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August 24, 2017

Mr. David Goodison
City of Sonoma
No. 1 The Plaza
Sonoma, CA 95476
VIA E-MAIL: davidg@sonomacity.org

SUBJECT: 49 unit Altamira apartment project, 20269 Broadway Sonoma, CA
Environmental Noise Assessment

Dear David:
This letter report presents the results of Illingworth &Rodkin's (I&R) environmental noise assessment conducted for the 49 unit apartment project proposed at 20269 Broadway in Sonoma, California (see Figure 1). This assessment evaluates;

1) The noise and land use compatibility of the proposed residential use of the site with respect to the noise environment resulting from vehicular traffic on Broadway and Clay Street and the adjacent loading dock and service yard of The Lodge at Sonoma (The Lodge) and,
2) The noise and land use compatibility of the noise produced by project operations with the noise environment at the existing noise sensitive residential uses adjacent to the site.

This report presents the regulatory criteria used in the assessment, the results of on-site noise monitoring, and our evaluation of the compatibility of the noise environment at the project site in relation to the project site plan. Preliminary noise reduction measures are presented to provide an acceptable interior and exterior noise environment per City of Sonoma Guidelines. Persons not familiar with environmental noise analysis are referred to Appendix A for additional discussion.

REGULATORY BACKGROUND

The City of Sonoma and State of California have established plans and policies designed to limit noise exposure at noise sensitive single residential land uses that are relevant to the proposed project. These plans and policies are contained in (1) the California Building Code, Title 24, Part 2, (2) the City of Sonoma Noise Ordinance, and (3) the City of Sonoma General Plan.

1. 2013 California Building Code, Title 24, Part 2. The current (2013) California Building Code (CBC) does not place limits on interior noise levels attributable to exterior environmental noise sources. The July 1, 2015 Supplement to the 2013 California Building Code (CBC) corrects this omission, reinstating limits on interior noise levels attributable to exterior environmental noise sources which had been contained in all prior versions of the CBC dating back to 1974. In keeping with the provisions of the 2015 supplement, this report considers interior noise levels

attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn} in any habitable room for new dwellings other than detached single-family dwellings.

Figure 1: Aerial Photo with Project Site and Measurement Locations

2. City of Sonoma Noise Ordinance. The City's Noise Ordinance sets forth the general noise limits presented in Table 1, below, for residential properties within the City. With respect to these levels the Noise Ordinance states that;

1. No person shall produce, suffer or allow to be produced by any machine, animal or device, or by any other means, a noise level greater than the following levels (see Table 1), when measured on any residential property, and
2. For purposes of determining sound levels from any source of sound, a sound level measurement shall be made at any point on any receiving private or public property."

Table 1: Noise Ordinance Residential Property Noise Limits

Level	**Daytime *(7 am to 10 pm)***	**Nighttime *(10 pm to 7 am)***
Constant Level (Leq), dBA	**50**	**40**
Intermittent Level (Lmax), dBA	**60**	**50**

3. City of Sonoma General Plan. The Noise Element of the City of Sonoma's General Plan identifies policies that are intended to guide the development of new projects with regard to

exposure to or generation of noise. These guidelines are used to assess the compatibility of a land use relative to the noise environment where the land use is proposed. The City considers residential land uses "normally acceptable" in noise environments characterized by an L_{dn} of 60 dBA or less, "conditionally acceptable" in noise environments characterized by an L_{dn} 60 to 65 dBA, "normally unacceptable" in noise environments characterized by an L_{dn} 65 to 70 dBA, and "clearly unacceptable" in noise environments characterized by an L_{dn} 70 dBA or more. The maximum allowable interior noise level, attributable to exterior noise sources, is 45 dBA L_{dn} for all residential land uses. Where the exterior or interior noise levels would exceed the normally acceptable level the General Plan Noise Element requires mitigation measures to achieve the normally acceptable noise limits.

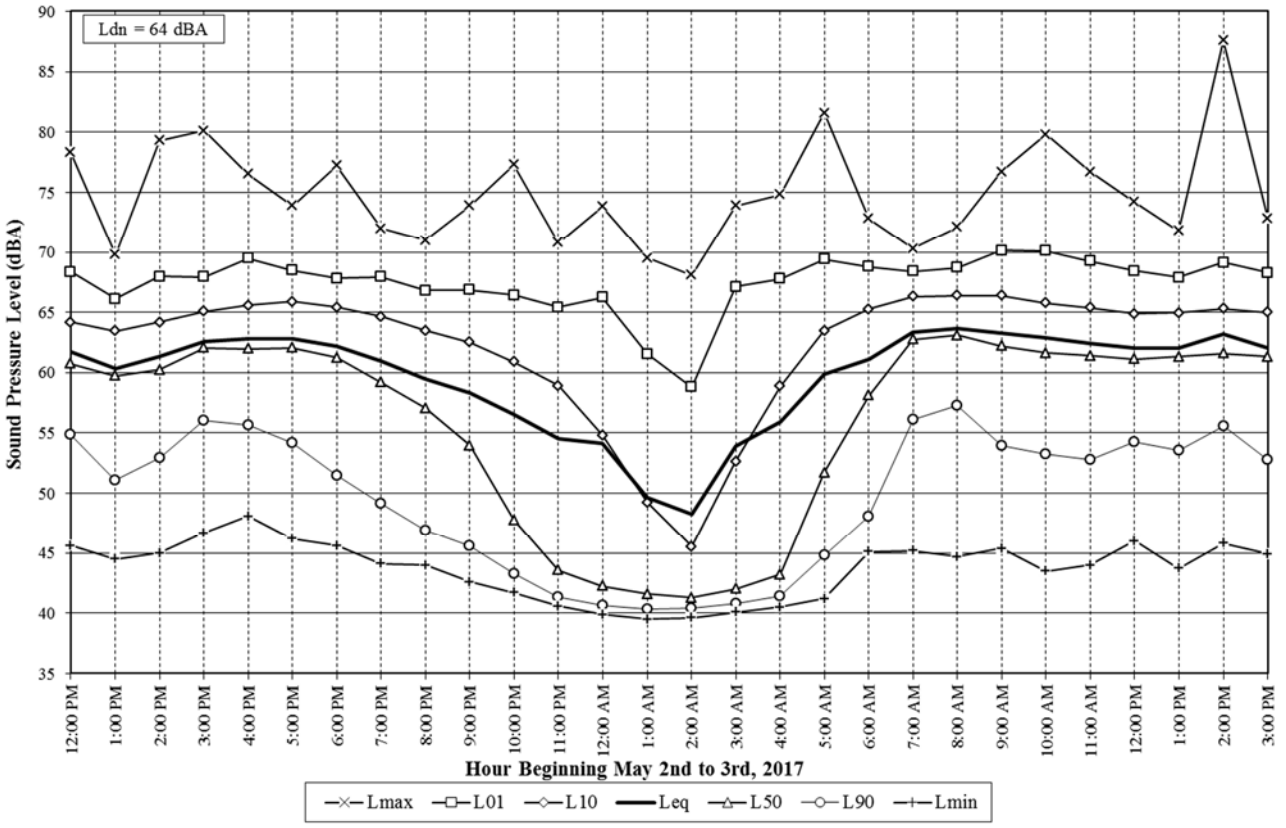
The Noise element further states that the allowable levels are to be raised to the ambient noise levels where ambient levels exceed the allowable levels and that where the ambient Leq is at least 10 dB lower than the allowable level, the allowable levels are to be reduced by 5 dB. To evaluate the intrusiveness of a noise source, the Noise Element of the General Plan also establishes that 15 minute integrated average noise level (L_{eq}) measurements be made at a location where potential impact may be significant, with and without (ambient conditions) the intrusive noise present. The measured L_{eq} with the intrusive noise is then to be corrected to, "account for special noise source characteristics and the prevailing attitude of Sonoma residents toward noise." If, after adjustments are made, the potentially intrusive noise source would cause exterior noise levels in the immediate or surrounding neighborhood to exceed the ambient level by more than 5 dBA (based on the L_{eq} over a 15-minute period), the standard states that "mitigation measures shall be developed to reduce the projected noise increase to less than 5 dBA above ambient levels".

EXISTING NOISE ENVIRONMENT

A noise monitoring survey was performed at the site between May 2nd and May 3rd, 2017 to document ambient noise conditions on the project site. The noise monitoring survey included two unattended long-term noise measurements. Noise measurement locations are shown on Figure 1. All noise measurements where conducted with Larson Davis Laboratories (LDL) Type I Model 820 Sound Level Meter fitted with a ½-inch pre-polarized condenser microphone and windscreen. The meters were calibrated with a Larson Davis Model CA250 precision acoustic calibrator prior to and following the measurement survey.

The first long-term noise measurement (LT-1) was made on the northern portion of the site at 95 feet from the centerline of Broadway in a tree at about 10 feet above the existing grade. This measurement position is setback about 20 feet further from Broadway than the easternmost project façade. Therefore, based on traffic the accepted traffic noise attenuation factor of 3 dBA, per doubling of distance, noise levels at the project facades closest to Broadway would be 1 dBA higher than those measured at LT-1. The measured noise levels at site LT-1, including the energy equivalent noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 10, 50 and 90 percent of the time (indicated as L_{10}, L_{50} and L_{90}) are shown on Chart 1. The L_{eq} noise level is typically considered the average noise level, while the L_1 is considered the intrusive level, the L_{50} is considered the median noise level and the L_{90} is considered the background or ambient noise level.

Chart 1: Measured Noise Levels at LT-1



A review of Chart 1 indicates that the noise levels at site LT-1 follow a diurnal pattern characteristic of traffic noise, with the average noise levels ranging from 57 to 64 dBA L_{eq} daytime and 48 to 61 dBA L_{eq} nighttime, with overall average hourly noise levels at 62 dBA L_{eq} daytime and 55 dBA L_{eq} nighttime. Hourly maximum noise levels at LT-1 ranged from 70 to 88 dBA L_{max} daytime and 74 to 82 dBA L_{max} nighttime, with daytime and nighttime recurring maximum L_{max30}[1] noise levels of 72 dBA. The Day/Night Average Noise Level (L_{dn}) over the 28-hour measurement period at LT-1 was calculated to be 64 dBA. Based on the above discussion of the noise monitoring position, the project facades closest to Broadway would be exposed to an L_{dn} of 65 dBA under current conditions.

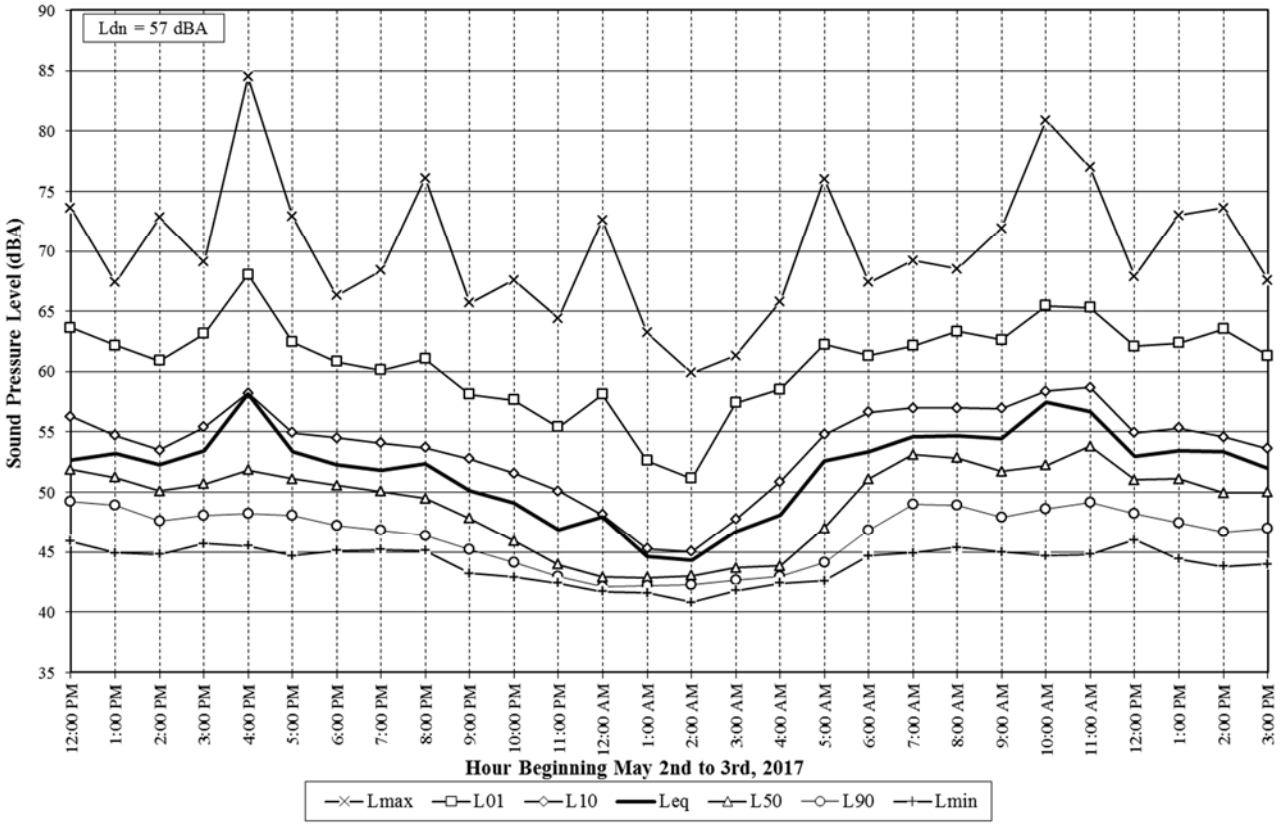
The second long-term noise measurement (LT-2) was made on the western property line of the site at 45 feet from the centerline of Clay Street in a tree at about 10 feet above the existing grade. This measurement position is setback at about the same distance from Clay Street as the southernmost project façades. The measured noise levels at site LT-2, including the energy equivalent noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 10, 50 and 90 percent of the time (indicated as L_{10}, L_{50} and L_{90}) are shown on Chart 2.

A review of Chart 2 indicates that the noise levels at site LT-2 also follow a diurnal pattern characteristic of traffic noise, with the average noise levels ranging from 49 to 58 dBA L_{eq} daytime and 44 to 53 dBA L_{eq} nighttime, with overall average hourly noise levels at 54 dBA L_{eq}

[1] The L_{max30} is obtained by averaging the loudest 30-percent of maximum sound levels obtained by logarithmically averaging the loudest 30-percent of maximum sound levels for 1-hour intervals over the stated time period, and is used to establish a maximum level intrusive level for transportation noise sources.

daytime and 48 dBA L_{eq} nighttime. Hourly maximum noise levels at LT-1 ranged from 66 to 85 dBA L_{max} daytime and 60 to 76 dBA L_{max} nighttime, with daytime and nighttime recurring maximum noise levels (L_{max30}) of 68 dBA and 64 dBA. The Day/Night Average Noise Level (L_{dn}) over the 28-hour measurement period at LT-1 was calculated to be 57 dBA. Based on the above discussion of the noise monitoring position, the project facades closest to Clay Street would be exposed to an L_{dn} of 57 dBA under current conditions.

Chart 2: Measured Noise Levels at LT-2



At location LT-2 sound levels from The Lodge loading dock were 71 to 72 dBA due to truck lifts and door clanging and 68 to 72 dBA due to back up beepers of truck in the dock. In the past operation of building HVAC equipment in the mechanical yard adjacent to the loading dock and on the roof top of The Lodge have caused intrusive noise impacts on the residence at the corner of Bragg and Clay Street. Based on the results of consultations with and noise investigations by I&R, these issues were resolved and the equipment operation was brought into compliance with the City of Sonoma Intrusive Noise Standards in 2008. During our current site surveys, I&R staff observed the mechanical noise at this residence and in the vicinity of site LT-2. Though frequency based noise measurements were not conducted during this observation, no tonal noise from mechanical equipment at The Lodge were observed and daytime ambient noise levels without any loading dock activity or passing traffic on Clay Street were observed to be between 46 and 47 dBA. Therefore, it appears that the operation of mechanical equipment at this facility continues to comply with the City of Sonoma Noise Standards.

COMPATIBILITY OF PROJECT USES WITH ON-SITE NOISE ENVIRONMENT

Future Noise Environment

Based on the results of the noise survey, the major sources affecting the noise environment on the project site were determined to be vehicle traffic Broadway to the east and truck deliveries on Clay Street and other activities associated with the loading dock and service yard of The Lodge on the south side of Clay Street. The General Plan Noise Element contains a projection traffic noise increases are not expected to exceed 2 dBA. With a 2 dBA increase noise levels exterior noise levels would be as high as 67 dBA L_{dn} at residential facades closest to Broadway and 59 dBA L_{dn} at the residential property lines closest to Clay Street under future conditions.

Exterior Noise Review

A review of the project's site plan indicates that two central courtyards will be provided as common outdoor use areas for project residents. A review of the site plan shows that these courtyards will be acoustically shielded by intervening project structure from roadway, loading dock, and service yard noise such that sound levels in these areas are expected to be below 60 dBA L_{dn}. Such exterior noise levels are considered "normally acceptable" by the City of Sonoma General Plan Noise Element.

Interior Noise Review

The City of Sonoma and the State of California require that interior noise levels within new multifamily residential units be maintained at or below 45 dBA L_{dn}. Unshielded façades of the residential units proposed nearest Broadway would be exposed to future noise levels of up to 67 dBA L_{dn}, while those adjacent to Clay Street and furthest from Broadway would be exposed to an L_{dn} of up to 59 dBA.

The proposed exterior siding types are not called out in the current drawings, but based on the project elevations, it appears that the exterior walls may be finished with fiber cement siding. Though the assemblies of the walls have not yet been determined, they are also expected to be wood stud framed walls and based on typical California construction techniques it is assumed that they will also include cavity insulation and a single layer of gypsum board at the interior face. Based on this and that Hardie brand siding, or equal, will be used for the fiber cement siding, the sound isolation rating of the exterior wall assembly would be STC 40 for fiber cement sided walls[2].

Considering this exterior wall assembly and exterior door and window percentages of between 20% and 40% of the exterior wall area, with closed standard thermal insulating windows and weather sealed doors, the exterior noise levels will be reduced within the residential interiors by between 25 to 27 dBA. When windows or doors are open the noise attenuation from exterior to interior is typically reduced by 10 to 12 dBA, such that for this project we would expect exterior to interior noise reduction to be between 13 to 19 dBA with open windows and/or doors.

Based on this consideration closed standard thermal insulating windows and weather sealed doors will be sufficient to allow interior noise levels to be an L_{dn} of 45 dBA or less. Thus, standard thermal insulating windows and weather sealed doors would be acceptable throughout the project. However, considering the exterior to interior attenuation with open windows, the interior noise standard of 45 dBA L_{dn} of may not be met with open windows in areas where the exterior noise levels exceed an L_{dn} of 58 dBA. In view of our future noise projections, the first

[2] Based on laboratory test TL365A as published in James Hardie Building Products Sound Isolation Technical Bulletin 07272007

row of homes along Clay Street and homes within 375 feet of the centerline of Broadway with an unobstructed view of passing traffic on this roadway, may be exposed to exterior noise levels exceeding an L_{dn} of 58 dBA.

Therefore, we recommend that the perimeter residences in Buildings 2, 3, 4, 5, 6, and 8 as indicated in Figure 2, be equipped with a mechanical ventilation system capable of providing adequate fresh air to the residence while allowing the windows to remain closed to control noise. In our experience a standard central air conditioning system or a central heating system equipped with a 'summer switch' which allows the fan to circulate air without furnace operation will provide a habitable interior environment.

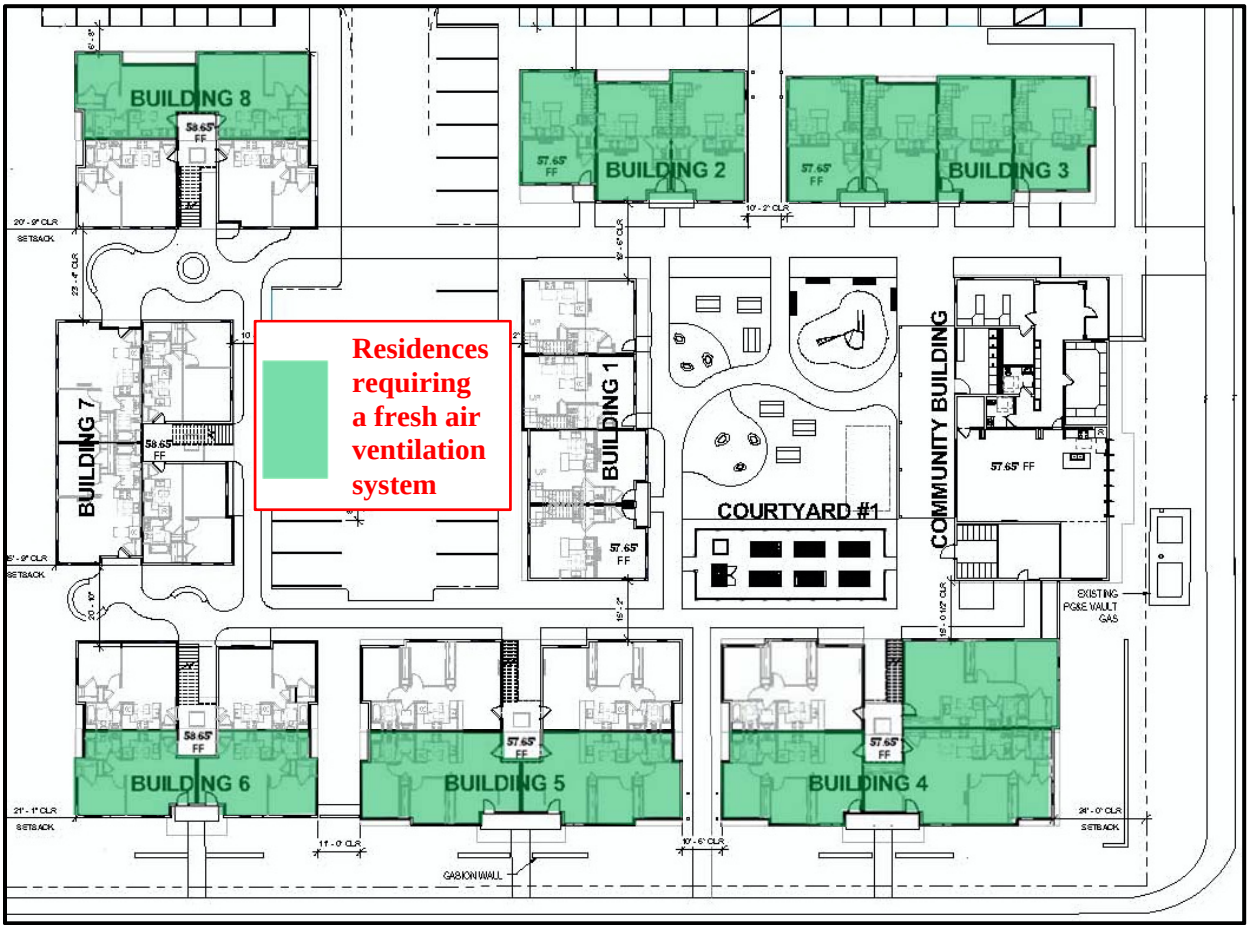


Figure 2: Project Site Plan with Needed Interior Noise Mitigation

COMPATIBILITY OF PROJECT OPERATIONS WITH ADJACENT RESIDENCES

The project site adjoins six single-family residential lots along its western property line. Though the development of the Project would reduce noise from Broadway traffic at these adjoining single-family residences, the project would generate operational noise through outdoor residential activities and the use of the parking lot by residents and guests. The three building clusters on the west side of the site will all contain one-bedroom units. These units will be setback 15-20 feet from the shared property line, with the setback area serving as landscaped yard space. Considering that one bedroom units are more likely to accommodate single persons and seniors, rather than families with children. Therefore, we expect that noise generated by normal residential activities within the units and in the landscaped yard space would be

consistent with the type and level of sound generated at the single-family home lots and would not result in noise impacts at the existing residential uses.

However, further to the north, a portion of the project parking lot would adjoin two of the single-family lots on the western property line, with a proposed setback of 5-10 feet. This portion of the parking lot is a dead-end, and thus would not have through traffic movements. Nevertheless, the use of the parking lot, especially in the evening or nighttime hours, could result in noise impacts on the two adjoining single-family residences to the west. To attenuate parking lot noise within the adjacent residential area a 6-foot-high solid fence/wall extending 50 feet from the northeastern corner of the along the northern property, and along the length of the two adjoining residential parcels to the west as shown in Figure 3.

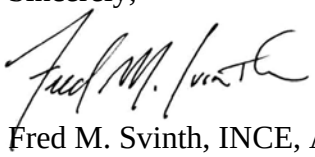
Figure 3: Location of Proposed Noise Barriers

To be effective as a noise barrier the fence/wall shall be built without cracks or gaps in the face or base, have a minimum surface weight of 3.0 lbs. per square feet, and be capable of reducing noise traveling directly through it by a minimum of 10 dBA. A wood fence built with a double layer of 1-inch nominal thickness fence boards, where the second layer of boards installed to cover the joints of the first layer would meet these surface weight and noise reduction requirements. Other wall types that will provide the needed level of noise reduction include

masonry block, and concrete panel walls, but any alternative proposal shall include verification from a qualified acoustical consultant that the required noise attenuation will be met.

This concludes the Illingworth & Rodkin's environmental noise assessment for the proposed 49 unit apartment project proposed at 20269 Broadway in Sonoma, California. If you have any questions, or if we can be of further assistance, please do not hesitate to call.

Sincerely,



Fred M. Svinth, INCE, Assoc, AIA
Senior Consultant, Principal
Illingworth & Rodkin, Inc.

APPENDIX A:
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 A1.

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 A2. 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.

TERM	DEFINITIONS
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, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
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. All sound levels in this report are A-weighted, unless reported otherwise.
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.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Day/Night Noise Level, L_{dn}	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.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
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.

Definitions of Acoustical Terms | **Table 1**

At a Given Distance From Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
	140		
Civil Defense Siren (100')	130		Pain Threshold
Jet Takeoff (200')	120	Rock Music Concert	
	110		Very Loud
Diesel Pile Driver (100')	100	Boiler Room Printing Press Plant	
	90		
Freight Cars (50') Pneumatic Drill (50') Freeway (100') Vacuum Cleaner (10')	80	In Kitchen With Garbage Disposal Running	Moderately Loud
	70	Data Processing Center	
	60	Department Store	
Light Traffic (100') Large Transformer (200')	50	Private Business Office	Quiet
	40	Quiet Bedroom	
Soft Whisper (5')	30	Recording Studio	
	20		Threshold of Hearing
	10		
	0		

Typical Sound Levels Measured In The Environment And Industry — **Table 2**

ILLINGWORTH & RODKIN, INC./Acoustical Engineer

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 noise 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 55 dBA L_{dn}. At an L_{dn} of about 60 dBA, approximately 2 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 12 percent of the population. There is, therefore, an increase of about 1 percent per dBA between an L_{dn} of 60-70 dBA. Between an L_{dn} of 70-80 dBA, each decibel increase increases by about 2 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 10 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 2 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 3 percent increase in the percentage of the population highly annoyed.