APPENDIX E

NOISE IMPACT ASSESSMENT

Noise Assessment Summary

MARTA Five Points Station Transformation

September 2023

REVISION HISTORY

Revision Date	Revision Number	Sections Affected	Comments
	0		

CONTENTS

LIST OF FIGURES

LIST OF TABLES

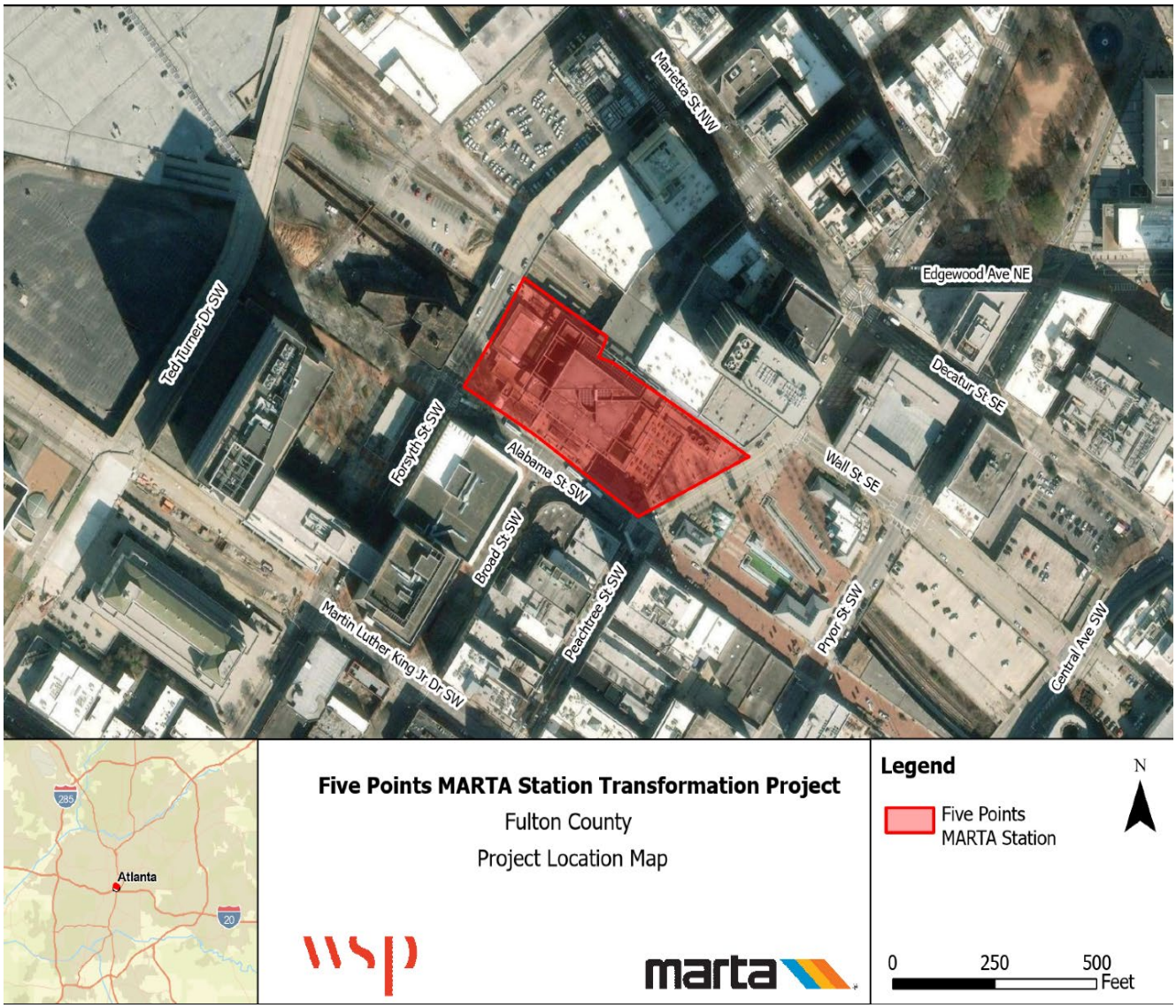
LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
dB	Decibels
dB(A)	A-Weighted decibel scale notation
FTA	Federal Transit Administration
IBC	International Building Code
L_{dn}	24-Hour Day/Night Noise Level
L_{eq}	Equivalent Noise Level
LFD	Load Factor Design
LRFD	Load and Resistance Factor Design
MARTA	Metropolitan Atlanta Rapid Transit Authority
UBC	Uniform Building Code

1. Introduction

An ambient noise monitoring survey and assessment was completed for the proposed Downtown Atlanta Five Points MARTA improvement project. The proposed project is intended to improve bus stop movements on various MARTA bus lines operating on the adjoining roadways. Some of the bus lines terminate in this area while others include commuter stops and pickups. However, none of these proposed improvements will increase daily transit service operations and therefore future noise exposure at adjacent noise sensitive properties is expected to remain unchanged from noise levels experienced today. Consequently, a future noise exposure assessment using the 2018 FTA *Transit Noise and Vibration Assessment Manual* guidelines is not necessary. Instead measured ambient noise conditions within the study area are compared and characterized by their relative loudness and/or annoyance within a typical urban environmental setting. A depiction of the proposed project location is provided in **Figure 1**. The proposed project purpose and need are described in more detail in the next section.

FIGURE 1. PROJECT LOCATION MAP



2. Purpose and Need

2.1 Purpose

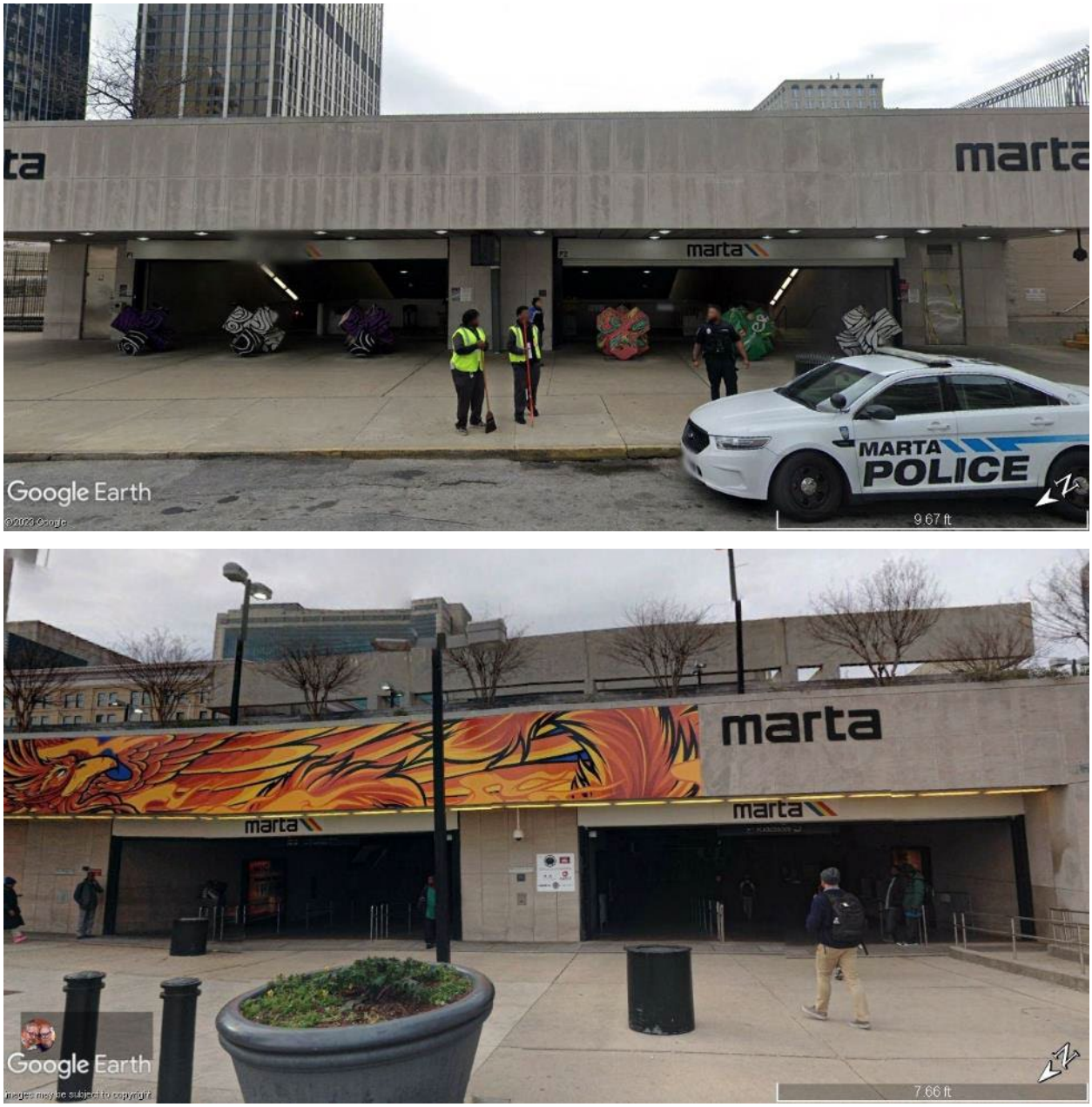
Five Points Station is the hub of the MARTA system by strategically connecting buses and rail in the heart of downtown Atlanta. The Project is intended modernize and improve the station to reflect its importance as a downtown rail hub reflective of a world class city. The Project will address critical infrastructure needs, improve bus and rail connectivity, and enhance site access, safety and the overall customer experience at the station by increasing natural light and air circulation, with the overall goal to create a welcoming and more functional station.

2.1.1 Enhance Site Access and Safety

Five Points Station is the heart of the MARTA system and serves approximately 55,000 bus and rail customers on a daily basis. Currently those customers encounter limited sight distance, grade changes, and barrier walls that hinder circulation and ease of connection between the rail station, bus facilities and surrounding areas. The existing grade changes create difficulties for users, particularly those with mobility challenges who must navigate a labyrinth of stairs and ramps. The lack of direct connections between Alabama Street and the rail concourse degrades accessibility and connectivity for bus and rail passengers. The thick barrier walls surrounding the station impede riders' sightlines and limit integration of the station with the surrounding city center environment. This hinders access to and from the station and mobility within and across the entire plaza area. Additionally, the site's darkness and limited visibility make the area uninviting. The primary entrances to the concourse levels from Peachtree Street and Forsyth Street are dark and have a heavy overhang that gives the impression of entering a dark tunnel or cave, as depicted in Figure 1. On the plaza level, the large pillars and grade changes obstruct sightlines, creating potential blind spots for riders and station staff. The limited visibility not only hampers navigation and efficient movement within the station but also poses safety concerns, both real and perceived, because the large pillars and grade changes make it difficult for customers to see all areas proximate to them or for security personnel to monitor the area effectively. Addressing these safety concerns is imperative to ensure the actual and perceived well-being and security of all riders, staff, and downtown pedestrians.

The Project aims to address these challenges by significantly improving site access and visibility to provide smoother transitions between platforms, entry/exit points, and transit facilities to optimize passenger flow and reduce potential hazards. MARTA also seeks to implement changes at Five Points Station that create an environment that enhances customers' perception of safety and security.

FIGURE 2. FORSYTH STREET AND PEACHTREE STREET CONCOURSE ENTRANCES



2.1.2 Increase Natural Light and Air Circulation

The majority of the current station is subterranean, and the existing design restricts natural light and air circulation on the concourse level due to the presence of the plaza level above. The existing concrete canopy and roof structure add to the darkness and limit natural light at the plaza level. The existing roof covers just over a half an acre. There is an existing skylight along the northern edge of the roof towards the Broad Street Plaza side and a circular skylight in the center of the roof, which is partially obstructed by other roof layers, substantially limiting the amount of natural light to the interior of the plaza. Figure 2 shows the levels of Five Points Station, and Figure

3 shows the existing roof. This dearth of natural light makes the concourse level dark and limits visibility for passengers and wayfinding. The darkness of the station presents an uninviting entrance to the center of the transit system in what otherwise could and should be an active vibrant public space in the heart of downtown. Additionally, the station is not an air-conditioned space and relies on natural air circulation that is hampered by the limited plaza level openings. Increasing the amount of natural light and air circulation within the station is essential to improving the overall passenger experience and creating a safer and more inviting environment. The project will incorporate design elements that provide more public space, make use of the increased natural light and enhance the concourse levels and subterranean levels by allowing better air circulation. The result will create a more pleasant and inviting atmosphere for passengers through the efficient use of daylight and passive ventilation strategies.

FIGURE 3. STATION LEVELS AT FIVE POINTS STATION

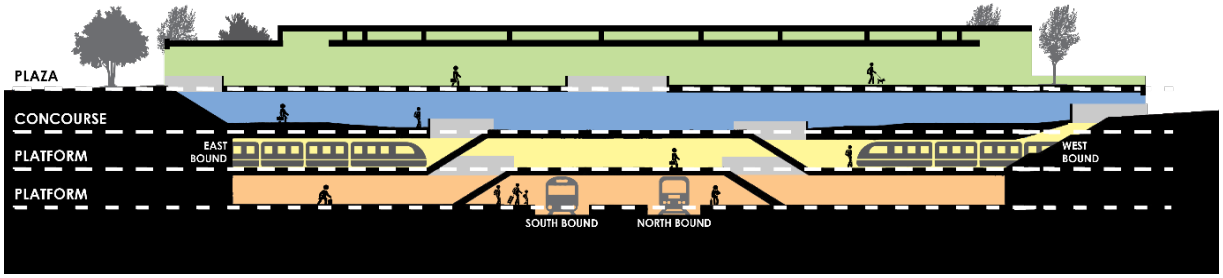
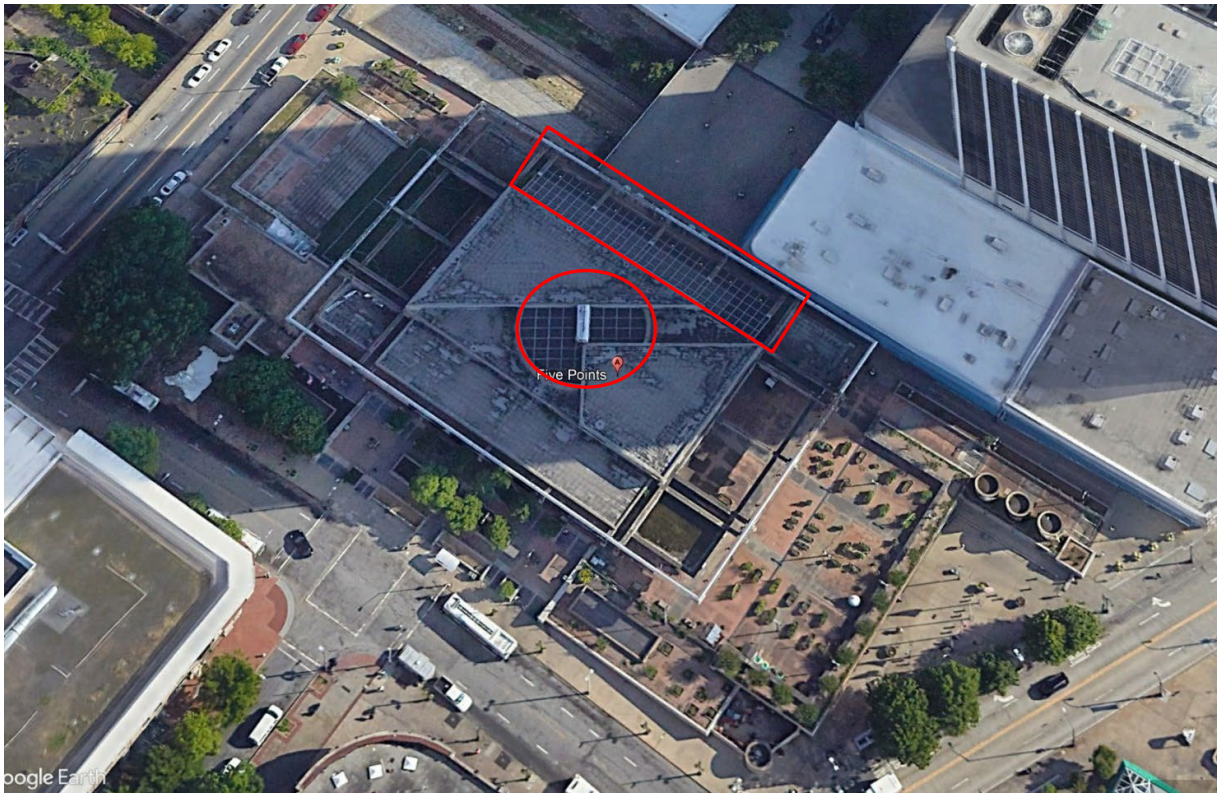


FIGURE 4. FIVE POINTS STATION AERIAL VIEW OF ROOF AND SKYLIGHTS



2.1.3 Modernize Facility

There are two primary needs to modernizing the facility. First, MARTA seeks to improve connectivity between bus and rail and better integrate the station with the downtown environment. Second, the deficiencies of the canopy roof structure that result in significant leaking during rainfall events and degradation of the station must be addressed. The overall station conditions have worsened due to regular usage and the passage of time as the station elements, including the roof, reach the end of their functional life. Modernizing the facility involves both transforming the site into a more cohesive and welcoming station and bringing the station's design up to current standards. The existing plaza is burdened by the deficiencies of the existing canopy roof that contribute to leaking, shown in Figures 4 and 5, and impede pedestrian travel through the station in the plaza and concourse levels posing safety risks and increasing maintenance costs.

The complexity of the roof design, with troughs between deep double beams, and large flat sections that retain water (see Figure 6), puts stress on the structure and complicates maintenance efforts because of water retention, debris accumulation and vegetation growth. The canopy roof is constructed from a series of prestressed precast concrete hollow core slabs supported by post-tensioned precast concrete beams. Due to the intricacies in the method of construction, the complexity of the system does not lend itself to cutting or rearranging of individual concrete elements, which means individual areas of the beams cannot be replaced. Therefore, a simple repair is not possible and the entire slab would need to be reconstructed. Details on the canopy roof condition can be found in Appendix A. The plaza level support beams are overloaded and although this is not a deficiency in terms of safety, this condition can lead to cracking which can further deteriorate the overall structure. New plaza and roof designs that improve circulation and prevent water retention are essential to prevent further deterioration and ensure the safety and functionality of the station. By addressing these issues, the project aims to provide a modern facility that is more resilient, easier to maintain, and easier to navigate.

FIGURE 5. EXAMPLE OF WATER CONDITIONS ON THE CONCOURSE LEVEL AFTER A STORM EVENT

FIGURE 6. EXAMPLE OF THROUGH LEAKING DAYS AFTER A STORM EVENT THAT IMPEDES STATION MOBILITY

FIGURE 7. WATER RETENTION ON FLAT ROOF

3. Overview of Environmental Noise

Sound is created by the vibration of air molecules and noise can be best described as unwanted sound. Environmental noise is all around us and is generated from the movement of people traveling on highways, transit systems, industrial processes, construction activities, air ventilation and power generation. Sound can be quantified in several ways, depending on its duration (time), tonal (frequency), or magnitude (loudness). Sound is typically measured in units of decibels abbreviated as "dB." The human hearing range is more sensitive to midrange frequencies as compared to either low or high frequencies. This characteristic of the human ear is accounted for by adjusting or weighting the spectrum of the sound measured for the sensitivity of the human hearing range. This weighting process is referred to as the A-weighted decibel scale and is denoted by the "dB(A)" notation. The following noise metrics, weighted to the dB(A) scale, were developed and adapted by government agencies for the assessment of impact and annoyance:

- L_{eq} is called the "equivalent noise level" and it is a single value metric derived from the sum of the cumulative noise exposure from all events normalized to a specific period of time, typically a one hour period, denoted as L_{eq} (1-hr). The L_{eq} is the noise descriptor most commonly used in noise impact assessment criteria and is used for both traffic and transit impact assessment.
- The 24-hour Day/Night Noise Level or "L_{dn}" is a computed value representing the time averaged noise exposure for a single full 24-hour period. Because of the greater sensitivity of people to annoyance during sleeping hours, the L_{dn} metric, when computed, includes a ten decibel added adjustment to noise levels for the 9 hour nighttime period, defined from the hours of 10:00 p.m. to 7:00 a.m. The details of how the L_{dn} calculation is computed are described in the appendix of the FTA Manual. The FTA considers the L_{dn} metric as the preferred descriptor when assessing transit noise exposure in residential communities or other land uses involving places where people sleep.

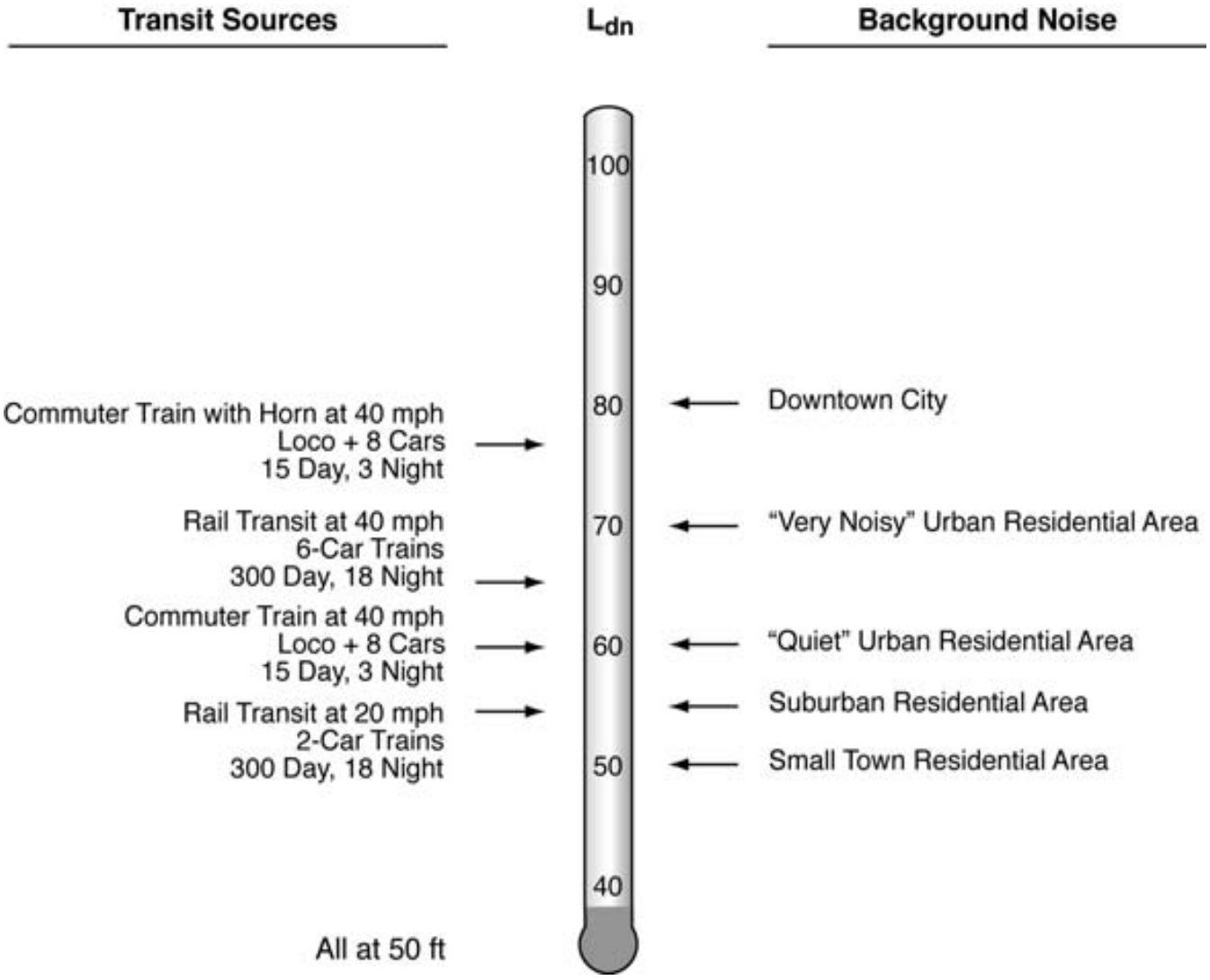
Various metrics are used to quantify changes in noise levels. **Table 2** presents a summary of the average person's ability to perceive changes in noise levels. Since the dB(A) scale is logarithmic, a ten dB(A) increase in a noise level is generally perceived as a doubling of loudness, while a three dB(A) increase in noise level is observed to be just barely perceptible to the human hearing range. **Figure 7** illustrates the typical dB(A) sound levels generated from transit and other common noise sources. For example, a quiet urban environment is one exposed to a 60 dB(A) day-night (L_{dn}) noise level whereas a very noisy noise urban environment is characterized with a 70 dB(A) or greater day-night noise exposure level. In a very busy downtown area the L_{dn} can approach 80 dB(A) and on the other end of the spectrum in more rural small towns the L_{dn} level can remain below 50 dB(A).

TABLE 1. AVERAGE ABILITY TO PERCIEVE CHANGES IN NOISE LEVELS

Change in dB(A)	Human Perception
2 to 3	Barely Perceptible
5	Readily noticeable
10	A doubling or "halving" of the loudness of sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt, Beranek and Newman, Inc., Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703. Prepared for the Federal Highway Administration, June 1973.

FIGURE 8. TYPICAL A-WEIGHTED DECIBEL LEVELS FOR TRANSIT AND NON-TRANSIT NOISE SOURCES



Source: Federal Transit Authority, 2018.

4. FTA Land Uses Categories

The Federal Transit Administration (FTA) has developed impact assessment procedures for determining annoyance and impact assessment along transit corridors. These procedures are described in detail in FTA's *Transit Noise and Vibration Impact Assessment Manual* (FTA, September 2018). However, since the proposed Five Points Project improvements will not result in an increase in MARTA service line operations only a description of the FTA land use activity categories and the type of noise descriptor required for measurement and assessment for each category is shown in **Table 3**. Representative noise monitoring sites were selected based on a review of sensitive land uses within the study area. The FTA land use categories are defined as follows:

FTA Category 1: 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 recording studios, concert halls and national historic landmarks would be included in this category. For this land use category the nosiest hour (peak) $L_{eq}(h)$ dB(A).

FTA Category 2: Residences and buildings where people normally sleep. This category includes residences, hospitals, motels and hotels, where sensitivity to nighttime noise is assumed to be of utmost importance and therefore the day-night L_{dn} noise descriptor is used to establish impact.

FTA Category 3: Institutional land uses with primarily daytime and evening use and thus the noisiest hour (peak) $L_{eq}(h)$ metric is used to determine potential impact. This category includes schools, libraries, theaters, and churches as well as other uses listed in **Table 3** below.

TABLE 2. FTA LAND USE CATEGORIES AND METRICS FOR TRANSIT NOISE IMPACT CRITERIA

Land Use Category	Noise Metric (dB(A))	Description of Land Use Category
1	Outdoor L_{eq} (h)*	Tract 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 L_{dn}	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.
3	Outdoor L_{eq} (h)*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries 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 in this category. Certain historical sites and parks are also included.

Source: Federal Transit Administration: Transit Noise and Vibration Impact Assessment. U.S. Department of Transportation Report Number FTA-VA-90-1003-06, September 2018.

Notes: * L_{eq} for the noisiest hour of transit related activity during hours of noise sensitivity

5. Noise Impact Assessment Methodology

Future transit noise levels are determined based on the projected service line operations under future build conditions and impacts are determined by comparing future noise exposure levels against the measured levels with the magnitude of projected future build condition increase establishing the degree of impact. However, since transit operations for the Five Points project are expected to remain unchanged, this analysis process does not apply. Instead, measured ambient noise levels are characterized by their relative loudness within a typical urban environment and determining if current noise exposure levels rise to levels of concern.

6. Measured Existing Noise Levels

A review of the land uses within the Five Points project study areas was completed and four representative noise sensitive sites were identified and selected for noise monitoring. The Five Points study area consisted of a combination of Category 2 and 3 land uses. Noise measurement sites #1 and #2 are illustrated in **Figure 8** and sites #3 and #4 are depicted in **Figure 9**. Measurement sites #1 and #3, are FTA Category 2 land uses because they involve places where people currently sleep or will sleep based of future development and have sensitivity to nighttime noise, thus require estimation of the day-night L_{dn} noise descriptor. The existing L_{dn} level is computed based on the averaging the various daytime and nighttime noise measurements using the methodology described in the FTA Manual Appendix E. Conversely, measurement sites #2 and #4, are Category 3 daytime limited land uses and thus utilize the peak hour L_{eq} reading extracted directly from the measurement data.

FIGURE 9. NOISE MEASUREMENT SITES 1 AND 2

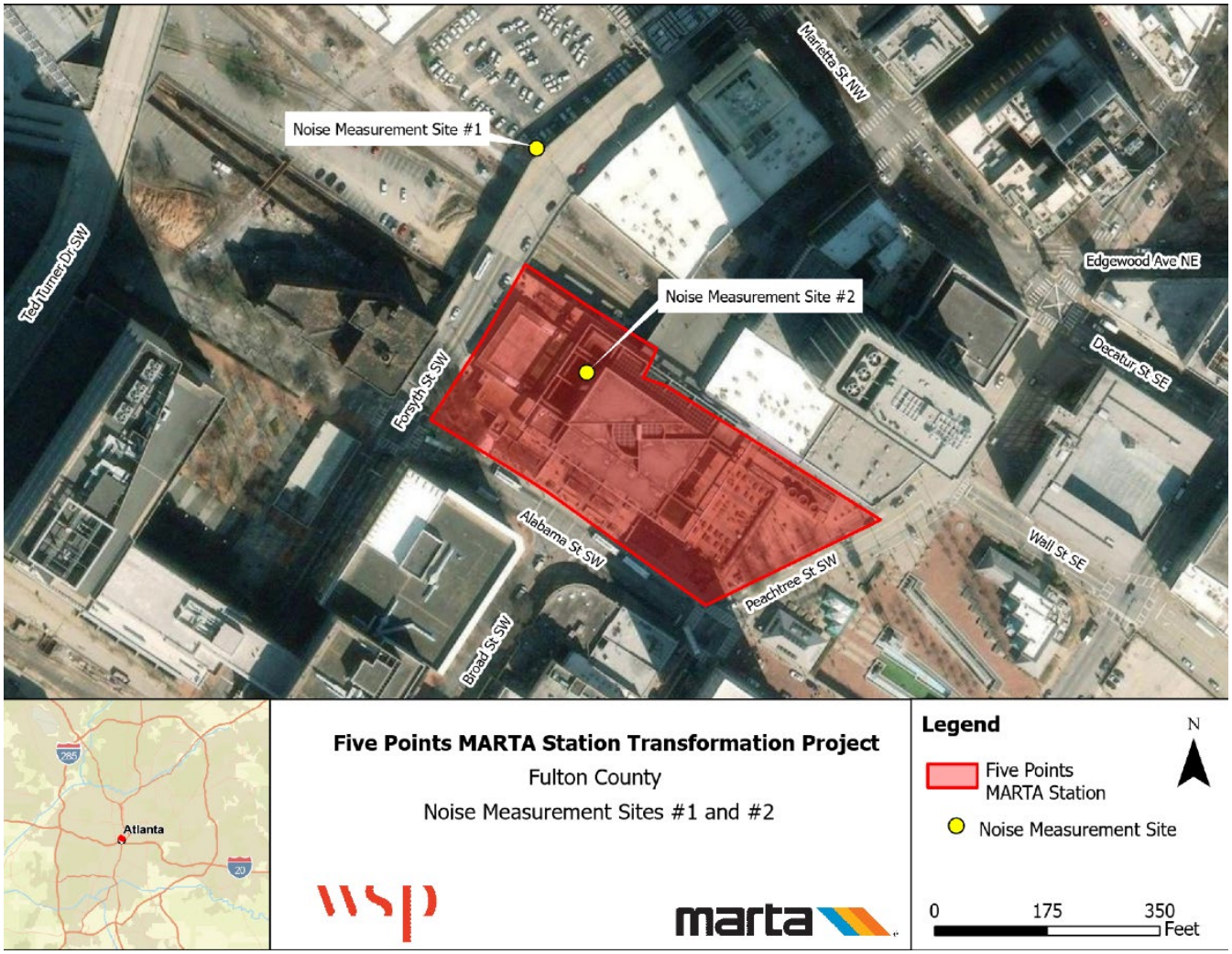
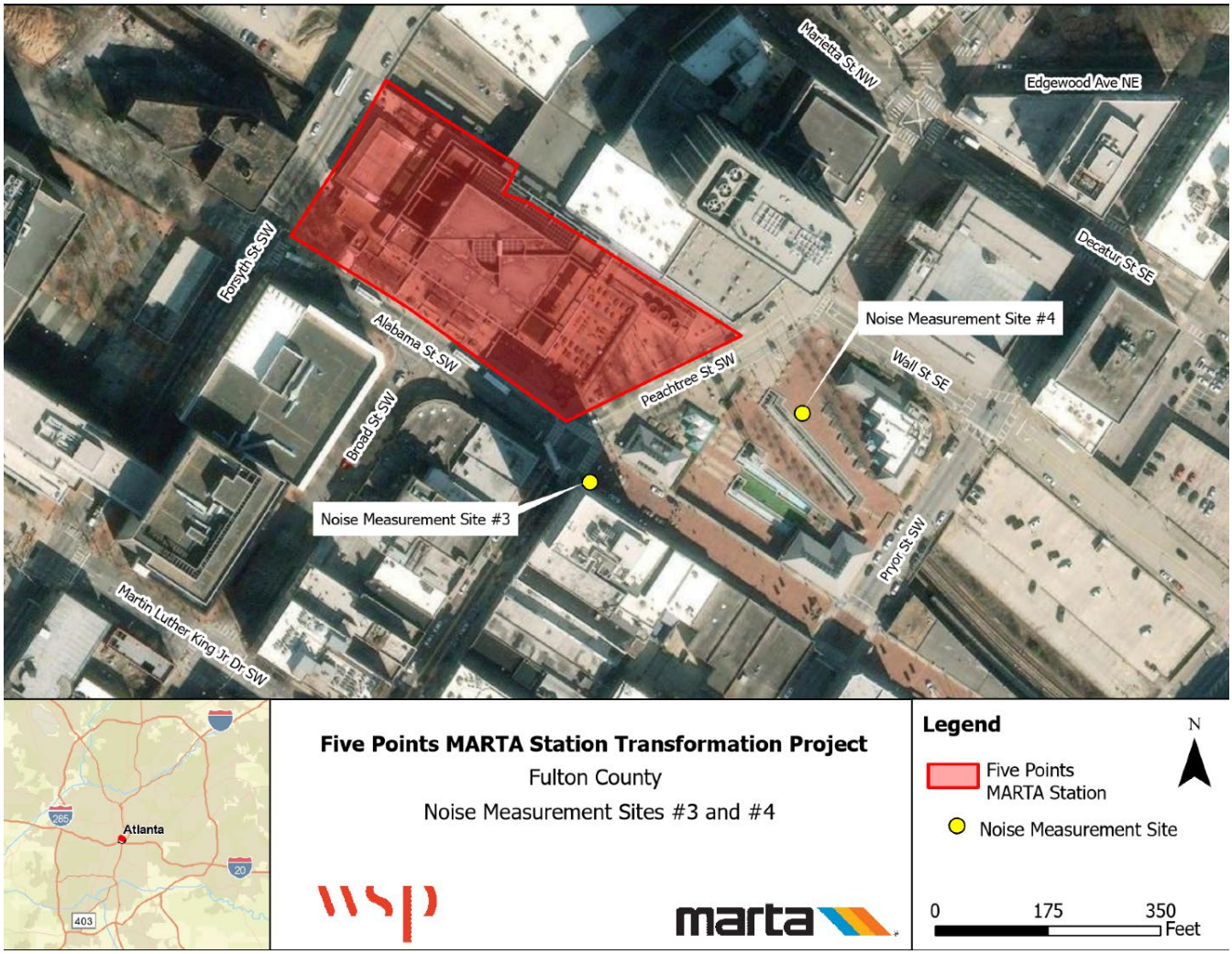


FIGURE 10. NOISE MEASUREMENT SITES 3 AND 4



Noise measurements were recorded on May 4th, 2023, during favorable weather conditions, using a laboratory calibrated sound-level meter attached to a calibrated condenser microphone covered with a windscreen mounted on a tripod at a height of approximately 5.5 feet above the ground. FTA Category 2 sites included daytime and late night noise measurements and Category 3 land uses were collected only for the daytime hours. A summary of the measured noise levels are presented in **Table 4**. Peak AM time period noise levels were consistently lower than the peak PM levels at all monitoring locations and therefore the peak AM values are not included in **Table 4**. Measured noise levels consisted of a combination of human induced noise, such as people shouting, playing music and a combination of vehicle traffic and transit movements.

Measured L_{eq} and estimated L_{dn} levels collected at the Category 2 sites #1 and #3, are best described as consistent very noisy ambient noise exposure conditions of 70 dB(A) or higher. Moreover, particular attention should be given to the future design of the proposed Centennial Yard Development project, adjacent to Site #1, because of the high 71 dB(A) L_{dn} level estimated adjacent to this development area. Adding building setbacks and allowing for shielding elements as part of the development design may be necessary to achieve an acceptable exterior noise environment. Furthermore, for the interior structure side, windows rated to provide a minimum of 35 dB(A)

exterior to interior noise reduction will be necessary to maintain an acceptable interior noise environment within living spaces of this future residential development.

On the other hand, noise monitoring sites #2 and #4 which are active recreational FTA Category 3 land uses, yielded peak L_{eq} (1-hr) levels of less than 65 dB(A) which is consistent with a quieter daytime exposure environment. Sites #2 and #4 are somewhat shielded and isolated from traffic movements and no active recreation was reported taking place on the soccer field during the noise measurement survey; therefore, resulting in the lower reported measured noise exposure conditions.

TABLE 3. SUMMARY OF MEASURED NOISE LEVELS

Receptors	Land Use Description	FTA Land Use	Measured Noise Levels (dB(A)) *			
			Midday (Leq)	Peak PM (Leq)	Late Night (Leq)	Ldn
R1	Future Centennial Yard Development	Cat 2 & 3	68	72	66	71
R2	Five Point Station Soccer Field	Cat 3	63	61	NA	NA
R3	Fairfield Inn & Suites	Cat 2	67	67	65	70
R4	Underground Atlanta Park	Cat 3	62	60	NA	NA

Notes: * Measured noise levels were collected on May 4, 2023

7. Construction Noise

The project is subject to the City of Atlanta Noise Ordinance which limits construction activities to weekdays time period from 7 AM to 8 PM. Furthermore the ordinance sets a minimum 100 foot distance between the property where the noise emanates to the nearest residential property. In addition to these requirements, since the proposed project involves transit infrastructure improvements, the FTA Construction Noise Criteria, shown in Table 4, applies. The FTA noise criteria sets a maximum 8 hour average daytime noise exposure up to 80 dB(A) near residential properties and 85 dB(A) near commercial businesses. FTA defines the 8 hour daytime period as any 8 hours where construction activities will occur between 7 AM to 7 PM and similarly at night as any 8 working hours between 7 PM to 7 AM. However, because of the Atlanta Noise Ordinance does not allow for construction after 8 PM, unless in the case of an emergency, the nighttime impact threshold limits can be ignored for the Five Points Project.

TABLE 4.FTA CONSTRUCTION NOISE CRITERIA

Land Use	Eight-Hour L_{eq} (dB(A))	
	Day	Night
Residential	80	70
Commercial	85	85
Industrial	90	90
Source: *Transit Noise and Vibration Impact Assessment*, FTA, 2018		

The principal construction activities associated with the Five Points Project consist of the demolish the existing station canopy, and the construction of the new canopy, and redesign the plaza area entirely within the same geographic footprint of the existing plaza. Construction activities associated with demolition of the existing canopy and the and construction of the new open air canopy would likely generate outdoor noise that could be perceived and potentially result in some periodic annoyance to outdoor activities within 200 feet of the construction work. The magnitude of noise would depend on the particular construction equipment being used, its duration of use and any intervening shielding by buildings or other obstacles between the noise generating construction activity and the listener. In general, the most intrusive construction noise activity is associated with impact pile driving which fortunately will not be necessary for the construction of the new canopy. However, other types of construction equipment likely to be used such as jackhammers, pneumatic tools, cranes and ram hoes are fairly loud activities that can be heard for distances of up to 200 feet and result in temporary annoyance. In addition, other activities, such as dropping debris in dump trucks, loud back-up alarms and demolition trucks driving in close proximity to sensitive receptors can result in annoyance to people living or working nearby.

Fortunately, there are means and methods for mitigating unwanted noise from a construction project. Quieter equipment and alternative methods of doing certain tasks can be required by the contractor. These measures may include using enhanced exhaust mufflers, restricting work activities from occurring during sensitive nighttime hours and enclosing the entire construction site with a 12 foot tall ply-wood parameter barrier. The parameter barrier will reduce noise levels by a minimum of 5 to 7 dB(A) and make the construction work less visible to the surrounding communities. The City of Atlanta Ordinance does not allow for construction activities after 8 PM and before 7 AM in the morning. Exclusions outlined in Section 74-132 of the Noise Control Ordinance are only granted in cases of public safety emergencies or restoring water or power to the public caused by natural storm events. Moreover, in the case of MARTA construction related work, the ordinance indicates that MARTA must develop and implement procedures by which contractors conducting planned new construction must be monitored as to ensure that the work is performed in a manner that will result in the creation of the least amount of noise disturbance.

In general, utilizing noise control and best management practices measures would ensure exterior noise levels remain below the FTA daytime 80 dB(A) limit near residential properties and below 85 dB(A) near businesses such as the nearby Fairfield Inn & Suites (site #3) and the active recreation areas (sites #2 and #4) in the study area. Further, based on the relatively short duration of construction phase, the predominantly non-residential character of the area adjacent areas and the relatively high existing ambient noise levels, it is unlikely there would be adverse noise effects from construction activities. Potential measures and best practices that can be employed include the following:

- Comply with all the requirements of the City of Atlanta City of Atlanta Noise Ordinance Regulations.
- Require the contractor to conduct construction work in a manner that will result in the creation of the least amount of noise which may require periodic ambient noise monitored as to ensure noise levels near residential properties do not exceed 80 dB(A) or 85 dB(A) near commercial properties that are within 300 feet of the construction boundary.
- For back-up alarms, use either audible self-adjusting back-up alarms or manual adjustable alarms.
- If possible, equip all impact and drilling equipment such as jackhammers, hoe rams, core drills, direct push soil probes and rock drills with a muffler.
- Route construction equipment and heavy truck vehicles carrying rock, concrete, or other materials over truck designated routes that will cause the least disturbance to noise-sensitive locations.

- Prohibit slamming of dump truck tail gates and operate equipment in such a manner to minimize banging, clattering, buzzing, and other annoying types of noises.
- To restrict the transmission of noise, construct a temporary 12 foot tall plywood based noise barrier wall around the parameter of the station reconstruction zone.
- Maintain an honest communication with businesses and residences within the general Five Points area by informing the public of all upcoming construction work.

Maintain a log of any complaints and adjust the work as best possible to reduce noise exposure without jeopardizing construction schedule.

8. Conclusion

Noise measurements were collected at 4 representative sites within the proposed Five Points project study area. The results of the measurement survey showed that ambient noise levels at the two FTA Category 2 land uses, sites #1 and #3, are areas characterized with relatively high ambient noise exposure levels reaching day-night noise levels of 70 dB(A) or more. Construction activities are not expected to exceed the FTA maximum allowable 80 dB(A) and 85 dB(A) outdoor limits associated with residential and commercial land uses, respectively. However, to minimize overall noise exposure throughout the construction phase, it is vital that the noise control measures listed in the attached summary be followed. Lastly, because transit operations are expected to remain unchanged, the proposed Five Point project itself, is not expected to further exacerbate the current ambient noise environment within and surrounding this community.