FINAL ACOUSTICAL REPORT

A-TOWN METRO MASTER LAND USE PLAN PROJECT – PARCEL E

CITY OF ANAHEIM, CALIFORNIA

LSA

March 2021

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CITY OF ANAHEIM, CALIFORNIA

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LSA

March 2021

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LIST OF ABBREVIATIONS AND ACRONYMS

City	City of Anaheim
CNEL	Community Noise Equivalent Level
dB	decibel(s)
dBA	A-weighted decibel(s)
FAR	final acoustical report
FHWA	Federal Highway Administration
ft	foot/feet
I-5	Interstate 5
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous noise level
MM	Mitigation Measure
MMP	Mitigation Monitoring Plan
sf	square foot/square feet
STC	Sound Transmission Class

INTRODUCTION

This final acoustical report (FAR) has been prepared to evaluate the potential noise impacts and project features associated with the A-Town Metro Master Land-Use Plan Project – Parcel E (proposed project) in Anaheim, California. The FAR is a requirement of the *Mitigation Monitoring Plan No. 231 (MMP) for Lennar's "A-Town Metro" Project – Amended Master Land Use Plan* (August 2015). Specifically, this analysis will satisfy Mitigation Measure (MM) No. 5-2.

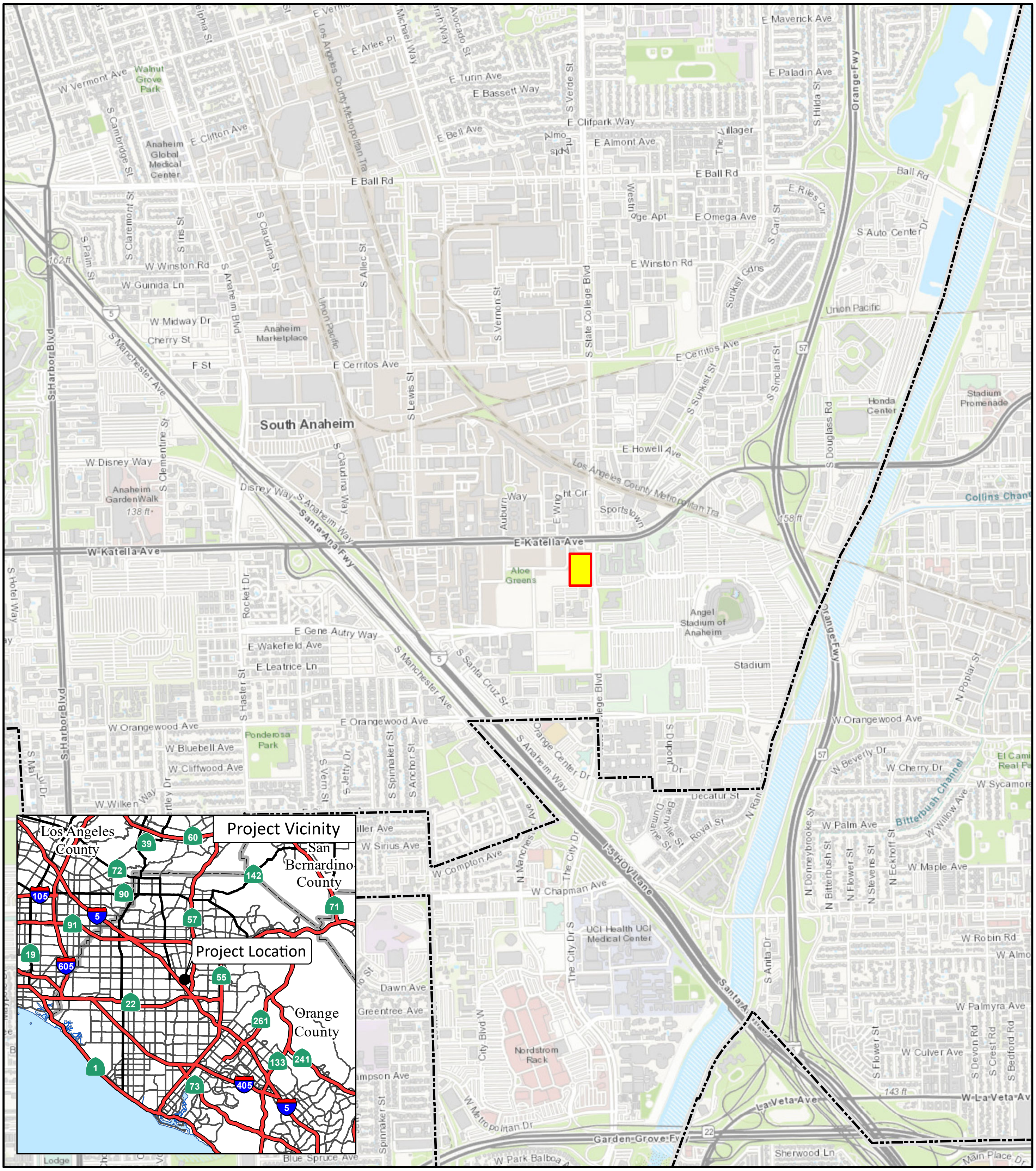
Project Description and Location

The proposed project is located west of South State College Boulevard between East Katella Avenue and East Gene Autry Way in the City of Anaheim, California and will consist of 265 residential units, also referred to as flats, in within a single building that would be three (3) stories tall.

The regional location is illustrated on Figure 1, and the site plan is illustrated on Figure 2.

Mitigation Monitoring Plan Requirements

As stated above, the analysis intends to satisfy the requirements of MM No. 5-2. MM No. 5-2 requires interior noise levels of 45 dBA CNEL or less; and maximum noise levels from stadium event noise and train horns of less than 81 dBA L_{max}.



LSA

LEGEND

Project Site

City Boundary

FIGURE 1

N

0 1000 2000
FEET

A-Town Metro Master Land Use Plan Project - Parcel E

Project Location

SOURCE: ArcGIS Online Topographic Map (2020)

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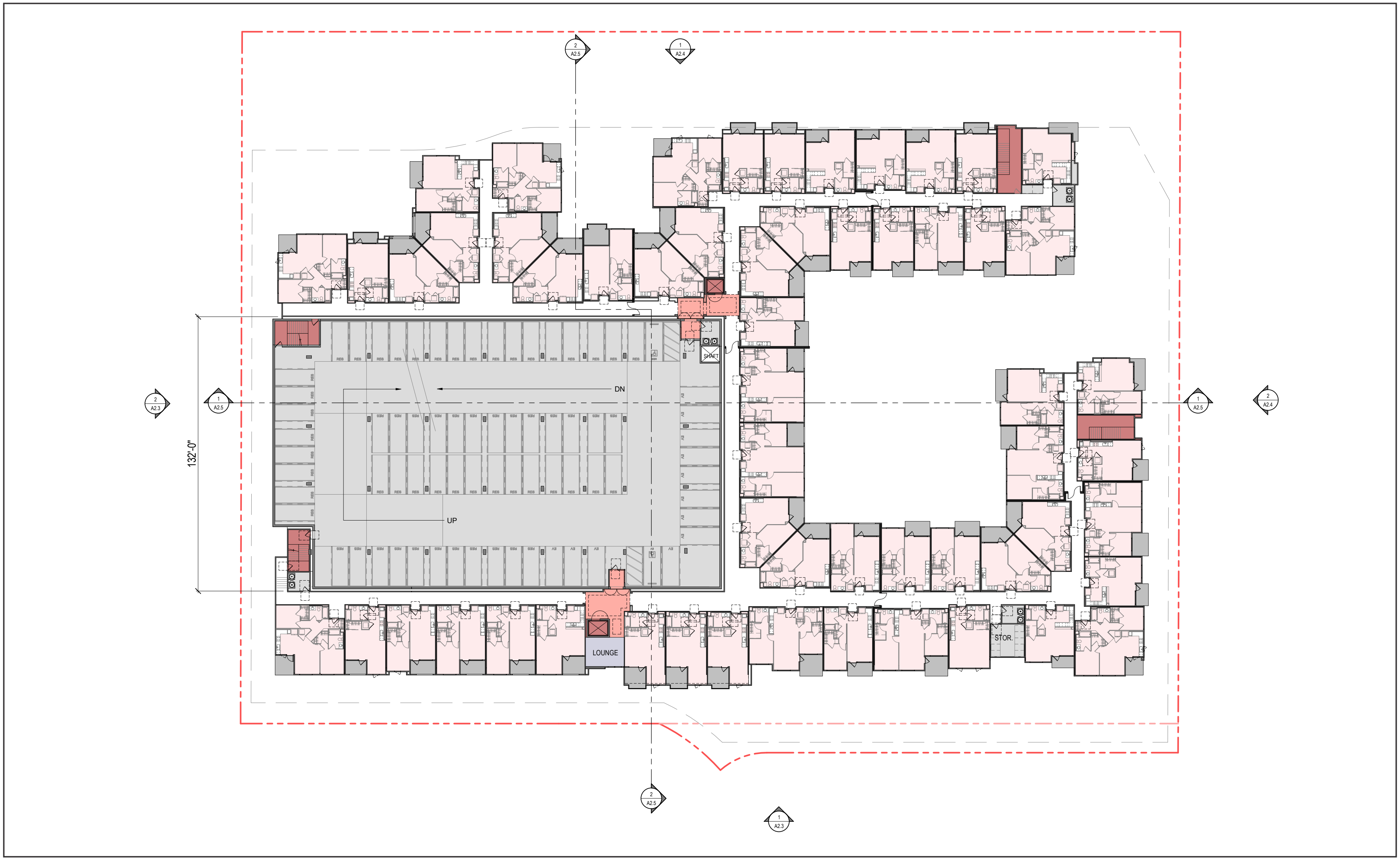

FIGURE 2

0 35 70
FEET

SOURCE: KTGY Architecture & Engineering

A-Town Metro Master Land Use Plan Project - Parcel E

Site Plan - Typical Floor

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CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units (e.g., inches or pounds), decibels are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 decibels (dB) is 10 times more intense than 1 dB, 20 dB is 100 times more intense than 1 dB, and 30 dB is 1,000 times more intense than 1 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 1 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single-point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations) the sound decreases 3 dB for each doubling of distance in a hard site environment. Similarly, line sources with intervening absorptive vegetation or line sources that are located at a great distance to the receptor would decrease 4.5 dB for each doubling of distance, which is consistent with information provided in the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA RD-77-108).

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and

Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours), and a 10 dBA weighting factor applied to noises occurring from 10:00 PM to 7:00 AM (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the CNEL noise scale for long-term noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. L_{max} is often used together with another noise scale or noise standards in terms of percentile noise levels in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level (i.e., half the time the noise level exceeds this level, and half the time it is less than this level). The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

The human perception of noise level increases can be described in three categories:

- **Inaudible/Not Perceptible:** Changes in noise levels of less than 1 dB are inaudible to the human ear and often referred to as not perceptible.

- **Potentially Audible/Barely Perceptible:** A potentially audible impact refers to a 1 to 3 dB change in noise levels. This range of noise levels has been found to be noticeable in low-noise environments.

- **Audible/Readily Perceptible:** An audible impact refers to a noticeable increase in noise for humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be readily perceptible in exterior environments. For reference, a 10 dB increase is experienced by humans as a doubling of sound or perceived to be twice as loud.

Only readily perceptible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Exposure to prolonged high noise levels has been found to have effects on human health (Suter 1991; World Health Organization 1999), including physiological and psychological effects to humans. Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of

75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear (the threshold of pain). A sound level of 160 to 165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and is generally more concentrated in urban areas than in outlying, less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter deemphasizes the very low- and very high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted, unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 PM to 10:00 PM and after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time; usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	—
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2017).

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are transportation facilities. Traffic on South State College Boulevard, East Katella Avenue, Interstate-5 (I-5), and other adjacent roadways is a steady source of ambient noise. Construction noise in the project vicinity was also observed. Lastly, the project site is located between two event and entertainment centers that have regular firework shows during typical, non-pandemic conditions. Disneyland, located approximately 1.8 miles northwest of the project site, has nightly firework shows around 9:30 p.m. Located 0.45 miles to the east of the project site, Angel Stadium has a firework show at the end of Saturday night baseball games which occur March through September. It is also possible that other events at Angel Stadium throughout the year may have firework shows, but those are not regularly scheduled.

Existing Long-Term Measurements

In order to assess the existing noise conditions in the area, noise measurements were conducted on the project site. Two (2) long-term 48-hour measurements were taken from February 22nd through 24th, 2021. Based on field observations, the dominate noise sources in the project area were traffic from the surrounding roadways, activities at the gas station to the north and the utility use to the south, as well as construction noise during daytime hours west of the project site. The results of the measurements show that the highest daily noise level at the northern property line of project site adjacent to the gas station is 70.4 dBA CNEL and the highest daily noise level at the southern property line of project site adjacent to the utility use is 67.2 dBA CNEL for existing conditions. Figure 3 shows the locations of the noise measurements, and the results are summarized in Table C. Measurement data and field survey sheets are provided in Appendix A.

Table C: Existing Noise Level Measurements – Long Term

Location	Description	Date	Daytime Noise Levels[1] (dBA L_{eq})	Nighttime Noise Levels[2] (dBA L_{eq})	Daily Noise Levels (dBA CNEL)	Highest Daily Noise Level (dBA CNEL)
LT-1	Near the southwest corner of the project, on a light pole above the top of the property wall.	2/22/2021	56.2-60.7	54.3-58.0	60.5	67.2
		2/23/2021	54.1-59.8	51.1-60.7	63.4	
		2/24/2021	57.9-61.5	51.6-62.7	67.2	
LT-2	On the northern edge of the project, on a light pole at property line.	2/22/2021	62.3-65.0	58.5-61.9	65.6	70.4
		2/23/2021	62.1-64.6	55.1-64.0	67.5	
		2/24/2021	64.8-64.9	55.6-65.4	70.4	

Source: Compiled by LSA (2021).
1 Daytime Noise Levels = noise levels during the hours from 7:00 AM to 10:00 PM.
2 Nighttime Noise Levels = noise levels during the hours from 10:00 PM to 7:00 AM.
3 Daily noise level taken from data that was not heavily influenced by construction noise.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level
CNEL = Community Noise Equivalent Level

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LEGEND

- Project Site Boundary
ST-1 - Short-term Noise Monitoring Location
LT-1 - Long-term Noise Monitoring Location

0 200 400
FEET

SOURCE: Google Earth (2020)

FIGURE 3

A-Town Metro Master Land Use Plan Project
- Parcel E

Noise Monitoring Locations

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Short-Term Fireworks Reference Noise Measurements

In addition to the long-term noise measurements that captured typical daily noise levels, short-term noise measurements were taken near the project site during firework shows at both Disneyland and Angel Stadium. Due to COVID-19, measurements conducted in 2018 were used and then attenuated for distance to the project site. The first short-term measurement, ST-1A, was taken to measure and compare the ambient noise prior to fireworks to the levels measured during fireworks. ST-1B presents the noise levels measured during the Disneyland fireworks, and ST1-C presents the noise levels measured from activities at Angel Stadium. Figure 3 shows the locations of the noise measurements, and the results are summarized in Table D. Measurement data and field survey sheets are provided in Appendix A.

Table D: Noise Level Measurements During Fireworks

Location	Scenario	Time	Average Noise Level (dBA L_{eq})	Maximum Noise Level (dBA L_{max})
ST-1	A – Measurement prior to fireworks	9:21 p.m. – 9:30 p.m.	53.3	80.2
	B – Measurement during Disneyland fireworks	9:31 p.m. – 9:38 p.m.	61.7	87.0
	C – Measurement during Angel Stadium fireworks	9:38 p.m. – 9:47 p.m.	77.4	96.7

Source: Compiled by LSA (August 25, 2018).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level
L_{max} =maximum noise level

Train Horn Noise Impacts

The nearest at-grade crossing to the project site is located approximately 1,150 feet to the northeast. The *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) identifies a maximum noise level of 110 dBA L_{max} at a distance of 50 feet. Utilizing the following equation, train horn noise levels can be estimated at 82.8 dBA Lmax at the project site.

$$Lmax\ (at\ distance\ X) = Lmax\ (at\ 50\ ft.) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

Existing Aircraft Noise

Airport-related noise levels are primarily associated with aircraft engine noise made while aircraft are taking off, landing, or running their engines while still on the ground. The closest airport to the project site is the Orange County - John Wayne International Airport, approximately 8.8 miles to the south. While periodic aircraft flyovers may be audible at the project site, no portion of the project site lies within the 65 dBA CNEL noise contours of an airport plan.

METHODOLOGY AND LOCAL NOISE STANDARDS

Potential noise impacts for the proposed project are associated with long-term transportation noise from the surrounding roadways and firework shows at Disneyland and Angel Stadium. An analysis of potential long-term noise impacts, as compared to the City's pertinent standards, associated with off-site noise sources using noise monitoring results gathered August 25, 2018 and February 22-24, 2021, was completed.

Applicable Noise Standards

As stated above, the analysis intends to satisfy the requirements of Mitigation Measure (MM) No. 5-2. The specific requirements of MM No. 5-2 are as follows:

Prior to issuance of a building permit, the project property owner/developers shall submit a final acoustical report prepared to the satisfaction of the Planning Director. The report shall show that the development will be sound-attenuated against present and projected noise levels, including roadway, aircraft, helicopter, stationary sources (e.g., industrial, commercial, stadium, etc.), and railroad, to meet City interior noise standards as follows:

a. The report shall demonstrate that the proposed residential design will result in compliance with the 45 dBA CNEL interior noise levels, as required by the California Building Code and California Noise Insulation Standards (Title 24 and 25 of the California Code of Regulations).

b. The report shall demonstrate that the Proposed Project residential design shall minimize nighttime awakening from stadium event noise and train horns such that interior single-event noise levels are below 81 dBA Lmax. The property owner/developer shall submit the noise mitigation report to the Planning Director for review and approval. Upon approval by the City, the project acoustical design features shall be incorporated into construction of the Proposed Project.

LONG-TERM ON-SITE NOISE IMPACTS

The proposed project is located in an area in which most surrounding parcels are currently in use. More specifically, the uses to the north and south of the proposed project have the potential to impact future residential uses. At the existing utility property to the south of the project site, impact from activities such as car doors opening and closing as well as materials being loaded on and off of trucks on the northwest portion of the parking lot can generate elevated noise levels. These effects were captured at noise monitoring location LT-1. At the existing gas station to the north of the project site, impact from activities such as car doors opening and closing as well as truck deliveries can generate elevated noise levels. These effects were captured at noise monitoring location LT-2.

Due to the variety of sources, future traffic noise levels were taken from *The Revised Platinum Triangle Expansion Project Subsequent Environmental Impact Report No. 339* (The Planning Center 2010) to assess noise levels at the western façade of the proposed project. For Year 2030 conditions, traffic noise levels along State College Boulevard from Gene Autry Way to Katella Avenue would be

75.8 dBA CNEL at 50 feet. The future noise levels can then be adjusted for distance to the nearest façade using the following equation:

$$CNEL\ (at\ facade) = CNEL\ (at\ 50\ feet) - 10 * \log_{10}\left(\frac{Facade\ Dist.}{50\ feet}\right)$$

Based on reference level of 75.8 dBA CNEL, the exterior noise level at the western façade will be 73.5 dBA CNEL. Based on noise monitoring results shown in Table C, noise levels at the northern façade of the project will approach 71 dBA CNEL and noise levels at the southwestern corner of the project would approach 68 dBA CNEL.

INTERIOR NOISE ASSESSMENT

Based on the EPA's *Protective Noise Levels* (EPA 1978), with windows and doors open, interior noise levels would be 61.5 dBA (i.e., 73.5 dBA - 12 dBA = 61.5 dBA), which would exceed the 45 dBA CNEL interior noise standard. Therefore, the interior noise assessment assumes a windows-and-doors-closed condition, which would require mechanical ventilation (e.g., air conditioning) for all residential units so that windows and doors can remain closed to maintain the interior noise standard.

Using the unit plans for the proposed project (ktgy 2021), LSA conducted interior noise calculations for the bedrooms and living rooms for each unit type, including a standard 6 foot-by-6-foot window in each room with typical stucco construction.

At this time, the specific window supplier has yet to be chosen; therefore, this information references VPI Windows for comparison purposes. Based on research completed by LSA, most window manufacturers, including VPI, currently produce windows with a minimum STC ratings of 28. For the purposes of this analysis, this rating is assumed to be standard. With the wall construction provided above, a noise level reduction of approximately 25 dBA is assumed.

Interior CNEL Assessment

Under normal conditions, the environment is dominated by traffic noise on the surrounding roadways and neighboring uses in the area. As specified in MM No 5-2 (a), the project must demonstrate compliance with the interior noise standard of 45 dBA CNEL which would require a noise reduction of 28.5 dBA CNEL at the façades closest to State College Boulevard.

For the sensitive living rooms and bedrooms at the northern façade, the results of the analysis show a 29 dBA exterior-to-interior noise reduction with upgraded windows. These calculations (shown in Appendix B) assume a wall rating of Sound Transmission Class (STC) 46 (Harris 1997) along with a window rating of STC-31 (VPI 2007). With windows closed, interior noise levels at the bedrooms would be 44.5 dBA (i.e., 73.5 dBA – 29 dBA = 44.5 dBA), which is below the 45 dBA CNEL interior noise standard with windows closed for noise-sensitive land uses. For all units along the northern and southern façades, due to the nature of the adjacent uses, it is recommended that windows with STC-31 be installed. For all units along the western façade, windows with a minimum STC rating of 28 would reduce noise levels to less than 45 dBA CNEL.

Therefore, with standard building construction, central air conditioning that would allow windows to remain closed, and windows with a minimum STC rating of 28 or higher at the western façade and windows with a minimum STC rating of 31 or higher for the other façades, the interior noise levels would be considered acceptable.

Maximum Noise Level Analysis

As specified in MM No 5-2 (b), the project must demonstrate compliance with the interior noise standard of 81 dBA L_{max} from train horns and stadium events. As described above under the existing conditions section, exterior train horn noise levels can be estimated at 82.8 dBA L_{max} at the project site. Given the exterior noise level is only 1.8 dBA above 81 dBA L_{max}, the interior noise levels will comply even during a windows open condition at the residential uses.

In addition to the loudest source of noise from the Saturday night firework shows at Angel Stadium, fireworks associated with Disneyland would also be audible at the project site. The results of the noise level measurements taken during both firework shows identify maximum noise levels of 87.0 and 96.7 dBA L_{max} from Disneyland and Angel Stadium, respectively. A distance attenuation of -0.2 dBA and 2.6 dBA would adjust the maximum noise levels at the project site to 86.8 and 99.3 dBA L_{max} from Disneyland and Angel Stadium, respectively. For maximum noise levels approaching 100 dBA L_{max}, a reduction of 19 dBA L_{max} would be required. With the incorporation of the windows analyzed above, noise would be reduced by a minimum of 29 dBA to 71 dBA L_{max} and therefore would be below the maximum noise level requirement of 81 dBA L_{max}.

SUMMARY OF RECOMMENDATIONS

Based on the analysis above, the Project Applicant should verify that final design plans reflect the following measures in order for all exterior and interior noise sensitive spaces to comply with the City's noise standards:

- Provide mechanical ventilation systems (e.g., air conditioning) for all units such that windows and doors can remain closed.

- Standard building construction requirements shall consist of wall construction with a minimum rating of STC-46 and upgraded windows and sliding glass doors at the northern, eastern, and southern façades shall meet a minimum STC rating of STC-31 and windows with a minimum STC of 28 for all other windows on the western façade.

REFERENCES

Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment Manual*. September.

Harris, Cyril M., *editor*. 1991. *Handbook of Acoustical Measurements and Noise Control*, Third Edition.

ktgy. 2021. *A-Town Development Area E Unit Plans*. January.

LSA. 2021. *Average Daily Roadway Volumes for A-Town Development Areas B and E*. March.

Suter, Dr. Alice H. 1991. "Noise and Its Effects." Administrative Conference of the United States. November.

The Planning Center. 2010.*The Revised Platinum Triangle Expansion Project Subsequent Environmental Impact Report No. 339*

World Health Organization. 1999. *Guidelines for Community Noise*. Edited by Birgitta Berglund, Thomas Lindvall, and Dietrich H. Schwela. April.

VPI. 2007. Sound Transmission Loss Tests. Various Reports.

APPENDIX A

NOISE SURVEY SHEETS

Noise Measurement Survey – 24 HR

Project Number: LHC2002.01
Project Name: A-Town Parcel B

Test Personnel: Corey Knips
Equipment: Spark 706RC (SN:18907)

Site Number: LT-1 Date: 2/22/2021

Time: From 10:00 a.m. To 10:00 a.m.

Site Location: Southeast of the intersection of Katella Avenue and Westside Drive, on a light pole.

Primary Noise Sources: Traffic on Katella Avenue and light traffic on Westside Drive.

Comments:

Photo:

Noise Measurement Survey – 24 HR

Project Number: LHC2002.01
Project Name: A-Town Parcel B
Test Personnel: Corey Knips
Equipment: Spark 706RC (SN:18908)

Site Number: LT-2 Date: 2/22/2021
Time: From 10:00 a.m. To 10:00 a.m.

Site Location: Northwest of the intersection of Meridian Street and Market Street, on a tree.

Primary Noise Sources: Traffic on Katella Avenue, light traffic on Market Street and Meridian Street, a fountain with running water, and construction noise from the south.

Comments:

Photo:

Noise Measurement Survey

Project Number: PTM1801&PTM1802
Test Personnel: Daniel Kaufman
Project Name: A-Town Parcels G&H
Equipment: Larson Davis 831

Site Number: ST-1A Date: 8/25/2018
Time: From 9:21 p.m To 9:30 p.m

Site Location: East side of the project site. West of Southern California Gas Company 1919 South State College Boulevard and northwest of George T. Hall Company 1605 East Gene Autry Way.

Primary Noise Sources: Traffic on I-5 and Gene Autry Way

Comments: Filtered multiple cars honking 9:25 PM

Adjacent Roadways: Gene Autry Way.

Measurement Results

	dBA
L_{eq}	53.3
L_{max}	80.2
L_{min}	49.0
L_2	55.6
L_8	54.2
L_{25}	53.1
L_{50}	52.4
L_{90}	51.0
L_{99}	50.2

Atmospheric Conditions:

Maximum Wind Velocity (mph)	
Average Wind Velocity (mph)	
Temperature (F)	
Relative Humidity (%)	
Comments:	

Map:

Location Photo:

Noise Measurement Survey

Project Number: PTM1801&PTM1802
Test Personnel: Daniel Kaufman
Project Name: A-Town Parcels G&H
Equipment: Larson Davis 831

Site Number: ST-1B Date: 8/25/2018
Time: From 9:31 p.m To 9:38 p.m

Site Location: East side of the project site. West of Southern California Gas Company 1919 South State College Boulevard and northwest of George T. Hall Company 1605 East Gene Autry Way.

Primary Noise Sources: Fireworks at Disneyland, including echoes. Distant traffic on I-5.

Comments: Occasional car on Gene Autry Way.

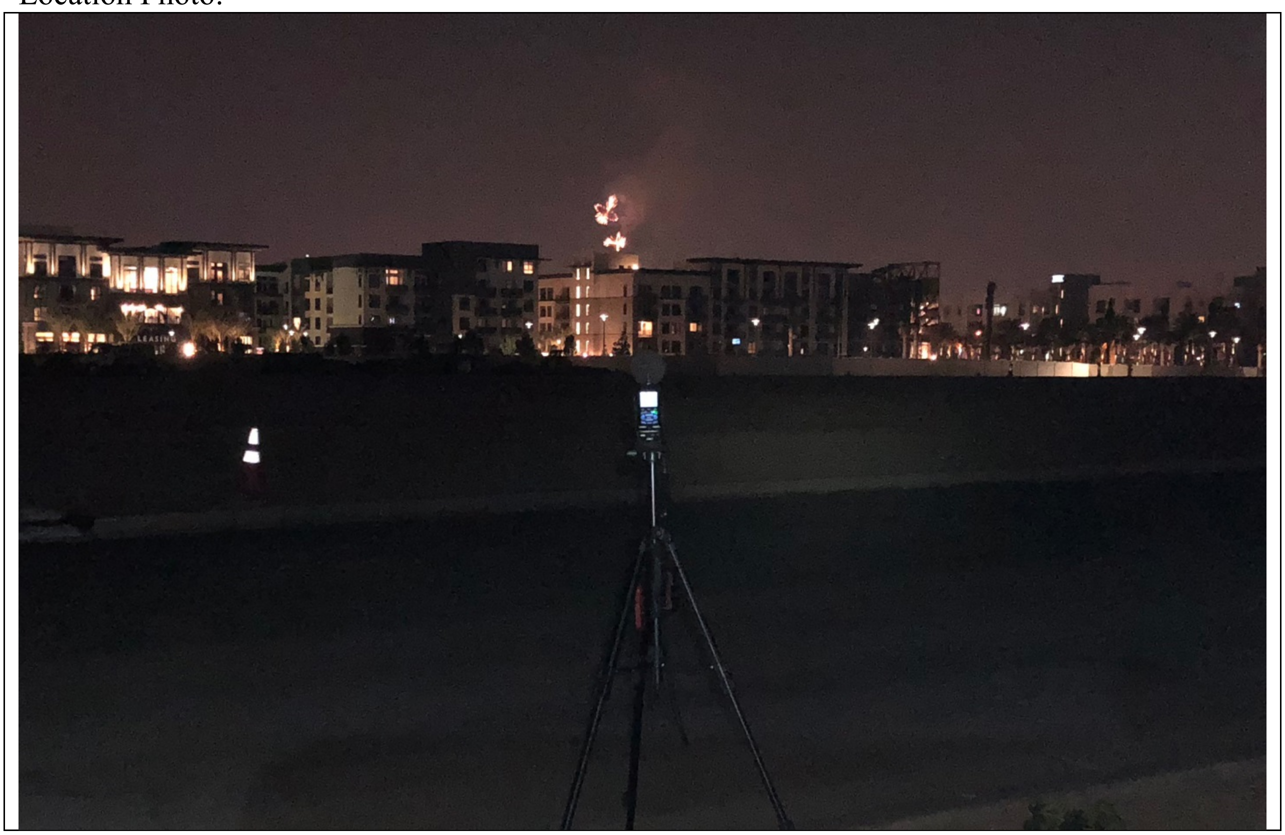
Adjacent Roadways: Gene Autry Way

Measurement Results

	dBA
L_{eq}	61.7
L_{max}	87.0
L_{min}	47.6
L_2	71.6
L_8	64.1
L_{25}	55.8
L_{50}	52.0
L_{90}	49.7
L_{99}	48.5

Map:

Location Photo:



Noise Measurement Survey

Project Number: PTM1801&PTM1802
Test Personnel: Daniel Kaufman
Project Name: A-Town Parcels G&H
Equipment: Larson Davis 831

Site Number: ST-1C Date: 8/25
Time: From 9:38 p.m. To 9:47 p.m.

Site Location: East side of the project site. West of Southern California Gas Company 1919 South State College Boulevard and northwest of George T. Hall Company 1605 East Gene Autry Way.

Primary Noise Sources: Fireworks at Angel Stadium, including echoes.

Comments: Disneyland fireworks, including echoes present as secondary source until approximately 9:43 p.m.

Adjacent Roadways: Gene Autry Way

Measurement Results

	dBA
L_{eq}	77.4
L_{max}	96.7
L_{min}	48.7
L_2	87.6
L_8	81.5
L_{25}	72.1
L_{50}	63.3
L_{90}	52.7
L_{99}	50.1

Atmospheric Conditions:

Maximum Wind Velocity (mph)	1.7
Average Wind Velocity (mph)	5.4
Temperature (F)	70.6
Relative Humidity (%)	76.9
Comments:	

Map:

Location Photo:

APPENDIX B

INTERIOR NOISE CALCULATIONS

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B | *Job Number:* LHC2002.01

Floor Plan: BO | *Analyst:* J.T. Stephens

Room: Bedroom

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	Source	Wall Area	STC	Transmission Loss (dB) by Frequency (Hz) 125	250	500	1000	2000	4000	Fractional Area S/(10^(TL/10)) 125	250	500	1000	2000	4000	dB
Stucco	David Harris p. 371	72.0	46	27	42	44	46	49	54	0.1437	0.0045	0.0029	0.0018	0.0009	0.0003	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		108								0.0030	0.0053	0.0004	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss	10*LOG(1/t)									25.23	22.74	33.50	39.98	39.44	38.69	36.83

(2) Room Effects (Absorption)

Room Surface/ Material	Source	Area	NRC	Absorption Coefficients by Frequency (Hz) 125	250	500	1000	2000	4000	Absorption (Sabins) 125	250	500	1000	2000	4000	
Floor - Carpet	David Harris p. 347	132.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	19.80	22.44	15.84	42.24	68.64	39.60	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	132.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	13.20	10.56	6.60	3.96	3.96	3.96	
Walls - Drywall	David Harris p. 348	414.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	41.40	33.12	20.70	12.42	12.42	12.42	
Totals		678								74.4	66.12	43.14	58.62	85.02	55.98	77.66
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-1.62	-2.13	-3.99	-2.65	-1.04	-2.85	-1.43

(3) Adjustment Factor

	125	250	500	1000	2000	4000	
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	250	500	1000	2000	4000	dBA
(Transmission Loss + Room Effects + Adjustment Factor)	20.61	17.61	26.52	34.33	35.40	32.83	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	36.71	26.21	29.72	34.33	34.20	31.83	
Noise Reduction (dBA)	36.58	26.08	29.59	34.20	34.07	31.71	**33**

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B | *Job Number:* LHC2002.01

Floor Plan: BO | *Analyst:* J.T. Stephens

Room: Living

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)* 125	250	500	1000	2000	4000	*Fractional Area S/(10^(TL/10))* 125	250	500	1000	2000	4000	dB
Stucco	David Harris p. 371	83.3	46	27	42	44	46	49	54	0.1661	0.0053	0.0033	0.0021	0.0010	0.0003	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		119.25								0.0029	0.0048	0.0004	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										25.37	23.16	33.90	40.30	39.82	39.10	37.19

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)* 125	250	500	1000	2000	4000	*Absorption (Sabins)* 125	250	500	1000	2000	4000	
Floor - Carpet	David Harris p. 347	0.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	0.00	0.00	0.00	0.00	0.00	0.00	
Floor - Vinyl	David Harris p. 347	238.5	0.05	0.02	0.03	0.05	0.03	0.03	0.02	4.77	7.16	11.93	7.16	7.16	4.77	
Ceiling - Drywall	David Harris p. 348	238.5	0.50	0.10	0.08	0.05	0.03	0.03	0.03	23.85	19.08	11.93	7.16	7.16	7.16	
Walls - Drywall	David Harris p. 348	281.3	0.50	0.10	0.08	0.05	0.03	0.03	0.03	28.13	22.50	14.06	8.44	8.44	8.44	
Totals		758.25								56.745	48.735	37.9125	22.7475	22.7475	20.3625	49.65
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-3.23	-3.89	-4.98	-7.20	-7.20	-7.68	-3.81

(3) Adjustment Factor

	125	250	500	1000	2000	4000	dB
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	19.14	16.28	25.92	30.10	29.62	28.43	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	35.24	24.88	29.12	30.10	28.42	27.43	
Noise Reduction (dBA)	35.12	24.75	28.99	29.98	28.30	27.30	**30.4**

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B | *Job Number:* LHC2002.01

Floor Plan: B1 | *Analyst:* J.T. Stephens

Room: Bedroom

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	Source	Wall Area	STC	Transmission Loss (dB) by Frequency (Hz) 125	250	500	1000	2000	4000	Fractional Area S/(10^(TL/10)) 125	250	500	1000	2000	4000	dB
Stucco	David Harris p. 371	81.0	46	27	42	44	46	49	54	0.1616	0.0051	0.0032	0.0020	0.0010	0.0003	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		117								0.0029	0.0049	0.0004	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										25.34	23.08	33.82	40.24	39.75	39.02	37.12

(2) Room Effects (Absorption)

Room Surface/ Material	Source	Area	NRC	Absorption Coefficients by Frequency (Hz) 125	250	500	1000	2000	4000	Absorption (Sabins) 125	250	500	1000	2000	4000	
Floor - Carpet	David Harris p. 347	169.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	25.35	28.73	20.28	54.08	87.88	50.70	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	169.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	16.90	13.52	8.45	5.07	5.07	5.07	
Walls - Drywall	David Harris p. 348	468.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	46.80	37.44	23.40	14.04	14.04	14.04	
Totals		806								89.05	79.69	52.13	73.19	106.99	69.81	99.29
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-1.19	-1.67	-3.51	-2.04	-0.39	-2.24	-0.71

(3) Adjustment Factor

	125	250	500	1000	2000	4000	
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	250	500	1000	2000	4000	dBA
(Transmission Loss + Room Effects + Adjustment Factor)	21.16	18.41	27.31	35.20	36.36	33.78	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	37.26	27.01	30.51	35.20	35.16	32.78	
Noise Reduction (dBA)	37.13	26.89	30.38	35.08	35.03	32.65	**34.0**

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B — *Job Number:* LHC2002.01

Floor Plan: B1 — *Analyst:* J.T. Stephens

Room: Living

(1) Transmission Loss Calculations (Exterior Wall)

				Transmission Loss (dB) by Frequency (Hz)						*Fractional Area S/(10^(TL/10))*						
Exterior Wall Assembly	***Source***	***Wall Area***	***STC***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***dB***
Stucco	David Harris p. 371	85.5	46	27	42	44	46	49	54	0.1706	0.0054	0.0034	0.0021	0.0011	0.0003	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		121.5								0.0029	0.0047	0.0004	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										25.39	23.24	33.97	40.36	39.89	39.18	37.26

(2) Room Effects (Absorption)

				Absorption Coefficients by Frequency (Hz)						*Absorption (Sabins)*						
Room Surface/ Material	***Source***	***Area***	***NRC***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***125***	***250***	***500***	***1000***	***2000***	***4000***	
Floor - Carpet	David Harris p. 347	0.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	0.00	0.00	0.00	0.00	0.00	0.00	
Floor - Vinyl	David Harris p. 347	249.8	0.05	0.02	0.03	0.05	0.03	0.03	0.02	5.00	7.49	12.49	7.49	7.49	5.00	
Ceiling - Drywall	David Harris p. 348	249.8	0.50	0.10	0.08	0.05	0.03	0.03	0.03	24.98	19.98	12.49	7.49	7.49	7.49	
Walls - Drywall	David Harris p. 348	288.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	28.80	23.04	14.40	8.64	8.64	8.64	
Totals		787.5								58.77	50.5125	39.375	23.625	23.625	21.1275	51.64
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-3.15	-3.81	-4.89	-7.11	-7.11	-7.60	-3.72

(3) Adjustment Factor

	125	250	500	1000	2000	4000	
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	***250***	***500***	***1000***	***2000***	***4000***	***dBA***
(Transmission Loss + Room Effects + Adjustment Factor)	19.24	16.43	26.07	30.25	29.78	28.58	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	35.34	25.03	29.27	30.25	28.58	27.58	
Noise Reduction (dBA)	35.21	24.91	29.15	30.12	28.45	27.46	**30.5**

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B
Floor Plan: B2
Room: Bedroom

Job Number: LHC2002.01
Analyst: J.T. Stephens

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	***Source***	***Wall Area***	***STC***	***Transmission Loss (dB) by Frequency (Hz)*** 125	250	500	1000	2000	4000	***Fractional Area S/(10^(TL/10))*** 125	250	500	1000	2000	4000	dB
Stucco	David Harris p. 371	72.0	46	27	42	44	46	49	54	0.1437	0.0045	0.0029	0.0018	0.0009	0.0003	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		108								0.0030	0.0053	0.0004	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										25.23	22.74	33.50	39.98	39.44	38.69	36.83

(2) Room Effects (Absorption)

Room Surface/ Material	***Source***	***Area***	***NRC***	***Absorption Coefficients by Frequency (Hz)*** 125	250	500	1000	2000	4000	***Absorption (Sabins)*** 125	250	500	1000	2000	4000	
Floor - Carpet	David Harris p. 347	138.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	20.70	23.46	16.56	44.16	71.76	41.40	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	138.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	13.80	11.04	6.90	4.14	4.14	4.14	
Walls - Drywall	David Harris p. 348	423.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	42.30	33.84	21.15	12.69	12.69	12.69	
Totals		699								76.8	68.34	44.61	60.99	88.59	58.23	81.14
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-1.48	-1.99	-3.84	-2.48	-0.86	-2.68	-1.24

(3) Adjustment Factor

	125	250	500	1000	2000	4000	
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	***250***	***500***	***1000***	***2000***	***4000***	***dBA***
(Transmission Loss + Room Effects + Adjustment Factor)	20.75	17.75	26.66	34.50	35.58	33.00	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	36.85	26.35	29.86	34.50	34.38	32.00	
Noise Reduction (dBA)	36.72	26.22	29.74	34.37	34.25	31.88	**33.4**

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B — *Job Number:* LHC2002.01

Floor Plan: B2 — *Analyst:* J.T. Stephens

Room: Living

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)* 125	250	500	1000	2000	4000	*Fractional Area S/(10^(TL/10))* 125	250	500	1000	2000	4000	dB
Stucco	David Harris p. 371	182.3	46	27	42	44	46	49	54	0.3636	0.0115	0.0073	0.0046	0.0023	0.0007	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		218.25								0.0025	0.0027	0.0002	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										26.03	25.74	36.18	42.05	42.03	41.61	39.33

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)* 125	250	500	1000	2000	4000	*Absorption (Sabins)* 125	250	500	1000	2000	4000	
Floor - Carpet	David Harris p. 347	0.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	0.00	0.00	0.00	0.00	0.00	0.00	
Floor - Vinyl	David Harris p. 347	203.1	0.05	0.02	0.03	0.05	0.03	0.03	0.02	4.06	6.09	10.16	6.09	6.09	4.06	
Ceiling - Drywall	David Harris p. 348	203.1	0.50	0.10	0.08	0.05	0.03	0.03	0.03	20.31	16.25	10.16	6.09	6.09	6.09	
Walls - Drywall	David Harris p. 348	405.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	40.50	32.40	20.25	12.15	12.15	12.15	
Totals		811.25								64.875	54.74375	40.5625	24.3375	24.3375	22.30625	57.51
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-5.27	-6.01	-7.31	-9.53	-9.53	-9.91	-5.79

(3) Adjustment Factor

	125	250	500	1000	2000	4000	
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	17.76	16.73	25.87	29.52	29.50	28.71	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	33.86	25.33	29.07	29.52	28.30	27.71	
Noise Reduction (dBA)	33.74	25.21	28.95	29.40	28.18	27.58	**29.7**

INTERIOR NOISE REDUCTIONS

Project Name:	Parcel B	*Job Number:*	LHC2002.01
Floor Plan:	B2-4	*Analyst:*	J.T. Stephens
Room:	Bedroom		

(1) Transmission Loss Calculations (Exterior Wall)

				Transmission Loss (dB) by Frequency (Hz)						*Fractional Area S/(10^(TL/10))*						
Exterior Wall Assembly	***Source***	***Wall Area***	***STC***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***dB***
Stucco	David Harris p. 371	60.8	46	27	42	44	46	49	54	0.1212	0.0038	0.0024	0.0015	0.0008	0.0002	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		96.75								0.0031	0.0059	0.0005	0.0001	0.0001	0.0002	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										25.06	22.26	33.07	39.62	39.01	38.22	36.41

(2) Room Effects (Absorption)

				Absorption Coefficients by Frequency (Hz)						*Absorption (Sabins)*						
Room Surface/ Material	***Source***	***Area***	***NRC***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***125***	***250***	***500***	***1000***	***2000***	***4000***	
Floor - Carpet	David Harris p. 347	115.6	0.30	0.15	0.17	0.12	0.32	0.52	0.30	17.33	19.65	13.87	36.98	60.09	34.67	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	115.6	0.50	0.10	0.08	0.05	0.03	0.03	0.03	11.56	9.25	5.78	3.47	3.47	3.47	
Walls - Drywall	David Harris p. 348	387.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	38.70	30.96	19.35	11.61	11.61	11.61	
Totals		618.13								67.590625	59.850625	38.995625	52.056875	75.169375	49.745625	68.22
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-1.56	-2.09	-3.95	-2.69	-1.10	-2.89	-1.52

(3) Adjustment Factor

Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	***250***	***500***	***1000***	***2000***	***4000***	***dBA***
(Transmission Loss + Room Effects + Adjustment Factor)	20.50	17.18	26.12	33.92	34.92	32.33	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	36.60	25.78	29.32	33.92	33.72	31.33	
Noise Reduction (dBA)	36.48	25.65	29.20	33.80	33.59	31.21	**32.9**

INTERIOR NOISE REDUCTIONS

Project Name: Parcel B — *Job Number:* LHC2002.01
Floor Plan: B2-4 — *Analyst:* J.T. Stephens
Room: Living

(1) Transmission Loss Calculations (Exterior Wall)

				Transmission Loss (dB) by Frequency (Hz)						Fractional Area S/(10^(TL/10))						
Exterior Wall Assembly	**Source**	**Wall Area**	**STC**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**dB**
Stucco	David Harris p. 371	90.0	46	27	42	44	46	49	54	0.1796	0.0057	0.0036	0.0023	0.0011	0.0004	
	VPI	36.0	31	23	18	29	36	35	34	0.1804	0.5706	0.0453	0.0090	0.0114	0.0143	
Windows/Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		126								0.0029	0.0046	0.0004	0.0001	0.0001	0.0001	
Composite Exterior Wall Sound Transmission Loss 10*LOG(1/t)										25.44	23.40	34.11	40.47	40.03	39.33	37.40

(2) Room Effects (Absorption)

				Absorption Coefficients by Frequency (Hz)						Absorption (Sabins)						
Room Surface/ Material	**Source**	**Area**	**NRC**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**125**	**250**	**500**	**1000**	**2000**	**4000**	
Floor - Carpet	David Harris p. 347	0.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	0.00	0.00	0.00	0.00	0.00	0.00	
Floor - Vinyl	David Harris p. 347	168.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	3.36	5.04	8.40	5.04	5.04	3.36	
Ceiling - Drywall	David Harris p. 348	168.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	16.80	13.44	8.40	5.04	5.04	5.04	
Walls - Drywall	David Harris p. 348	360.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	36.00	28.80	18.00	10.80	10.80	10.80	
Totals		696								56.16	47.28	34.8	20.88	20.88	19.2	48.94
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-3.51	-4.26	-5.59	-7.81	-7.81	-8.17	-4.11

(3) Adjustment Factor

	125	250	500	1000	2000	4000	
Sound Source Adjustment Factor	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

(4) Calculated Interior Noise Reduction (dBA)

	125	**250**	**500**	**1000**	**2000**	**4000**	**dBA**
(Transmission Loss + Room Effects + Adjustment Factor)	18.93	16.14	25.52	29.67	29.22	28.16	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	35.03	24.74	28.72	29.67	28.02	27.16	
Noise Reduction (dBA)	34.91	24.62	28.60	29.54	27.90	27.04	**30.1**