Kimley»Horn

October 23, 2020

Identify acoustic or traffic engineer prepared this report?

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Subject: ***Meadowbrook Park Noise Analysis***
Colorado Springs, CO

Executive Summary

The purpose of this technical memorandum is to summarize the evaluated noise levels surrounding the proposed Meadowbrook Park development in Colorado Springs, CO. The proposed development is approximately 2 miles north of the Colorado Springs Airport and approximately 7 miles east of Downtown Colorado Springs. The site is located immediately west of US 24 and north of Meadowbrook Parkway. The site is surrounded by undeveloped land to the east, residential land uses to the west, and commercial uses to the north and south. The location of the proposed development is shown in **Figure 1**.

Analysis Findings

- *Traffic noise levels from the surrounding roadway network are not anticipated to impact the proposed residences within the Meadowbrook Park development. Noise walls are not recommended.*

Project Description

This noise assessment was conducted to study and analyze the existing noise environment and determine the anticipated noise levels at the proposed Meadowbrook Park residential development. This memorandum describes the proposed development, provides general information on noise, outlines the methodologies and procedures for the analysis, and evaluates existing and anticipated future noise levels from the surrounding roadway network.

The proposed development will consist of approximately 70 single-family dwelling units.

Figure 1: Site Location and Vicinity

Characteristics of Noise

Noise is generally defined as unwanted sound. It is emitted from many natural and man-made sources. Sound pressure levels are usually measured and expressed in decibels (dB). The decibel scale is logarithmic and expresses the ratio of the sound pressure unit being measured to a standard reference level. Most sounds occurring in the environment do not consist of a single frequency, but rather a broad band of differing frequencies. The intensities of each frequency add together to generate sound. Because the human ear does not respond to all frequencies equally, the method commonly used to quantify environmental noise consists of evaluating all of the frequencies of a sound according to a weighting system. It has been found that the A-weighted decibel [dB(A)] filter on a sound level meter, which includes circuits to differentially measure selected audible frequencies, best approximates the frequency response of the human ear.

The degree of disturbance from exposure to unwanted sound – noise – depends upon three factors:

1. The amount, nature, and duration of the intruding noise
2. The relationship between the intruding noise and the existing sound environment; and
3. The situation in which the disturbing noise is heard

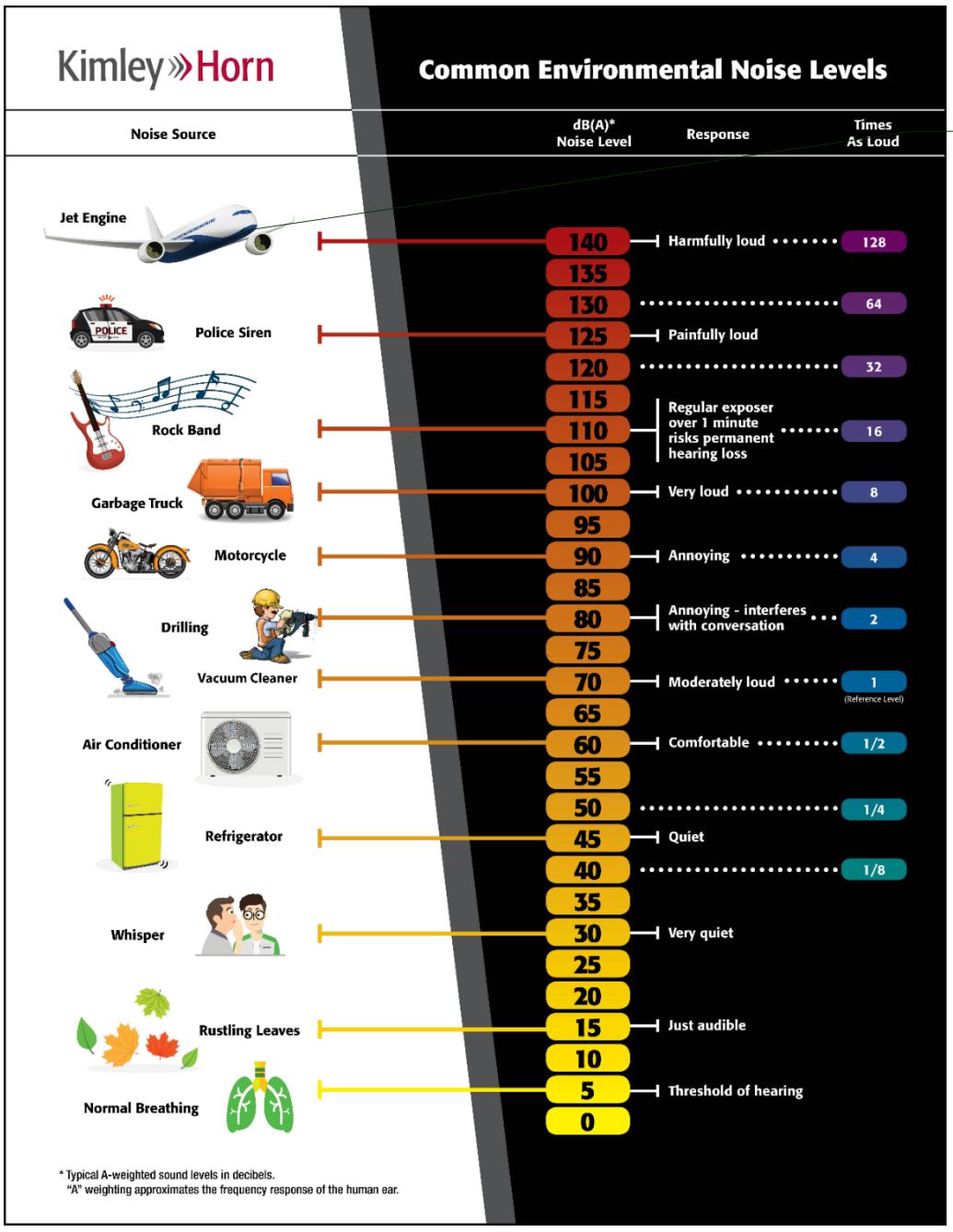
In considering the first of these factors, it is important to note that individuals have varying sensitivity to noise. Loud noises bother some people more than other people, and some individuals become increasingly upset if an unwanted noise persists. The time patterns and durations of noise(s) also affect perception as to whether or not it is offensive. For example, noises that occur during nighttime (sleeping) hours are typically considered to be more offensive than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). A car horn blowing at night when background noise levels are low would generally be more objectionable than one blowing in the afternoon when background noise levels are typically higher. The response to noise stimulus is analogous to the response to turning on an interior light. During the daytime an illuminated bulb simply adds to the ambient light, but when eyes are conditioned to the dark of night, a suddenly illuminated bulb can be temporarily blinding.

The third factor – situational noise – is related to the interference of noise with activities of individuals. In a 60 dB(A) environment such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

As shown in **Figure 2**, most individuals are exposed to fairly high noise levels from many sources on a regular basis. To perceive sounds of greatly varying pressure levels, human hearing has a non-linear sensitivity to sound pressure exposure. Doubling the sound pressure results in a three decibel change in the noise level; however, variations of three decibels [3 dB(A)] or less are commonly considered “barely perceptible” to normal human hearing. A five decibel [5 dB(A)] change is more readily noticeable. A ten-fold increase in the sound pressure level correlates to a 10 decibel [10 dB(A)] noise level increase; however, it is judged by most people as only sounding “twice as loud”.

Figure 2: Common Noise Levels



Site is just outside of the airport crash zone, but you didnt address airplane noise and why you have a requirement to reduce interior noise to 30db on PUD??

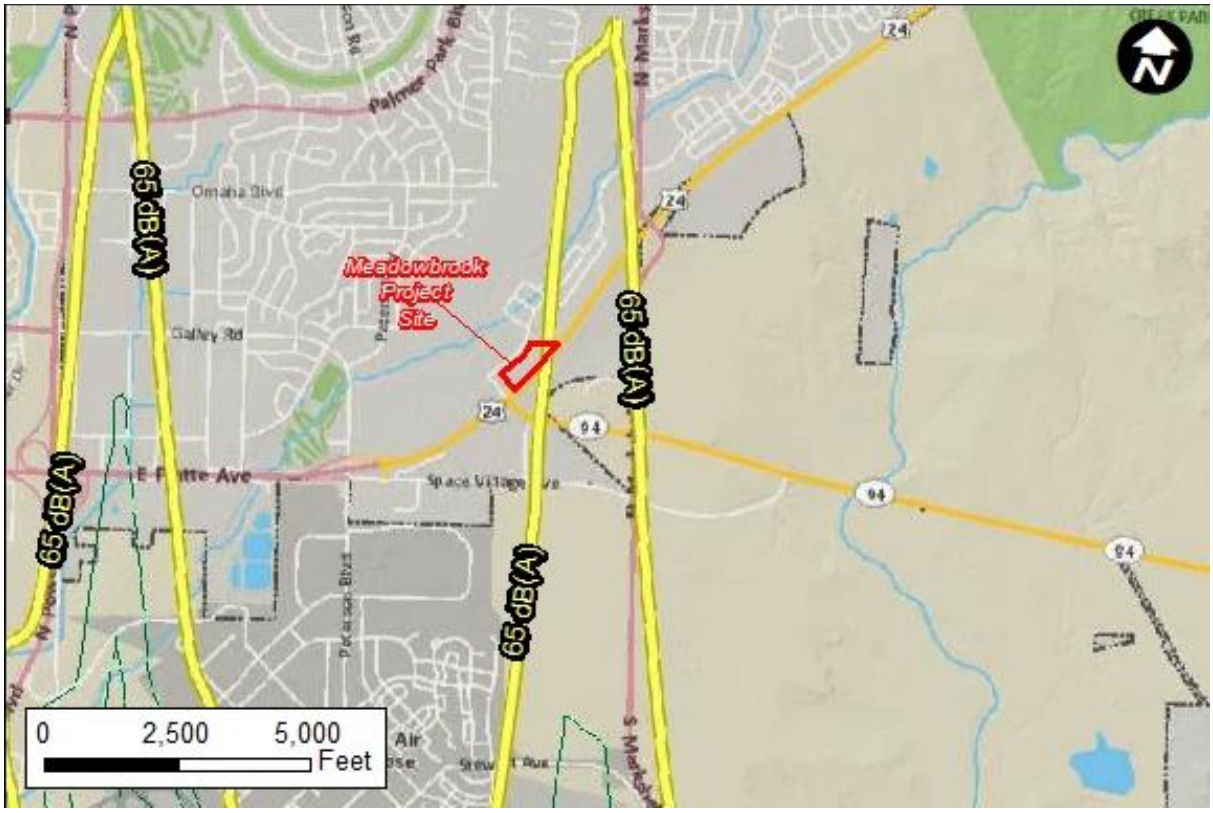
Over time, individuals tend to accept the noises that intrude into their lives on a regular basis. However, exposure to prolonged and/or extremely loud noise(s) can prevent use of exterior and interior spaces and has been theorized to pose health risks.

Existing Conditions

The site is located north of the intersection of US 24 and Meadowbrook Parkway. The site is surrounded by undeveloped land to the east, residential land uses located to the west, and commercial uses to the north and south of the site.

The predominant sources of noise in the vicinity of the proposed Meadowbrook Park development are the traffic noise along US 24 and Meadowbrook Parkway as well as operational activity at nearby commercial/industrial facilities. Other sources of noise also include ambient environmental noise, which includes wind, birds chirping, insects, household appliances, lawn mowers, etc. The proposed development is approximately 2 miles north of the Colorado Springs Airport; therefore, overhead airplane noise is likely to occur on a frequent basis. Also, according to the published noise level contours for the Colorado Springs Airport, the proposed Meadowbrook Park development falls partially within the 65 dB(A) noise band shown in **Figure 3**.

Figure 3. Colorado Springs Airport Noise Contours



To assess existing noise conditions at the site, noise measurements were taken on September 28, 2020 and September 29, 2020. A Larson Davis LxT Type I Precision Integrating Sound Level Meter was set up at one long-term noise monitoring location and a Norsonic NOR140 Type I Precision Integrating Sound Level Meter was set up at four short-term noise monitoring locations. Long-term noise measurement hourly Leq values obtained in the field ranged between 49 dB(A) and 63 dB(A). The noise field data of each monitoring site is shown in **Table 1**.

Where are the studys from peak hours? Mind you this is during Covid...

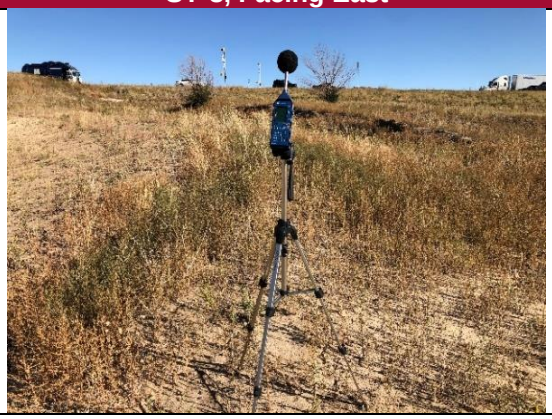
Table 1. Noise Measurement Data

Setup	Measurement Time	L_{eq} Noise Level [dB(A)]	Maximum 1-min L_{eq} Noise Level [dB(A)]
LT-1	September 28, 1:00 PM – September 29, 1:00 PM	58.3	81.7
ST-5	September 29, 2:26 PM – 2:56 PM	61.0	80.8
ST-6	September 29, 3:07 PM – 3:37 PM	59.1	70.3
ST-7	September 29, 3:39 PM – 4:09 PM	58.4	67.5
ST-8	September 29, 4:11 PM – 4:41 PM	62.3	70.0

The measurements were taken using the A-weighted scale and are reported in decibels [dB(A)]. Data collected by the noise meters included time, average noise level (Leq), maximum noise level (Lmax), and instantaneous peak noise level (Lpk) for each interval. Hourly average noise levels (Leq(h)) were derived from the Leq values. The existing noise measurements were collected under meteorologically acceptable conditions and were conducted based on the acceptable collection of existing noise level readings. Pictures of each field monitoring setup are shown in **Table 2** and the locations of the monitoring sites are shown in **Figure 4**.

The Federal Highway Administration (FHWA) has developed the Noise Abatement Criteria (NAC) for determining traffic noise impacts for a variety of land uses in accordance with *Title 23 Code of Federal Regulations (CFR), Part 772 (23 CFR 772): Procedures for Abatement of Highway Traffic Noise and Construction Noise* (July 13, 2010). This assessment utilized the guidelines contained in *23 CFR 772* and the current Colorado Department of Transportation (CDOT) *Noise Analysis and Abatement Guidelines* (January 15, 2015) in order to be consistent with standard methodologies.

Table 2. Noise Measurement Setup Pictures

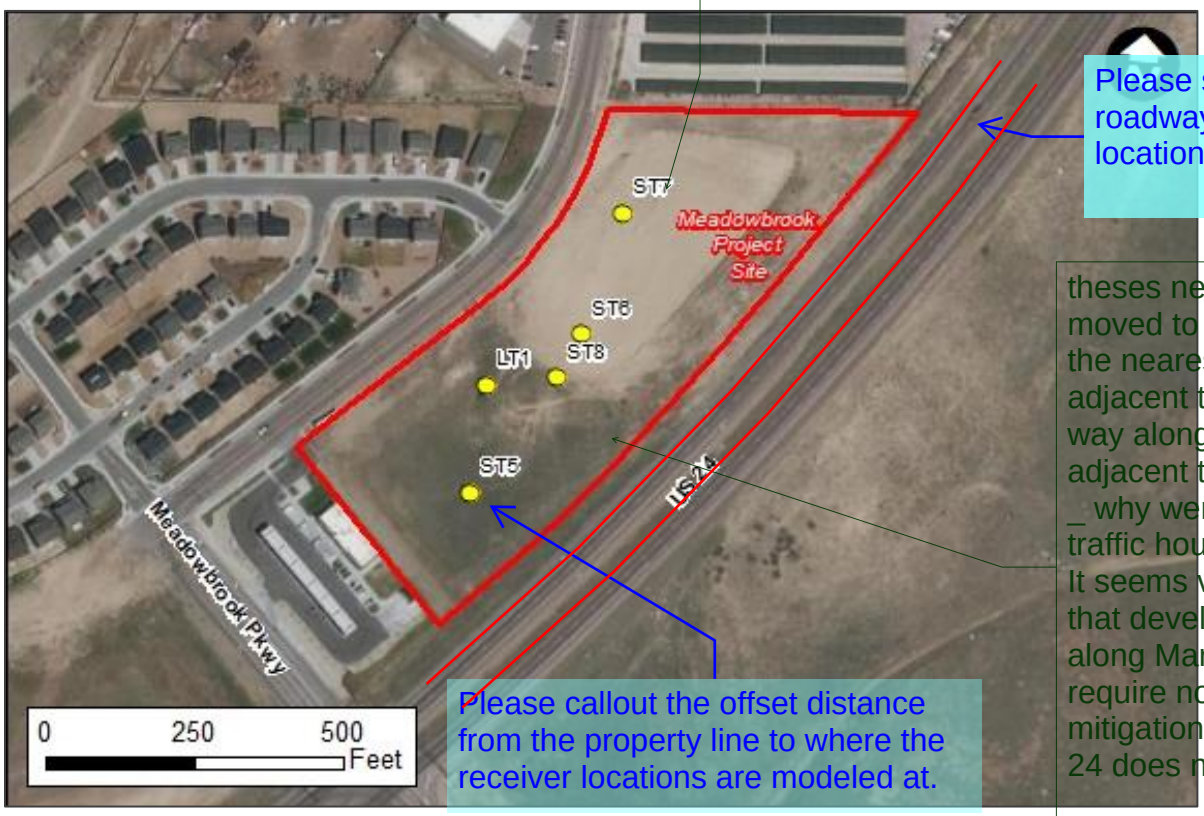
LT-1, Facing East	ST-5, Facing South
	
ST-6, Facing East	**ST-7, Facing East**
	
ST-8, Facing East	
	

include the input and output data of your noise study.

5 stations, in the center of the site for 70 single family lots is not typical for the engineered noise studys we receive.

typical studies we receive indicate receiver location at most of the lots along the critical roadway

Figure 4: Measurement Site Locations



Please show the roadway model location.

theses need to be moved to the edge of the nearest lots adjacent to the high way along the lots adjacent to highway _ why were peak traffic hours avoided? It seems very odd that developments along Marksheffel require noise mitigation and HWY 24 does not.

Please callout the offset distance from the property line to where the receiver locations are modeled at.

The NAC, listed in **Table 3** for various activities, represent the upper limit of acceptable traffic noise conditions and also a balancing of that which may be desirable with that which may be achievable. The NAC applies to areas having frequent human use but does not apply to the entire tract of land on which the activity is based, only to that portion where the activity takes place. The NAC is given in terms of the hourly, A-weighted, equivalent sound level in decibels [dB(A)]. The A-weighted sound level is a single number measure of sound intensity with weighted frequency characteristics that correspond to human subjective response to noise. However, since most environmental noise fluctuates from moment to moment, it is common practice to condense all this information into a single number called the equivalent sound level (L_{eq}). The L_{eq} is the value of a steady sound level that would represent the same sound energy as the actual time-varying sound evaluated over the same time period. L_{eq} is typically evaluated over a one-hour time period and is denoted as $L_{eq(h)}$. The noise impact assessment was made using the criteria in **Table 3**.

Table 3. Noise Abatement Criteria

Activity Category	Activity Criteria[1] $L_{eq(h)}$[2] dB(A)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[3]	67	Exterior	Residential
C[3]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(f) sites, schools, television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[3]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	-	-	Undeveloped lands that are not permitted

1. *The $L_{eq(h)}$ Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.*
2. *The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq(h)}$ being the hourly value of L_{eq}.*
3. *Includes undeveloped lands permitted for this activity category.*

OUR ECM does require to meet Federal 66 DB requires mitigation.

It is important to note that these criteria do not apply to the proposed Meadowbrook Park development but are offered as a frame of reference for how traffic noise is considered for federally funded projects considering noise impacts to an area. Also, the information in the CDOT *Noise Analysis and Abatement Guidelines* was used for reference purposes only, being that the proposed development is not required to meet federal and state traffic noise guidelines.

Traffic noise impacts are defined as noise levels that 1) "approach" or exceed the FHWA Noise Abatement Criteria (NAC), as shown in **Table 3**, or 2) those that represent a "substantial increase" over existing noise levels. An impact that represents a "substantial increase" is defined as an increase in noise levels of 10 dB(A) or more over the existing noise level (measured or predicted) as a direct result of a proposed roadway project.

Noise Analysis

Noise levels from the surrounding roadway network were evaluated using the Federal Highway Administration (FHWA) Traffic Noise Model version 2.5 (TNM 2.5). This program computes predicted noise levels at noise-sensitive areas through a series of adjustments to reference sound levels. TNM 2.5 also accounts for topography, groundcover type, and intervening structures.

Traffic noise emission is composed of several variables, including the number, types, and travel speeds of the vehicles, as well as the geometry of the roadway(s) on which the vehicles travel. Traffic noise consists of three primary parts: tire noise, engine noise, and exhaust noise. Of these sources, tire noise is typically the most offensive at unimpeded travel speeds. Traffic noise is not constant; it varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receptor. According to the Noise Abatement Criteria impact thresholds shown in **Table 3**, existing traffic noise impacts occur at residential land uses when a noise level of 67 dB(A) is approached [within 1 dB(A)] or exceeded.

The “worst” traffic noise condition is evaluated as the lesser of the design hourly volume (DHV) or the roadway vehicle capacity Level of Service “C” (LOS C) operating at the design speed. The FHWA TNM was used to evaluate highway traffic-related noise conditions at the proposed development. Existing year traffic volumes obtained from the *Crossroads-Meadowbrook – Traffic Impact Study (August 2020)* were used to assess the existing traffic noise conditions. The calculated existing noise levels throughout the property without the proposed development are shown in **Figure 5**.

Build year 2040 design hourly volumes obtained from the *Traffic Impact Study* completed for the proposed development were used to assess the anticipated future traffic noise impacts. Future traffic noise levels are predicted to impact the property to approximately 100 feet from the edge of US 24 which encompasses the first row of units in the proposed development. The anticipated future noise levels throughout the property are shown in **Figure 6**.

Noise Mitigation Measures

The El Paso County Land Development Code specifies design considerations for noise in Chapter 8, Section 8.4, part 2. The code states the County’s desire that “divisions of land shall be designed to minimize impacts of noise pollution to residents.” In subpart 8.4.2.b.i. several forms of noise mitigation are listed for consideration where noise levels are predicted to exceed 67 dB(A):

- Increased building setbacks;
- Modified site orientation for buildings and outdoor areas;
- Landscape buffers or tracts;
- Noise easement;
- Soil berming; or
- Noise barrier

No traffic noise impacts are expected on this site. However, a portion of the site is located within the 65 dB(A) noise contour for the Colorado Springs Airport. Residential units should be constructed with sound mitigation techniques that result in lowered interior noise levels. Some options may include

double-paned windows, thicker drywall or insulation, or other standard noise-reducing techniques. No additional noise mitigation is required or recommended.

Conclusions

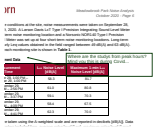
This assessment analyzed the potential noise levels at the proposed Meadowbrook Park residential development associated with the surrounding roadway network. It was determined that traffic related noise from the adjacent roadways is anticipated to be the main source of noise throughout the site. However, no traffic noise impacts are expected on this site. A portion of the site is located within the 65 dB(A) noise contour for the Colorado Springs Airport. Residential units should be constructed with sound mitigation techniques that result in lowered interior noise levels. No additional noise mitigation is required or recommended for the site.

Figure 5: Existing Noise Levels

Figure 6 Build Noise Levels

Noise V_1 redlines planning.pdf Markup Summary 12-15-2020

dsdparsons (7)



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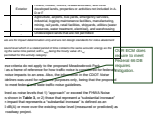

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OUR ECM does require to meet Federal 66 DB requires mitigation.

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Please redo the test sites and locate at the nearest lots along Highway...

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theses need to be moved to the edge of the nearest lots adjacent to the high way along the lots adjacent to highway _ why were peak traffic hours avoided? It seems very odd that developments along Marksheffel require noise mitigation and HWY 24 does not.

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Identify acoustic or traffic engineer prepared this report?

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Site is just outside of the airport crash zone, but you didnt address airplane noise and why you have a requirement to reduce interior noise to 30db on PUD??

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Daniel Torres (6)

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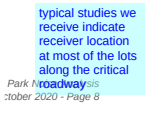

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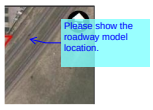

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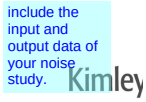
Please show the roadway model location.



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include the input and output data of your noise study.

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Please callout the offset distance from the property line to where the receiver locations are modeled at.