C.8 NOISE AND VIBRATION

C.8 NOISE AND VIBRATION

This section addresses the environmental setting and impacts related to the proposed project and alternatives. Specifically, Section C.8.1 provides a description of the environmental baseline and regulatory settings, followed by an environmental impacts analysis of the proposed project in Section C.8.2. Impact analysis for the alternatives is provided in Sections C.8.3 and C.8.4.

C.8.1 ENVIRONMENTAL BASELINE AND REGULATORY SETTING

Much of the information in Section C.8.1 is from the PEA (Section 13.2), and is not referenced for individual subsections below.

C.8.1.1 Environmental Setting

C.8.1.1.1 *General Characteristics of Community Noise*

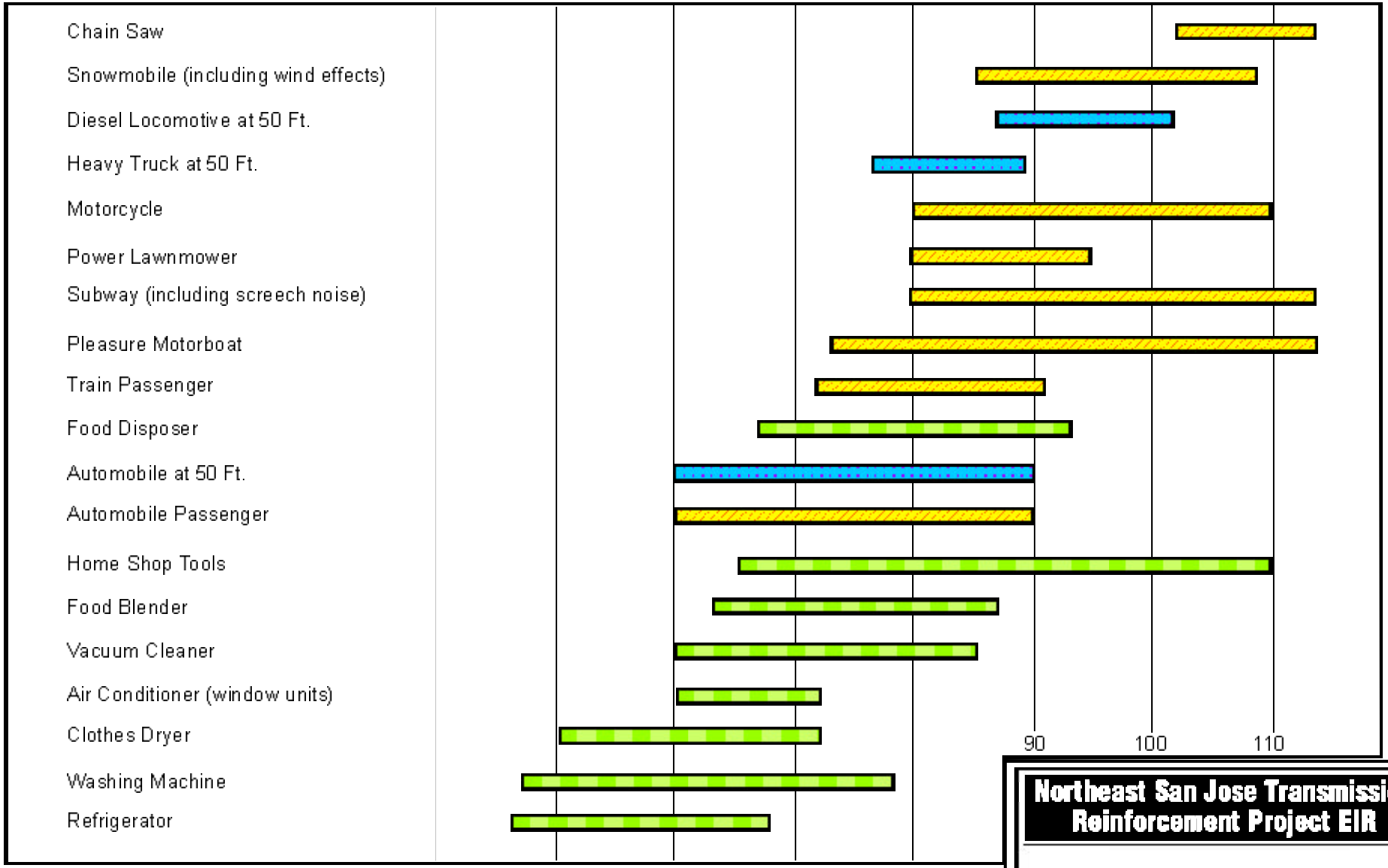
To describe noise environments and to assess impacts on noise sensitive areas, a frequency weighting measure that simulates human perception is customarily used. It has been found that *A-weighting* of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. Figure C.8-1 is an illustration of a typical range of common sounds heard in the environment.

Noise environments and consequences of human activities are usually well represented by an equivalent A-weighted sound level over a given time period (L_{eq})[1], or by the average day-night noise levels (L_{dn})[2]. Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. As illustrated in Figure C.8-2, outdoor L_{dn} levels vary over 50 dBA depending on the specific type of land use. In wilderness areas, the L_{dn} noise levels average approximately 35 dBA, 50 dBA in small towns or wooded residential areas, 75 dBA in major metropolis downtown areas (e.g., San Francisco), and 85 dBA near major freeways and airports. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, they nevertheless are considered to be adverse levels of noise to public health.

Various environments can be characterized by levels that are generally considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than what would be expected for

[1]The Equivalent Sound Level (L_{eq}) is a single value of sound level for any desired duration, which includes all of the time-varying sound energy in the measurement period.

[2]Day-night average sound level that is equal to the 24 hour A-weighted equivalent sound level with a 10 decibel penalty applied to nighttime levels.



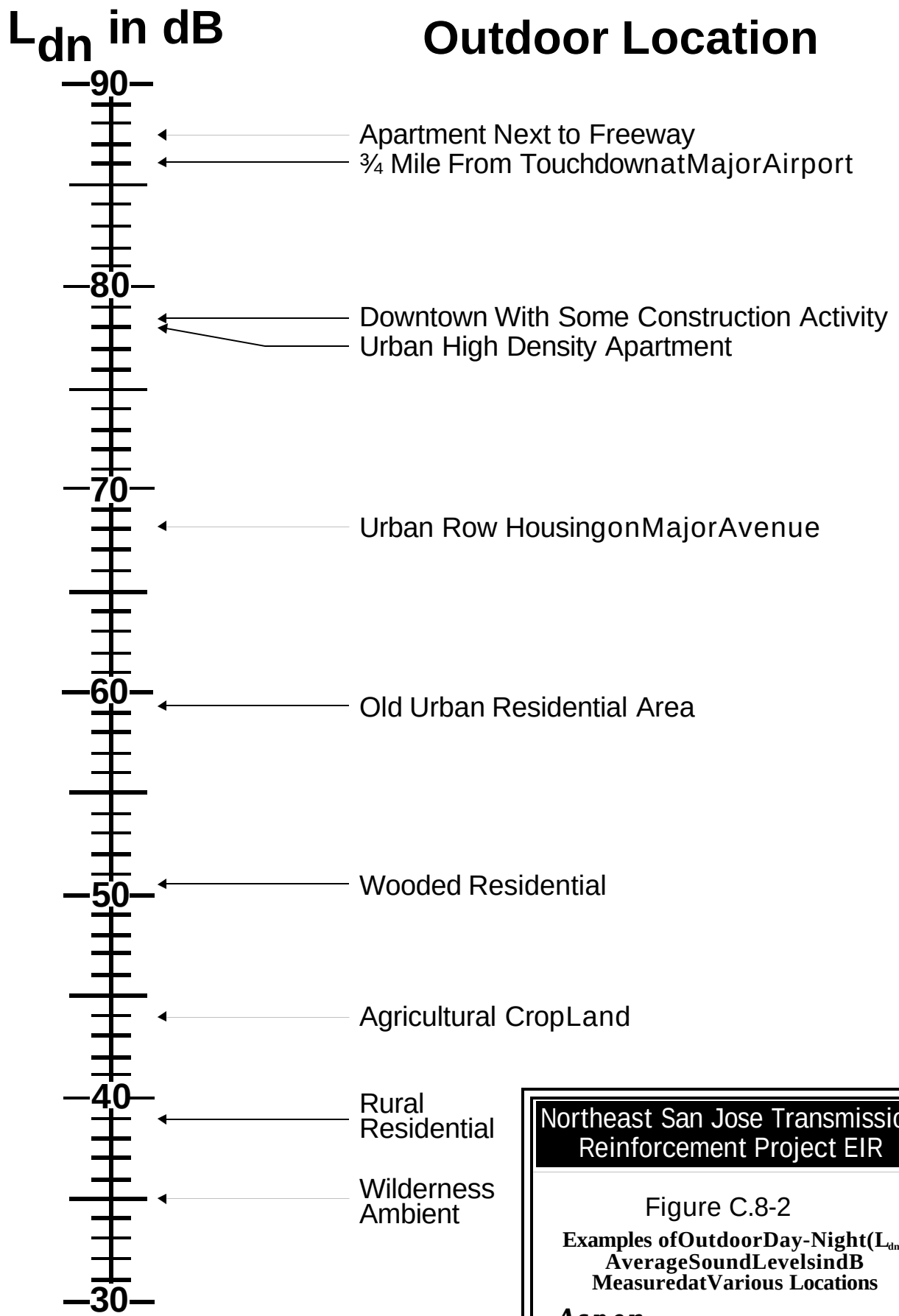
Source: USEPA, 1978. Protective Noise Levels
Condensed Version of EPA Levels Document

Northeast San Jose Transmission Reinforcement Project EIR

Figure C.8 1

Typical Range of Common Sounds

Aspen Environmental Group



Source: USEPA,1978. ProtectiveNoiseLevels CondensedVersionofEPALevelsDocument

Northeast San Jose Transmission Reinforcement Project EIR

Figure C.8-2

Examples ofOutdoorDay-Night(L_{dn}) AverageSoundLevelsindB MeasuredatVarious Locations

Aspen EnvironmentalGroup

commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise that are the same as daytime levels are often considered objectionable relative to noise disturbance. Noise levels above 45 dBA at night can result in the onset of sleep interference effects (U.S. EPA, 1971). At 70 dBA, sleep interference effects become considerable.

C.8.1.1.2 *Noise Environment in the Project Area*

The major noise sources in the project area are vehicular traffic on Interstate 880, Auto Mall Parkway, Dixon Landing Road, and State Route 237. The Union Pacific railroad tracks are located approximately 1,500 feet west of the proposed 230kV power line route (Milepost 0.3) at its nearest point.

Ambient Noise Levels

The existing noise environment was measured at three locations with calibrated, digitally logging, sound-level meters. The measurement locations were selected to characterize the existing noise environment at potential noise-sensitive areas within the project area. Continuous noise data at the sites were collected over seven days in February 1997 for Locations 1 and 2 and in June 1997 for Location 3. The frequency characteristics of the ambient noise environment were determined from statistical analysis of recorded noise obtained with a calibrated microphone and sound-level meter, in conjunction with a digital audio tape recorder. Table C.8-1 summarizes the noise survey results in terms of L_{dn} and L_{eq}. No measurements were taken along the alternative transmission line routes. Following are brief descriptions of the measurement locations.

Location 1. Noise level measurements were taken near the proposed Los Esteros Substation, approximately 1,100 feet north of State Route 237 and 1,200 feet east of Zanker Road. This site represents noise levels characteristic of those on the greenhouse property and in the McCarthy Ranch Business Park development east of Coyote Creek.

Location 2. Noise level measurements were taken near Spreckels Avenue, adjacent to the wildlife refuge. This site represents typical noise levels in the wildlife refuge and at residences in the Alviso District west of the proposed 230kV Transmission Line.

Location 3. Noise measurements were taken on Spindrift Avenue in the Mobile West mobile home park across from the Zanker Road Substation Alternative. This location is approximately 1,200 feet south of State Route 237 and 200 feet west of Zanker Road. It is anticipated that commercial and residential areas further south of State Route 237 will have similar noise environments.

Table C.8-1 Noise Measurement Results

Location	L_{dn}	Daytime L_{eq}	Nighttime L_{eq}
Proposed Los Esteros Substation	63-65	66-66	55-58
Alviso, Wildlife Refuge	NA	60[1]	NA
Mobile West Home Park	57-61	56-60	47-54
McCarthy Ranch[2]	56-62	NA	NA
Bayside Business Park[3]	63	NA	NA
Pacific Commons Development[4]	63	NA	NA

Notes: [1] From short-term measurement.
[2] McCarthy Ranch Draft EIR, 1996.
[3] Bayside Business Park Draft EIR.
[4] Pacific Commons Draft Supplemental EIR, 1996.
NA = not applicable.
Daytime is defined as 7 a.m. to 10 p.m., and nighttime is from 10 p.m. to 7 a.m.

The proposed Trimble-Montague Upgrade would pass through a professional/light industrial park. Construction equipment would be approximately 50 feet from nearby buildings. It is expected that noise levels at the buildings in this area are comparable to those taken at other business parks in the area (63 L_{dn}, on Table C.8-1.)

C.8.1.1.3 *Sensitive Receptors*

Noise-sensitive receptors are facilities or areas (e.g., residential areas, hospitals, schools, offices) where excessive noise may cause annoyance or loss of business.

Proposed 230kV Transmission Line

Table C.8-2 indicates the distance from the proposed 230kV Transmission Line to the closest sensitive receptors. In addition, several vibration-sensitive, semiconductor-related businesses (i.e., lithographers and semiconductor manufacturers) with sensitive equipment may be along the proposed 230kV Transmission Line at Bayside Business Park. Sensitive equipment includes scanning electron microscopes, lithography equipment, crystal growth furnaces, etc. These facilities are as close as 60 feet to the proposed line.

Proposed Los Esteros Substation Site

The nearest existing residential noise-sensitive receptors to the proposed Los Esteros Substation are the residences within the greenhouse property boundary. The Los Esteros Substation site boundary line is approximately 250 feet north of the residences within the greenhouse property boundary, 2,500 feet from a residence on an agricultural property to the east, and 4,000 feet from the mobile home park located south of State Route 237 and west of Zanker Road.

Table C.8-2 Distance of Noise-Sensitive Receptors to the proposed 230kV Transmission Line

Receptor	Distance (feet) from Proposed Transmission Line
National wildlife refuge	0
Bayside Business Park	500
Mayne School	>8,000
Alviso residential area	8,000
San Jose/Santa Clara Water Pollution Control Plant	3,000
McCarthy Ranch future residential area	12,000
Mobile West mobile home park	3,500

Other residential areas include mobile home parks and residences in Alviso, approximately 8,000 feet away from the proposed site. Mayne School is approximately 8,000 feet to the west of the proposed site.

Proposed Trimble-Montague Upgrade Alternative

Noise receptors in the vicinity of the proposed Trimble-Montague Upgrade Alternative include professional offices and light industrial uses along Montague Expressway. See Section C.7 (Land Use and Public Recreation) for a description of the land use near the proposed Trimble-Montague Upgrade Alternative site.

C.8.1.2 Regulatory Setting

Federal and State Standards and Regulations

There are no federal noise standards that directly regulate environmental noise from construction or operation of a transmission line project. However, it should be noted that the U.S. EPA has developed guidelines on recommended maximum noise levels to protect public health and welfare (U.S. EPA, 1974). Table C.8-3 provides a summary of noise levels identified as requisite to protect public health and welfare with an adequate margin of safety. With regard to noise exposure and workers, the Occupational Safety and Health Administration (OSHA) regulations safeguard the hearing of workers exposed to occupational noise. Refer to 29 CFR Section 1910.95 (Code of Federal Regulations) for a list of permissible noise exposures.

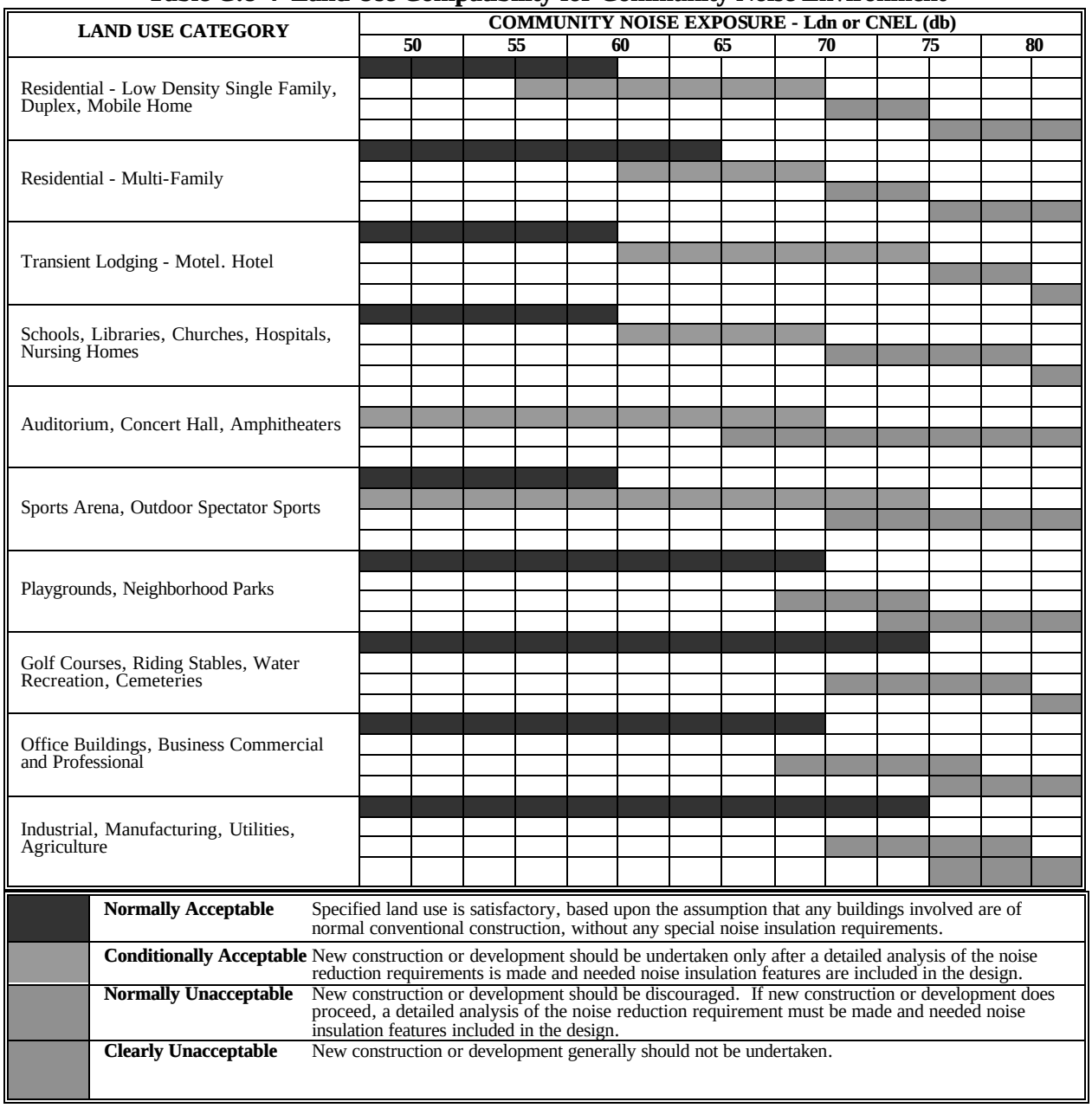
Table C.8-3 Provides Examples Of Protective Noise Levels Recommended by U.S.EPA

Effect	Level	Area
Hearing Loss	Leq(24)<70 dB	All areas
Outdoor Activity Interference and Annoyance	Ldn<55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	Leq (24)<55 dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor Activity Interference and Annoyance	Ldn<45 dB	Indoor residential areas
	Leq(24)<45 dB	Other indoor areas with human activities such as schools, etc.

Source: U.S. EPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974.
Note: Leq (24) = Represents the sound energy averaged over a 24-hour period.
Ldn = Represents the Leq with a 10 dB nighttime weighting.

California encourages each local government entity to perform noise studies and implement a noise element as part of their general plan. Standards and implementation are administered by the California Office of Noise Control. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. The State land use compatibility guidelines are listed in Table C.8-4.

Table C.8-4 Land Use Compatibility for Community Noise Environment



	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: State of California General Plan Guidelines, Office of Planning and Research, June 1990.

Local Noise Policies

City of Fremont. The Noise Element of the City of Fremont's General Plan identifies Land Use Compatibility Guidelines for Community Noise Environments. For commercial and professional land uses, noise exposure levels of 50 to 65 dBA L_{dn} are "normally acceptable," and noise exposure levels of 65 to 77 dBA L_{dn} are "conditionally acceptable." Similarly, for industrial and agricultural land uses, noise exposure levels of 50 to 70 dBA L_{dn} are "normally acceptable," and noise exposure levels of 70

to 80 dBA L_{dn} are "conditionally acceptable." (Fremont, 1999) Vibration at the property line adjacent to a project that is discernible without instruments is prohibited. Table C.8-5 indicates the noise level limits of the City of Fremont Noise Ordinance.

Table C.8-5 City of Fremont Noise Ordinance Level Limits

Adjacent Use (at property line)	Noise Level (dBA)
Residential, park, or institutional	60
Offices, retail, or sensitive industries	65-70
Industrial or wholesale	70-75

Source: PG&E Co., 1998

City of San Jose. The Noise Element of the City of San Jose's General Plan emphasizes the City's commitment to achieving a long-term exterior noise level limit of 55 dBA L_{dn}. The Noise Element indicates that available noise suppression devices and techniques should be used during construction activities. The Noise Element provides noise exposure levels that are compatible with different land uses. For example, noise levels for residential land uses that are less than 60 dBA L_{dn} are considered "satisfactory," levels of 60 to 70 are "conditional," and levels greater than 70 are "unsatisfactory." For new development in areas where the noise levels are "conditional," residential projects are required to incorporate sufficient elements to reduce the interior noise levels so that the long-term interior noise level from exterior sources is less than 45 dBA L_{dn}. For open land, such as park land, noise levels that are less than 45 dBA L_{dn} are considered "satisfactory," levels of 45 to 70 are "conditional," and levels greater than 70 are "unsatisfactory."

San Jose's Noise Ordinance sets limits on noise generated in zoned industrial districts. These limits are applicable at the property boundary and are based on obsolete standard octave band C-weighted noise level limits. The equivalent A-weighted noise level limit is 55 dBA. No provisions in the noise ordinance are explicitly related to construction noise or vibration

City of Milpitas. The Noise Element of the Milpitas General Plan identifies Land Use Compatibility Guidelines for Community Noise Environments. For single-family residential land uses, noise exposure levels of 50 to 60 dBA L_{dn} are "normally acceptable," and noise exposure levels of 55 to 70 are "conditionally acceptable." New construction or development in conditionally acceptable areas require a noise analysis to determine appropriate mitigation designs. The Milpitas policies state that construction hours should be restricted and that available noise suppression devices and techniques should be utilized.

The Noise Abatement Ordinance of the City of Milpitas prohibits "disturbing noises," or those noises that disturb the peace and quiet of any person in residential zones between the hours of 10 p.m. and 7 a.m. However, no measures are explicitly applicable to noise generated in a different zone and none are applicable to construction noise.

Santa Clara County. The Noise Element of Santa Clara County's General Plan does not have any provisions for noise affecting an agricultural zone. However, it is the County's policy that noise standards are applied according to the building use, rather than the zoning. The exterior noise limit that is not to be exceeded for more than 30 minutes in any hour (L_{50}) at one- and two-family residences is

45 dBA from 10 p.m. to 7 a.m. and 55 dBA from 7 a.m. to 10 p.m. If the ambient noise level is higher than 45 dBA, the limit may be increased in 5-dBA increments to encompass or reflect the existing ambient noise level. For noises with tonal components, the noise limit is 5 dBA less. The noise element indicates that exterior noise exposure levels of 55 to 65 dBA are "cautionary" for single-family residences.

Noise from construction operations is limited from 7 a.m. to 7 p.m. Monday through Saturday; a variance is required for other hours. Mobile equipment noise levels are limited to 75 dBA during allowed hours and 50 dBA during restricted hours. Stationary equipment noise levels are limited to 60 dBA during allowed hours and 50 dBA during restricted hours.

City of Santa Clara. The exterior noise limits as set forth in the Noise Ordinance are summarized for the City of Santa Clara in Table C.8-6. These limits are applicable at the property line of the affected zone. These limits are not applicable to mobile noise sources (i.e., vehicles and hand-held power equipment) or to construction noise.

Table C.8-6 City of Santa Clara Exterior Noise Limits (Schedule A)

Receiving Zone Zoning Category	Time Period[1]	Noise Level (dBA)
Category 1: Single Family and Duplex Residential (R1, R2)	Daytime Nighttime	55 50
Category 2: Multiple Family Residential, Public Space (R3, B)	Daytime Nighttime	55 50
Category 3: Commercial, Office (C, O)	Daytime Nighttime	65 60
Category 4: Light Industrial (ML, MP) Heavy Industrial (MH)	Anytime Anytime	70 75

Notes:[1] Daytime: 7 a.m. to 10 p.m.; Nighttime: 10 p.m. to 7 a.m.

Vibration is limited to a velocity of 0.01 inch/second over the frequency range of 1 to 100 hertz, which is defined by the City as the threshold of perception.

Construction activities occurring during "allowed hours" are exempt from these noise and vibration limits. Allowed hours are defined as Monday through Friday 7 a.m. to 6 p.m. and Saturday 9 a.m. to 6 p.m. Construction is not allowed on Sunday or holidays.

C.8.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES FOR THE PROPOSED PROJECT

C.8.2.1 Introduction

Short-term construction impacts and long-term operational impacts would result from implementation of the proposed project. In this section, the potential incremental impacts associated with the construction and operation of the proposed project are analyzed. Impacts and mitigation measures are presented in Sections C.8.2.4 through C.8.2.6, and cumulative impacts are presented in presented in Table C.8.2.7.

C.8.2.2 Definition and Use of Significance Criteria

Noise

There are two criteria for judging noise impacts. First, noise levels projected for the planned facility must comply with the relevant federal, State, or local standards or regulations. Mitigation of noise impacts on worker safety and health is enforced by OSHA (by CAL OSHA in California), but effectiveness depends on the vigilance of supervisors in seeing that workers use protective gear in high noise environments. Noise impacts on the surrounding community are enforced through local noise ordinances, supported by nuisance complaints and subsequent investigation. There are no regulatory significance criteria applicable to the proposed project during construction or operation, but it is assumed that existing regulations would be enforced.

The second measure of impact recognized by noise analysts is the increase in noise levels above the existing ambient level as a result of the introduction of a new source of noise. A change in noise level due to a new noise source can create an impact on people. The degree of impact is hard to assess because of the highly subjective character of individuals' reactions to changes in noise. Empirical studies have shown people begin to notice changes in environmental noise levels of around five dBA (U.S. EPA, 1974). Thus, average changes in noise levels less than five dBA cannot be definitively considered as producing an adverse impact. For changes in noise levels above five dBA, it is difficult to quantify the impact beyond the obvious: the greater the noise level change, the greater the impact. A judgment commonly used in community noise impact analyses associates long-term noise increases of 5 to 10 dBA with "some impact." Noise level increases of more than 10 dBA are generally considered severe. In the case of short-term noise increases, such as those from construction, the 10 dBA threshold between "some" and "severe" impact is often replaced with a criterion of 15 dBA. These noise-averaged thresholds are to be lowered when the noise level fluctuates, or the noise has an irritating character with considerable high frequency energy, or if it is accompanied by subsonic vibration. In these cases, the impact must be individually estimated.

For this analysis, impacts from noise would be considered significant if:

- Adopted local standards, noise element, or ordinance would be exceeded in noise level, timing, or duration
- The project would increase the ambient noise level above ordinance-specified limits for the land use zoning
- An increase in noise levels of 15 dB or more would occur over a period of at least one-half day at a sensitive receptor with any ambient noise level; permanent increases of 10 dB would also be significant
- Long term noise would conflict with State or local guidelines, interior noise levels, and 24-hour averages, and specifically, noise levels exceeding a day-night average sound pressure level L_{dn} of 60 dBA at the nearest noise sensitive receptor (California Office of Noise Control)
- Noise increments to the ambient that are as low as 5 dB would be significant if they occur during quieter hours at night (between 10 p.m. and 7 a.m.). There is no precise threshold as the character of the noise is also important.

Vibrations

Most local agencies have not established specific criteria for the evaluation of vibration impacts. Table C.8-7 recommends vibration criteria for different vibration-sensitive uses. The human annoyance criteria are primarily intended for construction projects that require several days in one location. Both the building damage criteria and the microelectronics criteria are applicable regardless of the project duration. Table C.8-7 indicates the level that a significant vibration impact would occur for humans, for buildings, and for microelectronics equipment.

Table C.8-7 Vibration Criteria

Human Annoyance	
Vibration Type and Permissible Aggregate Duration	**Vibration Velocity Limit (rms)**
Sustained (≥ 1 hour/day)	0.01 inch/second
Transient (> 1 hour/day)	0.03 inch/second
Transient (< 10 minutes/day)	0.10 inch/second
Potential Building Damage	
Type of Building	**Vibration Velocity Limit (ppv)**
Industrial, heavy office, modern construction	1.0 inch/second
Residential, reinforced	0.15 inch/second
Historic, unreinforced	0.05 inch/second
Microelectronics	**Vibration Velocity Limit (ppv)**
Scanning electron microscopes, lithography equipment, crystal growth furnaces, steppers, etc.	0.0003 to 0.001 inch/second

Notes: ppv = peak particle velocity; rms = root-mean-square
Source: PG&E Co., 1998

C.8.2.3 Applicant Proposed Measures

Table C.8-8 contains measures that are proposed by PG&E Co. to reduce the potential construction and operational noise impacts associated with the proposed project. Potential construction and operational impacts are evaluated assuming that the applicant proposed measures would be implemented.

Table C.8-8 Applicant Proposed Measures for Noise and Vibration

#	Measure Text
	Construction Measures: Noise
13.1a	Compressors and other small stationary equipment will be shielded with portable barriers.
13.1b	"Quiet" equipment (i.e., equipment that incorporates noise control elements into the design; compressors and jackhammers have "quiet" models) will be used during construction.
13.1c	Equipment exhaust stacks/vents will be directed away from buildings.
13.1d	Truck traffic will be routed away from noise-sensitive areas where feasible.
13.1e	Temporary sound barriers or sound curtains will be employed, if necessary, under the following conditions: • Other noise reduction methods are not effective or possible • Construction will occur within 100 feet of businesses • Sensitive receptors will be exposed to construction noise for more than 1 day
13.1f	Construction techniques, including, but not limited to, non-vibratory means of compressing the soil, will be used where possible to reduce noise and vibration levels to the extent possible.
	Construction Measures: Vibration
13.3a	A detailed survey of the microelectronics companies will be conducted within 1,400 feet of the transmission line route, noting which vibration-sensitive equipment is in operation.
13.3b	Ambient ground/floor vibration levels at sensitive equipment sites will be measured to determine the construction vibration criterion for each sensitive site.
13.3c	Pre-drilled piles and/or other methods will be used, where possible, to reduce duration of impact pile driving and reduce the noise and vibration impacts.
13.3d	Vibration levels will be monitored at the beginning of the project and when construction is occurring near sensitive equipment. This will document the vibration propagation through the local soils for different construction activities and ensure that vibration criteria are not being exceeded at sensitive locations.
13.3e	Construction techniques, including, but not limited to, the use of non-vibratory means of compressing the soil, will be used where possible to ensure that the determined construction criteria are not exceeded.

#	Measure Text
	Operational Measures: Noise
13.7a	Design specifications for the substation transformers will meet or exceed the following: • 420 MVA 230/120 kV transformers will meet 76 dBA, at 252MVA (60 percent) OA rating (without fans operating) and 79 dBA at 420 MVA (full capacity) FA rating (all fans operating) • 45 MVA , 230-21 kV transformers will meet 69 dBA, OA rating and 72 dBA, FA rating
13.7b	Design of the substation to maintain a minimum of 500 feet of distance between the three 420 MVA transformers and the nearest fence line will maintain noise levels below the 55 dBA ordinance during daytime full load operation. The four 45 MVA transformers will be positioned optimally at 200 or more feet away from the fence line to maintain daytime noise levels below 55 dBA.
13.7c	To achieve the 55 dBA L_{dn} long-term goal, all transformers at all locations will be operated at reduced loading and without fan cooling between the hours of 10:00 p.m. and 7:00 a.m. In addition, 900 feet of separation is required between the transformers and the nearest residences to be below 45 dBA at night to compensate for the 10-dBA penalty.
13.7d	For more sensitive site locations, quiet transformers will be purchased to result in 55 dBA or less of expected noise at the fence line. Installation of such a transformer would achieve the noise requirements.

Source: PG&E Co., 1998

C.8.2.4 Proposed 230kV Transmission Line

Noise and vibration impacts could result from the construction or operation of the proposed 230kV Transmission Line. Construction impacts are generally short-term, while operational impacts (if any) can be short-term or long-term. Approximate noise levels from construction of the proposed project were estimated based on the construction equipment characteristics information provided in Table C.8-9. Maximum estimated noise levels from on-site and off-site construction activities were determined and then compared to the significance criteria as described in Section C.8.2.2. With regard to operations, noise levels were estimated for permanent noise levels associated with audible transmission line noise, as well as from maintenance and inspection operations. Estimated operational noise levels were also compared to the appropriate significance criterion. An exceedance of one of the criteria listed in Section C.8.2.2 would indicate the potential for the proposed 230kV Transmission Line to result in a significant impact.

Construction Noise Impacts

Construction noise can be created from on-site and off-site sources. On-site noise sources would principally consist of the operation of heavy duty diesel- and gasoline-powered construction equipment. Off-site noise sources would include vehicles commuting to and from the job site, as well as from trucks transporting material to the staging areas or construction right-of-way (ROW). These sources are described further in the following paragraphs.

On-site Noise Sources. On-site construction noise would occur primarily from heavy-duty construction equipment (e.g., dozers, backhoes, pile driver). Noise levels from these individual pieces of construction equipment range from 70 dBA to 105 dBA at a distance of approximately 50 feet (see Table C.8-9). It should be noted that noise levels are calculated based on the assumption that noise from a localized source is reduced by approximately 6 dBA with each doubling of distance from the source of noise. Table C.8-9 presents a list of typical equipment that would be used to construct the transmission line, as well as the noise intensity level at 50 feet from the noise source.

Table C.8-9 Noise Characteristics of Construction Equipment

Equipment	Range of Noise Level (dBA) at 50 feet	Equipment	Range of Noise Level (dBA) at 50 feet
Front loaders	72-84	Forklifts	76-82
Backhoes	72-93	Pumps	69-71
Tractors, dozers	76-96	Generators	71-82
Scrapers, graders	80-93	Compressors	74-86
Trucks	82-94	Pneumatic tools	83-88
Concrete mixers	75-88	Jack hammers and rock drills	81-98
Concrete pumps	81-83	Pile drivers (peak levels)	95-105
Cranes (movable)	75-86	Compactors	84-90
Cranes (derrick)	86-88	Drill rigs	70-85

Source: PG&E Co., 1998

While noise levels will vary for different construction tasks, the maximum expected noise levels would occur during pile-driving operations. Pile-driving activities for the foundations of the transmission towers would take approximately 60 to 90 days (PG&E Co., 1998).

Two types of noise are associated with on-site construction activities: intermittent and continuous. The projected maximum intermittent noise level from pile-driving activities would be 89 to 99 dBA at 100 feet and 83 to 93 dBA at 200 feet. Intermittent pile-driving noise could be annoying to commercial and business park uses within 1,600 feet of the activity. No residences are within 3,000 feet of areas proposed for pile driving, so residences are not expected to be impacted (PG&E Co., 1998).

The maximum intermittent construction noise levels would range from 80 to 90 dBA at 50 feet for supporting structure assembly and tamping operations. Helicopter noise levels are expected to range from 92 to 95 dBA at 150 feet from the helicopter (PEA, 1998).

The continuous noise levels from construction activities at 50 feet would range from 70 to 77 dBA. At 100 feet, the continuous noise levels would be 64 to 71 dBA. At 200 feet, the noise levels would be 58 to 65 dBA. Workers in the vicinity of Bayside Business Park would be affected by intermittent and continuous noise levels during transmission line construction. Applicant Proposed Mitigation Measures 13.1a through 13.1c and 13.1e and 13.1f would reduce potentially significant on-site construction noise impacts to non-significant levels. However, the following mitigation measures would further reduce noise impacts to workers at the Bayside Business Park **(Class III)**.

Impact. Workers or residents in the vicinity of project construction would be affected by intermittent and continuous noise levels during transmission line construction **(Class III)**.

While significant impacts have not been identified, the following measures would further reduce the impacts associated with on-site construction noise.

Mitigation Measures for On-site Construction Noise

L-1 Described in Section C.7.2.4.1, Mitigation Measure L-1 requires that PG&E Co. provide advance notice to residents, tenants, and occupants near the project.

L-2 Described in Section C.7.2.4.1, Mitigation Measure L-2 requires that PG&E Co. provide a public liaison person and a toll-free information line for construction complaints or questions.

Off-site Noise Sources. Off-site noise during construction would occur primarily from commuting workers, and from various truck trips to and from the construction sites. As described in Section 2.4.2 of the Supplemental PEA (PG&E Co., 1999), the procedures for bringing personnel, materials, and equipment to each structure site would vary along the route alignment. However, it is anticipated that most workers would be meeting at one of the staging areas and would travel to the construction site in commuter vans or buses. It is also assumed that truck trips would be required to haul structures, conductor line, and other materials to the construction sites. The peak noise levels (approximately 70 to 75 dBA at 50 feet) associated with passing trucks and commuting worker vehicles would be short-term in duration and would generate adverse, but less than significant impacts **(Class III)**. Applicant Proposed Mitigation Measure 13.1d would reduce adverse impacts by routing project truck traffic away from noise-sensitive areas where feasible.

Construction Vibration Impacts

Vibration levels from heavy equipment transport, grading, tamping, and pile-driving activities may be perceptible to workers in nearby commercial areas and business parks. As indicated by measurements in the Bay Area, typical vibration levels from pile driving activities at 50 feet range from 0.01 to 0.1 inch/second peak particle velocity (ppv)(PG&E Co., 1998). Tamping operations are expected to generate significantly lower vibration levels of 0.03 inch/second ppv at 50 feet (PG&E Co., 1998). These levels are highly dependent on the soil type at the construction site and type of equipment used.

Vibration levels exceeding 0.015 inch/second for an aggregate period of more than 1 hour per day could cause annoyance (PG&E Co., 1998). Therefore, tamping operations could temporarily impact persons in buildings within 50 feet of the construction equipment.

Because pile driving would last for no more than 1 hour (aggregate) during any construction day (PG&E Co., 1998), temporary vibration impacts to office workers within 200 feet of the activity could occur. Implementation of Mitigation Measures 13.3a through 13.3e would reduce vibration impacts to a less than significant level **(Class III)**.

Microelectronics Equipment

For tamping operations, the potential maximum vibration levels at 200 feet would be 0.008 inch/second (PG&E Co., 1998), which exceeds the vibration criteria for microelectronics equipment. At 700 feet, the maximum vibration levels would be 0.002 inch/second (PG&E Co., 1998). For pile driving operations, the potential maximum vibration levels at 700 feet would be 0.007 inch/second (PG&E Co., 1998). It is anticipated that microelectronics equipment would already be isolated from ambient vibration exceeding 0.001 inch/second (PG&E Co., 1998); however, the additional vibration caused by construction equipment could affect the equipment. Implementation of Mitigation Measures 13.3a through 13.3e would reduce impacts to a less than significant level.

Vibratory pile driving would produce substantially lower vibration levels than those generated by impact pile driving, as long as no significant obstructions are encountered. Pre-drilling also generates a lower noise and vibration level. It is anticipated that most of the underlying soil is bay mud, and unless vibratory piles are being driven into artificial fill or rock formations, vibratory piling and pre-drilled piling noise and vibration levels would be less than significant **(Class III)** at nearby sensitive areas.

Operation Noise Impacts

Audible transmission line noise is generated from corona discharge, which is experienced as a random crackling or hissing sound. Corona discharge occurs when particles, such as dust or water droplets, come into contact with a conductor. The potential for noise from corona discharge is greater during wet or windy weather than during dry, calm weather. The sound generated by 230 kV lines during adverse weather conditions, such as fog or rain, are generally expected to be about 25 dBA (PG&E Co., 1998) at the edge of the right-of-way. This would amount to a less than significant impact (**Class III**).

Other noise sources associated with operations of the proposed 230kV transmission line would be inspection and maintenance of the transmission line, instrumentation and control, and support systems. Two patrols per year, one surface patrol and one air patrol, would check the overall line for integrity. PG&E Co. would inspect all of the structures from the surface annually for corrosion, misalignment, and excavations. Ground inspection would occur on selected lines to check the condition of hardware, insulator keys, and conductors. Approximately 50 PG&E Co. employees will be involved at various times in the maintenance of the facilities. These employees would be based off site at existing PG&E Co. facilities in the South San Francisco Bay Area (PG&E Co., 1998). Noise generated by the two patrols per year and by maintenance activities occurring at various times are considered to be adverse, but less than significant short-term impacts **(Class III)**.

C.8.2.5 Proposed Los Esteros Substation and 115kV Connections

Construction Noise Impacts

On-site Sources. On-site construction of the proposed Los Esteros Substation would involve use of earthmoving equipment, trucks, and cranes. The noise levels would vary with the type of activity and the actual equipment being used. It is assumed that the residences to the south of the site would not be occupied by the time the substation would be constructed. The nearest sensitive receptors to the proposed substation site would be a residence on the agricultural property 2,500 feet to the east (PG&E Co., 1998), and the Mobile West mobile home park approximately 4,000 feet from the proposed site, south of State Route 237 and west of Zanker Road. Although construction noise levels may be audible at these sensitive receptors, noise levels would be temporary and impacts would be considered less than significant **(Class III)** with implementation of Mitigation Measures 13.1a through 13.1c and 13.1e and 13.1f.

Off-site Sources. Similar to what was described for the proposed 230kV Transmission Line, off-site noise during construction would occur primarily from commuting workers, and from various truck trips to and from the construction sites. The peak noise levels (approximately 74 dBA at 50 feet) associated with truck and commuting worker trips would be temporary in duration and would generate adverse, but less than significant impacts **(Class III)**. Applicant Proposed Mitigation Measure 13.1d would reduce adverse impacts by routing truck traffic trips away from noise-sensitive areas where feasible.

Construction Vibration Impacts

Vibration levels would be generated from heavy equipment transport, grading, pile driving, etc. associated with construction of the proposed substation. However, because there are no sensitive receptors in the immediate vicinity of the proposed substation site, it is anticipated that vibration impacts associated with the construction of the proposed substation site would be less than significant **(Class III)**.

Operation Noise Impacts

Two banks of different size transformers are planned for the proposed Los Esteros Substation. Three 420 megavolt amperes (MVA) transformers will be located in the center of the substation yard and four 45 MVA transformers are planned near the perimeter of the yard. The manufacturer specifications for the transformers are as follows: 420 MVA, 230/120 kV transformers would meet 76 dBA noise level at 252 MVA (60 percent) OA rating (without fans operating) and 79 dBA noise level at 420 MVA (full capacity) FA rating (all fans operating).

The San Jose Noise Ordinance (55 dBA) is applicable at the property line for the proposed Los Esteros Substation. Three 420 MVA transformers are located approximately 500 feet north of the southern boundary line in the center of the site. The four 45 MVA transformers are located at the center of the western fence line.

The noise level from the substation transformers are predicted to be less than 45 dBA at distances greater than 1,100 feet. These noise levels are well within the goals of the City of San Jose's General Plan in accordance with the City's commitment to achieving a long-term exterior noise level limit of 55 dBA L_{dn}. Implementation of Applicant Proposed Mitigation Measures 13.7a through 13.7d would reduce potential adverse impacts to a less than significant level **(Class III)**.

C.8.2.6 Proposed Trimble-Montague 115 kV Upgrade

Construction Impacts

Construction of the proposed Trimble-Montague 115 kV Upgrade would generate similar noise and vibration impacts as described in Section 2.8.2.4 for the proposed 230kV Transmission Line. Sensitive receptors in the vicinity of the proposed Trimble-Montague 115 kV Upgrade are primarily limited to professional/light industrial land uses. Workers in the vicinity of professional/light industrial land uses

might be affected by intermittent and continuous noise and vibration during construction of the proposed Trimble-Montague 115 kV Upgrade. Although no significant noise or vibration impacts are identified, Mitigation Measures L-1 and L-2 (see Section C.7.2.4.1), in addition to Applicant Proposed Measures 13.1a through 13.1f (for noise impacts) and 13.3a through 13.3e (for vibration impacts), would further reduce potentially adverse construction noise and vibration impacts **(Class III)**.

Operation Impacts

Operation of the proposed Trimble-Montague 115 kV Upgrade would result in similar impacts as those described for the proposed 230kV Transmission Line (see Section C.8.2.4): Audible transmission line noise generated from corona discharge and vehicle trips associated with inspection and maintenance of the transmission line. Noise impacts associated with these sources are considered to be adverse, but less than significant short-term impacts **(Class III)**.

C.8.2.7 Cumulative Impacts and Mitigation Measures

Future and proposed construction projects in close proximity to construction of the proposed North East San Jose Transmission Reinforcement Project could have cumulative noise impacts on the study area. A list of cumulative projects in proximity to the proposed project is presented in Table B.8-1. The majority of the projects are light industrial (e.g., Cisco Systems, Bayside Business Park Grading Plan Project) and commercial (e.g., Hampton Inn, Catellus) developments. Noise generated from these projects would have an impact on sensitive receptors if they were constructed in close proximity and at the same time as the proposed project.

Construction of the cumulative projects could further exacerbate the adverse, but less than significant **(Class III)** noise and vibration impacts assessed for construction of the proposed project.

Cumulative impacts during the operation of the proposed project are not expected because noise related to the proposed project would be limited and there are no sensitive receptors adjacent to the proposed Los Esteros Substation.

C.8.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES FOR THE ALTERNATIVES

The noise and vibration impacts for the alternative alignments and substation sites would not be significantly different from the proposed project. Localized short-term construction noise and vibration impacts would occur in the same manner as the proposed project. Implementation of the Mitigation Measures L-1 and L-2, in addition to Applicant Proposed Measures 13.1a through 13.1f, would further reduce potentially adverse noise impacts (**Class III**) generated during the construction phase of the project. In addition, Applicant Proposed Measures 13.3a through 13.3e would reduce potentially adverse construction vibration impacts to a level less than significant **(Class III)**.

The factor that could cause a difference in noise impacts from project construction or operation is if more sensitive receptors exist within the vicinity of an alternative compared to the proposed route. The

long-term noise from maintenance and inspection operations would be similar to those of the proposed project. No significant noise impacts would occur from operational activities.

C.8.3.1 Underground Through Business Park

This alternative would follow the same alignment as the proposed project except between MP 1.8 and MP 4.1. Between MP 1.8 and the north end of the Bayside Business Park (approximately MP 2.7), the existing noise receptors are the same as described for the proposed project. At the north end of the business park, where the underground segment of the alternative alignment begins, the alignment passes between light industrial buildings and through parking lots located behind light industrial and office buildings.

Noise and vibration impacts due to construction of both the overhead and underground portions of the route would be similar to the impacts identified for the proposed route. Construction noise and vibration could temporarily impact the Bayside Business Park. Implementation of the mitigation measures described for the proposed route would help reduce noise impacts.

C.8.3.2 I-880-A Alternative

The northern end of this alternative route is a vacant field adjacent to the southbound on-ramp to I-880, just south of Auto Mall Parkway. The north side of Auto Mall Parkway near the alignment is lined with office and light industrial development. Most of the alignment segment along the west side of I-880 is through undeveloped open space. However, it passes several office developments and a heavy industrial area centered around the south end of Christy Street. The east side of this stretch of I-880 is lined with light and heavy industrial uses and high technology office buildings, as well as the California Highway Patrol.

Where this alternative route ends its initial southeast trajectory and heads southwest, it passes more high technology office development on the east, located along Northport Loop, off of Cushing Parkway. Noise and vibration impacts due to construction of this alternative would be similar to the impacts identified for the proposed route. Construction noise and vibration could temporarily impact the workers in the offices and other light industrial developments. Implementation of the mitigation measures described for the proposed route would help reduce noise impacts.

C.8.3.3 I-880-B Alternative

The I-880-B Alternative alignment follows the same route as the I-880-A Alternative from the northern end until the alignment reaches Cushing Parkway, at which point this alternative would veer sharply to the east, following Cushing Parkway on the south side of the street to the I-880 on-ramp. The stretch of Cushing Parkway followed by the alternative alignment is lined on both sides by high technology office and light industrial development until the crossing of a large drainage channel. Between the channel and I-880, the north side of Cushing Parkway is occupied by a hotel and the Northport Center,

a small commercial center with fast food restaurants, a dance studio, and a few commercial businesses. The south side of Cushing Parkway is vacant.

As the alternative alignment veers southeast at I-880, it passes four hotels on the west side of the alignment. The New Motors automobile factory is on the east side of the freeway. The alternative alignment continues hugging the west side of the freeway along the east side of Bayside Business Park. At the southern end of the park, the alignment veers west to the end of Fremont Boulevard, at which point it turns south into open space and shortly rejoins the proposed project alignment at Milepost (MP) 4.3.

Noise and vibration impacts due to construction of this alternative would be similar to the impacts identified for the proposed route. Construction noise and vibration could temporarily impact the workers in the light industrial developments and other commercial facilities. Implementation of the mitigation measures described for the proposed route would help reduce noise impacts.

C.8.3.4 Westerly Route Alternative

There are no sensitive receptors located adjacent to the Westerly Route Alternative alignment. Therefore, there would be no potentially significant noise or vibration impacts associated with this alternative.

C.8.3.5 Westerly Upgrade Alternative

This alternative follows the same alignment as the Westerly Route Alternative from MP 0.0 to about MP 5.3. At about MP 5.3 the western line of the Westerly Upgrade Alternative turns southwest and crosses open space. South of Los Esteros Road, the single-family residential development in Alviso lies to the northwest of the alignment, which then passes between the Aliso Public Library and Alviso Park to the south and new residential development under construction to the north. This alternative is also located adjacent to a church on Grand Boulevard (the frontage of the church is on Michigan Avenue) near Essex Street, the George Mayne Elementary School on N. First Street, a mobile home park, the Calle del Mundo Business Park, and other residential developments.

Noise and vibration impacts due to construction of this alternative would be similar to the impacts identified for the proposed route; however, there are many more sensitive receptors along this alternative route that would be potentially impacted by construction noise compared to the proposed route. Construction noise and vibration could temporarily impact the workers in the light industrial developments and other commercial facilities. Implementation of the mitigation measures described for the proposed route would help reduce noise impacts.

C.8.3.6 Substation Alternatives

C.8.3.6.1 *Northern Receiving Substation Alternative*

All of the impacts identified for the Westerly Upgrade Alternative would apply to the Northern Receiving Station Alternative. In addition, the construction of a 230 kV substation at the Northern Receiving Station would adversely affect neighboring residential uses immediately south of the site. Because of this site's proximity to several sensitive receptors, there would be more noise impacts associated with this alternative compared to proposed Los Esteros Substation.

C.8.3.6.2 *Zanker Road Substation Alternative*

The alignment for this alternative follows that of the proposed project until MP 7.0, at which point it continues west to Zanker Road, past a WPCP pumping station on the south and WPCP sludge ponds to the north. South of State Route 237, there are office buildings and a subdivision of mobile homes enclosed by a 6-foot wall on the west side of Zanker Road. On the east side of Zanker Road, a vacant field is immediately south of State Route 237, followed by the Santa Clara Valley Transportation Authority's (VTA) maintenance facility, which borders the north side of the Zanker Substation site (the VTA is planning to expand its maintenance facility into this property, as shown in Figure B.6-5). The Zanker Substation site is currently a vacant field overgrown with grasses and weeds and enclosed by a cyclone fence. It is bordered on the east by the western levee alongside Coyote Creek. Part of the large Cisco office campus borders the site on the south.

Because of this site's proximity to several sensitive receptors, there would be more noise impacts associated with this alternative compared to proposed Los Esteros Substation.

C.8.3.7 Trimble-Montague 115kV Upgrade Alternatives

C.8.3.7.1 *Barber 115kV Alternative*

Construction of the Barber 115kV Alternative would involve similar impacts as those described for the proposed Trimble-Montague 115kV Upgrade.

C.8.3.7.2 *Underground Trimble-Montague 115kV Alternative*

Construction of the Underground Trimble-Montague 115kV Alternative would involve similar impacts as those described for the proposed Trimble-Montague 115kV Upgrade.

C.8.4 NO PROJECT ALTERNATIVE

Under the No Project Alternative, the proposed Northeast San Jose Reinforcement Project would not be constructed, eliminating the noise impacts discussed in Section C.8.2. However, PG&E Co. would

have to upgrade their existing facilities and add new transmission and generation capacity to compensate for existing system limitations and anticipated loads. Localized short-term construction scenarios could create significant noise impacts.

C.8.5 MITIGATION MONITORING PROGRAM

Two mitigation measures (L-1 and L-2) would reduce noise impacts to non-significant levels; these measures are proposed in Section C.7 (Land Use and Public Recreation) and are included in Table C.7-3, Mitigation Monitoring Program for Land Use and Public Recreation.

C.8.6 REFERENCES

Fremont, 1999. Health and Safety Section of the Fremont General Plan, Figure 10-11 *Land Use Compatibility for Community Exterior Noise Measurements*

Office of Planning and Research, 1990. *State of California General Plan Guidelines*, June.

PG&E Co., 1998. *PG&E Co.'s Proponent's Environmental Assessment, Northeast San Jose Transmission Reinforcement Project*. Prepared for the California Public Utilities Commission, June.

PG&E Co., 1999. *PG&E Co.'s Supplemental Proponent's Environmental Assessment, Northeast San Jose Transmission Reinforcement Project*. Prepared for the California Public Utilities Commission, September.

U.S.EPA, 1971. *Community Noise*. Washington D.C. December 31.

_____, 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, March.