APPENDIX G

Noise Supporting Information

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Subject: Connect Cobb Corridor Noise and Vibration

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Noise

This section describes the noise assessment conducted for the Connect Cobb Northwest Transit Corridor project, including noise basics and impact criteria, the methodology used to assess impact, a description of the existing noise conditions, the impact assessment and the noise mitigation measures required.

Noise Basics

Sound is defined as small changes in air pressure above and below the standard atmospheric pressure and noise is usually considered to be unwanted sounds. The three parameters that define noise include:

- **Level** – The level of sound is the magnitude of air pressure change above and below atmospheric pressure, and is expressed in decibels (dB). Typical sounds fall within a range between 0 dB (the lower limits of human hearing) and 120 dB (the highest sound levels experienced in the environment). A 3 dB change in sound level is perceived as a barely noticeable change outdoors and a 10 dB change in sound level is perceived as a doubling (or halving) of the sound level.
- **Frequency** – The frequency (pitch or tone) of sound is the rate of air pressure changes and is expressed in cycles per second, or Hertz (Hz). Human ears can detect a wide range of frequencies from around 20 Hz to 20,000 Hz. However, human hearing is not effective at high and low frequencies, and the A-weighting system (dBA) is used to correlate with human response to noise. The A-weighted sound level has been widely adopted by acousticians as the most appropriate descriptor for environmental noise.
- **Time Pattern** – Because environmental noise is constantly changing, it is common to condense all of this information into a single number, called the "equivalent" sound level (Leq). The Leq represents the changing sound level over a period of time, typically 1 hour or 24-hours in transit noise assessments. For transit projects, the Day-Night Sound Level (Ldn) is the common noise descriptor used, and has been adopted by most agencies as the best way to describe how people respond to noise in their environment. Ldn is a 24-hour cumulative A-weighted noise level that includes all noises that happen within a day, with a 10 dB penalty for nighttime noise (10 PM to 7 AM). This nighttime penalty means that any noise events at night are equivalent to ten similar events during the day. Typical Ldn values for various transit and bus operations are shown in Figure 1.

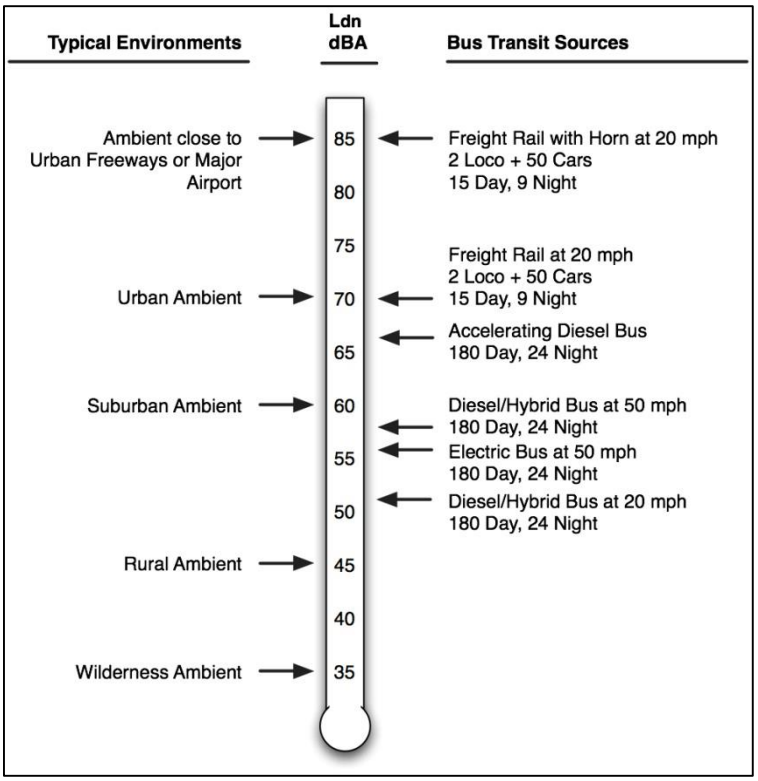

Figure 1. Cumulative Noise Levels from Transit and Bus Sources

Noise Impact Criteria

The noise impact criteria used for the project are based on the information contained in Chapter 3 of the FTA noise and vibration guidance manual[1]. The FTA noise impact criteria are based on well-documented research on community response to noise and are based on both the existing level of noise and the change in noise exposure due to a project. The FTA noise criteria compare the project noise with the existing noise (not the no-build noise).

The FTA noise criteria are based on the land use category of the sensitive receptor, and use Ldn for locations where people sleep (Category 2) and Leq for locations with daytime and/or evening use (Category 1 or 3), as shown in Table 1.

Table 1. Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor Leq(h)*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

[1] U. S. Federal Transit Administration, "Transit Noise and Vibration Impact Assessment." Report FTA-VA-90-1003-06, May 2006.

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
3	Outdoor Leq(h)*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.
* Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.		

Source: FTA Guidance Manual (2006)

The noise impact criteria are defined by the two curves shown in Figure 2, which allow increasing project noise as existing noise levels increase, up to a point at which impact is determined based on project noise alone. The FTA noise impact criteria include three levels of impact, as shown in Figure 2. The three levels of impact include:

- **No Impact:** In this range, the proposed project is considered to have no impact since, on average; the introduction of the project will result in an insignificant increase in the number of people highly annoyed by the new project noise.
- **Moderate Impact:** At the moderate impact range, changes in the cumulative noise level are noticeable to most people, but may not be sufficient to cause strong, adverse reactions from the community. In this transitional area, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation, such as the existing level, predicted level of increase over existing noise levels and the types and numbers of noise-sensitive land uses affected.
- **Severe Impact:** At the severe impact range, a significant percentage of people would be highly annoyed by the new project noise. Severe noise impacts are considered to be "significant" under NEPA, and should be avoided if possible. Noise mitigation should be applied for severe impacts where feasible.

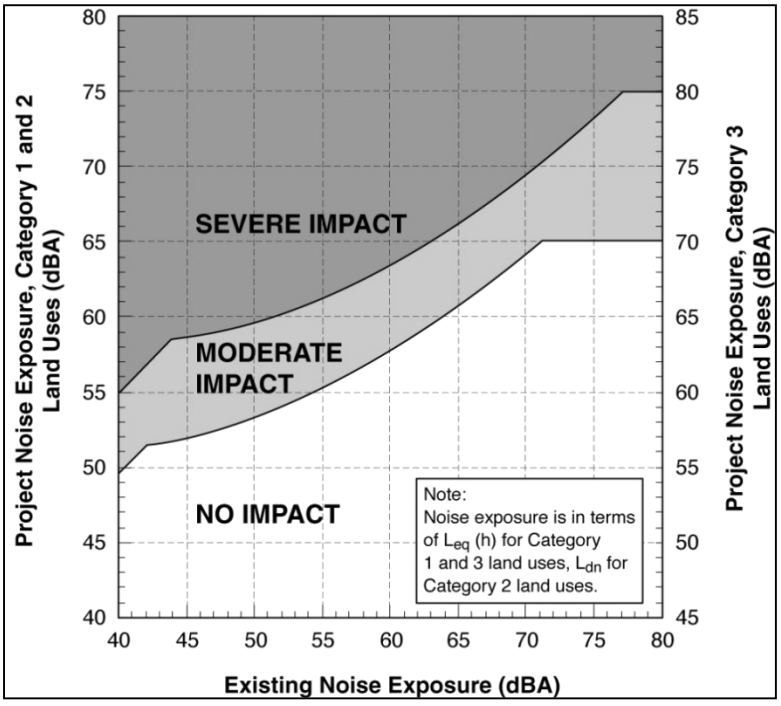

Figure 2. FTA Noise Impact Criteria

Impact Assessment Methodology

Noise impact has been evaluated using the detailed noise assessment methodology contained in Chapter 6 of the FTA guidance manual. The steps in a noise assessment for a transit project include:

- identifying noise-sensitive land uses in the corridor using aerial photography, GIS data and field surveys
- screening out areas, such as those along I-75, where no noise sensitive receptors are located within 200 feet of the proposed alignment
- measuring the existing noise levels in the corridor
- projecting noise levels from transit operations
- assessing impact from transit by comparing the project noise with the existing noise using the criteria detailed above
- recommending mitigation at locations where project noise levels exceed the impact criteria

Projected noise levels for the Connect Cobb Northwest Transit Corridor project are based on operations data and drawings provided by Kimley-Horn and Associates. Specific assumptions used in the noise impact assessment include:

- Bus speeds were assumed to be consistent with existing roadway speed limits. Generally bus speeds ranged from 45 mph to 55 mph on the Route 41 portion of the alignment and 25 mph to 35 mph on connectors roads and city streets in Atlanta.
- The operating hours and headways included the following:
    - Early morning hours (5:00 AM to 6:00 AM) – 15 minute headways
    - Peak operating hours (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM) - 8 minute headways
    - Daytime and late evening hours (9:00 AM to 4:00 PM and 6:00 PM to 1:00 AM) - 15 minute headways
- Bus vehicle reference noise levels are based on information contained in the FTA noise and vibration guidance manual.

Existing Conditions

Noise Sensitive Land Use

Noise-sensitive land use for the Connect Cobb Northwest Transit Corridor project was identified based on aerial photography, project maps and a site survey. Based on the information from these sources, the noise-sensitive land use is as follows:

Barrett Parkway to South Barrett Parkway Reliever: The land use in this portion of the alignment is mixed, with one hotel and a multi-family residence on the north side of the alignment.

Barrett Lakes Boulevard: The land use in this portion of the alignment includes one hotel, and several multi-family residences along the roadway.

Cobb Parkway, south of Barrett Lakes Boulevard: The land use in this portion of the alignment is primarily commercial and industrial. There is one residential development between Barrett Lakes Boulevard and White Circle Drive and two churches along Cobb Parkway.

Cobb Parkway, between Canton Road and North Marietta Parkway: The land use in this portion of the alignment includes three hotels, single-family residences, and a school.

Cobb Parkway, between South Marietta Parkway and South Cobb Drive: The land use in this portion of the alignment includes two hotels.

South of South Cobb Drive: The land use in this portion of the alignment is primarily commercial. Dobbins Air Force Base is located to the west of Cobb Parkway. The residential land use along this segment lies outside of the noise screening distance.

Caswell Parkway to south of Windy Hill Road SE: The Georgia Memorial Cemetery is located just south of Caswell Parkway, to the west of Cobb Parkway. There are no residential land uses along this portion of the alignment.

Cumberland Boulevard: The land use along this portion of the alignment includes four hotels and one multi-family development, as well as commercial shopping areas.

Northside Drive, Northside Circle to 17th Street NW: The land use along this portion of the alignment is primarily commercial. There is one residential development north of Northside Circle NW, to the east of Northside Drive.

17th Street NW, Bishop Street to Market St NW (Atlantic Station): The land use along this portion of the alignment includes several multi-story residential developments, mixed-use residential and commercial buildings, and three hotels.

Spring St NW, 17th Street to 10th Street: The land use along this portion of the alignment includes two performance halls.

W. Peachtree Street, 17th Street to 10th Street: The land use in this portion of the alignment includes multi-family residences along with commercial buildings.

North McCollum Parkway/Chastain Road to Frey Road (alignment alternative): The land use in this portion of the alignment includes one residential multi-family development, one hotel, and a mix of commercial and industrial buildings.

Frey Road to Busbee Drive (alignment alternative): The land use in this portion of the alignment includes one educational institution, four hotels, one museum, and one multi-family residential development.

South Busbee Drive to George Busbee Parkway (alternative alignment): The land use in this portion of the alignment includes residential developments, a hotel and commercial buildings.

Existing Noise Measurements

Existing noise levels were measured at thirteen sites near the proposed Connect Cobb Northwest Transit Corridor project during October 2013. Because the thresholds for impact in the FTA noise criteria are based on the existing noise levels, measuring the existing noise and characterizing noise levels at sensitive locations is an important step in the impact assessment. The noise measurements included long-term (24-hour) and short-term (1 hour) monitoring of the A-weighted sound level at noise-sensitive locations near the proposed busway.

Table 2 summarizes the results of the existing noise measurement program and Figure 3 shows the location of the six long term measurements of 24 hours, and eight one hour short-term noise monitoring sites for the proposed busway. At each site, the measurement was conducted at the approximate set back of the building or buildings relative to the project location. The results of the existing noise measurements program are used to determine the existing noise levels for all the noise sensitive locations for the project. The noise measurement results at each site are described below.

Table 2. Summary of Existing Long- and Short-Term Noise Level Measurements

Site No.	Measurement Location	Measurement Start		Meas. Duration (Hrs)	Noise Level (dBA)[1]	
		Date	Time		Ldn	Leq
N1	Century Crest Apartments	10/22/2013	13:17	24	71	--
N2	121 Paris Lane Street, Marietta	10/22/2013	10:41	24	64	--
N3	Princeton Place Apartments	10/22/2013	15:29	24	61	--
N4	Budget Inn Motel-Cobb Pkwy	10/24/2013	10:21	24	69	--
N5	Walker School	10/22/2013	08:05	1	58	60
N6	Cumberland Crossing Apartments	10/22/2013	13:55	24	55	--
N7	Georgia Memorial Park	10/23/2013	11:07	1	54	56
N8	Trinity School	10/23/2013	08:25	1	54	56
N9	Highland Ridge A.	10/21/2013	16:43	24	64	--
N10	Bishop St NE & 17th Street	10/24/2013	10:01	1	57	59
N11	17th street Play Ground	10/23/2013	15:30	1	59	61
N12	Fowler Street & 16th Street	10/24/2013	14:40	1	61	63
N13	17th Street and Peach Street	10/23/2013	16:34	1	57	59
1. Ldn is used for Category 2 (residential) land use and Leq is used for Category 3 (institutional land use).						

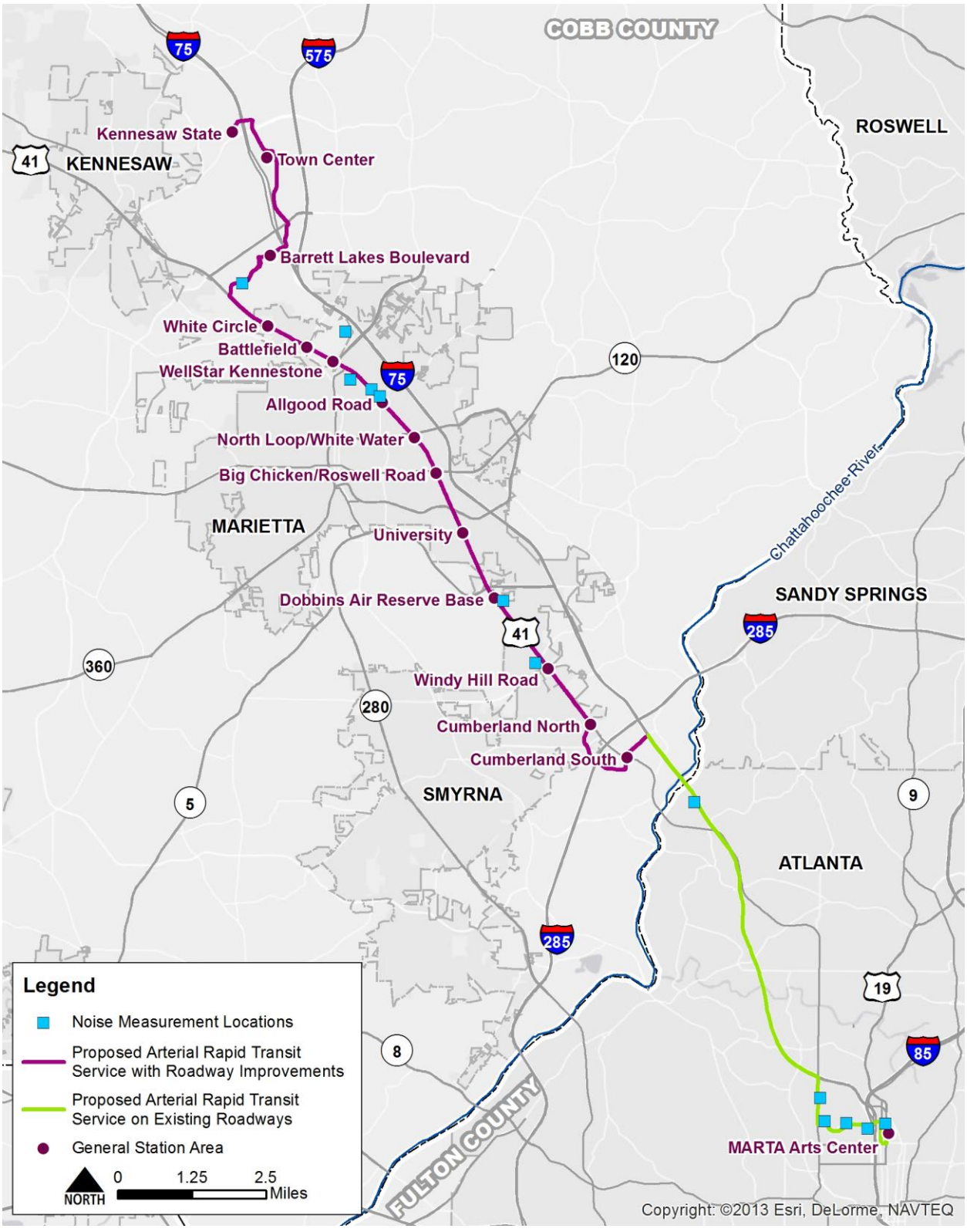

Figure 3. Noise Measurement Locations

Site N1 – Century Crest Apartments, Barrett Boulevard: The measured Ldn at this location was 71 dBA. The dominant noise sources were local traffic and occasional aircraft overflights. Noise levels were measured for 24 hours on the north side of the property near the buildings facing Barrett Boulevard.

Site N2 - 121 Paris Lane, Marietta: The measured Ldn at this location was 64 dBA. Noise levels were measured for 24 hours in the back yard of the property facing the location of the proposed bus maintenance facility. The dominant noise sources were local traffic on Paris Lane, distant traffic on I-75, birds and other natural sounds.

Site N3 - Princeton Place Apartments, Canton Road: The measured Ldn at this location was 61 dBA. Noise levels were measured for 24 hours at the northern edge of the property facing a proposed park and ride lot. The dominant noise source was local traffic on Canton Road.

Site N4 – Budget Inn Motel, Cobb Pkwy: The measured Ldn at this location was 69 dBA. The dominant noise sources were local traffic from Cobb Parkway. Noise levels were measured for 24 hours at the western edge of the property at the setback distance of the motel from the roadway.

Site N5 - Walker School, Cobb Parkway: The Leq measured at this location was 60 dBA. The dominant noise sources were local traffic from Cobb Parkway, occasional aircraft overflights, and vehicles idling in the school parking lot.

Site N6 - Cumberland Crossing Apartments, Hidden Glen Dr. SE: The measured Ldn at this location was 55 dBA. The dominant noise sources were local traffic from Franklin Drive and Hidden Glen Drive. Noise levels were measured for 24 hours on the western edge of the property near Franklin Drive.

Site N7 - Georgia Memorial Park, Cobb Parkway: The Leq measured at this location was 56 dBA. This measurement was conducted near the center of the memorial at a distance of about 150 feet from the front entrance on Cobb Parkway. The dominant noise sources were local traffic from Cobb Parkway and occasional aircraft overflights.

Site N8 - Trinity School, Northside Pkwy NW: The Leq measured at this location was 56 dBA. The measurement was conducted in the school parking lot on the northeast edge of the property. The dominant noise sources were local traffic and traffic along I-75.

Site N9 - Highland Ridge Apartments, Northside Drive: The measured Ldn at this location was 64 dBA. The dominant noise source was local traffic along Northside Drive. Noise levels were measured for 24 hours on the west side of the complex facing Northside Drive.

Site N10 - Bishop St NE & 17th Street: The Leq measured at this location was 59 dBA. The measurement was conducted at the intersection of Bishop Street and 17th Street. The dominant noise source was local traffic along 17th Street and Bishop Street.

Site N11 - 17th Street Playground/ Charging Station: The Leq measured at this location was 61dBA. The measurement was conducted at the playground adjacent to the electric car charging station on 17th Street. The dominant noise source was local traffic along 17th Street.

Site N12 - Fowler Street & 16th Street: The Leq measured at this location was 63 dBA. The measurement was conducted along Fowler Street just west of the fire station on 16th Street. The dominant noise source was traffic along 16th Street, 17th Street, and I-75.

Site N13 - 17th Street and W. Peachtree Street: The Leq measured at this location was 59 dBA. The measurement was conducted at the intersection of 17th Street and West Peachtree Street. The dominant noise source was local peak hour traffic along 17th Street and Peachtree Street.

Potential Environmental Impacts

For the proposed Connect Cobb Northwest Transit Corridor project, a detailed noise assessment was conducted. The results are presented below and include both residential and institutional land use. The results include tables of all sensitive locations, which show the location information for each sensitive receptor group, the existing noise levels, the projections of future noise levels, the impact criteria and

whether or not there are any noise impacts. The tables also show the total number of moderate and severe noise impacts for each location.

The results in Tables 3 and 4 indicate no noise impacts for residential or institutional land uses along the corridor. The primary reason that there are no impacts is the high existing noise levels in the corridor from traffic on local streets, Cobb Parkway and I-75.

Table 3. Summary of Noise Impacts for Residential Land Use

Receiver		Dist.	Speed	Exist	Proj. Noise Level Criteria			Impact	# of Impacts	
Type	Location	(ft)	(mph)	Ldn	Mod	Sev	BRT	?	Mod	Sev
MF	General Wheeler CT & Shiloh Valley Dr. NW	47	25	64	61	65	56	No	0	0
MF	Roberts Ct. NW Kennesaw & Heritage Park Trace	111	25	64	61	65	55	No	0	0
Hotel	Roberts Ct. NW Kennesaw & Heritage Park Trace	86	25	64	61	65	55	No	0	0
MF	General Wheeler CT & Shiloh Valley Dr. NW	79	45	64	61	65	59	No	0	0
MF	Barrett Lakes Blvd. & Shiloh Valley Dr. NW	66	45	64	61	65	59	No	0	0
MF	Barrett Lakes Blvd. & Shiloh Valley Dr. NW	84	45	69	64	69	59	No	0	0
MF	Barrett Lakes Blvd. & Esquire Cir	91	45	69	64	69	59	No	0	0
SF	Barrett Lakes Blvd. & Esquire Cir	113	55	69	64	69	60	No	0	0
MF	1615 Cobb Pkwy N.	186	55	69	64	69	57	No	0	0
Hotel	Cobb Pkwy & Canton Drive	198	55	69	64	69	59	No	0	0
Motel	525 Cobb Parkway N.	92	55	69	64	69	60	No	0	0
Motel	525 Cobb Parkway N.	112	55	69	64	69	60	No	0	0
SF	525 Cobb Parkway N.	227	55	69	64	69	59	No	0	0
Motel	Seminole Dr. & Custer St.	143	55	69	64	69	60	No	0	0
Hotel	Seminole Dr. & Custer St.	85	55	69	64	69	60	No	0	0
MF	Franklin Dr. & Hidden Glen Dr.	159	45	69	64	69	58	No	0	0
MF	Franklin Dr. & Hidden Glen Dr.	238	45	69	64	69	57	No	0	0
MF	Wind Cliff 2350 Cobb Pkwy SE	252	45	69	64	69	57	No	0	0
Hotel	Cumberland Blvd. & Cobb Parkway	91	45	64	61	65	58	No	0	0
Hotel	Cumberland Blvd. & Cobb Parkway	98	45	64	61	65	58	No	0	0
Hotel	Cumberland Blvd. & Cobb Parkway	240	45	64	61	65	57	No	0	0
MF	499 Northside Cir NW. Atlanta	240	35	64	61	65	53	No	0	0
Hotel	17th Street to W. Peach Street	102	25	60	58	63	52	No	0	0
MF	17th Street to W. Peach Street	70	25	60	58	63	54	No	0	0
MF	17th Street to W. Peach Street	73	25	60	58	63	55	No	0	0
Hotel	17th Street to W. Peach Street	78	35	66	62	67	53	No	0	0
MF	17th Street to W. Peach Street	295	35	66	62	67	53	No	0	0
MF	17th Street to W. Peach Street	120	35	60	58	63	54	No	0	0
SF	Chastain Rd. NW & Town Point Pkwy NW	275	35	64	61	65	56	No	0	0
Hotel	Chastain Rd. NW & Town Point Pkwy NW	148	35	64	61	65	57	No	0	0
Hotel	Busbee Drive & George Busbee Pkwy.	107	40	64	61	65	58	No	0	0
Hotel	Busbee Drive & George Busbee Pkwy.	139	40	64	61	65	58	No	0	0
Hotel	Busbee Drive & George Busbee Pkwy.	220	40	60	58	63	57	No	0	0
MF	Busbee Drive & George Busbee Pkwy.	207	45	64	61	65	58	No	0	0
Hotel	Busbee Drive & George Busbee Pkwy.	135	40	64	61	65	57	No	0	0
MF	Big Shanty Rd. & George Busbee Pkwy.	146	35	64	61	65	57	No	0	0
MF	Greers Chapel Rd. & Cobb Pkwy. NW	178	45	64	61	65	55	No	0	0
Hotel	George Busbee Pkwy NW	143	35	64	61	65	57	No	0	0
Hotel	George Busbee Pkwy NW	70	25	64	61	65	55	No	0	0

Notes:
1. The reported noise levels are rounded to the nearest decibel.
2. SF – Single-family residences
3. MF – Multi-family residences

Table 4. Summary of Noise Impacts for Institutional Land Use

Receiver		Dist. (ft)	Speed (mph)	Exist Leq	Proj. Noise Level Criteria			Impact ?	# of Impacts	
Type	Location				Mod	Sev	BRT		Mod	Sev
School	1285 Cobb Parkway N	231	55	60	63	68	56	No	0	0
Church	1285 Cobb Parkway N	174	55	63	65	70	57	No	0	0
Church	1285 Cobb Parkway N	185	55	63	65	70	55	No	0	0
Park	75 South Cobb Dr SE	44	55	55	61	66	59	No	0	0
Cemetery	2000 Cobb Pkwy S	147	55	55	61	66	55	No	0	0
Theater	17th Street to W Peach Street	43	35	60	63	68	56	No	0	0
Museum	Busbee Dr & George Busbee Pkwy.	200	40	58	62	67	57	No	0	0
School	4301 Northside Pkwy NW	62	35	63	65	70	55	No	0	0
Art Center	17Th Street NE & Spring Street NW	116	35	60	63	68	53	No	0	0

Note:
1. The reported noise levels are rounded to the nearest decibel.

Proposed Mitigation

There are no noise impacts identified for the Connect Cobb project, so no mitigation is required.

Vibration

For projects that involve rubber-tire vehicles, such as the Connect Cobb Northwest Transit Corridor project, vibration impact is unlikely except in unusual situations, including vibration sensitive land uses near expansion joints, speed bumps or uneven road surfaces, or buses operating in or very close to a vibration sensitive building, such as a research facility or hospital.

For the Connect Cobb Northwest Transit Corridor project, a vibration screening was conducted to determine if any unusual situations exist. The procedure is detailed in Chapter 9 of the FTA's noise and vibration guidance manual. The vibration screening procedure is designed to identify locations where a project has the potential to cause vibration impact, and is typically used at the early planning stages of a project. This approach identifies areas for further vibration analysis at later stages of the project where impacts are likely, and eliminates locations where no impacts would be identified. The screening procedure is conservative enough to include all locations with the potential for vibration impact, and provide assurance that any areas outside the screening distances would have no vibration impacts.

There are no highly vibration sensitive land uses along the project corridor, and the assumption is that new busway sections will be newly paved with no irregularities and the on-street portions of the project would share lanes with existing buses and trucks (including any current roadway irregularities). Therefore, none of the unusual situations exist for the Connect Cobb Northwest Transit Corridor project and there are no locations with the potential for vibration impact on the project. No further vibration assessment is required at later stages of the project.