485 SOUTH MONROE STREET
ENVIRONMENTAL NOISE ASSESSMENT
SAN JOSE, CALIFORNIA

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Introduction

This report presents the results of the noise assessment conducted for the proposed townhomes and 4-story multifamily residential tower with ground floor parking at 485 South Monroe Street in San Jose, California. The primary noise-related issue is the compatibility of the proposed residential units with the traffic noise from I-280 and South Monroe Street. This assessment presents the fundamentals of environmental noise, provides a discussion of policies and standards applicable to the project, and presents the results of measurements conducted at the site. The report then evaluates impacts resulting from the project in terms of noise and land use compatibility, permanent noise level increases resulting from the operation of the project, and temporary noise level increases resulting from project construction. Mitigation is presented to reduce the potential for adverse effects resulting from the project.

Fundamentals of Environmental Noise

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. Decibels and other technical terms are defined in Table 1.

Most of the sounds which we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies, with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency mid-range. This is called "A" weighting, and the decibel level so measured is called the A-weighted sound level (dBA). In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Typical A-weighted levels measured in the environment and in industry are shown in Table 2 for different types of noise.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources which create a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors, L_{01}, L_{10}, L_{50}, and L_{90}, are commonly used. They are the A-weighted noise levels equaled or exceeded during 1%, 10%, 50%, and 90% of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time.

In determining the daily level of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes very noticeable. Further, most people sleep at night and are very sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, a descriptor, DNL (day/night average sound level), was developed. The DNL divides the 24-hour day into the daytime of 7:00 AM to 10:00 PM and the nighttime of 10:00 PM to 7:00 AM. The nighttime noise level is weighted 10 dB higher than the daytime noise level. The Community Noise Equivalent Level (CNEL) is another 24-hour average which includes both an evening and nighttime weighting.

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.
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.

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

Regulatory Background

The State of California and the City of San Jose have established plans and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies are contained in the following documents: (1) the State CEQA Guidelines, Appendix G, (2) the California Building Code, and (3) the City of San Jose Noise Element of the General Plan.

(1) California Environmental Quality Act (CEQA)
Under the California Environmental Quality Act (CEQA), noise impacts would be considered significant if the project would result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within 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, if the project would expose people residing or working in the project area to excessive noise levels;

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Of these guidelines, items (a), (c), and (d) are applicable to the proposed project. There are no existing substantial sources of groundborne vibration in the vicinity of the site and the site does not propose to develop any new sources or groundborne vibration. Based on review of the aircraft noise contours for Mineta San Jose International Airport, this project site is located outside of the 65 dB CNEL noise contour for the airport. Aircraft noise does not make a significant contribution to overall noise levels at the project site so no additional analysis of aircraft noise is included within this report.

CEQA does not define what noise level increase would be considered substantial. Typically, an increase in the L_{dn} noise level resulting from the project at noise sensitive land uses of 3 dBA or greater would be considered a significant impact when projected noise levels would exceed those considered acceptable for the affected land use. An increase of 5 dBA or greater would be considered a significant impact when projected noise levels would remain within those considered acceptable for the affected land use.

(2) 2001 California Building Code

Title 24, Appendix Chapter 12, Section 1208A.8.2 of the California Building Code, which is applicable to multi-family and attached dwellings, specifies that interior noise levels attributable to exterior noise sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room.

(3) City of San Jose General Plan

The Noise Element of the City of San Jose's 2020 Plan identifies noise and land use compatibility standards for various land uses. The City's goal is to, "...minimize the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies." Policies presented in the Noise Element applicable to this project are as follows:

> Policy 1. The City's acceptable noise level objectives are 55 dBA DNL as the long-range exterior noise quality level, 60 dBA DNL as the short-range exterior noise quality level, 45 dBA DNL as the interior noise quality level, and 76 dBA DNL as the maximum exterior noise level necessary to avoid significant adverse health effects. These objectives are established for the City, recognizing that the attainment of exterior noise quality levels in the environs of the San Jose International Airport, the Downtown Core Area, and along major roadways may not be achieved in the time frame of this Plan. To achieve the noise objectives, the City should require appropriate site and building design, building construction and noise attenuation techniques in new residential development.
>
> Policy 9. Construction operations should use available noise suppression devices and technology.

Existing Noise Environment

The project site is located on a 7.4-acre site at 485 South Monroe Street in San Jose, California. Single and multi-family residences are located north, east, and west of the project site. The site is located just north of Interstate 280 (I-280), east of South Monroe Street. Interstate 880/State Route 17 is located 800 feet east of the site and elevated through this portion of the roadway. A park and a fire station are located south of the site between Baywood Avenue and Monroe Street, and commercial uses and parking are located to the northwest. The project is surrounded by mostly commercial uses. The existing noise environment results primarily from traffic noise on the surrounding local streets and from I-280, which is shielded from the site by a 16 to 18 foot high noise barrier. A noise monitoring survey was conducted from January 9th to 11th, 2007 to quantify the existing noise environment on the project site. Two long-term noise measurement locations, and two short-term attended measurement locations were conducted at representative locations to complete the noise monitoring survey. Noise measurement locations are shown on Figure 1.

Long-term noise measurement LT-1 was located about 50 feet from the centerline of South Monroe Street, about 585 feet from the soundwall along I-280, and about 10 feet above the surrounding ground. The noise environment at this location resulted primarily from traffic on South Monroe Street during daytime hours with distant freeway traffic (from I-280 and I-880) raising nighttime noise levels and occasional loud events – presumably from emergency fire engines departing from the adjacent fire station – which raised the hourly L_{eq} by 3 to 11 dBA above levels typically occurring during those hours. The DNL noise level (day-night average) over the course of the measurement period ranged from 65 to 67 dBA DNL including the loud events and from 63 to 67 dBA DNL excluding the loud events. The daily trend in noise levels at LT-1 is shown in Figure 2.

Long-term noise measurement location LT-2 was made about 25 feet from the centerline of Tisch Way, about 50 feet from the soundwall along I-280, and about 10 feet above the surrounding ground. The noise environment at this location resulted primarily from traffic on I-280 and Tisch Way. Occasional loud events – presumably emergency fire engines – raised the hourly L_{eq} by about 6 dBA above levels typically occurring during those hours. The DNL noise level (day-night average) over the course of the measurement period ranged from 72 to 73 dBA DNL including the loud events and was 72 dBA DNL excluding the loud events. The daily trend in noise levels at LT-2 is shown in Figure 3.

Short-term noise measurement ST-1 was conducted adjacent to measurement location LT-1, at a height of about 16 feet above the surrounding ground. The 10-minute L_{eq} at this location, between 2:00 and 2:10 pm on January 11th, 2007, was 61 dBA, resulting primarily from traffic along South Monroe Street. Based on a comparison with the results at LT-1, the DNL at this elevated location is estimated to be similar to LT-1, 65 to 67 dBA DNL including the loud events and from 63 to 67 dBA DNL excluding the loud events.

Noise measurement ST-2 was located about 90 feet from the centerline of Tisch Way, about 115 feet from the soundwall along I-280, and about 16 feet above the surrounding ground. The 10-minute L_{eq} at this location, between 1:40 and 1:50 pm on January 11th, 2007, was 66 dBA, resulting primarily from traffic along I-280. Based on a comparison with the results at LT-2, the DNL at this location is estimated to be about 69 dBA DNL.

Figure 1: Noise Measurement Locations

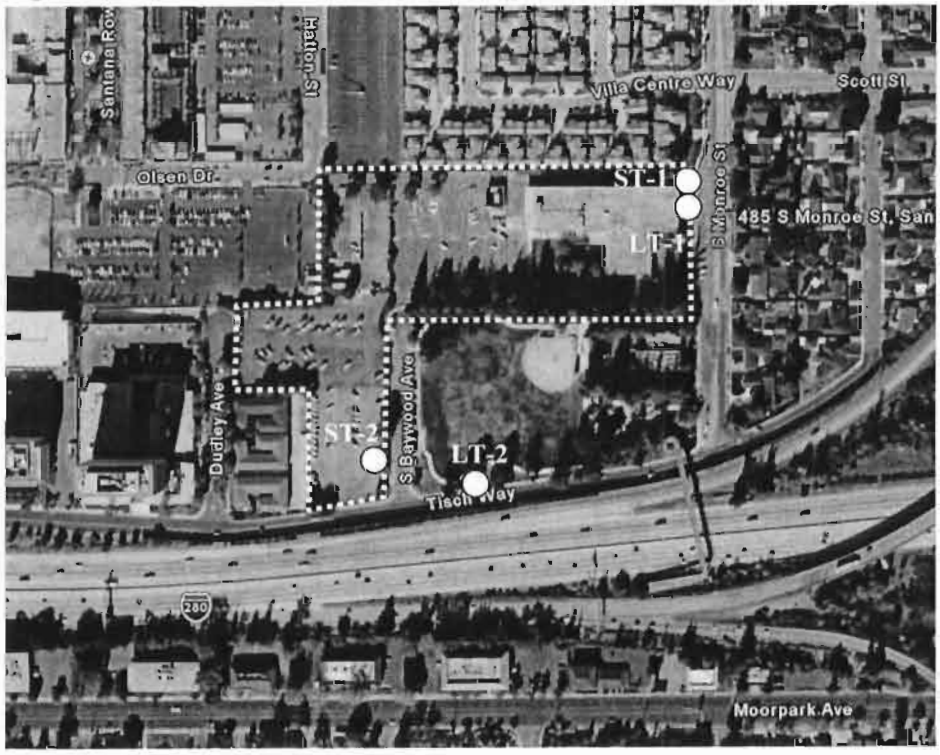


Figure 2 – Daily Trend in Noise Levels at LT-1

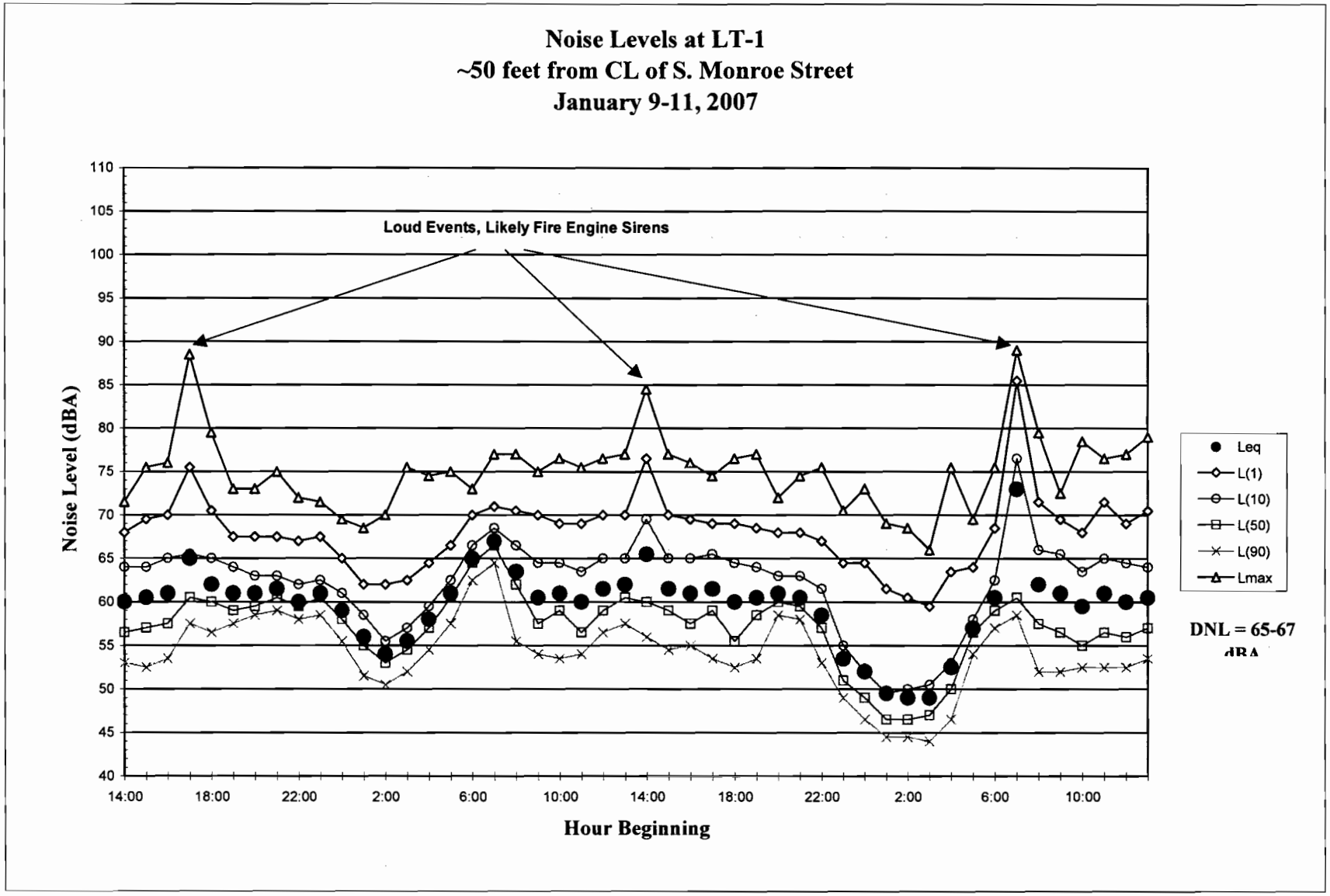
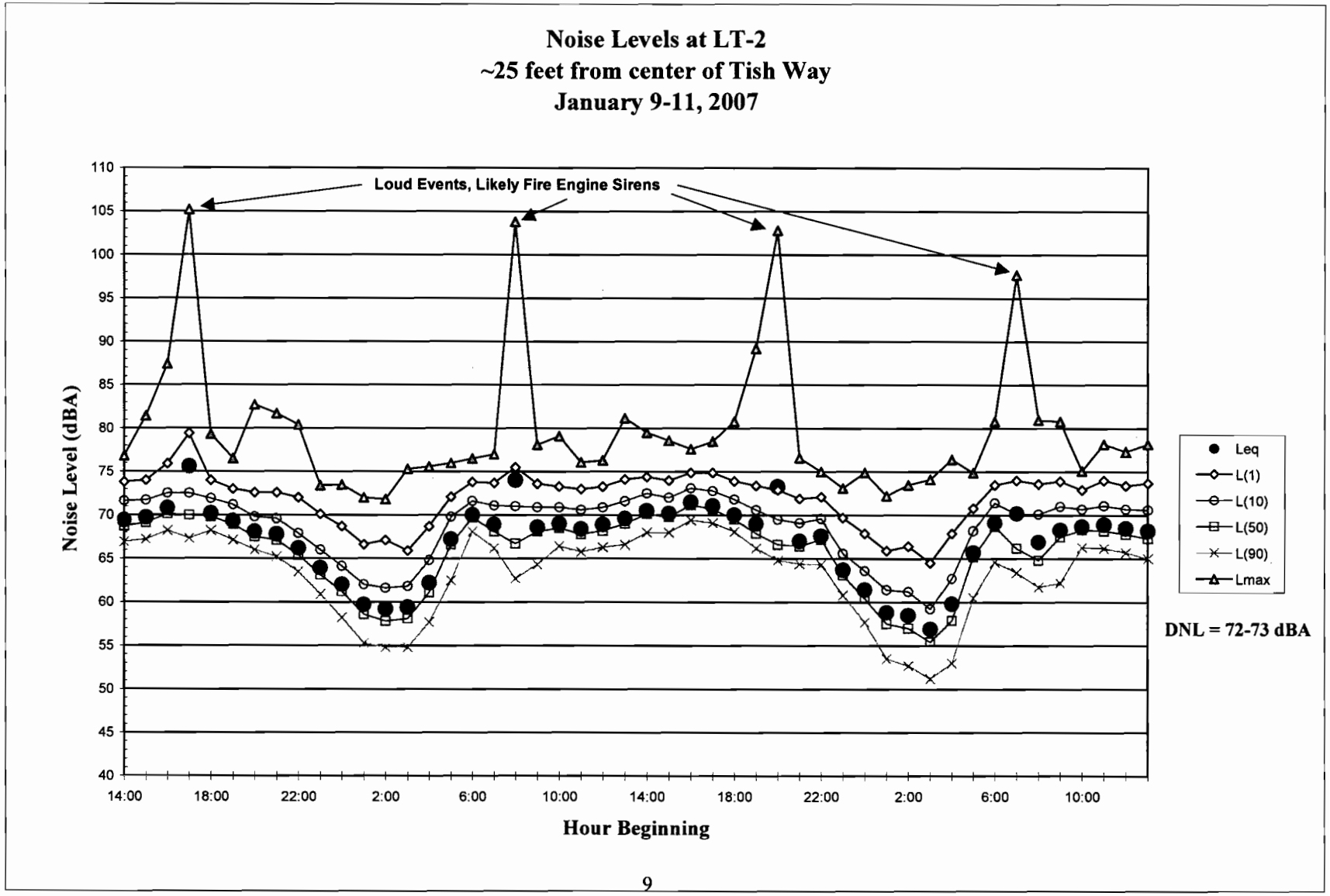


Figure 3 – Daily Trend in Noise Levels at LT-2



NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria
The following significance criteria are used in this report to evaluate the significance of noise impacts:

1. **Noise and Land Use Compatibility.** If proposed residential uses are exposed to a DNL in excess of City or State noise and land use compatibility guidelines, the impact would be considered significant (60 dBA DNL for exterior common use areas and 45 dBA DNL for interior residential uses);

2. **Project Generated Traffic Noise.** If project traffic were to increase noise levels at noise sensitive areas by more than 3 dBA DNL, the impact would be considered significant;

3. **Construction Noise.** Construction noise impacts would be considered significant when the noise from construction activities exceeds 60 dBA Leq and the ambient noise environment by at least 5 dBA at noise-sensitive uses in the project vicinity and persists for more than one year.

Impact 1: **Noise and Land Use Compatibility.** Without addition noise reduction measures, interior noise levels in some project units would exceed 45 dBA DNL. **This is a potentially significant impact.**

The project would develop 100 three-story townhomes on a 5.05-acre portion of the site (Parcel 1) and a 40-unit, four-story multi-family structure over two levels of above ground parking (Parcel 2). There are no common or private outdoor uses proposed for the site and residences would have access to the Frank Santana Park, which adjoins the site the southeast. Exterior noise guidelines are not typically applicable to small private uses such as upper level balconies. City and State standards have established a threshold of 45 dBA DNL for noise levels inside residences exposed to exterior noise sources.

The future traffic noise exposure for project residences was calculated based on the results of the noise monitoring survey, the project traffic study, and preliminary traffic noise modeling conducted using SoundPLAN 6.4. Based on traffic volumes provided by Hexagon Transportation Consultants, traffic noise levels along South Monroe Street are calculated to increase by about 4 dBA DNL under cumulative conditions. Future traffic volumes for I-280 were unavailable. For the purposes of this analysis, traffic noise levels generated along I-280 are estimated to increase by 1 dBA DNL in the future. Elevated residences would not benefit from the shielding provided by surrounding buildings and the soundwall along I-280 and would experience higher traffic noise levels from I-280. As a result, residential façades fronting South Monroe Street, which are setback about 70 feet from the centerline of the roadway, would be exposed to future exterior noise levels of about 69 dBA DNL at ground and upper stories. Townhomes with façades fronting the northern or southern project limits of Parcel 1 would be exposed to future exterior noise levels of up to 66 dBA DNL. Residential façades on Parcel 2 would be exposed to future exterior noise levels of up to 70 dBA DNL. A more detailed summary of future exterior noise levels calculated at proposed residential unit façades of the Parcel 2 tower is shown in Table 3.

Table 3: Future Exterior Noise Levels at Parcel 2 Residential Façades

Residential Floor	Residential Tower Façade, DNL			
	North	East	South	West
1st Floor	<60 dBA	64 dBA	64 dBA	60 dBA
2nd Floor	<60 dBA	65 dBA	67 dBA	63 dBA
3rd Floor	<60 dBA	65 dBA	68 dBA	65 dBA
4th Floor	<60 dBA	66 dBA	70 dBA	66 dBA

Standard California construction methods typically provide about 15 dBA of exterior-to-interior noise reduction with windows partially open and 20 to 25 dBA of noise reduction with windows closed. Where exterior day-night average noise levels are less than 60 dBA DNL, interior noise levels would typically meet City and State standards (45 dBA DNL) with standard construction only. Where exterior noise levels are less than 65 to 70 dBA DNL, interior noise levels can typically be maintained below 45 dBA DNL with the incorporation of forced air mechanical ventilation systems in residential units to allow occupants the option of keeping windows in the closed position. Where noise levels exceed 65 to 70 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction would be required.

Townhomes with façades fronting South Monroe Street and/or the northern or southern project limits of Parcel 1, and Parcel 2 residential units with east, west, and south facing façades would be exposed to future exterior noise levels exceeding 60 dBA DNL and would require forced-air mechanical ventilation to meet the 45-dBA DNL criteria. In addition, sound rated construction could be required for townhomes fronting South Monroe Street and for southern facing 2nd, 3rd, and 4th floor Parcel 2 units. The final building plans were not available at the time of this assessment. Based on preliminary calculations, these units would achieve the interior standard with the inclusion of forced-air ventilation and windows with STC ratings of 27 to 29. Specifications of window and wall systems would need to be determined during the final design stage of the project when building elevations and floor plans are available. Recommendations to control interior noise levels are indicated in Figure 4.

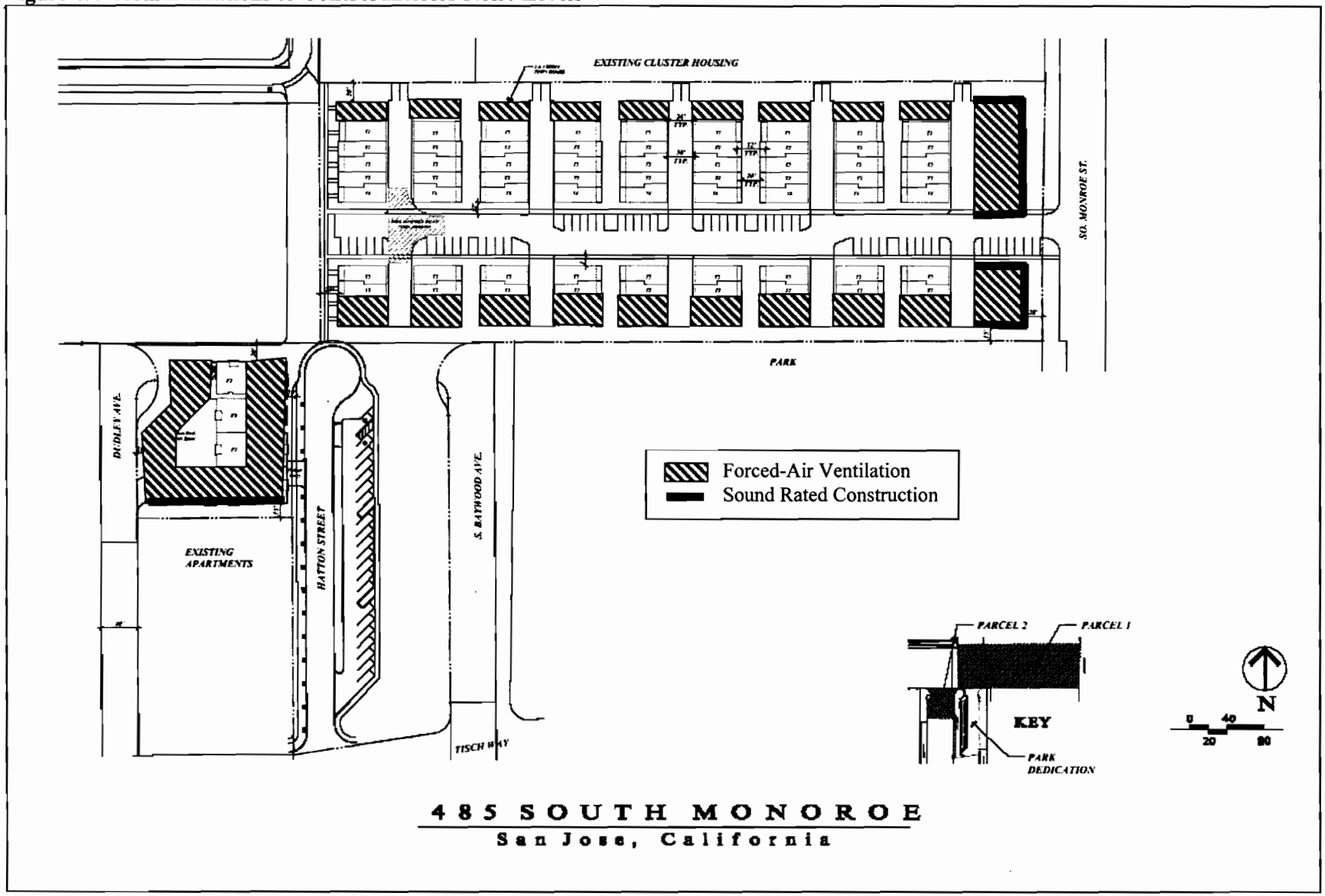
Emergency events are exempted from the noise ordinance and the planning guidelines. However, due to the proximity of the fire station to the project site and the regular occurrence of loud siren events, sirens from emergency vehicles could occasionally disturb occupants of the townhomes adjacent to South Monroe Street, particularly when they occur during late night hours. Emergency vehicles do not usually use sirens at night near stations in residential areas. About 1 to 2 emergency sirens were measured along South Monroe Street each day over the 2-day noise monitoring survey. All of the emergency events measured over the 2-day monitoring period along both South Monroe Street and Tisch Way took place during daytime or evening hours. More events could occur over weekends. Instantaneous maximum noise levels from sirens are calculated to reach 83 to 87 dBA L_{max} at the setback of project townhomes. With the inclusion of the measures indicated above, interior noise levels generated by sirens is anticipated to be 58 to 60 dBA L_{max}. During daytime and evening hours, these events are not anticipated to substantially disturb residents. Late night emergency events could wake residents, but are not anticipated to occur frequently.

Mitigation 1: The following mitigation measures shall be included in the project to reduce the impact to a less-than-significant level:

1. Forced-air mechanical ventilation, satisfactory to the local building official, must be provided for townhomes with façades fronting South Monroe Street and/or the northern or southern project limits of Parcel 1, and Parcel 2 residential units with east, west, and south facing façades, to allow occupants the option of keeping windows closed to control noise.

2. In addition, special building construction techniques may be required for townhomes fronting South Monroe Street and for southern facing 2nd, 3rd, and 4th floor Parcel 2 units, as indicated in Figure 4. These treatments could include, but are not limited to, sound rated windows and doors. The specification of necessary acoustical treatments shall be conducted by a qualified acoustical consultant during the final design stage. Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans, and approved prior to issuance of a building permit.

Figure 4: Recommendations to Control Interior Noise Levels



Impact 2: **Project Generated Traffic Noise.** Project generated traffic would not significantly increase traffic noise levels along roadways in noise sensitive areas. **This is a less-than-significant impact.**

Noise sensitive uses, including single and multi-family residences, are located adjacent to the project site to the north, east, and southwest. Based on traffic volumes supplied by Hexagon Transportation Consultants (April 2007), noise levels would not substantially increase at these nearby noise sensitive receptors as a result of project traffic (increase is calculated to be less than 1 dBA).

Mitigation 2: None Required

Impact 3: **Construction Noise.** Noise levels generated by construction activities would exceed ambient noise levels at nearby residences by more than 5 dBA; however, the noisiest activity would occur over a period of 12 months or less. **This is a less-than-significant impact.**

Construction on the site would generate noise, and would temporarily increase noise levels at adjacent land uses. Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise generating activities, and the distance between construction noise sources and noise sensitive receptors. Construction noise impacts primarily occur when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction durations last over extended periods of time. Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA at noise-sensitive uses in the project vicinity, the impact would be considered significant. In this area, ambient noise levels typically reach 60 dBA L_{eq} during the daytime.

Construction activities generate considerable amounts of noise. Construction-related noise levels are normally highest during the demolition and grading phase and during the construction of project foundations and framing. These phases of construction require heavy equipment that normally generates the highest noise levels over extended periods of time. Significant noise generating construction activities, including demolition, grading, and heavy construction would be completed within 12 consecutive months. Additional construction activities, such as interior finishing work, would continue after this period, but would generate much lower noise levels. Pile driving would not be used for the construction of the project. Typical hourly average construction generated noise levels are about 81 dBA to 88 dBA measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). Construction-related noise levels are normally less during building framing, finishing, and landscaping phases. There would be variations in construction noise levels on a day-to-day basis depending on the actual activities occurring at the site. Construction generated noise levels drop off at a rate of about 6 dBA per doubling of distance between the source and receptor. Shielding by buildings would provide an additional 5 to 10 decibels of attenuation at more distant receptors.

Noise sensitive land uses are located to the north of Parcel 1, across South Monroe Street from Parcel 1, and to the south of Parcel 2. Portions of construction activity would be adjacent to residential units, but due to the size of the project site, most construction activity would be considerably further from the individual residences. At 100 feet from the noise source, exterior hourly average noise levels would be approximately 75 to 82 dBA L_{eq} during busy construction periods. At 500 feet from the noise source, exterior hourly average noise levels would be approximately 61 to 68 dBA L_{eq}. Construction noise levels would exceed the 60 dBA L_{eq} exterior noise level threshold and the ambient level by more than 5 dBA.

Homes adjacent to noisy construction activities would be exposed to noise levels exceeding ambient levels by more than 5 dBA L_{eq}. However, noisy construction activities would be completed within 12 consecutive months. Typically, residential projects do not generate significant noise impacts when standard construction noise control measures are enforced at the project site and when the duration of the noise generating construction period is limited to one construction season (typically one year) or less.

With the following standard controls, construction noise impacts on nearby residences would be considered **less-than-significant**:

- Construction activities shall be limited to the hours between 7:00 a.m. to 7:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. and 6:00 p.m. on Saturdays. No construction activities should occur on Sundays or holidays.
- Equip all internal combustion engine driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Locate stationary noise generating equipment as far as possible from adjacent residential receivers.
- Avoid staging of equipment and unnecessary idling of equipment within 200 feet of noise sensitive uses.
- Acoustically shield stationary equipment located near existing residential receivers.
- Utilize "quiet" air compressors and other stationery noise sources where technology exists.
- The contractor shall prepare a construction plan identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.
- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem.