Noise Technical Report

Carlsbad Village Drive Mixed Use Project

DECEMBER 2023

Prepared for:

GRT Carlsbad Village, LLC
c/o Tooley Interests, LLC
2001 Wilshire Blvd Suite 420
Santa Monica, CA 90403

Prepared by:

DUDEK

605 Third Street
Encinitas, California 92024
Contact: Mark Storm, INCE Bd. Cert.

Printed on 30% post-consumer recycled material.

Table of Contents

SECTION **PAGE NO.**

TABLES

FIGURES

APPENDICES

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of Carlsbad
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
FTA	Federal Transit Administration
L_{dn}	day–night average noise level
L_{eq}	equivalent noise level
L_{max}	maximum sound level
L_{min}	minimum sound level
Carlsbad Village Mixed Use	proposed project
RCNM	Roadway Construction Noise Model
SF	square feet
SLM	sound level meter
SPL	sound pressure level
ST	short-term
VLI	very low income

INTENTIONALLY LEFT BLANK

1 Introduction

1.1 Report Purpose and Scope

This technical noise report evaluates the potential noise impacts during construction and operation of the proposed Carlsbad Village Drive Mixed Use project (proposed project). This assessment utilizes the significance thresholds in Appendix G of the California Environmental Quality Act Guidelines (14 CCR 15000 et seq.) adopted January 2019.

1.2 Regional and Local Setting

The project site is located in the City of Carlsbad (City), south of Carlsbad Village Drive and west of Interstate 5 (San Diego Freeway). The project site is bound by Carlsbad Village Drive to the north, Interstate 5 (San Diego Freeway) to the east, commercial residential development to the west, and Oak Avenue to the south (Figure 1, Project Location). The land is currently occupied by approximately 58,750 square feet (SF) of commercial businesses. The Project site includes Assessor's Parcel Numbers designated as Village (V) in the City's General Plan and zoned Village-Barrio (V-B) (APNs 203-320-53-00, 203-320-55-00, and 203-320-56-00).

1.3 Project Description

The Project proposes to develop a mixed-use development consisting of 218 multi-family units, as well as 13,800 square feet of commercial space, including parking and open space. The proposed commercial uses would be contained in two, one-story buildings along Carlsbad Village Drive, and the residential units would be provided in two five-story buildings. 340 vehicular parking spaces will be provided at grade surround the commercial and residential buildings and within an above-grade parking structure. The existing Project site is fully paved and developed with commercial buildings that would be demolished during Project construction.

1.4 Fundamentals of Noise

The following is a brief discussion of fundamental noise concepts and terminology.

1.4.1 Sound, Noise, and Acoustics

Sound is actually a process that consists of three components: the sound source, sound path, and sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there is no sound. Similarly, without a medium to transmit sound pressure waves, there is no sound. Finally, sound must be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receptors rather than just one of each. Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired.

1.4.2 Sound Pressure Levels and Decibels

The amplitude of a sound determines its loudness. Loudness of sound increases with increasing amplitude. Sound pressure amplitude is measured in units of micronewton per square meter, also called micropascal. One micropascal is approximately one-hundred billionth (0.00000000001) of normal atmospheric pressure. The pressure of a very loud sound may be 200 million micropascals, or 10 million times the pressure of the weakest audible sound. Because expressing sound levels in terms of micropascal would be very cumbersome, sound pressure level in logarithmic units is used instead to describe the ratio of actual sound pressure to a reference pressure squared. These units are called Bels. To provide a finer resolution, a Bel is subdivided into 10 decibels (dB).

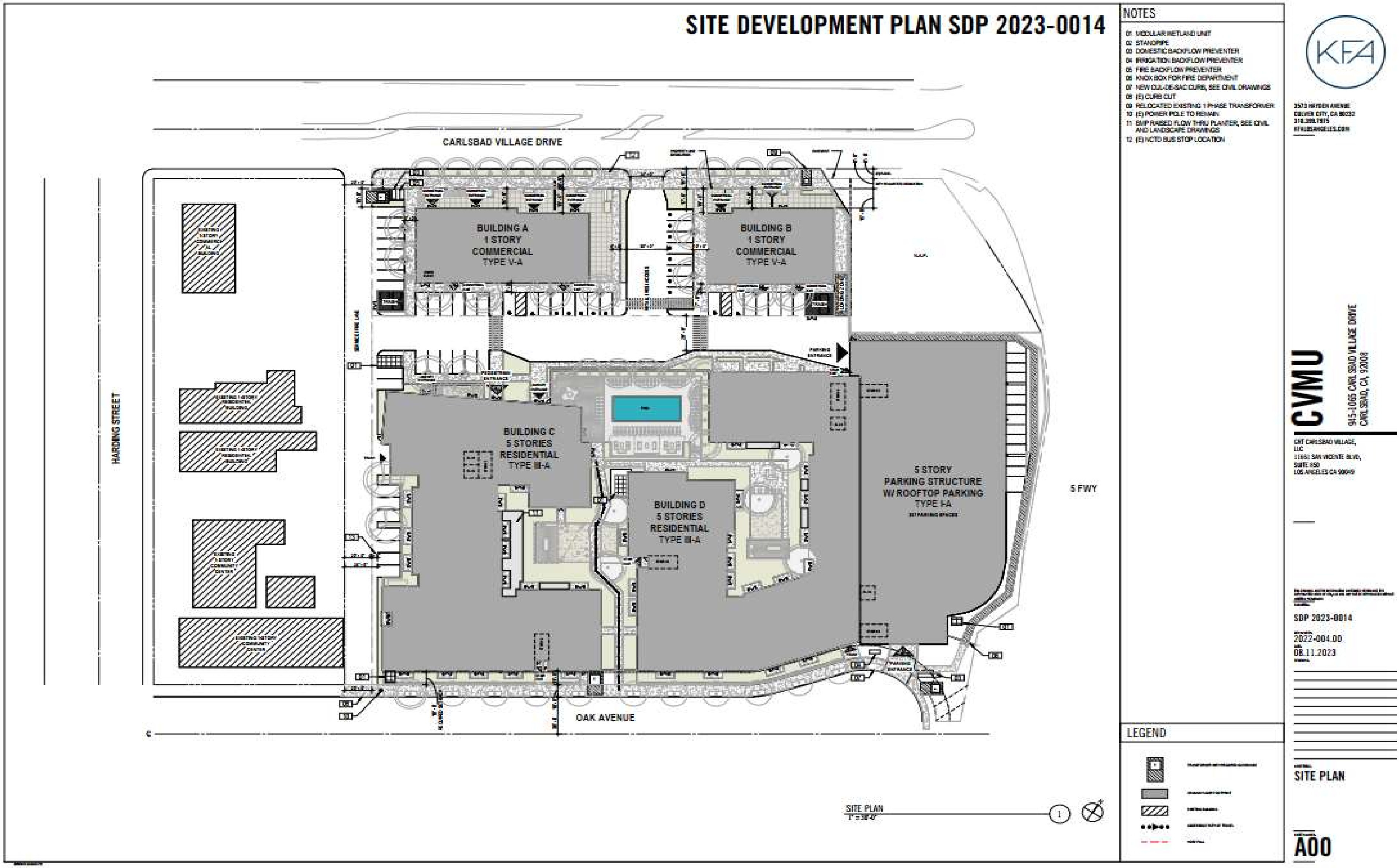
SOURCE: USGS 7.5-Minute Series San Luis Rey Quadrangle
Township: 12S; Range: 4W; Section: 6

DUDEK

0 250 500 Meters
0 1,300 2,600 Feet

FIGURE 1
Project Location
Tooley Carlsbad

INTENTIONALLY LEFT BLANK



SOURCE: Tooley 2023

DUDEK

FIGURE 2

Project Site Plan

Carlsbad Village Mixed Use Project (Dudek No. 14814)

INTENTIONALLY LEFT BLANK

1.4.3 A-Weighted Sound Level

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness, or human response, is determined by the characteristics of the human ear.

Human hearing is limited not only in the range of audible frequencies, but also in the way it perceives the sound in that range. In general, the healthy human ear is most sensitive to sounds between 1,000 and 5,000 hertz, and it perceives a sound within that range as more intense than a sound of higher or lower frequency with the same magnitude. To approximate the frequency response of the human ear, a series of sound level adjustments is usually applied to the sound measured by a sound level meter. The adjustments (referred to as a weighting network) are frequency dependent.

The A-scale weighting network approximates the frequency response of the average healthy young ear when listening to ordinary sounds. When people make judgments about the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special situations (e.g., B-scale, C-scale, D-scale), but these scales are rarely used in conjunction with most environmental noise. Noise levels are typically reported in terms of A-weighted sound levels. All sound levels discussed in this report are A-weighted decibels (dBA). Examples of typical noise levels for common indoor and outdoor activities are depicted in Table 1.

Table 1. Typical Sound Levels in the Environment and Industry

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
—	110	Rock band
Jet fly over at 300 meters (1,000 feet)	100	—
Gas lawn mower at 1 meter (3 feet)	90	—
Diesel truck at 15 meters (50 feet), at 80 kilometers per hour (50 miles per hour)	80	Food blender at 1 meter (3 feet); garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime; gas lawn mower at 30 meters (100 feet)	70	Vacuum cleaner at 3 meters (10 feet)
Commercial area; heavy traffic at 90 meters (300 feet)	60	Normal speech at 1 meter (3 feet)
Quiet urban, daytime	50	Large business office; dishwasher next room
Quiet urban, nighttime	40	Theater; large conference room (background)
Quiet suburban, nighttime	30	Library
Quiet rural, nighttime	20	Bedroom at night; concert hall (background)
—	10	Broadcast/Recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Source: Caltrans 2013.

1.4.4 Human Response to Changes in Noise Levels

Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern changes in sound levels of 1 dBA when exposed to steady, single-frequency signals in the mid-frequency range. Outside such controlled conditions, it is widely accepted that the average healthy ear can barely perceive noise level changes of 3 dBA. A change of 5 dBA is readily perceptible, and a change of 10 dBA is *perceived* as twice (if a gain) or half (if a loss) as loud. A doubling of sound energy results in a 3-dBA increase in sound, which means that a doubling of sound energy (e.g., doubling the volume of traffic on a road) would result in a barely perceptible change in sound level.

1.4.5 Noise Descriptors

Units of measure and standardized descriptors have been developed to quantify and evaluate characteristics of sound. For instance, the energy-equivalent sound level (L_{eq}) is the equivalent steady-state or constant sound level that in a stated period of time would contain the same acoustical energy as the actual time-varying sound level during the same time period. For instance, the 1-hour A-weighted equivalent sound level, $L_{eq(h)}$, is the energy average decibel value of A-weighted sound occurring during a 1-hour period, and represents one of the City's performance-based noise level standards.

People are generally more sensitive to and thus potentially more annoyed by noise occurring during the evening and nighttime hours. Hence, another noise descriptor used in community noise assessments—the community noise equivalent level (CNEL)—represents a time-weighted, 24-hour average noise level based on the A-weighted sound level. However, unlike an unmodified 24-hour L_{eq} value, the CNEL descriptor accounts for increased noise sensitivity during the evening (7 p.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) by adding 5 dBA and 10 dBA, respectively, to the average sound levels occurring during these defined hours within a 24-hour period.

1.4.6 Sound Propagation

Sound propagation (i.e., the traverse of sound from a noise emission source position to a receiver location) is influenced by multiple factors that include geometric spreading, ground absorption, atmospheric effects, and occlusion by natural terrain and/or features of the built environment.

Sound levels attenuate (or diminish) geometrically at a rate of approximately 6 dBA per doubling of distance from an outdoor point-type source due to the spherical spreading of sound energy with increasing distance travelled. The effects of atmospheric conditions such as humidity, temperature, and wind gradients are typically distance-dependent and can also temporarily either increase or decrease sound levels measured or perceived at a receptor location. In general, the greater the distance the receiver is from the source of sound emission, the greater the potential for variation in sound levels at the receptor due to these atmospheric effects. Additional attenuation can result from sound path occlusion and diffraction due to intervention of natural (ridgelines, dense forests, etc.) and built features (such as solid walls, buildings and other structures).

INTENTIONALLY LEFT BLANK

2 Regulatory Setting

2.1 Federal

In its Transit Noise and Vibration Impact Assessment guidance manual, the Federal Transit Administration (FTA) recommends a daytime construction noise level threshold of 80 dBA L_{eq} over an 8-hour period (FTA 2018) when detailed construction noise assessments are performed to evaluate potential impacts to community residences surrounding a project. Although this FTA guidance is not a regulation, it can serve as a quantified standard in the absence of such noise limits at the state and local jurisdictional levels.

2.2 State

In its assessment of applicant-proposed energy projects under its jurisdiction, and with respect to impact significance for durable increases in outdoor ambient sound level per CEQA, California Energy Commission (CEC) technical staff has often concluded that it is "reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA is considered significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of the case" (CEC 2010). In this context, the CEC defines "background" sound with an L_{90} statistical sound level descriptor, which is the sound level exceeded for a cumulative ninety percent (90%) of the time during a measurement period.

Regarding noise from construction activities, the CEC usually considers a project's impact less than significant with respect to CEQA compliance if it is temporary, limited to daytime hours, and industry-standard noise abatement measures are implemented for noise producing equipment.

2.3 Local

2.3.1 Noise Ordinance

The City's noise control ordinance (Municipal Code, Chapter 8.48) outlines regulations for limitation of hours for construction (i.e., the erection, demolition, alteration, or repair of any building or structure or the grading or excavation of land) that creates disturbing, excessive, or offensive noise. Construction can occur Monday through Friday from 7 a.m. to 6 p.m., and Saturday 8 a.m. to 6 p.m.; no work can be conducted on Sundays or on federal holidays. Carlsbad Municipal Code Chapter 8.48 also outlines exceptions that may be granted by the City for circumstances such as emergency repairs required to protect the health and safety of the community.

2.3.2 General Plan Noise Element

The Noise Element of the City's General Plan (City of Carlsbad 2015a) includes performance standards for noise that are applicable to the proposed project. Table 2 (reproduced from City of Carlsbad 2015, Table 5-3) provides City standards for noise from non-transportation noise sources, including on-site stationary equipment and machinery such as heating, ventilation, and air conditioning (HVAC) equipment. These standards apply to the noise sources themselves, as measured at the edge of the property line; noise caused by motor vehicles traveling to and from the site is exempt from this standard.

Table 2. Performance Standards for Non-Transportation Sources

Noise Level Descriptor	Daytime (7 A.M. to 10 P.M.)	Nighttime (10 P.M. to 7 A.M.)
Hourly L_{eq}, dB	55	45
Maximum Level, dB	75	65

Source: City of Carlsbad 2015, Table 5-3.
Note: Each of the noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

3 Existing Conditions

Sound pressure level (SPL) measurements were conducted near the project site on October 19, 2022, to quantify and characterize the existing outdoor ambient noise levels. Table 3 provides the location and time at which these baseline noise level measurements were taken. The SPL measurements were performed by an attending Dudek field investigator using a Rion NL-52 sound level meter (SLM) equipped with a 0.5-inch, pre-polarized condenser microphone with pre-amplifier. This SLM meets the current American National Standards Institute (ANSI) standard for a Type 1 (Precision Grade) instrument. The accuracy of the SLM was verified using a reference sound signal (i.e., field calibrator) before and after the measurements, and the measurements were conducted with the microphone positioned approximately 5 feet above the ground.

Four (4) short-term noise level measurement locations (ST1–ST4) are depicted on Figure 3, Noise Measurement and Modeling Locations. Two of these SPL survey positions, ST1 and ST3, represent existing offsite noise-sensitive receptors (NSR): 985 Oak Avenue (single-family home) and 965 Oak Avenue (Windsor Pointe Apartments); and The Lofts (multi-family residences). The L_{eq} and L_{max} noise levels are provided in Table 3, along with noted perceived sound sources that included traffic from adjacent roadways and the Interstate-5 (I-5) freeway, and birdsong. As shown in Table 3, the measured sound levels ranged from approximately 58.4 dBA L_{eq} at ST4 to 67.6 dBA L_{eq} at ST3. Noise measurement data is also included in Appendix A, Baseline Noise Measurement Field Data.

Given the proximity of the Project site and these measurement survey positions to the I-5 freeway, the dominant noise source in the outdoor environment, these samples of daytime measured L_{eq} can be interpreted as approximations of CNEL, since evening SPL would likely be 5 dBA less, and nighttime SPL would be 10 dBA less than the daytime values according to FTA outdoor ambient noise estimation techniques (FTA 2018).

Table 3. Measured Baseline Outdoor Ambient Noise Levels

Site	Location/Address (and noise-sensitive receptor)	Perceived/Observed Sound Sources	Date/Time	L_{eq} (dBA)	L_{max} (dBA)
ST1	985 Oak Avenue (single-family residence) 965 Oak Avenue (Windsor Pointe [multi-family residences])	Local roadway traffic, I-5 freeway traffic dominant	2022-10-19, 10:00 AM to 10:15 AM	67.1	70.4
ST2	3044 Harding Street, 3 feet from edge of pavement	Local roadway traffic, birds, I-5 freeway traffic	2022-10-19, 11:00 AM to 11:15 AM	62.7	70.4
ST3	1006 Carlsbad Village Drive, 20 feet from edge of pavement (multi-family residence)	Local roadway traffic, I-5 freeway traffic, train horn	2022-10-19, 09:30 AM to 09:45 AM	67.6	75.5
ST4	958 Oak Avenue	Local roadway traffic, I-5 freeway noise dominant, air-conditioning (AC) unit.	2022-10-19, 10:35 AM to 10:50 AM	58.4	60.7

Source: Appendix A.
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); L_{max} = maximum sound level during the measurement interval; dBA = A-weighted decibels; ST = short-term noise measurement locations.

SOURCES: Google 2021; Dudek 2022

DUDEK

0 81.5 163 Feet

FIGURE 3

Noise Measurement Locations and Nearest Noise-Sensitive Receptors

Carlsbad Village Mixed Use Project (Dudek No. 14814)

INTENTIONALLY LEFT BLANK

4 Thresholds of Significance

The following significance criteria are based on Appendix G of the California Environmental Quality Act Guidelines (14 CCR 15000 et seq.) and will be used to determine the significance of potential noise impacts. Impacts associated with noise would be significant if the proposed project would result in:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Expose people residing or working in the project area to excessive noise levels (for a project located within the vicinity of a private airstrip or an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport).

In light of these above significance criteria, this analysis uses the following standards to evaluate potential noise impacts.

- Construction noise – although neither the City's Municipal Code or its Noise Guidelines offer a quantitative decibel limit for construction noise, within allowable construction hours per the City of Carlsbad General Plan Noise Element (City of Carlsbad 2015), an informational-based threshold is utilized herein to evaluate a potential construction noise impact at an NSR (i.e., residential land use):
  - *Relative threshold* – up to a 10 dB increase over existing ambient sound level, akin to CEC assessment of potentially significant impact for long-duration changes to the outdoor sound environment. Because the Project site is already characterized by existing outdoor ambient levels ranging from 67 to 68 dBA L_{eq} per samples at ST1 and ST3, respectively, as appearing in Table 3, this means that construction noise would be considered a significant impact if greater than the position-dependent existing sound level by more than 10 dB. In other words, based on these measured outdoor ambient L_{eq} samples at ST1 and ST3 in Table 3, the allowable construction noise levels would be 77 to 78 dBA hourly L_{eq} values. For context, these construction noise magnitudes are slightly less than the 80 dBA noise threshold that FTA guidance recommends at the exterior of a receiving residence.
- Offsite traffic noise – the project would generate vehicle trips, thereby having the potential to increase traffic on local roadways. Such a change attributed to the project resulting in more than a 3 dB increase would be considered perceptible and thus a significant impact.
- Project operations (*onsite stationary sources)* – 55 dBA hourly L_{eq} during daytime hours and 45 dBA hourly L_{eq} during nighttime hours. Maximum sound levels (L_{max}) are 20 dB higher than these limits.

5 Impact Discussion

5.1 Project Impact Assessment

Potential noise impacts attributed to project construction and operation are studied in the following subsections that are categorized by the CEQA Guidelines Appendix G significance for noise.

a) *Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?*

Short-Term Construction

Construction noise is a temporary phenomenon, with emission levels varying from hour to hour and day to day, depending on the equipment in use, the operations performed, and the distance between the source and receptor. Equipment that would be in use during construction would include, in part, graders, backhoes, rubber-tired dozers, loaders, cranes, forklifts, pavers, rollers, and air compressors. The typical maximum noise levels at a distance of 50 feet from various pieces of construction equipment and activities anticipated for use on the proposed project site are presented in Table 4. Note that the equipment noise levels presented in Table 4 are maximum noise levels. Usually, construction equipment operates in alternating cycles of full power and low power, producing average noise levels over time that are less than the maximum noise level. The average sound level of construction activity also depends on the amount of time that the equipment operates and the intensity of construction activities during that time.

Table 4. Typical Construction Equipment Maximum Noise Levels

Equipment Type	Typical Equipment (L_{max}, dBA at 50 Feet)
All Other Equipment > 5 HP	85
Backhoe	78
Compressor (air)	78
Concrete Saw	90
Crane	81
Dozer	82
Excavator	81
Flat Bed Truck	74
Front End Loader	79
Generator	72
Grader	85
Man Lift	75
Paver	77
Roller	80
Scraper	84
Welder / Torch	73

Source: DOT 2006.

Note: L_{max} = maximum sound level; dBA = A-weighted decibels.

Aggregate noise emission from proposed project construction activities, broken down by sequential phase, was predicted from the geographic center of the construction site, which serves as the time-averaged location or geographic *acoustical centroid* of active construction equipment for the phase under study. The centroid-to-receptor distance is used in a manner similar to the general assessment technique as described in the FTA guidance for construction noise assessment, when the location of individual equipment for a given construction phase is uncertain over some extent of (or the entirety of) the construction site area. In this studied scenario, because of the equipment location uncertainty, all the equipment for a construction phase is assumed to operate—on average—from the acoustical centroid position and may be operating up to eight hours per day (i.e., a typical onsite daytime work shift).

Table 5. Estimated Distances between Construction Activities and the Nearest Noise-sensitive Receptors

Construction Phase (and Equipment Types Involved)	Distance from Noise-Sensitive Receptor to Site Acoustical Centroid (Feet)	
	ST1	ST3
Demolition (concrete saw/industrial saw, rubber-tired dozer, excavator)	300	285
Site preparation (dozer, tractor, loader, backhoe)	300	285
Grading (excavator, grader, rubber-tired dozer, tractor, loader, backhoe)	300	285
Building construction (crane, forklift, generator set, tractor, loader, backhoe, welder)	300	285
Paving (cement and mortar mixer, paver, paving equipment, roller, tractor, loader, backhoe)	300	285
Architectural coating (air compressor)	300	285

A Microsoft Excel–based noise prediction model emulating and using reference data from the Federal Highway Administration Roadway Construction Noise Model (RCNM) (FHWA 2008) was used to estimate construction noise levels at the nearest occupied noise-sensitive land use. (Although the RCNM was funded and promulgated by the Federal Highway Administration, it is often used for non-roadway projects, because the same types of construction equipment used for roadway projects are often used for other types of construction.) Input variables for the predictive modeling consist of the equipment type and number of each (e.g., two graders, a loader, a tractor), the duty cycle for each piece of equipment (e.g., percentage of time within a specific time period, such as an hour, when the equipment is expected to operate at full power or capacity and thus make noise at a level comparable to what is presented in Table 4), and the distance from the noise-sensitive receiver. The predictive model also considers how many hours that equipment may be on site and operating (or idling) within an established work shift. Conservatively, no topographical or structural shielding was assumed in the modeling. The RCNM has default duty-cycle values for the various pieces of equipment, which were derived from an extensive study of typical construction activity patterns. Those default duty-cycle values were used for this noise analysis, which is detailed in Appendix B, Construction Noise Modeling Input and Output, and produce the predicted results displayed in Table 6.

Table 6. Predicted Construction Noise at Indicated Receptors per Activity Phase

Construction Phase (and Equipment Types Involved)	Predicted Construction Noise (dBA, hourly L_{eq}) at the NSR	
	ST1	ST3
*Construction Noise Threshold**	*77.1*	*77.6*
Demolition (concrete saw/industrial saw, rubber-tired dozer, excavator)	71.2	71.7
Site preparation (dozer, tractor, loader, backhoe)	69.1	69.5
Grading (excavator, grader, rubber-tired dozer, tractor, loader, backhoe)	70.4	70.9
Building construction (crane, forklift, generator set, tractor, loader, backhoe, welder)	67.7	68.2
Paving (cement and mortar mixer, paver, paving equipment, roller, tractor, loader, backhoe)	71.8	72.2
Architectural coating (air compressor)	58.5	58.9
Do any predicted phase noise levels exceed the threshold?	*no*	*no*

Notes: L_{eq} = equivalent noise level; dBA = A-weighted decibels; NSR = noise-sensitive receptor.

*10 dB greater than the measured sample of outdoor ambient noise level at the NSR.

As presented in Table 6, the estimated construction noise levels are predicted to be as high as 72 dBA L_{eq} hourly L_{eq} at the nearest NSR during site demolition and paving phases. Although these nearby occupied properties to the north and south of the Project would be exposed to elevated construction noise levels, the increased noise levels would typically be relatively short term and, as shown in Table 6, represent a temporary and less than 10 dB increase of the outdoor ambient sound level. Thus, construction-related noise impacts would be considered **less than significant.**

Long-Term Operational

Off-Site Traffic Noise Exposure

The proposed project would result in the creation of additional vehicle trips on local arterial roadways (i.e., Carlsbad Village Drive); however, the Project Trip Generation Summary (LLG 2023) demonstrates that the net effect of substituting current commercial-only land use and associated traffic volumes with that of the proposed mixed-use project would be a reduction in traffic volumes and thus a corresponding reduction in traffic noise. Appendix C, Traffic Noise Modeling Input and Output, includes both this Project Trip Generation Summary and traffic noise prediction worksheets that estimate the with- and without-project traffic noise levels at baseline noise survey location ST3 (see Table 3). The ST3 survey position is, like the proposed project, near Carlsbad Village Drive and the "Lofts" existing multi-family (and mixed-use) residential receptor. The technique to predict traffic noise from both the local Carlsbad Village Drive roadway and the nearby (and acoustically dominant) I-5 freeway is based upon the Federal Highway Administration (FHWA) RD-77-108 model that applies Caltrans-adopted "Calveno" curves. In summary, the net change in outdoor traffic noise due to introduction of the proposed project is negligible because the I-5 freeway traffic is essentially unaffected, and the change to Carlsbad Village Drive is negative (i.e., a less than one dB reduction). For these reasons, **the impact to offsite exterior traffic noise would be less than significant.**

Stationary Noise Sources

The incorporation of new multi-family homes and a mix of open space uses attributed to development of the proposed project will add a variety of noise-producing electro-mechanical equipment that include those presented and discussed in the following paragraphs. Most of these noise-producing equipment or sound sources would be considered stationary, or limited in mobility to a defined area. Using the commercially available Datakustik CadnaA outdoor sound propagation prediction model, which incorporates International Organization of Standardization (ISO) 9613-2 algorithms and reference data, project-attributed operational noise at nearby community receptors was predicted using several parameters and assumptions as follows:

- The model calculation area encompasses the Project and surrounding land uses that adjoin its boundary.
- Acoustical ground absorption of the Project site and the surrounding topography (conservatively modeled as flat, which generally approximates the site terrain characteristics) is set at 0.50, which on a zero (reflective) to one (absorptive) scale approximates a combination of the grass-covered soils that generally surround the Project area and any anticipated loosely graveled Project site cover.
- Meteorological conditions presume "calm" wind conditions (i.e., less than 0.5 meters per second in any direction) and average air temperature and relative humidity of 50 degrees Fahrenheit and 70%, respectively.
- The model "configuration" settings include reflection order set to "1", which can be interpreted to mean that a sound emission path from a source will continue to be analyzed after impingement upon and reflection from the first intervening structure or barrier.

Please see Appendix D for quantitative details of the inputs and outputs that form the basis of the following assessment presentations.

Residential Unit Heating, Ventilation, and Air Conditioning Noise

For purposes of this analysis, each of the new occupied residential units would be expected to feature a split-system type air-conditioning unit, with an outdoor-exposed air-cooled (2 to 3-ton refrigeration capacity) condenser (ACC) unit having an SPL of approximately 68 dBA at 3 feet based on available data from a likely manufacturer (Carrier 2012). All such ACC units, as well as comparable air-conditioning units for the three retail buildings, would be located on the building rooftops. Table 7 presents the predicted aggregate noise level for each of three elevations above grade (roughly corresponding with potential ground floor, 2nd floor, and 3rd floor receptor heights) at the four surveyed receptor locations from Table 3.

Table 7. Predicted Project Rooftop HVAC Noise Levels

Site	Location(s)/Address(es)	At 5-feet above grade (dBA L_{eq})	At 15-feet above grade (dBA L_{eq})	At 25-feet above grade (dBA L_{eq})
ST1	985 Oak Avenue (single-family residence 965 Oak Avenue (Windsor Pointe [multi-family residences])	31.3	32.4	33.7

Table 7. Predicted Project Rooftop HVAC Noise Levels

Site	Location(s)/Address(es)	At 5-feet above grade (dBA L_{eq})	At 15-feet above grade (dBA L_{eq})	At 25-feet above grade (dBA L_{eq})
ST2	3044 Harding Street, 3 feet from edge of pavement	33.8	34.7	35.3
ST3	1006 Carlsbad Village Drive, 20 feet from edge of pavement (multi-family residence)	37.4	38.2	38.3
ST4	958 Oak Avenue	31.6	32.7	34.0

Source: Appendix D.
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); L_{max} = maximum sound level during the measurement interval; dBA = A-weighted decibels; ST = short-term noise measurement locations.

For all three receptor elevations at each of the four studied offsite geographic positions, aggregate Project HVAC noise is predicted to be compliant with the City's nighttime threshold of 45 dBA hourly L_{eq}. These predicted noise levels are also much less than the measured samples of daytime sound level in the Project vicinity, and would also be expected to be much less than nighttime noise levels, since FTA guidance indicates that nighttime outdoor ambient noise levels are estimated to be 10 dB less than those during the day when in the proximity of a major highway (FTA 2018) such as the I-5. Therefore, under such conditions, the operation of commercial and residential building HVAC units would result in a **less-than-significant noise impact.**

b) *For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*

There are no private airstrips within the vicinity of the project site. The closest airport to the proposed project site is the McClellan-Palomar Airport, approximately 6 miles southeast of the site and would therefore not expose people residing or working in the project area to excessive noise levels. Impacts would be **less than significant.**

5.2 Cumulative Impact Assessment

Noise in Excess of Standards

Implementation of the Project as well as unrelated development projects within its vicinity would all be individually subject to applicable noise regulations, such as the exterior noise level standards already discussed herein. On this basis, and because noise impacts of the Project with respect to relevant standards would be less than significant with mitigation, the Project would not contribute to cumulative exceedances of noise standards, and its incremental effect would be a less-than-significant impact.

Temporary/Periodic Increases in Ambient Noise Levels

The Project would result in temporary outdoor ambient noise increases during construction activities, as discussed under Section 5.1. An unrelated but potentially concurrent construction project, such as the anticipated renovation of the Carlsbad Village Inn, could introduce the potential for a cumulatively considerable significant impact, but it depends on both the intensity of the construction noise emission and its distance to a studied NSR common to both the Project and the unrelated other project site. Due to the decrease in propagated noise levels with distance and the potential presence of physical barriers (i.e., intervening buildings and topography) that can occlude direct and reflected sound paths between noise sources and a receptor position, such opportunity for cumulative noise effects tends to be very localized. By way of illustration, if there are two concurrent construction projects of comparable sound emission intensity, and the activity nearest to the studied noise-sensitive receptor is compliant with the City's applicable noise threshold, the other activity could be no closer than three times the distance of the receptor to the nearest activity and not make a cumulatively measurable contribution to the total and still City-compliant noise exposure level. If two concurrent projects were close to a receptor, the cumulative noise would be one of the following:

- the louder (in dBA) of the two concurrent activities; or,
- a logarithmic sum of the two activity noise levels that, per acoustic principles, cannot be more than 3 dBA greater than the louder of the two individual noise-producing activities.

In sum, cumulative construction noise is likely to be dominated by the closest or loudest activity to the receptor, and the combination will be no more than a barely perceptible difference (i.e., up to a 3 dBA change). This can be exemplified by a predictive study of the Project's predicted construction noise at ST3 (i.e., a position representing The Lofts, a multi-family NSR) combined with potential concurrent construction noise originating at the Carlsbad Village Inn site. Construction noise levels predicted for the Project that appear in Table 6 do not exceed 72.2 dBA at ST3 and are several dB less than the 77.6 dBA threshold that presumes a 10 dB allowable increase in outdoor ambient sound level. If construction noise from the unrelated Carlsbad Village Inn renovation project were to occur and have comparable phase-specific aggregate noise emission levels, meaning it too would cause 72.2 dBA noise exposure at ST3, then the logarithmic sum would be 75.2 dBA and thus still compliant with a 77.6 dBA threshold. In this case, neither the Project nor the unrelated proximate project would be making a cumulatively considerable contribution to push a combined noise level over the threshold. Thus, cumulative impacts associated with temporary increases in ambient noise levels would be considered less than significant.

Permanent Increase in Ambient Noise Levels

Off-Site Traffic

Implementation of the Project along with development from other unrelated projects would generate off-site traffic noise. But as discussed in Section 5.1, the Project is expected to yield a net reduction in proximate traffic volumes, and thus a traffic noise level reduction, based on its substitution of commercial land uses on the current Project site. Future traffic conditions are likely to exhibit greater volumes of traffic along the same roadways adjoining the Project due to the effects of other development projects in the area and expected regional growth. This means that a future year traffic noise setting without the Project traffic added, but including cumulative contribution from other projects such as those listed in Section 2.4, would result in a higher noise level against which a future-plus-Project case would be compared. Since the Project traffic contribution would be the same, its effect to the future traffic volumes would be smaller; hence, its change to traffic noise level would be less than the predicted sub-decibel decrease, and consequently less than the allowable dB increase of 3 dB. On this basis, the Project would have a less than significant cumulative traffic noise impact.

Stationary Sources

Noise from operation of stationary mechanical equipment added to the outdoor ambient sound environment as a result of Project implementation would include permanent on-site noise sources (e.g., rooftop HVAC equipment) as addressed under Section 5.1. A cumulative increase in the outdoor ambient sound environment due to such operation of Project onsite noise sources and comparable sound sources from other unrelated future projects could occur, but only if distances to a common receptor position were sufficiently short. Noise emission from HVAC equipment and other potential onsite sources attenuates with distance and can be occluded by structures and terrain. Since both the Project and a comparably distant unrelated project with respect to a common NSR, such as represented by ST3, would need to be compliant with the City's exterior noise standards, their potential logarithmic combination would be no greater than 3 dB higher than the louder of the two.

By way of illustration, if the concurrently operating and comparably distant unrelated project were to emit stationary-source operations noise (e.g., rooftop HVAC) at the same magnitude as that predicted for the Project, a noise level of 38 dBA at ST3, then the logarithmic combination would be 41 dBA and thus still lower than the City's nighttime threshold of 45 dBA. Furthermore, this combined HVAC noise level would still be far less than the pre-existing nighttime noise level due to the NSR's proximity to dominant I-5 noise levels estimated to be 57 dBA at night (i.e., 10 dB less than the daytime measured L_{eq} sample at ST3, per FTA guidance [FTA 2018]). Hence, cumulative impacts to outdoor ambient noise levels resulting from Project stationary sources would be less than significant.

INTENTIONALLY LEFT BLANK

6 Summary of Findings

This noise report was conducted for the proposed project. The results indicate that potential impacts during construction would be less than significant. Noise impacts due to operation of the proposed project (including traffic noise) would also be less than significant. No noise mitigation measures are anticipated at this time. Cumulative impacts area also found to be less than significant.

INTENTIONALLY LEFT BLANK

7 References Cited

Caltrans (California Department of Transportation). 2013. Technical Noise Supplement to the Traffic Noise Analysis Protocol. September.

Caltrans. 2020. Truck Traffic. https://dot.ca.gov/programs/traffic-operations/census

Carrier. 2012. CA16NA 018-061 Single-Stage Air Conditioner w/ Puron Refrigerant. Catalog No: CA16NA-06PD. https://resource.carrierenterprise.com/is/content/Watscocom/carrier_ca16na03600g_article_1404816230548_en_ss?_ga=2.123164302.489492439.1570570581-792571132.1570570581

City of Carlsbad. 2015. City of Carlsbad General Plan. Noise Element.

DOT (U.S. Department of Transportation). 2006. *FHWA Roadway Construction Noise Model: User's Guide*. Final Report. FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. Cambridge, Massachusetts: DOT, Research and Innovative Technology Administration. August 2006.

FHWA. 2008. Roadway Construction Noise Model (RCNM), Software Version 1.1. U.S. Department of Transportation, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division. Washington, D.C. December 8, 2008.

FTA (Federal Transit Administration). 2018. Transit Noise and Vibration Impact Assessment. FTA Report No. 0123. September.

Linscott Law & Greenspan. 2023. Project Trip Generation Summary. Carlsbad Village Mixed Use Project. November 10th.

INTENTIONALLY LEFT BLANK

Appendix A
Baseline Noise Measurement Field Data

FORMS DUDEK FIELD DATA REPORT

Field Noise Measurement Data

Record: 1498	
Project Name	*Carlsbad village*
Observer(s)	*Connor Burke*
Date	*2022-10-19*

Meteorological Conditions	
Temp (F)	*72*
Humidity % (R.H.)	*40*
Wind	*Light*
Wind Speed (MPH)	*5*
Wind Direction	*East*
Sky	*Sunny*

Instrument and Calibrator Information	
Instrument Name List	*(ENC) Rion NL-52*
Instrument Name	*(ENC) Rion NL-52*
Instrument Name Lookup Key	*(ENC) Rion NL-52*
Manufacturer	*Rion*
Model	*NL-52*
Serial Number	*553896*
Calibrator Name	*(ENC) LD CAL150*
Calibrator Name	*(ENC) LD CAL150*
Calibrator Name Lookup Key	*(ENC) LD CAL150*
Calibrator Manufacturer	*Larson Davis*
Calibrator Model	*LD CAL150*
Calibrator Serial #	*5152*
GPS Assistance Used	*Yes*
Pre-Test (dBA SPL)	*94*
Post-Test (dBA SPL)	*94*
Windscreen	*Yes*
Weighting?	*A-WTD*
Slow/Fast?	*Slow*
ANSI?	*Yes*

Monitoring	
Record #	*1*
Site ID	*ST3*
Site Location Lat/Long	*33.162655, -117.343688*
Begin (Time)	*09:30:00*
End (Time)	*09:45:00*
Leq	*67.6*
Lmax	*75.5*
Lmin	*61.7*
Other Lx?	*L90, L50, L10*
L90	*63.2*
L50	*66.2*
L10	*70.2*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Distant Traffic*
Other Noise Sources Additional Description	*Freeway noise. Train horn.*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as	*Yes*

previously noted?	

Source Info and Traffic Counts

Number of Lanes	*4*
Lane Width (feet)	*10*
Roadway Width (feet)	*40*
Roadway Width (m)	*12.2*
Distance to Roadway (feet)	*20*
Distance to Roadway (m)	*6.1*
Distance Measured to Centerline or Edge of Pavement?	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*35*

Traffic Counts

Vehicle Count Summary	*A 320, MT 6, HT 6, B 0, MC 0*
Select Method for Recording Count Duration	*Enter Manually*
Counting Both Directions?	*Yes*
Count Duration (minutes)	*15*
Vehicle Count Tally	
Select Method for Vehicle Counts	*Enter Manually*
Number of Vehicles - Autos	*320*
Number of Vehicles - Medium Trucks	*6*
Number of Vehicles - Heavy Trucks	*6*
Number of Vehicles - Buses	*0*
Number of Vehicles - Motorcyles	*0*

Description / Photos

Site Photos

Photo

FORMS FIELD DATA REPORT

Monitoring

Record #	*2*
Site ID	*ST1*
Site Location Lat/Long	*33.161674, -117.342166*
Begin (Time)	*10:00:00*
End (Time)	*10:15:00*
Leq	*67.1*
Lmax	*70.4*
Lmin	*64.5*
Other Lx?	*L90, L50, L10*
L90	*65.2*
L50	*66.9*
L10	*68.7*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources Additional Description	*Freeway traffic dominant*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Description / Photos

Site Photos

Photo	

FORMS FIELD DATA REPORT

Monitoring

Record #	*3*
Site ID	*ST4*
Site Location Lat/Long	*33.161466, -117.343572*
Begin (Time)	*10:35:00*
End (Time)	*10:50:00*
Leq	*58.4*
Lmax	*60.7*
Lmin	*56.3*
Other Lx?	*L90, L50, L10*
L90	*57.1*
L50	*57.8*
L10	*60.1*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources Additional Description	*Freeway noise dominant. AC unit.*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Description / Photos

Site Photos

Photo	

FORMS DUDEK FIELD DATA REPORT

Monitoring

Record #	*4*
Site ID	*ST2*
Site Location Lat/Long	*33.161376, -117.344028*
Begin (Time)	*11:00:00*
End (Time)	*11:15:00*
Leq	*62.7*
Lmax	*70.4*
Lmin	*58.5*
Other Lx?	*L90, L50, L10*
L90	*59.1*
L50	*60.7*
L10	*65.5*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Birds, Distant Traffic*
Other Noise Sources Additional Description	*Freeway audible.*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Source Info and Traffic Counts

Number of Lanes	*2*
Lane Width (feet)	*10*
Roadway Width (feet)	*20*
Roadway Width (m)	*6.1*
Distance to Roadway (feet)	*3*
Distance to Roadway (m)	*0.9*
Distance Measured to Centerline or Edge of Pavement?	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*25*

Traffic Counts

Vehicle Count Summary	*A 118, MT 2, HT 0, B 0, MC 0*
Select Method for Recording Count Duration	*Enter Manually*
Counting Both Directions?	*Yes*
Count Duration (minutes)	*15*
Vehicle Count Tally	
Select Method for Vehicle Counts	*Enter Manually*
Number of Vehicles - Autos	*118*
Number of Vehicles - Medium Trucks	*2*
Number of Vehicles - Heavy Trucks	*0*
Number of Vehicles - Buses	*0*
Number of Vehicles - Motorcyles	*0*

Description / Photos

FORMS FIELD DATA REPORT

Site Photos

Photo	

Appendix B
Construction Noise Modeling Input and Output

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit (ambient + 10 dB) for construction phase at NSR = 77

allowable hours over which Leq is to be averaged (example: 8 per FTA guidance) = 1

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Barrier / Topo Insertion Loss (dB)*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 1-hour Leq
Demolition	Concrete Saw	1	20	90	Concrete/Industrial Sa	300		74.4	1	60	67
	Dozer	2	40	82	Rubber Tired Dozers	300		66.4	1	60	65
	Excavator	3	40	81		300		65.4	1	60	66
										Total for Demolition Phase:	**71.2**
Site Preparation	Dozer	3	40	82		300		66.4	1	60	67
	Tractor	1	40	84	Tractors/Loaders/Back	300		68.4	1	60	64
	Front End Loader	0	40	79	Tractors/Loaders/Back	300		63.4	1	60	0
	Backhoe	0	40	78	Tractors/Loaders/Back	300		62.4	1	60	0
										Total for Site Preparation Phase:	**69.1**
Grading	Excavator	1	40	81		300		65.4	1	60	61
	Grader	1	40	85		300		69.4	1	60	65
	Dozer	1	40	82	Rubber Tired Dozers	300		66.4	1	60	62
	Tractor	1	40	84	Tractors/Loaders/Back	300		68.4	1	60	64
	Front End Loader	1	40	79	Tractors/Loaders/Back	300		63.4	1	60	59
	Backhoe	1	40	78	Tractors/Loaders/Back	300		62.4	1	60	58
										Total for Grading Phase:	**70.4**
Building Construction	Crane	1	16	81		300		65.4	1	60	57
	Man Lift	3	20	75	Forklifts	300		59.4	1	60	57
	Generator	1	50	72	Generator Sets	300		56.4	1	60	53
	Tractor	1	40	84	Tractors/Loaders/Back	300		68.4	1	60	64
	Front End Loader	1	40	79	Tractors/Loaders/Back	300		63.4	1	60	59
	Backhoe	1	40	78	Tractors/Loaders/Back	300		62.4	1	60	58
	Welder / Torch	1	40	73	Welders	300		57.4	1	60	53
										Total for Building Construction Phase:	**67.7**
Paving	Concrete Mixer Truck	2	40	79	Cement and Mortar Mi	300		63.4	1	60	62
	Paver	1	50	77		300		61.4	1	60	58
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	300		69.4	1	60	69
	Roller	2	20	80		300		64.4	1	60	60
	Tractor	1	40	84	Tractors/Loaders/Back	300		68.4	1	60	64
	Front End Loader	0	40	79	Tractors/Loaders/Back	300		63.4	1	60	0
	Backhoe	0	40	78	Tractors/Loaders/Back	300		62.4	1	60	0
										Total for Paving Phase:	**71.8**
Architectural Coating	Compressor (air)	1	40	78		300		62.4	1	60	58
										Total for Architectural Coating Phase:	**58.5**

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit (ambient + 10 dB) for construction phase at NSR = 78

allowable hours over which Leq is to be averaged (example: 8 per FTA guidance) = 1

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Barrier / Topo Insertion Loss (dB)*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 1-hour Leq
Demolition	Concrete Saw	1	20	90	Concrete/Industrial Sa	285		74.9	1	60	68
	Dozer	2	40	82	Rubber Tired Dozers	285		66.9	1	60	66
	Excavator	3	40	81		285		65.9	1	60	67
										Total for Demolition Phase:	**71.7**
Site Preparation	Dozer	3	40	82		285		66.9	1	60	68
	Tractor	1	40	84	Tractors/Loaders/Back	285		68.9	1	60	65
	Front End Loader	0	40	79	Tractors/Loaders/Back	285		63.9	1	60	0
	Backhoe	0	40	78	Tractors/Loaders/Back	285		62.9	1	60	0
										Total for Site Preparation Phase:	**69.5**
Grading	Excavator	1	40	81		285		65.9	1	60	62
	Grader	1	40	85		285		69.9	1	60	66
	Dozer	1	40	82	Rubber Tired Dozers	285		66.9	1	60	63
	Tractor	1	40	84	Tractors/Loaders/Back	285		68.9	1	60	65
	Front End Loader	1	40	79	Tractors/Loaders/Back	285		63.9	1	60	60
	Backhoe	1	40	78	Tractors/Loaders/Back	285		62.9	1	60	59
										Total for Grading Phase:	**70.9**
Building Construction	Crane	1	16	81		285		65.9	1	60	58
	Man Lift	3	20	75	Forklifts	285		59.9	1	60	58
	Generator	1	50	72	Generator Sets	285		56.9	1	60	54
	Tractor	1	40	84	Tractors/Loaders/Back	285		68.9	1	60	65
	Front End Loader	1	40	79	Tractors/Loaders/Back	285		63.9	1	60	60
	Backhoe	1	40	78	Tractors/Loaders/Back	285		62.9	1	60	59
	Welder / Torch	1	40	73	Welders	285		57.9	1	60	54
										Total for Building Construction Phase:	**68.2**
Paving	Concrete Mixer Truck	2	40	79	Cement and Mortar Mi	285		63.9	1	60	63
	Paver	1	50	77		285		61.9	1	60	59
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	285		69.9	1	60	70
	Roller	2	20	80		285		64.9	1	60	61
	Tractor	1	40	84	Tractors/Loaders/Back	285		68.9	1	60	65
	Front End Loader	0	40	79	Tractors/Loaders/Back	285		63.9	1	60	0
	Backhoe	0	40	78	Tractors/Loaders/Back	285		62.9	1	60	0
										Total for Paving Phase:	**72.2**
Architectural Coating	Compressor (air)	1	40	78		285		62.9	1	60	59
										Total for Architectural Coating Phase:	**58.9**

Appendix C
Traffic Noise Modeling Input and Output

Project Trip Generation Summary (rev 11.10.2023)

Carlsbad Village Mixed Use

Land Use	Quantity	Daily Volumes		AM Peak Hour					PM Peak Hour				
		Rate [a]	Volume	Rate	Split	In	Out	Total	Rate	Split	In	Out	Total
Proposed Project													
Apartment (Multi-family units >20 DU/acre) [b]	218 DU	6 /DU	1,308	8%	20% : 80%	21	84	105	9%	70% : 30%	83	35	118
Supermarket	5.8 KSF	150 /KSF	870	4%	70% : 30%	25	10	35	10%	50% : 50%	44	43	87
Retail / Strip Commercial	2 KSF	40 /KSF	80	3%	60% : 40%	1	1	2	9%	50% : 50%	4	3	7
Quality Restaurant	6 KSF	100 /KSF	600	1%	60% : 40%	4	2	6	8%	70% : 30%	34	14	48
Project Subtotal			**2,858**			**51**	**97**	**148**			**165**	**95**	**260**
Mixed Use Reduction [c]			**-616**			**-4**	**-4**	**-8**			**-39**	**-41**	**-80**
Final Project Trips			**2,242**			**47**	**93**	**140**			**126**	**54**	**180**
Existing to be replaced													
Neighborhood Shopping Center [d]	58.7 KSF	120 /KSF	7,044	4%	60% : 40%	169	113	282	10%	50% : 50%	352	352	704
Net New Trip Generation			**-4,802**			**-122**	**-20**	**-142**			**-226**	**-298**	**-524**

Footnotes:

a. Trip generation rates from SANGAG's (Not So) Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region, April 2002. ("SANDAG Brief Guide")

b. The site acreage is 4.12 therefore the residential density calculates to 53 DU/acre (218 / 4.12 = 53).

c. Mixed use reduction for AM/PM peak hours calculated using NCHRP 8-51 Internal Trip Capture Estimation Tool. Daily reduction estimated using relationship between peak hours and daily volumes for unadjusted project trips.

d. Per SANDAG this land use is typically less than 15 acres, less than 125,000 sq. ft., w/usually grocery & drugstore, cleaners, beauty & barber shop, & fast food services)
The existing 4.12 acre, 58.7 KSF site contains all of these individual uses including: grocery, drugstore, cleaners, barber shop, and eating establishments.
Therefore, the SANDAG "Neighborhood Shopping Center" rate is appropriate for the existing site. This rate accurately reflects the operations of a shopping center as a whole including trip-chaining and internal interaction between individual uses that are typical of similar shopping centers. If specific trip rates for existing individual uses within the shopping center were applied, this would increase the existing trip generation and therefore overstate the net trip reduction associated with the proposed project. The individual use trip rates pertain to isolated uses and do not accurately reflect driveway trips for a combined shopping center.

LINSCOTT LAW & GREENSPAN engineers

Roadway Traffic Noise Prediction (CNEL)
(FHWA RD-77-108, using Calveno curves)

Project: **Tooley - Carlsbad Village Mixed Use**

User Inputs (boxed cells)

Auto %	**93.74%**	Day	**80.00%**
MT (%)	**3.71%**	Evening	**10.00%**
HT (%)	**2.55%**	Nighttime	**10.00%**

Traffic Percentages by Vehicle Type

	Day	Evening	Nighttime	Equivalent
Auto	74.99%	9.37%	9.37%	198.4%
MT	2.97%	0.37%	0.37%	7.9%
HT	2.04%	0.25%	0.25%	5.4%

Study Year or Condition	Roadway	Roadway Segment and Direction of Traffic	Average Weekday Traffic (AWT)	Speed (mph)	Auto Noise (at 15m)	MT Noise (at 15m)	HT Noise (at 15m)	CNEL Total (at 15m)	at ST3 Distance (feet)	at ST3 CNEL (dBA)	at ST3 Leq* (dBA)
Existing (2025)	Interstate-5 Freeway	Southbound ramp onto I-5	6,200	30	58.3	54.9	58.9	62.5	350	49.7	49.9
		Southbound I-5	86,300	65	79.4	71.6	73.4	80.9	435	66.7	66.9
		Southbound I-5 HOV lane	12,700	65	71.1	63.2	65.1	72.6	455	58.1	58.3
		Northbound I-5 HOV lane	13,600	65	71.4	63.5	65.4	72.9	500	57.8	58.0
		Northbound I-5	87,100	65	79.4	71.6	73.5	81.0	530	65.5	65.7
								total CNEL at above receptor:		**67.8**	**68.0**

data from 2020 Caltrans truck AADT -->

RTE	DIST	CNTY	POST MILE	L E	DESCRIPTION	VEHICLE AADT TOTAL	TRUCK AADT TOTAL	TRUCK % TOT VEH	---------------- 2	TRUCK ------By 3	AADT Axle------ 4	TOTAL --------------- 5+	% -------------- 2	TRUCK -------By 3	AADT Axle----- 4	------------ 5+	EAL 2-WAY (1000)
5	11	SD	42.712		Leucadia Blvd.	17400	10893	6.26	6,456	591	237	3,607	59.27	5.43	2.18	33.12	1,560

3.710302 2.55

* based on conversion of CNEL to Leq(peak hour) per Caltrans TeNS eq. 2-32 (Caltrans 2013)

Roadway Traffic Noise Prediction (CNEL)
(FHWA RD-77-108, using Calveno curves)

Project: **Tooley - Carlsbad Village Mixed Use**

User Inputs (boxed cells)

Auto %	**96.39%**	Day	**80.00%**
MT (%)	**1.81%**	Evening	**10.00%**
HT (%)	**1.81%**	Nighttime	**10.00%**

Traffic Percentages by Vehicle Type

	Day	Evening	Nighttime	Equivalent
Auto	77.11%	9.64%	9.64%	204.0%
MT	1.45%	0.18%	0.18%	3.8%
HT	1.45%	0.18%	0.18%	3.8%

Study Year or Condition	Roadway	Roadway Segment and Direction of Traffic	Average Weekday Traffic (AWT)	Speed (mph)	Auto Noise (at 15m)	MT Noise (at 15m)	HT Noise (at 15m)	CNEL Total (at 15m)	at ST3 Distance (feet)	at ST3 CNEL (dBA)	at ST3 Leq* (dBA)
Existing (2025) *without* Project	Carlsbad Village Drive	west of I-5 and east of Hope	20,500	25	61.3	55.7	61.9	65.1	70	62.8	63.1

15-min traffic counts: (from CB 10/19/22 field survey at ST3)

autos	320
medium trucks	6
heavy trucks	6
buses	0

	CNEL (dBA)	Leq* (dBA)
acoustic contribution from I-5 traffic (see "I5_Caltrans" worksheet):	67.8	68.0
logarithmic sum of Carlsbad Village Drive and I-5 freeway traffic noise:	69.0	69.2
measured noise level at ST3 (Oct. 19, 2022 field survey sample Leq):		67.6
difference between measured outdoor noise level at ST3 and prediction:		-1.6
validated? (< +/-3 dB):		yes

* based on conversion of CNEL to Leq(peak hour) per Caltrans TeNS eq. 2-32 (Caltrans 2013)

Roadway Traffic Noise Prediction (CNEL)
(FHWA RD-77-108, using Calveno curves)

Project: **Tooley - Carlsbad Village Mixed Use**

User Inputs (boxed cells)

Auto %	**96.39%**	Day	**80.00%**
MT (%)	**1.81%**	Evening	**10.00%**
HT (%)	**1.81%**	Nighttime	**10.00%**

Traffic Percentages by Vehicle Type

	Day	Evening	Nighttime	Equivalent
Auto	77.11%	9.64%	9.64%	204.0%
MT	1.45%	0.18%	0.18%	3.8%
HT	1.45%	0.18%	0.18%	3.8%

Study Year or Condition	Roadway	Roadway Segment and Direction of Traffic	Average Weekday Traffic (AWT)	Speed (mph)	Auto Noise (at 15m)	MT Noise (at 15m)	HT Noise (at 15m)	CNEL Total (at 15m)	at ST3 Distance (feet)	at ST3 CNEL (dBA)	at ST3 Leq* (dBA)
Existing (2025) *without* Project	Carlsbad Village Drive	west of I-5 and east of Hope	15,698	25	60.2	54.6	60.7	64.0	70	61.7	61.9

from Sept. 15, 2022 LLG Project Trip Generation Summary:

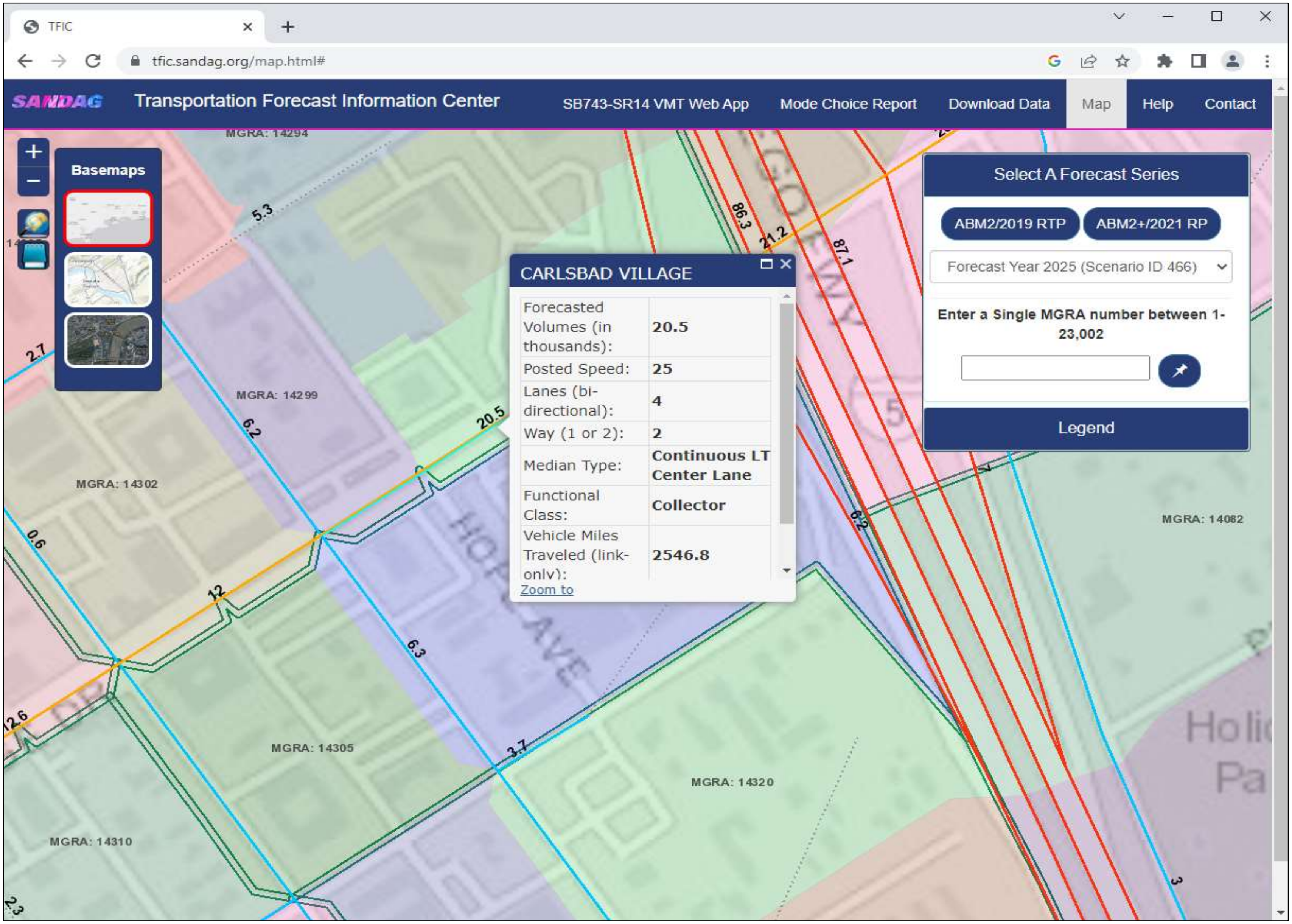
ADT of current shopping center to be replaced	-7044
Project added ADT	2242
net change to Carlsbad Village Drive 2025 ADT:	-4802

15-min traffic counts: (from CB 10/19/22 field survey at ST3)

autos	320
medium trucks	6
heavy trucks	6
buses	0

	CNEL (dBA)	Leq* (dBA)
acoustic contribution from I-5 traffic (see "I5_Caltrans" worksheet):	67.8	68.0
logarithmic sum of Carlsbad Village Drive and I-5 freeway traffic noise:	68.8	69.0
logarithmic sum of Carlsbad Village Drive and I-5 freeway traffic noise (without Project):	69.0	69.2
difference between with and without Project (dB):	-0.3	-0.3
significant impact? (> +3 dB):	no	no

* based on conversion of CNEL to Leq(peak hour) per Caltrans TeNS eq. 2-32 (Caltrans 2013)


TFIC
tfic.sandag.org/map.html#
SANDAG
Transportation Forecast Information Center
SB743-SR14 VMT Web App
Mode Choice Report
Download Data
Map
Help
Contact
Basemaps
CARLSBAD VILLAGE
Forecasted Volumes (in thousands): 20.5
Posted Speed: 25
Lanes (bi-directional): 4
Way (1 or 2): 2
Median Type: Continuous LT Center Lane
Functional Class: Collector
Vehicle Miles Traveled (link-only): 2546.8
Zoom to
Select A Forecast Series
ABM2/2019 RTP
ABM2+/2021 RP
Forecast Year 2025 (Scenario ID 466)
Enter a Single MGRA number between 1-23,002
Legend
MGRA: 14294
MGRA: 14299
MGRA: 14302
MGRA: 14305
MGRA: 14310
MGRA: 14320
MGRA: 14082
HOPE AVE

Appendix D
Project HVAC Noise Prediction

SOURCES: Tooley 2022; Dudek 2022

DUDEK

0 62.5 125 Feet

FIGURE D-1

Aggregate Project Operations Noise Prediction Results - across horizontal plane 5' above grade

Carlsbad Village Mixed Use Project (Dudek No. 14814)

SOURCES: Tooley 2022; Dudek 2022

DUDEK

0 74.5 149 Feet

FIGURE D-2

Aggregate Project Operations Noise Prediction Results - across horizontal plane 15' above grade

Carlsbad Village Mixed Use Project (Dudek No. 14814)

SOURCES: Tooley 2022; Dudek 2022

DUDEK

FIGURE D-3

Aggregate Project Operations Noise Prediction Results - across horizontal plane 25' above grade

Carlsbad Village Mixed Use Project (Dudek No. 14814)

SOURCES: Tooley 2022; Dudek 2022

DUDEK

0 74.5 149 Feet

FIGURE D-4

Aggregate Project Operations Noise Prediction Results - across horizontal plane 25' above grade - no pool or 5th floor deck noises

Carlsbad Village Mixed Use Project (Dudek No. 14814)

Receivers *5ft_plane*

Name	M.	ID	Level Lr Day (dBA)	Level Lr Night (dBA)	Limit. Value Day (dBA)	Limit. Value Night (dBA)	Land Use Type	Auto	Noise Type	Height (ft)		Coordinates X (ft)	Y (ft)	Z (ft)
noise sensitive receptor (and baseline SPL spot)		ST1	39	39	0	0		x	Total	5	r	953.25	410	5
baseline SPL spot		ST2	39.5	39.5	0	0		x	Total	5	r	329.65	382.19	5
noise-sensitive receiver (and baseline SPL spot)		ST3	44.5	44.5	0	0		x	Total	5	r	516.93	791.87	5
noise sensitive receptor (and baseline SPL spot)		ST4	35.8	35.8	0	0		x	Total	5	r	571.59	280.3	5

15ft_plane

Name	M.	ID	Level Lr Day (dBA)	Level Lr Night (dBA)	Limit. Value Day (dBA)	Limit. Value Night (dBA)	Land Use Type	Auto	Noise Type	Height (ft)		Coordinates X (ft)	Y (ft)	Z (ft)
noise sensitive receptor (and baseline SPL spot)		ST1	40.2	40.2	0	0		x	Total	15	r	953.25	410	15
baseline SPL spot		ST2	40.4	40.4	0	0		x	Total	15	r	329.65	382.19	15
noise-sensitive receiver (and baseline SPL spot)		ST3	45	45	0	0		x	Total	15	r	516.93	791.87	15
noise sensitive receptor (and baseline SPL spot)		ST4	37.2	37.2	0	0		x	Total	15	r	571.59	280.3	15

25ft_plane

Name	M.	ID	Level Lr Day (dBA)	Level Lr Night (dBA)	Limit. Value Day (dBA)	Limit. Value Night (dBA)	Land Use Type	Auto	Noise Type	Height (ft)		Coordinates X (ft)	Y (ft)	Z (ft)
noise sensitive receptor (and baseline SPL spot)		ST1	41.1	41.1	0	0		x	Total	25	r	953.25	410	25
baseline SPL spot		ST2	41	41	0	0		x	Total	25	r	329.65	382.19	25
noise-sensitive receiver (and baseline SPL spot)		ST3	45.6	45.6	0	0		x	Total	25	r	516.93	791.87	25
noise sensitive receptor (and baseline SPL spot)		ST4	39.2	39.2	0	0		x	Total	25	r	571.59	280.3	25

25ft_plane; without pool and fifth-floor common area sound sources

Name	M.	ID	Level Lr Day (dBA)	Level Lr Night (dBA)	Limit. Value Day (dBA)	Limit. Value Night (dBA)	Land Use Type	Auto	Noise Type	Height (ft)		Coordinates X (ft)	Y (ft)	Z (ft)
noise sensitive receptor (and baseline SPL spot)		ST1	39.2	39.2	0	0		x	Total	25	r	953.25	410	25
baseline SPL spot		ST2	37.6	37.6	0	0		x	Total	25	r	329.65	382.19	25
noise-sensitive receiver (and baseline SPL spot)		ST3	39.5	39.5	0	0		x	Total	25	r	516.93	791.87	25
noise sensitive receptor (and baseline SPL spot)		ST4	35.8	35.8	0	0		x	Total	25	r	571.59	280.3	25

Area Sources

Name	M.	ID	Result. PWL Day (dBA)	Result. PWL Evening (dBA)	Result. PWL Night (dBA)	Result. PWL'' Day (dBA)	Result. PWL'' Evening (dBA)	Result. PWL'' Night (dBA)	Lw / Li Type	Value	norm. dB(A)	Correction Day dB(A)	Correction Evening dB(A)	Correction Night dB(A)	Sound Reduction R	Area (ft²)	Attenuatio	Operating Time Day (min)	Special (min)	Night (min)	K0 (dB)	Freq. (Hz)	Direct.	Moving Pt. Src Number Day	Evening	Night
Building Retail A Noise Source		BRANS	79.2	79.2	79.2	51.7	51.7	51.7	Lw	RAAHU++RBAHU++RA/		0	0	0							0		(none)			
Building Retail B Noise Source		BRBNS	77.1	77.1	77.1	51.4	51.4	51.4	Lw	RCAHU++RCAC		0	0	0							0		(none)			
Residential Tower 1 AC		RT1AC	88.9	88.9	88.9	58.1	58.1	58.1	Lw	R1AC++R2AC++R3AC+-		0	0	0			3.4899				0		(none)			
Residential Tower 2 AC		RT2AC	89.6	89.6	89.6	57	57	57	Lw	R1AC++R2AC++R3AC+-		0	0	0			2.8421				0		(none)			
Residential Tower 2 AHU		RT2AHU	87.5	87.5	87.5	56.3	56.3	56.3	Lw	R1AHU++R2AHU++R3/		0	0	0			2.8421				0		(none)			
Residential Tower 1 AHU		RT1AHU	86.9	86.9	86.9	55	55	55	Lw	R1AHU++R2AHU++R3/		0	0	0			3.4899				0		(none)			
Bldg C northern deck guest speech		BCNDGS	90	90	90	72.6	72.6	72.6	Lw	HSS		0	0	0			-93.2				0		(none)			
Bldg C southern deck guest speech		BCSDGS	90	90	90	66.4	66.4	66.4	Lw	HSS		0	0	0			-93.2				0		(none)			
Bldg C northern deck guest speech		BCNDGS	90	90	90	69.2	69.2	69.2	Lw	HSS		0	0	0			-93.2				0		(none)			
pool area guest speech		PAGS	90	90	90	69.7	69.7	69.7	Lw	HSS		0	0	0			-93.2				0		(none)			
Parking Garage lvl 1 noises		PGL1N	78	78	78	47.7	47.7	47.7	Lw	PM		0	0	0			36.4-15				0		(none)			
Parking Garage lvl 2 noises		PGL2N	75	75	75	44.7	44.7	44.7	Lw	PM		0	0	0			36.4-12				0		(none)			
Parking Garage lvl 3 noises		PGL3N	72	72	72	41.7	41.7	41.7	Lw	PM		0	0	0			36.4-9				0		(none)			
Parking Garage lvl 4 noises		PGL4N	69	69	69	38.7	38.7	38.7	Lw	PM		0	0	0			36.4-6				0		(none)			
Parking Garage lvl 5 noises		PGL5N	66	66	66	35.7	35.7	35.7	Lw	PM		0	0	0			36.4-3				0		(none)			

Point Sources

Name	M.	ID	Result. PWL Day (dBA)	Result. PWL Evening (dBA)	Result. PWL Night (dBA)	Lw / Li Type	Value	norm. dB(A)	Correction Day dB(A)	Correction Evening dB(A)	Correction Night dB(A)	Sound Reduction R	Area (ft²)	Attenuatio	Operating Time Day (min)	Special (min)	Night (min)	K0 (dB)	Freq. (Hz)	Direct.	Height (ft)		Coordinates X (ft)	Y (ft)	Z (ft)
Bldg C northern deck outdoor spkr		BCNDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	591.64	506.55	54.25
Bldg C northern deck outdoor spkr		BCNDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	605.1	485.5	54.25
Bldg C northern deck outdoor spkr		BCNDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	629.62	501.67	54.25
Bldg C southern deck outdoor spkr		BCSDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	608.57	292.13	54.25
Bldg D northern deck outdoor spkr		BDNDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	699.5	622.01	54.25
Pool Area outdoor speaker		PAOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	691.99	573	0.25
Pool Area outdoor speaker		PAOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	682.7	524.05	0.25
Pool Area outdoor speaker		PAOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	635.94	508.46	0.25
Bldg D northern deck outdoor spkr		BDNDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	714	601.5	54.25
Bldg D northern deck outdoor spkr		BDNDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	728.76	579.9	54.25
Bldg C southern deck outdoor spkr		BCSDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	631.65	307.28	54.25
Bldg C southern deck outdoor spkr		BCSDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	653.36	323.48	54.25
Bldg C southern deck outdoor spkr		BCSDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	676.09	339.67	54.25
Bldg C southern deck outdoor spkr		BCSDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	697.11	354.14	54.25
Bldg C southern deck outdoor spkr		BCSDOS	78	78	78	Lw	HSS		0	0	0			-81.2				0		(none)	0.25	g	718.81	369.3	54.25

Sound Levels (local)

Name	ID	Type	Oktave Spectrum (dB) Weight.	31.5	63	125	250	500	1000	2000	4000	8000	A	lin	Source
Retail A AHU	RAAHU	Lw	A	49	52	64	65	66	63	56	50	45	70.9	89.5	stat-ops-noise-sources_mcs112222
Retail B AHU	RBAHU	Lw	A	47	50	62	63	64	61	54	48	43	68.9	87.5	stat-ops-noise-sources_mcs112222
Retail C AHU	RCAHU	Lw	A	50	53	65	66	67	64	57	51	46	71.9	90.5	stat-ops-noise-sources_mcs112222
Residential - Lvl 1 AHU	R1AHU	Lw	A	61	64	76	77	78	75	68	62	57	82.9	101.5	stat-ops-noise-sources_mcs112222
Residential - Lvl 2 AHU	R2AHU	Lw	A	62	65	77	78	79	76	69	63	58	83.9	102.5	stat-ops-noise-sources_mcs112222
Residential - Lvl 3 AHU	R3AHU	Lw	A	62	65	77	78	79	76	69	63	58	83.9	102.5	stat-ops-noise-sources_mcs112222
Residential - Lvl 4 AHU	R4AHU	Lw	A	61	64	76	77	78	75	68	62	57	82.9	101.5	stat-ops-noise-sources_mcs112222
Residential - Lvl 5 AHU	R5AHU	Lw	A	61	64	76	77	78	75	68	62	57	82.9	101.5	stat-ops-noise-sources_mcs112222
Retail A AC	RAAC	Lw		70	73	73	72	74	72	64	61	55	75.5	80.4	stat-ops-noise-sources_mcs112222
Retail B AC	RBAC	Lw		68	71	71	71	73	71	62	59	53	74.4	79	stat-ops-noise-sources_mcs112222
Retail C AC	RCAC	Lw		70	73	73	72	74	72	64	61	55	75.5	80.4	stat-ops-noise-sources_mcs112222
residential 1st floor AC	R1AC	Lw		79	82	82	80	82	83	74	72	67	85.4	89.5	stat-ops-noise-sources_mcs112222
residential 2nd floor AC	R2AC	Lw		79	82	82	80	82	83	74	72	67	85.4	89.5	stat-ops-noise-sources_mcs112222
residential 3rd floor AC	R3AC	Lw		79	82	82	80	82	83	74	72	67	85.4	89.5	stat-ops-noise-sources_mcs112222
residential 4th floor AC	R4AC	Lw		79	82	82	80	82	83	74	72	67	85.4	89.5	stat-ops-noise-sources_mcs112222
residential 5th floor AC	R5AC	Lw		79	82	82	80	82	83	74	72	67	85.4	89.5	stat-ops-noise-sources_mcs112222
Haynes speech spectrum	HSS	Lw		-14	-11	-8	-5	-5	-7	-13	-20	-26	-3.2	0.7	Haynes 2006
parking movement	PM	Lw	A	75	86	90	89	91	93	93	90	85	99.4	116.9	Nicol and Johnson 2011

AHUs (plenum-type return fan only, no condenser units [see separate worksheet]):

Building Minimum Ventilation

		63	125	250	500	1000	2000	4000	8000
A-weighting adjustments		26	13	9	3	0	-1	-1	1
average of values for the two fan diameter ranges, per Guyer (Table 12)	plug	40	40	38	34	29	23	19	16
average of values for the two fan diameter ranges, per Guyer (Table 12)	tube	47	44	46	47	44	45	38	35
per Guyer (Table 12, presumed based on Bies & Hansen ENC)	prop	46	48	55	53	52	48	43	38

percent GSF actually occupied (and need ventilation): 90

Tag	Building	GSF	Avail. SF	Height (ft)	Avg. minutes to change air*	Volume (ft3)	CFM	m^2	comparable facility function	Pressure (iwg)	Pressure (Pa)	Q (m^3/s)	fantype = plug, tube, or prop	A-weighted PWL (for CadnaA inputs) 63	125	250	500	1000	2000	4000	8000	OA dB
return air fans in building rooftop AHUs:																						
	Retail A	4800	4320	10	8	43200	5400	402	retail stores	2	500	3	plug	52	64	65	66	63	56	50	45	**71**
	Retail B	3260	2934	10	8	29340	3667.5	273	retail stores	2	500	2	plug	50	62	63	64	61	54	48	43	**69**
	Retail C	5735	5162	10	8	51615	6451.875	480	retail stores	2	500	3	plug	53	65	66	67	64	57	51	46	**72**
	Residential - Lvl 1	51619	46457	8	4	371657	92914.2	4318	residences	2	500	44	plug	64	76	77	78	75	68	62	57	**83**
	Residential - Lvl 2	53627	48264	8	4	386114	96528.6	4486	residences	2	500	46	plug	65	77	78	79	76	69	63	58	**83**
	Residential - Lvl 3	53627	48264	8	4	386114	96528.6	4486	residences	2	500	46	plug	65	77	78	79	76	69	63	58	**83**
	Residential - Lvl 4	50878	45790	8	4	366322	91580.4	4256	residences	2	500	43	plug	64	76	77	78	75	68	62	57	**83**
	Residential - Lvl 5	43652	39287	8	4	314294	78573.6	3652	residences	2	500	37	plug	64	76	77	78	75	68	62	57	**83**

	63	125	250	500	1000	2000	4000	8000
fan or AHU cabinet liner/interior attenuation (excludes inlet/outlet PWL split, already in calcs above:	2	3	4	5	6	8	10	10

*from 3-10 minute range for "retail stores", 2-5 minute range for "residences" per Loren Cook's "Engineering Cookbook", 1999 edition, p. 41

ACCs (air-cooled chillers on rooftops):

Building Interior Comfort

with or without sound insulation? (enter Y/N): y

unweighted PWL (dB) per OCBF (Hz) at full load (100%)

	tons	LWA	63	125	250	500	1000	2000	4000	8000
Bryant BH16-018 (no sound blanket)	1.5	67	66.2	66.2	63.9	63.8	62.3	58.4	56.4	50.3
Bryant BH16-024 (no sound blanket)	2	71	65	65	63.7	63.4	68.5	64.7	58.7	52.8
Bryant BH16-036 (no sound blanket)	3	71	68.2	68.2	66.4	67.5	68.4	59.6	58.2	52.4
Bryant BH16-048 (no sound blanket)	4	71	68.4	68.4	67.7	69.7	67.6	59.4	56.4	50
Bryant BH16-060 (no sound blanket)	5	69	63.7	63.7	65.4	67.3	64.9	58.3	56.2	51.9
Daikin AGZ-E 30 (w/out sound insulation)	30	85	84	84	83	84	77	75	74	70
Daikin AGZ-E 40 (w/out sound insulation)	40	85	84	84	83	84	77	75	74	70
Daikin AGZ-E 50 (w/out sound insulation)	50	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 60 (w/out sound insulation)	60	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 70 (w/out sound insulation)	70	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 80 (w/out sound insulation)	80	88	88	85	87	86	81	81	77	71
Daikin AGZ-E 90 (w/out sound insulation)	90	88	88	87	87	86	83	80	77	71
Daikin AGZ-E 120 (w/out sound insulation)	120	89	91	85	88	86	82	81	79	72
Daikin AGZ-E 240 (w/out sound insulation)	241	94	94	88	91	90	91	84	82	75

data for models "without sound insulation" or no "sound blankets"

	LWA	63	125	250	500	1000	2000	4000	8000
Bryant BH16-018 (no sound blanket)	68	*66.2*	66.2	63.8	64.1	64.6	59.9	57.7	53.6
Bryant BH16-024 (no sound blanket)	72	*63.4*	63.4	63.3	63.3	70.4	64.5	59.3	55.5
Bryant BH16-036 (no sound blanket)	72	*67.7*	67.7	66.8	68.1	69.9	62.8	60.3	55.2
Bryant BH16-048 (no sound blanket)	73	*67.5*	67.5	67.8	70.1	70.6	63.1	58.5	53.3
Bryant BH16-060 (no sound blanket)	70	*61.7*	61.7	65.6	68.1	65.8	59.8	58.4	56.1
Daikin AGZ-E 30 (w/out sound insulation)	88	92	91	88	87	83	78	73	68
Daikin AGZ-E 40 (w/out sound insulation)	89	92	91	90	88	84	79	74	69
Daikin AGZ-E 50 (w/out sound insulation)	90	93	93	91	89	85	79	74	69
Daikin AGZ-E 60 (w/out sound insulation)	91	94	93	94	89	86	81	76	71
Daikin AGZ-E 70 (w/out sound insulation)	92	95	95	94	89	87	81	76	71
Daikin AGZ-E 80 (w/out sound insulation)	92	95	95	95	89	87	81	76	71
Daikin AGZ-E 90 (w/out sound insulation)	93	94	95	92	91	89	83	81	81
Daikin AGZ-E 120 (w/out sound insulation)	95	93	96	92	92	90	84	84	82
Daikin AGZ-E 240 (w/out sound insulation)	100	98	98	98	95	96	90	90	86

data for models "with sound insulation" or "sound blankets"

	LWA	63	125	250	500	1000	2000	4000	8000
Bryant BH16-018 (no sound blanket)	67	*66.2*	66.2	63.9	63.8	62.3	58.4	56.4	50.3
Bryant BH16-024 (no sound blanket)	71	*65*	65	63.7	63.4	68.5	64.7	58.7	52.8
Bryant BH16-036 (no sound blanket)	71	*68.2*	68.2	66.4	67.5	68.4	59.6	58.2	52.4
Bryant BH16-048 (no sound blanket)	71	*68.4*	68.4	67.7	69.7	67.6	59.4	56.4	50
Bryant BH16-060 (no sound blanket)	69	*63.7*	63.7	65.4	67.3	64.9	58.3	56.2	51.9
Daikin AGZ-E 30 (w/out sound insulation)	85	84	84	83	84	77	75	74	70
Daikin AGZ-E 40 (w/out sound insulation)	85	84	84	83	84	77	75	74	70
Daikin AGZ-E 50 (w/out sound insulation)	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 60 (w/out sound insulation)	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 70 (w/out sound insulation)	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 80 (w/out sound insulation)	88	88	85	87	86	81	81	77	71
Daikin AGZ-E 90 (w/out sound insulation)	88	88	87	87	86	83	80	77	71
Daikin AGZ-E 120 (w/out sound insulation)	89	91	85	88	86	82	81	79	72
Daikin AGZ-E 240 (w/out sound insulation)	94	94	88	91	90	91	84	82	75

actual percent of GSF occupied: 90

Phase	Building Tag	GSF	Avail. SF	comparable facility function	Avg. GSF per ton*	tons of refrig.	Approx. Qty. of ACCs	tons per ACC	Approx. Total PWL (dBA)	unweighted PWL (dB) per OCBF (Hz) at full load (100%) 63	125	250	500	1000	2000	4000	8000
	Retail A	4800	4320	Department Stores - main floor	350	12.3	3	4	**76**	73	73	72	74	72	64	61	55
	Retail B	3260	2934	Department Stores - main floor	350	8.4	2	4	**74**	71	71	71	73	71	62	59	53
	Retail C	5735	5162	Department Stores - main floor	350	14.7	8	2	**76**	75	75	73	73	71	67	65	59
	Residential - Lvl 1	51619	46457	Residential - large	600	77.4	24	3	**85**	82	82	80	81	82	73	72	66
	Residential - Lvl 2	53627	48264	Residential - large	600	80.4	26	3	**85**	82	82	81	82	83	74	72	67
	Residential - Lvl 3	53627	48264	Residential - large	600	80.4	26	3	**85**	82	82	81	82	83	74	72	67
	Residential - Lvl 4	50878	45790	Residential - large	600	76.3	25	3	**85**	82	82	80	81	82	74	72	66
	Residential - Lvl 5	43652	39287	Residential - large	600	65.5	21	3	**84**	81	81	80	81	82	73	71	66

*based upon "lo" value per Loren Cook's "Engineering Cookbook", 1999 edition, pp. 59-60