

***THE REDWOOD APARTMENTS
3422 SANTA ROSA AVENUE
ENVIRONMENTAL NOISE ASSESSMENT***

Santa Rosa, California

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INTRODUCTION

The project proposes to construct five buildings and 180 parking spaces on a 4.28 acre lot located on the southeast corner of Santa Rosa Avenue and East Robles Avenue. Four three story buildings consisting of 96 residential units will be constructed on the north, east and west side of the property and a community building, housing recreational amenities and office will be constructed in the approximate center of the property. The project site is bordered by single-family residences to the northeast and east and commercial land uses to the north, south and west.

This report evaluates the project's potential to result in significant environmental noise impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency section discusses land use compatibility utilizing noise policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the impacts to a less-than-significant level.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA)*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an

average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq} . The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL)* is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (DNL or L_{dn})* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn} . Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn} . At a L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 dBA, each additional decibel increases the percentage of the population highly annoyed by about 3 percent. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes 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.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max} , L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which 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, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
	10 dBA	Broadcast/recording studio
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

Regulatory Background – Noise

The State of California and Sonoma County have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies. A summary of applicable regulatory criteria is provided below.

2018 State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

- (a) 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;
- (b) Generation of excessive groundborne vibration or groundborne noise levels;
- (c) 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 would expose people residing or working in the project area to excessive noise levels?

Checklist items (a) and (b) are applicable to the proposed project. The project is not located within the vicinity of a private airstrip or a public airport and would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, item (c) is not carried further in this analysis.

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn}/CNEL in any habitable room.

Sonoma County 2020 General Plan. The Noise Element of Sonoma County’s 2020 General Plan identifies policies intended to “Protect people from the adverse effects of exposure to excessive noise bad to achieve an environment in which people and land uses function without impairment from noise.” Objectives and policies of the Noise Element that are applicable in the assessment of the proposed project are as follows:

- Objective NE-1.1:** Provide noise exposure information so that noise impacts may be effectively evaluated in land use planning and project review.
- Objective NE-1.2:** Develop and implement measures to avoid exposure of people to excessive noise levels.
- Objective NE-1.3:** Protect the present noise environment and prevent intrusion of new noise sources which would substantially alter the noise environment.

Objective NE-1.4: Mitigate noise from recreational and visitor serving uses.

Policy NE-1a: Designate areas within Sonoma County as noise impacted if they are exposed to existing or projected exterior noise levels exceeding 60 dB L_{dn}, 60 dB CNEL, or the performance standards of Table NE-2.

Policy NE-1b: Avoid noise sensitive land use development in noise impacted areas unless effective measures are included to reduce noise levels. For noise due to traffic on public roadways, railroads and airports, reduce exterior noise to 60 dBA L_{dn} or less in outdoor activity areas and interior noise levels to 45 dBA L_{dn} or less with windows and doors closed. Where it is not possible to meet this 60 dBA L_{dn} standard using practical application of best available noise reduction technology, a maximum level up to 65 dBA L_{dn} may be allowed but interior noise level shall be maintained so as not to exceed 45 dBA L_{dn}. For uses such as Single Room Occupancy, Work-Live, Mixed Use Projects and Caretaker Units, exterior noise levels above 65 dBA L_{dn} or the Table NE-2 standards may be considered if the interior standards of 45 dBA L_{dn} can be met. For schools, libraries, offices, and other similar uses, the interior noise standard shall be 45 dBA L_{eq} in the worst case hours when the building is in use.

Policy NE-1c: Control non-transportation related noise from new projects. The total noise level resulting from new sources shall not exceed the standards in Table NE-2 as measured at the exterior property line of any adjacent noise sensitive land use. Limit exceptions to the following:

- (1) If the ambient noise level exceeds the standard in Table NE-2, adjust the standard to equal the ambient level, up to a maximum of 5 dBA above the standard, provided that no measurable increase (i.e. +/- 1.5 dBA) shall be allowed.
- (2) Reduce the applicable standards in Table NE-2 by five dBA for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises, such as pile drivers and dog barking at kennels.
- (3) Reduce the applicable standards in Table NE-2 by 5 decibels if the proposed use exceeds the ambient level by 10 or more decibels
- (4) For short term noise sources which are permitted to operate no more than six days per year, such as concerts or race events, the allowable noise exposures shown in Table NE-2 may be increased by 5 dB. These events shall be subject to a noise management plan including provisions for maximum noise level limits, noise monitoring, complaint response and allowable hours of operation. The plan shall address potential cumulative noise impacts from all events in the area.

- (5) Noise levels may be measured at the location of the outdoor activity area of the noise sensitive land use, instead of the exterior property line of the adjacent noise sensitive land use where:
 - (a) the property on which the noise sensitive use is located has already been substantially developed pursuant to its existing zoning, and
 - (b) there is available open land on those noise sensitive lands for noise attenuation.

This exception may not be used on vacant properties which are zoned to allow noise sensitive uses.

TABLE NE-2 Maximum Allowable Exterior Noise Exposures for Non-Transportation Noise Sources

Hourly Noise Metric ¹ , dBA	Daytime 7 am to 10 pm	Nighttime 10 pm to 7 am
L ₅₀ (30 minutes in any hour)	50	45
L ₂₅ (15 minutes in any hour)	55	50
L ₀₈ (5 minutes in any hour)	60	55
L ₀₂ (1 minute in any hour)	65	60

¹ The sound level exceeded n% of the time in any hour. For example, the L₅₀ is the value exceeded 50% of the time or 30 minutes in any hour; this is the median noise level. The L₀₂ is the sound level exceeded 1 minute in any hour.

Policy NE-1d: Consider requiring an acoustical analysis prior to approval of any discretionary project involving a potentially significant new noise source or a noise sensitive land use in a noise impacted area.

Policy NE-1e: Continue to follow building permit procedures to ensure that requirements based upon the acoustical analysis are implemented.

Policy NE-1f: Require development projects that do not include or affect residential uses or other noise sensitive uses to include noise mitigation measures where necessary to maintain noise levels compatible with activities planned for the project site and vicinity.

Existing Noise Environment

The project site is located southeast of the Santa Rosa Avenue/East Robles Avenue intersection in Santa Rosa, unincorporated Sonoma County. A noise monitoring survey was performed to document existing noise levels at the site and nearby receptors beginning on Monday, December 31, 2018 and concluding on Friday January 4, 2019. The monitoring survey included two long-term and two short-term measurements, as shown in Figure 1.

Long-term noise measurement LT-1 was made near the west boundary of the project site, approximately 70 feet from the centerline of Santa Rosa Avenue and 130 feet from the centerline of East Robles Avenue. The primary noise source at this location was traffic along Santa Rosa Avenue. Hourly average noise levels at this location ranged from 62 to 74 dBA L_{eq} during the day

and from 58 to 68 dBA L_{eq} at night. The day-night average noise level ranged from 70 to 72 dBA L_{dn} between January 1, 2019 and January 3, 2019. Ambient daytime and nighttime noise levels for each L_n descriptor are shown in Table 3. The measured noise data are summarized in terms of the metrics appropriate for the Sonoma County noise performance standards. Ambient daytime noise levels were determined based on the average of four quietest hours (L_{eq}). The daily trends in noise levels at LT-1 over three 24-hour days are shown in Figures 2-4.

TABLE 3 Existing Ambient Noise Levels at LT-1

Time Period	Average Hourly Noise Level, dBA				
	L ₀₂	L ₀₈	L ₂₅	L ₅₀	L _{eq}
Daytime ¹	74	71	68	64	67
Nighttime ²	69	64	57	53	59

¹ Calculated based on the four quietest L_{eq} hours between 7:00 a.m. and 10:00 p.m.

² Calculated based on the four quietest L_{eq} hours between 10:00 p.m. and 7:00 a.m.

Long-term noise measurement LT-2 was made near the northeast corner of the project site, approximately 20 feet from the centerline of East Robles Avenue. The primary noise source at this location was vehicular traffic on East Robles Avenue. Hourly average noise levels at this location ranged from 57 to 69 dBA L_{eq} during the day and from 51 to 68 dBA L_{eq} at night. The day-night average noise level ranged from 67 to 68 dBA L_{dn} between January 1, 2019 and January 3, 2019. Ambient daytime and nighttime noise levels for each L_n descriptor, determined based on the average of four quietest hours (L_{eq}) and summarized in terms of the metrics appropriate for the Sonoma County noise performance standards are shown in Table 4. The daily trends in noise levels at LT-2 over three 24-hour days are shown in Figures 5-7.

TABLE 4 Existing Ambient Noise Levels at LT-2

Time Period	Average Hourly Noise Level, dBA				
	L ₀₂	L ₀₈	L ₂₅	L ₅₀	L _{eq}
Daytime ¹	70	64	56	52	60
Nighttime ¹	63	56	52	50	54

¹ Calculated based on the four quietest L_{eq} hours between 7:00 a.m. and 10:00 p.m.

² Calculated based on the four quietest L_{eq} hours between 10:00 p.m. and 7:00 a.m.

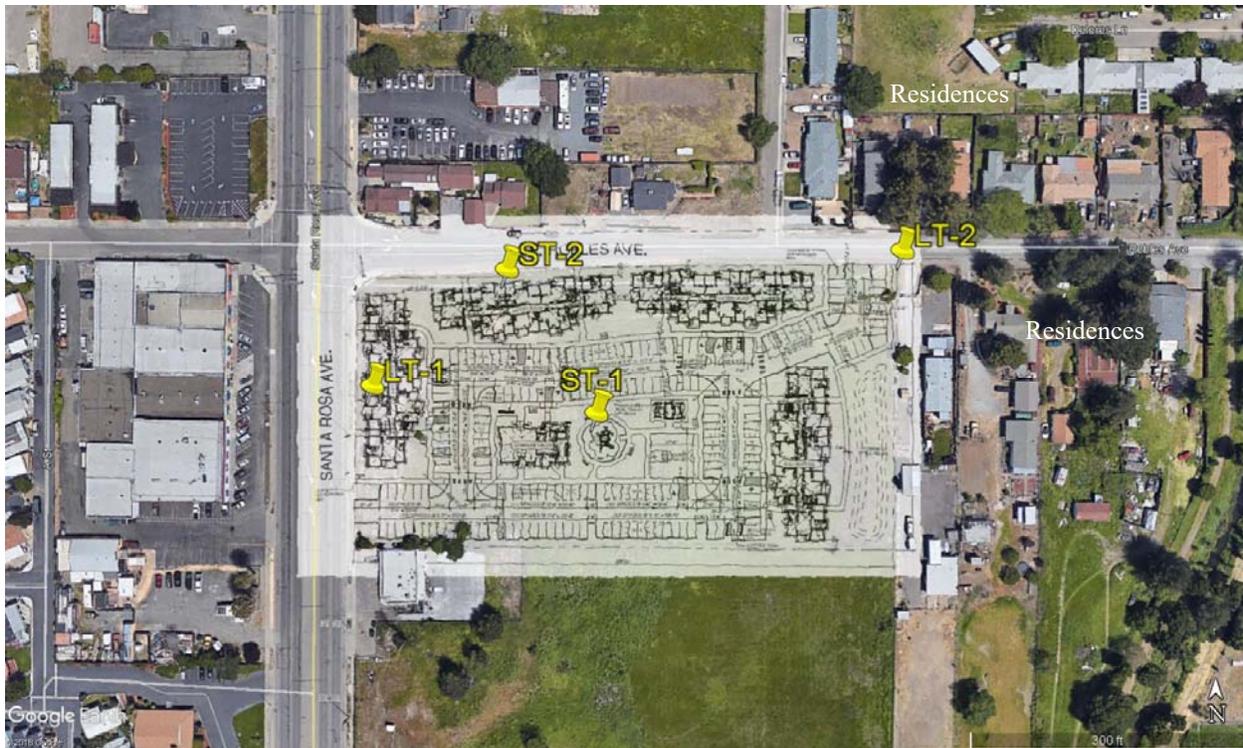
Short-term noise measurement ST-1 was made on Monday, December 31, 2018 near the center of the site, approximately 200 feet from East Robles Avenue and 320 feet from Santa Rosa Avenue. This location was selected to quantify the ambient noise levels near the proposed children’s play area and picnic tables. The 10-minute average noise level measured at this location was 50 dBA L_{eq} , resulting primarily from vehicular traffic along Santa Rosa Avenue and East Robles Avenue. Maximum instantaneous noise levels produced by vehicle passbys ranged from 62 to 66 dBA L_{max} .

Short-term noise measurement ST-2 was made also on Monday, December 31, 2018 near the northern boundary of the site, approximately 35 feet from East Robles Avenue and 220 feet from Santa Rosa Avenue. The 10-minute average noise level measured at this location was 63 dBA L_{eq} , resulting primarily from vehicular traffic along East Robles Avenue. Maximum instantaneous noise levels produced by vehicle passbys ranged from 63 to 80 dBA L_{max} . Table 3 summarizes the results of both short-term measurements.

TABLE 5 Summary of Short-Term Noise Measurement Data (dBA)

Noise Measurement Location	L _{max}	L _{min}	L(2)	L(8)	L(25)	L(50)	L _{eq}
ST-1: Approximate center of project site, 200 feet from East Robles Avenue, 320 feet from Santa Rosa Avenue. (12/31/2018, 9:20 a.m. - 9:30 a.m.)	66	53	62	59	58	56	50
ST-2: North boundary of project site, 35 feet from East Robles Avenue, 220 feet from Santa Rosa Avenue. (12/31/2018, 9:40 a.m. - 9:50 a.m.)	80	55	69	66	63	60	63

FIGURE 1 Aerial View of Noise Measurement Locations in Reference to Site Plan



Source: Google Earth

FIGURE 2 Daily Trend in Noise Levels at LT-1, January 1st, 2019

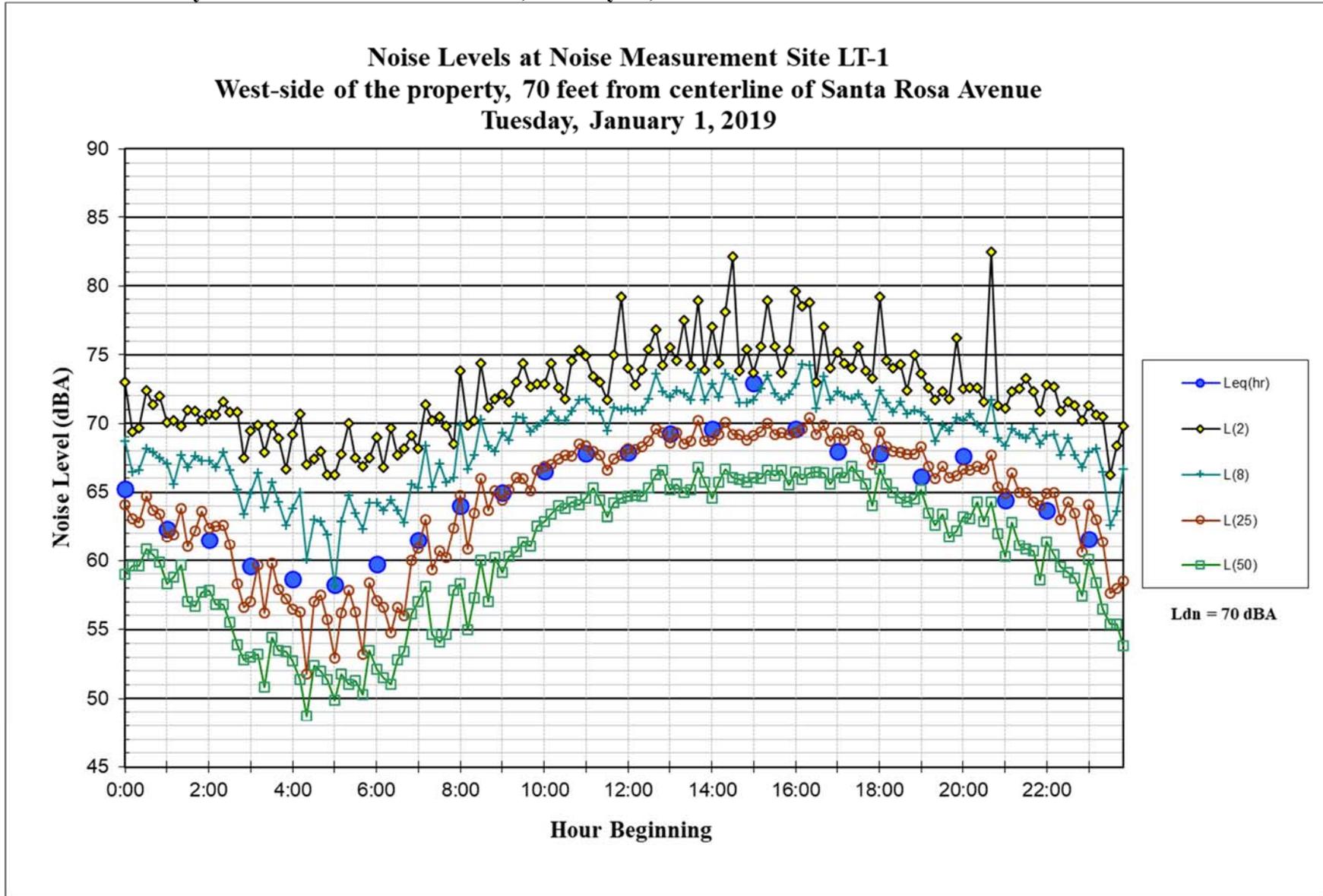


FIGURE 3 Daily Trend in Noise Levels at LT-1, January 2nd, 2019

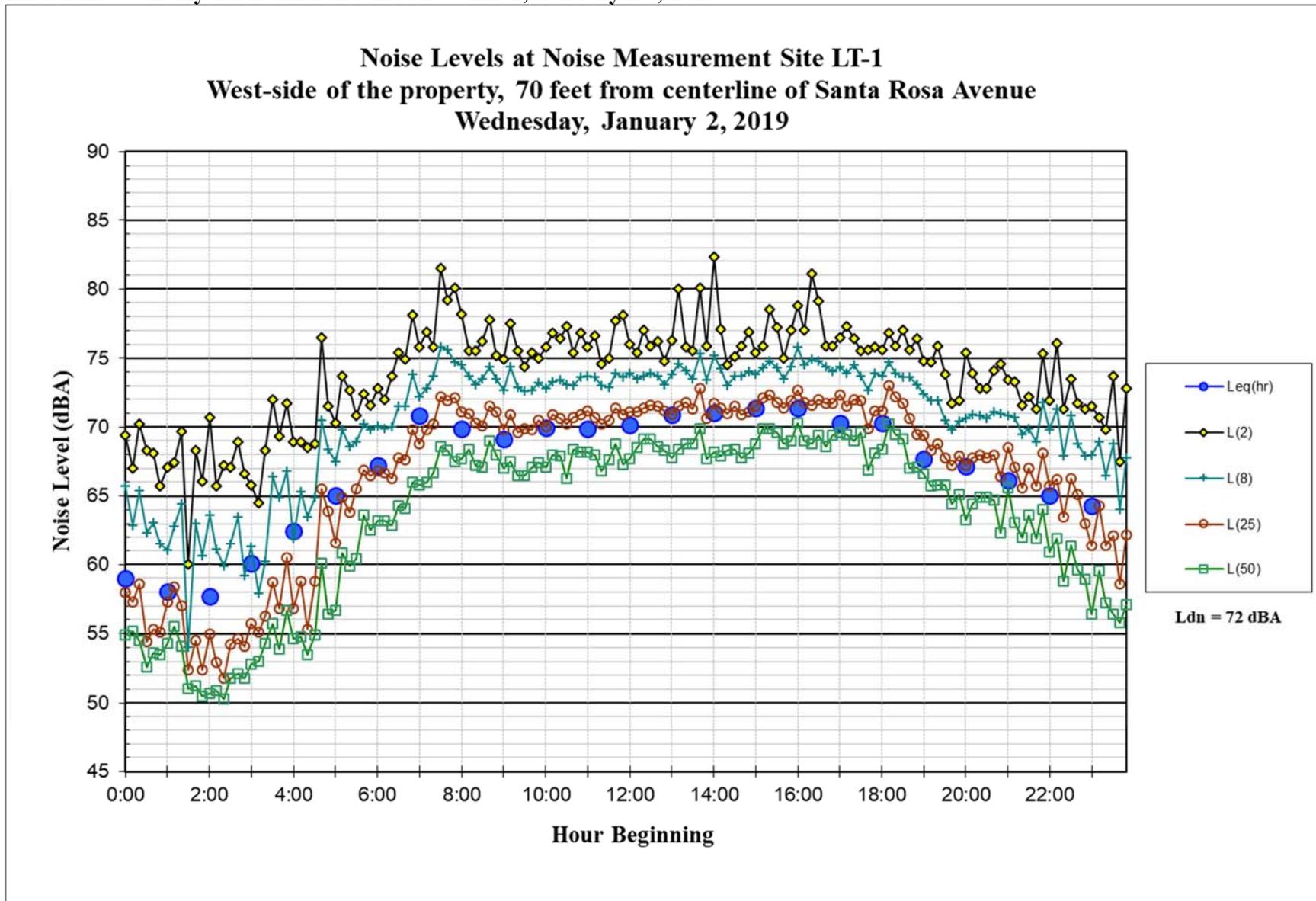


FIGURE 4 Daily Trend in Noise Levels at LT-1, January 3rd, 2019

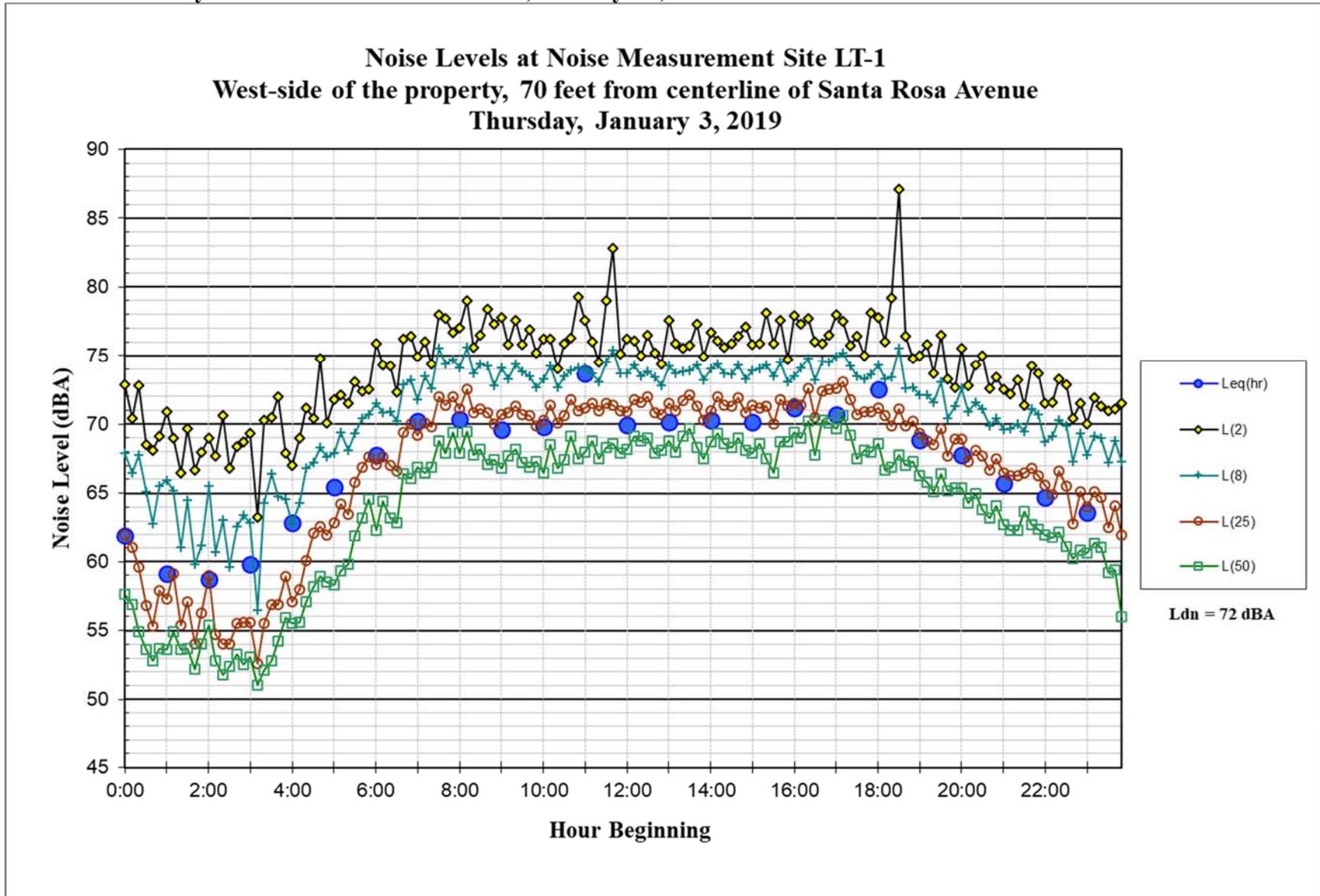


FIGURE 5 Daily Trend in Noise Levels at LT-2, January 1st, 2019

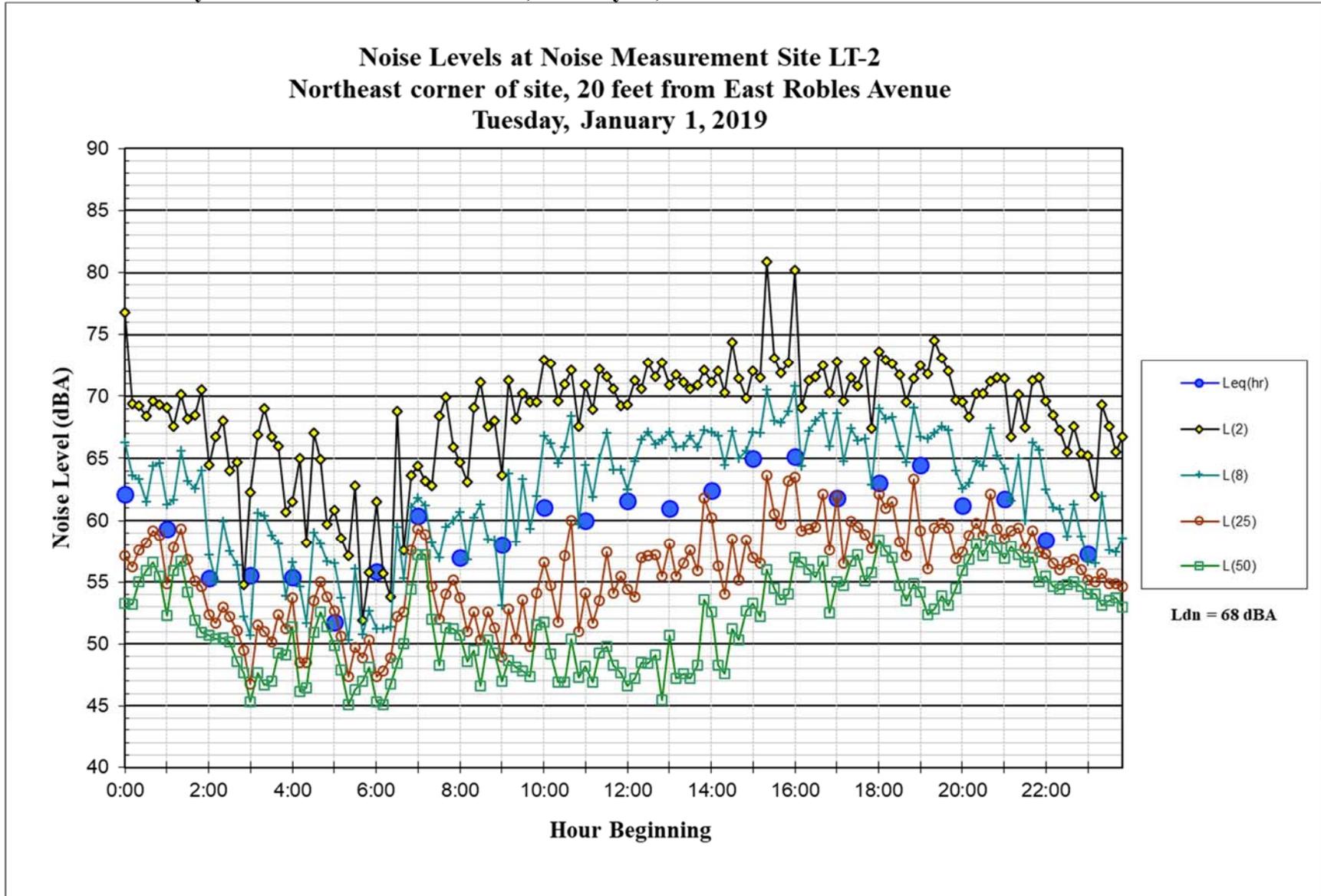


FIGURE 6 Daily Trend in Noise Levels at LT-2, January 2nd, 2019

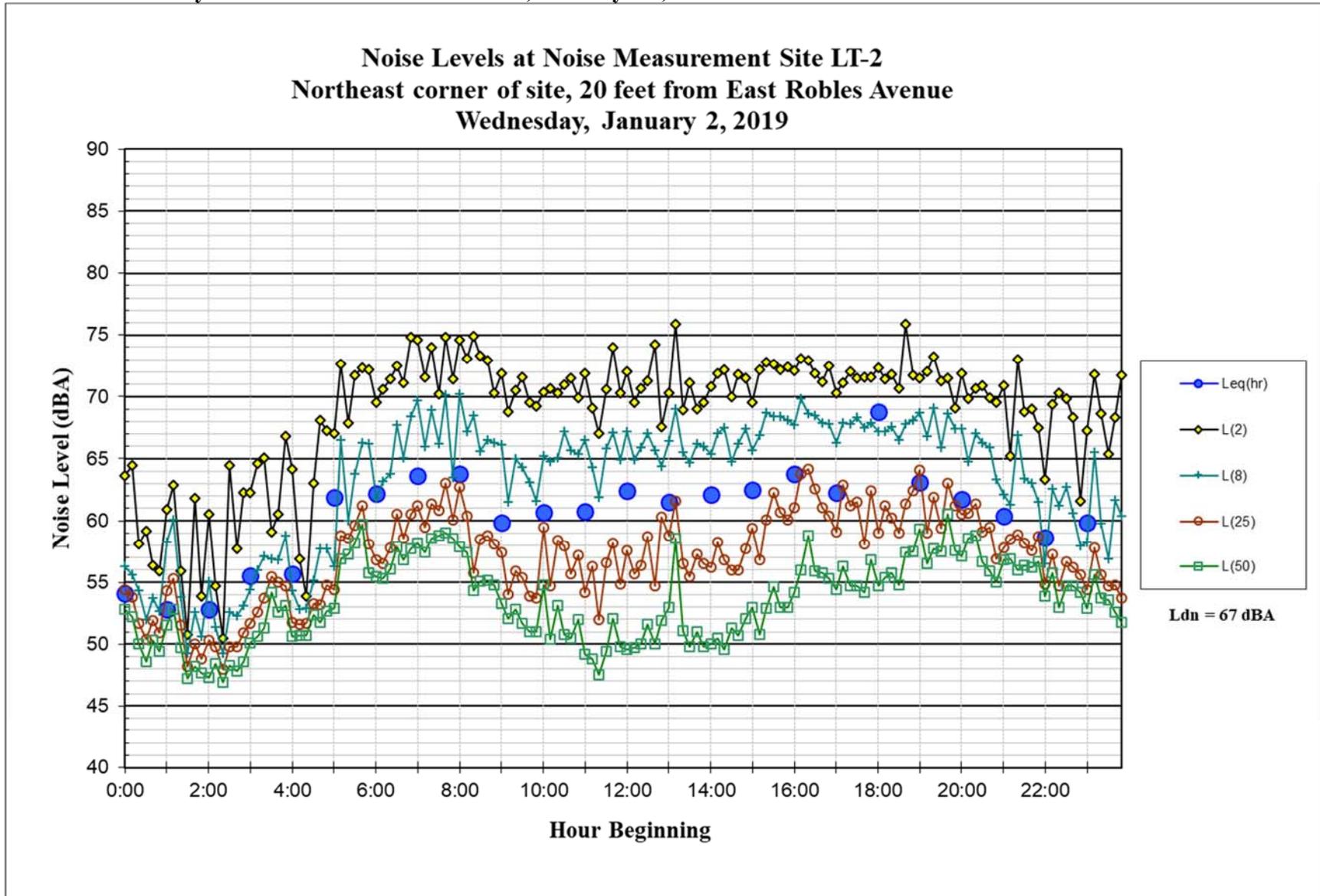
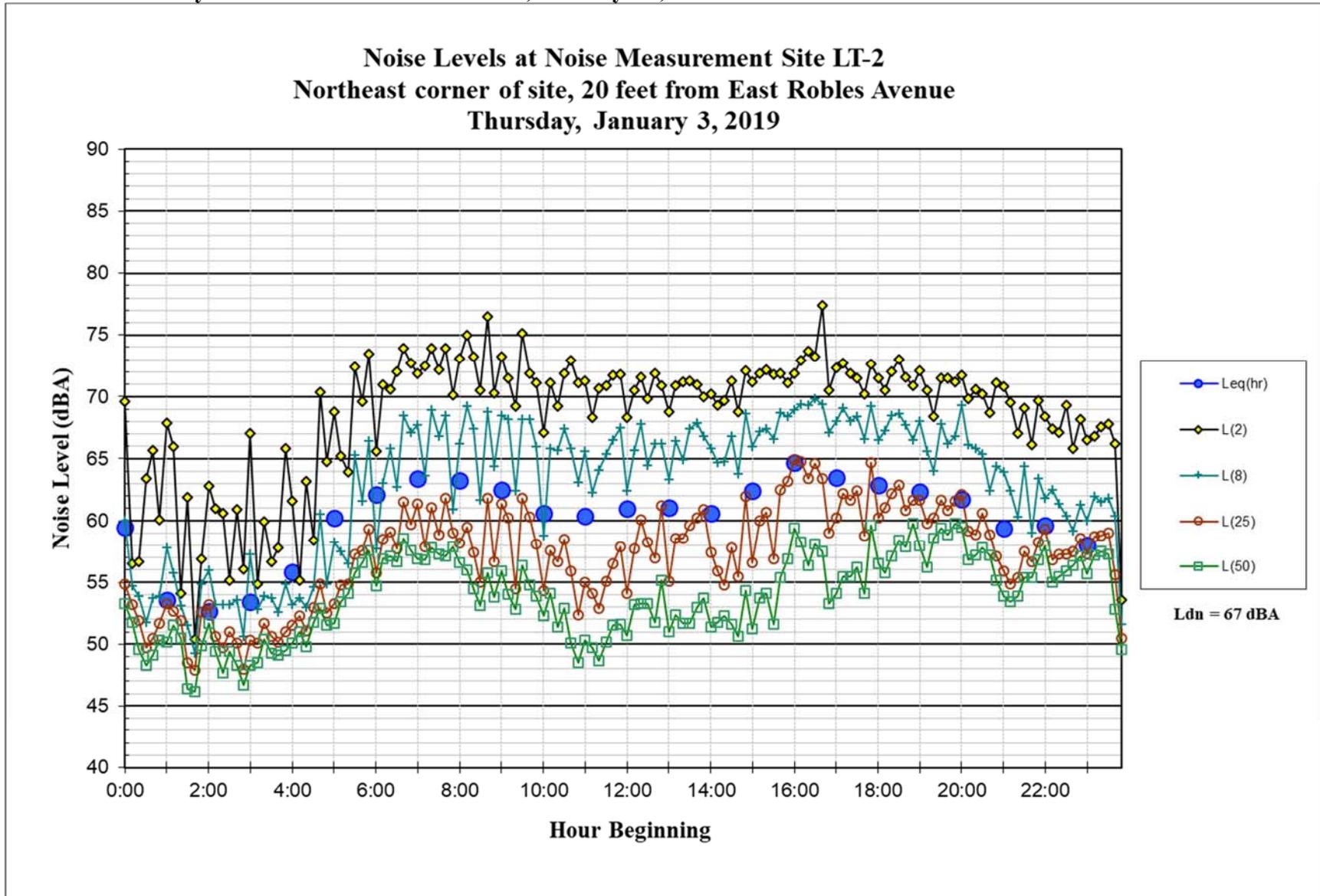


FIGURE 7 Daily Trend in Noise Levels at LT-2, January 3rd, 2019



GENERAL PLAN CONSISTENCY ANALYSIS

The impacts of site constraints such as exposure to excessive levels of noise and vibration are not considered under CEQA. This section addresses Noise and Land Use Compatibility for consistency with the policies set forth in the Sonoma County General Plan.

Noise and Land Use Compatibility

The Noise Element of Sonoma County General Plan sets forth policies with a goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below:

- Sonoma County's acceptable exterior noise level objective is 60 dBA L_{dn}.
- Sonoma County's standard for interior noise levels is 45 dBA L_{dn}.

Future Exterior Noise Environment

Future exterior noise levels at the project site would continue to result primarily from local traffic along Santa Rosa Avenue and East Roble Avenue. The noise sensitive outdoor use areas proposed by the project would be located in the approximate center of the site and include a picnic area, seating area, tot lot and half court for basketball. Based on the noise monitoring survey, vehicular traffic generates an existing noise level of about 72 dBA L_{dn} at a distance of 70 feet from the center of Santa Rosa Avenue and about 68 dBA L_{dn} at a distance of 20 feet from the center of East Robles Avenue. Calculations based on the traffic volumes provided by W-Trans¹ indicate that traffic noise levels under future conditions would increase by 2 dBA and 1 dBA along East Robles Avenue and along Santa Rosa Avenue, respectively. The noise levels at proposed outdoor use areas are anticipated to be 42 dBA L_{dn} when accounting for acoustical shielding provided by project buildings and additional distance from the noise source. Future exterior noise levels at the project site would meet Sonoma County's acceptable exterior noise level objective of 60 dBA L_{dn}.

Future Interior Noise Environment

The future exterior noise level exposures of building façades are summarized in Table 6. Exterior noise levels would be 73 dBA L_{dn} at the west facing residential facades adjacent to Santa Rosa Avenue and up to 68 dBA L_{dn} at the north facing façades adjacent to East Robles Avenue.

Interior noise levels would vary depending upon the design of the buildings (relative window/door area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows and doors closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn}, the inclusion of adequate forced-air mechanical ventilation can reduce interior noise levels to acceptable levels by allowing occupants the option of closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn}, forced-air

¹ Draft Traffic Impact Study for Redwood Apartments Project, W-Trans, December 27, 2018.

mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant’s discretion.

TABLE 6 Calculated Exterior Noise Levels at Building Façades

Façade	Building #	Calculated Noise Levels (dBA)		Recommended Sound Rated Construction ² for 45 dBA L _{dn} threshold
		Exterior	Interior with Windows Open	
West	Building fronting Santa Rosa Avenue	73 L _{dn}	58 L _{dn}	STC 30 and Forced-air ¹
North and South	Building fronting Santa Rosa Avenue	70 L _{dn}	55 L _{dn}	STC 26 and Forced-air ¹
East	Building fronting Santa Rosa Avenue	54 L _{dn}	39 L _{dn}	Not required
North	Buildings fronting East Robles Avenue	68 L _{dn}	53 L _{dn}	Forced-air ¹
East and West	Buildings fronting East Robles Avenue	62 L _{dn}	47 L _{dn}	Forced-air ¹
South	Buildings fronting East Robles Avenue	47 L _{dn}	32 L _{dn}	Not required
All	Southeast Building	55 L _{dn}	40 L _{dn}	Not Required

¹ Assumes forced-air mechanical ventilation is provided to allow occupants the option of keeping windows closed to control noise.

² Analysis assumes window/door area to be 40% of the façade area or less and wall with STC 39 rating or greater.

The minimum STC² rating required to achieve the 45 dBA L_{dn} interior noise level threshold is summarized in Table 6. The analysis assumes that the window/door area is 40% of the façade area or less. Where sound-rated construction is recommended, windows are assumed to be in closed position, requiring forced-air ventilation to allow occupants the option of keeping windows closed.

Based on the preliminary calculations, residential units of building fronting East Robles Avenue would achieve the 45 dBA L_{dn} interior standard with the inclusion of forced air mechanical

² **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

ventilation and windows in the closed position. Residential units fronting Santa Rosa Avenue would achieve the 45 dBA L_{dn} interior noise standard with inclusion of forced air mechanical ventilation and windows/doors with STC ratings of 26 to 30. Standard construction is sufficient for maintaining acceptable interior levels in residential units of building in the southeast part of the site.

Recommended Conditions of Approval

For consistency with General Plan, the following Conditions of Approval are recommended:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for residential buildings adjacent to Santa Rosa Avenue and East Robles Avenue, so that windows can be kept closed to control noise.
- Provide sound rated windows and doors for north, west, and south building facades having line of sight to Santa Rosa Avenue to maintain interior noise levels at acceptable levels. Preliminary calculations show that sound-rated windows and doors with minimum STC Ratings of 26 to 30 would be satisfactory for units to achieve acceptable interior noise levels. The specific noise insulation treatments shall be confirmed during final design of the project, prior to issuance of building permits.

NOISE IMPACTS AND MITIGATION MEASURES

Noise generated by the proposed project was assessed against the Table NE-2 noise standards presented in the County's Noise Element. The guidelines establish daytime and nighttime noise limits for noise events of varying durations. The primary noise producing activities associated with the Project are vehicular traffic events, parking lot activities, mechanical equipment, and outdoor play. Future noise levels were assessed for noise sensitive receptors including residences, schools, hospitals, churches and parks within 1,200 feet of the project site.

Permanent Noise Increase Due to Project Generated Traffic

The traffic report provided by *W-Trans*¹ included AM and PM peak hour traffic volumes for the intersection of Santa Rosa Avenue and East Robles Avenue. To determine the project-generated traffic noise increase, peak hour volumes for the Existing scenario were compared to Existing plus Project conditions. Traffic noise levels as a result of the project are not anticipated to increase at receptors in the project vicinity during peak hour traffic conditions.

Typically, a significant permanent traffic noise increase would occur if the project would increase noise levels at a noise sensitive receptor by 3 dBA L_{dn} or greater where ambient noise levels exceed the "normally acceptable" noise level standard. Where ambient noise levels are at or below the "normally acceptable" noise level standard, noise level increases of 5 dBA L_{dn} or greater would be considered significant. According to the County's General Plan, the "normally acceptable" outdoor noise level standard for noise-sensitive land uses would be 60 dBA L_{dn} .

Calculated noise increases due to project generated traffic would be less than 1 dBA L_{eq} during worst-case project operations. When averaged on a 24-hour basis to calculate L_{dn} , noise increases

would be even lower. This increase would not be considered significant and would not typically be measurable or noticeable. This is a **less-than-significant** impact.

Permanent Noise Increase Due to Parking Lot Operations

Parking for 181 vehicles will be provided along the interior portion of the site and accessed from Santa Rosa Avenue and East Robles Avenue. Peak activity within the parking lot would primarily occur during morning and evening peak traffic hours on weekdays. Vehicles accessing the parking areas, engine starts, and door slams would be the primary noise sources. These noises typically range from 50 dBA to 60 dBA L_{max} at 50 feet. The cumulative duration of noise from these intermittent sounds would be more than five minutes, but less than 15 minutes in any hour, therefore, the L_{08} would be the applicable regulatory threshold used in the analysis.

The closest residential property lines to the north are located about 60 feet from the edge of the parking lot and 120 feet from the center of the northern portion of the parking lot. Table 7 summarizes the assessment of parking lot noise.

TABLE 7 Parking Lot L_{08} Noise Levels

Receptor	L_{08} (Noise Level Exceeded 5 Minutes in any Hour)			
	Daytime		Nighttime	
	From Parking Lot Edge (70 feet)	From Parking Lot Center (200 feet)	From Parking Lot Edge (70 feet)	From Parking Lot Center (200 feet)
Unadjusted Table NE-2 Limit	60	60	55	55
Ambient Noise Levels at property line of residence to east	54	54	46	46
Parking Lot Noise Level	47-57	28-38*	47-57	28-38*
Operations Exceed Ambient by 10 dBA?	No	No	No	No
NE-2 Ambient Adjustment	0	0	0	0
Adjusted Table NE-2 Limit	60	60	55	55
Operations Exceed NE-2?	No	No	Yes	No

* Calculations account for 10 dB attenuation due to proposed building which would act as a barrier between the central parking lot and eastern residential property line.

As shown in Table 7, regular parking lot activities would generate noise levels in the range of 47 to 57 dBA L_{08} at the nearest residential property line to the east of the project site when activities are located in the eastern portion of the lot and 28 to 38 dBA L_{08} when activities are located in the center of the lot, assuming 10 dB attenuation due to proposed residential building which would block the direct line of sight between parking lot and residence to the east. Parking lot activities are not anticipated to exceed the daytime L_{08} noise thresholds at the closest residences to the east. Noise levels at more distant residences would be even lower. However, parking lot activities close to the eastern edge of the project site during night time hours would generate noise levels higher

than the 55 dBA nighttime threshold at the nearest residential property line. This is a **potentially significant** impact.

The following control measure is recommended to reduce parking lot noise levels to within Sonoma County Noise Limits:

- A 6-foot high noise barrier at the eastern edge of property blocking the line of sight of parking spaces and residence would reduce the noise levels to County’s limits.
- Removing the parking spaces near the eastern edge and accommodating the spaces in the central portion of the project site would also eliminate the residential property line on the east from being exposed to high noise levels.

Permanent Noise Increase Due to Mechanical Equipment Operations

The residential buildings would include various mechanical equipment such as air conditioners, exhaust fans, and air handling equipment. The most substantial noise-generating equipment would likely be exhaust fans and air conditioning units. Information regarding the number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. Due to slanted roofs, mechanical equipment is assumed to be installed outside of, and adjacent to the proposed buildings.

Mechanical equipment noise levels for similar facilities typically range from 50 to 60 dBA L_{eq} at a distance of 50 feet, assuming direct line-of-site between the receiver and the mechanical equipment. Noise from mechanical equipment would typically drop off at a rate of about 6 dBA per doubling of distance. The nearest residential property lines are approximately 75 feet to the east of the proposed building located in the southeast portion of the site.

TABLE 8 Mechanical Equipment L_{50} Noise Levels

Receptor	L_{50} (Noise Level Exceeded 30 Minutes in any Hour)			
	Daytime		Nighttime	
	Residence to the East from SE Building Edge (75 feet)	Residence to the North from North Building Edge (90 feet)	Residence to the East from SE Building Edge (75 feet)	Residence to the North from North Building Edge (90 feet)
Unadjusted Table NE-2 Limit	50	50	45	45
Ambient Noise Levels	42	52	40	50
Equipment Noise Level	47-57	45-55	47-57	45-55
Operations Exceed Ambient by 10 dBA?	Yes	No	Yes	No
NE-2 Ambient Adjustment	-5	+2	-5	+5
Adjusted Table NE-2 Limit	45	52	40	47
Operations Exceed NE-2?	Yes	Yes	Yes	Yes

¹ Calculated based on the four quietest nighttime L_{eq} hours.

Not considering any noise reduction due to shielding, mechanical equipment would be anticipated to generate noise levels of 47 to 57 dBA L_{eq} at residences to the east and 45 to 55 dBA L_{eq} at residences to the north. Mechanical equipment noise is anticipated to exceed the daytime and nighttime L_{50} noise thresholds at the closest residences and would exceed ambient noise levels during most daytime and nighttime hours at these locations. This is a **potentially significant** impact.

The following control is recommended to reduce mechanical equipment noise levels to within Sonoma County Noise Limits:

- Prior to issuance of building permits, mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the County's requirements. A qualified acoustical consultant shall be retained by project applicant to review mechanical equipment systems selected, in order to determine specific noise reduction measures necessary to reduce noise to comply with County's L_{50} limit at shared property lines. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers such as enclosures and/or parapet walls to block the line of sight between the noise source and the nearest receptors.

Permanent Noise Increase Due to Basketball Court, Tot-lot playground Noise

The project proposes a half basketball court in the central portion of the site. Noise measurements conducted for a community park in San Jose³ indicate that noise levels generated by recreational basketball and playground are 55 dBA L_{50} at a distance of 60 feet from the basketball court.

The basketball courts are about 240 feet from the nearest residences to the east. At this distance basketball activities would be anticipated to generate noise levels of 33 dBA L_{50} or less after accounting for 10 dB attenuation due to proposed building. Table 9 summarizes the assessment of basketball related noise, not considering any additional reduction in noise due to shielding.

³ Calabazas Park Community Center, Environmental Noise and Vibration Assessment; M. Biwalkar, D. Lodico, Illingworth & Rodkin, Inc.; July 10, 2018.

TABLE 9 Basketball L₅₀ Noise Levels

Receptor	L ₅₀ (Noise Level Exceeded 30 Minutes in any Hour)	
	Daytime	Nighttime
	Residence to East (240 feet)	Residence to East (240 feet)
Unadjusted Table NE-2 Limit	50	45
Ambient Noise Levels	42	40
Basketball Activity Level	33*	33*
NE-2 Ambient Adjustment	0	0
NE-2 Speech/Music Adjustment	0	0
Operations Exceed Ambient by 10 dBA?	No	No
Adjusted Table NE-2 Limit	50	45
Operations Exceed NE-2?	No	No

* Calculations account for 10 dB attenuation due to proposed building which would act as a barrier between central parking lot and eastern residential property line.

As indicated in Table 9, basketball and playground activities would not be anticipated to exceed the Sonoma County noise limits. This is a **less-than-significant** impact.

Temporary Noise Increase Due to Construction Noise

Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, the distance between construction noise sources and noise-sensitive receptors, any shielding provided by intervening structures or terrain, and ambient noise levels. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), when construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction durations last over extended periods of time.

Each construction phase would include a different mix of equipment operating. The highest noise levels are typically generated when impact tools are used (e.g., jackhammers, hoe rams). Site grading and excavation activities would also generate high noise levels as these phases often require the simultaneous use of multiple pieces of heavy equipment, such as dozers, excavators, scrapers, and loaders. Lower noise levels result from construction activities when less heavy equipment is required to complete the tasks. Pile driving is not anticipated for project construction.

Typical construction noise levels at a distance of 50 feet are shown in Tables 10 and 11. Table 10 illustrates the average noise level range by typical construction phase type and Table 11 shows the maximum noise level range for different construction equipment.

TABLE 10 Typical Ranges of Noise Levels at 50 Feet from Construction Sites (dBA L_{eq})

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.

II - Minimum required equipment present at site.

Source: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1, p. 2-104.

TABLE 11 Construction Equipment Noise Emission Levels (at 50 feet)

Equipment Category	L _{max} Level (dBA) ^{1,2}	Impact/Continuous*
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor ³	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

*Impact activities impact the ground or construction surface, such as pile driving, while continuous activities emit more constant noise, such as construction vehicles.

¹Measured at 50 feet from the construction equipment, with a “slow” (1 sec.) time constant.

²Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

³Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Source: FHWA

Residences are located as close as about 75 feet to the east and 90 feet to the north of proposed construction areas. Construction noise levels would be anticipated to range from 70 to 80 dBA L_{eq} at a distance of 75 feet and from 69 to 79 dBA L_{eq} at a distance of 90 feet during periods of heavy construction. Construction noise levels would be anticipated to drop off at a rate of about 6 dBA per doubling of distance as construction moves away from shared property lines.

The duration and daily hours of construction activity were unknown at the time of this analysis. Therefore, a worst-case scenario was assumed where construction activity lasts for over a year. Noise levels at nearby residences are anticipated to be higher than the allowable exterior noise limit set by the Sonoma County for more than one year. This is a **potentially significant impact**.

Implementation of the following measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance at adjacent noise sensitive uses:

Best Construction Management Practices

- Limit construction to between the hours of 8:00 am to 5:00 pm.
- Limit work to non-motorized equipment on Sundays and holidays.
- Locate construction staging areas as far as practical from nearby sensitive receptors.
- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as practical from nearby sensitive receptors.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment. Air compressors and pneumatic equipment should be equipped with mufflers, and impact tools should be equipped with shrouds or shields.
- Prohibit all unnecessary idling of internal combustion engines.

With the inclusion of the best management measures listed above, this would be a **less-than-significant** impact.

CEQA INITIAL STUDY CHECKLIST QUESTIONS

The California Environmental Quality Act (CEQA) includes qualitative guidelines for determining the significance of environmental noise impacts. The CEQA Initial Study checklist questions are listed below:

- a) 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?

*Project traffic would result in traffic noise increases of less than 1 dB L_{dn} at sensitive locations. This increase would be below 5 dBA L_{dn} and 3 dBA L_{dn} criteria and would not be anticipated to be perceptible or measurable. **Less-than-Significant Impact.***

*Parking spaces would be provided for residents of proposed building in the central and northeastern portion of the project site. Noise increase due to parking noise at nearest residence to the east would exceed the ambient noise levels during nighttime. **Potentially Significant Impact.** With construction of a barrier at the eastern edge or by relocating parking spaces to central portion of the project site, this impact could be reduced to **Less-than-Significant Impact.***

*Mechanical equipment data is currently unavailable. It is assumed under a worst-case scenario that equipment will be housed outdoors adjacent to residential buildings. Exterior noise levels at nearby residential property lines to the east and north may exceed the allowable noise limit set by County of Sonoma. **Potentially Significant Impact.** With implementation of mitigation, this impact could be reduced to a **Less-than-Significant Impact.***

*Basketball activity is not anticipated to exceed Sonoma County standards during daytime or nighttime. **Less-than-Significant Impact.***

*Construction equipment and timeline details were not available at the time of analysis. It was assumed, under a worst-case scenario that the duration of construction would exceed one year. **Potentially Significant Impact.***

- b) Generation of excessive groundborne vibration or groundborne noise levels?

*Construction would be located 50 feet or further from structures and pile driving is not anticipated as a method of construction, based on similar projects' construction in the past. At a distance of 50 feet, groundborne vibration from construction is anticipated to generate vibration levels in the range of 0.001 to 0.098 in/sec PPV. These vibration levels would be well below the conservative 0.3 in/sec PPV vibration limit recommended by the California Department of Transportation for buildings that are found to be structurally sound but where structural damage is a major concern. **Less-than-Significant Impact.***

- c) For a project located within the vicinity of a private airport or 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?

*The project site is not located in the vicinity of an existing airport or airport land use zone and would not expose people residing or working in the project area to excessive aircraft noise levels. **No Impact.***

RECOMMENDED MITIGATION

The following control is recommended to reduce operational noise from mechanical equipment and temporary construction noise to within Sonoma County Noise Limits:

- Prior to issuance of building permits, mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the County's requirements. A qualified acoustical consultant shall be retained by project applicant to review mechanical equipment systems selected, in order to determine specific noise reduction measures necessary to reduce noise to comply with County's L₅₀ limit at shared property lines. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers such as enclosures and/or parapet walls to block the line of sight between the noise source and the nearest receptors.

With the inclusion of the measure listed above and *Best Construction Management Practices*, Impact (a) would be reduced to a ***Less-than-Significant*** level.

SUMMARY/CONCLUSIONS

Based on the above findings, permanent noise increase associated with the project is not anticipated to exceed the Sonoma County noise standards. However, permanent noise increases from mechanical equipment operations and temporary noise increase from construction of the project could exceed the Sonoma County noise standards at nearest residential properties to the east and north of the project site. Limiting construction hours, following the *Best Construction Management Practices*, and providing enclosures for mechanical equipment are some of the control measures that would reduce construction and mechanical equipment noise to within allowable limits. Additionally, the inclusion of forced-air mechanical ventilation would be required for all residential units fronting Santa Rosa Avenue and East Robles Avenue. In addition, the north, west, and south facades of the building nearest Santa Rosa Avenue would require windows and doors with minimum STC ratings of 26 to 30 to reduce interior noise to allowable levels. Exterior noise levels in the proposed residential outdoor use areas would be below the allowable exterior noise limits set by County of Sonoma.