IV.E Noise and Vibration

IV.E.1 Introduction

This section evaluates the potential noise and vibration impacts associated with construction of subsequent development projects and changes in traffic noise levels due to development resulting from implementation of the Central SoMa Plan and from proposed changes to the Plan Area street network. The study area for noise impacts is generally the same as for transportation impacts bounded by Market, Second, King and Sixth Streets (see Figure IV.D-1, Transportation Study Area, in Section IV.D, Transportation and Circulation). Some of the proposed streetscape improvements extend beyond the area of proposed land use changes, and because some transportation noise effects of the proposed land use program may extend beyond the area to be rezoned, the study area for noise impacts was expanded beyond the Plan Area boundaries. The study area also extends to Mission, 12th, and Bryant Streets on the west, and Folsom Street, The Embarcadero, and Bryant Street on the east, and Market, Second, and Sixth Streets on the north.

This section characterizes the existing noise environment in the Study Area based on noise measurements collected in the area and citywide modeling of traffic noise, describes relevant noise standards and guidelines, identifies sensitive receptors, and evaluates construction and operational noise, including changes in traffic noise levels, resulting from both development allowed by the Plan and from the proposed street network changes (both within and outside the Plan Area), as well as from cumulative development generating traffic on Plan Area streets.

IV.E.2 Environmental Setting

Sound Descriptors

Decibel

Sound is characterized by various parameters that describe the rate of oscillation (frequency) of sound waves, the distance between successive troughs or crests in the wave, the speed at which it travels, and the pressure level or energy content of a given sound. The sound pressure level is the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and understandable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about zero dBA to about 140 dBA. A 10 dBA increase in the level of a continuous noise represents a perceived doubling of loudness. With respect to traffic noise, increases of three dBA are barely perceptible to people, while a five dBA increase is readily

noticeable; an increase of less than three dBA is generally not perceptible outside of controlled laboratory conditions.[231] The equivalent noise level, L_{eq}, is the steady-state energy level of noise measured over a given time period. Because of many receptors' typically greater sensitivity to unwanted noise at night, a 24-hour noise descriptor, called the day-night noise level (L_{dn}), adds an artificial 10 dBA increment to nighttime noise levels (10:00 p.m. to 7:00 a.m.) to "penalize," or more heavily weight, nighttime noise in calculating average (24-hour) noise levels.[232] **Table IV.E-1, Typical Sound Levels Measured in the Environment**, shows some representative noise sources and their corresponding noise levels in dBA.[233]

TABLE IV.E-1 TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Examples of Common, Easily Recognized Sounds	Decibels (dBA) at 50 feet	Subjective Evaluations
Near Jet Engine	140	Deafening
Threshold of Pain (Discomfort)	130	
Threshold of Feeling – Hard Rock Band	120	
Accelerating Motorcycle (at a few feet away)	110	
Loud Horn (at 10 feet away)	100	Very Loud
Noisy Urban Street	90	
Noisy Factory	85[1a]	
School Cafeteria with Untreated Surfaces	80	Loud
Near Freeway Auto Traffic	60[b]	Moderate
Average Office	50[2]	
Soft Radio Music in Apartment	40	Faint
Average Residence Without Stereo Playing	30	
Average Whisper	20	Very Faint
Rustle of Leaves in Wind	10	
Human Breathing	5	
Threshold of Audibility	0	

SOURCE: U.S. Department of Housing and Urban Development, *The Noise Guidebook*, 1985.

NOTES:

a. Continuous exposure above 85 dBA requires implementation of a Hearing Conservation Plan under regulations of the Occupational Health and Safety Administration.

b. Range of speech is 50 to 70 dBA.

[231] California Department of Transportation, Division of Environmental Analysis, "Technical Noise Supplement," November 2009; pp. 2-48–2-49. Available at http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf, accessed on August 29, 2016. This document (and all other documents cited in this report, unless otherwise noted), is available for review at 1650 Mission Street, Suite 400, San Francisco, CA, as part of Case No. 2011.1356E.

[232] Another descriptor, the Community Noise Equivalent Level (CNEL) similarly adds a 10 dBA penalty for nighttime noise, and also adds a 5 dBA penalty for evening (7:00 to 10:00 p.m.) noise.

[233] U.S. Department of Housing and Urban Development, The Noise Guidebook, 1985. Available at https://www.hudexchange.info/resource/313/hud-noise-guidebook/, accessed on August 29, 2016.

Noise levels decrease with distance. In urban areas, traffic noise (a "line source," in which the noise emanates not from a single location but from multiple locations along a street or roadway) typically is reduced by about three dBA for each doubling of distance. Noise from construction activities and other similar "point sources" generally attenuates at a rate of six dBA per doubling of distance. In areas without the hard, reflective ground surface of an urban streetscape, attenuation of noise from a point source is typically about 1.5 dBA greater.[234]

Health Effects of Environmental Noise

The World Health Organization (WHO) is perhaps the best source of current knowledge regarding health impacts of noise as European nations have continued to study noise and its health effects, while the U.S. Environmental Protection Agency all but eliminated its noise investigation and control program in the 1970s.[235] According to the WHO, sleep disturbance can occur when continuous indoor noise levels exceed 30 dBA or when intermittent interior noise levels reach 45 dBA, particularly if background noise is low.[236] With a bedroom window slightly open (a reduction from outside to inside noise levels of 15 dB), the WHO criteria would suggest exterior continuous (ambient) nighttime noise levels in residential areas, particularly those with older housing stock, should be 45 dBA or below, and short-term events should not generate noise in excess of 60 dBA.[237] An acoustically well-insulated building with windows and doors closed can provide 30–35 dB of noise attenuation, while more-conventional residential construction provides 20–25 dB of noise reduction with windows closed and only about 15 dB of noise reduction when windows are open.[238]

Other potential health effects of noise identified by the WHO include decreased performance on complex cognitive tasks, such as reading, attention, problem solving, and memorization; physiological effects such as hypertension and heart disease (after many years of constant exposure, often by workers, to high noise levels); and hearing impairment (again, generally after long-term occupational exposure, although shorter-term exposure to very high noise levels, for example, several times a year to concert noise at 100 dBA, can also cause hearing impairment). Noise can also disrupt speech intelligibility at relatively low levels; for example, in a classroom setting, a noise level as low as 35 dBA can disrupt clear understanding. Finally, noise can cause annoyance and can trigger emotional reactions like anger, depression, and anxiety. The WHO reports that, during daytime hours, few people are seriously annoyed by activities with noise levels below 55 dBA, or moderately annoyed with noise levels below 50 dBA.[239]

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[234] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013. Available at http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf, accessed on August 29, 2016.

[235] *San Francisco General Plan,* Land Use Compatibility Guidelines for Community Noise, presented in Figure IV.E-3, were created during the same era.

[236] World Health Organization (WHO), *Guidelines for Community Noise.* Geneva, 1999. Available at http://www.who.int/docstore/peh/noise/guidelines2.html, accessed on August 29, 2016.

[237] It is noted that these noise levels represent ambient noise and are not comparable with the day-night noise level, L_{dn}, which, as noted above, adds a 10-dB "penalty" to nighttime noise. Thus, for example, the L_{dn} calculated for two 24-hour noise measurements in the Plan Area was 7 to 8 dBA higher than the measured nighttime noise level.

[238] Harris, David A., *Noise Control Manual for Residential Buildings*, 1997; Wyle Laboratories, Wyle Research Report WR 94-23, Raleigh-Durham International Airport New Construction Acoustical Design Guide, prepared for Raleigh-Durham Airport Authority, September 30, 1994; and California Governor's Office of Planning and Research, General Plan Guidelines, 2003.

[239] World Health Organization (WHO), *Guidelines for Community Noise*. Geneva, 1999. Available at http://www.who.int/docstore/peh/noise/guidelines2.html, accessed on August 29, 2016.

Fundamentals of Vibration

As described by the Federal Transit Administration (FTA), ground-borne vibration, in contrast to airborne noise, is not a common environmental problem, and it is uncommon for vibration caused by heavy vehicles, such as trucks and buses, to be perceptible, even close to major roads. However, the FTA notes that "ground-borne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard." Another common source of vibration is certain construction activities, such as pile driving and the operation of heavy earthmoving equipment.[240]

Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal in inches per second (in/sec). The PPV is most frequently used to describe vibration impacts to buildings. Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration from construction activity typically include fragile structures (especially older masonry structures) and vibration-sensitive equipment; however, the latter is generally a concern only in laboratory and similar settings, which are typically installed in buildings constructed and/or renovated to provide for needed isolation from exterior vibration, and thus impacts to vibration-sensitive equipment are unlikely to result in a significant impact.

The effects of ground-borne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of activities such as pile driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. However, a vibration level that causes annoyance would be well below the damage threshold for normal buildings, and would not be expected to reach a level of significance in the case of temporary and intermittent construction activities, which is the only vibration-inducing activity anticipated as a result of Plan implementation.

Existing Noise Environment

To characterize the existing noise environment in the Study Area, a series of both short-term (10-minute) and long-term (48-hour) noise measurements were conducted in May 2014, and available noise data collected as part of other recent environmental documents were compiled. Two areas of focus were (1) nighttime entertainment activities in the Study Area, including the area of the proposed Central SoMa Special Use District (SUD) Entertainment Subarea (the area generally bounded by Bryant, Townsend, Fourth, and Sixth Streets), and (2) existing and planned locations of residential uses.

The results of the 2014 noise monitoring, presented in **Table IV.E-2, Study Area Noise Measurements (2014),** and illustrated in **Figure IV.E-1, Noise Monitoring Results**, show that day-night noise levels in the study area average about 75 dBA (L_{dn}) except in relatively quieter locations, such as along mid-block alleys, where noise levels are up to about 10 decibels quieter. Monitored noise levels ranged between 69 dBA and 74 dBA, except

[240] Federal Transit Administration, Office of Planning and Environment, Transit Noise and Vibration Impact Assessment, May 2006. Available at http://www.hmmh.com/cmsdocuments/FTA_cover_sec01.pdf, accessed on August 29, 2016.

that one location (#2), on Folsom Street between Third and Fourth Streets, exhibited a noise level of 78 dBA (L_{dn}) in a long-term (24-hour) measurement. This location is two blocks east of San Francisco Fire Department Station No. 1 at 935 Folsom Street, and is on the route that fire apparatus travel when responding to calls north and east of the station, because all major streets in the area are one-way. A review of Fire Department response records determined that apparatus from Station 1 was dispatched during the hours when the highest noise levels were recorded. Therefore, it appears likely that average noise levels at this location can be strongly influenced by fire apparatus pass-bys, depending on response patterns on a given day and time.

TABLE IV.E-2 STUDY AREA NOISE MEASUREMENTS (2014)

No.	Date	Location	Street/ Alley	Duration	Noise Level (dBA, L_{dn})[a]
1	5/29/14–5/30/14	Fourth Street south of Bryant Street[b]	S	LT (24 hrs.)	74
2	5/29/14–5/30/14	Folsom Street at Mabini Street (between Third and Fourth Streets)[c]	S	LT (24 hrs.)	78
3	5/19/14	Minna Street west of Sixth Street	A	ST (10 min., p.m. peak hr.)	67
4	5/19/14	Fourth & Howard Streets (SW corner)	S	ST (10 min., p.m. peak hr.)	74
5	5/19/14	Fifth Street between Folsom & Harrison Streets	S	ST (10 min., p.m. peak hr.)	69
6	5/19/14	Harrison Street between Fifth & Sixth Streets	S	ST (10 min., p.m. peak hr.)	72
7	5/20/14	Bluxome Street east of Fifth Street	A	ST (10 min., p.m. peak hr.)	66
8	5/20/14	Second and Bryant Streets (NE corner)[b]	S	ST (10 min., p.m. peak hr.)	76
Average[d]					**75**

NOTES:

dBA = Decibel (A-weighted); S = Street; LT = Long-term noise measurement (minimum 24 hours); L_{dn} = Day-Night Noise Level; A = Alley; ST = Short-term noise measurement (i.e., 10 or 15 minutes)

a. Short-term noise measurements during the peak traffic hours approximate the day-night noise level (generally within two dBA), according to the Caltrans document Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013. Available at http://sfwater.org/index.aspx?page=616://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf, accessed on August 29, 2016.

b. Likely affected by traffic noise from nearby elevated I-80 freeway.

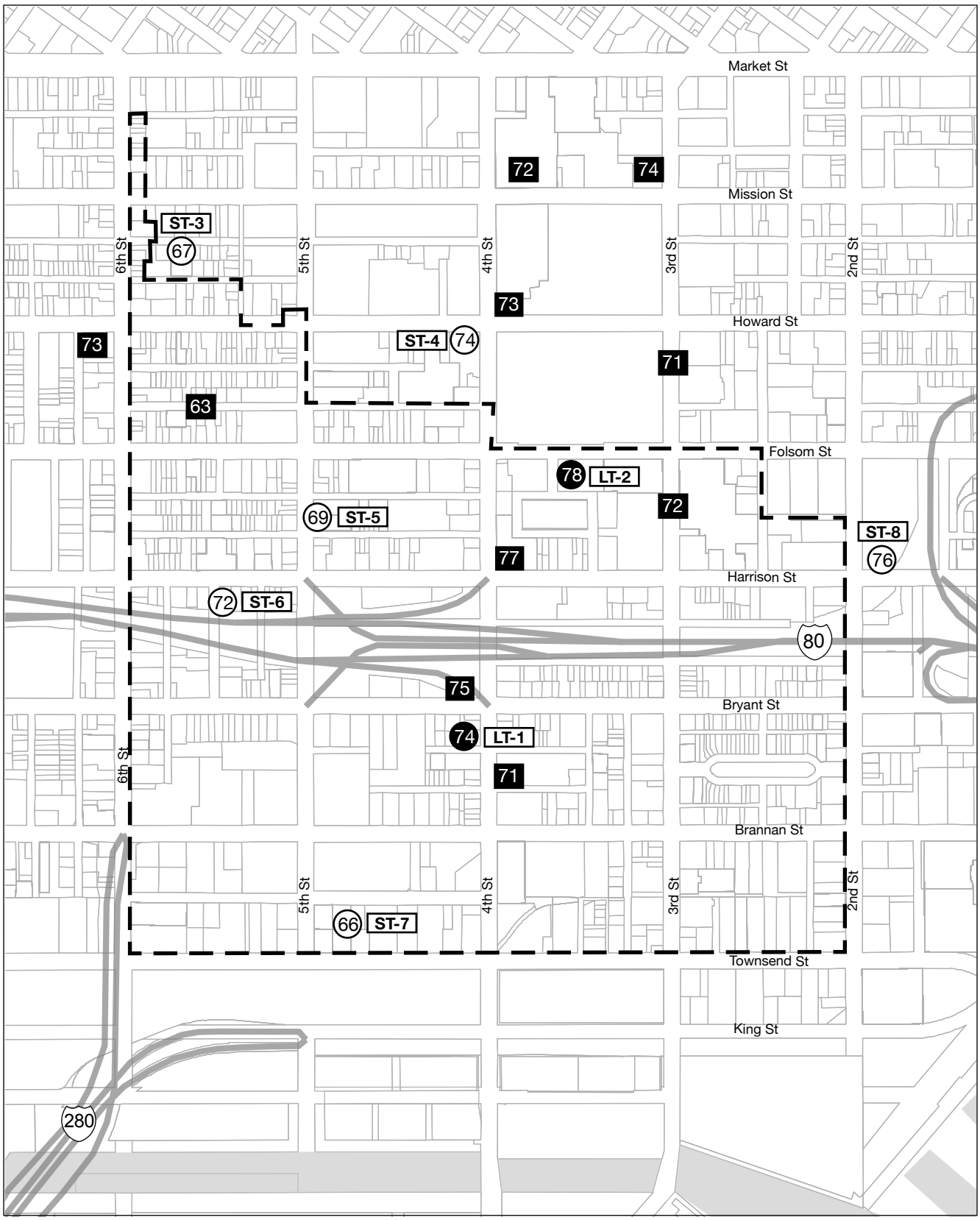
c. Based on dispatch information from the San Francisco Fire Department, the average noise level at this location is influenced from fire apparatus traveling from Station No. 1 at 935 Folsom Street, two blocks east, when responding to calls north and east of the station.

d. Average (calculated logarithmically) excludes the two alley measurements, where noise levels are lower than the major street noise levels.

As is the case elsewhere in San Francisco, and particularly in the greater Downtown area, traffic is the predominant overall noise source. In the Study Area, many streets carry relatively larger volumes of heavy trucks and, on bus routes, buses, than elsewhere in the city, and traffic volumes are generally high.

The noise levels measured in the 2014 monitoring are consistent with noise modeling undertaken by the San Francisco Department of Public Health (DPH) and incorporated as Map 1 in the *San Francisco General Plan* Environmental Protection Element's Noise section.[241] The portion of the *General Plan* noise map that includes the Plan Area is presented in **Figure IV.E-2, Traffic Noise in the Central SoMa Transportation Study Area**, which

[241] *San Francisco General Plan*, Background Noise Levels, 2009. Available at http://www.sf-planning.org/ftp/General_Plan/images/I6.environmental/ENV_Map1_Background_Noise%20Levels.pdf, accessed on August 29, 2016.



SOURCE: ESA; San Francisco Planning Department base map

Case No. 2011.1356E: Central SoMa Plan

Figure IV.E-1

Noise Monitoring Results

SOURCE: City of San Francisco Noise Data, 2011; ESA, 2014

Case No. 2011.1356E: Central SoMa Plan

Figure IV.E-2

Traffic Noise in the Central SOMA Transportation Study Area

also depicts the study area and its vicinity, including the area in which the proposed street network changes would be implemented. The modeling shows that virtually all major streets in the Study Area are subject to traffic noise levels in excess of 70 dBA (L_{dn}). The 2014 monitoring results are also consistent with monitoring undertaken in connection with several Planning Department CEQA documents for projects in the study area. For comparison purposes, noise measurement data collected as part of other recent environmental documents are presented in **Table IV.E-3, Previous Noise Measurements in Study Area**, and also shown on Figure IV.E-1. Measurement data indicate similar noise levels along streets within the study area, with noise levels of around 74 dBA (L_{dn}) and a range of between 71 and 77 dBA on major streets, with one alley location being considerably quieter, at 63 dBA (L_{dn}).

TABLE IV.E-3 PREVIOUS NOISE MEASUREMENTS IN STUDY AREA

Date	Location	Street/ Alley	Duration	Noise Level (dBA, L_{dn})[a]	Source
2/28/11	Howard Street at Sixth Street	S	LT (24 hrs.)	72	200-214 Sixth Street Initial Study (Case No. 2011.0119E)
2/28/11	Sixth Street at Howard Street	S	LT (24 hrs.)	73	
4/4/11	Third & Mission Streets	S	ST (15 min., Mid-day)	74*	706 Mission DEIR (Case No. 2008.1084E) *Avg. of 6 readings: 74 dBA*
4/4/11	Third & Mission Streets	S	ST (15 min., Mid-day)	74*	
4/4/11	Third & Mission Streets	S	ST (15 min., Mid-day)	75*	
4/4/11	Third & Jessie Streets	S	ST (15 min., Mid-day)	71*	
4/4/11	Third Street south of Jessie Street	S	ST (15 min., Mid-day)	76*	
4/4/11	Mission Street near Fourth Street	S	ST (15 min., Mid-day)	72*	
9/27/11	Clementina Street btw. Fifth & Sixth Streets	A	LT (41 hrs.)	63	465 Tehama/468 Clementina MND (Case No. 2005.0424E)
11/14/07	Fourth & Howard Streets	S	ST (15 min., Mid-day)	73	Central Subway SEIS/R (Case No. 96.281E)
11/15/07	Fourth & Harrison Streets	S	ST (15 min., mid-day)	77	
11/14/07	Fourth & Bryant Streets	S	ST (15 min., mid-day)	75	
11/14/07	Fourth Street south of Bryant Street	S	LT (24 hrs.)	71	
7/29/97	Third Street between Harrison & Folsom Streets	S	ST (15 min., mid-day)	72	
Average[b]				**74**	

NOTES:

dBA = Decibel (A-weighted); S = Street; LT = Long-term noise measurement (minimum 24 hours); L_{dn} = Day-Night Noise Level; A = Alley; ST = Short-term noise measurement (i.e., 10 or 15 minutes)

a. Short-term noise measurements during the peak traffic hours approximate the day-night noise level; short-term measurements taken outside peak traffic hours, where not already adjusted, have been increased by two dBA (noted with asterisk [*]), based on the relationship between non-peak-hour and daily noise levels reported in the Central Subway SEIS/R.

b. Average (calculated logarithmically) excludes the one alley measurement, on Clementina Street between Third and Fourth Streets, where the noise level was much lower than the major street noise levels.

The existing noise levels mean that, in accordance with the *San Francisco General Plan* Noise Element, most major streets in the study area are considered too noisy for unprotected residential and other sensitive land uses, and such development should only be undertaken when "a detailed analysis of the noise reduction requirements [is] made and needed noise insulation features included in the design." In practice, this means

that project-specific noise studies must be undertaken for individual residential (and other noise-sensitive) land uses and the project must include noise-reducing design features such as noise-insulating glass, often with mechanical ventilation provided so that residents can obtain fresh air without having to open windows, along with sound-dampening wall assemblies and doors. For residential and certain other uses, this requirement of the *General Plan* is consistent with and implemented by the noise insulation requirements in the *California Building Code* (discussed further in the Regulatory Framework section below).

Sensitive Receptors

Sensitive noise receptors are land uses that are generally considered to include residences, schools, child care facilities, religious facilities (churches), hospitals, skilled nursing/convalescent care facilities, and libraries. Land uses within the study area are described in Section IV.A, Land Use and Land Use Planning. In summary, residential uses occur throughout the study area, with the highest concentration of housing occurring in the northwestern portion of the Plan Area (a good deal of the area bounded by Fifth, Seventh, Mission, and Harrison Streets, a portion of which is within the Plan Area, is developed with residential uses). In particular, the Plan Area contains a concentration of senior housing developments, home to roughly 2,000 seniors, south and west of Moscone Center within the former Yerba Buena Redevelopment Area, in the blocks bounded by Howard, Fifth, Harrison, and Fourth Streets. Relatively newer residential development is located along Folsom Street (both sides) between Third and Fifth Streets (a portion of this area is within the Plan Area) and along or near Fourth Street south of the I-80 freeway. In general, much of the residential development in the eastern portion of the Plan Area is located on mid-block alleys and around South Park.

Schools include Bessie Carmichael Middle School on Harrison Street (just west of Fourth Street) and various Academy of Arts facilities located mostly in the northeastern Plan Area. There are three child development facilities located within the study area, but not within the Plan Area: at 95 Hawthorne Street between Harrison and Folsom Streets, 303 Second Street at Folsom Street, 790 Folsom Street at Fourth Street, 375 Seventh Street (in the Bessie Carmichael Elementary School), and in the Federal Building at Seventh and Mission Streets. Religious facilities within the study area include St. Patrick's Catholic Church, which is located on Mission Street across from Yerba Buena Gardens.

There are no hospitals, skilled nursing facilities, or libraries within the Plan Area. The closest library is the Mission Bay Library, located at 960 Fourth Street, just south of the Plan Area.

IV.E.3 Regulatory Framework

Federal Regulations

Federal regulations establish noise limits for medium and heavy trucks.[242] The federal truck pass-by noise standard is 80 dBA at 50 feet from the vehicle pathway centerline, under specified test procedures. These controls are implemented by regulation of truck manufacturers. There are no comparable standards for vibration, which are dependent on the roadway surface, the vehicle load, and other factors.

[242] The standards are codified in 40 CFR, Part 205, Subpart B.

State Regulations

The 2013 *California Building Code* (Title 24, Part 2, of the *California Code of Regulations* [CCR]) requires that interior noise levels from outside sources not exceed 45 dBA (L_{dn} or CNEL) in any habitable room (rooms for sleeping, living, cooking, and eating, but excluding bathrooms, closets, and the like) or a residential unit (*Building Code* Section 1207.4). The *Building Code* (Section 1207.2) also mandates that walls and floor/ceiling assemblies separating dwelling units from each other or from public or service areas have a Sound Transmission Class (STC) of at least 50, meaning they can reduce noise by a minimum of 50 dB.

In addition, the 2013 *Green Building Standards Code* (also part of the *California Building Code*; CCR Title 24, Part 11) specifies the following insulation standards for Environmental Comfort (Section 5.507) to minimize exterior noise transmission into interior spaces for non-residential buildings:

Section 5.507.4.1, Exterior Noise Transmission, requires wall and roof-ceiling assemblies to have an STC of at least 50 and exterior windows to have a minimum STC of 30 for any of the following building locations: (1) within the 65 dBA, L_{dn}, noise contour of a freeway, expressway, railroad, or industrial source; and (2) within the 65 dBA noise contour of an airport. Exceptions include buildings with few or no occupants and where occupants are not likely to be affected by exterior noise, such as factories, stadia, parking structures and storage or utility buildings.

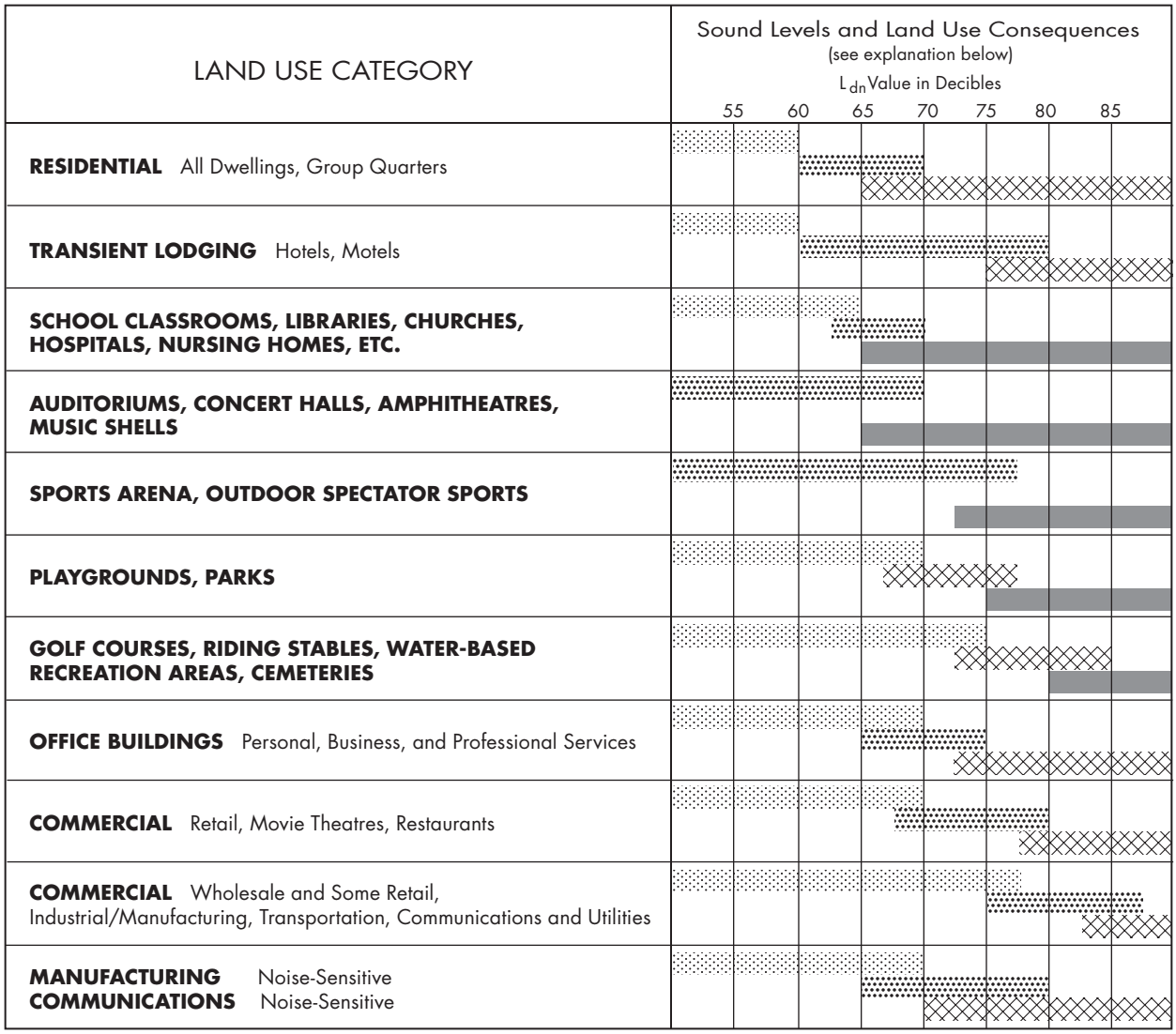
Section 5.507.4.3, Interior Sound Transmission, requires wall and floor-ceiling assemblies separating tenant spaces and public places to have an STC of at least 40. There are no State standards for vibration, outside of California Title 24 Building Standards Code for earthquake safety.

Local Regulations

San Francisco General Plan

The Environmental Protection Element of the *San Francisco General Plan* contains Land Use Compatibility Guidelines for Community Noise.[243] These guidelines, which are similar to state guidelines promulgated by the Governor's Office of Planning and Research, indicate maximum acceptable noise levels for various newly developed land uses. These guidelines are presented in **Figure IV.E-3, Land Use Compatibility Chart for Community Noise**. Although this figure presents a range of noise levels that are considered compatible or incompatible with various land uses, the maximum "satisfactory" noise level is 60 dBA (L_{dn}) for residential and hotel uses, 65 dBA (L_{dn}) for school classrooms, libraries, churches and hospitals, 70 dBA (L_{dn}) for playgrounds, parks, office buildings, retail commercial uses and noise-sensitive manufacturing/communications uses, and 77 dBA for other commercial uses such as wholesale, some retail, industrial/manufacturing, transportation, communications, and utilities. If these uses are proposed to be located in areas with noise levels that exceed these guidelines, a detailed analysis of noise reduction requirements would be necessary prior to final review and approval. None of the noise measurements made for this EIR, nor the previous noise measurements in or near

[243] *San Francisco General Plan*, Environmental Protection Element, Policy 11.1. Available at http://generalplan.sfplanning.org/I6_Environmental_Protection.htm, accessed August 29, 2016.



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 requirements must be made and needed noise insulation features included in the design.

New construction or development should generally not be undertaken.

SOURCE: San Francisco General Plan, Environmental Protection Element

Case No. 2011.1356E: Central SoMa Plan

Figure IV.E-3
Land Use Compatibility Chart for Community Noise

the Plan Area, nor any of the modeling of existing peak-hour traffic noise revealed existing noise levels of 65 dBA or less, with the exception of a single 24-hour noise measurement, were taken on Clementina Street between Fifth and Sixth Streets in 2011, and none of the results was 60 dBA or less. Therefore, it can be assumed that the entire Plan Area exceeds the *General Plan*'s maximum "satisfactory" residential noise level of 60 dBA. The General Plan does not establish vibration standards or otherwise address vibration.

San Francisco Noise Ordinance

In the city, regulation of noise is addressed in Article 29 of the *Police Code* (the Noise Ordinance), which states the City's policy is to prohibit unnecessary, excessive, and offensive noises from all sources subject to police power. Sections 2907 and 2908 of Article 29 regulate construction equipment and construction work at night, while Section 2909 provides for limits on stationary-source noise from machinery and equipment. Sections 2907 and 2908 are enforced by the Department of Building Inspection, and Section 2909 is enforced by the Department of Public Health. Summaries of these and other relevant sections are presented below.

Section 2907(a) of the *Police Code* limits noise from construction equipment to 80 dBA when measured at a distance of 100 feet from such equipment, or an equivalent sound level at some other convenient distance. Exemptions to this requirement, pursuant to Section 2907(b), include impact tools with approved mufflers, pavement breakers and jackhammers with approved acoustic shields, and construction equipment used in connection with emergency work. Section 2908 prohibits nighttime construction (between 8:00 p.m. and 7:00 a.m.) that generates noise exceeding the ambient noise level by five dBA at the nearest property line unless a special permit has been issued by the City.

Section 2909 generally prohibits fixed mechanical equipment noise and music in excess of five dBA more than ambient noise from residential sources, eight dBA more than ambient noise from commercial sources, and 10 dBA more than ambient on public property at a distance of 25 feet. Section 2909(d) establishes maximum noise levels for fixed noise sources (e.g., mechanical equipment) of 55 dBA (7:00 a.m. to 10:00 p.m.) and 45 dBA (10:00 p.m. to 7:00 a.m.) inside any sleeping or living room in any dwelling unit located on residential property to prevent sleep disturbance. The Police Code does not establish vibration standards or otherwise address vibration.

San Francisco Building Code

The *San Francisco Building Code* was amended in 2015 to incorporate language included in Section 1207.4 (interior noise standards) of the *California Building Code*; (see discussion of State Regulations, above). San Francisco's current Section 1207.6.2 accordingly reads the same as Section 1207.4 of the *California Building Code*. The *San Francisco Building Code* also includes a requirement that residential structures in "noise critical areas, such as in proximity to highways, county roads, city streets, railroads, rapid transit lines, airports, nighttime entertainment venues, or industrial areas," be designed to exceed the *Code*'s quantitative noise reduction requirements, and specifies, "Proper design to accomplish this goal shall include, but not be limited to, orientation of the residential structure, setbacks, shielding, and sound insulation of the building" (Section 1207.6.1). Section 1207.7 requires submittal of an acoustical report along with a project's building permit application to demonstrate compliance with the *Code*'s interior noise standards. The Building Code does not establish vibration standards or otherwise address vibration.

Regulation of Noise from Places of Entertainment

In May 2015, in recognition of both the potential noise effects on nearby residences from Places of Entertainment (e.g., nightclubs, bars with live music and/or disc jockeys, theaters, and the like) and of the cultural and economic importance to the city of Places of Entertainment, the Board of Supervisors passed, and the Mayor signed into law, Ordinance 70-15, which made amendments to the *San Francisco Building Code*, *Administrative Code*, *Planning Code*, and *Police Code* that require attenuation of exterior noise for new residential structures and acoustical analysis (as described above under *San Francisco Building Code*); to require a process of consultation between the Planning Department and the Entertainment Commission regarding proposed residential uses within 300 feet of Places of Entertainment, including notifying a potential residential project sponsor if there are nearby Places of Entertainment; to allow the Entertainment Commission to conduct a hearing, attended by the residential project sponsor, on such a project and to provide comments and recommendations to the Planning Department regarding the project; to require the Planning Department to consider noise issues in reviewing the project; to preclude a Place of Entertainment from being declared a public or private nuisance on the basis of noise for residents of residential structures developed since 2005; and to require disclosure to residential renters and buyers of potential noise and other inconveniences associated with nearby Places of Entertainment. Additionally, the Entertainment Commission is authorized to impose noise conditions on a permit for a Place of Entertainment, including noise limits "that are lower or higher than those set forth in Article 29" of the *Police Code*.

IV.E.4 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, implementation of the Plan would have a significant noise or vibration impact if it would:

- Expose people to or generate noise levels in excess of standards established in the *San Francisco General Plan* or Noise Ordinance (Article 29 of the *Police Code*);
- Expose people to or generate excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project; or
- Result in people being substantially affected by existing noise levels.

A project would also normally result in a significant impact with respect to noise if it is located within an airport land use plan area or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, or if the project would expose people residing or working in the vicinity of a private airstrip to excessive noise levels. The Planning Department published the Initial Study on February 12, 2014 (see Appendix B), in order to focus the scope of the EIR by assessing which of the Plan's environmental topics would not result in significant impacts on the environment. As stated in the Initial Study, the Plan Area is not within an airport land use plan area, nor is it in the vicinity of a private airstrip. Therefore, these two topics need not be addressed in this Draft EIR.

Approach to Analysis

The Plan is a regulatory program and would result in new planning policies and controls for land uses to accommodate additional jobs and housing. With the exception of the street network changes and open space improvements, the Plan itself would not result in direct physical changes to the existing noise environment. Indirect effects from the Plan could result as subsequent development projects allowed under the Plan replace existing residences and businesses, or increase space for residences or businesses over time in the Plan Area.

In the California Building Industry Association v. Bay Area Air Quality Management District case decided in 2015,[244] the California Supreme Court held that CEQA does not generally require lead agencies to consider how existing environmental conditions might impact a project's users or residents, except where the project would significantly exacerbate an existing environmental condition. Accordingly, the significance criteria above related to exposure of persons to noise levels in excess of standards in the General Plan or Noise Ordinance, exposure of persons to excessive groundborne vibration or groundborne noise levels, and people being substantially affected by existing noise levels are relevant only to the extent that the project significantly exacerbates the existing noise environment. Thus, the analysis below evaluates whether the proposed project could significantly exacerbate the existing or future noise environment. An impact is considered significant if implementation of subsequent projects that may be permitted by the Plan, or overall development under the Plan including proposed street network changes and open space improvements, would significantly exacerbate existing or future noise above levels that would occur without the project.

This analysis identifies potential noise impacts associated with future development that could result from implementation of the Plan. Noise issues evaluated in this section include (1) noise generated by future increases in traffic volumes under the Plan in combination with traffic volumes that would be redistributed as a result of implementation of the proposed street network changes; (2) noise that would be generated by fixed-noise sources and/or other sources of substantial noise; (3) compatibility of potential future uses with the San Francisco Land Use Compatibility Guidelines for Community Noise; and (4) construction noise and vibration. Land use development, including residential development has the potential to result in noise as vehicle trips associated with development may have indirect noise impacts and stationary equipment such as air handling equipment can result in direct noise exposure impacts to adjacent sensitive uses.

In general, traffic noise increases of less than three dBA are not perceptible to people, while a five dBA increase is readily noticeable.[245] Therefore, permanent increases in ambient noise levels of five dBA or more are considered a significant impact, unless the resulting noise environment is unacceptable for the surrounding uses. Here, a permanent increase in ambient noise levels of three dBA is considered a significant impact because existing noise levels already exceed satisfactory standards for residential uses, as shown on Figure IV.E-3. The existing average ambient noise level in the Plan Area is approximately 74–75 dBA L_{dn}, which exceeds the levels considered satisfactory for all land uses (except for certain recreational or commercial uses); therefore, this EIR considers an increase in ambient noise levels from traffic above three dBA to be a significant impact.

[244] *California Building Industry Association v. Bay Area Air Quality Management District,* 62 Cal.4th 369. Opinion Filed December 17, 2015.

[245] California Department of Transportation, Division of Environmental Analysis, "Technical Noise Supplement," November 2009; pp. 2-48–2-49. Available at http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf, accessed on August 29, 2016.

For noise generating uses, noise impacts are determined based on compliance with Section 2909 of the Noise Ordinance. Section 2909 of the Noise Ordinance specifies noise limits for fixed stationary noise sources that do not specifically apply to all types of noise generating uses. However, the restrictions in the Noise Ordinance are designed to prevent sleep disturbance, protect public health, and prevent the acoustical environment from progressive deterioration and are therefore appropriate to apply to noise generating sources not specifically regulated under the Noise Ordinance with the exception of transportation sources, which are evaluated based on the criteria above.

Section 2909 of the Noise Ordinance establishes property line noise limits in excess of ambient noise levels that should not be exceed at five dBA for residential uses, eight dBA for commercial uses, and 10 dBA for noise from public properties. Section 2909(d) also establishes that fixed noise sources cannot exceed 55 dBA at interior residential units during daytime hours (7:00 am to 10:00 pm) and 45 dBA during nighttime hours (10:00 pm to 7:00 am). Generally, if a noise generating use meets the property line noise levels additional analysis of compliance with Section 2909(d) requirements is not necessary. The exception would be in cases where residential uses directly abut the noise generating use.

Construction noise impacts are generally evaluated based on standards in the Noise Ordinance, specifically the standard in Section 2907(a) of the *Police Code*, which limits noise from construction equipment to 80 dBA at a distance of 100 feet from such equipment. As discussed in the Environmental Setting section above, construction noise is assumed to attenuate at a rate of six dBA per doubling of distance. Thus, for example, construction activity that generates a noise level of 80 dBA at a distance of 50 feet from the noise source would be reduced to 74 dBA at 100 feet, and to 68 dBA at 200 feet.

The FTA has developed criteria for judging the significance of vibration produced by construction equipment, which is the only vibration-producing activity anticipated to occur as a result of Plan implementation. The FTA establishes the following standards to prevent architectural damage: (1) 0.5 in/sec PPV for reinforced-concrete, steel, or timber (no plaster) construction and (2) 0.2 in/sec PPV for fragile buildings (i.e., non-engineered timber or masonry structures).[246] These are used as the thresholds of significance for vibration impacts in this EIR.

Impact Evaluation

Impact NO-1: Development under the Plan, including the proposed street network changes, would generate noise that would result in exposure of persons to noise levels in excess of standards in the *San Francisco General Plan* or Noise Ordinance (Article 29 of the *Police Code*), and would result in a substantial permanent increase in ambient noise above existing levels. (Significant and Unavoidable with Mitigation)

Traffic Noise Impacts

Noise modeling was undertaken to evaluate the noise generated by increased traffic in the study area due to development allowed by the Plan and probable future cumulative projects that would generate traffic on study area streets (see Impact C-NO-1 for analysis of cumulative impacts), as well as the changes in traffic

[246] FTA, *Transit Noise and Vibration Impact Assessment*; see Table 12-3, p. 12-13.

noise that would result from redistribution of traffic with implementation of the proposed street network changes. Changes in traffic noise were evaluated between existing conditions and each of the three development scenarios: (1) the addition of traffic volumes related to growth from implementation of the Plan; (2) this same Plan-generated growth plus changes in the street network, with Howard and Folsom Streets remaining one-way streets; and (3) Plan growth plus street network changes and including conversion of Howard and Folsom Streets to two-way traffic operations. In total, three different comparisons (as shown in **Table IV.E-4, Traffic Noise Analysis Scenario Comparisons**) were made between the following analysis scenarios:

- Existing Conditions
- Existing + Growth Attributed to the Plan
- Existing + Growth Attributed to the Plan with Street Improvements (Folsom/Howard one-way)
- Existing + Growth Attributed to the Plan with Street Improvements (Folsom/Howard two-way)

TABLE IV.E-4 TRAFFIC NOISE ANALYSIS SCENARIO COMPARISONS

Change in Traffic Noise	Components of Change
From Existing to Plan Land Use	Traffic noise from plan-generated growth only
From Existing to Existing plus Plan Land Use plus Street Network Changes (One-Way)	Traffic noise from plan growth plus Street Network Changes; Howard & Folsom remain one-way streets.
From Existing to Existing plus Plan Land Use plus Street Network Changes (Two-Way)	Traffic noise from plan growth plus Street Network Changes; Howard & Folsom converted to two-way streets.

The results of the traffic noise modeling revealed that effects of Plan-generated growth on the existing noise environment would be relatively limited. Of the nearly 149 street segments[247] (generally one block long and each evaluated for the three analysis scenario comparisons representing a change from one development scenario to another), only two street segments would experience increases in traffic-generated noise that would exceed three dBA—Howard Street between 10th and 11th Streets and Howard Street west of 11th Street (both of which are outside the Plan Area). These two street segments would experience an increase in traffic noise of three dBA or more due to the Plan's land use program plus the potential conversion of Howard and Folsom Streets to two-way operation. At the other locations, Plan traffic and the proposed street network changes would result in a noise increase of less than three dBA.

Table IV.E-5, Existing plus Plan Traffic Noise Analysis, presents the two street segments where traffic-generated noise would increase by three dBA or more. (Affected street segments within the study area are also shown in Figure IV.E-1.) The complete modeling for all street segments is included in Appendix D of this EIR.

[247] In the Plan transportation analysis, 80 study intersections and the street segments between these same intersections were modeled for the above scenarios. Some of the study intersections are outside the Plan Area to capture the effect of traffic changes due to the proposed street network changes that extend east and west of the Plan Area, primarily on Howard, Folsom, and Harrison Streets. Other intersections outside the Plan Area analyze effects on key gateway intersections, such as those on King Street, which leads to and from Interstate Highway 280.

TABLE IV.E-5 EXISTING PLUS PLAN TRAFFIC NOISE ANALYSIS

Segment (Cross Streets)	Existing	Existing + Plan Land Uses		Existing + Plan Land Uses 1-Way Howard/ Folsom		Existing + Plan Land Uses 2-Way Howard/ Folsom	
	Noise (dBA)	Noise (dBA)	Change from Existing	Noise (dBA)	Change from Existing	Noise (dBA)	Change from Existing
Fourth (Bryant / Brannan)	68.5	69.5	1.0	69.4	0.9	68.7	0.2
Fourth (Brannan / Townsend)	69.0	70.2	1.2	69.6	0.6	68.4	-0.6
Fifth (Bryant / Brannan)	71.2	72.6	1.4	72.3	1.1	72.4	1.2
Fifth (Brannan / Townsend)	68.8	70.7	1.8	71.3	2.4	71.2	2.3
Howard (Fifth / Sixth)	71.7	72.2	0.5	72.7	1.0	73.9	2.2
Howard (Sixth / Seventh)	70.6	71.1	0.5	71.3	0.6	72.7	2.1
Howard (Seventh / Eighth)	70.7	71.3	0.6	71.3	0.6	72.9	2.2
Howard (Eighth / Ninth)	71.0	71.3	0.4	71.3	0.4	73.3	2.3
Howard (Ninth / Tenth)	69.6	70.0	0.4	70.1	0.4	72.1	2.5
Howard (Tenth / Eleventh)	67.9	68.5	0.6	68.6	0.7	71.0	**3.1**
Howard west of Eleventh	66.9	67.0	0.2	67.0	0.2	72.1	**5.2**
Bryant east of Second	66.5	67.8	1.3	67.9	1.4	68.1	1.6
Bryant (Third / Fourth)	70.4	71.2	0.8	71.7	1.3	71.8	1.4
Increases of 3.0 dB or more			**0**		**0**		**2**

SOURCE: Environmental Science Associates, 2016.

NOTE:

Bold-face type indicates significant impact (increase of 3.0 dBA or more over existing conditions).

Traffic Generated by Development under the Plan

The noise modeling indicates that traffic increases under the Existing plus Plan scenario would result in noise increases of 2.5 dBA or less.[248] When compared to the three dBA perceptibility threshold, a 2.5 dBA noise increase would have a less-than-significant impact on existing residential and other noise-sensitive uses.

Under existing conditions, three-fourths of the street segments modeled experience traffic noise levels of 70 dBA (L_{dn}) or greater. As noted above, the *General Plan* Environmental Protection Element noise map indicates that nearly all major streets in the study area have traffic noise levels above 70 dBA, L_{dn}. Many of the street segments that were identified as having noise levels below 70 dBA are outside the Plan Area and away from the highest-traffic volume blocks near freeway on- and off-ramps. The addition of Plan traffic to existing conditions would increase the percentage of street segments with traffic noise levels of 70 dBA (L_{dn}) or greater from 74 percent to 77 percent, which would not substantially affect the overall ambient noise level in the study area. Moreover, as noted, none of the street segments would experience a noise increase of three dBA or greater. Therefore, traffic generated by anticipated Plan Area development alone would not result in a substantial permanent increase in

[248] The location of this increase of 2.5 dBA, Fifth Street between Brannan and Townsend Streets, is not included in Table IV.E-5, as it would occur at a location that would not result in a 3 dBA increase in any analysis scenario, including cumulative analysis scenarios. This and all modeling results are included in Appendix D.

ambient noise levels, and would not expose persons to noise levels in excess of standards in the *San Francisco General Plan*. Given these findings, together with the fact that the study area already exceeds 60 dBA, the maximum "acceptable" noise level for residential uses, the Plan would not result in people being substantially affected by noise levels, and would not significantly exacerbate the existing noise environment.

Proposed Street Network Changes

The additional consideration of the proposed changes to the street network results in minor changes to the foregoing analysis. When compared to existing conditions, the one-way Howard and Folsom street network changes (that is, Plan growth plus the street network changes) would result in increases of 2.4 dBA or less along study segments; these increases of less than three dBA would not be noticeable and would be ***less than significant***.

The two-way Howard and Folsom Streets network changes would result in noise increases greater than three dBA along study segments at two locations: a 3.1 dBA and 5.2 dBA increase along two segments of Howard Street, 10th to 11th Street and west of 11th Street, respectively, when compared to existing conditions (see Table IV.E-5). This would be a significant noise impact at these two locations. At all other locations, traffic noise increases would be less than three dBA and thus would be ***less than significant***.

There is no feasible way to reduce traffic noise, short of reducing traffic volumes. Increased traffic noise would primarily affect residents of existing buildings, particularly residents living in early 20th century residential structures that are less likely than newer buildings to have adequate noise insulation. **Mitigation Measure M-NO-1a, Transportation Demand Management for New Development**, would reduce traffic noise by reducing traffic volumes generated in the study area. The Transportation Demand Management (TDM) measures would encourage drivers to switch to alternative modes of travel, such as walking, biking, and transit. However, it cannot be stated with certainty that the reduction in traffic volume would be sufficient to avoid significant impacts to existing land uses in and near the study area.

With implementation of **Mitigation Measure M-NO-1a, Transportation Demand Management Plan for Development Projects**, sustainable modes would be encouraged and the use of single-occupant vehicles would be discouraged, which would increase the use of taxi/rideshare, transit, bicycle, and pedestrian modes. The impacts resulting from such a shift of vehicle trips to other modes are difficult to predict. If many vehicle trips were to shift to transit and pedestrian trips, it is possible that **Mitigation Measure M-NO-1a** could contribute to Plan-related significant and unavoidable transit and pedestrian impacts (see Impact TR-2 for transit and Impact TR-3 for pedestrians), but not likely to a substantial degree. The potential for such contributions to occur as a result of **Mitigation Measure M-NO-1a** is speculative because it is unknown which TDM specific measures subsequent development project sponsors would select. Moreover, current literature does not document which travel modes people would choose in response to implementation of several TDM measures from the menu provided as part of **Mitigation Measure M-NO-1a**. In addition, most subsequent development projects that would be subject to **Mitigation Measure M-NO-1a** would also be subject to the Transportation Sustainability Fee.[249] The Transportation Sustainability Fee requires developers to pay a portion of their fair share to enhance intersections, sidewalks, and transit facilities to accommodate the

[249] San Francisco Planning Code Section 411A.

increase in trips associated with new development. Therefore, implementation of **Mitigation Measure M-NO-1a** would not cause any significant effects in addition to those that would be caused by the Plan as proposed.

As discussed in the Regulatory Framework section above, new residential buildings would be subject to the interior noise standards in Title 24 of the *California Building Code*, which requires that interior noise levels from outside sources not exceed 45 dBA L_{dn}. Therefore, new residential uses would not be substantially affected by Plan-generated traffic noise. Subsequent development under the Plan could also include new non-residential noise-sensitive land uses. However, the 2013 *San Francisco Green Building Code*, which incorporates the 2013 *California Green Building Standards Code*, requires that non-residential buildings that are exposed to one-hour traffic noise levels or 65 dBA, L_{eq}, or greater be constructed with minimum noise insulation properties or meet a maximum hourly noise level of 50 dBA in occupied interior areas (*California Green Building Code* Sections 5.507.4.1.1 and 5.507.4.2). Therefore, new non-residential noise-sensitive land uses would be sufficiently insulated from substantial exterior noise, and like new residential uses, the noise impact would be ***less than significant***.

In summary, Plan traffic growth, along with the potential two-way operation of Howard and Folsom Streets, would subject existing residents and possibly other sensitive receptors on Howard Street west of 10th Street to perceptible increases in ambient noise in excess of three dBA, resulting in a significant impact. Implementation of Mitigation Measure M-NO-1a, Transportation Demand Management for New Development, would require subsequent development projects that propose 10 or more units, new non-residential uses greater than 10,000 square feet, or a change of use covering greater than 25,000 square feet of non-residential space to implement a suite of TDM measures. Mitigation Measure M-NO-1a would encourage the use of sustainable modes of transportation and discourage travel by vehicle, thereby reducing vehicle trips and associated traffic noise generated by subsequent development projects. However, the effectiveness of Mitigation Measure M-NO-1a to reduce traffic noise to less-than-significant levels is unknown at this time; therefore, noise impacts associated with implementation of the Plan and the Folsom and Howard two-way street network operation would be considered ***significant and unavoidable with mitigation***.

Proposed Open Space Improvements

Any new open spaces and related improvements, such as landscaped, pedestrian-oriented alleys, and privately owned, publicly-accessible open spaces (POPOS) in the Plan Area would primarily serve local residents and employees. No large-scale, city-serving or regional open space improvements are planned or anticipated. Therefore, the proposed open space improvements would generate little, if any, new vehicular traffic and, accordingly, would result in little or no increase in indirect traffic-generated noise.

Noise Generating Sources

Development under the Plan

Development of certain commercial uses in proximity to existing residential uses would increase the potential for noise disturbance or conflicts. Sources of noise typically associated with non-residential uses can include loading/unloading activities, delivery trucks, parking cars, garbage trucks, and use of refuse bins. In addition, production, distribution, and repair (PDR) uses, such as light industrial uses, trucking uses, and commercial contractors, may operate early in the morning and/or late at night, when residents would be expecting a

relatively quiet environment. Stationary sources of noise from commercial and PDR uses can include refrigeration, air conditioning, heating units, and generators. As stated in the Regulatory Framework section, above, the City's Noise Ordinance limits noise from residential and commercial properties. However, depending on the type of commercial activities, noise generated from the sources described above could result in a substantial permanent, temporary or periodic increase in ambient noise levels, creating noise conflicts between residential and commercial uses. Similar conflicts could arise in the case of other non-residential sensitive uses, such as child care centers, schools, and the like. Noise-generating uses that result in a substantial permanent, temporary, or periodic increase in noise levels in excess of the standards in Section 2909 of the Noise Ordinance would be a significant impact. Implementation of **Mitigation Measure M-NO-1b, Siting of Noise Generating Uses**, would ensure that development of new uses that could create substantial new sources of noise not already regulated by Section 2909 of the Noise Ordinance is properly evaluated and potential effects ameliorated so that potential conflicts between new noise-generating uses and existing noise-sensitive uses are avoided. This mitigation measure would reduce noise impacts from noise generating sources to a ***less-than-significant*** level.

Proposed Open Space Improvements

As noted above, proposed open space improvements in the Plan Area are likely to include landscaped, pedestrian-oriented alleys; POPOS; and, potentially, one or more small community parks. No large-scale, city-serving or regional open space improvements, such as ball fields, or other major active use areas are planned or anticipated. Therefore, proposed open space improvements that would be implemented as part of the Plan would not be expected to introduce a new source of substantial noise that could cause disturbance to residential or other noise-sensitive land uses.

Noise Compatibility of Future Uses

As indicated above, Plan-generated traffic noise under the Folsom/Howard two-way configuration would result in a significant increase in ambient noise levels, meaning that Plan-generated traffic would significantly exacerbate the existing noise environment. Therefore, this section analyzes whether the Plan would expose people to noise levels in excess of standards established in the *San Francisco General Plan* (significance criterion 1). As stated in the Environmental Setting, much of the study area has traffic noise levels that exceed 70 dBA along major streets, although conditions are quieter along mid-block alleys; as also noted in the Environmental Setting, noise levels in the entire Plan Area exceed 60 dBA, the maximum "satisfactory" noise level for residential uses as identified in the *San Francisco General Plan*. In compliance with the *San Francisco Building Code*, new development would be required to incorporate sufficient noise insulation to result in an interior noise level of 45 dBA in all habitable rooms. A typical new building with double-glazed windows can provide sufficient noise reduction with the windows closed; however, this requires that an alternative source of fresh air, such as mechanical ventilation, be provided. Therefore, residential development in the Plan Area would be required to incorporate sufficient noise insulation such that residents would not be exposed to noise levels in excess of established standards or be substantially affected by existing or existing plus project noise levels.

The Plan proposes to permit nighttime entertainment uses within a limited area, south of Harrison Street between Fourth and Sixth Streets, where the Plan would establish a new Central SoMa SUD. The underlying zoning in this area is proposed as MUO, which permits a variety of uses, including both office and residential use, along with small-scale light industrial uses. Because entertainment uses typically generate nighttime noise

and residential uses require quieter nighttime noise levels, noise conflicts could result where these land uses are in proximity to one another and where buildings may not be sufficiently insulated to prevent the intrusion of excessive noise. This potential would increase with development of new housing, which in some cases could result in a significant impact. There is currently only a small number of Places of Entertainment within the area proposed for the Central SoMa SUD and the Plan notes that "there is an opportunity to address potential conflicts before they occur, through soundproofing [of new venues] and policing measures already required by the City." Depending on proximity of Places of Entertainment and presence of intervening buildings (which would serve as effective noise barriers) or other attenuating factors, it is possible that new residential development would have to be designed to minimize noise conflicts with existing entertainment uses, as required by the City's recently adopted revisions to the *Building Code*, *Administrative Code*, *Planning Code*, and *Police Code*, described in the Regulatory Framework under Regulation of Noise from Places of Entertainment. Additionally, new entertainment uses would be required to be designed to minimize noise impacts on any nearby existing residential uses (Mitigation Measure M-NO-1b, Siting of Noise-Generating Uses, along with *Police Code* provisions that allow the Entertainment Commission to adopt noise-related permit conditions on Places of Entertainment). Combined implementation of the City code provisions and Mitigation Measure M-NO-1b, Siting of Noise Generating Uses, would reduce the potential for noise conflicts between new entertainment and residential uses to a ***less-than-significant*** level.

Proposed Street Network Changes

Implementation of proposed street network changes would alter traffic noise levels along roadways in the study area vicinity, and these changes are discussed above.

Proposed Open Space Improvements

Depending on the nature of the open spaces developed, including design and proximity to major streets, proposed public open space areas could be located in areas where noise levels exceed 70 dBA, L_{dn}, the level at which speech interference occurs. As shown in the land use compatibility chart (Figure IV.E-3, Land Use Compatibility Chart for Community Noise), the noise level in parks and playgrounds is considered unsatisfactory. However, in urban environments, playgrounds and parks (active recreation areas) are not considered a noise sensitive use. Users would be exposed to noise in open spaces of shorter duration and due to their use as recreational facilities are not likely to result in the adverse health effects from sleep disturbance. Therefore, impacts to proposed open spaces from noise generated by the Plan and subsequent development projects would not be considered a significant impact.

Mitigation Measures

Mitigation Measure M-NO-1a: Transportation Demand Management for New Development Projects. To reduce vehicle noise from subsequent development projects in the Plan Area, the project sponsor and subsequent property owners shall develop and implement a TDM Plan as part of project approval. The scope and number of TDM measures included in the TDM Plan shall be in accordance with Planning Department's TDM Program Standards for the type of development proposed, and

accompanying appendices.[250] The TDM Program Standards and accompanying appendices are expected to be refined as planning for the proposed TDM Ordinance continues. Each subsequent development project's TDM Plan shall conform to the most recent version of the TDM Program Standards and accompanying appendices available at the time of the project Approval Action, as defined in Section 31.04(h) of the San Francisco Administrative Code. The Planning Department shall review and approve the TDM Plan, as well as any subsequent revisions to the TDM Plan. The TDM Plan shall target a reduction in the vehicle miles traveled (VMT) rate (i.e., VMT per capita), monitor and evaluate project performance (actual VMT), and adjust TDM measures over time to attempt to meet VMT target reduction. This measure is applicable to all projects within the Plan Area that do not otherwise qualify for an exemption under Article 19 of the CEQA Guidelines. This measure may be superseded if a comparable TDM Ordinance is adopted that applies to projects in the Plan Area. The TDM Plan shall be developed by the project sponsor for each particular development project, and shall aim to achieve the maximum VMT rate reduction feasible. The TDM Plan shall be developed in consultation with the Planning Department and rely generally on implementation of measures listed in *Updating Transportation Impacts Analysis in the CEQA Guidelines* document published by California Office of Planning and Research on August 6, 2014, or whatever document supersedes it, and the Planning Department TDM Program Standards and accompanying appendices in effect at the time of the Project Approval Action. The TDM program may include, but is not limited to the types of measures, which are summarized below for explanatory example purposes. Actual development project TDM measures shall be applied from the TDM Program Standards and accompanying appendices, which describe the scope and applicability of candidate measures in detail:

1. Active Transportation: Provision of streetscape improvements to encourage walking, secure bicycle parking, shower and locker facilities for cyclists, subsidized bike share memberships for project occupants, bicycle repair and maintenance services, and other bicycle-related services
2. Car-Share: Provision of car-share parking spaces and subsidized memberships for project occupants
3. Delivery: Provision of amenities and services to support delivery of goods to project occupants
4. Family-Oriented Measures: Provision of on-site childcare and other amenities to support the use of sustainable transportation modes by families
5. High-Occupancy Vehicles: Provision of carpooling/vanpooling incentives and shuttle bus service
6. Information: Provision of multimodal wayfinding signage, transportation information displays, and tailored transportation marketing services
7. Land Use: Provision of on-site affordable housing and healthy food retail services in underserved areas
8. Parking: Provision of unbundled parking, short term daily parking provision, parking cash out offers, and reduced off-street parking supply.

[250] San Francisco Planning Department, *Draft TDM Program Standards*, July 2016, and accompanying appendices. The most up-to-date *Draft TDM Program Standards* and accompanying appendices are available at http://sf-planning.org/tdm-materials-and-resources. Accessed on September 19, 2016.

Mitigation Measure M-NO-1b: Siting of Noise-Generating Uses. To reduce potential conflicts between existing sensitive receptors and new noise-generating uses, for new development including PDR, Places of Entertainment, or other uses that would potentially generate noise levels substantially in excess of ambient noise (either short-term during the nighttime hours, or as a 24-hour average), the Planning Department shall require the preparation of a noise analysis that includes, at a minimum, a site survey to identify potential noise-sensitive uses within 900 feet of, and that have a direct line-of-sight to, the project site, and including at least one 24-hour noise measurement (with maximum noise level readings taken so as to be able to accurately describe maximum levels reached during nighttime hours), prior to the first project approval action. The analysis shall be prepared by persons qualified in acoustical analysis and/or engineering and shall demonstrate with reasonable certainty that the proposed use would not adversely affect nearby noise-sensitive uses, and that there are no particular circumstances about the proposed project site that appear to warrant heightened concern about noise levels that would be generated by the proposed use. Should such concerns be present, the Department may require the completion of a detailed noise assessment by person(s) qualified in acoustical analysis and/or engineering prior to the first project approval action, and the incorporation of noise reduction measures as recommended by the noise assessment.

Significance after Mitigation: Implementation of Mitigation Measure M-NO-1b, Siting of Noise Generating Uses, and compliance with the *San Francisco Building Code*, *San Francisco Green Building Code*, and Regulation of Noise from Places of Entertainment would reduce noise impacts to the maximum extent feasible, consistent with the *San Francisco General Plan*, and would render impacts less than significant with respect to exposure of new residential receptors and other new sensitive land uses to excessive noise levels or permanent increases in ambient noise resulting from implementation of the Plan. However, existing sensitive land uses would be adversely affected by increased traffic noise levels generated by Plan traffic on Howard Street under two-way Howard and Folsom Streets network changes. This impact could be substantially reduced by implementation of Mitigation Measure M-NO-1a, but it is uncertain the degree to which this mitigation measure could reduce traffic noise to a less-than-significant level. Therefore, this impact is considered ***significant and unavoidable*** for the development of the Plan in combination with two-way street network changes only.

Construction-Related Noise Increases

Impact NO-2: Development under the Plan, including the proposed street network changes and open space improvements, would result in construction activities in the Plan Area that could expose persons to substantial temporary or periodic increases in noise levels substantially in excess of ambient levels. (Significant and Unavoidable with Mitigation)

Development under the Plan

Development that could result from implementation of the Plan would result in construction of new buildings, demolition, or retrofitting (if applicable) near existing residential or other noise-sensitive uses. Increased ambient noise levels from construction would be considered short-term and intermittent.

Construction activity noise levels at and near any construction site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. Construction-related material haul trips would increase ambient noise levels along haul routes, with the magnitude of the

increase depending on the number of haul trips made and types of vehicles used. In addition, certain types of construction equipment generate percussive noises (such as pile driving), which can be particularly annoying. Due to the programmatic nature of the Plan, it is assumed that at least some development in the Plan Area would necessitate pile driving. **Table IV.E-6, Typical Construction Equipment Noise Levels**, shows typical noise levels generated by construction equipment.

TABLE IV.E-6 TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Construction Equipment	Noise Level at 50 Feet (dB, L_{max})	Noise Level at 100 Feet (dB, L_{max})
Impact Pile Driver[a]	101 (intermittent)	95 (intermittent)
Hoe Ram (Impact Hammer)[a]	90	84
Concrete Saw	90	84
Jackhammer[a]	89	83
Grader	85	79
Auger Drill Rig	84	78
Tractor	84	78
Bulldozer	82	76
Concrete Pump Truck	81	75
Excavator	81	75
Crane	81	75
Roller	80	74
Front End Loader	79	73
Air Compressor	78	72
Backhoe	78	72
Paver	77	71
Dump Truck	76	70

SOURCE: Federal Highway Administration, *Roadway Construction Noise Model User's Guide*, 2006.
NOTE:
a. Impact Tool.

Construction of probable future projects in the Plan Area could occur adjacent to or near noise-sensitive receptors. As indicated in **Table IV.E-7, Vibration Levels for Construction Equipment**, p. IV.E-28, the noise level associated with, for example, a concrete saw, is 90 dBA at 50 feet and 84 dBA at 100 feet, which would substantially exceed the ambient noise levels of approximately 70 to 75 dBA, as described in the Environmental Setting and, absent noise controls, would exceed the limit specified in the *Police Code* of 80 dBA at 100 feet. This would be a significant impact. Similar noise levels could be reached with operation of multiple pieces of construction equipment, on the same site or on multiple sites, depending on their distance from sensitive receptors. Similarly, the duration of noise experienced by receptors may be increased due to overlapping construction projects. Compliance with the *Police Code* and implementation of **Mitigation Measure M-NO-2a, General Construction Noise-Control Measures**, would reduce construction noise to the maximum feasible extent. With implementation of this measure, construction noise from individual

development projects within the Plan Area would be reduced to levels that would not substantially exceed ambient noise, thus reducing potential construction-related noise impacts on adjacent or nearby noise-sensitive receptors to a less-than-significant level at individual development sites. However, if multiple projects were under construction simultaneously in close proximity to the same sensitive receptors, the combined effect of these construction noise impacts may result in noise levels for which the available, feasible measures identified in Mitigation Measure M-NO-2a would be insufficient to reduce noise impacts to a less-than-significant level. Therefore, potential construction-related noise impacts on adjacent or nearby noise-sensitive receptors would be ***significant and unavoidable***.

In the event that pile driving is required for a subsequent development project, the sponsor of that project would be required to implement **Mitigation Measure M-NO-2b, Noise Control Measures for Pile Driving**, which would reduce pile-driving noise impacts to a less-than-significant level at individual development sites. However, as stated above for standard construction noise impacts, if multiple projects involving pile driving were to be under construction simultaneously in close proximity to the same sensitive receptors, the combined effect of these noise impacts may result in noise levels for which the available, feasible measures identified in Mitigation Measure M-NO-2b would be insufficient to reduce the construction-related noise impacts to a less-than-significant level. Therefore, adverse impacts from pile-driving noise upon sensitive receptors near multiple construction sites would be ***significant and unavoidable***.

Proposed Street Network Changes and Proposed Open Space Improvements

Proposed street network changes and open space improvements in the Plan Area would include use of similar construction equipment as would development projects, although typically for a lesser duration and generally with fewer pieces of equipment than for a major development. Accordingly, construction noise impacts would be similar to, or somewhat less substantial than, those for subsequent development projects. Pile driving would not be necessary for the street network changes or open space improvements, but they could require the use of jackhammers. Construction of open space improvements and street network changes that require the use of impact tools could result in significant construction noise impacts. Accordingly, Mitigation Measure M-NO-2a would reduce construction noise impacts from individual open space and street network projects to a less-than-significant level. However, as stated above, construction noise from multiple projects, such as construction along city streets in proximity to construction of a subsequent development project could result in construction noise at nearby sensitive receptor locations that cannot be reduced to less than significant with mitigation and would therefore be considered ***significant and unavoidable***. Mitigation Measure M-NO-2b would not be applicable to the street network changes or open space improvements because pile driving would not be necessary.

Mitigation Measures

Mitigation Measure M-NO-2a: General Construction Noise Control Measures. To ensure that project noise from construction activities is reduced to the maximum extent feasible, the project sponsor of a development project in the Plan Area that is within 100 feet of noise-sensitive receptors shall undertake the following:

- Require the general contractor to ensure that equipment and trucks used for project construction utilize the best available noise control techniques (e.g., improved mufflers,

equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds), wherever feasible.

- Require the general contractor to locate stationary noise sources (such as compressors) as far from adjacent or nearby sensitive receptors as possible, to muffle such noise sources, and to construct barriers around such sources and/or the construction site, which could reduce construction noise by as much as five dBA. To further reduce noise, the contractor shall locate stationary equipment in pit areas or excavated areas, if feasible.
- Require the general contractor to use impact tools (e.g., jack hammers, pavement breakers, and rock drills) that are hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used, along with external noise jackets on the tools, which could reduce noise levels by as much as 10 dBA.
- Include noise control requirements in specifications provided to construction contractors. Such requirements could include, but are not limited to, performing all work in a manner that minimizes noise to the extent feasible; use of equipment with effective mufflers; undertaking the most noisy activities during times of least disturbance to surrounding residents and occupants, as feasible; and selecting haul routes that avoid residential buildings to the extent that such routes are otherwise feasible.
- Prior to the issuance of each building permit, along with the submission of construction documents, submit to the Planning Department and Department of Building Inspection (DBI) a list of measures that shall be implemented and that shall respond to and track complaints pertaining to construction noise. These measures shall include (1) a procedure and phone numbers for notifying DBI and the Police Department (during regular construction hours and off-hours); (2) a sign posted on-site describing noise complaint procedures and a complaint hotline number that shall be answered at all times during construction; (3) designation of an on-site construction complaint and enforcement manager for the project; and (4) notification of neighboring residents and non-residential building managers within 300 feet of the project construction area at least 30 days in advance of extreme noise generating activities (defined as activities generating anticipated noise levels of 80 dBA or greater without noise controls, which is the standard in the *Police Code*) about the estimated duration of the activity.

Mitigation Measure M-NO-2b: Noise and Vibration Control Measures during Pile Driving. For individual projects that require pile driving, a set of site-specific noise attenuation measures shall be prepared under the supervision of a qualified acoustical consultant. These attenuation measures shall be included in construction of the project and shall include as many of the following control strategies, and any other effective strategies, as feasible:

- The project sponsor of a development project in the Plan Area shall require the construction contractor to erect temporary plywood or similar solid noise barriers along the boundaries of the project site to shield potential sensitive receptors and reduce noise levels;
- The project sponsor of a development project in the Plan Area shall require the construction contractor to implement "quiet" pile-driving technology (such as pre-drilling of piles, sonic pile drivers, and the use of more than one pile driver to shorten the total pile driving duration), where feasible, with consideration of geotechnical and structural requirements and

soil conditions (including limiting vibration levels to the FTA's 0.5 inch per second PPV to minimize architectural damage to adjacent structures);

- The project sponsor of a development project in the Plan Area shall require the construction contractor to monitor the effectiveness of noise attenuation measures by taking noise measurements, at a distance of 100 feet, at least once per day during pile-driving; and
- The project sponsor of a development project in the Plan Area shall require that the construction contractor limit pile driving activity to result in the least disturbance to neighboring uses.

Significance after Mitigation: Implementation of Mitigation Measures M-NO-2a and M-NO-2b would reduce the noise impact from future construction throughout the Plan Area to a less-than-significant level from individual construction sites. However, as discussed in Chapter IV, Overview, under Subsequent Development Projects, a number of projects have environmental applications on file and are dependent upon the Central SoMa Plan's proposed zoning. It is possible that such projects, some of which are located in close proximity to each other, could be under construction at the same time. The combined effect of these noise impacts may result in noise levels for which available feasible mitigation measures may not be sufficient to reduce the impact to less than significant. Thus, this impact is conservatively judged to be ***significant and unavoidable***.

Construction-Related Vibration Effects

Impact NO-3: Development under the Plan, including the proposed street network changes, would result in construction activities that could expose persons to temporary increases in vibration substantially in excess of ambient levels. (Less than Significant with Mitigation)

Development under the Plan

Construction in the Plan Area could potentially expose people to the impacts of excess groundborne vibration or noise levels. Specifically, vibration created through construction activities such as pile driving could occur adjacent to sensitive receptors.

As shown in **Table IV.E-7, Vibration Levels for Construction Equipment**, p. IV.E-28, pile driving can generate vibration levels as high as 1.518 in/sec PPV. Where pile driving is not required, use of heavy equipment for project construction can generate vibration levels up to 0.089 in/sec PPV at a distance of 25 feet, for the largest typical construction equipment such as a large bulldozer. Because most streets in the study area are 82.5 feet wide, vibration from construction would have the greatest effect on receptors on adjacent parcels. Vibration levels, measured as PPV, across the street from construction sites would be reduced by more than 80 percent. Other pieces of equipment, such as a small bulldozer, would result in lower vibration levels. Therefore, with the exception of pile driving, most construction activities would generate ground-borne vibration levels that would not exceed the FTA criterion of 0.5 in/sec PPV for structural damage to typical construction (reinforced concrete), a less-than-significant vibration impact. However, if pile driving is required, vibration levels at adjacent buildings (within 65 feet, allowing for a 25 percent safety factor) could exceed the FTA's criterion of 0.5 in/sec PPV for structural damage, resulting in a significant vibration impact. Additionally, multiple projects under construction could increase vibration, although vibration tends to

dissipate quickly with distance and therefore effects from one project would not typically combine to result in a significant vibration impact from multiple simultaneous projects constructed under the Plan. Implementation of Mitigation Measure M-NO-2b, Noise and Vibration Control Measures during Pile Driving, would ensure that vibration impacts from any pile driving activities associated with future construction would be reduced to a ***less-than-significant*** level.

TABLE IV.E-7 VIBRATION LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	Peak Particle Velocity (PPV) (in/sec) At 25 Feet[a]
Pile Driver (upper range)	1.518
Pile Driver (typical)	0.644
Caisson Drilling, Large Bulldozer	0.089
Loaded Trucks	0.076
Jackhammer	0.035

SOURCE: FTA, *Transit Noise and Vibration Impact Assessment*, DTA-VA-90-1003-06, U.S. Department of Transportation, May 2006. Available on http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf (accessed February 1, 2012).

NOTE:

a. Vibration amplitudes for construction equipment assume normal propagation conditions.

Groundborne vibration associated with pile-driving activities could exceed the FTA criterion of 0.2 in/sec PPV for fragile buildings, which could affect historic resources, and result in a significant impact. Mitigation for this potential impact is addressed in Section IV.D, Cultural and Paleontological Resources. Mitigation identified in that section would require contractors to undertake certain best practices during construction and to conduct pre-construction surveys of historical resources within 125 feet of proposed construction (to allow for a 25 percent safety factor) and to conduct construction-period monitoring of these resources to ensure that potential construction impacts would be reduced by the maximum feasible degree, and would be ***less than significant***.

Proposed Street Network Changes and Proposed Open Space Improvements

As with construction noise, vibration effects associated with construction of the proposed street network changes and open space improvements would be similar to, or somewhat less substantial than, those for subsequent development projects. However, because pile driving would not be necessary for the street network changes or open space improvements, vibration effects from the street network changes and open space improvements would be ***less than significant***.

> **Mitigation:** Implement **Mitigation Measures M-NO-2b, Noise and Vibration Control Measures During Pile Driving**, **M-CP-3a, Protect Historical Resources from Adjacent Construction Activities**, and **M-CP-3b, Construction Monitoring Program for Historical Resources**.

Significance after Mitigation: Implementation of Mitigation Measures M-NO-2b, M-CP-3a, and M-CP-3b would reduce the vibration impact from future construction to a ***less-than-significant*** level.

IV.E.5 Cumulative Impacts

The cumulative context for noise impacts is the vicinity surrounding the Plan Area and proposed street network changes (i.e., the study area). The analysis considers traffic noise from cumulative growth, which was forecast for the EIR transportation analysis by the San Francisco Transportation Authority's citywide travel demand model.

Impact C-NO-1: Development under the Plan, including the proposed street network changes and open space improvements, in combination with past, present, and reasonably foreseeable future projects, would result in cumulative noise impacts. (Significant and Unavoidable with Mitigation)

Changes in traffic noise were evaluated between cumulative 2040 conditions without Plan implementation and the same three development scenarios (listed below). The three cumulative growth scenarios were also evaluated against the existing condition to ensure that cumulative effects were captured.[251] These five scenarios, listed below, result in seven cumulative traffic noise analysis scenario comparisons, which are shown in **Table IV.E-8, Cumulative Traffic Noise Analysis Scenario Comparisons**.

- Existing Conditions
- 2040 Cumulative (No Project)
- 2040 Cumulative + Growth Attributed to the Plan
- 2040 Cumulative + Growth Attributed to the Plan with Street Improvements (Folsom/Howard one-way)
- 2040 Cumulative + Growth Attributed to the Plan with Street Improvements (Folsom/Howard two-way)

TABLE IV.E-8 CUMULATIVE TRAFFIC NOISE ANALYSIS SCENARIO COMPARISONS

Change in Traffic Noise	Components of Change
From Existing to Cumulative 2040	Traffic noise from cumulative growth excluding Plan-generated growth
From Existing to Cumulative 2040 plus Plan Land Use	Traffic noise from cumulative growth and Plan-generated growth
From Cumulative 2040 to Cumulative 2040 plus Plan Land Use	Traffic noise from plan-generated growth only
From Existing to 2040 Cumulative plus Plan Land Use plus Street Network Changes (One-Way)	Traffic noise from cumulative Growth plus Plan growth plus Street Network Changes; Howard & Folsom remain one-way streets.
From Cumulative 2040 to Cumulative 2040 plus Plan Land Use plus Street Network Changes (One-Way)	Traffic noise from plan growth plus Street Network Changes; Howard & Folsom remain one-way streets.
From Existing to 2040 Cumulative plus Plan Land Use plus Street Network Changes (Two-Way)	Traffic noise from cumulative Growth plus Plan growth plus Street Network Changes; Howard & Folsom converted to two-way streets.
From Cumulative 2040 to Cumulative 2040 plus Plan Land Use plus Street Network Changes (Two-Way)	Traffic noise from plan growth plus Street Network Changes; Howard & Folsom converted to two-way streets.

[251] The first cumulative scenario, Cumulative 2040 (Scenario 8), includes background growth to the year 2040 and Plan Area growth consistent with existing use districts and height and bulk limits.

The results of the cumulative traffic noise modeling are shown in **Table IV.E-9, Cumulative plus Plan Traffic Noise Analysis**, and reveal that effects of Plan-generated and cumulative traffic growth would be relatively minimal overall. Of the 149 street segments, each evaluated for seven analysis scenario comparisons representing a change from existing or cumulative traffic noise to noise generated by Plan development and, in some cases, the proposed street network changes, 15 street segments would experience increases in traffic-generated noise that would exceed three dBA, which is generally considered the minimum change that is perceptible to humans. Cumulative traffic alone (without the Plan) would result in an increase of 3.1 dBA on Fourth Street between Brannan and Townsend Street (Column D in Table IV.E-9).

TABLE IV.E-9 CUMULATIVE PLUS PLAN TRAFFIC NOISE ANALYSIS

		Cumulative		Cumulative + Plan Land Uses			Cumulative + 1-Way Howard/Folsom			Cumulative + 2-Way Howard/Folsom		
Reference Column	**Exist.**		**D**		**E**	**F**		**G**	**H**		**J**	**K**
Segment (Cross Streets)	**Noise (dBA)**	**Noise (dBA)**	**Δ. fr. Exist.**	**Noise (dBA)**	**Δ fr. Exist.**	**Δ fr. Cum.**	**Noise (dBA)**	**Δ fr. Exist.**	**Δ fr. Cum.**	**Noise (dBA)**	**Δ fr. Exist.**	**Δ fr. Cum.**
Fourth (Bryant-Brannan)	68.5	70.7	2.2	70.9	2.3	0.1	70.7	2.2	0.0	71.6	**3.1**	0.9
Fourth (Brannan-Townsend)	69.0	72.1	**3.1**	71.7	2.7	0.4	71.4	2.4	-0.7	71.9	2.9	-0.2
Fifth (Bryant-Brannan)	71.2	74.0	2.8	74.5	**3.3**	0.4	73.6	2.4	-0.3	73.1	1.9	-0.9
Fifth (Brannan-Townsend)	68.8	70.0	1.1	71.5	2.7	1.6	72.0	**3.1**	2.0	71.2	2.3	1.2
Howard (Fifth-Sixth)	71.7	73.0	1.3	73.4	1.7	0.4	73.3	1.6	0.3	74.8	**3.1**	1.8
Howard (Sixth-Seventh)	70.6	72.2	1.5	72.8	2.2	0.6	72.3	1.7	0.1	74.1	**3.5**	2.0
Howard (Seventh-Eighth)	70.7	72.2	1.5	72.7	2.0	0.5	72.4	1.7	0.2	74.2	**3.5**	1.9
Howard (Eighth-Ninth)	71.0	72.1	1.1	72.6	1.6	0.5	72.3	1.3	0.1	74.7	**3.7**	2.6
Howard (Ninth-Tenth)	69.6	71.2	1.6	71.8	2.2	0.6	71.7	2.1	0.5	73.9	**4.3**	2.7
Howard (Tenth-Eleventh)	67.9	69.9	2.0	70.5	2.6	0.6	70.6	2.7	0.6	72.6	**4.7**	2.7
Howard west of Eleventh	66.9	68.4	1.5	68.2	1.3	-0.1	68.3	1.5	0.0	73.3	**6.5**	**5.0**
Bryant east of Second	66.5	68.9	2.4	69.3	2.8	0.4	69.6	**3.0**	0.6	69.7	**3.2**	0.8
Bryant (Third-Fourth)	70.4	72.3	1.9	72.7	2.3	0.3	73.1	2.7	0.8	73.6	**3.2**	1.2
Increases of 3.0 dB or more	**15 (Total)**		**1**		**1**	**0**		**2**	**0**		**10**	**1**

SOURCE: Environmental Science Associates.

NOTES:

Δ = Change

Bold-face type indicates significant impact (increase of 3.0 dBA or more over existing conditions).

It is also noted that not all of these noise increases would occur, and some are mutually exclusive (i.e., Howard and Folsom Streets would either operate as one-way or two way streets, so three dBA exceedances that occur under one of these operational scenarios would not occur if the other scenario were implemented). As shown in Table IV.E-9, two-way operation of Howard and Folsom Streets would result in a substantially greater number of street segments experiencing significant noise impacts because this scenario would be anticipated to shift a relatively large amount of traffic from Folsom Street to Howard Street.

Traffic Generated by Development Under the Plan

When Plan growth alone is added to the 2040 baseline cumulative condition, traffic noise increases would generally be less than three dBA. However, when this analysis scenario is compared to existing conditions, one street segment on Fifth Street between Bryant and Brannan Streets would experience a noise increase greater than three dBA (Column E in Table IV.E-9); this would be a significant cumulative impact. However, the Plan contribution would be minimal (less than 0.5 dBA) and thus not a considerable contribution to the significant cumulative impact. By 2040, cumulative traffic growth alone (without the Plan) would increase the percentage of street segments with traffic noise levels of 70 dBA (L_{dn}) or greater from 74 percent under existing conditions to 83 percent. With Plan growth, it would increase further to 86 percent.

Proposed Street Network Changes

Comparing existing noise levels with the 2040 cumulative plus Plan scenario with street network changes, Howard Street between Fifth and 11th Streets would experience the greatest increases in traffic noise of three dBA or greater due to a combination of cumulative growth, Plan growth, and two-way operation of Howard and Folsom Streets and this would be a significant cumulative impact (Column J in Table IV.E-9). For the entire portion of Howard Street west of Fifth Street, the proposed two-way street network changes—which would result in traffic volumes increasing by a greater degree on Howard Street—would be responsible for between about 40 percent and 70 percent of the cumulative increase in traffic noise. In addition, a significant cumulative impact would occur on Fourth Street between Bryant and Brannan Streets and on Bryant Street east of Fourth Street (Column J in Table IV.E-9). Here, the two-way street network change would result in about one-third of the increase in traffic noise. Therefore, Plan growth plus the street network changes with two-way operation of Howard and Folsom Streets would make a considerable contribution to cumulative significant traffic noise impacts. Plan growth plus the street network changes with one-way operation of Folsom and Howard Streets would likewise make a considerable contribution to cumulative significant traffic noise impacts, albeit at fewer locations: there would be only two street segments under one-way operations with traffic noise increases greater than three dBA (Fifth Street between Brannan and Townsend Streets and Bryant Street east of Second Street), and Plan traffic would increase noise by 0.6 dBA or more (20 percent or more of the increase). Under both the land use plan plus one-way and two-way options for Folsom and Howard Streets, the impact would be ***significant and unavoidable*** with mitigation for existing noise-sensitive land uses, and ***less than significant*** for new development.

Cumulative Construction Noise

Cumulative construction impacts would occur from other projects in the vicinity. As discussed in Chapter VI, Approach to Cumulative Analysis, there are several projects for which the Planning Department has applications on file in the Plan Area. The simultaneous construction of projects dependent upon the Plan is addressed in the Plan-level analysis (Impact NO-2). Other cumulative projects include 5M, 706 Mission, Moscone Center Expansion, and the Central Subway, all of which are expected to be completed prior to construction of subsequent develop projects or streetscape and open space improvements enabled by the Plan. Thus, the construction from Plan projects would not overlap with construction of these projects to result in cumulative construction noise impacts. Other cumulative projects include Better Market Street and the Sixth Street Improvement Project. However, these projects are located outside the Plan Area and because streetscape projects are typically constructed block by block, they would not impact a nearby receptor for a substantial amount of time. Additionally, noise would attenuate with distance as streetscape projects advance away from the receptor. Therefore, it is not anticipated that construction noise from these projects would combine with that of subsequent development projects to result in a significant cumulative construction noise impact. Therefore, cumulative construction noise impacts would be ***less than significant***.