

APPENDIX F

PROJECT SPECIFIC NOISE ANALYSIS



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September 22, 2014

Ms. Rebekah Ross
City of San José, Planning Division
Environmental Review Team
200 E. Santa Clara Street, Tower 3
San José, CA 95113

Subject: Fairfield at West San Carlos Noise Impact Analysis

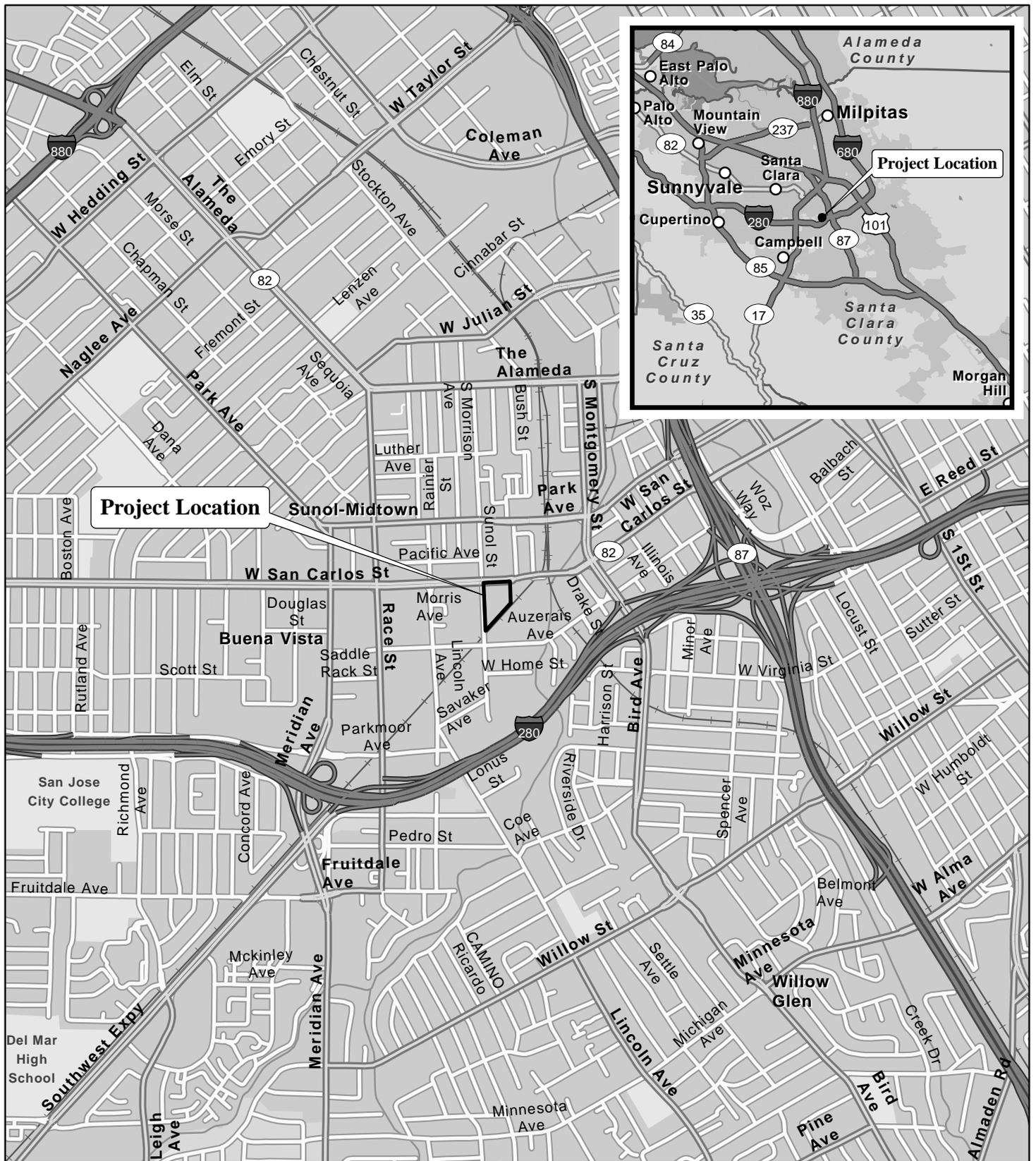
Dear Ms. Ross:

LSA Associates, Inc. (LSA) is pleased to submit this project specific analysis of noise impacts for construction and operation of the Fairfield at West San Carlos residential project in the City of San Jose, California. The proposed project is located on an approximately 4.7-acre site at 800-820 West San Carlos Street. It is located within the Diridon Station Area Plan and is bordered by West San Carlos Street to the north; light industrial uses to the east; a Santa Clara Valley Transportation Authority (VTA) light rail line to the south; and Sunol Street to the west. The project site is currently developed with an approximately 4,500-square-foot office and showroom building, a 24,000-square-foot warehouse containing four discrete substructures, a pole barn with about 10,500 square feet of covered area, and associated surface parking and paved areas. The proposed project consists of development of a mixed-use project, consisting of 315 residential units, 22,665 square feet of commercial uses, and ancillary facilities. Retail space associated with the project would be concentrated along the West San Carlos Street frontage of the project site. The project would include an 8-foot high concrete wall along the southern boundary of the property. Figure 1 shows the location of the project site and Figure 2 shows an aerial photograph of the project site and its surroundings. This analysis focuses on the project land use noise compatibility, identifies existing noise in the project area, and identifies construction and operational noise impacts associated with the project.

CHARACTERISTICS OF NOISE AND VIBRATION

Noise is generally defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

Several noise measurement scales exist which are used to describe noise in a particular location. A *decibel* (dB) is a unit of measurement which indicates the relative intensity of a sound. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3.0 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3.0 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Sound levels in dB are calculated on a logarithmic basis. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense. Each 10-dB increase in sound level is perceived as



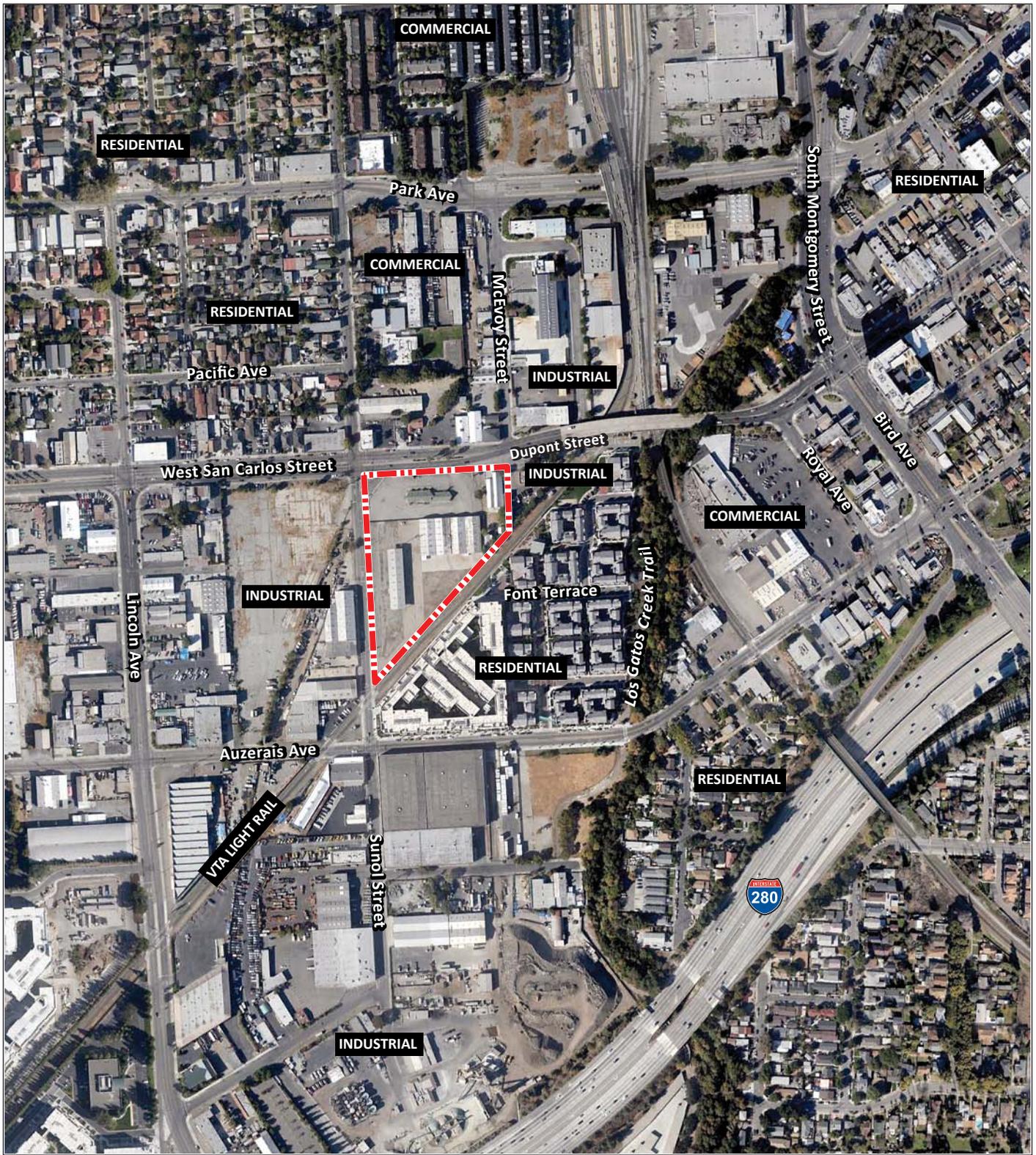
LSA

FIGURE 1



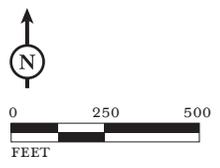
SOURCE: ESRI StreetMap North America (2012).

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LSA

FIGURE 2



Fairfield at West San Carlos Noise Analysis
Aerial Photograph

SOURCES: GOOGLE EARTH 9/11/12; LSA ASSOCIATES, INC., 2014.

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approximately a doubling of loudness. Sound intensity is normally measured through the A-weighted sound level (dBA). This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive.

Noise impacts can be described in three categories. The first is audible impacts, which refers to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3.0 dB or greater, since this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise level of less than 1.0 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

As noise spreads from a source, it loses energy so that the farther away the noise receiver is from the noise source, the lower the perceived noise level would be. Geometric spreading causes the sound level to attenuate or be reduced, resulting in a 6-dB reduction in the noise level for each doubling of distance from a single point source of noise to the noise sensitive receptor of concern. There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within one dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise.

Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings. Common sources of ground-borne vibration include trains and construction activities such as blasting, pile driving and operating heavy earthmoving equipment.

Factors that influence ground borne vibration include the:

- Vibration source: Type of activity or equipment, such as impact or mobile, and depth of vibration source;
- Vibration Path: Soil type, rock layers, soil layering, depth to water table, and frost depth; and
- Vibration Receiver: Foundation type, building construction, and acoustical absorption.

To distinguish vibration levels from noise levels, the unit is written as “VdB.” Human perception to vibration starts at levels as low as 67 VdB and sometimes lower. Annoyance due to vibration in residential settings starts at approximately 70 VdB. Ground-borne vibration is almost never annoying to people who are outdoors. Although the motion of the ground may be perceived, without the effects associated with the shaking of the building, the motion does not provoke the same adverse human reaction.

In extreme cases, excessive ground borne vibration has the potential to cause structural damage to buildings. The Federal Transit Administration’s (FTA) vibration impact criteria and impact assessment guidelines are published in their *Transit Noise and Vibration Impact Assessment* document.¹ The FTA guidelines include thresholds for impacts from frequent and infrequent transportation events (such as train passings) as well as construction vibration impacts for various structural categories. The FTA’s construction vibration damage criteria for buildings considered extremely susceptible to vibration damage is 90 VdB; the damage threshold for other structures is 94 VdB to 102 VdB.²

REGULATORY FRAMEWORK

The City of San José addresses noise in the policies of the General Plan 2040 and in the provisions of the City’s Municipal Code. The State of California regulates interior noise level through the State Building Code. The FTA also provides guidelines for levels of ground-borne vibration due to rail lines adjacent to various land uses. This section describes the regulatory framework for addressing noise from these agencies.

a. City of San José 2040 Envision General Plan. The Noise Element standards of the General Plan specify an exterior noise limit of 60 A-weighted decibels on the day-night equivalent level (dBA L_{dn}) for residential uses affected by transportation-related noise sources; and a limit of 45 dBA L_{dn} is specified for interior noise-sensitive spaces. The standards also require that new residential uses impacted by rail related noise include mitigation so that recurring maximum instantaneous noise levels do not exceed 50 dBA L_{max} in bedrooms and 55 dBA L_{max} in other rooms.

Various policies in the City’s General Plan have been adopted that avoid or mitigate noise impacts resulting from planned development within the City. The City of San José has the following goals and policies related to the proposed project that would reduce noise impacts:

- *Goal EC-1 – Community Noise Levels and Land Use Compatibility:* Minimize the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies.
- Policy EC-1.1: Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:
 - a. Interior Noise Levels: The City’s standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA L_{dn} . Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this standard. For sites with exterior noise levels of 60 dBA L_{dn} or more, an acoustical analysis

¹ Federal Transit Administration, 2006. *Transit Noise and Vibration Impact Assessment*. May. Website: www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

² Ibid.

following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency over the life of this plan.

- b. Exterior Noise Levels: The City's acceptable exterior noise level objective is 60 dBA L_{dn} or less for residential and most institutional land uses. The acceptable exterior noise level objective is established for the City, except in the environs of the SJIA and the Downtown, as described below:
 - i. For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA L_{dn} in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA L_{dn} exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA L_{dn} standard for noise from sources other than aircraft and elevated roadway segments.
 - ii. For single-family residential uses, use a standard of 60 dBA L_{dn} for exterior noise in private usable outdoor activity areas, such as backyards.
- Policy EC-1.2: Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:
 - Cause the L_{dn} at noise sensitive receptors to increase by five dBA L_{dn} or more where the noise levels would remain "Normally Acceptable"; or
 - Cause the L_{dn} at noise sensitive receptors to increase by three dBA L_{dn} or more where noise levels would equal or exceed the "Normally Acceptable" level.
- Policy EC-1.3: Mitigate noise generation of new nonresidential land uses to 55 dBA L_{dn} at the property line when located adjacent to existing or planned noise sensitive residential and public/quasi-public land uses.
- Policy EC-1.4: Include appropriate noise attenuation techniques in the design of all new General Plan streets projected to adversely impact noise sensitive uses.
- Policy EC-1.5: Encourage the State Department of Transportation and County transportation agencies to provide visually pleasing sound attenuation devices on all new and existing freeways and expressways.
- Policy EC-1.6: Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City's Municipal Code.
- Policy EC-1.7: Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City's Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:
 - Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

- For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.
- Policy EC-1.9: Require noise studies for land use proposals where known or suspected loud intermittent noise sources occur which may impact adjacent existing or planned land uses. For new residential development affected by noise from heavy rail, light rail, BART or other single-event noise sources, implement mitigation so that recurring maximum instantaneous noise levels do not exceed 50 dBA L_{max} in bedrooms and 55 dBA L_{max} in other rooms.
- Policy EC-1.11: Require safe and compatible land uses within the SJIA noise zone (defined by the 65 CNEL contour as set forth in State law) and encourage aircraft operating procedures that minimize noise.
- Policy EC-1.12: Encourage the Federal Aviation Administration to enforce current cruise altitudes that minimize the impact of aircraft noise on land use.
- Policy EC-1.14: Require acoustical analyses for proposed sensitive land uses in areas with exterior noise levels exceeding the City's noise and land use compatibility standards to base noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency.
- *Goal EC-2 – Vibration*: Minimize vibration impacts on people, residences, and business operations.
- Policy EC-2.1: Near light and heavy rail lines or other sources of ground-borne vibration, minimize vibration impacts on people, residences, and businesses through the use of setbacks and/or structural design features that reduce vibration to levels at or below the guidelines of the Federal Transit Administration. Require new development within 100 feet of rail lines to demonstrate prior to project approval that vibration experienced by residents and vibration sensitive uses would not exceed these guidelines.
- Policy EC-2.3: Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to a building. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

b. City of San José Municipal Code. The Zoning Ordinance of the San José Municipal Code contains performance standards for the generation of noise at adjacent properties. The sound pressure level generated by any use or combination of uses on a property shall not exceed the decibel levels indicated in the Noise Table below at any property line, except upon issuance and in compliance with a Conditional Use permit as provided in Chapter 20.100.

The Zoning Ordinance restricts construction and demolition activity to the hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday. No construction or demolition work is permitted on Sundays or federal holidays.

Table 1: Noise Performance Standards

	Maximum Noise Level in Decibels at Property Line
Uses adjacent to a property used or zoned for residential purposes	55
Uses adjacent to a property used or zoned for commercial purposes	60
Uses adjacent to a property used or zoned for industrial or use other than commercial or residential purposes	70

Source: San José Municipal Code Zoning Ordinance

c. California Building Code, Title 24, Part 2. The State Building Code, Title 24, Part 2 of the State of California Code of Regulations establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room. Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

d. Federal Transit Administration. The FTA provides guidance for acceptable levels of ground-borne vibration for various land uses due to rail lines.³ While the guidelines are generally intended to help assess the potential impact of new rail projects adjacent to existing land uses, they are frequently used to help assess the compatibility of new projects adjacent to existing rail lines. The following is a summary of the guidelines.

- Frequent Events (more than 70 per day) – 72 VdB
- Occasional Events (30 to 70 per day) – 75 VdB
- Infrequent Events (fewer than 30 per day) – 80 VdB

EXISTING NOISE CONDITIONS

Noise conditions in the project vicinity were documented in the Diridon Station Area Plan Draft PEIR.⁴ Existing sources of noise in the project vicinity primarily include traffic noise and rail noise. As noted in the DSAP PEIR, exterior traffic noise levels along West San Carlos range up to 70 dBA L_{dn} . The specific pages from the PEIR documenting these noise levels are included as an attachment. According to the DSAP PEIR, exterior noise from the UPRR/LTR corridor adjacent to the project site would be approximately 67 dBA L_{dn} at a distance of 10 feet from the UPRR/LRR corridor. Maximum sound levels 35 feet from the centerline of the tracts would range from 83 to 87 dBA L_{max} .

³ Federal Transit Administration, 2006, op. cit.

⁴ San José, City of, 2013. *Diridon Station Area Plan Draft PEIR*. December.

The UPRR/LTR corridor would also expose the project site to ground-borne vibration. Ground-borne vibration levels due to VTA light rail trains at 35 feet from the centerline of the tracks would range between 71 VdB and 80 VdB. Maximum ground-borne vibration levels 35 feet from the centerline of the freight trains are estimated to be approximately 85 VdB.⁵

PROJECT IMPACTS

The proposed project would generate noise impacts during the construction period and operation of the proposed project.

a. Construction Period Impacts. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

Short-term noise generated by the approximately 24-month construction period would temporarily increase noise levels in the vicinity of the project site. Construction activities would be performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. Noise impacts from construction crew commutes and the transport of construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the site. The site preparation and grading phase of construction tends to generate the highest noise levels, because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery, such as bulldozers and loaders, and compacting equipment, including compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 to 4 minutes at lower power settings. The construction phase of the project is expected to require the use of graders, dozers, and haul trucks. Typical hourly noise levels associated with the use of this type of construction equipment is estimated between 80 and 85 dBA at a distance of 50 feet from the operating equipment.⁶ Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates as an individual noise source, the worst-case composite noise level during this phase of construction would be approximately 91 dBA L_{max} , as measured at 50 feet from multiple pieces of equipment operating simultaneously at full power.

The closest sensitive land uses to the project construction area are multi-unit residential complexes located approximately 120 feet from the project site, across the railroad tracks to the south and southeast. There are also commercial uses to the north, across West San Carlos Street; there are commercial uses to the southwest, across Sunol Street; and there is a commercial use approximately 20 feet to the east of the site. However, only residential areas would be considered noise sensitive land uses.

⁵ Charles M. Salter Associates, Inc., 2009. *The Ohlone Mixed-Use Project Environmental Noise and Ground-Borne Vibration Assessment*. July.

⁶ San José, City of, 2014, op. cit.

Due to distance attenuation, maximum noise levels associated with project construction activities would be reduced to below 84 dBA L_{\max} ⁷ at the closest sensitive receptor to proposed project construction. Without restrictions on permissible hours of construction and implementation of best management practices, project construction could still result in high levels of annoyance at the closest receptors, such as the nearby residential uses in the project site vicinity. The DSAP FPEIR included measures to reduce the impacts of short-term noise related to the development of the Diridon Plan. The proposed project would be required to implement the measures during all phases of construction activity.

Measures included in the Diridon Plan FPEIR which will be included as development Permit Conditions:

- Construction will be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday for any on-site or off-site work within 500 feet of any residential unit. Construction outside of these hours may be approved through a development permit based on a site-specific “construction noise mitigation plan” and a finding by the Director of Planning, Building and Code Enforcement that the construction noise mitigation plan is adequate to prevent noise disturbance of affected residential uses.
- The contractor shall use “new technology” power construction equipment with state-of-the-art noise shielding and muffling devices. All internal combustion engines used on the project site shall be equipped with adequate mufflers and shall be in good mechanical condition to minimize noise created by faulty or poorly maintained engines or other components.
- The unnecessary idling of internal combustion engines shall be prohibited.
- Staging areas and stationary noise-generating equipment shall be located as far as possible from noise-sensitive receptors such as residential uses (a minimum of 200 feet).
- The surrounding neighborhood shall be notified early and frequently of the construction activities.
- A “noise disturbance coordinator” shall be designated to respond to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaints (e.g., beginning work too early, bad muffler, etc.) and institute reasonable measures warranted to correct the problem. A telephone number for the disturbance coordinator would be conspicuously posted at the construction site. This plan shall be made publicly available for interested community members.
- Additionally, the following measures would be included as Permit Conditions in the development permit and implemented as part of the project noise logistics plan to further reduce construction noise and vibration levels consistent with the City of San José policy:
- Utilize ‘quiet’ models of air compressors and other stationary noise sources where technology exists;
- Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment;

⁷ The formula to calculate the amount of attenuation in decibels one can expect with a change in receiver distance is: Decibels of Change = $20 \times \log(\text{distance}1/\text{distance}2)$.

- Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from adjacent land uses;
- If impact pile driving is proposed, multiple-pile drivers shall be considered to expedite construction. Although noise levels generated by multiple-pile drivers would be higher than the noise generated by a single-pile driver, the total duration of pile driving activities would be reduced.
- If impact pile driving is proposed, temporary noise control blanket barriers shall shroud pile drivers or be erected in a manner to shield the adjacent land uses. Such noise control blanket barriers can be rented and quickly erected.
- If impact pile driving is proposed, foundation pile holes shall be pre-drilled to minimize the number of impacts required to seat the pile. Pre-drilling foundation pile holes is a standard construction noise control technique. Notify all adjacent land uses of the construction schedule in writing.
- The disturbance coordinator will be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g. starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem be implemented. The telephone number for the disturbance coordinator at the construction site will be posted and included in the notice sent to neighbors regarding the construction schedule.

With implementation of these measures, General Plan Policy EC-1.7, and the Municipal Code requirements, the proposed project would avoid short-term construction noise impacts. Therefore, the proposed project would not result in more or significant impacts than were previously evaluated in the DSAP FPEIR.

b. Project-Generated Operational-Period Impacts. The proposed project could generate noise from motor vehicle trips as well as from stationary sources (i.e., HVAC equipment, garbage collection, etc.) that could adversely affect nearby noise-sensitive land uses.

(1) Stationary Noise Source Impacts. Potential long-term stationary operational noise impacts at the project site would be primarily associated with outdoor activities, and operations associated with delivery truck activities and garbage service providers. Of the stationary noise sources, noise generated by delivery truck activity and garbage service providers would generate the highest maximum noise levels. Based on previous LSA noise monitoring experience, representative parking activities, such as people conversing or doors slamming, would generate approximately 60 dBA to 70 dBA L_{max} at 50 feet for singular events. (See the attachment for noise monitoring results.) Delivery truck loading and unloading activities can result in maximum noise levels from 75 dBA to 85 dBA L_{max} at 50 feet for singular events. The parking structure would be located in the interior of the project site; therefore noise levels at off-site receptors would be reduced to less than 55 dBA due to shielding from buildings and distance attenuation. Deliveries and trash pick-up would occur on Sunol Street. The adjacent property uses on Sunol Street include only industrial land uses that are not considered noise-sensitive. Any deliveries and project related garbage pick-up activity would be temporary and intermittent, and would not be a permanent, continuous noise generating use on the project site. Noise levels from these activities would be similar to what is currently experienced at adjacent commercial and residential properties, and nearby light industrial land uses in the project site vicinity. Therefore, project-related noise from delivery activities would not result in a substantial

increase in ambient noise levels compared with noise levels existing without the project. The closest sensitive land uses to the project site are multi-unit residential complexes located approximately 120 feet from the project site. Noise generated by outdoor activities or HVAC units would be limited to the immediate vicinity of the project site, as attenuation at a distance of 120 feet would be more than 21 dBA. Therefore, stationary and other operational noise sources and would not exceed the City of San Jose's Municipal Code Zoning Ordinance performance standards.

(2) Traffic Noise Impacts. Implementation of the proposed project would result in new daily trips on local roadways in the project site vicinity. However, project-related traffic would not be expected to result in a perceptible increase in existing traffic noise levels along roadways in the site vicinity, including West San Carlos. Based on acoustical engineering principles as documented by the California Department of Transportation, a characteristic of sound is that a doubling of a noise source is required in order to result in a perceptible (3 dBA or greater) increase in the resulting noise level.⁸ Project daily trips would not result in a doubling of traffic volumes along any roadway segment in the project vicinity. Current daily traffic volumes on West San Carlos are 13,890, while the project would add 2,072 trips per day. This level of traffic increase would result in an approximately 1 dBA change in traffic noise which would not be perceptible to the human ear in the outdoor environment. Therefore the project would not result in a perceptible increase in traffic noise levels at receptors in the project vicinity. Therefore, project-related traffic would result in a less-than-significant impact on off-site sensitive land uses, including existing residential properties in the vicinity.

c. Ambient Noise Impacts on the Project. According to the DSAP PEIR, exterior noise from the UPRR/LTR corridor adjacent to the project site would be approximately 67 dBA L_{dn} at a distance of 10 feet from the UPRR/LRR corridor. As noted in the DSAP PEIR, exterior traffic noise levels along West San Carlos range up to 70 dBA L_{dn} . The City's acceptable exterior noise level objective is 60 dBA L_{dn} or less for residential land uses. For new multi-family residential projects and for the residential component of mixed-use development, the City's standard is 60 dBA L_{dn} in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Common use areas must meet the 60 dBA exterior standard. For land use compatibility, the City considers environments with noise levels up to 60 dBA L_{dn} to be satisfactory for new residential development and environments with noise levels up to 75 dBA L_{dn} to be conditionally acceptable for new residential development when insulation features are incorporated into the project design to maintain an indoor noise level that meet the State Building Code requirement of 45 dBA L_{dn} .

(1) Interior Noise. As outlined above, the interior noise standard is 45 dBA L_{dn} . Based on the United States Environmental Protection Agency (U.S. EPA) Protective Noise Levels, a standard combination of walls, doors, and windows provides approximately 25 dBA in exterior to interior noise reduction with windows closed and 15 dBA with windows open. As described previously, the highest ambient noise levels on the project site are 70 dBA L_{dn} , with the primary noise source of traffic on adjacent roadways. With windows open, interior residential rooms would not meet the interior noise standard (i.e., 70 dBA – 15 dBA = 55 dBA). However, the inclusion of an alternative form of ventilation, such as noise-baffled passive air ventilation systems or mechanical air conditioning systems, would allow windows to remain closed for prolonged periods of time, which could achieve the interior noise level goal of 45 dBA L_{dn} (i.e., 70 dBA – 25 dBA = 45 dBA). Therefore, the addition of an alternative form of ventilation such an air conditioning system as would

⁸ California Department of Transportation, Division of Environmental Analysis, 2009. *Technical Noise Supplement*. November. Website: www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf.

need to be included in the project design to allow windows to remain closed and maximize the exterior to interior noise attenuation. The project applicant has indicated that air conditioning systems would be provided in all residential units, which would also be required as a condition of project approval.⁹ Therefore, interior noise levels would meet the City and Uniform Building Code Requirements of interior noise levels of 45 dBA.

The following measure will be included as a development Permit Condition:

- Residential units associated with the project will include an alternate form of ventilation, such as noise-baffled passive air ventilation systems or mechanical air conditioning systems so that windows can remain closed.

(2) Exterior Noise. The project would include a central courtyard within the interior of the project site which would contain a pool, pool-side cabanas, group seating areas, a barbecue, and accent plantings. The project buildings would provide a 15 dBA reduction at this courtyard due to shielding from West San Carlos and Sunol Streets. Additionally the courtyard would be located approximately 100 feet from these roadways which would provide an additional 10 dBA reduction in noise levels from the roadway. Therefore, interior courtyard noise levels would be less than 60 dBA L_{dn} and would meet the City's General Plan noise standards for exterior space.

The project would also provide ground level open space adjacent to the light rail line which would consist of an approximately 4,500-square-foot private "southeast courtyard" containing a dog park and an approximately 4,500-square-foot private "southwest courtyard" containing group seating areas, barbecue, moveable tables and chairs, plantings, lighting, and a water feature. The project would also include an 8-foot concrete wall spanning the length of the southern edge of the property line, adjacent to the railroad tracks. Therefore, these areas would not have a direct line of site to the UPRR/LTR corridor adjacent to the project site, which has a noise level of approximately 67 dBA L_{dn} at a distance of 10 feet from the UPRR/LRR corridor. The wall would provide a 10 dBA reduction in noise levels. In addition, based on the project site plans, the site would include plantings within 25 feet of the rail line with the usable outdoor area located approximately 25 feet from the of the rail line. Noise levels at a distance of 25 feet from the rail line would be reduced by 8 dBA due to distance attenuation, resulting in noise levels from rail sources of 49 dBA L_{dn} [i.e., 67 dBA (existing rail noise) – 10 dBA (reduction from soundwall) - 8 dBA (distance attenuation) = 49 dBA L_{dn}]. Therefore, noise levels for the outdoor use areas would meet the City's noise requirement for exterior noise in active use areas.

d. Ground-Borne Vibration or Ground-Borne Noise Impacts. The proposed project would redevelop the site with residential and commercial uses, it would not involve the construction of new sources of ground borne vibration or noise. Construction of the project would not generate excessive ground borne vibration, as pile driving is not proposed as part of the project. The project site is adjacent to roadway and UPRR/LRT tracks.

Light rail, heavy buses, and trucks are considered sources of vibration, although, typically ground-borne vibration levels are limited to the immediate vicinity of the source and not generally perceptible at adjacent uses. Future development within 100 feet of heavy rail tracks (UPRR) has the most potential to be exposed to excessive ground-borne vibration. The City of San José uses the FTA's vibration impact criteria for evaluating land use development near rail lines. Consistent with GP

⁹ Craig, Anthony, 2014. Email communication with LSA Associates, Inc. August 24.

Policy EC-2.1 and as identified in the DSAP, new development within 100 feet of heavy or light rail lines must demonstrate that vibration experienced by residents and vibration-sensitive uses would not exceed FTA guidelines. Vibration impacts can be minimized through the use of setbacks and/or structural design. The project would include floor joist reinforcement to reduce vibration by increasing the floor stiffness. It would also include stucco exterior walls and would be a Type III structure, all of which would prevent damage to the building from vibration impacts. Additionally, the project would include trenching parallel to the southern property line and/or stiffening of the structures closest to the tracks to reduce ground-borne vibration levels to 75 VdB or less.¹⁰ Therefore, the project would not expose persons to excessive ground-borne vibration or noise.

The following measure will be included as a development Permit Condition:

- The project will incorporate trenching parallel to the southern property line and/or stiffening of the residential structures closest to the rail tracks to the extent necessary to demonstrate a reduction of ground-borne vibration levels to 75 VdB or less.

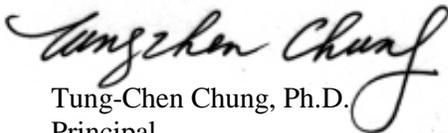
CONCLUSION

Based on the results of this analysis, operation of the proposed project is not expected to result in an exceedance of any established noise or vibration law, regulation or standard.

If you have any questions regarding this analysis, please feel free to call me at (949) 553-0666 or contact Amy Fischer, Associate at (559) 490-1210.

Sincerely,

LSA ASSOCIATES, INC.



Tung-Chen Chung, Ph.D.
Principal
Director of Acoustical and Air Quality Services



Amy Fischer
Associate

Attachment

¹⁰ Craig, Anthony, 2014. Email communication with LSA Associates, Inc. September 19.

Attachment

Noise Analysis Supporting Documentation

<i>Park/San Carlos*</i>	Autumn St., Bird Ave., San Carlos St., SR 87	Light rail (northeast corner)	60 CNEL Contour (east of Gifford Ave.)	-
<i>Royal/Auzerais**</i>	Autumn St., Bird Ave., San Carlos St., I-280	Heavy rail	-	Industrial uses
<i>Community Park Site</i>	Autumn St., San Carlos St.	Heavy rail, Light rail	-	-
* Subarea designated for residential and/or hotel uses. ** Hotel uses allowed in these employment-oriented subareas.				

Traffic Noise

Traffic noise represents the primary source of noise in the Plan area. According to the 2035 Noise Contours shown in the Envision PEIR, noise levels in the Plan area would range from 55 to 75 dBA DNL. Traffic noise would be highest adjacent to I-280 in the Royal/Auzerais subarea, which is planned for industrial/commercial uses. The Park/San Carlos subarea is expected to be located outside of the 70 dBA DNL contour of SR 87 (approximately 250 feet from the centerline).¹⁰² Traffic noise levels are expected to range up to 70 dBA DNL along San Carlos Street and The Alameda (east of Julian Street). Traffic noise along Autumn Street between Santa Clara Street and Park Avenue may reach up to 73 dBA DNL.¹⁰³ Noise levels along Julian Street and Stockton Avenue would range from 65-70 dBA DNL.¹⁰⁴ It is anticipated that traffic noise along Park Avenue, Sunol Street, and other smaller roadways in the Plan area would be less than 65-70 dBA DNL due to the relatively lower traffic volumes.

Rail Noise

Within the Plan area, heavy rail would have the largest affect on the ambient noise environment in the Dupont/McEvoy subarea, which is proposed for residential use under the DSAP. In addition, noise from LRT operations would contribute to the ambient noise environment. New development between Park Avenue and San Carlos would be exposed to similar noise levels as those at existing and approved housing developments to the north and south (i.e., Monte Vista, Park Avenue Townhomes, Plant 51, and Cahill Station). North of San Carlos Street, noise levels from train operations would be approximately 74 dBA DNL at a distance of 65 feet from the track centerline, while south of San Carlos Street, train noise would be approximately 67 dBA DNL at a distance of 10 feet from the UPRR/LRT corridor.¹⁰⁵

North of the station, the Caltrain/freight line forms the eastern boundary of the Stockton Corridor subarea. Transit employment center uses within 350 feet of the line would be exposed to noise levels ranging from 60 to 75 dBA DNL, depending on the distance to the tracks. Train pass-bys may be

¹⁰² City of San José. *San José Downtown Strategy 2000 EIR*. 2005.

¹⁰³ City of San José. *Coleman Avenue/Autumn Street Improvement Project Final Integrated Focused EIR*. 2008.

¹⁰⁴ City of San José. *Morrison Park Residential Project Recirculated Initial Study*. March 2008.

¹⁰⁵ These measurements were taken 175 feet and 130 feet south of San Carlos Street, respectively. **Source:** City of San José. *KB Home Monte Vista Residential Planned Development Zoning Project Draft EIR*. 2004.

audible at the properties proposed for residential development on the west side of Stockton Avenue, although it is not considered a substantial source of noise in relation to traffic at this location.¹⁰⁶

A small portion of the Park/San Carlos subarea is bounded by the LRT line. While LRT operations contribute to the ambient noise environment, traffic noise from SR 87 and Santa Carlos Street and aircraft over-flights are the predominant sources.

Aircraft Noise

The entire Plan area would be subject to noise from aircraft over-flights, particularly the areas within the AIA for the Mineta San José International Airport. The subareas located entirely or partly in the AIA include: Stockton Corridor, Julian North, Arena North, Station East, and Park/San Carlos. As shown on Figure 4-7, only the eastern portions of the Julian North and Arena North subareas are within the 65 CNEL noise contour. These subareas are designated as *Transit Employment Center* under both the DSAP and 2040 General Plan. No residential uses are proposed within the 65 dBA CNEL noise contour.

Noise-generating Land Uses

Industrial uses that involve fabrication, large mechanical equipment, and/or loading areas can make a substantial contribution to community noise levels. The DSAP Land Use Diagram generally separates areas designated for residential uses from planned light industrial uses, which would reduce potential impacts from stationary sources. Depending on the timing and location of redevelopment, however, new noise-generating uses may be located near existing noise-sensitive uses, or new noise-sensitive uses may be located near existing noise-generating uses. For example, in the Northern Zone of the Plan area, new light industrial facilities may be located near residential uses that are currently located along Autumn, Montgomery, and Julian Streets. Conversely, new residential development in the Dupont/McEvoy subarea may occur near existing industrial uses. (Refer to Section 4.1.3.2 for additional discussion on long-term and interim land use conflicts).

Consistency with City Standards by Land Use Type

When considering the primary sources of noise, existing and future ambient levels are not expected to exceed 75 dBA DNL at development sites in the Plan area. Based on the General Plan Land Use Compatibility Guidelines, summarized in Table 4.3-3 above, noise levels of 75 dBA DNL or less would be within the normally or conditionally acceptable range for all land uses proposed by the DSAP.

Future Residential Uses

New residential development may be located in areas with conditionally acceptable noise levels for category 1 uses (60-75 dBA DNL). All residential development projects in the Plan area would be subject to the interior noise level objective of 45 dBA DNL, while residential development outside of the Downtown Core would be subject to both the interior and exterior noise level objectives. In

¹⁰⁶ City of San José. *Morrison Park Residential Project Recirculated Initial Study*. 2008.

Noise Measurement Survey

Site Number: _____ Date: 9/16/14 Time: From 9:00 To 9:15 a.m.

Site Location: Parking Lot of 2215 Fifth Street, Berkeley CA

Primary Noise Sources: Traffic on Sixth & fifth streets, birds

Measurement Results

	dB(A)
Leq	
Lmax	
Lmin	
Lpeak	
L2	
L8	
L25	
L50	
SEL	

Observed Noise Sources/Events

Time	Noise Source/Event	dB(A)
9:00	Car door closing	65
9:02	"	64
9:04	"	61
9:07	"	62
9:09	"	55
9:10	Car door closing w/ conversation	56
9:12	"	58
9:14	"	63
9:16	"	58

Comments: _____

Equipment: Larson Davis 720 SLM; Kestrel 3000 Calibration Offset: 27.6 dB(A)
 Settings: A-Weighted Other _____ Slow Fast Windscreen

Atmospheric Conditions:

Maximum Wind Velocity (mph)	Average Wind Velocity (mph)	Temperature (F)	Relative Humidity (%)
<u>0-1</u>	<u>0-1</u>	<u>65</u>	<u>⊖</u>
Comments: <u>Calm, quiet, clear</u>			

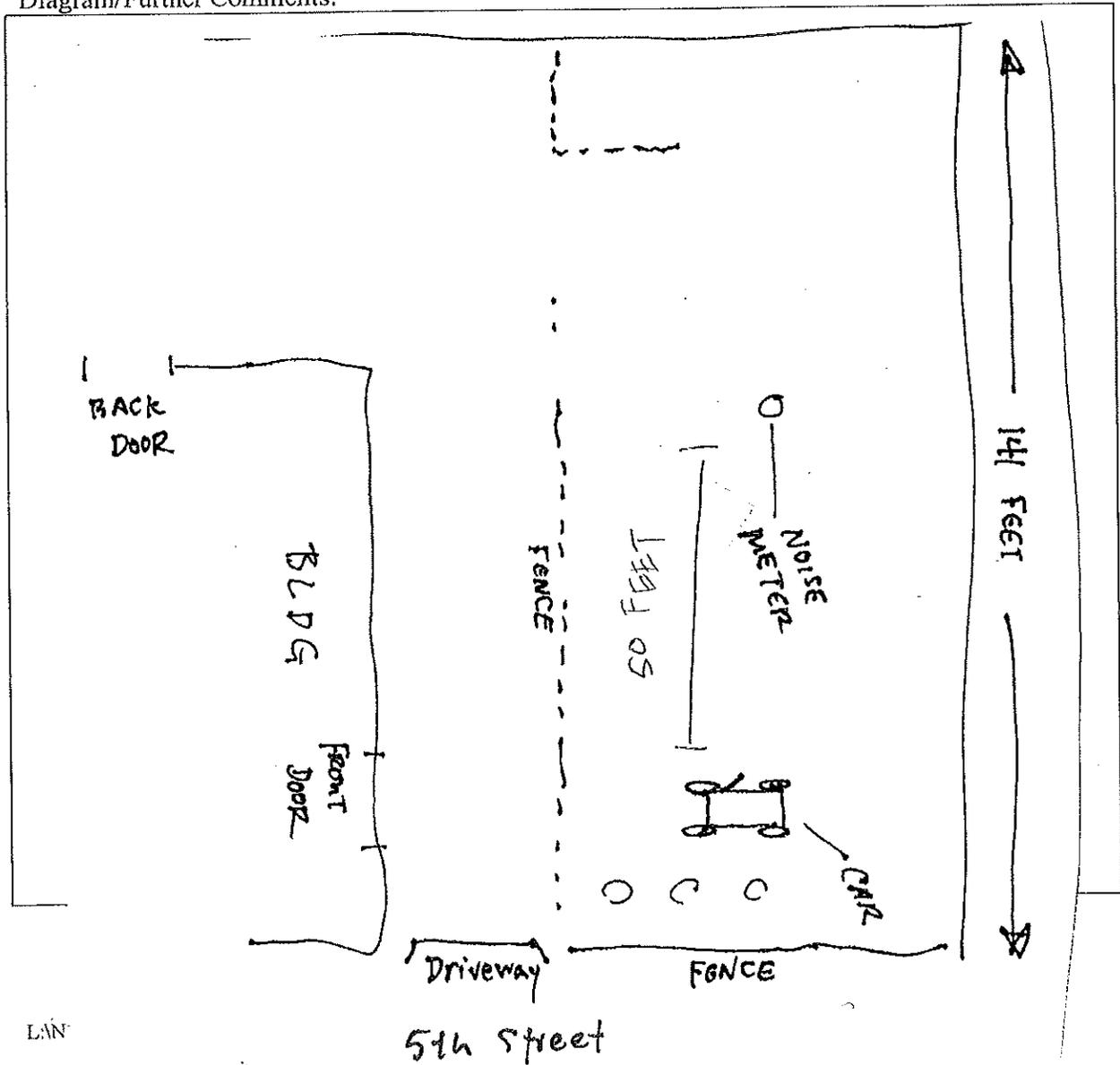
Photos Taken:

Photo Number	Location/Description

Traffic Description:

Roadway	# Lanes	Posted Speed	Average Speed	NB/EB Counts	SB/WB Counts

Diagram/Further Comments:



Technical Noise Supplement

Prepared for:

California Department of Transportation
Division of Environmental Analysis
1120 N Street, Room 4301 MS27
Sacramento, CA 94274-0001
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916/653-6073

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916/737-3000

November 2009

of this concept. The SPL from any source observed at a given distance from the source may be expressed as $10\log_{10}(P_1/P_0)^2$ (see Equation 2-7). Therefore, the SPL from two equal sources at the same distance would be calculated as follows:

$$\text{SPL} = 10\log_{10} [(P_1/P_0)^2 + (P_1/P_0)^2] = 10\log_{10}[2(P_1/P_0)^2]$$

This can be simplified as $10\log_{10}(2) + 10\log_{10}(P_1/P_0)^2$. Because the logarithm of 2 is 0.301, and 10 times that would be 3.01, the sound of two equal sources is 3 dB more than the sound level of one source. The total SPL of the two automobiles therefore would be $70 + 3 = 73$ dB.

Adding and Subtracting Equal Sound Pressure Levels

The previous example of adding the noise levels of two cars may be expanded to any number of sources. The previous section described the relationship between decibels and relative energy. The ratio $(P_1/P_0)^2$ is the relative (acoustic) energy portion of the expression $\text{SPL} = 10\log_{10}(P_1/P_0)^2$, in this case the relative acoustic energy of one source. This must immediately be qualified with the statement that this is not the acoustic power output of the source. Instead, the expression is the relative acoustic energy per unit area received by the observer. It may be stated that N identical automobiles or other noise sources would yield an SPL calculated as follows:

$$\text{SPL}_{\text{Total}} = \text{SPL}_1 + 10\log_{10}(N) \quad (2-10) \quad *$$

Where:

SPL_1 = SPL of one source

N = number of identical sources to be added (must be more than 0)

Example

If one noise source produces 63 dB at a given distance, what would be the noise level of 13 of the same source combined at the same distance?

Solution

$$\text{SPL}_{\text{Total}} = 63 + 10\log_{10}(13) = 63 + 11.1 = 74.1 \text{ dB}$$

Equation 2-10 also may be rewritten as follows. This form is useful for subtracting equal SPLs:

$$SPL_1 = SPL_{Total} - 10\log_{10}(N) \quad (2-11)$$

Example

The SPL of six equal sources combined is 68 dB at a given distance. What is the noise level produced by one source?

Solution

$$SPL_1 = 68 \text{ dB} - 10\log_{10}(6) = 68 - 7.8 = 60.2 \text{ dB}$$

In these examples, adding equal sources actually constituted multiplying one source by the number of sources. Conversely, subtracting equal sources was performed by dividing the total. For the latter, Equation 2-10 could have been written as $SPL_1 = SPL_{Total} + 10\log_{10}(1/N)$. The logarithm of a fraction yields a negative result, so the answers would have been the same.

These exercises can be further expanded to include other useful applications in highway noise. For example, if one were to ask what the respective SPL increases would be along a highway if existing traffic were doubled, tripled, or quadrupled (assuming traffic mix, distribution, and speeds would not change), a reasonable prediction could be made using Equation 2-10. In this case, N would be the existing traffic ($N = 1$); $N = 2$ would be doubling, $N = 3$ would be tripling, and $N = 4$ would be quadrupling the existing traffic. Because $10\log_{10}(N)$ in Equation 2-10 represents the increase in SPL, the above values for N would yield +3, +4.8, and +6 dB, respectively.

Similarly, one might ask what the SPL decrease would be if traffic were reduced by a factor of 2, 3, or 4 (i.e., $N = 1/2$, $N = 1/3$, and $N = 1/4$, respectively). Applying $10\log_{10}(N)$ to these values would yield -3, -5, and -6 dB, respectively.

The same problem also may arise in a different form. For example, the traffic flow on a given facility is 5,000 vehicles per hour, and the SPL is 65 dB at a given location next to the facility. One might ask what the expected SPL would be if future traffic increased to 8,000 vehicles per hour. The solution would be:

$$65 + 10\log_{10}(8,000/5,000) = 65 + 2 = 67 \text{ dB.}$$

Therefore, N may represent an integer, fraction, or ratio. However, N always must be more than 0. Taking the logarithm of 0 or a negative value is not possible.

In Equations 2-10 and 2-11, $10\log_{10}(N)$ was the increase from SPL_1 to SPL_{Total} and equals the change in noise levels from an increase or decrease