Noise and Vibration Technical Report

Durham-Orange Light Rail Transit Project

July 24, 2015
The NEPA Preferred Alternative for the D-O LRT Project would generally follow NC 54, I-40, US 15-501, and the North Carolina Railroad (NCRR) Corridor in downtown Durham and east Durham. The alignment would begin at UNC Hospitals, parallel Fordham Boulevard, proceed east on NC 54, travel north on I-40, parallel US 15-501 before it turns east toward the Duke University campus along Erwin Road, and then follow the NCRR Corridor parallel to NC 147 through downtown Durham, before reaching its eastern terminus near Alston Avenue. The alignment would consist of at-grade alignment, fill and cut sections, and elevated structures. In two sections of the alignment, Little Creek and New Hope Creek, multiple Light Rail Alternatives are evaluated in the DEIS.

This technical report contains information for all alternatives analyzed in the DEIS. However, pursuant to MAP 21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), a NEPA Preferred Alternative has been developed, which recommends C2A in the Little Creek section of the alignment, NHC 2 in the New Hope Creek section of the alignment, the Trent/Flowers Drive station, and the Farrington Road Rail Operations and Maintenance Facility.
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<th>Definition</th>
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<tbody>
<tr>
<td>dB</td>
<td>Decibel</td>
</tr>
<tr>
<td>dBA</td>
<td>A-Weighted Decibel</td>
</tr>
<tr>
<td>DEIS</td>
<td>Draft Environmental Impact Statement</td>
</tr>
<tr>
<td>D-O</td>
<td>Durham-Orange</td>
</tr>
<tr>
<td>D-O LRT</td>
<td>Durham-Orange Light Rail Transit</td>
</tr>
<tr>
<td>FTA</td>
<td>Federal Transit Administration</td>
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<tr>
<td>Hz</td>
<td>Hertz</td>
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<tr>
<td>I-40</td>
<td>Interstate 40</td>
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<tr>
<td>Ldn</td>
<td>24-Hour Average Noise Level</td>
</tr>
<tr>
<td>Leq</td>
<td>Hourly Equivalent Noise Level</td>
</tr>
<tr>
<td>LPA</td>
<td>Locally Preferred Alternative</td>
</tr>
<tr>
<td>LRT</td>
<td>Light Rail Transit</td>
</tr>
<tr>
<td>mph</td>
<td>miles per hour</td>
</tr>
<tr>
<td>LRV</td>
<td>Light Rail Vehicle</td>
</tr>
<tr>
<td>NC</td>
<td>North Carolina</td>
</tr>
<tr>
<td>NCRR</td>
<td>North Carolina Railroad</td>
</tr>
<tr>
<td>NHC</td>
<td>New Hope Creek</td>
</tr>
<tr>
<td>ROMF</td>
<td>Rail Operations Maintenance Facility</td>
</tr>
<tr>
<td>SEL</td>
<td>Source Exposure Level</td>
</tr>
<tr>
<td>STC</td>
<td>Sound Transmission Class</td>
</tr>
<tr>
<td>TPSs</td>
<td>Traction Power Substation</td>
</tr>
<tr>
<td>UNC</td>
<td>University of North Carolina</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>VA</td>
<td>Veterans Affairs</td>
</tr>
<tr>
<td>VdB</td>
<td>Vibration Decibel</td>
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1. Introduction

Triangle Transit, in cooperation with the Federal Transit Administration (FTA), has prepared a Draft Environmental Impact Statement (DEIS) to evaluate a potential high-capacity transit improvement in the Triangle region, within the Durham-Orange (D-O) Corridor, between Chapel Hill and Durham. This technical appendix focuses on the potential effects of the alternatives to resources sensitive to noise and vibration. These resources are generally referred to as sensitive receptors and include places such as parks, residences, hospitals, hotels/motels, schools, libraries, churches, natural areas/wildlife habitats, and historic properties.

This Noise and Vibration Technical Report provides a detailed technical appendix to the assessment of noise and vibration impacts presented in the Durham-Orange Light Rail Transit Project DEIS, chapter 4.10. The noise and vibration impact assessments have been developed in accordance with the FTA Guidance Manual Transit Noise and Vibration Impact Assessment (FTA Guidance Manual).

1.1 Description of the Study Corridor

The D-O Corridor is located within the Triangle region. It extends roughly 17 miles from southwest Chapel Hill to east Durham, and includes several educational, medical, and other key activity centers that generate a large number of trips each day. The land uses in the D-O Corridor are supported by a network of major highways, including NC 54, I-40, US 15-501, Erwin Road, and NC 147. Additional detail regarding the study corridor is included in the Durham-Orange Light Rail Transit Project DEIS, chapters 1 and 2.

1.2 Alternatives Considered

- No-Build Alternative
- Light Rail Alternatives

In addition to the Light Rail Alternatives under study in this DEIS, the DEIS considers a No-Build Alternative comprised of the existing and programmed transportation network improvements without the planned rail improvements and associated bus network modifications. Additional detail regarding the alternatives considered is included in the Durham-Orange Light Rail Transit Project DEIS, chapter 2.

1.2.1 No-Build Alternative

The No-Build Alternative includes the existing and planned transportation programs and projects scheduled to be built and implemented before forecast year 2040 and contained in the 2040 Metropolitan Transportation Plan, excluding only the proposed Light Rail Alternatives, rail transit improvements, and related bus transit modifications that would be associated with the proposed D-O LRT Project.

1.2.2 Light Rail Alternatives

Through the Alternatives Analysis and Scoping process, a majority of the proposed D-O LRT Project alignment was identified. However, there are a few areas where different alternatives were retained for
As a result, multiple alignments crossing Little Creek and New Hope Creek are evaluated in the DEIS.

- Four potential crossings of Little Creek between Hamilton Road and the proposed Leigh Village Station (Alternatives C1, C1A, C2, and C2A)
- Three potential crossings of New Hope Creek and Sandy Creek between Patterson Place and South Square (Alternatives NHC LPA, NHC 1, and NHC 2)
- Station alternatives at Duke/VA Medical Centers (i.e., Duke Eye Center and Trent/Flowers Drive)

Five proposed locations for the ROMF (i.e., Leigh Village ROMF, Farrington Road ROMF, Patterson Place ROMF, Cornwallis Road ROMF, and Alston Avenue ROMF). The Light Rail Alternative would generally follow North Carolina (NC) Highway 54 (NC 54), Interstate 40 (I-40), United States (US) 15-501, and the North Carolina Railroad (NCRR) Corridor in downtown Durham and east Durham. The alignment would begin in Chapel Hill at University of North Carolina at Chapel Hill (UNC) Hospitals, parallel Fordham Boulevard, proceed eastward adjacent to NC 54, travel north along I-40, parallel US 15-501 before it would turn east toward Duke University and run within Erwin Road, and then follow the NCRR Corridor that parallels NC Highway 147 (NC 147) through downtown Durham, before reaching its eastern terminus in Durham near Alston Avenue. The alignment would consist of at-grade alignment, fill and cut sections, and elevated structures. A total of 17 stations are planned, and up to 5,100 parking spaces would be provided along the Light Rail Alternative. In addition, a rail operations maintenance facility (ROMF) would be constructed to accommodate the D-O LRT fleet (16 vehicles, expandable to 26).

Bus routes would be modified to feed into the D-O LRT stations, and headways would be adjusted to provide more frequent service and minimize transfer waiting times. These services would also connect light rail passengers with other area transportation hubs, including park-and-ride lots and transfer centers.

1.3 Transit Noise

1.3.1 Definition of Noise

“Noise” is defined as “unwanted sound.” Sounds are described as noise if they interfere with an activity or disturb the person hearing them. Sound is measured in a logarithmic unit called a decibel (dB). Since the human ear is more sensitive to middle and high-frequency sounds than it is to low frequency sounds, sound levels are weighted to reflect human perceptions more closely. These “A-weighted” sounds are measured using the decibel unit dBA.

Typical sound levels from common noise sources are shown on Figure 1. Noise that is transmitted through the air is referred to as "airborne noise." Likewise, noise that is transmitted through the ground is referred to as "ground-borne noise." Ground-borne noise is discussed in section 4.1.

Sound levels fluctuate with time depending on the sources of the sound audible at a specific location. In addition, the degree of annoyance associated with certain sounds can vary by time of day, depending on other ambient sounds affecting the listener and the activities of the listener. Because the time-varying
fluctuations in sound levels at a fixed location can be complex, they typically are reported using statistical or mathematical descriptors that are a function of sound intensity and time.

Figure 1: Path of Airborne Noise

1.3.2 Sources of Transit Noise

Transit noise not only includes noise from moving vehicles, but also supporting services such as maintenance facilities. The perceptible transit noise generated from the proposed light rail transit system includes (1) light rail operations, (2) light rail stations and traction power substations (TPSSs), (3) an ROMF location, (4) associated feeder bus service, and (5) park-and-rides at transit stations. Table 1 identifies some of the most common noises generated from light rail operations.

Figure 2 lists the typical sound levels for common noise sources. The level of noise impact is based on the intensity of noise that originates from the source and the distance between the source and the receptor. Other factors that may increase or reduce the perceived impact of noise are:

- **Topography/intervening buildings** – noise can be modified, dampened, or interrupted by buildings, structures, or topography standing between the noise source and the sensitive receptor.
- **Time of day** – the degree of annoyance with noise sensed by a listener can vary by time of day (e.g., at night).
- **Other sounds in the environment** – the degree of annoyance with noise sensed by a listener can vary based on the other sounds occurring in the environment (e.g., city noises).
- **Listener’s other activities** – the degree of annoyance with noise sensed by a listener can vary based on the activity that the listener is doing at the time the sound is sensed (e.g., sleeping).
### Table 1: Sources of Transit Noise for Light Rail

<table>
<thead>
<tr>
<th>Transit Component</th>
<th>Source of Noise</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light rail vehicle in motion</td>
<td>Wheel rolling on rail</td>
<td>Increases with speed. Depends upon condition of wheels and rails. Can be controlled by regular system maintenance.</td>
</tr>
<tr>
<td></td>
<td>Vehicle propulsion system</td>
<td>Increases somewhat while accelerating and at higher speeds. Can be controlled by vehicle procurement specification. Forced ventilated system is generally quieter than self-ventilated system when operating on embedded track.</td>
</tr>
<tr>
<td></td>
<td>Auxiliary equipment for vehicle and ventilation</td>
<td>Usually not significant source of noise. Can be controlled by vehicle procurement specification.</td>
</tr>
<tr>
<td>Wheel squeal</td>
<td></td>
<td>Can occur on tight curves of less than 1,000 feet radii. Can be controlled by wheel and rail treatments.</td>
</tr>
<tr>
<td>Special trackwork</td>
<td></td>
<td>Impact noises occur when wheels encounter discontinuity in tracks such as rail joints, turnouts, or switches used at crossovers.</td>
</tr>
<tr>
<td>Brakes</td>
<td></td>
<td>Occasional squeal when stopping.</td>
</tr>
<tr>
<td>Horns and whistles</td>
<td></td>
<td>Used infrequently as warning device for pedestrians and at intersections.</td>
</tr>
<tr>
<td>Bells</td>
<td></td>
<td>Used sometimes as warning device at grade crossings.</td>
</tr>
<tr>
<td>Light rail vehicle stopped</td>
<td>Auxiliary equipment for vehicle and ventilation</td>
<td>Dominant source for stationary vehicle. Controlled by vehicle procurement specification.</td>
</tr>
<tr>
<td>ROMF</td>
<td>Auxiliary equipment for vehicle and ventilation</td>
<td>Dominant source for stationary vehicle. Controlled by vehicle procurement specification.</td>
</tr>
<tr>
<td>Traction power substation</td>
<td>Transformers</td>
<td>Usually not significant source of noise for light rail.</td>
</tr>
</tbody>
</table>

1.3.3 Metrics When Noise is Affected by Other Factors

The intensity of the noise event varies due to a number of factors. Examples include the distance of the receptor from the tracks or the station locations, presence of intervening terrain or buildings, and specific train related parameters such as vehicle speed, vehicle length, vehicle equipment (e.g., air conditioning systems), and the type, condition and curvature of the running surfaces (i.e., rails and wheels). In addition, the guideway structure can radiate noise as it vibrates in response to dynamic loading of the vehicle. Stationary vehicles generate noise as well. Auxiliary equipment, such as cooling fans, radiator fans, and air-conditioning pumps, often continue to run after vehicles have stopped. Because many of these conditions concerning receptor location and light rail vehicle operation vary throughout the corridor, the noise impacts due to light rail can be expected to vary. Common noise metrics include:

- $L_{eq}$ – “equivalent continuous noise level”: an average noise level collected for a defined period of time. $L_{eq}$ is used to describe sound levels that vary over time, resulting in a single decibel
value that takes into account the total sound energy over the defined period of time. For example, the \( L_{eq} \) measures noise at peak traffic hour when noise levels are expected to be the highest.

- \( L_{dn} \) – “Day-night equivalent level”: an average of “day” and “night” sound. \( L_{dn} \) is an \( L_{eq} \) sound level, measured over a 24-hour period, with a 10 dBA penalty added to nighttime levels to account for a listener’s heightened noise sensitivity. \( L_{dn} \) is typically used in areas where sleep takes place, such as residences, hotels, and hospitals.

2. **Legal and Regulatory Framework**

The assessment of potential impacts for noise and vibration followed the FTA Guidance Manual. The local thresholds for noise within the D-O LRT Corridor are defined in the text of the relevant sections of the applicable noise ordinances for the Town of Chapel Hill and the City of Durham:


2.1 **FTA Guidance Manual**

The FTA Guidance Manual provides the steps in defining noise and vibration impacts for transit projects. The Manual’s impacts and mitigation sections are referenced throughout this technical appendix.

2.2 **Municipal Noise Ordinances**

The information below represents a summary of the noise ordinances for the Town of Chapel Hill and City of Durham. As such, sections of the ordinances that are not applicable are not included. The Chapel Hill noise ordinance is intended to prevent nuisance noises and applies to the behaviors of individuals or groups of persons. Government operations and infrastructure maintenance services are exempted from regulation. Similarly, the City of Durham noise ordinance does not apply to municipal, state, or federally authorized projects. As a result, the proposed D-O LRT project is exempt from the respective noise ordinances.

2.2.1 **Town of Chapel Hill Noise Ordinance**

Chapel Hill Noise Ordinance¹

No person or group of persons shall operate or cause to be operated any source of sound in such a manner as to create a root mean square steady state sound level that exceeds the limits set forth in Table 1 and 2 (See Ref. 1) when measured at any point on the boundary planes of the property line from which the sound originates or beyond.

<table>
<thead>
<tr>
<th>Primary Use Category</th>
<th>Daytime (7AM-11PM)</th>
<th>Nighttime (11PM-7AM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>50 dBA</td>
<td>45 dBA</td>
</tr>
<tr>
<td>Business, Office, Commercial,</td>
<td>65 dBA</td>
<td>55 dBA</td>
</tr>
<tr>
<td>Institutional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shopping Center, Thoroughfare,</td>
<td>70 dBA</td>
<td>65 dBA</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Chapel Hill, North Carolina Code of Ordinances, Sec. 11-37 through 11-43.
Exceptions include, among others, all noises from operations of motor vehicles properly operated, construction operations from 7:00 a.m. to 9:00 p.m. on weekdays and 8:00 a.m. to 9:00 p.m. on weekends.

2.2.2 City of Durham Noise Ordinance

City of Durham Noise Ordinance

Sec. 26-23. – Generally

a. Subject to the provisions of this section, it shall be unlawful for any person or persons to make, permit, continue, or cause to be made or to create any unreasonably loud and disturbing noise in the city. For purposes of this section, the following definitions shall apply:

1) Unreasonably loud: Noise which is substantially incompatible with the time and location where created to the extent that it creates an actual or eminent interference with peace or good order.

2) Disturbing: Noise which is perceived by a person of ordinary sensibilities as interrupting the normal peace and calm of the area. In determining where a noise is unreasonably loud or disturbing, the following factors incident to such noise are to be considered: Time of day; proximity to residential structures; whether the noise is recurrent, intermittent, or constant; the volume and intensity; whether the noise has been enhanced in volume or range by any type of electronic or mechanical means; the character of the zoning of the area; whether the noise is related to the normal operation of a business or other labor activity; whether the noise is subject to being controlled without unreasonable effort or expense to the creator thereof.

d. Particular Standards Established

1) No person shall cause, produce, or allow any mechanically or electronically produced or amplified sound that: (i) exceeds the levels set out in subsection (d) of this section as such sound is measured at any point beyond the boundary of the property from which the sound emanates, and (ii) is not authorized by a permit issued pursuant to the City Code or state or federal authority;

2) No nighttime (11:00 p.m. – 8:00 a.m.) sound level shall exceed 50 dBA;

3) No daytime or evening (after 8:00 a.m. – before 11:00 p.m.) sound level shall exceed 60 dBA.

e. Applicable Exemptions

The following sounds shall be exempt from the provisions of this section: (5) Sounds emanating from a motor vehicle, or lawnmower or agricultural equipment operated between the hours of 7:00 a.m. and 9:00 p.m. when the vehicle or equipment is properly equipped with the manufacturer’s or other authorized standard muffler and sound reduction equipment and in use under proper operating conditions.

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3. Noise Impact Methodology

The FTA Guidance Manual describes the general process for assessing the potential effects of transit noise and vibration. This process involves three levels of assessment, which are described in more detail below.

- **Screening** – involves locating the alternatives within the D-O LRT Corridor and identifying any sensitive receptors along the D-O LRT Corridor.

- **General assessment** – identifies the existing ambient noise or vibration levels, the sensitive receptors, and the projected noise and vibration levels for each of the Light Rail Alternatives under consideration. The general assessment then estimates the anticipated impacts by comparing the existing levels to projected levels, and comparing projected levels and the allowable thresholds described in the FTA Guidance Manual. The thresholds vary by category for each type of sensitive receptor.

- **Detailed analysis** - identifies advanced design and operational details, such as the effects of track curve radii on noise levels and the location of special track work and geotechnical data on vibration levels. The FTA Guidance Manual provides details on how to incorporate design and operational details into overall project level assessments.

3.1 Noise Screening

**Identify representative noise-sensitive receptors** near Light Rail Alternative elements that would potentially be adversely affected by operating light rail.

- Consistent with FTA guidance, the following geographic areas were examined for the presence of noise-sensitive receptors:
  - 350 feet from the center of the proposed track and station location alternatives
  - 225 feet from the center of the proposed park-and-ride alternatives
  - 1,000 feet from the center of the five proposed ROMF alternatives

- If intervening buildings exist between the source (the proposed light rail) and the receptor (building or land use), the following geographic areas were examined:
  - 175 feet from the center of the proposed track and station location alternatives
  - 150 feet from the center of the proposed park-and-ride alternatives
  - 650 feet from the center of the five proposed ROMF alternatives

Maps, photographs, and field studies were used to identify noise-sensitive land uses within the appropriate screening distances.

3.2 Noise General Assessment

After noise-sensitive land uses were identified, receptor sites were established to judge the noise- and vibration-related impact that the Light Rail Alternatives might have. The following process was followed:

- **Measure existing noise levels** at each representative noise-sensitive receptor location.

- **Estimate the anticipated future transit-related noise** exposure levels at each receptor location and compare with FTA impact criteria.

- **Assess the noise impacts** by comparing the estimated levels to the applicable FTA impact thresholds.
Identify reasonable and feasible design refinements that would reduce project-related noise and incorporate them into the project.

As part of the assessment, two types of noise impacts were evaluated:

- **Airborne Noise** is noise transmitted through the air.
- **Ground-borne noise** is noise transmitted through the ground.

### 3.2.1 Noise Impact Criteria

To assess the effects of transit noise in the General Assessment, the FTA Guidance Manual provides criteria for assessing noise impacts, shown on Figure 3 and Table 2. These criteria are based on a comparison of the existing noise levels to future noise levels that would be anticipated to be associated with the Light Rail Alternatives. The criteria are defined by two curves, designating different levels of project noise — (1) no impact, (2) impact, and (3) severe impact conditions.

The basis of noise impact criteria is the percentage of people who would be highly annoyed by measured noise levels in their living environment. As a result, the criteria reflect a range of annoyance associated with different human activities that occur in areas such as homes, businesses, and parks.

It should be noted that historically significant sites and parklands may be evaluated based on their use and setting. For more information on these special cases, see the FTA Guidance Manual.

**Figure 3: FTA Noise Impact Criteria**

![FTA Noise Impact Criteria](image_url)
### Table 2: Noise Levels Defining Impact for Transit Projects

<table>
<thead>
<tr>
<th>Existing Ambient Noise Level $L_{eq}$ or $L_{dn}$ (dBA)</th>
<th>Project Noise Impact Levels $L_{eq}$ or $L_{dn}$ (dBA)</th>
<th>Category 1 or 2 Sites</th>
<th>Category 3 Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Impact</td>
<td>Moderate Impact</td>
<td>Severe Impact</td>
</tr>
<tr>
<td>&lt;43</td>
<td>&lt;(Amb.+10)</td>
<td>Ambient + 10 to 15</td>
<td>&gt;(Amb.+15)</td>
</tr>
<tr>
<td>43</td>
<td>&lt;52</td>
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<tr>
<td>&gt;77</td>
<td>&lt;66</td>
<td>66-75</td>
<td>&gt;75</td>
</tr>
</tbody>
</table>

Note: $L_{dn}$ is used for land uses where nighttime sensitivity is a factor and $L_{eq}$ during the noisiest transit-related hour is used for land use involving only daytime activities. Source: FTA Guidance Manual.
The noise criteria and descriptors used in an impact analysis depend on whether the land use is designated within one of the following three categories of noise-sensitive land use:

- **Category 1**: This category includes buildings and parks where quiet is an essential element in their intended purpose. Land uses include open space set aside for serenity and quiet (e.g., wilderness areas) and areas for outdoor concert pavilions.

- **Category 2**: This category includes residences and buildings where people normally sleep. Land uses include homes, hospitals, nursing homes, and hotels where nighttime sensitivity to noise is assumed to be of utmost importance.

- **Category 3**: This category includes institutional land uses with primary daytime and evening use. Land uses include schools, libraries, places of worship, museums, historically significant sites, and active parks where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. For Category 3 uses, however, the entire use may not be designated as a sensitive receptor; rather, only those areas typically used for quiet activities are designated as sensitive receptor areas. Buildings with interior spaces where quiet is important, such as medical offices and conference rooms, recording studios, and concert halls, are also included in this category.

The criteria do not apply to most commercial and industrial uses because these activities generally are compatible with higher noise levels. They do apply to business uses that depend on quiet as an important part of operations, such as sound and motion picture recording studios.

### 3.3 Detailed Noise Assessment

In accordance with the FTA Guidance Manual, a detailed noise analysis is required for new fixed rail transit projects. This analysis utilizes the best available project details including engineering design and operational details, such as hourly operational schedules during day and night, speed profiles, plan and profiles of guideway, and location of grade crossings, curved track data, horn and bell inputs, and size and facilities of park-and-rides and ROMF.

#### 3.3.1 Assumptions of Future Transit Noise Levels for the Light Rail Alternatives

The future transit noise levels that would be associated with the Light Rail Alternatives were computed by using conservative estimates of noise levels that would likely be generated from light rail operations, ROMF, connecting feeder bus service, and park-and-rides.

#### 3.3.1.1 Light Rail Alternative Operations

Table 3 lists the assumptions that would be associated with light rail operations.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Source</td>
<td>Line</td>
</tr>
<tr>
<td>Source Exposure Level (SEL) at 50 feet</td>
<td>75 dBA</td>
</tr>
<tr>
<td>Alignment</td>
<td>At-grade and elevated</td>
</tr>
<tr>
<td>Track</td>
<td>Continuous welded rail on ballast</td>
</tr>
</tbody>
</table>
## Noise and Vibration Technical Report

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Rail Operations (Headways)</td>
<td></td>
</tr>
<tr>
<td>5:30 am – 9:00 am</td>
<td>10 minute</td>
</tr>
<tr>
<td>9:00 am – 3:30 pm</td>
<td>20 minute</td>
</tr>
<tr>
<td>3:30 pm – 7:00 pm</td>
<td>10 minute</td>
</tr>
<tr>
<td>7:00 pm – 12:00 am</td>
<td>20 minute</td>
</tr>
<tr>
<td>Light Rail Daytime Hourly Volumes (7:00 am-10:00 pm)</td>
<td>8.2 Trains (both directions)</td>
</tr>
<tr>
<td>Light Rail Nighttime Hourly Volumes (10:00 pm – 7:00 am)</td>
<td>3.3 Trains (both directions)</td>
</tr>
<tr>
<td>Number of Cars per Train</td>
<td>1-2</td>
</tr>
<tr>
<td>Length of Train</td>
<td>180 feet</td>
</tr>
<tr>
<td>Hours of Operation</td>
<td>5:30 am – 12:00 am (Monday – Saturday)</td>
</tr>
<tr>
<td></td>
<td>6:30 am – 12:00 am (Sunday)</td>
</tr>
<tr>
<td>Nominal Speed Maximum Speed</td>
<td>10-55 mph depending on location</td>
</tr>
<tr>
<td></td>
<td>55 mph</td>
</tr>
<tr>
<td>Embedded Track (University Drive, Erwin Road, and Pettigrew Street)</td>
<td>+3 dBA</td>
</tr>
<tr>
<td>Aerial Structure</td>
<td>+4 dBA</td>
</tr>
<tr>
<td>ROMF SEL at 50 feet</td>
<td>111 dBA</td>
</tr>
<tr>
<td>Light Rail Bells at 50 feet entering stations</td>
<td>80 dBA</td>
</tr>
<tr>
<td>Light Rail Bells at 50 feet - unprotected at-grade crossings</td>
<td>80 dBA</td>
</tr>
<tr>
<td>Crossover Switches SEL at 50 feet</td>
<td>100 dBA</td>
</tr>
<tr>
<td>TPSS SEL at 50 feet</td>
<td>99 dBA</td>
</tr>
<tr>
<td>Light Rail Horns</td>
<td>For Emergency Use Only</td>
</tr>
<tr>
<td>Rail Curves (Wheel Squeal)</td>
<td>136 dBA</td>
</tr>
<tr>
<td>Bus Source Exposure Level (SEL) at 50 feet</td>
<td>82 dBA</td>
</tr>
</tbody>
</table>

Source: URS May 2015

Notes:  
* SEL levels provided by URS representing project specifications.

**Resilient/damped wheels are incorporated into project design to reduce wheel squeal noise 10-20 decibels.**

The projected noise levels are based on operations of revenue trains on well-maintained, standard at-grade and elevated track. Noise from light rail wheel squeal on tight curve radii can result in high levels of noise. While evaluated in the noise analysis, vehicle specifications will include damped or resilient wheels, which attaches a vibration absorbing rubber flange to the wheels, significantly reducing or eliminating wheel squeal noise.

Special trackwork with gaps in the rail (e.g., track switches) can generate higher noise levels than those created by trains running on standard track. The relationship between standard track noise and switch noise levels depends on several factors such as train speed, type of switch, and distance from the gap in the rail at the “switch frog” (special trackwork that allows the trains to switch tracks). Less than 100 feet from the rail gap, the switch noise is almost always greater than the standard track noise by as much as 6 to 10 dBA. Consequently, it is important to locate switches in areas that are not particularly noise sensitive.

Light rail transit systems typically use bells before entering station areas to warn motorists and pedestrians of the oncoming train. Light rail bells would be sounded approximately 100 feet prior to...
entering stations. Horns are sometimes used at grade crossings to warn motorists and pedestrians. Triangle Transit does not propose to use horns on the D-O LRT as regular operating procedures. Horns would only be used in emergencies. Therefore, noise from horns is not included in this analysis.

3.3.1.2 ROMF Alternatives

Regardless of the alternative selected, the ROMF would include a TPSS, a cleaning platform with vehicle car wash, a wheel truing area, maintenance building and storage tracks. Noises from all sources were evaluated together at the center of activity, as required in the FTA Guidance Manual.

3.3.1.3 Connecting Feeder Bus Service and Park-and-Rides

Noise from light rail stations is generally related to those stations with park-and-ride lots. Table 4 lists the proposed stations with park-and-ride and associated bus operations.

Eight stations (Hamilton Rd., Meadowmont Lane, Patterson Place, LaSalle Street, Duke/VA Medical Centers: Duke Eye Center, Duke/VA Medical Centers: Trent/Flowers Drive, Ninth Street, and Buchanan Boulevard) have bus pull in driveways that accommodate between one and two buses in each direction. Based on the proposed bus operations plans, average headways were assumed to be 15 minutes in the peak period. These bus operations are evaluated in the detailed analysis.

Table 4: Light Rail Stations with Park-and-Ride Lots

<table>
<thead>
<tr>
<th>Stations</th>
<th>Park-and-Ride Spaces</th>
<th>Buses/Hour*</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNC Hospitals Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Mason Farm Road Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Hamilton Road Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Friday Center Drive Station (C1/C1A)</td>
<td>860 Existing Spaces</td>
<td>2/1</td>
</tr>
<tr>
<td>Friday Center Drive Station (C2)</td>
<td>860 Existing Spaces</td>
<td>2/1</td>
</tr>
<tr>
<td>Friday Center Drive Station (C2A)</td>
<td>860 Existing Spaces</td>
<td>2/1</td>
</tr>
<tr>
<td>Meadowmont Lane Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Woodmont Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Leigh Village Station</td>
<td>900 Spaces</td>
<td>14/8</td>
</tr>
<tr>
<td>Gateway Station</td>
<td>300 Spaces</td>
<td>17/8</td>
</tr>
<tr>
<td>Patterson Place Station (NHC 1/NHC 2)</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Patterson Place Station (NHC LPA)</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Martin Luther King Jr. Parkway Station (NHC 1)</td>
<td>500 Spaces</td>
<td>10/5</td>
</tr>
<tr>
<td>Martin Luther King Jr. Parkway Station (NHC 2/NHC LPA)</td>
<td>500 Spaces</td>
<td>10/5</td>
</tr>
<tr>
<td>South Square Station</td>
<td>250 Spaces</td>
<td>8/4</td>
</tr>
<tr>
<td>LaSalle Street Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Duke/VA Medical Centers Station (Duke Eye Center)</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Duke/VA Medical Centers Station (Trent Drive)</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Ninth Street Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Buchanan Boulevard Station</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Durham Station</td>
<td>150 Spaces</td>
<td>4/2</td>
</tr>
<tr>
<td>Dillard Street Station</td>
<td>1,000 Spaces</td>
<td>4/2</td>
</tr>
<tr>
<td>Alston Avenue Station</td>
<td>978 Spaces</td>
<td>10/7</td>
</tr>
</tbody>
</table>

Source: URS March 2015.
3.3.2 Detailed Noise Assessment Methodology

Noise impacts are identified by comparing the ambient noise levels and the predicted noise level. This process defines the level of noise impact (no impact, moderate impact, or severe impact) for each classification of land use.

As discussed in the previous section, noise associated with the Light Rail Alternatives would likely be generated from the operation of light rail, bells, crossover switches, TPSSs, park-and-ride lots, and ROMFs. The following methodology, in accordance with the FTA Guidance Manual, was used to predict project noise levels at sensitive land uses:

$L_{eq}$ and $L_{dn}$ noise levels from fixed guideway sources (light rail cars) and stationary sources (ROMF, park-and-ride lots, TPSS, switches, and bells) are calculated at 50 feet, using the following equations:

**(a) Hourly $L_{eq}$ at 50 feet for light rail vehicles:**

$$L_{eq}(h) = SEL_{ref} + 10 \log (N_{cars}) + 20 \log(S/50) + 10 \log (V) -35.6$$

Where:

- $SEL_{ref}$ light rail = 75 dBA
- $N_{cars}$ = number cars per train
- $V$ = average hourly volume of traffic, in trains per hour
- $S$ = Vehicle speed

Use the following adjustments as applicable

+3 for embedded track on grade

+4 for aerial structure with slab track

**(b) Hourly $L_{eq}$ at 50 feet for ROMF**

$$L_{eq}(h) = SEL_{ref} + 10 \log (N_{T}/20) -35.6$$

where:

- $SEL_{ref}$ = 118 dBA for ROMF
- $N_{T}$ = number of trains/hour entering the facility

**(c) Hourly $L_{eq}$ at 50 feet for light rail warning bells:**

- Daytime Leq at 50 feet: $Leq$ (day) = $Leq(h)$ using $V_d$ as $V$
- Nighttime Leq at 50 feet: $Leq$ (night) = $Leq(h)$ using $V_n$ as $V$

$$L_{dn} at 50 feet : L_{dn} = 10 \log [(15) * 10^{(Leq(day)/10)} + (9) * 10^{(Leq(night)+10/10)}] -13.8$$

where:

- $S$ = train speed, in miles per hour
- $V$ = average hourly volume of traffic, in trains per hour
- $V_d$ = average hourly daytime volume of traffic, in trains per hour
= number of trains 7AM to 10PM /15 (both directions)

\( V_n \) = average hourly nighttime volume of traffic, in trains per hour

= number of trains 10PM to 7AM /9 (both directions)

\( \text{SEL}_{\text{ref}} \) = 80 dBA for all light rail bells

(d) Hourly \( L_{eq} \) at 50 feet for Park and Ride Lots:

\[ L_{eq}(h) = \text{SEL}_{\text{ref}} + 10 \log \left( \frac{N_a}{2000} + \frac{N_b}{24} \right) - 35.6 \]

where:

\( \text{SEL}_{\text{ref}} \) = 101 dBA

\( N_a \) = Number of cars/hour (Assumed to be total lot capacity/2)

\( N_b \) = Number of buses/hour (Peak hour)

(e) Hourly \( L_{eq} \) at 50 feet for Crossover Switches Wheel Squeal and TPSS:

\[ L_{eq}(h) = \text{SEL}_{\text{ref}} + 10 \log (N) + 10 \log \left( \frac{E}{3600} \right) - 35.6 \]

where:

\( \text{SEL}_{\text{ref}} \) Crossover Switches = 100 dBA

\( \text{SEL}_{\text{ref}} \) TPSS = 99 dBA

\( \text{SEL}_{\text{ref}} \) Wheel Squeal = 136 dBA

\( N \) = Number of light rail trains per hour

\( E \) = Duration of event pass by in seconds

(f) Hourly \( L_{eq} \) at 50 feet for diesel buses:

\[ L_{eq}(h) = \text{SEL}_{\text{ref}} + 10 \log (V) + C_s \log \left( \frac{S}{50} \right) - 35.6 \]

Where:

\( \text{SEL}_{\text{ref}} \) diesel buses = 82 dBA

Volume = peak buses/hour = 8 daytime and 4 nighttime

\( C_s = 15 \)

3.3.2.1 Adjustment for Propagation and Attenuation Characteristics

Once estimates of noise exposure at 50 feet from each source have been determined, then propagation and attenuation characteristics must be taken into account to compute the noise exposure at the receivers of interest, using the following equations:

For fixed guideway sources (light rail):

\[ L_{dn} \text{ or } L_{eq} = (L_{eq} \text{ or } L_{dn} @ 50 \text{ feet}) - 10 \left( \log \left( \frac{D}{50} \right) \right) - \left( 10 \times G \right) \left( \log \left( \frac{D}{42} \right) \right) - A_{\text{shielding}} \]

For fixed guideway sources (light rail bells):

\[ L_{dn} \text{ or } L_{eq} = (L_{eq} \text{ or } L_{dn} @ 50 \text{ feet}) - 10 \left( \log \left( \frac{D}{50} \right) \right) - \left( 10 \times G \right) \left( \log \left( \frac{D}{29} \right) \right) - A_{\text{shielding}} \]
For stationary sources:
\[ L_{\text{dn}} \text{ or } L_{\text{eq}} = (L_{\text{eq}} \text{ or } L_{\text{dn}} @ 50 \text{ feet}) - 20 \times \log(D/50) - \left(10 \times G\right) \times \log(D/50) - A_{\text{shielding}} \]
where:
\[ D = \text{Distance from source to receiver} \]
\[ G = \text{Ground Factor (hard ground = 0; soft ground = 0.66)} \]

3.3.2.2 Combination of all sources of Ldn or Leq

Once the noise level of each noise source has been determined at 50 feet, and has been adjusted for distance to the receivers, ground attenuation, and shielding, the noise sources are combined using the following equations:

Total \( L_{\text{eq}} \) from all sources combined for the hour of interest:
\[ L_{\text{eq (total)}} = 10 \log \left( \sum 10^{L_{\text{eq (all sources)}}/10} \right) \]

Total \( L_{\text{dn}} \) from all sources combined:
\[ L_{\text{dn (total)}} = 10 \log \left( \sum 10^{L_{\text{dn (all sources)}}/10} \right) \]

4. Ground-Borne Noise and Vibration Methodology

4.1 Definition of Ground-Borne Noise and Vibration

Vibration is the transfer of energy resulting from the motion of a mechanical system.

- **Ground-borne vibration** – vibration that is transmitted through the earth that can be perceived.
- **Ground-borne noise** – although not directly a type of vibration, ground-borne noise is the low-pitched, rumbling noise that can result from ground-borne vibration.

"Ground-borne vibration" is the transmission of energy through the earth. It is also quantified using a decibel unit of measure. However, noise and vibration decibels are unrelated. Ground-borne vibration, if strong enough to be perceptible, is sensed as motion of the floors or walls inside a building. The low-pitched, rumbling noise that can result from ground-borne vibration is called "ground-borne noise" and can only occur inside a building. Vibration-sensitive receptors include buildings in which vibration could be perceived by occupants or equipment.

4.1.1 Definition of Transit Ground-Borne Noise and Vibration

In its guidance manual, the FTA establishes criteria for assessing vibration impacts related to light rail transit projects. The extent of ground-borne noise and vibration from light rail operations depends substantially on local geology and structural details of associated buildings. When light rail vehicle (LRV) speeds are moderate (less than 30 miles per hour [mph]), vibration impacts are usually limited to buildings within 50 feet of light rail. When LRV speeds are higher, the zone of ground-borne noise and vibration impacts may extend farther. A significant proportion of complaints about both ground-borne vibration and noise can be attributed to the proximity of track switches where LRVs can cross from one track to another, rough or corrugated track, or wheel flats.

The criteria are based on community reaction to transit-related vibration and the potential for adverse effects on vibration-sensitive activities and processes. The criteria identify intensities of ground-borne
vibration and noise that may be considered significant and would thus require Triangle Transit to consider ways of abating and mitigating the impact.

Transit systems can sometimes create ground-borne noise and vibration impacts. In contrast to airborne noise, ground-borne vibration is not a common environmental issue.

Ground-borne noise impacts usually occur for subway (underground) transit operations or in situations where the affected building is specially designed and constructed to be isolated from the exterior ambient noise environment such as a concert hall or recording studio.

The vertical motion due to ground-borne vibration is described in terms of vibration velocity levels, measured in vibration decibels (VdB). The threshold of human perception for vibration is on the order of 60 to 70 VdB. Ground-borne noise, the noise within a building produced by external vibration, is measured in dBA.

The effects of various levels of ground-borne vibration differ among vibration-sensitive activities. The land uses that are most sensitive to vibration include those that conduct precision research and manufacturing, hospitals with highly sensitive equipment, and university research operations. Residential land uses and buildings where people sleep, like hotels and hospitals, are also a concern, more than schools and other institutions.

4.2 Vibration Screening

Identify representative vibration-sensitive receptors that would potentially be adversely affected by the operation of light rail.

Establish screening distances based on the FTA Guidance Manual (widths vary by FTA-defined land use categories).

- Residential land uses - 150 feet on either side of the Light Rail Alternatives.
- Institutional land uses - 100 feet on either side of the Light Rail Alternatives.
- Special uses, such as concert halls and recording studios, which may be particularly sensitive to vibration - 450 feet on each side of the Light Rail Alternatives.

Maps, photographs, and field studies were used to identify noise-sensitive land uses within the appropriate screening distances.

4.3 General Vibration Assessment

- Estimate the anticipated future project-related vibration levels at each receptor using generalized ground-borne vibration curves provided in the FTA Guidance Manual.
- Assess the vibration impacts by comparing the estimated vibration levels to applicable FTA criteria to identify areas of impact.
- Identify the possible refinements (mitigation) that would dampen project-related vibration.

As part of the assessment, two types of noise impacts were evaluated:

- Ground-borne vibration – vibration that is transmitted through the earth that can be perceived (Figure 4).
- Ground-borne noise – although not directly a type of vibration, ground-borne noise is the low-pitched, rumbling noise that can result from ground-borne vibration.
Figure 5 illustrates typical ground-borne vibration levels for common sources as well as criteria for human and structural responses to ground-borne vibration. As shown, the range of interest is approximately 50 to 100 VdB, from imperceptible background vibration to the threshold of damage. Although the approximate threshold of human perception to vibration is 65 VdB, annoyance is usually not significant unless the vibration exceeds 70 VdB.

**Figure 5: Typical Levels of Ground-Borne Vibration**

<table>
<thead>
<tr>
<th>Human/Structural Response</th>
<th>Velocity Level*</th>
<th>Typical Sources (50 ft from source)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold, minor cosmetic damage</td>
<td>50</td>
<td>Blasting from construction projects</td>
</tr>
<tr>
<td>Difficulty with tasks such as reading a VOT screen</td>
<td>90</td>
<td>Bulldozers and other heavy tracked construction equipment</td>
</tr>
<tr>
<td>Residential annoyance, infrequent events (e.g., commuter rail)</td>
<td>60</td>
<td>Commuter rail, upper range</td>
</tr>
<tr>
<td>Residential annoyance, frequent events (e.g., rapid transit)</td>
<td>70</td>
<td>Rapid transit, upper range</td>
</tr>
<tr>
<td>Limit to vibration sensitive equipment. Approx. threshold for human perception of vibration</td>
<td>60</td>
<td>Commuter rail, typical</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>Bus or truck over bump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rapid transit, typical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bus or truck, typical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Typical background vibration</td>
</tr>
</tbody>
</table>

* RMS Vibration Velocity Level in VdB relative to 10^-6 inches/second
4.3.1 Ground-borne Noise and Vibration Criteria

In its guidance manual, FTA developed criteria for assessing vibration impacts related to light rail projects. The criteria are based on community reaction to transit-related vibration and the potential for adverse effects on vibration-sensitive activities and processes. The criteria identify intensities of ground-borne vibration and noise that may be considered significant and, thus, require consideration of mitigation and abatement measures.

Table 5 contains the FTA criteria used for this project. Where vibration is intermittent (e.g., a transit train pass-by) human annoyance from ground vibration and noise is dependent on the number of vibration events that occur during a typical 24-hour period. The FTA Guidance Manual presents two categories of criteria for infrequent and frequent events, respectively. “Frequent events” is defined as more than 70 vibration events per day. The FTA impact criteria for “frequent events” are 65 VdB, 72 VdB, and 75 VdB for land use categories 1, 2, and 3, respectively. Land use categories 4, 5, and 6 are special cases that are defined in the FTA Guidance Manual, though rarely used. Land use categories are described in the following paragraph.

Table 5: Criteria for Human Annoyance Impact and Interference with use of Vibration-Sensitive Equipment

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Category Comment</th>
<th>Ground-borne Vibration (VdB re 1 micro in/sec)</th>
<th>Ground-borne Noise (dBA re 20 micro Pa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequent Infrequent Frequent Infrequent</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Low interior ambient is essential</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>Residential &amp; sleep</td>
<td>72</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>Institutional &amp; daytime</td>
<td>75</td>
<td>83</td>
</tr>
<tr>
<td>4</td>
<td>Concert hall, TV/Recording Studio **</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>Auditorium **</td>
<td>72</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>Theater **</td>
<td>72</td>
<td>80</td>
</tr>
</tbody>
</table>


Notes:  
* Frequent is defined as greater than or equal to 70 events per day.
** See section 12.2.2 of FTA Guidance Manual regarding the potential for structural damage to fragile structures if operational during transit events.

As shown in Table 5, some land use activities are more sensitive to vibration than others. For example, certain research and fabrication facilities, television and recording studios, and concert halls are more vibration-sensitive than residences and buildings where people normally sleep, which are more sensitive than institutional land uses with primarily daytime use. At those locations where vibration-sensitive equipment is used, such as hospital and medical facilities and high tech manufacturing and testing sites, there may be the potential for additional or more severe ground vibration impacts from transit operations. The FTA assigns sensitive land uses to the following three categories:

- **Vibration Category 1: High Sensitivity** - Buildings where low ambient vibration is essential for the interior operations in the building. Vibration levels may be below the level of human perception.
Vibration Category 2: Residential - Residences and buildings where people normally sleep. This includes private dwellings, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance. It also includes some special uses such as auditoriums or theaters.

Vibration Category 3: Institutional - Land uses with primarily daytime use including schools, churches, other institutions and quiet offices that do not have vibration-sensitive equipment.

It is extremely rare for vibration from train operations to cause any sort of building damage, even minor cosmetic damage. For historic structures that are very close to the right-of-way, the FTA Guidance Manual provides Vibration Damage Criteria (FTA Guidance Manual Table 12-3) of approximately 90 VdB.

5. Affected Environment

5.1 Existing Noise Conditions in the D-O Corridor

The project corridor currently experiences high levels of existing noise typical of suburban and downtown regions. In accordance with the FTA Guidance Manual, a noise screening procedure should be conducted to determine the area of analysis (area of potential effect) based on established distances from transit facilities. Once the area of analysis is determined, individual land uses that are sensitive to noise are targeted for impact analysis.

5.1.1 Noise Screening Procedure

A noise screening procedure was conducted to identify noise-sensitive areas within 350 feet of the centerline of the proposed light rail tracks or from the center of each proposed station, 225 feet from the center of the proposed park-and-ride lots, and within 1,000 feet of the proposed ROMF locations. If intervening buildings existed between the source and the receptor, then a screening distance of 175 feet was used for the light rail tracks and stations, 150 feet from the park-and-ride lots, or 650 feet for the yard and shop locations, as required. Maps, photographs, and field studies were used to identify noise-sensitive land uses within the appropriate screening distances. Sensitive receptors include residences, university buildings and other schools, hospitals, medical facilities, churches, hotels, parks, and golf courses. Tables 6 and 7 identify each noise-sensitive area, the alignment tracking, the applicable FTA noise category of land use, and the distance of the sensitive areas to each noise source. Table 6 lists receptors near the light rail tracks, stations, and park-and-ride lots, and Table 7 lists receptors near ROMFs. Multiple similar land uses that are approximately the same distance from the project have been grouped together. Where two alignment alternatives run close to the same receptor, with different distances, both distances are provided.

Refer to Figures 6 through 20 for the locations of each receptor.

Table 6: Noise-Sensitive Receptors (Light Rail Tracks and Stations with or without Park-and-Ride Lots)

<table>
<thead>
<tr>
<th>Site # (Figure Reference)</th>
<th>Alignment Alternative</th>
<th>Name/Locations of Receptor Sites</th>
<th>Light Rail Station Proximity</th>
<th>FTA Noise Category (Land Use)</th>
<th>Distance from Receptor to Light Rail Tracks (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 1</td>
<td>UNC Hospitals</td>
<td>2</td>
<td>200*</td>
</tr>
<tr>
<td>Site # (Figure Reference)</td>
<td>Alignment Alternative</td>
<td>Name/Location of Receptor Sites</td>
<td>Light Rail Station Proximity</td>
<td>FTA Noise Category (Land Use)</td>
<td>Distance from Receptor to Light Rail Tracks (feet)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
<td>---------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 2</td>
<td>UNC Hospitals</td>
<td>2</td>
<td>55*</td>
</tr>
<tr>
<td>3</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 3</td>
<td>UNC Hospitals</td>
<td>2</td>
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<tr>
<td>4</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 4</td>
<td>UNC Hospitals</td>
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</tr>
<tr>
<td>5</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 5</td>
<td>UNC Hospitals</td>
<td>2</td>
<td>40*</td>
</tr>
<tr>
<td>6</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 6</td>
<td>UNC Hospitals</td>
<td>2</td>
<td>130*</td>
</tr>
<tr>
<td>7</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 7</td>
<td>UNC Hospitals</td>
<td>2</td>
<td>10*</td>
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<tr>
<td>8</td>
<td>LRA</td>
<td>Branson Street &amp; Hibbard Drive 8</td>
<td>UNC Hospitals</td>
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<td>20*</td>
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<tr>
<td>9</td>
<td>LRA</td>
<td>Mason Farm Road North 1</td>
<td>UNC Hospitals</td>
<td>2</td>
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<tr>
<td>10</td>
<td>LRA</td>
<td>UNC Business School</td>
<td>UNC Hospitals</td>
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<td>LRA</td>
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<td>Batty Hill Drive</td>
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<tr>
<td>16</td>
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<td>East of Fordham Road</td>
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<tr>
<td>17</td>
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<td>Carmichael Street</td>
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<td>LRA</td>
<td>NC Botanical Gardens North Trails – Coker Pinetum</td>
<td>Mason Farm</td>
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<td>20*</td>
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<td>Finley Golf Course T Boxes</td>
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<td>24</td>
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<td>Meadowmont Lane East</td>
<td>Friday Center</td>
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<td>180*</td>
</tr>
<tr>
<td>25</td>
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<td>Meadowmont</td>
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<td>230</td>
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<td>Meadowmont</td>
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<td>27</td>
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<td>Leigh Village</td>
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<td>Iron Mountain Road</td>
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<td>2</td>
<td>65/210</td>
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<td>Iron Mountain Road</td>
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<td>28</td>
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<tr>
<td>Site # (Figure Reference)</td>
<td>Alignment Alternative</td>
<td>Name/Location of Receptor Sites</td>
<td>Light Rail Station Proximity</td>
<td>FTA Noise Category (Land Use)</td>
<td>Distance from Receptor to Light Rail Tracks (feet)</td>
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<td>49</td>
<td>LRA</td>
<td>Old Coach Road Leigh Village</td>
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<td>LRA</td>
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<td>LRA</td>
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<td>55</td>
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<tr>
<td>56</td>
<td>NHC 1, NHC 2</td>
<td>Northcreek Drive 1 Patterson Place</td>
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<tr>
<td>58</td>
<td>NHC 1</td>
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<tr>
<td>59</td>
<td>NHC 1</td>
<td>Lychan Parkway Martin Luther King Jr. Parkway</td>
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<td>Site # (Figure Reference)</td>
<td>Alignment Alternative</td>
<td>Name/Location of Receptor Sites</td>
<td>Light Rail Station Proximity</td>
<td>FTA Noise Category (Land Use)</td>
<td>Distance from Receptor to Light Rail Tracks (feet)</td>
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<tr>
<td>60</td>
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<td>Melstone Turn</td>
<td>Martin Luther King Jr. Parkway</td>
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<tr>
<td>62</td>
<td>NHC LPA</td>
<td>North Sayward Drive</td>
<td>Patterson Place</td>
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</tr>
<tr>
<td>63</td>
<td>NHC LPA</td>
<td>South Sayward Drive</td>
<td>Patterson Place</td>
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</tr>
<tr>
<td>64</td>
<td>NHC LPA</td>
<td>Southwest Durham Drive 1</td>
<td>Patterson Place</td>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>65</td>
<td>NHC LPA</td>
<td>Hopedale Avenue</td>
<td>Patterson Place</td>
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<td>310</td>
</tr>
<tr>
<td>66</td>
<td>NHC LPA</td>
<td>Garrett Road</td>
<td>Patterson Place</td>
<td>2</td>
<td>250*</td>
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<tr>
<td>66A</td>
<td>NHC LPA</td>
<td>New Hope Creek Trails</td>
<td>Patterson Place</td>
<td>3</td>
<td>20*</td>
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<td>Snow Crest Trail 1</td>
<td>Martin Luther King Jr. Parkway</td>
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<td>50</td>
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<td>68</td>
<td>NHC LPA, NHC 2</td>
<td>Snow Crest Trail 2</td>
<td>Martin Luther King Jr. Parkway</td>
<td>2</td>
<td>70</td>
</tr>
<tr>
<td>69</td>
<td>NHC LPA, NHC 2</td>
<td>Snow Crest Trail 3</td>
<td>Martin Luther King Jr. Parkway</td>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>70</td>
<td>NHC LPA, NHC 2</td>
<td>Larchmont Road</td>
<td>Martin Luther King Jr. Parkway</td>
<td>2</td>
<td>70</td>
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<tr>
<td>71</td>
<td>LRA</td>
<td>Pickett Road South</td>
<td>South Square</td>
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<td>74</td>
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<td>75</td>
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<td>15/501 West</td>
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<td>76</td>
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<td>Golf Course Greens</td>
<td>South Square</td>
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</tr>
<tr>
<td>77</td>
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<td>VA Medical Center North</td>
<td>Duke/VA Medical Centers</td>
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<td>78</td>
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<td>Duke/VA Medical Centers</td>
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<tr>
<td>Site # (Figure Reference)</td>
<td>Alignment Alternative</td>
<td>Name/Location of Receptor Sites</td>
<td>Light Rail Station Proximity</td>
<td>FTA Noise Category (Land Use)</td>
<td>Distance from Receptor to Light Rail Tracks (feet)</td>
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<td>John Hope Franklin Center</td>
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<td>Duke/VA Medical Centers</td>
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<tr>
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<td>Duke/VA Medical Centers</td>
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<td>81</td>
<td>LRA</td>
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<td>LRA</td>
<td>Hilton Garden Inn</td>
<td>Ninth Street</td>
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<td>82</td>
<td>LRA</td>
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<td>Ninth Street</td>
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<td>LRA</td>
<td>Pettigrew Rehab Center</td>
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<tr>
<td>82B</td>
<td>LRA</td>
<td>W. Pettigrew Dialysis</td>
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<td>LRA</td>
<td>Hillcrest Convalescent Center</td>
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<td>83</td>
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<td>Duke Center Documentary Studies</td>
<td>Buchanan Boulevard</td>
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<td>Buchanan Boulevard</td>
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<td>86</td>
<td>LRA</td>
<td>S. Duke Street East Hotel /West Village Apts.</td>
<td>Durham</td>
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<tr>
<td>87</td>
<td>LRA</td>
<td>Old Bull Bldg Apartments</td>
<td>Durham</td>
<td></td>
<td>2</td>
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<td>87A</td>
<td>LRA</td>
<td>Durham Performing Arts</td>
<td>Durham</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>87B</td>
<td>LRT</td>
<td>Venable Center</td>
<td>Durham</td>
<td></td>
<td>3</td>
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<tr>
<td>88</td>
<td>LRA</td>
<td>Avery Boys &amp; Girls Club</td>
<td>Alston Avenue</td>
<td></td>
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<td>89</td>
<td>LRA</td>
<td>Colfax House 1</td>
<td>Alston Avenue</td>
<td></td>
<td>2</td>
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<td>90</td>
<td>LRA</td>
<td>Colfax House 2</td>
<td>Alston Avenue</td>
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<td>2</td>
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<td>91</td>
<td>LRA</td>
<td>Murphy Street House West</td>
<td>Alston Avenue</td>
<td></td>
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<td>92</td>
<td>LRA</td>
<td>Murphy Street House East</td>
<td>Alston Avenue</td>
<td></td>
<td>2</td>
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</tbody>
</table>

Source: URS, February 2015.

Note: * Distances measured horizontally to elevated light rail alignment. For receptors under elevated track, distances include vertical clearance.
## Table 7: Noise-Sensitive Receptors (ROMF)

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Alternative</th>
<th>Name/Location of Receptor Sites</th>
<th>Land Use Category</th>
<th>Distance to Receptors From Center of ROMF&lt;sup&gt;1&lt;/sup&gt; (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Farrington</td>
<td>Farrington Road</td>
<td>2</td>
<td>1200</td>
</tr>
<tr>
<td>44</td>
<td>Leigh Village</td>
<td>Farrington Road</td>
<td>2</td>
<td>1200</td>
</tr>
<tr>
<td>94</td>
<td>Farrington</td>
<td>Leigh Farm Homes</td>
<td>2</td>
<td>880</td>
</tr>
<tr>
<td>95</td>
<td>Leigh Village</td>
<td>Farrington Road Houses</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>96</td>
<td>Farrington</td>
<td>Farrington Road North 1</td>
<td>2</td>
<td>920/1200</td>
</tr>
<tr>
<td>97</td>
<td>Farrington</td>
<td>Farrington Road North</td>
<td>2</td>
<td>1080/1500</td>
</tr>
<tr>
<td>98</td>
<td>Patterson Place</td>
<td>North Creek Drive Apartments</td>
<td>2</td>
<td>640</td>
</tr>
<tr>
<td>99</td>
<td>Cornwallis</td>
<td>Maureen Joy Charter School</td>
<td>3</td>
<td>480</td>
</tr>
<tr>
<td>100</td>
<td>Cornwallis</td>
<td>Lerner Jewish Community School</td>
<td>3</td>
<td>400</td>
</tr>
<tr>
<td>101</td>
<td>Alston Avenue</td>
<td>W. Bacon Street</td>
<td>2</td>
<td>685</td>
</tr>
</tbody>
</table>

Source: URS May 2015

Notes: <sup>1</sup> Center of ROMF means equal distance between center of Maintenance Shop, Wash Building, and Paint Shop
Figure 6: Noise Impacts

Noise Impacts
DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT

Source: ESRI, NCDOT, CGIA, URS
Figure 7: Noise Impacts
Figure 8: Noise Impacts
Figure 9: Noise Impacts
Figure 10: Noise Impacts
Figure 11: Noise Impacts
Figure 12: Noise Impacts
Figure 13: Noise Impacts
Figure 14: Noise Impacts
Figure 15: Noise Impacts

Noise Impacts

DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT

Source: ESRI, NCDOT, CGIA, URS

Draft April 2015

No Noise Impact

Proposed Light Rail Alignment
Rail Operations and Maintenance Facility Alternatives
Parcels
County Boundary

Durham-Orange Light Rail Transit Project | July 24, 2015 | 35
Figure 16: Noise Impacts

Noise Impacts
DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT

Source: ESRI, NCDOT, CGIA, URS

Proposed Light Rail Alignment
Parcels
County Boundary

Draft
April 2015
Figure 17: Noise Impacts
Figure 18: Noise Impacts

Noise Impacts
DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT

Source: ESRI, NCDOT, CGIA, URS

Durham-Orange Light Rail Transit Project | July 24, 2015 | 38

K.24-45
Figure 19: Noise Impacts
Figure 20: Noise Impacts
5.1.2 Ambient Noise Conditions

Noise monitoring was conducted using a Larson Davis 820 Type I sound level meter. Ambient noise measurements, shown on figures provided in Appendix A, were performed at 24 representative locations near sensitive receptor areas in November 2013. In order to identify the best measurement locations, the corridor was reviewed relative to the location of each of the sensitive receptor areas identified in Tables 6 and 7. The sensitive receptor areas were then analyzed to determine where monitoring locations would represent similar noise characteristics among noise-sensitive receptor areas.

Monitoring was conducted for approximately 20 minute periods at each site during the morning peak hours (6:00 a.m. to 9:00 a.m.), midday (10:00 a.m. to 3:00 p.m.), evening peak hours (3:30 p.m. to 6:30 p.m.), and late night (10:00 p.m. to 2:00 a.m.) periods during the week. This was extrapolated to 1 hour for the $L_{eq}$ and to 24 hours for the $L_{dn}$ equivalents. For the computation of the $L_{dn}$, the lowest measurement from AM and PM measurements was used in order to ensure a conservative methodology. The monitored existing noise levels are shown in Table 8. Location maps for the monitoring sites are provided in Appendix A. Appendix B provides the noise monitoring field data sheets. Appendix C provides photos of each respective monitoring site.

Table 8: Monitored Existing Noise Levels (dBA)

<table>
<thead>
<tr>
<th>Monitoring Sites</th>
<th>Peak Hour ($L_{eq}$)</th>
<th>$L_{dn}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM</td>
<td>Midday</td>
</tr>
<tr>
<td>M1A. N. Mason Farm Road &amp; Hibbard Drive</td>
<td>46</td>
<td>63</td>
</tr>
<tr>
<td>M2. N. Mason Farm Road</td>
<td>53</td>
<td>45</td>
</tr>
<tr>
<td>M3. Woodbine Drive &amp; Manning Drive</td>
<td>74</td>
<td>73</td>
</tr>
<tr>
<td>M4. Glenwood Elementary School</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>M5. Finley Golf 17th Hole T Box</td>
<td>53</td>
<td>62</td>
</tr>
<tr>
<td>M6. Meadowmont Lane &amp; Green Cedar Lane</td>
<td>57</td>
<td>59</td>
</tr>
<tr>
<td>M7. Crescent Drive south of Wendell Road</td>
<td>55</td>
<td>49</td>
</tr>
<tr>
<td>M8. Courtyard Chapel Hill –Friday Center Drive</td>
<td>64</td>
<td>59</td>
</tr>
<tr>
<td>M9. Stancell Drive &amp; Little John Road</td>
<td>62</td>
<td>64</td>
</tr>
<tr>
<td>M10. E. Ephesus Church Road &amp; Farrington Road</td>
<td>63</td>
<td>61</td>
</tr>
<tr>
<td>M11. N. White Oak Drive</td>
<td>56</td>
<td>53</td>
</tr>
<tr>
<td>M12. Sayward Drive</td>
<td>57</td>
<td>46</td>
</tr>
<tr>
<td>M12A. 600’ west of Garrett Road</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>M12B. West side Lyckan Parkway</td>
<td>61</td>
<td>59</td>
</tr>
<tr>
<td>M12C. North Creek Drive</td>
<td>52</td>
<td>46</td>
</tr>
<tr>
<td>M13. Snow Crest Trail</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>M14. Tower Boulevard &amp; Picket Road</td>
<td>55</td>
<td>52</td>
</tr>
<tr>
<td>M14A. Maureen Joy Charter School</td>
<td>57</td>
<td>51</td>
</tr>
<tr>
<td>M14B. Cornwallis Road Golf Course</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>M14C. Jewish Community Center</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>M15. Erwin Road &amp; Trent Road</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>M16. Durham Performing Arts Center</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>M17. N. Alston Avenue &amp; E. Pettigrew Street</td>
<td>74</td>
<td>72</td>
</tr>
<tr>
<td>M17A. Joplin &amp; Bernice Streets</td>
<td>62</td>
<td>61</td>
</tr>
</tbody>
</table>
5.2 Existing Ground-Borne Noise and Vibration Conditions in the D-O Corridor

The study area includes urban, suburban, and rural areas, all of which have different, though relatively low levels of existing ground-borne noise and vibration. Vibration levels are greater near roadways with greater volumes of heavy truck and bus traffic and near railroads with frequent freight or transit train services. The FTA Guidance Manual does not evaluate ground-borne noise and vibration impacts as a relationship to existing levels. As such, quantifying existing levels is not required for the impact assessment.

5.2.1 Impact Evaluation Procedure

Vibration impacts for this project are determined using two methods: the Vibration Screening Procedure and the General Vibration Assessment methods contained in the aforementioned FTA Guidance Manual. Using this two-tiered approach, the FTA’s Vibration Impact Criteria are used to identify locations where impacts might occur based on existing land use activities.

Ground vibration is generated by the wheel/rail interface and is influenced by wheel/rail roughness, transit vehicle suspension, train speed, track construction, location of switches and crossovers, and the geologic strata underlying the track. The vibration levels likely to be generated by the project are based on data contained in the FTA Guidance Manual, Figure 10-1, Generalized Ground Surface Vibration Curves. Vibration from a passing light rail train moves through the geologic strata into building foundations, causing the building to vibrate. The main concerns are annoyance to building occupants and interference with vibration-sensitive operations/equipment. Any damage from light rail ground vibration, including cosmetic damage to buildings, is highly unlikely.

The FTA vibration propagation data provide an estimate of vibration levels as a function of distance from the tracks. The FTA Screening Procedure distance criteria are shown in Table 9. No adjustments were utilized in the Screening Procedure. The Screening Criteria are very conservative and were used to exclude land uses from further analysis.

<table>
<thead>
<tr>
<th>Type of Project</th>
<th>Critical Distance from Track to Structure for Land Use</th>
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<tr>
<td>Light Rail Transit</td>
<td>Category 1: Within 450 feet</td>
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Table 9: Distance Criteria for Vibration Screening Procedure


Table 10 lists the potentially affected sites resulting from the Screening Procedure that are evaluated in more detail in the Impacts Assessment in section 6.2. Refer to Figures 21 through 35 for the locations of each receptor.
<table>
<thead>
<tr>
<th>Site # (Figure Reference)</th>
<th>Alternative</th>
<th>Name/Location of Receptor Sites</th>
<th>Light Rail Station Proximity</th>
<th>Vibration Land Use Category</th>
<th>Distance from Receptor to Light Rail Tracks (feet)</th>
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<tbody>
<tr>
<td>1A</td>
<td>LRA</td>
<td>UNC Marsico Hall – Sensitive Equipment</td>
<td>UNC Hospitals 1</td>
<td>430</td>
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<tr>
<td>2</td>
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<td>Branson Street &amp; Hibbard Drive 2</td>
<td>UNC Hospitals 2</td>
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<tr>
<td>3</td>
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<td>5</td>
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<td>Branson Street &amp; Hibbard Drive 5</td>
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<td>6</td>
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<td>Branson Street &amp; Hibbard Drive 6</td>
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<td>7</td>
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<td>8</td>
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<td>C1, C1A</td>
<td>Cedar Berry Lane</td>
<td>Meadowmont 2</td>
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<td>C1A</td>
<td>Park Bluff Drive</td>
<td>Leigh Village 2</td>
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<tr>
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<td>Iron Mountain Road</td>
<td>Leigh Village 2</td>
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<td>27B</td>
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<td>27C</td>
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<td>28</td>
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<td>C2</td>
<td>Brookberry Circle</td>
<td>Woodmont 2</td>
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<tr>
<td>32</td>
<td>C2, C2A</td>
<td>Stancell</td>
<td>Woodmont 2</td>
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</tr>
<tr>
<td>35</td>
<td>C2, C2A</td>
<td>Little John Road</td>
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</tr>
<tr>
<td>37</td>
<td>C2, C2A</td>
<td>George King Road</td>
<td>Woodmont 2</td>
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<td>Hudson Road</td>
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<tr>
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<td>LRA</td>
<td>Crescent Drive South</td>
<td>Leigh Village 2</td>
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<tr>
<td>41</td>
<td>LRA</td>
<td>Farrington Road North</td>
<td>Leigh Village 2</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>LRA</td>
<td>Old Coach Road</td>
<td>Leigh Village 2</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Site #</td>
<td>Alternative</td>
<td>Name/Location of Receptor Sites</td>
<td>Light Rail Station Proximity</td>
<td>Vibration Land Use Category</td>
<td>Distance from Receptor to Light Rail Tracks (feet)</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>---------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>50</td>
<td>LRA</td>
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<td>Leigh Village</td>
<td>2</td>
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<tr>
<td>52</td>
<td>LRA</td>
<td>N. White Oak Drive</td>
<td>Gateway</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>53</td>
<td>LRA</td>
<td>N. White Oak Drive</td>
<td>Gateway</td>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>54</td>
<td>LRA</td>
<td>Comfort Inn Univ.</td>
<td>Gateway</td>
<td>2</td>
<td>130*</td>
</tr>
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Note: * Proximity to elevated tracks.
Figure 21: Vibration Impacts
Figure 22: Vibration Impacts
Figure 23: Vibration Impacts

Vibration Impacts
DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT

Source: ESRI, NCDOT, CGIA, URS

Draft April 2015

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Figure 24: Vibration Impacts
Figure 25: Vibration Impacts
Figure 26: Vibration Impacts
Figure 27: Vibration Impacts
Figure 28: Vibration Impacts
Figure 29: Vibration Impacts
Figure 30: Vibration Impacts
Figure 31: Vibration Impacts
Figure 32: Vibration Impacts
Figure 33: Vibration Impacts
Figure 34: Vibration Impacts
Figure 35: Vibration Impacts
6. Assessment of Effects

6.1 Noise Impacts

6.1.1 No-Build Alternative

The No-Build Alternative would have no effect on noise levels in the area. Changes in traffic volumes and bus operations would not significantly change existing noise levels.

6.1.2 Light Rail Alternatives

The noise assessment includes noise from all possible sources, including light rail, light rail bells, station park-and-ride lots, TPSS, and the ROMF. The assessment includes comparing the project-related noise levels to the existing noise levels in order to determine human reaction to the amount of change. The three possible outcomes to the detailed noise assessment include no impact, moderate impact, and severe impact. The results of the detailed assessment for the Light Rail Alternatives are identified in Tables 11 and 12. Note that, for each noise-sensitive receptor, noise is generated by a combination of light rail vehicle, bell, crossover switches, wheel squeal TPSS, and/or light rail station park-and-ride, with each noise event occurring at different distances from the receptor.

Tables 11 and 12 identify the ambient noise levels, the future project-related noise levels, and whether a moderate impact or severe impact was identified by using the noise impact criteria described above. The moderate impact range indicates that the noise levels at a receptor would be 1 to 5 dBA over the acceptable level, as prescribed by the FTA Guidance Manual. The severe impact range indicates an increase of greater than 5 dBA.

Table 11: Summary of Noise Impacts

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<tr>
<th>Site No.</th>
<th>Alternative</th>
<th>Name/Location of Receptor Sites</th>
<th>Noise Sources</th>
<th>Project Noise (dBA)</th>
<th>Ambient Noise (dBA)</th>
<th>Impact Range (dBA)</th>
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### Table 12: Summary of Noise Impacts (ROMFs)

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<th>Name/Location of Receptor Sites ¹</th>
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¹ Receptor identification is based on land use/development conditions in February 2015.
² FTA Guidance Manual, Table 3-1, Noise Levels Defining Impact for Transit Projects.

As listed in Tables 11 and 12 and shown on Figures 6 through 20, the project would result in five moderate impacts and three severe noise impacts. The C1 Alternative would have one severe noise impact; the C1AAlternative would have one moderate noise impact; and the C2 and C2A Alternatives would both have one moderate impact to the same property. The NHC LPA would result in one severe impact to the trails passing below the alignment. The remaining impacts would be along the common segments of the Light Rail Alternatives.

6.1.2.1 Section 4(f) Resources

There are a large number of natural areas with existing and planned trails throughout the Project corridor. All existing trails have been evaluated in the noise analysis. Where trails pass under the proposed alignment, such as the Botanical Gardens trails on the north side of Fordham Boulevard and trails in the New Hope Creek preserve, noise levels from the light rail would impact the serenity of the hiking experience. The analysis of the Botanical Gardens trails assumed the elevated light rail structure would pass over the trails, approximately 20 feet overhead. Due to the close proximity to Fordham Boulevard, noise levels would not result in an impact. The New Hope Creek trail impacts would not occur under the NEPA Preferred Alternative. Other planned trails (Little Creek Trail, Long Branch Creek Trail), which would be located in the vicinity of the proposed alignments, would have the potential to be impacted by transit noise, depending upon the final trail alignments.

There are also a significant number of properties and historic districts within the Project corridor. In general, historic properties that include sensitive land uses that conform to the FTA Manual requirements for noise and/or vibration have been included in the analyses. Other historic properties with industrial or manufacturing land uses are not considered sensitive to noise and vibration. Structural damage to historic buildings is not likely and is detailed in the construction impacts sections of this report.

6.1.3 Noise Impact Mitigation

As noted in the previous section, the Light Rail Alternatives would result in a number of moderate impacts and severe impacts to sensitive land uses adjacent to the proposed light rail alignment. The FTA Guidance Manual states that mitigation must be considered for any site that falls within the impact range and mitigation measures should be employed if they are feasible and prudent. Mitigation measures were explored to eliminate or reduce impacts predicted to occur with the Light Rail Alternatives. The measures examined generally fall into three categories: treatments that reduce noise levels at the source; measures that reduce noise levels along the source-to-receiver propagation path; and treatments that reduce noise levels at the receiver. A description of each measure is provided below.

6.1.3.1 Source Treatments

Vehicle Noise Specifications

Among the most effective noise mitigation treatments is noise control at the outset, during the specification and design of the transit vehicle. Such source treatments apply to all transit modes. By
developing and enforcing stringent but achievable noise specifications, the transit property takes a major step in controlling noise everywhere on the system. It is important to ensure that the noise levels quoted in the specifications are achievable with the application of best available technology during the development of the vehicle and reasonable in light of the noise reduction benefits and costs.

Effective enforcement includes significant penalties for non-compliance with the specifications. The noise mitigation achieved by source treatment depends on the quality of installation and maintenance. In the past, transit vehicles have been delivered that did not meet a noise specification, causing complaints from the public and requiring additional noise mitigation measures applied to the wayside.

**Wheel Treatments (Rail)**

A major source of noise from steel-wheel/steel-rail systems is the wheel/rail interaction, which has three components: roar, impact, and squeal. Roar is the rolling noise caused by small-scale roughness on the wheel tread and rail running surface. Impacts are caused by discontinuities in the running surface of the rail or by a flat spot on the wheels. Squeal occurs when a steel-wheel tread or its flange rubs across the rail, setting up resonant vibrations in the wheel, which cause it to radiate a screeching sound. Various wheel designs and other mitigation measures exist to reduce the noise from each of these three mechanisms. The project specifications will include methods to minimize wheel squeal.

Resilient wheels, which include a rubber flange over the steel wheel, serve to reduce rolling noise, but only slightly. A typical reduction is 2 dB on tangent track. This treatment is more effective in eliminating wheel squeal on tight turns; reductions of 10 to 20 dB for high-frequency squeal noise are typical.

Damped wheels, like resilient wheels, serve to reduce rolling noise, but only slightly. A typical reduction is 2 dB on tangent track. This treatment involves attaching vibration absorbers to standard steel wheels. Damping is effective in eliminating wheel squeal on tight turns; reductions of 5 to 15 dB for high-frequency squeal noise are typical.

Spin-slide control systems, similar to anti-locking brake systems on automobiles, reduce the incidence of wheel flats, a major contributor of impact noise. Trains with smooth wheel treads can be up to 20 dB quieter than those with wheel flats. To be effective, the anti-locking feature should be in operation during all braking phases, including emergency braking. Wheel flats are more likely to occur during emergency braking than during dynamic braking.

**Vehicle Treatments**

Vehicle noise mitigation measures are applied to the various mechanical systems associated with propulsion, ventilation, and passenger comfort.

Ventilation requirements for vehicle systems are related to the noise generated by a vehicle. Fan noise often remains a major noise source after other mitigation measures have been instituted because of the need to have direct access to cooling air. This applies to heat exchangers for electric traction motors, and air-conditioning systems. Fan-quieting can be accomplished by installation of one of several new designs of quiet, efficient fans. Forced-air cooling on electric traction motors can be quieter than self-cooled motors at operating speeds. The location of the fans on the vehicle can make a significant difference in the noise radiated to the wayside or to patrons on the station platforms.

The vehicle body design can provide shielding and absorption of the noise generated by the vehicle components. Acoustical absorption under the car has been demonstrated to provide up to 5 dB of mitigation for wheel/rail noise and propulsion-system noise. Similarly, vehicle skirts over the wheels can
provide more than 5 dB of mitigation. By carrying their own noise barriers, vehicles with these features can provide cost-effective noise reduction.

**Guideway Support**

The smoothness of the running surface is critical in the mitigation of noise from a moving vehicle. Smooth rail running surfaces for rail systems are required. Roughness of the rail surfaces can be eliminated by resurfacing rails, thereby reducing noise levels by up to 10 dB.

In the case of steel-wheel/steel-rail systems with non-steerable trucks and sharp turns, squeal can be mitigated by installation of rail lubricators. Squeal in such systems can usually be eliminated altogether by designing all turn radii to be greater than 1,000 feet, or 100 times the truck wheelbase, whichever is less.

**Operational Restrictions**

Two changes in operations that can mitigate noise are the lowering of speed and the reduction of nighttime (10 p.m. to 7 a.m.) operations. Because noise from most transit vehicles depends on speed, a reduction of speed results in lower noise levels. The effect can be considerable. For example, the speed dependency of steel-wheel/steel-rail systems for $L_{eq}$ and $L_{dn}$ results in a 6 dBA reduction for a halving of the speed. Complete elimination of nighttime operations has a strong effect on reducing the $L_{dn}$, because nighttime noise is increased by 10 dB when calculating $L_{dn}$. Restrictions on operations are usually not feasible because of service demands, and FTA does not pursue restrictions on operations as a noise reduction measure. However, if early morning idling can be curtailed to the minimum necessary, this can have a measurable effect on $L_{dn}$.

**Path Treatments**

**Sound Barriers**

Sound barriers are effective in mitigating noise when they break the line-of-sight between source and receiver. The necessary height of a barrier depends on such factors as the source height and the distance from the source to the barrier. For example, if a barrier is located very close to a light rail train, it need only be 3 to 4 feet above the top of rail to be effective. Barriers close to vehicles can provide noise reductions of 6 to 10 dB. For barriers farther away, such as on the right-of-way line or for trains on the far track, the height must be increased to provide equivalent effectiveness. Otherwise, the effectiveness can drop to 5 dB or less, even if the barrier breaks the line-of-sight. Where the barrier is very close to the transit vehicle or where the vehicles travel between sets of parallel barriers, barrier effectiveness can be increased by as much as 5 dB by applying sound-absorbing material to the inner surface of the barrier.

Similarly, the length of the barrier wall is important to its effectiveness. The barrier must be long enough to screen out a moving train along most of its visible path. This is necessary so that train noise from beyond the ends of the barrier will not severely compromise noise-barrier performance at sensitive locations.

Noise barriers can be made of any outdoor weather-resistant solid material that meets a minimum sound transmission loss requirement. The sound requirements are not particularly strict; they can be met by many commonly available materials, such as 16-gauge steel, 1-inch thick plywood, and any reasonable thickness of concrete. The normal minimum requirement is a surface density of 4 pounds per square foot. To hold up under wind loads, structural requirements are more stringent. Achieving the
maximum possible noise reduction requires careful sealing of gaps between barrier panels and between
the barrier and the ground or elevated guideway deck.

6.1.3.3 Receiver Treatments

Sound Barriers
In certain cases it may be possible to acquire limited property rights for the construction of sound
barriers at the receiver. As discussed above, barriers need to break the line-of-sight between the noise
source and the receiver to be effective and are most effective when they are closest to either the source
or the receiver.

Building Insulation
In cases where sound barriers are not feasible, such as multi-story buildings, buildings very close to the
rights-of-way, or grade crossings, the only practical noise mitigation measure may be to provide sound
insulation for the buildings. Effective treatments include caulking and sealing gaps in the building façade,
and installation of new doors and windows that are specially designed to meet acoustical transmission-
loss requirements. Exterior doors facing the noise source should be replaced with well-gasketed, solid-
core wood doors and well-gasketed storm doors. Acoustical windows are usually made of multiple layers
of glass with air spaces between to provide noise reduction. Acoustical performance ratings are
published in terms of Sound Transmission Class (STC) for these special windows. A minimum STC rating
of 39 should be used on any window exposed to the noise source. These treatments are beneficial for
heat insulation as well as for sound insulation. As an added consideration for costs, however, acoustical
windows are usually non-operable so that central ventilation or air conditioning is needed.

Additional building sound insulation, if needed, can be provided by sealing vents and ventilation
openings and relocating them to a side of the building away from the noise source.

6.1.3.4 Proposed Mitigation
Table 13 identifies the six residences and New Hope Creek trails that would be impacted by the project.
Sites 2, 7, and 8 (Odum Village) are part of a larger redevelopment area sponsored by UNC. Buildings in
Odum Village are planned to be demolished regardless of the D-O LRT Project. Depending on the
alternative selected, sites 27A (C1A), 27D (C1), 37 (C2 or C2A), and 52 (common segments of the Light
Rail Alternatives) would be purchased as part of the D-O LRT Project right-of-way acquisition. The New
Hope Creek Trail would pass underneath the light rail alignment in several spots, resulting in a moderate
impact. With the exception of changing the vehicle specifications to further reduce light rail running
noise, the only possible mitigation would include the installation of sound barriers adjacent to the
elevated tracks, extending the width of the New Hope Creek trail area, which is approximately 3,000
feet between Durham Drive and Garrett Road. While effective, noise barriers are typically only used to
protect residential communities, and therefore may be considered cost-prohibitive.
Table 13: Mitigation of Moderate and Severe Noise Impacts

<table>
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<tr>
<th>Site No.</th>
<th>Receptor Site</th>
<th>Alternative</th>
<th>Project Noise</th>
<th>Impact Range</th>
<th>Distance Feet to Source</th>
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<td>59-64</td>
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<td>Elevated Track barriers</td>
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</table>

Source: URS February 2015.

Note: 1 FTA Guidance Manual, Table 6-12, Transit Noise Mitigation Measures.

6.2 Ground-Borne Noise and Vibration Impacts

Vibration impacts for this project were determined using two methods, the vibration screening procedure and the general vibration assessment methods contained in the FTA Guidance Manual. Using this two-tiered approach, the FTA’s vibration impact criteria were used to identify locations where impacts might occur based on existing land use activities. Where the general assessment shows the vibration impacts, potential mitigation measures are identified.

As the project study area includes several historic structures, vibration impacts to these structures were also evaluated.

6.2.1 General Vibration Assessment

The general vibration assessment procedure is intended to provide more specific estimates of vibration impacts at sensitive locations by incorporating project-specific information. The basic approach for the general assessment was to define a base curve that related overall ground-borne vibration to distance from the source then applied adjustments to the curve to account for other factors such as vehicle speed and track conditions. Using the base curve, the ground-borne vibration and noise due to the project were then estimated for sensitive land use locations in the corridor. After the forecasts were developed for each location, they were compared to the applicable criteria listed in Table 14 to evaluate the level of impact. The project-specific assumptions for the general vibration assessment, which included train trips or events, speed, soil type, building/foundation type, train characteristics and track characteristics, are described below.
6.2.1.1 Vibration Assessment Inputs

Average Daily Train Trips

The number of average daily train trips as computed from the operations plan resulted in an average of 141 trips per day and included both directions of travel. Because this figure is more than 70 trips per day, the analysis assumed the impact criteria for “frequent” events, as defined in Table 14.

Speed

FTA guidelines call for an adjustment of 6 VdB per doubling (or halving) of speed relative to 50 mph for light rail trains. The speeds used in the vibration analysis are consistent with the operations plan – maximum speed of 55 mph, with lower speeds near stations.

Soil Type

The vibration propagation characteristics used in this analysis were based on the data presented in the FTA Guidance Manual. The ability of the soil to propagate vibration was classified as being either efficient or non-efficient. The classification of propagation was based on FTA guidelines and a brief analysis of the geotechnical data. FTA guidelines state that shallow bedrock (within 30 feet of the surface) is likely to have efficient vibration propagation, and stiff clay soils have sometimes been associated with efficient vibration propagation.

Based on the geotechnical data obtained for this project, soils within the project corridor were determined to be predominantly stiff clay soils with shallow bedrock 20 to 40 feet below the surface. As a result, efficient vibration propagation was assumed for all vibration-sensitive receptors. Efficient vibration propagation would result in higher vibration levels of approximately 10 dB, which would more than double the potential impact zone for ground-borne vibration.

The FTA Guidance Manual states that, while it is known that geologic conditions have a significant effect on vibration levels, it is rarely possible to develop more than a broad-brush understanding of the vibration propagation characteristics for a general assessment. Therefore, if there is reason to suspect efficient propagation conditions, then a detailed analysis during the Engineering phase should be conducted. The detailed analysis would include vibration propagation tests at the areas identified as potentially efficient propagation sites.

The peak frequency of the vibration associated with the generation and estimation of ground-borne noise is related to soil type. FTA guidelines for the general vibration assessment provide three vibration frequency ranges: (1) low (less than 30 Hertz [Hz]), (2) typical (between 30 and 60 Hz), and (3) high (greater than 60 Hz). Low-frequency vibration characteristics can be assumed for non-efficient soils. Typical vibration characteristics can be assumed for efficient soils. Since the vibration analysis assumes efficient soils, the “typical” frequency range was used.
<table>
<thead>
<tr>
<th>Site #</th>
<th>Name/Location of Receptor Site</th>
<th>Alternative</th>
<th>Distance (feet)</th>
<th>Base Curve (^1) (VdB)</th>
<th>Speed</th>
<th>Elev. Structure</th>
<th>Special Track</th>
<th>Building</th>
<th>Soils (Efficient)</th>
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## Noise and Vibration Technical Report

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<td>+10</td>
<td>48</td>
<td>13</td>
<td>No</td>
</tr>
<tr>
<td>59</td>
<td>Lychan Parkway</td>
<td>NHC 1</td>
<td>75*</td>
<td>70 -6</td>
<td>-10</td>
<td>+10</td>
<td>57</td>
<td>22</td>
<td>No</td>
</tr>
<tr>
<td>62</td>
<td>North Sayward Drive</td>
<td>NHC LPA</td>
<td>150</td>
<td>63 -6</td>
<td>-10</td>
<td>+10</td>
<td>62</td>
<td>27</td>
<td>No</td>
</tr>
<tr>
<td>64</td>
<td>Southwest Durham Drive 1</td>
<td>NHC LPA</td>
<td>150</td>
<td>63 -2</td>
<td>-10</td>
<td>+10</td>
<td>61</td>
<td>26</td>
<td>No</td>
</tr>
<tr>
<td>67</td>
<td>Snow Crest Trail 1</td>
<td>NHC LPA, NHC 2</td>
<td>50</td>
<td>73 -2</td>
<td>-10</td>
<td>+10</td>
<td>71</td>
<td>36</td>
<td>No</td>
</tr>
<tr>
<td>68</td>
<td>Snow Crest Trail 2</td>
<td>NHC LPA, NHC 2</td>
<td>70</td>
<td>70 -2</td>
<td>-10</td>
<td>+10</td>
<td>68</td>
<td>33</td>
<td>No</td>
</tr>
<tr>
<td>69</td>
<td>Snow Crest Trail 3</td>
<td>NHC LPA, NHC 2</td>
<td>150</td>
<td>63 -3</td>
<td>-10</td>
<td>+10</td>
<td>60</td>
<td>25</td>
<td>No</td>
</tr>
<tr>
<td>70</td>
<td>Larchmont Road</td>
<td>NHC LPA, NHC 2</td>
<td>70</td>
<td>70 -6</td>
<td>-7</td>
<td>+10</td>
<td>64</td>
<td>29</td>
<td>No</td>
</tr>
<tr>
<td>Site #</td>
<td>Name/Location of Receptor Site</td>
<td>Alternative</td>
<td>Distance (feet)</td>
<td>Base Curve(^1) (VdB)</td>
<td>Adjustments(^2)</td>
<td>Speed</td>
<td>Elevated Structure</td>
<td>Special Track</td>
<td>Building</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>-------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>-------------------</td>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>71</td>
<td>Pickett Road South</td>
<td>LRA</td>
<td>50</td>
<td>73</td>
<td>-4</td>
<td>-5</td>
<td>+10</td>
<td>69</td>
<td>34</td>
</tr>
<tr>
<td>73</td>
<td>Pickett Road South</td>
<td>LRA</td>
<td>90</td>
<td>68</td>
<td>-3</td>
<td>-10</td>
<td>+10</td>
<td>65</td>
<td>30</td>
</tr>
<tr>
<td>74</td>
<td>Pickett Road North</td>
<td>LRA</td>
<td>60</td>
<td>72</td>
<td>-2</td>
<td>-10</td>
<td>+10</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>77</td>
<td>VA Med Center</td>
<td>LRA</td>
<td>150</td>
<td>63</td>
<td>-3</td>
<td>-13</td>
<td>+10</td>
<td>57</td>
<td>22</td>
</tr>
<tr>
<td>78</td>
<td>Duke Med Center</td>
<td>LRA</td>
<td>100</td>
<td>67</td>
<td>-3</td>
<td>-13</td>
<td>+10</td>
<td>61</td>
<td>26</td>
</tr>
<tr>
<td>80</td>
<td>Anderson Street Apartments</td>
<td>LRA</td>
<td>130</td>
<td>65</td>
<td>-3</td>
<td>-5</td>
<td>+10</td>
<td>67</td>
<td>32</td>
</tr>
<tr>
<td>82</td>
<td>Powe House</td>
<td>LRA</td>
<td>100</td>
<td>67</td>
<td>-3</td>
<td>-5</td>
<td>+10</td>
<td>69</td>
<td>34</td>
</tr>
<tr>
<td>82A</td>
<td>Pettigrew Rehab Center</td>
<td>LRA</td>
<td>60</td>
<td>72</td>
<td>-3</td>
<td>-7</td>
<td>+10</td>
<td>57</td>
<td>22</td>
</tr>
<tr>
<td>82B</td>
<td>W. Pettigrew Dialysis</td>
<td>LRA</td>
<td>80</td>
<td>69</td>
<td>-3</td>
<td>-7</td>
<td>+10</td>
<td>57</td>
<td>22</td>
</tr>
<tr>
<td>82C</td>
<td>Hillcrest Center</td>
<td>LRA</td>
<td>100</td>
<td>67</td>
<td>-3</td>
<td>-7</td>
<td>+10</td>
<td>57</td>
<td>22</td>
</tr>
<tr>
<td>83</td>
<td>Docum. Studies</td>
<td>LRA</td>
<td>45</td>
<td>74</td>
<td>-2</td>
<td>-7</td>
<td>+10</td>
<td>67</td>
<td>32</td>
</tr>
<tr>
<td>87</td>
<td>Old Bull Dog Apartments</td>
<td>LRA</td>
<td>40</td>
<td>75</td>
<td>-2</td>
<td>-7</td>
<td>+10</td>
<td>76</td>
<td>41</td>
</tr>
<tr>
<td>87A</td>
<td>Durham Performing Arts</td>
<td>LRA</td>
<td>245</td>
<td>58</td>
<td>-2</td>
<td>-13</td>
<td>+10</td>
<td>53</td>
<td>18</td>
</tr>
<tr>
<td>87B</td>
<td>Venable Center</td>
<td>LRA</td>
<td>30</td>
<td>58</td>
<td>-2</td>
<td>-2</td>
<td>+10</td>
<td>56</td>
<td>21</td>
</tr>
<tr>
<td>88</td>
<td>Avery Boys &amp; Girls</td>
<td>LRA</td>
<td>120</td>
<td>68</td>
<td>-6</td>
<td>10</td>
<td>-7</td>
<td>+10</td>
<td>73</td>
</tr>
</tbody>
</table>

Source: URS March 2015.

Notes:
1. FTA Guidance Manual, Figure 10-1, Generalized Ground Surface Vibration Curves.
   * Proximity to elevated tracks.
Building/Foundation Type

The FTA Guidance Manual allows for reduction of train vibration levels by 5 VdB, 7 VdB, and 10 VdB for wood-frame construction, one- to two-story commercial construction, and large masonry construction on piles, respectively. A review of field conditions and aerial photography identified the building and foundation types of all sensitive receptors. All single family residential receptors were conservatively assumed to have wood-frame construction. Multifamily apartments are typically brick/masonry structures.

Train and Track Characteristics

The train was assumed to have “soft” primary suspension with wheels in “good” condition. No special features/procedures such as floating slab trackbeds or ballast mats were assumed. The track was assumed to be continuously welded and in good condition. Although portions of the track would be elevated or at-grade with embedded track, the track would primarily be at-grade with ballasted trackbed and with stiffly supported ties of low resilience. The FTA Guidance Manual allows for a 10 VdB reduction of train vibration levels when the track is elevated relative to at-grade track.

Crossovers (“frogs”) are specified in the design of the light rail alignment. Frogs and other special trackwork add up to 10 VdB to overall train vibration levels per FTA guidelines. However, FTA qualitatively states that the increase would be less at greater distances from the track. For the purposes of the DEIS, it was assumed that the 10 VdB penalty would not apply for receptors outside of the screening criteria.

6.2.1.2 General Assessment Results

No-Build Alternative

The No-Build Alternative would have no effect on vibration levels in the area. Changes in traffic volumes and bus operations would not change existing vibration levels.

Light Rail Alternatives

The Light Rail Alternatives vibration and ground-borne noise impacts are displayed in Table 15 and are shown on Figures 21 through 35. The vibration and ground-borne noise impact criteria for residential land uses with frequent events is 72 VdB and 35 dBA, respectively. Based on the assumption of efficient propagation soil conditions, the Light Rail Alternatives, across all alignment alternatives, would result in vibration impacts to 13 residential areas and ground-borne noise impacts to 18 residential areas with a relatively even distribution across alignment alternatives.

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Receptor Site</th>
<th>Alignment Alternative</th>
<th>Vibration Impact</th>
<th>Ground-Borne Noise Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Branson Street &amp; Hibbard Drive 2</td>
<td>LRA</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Branson Street &amp; Hibbard Drive 7</td>
<td>LRA</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>26</td>
<td>Cedar Berry Lane</td>
<td>C1, C1A</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>27A</td>
<td>Iron Mountain Road</td>
<td>C1A</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>27C</td>
<td>Iron Mountain Road</td>
<td>C1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>27D</td>
<td>Iron Mountain Road</td>
<td>C1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### 6.2.1.3 Vibration Impacts to Historic Structures

The FTA Guidance Manual, Table 12-3 defines impact criteria for buildings that are extremely susceptible to vibration damage of 90 VdB. Evaluation of the project shows a maximum possible vibration level of 88 VdB with a wooden structure located 10 feet from the tracks and with vehicles traveling at 55 mph. There are no historic structures within 10 feet of the project alignment. As a result, vibration from the operation of the Light Rail Alternatives would not adversely affect historic structures.

### 6.2.2 Vibration Impact Mitigation

#### 6.2.2.1 Potential Mitigation Options

Options for reductions in the vibration levels fit into one of four categories: (1) vehicle modifications, (2) changes in the track support system, (3) building modifications, and (4) operational changes. Alternatively, the project may elect to acquire an impacted residence, especially where additional right-of-way impacts result.

#### Vehicle Specifications

The ideal rail vehicle, with respect to minimizing ground-borne vibration, should have a low unsprung weight, a soft primary suspension, a minimum of metal-to-metal contact between moving parts of the truck, and smooth wheels that are perfectly round. A limit for the vertical resonance frequency of the primary suspension should be included in the specifications for any new vehicle. A vertical resonance frequency of 12 Hz or less is sufficient to control the levels of ground-borne vibration. Some have recommended that transit vehicle specifications require that the vertical resonance frequency be less than 8 Hz.

#### Special Track Support Systems

When the vibration assessment indicates that vibration levels would be excessive, it is usually the track support system that is changed to reduce the vibration levels. Floating slabs, resiliently supported ties, high-resilience fasteners, and ballast mats have all been used in subways to reduce the levels of ground-borne vibration. To be effective, all of these measures must be optimized for the frequency spectrum of

---

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Receptor Site</th>
<th>Alignment Alternative</th>
<th>Vibration Impact</th>
<th>Ground-Borne Noise Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Brookberry Circle</td>
<td>C2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>37</td>
<td>George King Road</td>
<td>C2, C2A</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>38</td>
<td>Hudson Road</td>
<td>LRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>39</td>
<td>Crescent Drive South</td>
<td>LRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>41</td>
<td>Farrington Road North</td>
<td>LRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>50</td>
<td>Old Coach Road</td>
<td>LRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>53</td>
<td>N. White Oak Drive</td>
<td>LRA</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>56</td>
<td>Northcreek Drive 1</td>
<td>NHC 1, NHC 2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>67</td>
<td>Snow Crest Trail 1</td>
<td>NHC LPA, NHC 2</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>74</td>
<td>Pickett Road North</td>
<td>LRA</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>83</td>
<td>Ctr. Documentary Studies</td>
<td>LRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>87</td>
<td>Old Bull Bldg. Apartments</td>
<td>LRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: URS March 2015.
the vibration. Most of these relatively standard procedures have been successfully used on several subway projects. Applications on at-grade and elevated track are less common. This is because vibration problems are less common for at-grade and elevated track; cost of the vibration control measures is a higher percentage of the construction costs of at-grade and elevated track; and exposure to the elements can require significant design modifications.

Each of the major vibration control measures for track support is discussed below.

- **Resilient Fasteners**: Resilient fasteners are used to fasten the rail to concrete track slabs. Standard resilient fasteners are very stiff in the vertical direction, usually in the range of 200,000 pounds per inch, although they do provide vibration reduction compared to some of the rigid fastening systems used on older systems (e.g., wood half-ties embedded in concrete). Special fasteners with vertical stiffness in the range of 30,000 pounds per inch will reduce vibration by as much as 5 to 10 dB at frequencies above 30 to 40 Hz.

- **Ballast Mats**: A ballast mat consists of a rubber or other type of elastomer pad that is placed under the ballast. The mat generally must be placed on a concrete pad to be effective. They will not be as effective if placed directly on the soil or the sub-ballast. Consequently, most ballast mat applications are in subway or elevated structures. Ballast mats can provide 10 to 15 dB attenuation at frequencies above 25 to 30 Hz.

- **Resiliently Supported Ties**: The resiliently supported tie system consists of concrete ties supported by rubber pads. The rails are fastened directly to the concrete ties using standard rail clips. Existing measurement data indicate that resiliently supported ties may be very effective in reducing low-frequency vibration in the 15 to 40 Hz range. This makes them particularly appropriate for transit systems with vibration problems in the 20 to 30 Hz range.

- **Floating Slabs**: Floating slabs can be very effective at controlling ground-borne vibration and noise. They basically consist of a concrete slab supported on resilient elements, usually rubber or a similar elastomer. Floating slabs are effective at frequencies greater than their single-degree-of-freedom vertical resonance frequency.

**Building Modifications**

In some circumstances, it is practical to modify the impacted building to reduce the vibration levels. Vibration isolation of buildings basically consists of supporting the building foundation on elastomer pads similar to bridge bearing pads. Vibration isolation of buildings is seldom an option for existing buildings; normal applications are possible only for new construction.

**Operational Changes**

The most obvious operational change is to reduce the vehicle speed. Reducing the train speed by a factor of two will reduce vibration levels approximately 6 VdB. Other operational changes that can be effective in special cases include the following:

- Use the equipment that generates the lowest vibration levels during the nighttime hours when people are most sensitive to vibration and noise.

- Adjust nighttime schedules to minimize movements in the most sensitive hours.

While there are tangible benefits from speed reductions and limits on operations during the most sensitive time periods, these types of measures are usually not practical from the standpoint of service requirements. Furthermore, vibration reduction achieved through operating restrictions requires
continuous monitoring and will be negated if vehicle operators do not adhere to established policies. As with the options for noise control, FTA does not recommend limits on operations as a way to reduce vibration impacts.

**Property Acquisition**

While final designs will be needed to confirm the properties required for acquisition, preliminary designs suggest that the impacted residences 27A and 27D would be acquired for right of way requirements.

### 6.2.2.2 Mitigation Approach

As discussed in the previous section, all the vibration impacts, with the exception of the house at George King Road (C2 or C2A, designated for acquisition), would result from the inclusion of efficient soil propagation conditions, which increase vibration levels by 10 VdB. As a result, and in accordance with the FTA Guidance Manual, a detailed vibration analysis will be conducted during the Engineering phase to further evaluate geotechnical conditions and the effects of the proposed light rail system on area receptors.

Upon completion of the detailed geotechnical evaluation, vibration-sensitive receptors that are part of the NEPA Preferred Alternative and are not acquired for the project that remain impacted by project vibration will be mitigated through special track support systems.

**Special Track Support Systems**

When the vibration assessment indicates that vibration levels will be excessive, it is usually the track support system that is changed to reduce the vibration levels. Floating slabs, resiliently supported ties, high-resilience fasteners, and ballast mats can be used to reduce the levels of ground-borne vibration. To be effective, all of these measures must be optimized for the frequency spectrum of the vibration. Most of these relatively standard procedures have been successfully used on transit projects.

### 6.3 Construction Noise and Vibration Impacts

#### 6.3.1 Construction Noise Impacts

The construction process for the Light Rail Alternatives would involve the use of equipment and vehicle operations that typically result in high noise levels adjacent to the construction sites. Table 16 shows typical construction equipment noise emission levels at 50 feet. The use of especially noisy equipment, such as a rail saw, jack hammer, scrapers, and pneumatic tools, would be common throughout the alignment. Pile drivers, the noisiest type of equipment for light rail projects, may be used in areas where the tracks are on elevated structures, or where the ROMF requires a pile foundation.
Table 16: Typical Construction Equipment Noise Emission Levels at 50 Feet

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Typical Noise Levels at 50 feet from Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pile Drivers (Impact)</td>
<td>101</td>
</tr>
<tr>
<td>Rail Saw</td>
<td>90</td>
</tr>
<tr>
<td>Scraper</td>
<td>89</td>
</tr>
<tr>
<td>Truck</td>
<td>88</td>
</tr>
<tr>
<td>Jack Hammer</td>
<td>88</td>
</tr>
<tr>
<td>Mobile Crane</td>
<td>88</td>
</tr>
<tr>
<td>Grader</td>
<td>85</td>
</tr>
<tr>
<td>Dozer</td>
<td>85</td>
</tr>
<tr>
<td>Tie Inserter</td>
<td>85</td>
</tr>
<tr>
<td>Pneumatic Tool</td>
<td>85</td>
</tr>
<tr>
<td>Impact Wrench</td>
<td>85</td>
</tr>
</tbody>
</table>

Source: FTA Guidance Manual

Table 17 identifies the acceptable noise levels from construction activities for associated land uses. In order to identify whether the construction activity is likely to impact nearby sensitive receiver areas, the two loudest pieces of equipment, the pile driver and the rail saw, were added together (using decibel addition). These two pieces of equipment, used simultaneously at the same location, would result in the emission of 101 dB of noise at 50 feet from construction. In areas where pile drivers would not be used, the next loudest pieces of equipment (rail saw and jack hammer), if used together simultaneously at the same location, would emit 92 dB of sound at 50 feet from construction. It is likely that noise impacts would occur in residential areas and commercial/industrial areas within 50 feet of the proposed light rail alignment as a result of the construction activities. Due to the linear nature of track construction, these impacts would be intermittent and temporary.

Table 17: Acceptable Construction Noise Levels

<table>
<thead>
<tr>
<th>Land Use</th>
<th>One hour L&lt;sub&gt;eq&lt;/sub&gt; (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td>Residential</td>
<td>90</td>
</tr>
<tr>
<td>Commercial</td>
<td>100</td>
</tr>
<tr>
<td>Industrial</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: FTA Guidance Manual

At this early stage of project development, the extent of the short-term construction impact is indeterminable as the construction plans, which would identify the specific equipment to be used and the locations where the equipment would be used, will not be completed until the Engineering Phase of the project.

**Construction Noise Mitigation**

During the Engineering Phase of the project, a detailed construction noise assessment will be completed. This detailed assessment will provide property-specific detail that will then be used to develop mitigation plans to keep the noise levels at or below acceptable levels.
Construction activities would be conducted in accordance with applicable state and local requirements, and would be limited to weekday daytime hours (typically from 7 a.m. to 6 p.m.) Noise would be monitored on a regular basis during construction near potentially affected sensitive receptors.

Various means for the control of noise impacts during construction would be considered, including the following:

- Design considerations and project layout, such as noise barriers, minimizing the distance of truck routing, routing trucks away from residential streets, and locating noise-generating equipment as far away from the sensitive noise areas as possible
- Operations sequence, such as avoiding nighttime construction in residential areas
- Alternative methods, such as using drilled piers instead of impact pile driving, specifying quieter equipment in construction specifications, and alternative demolition and pavement breaking techniques

6.3.2 Vibration Impacts from Construction

The construction of the elevated structures may require the drilling of shafts to place the concrete foundations. Vibration sensitive buildings that are adjacent to elevated track sections and are listed and/or eligible for listing on the National Register are primarily concentrated between the Mason Farm Road Station and the Hamilton Road Station in Chapel Hill, and between the Ninth Street Station and Dillard Street Station, in Durham. In Chapel Hill, the closest National Register (eligible) properties include a house on Carmichael Street and the Aldersgate Methodist Church, which are 130 and 120 feet, respectively, from the elevated track. In Durham, the closest National Register property that is adjacent to a proposed elevated track section is the Trinity College Duke Center for Documentary Studies, which is located 45 feet from the alignment.

The closest historic building (Trinity College Duke Center for Documentary Studies) was evaluated for the potential for structural damage from the construction of the elevated structure foundations using a vibratory hammer or caisson drilling methods. Following the methodology in the FTA Guidance Manual, Chapter 12, and assuming the Trinity College building was extremely susceptible to vibration damage, the damage impact limit would be 0.12 inches/second peak particle velocity (PPV). This limit would not be exceeded at the Trinity College building based on the shaft drilling level of 0.089 PPV in Table 12-2 of the FTA Guidance Manual.

While structural damage is the principal concern of vibration impacts from construction activities, it is likely that the construction of the elevated track structures would result in short term impacts to human activities, especially in buildings very close to the work. Residential land uses where human activities may be impacted by vibration include the properties on Batty Hill Drive, which is 75 feet from elevated structures, and West Garrett Rodd, which is 50 feet from elevated structures. The properties next to UNC Hospital Station will be used by UNC for a future development.

Construction Vibration Mitigation

As part of the detailed vibration assessment that will be conducted during the Engineering Phase of the project, construction impacts to historic structures will be further evaluated. Vibration levels will be monitored at sensitive building structures during construction, particularly at buildings adjacent to areas where elevated structure foundations will be constructed. Some of these areas where further evaluation will be conducted, and where monitoring would occur during the Engineering and Construction Phases include the Oak Creek Village apartment complex for alternatives NHC 1 and NHC 2, and at sensitive
sites adjacent to the proposed aerial alignment along West Pettigrew Street. These locations would include four local historic landmark houses and the Duke Center for Documentary Studies.

In the event that the monitoring results in impacts beyond acceptable levels, additional site-specific mitigation will be implemented. Where construction of drilled shafts for the foundations for the elevated structures is shown to result in impacts, special foundation installation techniques will be employed to reduce vibration levels.
Appendix A: Noise Monitoring Sites
M8

35.901864, -79.009942

+56° 56' 6.71", -79° 0' 35.79"

Directions  Search nearby  Save to map  more→
M11

K.24-102
M13
### Field Noise Measurement Form

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Location:** M1A - Branson St.  
**Analyst:** Andrew Bell - #2 Equipment

#### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414

#### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704

#### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Calibration Level (dBA):** 94 / 114
- **Response:** Slow / Fast / Impl
- **Precipitation:** Yes (explain) / No
- **Windscreen:** Yes / No (explain)
- **Avg Wind Speed/Direction:** 2.2/NW

#### Topography
- **Topo:** Flat / Hilly

#### Terrain
- **Terrain:** Hard/Soft/Mixed/Snow

#### GPS Coordinates (at SLM location)
- +35° 54' 0.05", -79° 2' 57.04"

#### Weather Conditions
- **Temp (°F):** 36  
- **RH (%):** 82
- **Bar Psr (Hg):** 30.31  
- **Cloud Cover (%):** 0

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### Field Noise Measurement Data Form

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/14/2013  
**Monitoring Location:** M17 - Alston Ave. & Pettigrew St.  
**Analyst:** Andrew Bell - #2 Equipment

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**Sound Level Meter**  
Model #: 820  
Serial #: 1414  
Weighting: A / C / Flat  
Response: Slow / Fast / Impl  
Windscreen: Yes / No (explain)

**Field Calibration**  
Model #: CAL200  
Serial #: 3704  
Calibration Level (dBA): 94 / 114  
Pre-Test: 114.1 dBA  
Post-Test: 113.9 dBA

**Weather Data**  
Wind: Steady/Gusty/Calm  
Precipitation: Yes (explain) / No  
Avg Wind Speed/Direction: 2/NNW  
Temp (°F): 25  
RH (%): 50  
Bar Psr (Hg): 30.47  
Cloud Cover (%): 15

**GPS Coordinates (at SLM location)**  
+35° 59’ 4.21”, -78° 53’ 21.03”

**Notes/Events**  
Train on southernmost track
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<td>Count duration</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No | Multiple school buses passing by.

Additional Notes/Comments: Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### Project Information

- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/14/2013
- **Monitoring Location:** M17 - Alston Ave. & Pettigrew St.
- **Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter

- **Model #:** 820
- **Serial #:** 1414

### Field Calibration

- **Model #:** CAL200
- **Serial #:** 3704

### Weather Data

- **Model #:** SM-28
- **Serial #:** 3386

### Noise Measurement

#### Monitoring Details

- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

#### GPS Coordinates (at SLM location)

+35° 59' 4.21", -78° 53' 21.03"

#### Notes/Events

- Train on southernmost track

#### Temperature

- **Temp (°F):** 50
- **RH (%):** 34

#### Barometric Pressure

- **Bar Psr (Hg):** 30.46

#### Cloud Cover (%)

- **Cloud Cover (%):** 0

#### Wind Speed/Direction

- **Avg Wind Speed/Direction:** 4/WSW

#### Precipitation

- **Precipitation:** Yes (explain) / No

#### Wind

- **Wind:** Steady/Gusty/Calm

#### ID Start Time Stop Time L_eq L_min L_max L10 L50 L90

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</tbody>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-120
## Field Noise Measurement Form

### Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Alston Ave. NB/SB</th>
<th>compass</th>
<th>Site Diagram:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>35</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (pave/row)</td>
<td>24'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- or 2-way</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0</td>
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</tr>
<tr>
<td>Bus Stops</td>
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<td>Stoplights</td>
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<td>Heavy Trucks</td>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>10 min.</td>
<td></td>
<td></td>
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</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

**Photos Taken?** Yes/No

**Additional Notes/Comments:** Battery change required during middle of measurement.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

---

**Additional Notes and Sketches on Reverse**
### FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/14/2013  
**Monitoring Location:** M17 - Alston Ave. & Pettigrew St.  
**Analyst:** Andrew Bell - #2 Equipment

#### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No

#### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114

#### Weather Data
- **Wind:** Steady / Gusty / Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 8/SW  
- **Temp (°F):** 54  
- **RH (%):** 24  
- **Bar Psr (Hg):** 30.37  
- **Cloud Cover (%):** 0

#### Topo:
- **Flat / Hilly**

#### Terrain:
- **Hard/Soft/Mixed/Snow**

#### GPS Coordinates (at SLM location):
+35°59' 4.21", -78°53' 21.03"

#### ID  Start Time  Stop Time  L_{eq}  L_{min}  L_{max}  L_{10}  L_{50}  L_{90}  Notes/Events

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## FIELD NOISE MEASUREMENT

**DATA FORM**

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<th>Alston Ave. NB/SB</th>
<th>Site Diagram:</th>
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<tr>
<td>Speed (post/obs)*</td>
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<td>See scan of field sheet, and map with aerial and monitor location</td>
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<tr>
<td>Number of Lanes</td>
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<tr>
<td>Width (pave/row)</td>
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<tr>
<td>Count duration</td>
<td>10 min.</td>
<td></td>
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</tbody>
</table>

* - Speed estimated by Radar / Driving / Observation

Additional Notes/Comments:

Traffic on Alston stopped due to queuing at nearby traffic lights at Main St. and NC 147 WB.

Other Noise Sources: distant: aircraft/roadway/traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT DATA FORM**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date:</th>
<th>11/14/2013</th>
<th>Page of</th>
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<td>Analyst:</td>
<td>Andrew Bell - #2 Equipment</td>
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</table>

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test** 113.9 dBA
- **Post-Test** 113.9 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 6/S
- **Temp (° F):** 38
- **RH (%):** 50
- **Bar Psr (Hg):** 30.34
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location):
+35° 59' 4.21", -78° 53' 21.03"

### Notes/Events
- 820 CAL200 SM-28
- 1414 3704 3386

### ID | Start Time | Stop Time | $L_{eq}$ | $L_{min}$ | $L_{max}$ | $L_{10}$ | $L_{50}$ | $L_{90}$ | Notes/Events
---|-----------|-----------|---------|---------|---------|---------|---------|---------|---------------------
0 | 8:50 PM | 8:51 PM | 60.6 | 51.5 | 69.3 | 66.8 | 54.0 | 52.2 | 
1 | 8:51 PM | 8:52 PM | 66.2 | 58.9 | 71.3 | 69.8 | 64.7 | 60.7 | 
2 | 8:52 PM | 8:53 PM | 65.2 | 57.1 | 73.5 | 69.3 | 61.6 | 58.1 | 
3 | 8:53 PM | 8:54 PM | 70.9 | 55.4 | 81.4 | 75.1 | 65.7 | 58.4 | 
4 | 8:54 PM | 8:55 PM | 63.7 | 54.9 | 70.5 | 67.4 | 61.7 | 55.7 | 
5 | 8:55 PM | 8:56 PM | 66.1 | 56.1 | 70.8 | 69.6 | 64.4 | 58.9 | 
6 | 8:56 PM | 8:57 PM | 67.5 | 59.9 | 75.0 | 71.6 | 65.2 | 60.8 | 
7 | 8:57 PM | 8:58 PM | 68.9 | 59.2 | 75.5 | 73.3 | 67.4 | 60.1 | 
8 | 8:58 PM | 8:59 PM | 64.7 | 50.7 | 71.5 | 69.3 | 62.3 | 53.0 | 
9 | 8:59 PM | 9:00 PM | 61.5 | 49.1 | 69.0 | 66.3 | 56.7 | 49.7 | 
10 | 9:00 PM | 9:01 PM | 63.5 | 52.2 | 72.1 | 67.7 | 59.5 | 53.9 | 
11 | 9:01 PM | 9:02 PM | 65.5 | 53.2 | 73.9 | 69.5 | 61.0 | 54.4 | 
12 | 9:02 PM | 9:03 PM | 62.0 | 53.7 | 71.0 | 66.2 | 57.7 | 54.4 | 
13 | 9:03 PM | 9:04 PM | 67.2 | 58.1 | 73.4 | 70.2 | 66.0 | 59.8 | 
14 | 9:04 PM | 9:05 PM | 65.4 | 55.2 | 75.8 | 69.5 | 60.9 | 56.6 | 
15 | 9:05 PM | 9:06 PM | 65.3 | 52.8 | 73.3 | 68.7 | 63.3 | 54.8 | 
16 | 9:06 PM | 9:07 PM | 65.3 | 52.8 | 73.3 | 68.7 | 63.3 | 54.8 | 
17 | | | | | | | | | 
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26 | | | | | | | | | 
27 | | | | | | | | | 
28 | | | | | | | | | 
29 | | | | | | | | |
# URS Acoustics and Noise Control Practice

## FIELD NOISE MEASUREMENT DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Alston Ave. NB/SB</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
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<th>Motorcycles</th>
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<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
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<td>10 min.</td>
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* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? **Yes/No**

Additional Notes/Comments:

> Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location.
## URS Acoustics and Noise Control Practice

### FIELD NOISE MEASUREMENT

#### DATA FORM

<table>
<thead>
<tr>
<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/14/2013</th>
<th>Page of 1</th>
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<td>Monitoring Location: M16 - Mangum St. &amp; Vivian St.</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
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### Sound Level Meter

- **Model #:** 820
- **Serial #:** 1414

### Field Calibration

- **Model #:** CAL200
- **Serial #:** 3704

### Weather Data

- **Model #:** SM-28
- **Serial #:** 3386

#### Calibration Level (dBA):

94 / 114

#### Wind:

Steady/Gusty/Calm

#### Response:

Slow / Fast / Impl Pre-Test dBA

#### Post-Test dBA:

113.9 dBA

#### Pre-Test:

114.1 dBA

### GPS Coordinates (at SLM location)

+35° 59' 37.12", -78° 54' 6.46"

### Notes/Events

- Car started/running 40' from meter
- Car running 40' from meter
- Car running 40' from meter
- Car running 40' from meter
- Car running 40' from meter
- Car running 40' from meter
- Car running 40' from meter

### ID | Start Time | Stop Time | L<sub>eq</sub> | L<sub>min</sub> | L<sub>max</sub> | L<sub>10</sub> | L<sub>50</sub> | L<sub>90</sub> | Notes/Events |
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**Temp (°F):** 25  **RH (%):** 60  **Bar Psr (Hg):** 30.47  **Cloud Cover (%):** 20
### Field Noise Measurement Form

**Data Form**

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<th>Mangum St. SB</th>
<th>Vivian St. EB</th>
<th>Compass</th>
<th>Site Diagram:</th>
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<td>Speed (post/obs)*</td>
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<td>25</td>
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</tr>
<tr>
<td>Number of Lanes</td>
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<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (pave/row)</td>
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<td>22'</td>
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<tr>
<td>1- or 2- way</td>
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<td>2</td>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
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<td>10 min.</td>
<td></td>
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</table>

* - Speed estimated by Radar / Driving / Observation

**Photos Taken?** Yes/No

**Additional Notes/Comments:**
- Some noise generated from other nearby streets (Pettigrew St., Ramseur St.).
- Sound reflects off nearby buildings: Prison (9 floors), DPAC (5 floors).
- Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

*Additional Notes and Sketches on Reverse*
## FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/14/2013  
**Monitoring Location:** M16 - Mangum St. & Vivian St.  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704

### Weather Data
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Response:** Slow/Fast/Impl
- **Windscreen:** Yes/No
- **Pre-Test dBA:** 114.1 dBA
- **Post-Test dBA:** 113.9 dBA

### GPS Coordinates (at SLM location)
+35° 37' 12.2" N, -78° 54' 6.46" W

### Notes/Events
- Traffic normal until end of session
- Train gates down on Mangum St. upstream.

### Data Table

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<th>Stop Time</th>
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<th>L_min</th>
<th>L_max</th>
<th>L_10</th>
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K.24-128
# FIELD NOISE MEASUREMENT

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<tr>
<th>Roadway Name/Dir</th>
<th>Mangum St. SB</th>
<th>Vivian St. EB</th>
<th>compass</th>
<th>Site Diagram:</th>
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<tr>
<td>Speed (post/obs)*</td>
<td>25</td>
<td>25</td>
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<td>See scan of field sheet, and map with aerial and monitor location</td>
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<tr>
<td>Number of Lanes</td>
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<td>2</td>
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<tr>
<td>Width (pave/row)</td>
<td>50'</td>
<td>22'</td>
<td></td>
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<tr>
<td>1- or 2- way</td>
<td>1</td>
<td>2</td>
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<tr>
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<tr>
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<tr>
<td>Count duration</td>
<td>10 min.</td>
<td>10 min.</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No M16-1, M16-2, M16-3

Additional Notes: Longer measurement taken due to train and gates down. Count was taken after traffic resumed normal operation. Sound reflects off nearby buildings: Prison (9 floors), DPAC (5 floors).

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

| Project Name: Triangle Transit DEIS | Project #: 31829240 | Date: 11/14/2013 | Page of |
| Monitoring Location: M16 - Mangum St. & Vivian St. | Analyst: Andrew Bell - #2 Equipment |

**Sound Level Meter**

- **Model #:** 820
- **Serial #:** 1414

**Field Calibration**

- **Model #:** CAL200
- **Serial #:** 3704

**Weighting:** A / C / Flat

- **Calibration Level (dBA):** 94 / 114

**Response:** Slow / Fast / Impl

- **Pre-Test:** 114.1 dBA
- **Post-Test:** 113.9 dBA

**Windscreen:** Yes / No (explain)

- **Avg Wind Speed/Direction:** 8/SW

**GPS Coordinates (at SLM location)**

- +35° 59' 37.12", -78° 54' 6.46"

**Weather Data**

- **Temp (°F):** 52
- **RH (%):** 24
- **Bar Psr (Hg):** 30.37
- **Cloud Cover (%):** 0

**ID** | **Start Time** | **Stop Time** | **L\text{eq}** | **L\text{min}** | **L\text{max}** | **L\text{10}** | **L\text{50}** | **L\text{90}** | **Notes/Events** |
---|---|---|---|---|---|---|---|---|---|
0 | | | 67.6 | 59.0 | 73.9 | 71.8 | 65.6 | 59.7 |
1 | 4:44 PM | 4:45 PM | 65.2 | 58.4 | 70.8 | 69.2 | 62.7 | 59.4 |
2 | 4:45 PM | 4:46 PM | 66.1 | 56.4 | 70.6 | 68.8 | 66.3 | 58.5 |
3 | 4:46 PM | 4:47 PM | 66.0 | 56.1 | 71.2 | 69.4 | 63.9 | 57.9 |
4 | 4:47 PM | 4:48 PM | 65.0 | 59.6 | 69.6 | 66.9 | 64.5 | 61.2 |
5 | 4:48 PM | 4:49 PM | 66.1 | 56.6 | 71.6 | 69.3 | 65.9 | 58.7 |
6 | 4:49 PM | 4:50 PM | 63.6 | 57.3 | 68.2 | 67.0 | 62.0 | 58.9 |
7 | 4:50 PM | 4:51 PM | 63.0 | 53.9 | 69.4 | 66.6 | 61.7 | 55.5 |
8 | 4:51 PM | 4:52 PM | 65.8 | 59.9 | 70.9 | 68.6 | 64.6 | 61.0 |
9 | 4:52 PM | 4:53 PM | 65.4 | 57.4 | 70.0 | 68.2 | 64.5 | 59.8 |
10 | 4:53 PM | 4:54 PM | 66.4 | 58.9 | 73.1 | 69.7 | 64.9 | 60.7 |
11 | 4:54 PM | 4:55 PM | 65.5 | 57.8 | 70.7 | 68.6 | 64.7 | 60.4 |
12 | 4:55 PM | 4:56 PM | 65.0 | 59.6 | 68.5 | 67.2 | 64.8 | 61.1 |
13 | 4:56 PM | 4:57 PM | 67.1 | 59.2 | 77.7 | 70.5 | 63.6 | 60.9 |
14 | 4:57 PM | 4:58 PM | 63.3 | 57.7 | 68.2 | 66.3 | 62.3 | 59.2 |
15 | 4:58 PM | 4:59 PM | 63.5 | 54.8 | 68.4 | 66.1 | 63.2 | 57.3 |
16 | 4:59 PM | 5:00 PM | 62.9 | 54.1 | 67.7 | 66.5 | 61.6 | 58.2 |
17 | 5:00 PM | 5:01 PM | 64.5 | 54.1 | 68.1 | 67.0 | 64.6 | 58.4 |
18 | 5:01 PM | 5:02 PM | 63.1 | 54.4 | 67.2 | 66.2 | 62.2 | 56.9 |
19 | 5:02 PM | 5:03 PM | 62.7 | 54.0 | 68.3 | 66.4 | 61.0 | 55.7 |
20 | 5:03 PM | 5:04 PM | 65.7 | 59.7 | 70.8 | 68.4 | 65.0 | 61.2 |
21 | | | 67.2 | 59.3 | 73.5 | 70.2 | 65.8 | 62.2 |
22 | | | |
23 |
24 |
25 |
26 |
27 |
28 |
29 |

**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-130
### Field Noise Measurement Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Mangum St. SB</th>
<th>Vivian St. EB</th>
<th>Site Diagram:</th>
<th>Additional Notes and Sketches on Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>25</td>
<td>25</td>
<td>Compass</td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>3</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>50'</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>Grade</td>
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<td></td>
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</tr>
<tr>
<td>Bus Stops</td>
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</tr>
<tr>
<td>Stoplights</td>
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<tr>
<td>Count duration</td>
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<td>10 min.</td>
<td></td>
<td></td>
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</tbody>
</table>

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: WB Vivian St. closed due to upcoming play starting at 7:30. Approx. 8 vehicles diverted. Sound reflects off nearby buildings: Prison (9 floors), DPAC (5 floors). Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects
<table>
<thead>
<tr>
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<th>Stop Time</th>
<th>L\textsubscript{eq}</th>
<th>L\textsubscript{min}</th>
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## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT

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<tr>
<td>Count duration</td>
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<td>10 min.</td>
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</tbody>
</table>

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Photos Taken? **Yes/No**

Additional Notes/Comments: Sound reflects off nearby buildings: Prison (9 floors), DPAC (5 floors).

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
# FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/14/2013  
**Monitoring Location:**  
**Analyst:** Andrew Bell - #2 Equipment

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<th>$L_{max}$</th>
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**Sound Level Meter**  
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A/C/Flat  
- **Response:** Slow/Fast/Impl  
- **Windscreen:** Yes/No (explain)

**Field Calibration**  
- **Model #:** CAL200  
- **Calibration Level (dBA):** 94/114  
- **Pre-Test** 114.1 dBA  
- **Post-Test** 113.9 dBA

**Weather Data**  
- **Wind:** Steady/Gusty/Calm  
- **Wind Speed/Direction:** 1/NNW  
- **Avg Wind Speed/Direction:** 1/NNW  
- **Temp (°F):** 25  
- **RH (%):** 81  
- **Bar Psr (Hg):** 30.46  
- **Cloud Cover (%):** 16

**Topo:** Flat/Hilly  
**Terrain:** Hard/Soft/Mixed/Snow  
**GPS Coordinates (at SLM location):** +36° 0' 27.72", -78° 56' 1.90"  
**Notes/Events:**  
- 820 CAL200 SM-28  
- 1414 3704 3386

---

K.24-134
## FIELD NOISE MEASUREMENT DATA FORM

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<thead>
<tr>
<th>Roadway Name/Dir</th>
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<th>Trent Rd. NB/SB</th>
<th>Site Diagram:</th>
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<td>Speed (post/obs)*</td>
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<td>25</td>
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<td>Number of Lanes</td>
<td>5</td>
<td>4</td>
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<tr>
<td>Width (pave/row)</td>
<td>60'</td>
<td>48'</td>
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<td>1- or 2- way</td>
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<td>Buses</td>
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<td>10 min.</td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
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</table>

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

**Photos Taken?** Yes/No

**Additional Notes/Comments:** Lots of pedestrians, vehicles still main source of noise.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice**

FIELD NOISE MEASUREMENT

DATA FORM

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<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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<td><strong>Model #:</strong> 820</td>
<td><strong>Model #:</strong> CAL200</td>
<td><strong>Model #:</strong> SM-28</td>
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<td><strong>Serial #:</strong> 1414</td>
<td><strong>Serial #:</strong> 3704</td>
<td><strong>Serial #:</strong> 3386</td>
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<td><strong>Weighting:</strong> A / C / Flat</td>
<td><strong>Calibration Level (dBA):</strong> 94 / 114</td>
<td><strong>Wind:</strong> Steady/Gusty/Calm</td>
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<td><strong>Response:</strong> Slow / Fast / Impl Pre-Test 114.1 dBA</td>
<td><strong>Post-Test 113.9 dBA</strong></td>
<td><strong>Precipitation:</strong> Yes (explain) / No</td>
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<tr>
<td><strong>Windscreen:</strong> Yes / No (explain)</td>
<td></td>
<td><strong>Avg Wind Speed/Direction:</strong> 4/SW</td>
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<tr>
<td><strong>Topo:</strong> Flat / Hilly</td>
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**Notes/Events**

K.24-136
### URS Acoustics and Noise Control Practice
#### FIELD NOISE MEASUREMENT

**DATA FORM**

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<th>Roadway Name/Dir</th>
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<th>Site Diagram:</th>
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<td>Number of Lanes</td>
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# - note coordinate system  *

- Speed estimated by Radar / Driving / Observation

**Photos Taken? Yes/No**

M15-1, M15-2, M15-3

**Additional Notes/Comments:**

Lots of pedestrians, some rustling leaves, vehicles still main source of noise.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

**Additional Notes and Sketches on Reverse**
# URS Acoustics and Noise Control Practice
## FIELD NOISE MEASUREMENT
### DATA FORM

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<th>Project Name: Triangle Transit DEIS</th>
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<td>Monitoring Location:</td>
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<td>Analyst: Andrew Bell - #2 Equipment</td>
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### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test** 114.1 dBA
- **Post-Test** 113.9 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 7/SW
- **Temp (° F):** 50
- **RH (%):** 24
- **Bar Psr (Hg):** 30.37
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)
+36° 0' 27.72", -78° 56' 1.90"

### Table
<table>
<thead>
<tr>
<th>ID</th>
<th>Start Time</th>
<th>Stop Time</th>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-138
URS Acoustics and Noise Control Practice  
FIELD NOISE MEASUREMENT  
DATA FORM

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<tr>
<th>Roadway Name/Dir</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2- way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
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# - note coordinate system  
* - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

See scan of field sheet, and map with aerial and monitor location

Additional Notes and Sketches on Reverse
### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Pre-Test**
  - **Calibration Level (dBA):** 94 / 114
- **Post-Test**
  - **dBA:** 113.9

### Weather Data
- **Model #:** SM-28
- **Serial #:** 3386
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 4/S
- **Temp (°F):** 36
- **RH (%):** 50
- **Bar Psr (Hg):** 30.34
- **Cloud Cover (%):** 0

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# URS Acoustics and Noise Control Practice

## FIELD NOISE MEASUREMENT

### DATA FORM

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<td>Width (pave/row)</td>
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<td>48'</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Page of:**

**Monitoring Location:** M14C - Jewish Community Center  
**Analyst:** Andrew Bell - #2 Equipment

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704

### Weather Data
- **Calibration Level (dBA):** 94 / 114  
- **Wind:** Steady/Gusty/Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 2/SSW

### Topo: Flat / Hilly  
**GPS Coordinates (at SLM location):** +35° 58' 43.88", -78° 57' 21.09"  
**Temp (°F):** 40  
**RH (%):** 81  
**Bar Psr (Hg):** 30.06  
**Cloud Cover (%):** 23

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Terrain: Hard/Soft/Mixed/Snow

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K.24-142
URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT

DATA FORM

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<th>compass</th>
<th>Site Diagram:</th>
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<tr>
<td>Count duration</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: Birds chirping. US 15-501 can be heard in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT

**DATA FORM**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date:</th>
<th>11/12/2013</th>
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<tr>
<td>Monitoring Location:</td>
<td>M14C - Jewish Community Center</td>
<td>Analyst:</td>
<td>Andrew Bell - #2 Equipment</td>
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<table>
<thead>
<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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<tr>
<td>Model #:</td>
<td>820</td>
<td>Model #:</td>
</tr>
<tr>
<td>Serial #:</td>
<td>1414</td>
<td>Serial #:</td>
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- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)

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<thead>
<tr>
<th>Topo:</th>
<th>Flat / Hilly</th>
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</thead>
<tbody>
<tr>
<td>Terrain:</td>
<td>Hard/Soft/Mixed/Snow</td>
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| GPS Coordinates (at SLM location): | +35° 58' 43.88", -78° 57' 21.09" |

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<th>L&lt;sub&gt;min&lt;/sub&gt;</th>
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## URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

### DATA FORM

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<td>Width (pave/row)</td>
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<tr>
<td>1- or 2- way</td>
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<tr>
<td>Count duration</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No** 14C-1, 14C-2, 14C-3

Additional Notes/Comments: Leaves rustling. US 15-501 can be heard in distance.

Additional Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse
**FIELD NOISE MEASUREMENT DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/13/2013  
**Monitoring Location:** M14C - Jewish Community Center  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Pre-Test:** dBA

### Weather Data
- **Wind:** Steady / Gusty / Calm  
- **Max 9 mph**
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 6/NNW
- **Temp (°F):** 43  
- **RH (%):** 36  
- **Bar Psr (Hg):** 30.47  
- **Cloud Cover (%):** 0

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<td>45.7</td>
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<td>49.6</td>
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<td>45.4</td>
<td>Talking to pedestrian approx. 30’ from monitor.</td>
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<td>4:22 PM</td>
<td>4:23 PM</td>
<td>47.0</td>
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<td>46.8</td>
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<td>Talking to pedestrian approx. 30’ from monitor.</td>
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<tr>
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<td>48.8</td>
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<td>47.0</td>
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<td>Talking to pedestrian approx. 30’ from monitor.</td>
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<td>Car starting/leaving parking lot</td>
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<td>Slamming garage door at Pepsi building to west</td>
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<td>4:27 PM</td>
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</tbody>
</table>

**GPS Coordinates (at SLM location):** +35° 58' 43.88", -78° 57' 21.09"

**Notes:**
- Talking to pedestrian approx. 30’ from monitor.
- Talking to pedestrian approx. 30’ from monitor.
- Talking to pedestrian approx. 30’ from monitor.
- Car starting/leaving parking lot
- Truck downshifting on US 15-501
- Slamming garage door at Pepsi building to west
### FIELD NOISE MEASUREMENT DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Jewish Com. Ctr.</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2- way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
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<td>15 min.</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**


Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location.
### URS Acoustics and Noise Control Practice
#### FIELD NOISE MEASUREMENT

**DATA FORM**

| Field Noise Measurement Form | Vers. 1.2  | 111109 |

| Project Name: Triangle Transit DEIS | Project #: 31829240 | Date: 11/13/2013 | Page of |
| Monitoring Location: M14C - Jewish Community Center | Analyst: Andrew Bell - #2 Equipment |

#### Sound Level Meter

| Model #: | 820 | Field Calibration |
| Model #: | CAL200 | Serial #: 1414 |
| Serial #: | 3704 | Serial #: 3386 |

#### Weather Data

- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

#### GPS Coordinates (at SLM location)°

- +35° 58' 43.88", -78° 57' 21.09"
- **Temp (°F):** 29
- **RH (%):** 62
- **Bar Psr (Hg):** 30.50
- **Cloud Cover (%):** 0

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# URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

## DATA FORM

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<th>Jewish Com. Ctr.</th>
<th>compass</th>
<th>Site Diagram:</th>
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</tr>
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<td><strong>Speed (post/obs)</strong>*</td>
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<tr>
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<td>Heavy Trucks</td>
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<td>Buses</td>
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<td>Count duration</td>
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<td>See scan of field sheet, and map with aerial and monitor location</td>
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</tbody>
</table>

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: Very few vehicles parked near monitor / no significant noise created by Community Center.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## FIELD NOISE MEASUREMENT DATA FORM

### Project Information
- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/12/2013
- **Monitoring Location:** M14B - Duke Golf Club / Al Buehler Trail
- **Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter & Field Calibration
- **Model #:** 820
- **Serial #:** 1414
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Pre-Test dBA:** 114.1 dBA
- **Post-Test dBA:** 114.1 dBA

### Weather Data
- **Temp (°F):** 41
- **RH (%):** 83
- **Avg Wind Speed/Direction:** 2/WSW
- **Cloud Cover (%):** 75
- **Bar Psr (Hg):** 30.06

### Topography & Terrain
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Sof/Mixed/Snow

### GPS Coordinates (at SLM location)
- +35°59'6.55", -78°57'25.46"

### Notes/Events
- Truck with air brakes on US 15-501
- Car horn on US 15-501

### ID | Start Time | Stop Time | L\(_{eq}\) | L\(_{min}\) | L\(_{max}\) | L\(_{10}\) | L\(_{50}\) | L\(_{90}\) | Notes/Events
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
0 | | | | | | | | | 
1 | 8:38 AM | 8:39 AM | 57.1 | 56.4 | 57.3 | 57.3 | 57.3 | 57.0 | 
2 | 8:39 AM | 8:40 AM | 58.1 | 54.8 | 64.0 | 60.5 | 57.1 | 55.3 | 
3 | 8:40 AM | 8:41 AM | 59.8 | 56.2 | 65.8 | 61.5 | 59.0 | 57.2 | 
4 | 8:41 AM | 8:42 AM | 58.6 | 55.9 | 62.6 | 61.0 | 58.0 | 56.4 | 
5 | 8:42 AM | 8:43 AM | 58.9 | 55.4 | 63.4 | 62.2 | 57.3 | 55.6 | 
6 | 8:43 AM | 8:44 AM | 56.8 | 53.9 | 59.8 | 58.5 | 56.6 | 54.8 | 
7 | 8:44 AM | 8:45 AM | 58.8 | 56.3 | 62.1 | 60.0 | 58.7 | 57.1 | 
8 | 8:45 AM | 8:46 AM | 58.5 | 51.9 | 59.2 | 58.9 | 55.8 | 53.6 | 
9 | 8:46 AM | 8:47 AM | 57.1 | 54.7 | 58.9 | 58.2 | 57.1 | 56.0 | 
10 | 8:47 AM | 8:48 AM | 57.7 | 53.6 | 61.2 | 59.5 | 57.6 | 54.4 | 
11 | 8:48 AM | 8:49 AM | 57.4 | 54.6 | 62.0 | 60.1 | 56.5 | 55.1 | 
12 | 8:49 AM | 8:50 AM | 62.0 | 56.1 | 70.2 | 65.6 | 59.3 | 56.6 | 
13 | 8:50 AM | 8:51 AM | 56.6 | 53.6 | 61.6 | 58.0 | 56.0 | 54.3 | 
14 | 8:51 AM | 8:52 AM | 58.2 | 56.0 | 61.4 | 60.0 | 57.7 | 56.4 | 
15 | 8:52 AM | 8:53 AM | 58.1 | 56.5 | 59.7 | 59.0 | 58.2 | 57.1 | 
16 | | | 58.8 | 54.4 | 63.6 | 61.9 | 57.9 | 56.0 | 
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### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT DATA FORM**

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<td>Count duration</td>
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# - note coordinate system  
* - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**  
Additional Notes/Comments:  

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
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<th>Stop Time</th>
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<th>L_{max}</th>
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**Notes:**
- Project Name: Triangle Transit DEIS
- Monitoring Location: M14B - Duke Golf Club / Al Buehler Trail
- Analyst: John Burris - #2 Equipment
- Project #: 31829240
- Date: 11/15/2013
- Field Calibration:
  - Sound Level Meter: 820
  - Calibrator: CAL200
  - Serial #: 1414
  - Calibration Level (dBA): 94 / 114
- Weather Data:
  - Wind: Steady/Gusty/Calm
  - Pre-Test dBA: 113.9
  - Post-Test dBA: 113.9
  - Precipitation: No
  - Avg Wind Speed/Direction: 0
  - Temp (°F): 48
  - RH (%): 73
  - Barometer: 30.34
  - Cloud Cover (%): 80

**GPS Coordinates (at SLM location):**
+35° 59' 6.55", -78° 57' 25.46"
### FIELD NOISE MEASUREMENT

**Data Form**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Site Diagram:</th>
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<tr>
<td>Speed (post/obs)*</td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
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<tr>
<td>Heavy Trucks</td>
<td></td>
</tr>
<tr>
<td>Buses</td>
<td></td>
</tr>
<tr>
<td>Count duration</td>
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</table>

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse
## FIELD NOISE MEASUREMENT

### DATA FORM

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<thead>
<tr>
<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/13/2013</th>
<th>Page of</th>
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<tr>
<td>Monitoring Location: M14B - Duke Golf Club / Al Buehler Trail</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
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### Field Calibration

<table>
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<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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<tr>
<td>Model #: 820</td>
<td>Model #: CAL200</td>
<td>Model #: SM-28</td>
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<tr>
<td>Serial #: 1414</td>
<td>Serial #: 3704</td>
<td>Serial #: 3386</td>
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<td>Pre-Test 114.1 dBA</td>
<td>Precipitation: Yes (explain) / No</td>
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<td>Windscreen: Yes / No (explain)</td>
<td>Post-Test 113.9 dBA</td>
<td>Avg Wind Speed/Direction: 6/NNW</td>
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<td>GPS Coordinates (at SLM location): +35°59' 6.55&quot;, -78°57' 25.46&quot;</td>
<td>Temp (°F): 44 RH (%): 35</td>
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<td>Terrain: Hard/Soft/Mixed/Snow</td>
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<td>Bar Psr (Hg): 30.47 Cloud Cover (%): 0</td>
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### ID | Start Time | Stop Time | L_eq | L_min | L_max | L10 | L50 | L90 | Notes/Events |
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K.24-154
### Field Noise Measurement Data Form

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<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2-way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
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**Notes:**
- # - note coordinate system
- * - Speed estimated by Radar / Driving / Observation
- Photos Taken? **Yes**/No M14B-1, M14B-2, M14B-3
- Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

**Additional Notes and Sketches on Reverse**

**Site Diagram:**

See scan of field sheet, and map with aerial and monitor location.
## FIELD NOISE MEASUREMENT

### DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M14A - Vacant School Building  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter

- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Field Calibration

- **Model #:** CAL200  
- **Serial #:** 3704  
- **Pre-Test:** 114.1 dBA  
- **Post-Test:** 114.1 dBA

### Weather Data

- **Calibration Level (dBA):** 94 / 114  
- **Wind:** Steady/Gusty/Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 2/WSW

### Terrain

- **Topo:** Flat / Hilly  
- **GPS Coordinates (at SLM location):** +35° 58' 53.37", -78° 57' 20.55"

### Temp (° F): 39  
**RH (%):** 81  
**Bar Psr (Hg):** 30.06  
**Cloud Cover (%):** 23

### Notes/Events

- **K.24-156**

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## FIELD NOISE MEASUREMENT DATA FORM

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- Speed estimated by Radar / Driving / Observation

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

### Photos Taken? Yes/No

**Yes**

**Additional Notes/Comments:**


Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
## Field Noise Measurement Form

### Instrument Details
- **Sound Level Meter**
  - Model #: 820
  - Serial #: 1414
- **Field Calibration**
  - Model #: CAL200
  - Serial #: 3704
- **Weather Data**
  - Model #: SM-28
  - Serial #: 3386
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
  - Calibration Level (dBA): 94 / 114
  - Pre-Test: 113.9 dBA
  - Post-Test: 113.9 dBA
- **Windscreen:** Yes / No
  - Yes (explain)
- **Response:** Steady/Gusty/Calm
- **Wind:**
  - Steady: 0
- **Precipitation:**
  - Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Topo:** Flat / Hilly
- **Temp (° F):** 73
- **Relative Humidity (%):** 73
- **Barometric Pressure (Hg):** 30.35
- **Cloud Cover (%):** 75
- **GPS Coordinates (at SLM location):** +35° 58' 53.37", -78° 57' 20.55"

### Measurement Data

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**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-158
<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>School Parking Lot</th>
<th>compass</th>
<th>Site Diagram:</th>
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<tbody>
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<td>Speed (post/obs)*</td>
<td>5</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
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<tr>
<td>1- or 2- way</td>
<td>-</td>
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<tr>
<td>Grade</td>
<td>-4% to road</td>
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<td></td>
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<tr>
<td>Bus Stops</td>
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<td>Medium Trucks</td>
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<td>Heavy Trucks</td>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
<td></td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

**DATA FORM**

<table>
<thead>
<tr>
<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/13/2013</th>
<th>Page of</th>
</tr>
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<tbody>
<tr>
<td>Monitoring Location: M14A - Vacant School Building</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
<td></td>
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</tbody>
</table>

#### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

#### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Pre-Test:** 114.1 dBA
- **Post-Test:** 113.9 dBA

#### Weather Data
- **Weather Data:**
  - **Wind:** Steady/Gusty/Calm
  - **Precipitation:** Yes (explain) / No
  - **Avg Wind Speed/Direction:** 6/NNW
  - **Temp (°F):** 43
  - **RH (%):** 36
  - **Bar Psr (Hg):** 30.47
  - **Cloud Cover (%):** 0

#### GPS Coordinates (at SLM location)
+35° 58' 53.37", -78° 57' 20.55"

#### ID | Start Time | Stop Time | L_eq | L_min | L_max | L_10 | L_50 | L_90 | Notes/Events
|-----|------------|-----------|------|-------|-------|------|------|------|-----------------
| 0   | 4:34 PM    | 4:35 PM   | 53.3 | 51.6  | 55.0  | 54.2 | 53.4 | 52.3 |               |
| 1   | 4:35 PM    | 4:36 PM   | 53.4 | 51.8  | 55.9  | 55.0 | 53.0 | 52.2 |               |
| 2   | 4:36 PM    | 4:37 PM   | 54.3 | 52.3  | 56.0  | 55.6 | 54.2 | 53.0 |               |
| 3   | 4:37 PM    | 4:38 PM   | 53.7 | 51.4  | 55.8  | 55.2 | 53.6 | 51.8 |               |
| 4   | 4:38 PM    | 4:39 PM   | 53.5 | 50.4  | 55.6  | 55.5 | 53.1 | 51.2 |               |
| 5   | 4:39 PM    | 4:40 PM   | 53.4 | 50.8  | 55.6  | 54.7 | 53.3 | 51.7 |               |
| 6   | 4:40 PM    | 4:41 PM   | 55.1 | 53.1  | 57.4  | 56.0 | 55.2 | 54.0 |               |
| 7   | 4:41 PM    | 4:42 PM   | 54.4 | 51.9  | 57.7  | 55.6 | 54.2 | 52.6 |               |
| 8   | 4:42 PM    | 4:43 PM   | 54.4 | 53.0  | 56.5  | 55.7 | 54.2 | 53.2 |               |
| 9   | 4:43 PM    | 4:44 PM   | 51.9 | 49.0  | 54.8  | 53.8 | 51.4 | 49.6 |               |
| 10  | 4:44 PM    | 4:45 PM   | 54.1 | 51.7  | 55.8  | 55.1 | 54.1 | 52.5 |               |
| 11  | 4:45 PM    | 4:46 PM   | 53.2 | 50.1  | 55.2  | 54.5 | 53.3 | 51.2 |               |
| 12  | 4:46 PM    | 4:47 PM   | 56.6 | 53.3  | 62.4  | 59.0 | 55.7 | 54.0 |               |
| 13  | 4:47 PM    | 4:48 PM   | 55.0 | 53.7  | 57.4  | 56.3 | 54.8 | 54.1 |               |
| 14  | 4:48 PM    | 4:49 PM   | 55.0 | 52.7  | 58.3  | 57.4 | 54.1 | 53.1 |               |
| 15  | 4:49 PM    | 4:50 PM   | 54.2 | 52.3  | 55.7  | 55.1 | 54.2 | 53.1 |               |
| 16  | 4:50 PM    | 4:51 PM   | 53.5 | 51.4  | 55.4  | 54.9 | 53.4 | 51.8 |               |
| 17  | 4:51 PM    | 4:52 PM   | 54.3 | 52.0  | 56.4  | 55.8 | 54.0 | 52.6 |               |
| 18  | 4:52 PM    | 4:53 PM   | 54.0 | 52.2  | 56.3  | 55.7 | 53.6 | 52.4 |               |
| 19  | 4:53 PM    | 4:54 PM   | 55.1 | 52.1  | 59.0  | 58.0 | 54.3 | 52.6 |               |
| 20  | 4:54 PM    | 4:55 PM   | 54.3 | 50.8  | 57.0  | 56.0 | 54.2 | 51.6 |               |
| 21  | 4:55 PM    | 4:56 PM   | 54.3 | 50.8  | 57.0  | 56.0 | 54.2 | 51.6 |               |
| 22  |            |            |      |       |       |      |      |      |               |
| 23  |            |            |      |       |       |      |      |      |               |
| 24  |            |            |      |       |       |      |      |      |               |
| 25  |            |            |      |       |       |      |      |      |               |
| 26  |            |            |      |       |       |      |      |      |               |
| 27  |            |            |      |       |       |      |      |      |               |
| 28  |            |            |      |       |       |      |      |      |               |
| 29  |            |            |      |       |       |      |      |      |               |
### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

**DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>School Parking Lot</th>
<th>Compass</th>
<th>Site Diagram</th>
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<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>5</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
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<tr>
<td>Number of Lanes</td>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
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* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? **Yes/No**  M14A-1, M14A-2, M14A-3

Additional Notes/Comments: School is for sale. Vacant. US 15-501 is audible in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/13/2013  
**Monitoring Location:** M14A - Vacant School Building  
**Analyst:** Andrew Bell - #2 Equipment

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<td>Terrain:</td>
<td>Hard/Soft/Mixed/Snow</td>
<td>RH (%):</td>
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</tbody>
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**GPS Coordinates (at SLM location):**
+35° 58' 53.37", -78° 57' 20.55"

**Bar Psr (Hg):** 30.50  
**Cloud Cover (%):** 0

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<th>ID</th>
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**Notes/Events**
820 CAL200 SM-28  
1414 3704 3386  
Triangle Transit DEIS 31829240 11/13/2013  
M14A - Vacant School Building Andrew Bell - #2 Equipment Field Calibration  
Weather Data  
K.24-162
**URS Acoustics and Noise Control Practice**  
**FIELD NOISE MEASUREMENT**  
**DATA FORM**

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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>15 min.</td>
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</tbody>
</table>

# - note coordinate system  
* - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**  
Additional Notes/Comments: School is for sale. Vacant. US 15-501 is audible in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

---

K.24-163
## Field Noise Measurement Form

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M14 - Conifer Glen Ln.  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Pre-Test dBA:** 114.1 dBA  
- **Post-Test dBA:** 114.1 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 2/WSW  
- **Temp (° F):** 83  
- **RH (%):** 83  
- **Bar Psr (Hg):** 30.06  
- **Cloud Cover (%):** 33

### ID Start Time Stop Time L<sub>eq</sub> L<sub>min</sub> L<sub>max</sub> L<sub>10</sub> L<sub>50</sub> L<sub>90</sub> Notes/Events

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<td>67.4</td>
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<td>50.6</td>
<td>48.9</td>
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<td>50.7</td>
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</table>

### GPS Coordinates (at SLM location)
- 35° 58' 22.57", -78° 57' 25.10"

### Notes/Events
- Car passing / gate opened once
- Gate opened once
- Car passing / gate opened twice
- Gate opened twice
## FIELD NOISE MEASUREMENT

### DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Conifer Glen Ln. EB/WB</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2-way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conifer Glen Ln. EB/WB</td>
<td>10</td>
<td>2</td>
<td>22'</td>
<td>2</td>
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<td>0</td>
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<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20 min.</td>
</tr>
</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments: Traffic from Tower Blvd. audible.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
Project Name: Triangle Transit DEIS  
Project #: 31829240  
Date: 11/12/2013  
Page of
Monitoring Location: M14 - Conifer Glen Ln.
Analyst: Andrew Bell - #2 Equipment

**Sound Level Meter**
- Model #: 820
- Serial #: 1414
- Weighting: A / C / Flat
- Response: Slow / Fast / Impl
- Windscreen: Yes / No (explain)
- Topo: Flat / Hilly
- Terrain: Hard/Soft/Mixed/Snow

**Field Calibration**
- Model #: CAL200
- Serial #: 3704
- Calibration Level (dBA): 94 / 114
- Pre-Test: 114.1 dBA
- Post-Test: 114.1 dBA

**Weather Data**
- Wind: Steady/Gusty/Calm
- Precipitation: Yes (explain) / No
- Avg Wind Speed/Direction: 4/NW
- Temp (°F): 53
- RH (%): 60
- Bar Psr (Hg): 30.11
- Cloud Cover (%): 78

**GPS Coordinates (at SLM location)**
+35° 58' 22.57", -78° 57' 25.10"

**ID** | **Start Time** | **Stop Time** | **L<sub>eq</sub>** | **L<sub>min</sub>** | **L<sub>max</sub>** | **L<sub>10</sub>** | **L<sub>50</sub>** | **L<sub>90</sub>** | **Notes/Events**
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1 | 11:26 AM | 11:27 AM | 52.3 | 46.1 | 59.8 | 56.5 | 48.4 | 46.8 |  
2 | 11:27 AM | 11:28 AM | 49.5 | 46.6 | 54.1 | 51.2 | 49.1 | 47.1 |  
3 | 11:28 AM | 11:29 AM | 54.6 | 47.4 | 62.7 | 59.0 | 50.6 | 48.2 |  
4 | 11:29 AM | 11:30 AM | 47.8 | 45.7 | 50.9 | 49.4 | 47.4 | 46.2 |  
5 | 11:30 AM | 11:31 AM | 47.7 | 46.1 | 50.1 | 48.7 | 47.6 | 46.5 |  
6 | 11:31 AM | 11:32 AM | 52.2 | 46.1 | 61.0 | 56.6 | 48.3 | 46.6 | Pedestrian passing by monitor  
7 | 11:32 AM | 11:33 AM | 50.7 | 46.4 | 59.2 | 53.5 | 48.1 | 46.5 |  
8 | 11:33 AM | 11:34 AM | 54.8 | 48.4 | 59.9 | 57.7 | 54.2 | 49.8 |  
9 | 11:34 AM | 11:35 AM | 54.4 | 48.4 | 59.2 | 56.8 | 54.1 | 48.7 |  
10 | 11:36 AM | 11:37 AM | 50.7 | 45.5 | 55.6 | 53.3 | 50.2 | 46.8 |  
11 | 11:37 AM | 11:38 AM | 55.4 | 45.1 | 64.9 | 59.5 | 50.6 | 45.7 |  
12 | 11:38 AM | 11:39 AM | 51.6 | 46.6 | 64.0 | 52.8 | 49.4 | 47.4 |  
13 | 11:39 AM | 11:40 AM | 52.8 | 47.9 | 59.2 | 56.8 | 50.6 | 48.5 |  
14 | 11:40 AM | 11:41 AM | 54.1 | 47.0 | 64.6 | 57.8 | 48.9 | 47.4 |  
15 | 11:41 AM | 11:42 AM | 50.9 | 48.0 | 55.5 | 52.9 | 50.3 | 48.5 |  
16 | 11:42 AM | 11:43 AM | 48.1 | 45.8 | 50.9 | 49.0 | 48.1 | 46.9 |  
17 | 11:43 AM | 11:44 AM | 48.1 | 45.9 | 51.7 | 49.0 | 48.3 | 46.6 |  
18 | 11:44 AM | 11:45 AM | 50.1 | 47.5 | 53.7 | 52.0 | 49.8 | 48.1 |  
19 | 11:45 AM | 11:46 AM | 49.8 | 45.5 | 56.6 | 53.7 | 47.4 | 45.9 |  
20 | 11:46 AM | 11:47 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
21 | 11:47 AM | 11:48 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
22 | 11:48 AM | 11:49 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
23 | 11:49 AM | 11:50 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
24 | 11:50 AM | 11:51 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
25 | 11:51 AM | 11:52 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
26 | 11:52 AM | 11:53 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
27 | 11:53 AM | 11:54 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
28 | 11:54 AM | 11:55 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  
29 | 11:55 AM | 11:56 AM | 46.9 | 46.5 | 47.1 | 47.1 | 46.7 | 46.5 |  

URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109
K.24-166
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Conifer Glen Ln. EB/WB</th>
<th>compass</th>
<th>Site Diagram:</th>
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</thead>
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<tr>
<td>Speed (post/obs)*</td>
<td>10</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>22'</td>
<td></td>
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<tr>
<td>1- or 2-way</td>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>Grade</td>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
<td></td>
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* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? **Yes**/No M14-1, M14-2, M14-3

Additional Notes/Comments: Gates open. Traffic from Tower Blvd. audible.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/13/2013  
**Monitoring Location:** M14 - Conifer Glen Ln.  
**Analyst:** Andrew Bell - #2 Equipment

<table>
<thead>
<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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<tr>
<td><strong>Model #:</strong> 820</td>
<td><strong>Model #:</strong> CAL200</td>
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<td><strong>Serial #:</strong> 3704</td>
<td><strong>Serial #:</strong> 3386</td>
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**Weighting:** A / C / Flat  
**Calibration Level (dBA):** 94 / 114  
**Wind:** Steady / Gusty / Calm  
**Pre-Test** dBA: 114.1  
**Post-Test** dBA: 113.9  
**Response:** Slow / Fast / Impl  
**Calibration Level (dBA):** 94 / 114  
**Precipitation:** Yes (explain) / No

**Windscreen:** Yes / No (explain)  
**Avg Wind Speed/Direction:** 7/NNW

**Topo:** Flat / Hilly  
**Temperature:** 39°F  
**Cloud Cover (%):** 0

**Terrain:** Hard / Soft / Mixed / Snow  
**Relative Humidity (%):** 40

**Bar Psr (Hg):** 30.47

### GPS Coordinates (at SLM location)

- **Latitude:** +35° 58' 22.57"  
- **Longitude:** -78° 57' 25.10"

### ID Start Time Stop Time \( L_{eq} \) \( L_{min} \) \( L_{max} \) \( L_{10} \) \( L_{50} \) \( L_{90} \)

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<tr>
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<th>Start Time</th>
<th>Stop Time</th>
<th>( L_{eq} )</th>
<th>( L_{min} )</th>
<th>( L_{max} )</th>
<th>( L_{10} )</th>
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</tr>
<tr>
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<tr>
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<td>5:12 PM</td>
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**Bar P. (Hg):** 30.47  
**Notes/Events**
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No
Additional Notes/Comments: Gates open. Traffic from Tower Blvd. audible.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT

**Data Form**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/13/2013  
**Monitoring Location:** M14 - Conifer Glen Ln.  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter

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<th>L&lt;sub&gt;min&lt;/sub&gt;</th>
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### Field Calibration

- Model #: CAL200  
- Serial #: 3704

### Weather Data

- Calibration Level (dBA): 94 / 114  
- Wind: Steady/Gusty/Calm  
- Pre-Test: 114.1 dBA  
- Post-Test: 113.9 dBA

### Notes/Events

- Out gate open once.
- Out gate open once.

---

**GPS Coordinates (at SLM location)**

9°58'22.57", -78°57'25.10"
# Field Noise Measurement Data Form

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<td>Grade</td>
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<td>Motorcycles</td>
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* - Speed estimated by Radar / Driving / Observation
# - note coordinate system

Photos Taken? **Yes/No**
Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

See scan of field sheet, and map with aerial and monitor location
**URS Acoustics and Noise Control Practice**  
FIELD NOISE MEASUREMENT

**DATA FORM**

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<th>Triangle Transit DEIS</th>
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<th>31829240</th>
<th>Date:</th>
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<td>Andrew Bell - #2 Equipment</td>
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### Sound Level Meter

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### Weather Data

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### Topo:

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### GPS Coordinates (at SLM location)

+35° 57' 36.24", -78° 58' 3.23"

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<th>L min</th>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-172
### URS Acoustics and Noise Control Practice
#### FIELD NOISE MEASUREMENT

**DATA FORM**

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<thead>
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<th>Roadway Name/Dir</th>
<th>Snow Crest Tr. EB/WB</th>
<th>compass</th>
<th>Site Diagram: See scan of field sheet, and map with aerial and monitor location</th>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation  
Photos Taken? Yes/No  
Additional Notes/Comments: Dog walking area close by. US 15-501 can be heard in distance.  
Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects  

Additional Notes and Sketches on Reverse
## FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M13 - Snow Crest Trail  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** CAL200  
- **Serial #:** 3704

### Field Calibration
- **Calibration Level (dBA):** 94 / 114

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Temperature (°F):** 51  
- **RH (%):** 62  
- **Bar Psr (Hg):** 30.10  
- **Cloud Cover (%):** 60

### GPS Coordinates (at SLM location)
- **+35° 57' 36.24", -78° 58' 3.23"**

### Notes/Events
- Car starting, overhead plane.

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# URS Acoustics and Noise Control Practice

## FIELD NOISE MEASUREMENT

### DATA FORM

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<tr>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No** M13-1, M13-2, M13-3

Additional Notes/Comments: Dog walking area close by. Leaves rustling. US 15-501 can be heard in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT DATA FORM**

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<td>Andrew Bell - #2 Equipment</td>
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### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test** 114.1 dBA
- **Post-Test** 113.9 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 5/WNW
- **Temp (°F):** 39
- **RH (%):** 30
- **Bar Psr (Hg):** 30.47
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)
+35°57'36.24", -78°58'3.23"

### Windscreen
- Yes / No (explain)

### Weather Data
- **ID** | **Start Time** | **Stop Time** | **L_eq** | **L_min** | **L_max** | **L_{10}** | **L_{50}** | **L_{90}** | **Notes/Events** |
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**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-176
**FIELD NOISE MEASUREMENT DATA FORM**

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<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Snow Crest Tr. EB/WB</th>
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<th>Site Diagram:</th>
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<td>24'</td>
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<td>1- or 2-way</td>
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<tr>
<td>Stoplights</td>
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<td>Heavy Trucks</td>
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<td>Buses</td>
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<td>Count duration</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: Dog walking area close by. US 15-501 can be heard in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT DATA FORM

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<thead>
<tr>
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<th>M13 - Snow Crest Trail</th>
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<th>Andrew Bell - #2 Equipment</th>
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<td>Triangle Transit DEIS</td>
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**Sound Level Meter:**
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl Pre-Test / Post-Test
- **Windscreen:** Yes / No

**Field Calibration:**
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test:** 114.1 dBA
- **Post-Test:** 113.9 dBA

**Weather Data:**
- **Wind:** Steady/Gusty/Calm
- **Avg Wind Speed/Direction:** 0
- **Precipitation:** Yes (explain) / No
- **Bar Psr (Hg):** 30.50
- **Temp (°F):** 28
- **RH (%):** 78
- **Cloud Cover (%):** 0
- **GPS Coordinates (at SLM location):** +35°57'36.24", -78°58'3.23"

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# FIELD NOISE MEASUREMENT

## DATA FORM

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<th>Snow Crest Tr. EB/WB</th>
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<th>Site Diagram:</th>
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<td>Number of Lanes</td>
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</table>

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: Dog walking area close by. US 15-501 can be heard in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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<th>Project #: 31829240</th>
<th>Date: 11/12/2013</th>
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**Sound Level Meter**
- **Model #:** 820
- **Serial #:** 1324

**Field Calibration**
- **Model #:** CAL200
- **Serial #:** 3704

**Weather Data**
- **Model #:** SM-28
- **Serial #:** 3386

**Weighting:** A / C / Flat
- Calibration Level (dBA): 94 / 114

**Response:** Slow / Fast / Impl
- Pre-Test: 114.1 dBA
- Post-Test: 114.1 dBA

**Windscreen:** Yes / No (explain)
- Wind: Steady/Gusty/Calm
- Precipitation: Yes (explain) / No

**Topo:** Flat / Hilly
- Temp (° F): 37
- RH (%): 83

**Terrain:** Hard/Soft/Mixed/Snow
- Bar Psr (Hg): 30.06
- Cloud Cover (%): 33

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**GPS Coordinates (at SLM location):**

- +35° 57' 14.82", -78° 59' 07.54"

K.24-180

URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
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**Notes/Events:** Woman playing with dog at playground

**GPS Coordinates (at SLM location):** +35° 57' 14.82", -78° 59' 07.54"

**Topo:** Flat / Hilly

**Terrain:** Hard/Soft/Mixed/Snow
# FIELD NOISE MEASUREMENT DATA FORM

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* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Site Diagram:

See scan of field sheet, and map with aerial and monitor location
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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<td>John Burris - #2 Equipment</td>
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#### Sound Level Meter

- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard / Soft / Mixed / Snow

#### Field Calibration

- **Model #:** CAL200
- **Serial #:** 3704
- **Pre-Test:** 113.9 dBA
- **Post-Test:** 113.9 dBA

#### Weather Data

- **Temperature:** 60°F
- **RH (%):** 73
- **Bar Pss (Hg):** 30.20
- **Cloud Cover (%):** 100

#### Weather Data

- **Wind:** Steady / Gusty / Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed / Direction:** 0

#### GPS Coordinates (at SLM location)

- 35° 57' 14.82", -78° 59' 07.54"

#### ID Start Time Stop Time L_eq L_min L_max L_10 L_50 L_90 Notes / Events

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K.24-184
## Field Noise Measurement Data Form

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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No
Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
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### Weather Data
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Response:** Slow / Fast / Impl
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (°F):** 55
- **RH (%):** 73
- **Bar Psr (Hg):** 30.19
- **Cloud Cover (%):** 100

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414

### Topo/Terrain
- **Flat / Hilly**
- **Hard/Soft/Mixed/Snow**

### GPS Coordinates (at SLM location)
+35°57'14.82", -78°59'07.54"

---

Page dimensions: 612.0x792.0

URS Acoustics and Noise Control Practice

URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-186
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# - note coordinate system  
* - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**Project Name:** Triangle Transit DEIS  
**Project #:** 3182940  
**Date:** 11/12/2013  
**Monitoring Location:** M12B - Lykan Pkwy.  
**Analyst:** Andrew Bell - #2 Equipment

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¹ K.24-188
## Field Noise Measurement Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Lyckan Pkwy. NW/SE</th>
<th>compass</th>
<th>Site Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>24'</td>
<td></td>
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<tr>
<td>1- or 2-way</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0</td>
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</tr>
<tr>
<td>Bus Stops</td>
<td>0</td>
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</tr>
<tr>
<td>Stoplights</td>
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<tr>
<td>Motorcycles</td>
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<tr>
<td>Automobiles</td>
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</tr>
<tr>
<td>Medium Trucks</td>
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<tr>
<td>Heavy Trucks</td>
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</tr>
<tr>
<td>Buses</td>
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</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
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</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

**Photos Taken?** Yes/No

**Additional Notes/Comments:** MLK Pkwy. is significant source of noise, although traffic is too sporadic to account for constant noise.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location.
URS Acoustics and Noise Control Practice  FIELD NOISE MEASUREMENT
DATA FORM

Project Name: Triangle Transit DEIS  Project #: 31829240  Date: 11/12/2013  Page 1
Monitoring Location: M12B - Lyckan Pkwy.  Analyst: Andrew Bell - #2 Equipment

<table>
<thead>
<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model #: 820</td>
<td>Model #: CAL200</td>
<td>Model #: SM-28</td>
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<tr>
<td>Serial #: 1414</td>
<td>Serial #: 3704</td>
<td>Serial #: 3386</td>
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<table>
<thead>
<tr>
<th>Weighting: A / C / Flat</th>
<th>Calibration Level (dBA): 94 / 114</th>
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</thead>
<tbody>
<tr>
<td>Response: Slow / Fast / Impl Pre-Test dBA 114.1 dBA</td>
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<tr>
<td>Windscreen: Yes / No (explain) Post-Test 114.1 dB</td>
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<tr>
<td>Topo: Flat / Hilly</td>
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<tr>
<td>Terrain: Hard/Soft/Mixed/Snow</td>
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<table>
<thead>
<tr>
<th>GPS Coordinates (at SLM location)°</th>
<th>Bar Psr (Hg): 30.10 Cloud Cover (%): 78</th>
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<tbody>
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<td>+35° 57' 51.44&quot;, -78° 57' 49.00&quot;</td>
<td>Temp (°F): 51 RH (%): 63</td>
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<th>Stop Time</th>
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<th>L&lt;sub&gt;min&lt;/sub&gt;</th>
<th>L&lt;sub&gt;max&lt;/sub&gt;</th>
<th>L&lt;sub&gt;10&lt;/sub&gt;</th>
<th>L&lt;sub&gt;50&lt;/sub&gt;</th>
<th>L&lt;sub&gt;90&lt;/sub&gt;</th>
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<td>UPS truck present and running</td>
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</tbody>
</table>
# Field Noise Measurement Form

**Data Form**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Lyckan Pkwy. NW/SE</th>
<th>MLK Pkwy. NB/SB</th>
<th>Compass</th>
<th>Site Diagram:</th>
</tr>
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<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>15</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td>5</td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>24'</td>
<td>60'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- or 2- way</td>
<td>2</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Grade</td>
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<td>1%</td>
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</tr>
<tr>
<td>Bus Stops</td>
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<td>0</td>
<td></td>
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</tr>
<tr>
<td>Stoplights</td>
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<td>Motorcycles</td>
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<tr>
<td>Automobiles</td>
<td>4</td>
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<tr>
<td>Medium Trucks</td>
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<tr>
<td>Heavy Trucks</td>
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<tr>
<td>Buses</td>
<td>0</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
<td>10 min.</td>
<td></td>
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</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No** M12B-1, M12B-2, M12B-3

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT
DATA FORM

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date: 11/13/2013</th>
<th>Page of</th>
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<tbody>
<tr>
<td>Monitoring Location:</td>
<td>M12B - Lyckan Pkwy.</td>
<td>Analyst:</td>
<td>Andrew Bell - #2 Equipment</td>
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</table>

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704

### Weather Data
- **Model #:** SM-28
- **Serial #:** 3386
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Pre-Test dBA:** 114.1 dB
- **Post-Test dBA:** 113.9 dB

### Topo
- **Flat** / Hilly

### Terrain
- **Hard/Soft/Mixed/Snow**

### GPS Coordinates (at SLM location)
- +35°57'51.44", -78°57'49.00"

### Notes/Events
- 820 CAL200 SM-28
- 1414 3704 3386
- Triangle Transit DEIS 31829240 11/13/2013
- M12B - Lyckan Pkwy.

### Weather Data
- **Temp (°F):** 39
- **RH (%):** 43
- **Bar Psr (Hg):** 30.47
- **Cloud Cover (%):** 0

### Data Table

<table>
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<th>Stop Time</th>
<th>L_{eq}</th>
<th>L_{min}</th>
<th>L_{max}</th>
<th>L_{10}</th>
<th>L_{50}</th>
<th>L_{20}</th>
<th>Notes/Events</th>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109
K.24-192
### FIELD NOISE MEASUREMENT

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<th>Lyckan Pkwy. NW/SE</th>
<th>MLK Pkwy. NB/SB</th>
<th>Compass</th>
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<tr>
<td>Speed (post/obs)*</td>
<td>15</td>
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<tr>
<td>Number of Lanes</td>
<td>2</td>
<td>5</td>
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<td>Width (pave/row)</td>
<td>24'</td>
<td>60'</td>
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<td>Heavy Trucks</td>
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<tr>
<td>Count duration</td>
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<td>10 min.</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

Site Diagram:

See scan of field sheet, and map with aerial and monitor location
### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

**DATA FORM**

<table>
<thead>
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<th>Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/13/2013</th>
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<td>Analyst</td>
<td>Andrew Bell - #2 Equipment</td>
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<td>Windscreen:</td>
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<td>Post-Test 113.9 dBA</td>
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**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-194
### URS Acoustics and Noise Control Practice

#### FIELD NOISE MEASUREMENT DATA FORM

<table>
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<tr>
<th>Roadway Name/Dir</th>
<th>Lyckan Pkwy. NW/SE</th>
<th>MLK Pkwy. NB/SB</th>
<th>compass</th>
<th>Site Diagram:</th>
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<td>Speed (post/obs)*</td>
<td>15</td>
<td>55</td>
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<td>See scan of field sheet, and map with aerial and monitor location</td>
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<tr>
<td>Number of Lanes</td>
<td>2</td>
<td>5</td>
<td></td>
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<tr>
<td>Width (pave/row)</td>
<td>24'</td>
<td>60'</td>
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<tr>
<td>1- or 2- way</td>
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</tr>
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<td>Count duration</td>
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<td>10 min.</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

**Photos Taken?** Yes/No

**Additional Notes/Comments:** Businesses in office building closed for the day.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

**Additional Notes and Sketches on Reverse**
**URS Acoustics and Noise Control Practice**
**FIELD NOISE MEASUREMENT DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M12A - Oak Creek Village Apartments  
**Analyst:** John Burris - #6 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1324  
- **Weighting:** A / C / Flat

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No
- **Pre-Test dBA:** 114.1 dBA
- **Post-Test dBA:** 114.1 dBA

### Monitoring Conditions
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow
- **Temp (° F):** 37  
- **RH (%):** 83
- **Bar Psr (Hg):** 30.06  
- **Cloud Cover (%):** 50

### GPS Coordinates (at SLM location)
- `+35° 57' 36.88", -78° 58' 43.44"`

### Notes/Events
- `-35° 57' 36.88", -78° 58' 43.44"`
- **Bar Psr (Hg):** 30.06

### ID
- **Time**
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- **L<sub>min</sub>**  
- **L<sub>max</sub>**  
- **L<sub>10</sub>**  
- **L<sub>50</sub>**  
- **L<sub>90</sub>**  
- **Notes/Events**

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K.24-196
**URS Acoustics and Noise Control Practice**  
**FIELD NOISE MEASUREMENT**  
**DATA FORM**

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# - note coordinate system  
* - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M12A - Oak Creek Village Apartments  
**Analyst:** John Burris - #6 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1324  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Pre-Test dBA:** 114.1  
- **Post-Test:** N/A  
- **Avg Wind Speed/Direction:** 2.5

### Weather Data
- **Temp (°F):** 50  
- **RH (%):** 60  
- **Bar Psr (Hg):** 30.11  
- **Cloud Cover (%):** 0

### Topo: Flat / Hilly  
### Terrain: Hard/Soft/Mixed/Snow

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### GPS Coordinates (at SLM location)*
- +35° 57' 36.88", -78° 58' 43.44"

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K.24-198
### FIELD NOISE MEASUREMENT DATA FORM

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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

See scan of field sheet, and map with aerial and monitor location

Additional Notes and Sketches on Reverse
### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

**DATA FORM**

| Project Name: | Triangle Transit DEIS | Project #: | 31829240 | Date: | 11/15/2013 | Page of | Monitoring Location: | M12A - Oak Creek Village Apartments |
|---------------|-----------------------|------------|-----------|-------|-------------|---------| Analyst: | John Burris - #2 Equipment |

#### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)

#### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 113.9 dBA
- **Post-Test dBA:** 113.9 dBA

#### Weather Data
- **Wind:** Steady / Gusty / Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 1.5
- **Temp (°F):** 60
- **RH (%):** 73
- **Bar Psr (Hg):** 30.20
- **Cloud Cover (%):** 100

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#### Notes/Events
- **GPS Coordinates (at SLM location):** +35° 57' 36.88", -78° 58' 43.44"
- **Weather Data:** Triangle Transit DEIS 31829240 11/15/2013
## Field Noise Measurement Form

### Data Form

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<tr>
<td>Grade</td>
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<tr>
<td>Bus Stops</td>
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<td>Stoplights</td>
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<td>Count duration</td>
<td>10 min.</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

### Additional Notes and Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing Insects

Additional Notes and Sketches on Reverse

### Site Diagram:

See scan of field sheet, and map with aerial and monitor location
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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**Sound Level Meter**

- Model #: 820
- Serial #: 1411
- Weighting: A / C / Flat
- Response: Slow / Fast / Impl
- Windscreen: Yes / No (explain)
- Topo: Flat / Hilly
- Terrain: Hard/Soft/Mixed/Snow

**Field Calibration**

- Model #: CAL200
- Serial #: 3704
- Calibration Level (dBA): 94 / 114
- Pre-Test: 113.9 dBA
- Post-Test: 113.9 dBA

**Weather Data**

- Model #: SM-28
- Serial #: 3386
- Wind: Steady/Gusty/Calm
- Precipitation: Yes (explain) / No
- Avg Wind Speed/Direction: 0
- Temp (°F): 54
- RH (%): 73
- Bar Psr (Hg): 30.19
- Cloud Cover (%): 100

**GPS Coordinates (at SLM location)**

+35°57'36.88", -78°58'43.44"
### Field Noise Measurement Form

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<td>Count duration</td>
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* - Speed estimated by Radar / Driving / Observation
# - note coordinate system

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

See scan of field sheet, and map with aerial and monitor location

Additional Notes and Sketches on Reverse
**Field Noise Measurement Data Form**

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<th>Page of</th>
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<th>M12 - Sayward Drive</th>
<th>Analyst:</th>
<th>John Burris - #6 Equipment</th>
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### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)  
- **Topo:** Flat / Hilly  
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Post-Test** 114.1 dBA  
- **Wind:** Steady/Gusty/Calm  
- **Response:** Pre-Test 114.1 dBA  
- **Precipitation:** Yes (explain) / No  
- **Avd Wind Speed/Direction:** 0

### Weather Data
- **Temp (°F):** 37  
- **RH (%):** 83  
- **Bar Psr (Hg):** 30.06  
- **Cloud Cover (%):** 33

### GPS Coordinates (at SLM location)
- **+35° 57' 00.73", -78° 59' 12.09"**

### ID | Start Time | Stop Time | L<sub>eq</sub> | L<sub>min</sub> | L<sub>max</sub> | L<sub>10</sub> | L<sub>50</sub> | L<sub>90</sub> | Notes/Events |
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K.24-204
### URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT
### DATA FORM

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* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/15/2013  
**Page of:**  

**Monitoring Location:** M12 - Sayward Drive  
**Analyst:** John Burris - #2 Equipment  

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**Topo:** Flat / Hilly  
**Terrain:** Hard/Soft/Mixed/Snow  
**GPS Coordinates (at SLM location):** +35° 57' 00.73", -78° 59' 12.09"  
**Bar Psr (Hg):** 30.35  
**Cloud Cover (%):** 90  

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**Notes/Events:**  
- Car  
- Nearby Beeping Construction Equipment  

**K.24-206**
## FIELD NOISE MEASUREMENT

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* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT

DATA FORM

Project Name: Triangle Transit DEIS  
Project #: 3182940  
Date: 11/15/2013  
Analyst: John Burris - #2 Equipment

Monitoring Location: M12 - Sayward Drive  

Sound Level Meter  
Model #: 820  
Serial #: 1414  
Weighting: A / C / Flat  
Response: Slow / Fast / Impl  
Windscreen: Yes / No (explain)

Field Calibration  
Model #: CAL200  
Serial #: 3704  
Calibration Level (dBA): 94 / 114  
Pre-Test 113.9 dBA  
Post-Test 113.9 dBA

Weather Data  
Model #: SM-28  
Serial #: 3386  
Wind: Steady / Gusty / Calm  
Precipitation: Yes (explain) / No  
Avg Wind Speed/Direction: 1.5  
Temp (°F): 60  
RH (%): 73  
Bar Psr (Hg): 30.20  
Cloud Cover (%): 100

Topo: Flat / Hilly  
Terrain: Hard/Soft/Mixed/Snow  
GPS Coordinates (at SLM location): +35°57'00.73", -78°59'12.09"

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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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<tr>
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<td>Heavy Trucks</td>
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<tr>
<td>Count duration</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

Site Diagram:

See scan of field sheet, and map with aerial and monitor location
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Monitoring Location:</th>
<th>Date:</th>
<th>Page of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle Transit DEIS</td>
<td>M12 - Sayward Drive</td>
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<th>Model #:</th>
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<th>Weather Data</th>
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<tr>
<td>John Burris - #2 Equipment</td>
<td>820</td>
<td>CAL200</td>
<td>SM-28</td>
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<tr>
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<th>Calibration Level (dBA):</th>
<th>Wind:</th>
<th>Pre-Test</th>
<th>Precipitation:</th>
<th>Avg Wind Speed/Direction:</th>
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<td>Slow / Fast / Impl</td>
<td>Temp (°F): 55 RH (%): 73</td>
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<th>Windscreen:</th>
<th>Topo:</th>
<th>Notes/Events</th>
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<td>Yes / No (explain)</td>
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<td>GPS Coordinates (at SLM location): +35° 57' 00.73&quot;, -78° 59' 12.09&quot;</td>
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<th>L_max</th>
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| 18 |                         |            |      |       |       |     |     |     |              |
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| 24 |                         |            |      |       |       |     |     |     |              |
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| 26 |                         |            |      |       |       |     |     |     |              |
| 27 |                         |            |      |       |       |     |     |     |              |
| 28 |                         |            |      |       |       |     |     |     |              |
| 29 |                         |            |      |       |       |     |     |     |              |
## FIELD NOISE MEASUREMENT

### DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Sayward</th>
<th>Width (pave/row)</th>
<th>1- or 2- way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
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<tbody>
<tr>
<td>Speed (post/obs)*</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20 min.</td>
</tr>
<tr>
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<td>Site Diagram:</td>
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<td></td>
<td></td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
</tbody>
</table>

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date:</th>
<th>11/15/2013</th>
<th>Page of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Location:</td>
<td>M11 - White Oak Dr.</td>
<td>Analyst:</td>
<td>John Burris - #2 Equipment</td>
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<td></td>
<td></td>
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</table>

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test**
- **Post-Test**

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (° F):** 35
- **RH (%):** 73
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 50

### GPS Coordinates (at SLM location)
- +35° 56' 53.40", -78° 59' 56.79"

### ID | Start Time | Stop Time | L_eq | L_min | L_max | L_10 | L_50 | L_90 | Notes/Events
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
0 | 7:56 AM | 7:57 AM | 56.2 | 52.8 | 58.2 | 56.9 | 56.3 | 55.2 |
1 | 7:56 AM | 7:57 AM | 55.6 | 54.8 | 56.5 | 56.5 | 55.6 | 55.1 |
2 | 7:57 AM | 7:58 AM | 55.7 | 54.8 | 56.6 | 56.6 | 55.7 | 55.0 |
3 | 7:58 AM | 7:59 AM | 55.6 | 54.3 | 57.1 | 56.4 | 55.5 | 55.0 |
4 | 7:59 AM | 8:00 AM | 55.7 | 54.4 | 56.8 | 56.7 | 55.6 | 54.6 |
5 | 8:00 AM | 8:01 AM | 54.9 | 54.0 | 56.5 | 55.8 | 54.8 | 54.2 |
6 | 8:01 AM | 8:02 AM | 55.8 | 53.7 | 58.2 | 57.4 | 55.8 | 54.2 |
7 | 8:02 AM | 8:03 AM | 56.8 | 55.4 | 58.4 | 57.8 | 56.8 | 55.6 |
8 | 8:03 AM | 8:04 AM | 56.1 | 55.1 | 56.9 | 56.8 | 56.0 | 55.2 |
9 | 8:04 AM | 8:05 AM | 55.5 | 54.5 | 56.4 | 56.1 | 55.4 | 54.5 |
10 | 8:05 AM | 8:06 AM | 55.5 | 54.1 | 56.4 | 56.4 | 55.5 | 54.4 |
11 | 8:06 AM | 8:07 AM | 55.4 | 53.5 | 57.3 | 56.7 | 55.2 | 53.7 |
12 | 8:07 AM | 8:08 AM | 56.0 | 54.6 | 57.5 | 57.0 | 55.7 | 55.1 |
13 | 8:08 AM | 8:09 AM | 55.5 | 54.6 | 57.0 | 56.2 | 55.5 | 54.8 |
14 | 8:09 AM | 8:10 AM | 54.9 | 53.7 | 56.5 | 56.0 | 54.6 | 54.1 |
15 | 8:10 AM | 8:11 AM | 55.8 | 55.1 | 56.7 | 56.3 | 55.6 | 55.1 |
16 | 8:11 AM | 8:12 AM | 56.1 | 55.0 | 57.5 | 56.9 | 56.0 | 55.2 |
17 | 8:12 AM | 8:13 AM | 55.7 | 54.2 | 57.6 | 56.9 | 55.5 | 54.3 |
18 | 8:13 AM | 8:14 AM | 55.5 | 53.6 | 56.7 | 56.7 | 55.5 | 53.7 |
19 | 8:14 AM | 8:15 AM | 55.5 | 54.1 | 56.5 | 56.5 | 55.5 | 54.3 |
20 | 8:15 AM | 8:16 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
21 | 8:16 AM | 8:17 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
22 | 8:17 AM | 8:18 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
23 | 8:18 AM | 8:19 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
24 | 8:19 AM | 8:20 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
25 | 8:20 AM | 8:21 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
26 | 8:21 AM | 8:22 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
27 | 8:22 AM | 8:23 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
28 | 8:23 AM | 8:24 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
29 | 8:24 AM | 8:25 AM | 54.6 | 53.4 | 58.2 | 55.5 | 54.4 | 53.5 |
## FIELD NOISE MEASUREMENT

### DATA FORM

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<tr>
<th>Roadway Name/Dir</th>
<th>White Oak Dr. EB/WB</th>
<th>compass</th>
<th>Site Diagram:</th>
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<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>25</td>
<td>25°</td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
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<tr>
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<td>1- or 2- way</td>
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<tr>
<td>Count duration</td>
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</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### Project Information
- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/11/2013
- **Analyst:** Andrew Bell - #2 Equipment

### Monitoring Location
- **Location:** M11 - White Oak Dr.
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow
- **Windscreen:** Yes
- **Topo:** Flat
- **Terrain:** Hard

### Weather Data
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Response:** Post-Test 114.1 dBA
- **Precipitation:** Yes (explain) / No
- **Wind Speed/Direction:** 0
- **Temp (°F):** 54
- **RH (%):** 53
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)
- **+35° 56' 53.40", -78° 59' 56.79"

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704

### Data Form

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### Notes/Events
- **ID Start Time:** 820 CAL200
- **ID Stop Time:** 1414
- **Notes/Events:** Triangle Transit DEIS 31829240
- **Date:** 11/11/2013
- **Location:** M11 - White Oak Dr.
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Post-Test 114.1 dBA
- **Precipitation:** Yes (explain) / No
- **Wind Speed/Direction:** 0
### Field Noise Measurement Data Form

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<th>Roadway Name/Dir</th>
<th>White Oak Dr. EB/WB</th>
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<th>Width (pave/row)</th>
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<th>Grade</th>
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<th>Stoplights</th>
<th>Motorcycles</th>
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Additional Notes/Comments:
- I-40 in background creates constant low noise. Few leaves rustling.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Photos Taken? Yes/No: M11-1, M11-2, M11-3, M11-4

Site Diagram: See scan of field sheet, and map with aerial and monitor location

# - note coordinate system
* - Speed estimated by Radar / Driving / Observation

Additional Notes and Sketches on Reverse
URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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<th>Triangle Transit DEIS</th>
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<th>31829240</th>
<th>Date:</th>
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<th>Page of</th>
</tr>
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<td>Analyst:</td>
<td>Andrew Bell - #2 Equipment</td>
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**Sound Level Meter**
- Model #: 820
- Serial #: 1414

**Field Calibration**
- Model #: CAL200
- Serial #: 3704

**Weather Data**
- Model #: SM-28
- Serial #: 3386

**Weighing:**
- A / C / Flat

**Response:**
- Slow / Fast / Impl

**Windscreen:**
- Yes / No (explain)

**Topo:**
- Flat / Hilly

**Terrain:**
- Hard/Soft/Mixed/Snow

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</tbody>
</table>

**GPS Coordinates (at SLM location):**
+35° 56' 53.40", -78° 59' 56.79"

**Temperature:**
- Temp (°F): 61
- RH (%): 31

**Other Data:**
- Bar Psr (Hg): 30.23
- Cloud Cover (%): 0

*URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109*
<table>
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<tr>
<th>Field Noise Measurement Data Form</th>
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<tbody>
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<td>Count duration</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: **I-40 in background creates constant low noise.**

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
# Field Noise Measurement Form

## Data Form

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<th>Project #: 31829240</th>
<th>Date: 11/11/2013</th>
<th>Page of</th>
<th>Monitoring Location: M11 - White Oak Dr.</th>
<th>Analyst: Andrew Bell - #2 Equipment</th>
</tr>
</thead>
</table>

### Sound Level Meter

- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Field Calibration

- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114

### Weather Data

- **Wind:** Steady / Gusty / Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 3 / SSE

### Topo / Terrain

- **Topo:** Flat / Hilly  
- **Terrain:** Hard / Soft / Mixed / Snow

### GPS Coordinates (at SLM location)

- +35° 56' 53.40", -78° 59' 56.79"

### Weather Details

- **Temp (°F):** 46  
- **RH (%):** 57  
- **Bar Psr (Hg):** 30.19  
- **Cloud Cover (%):** 0

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K.24-218
# URS Acoustics and Noise Control Practice

## FIELD NOISE MEASUREMENT

### DATA FORM

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<th>Roadway Name/Dir</th>
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<tr>
<td>1- or 2- way</td>
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<tr>
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<td>Automobiles</td>
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<tr>
<td>Medium Trucks</td>
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<tr>
<td>Heavy Trucks</td>
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</tr>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments: I-40 in background creates constant low noise.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

Site Diagram:

See scan of field sheet, and map with aerial and monitor location
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

| Project Name: Triangle Transit DEIS | Project #: 31829240 | Date: 11/15/2013 | Page of 1 |
| Monitoring Location: M10 - Farrington Rd. & Ephesus Church Rd. | Analyst: John Burris - #2 Equipment |

**Sound Level Meter**

| Model #: 820 | Model #: CAL200 | Model #: SM-28 |
| Serial #: 1414 | Serial #: 3704 | Serial #: 3386 |

**Weighting:** A / C / Flat

**Response:** Slow / Fast / Impl

**Windscreen:** Yes / No (explain)

**Topo:** Flat / Hilly

**Terrain:** Hard/Soft/Mixed/Snow

---

**Weather Data**

| Calibration Level (dBA): 94 / 114 | Wind: Steady/Gusty/Calm |
| Post-Test 113.9 dBA | Precipitation: Yes (explain) / No |

**Avg Wind Speed/Direction:**

**Temp (° F):** 33

**RH (%):** 73

**Bar Psr (Hg):** 30.35

**Cloud Cover (%):** 25

---

**GPS Coordinates (at SLM location):** +35°55'47.30", -78°59'20.07"

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<th>L(_{min})</th>
<th>L(_{max})</th>
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<th>L(_{50})</th>
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K.24-220
## FIELD NOISE MEASUREMENT DATA FORM

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<th>Farrington Rd. NB/SB</th>
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<td>1- or 2-way</td>
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</tr>
<tr>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

<table>
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<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/11/2013</th>
<th>Page of</th>
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</table>

**Monitoring Location:** M10 - Farrington Rd. & Ephesus Church Rd.  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Wind:** Steady/Gusty/Calm

### Weather Data
- **Model #:** SM-28  
- **Serial #:** 3386
- **Pre-Test dBA:** 114.1 dBA  
- **Impl Post-Test dBA:** 114.1 dBA

### Notes/Events
- **114.1 GPS Coordinates (at SLM location):** +35° 55' 47.30", -78° 59' 20.07"

### Weather Data
- **Temp (°F):** 50  
- **RH (%):** 53  
- **Bar Psr (Hg):** 30.35  
- **Cloud Cover (%):** 0

### Terrain
- **Topo:** Flat / Hilly  
- **Terrain:** Hard/Soft/Mixed/Snow

### ID | Start Time | Stop Time | L<sub>eq</sub> | L<sub>min</sub> | L<sub>max</sub> | L<sub>10</sub> | L<sub>50</sub> | L<sub>90</sub> | Notes/Events
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K.24-222
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT DATA FORM**

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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes**/No M10-1, M10-2, M10-3

Additional Notes/Comments: I-40 (about 500' to east) creates constant low humming noise.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT
#### DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M10 - Farrington Rd. & Ephesus Church Rd.  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter

<table>
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<tr>
<th>Model #</th>
<th>Serial #</th>
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<tr>
<td>820</td>
<td>1414</td>
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### Field Calibration

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### Weather Data

- **Wind:** Steady/Gusty/Calm
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Pre-Test:** 114.1 dBA
- **Post-Test:** 114.1 dBA

### Topography

- **Topo:** Flat / Hilly

### Terrain

- **Terrain:** Hard/Soft/Mixed/Snow

### GPS Coordinates (at SLM location)

+35° 55' 47.30", -78° 59' 20.07"

### Weather Data

- **Temp (°F):** 60
- **RH (%):** 31
- **Bar Psr (Hg):** 30.23
- **Cloud Cover (%):** 0

### ID | Start Time | Stop Time | L<sub>eq</sub> | L<sub>min</sub> | L<sub>max</sub> | L<sub>10</sub> | L<sub>50</sub> | L<sub>90</sub> | Notes/Events
---|------------|-----------|---------------|---------------|---------------|---------------|---------------|---------------|-----------------------
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1 | 4:23 PM | 4:24 PM | 62.9 | 58.6 | 67.3 | 65.4 | 62.5 | 59.2 |
2 | 4:24 PM | 4:25 PM | 62.6 | 59.1 | 64.6 | 63.9 | 62.7 | 60.8 |
3 | 4:25 PM | 4:26 PM | 63.9 | 62.3 | 67.1 | 64.9 | 63.8 | 62.7 |
4 | 4:26 PM | 4:27 PM | 63.6 | 59.9 | 67.0 | 65.1 | 63.5 | 61.1 |
5 | 4:27 PM | 4:28 PM | 61.3 | 57.8 | 63.6 | 62.8 | 61.3 | 58.8 |
6 | 4:28 PM | 4:29 PM | 63.4 | 59.2 | 68.7 | 65.5 | 63.2 | 61.0 |
7 | 4:29 PM | 4:30 PM | 63.2 | 60.4 | 65.0 | 64.1 | 63.3 | 61.5 |
8 | 4:30 PM | 4:31 PM | 62.9 | 59.1 | 65.7 | 64.9 | 62.4 | 60.5 |
9 | 4:31 PM | 4:32 PM | 62.0 | 58.3 | 65.1 | 64.2 | 61.6 | 59.4 |
10 | 4:32 PM | 4:33 PM | 63.2 | 60.9 | 65.4 | 64.5 | 63.1 | 62.1 |
11 | 4:33 PM | 4:34 PM | 62.1 | 59.7 | 64.7 | 64.0 | 61.6 | 60.1 |
12 | 4:34 PM | 4:35 PM | 63.7 | 60.9 | 66.0 | 65.3 | 63.7 | 61.7 |
13 | 4:35 PM | 4:36 PM | 63.1 | 60.3 | 65.6 | 64.8 | 62.9 | 60.7 |
14 | 4:36 PM | 4:37 PM | 63.4 | 61.2 | 66.4 | 65.0 | 62.9 | 62.0 |
15 | 4:37 PM | 4:38 PM | 62.5 | 60.2 | 65.9 | 64.0 | 62.1 | 60.7 |
16 | 4:38 PM | 4:39 PM | 63.9 | 61.3 | 67.6 | 66.0 | 63.2 | 61.6 |
17 | 4:39 PM | 4:40 PM | 63.3 | 61.0 | 66.4 | 64.8 | 63.1 | 61.4 |
18 | 4:40 PM | 4:41 PM | 64.1 | 60.5 | 66.3 | 65.8 | 64.2 | 61.2 |
19 | 4:41 PM | 4:42 PM | 64.5 | 62.3 | 66.7 | 65.7 | 64.4 | 63.2 |
20 | 4:42 PM | 4:43 PM | 63.6 | 61.8 | 65.1 | 64.7 | 63.5 | 62.3 |
21 | 4:43 PM | 4:44 PM | 63.7 | 60.9 | 66.0 | 65.3 | 63.7 | 61.7 |
22 | 4:44 PM | 4:45 PM | 63.1 | 60.3 | 65.6 | 64.8 | 62.9 | 60.7 |
23 | 4:45 PM | 4:46 PM | 63.4 | 61.2 | 66.4 | 65.0 | 62.9 | 62.0 |
24 | 4:46 PM | 4:47 PM | 62.5 | 60.2 | 65.9 | 64.0 | 62.1 | 60.7 |
25 | 4:47 PM | 4:48 PM | 63.9 | 61.3 | 67.6 | 66.0 | 63.2 | 61.6 |
26 | 4:48 PM | 4:49 PM | 63.3 | 61.0 | 66.4 | 64.8 | 63.1 | 61.4 |
27 | 4:49 PM | 4:50 PM | 64.1 | 60.5 | 66.3 | 65.8 | 64.2 | 61.2 |
28 | 4:50 PM | 4:51 PM | 64.5 | 62.3 | 66.7 | 65.7 | 64.4 | 63.2 |
29 | 4:51 PM | 4:52 PM | 63.6 | 61.8 | 65.1 | 64.7 | 63.5 | 62.3 |
## URS Acoustics and Noise Control Practice

### FIELD NOISE MEASUREMENT

#### DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Farrington Rd.</th>
<th>Ephesus Ch. Rd. EB</th>
<th>compass</th>
<th>Site Diagram:</th>
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<tbody>
<tr>
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<td>35</td>
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# - coordinate system
* - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

- Medium Trucks
- Heavy Trucks
- Buses
- Count duration
- Speed estimated by Radar / Driving / Observation

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
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**URS Acoustics and Noise Control Practice**  
**FIELD NOISE MEASUREMENT**  
**DATA FORM**

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<tr>
<th>Roadway Name/Dir</th>
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<th>Ephesus Ch. Rd. EB</th>
<th>compass</th>
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<tr>
<td>Count duration</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**  
Additional Notes/Comments: I-40 (about 500’ to east) creates constant low humming noise.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM**

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<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date:</th>
<th>11/15/2013</th>
<th>Page of</th>
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<td>Analyst:</td>
<td>John Burris - #2 Equipment</td>
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**Sound Level Meter**

- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

**Field Calibration**

- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 113.9
dBA
- **Post-Test dBA:** 113.9
dBA

**Weather Data**

- **Model #:** SM-28
- **Serial #:** 3386
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (° F):** 33
- **RH (%):** 73
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 25
- **GPS Coordinates (at SLM location):** +35° 54’ 9.06", -79° 0’ 5.98"
- **School Bus on Little John**

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### URS Acoustics and Noise Control Practice
**FIELD NOISE MEASUREMENT**

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\# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### Project Information
- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/11/2013
- **Monitoring Location:** M9 - NC 54 at Little John Dr.
- **Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 114.1 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Response:** Pre-Test 114.1 dBA
- **Avg Wind Speed/Direction:** 0
- **Temp (° F):** 50
- **RH (%):** 53
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 0
- **GPS Coordinates (at SLM location):** +35° 54' 9.06", -79° 0' 5.98"

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K.24-230
**URS Acoustics and Noise Control Practice**  
**FIELD NOISE MEASUREMENT**  
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* - Speed estimated by Radar / Driving / Observation  
# - note coordinate system  
Photos Taken? Yes/No M9-1, M9-2, M9-3  
Additional Notes/Comments: Upstream traffic signals on NC 54 create platooning effect, causing fluctuating 1-min. levels.  
Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects  
Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM**

| Project Name: Triangle Transit DEIS | Project #: 31829240 | Date: 11/11/2013 | Page of | Monitoring Location: M9 - NC 54 at Little John Dr. | Analyst: Andrew Bell - #2 Equipment |

**Sound Level Meter**
- Model #: 820
- Serial #: 1414
- Weighting: A / C / Flat
- Response: Slow / Fast / Impl
- Windscreen: Yes / No (explain)
- Topo: Flat / Hilly
- Terrain: Hard/Soft/Mixed/Snow

**Field Calibration**
- Model #: CAL200
- Serial #: 3704
- Pre-Test: 114.1 dBA
- Post-Test: 114.1 dBA

**Weather Data**
- Calibration Level (dBA): 94 / 114
- Wind: Steady/Gusty/Calm
- Precipitation: Yes (explain) / No
- Avg Wind Speed/Direction: 3/S
- Bar Psr (Hg): 30.20
- Cloud Cover (%): 0

**GPS Coordinates (at SLM location)**: +35° 54' 9.06", -79° 0' 5.98"

**Sound Level Data**

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### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT

#### DATA FORM

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**Other Noise Sources:** distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-233
URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT
DATA FORM

Project Name: Triangle Transit DEIS  Project #: 31829240  Date: 11/11/2013  Page of
Monitoring Location: M9 - NC 54 at Little John Dr.  Analyst: Andrew Bell - #2 Equipment

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<th>Field Calibration</th>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109
K.24-234
### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM

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</table>

# Additional Notes/Comments:

- Upstream traffic signals on NC 54 create platooning effect, causing fluctuating 1-min. levels.

- Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## Field Noise Measurement Form

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M8 - NC 54 at Friday Center Drive  
**Analyst:** John Burris - #6 Equipment

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test:** 114.1 dBa
- **Post-Test:** 114.1 dBa

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 2.2/NW
- **Temp (°F):** 36
- **RH (%):** 82
- **Bar Psr (Hg):** 30.31
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)$^*$
- +35° 54' 6.71", -79° 0' 35.79"

### ID | Start Time | Stop Time | L$_{eq}$ | L$_{min}$ | L$_{max}$ | L$_{10}$ | L$_{50}$ | L$_{90}$ | Notes/Events
---|---|---|---|---|---|---|---|---|---
0 | 8:12 AM | 8:13 AM | 57.1 | 53.4 | 60.5 | 60.2 | 56.0 | 54.3 |
1 | 8:13 AM | 8:14 AM | 62.1 | 60.1 | 64.2 | 63.5 | 62.1 | 60.5 |
2 | 8:14 AM | 8:15 AM | 61.1 | 56.5 | 63.5 | 63.4 | 60.6 | 57.5 |
3 | 8:15 AM | 8:16 AM | 61.1 | 59.8 | 62.4 | 63.0 | 62.2 | 59.6 | 54.5 |
4 | 8:16 AM | 8:17 AM | 60.5 | 52.1 | 67.3 | 64.8 | 55.0 | 53.0 |
5 | 8:17 AM | 8:18 AM | 61.7 | 58.0 | 64.7 | 63.7 | 62.0 | 58.9 | Train in the Distance  
6 | 8:18 AM | 8:19 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
7 | 8:19 AM | 8:20 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
8 | 8:20 AM | 8:21 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
9 | 8:21 AM | 8:22 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
10 | 8:22 AM | 8:23 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
11 | 8:23 AM | 8:24 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
12 | 8:24 AM | 8:25 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
13 | 8:25 AM | 8:26 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
14 | 8:26 AM | 8:27 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
15 | 8:27 AM | 8:28 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
16 | 8:28 AM | 8:29 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
17 | 8:29 AM | 8:30 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
18 | 8:30 AM | 8:31 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
19 | 8:31 AM | 8:32 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
20 | 8:32 AM | 8:33 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
21 | 8:33 AM | 8:34 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
22 | 8:34 AM | 8:35 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
23 | 8:35 AM | 8:36 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
24 | 8:36 AM | 8:37 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
25 | 8:37 AM | 8:38 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
26 | 8:38 AM | 8:39 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
27 | 8:39 AM | 8:40 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
28 | 8:40 AM | 8:41 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |
29 | 8:41 AM | 8:42 AM | 61.7 | 57.5 | 64.6 | 63.8 | 62.0 | 58.9 |

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*URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109*
## FIELD NOISE MEASUREMENT

**DATA FORM**

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<tr>
<td>Count duration</td>
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Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

See scan of field sheet, and map with aerial and monitor location

Additional Notes and Sketches on Reverse

---

# - note coordinate system * - Speed estimated by Radar / Driving / Observation
## FIELD NOISE MEASUREMENT DATA FORM

### Project Information
- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/11/2013
- **Monitoring Location:** M8 - NC 54 at Friday Center Drive
- **Analyst:** John Burris - #6 Equipment

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow
- **Windscreen:** Yes
- **Topo:** Flat
- **Terrain:** Hard

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test:** 114.1 dBA
- **Post-Test:** 114.1 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (°F):** 50
- **RH (%):** 53
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)°
+35° 54’ 6.71", -79° 0’ 35.79"

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Notes/Events:
- ID 1: 05° 15’ 45.87", -78° 8’ 59.82"
### Field Noise Measurement Data Form

| Roadway Name/Dir | NC 54 | Speed (post/obs)* | 45 | Number of Lanes | 9 | Width (pave/row) | 115'/155' | 1- or 2-way | 2-Way | Grade | 0 | Bus Stops | 1 | Stoplights | 1 | Motorcycles | 1 | Automobiles | 418 | Medium Trucks | 3 | Heavy Trucks | 16 | Buses | 4 | Count duration | 10 min. |

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Photos Taken? **Yes/No**

Site Diagram: See scan of field sheet, and map with aerial and monitor location

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT

**DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M8 - NC 54 at Friday Center Drive  
**Analyst:** John Burris - #6 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1324  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Pre-Test** 114.1 dBA  
- **Post-Test** 114.1 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 0

### Topo:
- **Flat**  
- **Hilly**

### Terrain:
- **Hard/Soft/Mixed/Snow**

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**GPS Coordinates (at SLM location):**

+35° 54' 6.71", -79° 0' 35.79"

**Bar Psr (Hg):** 30.20  
**Cloud Cover (%):** 0

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K.24-240
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
### FIELD NOISE MEASUREMENT

**DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M8 - NC 54 at Friday Center Drive  
**Analyst:** John Burris - #6 Equipment

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**Weighting:** A / C / Flat  
**Response:** Slow / Fast / Impl  
**Windscreen:** Yes / No (explain)  
**Topo:** Flat / Hilly  
**Terrain:** Hard/Soft/Mixed/Snow

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**Notes/Events**

**Temperature (°F):** 45  
**Relative Humidity (%):** 57  
**Barometric Pressure (Hg):** 30.19  
**Cloud Cover (%):** 0

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K.24-242
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT
DATA FORM

Project Name: Triangle Transit DEIS  Project #: 31829240  Date: 11/15/2013  Page of
Monitoring Location: M7 - Crescent Dr.  Analyst: John Burris - #2 Equipment

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| Topo: Flat / Hilly | | |
| Terrain: Hard/Soft/Mixed/Snow | | |

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Notes/Events: +35° 55' 6.40", -78° 59' 15.81"  Bar Psr (Hg): 30.35  Cloud Cover (%): 33
# URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Crescent Dr.</th>
<th>Speed (post/obs)*</th>
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<td>1- or 2-way</td>
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<td>Stoplights</td>
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<td>Motorcycles</td>
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<td>Motorcycles</td>
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<td>Automobiles</td>
<td>0</td>
<td>Medium Trucks</td>
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<tr>
<td>Heavy Trucks</td>
<td>0</td>
<td>Buses</td>
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<td>Count duration</td>
<td>20 min.</td>
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* Speed estimated by Radar / Driving / Observation
# - note coordinate system

Photos Taken? Yes/No
Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Site Diagram:

See scan of field sheet, and map with aerial and monitor location

Additional Notes and Sketches on Reverse

K.24-245
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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<td>Triangle Transit DEIS</td>
<td>31829240</td>
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<td>Andrew Bell - #2 Equipment</td>
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<td>Response: Slow / Fast / Impl</td>
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**Notes:**

- **GPS Coordinates (at SLM location)**: +35° 55' 6.40", -78° 59' 15.81"
- **Temp (°F):** 52
- **RH (%):** 53
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 0

**ID Start Time**
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21

**ID Stop Time**
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- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21

**K.24-246**
### URS Acoustics and Noise Control Practice
#### FIELD NOISE MEASUREMENT

**DATA FORM**

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<tr>
<th>Roadway Name/Dir</th>
<th>Crescent Dr.</th>
<th>Speed (post/obs)*</th>
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<tr>
<td>Number of Lanes</td>
<td>1</td>
<td>Width (pave/row)</td>
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<td>Grade</td>
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<td>1- or 2- way</td>
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<td>Heavy Trucks</td>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
<td></td>
<td></td>
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</table>

* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? **Yes/No**

M7-1, M7-2, M7-3

Additional Notes/Comments:

I-40 can be heard in distance, which is the main source of noise in calm conditions.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
# FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M7 - Crescent Dr.  
**Analyst:** Andrew Bell - #2 Equipment

## Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414

## Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704

## Weather Data
- **Model #:** SM-28  
- **Serial #:** 3386

### Calibration Level (dBA)
- A / C / Flat
- **Pre-Test dBA**
- 114.1 dB

### Wind Condition
- **Steady / Gusty / Calm**
- Calm

### Windscreen
- Yes / No (explain)
- Yes

### Wind Speed/Direction
- **Avg Wind Speed/Direction:** 2/WNW

### Topo
- Flat / Hilly
- Flat

### Terrain
- Hard / Soft / Mixed / Snow
- Hard

### GPS Coordinates (at SLM location)
- +35° 55' 6.40", -78° 59' 15.81"

### Temperature (°F)
- 58

### Relative Humidity (%)
- 31

### Barometric Pressure (Hg)
- 30.23

### Cloud Cover (%)
- 0

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<td>5:11 PM</td>
<td>5:12 PM</td>
<td>54.2</td>
<td>53.3</td>
<td>55.8</td>
<td>55.2</td>
<td>54.4</td>
<td>53.3</td>
</tr>
<tr>
<td>17</td>
<td>5:12 PM</td>
<td>5:13 PM</td>
<td>54.7</td>
<td>53.2</td>
<td>56.3</td>
<td>56.0</td>
<td>54.6</td>
<td>53.3</td>
</tr>
<tr>
<td>18</td>
<td>5:13 PM</td>
<td>5:14 PM</td>
<td>55.1</td>
<td>53.5</td>
<td>56.6</td>
<td>56.6</td>
<td>54.8</td>
<td>54.0</td>
</tr>
<tr>
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<td>5:14 PM</td>
<td>5:15 PM</td>
<td>55.1</td>
<td>54.0</td>
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<td>55.9</td>
<td>55.3</td>
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<tr>
<td>20</td>
<td>5:15 PM</td>
<td>5:16 PM</td>
<td>55.8</td>
<td>54.5</td>
<td>59.4</td>
<td>56.9</td>
<td>55.7</td>
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<td>5:16 PM</td>
<td>5:17 PM</td>
<td>55.4</td>
<td>54.5</td>
<td>57.1</td>
<td>55.9</td>
<td>55.4</td>
<td>54.5</td>
</tr>
</tbody>
</table>

### Notes/Events
- Conversation with homeowner 50+ from monitor
- Vehicle leaving adjacent driveway
- Conversation with homeowner 50+ from monitor
- Conversation with homeowner 50+ from monitor
- Conversation with homeowner 50+ from monitor
- Conversation with homeowner 50+ from monitor
- Conversation with homeowner 50+ from monitor
- Conversation with homeowner 50+ from monitor
- Conversation with homeowner 50+ from monitor

---

**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-248
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Crescent Dr.</th>
<th>compass</th>
<th>Site Diagram:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (pave/row)</td>
<td>12'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- or 2-way</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus Stops</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stoplights</td>
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</tr>
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<td>Automobiles</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Medium Trucks</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy Trucks</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buses</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments: I-40 can be heard in distance, which is the main source of noise in calm conditions.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

---

K.24-249
## FIELD NOISE MEASUREMENT

### DATA FORM

<table>
<thead>
<tr>
<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/11/2013</th>
<th>Page of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Location: M7 - Crescent Dr.</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl Pre-Test dBA
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

#### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 114.1 dB
- **Post-Test dBA:** 114.1 dB

#### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Temp (°F):** 45
- **RH (%):** 57
- **Bar Psr (Hg):** 30.19
- **Cloud Cover (%):** 0

#### ID | Start Time | Stop Time | L<sub>eq</sub> | L<sub>min</sub> | L<sub>max</sub> | L<sub>10</sub> | L<sub>50</sub> | L<sub>90</sub> | Notes/Events
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
0 | | | 53.6 | 51.0 | 56.9 | 54.8 | 53.5 | 51.9 | 
1 | 8:41 PM | 8:42 PM | 55.4 | 53.7 | 57.3 | 56.6 | 55.3 | 54.1 | 
2 | 8:42 PM | 8:43 PM | 55.0 | 52.9 | 57.3 | 56.3 | 54.8 | 53.8 | 
3 | 8:43 PM | 8:44 PM | 55.5 | 53.5 | 58.1 | 56.9 | 55.5 | 54.0 | 
4 | 8:44 PM | 8:45 PM | 55.4 | 53.4 | 58.9 | 57.6 | 54.7 | 53.9 | 
5 | 8:45 PM | 8:46 PM | 55.9 | 53.4 | 58.6 | 57.5 | 55.7 | 54.2 | 
6 | 8:46 PM | 8:47 PM | 56.2 | 54.6 | 58.7 | 57.8 | 55.8 | 55.0 | 
7 | 8:47 PM | 8:48 PM | 56.2 | 54.4 | 58.7 | 57.7 | 55.9 | 54.6 | 
8 | 8:48 PM | 8:49 PM | 55.4 | 53.2 | 57.2 | 56.7 | 55.3 | 54.0 | 
9 | 8:49 PM | 8:50 PM | 55.3 | 53.6 | 57.2 | 56.4 | 55.2 | 54.1 | 
10 | 8:50 PM | 8:51 PM | 55.0 | 53.3 | 57.2 | 56.6 | 54.7 | 53.6 | 
11 | 8:51 PM | 8:52 PM | 55.9 | 53.7 | 58.1 | 57.5 | 55.7 | 54.3 | 
12 | 8:52 PM | 8:53 PM | 54.2 | 52.9 | 56.2 | 55.4 | 53.9 | 53.2 | 
13 | 8:53 PM | 8:54 PM | 55.1 | 53.2 | 56.4 | 55.9 | 55.1 | 54.0 | 
14 | 8:54 PM | 8:55 PM | 55.7 | 53.5 | 58.5 | 57.4 | 55.4 | 54.1 | 
15 | 8:55 PM | 8:56 PM | 55.4 | 53.4 | 60.9 | 56.6 | 54.9 | 53.7 | 
16 | 8:56 PM | 8:57 PM | 57.8 | 52.9 | 65.9 | 61.2 | 56.2 | 53.7 | 
17 | 8:57 PM | 8:58 PM | 53.5 | 52.2 | 54.5 | 54.3 | 53.5 | 52.6 | 
18 | 8:58 PM | 8:59 PM | 54.2 | 53.1 | 55.4 | 54.9 | 53.9 | 53.2 | 
19 | 8:59 PM | 9:00 PM | 53.9 | 52.4 | 55.1 | 54.7 | 53.7 | 52.6 | 
20 | 9:00 PM | 9:01 PM | 54.4 | 52.2 | 55.4 | 55.0 | 54.4 | 53.3 | 
21 | 9:01 PM | 9:02 PM | 53.1 | 51.5 | 58.7 | 54.0 | 52.6 | 51.7 | 
22 | | | | | | | | | 
23 | | | | | | | | | 
24 | | | | | | | | | 
25 | | | | | | | | | 
26 | | | | | | | | | 
27 | | | | | | | | | 
28 | | | | | | | | | 
29 | | | | | | | | |
## URS Acoustics and Noise Control Practice

### FIELD NOISE MEASUREMENT

#### DATA FORM

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Crescent Dr.</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2-way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>1</td>
<td>12'</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20 min.</td>
</tr>
</tbody>
</table>

* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? **Yes/No**

Additional Notes/Comments: I-40 can be heard in distance, which is the main source of noise in calm conditions.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT DATA FORM**

- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/11/2013
- **Monitoring Location:** M6 - Meadowmont Lane at Green Cedar Lane
- **Analyst:** John Burris - #6 Equipment

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl Pre-Test
- **Windscreen:** Yes / No (explain)

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test:** 114.1 dBA
- **Post-Test:** 114.1 dBA

### Weather Data
- **Model #:** SM-28
- **Serial #:** 3386
- **Wind:** Steady / Gusty / Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 2.2/NW
- **Temp (°F):** 36
- **RH (%):** 82
- **Bar Psr (Hg):** 30.31
- **Cloud Cover (%):** 0

### Topo: Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### GPS Coordinates (at SLM location)
- +35° 54’ 31.80”, -79° 0’ 28.21”

### ID Start Time Stop Time L\(_{eq}\) L\(_{min}\) L\(_{max}\) L\(_{10}\) L\(_{50}\) L\(_{90}\) Notes/Events

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<th></th>
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<th>Stop Time</th>
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<th>L(_{min})</th>
<th>L(_{max})</th>
<th>L(_{10})</th>
<th>L(_{50})</th>
<th>L(_{90})</th>
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<td>1</td>
<td>8:41 AM</td>
<td>8:42 AM</td>
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<td>46.5</td>
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<td>63.8</td>
<td>53.7</td>
<td>48.1</td>
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<td>2</td>
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<td>8:43 AM</td>
<td>51.7</td>
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<td>60.0</td>
<td>55.2</td>
<td>48.8</td>
<td>46.4</td>
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<td>60.5</td>
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<td>54.2</td>
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</tr>
</tbody>
</table>

K.24-252
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Meadowmont Lane</th>
<th>Green Cedar Lane</th>
<th>compass</th>
<th>Site Diagram:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>25/25</td>
<td>25/25</td>
<td></td>
<td></td>
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<tr>
<td>Number of Lanes</td>
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<td></td>
</tr>
<tr>
<td>Width (pave/row)</td>
<td>84'108'</td>
<td>22'30'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- or 2-way</td>
<td>2</td>
<td>2</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Grade</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus Stops</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stoplights</td>
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<tr>
<td>Motorcycles</td>
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</tr>
<tr>
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<tr>
<td>Heavy Trucks</td>
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<td>0</td>
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<td></td>
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<tr>
<td>Buses</td>
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<td>0</td>
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</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
<td>20 min.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

**Photos Taken?** Yes/No

**Additional Notes/Comments:**

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

**Additional Notes and Sketches on Reverse**
### Field Noise Measurement Form

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M6 - Meadowmont Lane at Green Cedar Lane  
**Analyst:** John Burris - #6 Equipment

<table>
<thead>
<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model #:</strong> 820</td>
<td><strong>Model #:</strong> CAL200</td>
<td><strong>Model #:</strong> SM-28</td>
</tr>
<tr>
<td><strong>Serial #:</strong> 1324</td>
<td><strong>Serial #:</strong> 3704</td>
<td><strong>Serial #:</strong> 3386</td>
</tr>
<tr>
<td><strong>Weighting:</strong> A/C/Flat</td>
<td><strong>Calibration Level (dBA):</strong> 94/114</td>
<td>Wind: Steady/Gusty/Calm</td>
</tr>
<tr>
<td><strong>Response:</strong> Slow/Fast/Impl</td>
<td><strong>Pre-Test</strong> 114.1 dBA</td>
<td><strong>Precipitation:</strong> Yes (explain) / No</td>
</tr>
<tr>
<td><strong>Windscreen:</strong> Yes/No (explain)</td>
<td><strong>Post-Test</strong> 114.1 dBA</td>
<td><strong>Avg Wind Speed/Direction:</strong> 2.5</td>
</tr>
</tbody>
</table>

| Topo: Flat/Hilly | **GPS Coordinates (at SLM location):** +35° 54' 31.80", -79° 0' 28.21" |
| **Terrain:** Hard/Soft/Mixed/Snow | **Temp (°F):** 50 | **Bar Psr (Hg):** 30.35 |
| **RH (%):** 53 | **Cloud Cover (%):** 0 |

<table>
<thead>
<tr>
<th>ID</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>L_eq</th>
<th>L_min</th>
<th>L_max</th>
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* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse
### Project Information

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M6 - Meadowmont Lane at Green Cedar Lane  
**Analyst:** John Burris - #6 Equipment

### Sound Level Meter

- **Model #:** 820  
- **Serial #:** 1324

### Field Calibration

- **Model #:** CAL200  
- **Serial #:** 3704

### Weather Data

- **Model #:** SM-28  
- **Serial #:** 3386

- **Wind:** Steady/Gusty/Calm
- **Pre-Calibration Level:** 94 / 114 dBA
- **Post-Calibration Level:** 114.1 dBA
- **Windscreen:** Yes / No (explain)
- **Response:** Slow / Fast / Impl
- **Response:** Slow / Fast / Impl
- **Wind Speed/Direction:** 2.6
- **Temp (° F):** 31
- **RH (%):** 31
- **Terrain:** Hard/Soft/Mixed/Snow
- **Bar Psr (Hg):** 30.20
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)

+35° 54’ 31.80”, -79° 0’ 28.21”

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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
# FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M6 - Meadowmont Lane at Green Cedar Lane  
**Analyst:** John Burris - #6 Equipment

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**Temperature:** 46°F  
**Relative Humidity:** 57%  
**Wind Speed/Direction:** 1  
**Barometric Pressure:** 30.19 Hg  
**Cloud Cover:** 0%

**GPS Coordinates (at SLM location):** +35° 54' 31.80", -79° 0' 28.21"
# FIELD NOISE MEASUREMENT

## DATA FORM

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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### URS Acoustics and Noise Control Practice
#### FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M5 - Prestwick Road  
**Analysis:** John Burris - #6 Equipment

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<td>Post-Test: 114.1 dBA</td>
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**Topo:** Flat / Hilly  
**Terrain:** Hard/Soft/Mixed/Snow  
**GPS Coordinates (at SLM location):** +35° 54' 21.87", -79° 1' 19.19"  
**Temp (°F):** 37  
**RH (%):** 83  
**Bar Psr (Hg):** 30.06  
**Cloud Cover (%):** 0

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**URS Acoustics and Noise Control Practice**  
**FIELD NOISE MEASUREMENT**  
**DATA FORM**

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# - note coordinate system  
* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse
URS Acoustics and Noise Control Practice  FIELD NOISE MEASUREMENT  DATA FORM

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<td>John Burris - #6 Equipment</td>
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| Topo: | Flat / Hilly |
|       | Terrain: Hard/Soft/Mixed/Snow |

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Notes/Events:
- Truck unloading
- Golf cart; golfers yell at mic

GPS Coordinates (at SLM location): +35° 54' 21.87", -79° 1' 19.19"
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* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## Field Noise Measurement Form

**Sound Level Meter**
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

**Field Calibration**
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 113.9 dB
- **Post-Test dBA:** 113.9 dB

**Weather Data**
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (° F):** 60
- **RH (%):** 73
- **Bar Psr (Hg):** 30.20
- **Cloud Cover (%):** 100

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**GPS Coordinates (at SLM location)** +35°54’21.87”, -79°01’19.19”

**Equipment**
- **Triangle Transit DEIS 31829240 11/15/2013**
- **Weather Data**
  - **K.24-264**
### Field Noise Measurement Form

#### DATA FORM

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<td>Buses</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

**Photos Taken? Yes/No**

**Additional Notes/Comments:**

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

**Additional Notes and Sketches on Reverse**
## URS Acoustics and Noise Control Practice
### FIELD NOISE MEASUREMENT

#### DATA FORM

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<thead>
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<th>Project Name: Triangle Transit DEIS</th>
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<th>Date: 11/15/2013</th>
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- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl Pre-Test dBA: 113.9 dB
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard / Soft / Mixed / Snow
- **GPS Coordinates (at SLM location):** +35°54'21.87", -79°1'19.19"

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- **Calibration Level (dBA):** 94 / 114 dB
- **Wind:** Steady / Gusty / Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (°F):** 52
- **RH (%):** 73
- **Bar Psr (Hg):** 30.19
- **Cloud Cover (%):** 100
# FIELD NOISE MEASUREMENT

## DATA FORM

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<td>Buses</td>
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Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

Site Diagram: See scan of field sheet, and map with aerial and monitor location

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

K.24-267
### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/12/2013  
**Monitoring Location:** M4 - Glenwood Elementary School  
**Analyst:** John Burris - #6 Equipment

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<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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**GPS Coordinates (at SLM location):** +35° 54' 23.62", -79° 1' 30.49"

**Bar Psr (Hg):** 30.06  
**Cloud Cover (%):** 0
<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
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<tr>
<td>Speed (\textit{post/obs})*</td>
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<tr>
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<tr>
<td>Width (pave/row)</td>
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<tr>
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<tr>
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<tr>
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<td>Medium Trucks</td>
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<tr>
<td>Heavy Trucks</td>
<td>0</td>
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<td>Buses</td>
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</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
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</tbody>
</table>

\* - Speed estimated by Radar / Driving / Observation

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes/Comments:

See scan of field sheet, and map with aerial and monitor location

Photos Taken? \textbf{Yes/No}

Additional Notes/Comments:

URS Acoustics and Noise Control Practice  FIELD NOISE MEASUREMENT
DATA FORM
<table>
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<tr>
<th>ID</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>L_{eq}</th>
<th>L_{min}</th>
<th>L_{max}</th>
<th>L_{10}</th>
<th>L_{50}</th>
<th>L_{90}</th>
<th>Notes/Events</th>
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</table>

**Sound Level Meter**

- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)

**Field Calibration**

- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 114.1 dBA
- **Post-Test dBA:** 114.1 dBA

**Weather Data**

- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 4.7
- **Temp (°F):** 46
- **RH (%):** 60
- **Bar Psr (Hg):** 30.11
- **Cloud Cover (%):** 100

**Topo:** Flat / Hilly

**Terrain:** Hard/Soft/Mixed/Snow

**GPS Coordinates (at SLM location):** +35° 54' 23.62", -79° 1' 30.49"
### Field Noise Measurement Form

#### Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Glenwood Elementary Entrance</th>
<th>Site Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td>Compass</td>
</tr>
</tbody>
</table>
| Width (pave/row) | 20'/24'                      | Site Diagram:
| Grade            | 0                            |              |
| Bus Stops        | 0                            | See scan of field sheet, and map with aerial and monitor location |
| Stoplights       | 0                            |              |
| Motorcycles      | 0                            |              |
| Automobiles      | 2                            |              |
| Medium Trucks    | 0                            |              |
| Heavy Trucks     | 0                            |              |
| Buses            | 0                            |              |
| Count duration   | 20 min.                      |              |

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

- Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM**

- **Project Name:** Triangle Transit DEIS  
- **Project #:** 31829240  
- **Date:** 11/15/2013  
- **Monitoring Location:** M4 - Glenwood Elementary School  
- **Analyst:** John Burris - #2 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1324  
- **Weighting:** A / C / Flat

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114

### Weather Data
- **Wind:** Steady/Gusty/Calm  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)  
- **Pre-Test dBA:** 113.9  
- **Post-Test dBA:** 113.9  
- **Precipitation:** Yes (explain) / No

### Terrain
- **Topo:** Flat / Hilly  
- **Temp (° F):** 73  
- **RH (%):** 73  
- **Bar Psr (Hg):** 30.20  
- **Cloud Cover (%):** 100

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<td>47.7</td>
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</tbody>
</table>

**GPS Coordinates (at SLM location):** +35° 54' 23.62", -79° 1' 30.49"
### Field Noise Measurement Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Glenwood Elementary Entrance</th>
<th>compass</th>
<th>Site Diagram:</th>
</tr>
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<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>10</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
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<tr>
<td>Width (pave/row)</td>
<td>20'24'</td>
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<tr>
<td>1- or 2- way</td>
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<tr>
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<td>Automobiles</td>
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<tr>
<td>Medium Trucks</td>
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<tr>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
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<td></td>
</tr>
</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT
DATA FORM

| Project Name: Triangle Transit DEIS | Project #: 31829240 | Date: 11/15/2013 | Page of |
| Monitoring Location: M4 - Glenwood Elementary School | Analyst: John Burris - #2 Equipment |

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow
- **Windscreen:** Yes
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test:** 113.9 dBA
- **Post-Test:** 113.9 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 0
- **Temp (° F):** 52
- **RH (%):** 73
- **Cloud Cover (%):** 100
- **GPS Coordinates (at SLM location):** +35° 54' 23.62", -79° 1' 30.49"
- **Bar Psr (Hg):** 30.19

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### Notes/Events

K.24-274
### FIELD NOISE MEASUREMENT DATA FORM

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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### FIELD NOISE MEASUREMENT DATA FORM

- **Project Name:** Triangle Transit DEIS
- **Project #:** 31829240
- **Date:** 11/11/2013
- **Project Monitoring Location:** M3 - US 15/501 at Manning Dr.
- **Analyst:** Andrew Bell - #2 Equipment

#### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A/C/Flat
- **Response:** Slow/Fast/Impl
- **Windscreen:** Yes/No (explain)
- **Topo:** Flat/Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

#### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Pre-Test DBA:** 114.1 dB
- **Post-Test DBA:** 114.1 dB
- **Calibration Level (dBA):** 94 / 114

#### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Avg Wind Speed/Direction:** 2.2/NW
- **Temp (°F):** 36
- **RH (%):** 82
- **Bar Psr (Hg):** 30.31
- **Cloud Cover (%):** 0

#### GPS Coordinates (at SLM location)
+35°53' 53.66", -79°2' 10.27"

#### ID | Start Time | Stop Time | L_{eq} | L_{min} | L_{max} | L_{10} | L_{50} | L_{90} | Notes/Events
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1 | 7:23 AM | 7:24 AM | 72.8 | 62.6 | 79.0 | 77.5 | 68.8 | 64.9 | 
2 | 7:24 AM | 7:25 AM | 74.0 | 68.4 | 77.5 | 76.3 | 73.9 | 68.7 | 
3 | 7:25 AM | 7:26 AM | 77.0 | 71.7 | 85.2 | 79.0 | 75.1 | 73.1 | 
4 | 7:26 AM | 7:27 AM | 72.2 | 67.3 | 77.4 | 74.8 | 71.4 | 68.3 | 
5 | 7:27 AM | 7:28 AM | 74.1 | 63.8 | 79.5 | 76.6 | 73.9 | 67.2 | 
6 | 7:28 AM | 7:29 AM | 75.2 | 68.4 | 78.2 | 77.5 | 75.0 | 71.5 | 
7 | 7:29 AM | 7:30 AM | 72.4 | 62.6 | 77.0 | 76.0 | 71.0 | 63.4 | 
8 | 7:30 AM | 7:31 AM | 70.7 | 60.1 | 75.1 | 74.3 | 68.1 | 61.1 | 
9 | 7:31 AM | 7:32 AM | 76.2 | 70.8 | 79.2 | 77.8 | 76.1 | 73.9 | 
10 | 7:32 AM | 7:33 AM | 73.9 | 60.9 | 80.0 | 77.7 | 71.3 | 63.1 | 
11 | 7:33 AM | 7:34 AM | 70.1 | 61.4 | 73.3 | 72.5 | 71.0 | 62.9 | 
12 | 7:34 AM | 7:35 AM | 74.5 | 71.5 | 81.6 | 76.0 | 73.8 | 72.3 | 
13 | 7:35 AM | 7:36 AM | 73.6 | 56.7 | 80.1 | 78.2 | 70.8 | 57.6 | 
14 | 7:36 AM | 7:37 AM | 71.0 | 59.7 | 76.1 | 73.5 | 71.1 | 61.9 | 
15 | 7:37 AM | 7:38 AM | 75.7 | 71.6 | 81.7 | 77.0 | 75.5 | 72.6 | 
16 | 7:38 AM | 7:39 AM | 73.4 | 63.6 | 83.6 | 76.8 | 69.0 | 64.1 | 
17 | 7:39 AM | 7:40 AM | 72.9 | 63.9 | 78.6 | 76.5 | 71.8 | 64.7 | 
18 | 7:40 AM | 7:41 AM | 75.2 | 68.0 | 80.0 | 77.7 | 75.0 | 70.4 | 
19 | 7:41 AM | 7:42 AM | 73.6 | 60.8 | 79.3 | 77.6 | 71.6 | 61.5 | 
20 | 7:42 AM | 7:43 AM | 73.2 | 63.4 | 78.9 | 76.0 | 72.6 | 64.7 | 
21 | 7:43 AM | 7:44 AM | 75.4 | 69.8 | 79.0 | 78.2 | 75.2 | 71.2 | 
22 | | | | | | | | | 
23 | | | | | | | | | 
24 | | | | | | | | | 
25 | | | | | | | | | 
26 | | | | | | | | | 
27 | | | | | | | | | 
28 | | | | | | | | | 
29 | | | | | | | | |
## FIELD NOISE MEASUREMENT

**DATA FORM**

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<th>Site Diagram:</th>
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<td>Number of Lanes</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

**Additional Notes and Sketches on Reverse**

URI ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-277
# Field Noise Measurement Data Form

Project Name: Triangle Transit DEIS  
Project #: 31829240  
Date: 11/11/2013  
Monitoring Location: M3 - US 15/501 at Manning Dr.  
Analyst: John Burris - #6 Equipment

## Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1324  
- **Weighting:** A / C / Flat  
- **Response:** Slow  
- **Windscreen:** Yes  
- **Topo:** Flat  
- **Terrain:** Hard/Soft/Mixed/Snow

## Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Pre-Test Cal Level:** 114.1 dBA  
- **Post-Test Cal Level:** 114.1 dBA

## Weather Data
- **Wind:** Steady/Gusty/Calm  
- **Calibration Level (dBA):** 94 / 114  
- **Wind:** Steady/Gusty/Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 2.5

## GPS Coordinates (at SLM location)
- +35° 53' 53.66", -79° 2' 10.27"

## Weather Data
- **Temp (°F):** 50  
- **RH (%):** 53

## Bar Psr (Hg):** 30.35  
- **Cloud Cover (%):** 0

## Notes/Events

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# URS Acoustics and Noise Control Practice
## FIELD NOISE MEASUREMENT
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<th>US 15-501/Manning Dr.</th>
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<th>Width (pave/row)</th>
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<th>Grade</th>
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<th>Stoplights</th>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
### URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** M3 - US 15/501 at Manning Dr.  
**Analyst:** John Burris - #6 Equipment

<table>
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<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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<tr>
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<td><strong>Serial #:</strong> 3704</td>
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<td><strong>Calibration Level (dBA):</strong> 94 / 114</td>
<td><strong>Wind:</strong> Steady/Gusty/Calm</td>
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<td><strong>Response:</strong> Slow/Fast/Impl</td>
<td><strong>Pre-Test dBA:</strong> 114.1</td>
<td><strong>Precipitation:</strong> Yes (explain) / No</td>
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<td><strong>Windscreen:</strong> Yes/No (explain)</td>
<td><strong>Post-Test dBA:</strong> 114.1</td>
<td><strong>Avg Wind Speed/Direction:</strong> 2.6</td>
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| Topo: Flat/Hilly | **GPS Coordinates (at SLM location):** +35° 53' 53.66", -79° 2' 10.27" | **Temp (°F):** 57 |
| Terrain: Hard/Soft/Mixed/Snow | | **RH (%):** 31 |
| | | **Bar Psr (Hg):** 30.20 |
| | | **Cloud Cover (%):** 0 |

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<th>L_min</th>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

K.24-280
**URS Acoustics and Noise Control Practice**  
**FIELD NOISE MEASUREMENT**  
**DATA FORM**

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<th>Roadway Name/Dir</th>
<th>US 15-501/Manning Dr.</th>
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<td><strong>Speed (post/obs)</strong></td>
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<tr>
<td><strong>Number of Lanes</strong></td>
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<tr>
<td><strong>Width (pave/row)</strong></td>
<td>84'/72'</td>
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<tr>
<td><strong>1- or 2- way</strong></td>
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<tr>
<td><strong>Grade</strong></td>
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</tr>
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<td><strong>Bus Stops</strong></td>
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<td><strong>Buses</strong></td>
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<td><strong>Count duration</strong></td>
<td>10 min.</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

**Photos Taken?**  
Yes/No

**Additional Notes/Comments:**

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

**Site Diagram:**

See scan of field sheet, and map with aerial and monitor location

---

**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-281
**URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM**

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<th>Project Name:</th>
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<td></td>
<td>Analyst:</td>
<td>John Burris - #6 Equipment</td>
</tr>
</tbody>
</table>

**Sound Level Meter**

- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)

**Field Calibraton**

- **Model #:** CAL200
- **Serial #:** 3704
- **Pre-Test:** 114.1 dBA
- **Post-Test:** 114.1 dBA

**Weather Data**

- **Model #:** SM-28
- **Serial #:** 3386
- **Calibration Level (dBA):** 94 / 114
- **Wind:** Steady/Gusty/Calm
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 1
- **Temp (° F):** 46
- **RH (%):** 57
- **Bar Psr (Hg):** 30.19
- **Cloud Cover (%):** 0

**ID** | **Start Time** | **Stop Time** | **L_{eq}** | **L_{min}** | **L_{max}** | **L_{10}** | **L_{50}** | **L_{90}** | **Notes/Events**
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**Notes/Events**

- Helicopter

**Gps Coordinates (at SLM location)**

+35° 53' 53.66", -79° 2' 10.27"

**K.24-282**
### Field Noise Measurement Form

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<th>US 15-501/Manning Dr.</th>
<th>compass direction</th>
<th>Site Diagram:</th>
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<td>Speed (post/obs)*</td>
<td>45/35</td>
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<td>See scan of field sheet, and map with aerial and monitor location</td>
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<tr>
<td>Number of Lanes</td>
<td>6/5</td>
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</tr>
<tr>
<td>Width (pave/row)</td>
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<td>1- or 2- way</td>
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* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT

DATA FORM

<table>
<thead>
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<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/11/2013</th>
<th>Page of</th>
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</thead>
<tbody>
<tr>
<td>Monitoring Location: M2 - Mason Farm Rd.</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
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<table>
<thead>
<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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</thead>
<tbody>
<tr>
<td>Model #: 820</td>
<td>Model #: CAL200</td>
<td>Calibration Level (dBA): 94 / 114</td>
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<tr>
<td>Serial #: 1414</td>
<td>Serial #: 3704</td>
<td>Wind: Steady/Gusty/Calm</td>
</tr>
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| Weighting: A / C / Flat | Maximum Calibration Level (dBA): Pre-Test 114.1 dBA | Precipitation: Yes (explain) / No |
| Response: Slow / Fast / Impl | Post-Test 114.1 dBA | Avg Wind Speed/Direction: 2.2/NW |
| Windscreen: Yes / No (explain) | | |

| Topo: Flat / Hilly | Temperature (°F): 36 | Bar Psr (Hg): 30.31 |
| Terrain: Hard/Soft/Mixed/Snow | RH (%): 82 | Cloud Cover (%): 0 |

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<th>Start Time</th>
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<th>L_eq</th>
<th>L_min</th>
<th>L_max</th>
<th>L10</th>
<th>L50</th>
<th>L90</th>
<th>Notes/Events</th>
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URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109
K.24-284
<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Apartment DW NB/SB</th>
<th>compass</th>
<th>Site Diagram:</th>
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<tbody>
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<td>Speed (post/obs)*</td>
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<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>24'</td>
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</tr>
<tr>
<td>1- or 2-way</td>
<td>2</td>
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</tr>
<tr>
<td>Grade</td>
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</tr>
<tr>
<td>Bus Stops</td>
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</tr>
<tr>
<td>Stoplights</td>
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</tr>
<tr>
<td>Motorcycles</td>
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<tr>
<td>Medium Trucks</td>
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<tr>
<td>Heavy Trucks</td>
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<tr>
<td>Buses</td>
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</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments: Traffic audible from Dean Smith Center service road audible - early morning maintenance crew.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date:</th>
<th>11/11/2013</th>
<th>Page of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Location:</td>
<td>M2 - Mason Farm Rd.</td>
<td>Analyst:</td>
<td>John Burris - #6 Equipment</td>
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<td></td>
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</tbody>
</table>

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test** 114.1 dBA
- **Post-Test** 114.1 dBA

### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 2.2
- **Temp (° F):** 50
- **RH (%):** 53
- **Bar Psr (Hg):** 30.35
- **Cloud Cover (%):** 0
- **GPS Coordinates (at SLM location):** +35°53'53.94", -79°2'40.93"

### ID | Start Time | Stop Time | L eq | L min | L max | L10 | L50 | L90 | Notes/Events
---|------------|-----------|------|-------|-------|-----|-----|-----|---------
0  | 11:05 AM  | 11:06 AM  | 45.4 | 44.1  | 48.2  | 47.1| 44.9| 44.2|         
1  | 11:06 AM  | 11:07 AM  | 44.9 | 43.4  | 47.1  | 46.0| 44.6| 43.7|         
2  | 11:07 AM  | 11:08 AM  | 45.3 | 43.1  | 46.7  | 46.0| 45.4| 44.1|         
3  | 11:08 AM  | 11:09 AM  | 43.9 | 42.2  | 49.5  | 44.8| 43.6| 42.5|         
4  | 11:09 AM  | 11:10 AM  | 43.7 | 42.8  | 44.5  | 44.5| 43.7| 43.1|         
5  | 11:10 AM  | 11:11 AM  | 44.1 | 43.0  | 46.0  | 44.9| 44.1| 43.2|         
6  | 11:11 AM  | 11:12 AM  | 45.4 | 43.5  | 50.9  | 48.1| 44.5| 43.5|         
7  | 11:12 AM  | 11:13 AM  | 45.1 | 43.5  | 53.9  | 49.1| 45.5| 44.3| Car     
8  | 11:13 AM  | 11:14 AM  | 44.6 | 43.9  | 45.4  | 45.2| 44.6| 44.1|         
9  | 11:14 AM  | 11:15 AM  | 45.0 | 43.9  | 48.4  | 45.9| 44.8| 44.1|         
10 | 11:15 AM  | 11:16 AM  | 45.1 | 44.3  | 46.6  | 45.9| 45.1| 44.3|         
11 | 11:16 AM  | 11:17 AM  | 46.0 | 44.6  | 48.3  | 46.9| 45.8| 45.1|         
12 | 11:17 AM  | 11:18 AM  | 45.1 | 42.7  | 50.1  | 46.6| 44.7| 43.4|         
13 | 11:18 AM  | 11:19 AM  | 45.3 | 43.7  | 47.7  | 46.3| 45.2| 44.2|         
14 | 11:19 AM  | 11:20 AM  | 45.1 | 43.7  | 49.1  | 48.0| 45.9| 44.7|         
15 | 11:20 AM  | 11:21 AM  | 46.1 | 45.1  | 50.3  | 46.9| 45.8| 45.2| Car     
16 | 11:21 AM  | 11:22 AM  | 44.5 | 42.6  | 47.5  | 46.6| 43.8| 42.6|         
17 | 11:22 AM  | 11:23 AM  | 46.2 | 42.7  | 52.2  | 48.6| 45.0| 43.4| Car     
18 | 11:23 AM  | 11:24 AM  | 45.1 | 44.2  | 48.0  | 45.8| 44.9| 44.2|         
19 | 11:24 AM  | 11:25 AM  | 46.4 | 43.5  | 51.6  | 48.9| 44.8| 43.5|         
20 | 11:25 AM  | 11:26 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
21 | 11:26 AM  | 11:27 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
22 | 11:27 AM  | 11:28 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
23 | 11:28 AM  | 11:29 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
24 | 11:29 AM  | 11:30 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
25 | 11:30 AM  | 11:31 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
26 | 11:31 AM  | 11:32 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
27 | 11:32 AM  | 11:33 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
28 | 11:33 AM  | 11:34 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         
29 | 11:34 AM  | 11:35 AM  | 46.4 | 44.1  | 50.1  | 47.0| 45.4| 44.3|         

K.24-286
# Field Noise Measurement Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Apartment DW NB/SB</th>
<th>Compass</th>
<th>Site Diagram</th>
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</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>24'</td>
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<tr>
<td>1- or 2-way</td>
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<td></td>
</tr>
<tr>
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<td>Heavy Trucks</td>
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<tr>
<td>Count duration</td>
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</table>

* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## Project Name: Triangle Transit DEIS
### Monitoring Location: M2 - Mason Farm Rd.
#### Analyst: John Burris - #6 Equipment

### Field Noise Measurement Form

<table>
<thead>
<tr>
<th>ID</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>L(_\text{eq})</th>
<th>L(_\text{min})</th>
<th>L(_\text{max})</th>
<th>L(_\text{50})</th>
<th>L(_\text{90})</th>
<th>Notes/Events</th>
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<tbody>
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<td>4:04 PM</td>
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<td>47.4</td>
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<tr>
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### Field Calibrations
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114

---

### Weather Data
- **Wind:** Steady / Gusty / Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 2.5
- **Temp (°F):** 57
- **RH (%):** 31
- **Bar Psr (Hg):** 30.20
- **Cloud Cover (%):** 0

---

### GPS Coordinates (at SLM location)
+35°53'53.94", -79°2'40.93"

---

### ID Start Time Stop Time L\(_\text{eq}\) L\(_\text{min}\) L\(_\text{max}\) L\(_\text{10}\) L\(_\text{50}\) L\(_\text{90}\) Notes/Events
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Apartment DW NB/SB</th>
<th>Compass</th>
<th>Site Diagram:</th>
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<tbody>
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<td>Speed (post/obs)*</td>
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<td>Number of Lanes</td>
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<td>Width (pave/row)</td>
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<td>1- or 2-way</td>
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<td>Grade</td>
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<td>Bus Stops</td>
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<td>Buses</td>
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Count duration: 20 min.

# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
## URS Acoustics and Noise Control Practice

### FIELD NOISE MEASUREMENT

**DATA FORM**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Triangle Transit DEIS</th>
<th>Project #:</th>
<th>31829240</th>
<th>Date:</th>
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<tbody>
<tr>
<td>Monitoring Location:</td>
<td>M2 - Mason Farm Rd.</td>
<td>Analyst:</td>
<td>John Burris - #6 Equipment</td>
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<table>
<thead>
<tr>
<th>Sound Level Meter</th>
<th>Field Calibration</th>
<th>Weather Data</th>
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<td>Topo:</td>
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<td>Terrain:</td>
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### GPS Coordinates (at SLM location)

+35° 53' 53.94", -79° 2' 40.93"

### Notes/Events

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<th>Start Time</th>
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### Additional Information

- **Temp (°F):** 47
- **RH (%):** 57
- **Bar Psr (Hg):** 30.19
- **Cloud Cover (%):** 0

K.24-290
## Field Noise Measurement Data Form

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Apartment DW NB/SB</th>
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<tbody>
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<td>Speed (post/obs)*</td>
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<tr>
<td>Number of Lanes</td>
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<td>Width (pave/row)</td>
<td>24'</td>
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<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>20 min.</td>
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</table>

- Speed estimated by Radar / Driving / Observation
- Photos Taken? Yes/No
- Additional Notes/Comments:
  - Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location.
**FIELD NOISE MEASUREMENT DATA FORM**

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/14/2013  
**Page of:**

**Monitoring Location:** M17A - Bernice St. & Joplin St.  
**Analyst:** Andrew Bell - #2 Equipment

### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1414  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No (explain)

### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Pre-Test:** 114.1 dBA  
- **Post-Test:** 113.9 dBA

### Weather Data
- **Wind:** Steady / Gusty / Calm  
- **Precipitation:** Yes (explain) / No  
- **Avg Wind Speed/Direction:** 1/N  
- **Temp (°F):** 30  
- **RH (%):** 75  
- **Bar Psr (Hg):** 30.47  
- **Cloud Cover (%):** 8

### Topo
- **Flat / Hilly**

### Terrain
- **Hard/Soft/Mixed/Snow**

### GPS Coordinates (at SLM location)
- +35° 58’ 49.20”, -78° 53’ 0.81”

### ID | Start Time | Stop Time | L_eq | L_min | L_max | L_10 | L_50 | L_90 | Notes/Events
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
0 | 8:42 AM | 8:43 AM | 64.1 | 62.8 | 65.5 | 65.4 | 63.8 | 63.1 | 
1 | 8:43 AM | 8:44 AM | 62.9 | 61.2 | 65.2 | 64.0 | 62.7 | 61.8 | 
2 | 8:44 AM | 8:45 AM | 63.0 | 60.4 | 64.9 | 64.6 | 62.8 | 61.3 | 
3 | 8:45 AM | 8:46 AM | 63.5 | 60.9 | 65.3 | 64.8 | 63.5 | 61.9 | 
4 | 8:46 AM | 8:47 AM | 63.3 | 61.2 | 66.8 | 64.8 | 62.8 | 61.8 | 
5 | 8:47 AM | 8:48 AM | 63.3 | 60.9 | 65.3 | 64.8 | 63.5 | 61.9 | 
6 | 8:48 AM | 8:49 AM | 60.9 | 58.9 | 63.5 | 61.9 | 60.7 | 59.8 | 
7 | 8:49 AM | 8:50 AM | 61.3 | 58.4 | 63.9 | 62.9 | 61.3 | 59.9 | 
8 | 8:50 AM | 8:51 AM | 62.0 | 60.5 | 64.0 | 63.1 | 61.9 | 61.0 | 
9 | 8:51 AM | 8:52 AM | 62.1 | 60.4 | 64.7 | 63.0 | 61.9 | 61.1 | 
10 | 8:52 AM | 8:53 AM | 61.5 | 60.0 | 64.0 | 62.0 | 61.5 | 60.6 | 
11 | 8:53 AM | 8:54 AM | 61.5 | 60.0 | 63.5 | 62.8 | 61.4 | 60.3 | 
12 | 8:54 AM | 8:55 AM | 62.3 | 61.3 | 64.8 | 63.5 | 62.3 | 61.3 | 
13 | 8:55 AM | 8:56 AM | 62.7 | 61.9 | 64.0 | 63.6 | 62.6 | 62.1 | 
14 | 8:56 AM | 8:57 AM | 61.7 | 59.0 | 63.3 | 62.7 | 61.7 | 61.1 | 
15 | 8:57 AM | 8:58 AM | 59.2 | 57.5 | 61.9 | 60.6 | 59.0 | 57.8 | 
16 | 8:58 AM | 8:59 AM | 62.1 | 60.4 | 64.7 | 63.0 | 61.9 | 61.1 | 
17 | 8:59 AM | 9:00 AM | 61.5 | 60.0 | 64.0 | 62.0 | 61.5 | 60.6 | 
18 | 9:00 AM | 9:01 AM | 61.5 | 60.0 | 63.5 | 62.8 | 61.4 | 60.3 | 
19 | 9:01 AM | 9:02 AM | 62.3 | 61.3 | 64.8 | 63.5 | 62.3 | 61.3 | 
20 | 9:02 AM | 9:03 AM | 62.7 | 61.9 | 64.0 | 63.6 | 62.6 | 62.1 | 
21 | 9:03 AM | 9:04 AM | 61.7 | 59.0 | 63.3 | 62.7 | 61.7 | 61.1 | 
22 | 9:04 AM | 9:05 AM | 59.2 | 57.5 | 61.9 | 60.6 | 59.0 | 57.8 | 
23 | 9:05 AM | 9:06 AM | 62.1 | 60.4 | 64.7 | 63.0 | 61.9 | 61.1 | 
24 | 9:06 AM | 9:07 AM | 61.5 | 60.0 | 64.0 | 62.0 | 61.5 | 60.6 | 
25 | 9:07 AM | 9:08 AM | 61.5 | 60.0 | 63.5 | 62.8 | 61.4 | 60.3 | 
26 | 9:08 AM | 9:09 AM | 62.3 | 61.3 | 64.8 | 63.5 | 62.3 | 61.3 | 
27 | 9:09 AM | 9:10 AM | 62.7 | 61.9 | 64.0 | 63.6 | 62.6 | 62.1 | 
28 | 9:10 AM | 9:11 AM | 61.7 | 59.0 | 63.3 | 62.7 | 61.7 | 61.1 | 
29 | 9:11 AM | 9:12 AM | 59.2 | 57.5 | 61.9 | 60.6 | 59.0 | 57.8 |
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Bernice St. / Joplin St.</th>
<th>compass</th>
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<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>15</td>
<td></td>
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<tr>
<td>Number of Lanes</td>
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<td></td>
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</tr>
<tr>
<td>Width (pave/row)</td>
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</tr>
<tr>
<td>1- or 2-way</td>
<td>2</td>
<td></td>
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<tr>
<td>Grade</td>
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</tr>
<tr>
<td>Bus Stops</td>
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<td></td>
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<tr>
<td>Stoplights</td>
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<tr>
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<td></td>
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</tr>
<tr>
<td>Heavy Trucks</td>
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<td></td>
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</tr>
<tr>
<td>Buses</td>
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</tr>
<tr>
<td>Count duration</td>
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# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments: NC 147 primary noise source.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
# FIELD NOISE MEASUREMENT

## DATA FORM

<table>
<thead>
<tr>
<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/14/2013</th>
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<tr>
<td>Monitoring Location: M17A - Bernice St. &amp; Joplin St.</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
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</tbody>
</table>

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test** 114.1 dBA
- **Post-Test** 113.9 dBA

### Weather Data
- **Wind:** Steady / Gusty / Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 4/WSW
- **Temp (°F):** 50
- **RH (%):** 34
- **Bar Psr (Hg):** 30.47
- **Cloud Cover (%):** 0

### GPS Coordinates (at SLM location)
+35° 58’ 49.20”, -78° 53’ 0.81”

### ID | Start Time | Stop Time | L\(_{eq}\) | L\(_{min}\) | L\(_{max}\) | L\(_{10}\) | L\(_{50}\) | L\(_{90}\) | Notes/Events
---|-----------|-----------|---------|---------|---------|---------|---------|---------|-----------------|
| 0 | 12:32 PM | 12:33 PM | 59.4 | 58.9 | 59.7 | 59.7 | 59.5 | 59.1 |
| 1 | 12:33 PM | 12:34 PM | 60.1 | 57.4 | 62.5 | 61.6 | 60.0 | 58.3 |
| 2 | 12:34 PM | 12:35 PM | 61.6 | 59.0 | 64.0 | 63.5 | 60.9 | 59.5 |
| 3 | 12:35 PM | 12:36 PM | 60.6 | 56.8 | 63.9 | 62.4 | 60.5 | 58.3 |
| 4 | 12:36 PM | 12:37 PM | 60.7 | 56.2 | 66.3 | 62.2 | 60.4 | 57.0 |
| 5 | 12:37 PM | 12:38 PM | 60.8 | 55.9 | 63.7 | 62.4 | 60.8 | 57.7 |
| 6 | 12:38 PM | 12:39 PM | 59.9 | 56.1 | 62.0 | 61.5 | 59.8 | 58.1 |
| 7 | 12:39 PM | 12:40 PM | 60.9 | 58.0 | 64.5 | 62.7 | 60.5 | 58.6 |
| 8 | 12:40 PM | 12:41 PM | 61.0 | 56.5 | 64.4 | 63.7 | 60.3 | 58.1 |
| 9 | 12:41 PM | 12:42 PM | 60.4 | 56.7 | 62.8 | 62.4 | 60.3 | 57.3 |
| 10 | 12:42 PM | 12:43 PM | 60.4 | 57.6 | 63.5 | 61.9 | 60.2 | 58.3 |
| 11 | 12:43 PM | 12:44 PM | 60.2 | 55.0 | 62.3 | 61.8 | 60.1 | 57.0 |
| 12 | 12:44 PM | 12:45 PM | 61.0 | 58.3 | 63.9 | 62.3 | 60.9 | 59.0 |
| 13 | 12:45 PM | 12:46 PM | 63.4 | 60.4 | 67.2 | 65.0 | 63.1 | 61.3 |
| 14 | 12:46 PM | 12:47 PM | 61.7 | 58.2 | 64.4 | 63.5 | 61.4 | 59.2 |
| 15 | 12:47 PM | 12:48 PM | 62.7 | 59.5 | 65.4 | 64.5 | 62.6 | 60.4 |
| 16 | 12:48 PM | 12:49 PM | 61.2 | 57.5 | 65.1 | 63.4 | 60.8 | 58.3 |

17
18
19
20
21
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23
24
25
26
27
28
29
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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<td>Number of Lanes</td>
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</tr>
<tr>
<td>Width (pave/row)</td>
<td>14'</td>
</tr>
<tr>
<td>1- or 2- way</td>
<td>2</td>
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<tr>
<td>Grade</td>
<td>2%</td>
</tr>
<tr>
<td>Bus Stops</td>
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<td>Stoplights</td>
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<tr>
<td>Buses</td>
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<tr>
<td>Count duration</td>
<td>10 min.</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

M17A-1, M17A-2, M17A-3

Additional Notes/Comments: NC 147 primary noise source.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location
# URS Acoustics and Noise Control Practice
## FIELD NOISE MEASUREMENT
### DATA FORM

<table>
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<tr>
<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/14/2013</th>
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<td>Monitoring Location: M17A - Bernice St. &amp; Joplin St.</td>
<td>Analyst: Andrew Bell - #2 Equipment</td>
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</table>

### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1414
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test** 114.1 dBA
- **Post-Test** 113.9 dBA

### Weather Data
- **Wind:** Steady / Gusty / Calm
- **Wind Speed/Direction:** 4/WSW
- **Avg Wind Speed:** 50
- **Bar Psr (Hg):** 30.47
- **Cloud Cover (%):** 0
- **Temp (°F):** 50
- **RH (%):** 34

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<th>L&lt;sub&gt;min&lt;/sub&gt;</th>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Notes/Events
- GPS Coordinates (at SLM location): +35° 58' 49.20", -78° 53' 0.81"

### Bar Psr (Hg): 30.47

### Cloud Cover (%): 0

**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**
# URS Acoustics and Noise Control Practice FIELD NOISE MEASUREMENT DATA FORM

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<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Bernice St. / Joplin St.</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2- way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>1</td>
<td>14'</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>15 min.</td>
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# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments: NC 147 primary noise source.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

Site Diagram:
See scan of field sheet, and map with aerial and monitor location

K.24-297
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

| Project Name: Triangle Transit DEIS | Project #: 31829240 | Date: 11/14/2013 | Page of |
| Monitoring Location: M17A - Bernice St. & Joplin St. | Analyst: Andrew Bell - #2 Equipment |

**Sound Level Meter**

<table>
<thead>
<tr>
<th>Model #:</th>
<th>Serial #:</th>
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**Field Calibration**

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**Weather Data**

- **Wind:** Steady/Gusty/Calm
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow
- **GPS Coordinates (at SLM location):** +35°58'49.20", -78°53'0.81"
- **Avg Wind Speed/Direction:** 6/S
- **Temp (°F):** 38
- **RH (%):** 50
- **Bar Psr (Hg):** 30.34
- **Cloud Cover (%):** 0

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<td>8:45 PM</td>
<td>58.8</td>
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<td>63.8</td>
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<td>Truck downshifting on NC 147</td>
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<tr>
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<td>8:46 PM</td>
<td>8:47 PM</td>
<td>60.5</td>
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<td>58.4</td>
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</tbody>
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**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**

K.24-298
**URS Acoustics and Noise Control Practice**

**FIELD NOISE MEASUREMENT**

**DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Bernice St. / Joplin St.</th>
<th>Speed (post/obs)*</th>
<th>Number of Lanes</th>
<th>Width (pave/row)</th>
<th>1- or 2- way</th>
<th>Grade</th>
<th>Bus Stops</th>
<th>Stoplights</th>
<th>Motorcycles</th>
<th>Automobiles</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Buses</th>
<th>Count duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>1</td>
<td>14'</td>
<td>2</td>
<td>2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15 min.</td>
</tr>
</tbody>
</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation

Photos Taken? **Yes/No**

Additional Notes/Comments: NC 147 primary noise source. Higher truck volume and lower passenger car volume on NC 147 causing more varied 1-minute readings.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

See scan of field sheet, and map with aerial and monitor location.
## URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT DATA FORM**

<table>
<thead>
<tr>
<th>Roadway Name/Dir</th>
<th>Branson St. EB/WB</th>
<th>compass</th>
<th>Site Diagram:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (post/obs)*</td>
<td>15</td>
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<td></td>
</tr>
<tr>
<td>Number of Lanes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Width (pave/row)</td>
<td>20'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- or 2- way</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>+4% WB</td>
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<td></td>
</tr>
<tr>
<td>Bus Stops</td>
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<tr>
<td>Medium Trucks</td>
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</tr>
<tr>
<td>Heavy Trucks</td>
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</tr>
<tr>
<td>Buses</td>
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<td></td>
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</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
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</table>

# - note coordinate system  * - Speed estimated by Radar / Driving / Observation
Photos Taken? **Yes/No**

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
**FIELD NOISE MEASUREMENT DATA FORM**

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<thead>
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<th>ID</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>L&lt;sub&gt;eq&lt;/sub&gt;</th>
<th>L&lt;sub&gt;min&lt;/sub&gt;</th>
<th>L&lt;sub&gt;max&lt;/sub&gt;</th>
<th>L&lt;sub&gt;10&lt;/sub&gt;</th>
<th>L&lt;sub&gt;50&lt;/sub&gt;</th>
<th>L&lt;sub&gt;90&lt;/sub&gt;</th>
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<td>Car</td>
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<td>40.9</td>
<td>Car</td>
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<td>65.4</td>
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<td>10:48 AM</td>
<td>10:49 AM</td>
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<td>54.8</td>
<td>42.9</td>
<td>39.2</td>
<td>38.2</td>
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<td>48.9</td>
<td>45.8</td>
<td>Nearby Garbage Truck</td>
</tr>
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<td>10:53 AM</td>
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<td>Nearby Garbage Truck</td>
</tr>
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<td>10:54 AM</td>
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<td>51.8</td>
<td>74.8</td>
<td>70.0</td>
<td>59.2</td>
<td>53.9</td>
<td>Nearby Garbage Truck</td>
</tr>
</tbody>
</table>

**URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109**
**FIELD NOISE MEASUREMENT DATA FORM**

<table>
<thead>
<tr>
<th>Field</th>
<th>Branson St. EB/WB</th>
<th>Compass</th>
<th>Site Diagram:</th>
</tr>
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<tbody>
<tr>
<td>Roadway Name/Dir</td>
<td>Branson St. EB/WB</td>
<td>compass</td>
<td>Site Diagram:</td>
</tr>
<tr>
<td>Speed (post/obs)*</td>
<td>15</td>
<td></td>
<td>See scan of field sheet, and map with aerial and monitor location</td>
</tr>
<tr>
<td>Number of Lanes</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (pave/row)</td>
<td>20'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- or 2-way</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>+4% WB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus Stops</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Stoplights</td>
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</tr>
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<td>Motorcycles</td>
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</tr>
<tr>
<td>Medium Trucks</td>
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<td></td>
</tr>
<tr>
<td>Heavy Trucks</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Buses</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Count duration</td>
<td>20 min.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* - Speed estimated by Radar / Driving / Observation

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### URS Acoustics and Noise Control Practice
#### FIELD NOISE MEASUREMENT

**DATA FORM**

<table>
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<th>Project Name: Triangle Transit DEIS</th>
<th>Project #: 31829240</th>
<th>Date: 11/11/2013</th>
<th>Page of 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Location: M1A - Branson St.</td>
<td>Analyst: John Burris - #6 Equipment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Sound Level Meter
- **Model #:** 820
- **Serial #:** 1324
- **Weighting:** A / C / Flat
- **Response:** Slow / Fast / Impl
- **Windscreen:** Yes / No (explain)
- **Topo:** Flat / Hilly
- **Terrain:** Hard/Soft/Mixed/Snow

#### Field Calibration
- **Model #:** CAL200
- **Serial #:** 3704
- **Calibration Level (dBA):** 94 / 114
- **Pre-Test dBA:** 114.1 dBA
- **Post-Test dBA:** 114.1 dBA
- **GPS Coordinates (at SLM location):** +35° 54' 0.05", -79° 2' 57.04"

#### Weather Data
- **Wind:** Steady/Gusty/Calm
- **Precipitation:** Yes (explain) / No
- **Avg Wind Speed/Direction:** 3
- **Temp (°F):** 57
- **RH (%):** 31
- **Bar Psr (Hg):** 30.20
- **Cloud Cover (%):** 0

#### ID  | Start Time  | Stop Time  | L<sub>eq</sub> | L<sub>min</sub> | L<sub>max</sub> | L<sub>10</sub> | L<sub>50</sub> | L<sub>90</sub> | Notes/Events |
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<tbody>
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<td>41.8</td>
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<td>39.2</td>
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<tr>
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<td>3:35 PM</td>
<td>3:36 PM</td>
<td>48.7</td>
<td>41.9</td>
<td>57.1</td>
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<td>44.6</td>
<td>43.0</td>
<td>Med. Truck</td>
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<td>43.7</td>
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<tr>
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<td>3:46 PM</td>
<td>3:47 PM</td>
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<td>3:53 PM</td>
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<td>39.2</td>
<td>58.5</td>
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### URS Acoustics and Noise Control Practice

**FIELD NOISE MEASUREMENT**

**DATA FORM**

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* - Speed estimated by Radar / Driving / Observation

# - note coordinate system

Photos Taken? Yes/No

Additional Notes/Comments:

- Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse
### FIELD NOISE MEASUREMENT DATA FORM

**Project Name:** Triangle Transit DEIS  
**Project #:** 31829240  
**Date:** 11/11/2013  
**Monitoring Location:** MIA - Branson St.  
**Analyst:** John Burris - #6 Equipment

#### Sound Level Meter
- **Model #:** 820  
- **Serial #:** 1324  
- **Weighting:** A / C / Flat  
- **Response:** Slow / Fast / Impl  
- **Windscreen:** Yes / No

#### Field Calibration
- **Model #:** CAL200  
- **Serial #:** 3704  
- **Calibration Level (dBA):** 94 / 114  
- **Pre-Test** 114.1 dBA  
- **Post-Test** 114.1 dBA

#### Weather Data
- **Wind:** Steady/Gusty/Calm  
- **Wind Speed/Direction:** 0  
- **Temp (° F):** 57  
- **RH (%):** 57  
- **Bar Psr (Hg):** 30.19  
- **Cloud Cover (%):** 0

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# URS Acoustics and Noise Control Practice

## FIELD NOISE MEASUREMENT

### DATA FORM

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<th>Roadway Name/Dir</th>
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* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

See scan of field sheet, and map with aerial and monitor location

Additional Notes and Sketches on Reverse
Appendix C: Monitoring Site Photos