E. Noise

This section addresses noise impacts associated with the proposed Gateway Community Project. It analyzes potential noise impacts caused both during the construction and operational phases of the proposed project on the ambient noise environment. It also analyzes the compatibility of the proposed noise-sensitive uses such as residences with the existing noise environment. Background information on environmental acoustics, including definitions of terms commonly used in noise analysis, is provided below.

Environmental Setting

Technical Background

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA).[1] Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously with time with respect to the contributing sound sources of the community noise

[1] All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment varies the community noise level from instant to instant requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level, which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level measured during the measurement period of interest.

L_{min}: The instantaneous minimum noise level measured during the measurement period of interest.

L_x: The sound level that is equaled or exceeded x percent of a specified time period. The L_{50} represents the median sound level.

DNL: The energy average of the A-weighted sound levels occurring during a 24-hour period, and which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.

CNEL: Similar to the DNL, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

The effects of noise on people can be placed into three categories:

- Subjective effects of annoyance, nuisance, dissatisfaction;
- Interference with activities such as speech, sleep, learning; and
- Physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants generally experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather they combine logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (i.e., atmospheric conditions and noise barriers, either vegetative or manufactured, etc.). Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate, approximately 4 to 6 dBA.

Noise Sources and Levels

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of noise in the urban environment. Along major transportation corridors, noise levels can reach 80 DNL, while along arterial streets, noise levels typically range from 65 to 70 DNL. Industrial and commercial equipment and operations also contribute to the ambient noise environment in their vicinities.

The project site is located in an urbanized area of Oakland and is bounded by East 12th Street and BART tracks to the north,[2] and the Union Pacific Railroad (UPRR) tracks to the south, and imaginary extension south at approximately 26th Avenue to the west, and Derby Avenue to the east. In addition, 29th Avenue divides the project site. The project site vicinity includes a burgeoning commercial/retail district along International Boulevard and in the Fruitvale Transit Village, the City of Oakland's Animal Shelter (north side of 29th Avenue) and several large shopping facilities including the Fruitvale Station Shopping Center (south side of 29th Avenue). This area also includes a range of industrial and truck-related uses, many small commercial businesses, small retail shops, some vacant industrial facilities, elementary schools, the Fruitvale BART Station, and a mix of multifamily and single-family housing.

Primary noise sources in the project site vicinity include activity along the UPRR tracks and BART tracks, and vehicular traffic on local roadways. Noise from activities associated with the retail, commercial and business establishments would be secondary. The Fruitvale BART Station is located approximately three blocks east of the project area. On a typical weekday, as many as 203 train trips take place from this station to other stations in the BART system. The frequency of freight trains on the UPRR tracks is lower and since they operate as line-haul vehicles with lower speeds in the range of 20 to 25 miles per hour, the associated maximum noise level is also lower. A typical UPRR train traveling at 25 mph may produce noise levels that exceed 95 dBA at 100 feet, while noise from train horns may approach 110 dBA (Illingworth & Rodkin, 2004). Brakes, coupling impacts, and crossing guard warnings are additional common sources of noise along a railroad corridor. BART trains achieve a maximum speed of 80 mph, and travel at an average of 33 mph between stations. A typical BART train produces 85 dBA noise level at a distance of 100 feet from the tracks (Illingworth & Rodkin, 2004). Noise levels are lower in the immediate vicinity of the project site, due to the slower speeds of approaching and departing trains at the Fruitvale Station.

To establish the environmental baseline against which to evaluate the potential effects of the project on the existing noise environment, ESA conducted noise measurements at the project site. Two long-term (24–hour) measurements were taken on a weekday at two onsite locations. The first measurement, LT-1, was taken along the northern boundary of the project site along East 12th Street, adjacent to the self-storage facility and approximately 50 feet from the edge of the road. The second measurement, LT-2, was taken along the southern boundary of the project site adjacent to the UPRR tracks. At both locations, noise from BART and UPRR activity was a prominent component of the ambient noise environment, in addition to traffic circulation on adjacent roadways and activities associated with the commercial businesses nearby. In addition, Charles M. Salter Associates, Inc. conducted five long-term (48-hour) noise measurements as part of the *Fruitvale Gateway Environmental Noise and Vibration Feasibility Study* (2005) for the project.

[2] Following the City of Oakland's convention, the Oakland hills are considered "north," and therefore the Estuary is south of the site. East 12th Street and International Boulevard therefore run in an east-west direction at and near the project site.

The monitored DNL levels at each measurement location are shown in **Table IV.E-1 and mapped in Figure IV.E-1**.

TABLE IV.E-1
BASELINE NOISE LEVELS AT THE PROJECT SITE (DBA)

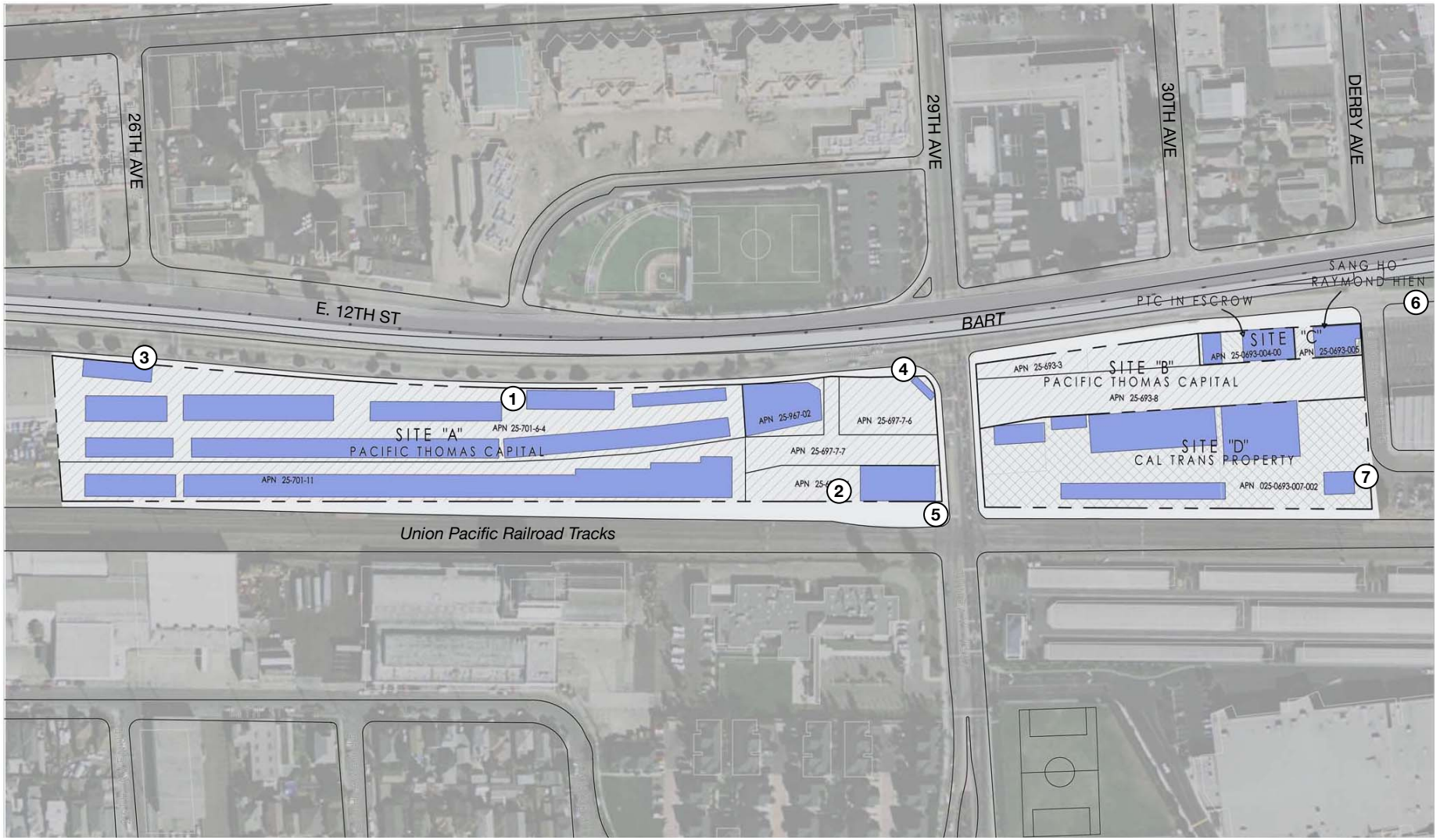
	DNL	Location
LT-1	71.6 dBA	At the gate of the storage facility along the eastern boundary of the project site approximately 50 feet from the edge of East 12th Street
LT-2	76.2 dBA	Along the western boundary of the project site approximately 100 feet from the UPRR tracks
LT-3	77 dBA	Approximately 85 feet southwest of the East 12th Street centerline on the 26th Avenue centerline, 12 feet above grade
LT-4	77 dBA	Approximately 55 feet southwest of the East 12th Street centerline, 120 feet northwest of the 29th Avenue centerline, 12 feet above grade
LT-5	83 dBA	Approximately 30 feet northwest of the 29th Avenue centerline, 60 feet northeast of the UPRR centerline, 12 feet above grade
LT-6	76 dBA	Approximately 75 feet southwest of the 12th Street centerline, 30 feet southeast of the Derby Avenue centerline, 12 feet above grade
LT-7	79 dBA	Approximately 115 feet northeast of the UPRR centerline, 25 feet northwest of the Derby Avenue centerline, 12 feet above grade

LT-1 and LT-2 are 24-hour measurements. LT-3 through LT-7 are 48-hour measurements.

SOURCE: Environmental Science Associates, 2005; Charles M. Salter Associates, Inc., June 2005.

Vibration

Ground vibration from passing trains consists of rapidly fluctuating motions or waves, which are also measured in decibels. The abbreviation “VdB” is used in this document for vibration decibels to avoid confusion with sound decibels. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside residences. As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate by a few ten-thousandths to a few thousandths of an inch. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. High frequency vibrations reduce much more rapidly than low frequencies, therefore, low frequencies tend to dominate the spectrum at large distances from the source. Discontinuities in the soil strata can also affect the amplitude of vibration over long distances. When vibration encounters a building, a ground-to-foundation coupling loss will usually reduce



True North | North for purposes of document

0 250

Feet

SOURCE: MBH Architects, 2007; ESA, 2007

Figure IV.E-1
Existing Noise Measurement Locations
(2005)

the overall vibration level, however, under certain circumstances, the ground-to-foundation coupling may also amplify the vibration level due to the structural resonances of the building's floors and walls.

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases. While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings may be perceived as motion of building surfaces or rattling of windows, items on shelves, and pictures hanging on walls. Vibration of building components can also take the form of an audible low-frequency rumbling noise, which is referred to as ground-borne noise. Groundborne noise is usually only a problem when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz), or when the structure and the source of vibration are connected by foundations or utilities, such as sewer and water pipes.

Table IV.E-2 lists some typical levels of vibration from various vibration sources.

Based on 2005 measures conducted by Charles M. Salter Associates, Inc., at the project site at setback distances of 130 feet, 85 feet and 50 feet from the centerline of the tracks, existing vibration levels are 73 to 82 dB, respectively. Acceleration levels due to groundborne vibration were recorded on digital tape at each setback distance and later analyzed to quantify the vibration levels at the respective setbacks. During the monitoring, three train pass-bys were measured.

Sensitive Receptors

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences, schools, hotels, hospitals, and nursing homes are considered to be the most sensitive to noise. Commercial and industrial uses are considered the least noise-sensitive.

TABLE IV.E-2
TYPICAL LEVELS OF GROUNDBORNE VIBRATION

Human/Structural Response	Velocity Level (VdB)	Typical Events (50 foot setback)
Threshold, minor cosmetic damage	100	Blasting, pile driving, vibratory compaction equipment
	95	Heavy Tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as reading television subtitles or computer screen	90	
	85	Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, frequent events	75	Commuter rail, typical Bus or truck over bump or on rough roads
	70	Rapid transit, typical
Approximate human threshold of perception to vibration	65	Buses, trucks and heavy street traffic
	60	
	55	Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

"Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems. "Frequent Event" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.

SOURCE: U.S. Department of Transportation, Federal Transit Administration, 2006.

A variety of heavy and light industrial uses, commercial, retail, civic, and residential uses surround the project site. The residential neighborhoods of Jingletown, Rancho San Antonio, St. Elizabeth, and the Fruitvale surround and encompass the project area. The Caesar Chavez Education Center is located across East 12th Street from the project site.

Regulatory Setting

Federal, state, and local agencies regulate different aspects of environmental noise. Federal and state agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies. Local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans identify general principles intended to guide and influence development plans; local noise ordinances establish standards and procedures for addressing specific noise sources and activities. Noise issues relevant to the proposed project are addressed in Title 24 of the *California Code of Regulations*, City of Oakland General Plan policies, and the Oakland Noise Ordinance standards.

State of California

State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in *California Code of Regulations*, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor ceiling assemblies must block or absorb sound. For limiting noise from exterior sources, the noise insulation standards set forth an interior standard of DNL 45 dBA in any habitable room and, where such units are proposed in areas subject to noise levels greater than DNL 60 dBA, require an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard. If the interior noise level depends upon windows being closed, the design for the structure must also specify a ventilation or air-conditioning system to provide a habitable interior environment. In Oakland, as in most jurisdictions, Title 24 standards are enforced through the building permit application, review, and inspection process.

City of Oakland

The Oakland General Plan contains guidelines for determining the compatibility of various land uses with different noise environments (City of Oakland, 2005). The Noise Element recognizes that some land uses are more sensitive to ambient noise levels than others, due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. The City uses state noise guidelines for judging the compatibility between various land uses and their noise environments (City of Oakland, 2005). For multifamily residential land uses, the guidelines indicate that a noise environment of DNL 60 dBA or less is "normally acceptable," while a noise environment between DNL 60 and 70 dBA is considered "conditionally acceptable" and DNL 70 to 75 dBA is "normally unacceptable." Noise environments of DNL greater than 75 dBA are considered "clearly unacceptable" for residential uses. For transient lodging such as hotels and motels, a noise environment of DNL 65 dBA or less is considered normally acceptable, a noise environment between DNL 65 and 75 dBA is considered conditionally acceptable and DNL 75 to 80 dBA is "normally unacceptable." For commercial and office uses, which are generally less noise-sensitive, a noise environment of DNL 70 dBA or less is considered "normally acceptable," while a noise environment between DNL 67 and 77 dBA is considered "conditionally acceptable."

In this context, "normally acceptable" is defined as satisfactory for the specific land use, assuming that normal conventional construction is used in buildings. "Conditionally acceptable" means that 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. Conventional construction, but with closed windows and fresh-air supply systems or air conditioning, will normally suffice. "Normally unacceptable" means that 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.

The Noise Element of the General Plan contains the following goals, which the city desires to achieve by implementing the Noise Element:

- To protect Oakland's quality of life and the physical and mental well-being of residents and others in the City by reducing the community's exposure to noise; and
- To safeguard Oakland's economic welfare by mitigating noise incompatibilities among commercial, industrial and residential land uses.

Goals form the basis for policies, which are less general than goals, and identify specific areas in which the city will direct efforts in order to attain its goals. These policies are listed below:

> *Policy 1:* Ensure the compatibility of existing and, especially, of proposed development projects not only with neighboring land uses but also with their surrounding noise environment.
>
> *Policy 2:* Protect the noise environment by controlling the generation of noise by both stationary and mobile noise sources.
>
> *Policy 3:* Reduce the community's exposure to noise by minimizing the noise levels that are *received* by Oakland residents and others in the City. (This policy addresses the *reception* of noise whereas Policy 2 addresses the *generation* of noise.)

The City of Oakland also regulates noise through enforcement of its Noise Ordinance, which is found in Section 17.120 of the Oakland Planning Code. The Noise Ordinance regulates only operational noise from stationary sources; cities and counties do not have regulatory authority over noise from mobile sources (transportation noise). Transportation noise is regulated at the state and federal level by noise limits placed on vehicle manufacturers. **Table IV.E-3** presents maximum allowable receiving noise standards applicable to long-term exposure for residential and civic land uses. The Noise Ordinance states that if the measured ambient noise level exceeds the applicable noise level standard in any category, then the stated applicable noise level shall be adjusted so as to equal the ambient noise level. **Table IV.E-4** presents noise level standards that apply to temporary exposure to short- and long-term construction noise. In this context, short-term refers to construction activity lasting less than 10 days, while long-term refers to construction activities lasting greater than 10 days.

Alameda County Airport Land Use Commission and the Federal Aviation Administration

The Alameda County Airport Land Use Plan (ALUP) developed by the Airport Land Use Commission of Alameda County has adopted Noise Impact Zones for the Oakland International Airport. Noise Impact Zones are areas where exposure to aircraft noise would be above the levels acceptable pursuant to the state noise guidelines for judging the land use compatibility of a site. Noise Impact Zones ensure that new development in the vicinity of an airport would not be

incompatible with existing and projected noise from airport operations. The project site would be located outside the 65-dBA contour for the Oakland International Airport and would therefore not be located within the Airport's Noise Impact Zone. The project would be located within the ALUP's Height Referral Area, as discussed in more detail in Section IV.A, *Land Use, Plans, and Policies*.

TABLE IV.E-3
CITY OF OAKLAND OPERATIONAL NOISE STANDARD AT RECEIVING PROPERTY LINE, DBA[a]

Receiving Land Use	Cumulative Number of Minutes in One-Hour Time Period[b]	Maximum Allowable Noise Level (dBA)	
		Daytime 7:00 a.m. to 10:00 p.m.	Nighttime 10:00 p.m. to 7:00 a.m.
Residential, School, Child Care, Health Care, or Nursing Home, and Public Open Space, or similar sensitive land use	20	60	45
	10	65	50
	5	70	55
	1	75	60
	0	80	65
		Anytime	
Commercial	20	65	
	10	70	
	5	75	
	1	80	
	0	85	
		Anytime	
Manufacturing, Mining, and Quarrying	20	70	
	10	75	
	5	80	
	1	85	
	0	90	

[a] These standards are reduced 5 dBA for simple tone noise, noise consisting primarily of speech or music, or recurring impact noise. If the ambient noise level exceeds these standards, the standard shall be adjusted to equal the ambient noise level.

[b] Lx represents the noise level that is exceeded X percent of a given period. Lmax is the maximum instantaneous noise level. For example, "20 minutes in an hour" is equivalent to the $L_{33.3}$, which is a noise descriptor identifying the noise level exceeded one-third (33.3 percent) of the time. Likewise, "10 minutes in an hour," "5 minutes in an hour," and "1 minute in an hour" are equivalent to the $L_{16.7}$, $L_{8.3}$, and $L_{1.7}$, respectively. L_{max}, or maximum noise level, represents the standard defined in terms of "0 minutes in an hour."

SOURCE: Oakland Noise Ordinance No. 11895, 1996

Federal Transit Administration Vibration Guidelines

Transit systems, including light and heavy rail, are potential sources of substantial ground vibration depending on distance, the type and speed of trains, and the type of track. The Federal Transit Administration (FTA) of the U.S Department of Transportation has developed vibration impact assessment criteria for evaluating vibration impacts associated with rapid transit projects. The FTA vibration standards for uses proposed by the project are listed in **Table IV.E-5**.

TABLE IV.E-4
CITY OF OAKLAND CONSTRUCTION NOISE STANDARDS AT RECEIVING PROPERTY LINE, dBA[a]

Receiving Land Use	Maximum Allowable Noise Level (dBA)	
	Weekdays 7:00 a.m. to 7:00 p.m.	Weekends 9:00 a.m. to 8:00 p.m.
Short-Term Operation (less than 10 days)		
Residential	80	65
Commercial, Industrial	85	70
Long-Term Operation (more than 10 days)		
Residential	65	55
Commercial, Industrial	70	60

[a] If the ambient noise level exceeds these standards, the standard shall be adjusted to equal the ambient noise level.

SOURCE: Oakland Noise Ordinance No. 11895, 1996

TABLE IV.E-5
FTA GROUNDBORNE VIBRATION CRITERIA, dB

Receiving Land Use Category	Groundborne Vibration Impact Limits
Residential	72 dB
Commercial Retail [a]	84 dB

NOTE: FTA Guidelines are independent of number of daily train pass-bys.
[a] The most similar category to "commercial retail use is "office" as identified by FTA.

SOURCE: U.S. Department of Transportation, Federal Transit Administration, 2006.

Impacts and Mitigation Measures

Significance Criteria

The City of Oakland considers a project to have a significant impact on the environment if it would:

1. Expose persons to or generate noise levels in excess of standards established in the Oakland general plan or applicable standards of other agencies (e.g., OSHA);

2. Violate the City of Oakland Noise Ordinance regarding operational noise (Oakland Planning Code Section 17.120.050) (shown in **Table IV.E-3)**;

3. Violate the City of Oakland Noise Ordinance regarding construction noise (shown in **Table IV.E-4**), except if an acoustical analysis is performed and all noise-related Standard Conditions of Approval imposed;

4. Violate the City of Oakland Noise Ordinance (Oakland Municipal Code Section 8.18.020) regarding nuisance of persistent construction-related noise;

5. Create a vibration which is perceptible without instruments by the average person at or beyond any lot line containing vibration-causing activities not associated with motor vehicles, trains, and temporary construction or demolition work, except activities located within the (a) M-40 zone or (b) M-30 zone more than 400 feet from any legally occupied residential property (Oakland Planning Code Section 17.120.060);

6. Generate interior L_{dn} or CNEL greater than 45 dBA for multi-family dwellings, hotels, motels, dormitories and long-term care facilities (and may be extended by local legislative action to include single family dwellings) per California Noise Insulation Standards (CCR Part 2, Title 24);

7. Result in a 5 dBA permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

8. Conflict with state land use compatibility guidelines for all specified land uses for determination of acceptability of noise (Source: State of California, Governor's Office of Planning and Research, *General Plan Guidelines*, 2003);

9. Be located within an airport land use plan and would expose people residing or working in the project area to excessive noise levels; or

10. Be located within the vicinity of a private airstrip, and would expose people residing or working in the project area to excessive noise levels.

Noise from project-related traffic is not regulated by the local general plan and noise ordinance. The State of California establishes noise limits for vehicles licensed to operate on public roads. These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by state and local law enforcement officials. Therefore, the significance of increase in noise levels due to project traffic has been evaluated based on Criterion 7 listed above. For long-term operational impacts, such as mechanical noise from stationary sources, Oakland Noise Ordinance standards, as presented in **Table IV.E-3**, would apply to the proposed project. Therefore, based on Criteria 1 and 2 listed above, operational noise from stationary sources that would exceed the values presented in **Table IV.E-3** would result in a significant impact to the noise environment. The significance of temporary increases in ambient noise levels is evaluated based on Criteria 3 and 4 listed above. For land use compatibility impacts (noise impacts of the environment on the proposed project occupants), the land use compatibility categories published in the State of California General Plan Guidelines referenced in Criterion 8 listed above would apply to the proposed project. Impacts from exposure of future occupants of the project site to groundborne vibration from Amtrak and freight trains along the UPRR tracks are evaluated using Criterion 5.

Project Impacts

Construction Noise

Impact NOI-1: Construction activities would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity. (Potentially Significant)

Project construction would involve the eventual demolition of all existing buildings at the project site and new construction of 810 units, of which 763 would be condominiums and 47 would be townhomes; approximately 25,950 square feet of commercial space; and 1,121 parking spaces in six new buildings that would be constructed in six phases. Construction-related activities would increase ambient noise levels in the project vicinity over the duration of construction. Construction-related noise levels at and near locations on the project site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. The effect of construction noise would depend upon the level of construction activity on a given day and the related noise generated by that activity, the distance between construction activities and the nearest noise-sensitive uses, and the existing noise levels at those uses.

Table IV.E-6 shows typical ranges of noise levels generated by construction of residential and commercial buildings. **Table IV.E-7** shows noise levels generated by individual construction equipment. As shown in **Table IV.E-6**, the noisiest phase of construction would be during pile driving, which could generate noise levels of approximately 90-105 L_{eq} at 50 feet. Excavation and exterior finishing may also generate a substantial amount of noise. The main noise sources associated with excavation are the operation of excavators removing material and trucks hauling excavated materials away. The main noise sources associated with exterior finishing would be operation of concrete mixers and pumps for application of stucco material to the building exterior.

As noted above, noise from construction activity generally attenuates (decreases) at a rate of 6 to 7.5 dBA per doubling of distance. Construction associated with the project could take place as close as 150 feet from the nearest existing sensitive receptors along East 12th Street. **Figure IV.E-2** shows the distances from the project site to sensitive receptors nearby. Is it assumed that noise-generating construction activities could occur anywhere on the site. It is not yet known whether pile driving would be required as part of construction of the project. If pile driving is used, conservatively assuming an attenuation of 6 dBA per doubling of distance, it could generate noise levels of 80 to 95 dBA, Leq at these receptors. At noise levels above 85 dBA, normal conversation is extremely difficult. Other noise-sensitive uses located within

TABLE IV.E-6
RANGES OF TYPICAL CONSTRUCTION ACTIVITY NOISE LEVELS FOR RESIDENTIAL AND COMMERCIAL USES

Phase	Noise Level ($L_{eq\ in}$ dBA)
Ground Clearing	83 - 84
Excavation	71 - 89
Foundations	77 - 81
Erection	65 - 87
Exterior Finishing	72 - 89
Pile Driving	90-105

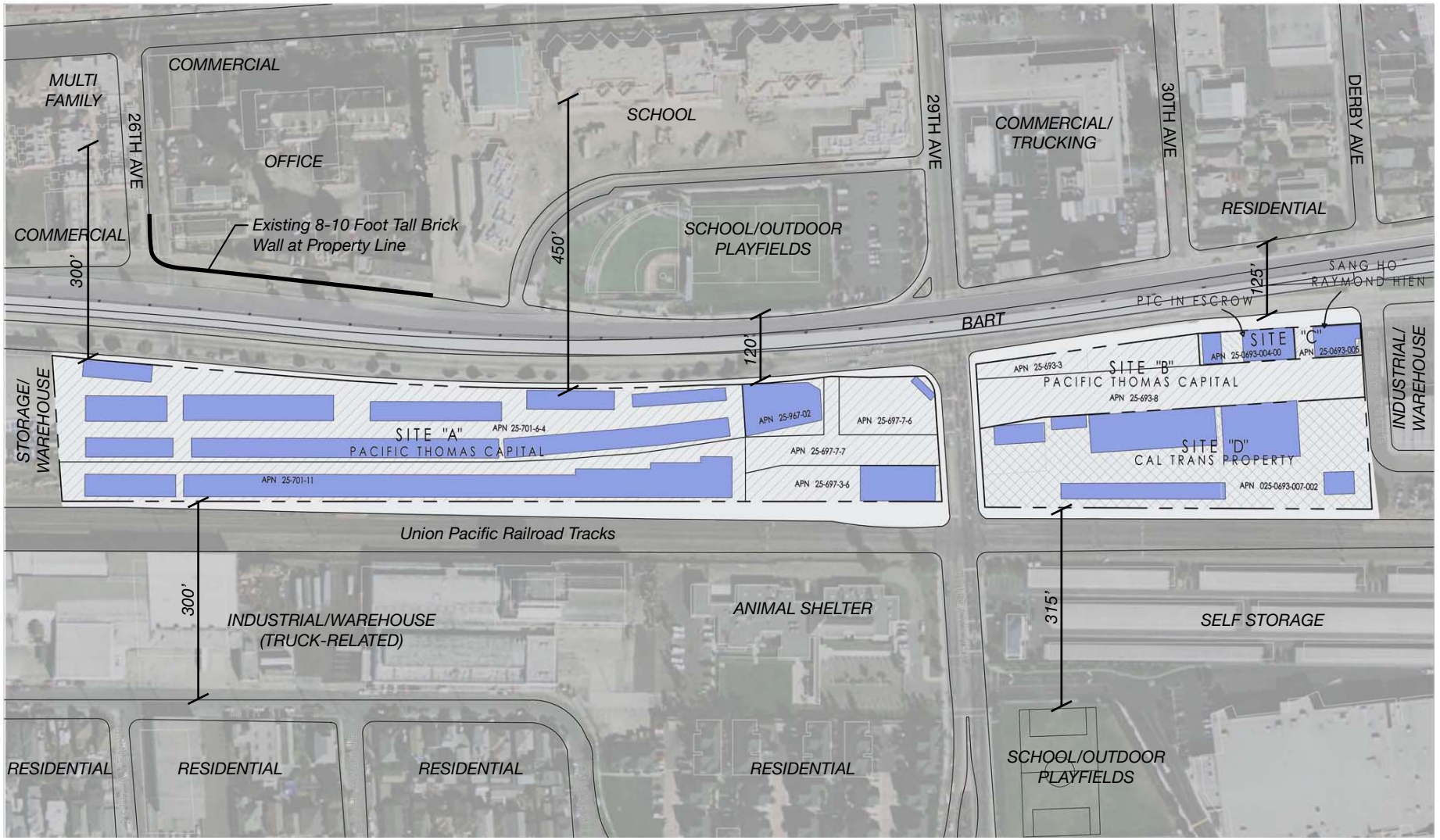
[a] Estimates correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase and 200 feet from the other equipment associated with that phase.

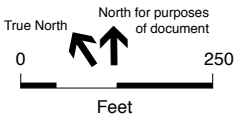
SOURCE: U.S. Environmental Protection Agency, Construction Noise Control Technology Initiatives, http://www.nonoise.org/epa/Roll5/roll5doc22.pdf, September 1980.

TABLE IV.E-7
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment	Noise Level (dBA) @ 50 Feet
Earthmoving	
Front Loader	79
Backhoe	85
Dozer	87
Tractor	88
Scraper	88
Grader	85
Paver	89
Materials Handling	
Concrete Mixer	85
Concrete Pump	82
Crane	83
Stationary	
Pump	76
Generator	78
Impact	
Pile Driver	101
Jack Hammer	85
Rock Drill	96
Pneumatic Tools	85
Other	
Framing	95
Saw	78
Vibrator	76

SOURCE: U.S. Environmental Protection Agency, Construction Noise Control Technology Initiatives, http://www.nonoise.org/epa/Roll5/roll5doc22.pdf, September 1980; Charles M. Salter Associates Inc., 2005





SOURCE: MBH Architects, 2007; ESA, 2007

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Figure IV.E-2
Distance from Project Site to Sensitive Noise Receptors

approximately 1,600 feet of pile-driving activity could also be substantially affected, depending on the presence of intervening barriers or other insulating materials. Intermittent noises such as pile-driving noise are more disturbing to many people than typical construction noise.

Table IV.E-8 shows noise levels at receptors adjacent to the project site during different phases of construction.

TABLE IV.E-8
ESTIMATED CONSTRUCTION NOISE LEVELS AT ADJACENT USES

		Earthwork			
	Distance (feet)	No Barrier (dBA)	With 8' Barrier (dBA)	Drilled Pile Driving (dBA)	Framing: Floor Two and Above (dBA)
Commercial – Across from NW Corner of Project Site	80	71 to 76	66 to 71	81	91
Residential – Across East 12th Street	215	63 to 68	58 to 63	73	83
School – Across East 12th Street	215	63 to 68	58 to 63	73	83

SOURCE: Charles M. Salter Associates, Inc., 2006

These predicted noise levels would exceed the standards of the Oakland Noise Ordinance, which states that, for residential receptors, the maximum allowable receiving noise for weekday (Monday through Friday, 7:00 a.m. to 7:00 p.m.) construction activity of greater than 10 days duration is 65 dBA. For construction activity of 10 days or less, the residential receiving standard is 80 dBA. Consequently, the noisiest phases of construction would have the potential to exceed the construction noise standard of the City of Oakland's Noise Ordinance. Without mitigation, this impact, though temporary, would be considered significant. As construction activities would be likely to occur during daytime hours, construction noise would also be disruptive to local businesses. However, the analysis focuses on impacts to nearest residential uses as they are considered to be more sensitive to noise than other commercial and industrial uses surrounding the project site.

The proposed project would be subject by the City of Oakland to the following standard conditions of approval throughout the duration of construction activity. Specific recommendations identified in the *Fruitvale Gateway Construction Noise and Vibration Feasibility Study* prepared by Charles Salter Associates, Inc. (2005) are also required and incorporated into the standard conditions below. Based on the significance criteria used by the City of Oakland, compliance with the Noise Ordinance is achieved if the following measures are implemented. Implementation of the following standard conditions would also reduce impacts to

on-site receptors during construction, and as a result, project construction impacts would be considered less than significant.

Standard Condition NOI-1a: The project applicant shall require construction contractors to limit standard construction activities as follows, ongoing throughout demolition, grading, and/or construction:

a) Construction activities are limited to between 7:00 AM and 7:00 PM Monday through Friday for all other cases. Pile driving and/or other extreme noise generating activities greater than 90 dBA limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday.

b) Any construction activity proposed to occur outside of the standard hours of 7:00 am to 7:00 pm Monday through Friday for special activities (such as concrete pouring which may require more continuous amounts of time) shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened and such construction activities shall only be allowed with the prior written authorization of the Building Services Division.

c) Construction activity shall not occur on Saturdays, with the following possible exceptions:

- Prior to the building being enclosed, requests for Saturday construction for special activities (such as concrete pouring which may require more continuous amounts of time), shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened. Such construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division.

- After the building is enclosed, requests for Saturday construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division, and only then within the interior of the building with the doors and windows closed.

d) No extreme noise generating activities (greater than 90 dBA) shall be allowed on Saturdays, with no exceptions.

e) No construction activity shall take place on Sundays or Federal holidays.

f) Construction activities include but are not limited to: truck idling, moving equipment (including trucks, elevators, etc) or materials, deliveries, and construction meetings held on-site in a non-enclosed area.

Also, the following project-specific recommendation identified in the *Fruitvale Gateway Construction Noise and Vibration Feasibility Study* (Salter Associates, Inc., 2005) is consistent with, and incorporated as part of Standard Condition NOI-1a:

g) During mobilization of earth moving equipment near noise-sensitive areas, equipment operations shall be performed during the peak traffic hours, to the extent feasible and in accordance with the Oakland Noise Ordinance. Based on the on-site noise measurements conducted for this EIR, traffic noise is fairly constant between the hours of 8 a.m. and 6 p.m.

Standard Condition NOI-1b: To reduce noise impacts due to construction, the project applicant shall require construction contractors to implement a site-specific noise reduction program, subject to City review and approval, which includes the following measures, ongoing throughout demolition, grading, and/or construction:

a) Equipment and trucks used for project construction shall 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).

b) Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

c) Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

d) If feasible, the noisiest phases of construction shall be limited to less than 10 days at a time.

Also, the following project-specific recommendation identified in the *Fruitvale Gateway Construction Noise and Vibration Feasibility Study* (Salter Associates, Inc., 2005) is consistent with, and incorporated as part of Standard Condition NOI-1b:

e) Temporary noise barriers shall be incorporated at the site shall and shall be:

- a minimum of three pounds per square foot (e.g., wood, steel) and have no visible cracks or gaps, including at the base;
- located and of a height (generally up to 8-feet tall) to break any line-of-sight between the receivers and equipment;

f) Equipment and staging areas shall be positioned closest to the UPRR tracks, avoiding as much as possible the southwest corner of East 12th Street and 29th Avenue and the northeast corner of East 12th Street and Derby Avenue, which are closest to residential, educational and outdoor recreational uses. Where

possible, noise barriers shall be erected around stationary noise generating operations.

g) "Quiet" procedures shall be used, wherever feasible, such as:

- use of drills rather than impact equipment;
- "quiet" gasoline or electric-powered compressors;
- electric rather than gasoline or diesel-powered forklifts;
- welded rather than bolted steel connections to reduce the use of impact wrenches;
- pre-cut metal decks and metal studs off-site to minimize on-site sawing;
- use of core bits instead of hammer drilling; and
- use concrete screws instead of powder-actuated fasteners.

Standard Condition NOI-1c: To further reduce potential pier drilling, pile driving and/or other extreme noise generating construction impacts greater than 90 dBA, a set of site-specific noise attenuation measures shall be completed under the supervision of a qualified acoustical consultant.

Prior to commencing construction, a plan for such measures shall be submitted for review and approval by the City to ensure that maximum feasible noise attenuation will be achieved. This plan shall be based on the final design of the project. A third-party peer review, paid for by the project applicant, may be required to assist the City in evaluating the feasibility and effectiveness of the noise reduction plan submitted by the project applicant. A special inspection deposit is required to ensure compliance with the noise reduction plan. The amount of the deposit shall be determined by the Building Official, and the deposit shall be submitted by the project applicant concurrent with submittal of the noise reduction plan. The noise reduction plan shall include, but not be limited to, an evaluation of the following measures. These attenuation measures shall include as many of the following control strategies as feasible, ongoing throughout demolition, grading, and/or construction:

a) Erect temporary plywood noise barriers around the construction site, particularly along on sites adjacent to residential buildings;

b) Implement "quiet" pile driving technology (such as pre-drilling of piles, the use of more than one pile driver to shorten the total pile driving duration), where feasible, in consideration of geotechnical and structural requirements and conditions;

c) Utilize noise control blankets on the building structure as the building is erected to reduce noise emission from the site;

d) Evaluate the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings by the use of sound blankets for example; and

e) Monitor the effectiveness of noise attenuation measures by taking noise measurements.

a) **Standard Condition NOI-1d: Prior to the issuance of each building permit, along with the submission of construction documents, the project applicant shall submit to the City Building Services Division a list of measures to respond to and track complaints pertaining to construction noise, ongoing throughout demolition, grading, and/or construction. These measures shall include the following:** A procedure and phone numbers for notifying the City Building Services Division staff and Oakland Police Department; (during regular construction hours and off-hours);

b) A sign posted on-site pertaining with permitted construction days and hours and complaint procedures and who to notify in the event of a problem. The sign shall also include a listing of both the City and construction contractor's telephone numbers (during regular construction hours and off-hours);

c) The designation of an on-site construction complaint and enforcement manager for the project. As recommended by the *Fruitvale Gateway Construction Noise and Vibration Feasibility Study* (Salter Associates, Inc., 2005), the manager shall act as a liaison between the project and its neighbors. The manager's responsibilities and authority shall include the following:

- familiarity with the project and construction schedule, including attending weekly construction meetings;
- an active role in monitoring project compliance with respect to noise;
- ability to reschedule noisy construction activities to reduce effects on surrounding noise sensitive receivers;
- Site supervision of all potential sources of noise (e.g., material delivery, shouting, debris box pick-up and delivery) for all trades; and
- Intervening or discussing mitigation options with contractors.

d) Notification of neighbors and occupants within 300 feet of the project construction area at least 30 days in advance of extreme noise generating activities about the estimated duration of the activity; and

e) A preconstruction meeting shall be held with the job inspectors and the general contractor/on-site project manager to confirm that noise measures and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.

Significance after Implementation of Standard Conditions: Less than Significant.

Project Operational Noise

Impact NOI-2: Noise from project-generated traffic and other operational noise sources, such as mechanical equipment, truck loading/unloading, etc., would not exceed the Oakland Noise Ordinance standards and impact nearby sensitive receptors. Less than Significant)

Operational activities associated with the proposed project that would generate noise include increased vehicular circulation on the local roadway network, and the operation of mechanical equipment such as HVAC equipment and noise from commercial activities proposed at the project site.

Motor vehicle trips generated by proposed residential and commercial uses on the project site would be distributed on the local road network and would increase noise levels along the affected roads. To assess the significance of the increase in traffic noise due to the project (5 dBA or more permanent increase in ambient noise levels), roadside p.m. peak-hour noise levels have been estimated for existing conditions (generally 2005), 2010, and 2025 (cumulative analysis year), with and without project, along those roadways most affected by the project. Noise modeling using the Federal Highway Administration's Noise Prediction Model was conducted for roadway segments on East 12th Street, 29th Street and 30th Street using data prepared by Korve Engineering (2006). Results of the modeling effort are presented in **Table IV.E-9**. These segments were chosen for analysis as they were found to experience the greatest percentage increase in traffic due to the project. As a rule of thumb, a doubling in traffic would lead to a 3-dBA increase in traffic noise.

As seen from **Table IV.E-9**, the proposed project would not lead to an increase in traffic associated noise greater than the 5 dBA threshold over the existing total ambient noise level at any of the analyzed roadway segments under all analyzed scenarios. Since the maximum increase in ambient noise from the addition of project and cumulative traffic would about 3 dBA, this increase would barely be perceivable over the baseline total ambient noise level (also shown in **Table IV.E-9**). Therefore, the addition of project and cumulative traffic would not increase the total ambient noise level by 5 dBA or greater over existing ambient levels. This would be a less than significant impact. Further, it should be noted that a 5 dBA increase in traffic related noise would not directly translate to a 5 dBA increase in the total ambient noise environment. Traffic noise forms just one of the several noise sources that constitute the ambient noise environment around the project area.

Once operational, a major source of noise would be from the operation of the heating, ventilation and air conditioning (HVAC) systems of the project buildings. It is assumed that the majority of HVAC equipment to serve the project buildings would be located within the mechanical equipment wells on the roofs of the buildings and in parking structures, which may significantly

TABLE IV.E-9
TRAFFIC NOISE INCREASES ALONG LOCAL ROADWAYS IN THE PROJECT AREA

	Modeled Noise Level at 50 Feet From Roadway Centerline					
Street Segment	**Baseline**	**Baseline + Project**	**Change vs. Baseline**	**2010 Baseline**	**2010 + Project**	**Change vs. Baseline**
E. 12th Street						
East of 29th Ave.	65.2	65.4	+0.2	65.7	65.8	+0.6
West of 29th Ave.	65.5	66.0	+0.5	65.9	66.4	+0.9
East of 25th Ave.	65.8	65.9	+0.1	66.3	66.4	+0.6
West of 25th Ave.	66.0	66.0	+0.0	66.5	66.5	+0.5
East of Derby Ave.	65.2	65.3	+0.1	65.8	65.9	+0.7
West of Derby Ave.	65.3	65.5	+0.2	66.0	66.1	+0.8
Derby Avenue						
North of E. 12th Street	52.5	52.6	+0.1	53.0	53.1	+0.6
South of E. 12th Street	53.2	55.1	+1.9	53.8	55.5	+2.3
29th Street						
North of E. 12th Street	61.7	61.9	+0.2	62.1	62.3	+0.6
South of E. 12th Street	64.7	65.3	+0.7	65.1	65.7	+1.0
25th Street						
North of E. 12th Street	55.7	55.8	+0.1	56.2	56.2	+0.5
South of E. 12th Street	47.0	47.0	+0.0	47.4	47.4	+0.4

SOURCE: Environmental Science Associates, 2006; Korve Engineering, Inc., 2007.

reduce noise levels audible from off-site locations. All roof HVAC equipment is proposed to be visually and acoustically screened to reduce impacts. Roof parapets are proposed to be a minimum of 3.5 feet tall for flat portions of roof, and approximately 5 feet tall where the roof is sloped. Operation of HVAC equipment would be subject to the Noise Ordinance standards shown in **Table IV.E-3**. Provided that the equipment is designed and used in a manner that complies with those standards, the related noise impact to project residences and adjacent land uses would not be significant. The applicable design standard would be 45 dBA at adjacent sensitive land uses. Also, the HVAC equipment for commercial buildings would be operated primarily during the less noise sensitive daytime hours with higher background noise levels. For these reasons, noise from HVAC equipment would not be expected to significantly affect the noise environment at nearby land uses. Air handling equipment is mounted on the rooftops of many buildings in Oakland and operates without noise impacts to adjacent buildings. The equipment for the proposed project is anticipated to be of recent manufacture and be compliant with the operational restrictions of the Oakland Noise Ordinance. Noise levels from the activity, property, or any

mechanical equipment on site shall comply with the performance standards of Section 17.120 of the Oakland Planning Code and Section 8.18 of the Oakland Municipal Code. If noise levels exceed these standards, the activity causing the noise shall be abated until appropriate noise reduction measures have been installed and compliance verified by the Planning and Zoning Division and Building Services.

Additionally, there would be operational noise related to the arrival, departure, and loading/unloading of goods from delivery trucks associated with the project's proposed commercial uses. This noise would be less than significant as it would primarily take place during the less noise sensitive daytime hours. Loading facilities for non-freight vehicles are proposed within the parking levels of the buildings on each site. Loading docks for freight vehicles are located on Derby Avenue and 29th Avenue, not adjacent to nearby sensitive uses. Also, the presence of intervening structures and the distance of the commercial uses to the existing sensitive receptors would attenuate these noise levels to a less than significant level.

Mitigation: None Required.

Impact NOI-3: The project would place noise-sensitive multifamily residential uses in a noise environment characterized as "clearly unacceptable" for such uses by the City of Oakland. (Potentially Significant)

Current project drawings indicate that the nearest facades fronting East 12th Street and the BART corridor would be setback from the East 12th Street centerline by approximately 55 and 85 feet (see **Figure IV.E-1**). Based on the noise measurements conducted, the noise level at this setback ranges from 76 to 77 dBA, DNL. These noise levels would exceed the City's goal for indoor noise exposure.

The nearest project buildings would be setback by approximately 75 feet from the railroad track centerline. Based on the noise measurements, noise levels at this setback range from 81 to 82 dBA, DNL. These noise levels would also exceed the City's goal for indoor noise exposure.

The multifamily residences would be subject to Title 24 of the *California Code of Regulations*, which requires an interior noise standard of DNL 45 dBA in any habitable room and requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard. To meet the interior standard of DNL 45 dBA, a noise level reduction of up 38 dBA would be required from the exterior façades of the buildings. To allow the project to meet the City and state interior noise requirement of 45 dBA, DNL in habitable rooms of residential dwellings, sound-rated assemblies would be required at the exterior facades of project buildings.

The project shall implement the following standard condition, which is supplemented with recommendations prescribing STC[3] ratings identified in the *2005 Fruitvale Gateway Construction Noise and Vibration Feasibility Study* conducted by Charles M. Salter & Associates Inc. to reduce indoor noise exposure to within City and State standards; Implementation would ensure that interior noise levels are reduced to 45 dB and are less than significant.

Standard Condition NOI-3a: If necessary to comply with the interior noise requirements of the City of Oakland's General Plan Noise Element and achieve an acceptable interior noise level, noise reduction in the form of sound-rated assemblies (i.e., windows, exterior doors, and walls) shall be incorporated into project building design, based upon recommendations of a qualified acoustical engineer. Final recommendations for sound-rated assemblies will depend on the specific building designs and layout of buildings on the site and shall be determined during the design phase. As recommended in the *Fruitvale Gateway Construction Noise and Vibration Feasibility Study* (Salter Associates, Inc., 2005), specific consideration shall be given to window size, degree of sound insulation of exterior walls, which can be increased through staggered- or double-studs, multiple layers of gypsum board, and incorporation of resilient channels.

Standard Condition NOI-3b: Sound rated walls, window, and exterior doors shall be installed on project building facades as follows, subject to review by a qualified acoustical engineer pursuant to Standard Condition NOI-3a, and as recommended in the *Fruitvale Gateway Construction Noise and Vibration Feasibility Study* (Salter Associates, Inc., 2005):

Building Façade Location	Mitigation STC[a] Rating (50 % Window Area)
North façades along East 12th Street / BART	STC 38 - 43
West façades along 25th Avenue	STC 34 – 39
East and West facades along 29th Avenue	STC 34 – 39
East façades along Derby Avenue	STC 40– 45
South facades along UPRR	STC 45+
Facades interior to the project site	STC 28 - 33
	Mitigation STC[a] Rating (90 % Window Area)
North façades along East 12th Street / BART	STC 40 - 45
West façades along 25th Avenue	STC 37 - 42
East and West facades along 29th Avenue	STC 37 - 42
East façades along Derby Avenue	STC 42 - 47
South facades along UPRR	STC 50+
Facades interior to the project site	STC 31 - 36

[a] Sound Transmission Class (STC) – A single figure rating standardized by ASTM and used to rate the sound insulation properties of building partitions.

Significance after Implementation of Standard Conditions: Less than Significant.

3 Sound Transmission Class (STC) – A single figure rating standardized by ASTM and used to rate the sound insulation properties of building partitions. The STC rating is derived from laboratory measurements of a particular building element and as such is representative of the maximum sound insulation. Increasing STC ratings correspond to improved noise insulation.

Impact NOI-4: The project would place noise-sensitive publicly-accessible outdoor uses in a noise environment characterized as "clearly unacceptable" for such uses, as established by the Noise Element of the Oakland General Plan. (Potentially Significant)

Oakland's consideration of land use compatibility impacts (noise impacts of the environment on the proposed project occupants) in accordance with State Guidelines also considers outdoor noise exposure. While the project would provide a mix of private and common usable open space areas for project residents and tenants, it also proposes usable open space area that would be accessible to the public, which the City considers in light of the State Guidelines and the General Plan. As shown in **Figure III-8a**, the project proposes approximately 8,000 square feet of publicly-accessible linear open space and children's park at grade level between Sites II and III.

Given the high ambient noise level at the project site, noise levels at this at-grade open space area are expected to exceed the maximum allowable receiving noise standards for open space areas, which the State Guidelines and City of Oakland establish as up to 70 dBA. To meet this level, an outdoor noise level reduction of up 5 dBA would be required, based on the 72 to 77 dBA DNL range that exists on the site in the area where this open space is proposed (see Table IV.E-1 and Figure IV.E-1).

Noise reduction by as much as 15 dBA would occur with the proposed site design. Project buildings themselves – along East 12th Street and the railroad tracks – would act as noise barriers and break the line of sight (primarily from the railroad tracks) between the noise sources and the proposed publicly-accessible open space. To further reduce the potential exposure of proposed publicly-accessible open space to existing noise levels, the project shall implement the following standard condition:

> **Standard Condition NOI-4: To comply with the land use compatibility requirements of the City of Oakland's General Plan Noise Element and achieve an acceptable outdoor noise levels at publicly-accessible open spaces, noise reduction in the form of specific layout of buildings on the site and, if warranted, barrier walls along the south façade of the site to break the line of site to/from the UPRR adjacent to the south may be used, based on recommendations of a qualified acoustical engineer.**

Significance after Implementation of Standard Condition: Less than Significant.

Impact NOI-5: The project would expose sensitive residential uses to groundborne vibration from trains passing by on the UPRR tracks. (Potentially Significant)

The 2006 FTA Guidelines regarding transit noise and vibration state that the ground velocity due to vibration at residential land uses should not exceed 72 dB, independent of the number of daily train pass-bys, and the ground velocity due to vibration for commercial land uses should not exceed 84 dB, independent of the number of daily train pass-bys (**Table IV.E-5**). In addition, according to the FTA, the threshold of human perception to vibration is approximately 65 dB,

while 72 dB is "barely perceptible," and 80 dB is "distinctly perceptible." The guideline levels identified by the FTA also include adjustment for vibration propagating from the ground surface, through the building, and into residential floors. The proposed project would construct three-story townhomes, four multifamily buildings (7 to 12 stories total), and two towers (15 to 16 stories total). At least the first two levels of each of the multifamily and tower buildings would be parking. Since the building design is still in the preliminary phase and the FTA does not include adjustments for a wide array of buildings types, the analysis conducted for this EIR assumes a conservative value of estimated vibration level losses at the foundation, based on the FTA levels for "Large Masonry Building on Piles" or "1 to 2 story residential." .

Based on the measurements taken on the project site, the maximum vibration level during the freight pass-by was 79 dB at 85 feet and 73 dB at 130 feet from the centerline of the tracks. These vibration levels correspond to levels above the threshold of human perception. These vibration levels would be above the FTA's standard for residential uses of 72 dB and would therefore lead to a significant impact. The worst case would be 79 dB at 85 feet from the centerline of the train tracks, therefore, mitigation that would reduce vibration levels by at least 7 dB is required. The currently proposed two levels of parking would be sufficient mitigation at a setback of 70 feet from the railroad track centerline, where the closest project buildings would be located.

The *2007 Gateway Community Groundborne Vibration* analysis study conducted by Charles M. Salter & Associates Inc. identified methods to reducing groundborne vibration at the project site with the project. On option involves the addition of a parking level which would reduce vibration levels to meet the FTA threshold, however, this option is infeasible primarily because it would provide excess parking for the project. Feasible methods to reduce the groundborne vibration levels at the project site to less-than-significant levels are presented in the following standard condition:

Standard Condition NOI-5a: The project applicant shall incorporate special building methods to reduce groundborne vibration being transmitted into project building structures containing residential uses. Potential methods include the following:

- Isolation of foundation and footings using resilient elements such as rubber bearing pads or springs, such as a "spring isolation" system that consists of resilient spring support that can support the podium or residential foundations. The specific system shall be selected so that it can properly support the structural loads, and provide adequate filtering of ground-borne vibration to the residences above.

- Trenching, which involves excavating soil between the railway and the project so that the vibration path is interrupted, thereby reducing the vibration levels before they enter the project's structures. Since the reduction in vibration level is based on a ratio between trench depth and vibration wavelength, additional measurements shall be conducted to determine the vibration wavelengths affecting the project. Based on the resulting measurement findings, an adequate trench depth and, if required, suitable fill shall be identified (such as foamed styrene packing pellets [i.e., Styrofoam] or low-density polyethylene). Since

trench depths required to mitigate groundborne vibration generated by railway operations can be significant (e.g. greater than 30-feet), the project sponsor shall submit the for City review and approval any trench proposal.

- The foundation system or other equivalent mechanism (such as trenching) shall effectively reduce groundborne vibration level at residential areas on the project site that are 1) not above at least two parking levels *and* 2) less than 70 feet from the nearest train track centerline, by at least 7 dB or other increment to ensure vibration levels that do not exceed the maximum FTA threshold of 72 dB for residential use.

Standard Condition NOI-5b: A qualified acoustical consultant shall be retained during the design phase of the project to comment on structural design as it relates to mitigating groundborne vibration at the project site.

Significance after Implementation of Standard Condition: Less than Significant.

Cumulative Impacts

Impact NOI-6: The proposed project, together with anticipated future development included in the Oakland cumulative growth scenario, could result in long-term traffic increases that could cumulatively increase noise levels. (Less than Significant)

Noise from cumulative development in the area would primarily occur from increases in motor vehicle traffic. Cumulative traffic noise levels in the project area were estimated using traffic data provided by Korve Engineering and are presented in **Table IV.E-8**. As shown in the table, the addition of project and cumulative traffic would not increase traffic noise levels by greater than 5 dBA along the analyzed roadway segments. Therefore, this increase would not be perceptible over the total noise levels that were monitored along these segments. Traffic noise forms one component of the total noise environment. An increase in traffic noise of 5 dBA would not necessarily translate to an increase of 5 dBA in the total ambient noise environment. When the resultant noise levels from project and cumulative traffic along these segments are logarithmically added to the existing monitored noise levels, the increase would be less than 5 dBA and hence, less than significant.

Mitigation: None Required.

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