3.10 NOISE AND VIBRATION

This section describes the existing physical and regulatory setting for noise and vibration and discusses the potential effects of the EIS Alternatives related to noise and vibration.

3.10.1 Affected Environment

Noise Properties, Effects, and Sources

Noise is generally defined as unwanted or objectionable sound. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. Noise effects can be caused by its pitch or loudness. Pitch is the height of a tone; higher pitched sounds are louder to humans than lower pitched sounds. Loudness is intensity or amplitude of sound.

Noise levels are measured as decibels (dB) on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3-dB decrease.

The human ear is not equally sensitive to all frequencies within the sound spectrum. Therefore, sound can be characterized by several methods. The most common method is the “A-weighted” sound level (dBA), which gives greater weight to the frequencies audible to the human ear by filtering out noise frequencies not audible to the human ear. Human judgments of the relative loudness or annoyance of a sound correlate well with the dBA levels of those sounds. Therefore, the dBA scale is used for measurements and standards involving the human perception of noise. Noise levels from aircraft and small-arms firing are measured in dBA.

Impulse noise (high-amplitude noise resulting from armor, artillery, and demolition activities) is measured in C-weighted decibels (dBC). The C-weighting scale measures more of the low-frequency components of noise than the A-weighting scale. The dBC scale is considered to better represent community response to impulse noise. The low-frequency sound components can cause buildings and windows to rattle and shake.

Human perception of noise has no simple correlation with acoustical energy. The perception of noise is not linear in terms of dBA or acoustical energy. Two noise sources do not sound twice as loud as one source. It is widely accepted that the average healthy ear can barely perceive either increases or decreases of 3 dBA; that a change of 5 dBA is readily perceptible; and that an increase (decrease) of 10 dBA sounds twice (half) as loud (Caltrans, 1998). Table 3.10-1 provides common indoor and outdoor activities and the corresponding sound levels to demonstrate human perception of the correlation of noise with acoustical energy.

In addition to instantaneous noise levels, the duration or magnitude of noise over time is important for the assessment of potential noise disturbance. Average noise levels over a period of time are usually expressed as dBA L_{eq}, or the equivalent noise level for that period. For example, $L_{eq(3)}$ would be a 3-hour average; when no period is specified, a 1-hour average is assumed.

Table 3.10-1: Representative Environmental Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Power Saw	—110—	Rock Band
Jet Fly-over at 100 feet		Crying Baby
Subway	—100—	
Gas Lawn Mower at 3 feet		
Tractor	—90—	
		Food Blender at 3 feet
Diesel Truck going 50 mph at 50 feet	—80—	Garbage Disposal at 3 feet
Noisy Urban Area during Daytime		
Gas Lawn Mower at 100 feet	—70—	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
Heavy Traffic at 300 feet	—60—	Sewing Machine
Air Conditioner		Large Business Office
Quiet Urban Area during Daytime	—50—	Dishwasher in Next Room
		Refrigerator
Quiet Urban Area during Nighttime	—40—	Theater, Large Conference Room (background)
Quiet Suburban Area during Nighttime		
	—30—	Library
Quiet Rural Area during Nighttime		Bedroom at Night, Concert Hall (background)
	—20—	
		Broadcast/Recording Studio
	—10—	
Lowest Threshold of Human Hearing	—0—	Lowest Threshold of Human Hearing

Source: Data Compiled by AECOM in 2012

The time of day is also an important factor for noise assessment; noise levels that may be acceptable during the day may interfere with the ability to sleep during evening or nighttime hours. Therefore, there are 24-hour noise level descriptors that incorporate noise penalties (in decibels) for evening and night periods. The community noise equivalent level (CNEL) is the cumulative noise exposure in a community during a 24-hour period, with a 5-dBA penalty added to evening sound levels (between 7 p.m. and 10 p.m.), and a 10-dBA penalty added to the night sound levels (between 10 p.m. and 7 a.m.). The day/night average sound level (L_{dn}) is similar to CNEL, except that the 3-hour evening period is considered with the daytime period.

The construction and operation of new facilities generate noise. Construction noise is generated by the operation of construction equipment and vehicles, and by the transport of material and workers to and from the site. Construction noise levels are a function of the type of equipment used and the timing and duration of the noise-generating activities. Table 3.10-2 provides a list of noise generation levels for various types of equipment that could be used for the construction of site facilities.

Table 3.10-2: Noise Levels of Typical Construction Equipment

Equipment Type	Typical Noise Level (dB) @ 50 feet	Usage Factor (%)
Air compressor	78	40
Backhoe	78	40
Concrete pump truck	81	20
Crane, mobile	81	16
Dozer	82	40
Drill rig truck	79	20
Excavator	81	40
Front-end loader	79	40
Generator	81	50
Jackhammer	89	20
Lift	75	20
Mounted impact hammer (hoe ram)	90	20
Pneumatic tools	85	50
Pumps	81	50
Roller	80	20
Soil mix drill rig	80	50
Welder	74	40
Trucks	74–81	

Notes:
dB = (A-weighted) decibels; usage factor = the percent per hour equipment is in use.
All equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacturer-specified noise levels for each piece of heavy construction equipment.
Source: FHWA, 2006:Table 1

As shown in Table 3.10-2, maximum noise levels from construction equipment range from approximately 70 to 90 dBA at 50 feet from the equipment. These noise levels vary for individual pieces of equipment, as equipment may come in different sizes and with different engines. Equipment noise levels also vary as a function of the activity level, or duty cycle. In a typical construction project, the loudest short-term noise generators tend to be earthmoving equipment under full load at approximately 85–90 dBA at a distance of 50 feet from the source. In addition to these maximum instantaneous noise levels, the magnitude of construction noise can be defined by the type of construction activity, the various pieces of equipment operating, and the duration of the activity. Typically, construction noise is averaged over time and expressed as dBA L_{eq}.

Noise levels from construction activities are typically considered as point sources. These noise levels attenuate with distance at rates of 6 dBA per doubling of distance over hard site surfaces, such as streets and parking lots, and 7.5 dBA per doubling of distance for soft site surfaces, such as grass fields and open terrain with vegetation (FTA, 2006).

Operational noise from constructed facilities includes equipment operation (e.g., pumps, generators, fans), vehicle trips to and from facilities for operation and maintenance, and facility worker trips.

Vibration Properties, Effects, and Sources

Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structureborne noise. Both natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment) can result in groundborne vibration. Some vibration sources, such as factory machinery, are continuous; others, such as explosions, are transient. As is the case with airborne sound, groundborne vibration may be described by its amplitude and frequency.

Vibration amplitude is typically expressed in peak particle velocity (PPV) or root mean square (RMS), as in RMS vibration velocity. The PPV and RMS velocity are normally described in inches per second (in/sec). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is the metric often used to describe blasting vibration and other vibration sources that result in structural stresses in buildings (FTA, 2006:7-3). Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a period of 1 second. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA, 2006:7-4). This vibration-decibel scale is based on a reference value of 1 microinch per second (µin/sec). The background vibration-velocity level typical of residential areas is approximately 50 VdB.

Groundborne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels. Table 3.10-3 summarizes the general human response to different levels of groundborne vibration.

Table 3.10-3: Human Response to Different Levels of Groundborne Vibration

Vibration-Velocity Level (VdB)	Human Reaction
65	Approximate threshold of perception.
75	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85	Vibration acceptable only if there is an infrequent number of events per day.

Note:
VdB = vibration decibels referenced to 1 microinch per second and based on the root mean square vibration velocity.
Source: FTA, 2006:7-8

Existing Noise and Vibration Sources

Existing SFVAMC Fort Miley Campus

The predominant noise sources at the existing SFVAMC Fort Miley Campus include mobile sources, such as personal-occupancy and delivery vehicles, and stationary equipment, such as heating, ventilation, and air conditioning (HVAC). Vehicle traffic on the Campus includes personal-occupancy vehicle and bus traffic along

the main Campus driveway, which is accessed via the intersection of Clement Street and 42nd Avenue. In addition, secondary on-Campus traffic occurs on Veterans Drive, which is accessed via the intersection of Clement Street and 43rd Avenue. The majority of the perceivable stationary-source equipment noise is located immediately east of the northwestern surface parking lot on the Campus. The existing equipment is shielded. Other stationary-source noise on Campus is located largely on the rooftops of existing structures and shielded from view by the existing structures.

Mission Bay Area

The predominant noise sources in the Mission Bay area are related to mobile-source noise along local streets. Portions of Interstate 80, Interstate 280, and U.S. Highway 101 traverse this area and are considered to represent a substantial portion of the overall ambient noise in the area. Other noise generators in this area are AT&T Park during special events (e.g., baseball games) and various commercial and industrial activities, including marine activities.

Noise Measurements

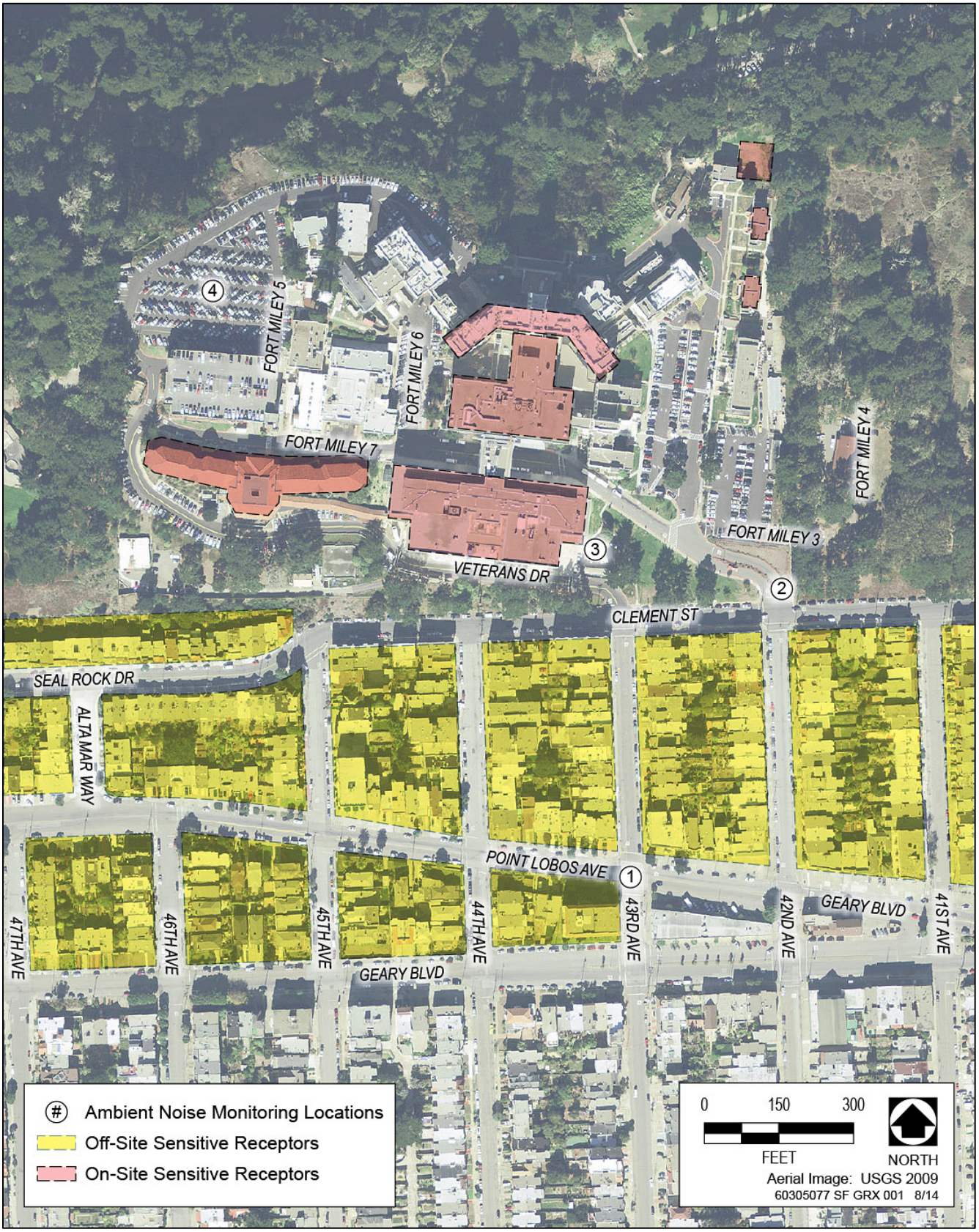
To identify representative noise levels in the vicinity of the existing SFVAMC Fort Miley Campus, existing daytime noise levels were monitored at four locations around the Campus, one off-site and three on-site (Figure 3.10-1).[1] Noise levels were measured using a Larson-Davis Model 821 precision sound level meter, which satisfies the American National Standards Institute's requirements for general environmental noise measurement instrumentation. The average noise levels and sources of noise measured at each location are identified in Table 3.10-4. These daytime noise levels are characteristic of a typical urban area.

Table 3.10-4: Existing Ambient Noise Levels in the SFVAMC Fort Miley Campus Area

Site	Location	Date/Time	Audible Noise Sources	A-Weighted Sound Level (dBA)			
				L_{eq}	L_{max}	L_{50}	L_{90}
1	43rd Avenue and Point Lobos Avenue (off-site)	12:20 p.m.–12:35 p.m.	Birds, construction (distant), vehicles (buses and personal-occupancy vehicles)	62.2	74.5	60.3	56.3
2	42nd Avenue and Clement Street (on-site)	10:15 a.m.–10:30 a.m.	Birds, pedestrian traffic, vehicles (buses and personal-occupancy vehicles)	61.8	82.4	56.5	51.1
3	Front lawn area southeast of main medical center structure (on-site)	11:10 a.m.–11:25 a.m.	Birds, pedestrian traffic, vehicles (buses and personal-occupancy vehicles)	62.1	76.7	55.0	51.3
4	Northwest on-site surface parking lot (on-site)	11:10 a.m.–11:25 a.m.	HVAC, birds, construction (distant)	51.8	61.3	51.5	50.7

Notes:
dBA = A-weighted decibels; HVAC = heating, ventilation, and air conditioning; L_{eq} = equivalent noise level; L_{max} = maximum noise level; L_n = noise level exceeded n% of a specific period of time
Monitoring locations correspond to those depicted in Figure 3.10-1.
Source: Data collected by AECOM on March 22 and March 25, 2011

[1] Measurements were not taken in the Mission Bay area because of two factors: uncertainty about where SFVAMC facilities might be located in this approximately 2.5-square-mile area, and the variability of noise levels.



Source: Data compiled by AECOM in 2012

Figure 3.10-1: Locations of Sensitive Receptors and Ambient Noise Monitoring

Existing Sensitive Receptors

Land uses that are sensitive to noise and vibration are those uses where exposure would result in adverse effects (i.e., injury or annoyance) and uses where lack of noise and vibration is an essential element of their intended purpose. In San Francisco, residences of all types are of primary concern because of the potential for increased, prolonged exposure of individuals to both interior and exterior noise and vibration. Other noise-sensitive land uses include schools, preschools, hospitals, convalescent facilities, hotels, motels, churches, libraries, and other uses where low interior noise levels are essential. Public parks are also typically considered sensitive receptors. The Cheryl Andersen-Sorensen Childcare Center (childcare center), occupied patient rooms, and the nursing home (Building 208) are the primary facilities on Campus with sensitive receptors. Existing on- and off-site sensitive receptors are depicted in Figure 3.10-1.

Residences, education buildings, and places of worship are also vibration-sensitive receptors because people can experience annoyance and fragile buildings may experience damage from groundborne vibration. People typically experience annoyance when exposed to vibration that exceeds certain thresholds. These thresholds are generally lower than threshold levels for vibration-related building damage. Buildings that are normally occupied by people are considered sensitive to groundborne vibration. Historic or lightweight buildings are considered most vulnerable to vibration damage; thus, more stringent vibration-damage thresholds are recommended for these building types. Buildings used for research, manufacturing, or health care operations that are sensitive to very low thresholds of vibration to function effectively (e.g., magnetic resonance imaging [MRI] or microelectronics manufacturing facilities) are also considered vibration sensitive; groundborne vibration can result in structural damage and/or interfere with the intended functions of such buildings (FTA, 2006).

Existing SFVAMC Fort Miley Campus

The childcare center, occupied patient rooms, and the Community Living Center (nursing home, Building 208) are the primary sensitive receptors on the SFVAMC Fort Miley Campus. The area immediately south of the Campus is largely residential, with a mix of single-family and multifamily buildings extending south toward Point Lobos Avenue. Some commercial uses also exist close by along Clement Street, Geary Boulevard, and Point Lobos Avenue. The areas north, east, and west of the Campus include Golden Gate National Recreation Area (GGNRA) open space and trails as well as Lincoln Park, a 112-acre facility owned and maintained by the San Francisco Recreation and Park Department that includes the Lincoln Park Golf Course and the Legion of Honor museum.

Mission Bay Area

Sensitive receptors in the Mission Bay area are largely residential. However, several places of worship and primary and secondary schools are located in the area. In addition, the University of California, San Francisco Medical Center at Mission Bay is located in this area, and certain uses associated with its operation would be considered sensitive receptors.

3.10.2 Regulatory Framework

Noise Control Act

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. The Office of Noise Abatement and Control subsequently established programs and guidelines under the Federal Noise Control Act of 1972 to identify and address the effects of noise on public health and welfare and the environment. Table 3.10-5 presents a summary of recommended guidelines for noise levels considered safe for community exposure without the risk of adverse health or welfare effects (EPA, 1974). To prevent hearing loss over the lifetime of a receptor, the yearly average L_{eq} should not exceed 70 dBA, and the L_{dn} should not exceed 55 dBA in outdoor activity areas or 45 dBA indoors to prevent interference and annoyance.

Table 3.10-5: Summary of U.S. Environmental Protection Agency–Recommended Noise Level Standards for Yearly Exposure

Effect	Level	Area
Hearing loss	$L_{eq(24)} \leq 70$ dB	All areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoor 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.
	$L_{eq(24)} \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{eq} \leq 45$ dB	Indoor residential areas.
	$L_{eq(24)} \leq 45$ dB	Other indoor areas with human activities, such as schools.

Notes:
dB = decibels; L_{dn} = day-night noise level (L_{eq} with a 10-dB nighttime weighting); $L_{eq(24)}$ = equivalent noise level (the sound energy averaged over a 24-hour period)
The exposure period for the potential hearing loss at the identified level is a period of 40 years.
Source: EPA, 1974:3

EPA administrators determined in 1981 that subjective issues such as noise would be better addressed at lower levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to state and local governments. However, noise control guidelines and regulations contained in the rulings by EPA in prior years are still upheld by designated federal agencies, allowing more individualized control for specific issues by designated federal, state, and local government agencies. The Noise Control Act is applicable to the EIS Alternatives because it establishes general guidelines for what would be considered acceptable noise levels generated by an EIS Alternative and perceived by adjacent or on-site receptors.

Federal Transit Administration Groundborne Vibration Guidelines

To address the human response to groundborne vibration, the Federal Transit Administration (FTA) has guidelines for maximum-acceptable vibration criteria for different types of land uses. Maximum-acceptable vibration criteria based on the frequency of an event are applied to different types of land uses to address the human response to groundborne vibration (FTA, 2006). These guidelines recommend 65 VdB, referenced to

1 µin/sec and based on the velocity amplitude for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities); 80 VdB for residential uses and buildings where people normally sleep; and 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA, 2006). Table 3.10-6 shows the project contributions to noise level increases that have been determined to be acceptable.

Table 3.10-6: Summary of Federal Transit Administration–Recommended Groundborne Vibration Impact Criteria

Land Use Category		Impact Levels (VdB; relative to 1 microinch per second)		
		Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1:	Buildings where vibration would interfere with interior operations	65[4]	65[4]	65[4]
Category 2:	Residences and buildings where people normally sleep	72	75	80
Category 3:	Institutional land uses with primarily daytime uses	75	78	83

Notes:
VdB = vibration decibels
1 Defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2 Defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3 Defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the heating, ventilation, and air conditioning systems and stiffened floors.
Source: FTA, 2006:8-3

Standards also have been established to address the potential for construction-caused vibration annoyance or interference. The primary concern regarding construction vibration is the potential for the operation of heavy-duty construction equipment to cause structural damage to buildings. Varying criteria have been developed to address the appropriate level of vibration considered acceptable before it may result in damage to structures or varying building types (FTA, 2006). Table 3.10-7 shows the project contributions to vibration-level thresholds that have been determined to be acceptable for different building types.

Table 3.10-7: Summary of Federal Transit Administration–Recommended Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate L_v[1]
Reinforced concrete, steel, or timber (no plaster)	0.5	102
Engineered concrete and masonry (no plaster)	0.3	98
Nonengineered timber and masonry buildings	0.2	94
Buildings extremely susceptible to vibration damage	0.12	90

Notes:
in/sec = inches per second; PPV = peak particle velocity
1 Root mean square velocity in decibels (VdB) referenced to 1 microinch per second.
Source: FTA 2006:12-13

The criteria established by FTA and noted above are applicable to the EIS Alternatives because they provide the basis for what would be considered acceptable noise levels generated by an EIS Alternative and perceived by adjacent or on-site receptors.

Department of Veterans Affairs Environmental Protection Specifications

Section 01568, EP-5 (F) of the *VA Environmental Protection Specifications* (VA Specifications) includes specific mitigating actions that would be required of any development on VA property to reduce construction-related noise. In particular, construction activities would mainly be limited to between the hours of 7:30 a.m. and 6:00 p.m. and would abide by City noise ordinances, unless otherwise permitted. In addition, all equipment is required to be properly maintained and muffled such that noise levels of specific equipment would not exceed those shown in Table 3.10-8. VA also requires monitoring of noise levels at least once every 5 days during high-noise-generating construction activities.

Table 3.10-8: Maximum Permissible Construction Equipment Noise Levels

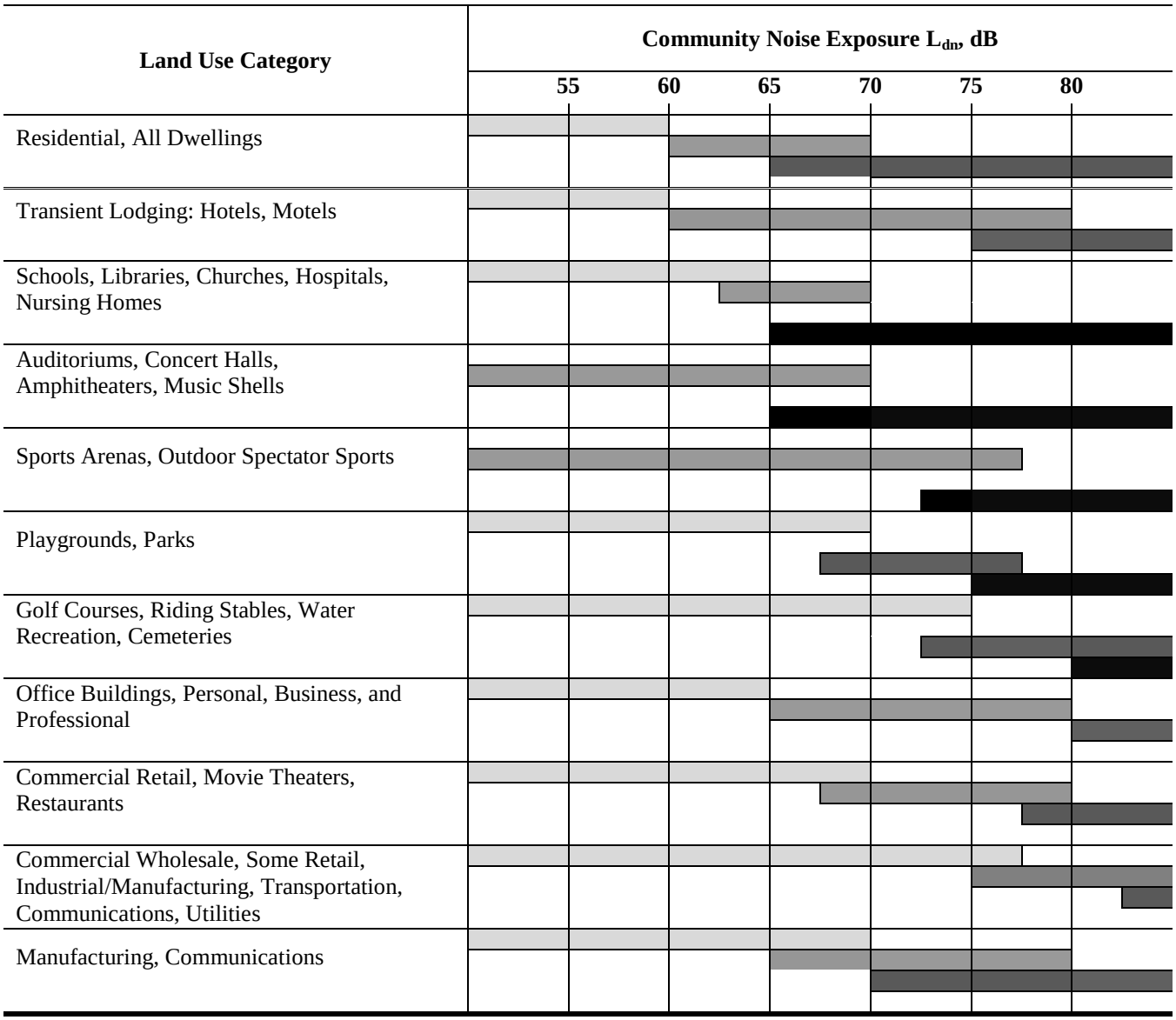
Earthmoving Equipment	Maximum Permissible Noise Level (L_{max})	Materials Handling Equipment	Maximum Permissible Noise Level (L_{max})
Front-end loader	75	Concrete mixer	75
Backhoe	75	Concrete pump truck	75
Dozer	75	Crane	75
Tractor	75	Derrick, impact	75
Scraper	80	Pile driver	95
Grader	75	Jackhammer	75
Truck	75	Rock drill	80
Paver, stationary	80	Pneumatic tools	80
Pumps	75	Concrete saw	75
Generator	75	Vibrator	75
Air compressor	75		

Source: VA, n.d.

San Francisco General Plan

The *San Francisco General Plan* focuses on the effect on the community of noise from ground-transportation noise sources and includes a land use compatibility chart for community noise. This chart (Table 3.10-9) identifies a range of noise levels considered generally compatible or incompatible with various land uses. The chart also indicates when to consider or analyze special noise reduction requirements, such as providing sound insulation for affected properties. Residential and hotel uses are considered compatible in areas where the noise level is 60 dBA L_{dn} or less; schools, classrooms, libraries, churches, and hospitals are compatible in areas where the noise level is 65 dBA L_{dn} or less; and playgrounds, parks, offices, retail commercial uses, and noise-sensitive manufacturing and communication uses are considered compatible in areas where the noise level is 70 dBA L_{dn} or less. Because the EIS Alternatives would generate noise levels that would be perceivable off-site and within the jurisdiction of the City and County of San Francisco, the noise criteria established in the *San Francisco General Plan* are appropriate to consider when assessing effects of the EIS Alternatives.

Table 3.10-9: City and County of San Francisco Land Use Compatibility Chart for Community Noise



Satisfactory, with no special noise insulation requirements.

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

New construction or development should generally 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.

New construction or development should generally not be undertaken.

Notes: dB = decibels; L_{dn} = day-night noise level
Source: SF Planning, 1996

San Francisco Noise Control Ordinance

The San Francisco Noise Control Ordinance regulates both construction noise and stationary-source noise within the city limits, such as transportation, construction, mechanical equipment, entertainment, and human or animal behavior. Found in Article 29, "Regulation of Noise," of the San Francisco Police Code, the ordinance addresses noise from construction equipment, nighttime construction work, and noise from stationary mechanical equipment and waste processing activities (CCSF, 2014). The following is the purpose of the San Francisco Noise Control Ordinance:

Sec. 2900, "Declaration of Policy"

(a) Building on decades of scientific research, the World Health Organization and the U.S. Environmental Protection Agency have determined that persistent exposure to elevated levels of community noise is responsible for public health problems including, but not limited to: compromised speech, persistent annoyance, sleep disturbance, physiological and psychological stress, heart disease, high blood pressure, colitis, ulcers, depression, and feelings of helplessness.

(b) The General Plan for San Francisco identifies noise as a serious environmental pollutant that must be managed and mitigated through the planning and development process. But given our dense urban environment, San Francisco has a significant challenge in protecting public health from the adverse effects of community noise arising from diverse sources such as transportation, construction, mechanical equipment, entertainment, and human and animal behavior.

(c) In order to protect public health, it is hereby declared to be the policy of San Francisco to prohibit unwanted, excessive, and avoidable noise. It shall be the policy of San Francisco to maintain noise levels in areas with existing healthful and acceptable levels of noise and to reduce noise levels, through all practicable means, in those areas of San Francisco where noise levels are above acceptable levels as defined by the World Health Organization's Guidelines on Community Noise.

(d) It shall be the goal of the noise task force described in this Article to determine if there are additional adverse and avoidable noise sources not covered in this statute that warrant regulation and to report to the Board of Supervisors and recommend amendments to this Article over the next three years. In addition, the noise task force shall develop interdepartmental mechanisms for the efficient disposition and any enforcement required in response to noise complaints.

(Added by Ord. 274-72, App. 9/20/72; Ord. 278-08, File No. 081119, App. 11/25/2008)

Section 2907, "Construction Equipment," and Section 2908, "Construction Work at Night"

These sections of the ordinance establish noise levels for construction equipment. Section 2907(a) limits noise levels from construction equipment as specified under the ordinance to 80 dB L_{eq} at 100 feet (or other equivalent noise level at another distance) from construction equipment between 7 a.m. and 8 p.m. According to Section 2908, construction work at night (from 8 p.m. to 7 a.m.) may not exceed the ambient level by 5 dB at the nearest property plane unless the Director of Public Works or the Director of Building Inspection grants a special permit before the start of such work.

The provisions of Section 2907(a) do not apply to impact tools and equipment that have intake and exhaust mufflers as recommended by the manufacturers and are approved by the Director of Public Works or the Director of Building Inspection as accomplishing maximum noise attenuation. The noise exemption also does not apply to pavement breakers and jackhammers that are equipped with acoustically attenuating shields or shrouds as recommended by the manufacturers and are approved by the Director of Public Works or the Director of Building Inspection as accomplishing maximum noise attenuation.

Section 2909, "Noise Limits"

This section of the ordinance regulates noise from on-site stationary noise sources (e.g., stationary mechanical and electrical equipment) within specific land uses. Section 2909 states that the noise levels from equipment operating on the project property shall not exceed the ambient noise levels at the property line by:

- 5 dBA if the noise source is on residential property,
- 8 dBA if the noise source is on a commercial/industrial properties, and
- 10 dBA if the noise source is on a public property.

In addition, Section 2909 states that no fixed (permanent) noise source, as defined by the ordinance, may cause the noise level inside any sleeping or living room in a residential dwelling unit to exceed 45 dB between 10 p.m. and 7 a.m. or 55 dB between 7 a.m. and 10 p.m. when windows are open, except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

Because the project would generate noise levels that would be perceivable off-site and within the jurisdiction of the City and County of San Francisco, the noise limits established in the San Francisco Noise Control Ordinance are appropriate to consider when assessing potential effects of the EIS Alternatives.

3.10.3 Environmental Consequences

Significance Criteria

A NEPA evaluation must consider the context and intensity of the environmental effects that would be caused by, or result from, the EIS Alternatives. There are no standard federal policies applicable to noise. Therefore, other environmental assessment documents were reviewed and the following criteria were selected for the evaluation.

An Alternative analyzed in this EIS is considered to result in an adverse impact related to noise if it would:

- result in the temporary exposure of on- and off-site sensitive receptors to construction noise levels in excess of EPA standards—as stated above in Table 3.10-5, this threshold is either:
  - 55 dBA hourly L_{eq}, if the existing ambient noise level is less than 55 dBA hourly L_{eq}; or
  - the ambient noise level plus 5 dBA, if the existing ambient noise level is greater than 55 dBA hourly L_{eq};
- result in the temporary exposure of the on-site childcare center to construction noise levels in excess of EPA standards—as stated above in Table 3.10-5, the standard is 45 dBA hourly L_{eq} at the interior of the childcare center;

- result in the temporary exposure of off-site sensitive receptors to construction noise levels in excess of the standards established in the San Francisco Noise Control Ordinance (maximum 80 dBA at 100 feet distance), as outlined above;

- result in a substantial permanent increase in ambient noise levels on- and off-site, with the following increases in 24-hour ambient noise levels considered substantial (FICON, 1992):
  - 5 dB if preproject conditions are determined to be less than 60 dBA L_{dn},
  - 3 dB if preproject conditions are greater than 60 dBA L_{dn} but less than 65 dBA L_{dn}, or
  - 1.5 dB if preproject conditions are greater than 65 dBA L_{dn};
- be implemented when preproject (existing) ambient noise conditions are less than 65 dBA L_{dn}, based on the measured ambient noise levels on- and off-site (Table 3.10-4) and the predicted off-site existing traffic noise levels (Table 3.10-12). Therefore, the applicable 3-dB and 5-dB thresholds utilized for the impact analysis would result in exposure of persons or structures to excessive groundborne vibration or groundborne noise levels in excess of FTA standards, as stated above in Tables 3.10-6 and 3.10-7; or

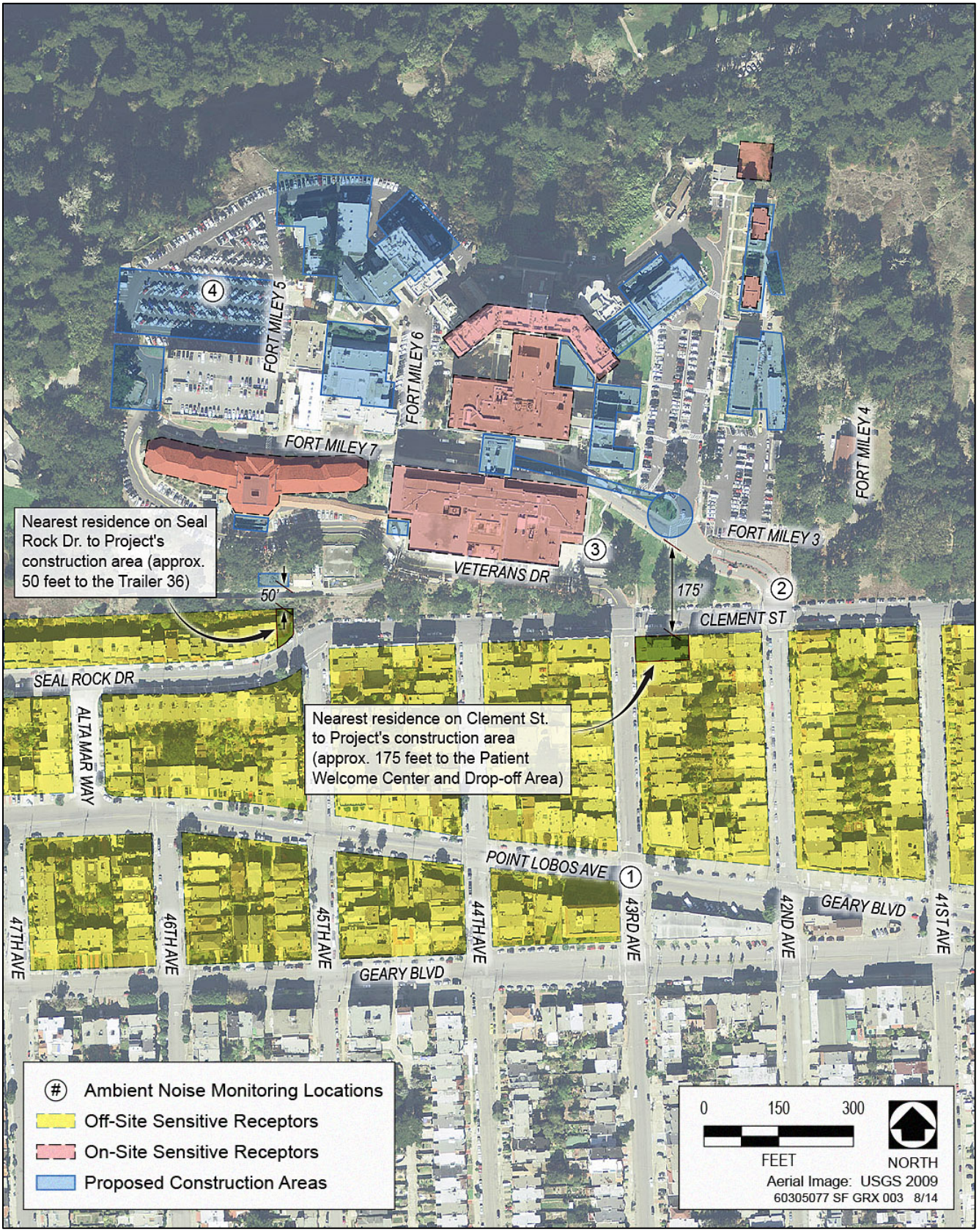
- be substantially affected by existing noise levels.

Assessment Methods

Noise-sensitive land uses and major noise sources were identified based on existing documentation (e.g., equipment noise levels and attenuation rates) and site reconnaissance data. Baseline ambient noise levels that were compared with noise generated by the EIS Alternatives were generated from a combination of sources:

- the existing-noise survey conducted for this project,
- data from previous noise measurements,
- predictions from traffic noise modeling,
- stationary-source noise levels based on manufacturers' specifications, and
- noise surveys for other types of stationary noise sources.

To assess the potential short-term noise impacts from construction, sensitive receptors and their relative levels of exposure were identified. Construction noise generated by the proposed short-term and long-term projects was predicted using the *Transit Noise and Vibration Impact Assessment* methodology for predicting construction noise (FTA, 2006). The noise emission levels and usage factors are based on the Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (FHWA, 2006). Noise levels of specific construction equipment and the resulting noise levels at the locations of sensitive receptors were calculated. Figure 3.10-2 provides the general locations of the proposed construction areas and of on- and off-site sensitive receptors. The potential noise impact of the on-site childcare center was analyzed by estimating the construction-related noise level at the interior of the childcare center and evaluating the noise level against the interior-noise impact criterion applicable to the childcare center. The interior-noise impact criterion provided by EPA for the interior of classrooms is 45 dBA (L_{eq}) (Table 3.10-5).



Source: Compiled by AECOM in 2014.

Figure 3.10-2: Proposed Construction Areas

The FHWA Traffic Noise Prediction Model (FHWA RD 77-108) was used to model traffic noise levels along affected local roadways, based on daily volumes and their distribution, from the traffic analysis prepared for the short-term and long-term projects in 2020 and 2027, respectively. The contribution of traffic noise levels along area roadways was determined by comparing the modeled noise levels at 50 feet from the centerline of the roadway under various conditions: existing, short-term without project, short-term with project, long-term without project, and long-term with project.

Potential long-term (operational) noise impacts from stationary sources, such as HVAC, were assessed based on existing documentation (equipment noise levels) and site reconnaissance data. This analysis also evaluates the proposed noise-generating uses that could affect noise-sensitive receptors near SFVAMC facilities. See Appendix F for calculations of construction noise levels from on- and off-site sources and calculations of operational noise levels from off-site sources.

Groundborne vibration impacts were assessed quantitatively based on existing documentation (e.g., vibration levels produced by specific operations of construction equipment) and the distance of sensitive receptors from the given source. Short-term and long-term vibration sources and levels were calculated using the FTA methodology for construction and transportation vibration sources, and evaluating impacts against the established thresholds presented above in Tables 3.10-6 and 3.10-7 (FTA, 2006).

Alternative 1: SFVAMC Fort Miley Campus Buildout Alternative

Short-Term Projects

Construction

Noise

During construction activities for Alternative 1 short-term projects, construction noise would be perceivable at multiple locations on- and off-site, depending on the project currently under construction. Construction activities would generally include demolition, site preparation, grading/excavation, building construction and retrofitting, and paving/landscaping. Various types of construction equipment would be used during each stage of construction. Because of space restrictions at the existing SFVAMC Fort Miley Campus, the amount of construction that could occur simultaneously would be limited.

Table 3.10-10 lists the estimated construction noise levels at various distances from construction activities for Alternative 1 short-term projects. As indicated in the table, construction of these projects would generate noise levels ranging from 80.1 dBA L_{eq} during building construction to 84.5 dBA during site demolition and grading/ excavation, at a distance of 50 feet from the construction area (Location 4). The construction noise levels would attenuate by 6 dBA at a distance of 100 feet, which would reduce the construction noise level to a maximum level of 78.5 dBA L_{eq}, less than the 80-dBA significance threshold.

Any construction activities conducted as part of the EIS Alternatives would adhere to the requirements for noise control outlined in Section 01568, “Environmental Protection,” of the VA Specifications. These controls include such requirements as providing sound-deadening devices on equipment, using shields or other physical barriers to restrict noise transmission, providing soundproof coverings or enclosures for noise-producing machinery, and

Table 3.10-10: Predicted Short-Term Construction Noise Levels—Alternative 1 Short-Term Projects

Location	Distance to Construction Area, feet	Estimated Noise Levels by Construction Activity,[1] dBA L_{eq}					Significance Threshold,[2] dBA L_{eq}
		Demolition	Site Preparation	Grading/ Excavation	Building Construction	Paving	
1—43rd Avenue and Point Lobos Avenue (off-site)	600	52.9	50.2	52.9	48.5	51.4	67.2
2—42nd Avenue and Clement Street (off-site)[3]	300	68.9	66.2	68.9	64.5	67.4	66.8
3—Front lawn area southeast of Building 203 (on-site)	100	78.5	75.8	78.5	74.1	76.9	67.1
4—Northwest on-site parking lot (on-site)	50	84.5	81.8	84.5	80.1	83.0	55.0

Notes:
dBA = A-weighted decibels; L_{eq} = equivalent noise level
1 Construction equipment used for the various construction stages:
- Demolition: One loader, one concrete saw, and two backhoes
- Site Preparation: One grader and one backhoe
- Grading/Excavation: One loader, one concrete saw, and two backhoes
- Building Construction: One crane, two forklifts, ad two backhoes
- Paving: One paver, four cement mixers, one roller, and one backhoe

2 Significance threshold is equal to 55 dBA L_{eq} (if the existing ambient noise level is less than 55 dBA L_{eq}) or the existing ambient noise level plus 5 dBA. See Table 3.10-4 for the existing ambient noise levels.
3 Represent the off-site residence on the south side of Clement Street and 42nd Avenue.
Source: Data compiled by AECOM in 2014

monitoring construction noise levels once a week when construction noise may exceed 55 dBA. Construction activities would mainly be limited to between the hours of 7:30 a.m. and 6:00 p.m. and would abide by City noise ordinances, unless otherwise permitted.

On-Site Receptors

As indicated in Figure 3.10-2, on-site sensitive receptors at the existing SFVAMC Fort Miley Campus would include occupied patient rooms, the Community Living Center (nursing home, Building 208), and the childcare center. Based on the anticipated phasing and locations of the Alternative 1 short-term projects, construction activities on the Campus may be located as close as 50 feet to a sensitive receptor. At a distance of 50 feet, exterior construction noise could reach as high as 84.5 dBA L_{eq}, thus exceeding existing L_{eq} noise levels by approximately 32 dBA (see Table 3.10-4, above).

The existing on-site childcare center is located inside Building 32 at the northeast boundary of the project site (Figure 2-1). The nearest construction areas would be for construction of Building 22 and retrofitting of Building 10, respectively located approximately 110 feet and 50 feet from the childcare center. The construction-related noise level at the exterior of the childcare center would be up to 75.0 dBA (L_{eq}). The building's façade would provide noise reduction of approximately 25 dBA with the windows closed and 15 dBA with the windows open

(EPA, 1974: Table B-4), thus resulting in an interior noise level of 50.0 dBA (L_{eq}) with windows closed or 60.0 dBA with windows open. Therefore, noise impacts at the interior of the childcare center would be adverse during construction hours for Alternative 1 short-term projects.

The childcare center's outdoor play area would be shielded from the construction activities by the existing Buildings 11 and 32. Retrofitting of Building 10 and construction of Building 32 would generate noise levels up to 60.0 dBA (L_{eq}) at the outdoor play area, which would exceed EPA's daycare significance threshold of 55 dBA (L_{eq}) before mitigation.

Therefore, impacts would be short term but noticeable. Although Section 01568, "Environmental Protection," of the VA Specifications would be implemented as part of Alternative 1 short-term projects, the potential exists for on-site receptors to be exposed to 24-hour (L_{dn}) noise levels exceeding the noise standards established by EPA and identified above in Table 3.10-5. Therefore, impacts would be potentially adverse.

Mitigation Measure NOI-1: Monitor Construction Noise Levels and Implement Additional Noise-Attenuating Features

VA will monitor exterior noise levels at on-site receptors located closest to a particular construction site for a 24-hour period at the onset of each major phase of construction (e.g., demolition, trenching, structure erection). If noise levels are found to exceed 55 dBA L_{dn}, VA will implement additional measures to reduce noise levels at affected on-site receptors as a result of construction noise. These additional measures may include but are not limited to relocating occupied patient beds to other areas of the SFVAMC Fort Miley Campus, installing temporary acoustic attenuating features/barriers, preventing the line of sight between the receptor in question and noise source, and providing in-room sound-masking equipment (e.g., white noise).

Management Measure NOI-1: Manage and Monitor Noise Disturbance

VA will manage and monitor noise disturbance during construction activities conducted on-site. The project engineer will be responsible for responding to and addressing complaints received by hospital or clinic staff members and nearby residences with respect to construction noise. Contact information will be available in the Engineering Office and will be provided to the community. When complaints are received, the project engineer will notify SFVAMC's Environmental Health & Safety Office, Engineering Office, and/or Green Environmental Management Systems Coordinator to conduct necessary surveys and determine the necessary actions needed to lessen the disturbance.

With implementation of Mitigation Measure NOI-1 and Management Measure NOI-1, VA would continually monitor construction noise levels and make provisions for receptors that may be exposed to noise levels exceeding EPA standards. In addition, implementing Mitigation Measure NOI-1 would reduce construction-related noise impacts at the childcare center's outdoor play area by a minimum of 5 dBA; thus, childcare-specific impacts would be reduced to a minor level. Impacts would also be temporary (approximately 13 months for the construction of Building 22 and retrofitting of Building 10). Therefore, with implementation of Mitigation Measure NOI-1 and Management Measure NOI-1, the temporary construction-related noise impact of Alternative 1 short-term projects on on-site receptors would be reduced to a minor level. No indirect impacts would occur.

Off-Site Receptors

Installation of the modular building Trailer 36 and construction of the Patient Welcome Center and Drop-off Area would result in the greatest potential increase in ambient noise levels caused by construction equipment operating near residences along the southern boundary of the existing SFVAMC Fort Miley Campus. The nearest off-site sensitive receptor to the Trailer 36 construction area is the existing residential use located on the north side of Seal Rock Drive, west of 45th Avenue, approximately 50 feet south of this construction area (Figure 3.10-2). The installation of Trailer 36 would generate noise levels up to 75.2 dBA L_{eq} at the nearest off-site residence, thus exceeding the significance threshold of 65 dBA L_{eq} (based on an ambient noise level of 60 dBA plus 5 dBA) and resulting in a temporary (approximately 3 months for Trailer 36 installation) adverse impact. However, implementing Mitigation Measure NOI-1 (i.e., installing a temporary noise barrier between the construction equipment and the sensitive receptor) would reduce the construction noise level by a minimum of 10 dBA, and the impact would be reduced to a minor level.

The nearest off-site sensitive receptor to the Patient Welcome Center and Drop-off Area construction area is the existing residence located on the south side of Clement Street (east of 43rd Avenue), approximately 175 feet south of the anticipated limits of construction (Figure 3.10-2). The estimated maximum construction noise level at this off-site receptor would be 73.6 dBA L_{eq}, about 12 dBA above the measured daytime ambient noise level of 61.8 dBA L_{eq}. The construction noise would exceed the significance threshold of 66.8 dBA L_{eq} (ambient plus 5 dBA) by 7 dBA before mitigation, resulting in an adverse impact. However, implementing Mitigation Measure NOI-1 (such as by installing a temporary acoustics-attenuating barrier, as described above) would reduce the construction noise level by a minimum of 10 dBA, and the impact would be reduced to a minor level.

All other construction activities that would occur as part of Alternative 1 short-term projects would be conducted at locations farther from nearby off-site sensitive receptors, including GGNRA visitors. Anticipated noise levels would be less than those identified above (for Trailer 36 and the Patient Welcome Center and Drop-off Area). Therefore, potential impacts at off-site sensitive receptors resulting from construction of Alternative 1 short-term projects would be noticeable and adverse but temporary, and implementation of mitigation measures would reduce these impacts to a minor level.

Construction of Alternative 1 short-term projects would extend up to 85 months. However, the noise impacts at the individual sensitive receptors would last for a much shorter time. Construction for most individual projects would last less than 24 months, and the construction noise would be reduced when construction activities move to another project farther away and are shielded by existing on-site building structures. In addition, if determined necessary, other noise-attenuating features and barriers would be implemented in accordance with Mitigation Measure NOI-1.

In addition to the on-site construction activities, traffic associated with Alternative 1 short-term projects (construction worker vehicles and vendor and haul trucks) would generate noise along the truck traffic routes established by the San Francisco Municipal Transportation Agency. The truck routes leading to the project site include 42nd Avenue, 43rd Avenue, Point Lobos Avenue, and Geary Boulevard. Based on the project's Transportation Impact Study, vendor and haul trucks would peak at 36 vehicles (72 trips) per day and construction worker vehicles would peak at 72 each way (144 trips) per day (VA, 2014). Based on an 8-hour work day and uniform distribution, it is estimated that there would be up to nine truck trips per hour. For a worst-case

analysis, construction workers have been assumed to arrive at the project site within a 1-hour period. The highest hourly noise level attributable to construction traffic for Alternative 1 short-term projects along the construction traffic routes would be 58.6 dBA L_{eq}. The estimated construction traffic noise level would be consistent with the existing ambient noise in the project vicinity of approximately 62 dBA (measured at Sites 1 and 2; see Table 3.10-4 and Figure 3.10-1). Therefore, noise impacts from off-site construction traffic related to Alternative 1 short-term projects would be minor.

Vibration

Construction activities for Alternative 1 short-term projects would include vibration-producing construction activities (e.g., demolition, excavation, grading, basement excavation, and clearing). No pile driving or rock blasting is anticipated. Depending on the specific construction equipment used and operations involved, short-term demolition and construction activities at the existing SFVAMC Fort Miley Campus may temporarily increase ground vibration. It is anticipated that the highest levels of construction-related groundborne noise and vibration would be generated during the demolition phase, because the equipment used during that phase generates the highest ground vibration levels.

<u>On-Site Receptors</u>

Alternative 1 short-term projects would require construction activities immediately adjacent to existing medical facilities and overnight patient rooms. As noted in Section 3.4, “Cultural Resources,” several structures on the existing SFVAMC Fort Miley Campus are more than 50 years old. Because of their age and the potential for degradation of building integrity over time, these structures are considered susceptible to damage from construction-related vibration.

Based on the equipment listed in Table 3.10-11, the potential exists for construction-related vibration from Alternative 1 short-term projects to exceed 0.12 in/sec PPV, the threshold established by FTA for potential damage to older structures. Specifically, a vibratory roller (used for compaction) could generate anticipated vibration levels of up to 0.21 in/sec PPV at adjacent structures. In addition, the potential exists for construction-related vibration to interfere with the operation of sensitive medical equipment used on-site. As noted by FTA, a standard of 65 VdB is recommended for facilities where vibration could interfere with operations. Based on the data shown in Table 3.10-11, construction of Alternative 1 short-term projects could result in interference with the use of sensitive medical equipment at the SFVAMC Fort Miley Campus.

Furthermore, in terms of potential human annoyance about construction vibration, on-site sensitive receptors (i.e., patients) could experience vibration levels up to 94 VdB at a distance of 25 feet, which would be considered noticeable.[2] However, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.) and would not be anticipated to disturb sleeping patients. As a result, this impact would be short-term, noticeable, and potentially adverse.

[2] As noted above in Table 3.10-3, 75 VdB is considered distinctly perceptible/noticeable.

Table 3.10-11: Representative Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 feet (in/sec)[1]	Approximate L_v (VdB) at 25 feet[2]
Vibratory roller	0.210	94
Large bulldozer	0.089	87
Hoe ram	0.089	87
Caisson drilling	0.089	87
Trucks	0.076	86
Concrete breaker	0.059	83
Jackhammer	0.035	79
Small bulldozer	0.003	58

Notes:
in/sec = inches per second; VdB = vibration decibels
[1] Where PPV is the peak particle velocity.
[2] Where Lv is the root mean square velocity expressed in vibration decibels (VdB), assuming a crest factor of 4.
Source: FTA, 2006:12-2

Mitigation Measure NOI-2: Conduct a Preconstruction Survey of Buildings in the Vicinity of Proposed Construction

The preexisting condition of all buildings within a 50-foot radius of construction areas (where large construction equipment would be utilized) will be recorded in the form of a preconstruction survey. The preconstruction survey will determine conditions that exist before construction begins and will be used to evaluate damage caused by construction activities. Fixtures and finishes within a 50-foot radius of construction activities susceptible to damage will be documented photographically and in writing before construction. All buildings damaged will be repaired to their preexisting condition.

Mitigation Measure NOI-3: Monitor Vibration-Sensitive Equipment during Construction

Vibration levels will be monitored at the nearest interior location of adjacent medical structures containing vibration-sensitive equipment to monitor potential impacts from construction related to this alternative. In the event that measured vibration levels exceed 65 VdB and would disturb the operation of sensitive medical equipment, additional measures will be implemented to the extent necessary and feasible. These measures include providing notice to equipment operators to coordinate regarding the timing of construction activities showing vibration levels above 65 VdB, possibly temporarily relocating the sensitive equipment, and/or installing isolation equipment (i.e., vibration-dampening mounts).

Implementing Mitigation Measures NOI-2 and NOI-3 would ensure that any potential damage to existing on-site structures or interference with on-site equipment caused by the construction of Alternative 1 short-term projects would be documented and repaired, and that construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.), which would minimize the potential for sleep disturbance. Therefore, with implementation of Mitigation Measures NOI-2 and NOI-3, the potential impact on on-site receptors, including structures (building damage) and vibration-sensitive equipment use, would be limited and impacts would be reduced to minor. However, vibration from construction equipment would be noticeable (i.e., above 75 VdB) if operating within

60 feet of the affected building, which would be potentially adverse with respect to sleep disturbance. This impact would be short term and would remain adverse even with mitigation.

Off-Site Receptors

To evaluate vibration impacts at sensitive receptors near the existing SFVAMC Fort Miley Campus, the use of the construction equipment was analyzed at the nearest off-site sensitive receptors. As noted above and identified in Figure 3.10-2, the residences located along the south side of the project site—specifically, the residence on Seal Rock Drive west of 45th Avenue and the residence on Clement Street east of 43rd Avenue—are the closest off-site sensitive receptors to any of the short-term projects proposed under Alternative 1. These residences are located approximately 50 feet and 175 feet, respectively, from the limits of the construction area. Visitors traversing the adjacent recreational trails also may also be temporary sensitive receptors, depending on their location.

Predicted groundborne noise and vibration levels at these residences could be as high as 78 VdB (0.031 PPV) at the residence on Seal Rock Drive and 69 VdB (0.011 PPV) at the residence on Clement Street (Figure 3.10-2). All other off-site residences are located farther from the limits of construction for Alternative 1 short-term projects, and construction-related vibration would be less than 78 VdB (0.031 PPV). As a result, attenuated vibration-inducing construction activities at off-site locations would not exceed FTA's threshold for building damage (0.12 PPV) or FTA's standard (80 VdB) for human response at off-site vibration-sensitive uses. Further, because construction activities would mainly be limited to weekday daytime hours (7:30 a.m. to 6:00 p.m.) and would avoid typical sleeping periods (nighttime), the potential for construction-related vibration at the existing SFVAMC Fort Miley Campus to result in human annoyance would be minimal. Therefore, based on established criteria, this direct impact would be minor. No indirect impacts would occur.

In addition to the on-site construction equipment, construction-related trucks traveling to and from the project site for Alternative 1 short-term projects would generate groundborne vibration along the designated construction truck routes. Based on FTA data, trucks traveling on typical roads would generate groundborne vibration levels of approximately 63 VdB or 0.006 in/sec PPV at a distance of 50 feet (FTA, 2006: Figure 7-3). Existing residential buildings are located approximately 25 feet from the truck travel lane, which would be exposed to groundborne vibration up to 72 VdB or 0.016 in/sec PPV. The groundborne vibration generated by construction-related truck trips for Alternative 1 short-term projects would be well below the most stringent significance threshold applicable for old building structures, 0.12 in/sec. Therefore, adverse building-damage impacts on the residential buildings along the construction truck route would not be expected. In addition, the estimated groundborne vibration level of 72 VdB would be less than the standard of 80 VdB for human annoyance. Therefore, groundborne vibration impacts on off-site sensitive receptors from truck traffic related to Alternative 1 short-term projects would be minor.

Operation

Noise

Mobile-Source Noise

Anticipated traffic-related increases in noise levels with implementation of Alternative 1 short-term projects were evaluated to determine whether they would result in a substantial increase in traffic noise at on- and off-site sensitive receptors. The FHWA Traffic Noise Prediction Model (FHWA-RD-77-108) was used to model traffic noise levels along affected roadways, based on daily traffic volumes and their distribution, from the traffic analysis prepared for full buildout of Alternative 1 short-term projects as predicted for the year 2020.

To determine the contribution of the Alternative 1 short-term projects to existing traffic noise along area roadways, modeled noise levels at 50 feet from the roadway centerline under no-project conditions were compared to those under plus-project conditions. The modeling assumed flat topography and did not include offsets to account for site-specific roadway conditions. The analyses below evaluate only the permanent change in traffic noise levels caused by the increase in daily traffic volumes. The use of emergency sirens, horns, and lights could temporarily and intermittently elevate ambient noise levels at nearby noise-sensitive land uses.

Operation of Alternative 1 short-term projects could result in an increase in average daily vehicle trips in the vicinity of the SFVAMC Fort Miley Campus. To examine the effect of project-generated traffic increases, traffic noise levels associated with the Campus were calculated for nearby roadway segments. Traffic volumes for each study segment were derived from p.m. peak intersection turning movements (see Section 3.13, “Transportation, Traffic, Circulation, and Parking”), using a K Factor of 10 to compute the average daily trips on roadway segments. (A K Factor is a multiplication factor used to compute average daily traffic.) Vehicle speeds and truck volumes on local roadways were determined based on field observations conducted on and around the Campus. Table 3.10-12 summarizes the modeled traffic noise levels at 50 feet from the centerline of affected roadway segments near the Campus.

Table 3.10-12: Predicted Short-Term Future Traffic Noise Levels (Alternative 1 Short-Term Projects)

Roadway	Segment		L_{dn} at 50 Feet, dBA			
	From	To	Existing	Short-Term (2020) Plus Alt. 1	Net Change	Substantial Increase?
Clement Street	43rd Avenue	42nd Avenue	62.0	62.4	0.4	No
Clement Street	42nd Avenue	34th Avenue	63.3	63.6	0.3	No
Clement Street	43rd Avenue	48th Avenue	60.7	61.0	0.3	No
43rd Avenue	Clement Street	Point Lobos Avenue	60.7	61.2	0.5	No
42nd Avenue	Clement Street	Point Lobos Avenue	57.5	57.9	0.4	No

Notes:
dB = (A-weighted) decibels; L_{dn} = day-night average noise level
Traffic noise levels are predicted at a standard distance of 50 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: Data modeled by AECOM in 2014

Based on the modeling conducted, the largest potential change in ambient roadway noise levels under short-term (2020) conditions under Alternative 1 would occur along 43rd Avenue between Clement Street and Point Lobos Avenue. This potential change would be approximately 0.5 dBA L_{dn}, which would be less than the more stringent threshold of 3.0 dBA for future roadway noise levels.

The increase in daily vehicle operations at the existing SFVAMC Fort Miley Campus with implementation of Alternative 1 short-term projects would not result in a noticeable increase in ambient traffic noise along local roadways. Therefore, this direct impact would be minor. No indirect impacts would occur.

Siren Noise

In general, the use of emergency sirens can temporarily and intermittently elevate ambient noise levels at noise-sensitive land uses adjacent to an ambulance's chosen route. Emergency vehicle sirens can generate intermittent L_{max} noise levels up to 106 dB. However, emergency services are prevalent throughout the project area under existing conditions, and siren use is common in the urban noise environment of San Francisco, including the neighborhoods around the existing SFVAMC Fort Miley Campus. Alternative 1 short-term projects would not alter the manner in which emergency vehicles access the Campus. Furthermore, none of the short-term projects for Alternative 1 would involve expanding the Campus's existing emergency department. In addition, the use of emergency medical services is determined based on need. Therefore, implementing Alternative 1 would not be anticipated to increase the potential for siren noise in the project area. Implementing this alternative would not increase capacity for accepting emergency transport or result in a substantial increase in local population (see Section 3.11, "Socioeconomics and Environmental Justice") that could reasonably be considered to have a secondary effect on the need for emergency services. As a result, this direct impact would be minor. No indirect impacts would occur.

Stationary-Source Noise

Receptors on and off the SFVAMC Fort Miley Campus could be exposed to stationary-source noise generated by on-site stationary equipment (especially HVAC) that would be installed during Alternative 1 short-term projects. On-Campus receptors of concern would be the SFVAMC patients, and off-site receptors would include the residences located immediately south of the Campus. Visitors traversing the adjacent recreational trails also may be temporary sensitive receptors, depending on their location.

Stationary equipment would be largely located on the rooftops of proposed structures and shielded from on-site receptors. Furthermore, any stationary equipment located on-site would be shielded to prevent a direct line of sight to any patient rooms or other noise-sensitive areas on Campus. To maintain exterior-to-interior noise levels within the Campus, including patient rooms, at 45 dBA L_{dn}, the following best management practice (BMP) regarding noise levels in relation to patient rooms would be implemented:

- VA will monitor noise levels in the SFVAMC patient rooms located closest to stationary equipment installed as part of the LRDP. Should noise levels from the operation of stationary equipment result in interior noise levels in patient rooms exceeding 45 dBA L_{dn}, VA will implement additional measures to reduce interior noise levels, such as replacing existing windows with double- or triple-paned windows, applying a sound-deadening window film, or installing additional acoustic shielding of the stationary source.

With implementation of this BMP, operation of Alternative 1 short-term projects would result in a minor direct impact. No indirect impacts would occur.

In terms of off-site receptors, stationary equipment must comply with Section 2909, "Noise Limits," of Article 29 of the San Francisco Noise Control Ordinance. The noise levels from the project's proposed on-site stationary equipment should not exceed the ambient noise levels at the project property line by 5 dB or exceed the fixed residential interior noise limits (45 dB between 10 p.m. and 7 a.m. and 55 dB between 7 a.m. and 10 p.m.). Based on the noise monitoring conducted at existing HVAC equipment on the project site, noise attributable to exterior equipment would not exceed 55 dB at a distance of 100 feet, which is the shortest distance between the proposed locations of Alternative 1 short-term projects and off-site residences. Therefore, the proposed project stationary equipment would not exceed the existing ambient noise level at the project property line by more than 5 dB. Assuming a conservative exterior-to-interior noise level reduction of 25 dB for modern residential wood construction and accounting for distance to the nearest off-site sensitive receptor façade, off-site sensitive receptors would not be exposed to interior noise levels exceeding 45 dB L_{eq} or experience a substantial increase in interior ambient noise levels with windows closed or open. Impacts would be minor.

Vibration

In general, the potential for operational vibration impacts is limited to areas subject to substantial heavy-truck traffic or rail operations, neither of which would occur in the vicinity of the existing SFVAMC Fort Miley Campus. Furthermore, on-site equipment would be appropriately installed, padded, and mounted to minimize the potential for perceivable on-site vibration during equipment operation. As a result, impacts would be minor. No indirect impacts would occur.

Long-Term Projects

Construction

Noise

The Alternative 1 long-term project would involve construction activities for the new Clinical Addition Building (Building 213) within the existing SFVAMC Fort Miley Campus. The nearest off-site sensitive receptors would be a minimum of 400 feet from the construction area and would be shielded by existing SFVAMC buildings and land topography. Based on the distance and intervening structures between the proposed structures and off-site receptors, the predicted construction noise level at the nearest off-site sensitive receptor would be 56.4 dBA L_{eq}, less than the existing ambient noise level of approximately 62 dBA L_{eq}. Therefore, impacts of on-site construction noise from the Alternative 1 long-term project on off-site receptors are not anticipated.

However, on-site receptors, including the Community Living Center (Building 208), could experience elevated noise levels during construction of the Alternative 1 long-term project. Construction activities would occur approximately 50 feet from Building 208. As noted above, exterior construction noise could reach levels as high as 84.5 dBA L_{eq} at a distance of 50 feet, thus exceeding existing L_{eq} noise levels by approximately 32 dBA (see Table 3.10-4, above). Also as described above, the building façade would provide noise reduction of approximately 25 dBA with the windows closed and 15 dBA with the windows open, resulting in an interior noise level of approximately 59.5 dBA (L_{eq}) with windows closed or 69.5 dBA with windows open. As a result, impacts

would be short term and noticeable. The on-site childcare center would be approximately 750 feet from construction activities for the Alternative 1 long-term project. During this project, the construction-related noise level at the on-site childcare center would be approximately 51.0 dBA L_{eq}, less than EPA's daycare significance threshold of 55 dBA. Section 01568, "Environmental Protection," of the VA Specifications would be implemented as part of the Alternative 1 long-term project, as under the short-term projects for this alternative, but on-site receptors could be exposed to noise levels exceeding the noise standards established by EPA (identified above in Table 3.10-5). Therefore, impacts would be potentially adverse.

However, with Mitigation Measure NOI-1 and Management Measure NOI-1 as discussed above, VA would continually monitor construction noise levels and make provisions for receptors that may be exposed to noise levels exceeding EPA standards. Therefore, with implementation of Mitigation Measure NOI-1 and Management Measure NOI-1, construction-related noise impacts of the Alternative 1 long-term project on on-site receptors would be noticeable but short term and would be reduced to a minor level. No indirect impacts would occur.

Like the short-term projects for this alternative, the long-term project for Alternative 1 would generate off-site traffic from construction worker vehicles and haul and vendor trucks. Based on the project's Transportation Impact Study, vendor and haul truck traffic would peak at 36 vehicles (72 trips) per day and construction worker vehicles would peak at 44 (88 trips) per day (VA, 2014). Based on an 8-hour workday and uniform distribution, it is estimated that there would be up to nine truck trips per hour. The highest hourly noise level associated with construction traffic for the Alternative 1 long-term project along the construction traffic routes would be 58.1 dBA L_{eq}. The estimated construction traffic noise level would be consistent with the existing ambient noise level in the project vicinity, approximately 62 dBA (measured at Sites 1 and 2; see Table 3.10-4). Therefore, noise impacts associated with the off-site construction traffic for the Alternative 1 long-term project would be minor.

Vibration

The proposed facility to be constructed as part of the Alternative 1 long-term project (Building 213) would be located within the existing SFVAMC Fort Miley Campus, farther from the existing off-site residences than the facilities proposed for the Alternative 1 short-term projects. Construction activities at the site would be located farther from these residences than the activities evaluated above for short-term projects, and would result in vibration levels of approximately 58 VdB at the nearest residential structures located to the south. This would be well below the FTA-established thresholds for structural damage and human annoyance (80 VdB); therefore, impacts would be minor.

With respect to on-site receptors, construction could occur within 50 feet of existing medical facilities, including patient beds. Similar to the impacts identified for short-term projects of Alternative 1, the potential exists for construction-related vibration from the Alternative 1 long-term project to exceed 0.12 PPV (the threshold established by FTA for potential damage to older structures). Specifically, a vibratory roller (used for compaction) could generate anticipated vibration levels of up to 0.21 PPV at adjacent structures. In addition, the operation of heavy construction equipment could interfere with the operation of existing medical equipment on-site if vibration levels were to exceed FTA's 65-VdB standard.

Furthermore, in terms of potential human annoyance as a result of construction vibration, on-site sensitive receptors could experience vibration levels up to 94 VdB at a distance of 25 feet, which would be considered noticeable (i.e., exceeding 75 VdB). However, construction activities would be limited to daytime hours

(7:30 a.m. to 6:00 p.m.) and would not be anticipated to disturb sleeping patients. As a result, this impact would be short term, noticeable, and potentially adverse.

With Mitigation Measures NOI-2 and NOI-3, potential damage to existing on-site structures or interference with on-site equipment caused by construction of the Alternative 1 long-term project would be documented and repaired. In addition, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.), minimizing the potential for sleep disturbance. As a result, the potential impact on on-site receptors, including structures, would be limited. Therefore, with implementation of Mitigation Measures NOI-2 and NOI-3, direct impacts would be noticeable but would be short term and reduced to a minor level. No indirect impacts would occur.

As with the short-term projects for Alternative 1, construction-related trucks traveling to and from the site for the Alternative 1 long-term project would generate groundborne vibration along the designated construction truck routes. Therefore, as during the short-term projects, existing residential buildings along the construction truck routes would be exposed to groundborne vibration up to 72 VdB or 0.016 in/sec PPV. The groundborne vibration generated by the construction-related truck trips for the Alternative 1 long-term project would be well below the most stringent significance threshold applicable for old building structures (0.12 in/sec) and the 80-VdB standard for human annoyance. Therefore, groundborne vibration impacts from the project's construction truck traffic at the off-site sensitive receptors would be minor.

Operation

Noise

Mobile-Source Noise

Operation of the Alternative 1 long-term project would result in an increase in average daily vehicle trips in the vicinity of the SFVAMC Fort Miley Campus. Like short-term conditions, long-term (2027) conditions were modeled based on the anticipated average daily traffic on local roadways surrounding the Campus. As shown in Table 3.10-13, the largest potential change in ambient roadway noise levels under long-term (2027) conditions would occur along 42nd Avenue between Clement Street and Point Lobos Avenue and would be approximately 1.9 dBA L_{dn} above existing conditions. This would be less than the more stringent threshold of 3.0 dBA identified above for future roadway noise levels. As a result, the increase in daily vehicle operations at the Campus caused by implementing the Alternative 1 long-term project would not result in a noticeable increase in ambient traffic noise along local roadways. Therefore, this direct, operational mobile-source noise impact would be minor. No indirect impacts would occur.

Siren Noise

As noted above for Alternative 1 short-term projects, the Alternative 1 long-term project would not alter the manner in which emergency vehicles access the existing SFVAMC Fort Miley Campus. Furthermore, the long-term project would not involve expanding the existing SFVAMC emergency department. The Alternative 1 long-term project would not be anticipated to increase the potential for siren noise in the project area because it would not increase capacity for accepting emergency transport or result in a substantial increase in local population (see Section 3.11, "Socioeconomics and Environmental Justice") that could reasonably be considered to have a secondary effect on the need for emergency services. Therefore, this direct, operational impact related to siren noise would be minor. No indirect impacts would occur.

Table 3.10-13: Predicted Long-Term Future Traffic Noise Levels (Alternative 1 Long-Term Project)

Roadway	Segment		L_{dn} at 50 Feet, dBA			
	From	To	Existing	Long-Term (2027) Plus Alt. 1	Net Change	Substantial Increase?
Clement Street	43rd Avenue	42nd Avenue	62.0	62.8	0.8	No
Clement Street	42nd Avenue	34th Avenue	63.3	64.1	0.8	No
Clement Street	43rd Avenue	48th Avenue	60.7	61.3	0.6	No
43rd Avenue	Clement Street	Point Lobos Avenue	60.7	61.8	1.1	No
42nd Avenue	Clement Street	Point Lobos Avenue	57.5	59.4	1.9	No

Notes:
dB = (A-weighted) decibels; L_{dn} = day-night average noise level
Traffic noise levels are predicted at a standard distance of 50 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: Data modeled by AECOM in 2014

Stationary-Source Noise

As with short-term projects for Alternative 1, on- and off-Campus receptors could be exposed to stationary-source noise generated by on-site stationary equipment (especially HVAC) that would be installed as part of the Alternative 1 long-term project. On-Campus receptors of concern would include SFVAMC patients, and off-site receptors would include the residences located immediately to the south and temporary visitors to recreation land adjacent to the Campus. Stationary equipment would be largely located on the rooftops of proposed structures and shielded from on-site receptors. Furthermore, any stationary equipment located on-site would be shielded to prevent a direct line of sight to any patient rooms or other noise-sensitive areas on Campus. To maintain exterior-to-interior noise levels within the Campus, including patient rooms, at 45 dBA L_{dn}, the BMP regarding noise levels in relation to patient rooms would be implemented. Therefore, operation of the Alternative 1 long-term project would represent a minor direct impact. No indirect impacts would occur.

In terms of off-site receptors, stationary equipment must comply with Section 2909, “Noise Limits,” of Article 29 of the San Francisco Noise Control Ordinance. The noise levels from the project’s proposed on-site stationary equipment should not exceed the ambient noise levels at the project property line by 5 dB or exceed the fixed residential interior noise limits (45 dB between 10 p.m. and 7 a.m. and 55 dB between 7 a.m. and 10 p.m.). Based on the noise monitoring conducted at the Campus, noise levels attributable to exterior equipment would not exceed 55 dB at a distance of 100 feet. Therefore, the project’s stationary equipment would not exceed the existing ambient noise level at the project property line by more than 5 dB. Assuming a conservative exterior-to-interior noise-level reduction of 25 dB for modern residential wood construction, and accounting for distance to the nearest off-site sensitive receptor’s façade, off-site sensitive receptors would not be exposed to interior noise levels exceeding 45 dB L_{eq} or experience a substantial increase in interior ambient noise levels with windows closed or open. Operational impacts of the Alternative 1 long-term project related to stationary-source noise would be minor. No indirect impacts would occur.

Vibration

In general, the potential for operational vibration impacts is limited to areas subject to substantial heavy-truck traffic or rail operations, neither of which would occur in the area of the existing SFVAMC Fort Miley Campus. Furthermore, on-site equipment would be appropriately installed, padded, and mounted to minimize the potential for perceivable on-site vibration during equipment operation. Therefore, the direct operational vibration impacts of the Alternative 1 long-term project would be minor. No indirect impacts would occur.

Alternative 2: SFVAMC Fort Miley Campus Buildout Alternative

Short-Term Projects

Alternative 2 short-term projects at the existing SFVAMC Fort Miley Campus would be the same as Alternative 1 short-term projects, with one exception. Specifically, retrofitting of the existing Buildings 1, 6, and 8 would not occur as part of Alternative 2 short-term projects (Table 2-3 and Figure 2-3), but would instead be accomplished in the long term. Alternative 2 short-term projects include construction of a total of 485,445 gross square feet (gsf), which is 115,547 gsf less than for short-term projects under Alternative 1. Therefore, impacts of Alternative 2 short-term projects would be similar to or less than those of Alternative 1 short-term projects.

Construction

Noise

As described above, Alternative 2 short-term projects would be similar to short-term projects under Alternative 1, except that the existing Buildings 1, 6, and 8 would not be retrofitted. Buildings 1, 6, and 8 are located at the interior of the Campus. Like Alternative 1 short-term projects, Alternative 2 short-term projects would include buildings at the southern portion of the Campus, which would generate the highest noise levels to the off-site sensitive receptors. Therefore, construction noise levels generated by Alternative 2 short-term projects at the off-site sensitive receptors would be similar to those of Alternative 1 short-term projects, as provided in Table 3.10-14. Noise impacts on the on-site receptors would also be similar to those of the short-term projects for Alternative 1 because construction activities from the short-term projects under either alternative would occur within 50 feet of the on-site sensitive buildings (e.g., nursing home and childcare center). Therefore, noise impacts related to construction activities on the Campus of Alternative 2 short-term projects would be minor with mitigation (see Mitigation Measure NOI-1 and Management Measure NOI-1).

Like the Alternative 1 short-term projects, the short-term projects for Alternative 2 would generate off-site traffic from construction worker vehicles and construction trucks. The number of vendor and haul trucks would be similar to those for Alternative 1, which would peak at 36 vehicles (72 trips) per day. Although Buildings 1, 6, and 8 would not be retrofitted under Alternative 2 short-term projects, the peak number of vendor and haul trucks would be similar to that under Alternative 1 short-term projects. The construction worker trips would be slightly less than under Alternative 1, peaking at 64 vehicles (128 trips) (VA, 2014). Therefore, the highest hourly noise level from traffic for Alternative 2 short-term projects along the construction traffic routes would be approximately 58.5 dBA L_{eq}, similar to Alternative 1, and would be consistent with the existing ambient noise in the project vicinity. Therefore, noise impacts from off-site construction traffic on off-site receptors for Alternative 2 short-term projects would be minor with mitigation (see Mitigation Measure NOI-1).

Table 3.10-14: Predicted Short-Term Construction Noise Levels—Alternative 2 Short-Term Projects

Location	Distance to Construction Area, feet	Estimated Noise Levels by Construction Activity,[1] dBA L_{eq}					Significance Threshold,[2] dBA L_{eq}
		Demolition	Site Preparation	Grading/ Excavation	Building Construction	Paving	
1—43rd Avenue and Point Lobos Avenue (off-site)	600	52.9	50.2	52.9	48.5	51.4	67.2
2—42nd Avenue and Clement Street (off-site)[3]	300	68.9	66.2	68.9	64.5	67.4	66.8
3—Front lawn area southeast of Building 203 (on-site)	100	78.5	75.8	78.5	74.1	76.9	67.1
4—Northwest on-site parking lot (on-site)	50	84.5	81.8	84.5	80.1	83.0	55.0

Notes:
dBA = A-weighted decibels; L_{eq} = equivalent noise level
1 Construction equipment used for the various construction stages:
- Demolition: One loader, one concrete saw, and two backhoes
- Site Preparation: One grader and one backhoe
- Grading/Excavation: One loader, one concrete saw, and two backhoes
- Building Construction: One crane, two forklifts, ad two backhoes
- Paving: One paver, four cement mixers, one roller, and one backhoe

2 Significance threshold is equal to 55 dBA L_{eq} (if the existing ambient noise level is less than 55 dBA L_{eq}) or the existing ambient noise level plus 5 dBA. See Table 3.10-4 for the existing ambient noise levels.
3 Represent the off-site residence on the south side of Clement Street and 42nd Avenue.
Source: Data compiled by AECOM in 2014

Vibration

As described above, construction for the Alternative 2 short-term projects would be similar to construction for short-term projects of Alternative 1, except that the existing Buildings 1, 6, and 8 would not be retrofitted. Because Buildings 1, 6, and 8 are located at the interior of the Campus, the vibration levels at the off-site residential structures would be influenced by the construction activities nearest to the Campus's southern property line. Therefore, construction activities at the site would result in vibration levels of approximately 58 VdB at the nearest residential structures located to the south. The estimated vibration level would be well below the FTA-established thresholds for structural damage and human annoyance (80 VdB). Therefore, construction-related vibration impacts at the off-site sensitive receptors would be similar to impacts of Alternative 1 short-term projects and would be minor.

As under Alternative 1 short-term projects, construction under Alternative 2 short-term projects could occur within 50 feet of on-site receptors, including existing medical facilities with patient beds. The potential exists under Alternative 2 short-term projects for construction-related vibration to exceed 0.12 PPV (the threshold established by FTA for potential damage to older structures). Specifically, a vibratory roller (used for compaction) could generate anticipated vibration levels of up to 0.21 PPV at adjacent structures. In addition, the operation of

heavy construction equipment could interfere with the operation of existing medical equipment on-site if vibration levels were to exceed FTA's 65-VdB standard. On-site sensitive receptors could experience vibration levels up to 94 VdB at a distance of 25 feet (because of the vibratory roller, if used), which would be considered noticeable (i.e., exceeding 75 VdB). However, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.) and would therefore not be anticipated to disturb sleeping patients. Because Buildings 1, 6, and 8 would not be retrofitted under the Alternative 2 short-term projects, potential vibration impacts at the on-site receptors (close to Buildings 1, 6, and 8) would be less than under the Alternative 1 short-term projects. Nevertheless, potential vibration impacts on on-site receptors would be short-term, noticeable, and potentially adverse.

As under Alternative 1, with Mitigation Measures NOI-2 and NOI-3, any potential damage to existing on-site structures or interference with on-site equipment caused by the construction of Alternative 2 short-term projects would be documented and repaired. In addition, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.), minimizing the potential for sleep disturbance. Therefore, with implementation of Mitigation Measures NOI-2 and NOI-3, direct impacts (with respect to building damage and vibration-sensitive equipment use) of Alternative 2 short-term projects would be noticeable but would be short term and reduced to a minor level. No indirect impacts would occur. However, similar to Alternative 1, potential vibration impacts with respect to sleep disturbance would be potentially adverse if heavy construction equipment is operating within 60 feet of the affected building. This impact would be short term and would remain adverse even with mitigation.

Construction-related trucks traveling to and from the project site for Alternative 2 short-term projects would utilize the same routes as under short-term projects for Alternative 1. Although the total number of construction-related trucks would be slightly lower under Alternative 2 short-term projects than under Alternative 1 short-term projects, these trucks would generate similar groundborne vibration levels of 72 VdB or 0.016 in/sec PPV at the residences along the construction haul routes. This is because the groundborne vibration level is based on a single truck traveling down the street. The groundborne vibration generated by the construction-related truck traffic would be well below the most stringent significance threshold applicable for old building structures (0.12 in/sec) and the 80-VdB standard for human annoyance. Therefore, groundborne vibration impacts from the project's construction truck traffic at the off-site sensitive receptors would be minor under Alternative 2 short-term projects.

Operation

Noise

Operation of the Alternative 2 short-term projects would result in an increase in average daily vehicle trips in the vicinity of the SFVAMC Fort Miley Campus, as under Alternative 1 short-term projects. Therefore, mobile-source noise impacts of Alternative 2 short-term projects would be the same as those of Alternative 1 short-term projects, as provided in Table 3.10-12. The largest potential change in ambient roadway noise levels under the short-term project conditions would occur along 43rd Avenue between Clement Street and Point Lobos Avenue, and would be approximately 0.5 dBA L_{eq} (Table 3.10-12). The predicted noise increase would be less than the more stringent threshold of 3.0 dBA. As a result, the increase in daily vehicle operations at the Campus caused by implementing Alternative 2 short-term projects would not result in a noticeable increase in ambient traffic noise along local roadways. Therefore, this direct, operational mobile-source noise impact would be minor. No indirect impacts would occur.

Noise impacts of Alternative 2 short-term projects from other noise sources, including sirens and on-site stationary equipment, would be similar to the impacts of Alternative 1 short-term projects. As discussed for Alternative 1, the use of emergency sirens would continue to generate noise along the ambulance's routes. However, as under Alternative 1, implementing Alternative 2 short-term projects would not increase capacity for emergency transport. Therefore, noise generated by emergency sirens would not be anticipated to increase, and noise impacts from emergency sirens would be minor.

On-site stationary equipment (e.g., HVAC equipment) for Alternative 2 short-term projects would be similar to equipment for Alternative 1 short-term projects. This equipment would largely be located on the rooftops of proposed structures and would be shielded. The BMP described for Alternative 1 also would be implemented under Alternative 2 to maintain noise levels at the on-site patient rooms at 45 dBA L_{dn}. In addition, stationary equipment would comply with the San Francisco Noise Control Ordinance, as described for Alternative 1, at the off-site sensitive receptors. As under Alternative 1, noise impacts of Alternative 2 short-term projects would be minor.

Vibration

As with the short-term projects for Alternative 1, on-site equipment for Alternative 2 short-term projects would be appropriately installed, padded, and mounted to minimize the potential for perceivable on-site vibration during equipment operation. As a result, vibration impacts of Alternative 2 short-term projects would be minor. No indirect impacts would occur.

Long-Term Projects

Alternative 2 long-term projects at the existing SFVAMC Fort Miley Campus would be similar to Alternative 1 long-term projects, with one exception. Specifically, three additional existing buildings—Buildings 1, 6, and 8—would be retrofitted as part of Alternative 2 long-term projects (Table 2-4 and Figure 2-4). Alternative 2 long-term projects include construction of a total of 285,487 gsf, which is 115,487 gsf more than under Alternative 1 long-term projects, because Alternative 2 includes construction of Building 213 along with the seismic retrofit of Buildings 1, 6, and 8.

Construction

Noise

As described above, Alternative 2 long-term projects would be similar to the long-term project for Alternative 1, except that Buildings 1, 6, and 8 would be retrofitted together with the construction of Building 213 (Clinical Addition Building). The nearest off-site sensitive receptors would be approximately 350 feet from the construction area (Building 1) (see Figure 3.10-2). Based on the distance attenuation, the predicted construction noise level at the nearest off-site sensitive receptor would be 63.2 dBA L_{eq}. The predicted construction noise level at the nearest off-site sensitive receptor would be 1 dBA above the existing ambient noise level of approximately 62 dBA L_{eq}, which would be less than the 5-dBA significance threshold. Therefore, impacts on off-site receptors from on-site construction activities for Alternative 2 long-term projects would be minor.

However, similar to Alternative 1 long-term projects, on-site receptors, including the Community Living Center (Building 208), would be located approximately 50 feet from the nearest construction area (Building 213). Therefore, exterior construction noise levels could reach as high as 84.5 dBA L_{eq} at Building 208, thus exceeding existing L_{eq} noise levels by approximately 32 dBA (see Table 3.10-4, above). As a result, impacts would be short term and noticeable. The on-site childcare center would be approximately 350 feet from and shielded from construction of Alternative 2 long-term projects (specifically, the Building 8 seismic retrofit). Therefore, construction-related noise levels at the on-site childcare center would be approximately 53.2 dBA L_{eq}, which would be less than the 55-dBA significance threshold. As under the Alternative 1 long-term project, Section 01568, "Environmental Protection," of the VA Specifications would be implemented as part of the Alternative 2 long-term projects, but the potential exists for on-site receptors to be exposed to noise levels exceeding the noise standards established by EPA (identified above in Table 3.10-5). Therefore, impacts would be potentially adverse.

However, with Mitigation Measure NOI-1 and Management Measure NOI-1 as discussed above, VA would continually monitor construction noise levels and make provisions for receptors that may be exposed to noise levels exceeding EPA standards. Therefore, with implementation of Mitigation Measure NOI-1 and Management Measure NOI-1, construction-related noise impacts on on-site receptors from Alternative 2 long-term projects would be noticeable but short term and reduced to a minor level. No indirect impacts would occur.

The Alternative 2 long-term projects would generate off-site traffic from construction worker vehicles and haul and vendor trucks. Vendor and haul trucks would peak at 36 vehicles (72 trips) per day and construction worker vehicles would peak at 45 (90 trips) per day (VA, 2014). The highest hourly noise level from construction-related traffic for the Alternative 2 long-term projects along the construction traffic routes would be 58.2 dBA L_{eq}, approximately 0.1 dBA higher than under the Alternative 1 long-term project. The estimated construction traffic noise level would be less than the existing ambient noise in the project vicinity of 62 dBA (measured at Sites 1 and 2; see Table 3.10-4). Therefore, noise impacts associated with the project's off-site construction traffic during Alternative 2 long-term projects would be minor.

Vibration

As under the Alternative 1 long-term project, the facilities proposed under Alternative 2 long-term projects would be located within the existing SFVAMC Fort Miley Campus, away from the existing off-site residences. However, the construction activities at Building 1 would occur approximately 350 feet from the nearest off-site residential receptor, which is 50 feet closer than the activities for Building 213 under the Alternative 1 long-term project. Therefore, construction activities at the site would be slightly greater than those evaluated above for the Alternative 1 long-term project, which would result in vibration levels of approximately 60 VdB at the nearest residential structures located to the south. This would be well below the FTA-established thresholds for structural damage and human annoyance (80 VdB); therefore, impacts would be minor.

Construction could occur within 50 feet of existing on-site medical facilities, including patient beds. Similar to the impacts identified for the Alternative 1 long-term project, the potential exists for construction-related vibration to exceed 0.12 PPV (the threshold established by FTA for potential damage to older structures). Specifically, a vibratory roller (used for compaction) could generate anticipated vibration levels of up to 0.21 PPV at adjacent structures. In addition, the operation of heavy construction equipment could interfere with the operation of existing medical equipment on-site if vibration levels were to exceed FTA's standard of 65 VdB.

With respect to potential human annoyance as a result of construction vibration, on-site sensitive receptors could experience vibration levels up to 94 VdB at a distance of 25 feet, which would be considered noticeable (i.e., exceeding 75 VdB). However, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.) and would not be anticipated to disturb sleeping patients. As a result, this impact would be short term, noticeable, and potentially adverse, as under the Alternative 1 long-term project.

With Mitigation Measures NOI-2 and NOI-3, any potential damage to existing on-site structures or interference with on-site equipment caused by the construction of long-term projects under Alternative 2 would be documented and repaired. In addition, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.), minimizing the potential for sleep disturbance. As a result, the potential impact on on-site receptors, including structures, would be limited. Therefore, with implementation of Mitigation Measures NOI-2 and NOI-3, direct impacts of Alternative 2 long-term projects would be noticeable but would be short term and reduced to a minor level. No indirect impacts would occur.

As under the Alternative 1 long-term project, trucks traveling to and from the project site for Alternative 2 long-term projects would generate groundborne vibration along the designated construction truck routes. Therefore, existing residential buildings along the construction truck routes would be exposed to groundborne vibration up to 72 VdB or 0.016 in/sec PPV, as for the Alternative 1 long-term project. The groundborne vibration generated by the project's construction-related truck traffic would be well below the most stringent significance threshold applicable for old building structures (0.12 in/sec) and the 80-VdB standard for human annoyance. Therefore, groundborne vibration impacts at the off-site receptors from the construction truck traffic for Alternative 2 long-term projects would be minor.

Operation

Noise

Operation of the Alternative 2 long-term projects would result in an increase in average daily vehicle trips in the vicinity of the SFVAMC Fort Miley Campus, as under the Alternative 1 long-term project. Therefore, mobile-source noise impacts of Alternative 2 long-term projects would be the same as those of the Alternative 1 long-term project, as provided in Table 3.10-13. As shown in Table 3.10-13, the largest potential change in ambient roadway noise levels under the long-term project conditions would occur at 42nd Avenue between Clement Street and Point Lobos Avenue and would be approximately 1.9 dBA L_{dn} above existing conditions (Table 3.10-13). The predicted noise increase would be less than the more stringent threshold of 3.0 dBA. Therefore, operational mobile-source noise impacts of Alternative 2 long-term projects would be minor.

Noise impacts of Alternative 2 long-term projects from other noise sources, including sirens and on-site stationary equipment, would be similar to those of the Alternative 1 long-term project. As discussed for the Alternative 1 long-term project, the use of emergency sirens would continue to generate noise along the ambulance's routes. However, as under the Alternative 1 long-term project, implementation of the Alternative 2 long-term projects would not increase capacity for emergency transport. Therefore, noise generated by emergency sirens would not be anticipated to increase. Noise impacts from emergency sirens would be minor.

On-site stationary equipment (e.g., HVAC equipment) for the Alternative 2 long-term projects would be similar to equipment for the Alternative 1 long-term project. This equipment would largely be located on the rooftops of

proposed structures and would be shielded. The BMP described for the Alternative 1 long-term project would be implemented under Alternative 2 long-term projects to maintain noise levels at the on-site patient rooms at 45 dBA L_{dn}. In addition, stationary equipment would comply with the San Francisco Noise Control Ordinance, as described for the Alternative 1 long-term project, at the off-site sensitive receptors. As under the Alternative 1 long-term project, noise impacts of the Alternative 2 long-term projects would be minor.

Vibration

As under the Alternative 1 long-term project, on-site equipment for Alternative 2 long-term projects would be appropriately installed, padded, and mounted to minimize the potential for perceivable on-site vibration during equipment operation. As a result, vibration impacts of Alternative 2 long-term projects would be minor. No indirect impacts would occur.

Alternative 3: SFVAMC Fort Miley Campus Plus Mission Bay Campus Alternative

Short-Term Projects

Construction and Operation

Alternative 3 short-term projects (during both construction and operation) would be the same as Alternative 1 short-term projects (see Table 2-1 and Figure 2-1). Therefore, the impacts of Alternative 3 short-term projects would be the same as the impacts of Alternative 1 short-term projects. These impacts would range in significance from minor to adverse with mitigation (Mitigation Measures NOI-1, NOI-2, and NOI-3).

Long-Term Projects

Alternative 3 long-term projects (during both construction and operation) would be similar to the Alternative 1 long-term project, except that the ambulatory care center and an associated parking garage would be located at the potential new SFVAMC Mission Bay Campus under Alternative 3 (see Table 2-5 and Figure 2-5).

Construction

Noise

Alternative 3 long-term projects would involve constructing facilities at a potential new SFVAMC Mission Bay Campus. The distance between construction activities for the potential new Campus and nearby off-site receptors is unknown at this time. The types of construction activities that would be required are also unknown. If, for example, pile-driving were determined to be necessary at the potential new Campus, noise levels would equate to 88 dBA L_{eq} at 100 feet, which would exceed the threshold established by the City and County of San Francisco for construction noise. Implementing Mitigation Measure NOI-1 and Management Measure NOI-1 would reduce potential noise impacts on receptors adjacent to the potential new Campus. Project-level analysis would be required once a specific location for potential new Campus is determined. It is anticipated that implementing Mitigation Measure NOI-1 and Management Measure NOI-1 would help to reduce this impact to a minor level.

Vibration

Alternative 3 long-term projects would involve constructing facilities at a potential new SFVAMC Mission Bay Campus. The distance between construction activities for the potential new Campus and nearby off-site receptors is unknown at this time. The types of construction activities that would be required are also unknown. Nonetheless, construction activities would be limited to daytime hours (7:30 a.m. to 6:00 p.m.), which would minimize the potential for sleep disturbance and human annoyance. In addition, with implementation of Mitigation Measures NOI-2 and NOI-3, the potential impact on on-site receptors, including structures, would be limited. Direct impacts would be noticeable but would be short term and would be reduced to a minor level. No indirect impacts would occur.

Operation

Noise

Mobile-Source Noise

Operation of the potential new SFVAMC Mission Bay Campus under Alternative 3 long-term projects would result in an increase in average daily vehicle trips in the Mission Bay area. Because the location of the potential new Campus has yet to be determined, a formal determination cannot be made at this time regarding the increase in roadway noise that could result from the potential new Campus's operation. As a result, the off-site medical facility would be subject to separate environmental review, as plans for the facility are developed. However, with respect to roadway traffic noise impacts, a doubling of the existing traffic volume would result in a 3-dBA increase (i.e., significance threshold). The potential new Mission Bay Campus would generate approximately 184 vehicle trips during the weekday p.m. peak hour (VA, 2014). Based on a conservative assumption that the Mission Bay Campus would be located in an area with small roadways (low existing traffic) as at the Fort Miley Campus, the increase in traffic noise in the area would likely be less than 2.0 dBA. Therefore, the noise impacts associated with roadway traffic of the potential new Mission Bay Campus under Alternative 3 long-term projects would be minor.

Siren Noise

Like Alternative 1 long-term projects, Alternative 3 long-term projects would not alter the manner in which emergency vehicles access SFVAMC facilities. The potential new SFVAMC Mission Bay Campus would not be anticipated to require or receive emergency medical services. Furthermore, none of the long-term projects for Alternative 3 would involve creating new emergency services at the potential new Campus. The use of emergency medical services is determined based on need. Therefore, implementing Alternative 3 long-term projects would not be anticipated to increase the potential for siren noise in the Mission Bay area. It would not increase capacity for accepting emergency transport or result in a substantial increase in local population (see Section 3.11, "Socioeconomics and Environmental Justice") that could reasonably be considered to have a secondary effect on the need for emergency services. Therefore, this direct impact would be minor. No indirect impacts would occur.

Stationary Source

Alternative 3 long-term projects would involve constructing facilities at a potential new SFVAMC Mission Bay Campus. With respect to off-site receptors in the Mission Bay area, the proposed stationary-source equipment for

the potential new Campus, which would be largely limited to HVAC and emergency generator equipment, could be located within 50 feet of existing residences, depending on the proposed site location. The exact location of HVAC equipment and emergency generators has yet to be determined. HVAC equipment is typically mounted on rooftops or mechanical rooms, while emergency generators may be located on the rooftop, loading dock area, or mechanical room. The lack of detailed project information precludes a quantitative analysis of proposed new stationary-source equipment at this time. However, it is reasonable to assume that operation of this stationary equipment could result in an exceedance of the City's noise limit of 8 dB above the ambient noise level at the property line, and in a substantial increase in ambient noise levels above existing levels near the off-site portion of Alternative 3. This is dependent on the need for HVAC equipment to properly filter and control the building climate. In this case, impacts would be potentially adverse.

> **Mitigation Measure NOI-4: Conduct a Site-Specific Noise Study to Inform Design of Stationary Noise Sources for the Potential New SFVAMC Mission Bay Campus**
>
> *VA will retain the services of a qualified acoustical consultant to conduct an additional site-specific noise study to evaluate and establish the appropriate ambient noise levels at the proposed off-site medical research facility for a detailed HVAC and emergency-generator noise reduction analysis. The recommendations of the acoustical consultant will include specific equipment design and operations measures to reduce HVAC and emergency-generator noise to acceptable levels for exterior and interior noise levels as specified in the San Francisco Noise Control Ordinance.*

With Mitigation Measure NOI-4, the design and installation of stationary-source equipment would include an evaluation and implementation of measures related to controlling noise from these sources to such an extent that noise levels at nearby residences would not exceed EPA or San Francisco Noise Control Ordinance standards. Therefore, with implementation of Mitigation Measure NOI-4, this direct impact would be reduced to a minor level. No indirect impacts would occur.

Vibration

In general, the potential for operational vibration impacts is limited to areas subject to substantial heavy truck traffic or rail operations. However, neither source of vibration would be present at the potential new SFVAMC Mission Bay Campus as a result of implementation of Alternative 3 long-term projects. Furthermore, on-site equipment would be appropriately installed, padded, and mounted so as to minimize the potential for perceivable on-site vibration during equipment operation. Therefore, operational vibration impacts would be minor. No indirect impacts would occur.

Alternative 4: No Action Alternative

Construction

Under Alternative 4, there would be no new construction and no retrofitting of existing buildings at the existing SFVAMC Fort Miley Campus. Thus, no construction-related noise or vibration would result, and no direct or indirect impacts on- and off-site receptors would occur.

Operation

Noise

Under Alternative 4, no new development would occur at the existing SFVAMC Fort Miley Campus; therefore, no additional noise from stationary sources or emergency transport sirens would be anticipated. With respect to ambient roadway noise levels, traffic to and from the Campus would be anticipated to incrementally increase as regional population increases. This would have a secondary effect of incrementally increasing traffic volumes on local roadways. Noise levels would increase by approximately 0.2 dBA L_{dn} under short-term (2020) conditions and 0.4 dBA L_{dn} under long-term (2027) conditions (Table 3.10-15). Also as shown in Table 3.10-15, roadway noise levels along the five segments adjacent to the Campus would increase (even without implementation of the LRDP) by less than 0.5 dBA L_{dn} by 2027, which would not exceed the 3.0-dBA thresholds identified above for incremental roadway noise-level increases. As a result, direct operational noise impacts from mobile and stationary sources and sirens would be minor. No indirect impacts would occur.

Table 3.10-15: Predicted Short-Term Future Traffic Noise Levels (Alternative 4)

Roadway	Segment		L_{dn} at 50 Feet, dBA						
	From	To	Existing	Short-Term (2020) Plus Alt. 4	Net Change	Substantial Increase?	Long-Term (2027) Plus Alt. 4	Net Change	Substantial Increase?
Clement Street	43rd Avenue	42nd Avenue	62.0	62.2	0.2	No	62.4	0.4	No
Clement Street	42nd Avenue	34th Avenue	63.3	63.5	0.2	No	63.6	0.3	No
Clement Street	43rd Avenue	48th Avenue	60.7	60.9	0.2	No	61.1	0.4	No
43rd Avenue	Clement Street	Point Lobos Avenue	60.7	60.9	0.2	No	61.0	0.3	No
42nd Avenue	Clement Street	Point Lobos Avenue	57.5	57.7	0.2	No	57.9	0.4	No

Notes:
dB = (A-weighted) decibels; L_{dn} = day-night average noise level
Traffic noise levels are predicted at a standard distance of 50 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: Data modeled by AECOM in 2012

Vibration

In general, under Alternative 4, the potential for operational vibration impacts is limited to areas subject to substantial heavy truck traffic or rail operations. However, neither source of vibration would be present as part of operation of the existing SFVAMC Fort Miley Campus. Furthermore, no additional on-site equipment that could generate vibration during its operation would be installed and operated under Alternative 4. Therefore, no direct or indirect operational vibration impact would occur.

3.10.4 References

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