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Creekside at Cabin Branch Phase I Noise Analysis

Montgomery County, Maryland

Report #201204
Project #PHC2001

For: Pulte Homes

By: Jeff Ford

1 EXECUTIVE SUMMARY

Phoenix Noise & Vibration has conducted an analysis of roadway noise impact upon the proposed Creekside at Cabin Branch residential development in Montgomery County, Maryland. Upon completion, the development will consist of 208 townhomes and 117 single family homes. This study was limited to noise impact from Clarksburg Road, and included:

- Computer modeling.
- Determination of future roadway noise levels.

Noise impact at Creekside at Cabin Branch will vary with height; therefore, impact has been presented at multiple elevations to show how the noise level changes with height throughout the site. Impact is presented in varying levels of noise indicating the future roadway noise level. All calculated noise levels are “mitigated,” accounting for the presence of existing buildings, significant structures, and surrounding topography, as well as all future site buildings and topography. 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 Montgomery County’s noise regulations.

Note that Creekside at Cabin Branch is located within the 55 dBA Ldn noise zone. While within the 55 dBA Ldn, it is recommended that the 60 dBA Ldn guideline value be used for evaluation of this development. Creekside at Cabin Branch and the surrounding developments in the area would be considered suburban areas. Using the 55 dBA Ldn value would be an unsuitable restriction since the 55 dBA Ldn noise zone is supposed to be applied to rural areas.

None of the outdoor activity areas or rear yards at the site will be exposed to noise levels greater than 55 dBA Ldn (nor 60 dBA Ldn); therefore, no mitigation will be required for these outdoor activity areas. It should be noted that some of rears of the townhomes closest to Clarksburg Road will be exposed to noise levels greater than 55 dBA Ldn; however, these are rear-loaded townhomes and would not be considered to have rear yards.

Of the 208 townhomes and 117 single family homes, 28 townhomes will be exposed to transportation noise levels greater than 55 dBA Ldn, and up to 63 dBA Ldn for six townhomes closest to Clarksburg Road. Only 12 townhomes closest to Clarksburg Road will be exposed to noise levels of 60 dBA Ldn. Depending on which noise level guideline is used for the site, some townhomes will require further analysis to determine if proposed building architecture will be capable of maintaining indoor noise levels at the required 45 dBA Ldn indoor limit. Note that regardless of which guideline value is used for the site, Montgomery County requires an indoor noise level limit of 45 dBA Ldn for all residences. This analysis can only be conducted once well-developed architectural plans for the residences to be offered throughout the site are available. Final mitigation designs will be detailed following the selection of the townhome models to be offered at the site.

Note that future noise impact determination in this analysis is based on computer modeling alone and does not incorporate on-site noise measurements.¹ Due to the COVID-19 Pandemic's effect on traffic volumes, roadway conditions are not typical and noise levels measured during a 24-hour survey may not accurately represent normal noise levels at the site. Once on-site noise measurements are incorporated into the analysis, projected noise impact at the site may change from the results presented in this analysis and at that time, this noise study will be updated as necessary.

¹See Section **Error! Reference source not found.** – **Error! Reference source not found.**

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 all 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, yet 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 & Building Line¹ For Noise Sensitive Land Uses (Table 2-1).

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 indoors 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 indoors if windows are partially opened, but available evidence indicates hearing is adequately protected. Noise attenuation measures will be strongly recommended to attain this level.

¹ 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, Creekside at Cabin Branch is located within the 55 dBA Ldn noise zone, indicating that noise levels in outdoor activity areas throughout the site should be maintained at or below 55 dBA Ldn; however, given the growth of the Clarksburg area since the date of this map (1983), it is recommended that the site be governed by, at least, the 60 dBA Ldn guideline value instead.

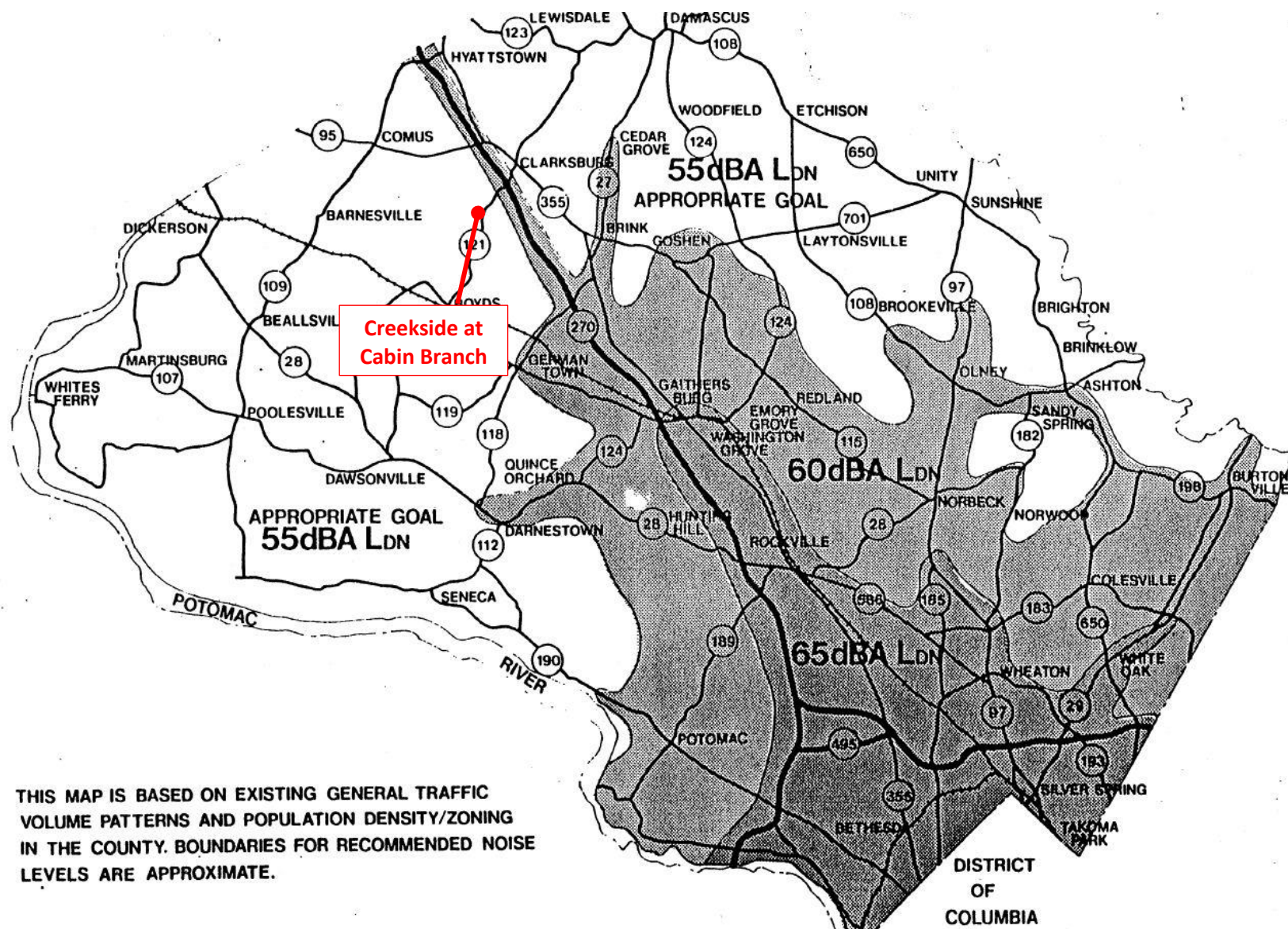
This recommendation is further supported by the description (in Table 1) for the 60 dBA Ldn guideline value, specifically the reference, “this is the basic residential noise guideline which will be applied in most areas of the County where suburban densities predominate.” Additionally, Table 1 indicates that the 55 dBA Ldn guideline value is “an appropriate goal in permanent rural areas of the County where residential zoning is for **five or more acres** per dwelling unit...” Given that the largest single-family home property in this development will have less than a ¼ acre, it is not accurate to apply the 55 dBA Ldn value for the site.

With the adoption of the 60 dBA Ldn guideline value, any outdoor activity area exposed to future transportation noise levels above 60 dBA Ldn would require further analysis to determine the mitigation designs necessary to comply with this requirement.

When outdoor noise levels exceed the guideline value, Montgomery County also requires an analysis of indoor 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 the chosen guideline value must be evaluated to certify that the building structure will be capable of maintaining indoor noise levels at 45 dBA Ldn. Note that regardless of the guideline value assigned to a site, the indoor noise level requirement is still 45 dBA Ldn.

Figure 1: Map 2-1 from *Staff Guidelines for the Consideration of Transportation Noise Impacts In Land Use Planning and Development* (June 1983).



4 SITE DESCRIPTION

Creekside at Cabin Branch (approximate development outline shown in red in Figure 2) is located to the west of Clarksburg Road. In the vicinity of the site, Clarksburg Road is composed of two northbound and two southbound lanes.

Figure 2: Existing site (outlined in red) and surroundings. Aerial image dated September 10, 2015, courtesy of Google Earth.



5 NOISE MEASUREMENTS

At the time of this study, the spread of the Coronavirus disease 2019 (COVID-19) still continues to affect traffic patterns due to school closures, increases of remote working, and reduction of general travel. As a result, traffic patterns are atypical, and the roadway conditions are likely not an accurate representation of roadway noise levels during more typical times.

Therefore, this study is based only on a computer model to predict noise impact at the site and does not incorporate on-site noise measurements, as is normally required by Montgomery County when completing a noise study. However, once traffic patterns return to normal conditions, an on-site 24-hour measurement survey will be conducted. At that time, noise impact at the site will be reevaluated, and this noise study will be updated as necessary.

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 the noise level impact from multiple noise sources across vertical and horizontal surfaces while accounting for factors such as topography, significant structures, surface reflections, and roadway data (traffic volumes, speeds, and vehicle classifications, etc.). Noise levels can be presented either in spot locations or as noise contours of equal value throughout a defined surface area.

6.1 Current Model

A current model was developed to simulate the existing site and its surroundings using information provided on the site's existing site plan,² the Montgomery County GIS, pre COVID traffic count data, inputting existing topography, roadway alignments, and buildings.

6.2 Future Model

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

The future model calculated the site's projected noise level contours at 5 and 25 feet above grade. Noise contours at 5 feet above grade represent the noise impact in outdoor activity areas and upon first floors of the planned residential units, while the noise contours at 25 feet account for the noise impact upon upper floors of the residences. Noise contours at 5 and 25 feet are shown on Drawings 1 and 2 of the Appendix, respectively.

All noise levels presented on Drawings 1 and 2 are "mitigated" noise levels, calculated in the presence of future site topography and all buildings, as well as all existing surrounding buildings, topography, and significant structures. Mitigated noise levels account for the effect of buildings, barriers, and other significant structures in reducing and reflecting roadway noise propagation and are more representative of the noise level actually experienced at a specific location.

² Provided by Rodgers Consulting on November 19, 2020.

6.3 Roadway Data

Existing average annual weekday traffic (AAWDT) volumes, vehicle percentages, and nighttime percentages for the roadways were based upon the most recent data published by the Maryland State Highway Administration (MDSHA). Future traffic data was taken from a traffic noise study developed for the site.³ The traffic study does not indicate the future year the data represents; therefore, it is assumed to be for the year 2020. A conservative, 2% increase in traffic compounded annually until 2041 was assumed.⁴ All necessary traffic data for Clarksburg Road are provided in Table 3.

Table 2: Roadway traffic data.

Traffic Data	Clarksburg Road Northbound (North of Dowitcher)	Clarksburg Road Southbound (North of Dowitcher)	Clarksburg Road Northbound (South of Dowitcher)	Clarksburg Road Southbound (South of Dowitcher)
2020 AAWDT	5,400	7,040	4,060	6,980
2041 AAWDT	8,185	10,670	6,154	10,579
Truck Percentage	8%	8%	8%	8%
Nighttime Percentage	6%	9%	6%	9%
Speed Limit	40 mph	40 mph	40 mph	40 mph
Table 3 Notes: A. Roadway data was based on data taken from the traffic study completed by Wells + Associates. In addition to this data, several assumptions were made in order to sufficiently model the roadways.				

As indicated in Table 3, there were several assumptions made for the roadway within the CadnaA model. The following assumptions were made:

- Only AM and PM peak values were provided for the roadway; therefore, the AAWDT was estimated by multiplying the roadway's largest peak hour traffic volume by a factor of 10.
- Since the traffic study did not include truck and nighttime percentages, these percentages were taken from the MDSHA data available for this roadway.

³ Creekside at Cabin Branch Local Area Transportation Review by Wells + Associates dated September 26, 2019, revised January 23, 2020.

⁴ Montgomery County typically requires that roadway noise impact studies be conducted using the projected traffic volumes 20 years from the date of the study.

6.4 Future Noise Impact

Drawing 1 of the Appendix (noise level contours at 5 feet above future grade) indicates that future roadway noise levels will be above 55 dBA Ldn around the townhomes closest to Clarksburg Road. Since these townhomes are all rear loaded residences, they will not have rear yards; therefore, it is not expected that Montgomery County will require outdoor mitigation for these spaces. Additionally, there will be no public outdoor activity areas exposed to noise levels greater than 55 dBA Ldn. Thus, no outdoor areas within the development will require additional analysis or mitigation.

Drawing 2 of the Appendix indicates that 28 townhomes closest to Clarksburg Road will be impacted by noise levels above 55 dBA Ldn. Of these 28 townhomes, only 12 will be exposed to noise levels above 60 dBA Ldn. Future roadway noise impact will be greatest for those residences nearest Clarksburg Road (up to 63 dBA Ldn).

As discussed earlier, due to the characteristics of the site, it is recommended to use the 60 dBA Ldn guideline value instead of the 55 dBA Ldn value. Residences exposed to noise levels above the limit (either 55 or 60 dBA Ldn) require further analysis (see Section 7.2 below) to determine the mitigation measures necessary to comply with Montgomery County's indoor noise limit of 45 dBA Ldn.

7 MITIGATION

According to Montgomery County's noise regulations for residential development, residential sites located within the 55 dBA Ldn zone require further analysis to determine the mitigation measures necessary to maintain noise levels in outdoor activity areas and indoor living spaces at 55 and 45 dBA Ldn, respectively. Note that while the site is within the 55 dBA Ldn noise zone, it is recommended to analyze the site according to the 60 dBA Ldn guidelines value.

7.1 Outdoor Noise Levels

Drawing 1 indicates that there will be no outdoor activity areas exposed to noise levels greater than 55 dBA Ldn; therefore, no further analysis or mitigation will be required for these outdoor areas.

7.2 Indoor Noise Levels

According to the future noise levels shown on Drawing 2, 28 townhomes will be exposed to noise levels above 55 dBA Ldn, while 12 townhomes will be exposed to noise levels greater than 60 dBA Ldn. It is recommended to use the 60 dBA Ldn guideline value for the site instead of 55 dBA Ldn. If approved by Montgomery County to use the 60 dBA Ldn limit, then only the 12 townhomes exposed to noise levels greater than 60 dBA Ldn will require additional analysis.

Residential buildings exposed to noise levels above the noise level limit (either 55 or 60 dBA Ldn), at any height, require further analysis to determine whether the proposed building construction will be capable of maintaining indoor noise levels below 45 dBA Ldn. This evaluation, or "building shell analysis," calculates a room's indoor noise level based upon its exterior noise level, the Sound Transmission Class (STC) ratings⁵ of its various building components, the amount of exposed exterior wall area, and the room's size and finish.

Modifications to standard building construction may not be necessary for all residences impacted by future noise levels above the limit used for the site. Since typical building construction will provide 20-22 dBA of noise reduction, it is expected that the proposed standard building construction will provide sufficient noise reduction to maintain the required 45 dBA Ldn indoor noise level for outdoor noise levels up to 63 dBA Ldn; however the proposed building construction must be evaluated to determine the need for modifications.

A detailed evaluation of the proposed architecture for the Creekside at Cabin Branch future buildings cannot be conducted at this time, as it is not known which townhome models will be offered at the site. When it is known which townhome models will be offered at the site, noise impact will be analyzed for each residence impacted by transportation noise levels above the noise level limit used for the site. Likewise, mitigation requirements will also be provided for each residence individually where necessary. Calculating minimum STC ratings specific to each residence reduces "overbuilding" (i.e. installing windows/doors with unnecessarily high STC ratings).

⁵ The STC rating is a single number value which describes a building element's (wall, window, door, roof, etc.) ability to reduce noise transmission from one side of the partition to the other.

8 CONCLUSION

The Creekside at Cabin Branch residential development will be exposed to future roadway noise levels above 55 dBA Ldn up to 63 dBA Ldn. While this represents a slight level of noise impact, compliance with Montgomery County's residential noise regulations can be achieved through building construction modifications, if necessary.

There will be no rear yards of outdoor activity areas exposed to ground level noise levels greater than 55 dBA Ldn; therefore, these outdoor areas will comply with Montgomery County's outdoor noise guidelines and no further analysis or mitigation will be required.

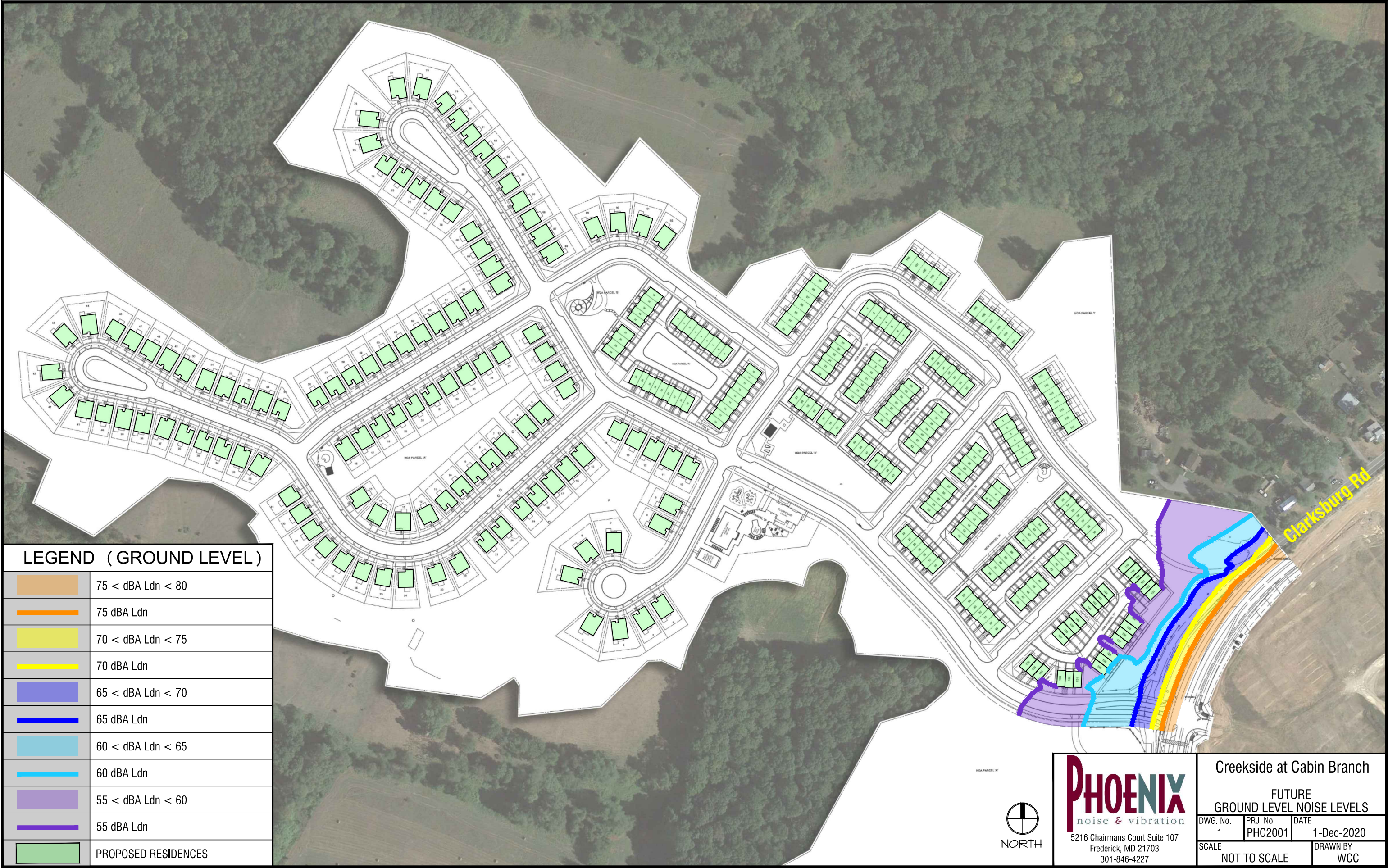
Of the 208 townhomes and 117 single-family homes, 28 townhomes will be exposed to future roadway noise levels above 55 dBA Ldn, while 12 townhomes will be exposed to noise levels above 60 dBA Ldn. Regardless of which noise level limit is used for the site, the impacted residences require further analysis to determine if modifications will be required to maintain interior noise levels below 45 dBA Ldn. Since noise impact will be up to 63 dBA Ldn upon the townhomes closest to Clarksburg Road, it is expected that modifications to Pulte Homes' standard building construction will not be required; however, a building shell analysis is still required per Montgomery County.

The extent of building construction modifications required for all impacted living units will be determined at a later time once future noise impact determination at the site can be verified through on-site noise measurements and the townhome models to be offered at the site are known.

The remaining 180 townhomes and 117 single-family homes will not be exposed to future transportation noise levels above 55 dBA Ldn. Further analysis will not be required for these remaining residences and the standard building construction may be used without modification for the residences to comply with Montgomery County's noise regulations.

Please Note: The results of this Phase I Noise Analysis have been based upon the site information made available at the time of this study, including existing and proposed topography, projected roadway traffic volumes, and the proposed building layout. Should any of this information be altered, additional analysis will be required to determine if the results and recommendations presented herein are capable of reducing outdoor and indoor noise levels to comply with Montgomery County's noise level requirements for residential development.

APPENDIX



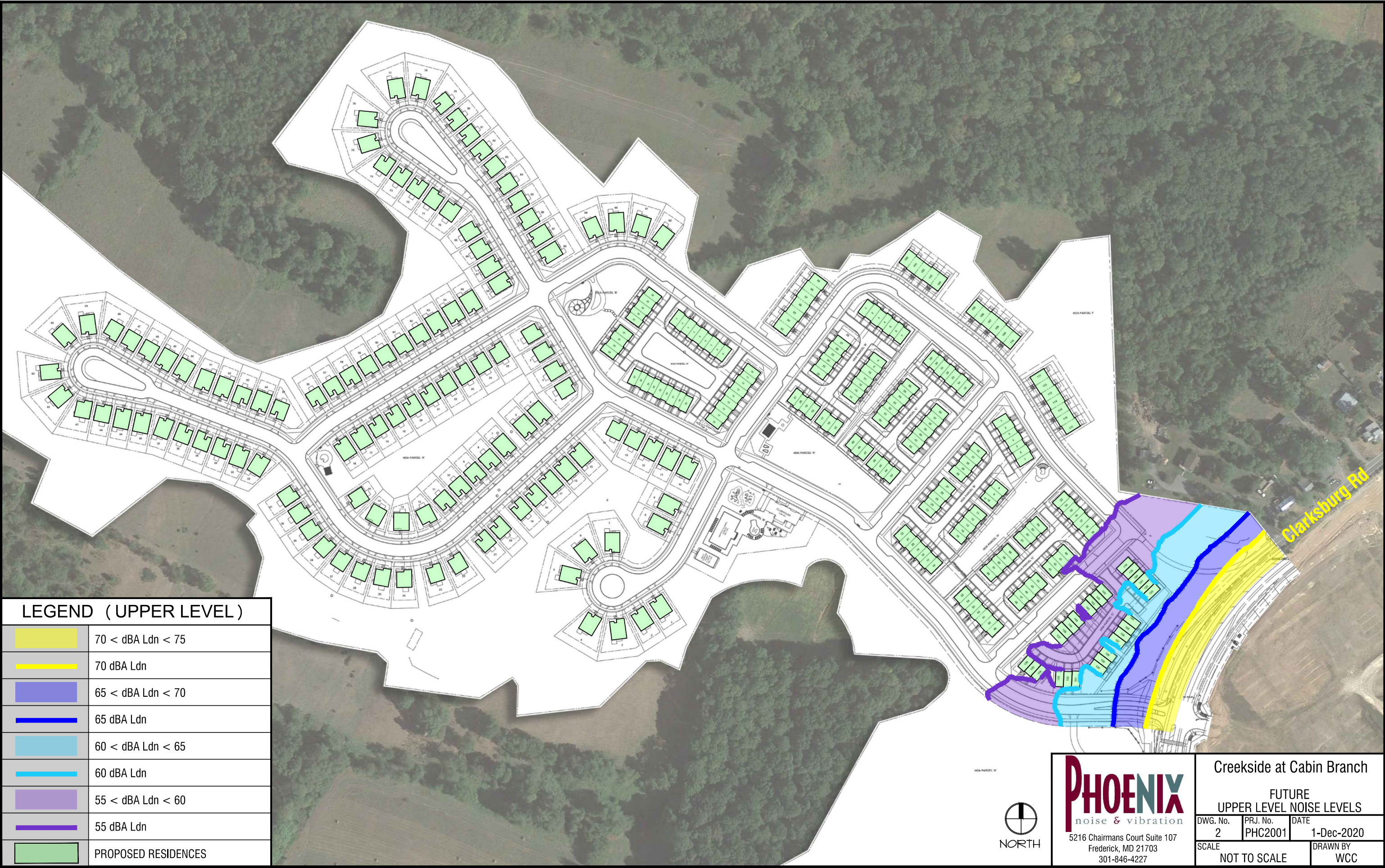
LEGEND (GROUND LEVEL)	
<div></div>	75 < dBA Ldn < 80
<div></div>	75 dBA Ldn
<div></div>	70 < dBA Ldn < 75
<div></div>	70 dBA Ldn
<div></div>	65 < dBA Ldn < 70
<div></div>	65 dBA Ldn
<div></div>	60 < dBA Ldn < 65
<div></div>	60 dBA Ldn
<div></div>	55 < dBA Ldn < 60
<div></div>	55 dBA Ldn
<div></div>	PROPOSED RESIDENCES



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Creekside at Cabin Branch		
FUTURE GROUND LEVEL NOISE LEVELS		
DWG. No. 1	PRJ. No. PHC2001	DATE 1-Dec-2020
SCALE NOT TO SCALE		DRAWN BY WCC



LEGEND (UPPER LEVEL)	
	70 < dBA Ldn < 75
	70 dBA Ldn
	65 < dBA Ldn < 70
	65 dBA Ldn
	60 < dBA Ldn < 65
	60 dBA Ldn
	55 < dBA Ldn < 60
	55 dBA Ldn
	PROPOSED RESIDENCES



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Creekside at Cabin Branch		
FUTURE UPPER LEVEL NOISE LEVELS		
DWG. No. 2	PRJ. No. PHC2001	DATE 1-Dec-2020
SCALE NOT TO SCALE		DRAWN BY WCC