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October 2, 2020

Martin Schulman, VMD
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**Subject** Noise Measurements, Old Dominion Animal Hospital, Crozet, VA

Dear Mr. Schulman:

On Monday September 21, 2020 we installed two temporary noise monitors outside the Old Dominion Animal Hospital at 1263 Three Parkview Drive on parcel 56-67B. At your direction, these monitors were placed 40 feet from the Eastern and Northern building façade nearest the indoor kennel areas. We understand that the distance of 40' was chosen to represent the closest possible setback you may request in an upcoming zoning request. The monitoring equipment was left onsite through the week retrieved the following Monday September 28. This report summarizes the noise measurement results.

## ALBEMARLE COUNTY NOISE ORDINANCE

We understand that you have had discussions with Albemarle County staff, and they have provided guidance that sound levels due to the indoor kennel must be at or below 55 dBA at any proposed setback from the animal hospital. This guidance refers to the allowable nighttime sound level for rural or residential zones as outlined in the Albemarle County noise ordinance [1]. The ordinance outlines details for how to conduct sound level measurements and applicable limits based on zoning and time of day [2]. It also includes a list of exemptions, which includes animals, however that exemption does not apply to commercial kennels. We recommend you and your team review the noise ordinance for yourselves so it is fully understood.

## MEASUREMENT RESULTS

The approximate noise monitoring locations are shown in Figure 1, each 40 feet from the building façade. Measurements were made 50 inches above the ground using NTI XL2-TA sound level meters, which are Type 1 certified devices [3]. These meters were both within their yearly laboratory calibration window and both field calibrated using a Larson Davis CAL200 at the start of measurements.

To show compliance with the noise ordinance a five-minute, A-weighted, equivalent-continuous sound level ($L_{Aeq}$) must be at or below the sound level limit. The $L_{Aeq}$ is essentially the average sound level over a five minute period that has been weighted to relate level to the human perception of sound. Note that during a five-minute period the sound level will be higher and lower since this is an average. The highest measured sound levels are known as the $L_{Amax}$ and the lowest as the $L_{Amin}$.

[1] Albemarle County Code, Chapter 18, Section 4.18.04, Noise.
https://library.municode.com/va/albemarle_county/codes/code_of_ordinances?nodeId=CH18ZO_ARTIIBARE_S4GERE_S4.18NO_S4.18.04MASOLE

[2] The county defines daytime as 7AM to 10PM and nighttime as 10PM to 7AM.

[3] ANSI S1.4 and IEC 61672, Specifications and Standards for Sound Level Meters.

Figure 1: Noise Monitoring Locations




## Barking Test

In an attempt to observe and measure the sound level due to barking dogs we entered the kennel to get the group of dogs excited. It took some effort, but some dogs did eventually get excited and bark continuously for a period of about 35 seconds, which resulted in a $L_{Amax}$ of 98 dBA inside the indoor kennel. During that same 35 second period, location 1 had a $L_{Aeq}$ of 46.5 dBA and a $L_{Amax}$ of 51 dBA. For reference, the five minute period immediately following the dog bark test (where no dogs were barking) had a $L_{Aeq}$ of 46.4 dBA and a $L_{Amax}$ of 52.8 dBA at location 1. This demonstrates that the barking dogs had little to no change to the total sound level measured at location 1 during the test, though the barking is audible.

## Long Term Measurements

Since the ambient sound levels during the day are much higher and the barking test showed sound levels well below the nighttime limit, we are reporting only the nighttime measurements. Given the time of year, insect noise can make up a significant portion of the measured sound levels, particularly at night where other ambient noises are lower. To better reflect the sound level from the source (kennel) we must remove the non-source sounds, such as insects. Removing insect noise from the sound level measurements is accomplished by reporting the ANS-weighted, equivalent-continuous sound level ($L_{Aeq,NS}$) following the industry accepted standard [4].

Table 1 shows the ANS-weighted sound levels that were measured over the course of the 1-week measurement period. While the reported sound levels have been ANS-weighted to remove insect noise, they still may contain other ambient sounds such as wind, rain, vehicles, and anything else that might be present in the environment. Over the course of the entire week long measurement period, each location had very few 5-minute measurement periods that exceeded the 55 dBA limit (1 at Location 1, 4 at Location 2, out of a total of 756 5-minute periods). Typical ANS-weighted sound levels were in the low 30 dBA range, well below the 55 dBA nighttime limit. We cannot say with any certainty what caused the handful of exceedances, just that they were rare.

[4] ANSI/ASA S12.100, Methods to Define and measure the Residual Sound in Protected Natural and Quiet Residential Areas.

Table 1: Nighttime (10PM – 7AM) Sound Level Measurement Results

| Starting Timeframe | Measurement Location 1 Eastern Side Facing Kennel | | | Measurement Location 2 Northern Side Around Corner From Kennel | | |
|---|---|---|---|---|---|---|
| | Typical 5-min $L_{Aeq,NS}$ | Maximum 5-min $L_{Aeq,NS}$ | Number of 5-min Periods Above 55 dBA | Typical 5-min $L_{Aeq,NS}$ | Maximum 5-min $L_{Aeq,NS}$ | Number of 5-min Periods Above 55 dBA |
| Mon Sep 21 | 31.0 | 54.9 | 0 | 32.7 | 60.8 | 1 |
| Tue Sep 21 | 32.3 | 44.7 | 0 | 34.3 | 51.5 | 0 |
| Wed Sep 21 | 31.7 | 56.2 | 1 | 33.2 | 57.1 | 2 |
| Thu Sep 21 | 30.7 | 53.0 | 0 | 32.6 | 53.9 | 0 |
| Fri Sep 21 | 28.4 | 46.6 | 0 | 29.3 | 39.5 | 0 |
| Sat Sep 21 | 29.2 | 40.3 | 0 | 32.1 | 41.0 | 0 |
| Sun Sep 21 | 30.4 | 49.8 | 0 | 33.0 | 60.6 | 1 |
| Median Daily | 30.7 | 49.8 | Total of 1 out of 756 | 32.7 | 53.9 | Total of 4 out of 756 |

## SOUND ISOLATION REVIEW

Given what we know about the specified building construction and what was observed onsite, we can estimate how much sound isolation the building assemblies may provide. Sound isolation performance is typically given in terms of a Sound Transmission Class (STC) rating that characterizes the ability of a given assembly to block sound in the human vocal range, with higher STC ratings providing higher performance.

We expect the exterior wall construction of solid concrete with rigid insulation and stucco to provide sound isolation performance greater than STC 55. We expect the interior gypsum ceiling and traditional roof construction will provide sound isolation performance near STC 45, not accounting for potential flanking through soffit vents or HVAC ductwork. We expect the exterior windows, roughly 1" IGU, in the indoor kennel will provide sound isolation performance around STC 25 – 30. Clearly the windows are the weakest performing element in your façade construction and should be the target of any potential improvements.

## CONCLUSION

Based on these measurement results, we do not expect you will have trouble meeting the nighttime noise ordinance. However, a different population of dogs in the kennel may have a different impact on the resulting sound level. If you find that further mitigation measures become necessary, we are available to provide you with recommendations for any desired improvements as an additional service.

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I hope this report provides you with the information that you need at this time. If you have any questions, please feel free to contact me at byoder@acentech.com or 434.218.0759.

Sincerely,

Acentech Incorporated

Bill Yoder
Senior Staff Scientist