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# Lake Apartments & Preston Place Transportation Noise Analysis

Montgomery County, Maryland

Report No. 220218  
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For: Toll Brothers

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## 1 EXECUTIVE SUMMARY

Phoenix Noise & Vibration has conducted an analysis of transportation noise impact upon the proposed Lake Apartments & Preston Place townhome development located in Montgomery County, Maryland. Upon completion, the project will consist of 146 townhome units. This study was limited to noise impact from Connecticut Avenue, Manor Road, Jones Bridge Road, and the future Purple Line, and included:

- 24-hour noise level measurements.
- Computer modeling.
- Determination of projected noise levels.

Noise impact upon the Lake Apartments & Preston Place development will vary with height; therefore, impact has been presented at both the ground level (5 feet above adjacent grade) and upper level (25 feet above adjacent grade). Impact is presented by varying colors indicating the future transportation noise level. The noise levels presented are due only to surrounding transportation sources and do not account for noise from other sources such as construction, mechanical noise, environmental noise, etc.

Calculated noise levels throughout the site and upon the future buildings are “mitigated;” i.e. accounting for the presence of existing topography, surrounding buildings, and significant structures, as well as future site topography and future site buildings. Structures along roadways act as noise barriers, providing protection from noise exposure and reducing the impact and extent of any potential mitigation required, if any, to comply with the noise regulations of Montgomery County.

Results of this analysis indicate that noise levels in the park and open space area within the development will be below 65 dBA Ldn; therefore, further analysis and mitigation for these outdoor activity areas will not be required.

Additionally, future transportation noise impact upon all residences within the Lake Apartments & Preston Place development will be below 65 dBA Ldn; therefore, further analysis will not be required, and the proposed standard building construction may be used without modification for all residences within the development.

## **2 NOISE TERMINOLOGY**

### **2.1 dB vs. dBA**

While the standard unit of measurement for sound is the decibel (dB), discussions of noise impacting the human ear use “dBA.” The “A” refers to a frequency weighting network used to simulate the human ear’s unequal sensitivity to different frequencies. The A-weighted noise level is therefore more representative of a human’s perception of a noise environment than the unweighted overall noise level in dB and is currently used in most environmental noise studies.

### **2.2 Ldn**

The day-night average noise level, or Ldn, is the equivalent sound pressure level averaged over a 24-hour period, obtained by adding 10 dB to sound pressure levels measured from 10:00 p.m. to 7:00 a.m. This 10 dB “penalty” accounts for the added sensitivity caused by noise generated during the nighttime hours.

The Ldn is NOT a measurement of the instantaneous noise level. It is very possible to have several short term events (tractor trailer, emergency vehicle siren, car horn, etc.) which generate a relatively high noise level (e.g. 85 dBA) during a given time period but have a more moderate overall Ldn value (e.g. 65 dBA Ldn).

### **2.3 Summing Noise Levels**

Noise levels from multiple sources do not add arithmetically, i.e. when two noise sources generate 60 dB individually, they do not produce 120 dB when combined. Noise levels are measured using a logarithmic scale; therefore, they must be summed logarithmically. In the decibel scale, two identical, non-coherent noise sources having the same noise level produce a 3 dB increase above the condition of one source alone (i.e. two 80 dB lawnmowers running at the same time generates 83 dB).

Similarly, two different noise sources with a difference of 10 dB in their individual levels results in no measurable increase in noise when they are combined. Put another way, the quieter noise source does not increase the overall noise generated by the louder source, i.e. adding an 80-dB lawnmower into a noise environment where a 90-dB lawnmower is already running does not increase the noise level above 90 dB.

### 3 NOISE REGULATION

Traffic noise impact for proposed residential developments in Montgomery County is governed by Table 2-1 (reprinted in Table 1) on page 8 of the *Staff Guidelines for the Consideration of Transportation Noise Impacts in Land Use Planning and Development* (June 1983).

Accompanying this table is Map 2-1 (see Figure 1), indicating outdoor noise level requirements not to be exceeded throughout the County.

**Table 1: Maximum Levels for Exterior Noise at the Building Line<sup>1</sup> For Noise-Sensitive Land Uses.**

Guideline Value	Area of Application
Ldn = 55 dBA	This guideline is suggested as an appropriate goal in permanent rural areas of the County where residential zoning is for five or more acres per dwelling unit and background levels are low enough to allow maintenance of a 55 dBA Level. This guideline is consistent with Federal, State, and County goals for residential areas.
Ldn = 60 dBA	This is the basic residential noise guideline which will be applied in most areas of the County where suburban densities predominate. Maintenance of this level will protect health and substantially prevent activity interference both interiors and outdoors. Noise attenuation measures will be recommended to allow attainment of this level.
Ldn = 65 dBA	This guideline will generally be applied in the urban ring, freeway, and major highway corridor areas, where ambient levels are such that application of a stricter guideline would be infeasible or inequitable. Significant activity interference will occur outdoors and interiors if windows are partially opened, but available evidence indicates hearing is adequately protected. Noise attenuation measures will be strongly recommended to attain this level.

<sup>1</sup> Building line as used here refers to habitable structures only. It does not include garages, sheds, or recreational accessory buildings.

According to Map 2-1, the Preston Place development will be located within the 65 dBA Ldn noise zone, indicating that noise levels in the building’s outdoor activity areas should be maintained at 65 dBA Ldn. Any outdoor area exposed to future transportation noise levels above 65 dBA Ldn typically requires further analysis to determine the mitigation designs necessary to comply with this requirement.

When outdoor noise levels exceed 65 dBA Ldn, Montgomery County also requires an analysis of interior noise levels in residential buildings. According to Sections 2.2.2 and 2.2.3 of the *Staff Guidelines*, any residential building impacted by noise levels above 65 dBA Ldn must be evaluated to certify that the building structure will be capable of maintaining interior noise levels at 45 dBA Ldn.



#### 4 SITE DESCRIPTION

The Lake Apartments & Preston Place development (shown in Figure 2) will be located along Manor Road. Part of the development (Lake Apartments) will be located approximately 1,000 feet from Connecticut Avenue, while the other part (Preston Place) will be located approximately 500 feet from Jones Bridge Road. Near the site, Connecticut Avenue consists of three travel lanes in each direction, while Manor Road and Jones Bridge Road consists of one travel lane in each direction.

Additionally, the future Purple Line light rail system will be located along Capital Crescent Trail, which runs parallel to the southern site property lines. The Purple Line light rail will change in elevation relative to the site's finished grade. Along the Preston Place portion of the development the railway will be within the site's grade, whereas along Lake Apartments the railway will be elevated compared to the site.

**Figure 2: Existing site and surroundings, with Lake Apartments & Preston Place sites approximately shaded in red; aerial image from Google Earth, dated October 7, 2020.**



## 5 NOISE MEASUREMENTS

On December 16 – 17, 2021, Phoenix Noise & Vibration conducted an on-site noise measurement survey to determine existing transportation noise levels throughout the site. This involved continuous noise level measurements and monitoring for one 24-hour period. Measurements were made using four Norsonic Type 139 Precision Integrating Sound Level Meters. All meters were calibrated prior to the survey traceable to National Institute of Standards and Technology (NIST). Each meter meets the ANSI S1.4 standard for Type 1 sound level meters.

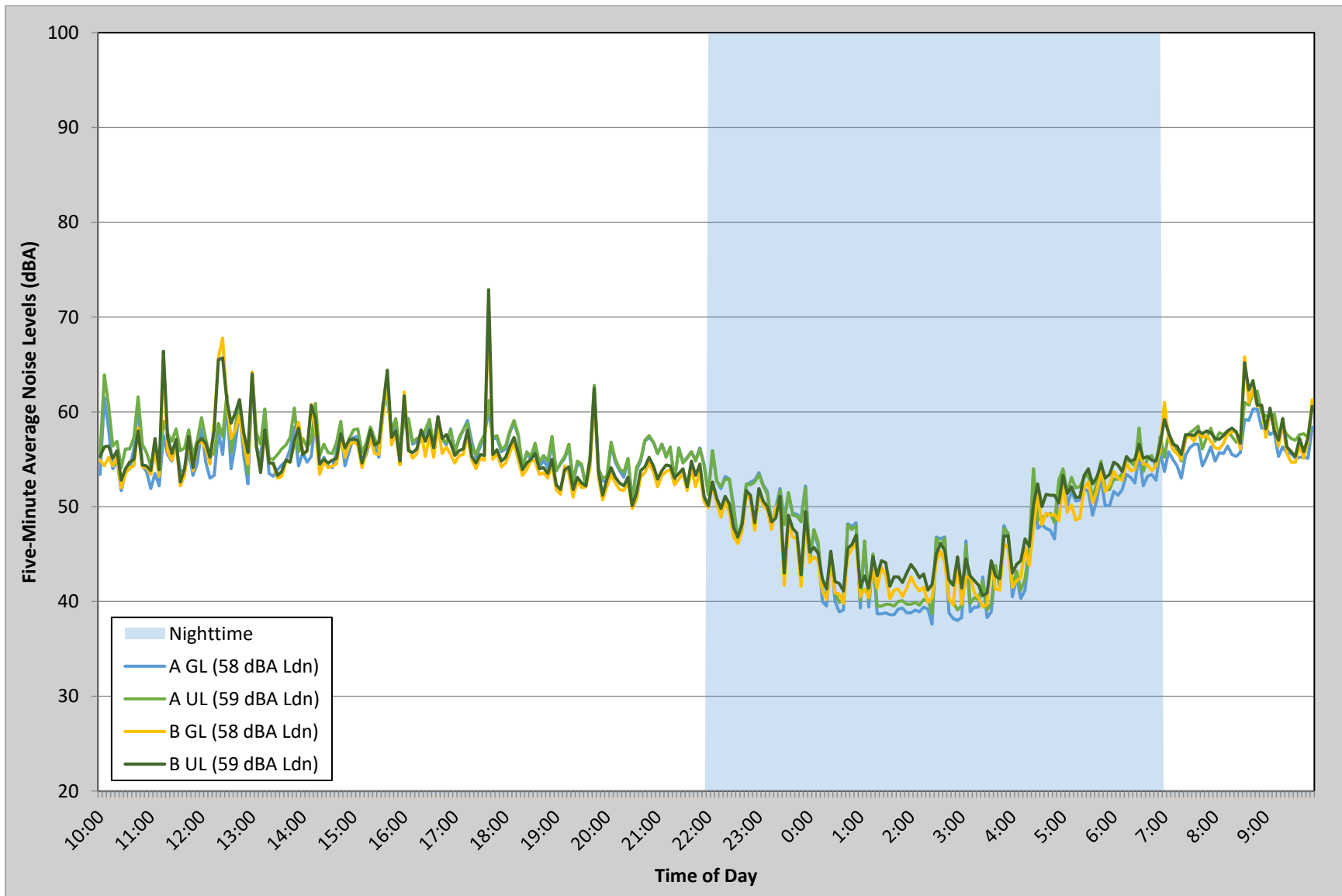
During the 24-hour measurement, noise levels were recorded and averaged over five-minute time intervals. Noise measurements were then used to calculate the site’s 24-hour average day-night noise level (Ldn) which includes the 10-dBA penalty for noise levels measured during nighttime hours. Measurements were made at the location shown on Drawing 1 of the Appendix at 5 feet (ground level, or GL) to represent noise impact in outdoor areas and upon the first floor of residences, and 25 feet (upper level, or UL) to represent the noise impact upon upper floors.

Measurement results are presented in Table 2. Noise level measurements were made at the locations shown on Drawing 1 of the Appendix. Figure 3 presents the survey results graphically, showing the noise levels as measured in five-minute increments throughout the survey. Figure 3 indicates the actual measured values over the 24-hour period. While the 10-dBA nighttime penalty is not shown graphically, it was included in the Ldn calculations.

**Table 2: 24-hour noise measurement results.**

Measurement Location	Height Above Existing Grade (feet)	Measured Noise Level (dBA Ldn)
A	5	58
	25	59
B	5	58
	25	59

**Figure 3: Five-minute average noise levels recorded during 24-hour noise measurement survey.**





## 6 COMPUTER MODELING

The existing and future sites were computer-modeled using the CadnaA software program, a three-dimensional noise propagation model capable of determining noise impact from multiple noise sources across vertical and horizontal surfaces while accounting for factors such as topography, buildings, barriers, surface reflections, roadway data (traffic volumes, speeds, and vehicle classifications, etc.), and railway data. Noise levels can be presented either in spot locations or as noise contours of equal value throughout a defined surface area.

### 6.1 Existing Model

An existing model was developed to simulate the existing site and its surroundings using information provided on the site's existing site plan,<sup>1</sup> the Montgomery County GIS, topography extracted from Google Earth, and data collected during the 24-hour measurement survey, inputting existing topography, roadway alignments, and buildings. Roadway noise levels were calibrated using the on-site noise measurements by adjusting the modeled input until the modeled noise level output matched the measured values.

### 6.2 Future Model

A future model was developed by altering the calibrated existing model to include the projected roadway data, future site topography, future site buildings, and the Purple Line. Currently there are no plans to alter any of the roadways in the vicinity of the site; therefore, the existing roadway alignments were used in the future model.

### 6.3 Roadway Data

Existing average annual weekday traffic (AAWDT) volumes, nighttime percentages, and truck percentages for Connecticut Avenue and Jones Bridge Road were based upon the most recent data published by the Maryland Department of Transportation State Highway Administration (MDOT SHA). The MDOT SHA does not maintain data for Manor Road, therefore this information was based on traffic counts collected during the noise measurement survey. Additionally, the MDOT SHA does not typically provide future traffic data; therefore, a conservative, 2% increase in traffic compounded annually until 2042 was assumed.<sup>2</sup> All necessary traffic data for all roadways in the vicinity of the site are provided in Table 3.

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<sup>1</sup> Provided by VIKA on February 09, 2022.

<sup>2</sup> Montgomery County typically requires that roadway noise impact studies be conducted using the projected traffic volumes 20 years from the date of the study.

**Table 3: Traffic data used in the analysis.**

Traffic Data	Connecticut Ave	Manor Rd	Jones Bridge Rd
2019 AAWDT	82,180	2,180	12,885
2042 AAWDT	129,590	3,239	20,318
Truck Percentage	3%	1%	4%
Nighttime Percentage	14%	18%	9%
Speed Limit (mph)	35	30	30
<b>Table 3 Notes:</b>			
A. MDOT SHA does not maintain data for Manor Rd, therefore information for this roadway was based on traffic counts collected during the noise measurement survey on December 16-17, 2021.			

## 6.4 Purple Line

The Purple Line is a light rail system proposed to open in 2026 and extend 16 miles between New Carrollton in Prince George’s County and Bethesda in Montgomery County, providing connections between Metro stations throughout the area. The future residences within Lake Apartments and Preston Place will be as close as 60 feet from the Purple Line track closest to the development. The Purple Line was included in the future model to determine the impact, if any, from the future railway upon the future buildings. Information for the Purple Line, including the alignment and projected noise output, was taken from the Purple Line Final Environmental Impact Statement (FEIS).<sup>3</sup>

The Purple Line was entered into the future model and validated according to the FEIS, which presented the expected noise impact the Purple Line will have on existing non-residential and residential buildings and properties located along its tracks. The future noise impact was calculated at various existing locations along the Purple Line (see Figure 4) based on either the Leq peak hour impact (for non-residential properties) or the 24-hour Ldn impact (for residential properties).

Since Montgomery County’s noise regulation (and the results of this Noise Study) is stated in terms of the Ldn, the locations used to calibrate the Purple Line in the future model were limited to the noise measurement locations closest to the site for which Ldn values were calculated: M-12, a residential development on Hamlet Place, and M-12A, an apartment building on Chevy Chase Drive. The noise level at M-12 is predicted to be 51 dBA Ldn 70 feet from the Purple Line tracks centerline, while the noise level at M-12A is predicted to be 57 dBA Ldn 120 feet from the Purple Line tracks centerline. These represent unmitigated noise levels due only to the future Purple Line (i.e. in absence of roadway noise and intervening barriers such as buildings).

While these calculated noise levels are relatively low when compared to the Montgomery County 65 dBA Ldn requirement, it should be noted that they represent a 24-hour average noise level (Ldn) and not an instantaneous noise level (i.e., noise level when a train passes by the site). It is expected that when a train passes by the site, the noise level will be greater than the Ldn and will likely be audible to residents.

<sup>3</sup> Entitled *Purple Line Noise Technical Report*, dated August 2013. Developed by Environmental Acoustics, Inc.

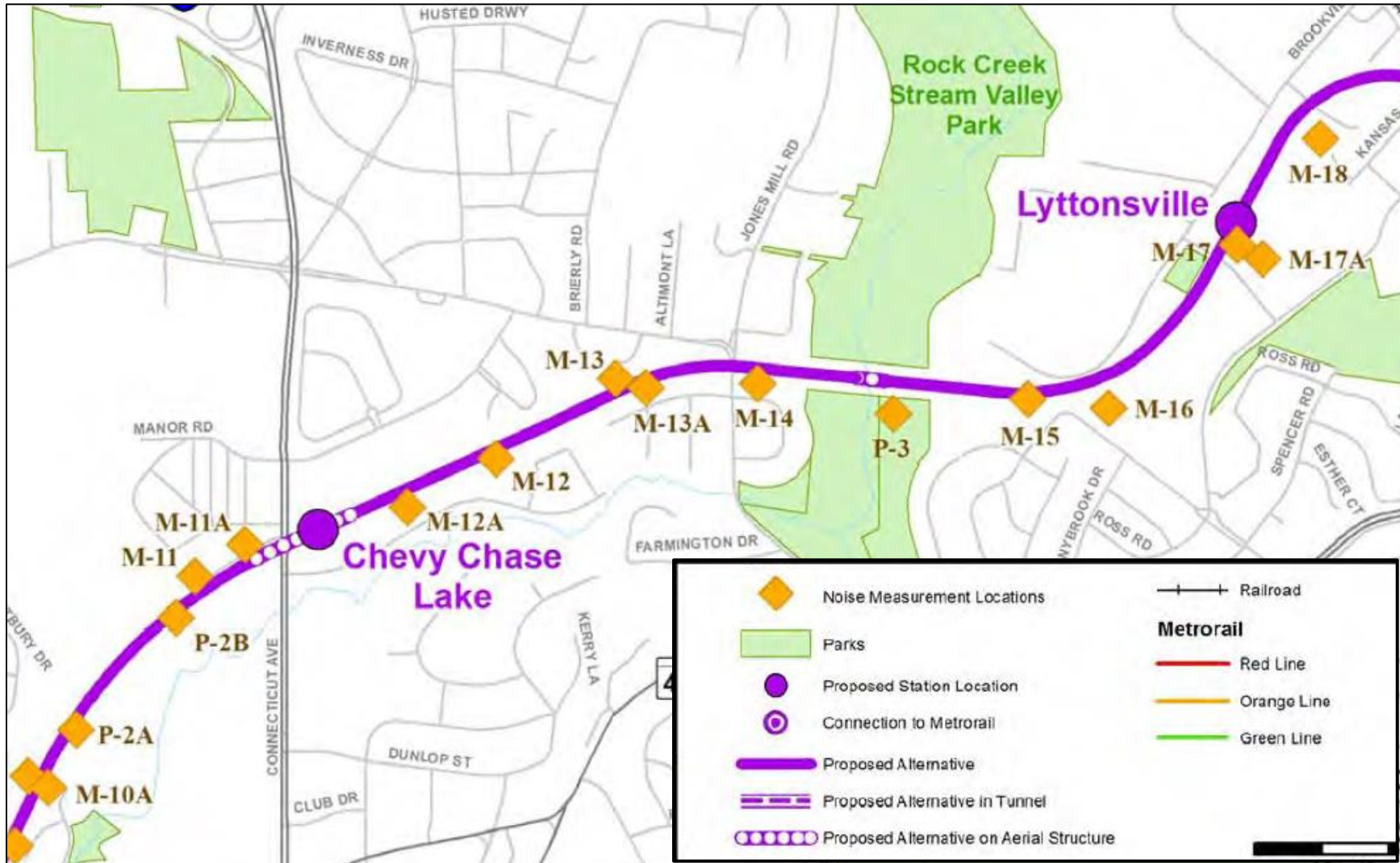
According to the Maryland Department of Transportation (MDOT) Maryland Transit Administration (MTA) website for the Purple Line,<sup>4</sup> the design requirements for exterior noise from the train is not to exceed 75 dBA on straightaways. This requirement is at 50 feet from the centerline of the track. Therefore, given the proposed development's distance relative to the railway, instantaneous noise levels may be greater than that of the calculated Ldn level.

To validate the model, the Purple Line noise level was calculated while accounting for light rail noise only, adjusting the noise level output of the light rail line until the modeled output agreed with the Ldn values calculated in the FEIS. As with the roadways, this "calibrates" the noise model for the railway and allows the resulting Purple Line impact upon the site to be calculated using CadnaA.

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<sup>4</sup> <https://www.purplelinemd.com/about-the-project/overview>.

Figure 4: Purple Line predicted noise level calculation locations.



## **6.5 Future Noise Impact**

The future model calculated noise levels throughout the entire site at both the ground level (5 feet above ground) and upper level (25 feet above ground), as shown on Drawings 2 and 3 of the Appendix, respectively. The varying colors on Drawings 2 and 3 represent the future noise impact as it varies by location.

All noise levels presented on Drawings 2 and 3 are “mitigated” noise levels, i.e. calculated in the presence of the future buildings as well as all existing surrounding buildings, topography, and significant structures. Mitigated noise levels account for the effect of buildings and other significant structures in reducing and reflecting roadway and railway noise propagation and are more representative of the actual noise level experienced at a specific location.

Drawing 2 of the Appendix indicates that noise levels in the park and open space area within the site will be below 65 dBA Ldn due to shielding provided by the future residences. As a result, additional analysis and mitigation will not be necessary for these outdoor activity areas.

Drawing 3 of the Appendix indicates that future transportation noise impact upon all future residences within the Lake Apartments & Preston Place development will be below 65 dBA Ldn. As a result, further analysis and mitigation will not be required for any residences to comply with Montgomery County’s 45 dBA Ldn interior noise limit, and the proposed standard building construction may be used without modification for all residences within the future development.

## **7 CONCLUSION**

Future transportation noise impact upon all residences within the Lake Apartments & Preston Place development will be below 65 dBA Ldn. As a result, further analysis and additional mitigation will not be required for any residences to comply with Montgomery County’s residential interior noise regulation. In other words, the proposed standard building construction may be used without modification for all residences within the development.

Additionally, noise levels in the park and open space area within the development will be below 65 dBA Ldn; therefore, additional mitigation for these outdoor activity areas will not be required.

## **APPENDIX**