 | 272 | 272 | 272 | 256 | 256 | 246 | 246 |
| MT (Veh/hr) | 6 | 6 | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 |
| HT (Veh/hr) | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| 2045 No-Build & Build | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Roadway Name | Segments / Roadway Name | | | | | | | |
| Main Road Name | Mountain Creek Rd | | Old Sweetwater Rd | | Stecoah Rd | | Lower Stecoah Rd | |
| Speed (mph) | 35 | | 35 | | 30 | | 40 | |
| VPD (Vehicle per Day) | 1100 | | 1600 | | 500 | | 500 | |
| K (Design Hour Factor) % | 11% | | 10% | | 5% | | 13 | |
| Directional Split (D) % | 50% | | 50% | | 50% | | 50% | |
| Duals % | 2% | | 3% | | 5% | | 5% | |
| TTSTs % | 1% | | 1% | | 1% | | 1% | |
| AADT | 121 | | 160 | | 25 | | 65 | |
| VPH/Direction | 60.5 | | 80 | | 12.5 | | 32.5 | |
| | EB | WB | EB | WB | EB | WB | EB | WB |
| No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| VPH/Lane | 61 | 61 | 80 | 80 | 13 | 13 | 33 | 33 |
| Auto (Veh/hr) | 57 | 57 | 76 | 76 | 12 | 12 | 31 | 31 |
| MT (Veh/hr) | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 1 |
| HT (Veh/hr) | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |




DRAFT

**Forecast Note:** Due to the seasonal variability within the study area and the need to develop travel time reliability metric, the volumes were developed for the same period that the counts were collected. Therefore, the volumes included on this figure show the Average May Weekday Traffic. To determine the Average Annual Daily Traffic (AADT) the volumes included in this forecast can be converted by multiplying the volumes by 0.91.

# 2019 MAY WEEKDAY DAILY TRAFFIC

## NO-BUILD SCENARIO

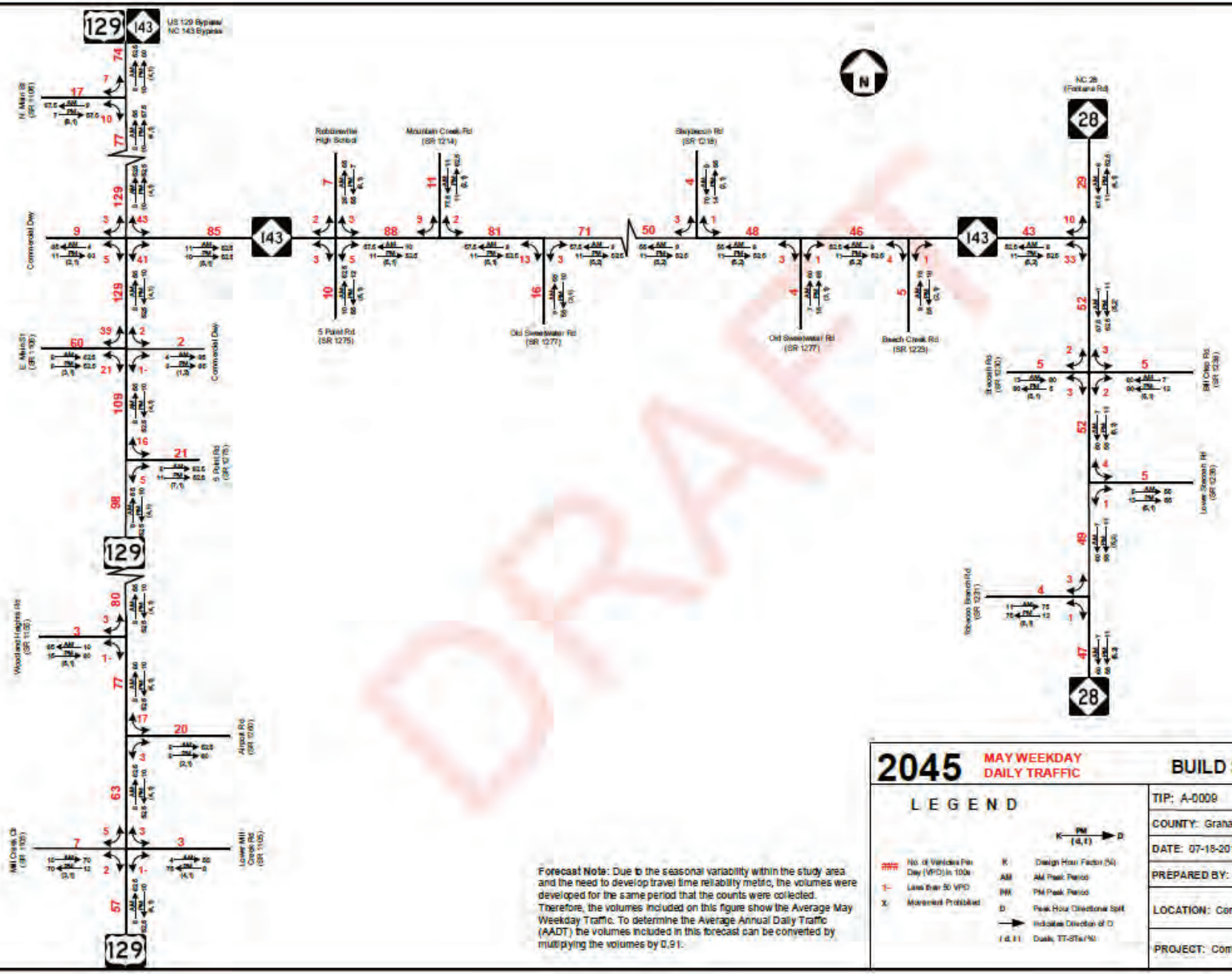
SHEET 1 OF 1

### LEGEND

- ### — No. of Vehicles Per Day (VPD) in 100s
- 1- — Less than 50 VPD
- X — Movement Prohibited
- K — Design Hour Factor (%)
- AM — AM Peak Period
- PM — PM Peak Period
- D — Peak Hour Directional Split
- → — Indicates Direction of D
- (d,t) — Duals, TT-STs (%)

K PM (d,t) D

| | |
|---|---|
| TIP: A-0009 | WBS: 32572.1.13 |
| COUNTY: Graham | DIVISION: 14 |
| DATE: 07-18-2019 | |
| PREPARED BY: Patriot Transportation Engineering, PLLC | |
| LOCATION: Corridor K – Robbinsville to Stecoah | |
| PROJECT: Corridor K – Robbinsville to Stecoah | |




**Forecast Note:** Due to the seasonal variability within the study area and the need to develop travel time reliability metric, the volumes were developed for the same period that the counts were collected. Therefore, the volumes included on this figure show the Average May Weekday Traffic. To determine the Average Annual Daily Traffic (AADT) the volumes included in this forecast can be converted by multiplying the volumes by 0.91.

# 2045 MAY WEEKDAY DAILY TRAFFIC

## BUILD SCENARIO

SHEET 1 OF 1

### LEGEND

- ### — No. of Vehicles Per Day (VPD) in 100s
- 1- — Less than 50 VPD
- X — Movement Prohibited
- K — Design Hour Factor (%)
- AM — AM Peak Period
- PM — PM Peak Period
- D — Peak Hour Directional Split
- → — Indicates Direction of D
- T (1.1) — Duals, TT-STs (%)

| | |
|---|---|
| TIP: A-0009 | WBS: 32572.1.13 |
| COUNTY: Graham | DIVISION: 14 |
| DATE: 07-18-2019 | |
| PREPARED BY: Patriot Transportation Engineering, PLLC | |
| LOCATION: Corridor K – Robbinsville to Stecoah | |
| PROJECT: Corridor K – Robbinsville to Stecoah | |

# Appendix E

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION TRAFFIC NOISE POLICY

# NORTH CAROLINA
# DEPARTMENT OF TRANSPORTATION

# TRAFFIC NOISE POLICY

**Effective Date: October 6, 2016**

**Noise Policy Committee:**

Glenn Mumford, PE .....Roadway Design Unit
Drew Joyner, PE.....Human Environment Section
Brian Hanks, PE.....Structures Management Unit
Daniel Keel, PE.....Division of Highways
Mike Mills, PE.....Division Engineer
Pat Ivey, PE.....Division Engineer
Greg Smith, PE.....Human Environment Section

**Sponsors:**

Clarence Coleman, PE .....Federal Highway Administration
Felix Davila, PE.....Federal Highway Administration
Edward L. Curran.....Board of Transportation

**APPROVED BY:**

10-6-16
Date of Approval

John F. Sullivan, III, PE, Division Administrator
Federal Highway Administration

10.6.16
Date of Approval

Nicholas J. Tennyson
Secretary of Transportation

10-5-16
Date of Approval

Edward L. Curran, Chairman
Board of Transportation

Person Responsible for Policy:

Traffic Noise & Air Quality Supervisor
Human Environment Section
1598 Mail Service Center
Raleigh, North Carolina 27699-1598
(919) 707-6087

## DEFINITIONS

a) Decibel (dB) - The logarithmic unit for measuring sound pressure levels. For traffic noise measurements, decibels are most commonly reported in terms of the A-weighing frequency scale, which best includes the frequencies to which human hearing is typically most sensitive and is denoted by the abbreviation dB(A).

b) Leq – The equivalent steady -state sound level which, in a defined period of time, contains the same amount of acoustic energy as a time-varying sound level during the same period of time.

c) Receptor – Any location that receives traffic noise.

d) Impacted Receptor – A receptor for which the predicted hourly equivalent traffic noise level 1) meets or exceeds the approach criteria value found in Table 1 of this policy or 2) exceeds the existing ambient noise level by 10 dB(A) or more.

e) Benefited Receptor - All receptors, both impacted and non-impacted, that receive a noise level reduction of 5 dB(A) or more through placement of a noise abatement measure.

f) Noise Abatement Measure – Any method used to reduce traffic noise levels, such as noise walls and earthen berms.

g) Worst Noise Hour – The hour within a day in which the highest magnitude hourly equivalent sound level occurs. The worst traffic noise hour typically occurs when traffic is flowing freely at a high volume relative to the peak traffic hour volume, with a high percentage of trucks.

h) Practicable – Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

## INTRODUCTION

This document represents the North Carolina Department of Transportation (hereinafter NCDOT) policy on highway traffic noise and construction noise and describes the implementation of the requirements of the Federal Highway Administration (hereinafter FHWA) Noise Standard at 23 Code of Federal Regulations Part 772 (23 CFR 772) as they relate to federal-aid and select state-funded highway construction in North Carolina. This policy was developed by the NCDOT and reviewed and approved by the FHWA.

The North Carolina Department of Transportation Traffic Noise Manual and 23 CFR 772 are intended to be companion documents to this policy.

## PURPOSE

This policy describes the NCDOT process that is used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the NCDOT approach to implementation.

## APPLICABILITY

Projects with a Date of Public Knowledge on or after the effective date of this policy shall comply with the criteria of this policy.

### Federal–Aid Projects

This policy applies to all "Type I" federal or federal-aid highway projects in the State of North Carolina, including federal projects that are administered by local public agencies. Therefore, this policy applies to any highway project that is funded with federal-aid highway funds or requires FHWA approval regardless of funding sources. NCDOT does not participate in nor fund Type II (retrofit) projects along existing transportation facilities. Noise analyses are not required for Type III projects. Each of these project types are defined below. This policy shall be applied uniformly and consistently to all Type I federal projects throughout North Carolina.

### Type I Project

(a) The construction of a highway on new location; or,

(b) The physical alteration of an existing highway where there is either:
   (i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
   (ii) Substantial Vertical Alteration. A project that removes shielding, therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,

(c) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,

(d) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,

(e) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,

(f) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,

(g) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

(h) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project.

### Type II Project.

A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with 23 CFR 772.7(e).

**Type III Project**

A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

The highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials in 23 CFR 772 and this policy constitute the noise standards mandated by 23 U.S.C. 109(1). All federally-funded highway projects which are developed in conformance with this policy shall be deemed to be in accordance with the FHWA noise standards.

**State-Funded Projects**

Projects that are State funded do not use the federal project type designation for applicability.

This policy will apply to State funded projects located on a US or Interstate route that is full control of access where the project involves adding a through-traffic lane.

All other State-funded projects for which a State Environmental Assessment (EA) or State Environmental Impact Statement (EIS) is prepared will comply with the North Carolina Environmental Policy Act (SEPA) and the North Carolina Administrative Code. For these projects, noise barriers will be considered where practicable.

## DATE OF PUBLIC KNOWLEDGE

The Date of Public Knowledge of the location and potential noise impacts of a proposed highway project is the approval date of the final environmental document, e.g., Categorical Exclusion (CE), State or Federal Finding of No Significant Impact (FONSI) or State or Federal Record of Decision (ROD).

NCDOT is not responsible for evaluating or implementing any noise barriers to protect developed lands that were not permitted before the Date of Public Knowledge.

The criterion for determining when undeveloped land is permitted for development is the approval date of a building permit for an individual lot or site. Approval of a development plat or any other development plan does not meet the permitted criteria.

NCDOT advocates use of local government authority to regulate land development, planning, design and construction in such a way that noise impacts are minimized.

## TRAFFIC NOISE PREDICTION

All traffic noise analyses performed by or for NCDOT must utilize the most current version of the FHWA Traffic Noise Model (TNM®) or any other model determined by the FHWA to be consistent with the methodology of the TNM® model, pursuant to 23 CFR 772.9.

Average pavement type shall be used in the FHWA TNM® for future noise level prediction.

Noise contour lines may be used only for project alternative screening or for providing information to local officials for their land use planning efforts associated with undeveloped lands as per 23 CFR 772.17. Noise contours shall not be used for determining highway traffic noise impacts or assessing noise barriers.

Traffic characteristics that yield the worst noise hour equivalent traffic noise levels, expressed in Leq(h), for the Design Year shall be used in predicting noise levels and assessing noise impacts.

Traffic noise prediction must adhere to all direction contained in the NCDOT Traffic Noise Manual.

## NOISE IMPACT DETERMINATION

Noise abatement measures for NCDOT highway projects must be considered when traffic noise impacts are created by either of the following two conditions:

(a) The predicted worst noise hour Leq(h) traffic noise levels for the Design Year approach (reach one decibel less than) or exceed the Noise Abatement Criteria (NAC) contained in 23 CFR 772 and in Table 1, found on page 4 of this policy, OR

(b) The predicted worst noise hour Leq(h) traffic noise levels for the Design Year substantially exceed existing noise by 10 dB(A) or more.

A receptor is a discrete or representative location within a noise sensitive area(s) for any of the land uses listed in Table 1. For multifamily dwellings, each residence shall be counted as one receptor when determining impacted and benefited receptors. Non-residential receptors shall be represented by Equivalent Receptors calculated according to direction contained in the NCDOT Traffic Noise Manual.

Primary consideration shall be given to exterior areas where frequent human use occurs in the determination of traffic noise impacts.

A traffic noise analysis shall be completed for each project alternative under detailed study and for all receptors and Equivalent Receptors defined to represent land use activities A, B, C, D, and E listed in Table 1 that are present in the study area. FHWA approval is required for designating a Category A Activity on federally-funded projects. Traffic noise analyses are not required for Activity Category F land uses. Noise predictions are required for Activity Category G land uses to the extent needed to develop estimated noise levels to provide to local officials for planning purposes.

**Table 1**

**Noise Abatement Criteria**

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))

| Activity Category | Activity Criteria[1] Leq(h)[2] | Evaluation Location | Activity Description |
|---|---|---|---|
| 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 [3] | 67 | Exterior | Residential |
| C [3] | 67 | Exterior | Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(f) sites, schools, television studios, trails, and trail crossings |
| D | 52 | Interior | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios |
| E [3] | 72 | Exterior | Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F |
| F | -- | -- | Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing |
| G | -- | -- | Undeveloped lands that are not permitted |

[1] The Leq(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2] The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

[3] Includes undeveloped lands permitted for this activity category.

## ANALYSIS OF NOISE ABATEMENT MEASURES

When traffic noise impacts are identified, noise abatement measures shall be considered and evaluated for feasibility for all impacted receptors and reasonableness for all benefited receptors. All of the following conditions must be met in order for noise abatement measures to be justified and incorporated into project design, as applicable. Failure to achieve any single element of feasibility or reasonableness will result in the noise abatement measure being deemed not feasible or not reasonable, whichever applies.

NCDOT will provide noise barriers for all possible impacted receptors that meet the feasibility and reasonableness criteria found in this policy. Noise barriers will not be extended solely to provide noise reduction for non-impacted receptors. Benefits for non-impacted receptors will only occur when they are incidental in noise barriers designed for impacted receptors.

### Feasibility

The combination of acoustical and engineering factors considered in the evaluation of a noise barrier.

(a) Any receptor that receives a minimum noise level reduction of five dB(A) due to a noise barrier shall be considered a benefited receptor. Noise reduction of five dB(A) must be achieved for at least two impacted receptors.

(b) Engineering feasibility of noise barriers shall consider adverse impacts created by or upon property access, drainage, topography, utilities, safety, and maintenance requirements.

### Reasonableness

The combination of social, economic, and environmental factors considered in the evaluation of a noise barrier.

(a) Property owners and tenants of all benefited receptors shall be solicited to obtain their preferences for or against a proposed noise barrier. No tenant ballots are distributed for vacant rental property. Points per ballot shall be distributed in the following weighted manner:

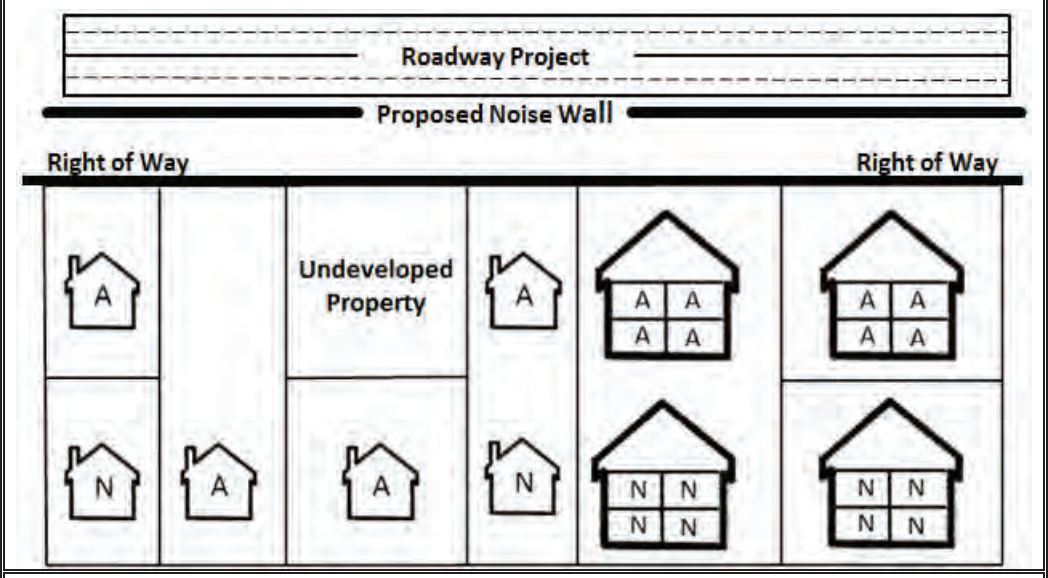
- 5 points/ballot for adjacent property owners who reside at property
- 4 points/ballot for adjacent property owners who rent property to others
- 3 points/ballot for all non-adjacent property owners who reside at property
- 2 points/ballot for all non-adjacent property owners who rent property to others
- 1 point/ballot vote for all tenants of rental property

Adjacent Receptor is a benefited receptor that 1) represents a property that abuts the highway right of way or 2) has no benefited receptor between it and the highway. Where multiple buildings containing benefited receptors are on the same property, such as an apartment or condominium complex, only the building closest to the highway is an adjacent receptor. Adjacent receptors will most often, but not always, be part of the front row of benefited receptors. Figure 1 provides graphic examples of Adjacent Receptors.

Owners of multi-unit rental locations will receive the applicable number of owner points for each individual benefited receptor (rental unit) owned.

**Figure 1**

**Examples of Adjacent Receptors**




A = Adjacent Receptor N = Non-Adjacent Receptor
Undeveloped Property = Vacant property for which no building permit has been issued and is not a park or recreation area

If 50% or greater of all possible voting points from benefited receptors for each noise barrier are received on the first solicitation, a simple majority of voting points cast will be used to determine if the proposed noise barrier will be constructed.

If less than 50% of all possible points for each noise barrier are received on the first solicitation, a second solicitation will be sent to benefited receptors who did not respond to the first solicitation.

If a second solicitation is conducted and 50% or greater of all possible voting points for each noise barrier are received after the second solicitation, a simple majority of voting points cast will be used to determine whether or not the proposed noise barrier will be constructed.

If less than 50% of total possible points for a noise barrier are received after the second solicitation, the noise barrier will not be constructed.

Noise barriers will be constructed in the case of a tie (equal number of points for and against a noise barrier).

All balloting soliciting the viewpoints of benefited property owners and applicable residents/tenants that occurs after the effective date of this policy, regardless of the Date of Public Knowledge, shall comply with the criteria of this policy.

(b) The allowable quantities for noise barriers per benefited receptor, with allowances for incremental increases based upon existing and predicted noise levels of all impacted receptors within each noise study area, are shown in Table 2.

For the purpose of calculating the incremental increase, the Noise Abatement Criteria (NAC) values for Activity Categories A, B, C, D, and E, as shown in Table 1, are to be used and not the NCDOT "approach" values used in traffic noise impact determinations.

**Table 2**

**Allowable Noise Barrier Base Quantities**

| Maximum Allowable Base Quantity | Noise Level Consideration | Noise Wall | Earthen Berm |
|---|---|---|---|
| | | 1,500 $ft^2$ | 4,200 $yd^3$ |
| Average dB(A) Increase Between Existing and Future Build for All Impacted Receptors | < 5 dB(A) | + 0 $ft^2$ | + 0 $yd^3$ |
| | 5-10 dB(A) | + 500 $ft^2$ | + 1,400 $yd^3$ |
| | > 10 dB(A) | + 1,000 $ft^2$ | + 2,800 $yd^3$ |
| Average Exposure to Absolute Noise Levels for All Impacted Receptors | < 5 dB(A) Over NAC Activity Category | + 0 ft2 | + 0 $yd^3$ |
| | 5-10 dB(A) Over NAC Activity Category | + 500 $ft^2$ | + 1,400 $yd^3$ |
| | > 10 dB(A) Over NAC Activity Category | + 1,000 $ft^2$ | + 2,800 $yd^3$ |

(c) A noise reduction design goal of at least 7 dB(A) must be evaluated for all benefited receptors. At least one benefited receptor must achieve the noise reduction design goal of 7 dB(A) to indicate the proposed noise barrier effectively reduces traffic noise.

**Other Considerations**

Prior to CE approval or issuance of a FONSI or ROD, NCDOT shall identify in all applicable environmental documents:

(a) Noise barriers that are feasible and reasonable,

(b) Noise impacts for which no noise barrier appears to be feasible and reasonable;

(c) Locations where noise impacts will occur, where noise barriers are feasible and reasonable, and the locations that have no feasible and reasonable noise barriers.

(d) Whether it is “likely” or “unlikely” that noise barriers will be installed for each noise sensitive area identified. "Likely" does not mean a firm commitment. The final decision on the installation of noise barriers shall be made upon completion of the project design, the public involvement process, compliance with the NCDOT Policy, and FHWA approval.

**Third Party Participation**

(a) Third party funding of noise barriers cannot be used to make up the difference between the reasonable quantity allowance and the actual quantity of noise barriers. Third party funding is allowed only by local, state and federal government agencies, and can only be used to pay for additional features such as landscaping and aesthetic treatments for noise barriers that meet all feasible and reasonable criteria previously detailed in this policy. Private parties may freely enter into agreements with government agencies to develop noise barrier enhancements; however, all funding for enhancements paid to NCDOT must come from government agencies

(b) Traditional highway construction resources pay for required noise barriers. Should a local government request that materials be used that are more costly than the standard materials proposed by NCDOT, the requesting entity must assume 100% of the actual additional construction cost.

(c) If a local government insists on the provision of a noise barrier deemed not reasonable by NCDOT, a noise barrier may be installed provided the local government assumes 100% of the costs and obtains an encroachment permit from NCDOT to perform the work. These costs include, but are not limited to, preliminary and final engineering, actual construction and all related maintenance. In addition, local governments must ensure that NCDOT's material, design and construction specifications are met. The local government must also assume 100% of the liability associated with the measure and hold harmless the NCDOT.

(d) For (b) and (c) above, the settlement agreement shall be signed before third party noise barrier design begins and payment shall be made to NCDOT in accordance with N.C.G.S. 136-66.3(e).

## ARCHITECTURAL TREATMENT OF NOISE WALLS

The standard noise wall architectural treatment consists of:

(a) Concrete columns; Steel piles may be used when necessary to address site conditions adverse to the use of concrete columns;

(b) Precast concrete panels textured on both sides;

(c) No texture on the uppermost foot of each wall segment;

(d) A single color of stain in brown or gray tones applied to both sides of textured panels;

(e) No stain applied to the uppermost foot of each wall segment and the concrete columns.

All enhancements to this standard noise wall must be paid for in accordance with Third Party Participation provisions in this policy.

NCDOT Division Engineers are responsible for determining noise wall textures and colors in their respective Divisions.

## PUBLIC INVOLVEMENT

Communication with the community regarding noise impacts and possible noise abatement shall occur at the start of the noise study process and continue throughout the development of the project. NCDOT will communicate with citizens to present information on the nature of highway traffic noise and discuss the effects of noise abatement and how public preferences for noise abatement is solicited via a balloting process.

Noise study areas showing "likely" noise barriers and/or proposed locations of any "recommended" noise barriers will be presented and discussed when holding Public Hearings and Public Meetings. Likely noise barriers are based on preliminary design traffic noise analyses and are described in environmental documents. Recommended noise barriers are based on final design noise analyses and are usually identified after the environmental document is completed. Property owners and tenants who are being balloted for a recommended noise barrier will be provided a visual of the noise barrier location prior to their casting a ballot.

## COORDINATION WITH LOCAL OFFICIALS

NCDOT will provide all traffic noise analyses to local government officials within whose jurisdiction a highway project is proposed as early in the project planning process as possible to protect future development from becoming incompatible with traffic noise levels. Specifically, environmental documents and design noise reports will contain information identifying areas that may be impacted by traffic noise, predicted noise level contour information, the best estimation of future noise levels for developed and undeveloped lands or properties in the immediate vicinity of the project and other appropriate design information. If requested, NCDOT will assist local officials with coordination and distribution of this information to residents, property owners and developers. NCDOT will provide information to assist local jurisdictions in the development of local noise controls, when requested. NCDOT strongly advocates the planning, design and construction of noise-compatible development and encourage its practice among planners, building officials, developers and others.

## CONSTRUCTION NOISE

To minimize the impacts of construction noise on the public, NCDOT shall:

(a) Identify land uses or activities that may be affected by noise from construction of the project.

(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall consider the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.

(c) Consider construction techniques and scheduling to reduce construction noise impacts to nearby receptors and incorporate the needed abatement measures in the project plans and specifications.

## FEDERAL PARTICIPATION

The costs of noise barriers may be included in federal-aid participating project costs with the federal share being the same as that for the system on which the project is located when:

(a) Traffic noise impacts have been identified; and

(b) Noise barriers have been determined to be feasible and reasonable pursuant to 23 CFR 772 and this policy.

## REVIEW OF POLICY

This policy shall be reviewed by the NCDOT Board of Transportation at least every five years.