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May 16, 2013

Mr. Mangal Dhillon
2743 Yulupa Ave.
Santa Rosa, CA 95405
VIA Email: C/O Gwyn Bauer, J. Kapolchok & Associates, (gwynbauer@sbcglobal.net)
Ray Hickman, Hickman Realty, (hickmanrealestate@sbcglobal.net)

SUBJECT: Environmental Noise Study, Elm Tree Station, Santa Rosa, CA

Dear Mr. Dhillon:
This letter report summarizes Illingworth & Rodkin's (I&R) findings regarding the effects of noise generated by the proposed Elm Street Station project, which will include market and retail buildings and an electric charging and gasoline fueling station at 847 North Wright Road in Santa Rosa, CA. Our assessment presents the applicable regulatory criteria used, and the results of noise measurements conducted on the site. Noise generated by the project is evaluated with respect to the Santa Rosa General Plan and Municipal Code, and noise reduction measures are presented to reduce noise generated due to the operation of the project at the new residential uses proposed on the eastern side of the project site. Persons not familiar with environmental noise analysis are referred to Appendix A for additional discussion.

REGULATORY CRITERIA

CITY OF SANTA ROSA GENERAL PLAN

The City of Santa Rosa's General Plan[1] establishes noise and land use compatibility standards to evaluate a project's compatibility with the noise environment and General Plan policies designed to minimize the effects of noise throughout the community. Single-family residential land uses are considered "normally acceptable" in noise environments of 60 dBA L_{dn} or less. The City of Santa Rosa also establishes policies in the Noise and Safety Element of the General Plan in order to achieve the goal of maintaining an acceptable community noise level. The following policies are applicable to the proposed project:

NS-B-1 Do not locate noise-sensitive uses in proximity to major noise sources.

NS-B-2 Encourage residential developers to provide buffers other than sound walls, where practical. Allow sound walls only when projected noise levels at a site exceed land use compatibility standards…

[1] *Santa Rosa 2035: General Plan*, Adopted November 2009.

NS-B-3 Prevent new stationary and transportation noise sources from creating a nuisance in existing developed areas. Use a comprehensive program of noise prevention through planning and mitigation, and consider noise impacts as a crucial factor in project approval.

NS-B-4 Require new projects in the following categories to submit an acoustical study, prepared by a qualified acoustical consultant:

- All new projects that could generate noise whose impacts on other existing uses would be greater than those normally acceptable.

NS-B-5 Pursue measures to reduce noise impacts primarily through site planning. Engineering solutions for noise mitigation, such as sound walls, are the least desirable alternative.

NS-B-6 Do not permit existing uses to generate new noises exceeding normally acceptable levels unless:

- Those noises are mitigated to acceptable levels; or
- The activities are specifically exempted by the City Council on the basis of community health, safety, and welfare.

NS-B-14 Discourage new projects that have potential to create ambient noise levels more than 5 dBA L_{dn} above existing background, within 250 feet of sensitive receptors.

CITY OF SANTA ROSA NOISE ORDINANCE

The City of Santa Rosa has adopted a quantitative noise ordinance in Chapter 17-16 of the Municipal Code. Relevant sections of this Code are presented below:

Section 17-16.120 regulates noise from machinery and equipment as follows:
It is unlawful for any person to operate any machinery, equipment, pump, fan, air-conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five (5) decibels. The baseline (ambient) noise levels for residential areas from which noise levels can be compared are established in Section 17-16.030. These levels are shown in Table 1.

TABLE 1: City of Santa Rosa Municipal Code Ambient Base Noise Levels

Land Use Zone	Daytime Level: 7 am to 7 pm (dBA)	Evening Level: 7 pm to 10 pm (dBA)	Nighttime Level: 10 pm to 7 am (dBA)
Single-Family Residential	55	50	45
Multi-Family Residential	55	55	50

In Section 17-16.010, the Noise Ordinance defines ambient noise as follows:
Ambient noise is the all-encompassing noise associated with a given environment usually a composite of sounds from many sources near and far. For the purpose of this chapter, ambient noise level is the level obtained … without inclusion of noise from isolated identifiable sources at the location and time of day near that at which a comparison is to be made.

The noise descriptor, L_{eq}, is used in this report for the purposes of determining noise levels with respect to these limits.

EXISTING NOISE ENVIRONMENT

The project site is located at the southeast corner of the North Wright Road/ Highway 12 intersection at the western edge of Santa Rosa. Currently the site is undeveloped, with North Wright Road to the west, Highway 12 and the Joe Rodota multiuse trail to the north and the Blue Star Gas Company to the south of the project site. Future residential uses are proposed on the currently undeveloped land to the east. Based on a review of the future development street and parking layout we expect that residences may be built as close as 85 feet from the project property line. When built these residential uses may be impacted by noise from the operation of the Market and Retail buildings.

A noise monitoring survey was conducted to quantify the existing noise environment to establish existing baseline (ambient) noise levels at the proposed residential areas adjacent to the project site. One long-term and two (2) short-term simultaneous noise measurements were made to complete the noise monitoring survey. The noise measurement locations are shown on the proposed site plan in Figure 1.

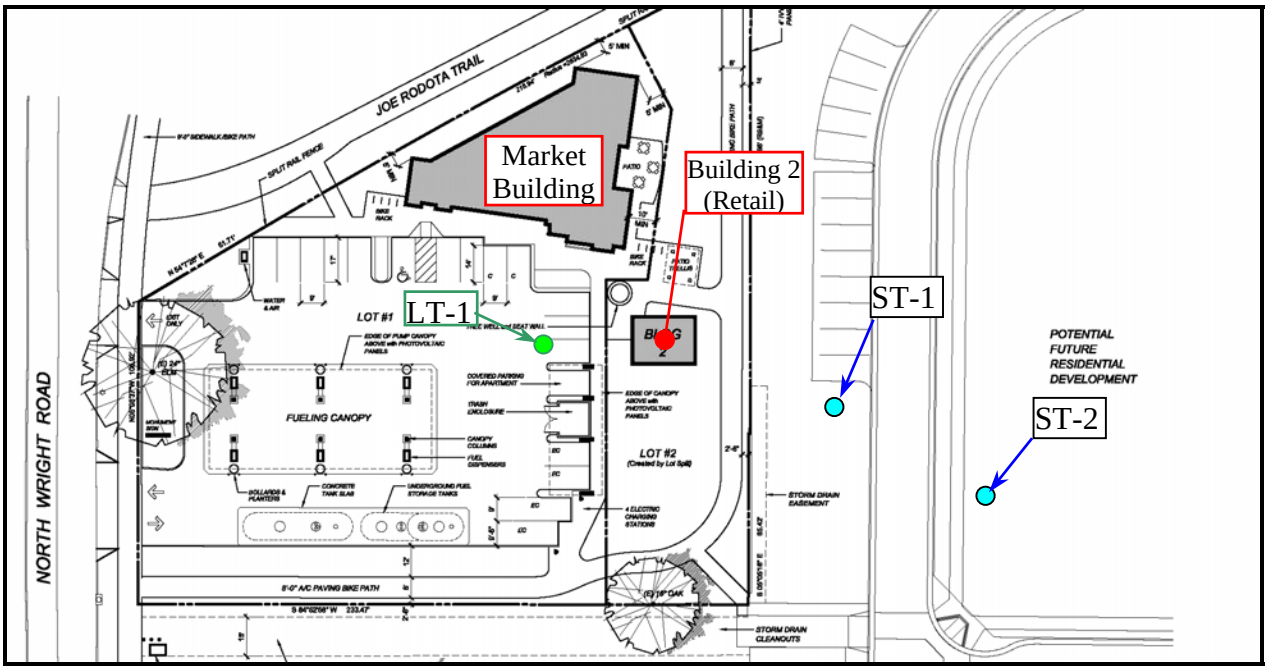
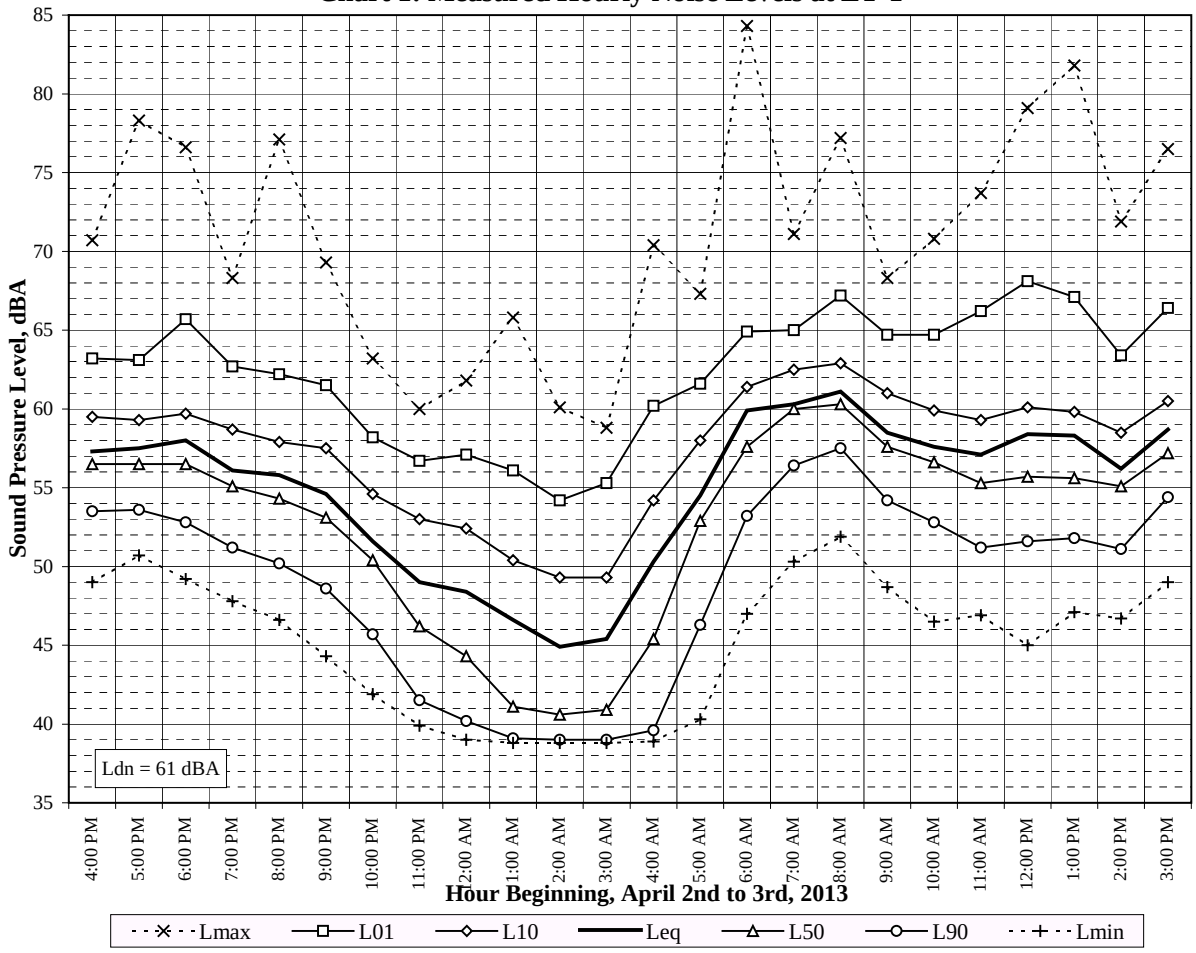


Figure 1: Project Site Plan, Future Residential Uses, and Noise Measurement Locations

The long-term noise measurement (LT-1) was conducted in the branches of an existing tree at a height of 12 feet above the existing grade and approximately 450 feet from the centerline of Hwy 12. Though made on the project site itself, this location is represents a potential setback of the future residential structures on the adjacent property from Highway 12 (Setback #1). The two short-term simultaneous noise measurements (ST-1 and ST-2) were made at distances of approximately 520 and 580 feet from the centerline of Hwy 12. These measurement locations also represent potential setback distances of future residential structures on the adjacent property from Highway 12 (Setbacks #2 and #3).

Chart 1: Measured Hourly Noise Levels at LT-1



The long-term measurement was made between 4 p.m. on April 2nd and 4 p.m. on April 4th, 2013 on an hourly basis. The noise environment at this location was primarily the result of vehicular traffic along Hwy 12, with secondary contributions from North Wright Road traffic. The hourly trend in noise levels measured including the energy equivalent noise level (L_{eq}), and the noise levels exceeded 01, 10, 50 and 90 percent of the time (indicated as $L_{1,}$ L_{10}, L_{50} and L_{90}) are shown on Chart 1. A review of this chart indicates that daytime, evening, and nighttime average (L_{eq}) noise levels at potential residential setback #1 (relative to Hwy 12) ranged from 55 to 61 dBA, 55 to 56 dBA and 45 to 60 dBA, respectively, with an average daytime L_{eq} of 58 dBA, an average evening L_{eq} of 56 dBA, and an average nighttime L_{eq} of 53 dBA. The average Day-Night noise Level (L_{dn}) at the long-term position was calculated to be 61 dBA.

The results of the short-term measurements ST-1 and ST-2, which respectively represent the future noise exposure at potential residential setbacks #2 and #3, relative to the simultaneously measured levels at LT-1, indicate that the average (L_{eq}) sound levels at ST-1 are 2 dBA lower than those at the long-term position and that the L_{eq} sound levels at ST-2 are 3 dBA lower than those at the long-term position. Based on the measured levels at LT-1 and these differences we have determined the existing ambient daytime, evening and nighttime noise levels at potential residential setbacks #2 and #3. These levels are presented in Table 2, following.

Table 2: Existing Ambient Noise Levels at Future Residential Structures

Future Residential Setbacks	Average (L_{eq}) Ambient Noise Levels, dBA		
	Daytime Level (range) 7:00 AM to 7:00 PM	**Evening Level** (range) 7:00 PM to 10:00 PM	**Nighttime Level** (range) 10:00 PM to 7:00 AM
#1	58 (55 to 61)	56 (55 to 56)	53 (45 to 60)
#2	56 (53 to 59)	54 (53 to 54)	51 (43 to 58)
#3	55 (52 to 58)	53 (52 to 53)	50 (42 to 57)

A comparison of these noise levels with the ambient base noise levels for multifamily residential areas as established in Section 17-16.030 of the noise ordinance (see Table 1) shows that in all cases existing daytime and nighttime ambient noise levels at the setbacks of multifamily residential structures on the adjacent property are equal to or greater than the City's non-site specific base criteria. However, the evening ambient noise levels at setback #3 is below the City's non-site specific base criteria. Therefore, in keeping with the municipal code definition of ambient noise (see italicized entry on page 3), we would establish the applicable ambient noise levels at the proposed residential setbacks to be equal to the actual ambient noise levels in those areas where ambient noise levels exceed the City's non-site specific base criteria. Based on these ambient noise levels plus 5 dBA[2], the allowable noise levels from the operation of the proposed project at future residential structures are as shown in Table 3.

Table 3: Allowable Project Noise Levels at the Future Residential Structures

Future Residential Setbacks	Average (L_{eq}) Ambient Noise Levels, dBA		
	Allowable Daytime Level 7:00 AM to 7:00 PM	**Allowable Evening Level** 7:00 PM to 10:00 PM	**Allowable Nighttime Level** 10:00 PM to 7:00 AM
#1	63	61	58
#2	61	60	56
#3	60	60	55

NOISE ASSESSMENT

The proposed project would generate noise and introduce new noise sources into the existing noise environment. Operational noise sources would include;

1. Parking lot activity (including engine starts, door slams, and patron noise in the parking/gas pumping/electric charging area south of the market),
2. Truck deliveries to the market and gasoline pumps,
3. Building mechanical equipment.

The following discussions provide the estimated noise levels at the future adjacent residential uses at previously discussed setbacks from Hwy 12, and as close as 85 feet from the project property line, due to project operation noise generation.

Parking Lot Activity

The primary parking lot noise at the site would be from patrons at the gas pumps, electric charging, and those in the parking areas south of the market building. Noise would be generated by vehicles circulating within the lot, engine starts, door slams, and by the sound of human

[2] Section 17-16.120, which regulates noise from machinery and equipment, limits noise from these sources to not more than 5 dB above ambient noise levels.

voices. The sound of a passing car at 15 mph typically ranges from 55 dBA to 65 dBA at 25 feet. The noise of an engine start is similar. Door slams and patron voices create noise levels lower than engine starts. Based on the orientation of the market and retail buildings, future adjacent multi-family residences may not receive significant acoustical shielding from the building structures for noise generated by autos and patrons in these areas.

Considering this the noise level resulting from activity in the closest portions of the parking area to the eastern property line would result in sound levels ranging from 43 to 53 dBA, and 42 to 52 dBA at the closest (expected) future residential facades. Using this same method of analysis, the noise level resulting from activity generated by autos and patrons at the gas pumps would result in sound levels ranging from 41 to 51 dBA, and 40 to 50 dBA, at the closest (expected) future residential facades.

These sound levels would be below the site-specific allowable daytime, evening, and nighttime noise levels (refer to Table 3), and potential setbacks from Hwy 12 of the closest (expected) future residential facades.

Truck Deliveries

Noise generated by delivery trucks depends primarily on the truck. For the proposed market facility we would expect only step van and moderate sized truck deliveries. Heavy (semi-trailer type) trucks would be expected to deliver gasoline to the underground storage tanks. A-weighted noise levels generated by step vans and smaller gasoline-powered delivery trucks typically range from 60 to 70 dBA at a distance of 50 feet. Maximum noise levels generated at by heavy trucks typically reach 70 to 80 dBA at a distance of 50 feet. As in the previous discussion, given the orientation of the market building, future adjacent multi-family residences may not be acoustically shielded by the building structure from noise generated by in the parking areas of the site.

Based a similar analysis to that used for parking lot noise, medium truck deliveries at the market would be expected result in noise levels ranging from 52 to 62 dBA, and 51 to 61 dBA, at the closest respective facades of residences at setbacks 1 and 2. These sound levels would generally be at or near the site-specific allowable daytime and evening noise levels at residential setbacks 1 and 2 (refer to Table 2), however noise resulting from nighttime deliveries could exceed these limits by up 7 dBA.

A similar analysis shows that noise associated with heavy (semi-trailer type) truck fuel deliveries would be expected to range from 60 to 70 dBA and 59 to 69 dBA, at the closest facades of residences at setbacks 1 and 2. These sound levels would exceed site-specific daytime, evening and nighttime allowable noise levels at residential setbacks 1 and 2 by 7 to 12 and 9 to 14 dBA.

Based on these levels, daytime and evening medium truck deliveries at the market would comply with site-specific allowable noise levels, however nighttime medium truck market deliveries at residences at setbacks 1 and 2, and heavy truck fuel deliveries during all hours of the day or night hours could exceed the allowable noise levels.

Building Mechanical Equipment

Mechanical equipment associated with the market will likely include Heating, Ventilation, and Air Conditioning (HVAC) equipment. Though the location of this equipment in unspecified at the time, I&R expects that may either be located in the facilities attic space and vented to the rooftop, or located on a ground level pad on the north side of the building (away from customer entrances). The store's refrigeration equipment would likely be located inside the building and considering structural shielding would not be expected to increase noise levels at adjacent receivers. Noise from HVAC equipment located on a ground level pad on the north side of the building would also be expected to receive significant building shielding, such that equipment in this location would not be expected to increase noise levels at adjacent receivers.

Noise generated by rooftop/attic mounted mechanical equipment, because it may not be well shielding by building components, has the potential to resulting in increased noise at adjacent receivers. The noise level produced by such equipment varies significantly depending upon the equipment type and size. The precise noise impacts of rooftop vented mechanical equipment cannot be determined without detailed system design specifications regarding location, type, size, capacity, etc.—details, which are typically provided during later phases of the project design and development review along with other more detailed project engineering specifications. However, based on noise measurements made at other commercial centers, mechanical systems noise levels are typically 70 to 80 dBA at 3 feet in the open environment. Considering distance attenuation due to the spreading out of sound waves with distance for HVAC equipment located in an enclosed attic space and vented to the exterior, the sound level at a position five feet above ground level would be expected to range from 44 to 54 dBA and 42 to 52 dBA, at the closest expected facades at residential setbacks 1 and 2. These noise levels would not exceed the site-specific allowable noise levels in these areas.

MITIGATION GUIDELINES

Based on the results of this Noise Assessment, the following project activities could exceed the site-specific allowable noise levels, as shown in Table 2, at the future adjacent residential uses;

1. Nighttime market/retail deliveries,
and
2. Daytime, evening or nighttime fuel deliveries.

To reduce these potential project noise impacts and allow daytime fuel deliveries and daytime, evening and nighttime market deliveries to comply with the City's Noise ordinance limits, we recommend that prior to the occupation residences on the adjacent property (as discussed above) a sound wall with a minimum height of ten (10) feet above parking lot grade, be built on the eastern property line from the northern edge of the proposed southeast corner pedestrian access point northward for approximately 160 feet to a point approximately 30 feet north of the southernmost edge of the market footprint. A graphic representation of the location of this wall is shown in Figure 2, below.

To be effective as a noise barrier the wall should be built without cracks or gaps in the face or large or continuous gaps at the base and have a minimum surface weight of 3.0 lbs. per sq. ft. Acceptable materials for the wall includes, but are not limited to, masonry block and pre-cast

concrete panels. Wood may also be used. For a wood wall to meet these requirements we typically recommend that a homogenous sheet material, such as 3/4" plywood, be used as a backing for typical 1" thick (nominal) wood fence slats. Using the plywood ensures the continued effectiveness of the barrier with age, since wood slats alone have a tendency to warp and separate with age allowing gaps to form and the barrier effect of the wall to diminish.

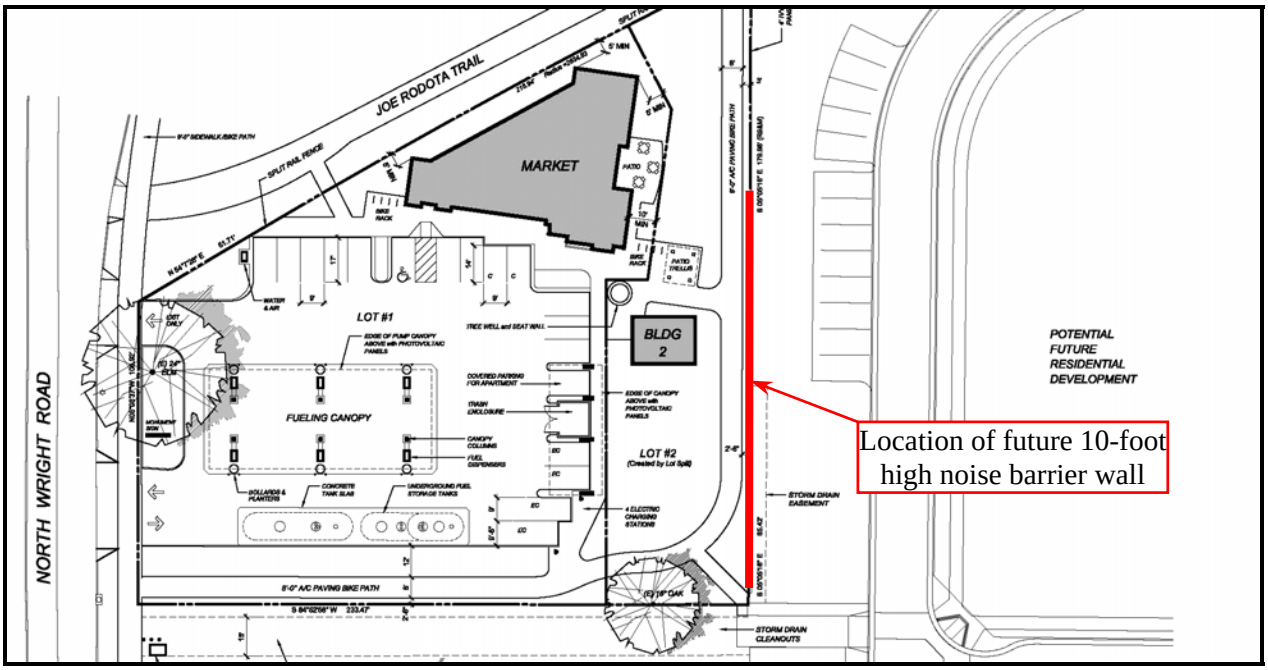


Figure 2: Site Plan with location of 10-foot high noise barrier wall

Since this measure will not fully mitigate noise impacts to future residential uses from heavy (semi-trailer type) truck fuel deliveries, in addition to the incorporation of the 10 foot high property line soundwall, a daytime only (7 am to 7 pm) restriction on fuel deliveries should be specified in the Conditions of Approval for the project.

This concludes our environmental noise assessment for the proposed Elm Street Station retail market, electric charge and gasoline fueling station project proposed at 847 North Wright Road in Santa Rosa, CA. If you have any questions or comments, please do not hesitate to call.

Sincerely,

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

Appendix A:

Fundamental Concepts of Environmental Acoustics

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 that are used to describe noise in a particular location. *A decibel (dB)* is a unit of measurement that 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 or 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.

Table 1: Definitions of Acoustical Terms Used in this Report

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. The reference pressure for air is 20.
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, Leq	The average 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.

Table 2: Typical Noise Levels in the Environment

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
	120 dBA	
Jet fly-over at 300 meters		Rock concert
	110 dBA	
Pile driver at 20 meters	100 dBA	
		Night club with live music
	90 dBA	
Large truck pass by at 15 meters		
	80 dBA	Noisy restaurant
		Garbage disposal at 1 meter
Gas lawn mower at 30 meters	70 dBA	Vacuum cleaner at 3 meters
Commercial/Urban area daytime		Normal speech at 1 meter
Suburban expressway at 90 meters	60 dBA	
Suburban daytime		Active office environment
	50 dBA	
Urban area nighttime		Quiet office environment
	40 dBA	
Suburban nighttime		
Quiet rural areas	30 dBA	Library
		Quiet bedroom at night
Wilderness area	20 dBA	
Most quiet remote areas	10 dBA	Quiet recording studio
Threshold of human hearing	0 dBA	Threshold of human hearing