Y Construction Noise Study

Memorandum

To: Hampshire Recreation, LLC

Date: August 24, 2018

Project #: 28677.03

From: Jason Ross, Director of Noise and Vibration

Re: Hampshire Country Club Planned Residential Development - Construction Noise Study

Introduction

The Applicant ("Hampshire Recreation, LLC") proposes to develop a new Planned Residential Development ("PRD") of single-family homes and semi-detached carriage houses located on a portion of the existing Hampshire County Club golf course in the Village of Mamaroneck, NY. The proposed PRD would consist of 105 residential units (comprising 44 single-family detached housing lots and 61 carriage homes, which consist of 28 two-family and 33 three-family semi-detached housing lots) on the Project Site (the "Proposed Action"). The Proposed Action would also include development of seven tennis courts, 36 acres of common open space, and the existing golf course would be downsized to a 9-hole course.

VHB has conducted a study of construction noise associated with the Proposed Action. The noise study includes a summary of applicable construction-related noise policies and ordinances, background on sound level concepts, ambient noise measurements at noise-sensitive locations in the study area, predictions of future construction noise including stationary equipment and construction trucking operations, an assessment of potential construction noise effects, and recommendations for best management practices to reduce construction noise.

Noise Policies and Ordinances

Construction will be conducted in accordance with the Village of Mamaroneck, Noise Ordinance (Chapter 254) to minimize potential impact. The village ordinance prohibits construction activities including "… the erection, construction or reconstruction of buildings or major repairs to buildings, the excavation, clearing, filling or grading of land or the placement or removal of earth, stone or building material of any kind, whether or not the work involved the use of machinery or power tools, such that the sound therefrom creates unreasonable noise across a residential real property boundary, other than between the hours of 8:00 a.m. and 6:00 p.m., Monday through Saturday…" Additionally, no such activity shall be permitted on Sundays or on any of the following holidays: New Year's Day, Martin Luther King's Birthday, Presidents' Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Yom Kippur, Thanksgiving and Christmas.

To comply with Article 8 of the New York State Environmental Conservation Law and 6 NYCRR Part 617 regulations, noise impact must be evaluated as a potential issue in making a determination of environmental significance. The New York State Department of Environmental Conservation (NYSDEC) has issued a program policy "Assessing and Mitigation Noise Impacts" which provides guidance on the methods to assess potential noise impact and avoid or reduce significant adverse impacts for fulfillment of SEQRA regulations. The SEQRA process and the NYSDEC noise policy focuses on noise that would be generated by the Proposed Action and activities that are within the control of the property owner. According to NYSDEC noise policy, the goal for any permitted operation is to minimize increases in sound levels. The NYSDEC policy has guideline thresholds for assessing the effects of long-term permanent sources

50 Main Street
Suite 360
White Plains, NY 10606-1900
P 914.467.6600

of noise. If a Proposed Action would increase ambient noise levels by 3 to 6 dBA, there is potential for adverse noise impact and there may be a need for mitigation for the most sensitive receptors. For increases in noise of 6 to 10 dBA, there is a greater potential for impact and mitigation is generally needed. For increases in ambient noise of 10 dBA or more, mitigation is warranted where reasonable. NYSDEC policy states that the addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dBA. Therefore, given the temporary nature of construction noise, increases in ambient noise of 10 dBA or more which would increase levels above 65 dBA are considered reasonable impact criteria that would warrant construction noise mitigation or best management practices.

Sound Level Concepts

Sound is the rapid fluctuations of air pressure above and below ambient pressure levels. Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, communication, or recreation. How people perceive sound depends on several measurable physical characteristics, including:

Sound Level - Sound level is based on the amplitude change in pressure and is related to the loudness or intensity. Human hearing covers a wide range of changes in sound pressure amplitude. Therefore, sound levels are most often measured on a logarithmic scale of decibels (dB) relative to 20 micro-pascals. The dB scale compresses the audible range of acoustic pressure levels, which can vary from the threshold of hearing (0 dB) to the threshold of pain (120 dB). Because sound levels are measured in dB, the addition of two sound levels is not linear. For example, adding two equal sound levels results in a 3 dB increase in the overall level. Research indicates the general relationships between sound level and human perception are as follows:

- A 3-dB increase is a doubling of acoustic energy and is approximately the smallest difference in sound level that can be perceived in most environments.
- A 10-dB increase is a tenfold increase in acoustic energy and is generally perceived as a doubling in loudness to the average person.

Frequency - Sounds are comprised of acoustic energy distributed over a range of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz (Hz). Human hearing generally ranges from 20 to 20,000 Hz; however, the human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter known as A-weighting is commonly used to evaluate environmental noise levels, and sound levels are denoted as "dBA."

- Sound levels reported in octave or one-third-octave frequency bands are often used to describe the frequency content of different sounds. Some sources of sound can generate "pure tones," which is when there is a concentration of sound within a narrow frequency range such as a whistle. Humans can hear pure tones very well, and such conditions can be a cause of increased annoyance.

A variety of sound level descriptors can be used for environmental noise analyses. These descriptors relate to the way sound varies in level over time. The following is a list of common sound level descriptors:

Energy-Average Sound Level (Leq) - Leq is a single value, which represents the same acoustic energy as the fluctuating levels that exists over a given period of time. The Leq takes into account how loud noise events are during the period, how long they last, and how many times they occur. Leq is commonly used to describe environmental noise and relates well to human annoyance.

Statistical Sound Levels – Sound level metrics, such as L01, L10, L50 or L90, represent the levels that are exceeded for a particular percentage of time over a given period. For example, L10 is the level that is exceeded for 10 percent of the time. Therefore, it represents the higher end of the range of sound levels. The L90, on the other hand, is the level that is exceeded 90 percent of the time, and therefore, is representative of the background sound level.

Maximum Sound Level (Lmax) – Many sources of sound, including mobile sources and stationary sources, change over time. Stationary sources associated with energy facilities can often generate different sound levels depending on the operational condition of the equipment. It is common to describe sound in terms of the maximum (Lmax) sound level emissions. Table 1 presents a list of the maximum sound levels of common outdoor and indoor sources.

Table 1: Maximum Sound Levels of Common Outdoor and Indoor Sources

Outdoor Source	Sound Level (dBA)	Indoor Source
	110	Rock Band at 5 m
Jet Over Flight at 300 m	**105**	
	100	Inside New York Subway Train
Gas Lawn Mower at 1 m	**95**	
	90	Food Blender at 1 m
Diesel Truck at 15 m	**85**	
Noisy Urban Area—Daytime	**80**	Garbage Disposal at 1 m
	75	Shouting at 1 m
Gas Lawn Mower at 30 m	**70**	Vacuum Cleaner at 3 m
Suburban Commercial Area	**65**	Normal Speech at 1 m
	60	
Quiet Urban Area—Daytime	**55**	Quiet Conversation at 1 m
	50	Dishwasher Next Room
Quiet Urban Area—Nighttime	**45**	
	40	Empty Theater or Library
Quiet Suburb—Nighttime	**35**	
	30	Quiet Bedroom at Night
Quiet Rural Area—Nighttime	**25**	Empty Concert Hall
Rustling Leaves	**20**	
	15	Broadcast and Recording Studios
	10	
	5	
Reference Pressure Level	**0**	Threshold of Hearing

Source: Highway Noise Fundamentals. Federal Highway Administration, September 1980.

Existing Noise Conditions

Noise-sensitive receptors near the subject site include residences such as those on Rock Ridge Road, Fairway Green, Old Post Lane, Cooper Avenue, Protano Lane, Sylvan Lane, Orienta Avenue, Fairway Lane, Cove Road (East, North, and South), Eagle Knolls Road, , Cove Road, and Hommocks Road. Additionally, the Hommocks Middle School on Hommocks Road is adjacent to the subject site. The predominant sources of existing noise at these receptors include

traffic on Boston Post Road (Route 1), local roads, and other sources such as landscaping equipment associated with maintenance of the golf course.

Ambient sound measurements were conducted at six locations (See Figure 1) around the subject site at locations representative of the closest receptors. Measurements were conducted using a Larson Davis model 831 sound level meter certified to have Type I accuracy according to the ANSI S1.4 "Specifications for Sound Level Meters." The sound level meter was calibrated in the field prior to and after the measurements and by a laboratory traceable to the National Institute of Standards and Technology within one year of the field measurements.

Measurement data collected included overall A-weighted sound levels and one-third-octave band sound levels, which provide information on the frequency content (i.e. low or high-pitched) character of sound. Data collection included one-second time histories and results for the entire measurement duration including minimum, maximum, percentile values (L01, L10, L33, L50, L90, and L99), and the energy-average sound level (Leq). Atmospheric observations of wind speed, wind direction, air temperature, precipitation, and relative humidity were made in the field and from a nearby online weather station. Observations were also made of the predominant sources of sound.

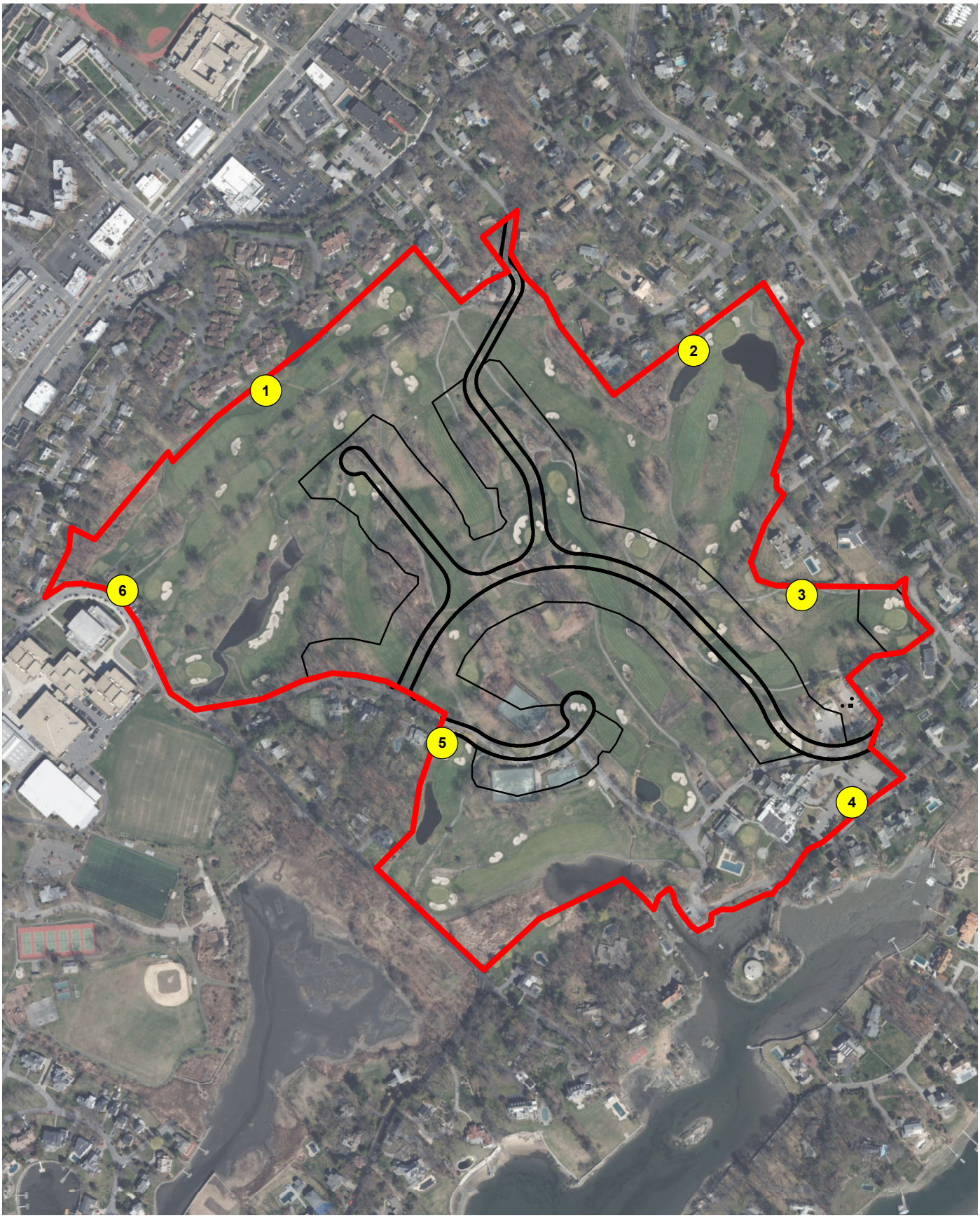
Ambient measurements were conducted on July 30, 2018 between approximately 9:00 AM and noon. Atmospheric conditions included air temperature between 68 and 72 degrees, with 53 to 70% relative humidity, winds generally 5 to 10 mph, and no precipitation. As shown in Table 2, the measurements show that energy-equivalent sound levels ranged from 47 to 56 dBA. Generally, ambient sound levels ranged from 47 to 56 dBA. At Site 2, sound levels were 68 dBA (Leq) during a period when landscaping equipment was in close proximity to the microphone.

Table 2: Ambient Sound Measurement Results

Receptor	Address	Start Time	Duration (min)	Sound Level (dBA)								
				Leq	Lmax	L01	L10	L33	L50	L90	L99	Lmin
1	Near 1202 Fairway Green	8:57 AM	20	**53**	69	66	53	48	48	45	43	42
2	Near 930 Sylvan Lane	9:29 AM	20	**56**[A]	63	62	58	56	55	52	51	51
3	Near 1000 Fairway Lane	9:58 AM	20	**52**	65	64	55	51	49	47	44	44
4	1058 Cove Road	10:34 AM	20	**47**	58	54	50	47	46	43	41	41
5	541 Eagle Knolls Rd	11:07 AM	20	**48**	63	60	50	45	44	42	41	40
6	Near Hommocks Middle School	11:41 AM	20	**53**	64	61	57	52	50	48	47	46

A Noise measurement at this site excludes a period of time when landscaping equipment was within close proximity to the microphone. During that period of time, the ambient Leq sound level was 68 dBA.

Source, VHB, 2018.



0 175 350 700 Feet

Noise Monitoring Location

Project Site

Proposed Project New Roadways and Property Boundary

Hampshire Country Club - PRD | Village of Mamaroneck, NY

Noise Monitoring Locations

Construction Noise Predictions

Construction of the PRD would introduce new sources of noise which have the potential to impact existing receptors adjacent to the property or new receptors that would be introduced during the phased development. Construction noise depends on the phase of construction which include site grading and fill, building erection, final fit out, and landscaping.

The loudest phase of noise is the earthwork phase which includes bringing in fill by truck, excavators and back hoes to move soil around the site, grading, and a vibratory compactor (dual drum) to compact the soil. Based on the composition of the bedrock, blasting will be required for removal.

A New York State licensed blasting contractor will prepare a written Blasting Plan in accordance the with the Village of Mamaroneck Village Code Chapter 120 and the New York Department of Transportation "Geotechnical Engineering Manual: Procedure for Blasting" latest edition (Appendix 5), providing a detailed description of the means and methods of the proposed rock removal program. The blasting contractor will implement acoustic overpressure and vibration monitoring as required by the Blasting Plan to minimize the risk of structural damage to nearby structures. Since blasting involves relatively short (a few seconds) noise exposures in the community, it is not considered a significant cause of human annoyance.

The Proposed Action will be constructed in one phase, with construction of roads and related improvements anticipated to last between 18 and 24 months and residential construction anticipated to last between 24 and 36 months. It is estimated that the initial construction period would be approximately 9 months with an estimated 16-yard truck visits per day (or 24 per day on a 5-day week schedule). After that, truck activity is expected to diminish to approximately 3-4 per day as the 105 units are built out.

All construction trucks accessing the Project Site will be required to use I-95, exiting at either Exit 17 (to and from the south) or Exit 19 (to or from the north) to use Boston Post Road (US Route 1) to get to and from Hommocks Road and Eagle Knolls Road. There will be no truck access allowed via Orienta Avenue or East Cove Road. When school is in session, truck access to the Project Site will only be permitted between 8:15 am and 2:30 pm, as well as between 4:00 pm and 6:00 pm.

Construction noise has been modeled using standard methods for residential development projects in a manner that is consistent with federal guidelines. Cadna-A sound prediction software has been used. Cadna-A is an internationally-accepted sound prediction program that implements the International Standards Organization 9613-2 sound propagation standard. This model takes into account the sound emissions of equipment, the areas where the construction equipment will be, the ground cover, terrain, and intervening objects such as buildings.

The construction noise model accounts for the types of construction equipment, the number of each type of equipment, the amount of time they typically operate during a work period (usage factor), and the distance between receptor locations and the areas where construction will occur. For typical daytime construction activities, construction noise is evaluated according to the energy-average Leq. The reference noise emissions of the equipment anticipated

for construction of the Project is based on the Federal Highway Administration's Roadway Construction Noise Model, as shown in Table 3.

Table 3: Stationary Construction Equipment Noise Emissions

Construction Equipment	Number	Maximum Sound Level at 50 feet (dBA)	Utilization Factor
Backhoe	**2**	**80**	**40%**
Excavator	**2**	**85**	**40%**
Vibratory Compactor	**1**	**80**	**20%**

Source: RCNM, 2011.

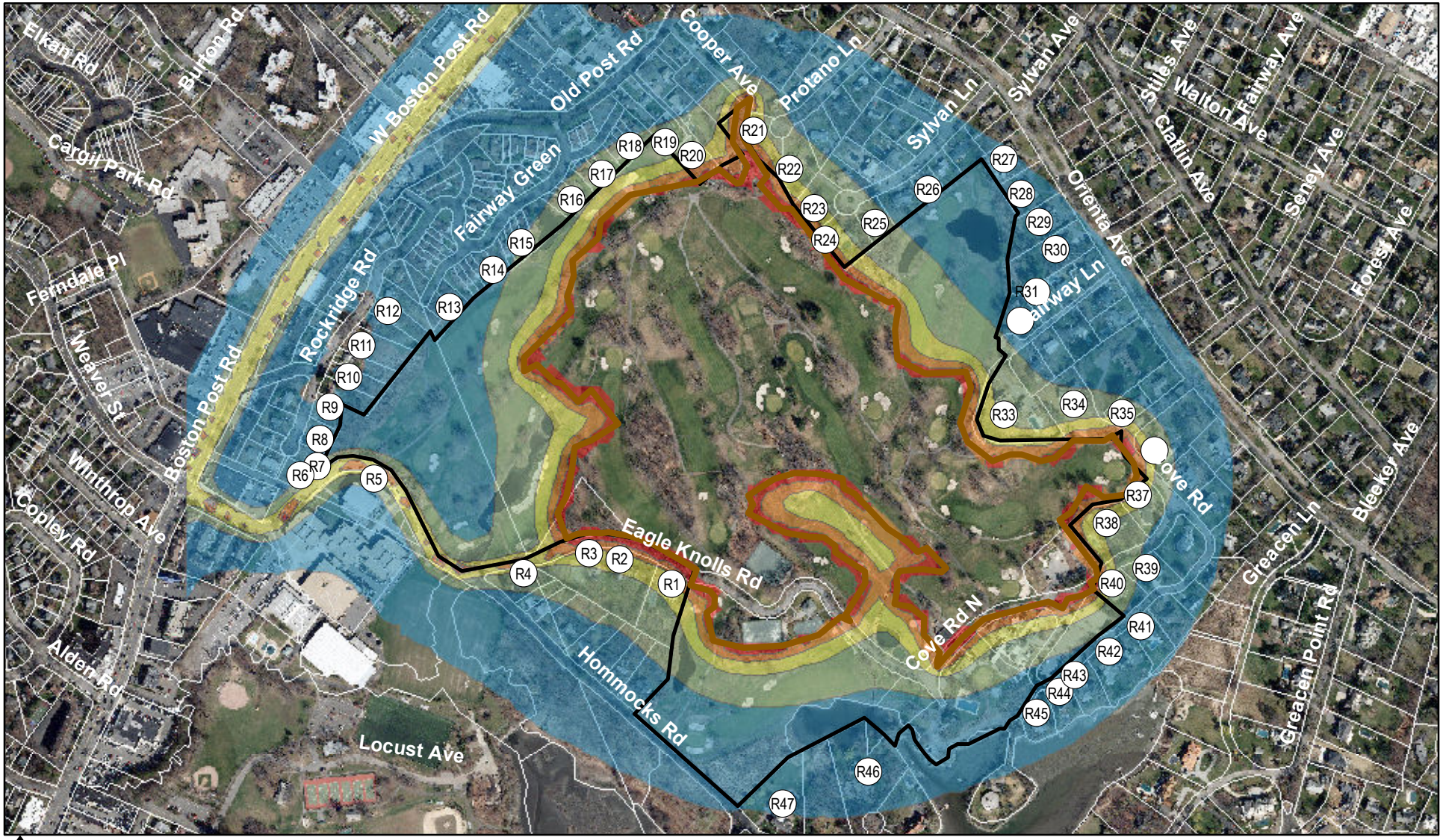
Construction Noise Assessment

Table 4 and Figure 2 present the results of the construction noise assessment. This table presents the existing measured sound levels, predicted construction noise levels, and the results of the assessment relative to the NYSDEC guidelines. The evaluation considers construction noise levels which exceed ambient levels by 10 dBA and also exceed 65 dBA (Leq) to warrant noise mitigation or best management practices.

Construction including trucking operations and stationary equipment would generate noise levels ranging from 49 to 65 dBA (Leq) at adjacent receptor locations. Noise levels would generally increase over existing ambient conditions by three to eight dBA at most locations. At some locations particularly close to the proposed earthwork, construction noise would increase existing ambient conditions by up to 13 dBA (Leq). The increases in construction noise is primarily due to the stationary earthwork equipment. There would be up to 24 daily truck trips, however, since the truck passbys are relatively brief events lasting only approximately 10 seconds, the overall noise exposure from the trucks is substantially less than the stationary equipment.

Locations where construction would increase existing ambient conditions by 10 dBA or more include residences on Eagles Knolls Road, Sylvan Lane, and Cove Road North which are near the limits of earthwork construction. Future noise levels which include existing ambient noise and construction noise would typically be 60 to 65 dBA (Leq) at these receptors. Although future noise levels would not exceed 65 dBA (Leq), they would approach this threshold and therefore best management practices should be considered.

Table 4: Construction Noise Assessment



0 250 500 1000 Feet

Hampshire Country Club PRD | Construction Noise Analysis

Legend

- Receptors
- Approximate Limits of Earthwork
- Site Boundary

Construction Noise Contours

- 50 dBA (Leq)
- 55 dBA (Leq)
- 60 dBA (Leq)
- 65 dBA (Leq)
- 70 dBA (Leq)

Source: NYSDOP

Receptor	Address	Existing Noise Level (Leq, dBA)	Construction Noise Level (Leq, dBA)	Future (Existing and Construction) Noise Level (Leq, dBA)	Increase over Ambient (Leq, dBA)	Impact?
R1	541 Eagles Knolls Rd	48	61	61	13	**No**
R2	521 Eagles Knolls Rd	48	61	61	13	**No**
R3	521 Eagle Knolls Rd (2)	48	61	61	13	**No**
R4	45 Hommocks Rd	48	55	56	8	**No**
R5	Hommocks School	53	55	57	4	**No**
R6	7 Hommocks Rd	53	52	56	2	**No**
R7	2 Rock Ridge Rd	53	53	56	3	**No**
R8	4 Rock Ridge Rd	53	50	55	2	**No**
R9	8 Rock Ridge Rd	53	49	54	2	**No**
R10	12 Rock Ridge Rd	53	49	54	2	**No**
R11	16 Rock Ridge Rd	53	49	54	2	**No**
R12	20 Rock Ridge Rd	53	50	54	2	**No**
R13	1001-1002 Fairway Green	53	52	55	3	**No**
R14	901-905 Fairway Green	53	53	56	3	**No**
R15	801-805 Fairway Green	53	54	56	4	**No**
R16	601-605 Fairway Green	53	56	58	5	**No**
R17	501-505 Fairway Green	53	56	58	5	**No**
R18	401-405 Fairway Green	53	55	57	5	**No**
R19	74 Post Lane	53	56	58	5	**No**
R20	37 Post Lane	53	60	60	8	**No**
R21	970 Proano Ln	53	61	61	9	**No**
R22	939 Sylvan Ln	53	59	60	7	**No**
R23	945 Sylvan Ln	53	61	61	9	**No**
R24	950 Sylvan Ln	53	65	65	12	**No**
R25	940 Sylvan Ln	56	56	59	3	**No**
R26	1002 Fairway Green	56	52	57	1	**No**
R27	511 Orienta Ave	53	50	55	2	**No**
R28	521 Orienta Ave	53	50	55	2	**No**
R29	531 Orienta Ave	53	50	55	2	**No**
R30	555 Orienta Ave	53	51	55	2	**No**
R31	921 Fairway Ln	53	52	56	2	**No**
R32	931 Fairway Ln	53	53	56	3	**No**
R33	1000 Fairway Ln	53	58	59	6	**No**

Receptor	Address	Existing Noise Level (Leq, dBA)	Construction Noise Level (Leq, dBA)	Future (Existing and Construction) Noise Level (Leq, dBA)	Increase over Ambient (Leq, dBA)	Impact?
R34	925 Cove Rd	53	56	58	5	**No**
R35	917 Cove Rd East	53	57	59	5	**No**
R36	742 Cove Rd	53	57	59	6	**No**
R37	727 Cove Rd	53	60	61	8	**No**
R38	1013 Cove Rd North	53	59	60	7	**No**
R39	1031 Cove Rd South	47	53	54	7	**No**
R40	1022 Cove Rd North	47	58	59	11	**No**
R41	1044 Cove Rd South	47	52	53	6	**No**
R42	1058 Cove Rd South	47	52	54	6	**No**
R43	1100 Cove Rd South	47	52	54	6	**No**
R44	1110 Cove Rd South	47	52	53	6	**No**
R45	1120 Cove Rd South	47	51	53	5	**No**
R46	11 Oak Ln	47	50	52	5	**No**
R47	3 Oak Ln	47	50	52	4	**No**

Source: VHB, 2018.

Construction Noise Mitigation / Best Management Practices

As discussed in the previous section, construction noise levels would increase existing ambient conditions by more than 10 dBA at certain locations close to the proposed earthwork construction. Although noise levels would not exceed 65 dBA (Leq), best management practices to reduce construction noise should be implemented. The predominant source of construction noise is the stationary equipment since trucking operations generate relatively brief noise exposure. In efforts to reduce potential noise impacts during construction, noise reduction measures would include the following:

- Construction activities will be limited to daytime and week day hours in accordance with the Village ordinance.
- Supplemental stationary construction equipment, such as generators or air compressors, will be located as far as possible from noise-sensitive sites.

- Of the various types of construction equipment, diesel engines can be the most significant noise source. The contractor will ensure that all equipment is operating properly and is fitted with the appropriate noise-reducing features such as exhaust mufflers and engine compartment shields.
- Most wheeled and tracked construction equipment is required to have back-up alarms for safety purposes. Due to their tonal character, these alarms are often a significant noise concern. Special back-up alarms may be implemented including ambient-adjusted alarms which only sound five decibels higher than ambient conditions or "quackers" which have a less tonal character. Flagging may also be used to eliminate the need for back-up alarms.
- Mitigation may include re-routing truck routes and minimizing idling times.
- Acoustic enclosures may be used to reduce emissions from small construction equipment, such as generators.
- Temporary noise barriers or noise blankets can be installed between construction equipment and sensitive receptors to provide significant noise reduction (typically five to 15 decibels).
- As more detailed information on the construction equipment and methods become available as the project design advances, the contractor shall prepare a noise control plan to further evaluate the potential for construction noise impact and identify specific mitigation measures that will be implemented.
- A key aspect to minimizing the effects of construction noise is maintaining good communication with the nearby residences and informing them of the schedule of construction activities and the approaches that will be taken to minimize construction noise.