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September 3, 2020

Mr. Greg Ruff
Development Manager
Winchester Homes
12435 Park Potomac Avenue, Suite 600
Potomac, MD 20854

Re: Northpark at Montrose (Wilgus Property)
Traffic Noise Analysis

Mr. Ruff:

This report summarizes the traffic noise analysis for the Northpark at Montrose (Wilgus Property) project in Montgomery County, Maryland.

1. Executive summary

A site survey was performed and sound levels were measured in two locations for nearly five days. Traffic volumes were counted briefly at the beginning and end of the survey. The Traffic Noise Model was used to model existing conditions. The output sound levels compared well to the measured sound levels. Traffic forecasts were developed based on forecast daily traffic volumes provided by the State Highway Administration, plus other historical data on their website. The Traffic Noise Model was used to predict future noise levels in outdoor recreation areas and at the facades of residences.

The design goals are to ensure that the Day-Night Average Sound Level (DNL) not exceed 75 dB outdoors at the facades or 43 dB inside residences. The 2040 DNL will be as high as 73.6 dB which does not exceed 75 dB at any house. Once architectural drawings have been finalized for this project, we can evaluate indoor noise and determine what upgrades will be required to reduce the DNL to 43 dB in each room.

2. Introduction

Hush Acoustics LLC was contracted by Winchester Homes to perform sound level measurements on the site and to model future noise levels. This analysis was based on the Preliminary Plan Wilgus Tract drawings prepared by Soltesz dated January 2020. These drawings show lot locations, proposed house locations and elevations, existing and proposed ground elevations, and the location and elevation of the existing Montrose Parkway and Montrose Road pavement. The site is located along the north side of Montrose Parkway and the south side of Montrose Road between E. Jefferson St. and Towne Road. A vicinity map is included as Figure 1.

Figure 1. Vicinity Map

Per a conversation with Mr. Mark Pfefferle of Montgomery County Park and Planning staff on December 22, 2006, and with Mr. Josh Penn on February 24, 2012, we understand that Montgomery County uses the 1983 Staff Guidelines to evaluate transportation noise impacts for proposed residential land development. The Staff Guidelines as well as the conditions for this project state that the interior noise guideline is a DNL of 45 dB. To provide a margin for error, we recommend aiming for 43 dB indoors. We also recommend not locating houses where the DNL at the façade exceeds 75 dB.

3. Site survey

The purposes of the site survey are as follows:

1. to collect noise level data on the site. Noise level data are useful for the following reasons:
    a. to validate the noise model
    b. to determine how the hourly average sound levels, compare to the Day-Night Average Sound Levels (DNL). The DNL is the noise metric used by Montgomery County staff. However, the Traffic Noise Model (TNM) uses the hourly average sound level. For locations mostly impacted by traffic noise, the relationship between the DNL and loudest hour average sound level is relatively constant. The measured sound levels are useful for determining this relationship.
    c. to identify any significant non-traffic noise sources.
2. to observe traffic conditions such as prevailing speeds, classifications (i.e., percentages of automobiles, trucks, buses, and motorcycles), and directional distributions. Many of these

parameters are not well documented in traffic studies. The prevailing speed often differs from the posted speed limit.

3. to observe road conditions such as locations and timing of traffic flow control devices (e.g., traffic signals, stop signs, and toll booths), and the pavement type.
4. to observe site conditions not represented on the site plan such as the presence and height of existing noise barriers along the road right-of-way.

The purpose of the site survey was not to determine how loud it will be at the proposed buildings. That is performed using the computerized noise modeling discussed below.

3.1 Sound level measurement procedure

Larson Davis model 831 sound level meters were installed in the locations indicated in Figure 2 from approximately 12 pm on Wednesday August 14, 2019, through approximately 11 am on Monday August 19, 2019. The sound level meters were programmed to report average, maximum, and minimum A-weighted sound levels during each one-minute interval. In addition, the meters were programmed to record audio files each time sound levels exceeded 83 dBA. The meters were chained to trees and the microphones were attached to poles approximately 18 feet above the ground.

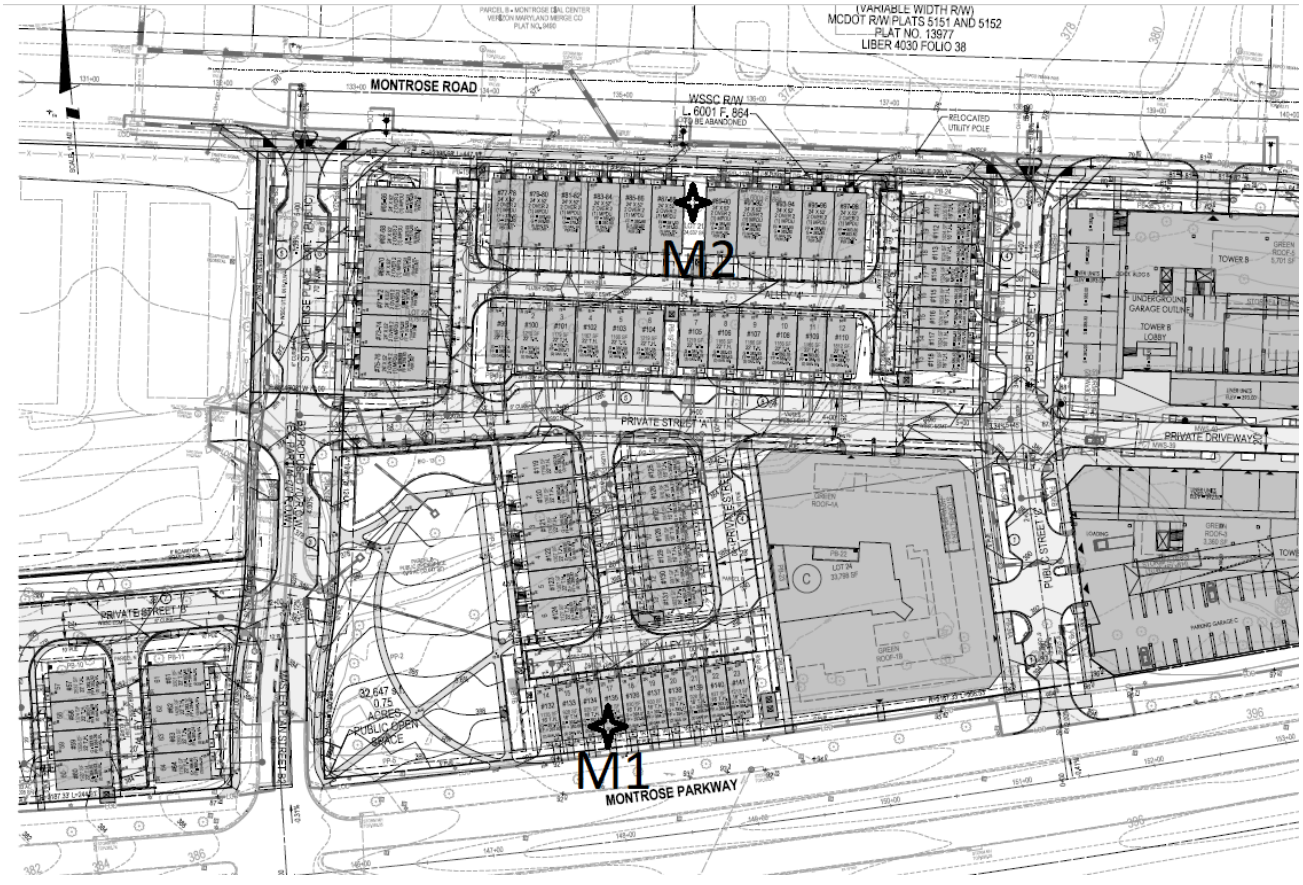

Figure 2. Sound Level Meter Locations

3.2 Site observations

The site currently has a forest. The ground elevation is generally level with or slightly higher than Montrose Parkway and Montrose Road. The main noise source on the site is traffic on Montrose Parkway and Montrose Road. However, there is also significant sound from insects such as cicadas. Aircraft noise is relatively minor. There is some construction on a site to the south of Montrose Parkway between E. Jefferson St. and Stonehenge Place; while we were on site that noise was not significant at location M1.

There are traffic signals on Montrose Parkway at the intersections with E. Jefferson St. and Towne Road but not at Stonehenge Place. There are traffic signals on Montrose Road at the intersections with E. Jefferson St., Towne Road, and the commercial buildings across from the Sunoco gas station to the west of M2.

Montrose Parkway currently has two through lanes each direction with a central grassy median and left turn lanes at intersections. Montrose Road currently has two through lanes each direction with a central turn lane. The pavement of both roads is asphaltic concrete. The posted speed limits are 40 mph on Montrose Parkway and Montrose Road, and 30 mph on E. Jefferson St.

3.3 Measured sound levels

Average sound levels during five-minute intervals were calculated based on the measured one-minute average sound levels. Figure 3 presents the resulting five-minute average sound levels. Hourly average sound levels were calculated based on the five-minute average sound levels. Figure 4 presents the hourly average sound levels. The Day-Night Average Sound Levels (DNL) were calculated for each full calendar day. Table 1 presents the DNL and loudest-hour average sound level, and the difference between the two, for each calendar day.

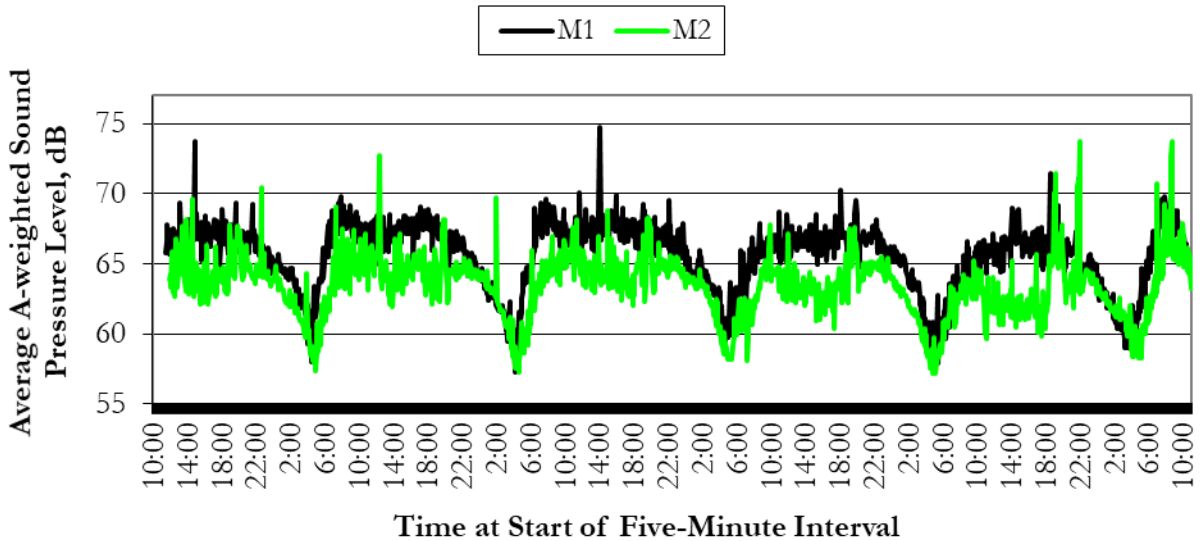

Figure 3. Five-Minute Average Sound Levels

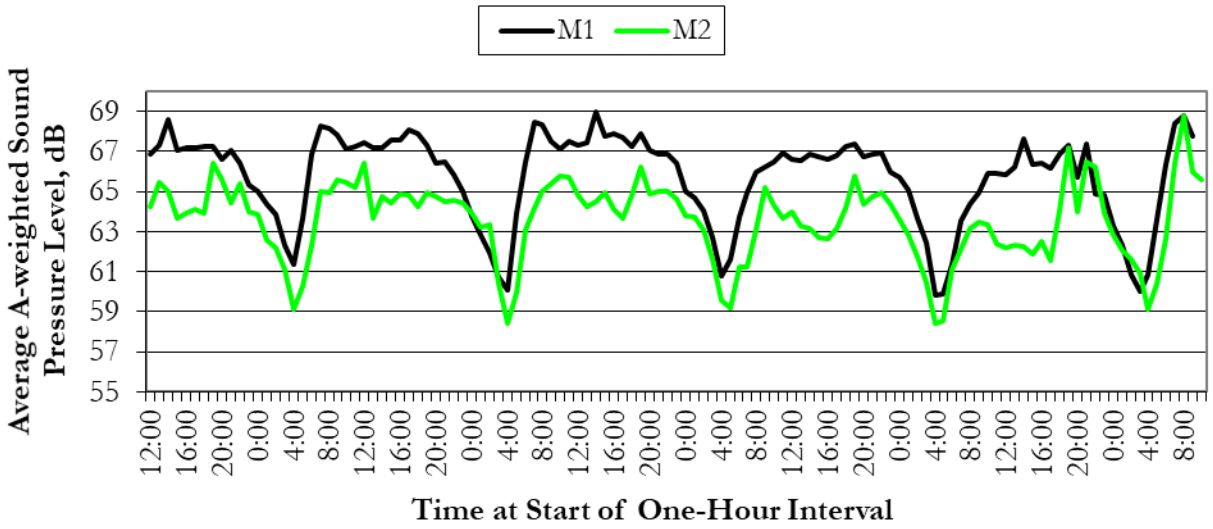

Figure 4. Hourly Average Sound Levels

The sound level exceeded 83 dB and audio recordings were created 13 times at location M1 and 17 times at location M2. We listened to the audio files and determined that these included 11 loud vehicles and 2 sirens at location M1, and at location M2 it included 8 loud vehicles, 8 sirens, and 1 horn.

While on site we observed that insects were very loud. This is also evident in the sound level data since there are high sound levels in the high-frequency bands of 6,300 and 8,000 Hz; traffic noise is generally not that loud in this frequency range. We attempted to estimate how loud it would have been if insects were not present by subtracting out sound levels in the 6,300 and 8,000 Hz bands. The result is presented at the end of Table 1.

Table 1. Measured DNL and Loudest-Hour Average Sound Levels, dB

Day, Date	DNL		Loudest-Hour Average Sound Level		DNL Minus Loudest-Hour Average	
	M1	M2	M1	M2	M1	M2
Wed., August 14, 2019			68.6	66.4		
Thursday, August 15, 2019	71.5	69.4	68.3	66.4	3.2	3.0
Friday, August 16, 2019	71.4	69.7	69	66.2	2.4	3.5
Saturday, August 17, 2019	71.2	69.4	67.4	65.8	3.8	3.6
Sunday, August 18, 2019	70.5	69.1	67.6	67.2	2.8	1.9
Monday, August 19, 2019			68.8	68.8		
Estimated w/o Insects:						
Thursday, August 15, 2019	70.4	66.5	67.2	64.0	3.2	2.5
Friday, August 16, 2019	70.4	67.1	68.0	63.6	2.4	3.5
Saturday, August 17, 2019	69.9	66.3	65.9	62.5	4.0	3.7
Sunday, August 18, 2019	69.2	66.9	65.9	65.4	3.3	1.6

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3.4 Traffic counts

Traffic volumes were counted during 10- or 15-minute intervals for each direction of traffic on Montrose Parkway and Montrose Road at the start and end of the survey. From these volumes the hourly average traffic volumes were extrapolated. Table 2 presents the extrapolated hourly traffic volumes. Automobiles include pickup trucks, passenger cars hauling trailers, and vans. Medium trucks are six-wheeled cargo vehicles with two axles. Heavy trucks are cargo vehicles with three or more axles. Speeds were determined using a hand-held radar gun. The median speeds for dozens of vehicles are listed in Table 2.

Table 2. Extrapolated Hourly Traffic Volumes and Prevailing Speeds

Day, Date and Time	Lanes	Speed	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
1244-1254 pm Wed. 8-14-19	EB Mont Pkwy	34	1038	6	0	6	0
	WB Mont Pkwy	38	768	0	0	6	0
1244-1254 pm Wed. 8-14-19	WB Mont Rd	34	332	16	0	0	0
	EB Mont Rd	35	164	4	0	4	0
1020-1030 am Monday 8-19-19	EB Mont Pkwy	-	702	24	0	0	0
	WB Mont Pkwy	-	528	6	0	0	0
1048-1103 am Monday 8-19-19	WB Mont Rd	-	248	8	4	4	0
	EB Mont Rd	-	136	4	0	4	0

3.5 Weather

Weather can affect both the propagation of sound from a roadway, as well as produce sound by rustling leaves or causing wind or rain noise at the microphone. For these reasons, weather conditions were documented during the survey. Hourly weather information was obtained from the National Weather Service for Washington Dulles International Airport. The following precipitation and wind faster than 10 mph were noted:

Wed. Aug. 14 – 12:46 pm (during traffic counts): N at 11 mph
2:52 pm: N at 13 (gusting to 20) mph
5:04 pm: N at 10 (gusting to 16) mph
Thur. Aug. 15 – 2:31 pm: thunder, ESE at 10 mph
3:36 to 4:17 pm: thunder, shower, SE to ESE at 8-16 (gusting to 25 to 40) mph
8:22 pm: thunder, shower, SSE at 13 mph
Fri. Aug. 16 – nothing
Sat. Aug. 17 – 7:12 and 7:52 pm: thunder
Sun. Aug. 18 – 5:52 pm: light rain, S at 13 (gusting to 17) mph
8:52 pm: W at 9 (gusting to 17) mph
Mon. Aug. 19 – 9:52 and 10:52 am (during traffic counts): N at 0 to 3 mph

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4. Outdoor noise modeling

4.1 TNM overview

In the United States, roadway traffic noise levels are typically analyzed using the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM). The current version is 2.5. The output from TNM is the hourly average sound level at the receivers. The program allows input of the following information:

- Coordinates of selected points along the road centerlines
- Pavement width and type
- Hourly volumes and speeds of autos, medium trucks, heavy trucks, buses, and motorcycles for each road segment
- Locations of traffic flow control devices such as stop signs, traffic signals, and toll booths at the start of roads
- Coordinates and heights of evaluation points (receivers)
- Coordinates of ground elevations in selected locations (terrain lines)
- The default ground type
- Coordinates of existing and proposed objects that shield the site such as noise walls and buildings (barriers)

Not used for this project:

- Coordinates and ground material in selected locations (ground zones)
- Coordinates and height of areas covered with thick evergreen forest (tree zones)
- Road locations that are elevated (structure roadways)
- Coordinates, height and spacing between buildings of rows of buildings which partially shield the site (building rows)

4.2 TNM validation

The traffic volumes and speeds presented in Table 2 were input into TNM. This TNM run is called the validation run. Each direction of travel of each Montrose Road and Montrose Parkway were modeled as an individual road in TNM. Various additional roads were included solely to define the pavement elevation and include the pavement ground type; this includes each direction of E. Jefferson St., left turn lanes on Montrose Parkway, the bike path along Montrose Parkway, the central turn lane on Montrose Road, and Stonehenge Place. The locations and elevations of selected points along each road and the width of each road were taken from the site plan. Per FHWA guidance, the pavement was modeled as "average." One terrain line was added at the middle of the Montrose Parkway median to model the slight change in elevation between the two directions of the road. The default ground type was lawn. Receivers were included at the two measurement locations.

After an initial run it was noted that sound levels output from TNM were noticeably lower than were measured on site. As a result, we made 3 changes. First, the effect of the traffic signals for each road was included; 33% of traffic was assumed to accelerate from a stop at each intersection for each road. Second, traffic speeds were increased to 45 mph on Montrose Parkway and Montrose Road. Third, we attempted to adjust the measured sound levels to account for sound from insects. The output sound levels were

again compared to the sound levels measured during the traffic counts. Table 3 presents this final comparison.

Table 3. Comparison of TNM Validation Run Output and Measured Sound Levels, dB

	M1	M2
Measured on Wednesday during Traffic Counts	67.0	63.2
Measured without Including Insect Sound	66.8	62.5
TNM Output for Wednesday	67.3	63.3
TNM Minus Measured for Wednesday	0.3	0.1
Measured on Monday during Traffic Counts	66.2	64.6
Measured without Including Insect Sound	65.9	63.2
TNM Output for Monday	65.9	62.6
TNM Minus Measured for Monday	-0.3	-2.0

It can be seen from Table 3 that TNM was accurate, producing sound levels between 2 dB lower than and 0.3 dB higher than were measured. This level of agreement between the modeled and measured sound levels is reasonable and is within the accepted level of accuracy of TNM. It should also be noted that the biggest discrepancy was at location M2 on Monday and this was the location and time for which insects were loudest.

4.3 Future traffic conditions

The following traffic data were obtained from the Maryland State Highway Administration (SHA) website:

- During a 48-hour traffic count on Montrose Parkway at the site on May 7 and 8, 2019, there were 1.94% Class 5 trucks (we counted these as medium trucks), 0.32% Class 6 to 13 trucks (we counted these as heavy trucks), 0.41% buses, and 0.17% motorcycles. We used these percentages for the future case for Montrose Parkway. The westbound lanes are closer to the site and the highest volumes westbound were observed at 8-9 am (this hour also had the highest total volume considering both directions); the volume during this hour was 8.67% of the daily volume and the volume westbound was 52.2%.
- During a 48-hour traffic count on E. Jefferson St. not far from the site (0.1 mi north of Montrose Road) on November 1 and 2, 2017, there were 1.26% medium trucks, 0.74% heavy trucks, 0.95% buses, and 0.22% motorcycles. We used these percentages for the future case for E. Jefferson St. In lieu of other information, we used these percentages for Montrose Road as well. The highest volumes were observed at 5-6 pm; the volume during this hour was 8.14% of the daily volume and the volume northbound was 57.0%.
- In lieu of other information we used the peak-hour percentage from E. Jefferson St. for Montrose Road, and used the directional factor from Montrose Parkway for Montrose Road.

The following daily traffic volumes were provided in an email from SHA staff on August 20, 2019:

- Montrose Parkway: 24,000 in 2019 and 29,000 in 2040
- Montrose Road: 9,300 in 2011 and 12,000 in 2040

- E. Jefferson St: 14,100 in 2011 and 18,200 in 2040

We used the hourly-to-daily ratios discussed above to estimate that the year 2040 peak-hour volumes will be:

- Montrose Parkway: 8.67% of daily volume of 29,000 or 2,512 with 52.2% westbound
- Montrose Road: 8.14% of the daily volume of 12,000 or 977 with 52.2% eastbound
- E. Jefferson St: 8.14% of the daily volume of 18,200 or 1,482 with 57.0% northbound

The resulting forecast traffic volumes are presented in Table 4. It can be seen from Tables 2 and 4 that the forecast traffic volumes are higher than those observed during the site visits.

Table 4. Year 2040 Loudest-Hour Traffic Volumes

Lanes	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles	Prevailing Speed (mph)
Montrose Pkwy Far EB	1,167	23	4	5	2	45
Montrose Pkwy Near WB	1,274	25	4	5	2	45
Montrose Rd Far WB	452	6	3	4	1	45
Montrose Rd Near EB	494	6	4	5	1	45
E. Jefferson St Far SB	617	8	5	6	1	35
E. Jefferson St Near NB	817	11	6	8	2	35

4.4 Future traffic noise modeling

The Montgomery County Master Plan of Highways and Transitways dated July 24, 2018 does not indicate any road widening for the roads at the site.

TNM was run using the traffic volumes and speeds presented in Table 4. The following parameters were retained from the validation run:

- Traffic speed of 45 mph on Montrose Road and Montrose Parkway
- 33% of traffic accelerating from a stop at each traffic signal on Montrose Road and Montrose Parkway
- Existing road locations, elevations, and "Average" pavement type
- Lawn default ground type
- Various roads without traffic; this includes left turn lanes on Montrose Parkway, the bike path along Montrose Parkway, the central turn lane on Montrose Road, and Stonehenge Place
- The terrain line along the Montrose Parkway median

The following was added for the future case:

- Traffic was added on E. Jefferson St. The posted speed is 30 mph, so a speed of 35 mph was used. 50% of traffic was assumed to accelerate from a stop northbound.
- The proposed extension of Stonehenge Place was added without traffic, and the new private streets were also added without traffic

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- Barriers representing the proposed townhouses, 2-over-2 units, and apartment buildings, as well as the existing townhouses along Stonehenge Place modeled as barriers
- Receivers at facades of proposed buildings

4.5 Future outdoor traffic noise levels

It can be seen from Table 2 that the DNL was between 2.4 and 3.5 dB higher than the loudest-hour average sound level. The future loudest-hour average sound levels were output from TNM. We assumed that in the year 2040 the DNL would be 3.5 dB higher than the loudest-hour average sound level. This assumption is equivalent to assuming that the percentage of traffic traveling at night (between 10 p.m. and 7 a.m.) in the future would match the highest percentage that occurred during the noise monitoring period.

The resulting year 2040 DNL are presented in Figure 5. It can be seen from Figure 5 that the DNL will not exceed 75 dB at any house.

If you have any questions, please contact me at 703/534-2790 or via e-mail at Gary@HushAcoustics.com.

Sincerely,

Gary Ehrlich, P.E.
Principal

Figure 5. Year 2040 DNL, dB, at Facades of Residences on Loudest Floor