6.12 Noise and Vibration

6.12.1 Introduction

This section discusses existing conditions and the regulatory setting regarding noise and vibration, and it describes impacts that would result from construction and operation of the CEQA Alternatives.

6.12.2 Regulatory Setting

6.12.2.1 City of San Jose Municipal Code

City of San Jose Municipal Code Section 20.100.450 states the following with regard to construction activity within 500 feet of a residential unit.

a. Unless otherwise expressly allowed in a Development Permit or other planning approval, no applicant or agent of an applicant shall suffer or allow any construction activity on a site located within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m., Monday through Friday, or at any time on weekends.

b. Without limiting the scope of Section 20.100.310, no applicant or agent of an applicant shall suffer or allow any construction activity on a site subject to a Development Permit or other planning approval located within 500 feet of a residential unit at any time when that activity is not allowed under the Development Permit or planning approval.

c. This section is applicable whenever a Development Permit or other planning approval is required for construction activity.

Municipal Code 20.40.600 limits noise levels at any residential property to 55 A-weighted decibels (dBA) from noise sources located on an adjacent property.

6.12.2.2 City of Santa Clara Municipal Code

City of Santa Clara Municipal Code Section 9.10.070 states that the provision of Section 9.10 shall not apply to noise, sound or vibration created by: (e) Construction activities during allowed hours, as otherwise specified in the Code. Where there is residentially zoned property within 300 feet, the hours permitted for construction are weekdays other than holidays from 7:00 a.m. to 6:00 p.m., and 9:00 a.m. to 6:00 p.m. on any Saturday.

Municipal Code 9.10 limits noise at a residential property to 55 dBA from 7:00 a.m. to 10:00 p.m. and limits the noise to 50 dBA from 10:00 p.m. to 7:00 a.m.

6.12.2.3 Federal Transit Administration

Operational Noise and Vibration

Refer to Chapter 4, Section 4.12.2.3, *Regulatory Setting*, for a discussion of Federal Transit Administration (FTA) airborne noise, groundborne noise, and vibration criteria related to rail operation.

Construction Noise

Table 6.12-1 summarizes construction noise criteria provided by FTA (Federal Transit Administration 2006).

Table 6.12-1: FTA Construction Noise Criteria

Land Use	8-hour Leq (dBA)		Ldn (dBA)
	Day	Night	30-day Average
Residential	80	70	75[a]
Commercial	85	85	80[b]
Industrial	90	90	85[b]

[a] In urban areas with very high ambient noise levels (L_{dn} > 65 dB), L_{dn} from equipment should not exceed existing ambient by more than 10 dB.
[b] Use a 24-hour L_{eq} not L_{dn}.

Construction Vibration

FTA provides criteria for two types of impact from construction vibration. The criteria address impacts due to annoyance and impacts due to building damage. For evaluating annoyance impacts the criteria presented in Section 4.12.2.3 are applicable and depend on the duration of the vibration generated.

Construction vibration impacts can result in short-term annoyance and can be classified as Infrequent Events as indicated in Table 4.12-3 in Section 4.12, *Noise and Vibration*. FTA guidelines for construction vibration criteria that minimize the risk of building damage are presented in Table 6.12-2. The criteria are specified in terms of peak particle velocity (PPV) in inches per second. The damage related criteria depend on the age and construction of the receptor building and also on how well it has been maintained if it is an older building.

Table 6.12-2: FTA Construction Vibration Criteria

Building Category	Peak Particle Velocity (in/sec)	Approximate Vibration Level (Lv)[a]
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry building	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

[a] Root mean square velocity in decibels (VdB) re 1 micro-inch/second

Historic buildings were identified within the study area. They are close enough to warrant analysis. FTA recommends a PPV criterion of 0.12 inch per second for buildings that are extremely susceptible to vibration, which might include fragile historic buildings depending on their construction, age and level of maintenance. At this level of PPV, an historic building that is fragile may suffer cosmetic damage, characterized by fine cracking (in plaster or masonry) or the re-opening or widening of old cracks. At this level of vibration there is no risk of structural damage.

6.12.3 CEQA Methods of Analysis

6.12.3.1 Construction

Construction noise and vibration impacts for the tunnel segment were analyzed in previous environmental studies for the BART Extension (HMM/Bechtel SVRT 2005). HMM/Bechtel SVRT (2005) presents a detailed evaluation of construction noise impacts for the BART Extension using assumptions provided at that time. The construction phasing, anticipated construction equipment and their duration of use have not materially changed for the current undertaking. The results of the 2005 construction impact study are summarized herein. The 2005 construction impact analysis evaluated seven areas of construction.

1. Downtown San Jose Station
2. Alum Rock Station
3. Diridon/Arena Station
4. Portals
5. 15th Street ventilation shaft
6. Schiele Avenue ventilation shaft
7. Gap breaker stations (5)

There have been changes to the project since 2005. Currently, there are two options for the Downtown San Jose Station (East and West); otherwise, the locations of the construction sites are very similar or the same as those in 2005. The ventilation shaft facility formerly at 15th Street would now be at 13th Street. The ventilation facility at Schiele Avenue is actually four alternative locations along Stockton Avenue and is now labeled Stockton Avenue ventilation facility. The Santa Clara Station was not included in the referenced 2005 study. The only noise receptor near the Santa Clara Station construction site would be the Candlewood Suites, which would be approximately 300 feet away at the closest point of the station.

Construction Equipment

Typical construction equipment would include backhoes, bulldozers, end-loaders, cranes, wrecking balls, forklifts, haul trucks, jackhammers, excavators, boom drill rigs, crawler cranes, crawler bulldozers/loaders, pavement breakers, loader/bobcats, trucks, excavators,

generator/compressors, water trucks for dust control, and concrete and materials/equipment trucks. Significant oversized equipment will be used extensively, such as crane, bulldozers, loaders, pavement breakers, excavators, and backhoes. A soil mix wall batch plant for cement slurry preparation will be required for cut-and-cover excavation.

Tunnel Construction

The tunnels would be constructed using one or more tunnel boring machines (TBM). The TBM is anticipated to progress at a rate of from 30 to 75 feet a day depending on soil conditions encountered. The TBM would be a source of groundborne noise and/or vibration, the impact of which depends on the proximity of the tunnel to sensitive receptors and soil conditions encountered.

The soil excavated by the TBM would be removed from the tunnel by either by a muck train or a conveyor system. Typically muck trains operate on small jointed rails supported on wood crossties laid on the tunnel floor. This type of soil removal can be source of groundborne noise depending on the proximity of the tunnel to sensitive receptors and soil conditions encountered. Generally, a soil conveyor system generates no perceptible noise or vibration for receptors on the surface above.

Portal, Station Box, Ventilation Facility, and Underground Crossover Construction

The portals, the three underground station boxes, one underground crossover, and two mid-tunnel ventilation structures would be constructed by a cut-and-cover construction method. Demolition of existing structures would be required at various locations where cut-and-cover occurs. Cut-and-cover construction involves excavation from the street or ground level. Temporary shoring walls would be required to support the walls during excavation. A typical method for doing this is soil-cement mix wall or slurry diaphragm wall. A soil mix wall construction involves either drilling many holes with an auger or digging a trench, both of which generate airborne noise and ground vibration.

Truck Haul Routes

Trucks hauling equipment, materials and soil can be a source of noise impact depending on the routes selected.

Construction Noise

Noise emission levels for the various anticipated construction equipment, the number of pieces of equipment, and the anticipated percentage of time the equipment will be used each hour and during each construction shift are provided in tables in Reference 14 for each of the construction phases. Based on these data, hourly equivalent (L_{eq}) noise levels were projected at the nearest noise-sensitive receptors for each phase of construction. The analysis concluded that L_{eq} levels for an 8-hour period would be similar to the hourly L_{eq} levels. The

noise emission levels used in the 2005 analysis for the anticipated construction equipment are provided in Table 6.12-3.

Table 6.12-3: Construction Equipment and Noise Emission Levels

Equipment Type	Usage Factor (Percentage of Time Used During Each Hour and During Each Shift)	Typical Sound Level @ 50 feet dBA
Excavators (Cat 235, Cat 245, Cat 225)	75%	82 Cat 245 70 Cat 235 82 Cat 225
Dump trucks	10%	81
Front end loaders (Cat 966, Cat 988)	75%	81
Dozers (Cat D-6, Cat D-8)	75%	82 Cat D-6 85 Cat D-8
Concrete trucks	25%	77
Small construction vehicles (pickup trucks)	25%	68
Cranes (Manitowoc 4100, Grove 20T RT)	50%	81 Manitowoc 74 Grove
Large diameter drill-rig (Casagrande C800)	75%	81
Small diameter drill-rig (Soilmec 825)	25%	80
Diesel generators (150 KW)	100%	69a
Flat-bed semi-trucks	10%	81
Diesel pumping equipment	100%	77
Compressed-air construction tools	25%	81
Tie-back installation drilling equipment	75%	75
Concrete pumping truck	25%	77
Rail welding plant (Holland Welder)	75%	77
Air compressors (125 cfm, 250 cfm)	75%	70*
Earth pressure balance tunnel boring machine	60%	70
Muck conveyor	75%	65
Grout batch plant	75%	80
Supply train, including locomotive (25–35 ton)	50%	70 @5mph near portal
Welding equipment (400 Amp)	50%	73
Grout silos	100%	70
Grout mixers	100%	71
Grout pumps	100%	77
[a] Assumed to be acoustically treated with proper noise control		

The L_{eq} for a single piece of equipment is obtained from the following formula.

$$L_{eq}(equip) = E.L. + 10 \times \log10(U.F.) - 20 \times \log10(D/50) - 10 \times G \times \log10(D/50)$$

Where L_{eq}(equip) is the L_{eq} at a receiver resulting for operation of a single piece of equipment over a specified time period, E.L. is the noise emission level (i.e., typical sound level) of the particular piece of equipment at the reference distance of 50 feet as obtained in Table 6.12-3, G is a constant to account for topography and ground effects, D is the distance from the receiver to the piece of equipment, and U.F. is the usage factor that accounts for the fraction of time that the equipment is in use over the specified time period. The factor G is obtained from Chapter 6 of the FTA Guidance Manual. For most situation G can conservatively be taken to be equal to zero (0), which it is for hard ground.

The combination of noise "L_{eq}(combined)" from more than one piece of equipment operating during the same time period is obtained from the decibel addition of the L_{eq} of each single piece of equipment as given by:

$$L_{eq}(combined) = 10 \times \log10(10L_{eq}1/10 + 10L_{eq}2/10 + 10L_{eq}3/10 + \cdots + 10L_{eq}N/10)$$

Where $L_{eq}1$, $L_{eq}2$, $L_{eq}3$, $L_{eq}N$ are the individual L_{eq} for 1 through N pieces of equipment.

Construction Vibration

The TBM create vibration as the cutting head rotates and removes soil at the tunnel face. With an anticipated rate of from 30 to 75 feet a day advancement of the tunnel face vibration may be perceptible as either groundborne noise or vibration from 3 to 4 days. If the soil excavated by the TBM is removed from the tunnel by a muck train operating on jointed rails supported on wood crossties laid on the tunnel floor, this can be a significant source of groundborne noise impact depending on the proximity of sensitive receptors.

The cut-and-cover construction for the portals, the underground station boxes, underground crossover, and mid-tunnel ventilation structures can be a source of vibration impact depending on the proximity of nearby receptors. Demolition of existing structure can also be a source of vibration impact. Table 6.12-4 provides typical vibration levels for equipment generally used in the type of construction anticipated. Driven piles either with impact hammer or sonic would not be used unless vibration levels are below the acceptable criteria.

Table 6.12-4: Typical Vibration Levels for Construction Equipment

Equipment		PPV at 25 feet (in/sec)	Approximate L_v [a] at 25 feet
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory roller		0.210	94
Hoe ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: FTA Guidance Manual
[a] Root mean square velocity in decibels (VdB) re 1 micro-inch/second

For the purpose of assessing the potential for damage to buildings due to construction activity for the equipment listed in Table 6.12-4, the peak particle velocity vibration at distances other than 25 feet can obtained using the following formula.

$$PPVequip = PPVref \times (25/D)1.5$$

where: PPVequip is the peak particle velocity in inches/second of the equipment adjusted for distance, PPVref is the reference vibration level in inches/second at 25 feet obtained from Table 6.12-4, D is the distance in feet between the equipment and receiver.

For the purpose of assessing the potential for annoyance or interference with vibration-sensitive activities, the vibration level at any distance D can be obtained from the following equation.

$$Lv(D) = Lv(25ft) - 30 \times \log10(D/25)$$

To assess the potential for annoyance, this level of vibration is compared to the infrequent events criteria in Table 4.12-3 depending on the type of receiver.

For vibration generated by TBM operation, Dowding (2000) provides data for soil and rock. The data for TBM in rock was used to project vibration levels at the ground surface due to TBM operation.

Transit Operations

Refer to Section 4.12 for a discussion of analysis methods for transit operation noise and vibration.

6.12.4 CEQA Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the project would have a significant impact if it would result in any of the conditions listed below.

- Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies.
- Expose persons 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.
- Be located within an airport land use plan area, or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels.
- Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels.

6.12.5 Environmental Consequences

This section identifies the impacts related to noise and vibration under CEQA, as well as mitigation measures necessary to reduce the level of potentially significant impacts.

6.12.5.1 No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and transportation programmed improvements (see Chapter 2, Section 2.2.1, *NEPA No Build Alternative*, for a list of these projects). The No Build Alternative projects could result in effects due to noise and vibration typically associated with transit, highway, bicycle, and pedestrian facilities, and roadway projects, as well as land development projects.

All individual projects planned under the No Build Alternative would undergo separate environmental review to identify effects due to noise and vibration. Review would include an analysis of impacts and identification of mitigation measures to reduce potential impacts.

6.12.5.2 BART Extension Alternative

Impact BART Extension NOI-1: Expose persons to or generate noise in excess of local or agency standards

Construction

The following analysis draws upon the construction noise and vibration analysis performed in 2005 (HMM/Bechtel SVRT 2005). Land uses at stations and along the alignment have not changed dramatically since the completion of that study.

Portals

It was determined in 2005 that construction at the east and west portal sites would not cause noise impacts.

East Portal

The land use around the East Portal is primarily industrial. The closest building is 340 feet away on Las Plumas Avenue. The projected 8-hour L_{eq} is 71 dBA, which is less than the daytime criterion of 90 dBA (see Table 6.12-1). No noise impact is projected for the East Portal construction.

West Portal

There are four single-family homes (single-story) on Stockton Avenue approximately 500 feet from the site of the West Portal. The projected 8-hour L_{eq} is 70 dBA. The daytime L_{eq} criterion is 80 dBA and 70 dBA for nighttime (see Table 6.12-1). No noise impact is projected for the West Portal construction.

Alum Rock/28th Street Station

The adjacent land use is primarily light industrial on both sides of N. 28th Street. The closest sensitive receiver is the Five Wounds Portuguese National Church, which would be at least 350 feet from the station box construction. The closest residences are on 27th Street. Four single-family residences would be between 400 and 750 feet away. At these distances the 8-hour L_{eq} is projected to be from 63 to 72 dBA. This would exceed the nighttime criterion for residences, but not the daytime criterion (see Table 6.12-1).

A significant noise impact would occur if there were nighttime work. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce this impact to a *less-than-significant* level (see Chapter 5, Section 5.5.13, *Noise and Vibration,* for all construction-related mitigation).

Ventilation Facilities13th Street Ventilation Structure

There are residences at 85 feet and at 95 feet away from the 13th Street ventilation structure. Consequently, construction of the 13th Street Ventilation Structure FSS is predicted to result

in significant construction noise impacts. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce this impact to a *less-than-significant* level.

Stockton Avenue Ventilation Structure

There is one residence that is approximately 120 feet from the Stockton Avenue Ventilation Structure FSS. Construction of either of the two southernmost alternative sites would result in significant construction noise impacts. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce this impact to a *less-than-significant* level.

Downtown San Jose Station

Downtown San Jose Station East Option

This option is two blocks to the east of the West Option. The City office building is between 4th and 6th Streets and at its closest is 100 to 150 feet away. The projected noise level is an 8-hour L_{eq} of 79 dBA, which is less than the 85 dBA criterion for commercial spaces, which could include offices. The other buildings between 4th and 3rd Streets are similar to those for the Downtown San Jose Station West Option, which include residences above ground floor and commercial spaces. A significant noise impact on some of the residences could occur for the Downtown San Jose Station East option.

A significant noise impact to noise sensitive uses could occur for the Downtown San Jose East Option. Even after implementation of Mitigation Measures NV-CNST-A through NV-CNST-O, this impact would be *significant and unavoidable*.

Downtown San Jose Station West Option

There are several apartments on both sides of Santa Clara Street on the upper floors of buildings between 3rd and 4th Streets. The Town Park Towers, a 10-story apartment building, is located on 3rd Street about 200 feet from Santa Clara Street. While the lower floors on the west side are somewhat shielded by adjacent buildings, on the east side all units have a clear line of sight to Santa Clara Street. All other buildings along Santa Clara Street are commercial at ground floor with offices above.

The buildings on Santa Clara Street are approximately 40 feet from the centerline of the closest construction activity. For commercial buildings in the area, Phase I and Phase III construction would essentially be in compliance with the 8-hour L_{eq} noise limit of 85 dBA with possibly occasional exceedances of 1 to 2 dBA. For the residences in the area, nighttime construction could exceed the 8-hour L_{eq} limit of 70 dBA by as much as 15 to 18 dBA, making nighttime construction difficult to mitigate. During the daytime, the limit is 80 dBA, which is projected to be exceeded by 5 to 8 dBA. It is projected that some of the units at the Town Park Towers could be exposed to an 8-hour L_{eq} of 76 dBA, which exceeds the nighttime limit but not the daytime limit.

A significant noise impact on noise sensitive uses could occur for the Downtown San Jose Station West Option. Even after implementation of Mitigation Measures NV-CNST-A through NV-CNST-O, this impact would remain *significant and unavoidable.*

Diridon Station (South and North Options)

The area surrounding the Diridon Station (South and North Options) is primarily characterized by a mix of commercial buildings (the closest would be 140 feet from the staging area), a church (255 feet away), and residences (the closest multi-family residence would be 200 feet away). The noise levels would exceed the threshold and would therefore result in a significant impact. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce noise impacts, but not would guarantee that the noise levels would be less than the threshold. Therefore, construction noise impacts for the Diridon Station (South and North Options) would be *significant and unavoidable*.

Santa Clara Station

The area surrounding the station site is characterized by a mix of commercial, light industry hotel and residences. The closest multi-family receptor is approximately 615 feet away and the hotel is approximately 400 feet from the construction site. The noise threshold would not be exceeded at any sensitive receptors. Therefore, *less than significant* noise impacts would occur during construction of the Santa Clara station.

Newhall Maintenance Facility

The area surrounding the Newhall Maintenance Facility is characterized by a mix of commercial, light industry, and residential land uses. The nearest multi-family residential use and hotel are approximately 400 feet away. The noise threshold would not be exceeded at any sensitive receptors. Therefore, impacts would be *less than significant* during construction.

Operation

As described under BART Extension Impact NOI-3, there are several elements of the BART facilities that would generate noise in excess of local or agency standards. The increase in wayside noise levels from train operations at all ground level and second story receptors are projected to be less than the 5 dBA threshold that indicates a significant impact under CEQA. Therefore, impacts would be *less than significant*, and no mitigation is required.

BART ancillary facility noise impacts were analyzed in a memorandum prepared by Wilson, Ihrig & Associates (2006). The results of these analyses are summarized below. Analyses for ventilation shafts at the Santa Clara and 13th Street and Stockton were evaluated in *VTA's BART Silicon Valley—Phase II Extension Project Noise and Vibration Technical Report* (Wilson, Ihrig & Associates 2016).

Tunnel Ventilation Shafts

Emergency Ventilation Fan Noise

Untreated ventilation facilities could produce a noise level of 67 to 77 dB at 50 feet. This could result in exceedance to the City of San Jose's noise limit of 55 dBA at residences within 200 to 630 feet of these facilities. This would be a significant impact. Implementation of Mitigation Measure NV-A would reduce this impact to a *less-than-significant* level.

Mitigation Measure NV-A: Implement Noise Reduction Treatments at Ancillary Facilities

Noise reduction treatments will be implemented at ancillary facilities such as tunnel ventilation shafts, piston relief shafts, traction power substations, and emergency backup generators such that noise levels comply with applicable Cities of San Jose and Santa Clara noise criteria at nearby developed land uses. Treatments that will be implemented, if necessary, include but are not limited to:

- Sound attenuators and acoustical absorptive treatments in ventilation shafts and facilities.
- Sound attenuators for the tunnel emergency ventilation fans.
- Perimeter noise walls (nominally an 8 feet high wall) placed around emergency generators.

Train Noise

Noise from BART trains operating in the subway tunnels can be transmitted to the surface via the ventilation shafts.

Santa Clara and 13th Streets Ventilation Facility

Long-term ambient noise measurements were conducted near the Santa Clara and 13th Streets Ventilation Facility in 2008. Ambient noise measurements were conducted in 2015 at two of the same locations studied in 2008. Table 6.12-5 summarizes the results of the 2008 and 2015 ambient noise measurements. Measurement locations are depicted in Figure 4.12-6 in Section 4.12, *Noise and Vibration*.

Table 6.12-5: Ambient Noise in Santa Clara and 13th Street Neighborhood

Measurement Location Label	Ambient L_{dn} (dBA)				
	2008		2015		Ambient Used in Analysis
	Range	Average	Range	Average	
A	61–62	61.5	--	--	62
B	70–71	70.5	67	67	71
C	62–64	63	62–63	62.5	63
E	64–67	65.5	--	--	66
H	59–60	59.5	--	--	60
I	61–64	62.5	--	--	63

The ambient noise at Location B was measured to be 3.5 dBA lower in 2015 as compared with 2008. The ambient noise at Location C did not change. Because higher existing ambient noise levels are more critical (more likely to require mitigation) and there is no consistent trend, the greater of the ambient readings from 2008 and 2015 was used in the impact analysis to characterize the ambient at the six locations.

There are two noise sources associated with ventilation facilities: noise from trains running in the tunnel and the testing of emergency ventilation fans. Trains run continuously during revenue hours and have potential for impacting ambient noise over the course of a day.

Table 6.12-6 presents the projected noise from train noise exiting the tunnel from the ventilation shaft. The train noise emitted from the Santa Clara/13th Street ventilation shaft is minimal. No noise impacts are projected to occur from this source of operational noise. Therefore, no mitigation is required for train noise that exits the tunnel from the ventilation shaft.

Table 6.12-6: Airborne Train Noise from Santa Clara/13th Street Ventilation Facility

Civil Station	Receiver Location Address	Land Use	Vehicle Speed (mph)	Distance to Vent Structure (ft)	Existing Ambient L_{dn}/L_{eq} (dBA)	Total L_{dn}/L_{eq} (dBA)	Increase over Existing Ambient (dBA)	Moderate Impact Increase Threshold (dBA)	Impact Type
657	30 North 13th Street	MFR	67	85	67	67.1	0.1	1.2	NI
658	602 East Santa Clara Street – Indian Health Center of Santa Clara Valley	Institutional	67	145	69	69.0	0.0	1.1	NI
658	28 South 13th Street	SFR	67	280	63	63.0	0.0	1.6	NI
660	29 South 13th Street – Duong Bich-Hai Thi, DDS	Institutional	67	260	63	63.0	0.0	1.6	NI
660	26 South 12th Street	SFR	67	250	63	63.0	0.0	1.6	NI
661	551 East Santa Clara Street – Holistic Health Care Clinic (Chiropractic)	Institutional	67	80	69	69.1	0.1	1.1	NI
661	32 North 12th Street	MFR	67	100	66	66.1	0.1	1.3	NI
662	15 South 12th Street	SFR	67	270	64	64.0	0.0	1.5	NI
663	12 South 11th Street	MFR	67	395	64	64.0	0.0	1.5	NI
665	32 North 11th Street	MFR	67	360	66	66.0	0.0	1.3	NI

MFR = Multifamily residence
SFR = Single family residence
NI = No Impact
mph = miles per hour
ft = feet
dBA = A-weighted decibels

Stockton Avenue Ventilation Facility

Long-term ambient measurements were conducted near the site of the Stockton Avenue Ventilation Facility in 2008 to characterize the existing conditions. In 2015, ambient noise measurements were repeated at three of the four same locations to determine changes that might have occurred. Table 6.12-7 summarizes the results of the 2008 and 2015 ambient noise measurements. Measurement locations are depicted in Figure 4.12-7.

Table 6.12-7: Ambient Noise in Stockton Avenue Neighborhood

Measurement Location Label	Ambient L_{dn} (dBA)				
	2008		2015		Ambient Used in Analysis
	Range	Average	Range	Average	
L	66-68	67	68-70	69	69
N	64-66	65	69-70	69.5	70
O	60-63	61.5	--	--	62
P	67-70	68.5	68-70	69	69

The ambient noise levels at Location N increased by 4.5 dBA. Because higher existing ambient noise levels are more critical (more likely to require mitigation) and there is no consistent trend, the greater of the ambient readings from 2008 and 2015 was used in the impact analysis to characterize the ambient at the four locations.

Table 6.12-8 presents the projected noise from train noise exiting the tunnel from the ventilation shaft. The train noise emitted from the Stockton ventilation shaft is minimal. No noise impacts are projected to occur for this source of operational noise. Therefore, no mitigation is required for train noise that exits the tunnel from the ventilation shaft.

Table 6.12-8: Airborne Train Noise from Stockton Ventilation Shaft

Civil Station	Receiver Location Address	Land Use	Vehicle Speed (mph)	Distance to Vent Structure (ft)	Existing Ambient L_{dn}/L_{eq} (dBA)	Total L_{dn}/L_{eq} (dBA)	Increase over Existing Ambient (dBA)	Moderate Impact Increase Threshold (dBA)	Impact Type
782	701 Harding Avenue	SFR	67	345	70	70.0	0.0	1.6	NI
784	551 Stockton Avenue	SFR	67	195	70	70.0	0.0	1.1	NI
785	599 Stockton Avenue	SFR	67	115	70	70.0	0.0	1.1	NI
787	733 Schiele Avenue	SFR	67	250	63	63.0	0.0	1.1	NI
788	623 Stockton Avenue	SFR	67	165	69	69.0	0.0	1.1	NI
788	635 Stockton Avenue	SFR	67	180	69	69.0	0.0	1.7	NI
789	641 Stockton Avenue	SFR	67	140	69	69.0	0.0	1.6	NI
794	647 Stockton Avenue	SFR	67	120	69	69.0	0.0	1.0	NI
796	759 Villa Street	SFR	67	330	62	62.0	0.0	0.0	NI
796	745 West Taylor Street	SFR	67	340	63	63.0	0.0	0.0	NI
797	727 Stockton Avenue	SFR	67	400	70	70.0	0.0	0.0	NI

SFR = Single family residence
NI = No Impact
mph = miles per hour
ft = feet
dBA = A-weighted decibels

Pressure Relief Shaft

Based on previous BART projects, the sound attenuators that would be required to reduce the noise from tunnel emergency ventilation fans would be more than adequate to reduce the sound of trains. Introducing two silencers in the pressure relief shaft as specified in Mitigation Measure NV-A (one to control noise within the tunnel and station, the other to control noise at the surface) can reduce the train noise by more than 15 dBA. This would be a *less-than-significant* impact.

Traction Power Substations

Based on previous BART projects (e.g., BART SFO) traction power substations (TPSS) that are beyond 250 feet from residences would not require noise mitigation. There are TPSS that lie within 250 feet of receptors at the Downtown San Jose Station West Option and Diridon Station South and North Options. Tables 6.12-9 through 6.12-11 summarize the noise analysis at each location. The FTA Guidance Manual provides a reference maximum noise level (L_{max}) noise level of 63 dBA for substations. Using a noise level criterion of 55 dBA, there would be one impact each at the Downtown San Jose Station West Option, Diridon Station South Option, and Diridon Station North Option. Implementation of Mitigation Measure NV-A would reduce this impact to a *less-than-significant* level.

Table 6.12-9: Predicted TPSS Noise Levels Near the Downtown San Jose Station West Option

Receptor	Land Use	Distance to TPSS (ft)	Projected Maximum Noise Level (dBA)	Impact Threshold (dBA)	Impact Type
97 East Santa Clara Street	MFR	20	71.0	55	Impact
101 East Santa Clara Street	MFR	125	55.0	55	No Impact
60 North 3rd St	MFR	175	52.1	55	No Impact
100 East Santa Clara Street	MFR	166	52.6	55	No Impact
126 East Santa Clara Street	MFR	220	50.1	55	No Impact
20 South 2nd Street	MFR	210	50.5	55	No Impact
MFR = Multifamily residence ft = feet dBA = A-weighted decibels					

Table 6.12-10: Predicted TPSS Noise Levels Near the Diridon Station South Option

Receptor	Land Use	Distance to TPSS (ft)	Projected Maximum Noise Level (dBA)	Impact Threshold (dBA)	Impact Type
35 South Autumn Street	Single-family residence	90	57.9	55	Impact
ft = feet dBA = A-weighted decibels					

Table 6.12-11: Predicted TPSS Noise Levels Near the Diridon Station North Option

Receptor	Land Use	Distance to TPSS (ft)	Projected Maximum Noise Level (dBA)	Impact Threshold (dBA)	Impact Type
35 South Autumn Street	Single-family residence	90	57.9	55	Impact
ft = feet dBA = A-weighted decibels					

Emergency Backup Generators

Emergency backup generators would be located at the Alum Rock/28th Street and Downtown San Jose Stations.

Alum Rock Generator

The Alum Rock generator would be located at grade, within a concrete structure. Although specific details on the size of the generator are not available it is anticipated that noise from operation of the generator could exceed 55 dBA. However, there are no nearby noise-sensitive receptors. As such, impacts would be *less-than-significant,* and no mitigation is required.

Downtown San Jose Station Generator

The generator for the Downtown San Jose Station would be fully enclosed by the station structure. Noise from operation of the generator could exceed 55 dBA at nearby receptors and result in an adverse impact. Implementation of Mitigation Measure NV-A would reduce this impact to a *less-than-significant* level.

Newhall Maintenance Facility

The Newhall Maintenance Facility tracks were studied in 2006 as part of the preliminary engineering design process. The maintenance facility and storage yard tracks location and usage have not changed significantly since 2006. Therefore, the previous noise analysis (ATS Consulting 2006a, 2006b) conclusions remain valid, and, as shown in Table 6.12-12, there

would be *no noise impacts* from train activity within the Newhall Maintenance Facility, nor would there be noise impacts from facility activity. Accordingly, no mitigation would be required.

Table 6.12-12: Estimated Noise Levels at Noise-Sensitive Receptors near Newhall Maintenance Facility

Potential Outdoor Noise Sources	Estimated L_{dn} at Representative Receptors			
	R-1 Chestnut	R-2 Elm	R-3 Future Res. on Campbell	R-4 Candlewood Suites Hotel
Train Movements on Transfer Track	47	47	50	57
Train Movements on Storage Tracks	39	44	49	31
Hi-Rail Vehicle	41	44	46	46
Carwash	34	35	36	42
Cleaning/Blow-Down	29	30	32	45
Noise from Maintenance Shops	40	41	44	49
Vehicular Traffic Into/Out of Facility	52	N/A	N/A	N/A
Total Maintenance Facility Noise	54	51	54	58
Existing L_{dn}	61	65	65	65
FTA Impact Threshold	58	61	61	61
Impact (Y/N)	N	N	N	N
Source: ATS Consulting 2006a, 2006b..				

Impact BART Extension NOI-2: Expose persons to or generate excessive groundborne vibration or groundborne noise

Construction

Except for TBM operation, most construction vibration would occur during daytime hours. Operation of the TBM would be two 10-hour shifts with an estimated progress at a rate of from 30 to 75 feet a day depending on soil conditions encountered.

Tunnel Construction – TBM

The depth of the tunnel centerline below the ground surfaces typically ranges from approximately 40 to 60 feet with the Twin-Bore Option. Some residences would be located directly over the tunnels. For those residences the distance from the tunnel center is 45 feet or more. At 45 feet the vibration level (measured as PPV) is projected to be less than 0.02 inches/second. In terms of human perception, this vibration could vary from 75 to 83 VdB depending on soil conditions. Typically, residences are at least 75 feet away from a tunnel centerline and vibration would be less than 75 VdB. The Single-Bore Option tunnel boring machine is larger and would generate greater vibration. However, the Single-Bore Option would be at a greater depth, which would offset the greater vibration and result in vibration levels comparable to the Twin-Bore Option.

Impacts on Buildings (Cosmetic Building Damage)

A PPV of 0.02 inches/second is substantially below the most conservative building damage criterion of 0.12 inches/second, which addresses the potential for cosmetic damage (e.g., plaster cracks) to buildings in a fragile condition (e.g., possible older historic buildings). Consequently, there are no projected impacts to buildings due to TBM operation.

Impacts on Occupants (Annoyance)

The FTA impact criterion for infrequent events is 80 VdB for residences and for occasional events it is 75 VdB and for frequent events it is 72 VdB. Since the perceptible vibration would last no more than four days and typically only three days, the occasional events criterion (75 VdB) would be applicable. This level of vibration may be perceptible to some people.

For residences that are at least 75 feet horizontally from a tunnel centerline, the vibration would be less than the criterion (72 VdB) for frequent events. For residences less than 75 feet, the vibration would be perceptible depending on the depth of the tunnel and the horizontal distance the residence is from the tunnel centerline.

It is projected that residences within a horizontal distance of 50 feet of the tunnel centerline may be exposed to significant impacts by TBM vibration for a period of up to four days, which includes approximately three dozen residences that could be impacted by TBM vibration for a period of up to four days. Implementation of Mitigation Measure NV-CNST-P through NV-CNST-S would reduce this impact to a *less than significant* level.

Tunnel Construction – Muck Train

Soils excavated by the TBM would be removed by a muck train or conveyor system. Muck trains have been found to cause groundborne noise impacts in the past and are assumed to result in significant vibration impacts. Implementation of Mitigation Measures NV-CNST-P through NV-CNST-S would reduce this impact to *less-than-significant* level.

Station Excavation

Vibration from station and ventilation shaft excavation would be generated from implementation of excavation shoring and tiebacks where necessary. Construction of the Downtown San Jose Station would require demolition and removal of the existing roadway and in some places possibly the sidewalk. After the station box is completed the roadway would be rebuilt.

Table 6.12-13 indicates the various demolition and construction activities and the equipment that would produce vibration. Also indicated are the distance beyond which the vibration should be less than 0.12 inch per second PPV. Where a range of distance is shown, the distance depends on the actual equipment used and/or the local soil conditions.

Table 6.12-13: Demolition and Construction Vibration

Activity	Equipment	Distance (feet)[a]
Demolition	Hoe Ram	20
	Jackhammer	10 to 15
Excavation	Trencher	20
	Caisson Drilling	20
	Hydro Mill Slurry Wall	5 to 10
	Drilling for Tiebacks	6 to 8
Roadway Subgrade Compaction	Vibratory Roller	35 to 40
[a] Distance to reach 0.12 inch per second		

The results in Table 6.12-13 indicate that structures close to station excavation could be exposed to excessive vibration. This impact is therefore considered to be significant. Implementation of Mitigation Measures NV-CNST-P through NV-CNST-R would reduce this impact to a *less-than-significant* level.

Operation

At-grade Segment

All sensitive receptors adjacent to the at-grade segment of the alignment, which starts approximately 600 feet north of I-880, would be over 200 feet (i.e., 223 feet and greater) from the nearest track. The Screening Distance for a rail rapid transit system such as BART is 200 feet. Consequently, there would be *no impact* from groundborne noise and vibration for the at-grade segment of the BART Extension.

Tunnel Segment – Twin-Bore Option

Tables 4-8 through 4-10 in *VTA's BART Silicon Valley—Phase II Extension Project Noise and Vibration Technical Report* (Wilson, Ihrig & Associates 2016) and Tables 4.12-16 through 4.12-20 in Section 4.12, *Noise and Vibration*, indicate groundborne vibration and noise levels along the tunnel segment. Groundborne vibration and noise levels are presented as a range of projected values reflecting the use of a modeling factor, which conservatively accounts for the various uncertainties in the model. The levels at each receptor location are based on distance to and depth of the track, train design speed, wheel/rail interaction forces, dynamic characteristics of rail support system, soil conditions, and the dynamic response of the receptor building. Determinations of noise and vibration impacts are based on the upper value of the predicted range. Table cells that are shaded indicate impacts.

As indicated in Tables 4.12-16 through 4.12-20 in Section 4.12, *Noise and Vibration*, no vibration impacts are projected for the BART Extension's tunnel alignment when comparing the FTA 1/3-octave band criteria to the predicted levels of vibration. The analysis does indicate that groundborne noise levels are projected to exceed the FTA criteria for many

receptors, as shown in Tables 4.12-16 through 4.12-20 in Section 4.12, *Noise and Vibration*. This would result in significant noise impacts.

Mitigation Measure NV-B is an Isolated Slab Track (IST), which can provide approximately 13 dBA of noise reduction. An IST is a form of floating slab track (FST). In the case of special trackwork (i.e., crossover), Mitigation Measure NV-B, can also be used underneath a crossover. Implementation of Mitigation Measure NV-B would reduce the impacts of groundborne noise to *less than significant*.

Mitigation Measure NV-B: Reduce Groundborne Noise Levels

The mitigation strategy to achieve the FTA groundborne noise criteria is an Isolated Slab Track (IST), which is a special form of concrete slab track design similar to but not as effective as a floating slab track (FST) system. The IST system is constructed with a continuous elastomeric mat instead of discrete elastomeric pads that are typically used for an FST system. The IST can be designed to provide approximately 13 dBA of noise reduction. The locations for implementing mitigation are shown in Table 4.12-16 through 4.12-20. The specific mitigation strategy will be determined in final design and could include alternative strategies that similarly achieve the FTA groundborne noise criteria.

Tunnel Segment – Single-Bore Option

An analysis was performed comparing projected groundborne noise levels from the Single-Bore Option to the Twin-Bore Option. The conclusion from this analysis is that due to the greater depth of the single-bore tunnel the projected groundborne noise levels for the lower level of the single-bore tunnel would be less (from 1 to 2 dBA) than those from the twin-bore tunnel. Based on an analysis for a similar bi-level tunnel groundborne noise from the upper level are projected to be substantially less than for the lower level.

In the engineering phase of the Phase II Project, vibration propagation test data will be required for tunnel depths of the single-bore tunnel to allow for more detailed analysis and determination of specific mitigation required, if this is the preferred alternative. For purposes of this analysis, where groundborne noise level exceed the noise criterion by 1 dBA for the Twin-Bore Option, it was determined that mitigation for the lower level of the single-bore tunnel would be less than for the Twin-Bore Option. It is expected that for the upper level, the groundborne noise mitigation would be substantially less for the upper level of the single-bore tunnel compared to the mitigation for the twin-bore tunnel.

Impact BART Extension NOI-3: Permanently increase ambient noise levels in the vicinity

Construction

Construction of the BART Extension would be temporary by nature and thus would not result in any permanent increase of ambient noise levels along the alignment. Refer to Impact BART Extension NOI-4 for temporary ambient noise impacts from construction.

Operation

Airborne noise impacts from train operations can occur where trains are running on track aboveground, at ventilation facilities where train noise is transmitted to the surface from the tunnel below, and from storage yard tracks and maintenance facility activities.

Wayside Train Noise

Table 4-2 in *VTA's BART Silicon Valley—Phase II Extension Project Noise and Vibration Technical Report* (Wilson, Ihrig & Associates 2016) presents the projected wayside noise levels for ground-floor receptors. For ground-floor receptors, wayside noise would result in no impact for all but one receiver (Candlewood Suites at 481 El Camino Real in Santa Clara). For the other ground-floor receptors, the projected increase is 0.8 dBA or less and the threshold for Moderate Impact (see Figure 4.12-8) for these receptors is 1.2 or greater based on existing ambient ranging from 62 to 67 dBA. With an existing day-night sound level (L_{dn}) of 65 dBA at Candlewood Suites, the threshold for Moderate Impact is 1.4 dBA. The increase in noise level for this receptor is projected to be 2 dBA. The mitigation policy adopted for the Phase II Project is to mitigate Moderate Impacts only when the increase in noise levels is greater than 5 dBA. For the purpose of CEQA, noise increases of 5 dBA or less with a Moderate Impact is a *less-than-significant* impact.

Table 4-3 in *VTA's BART Silicon Valley—Phase II Extension Project Noise and Vibration Technical Report* (Wilson, Ihrig & Associates 2016) presents the projected wayside noise levels for second story receivers. For second story receivers, wayside noise is projected to impact two receivers (Dahlia Loop SFR complex and Candlewood Suites) with Moderate Impacts. The threshold for Moderate Impact for Dahlia Loop SFR is 1.2 dBA. The increase in noise level at the second story of this receptor is 1.7 dBA. For Candlewood Suites, the increase in noise level is projected to be 2 dBA. Because the mitigation policy is to mitigate Moderate Impacts only when the increase in noise levels is greater than 5 dBA, no mitigation is anticipated and these Moderate Impacts would be considered *less than significant* under CEQA.

Tunnel Ventilation Shafts

There are two noise sources associated with ventilation facilities: noise from trains running in the tunnel and the testing of emergency ventilation fans. Trains run continuously during revenue hours and have potential for impacting ambient noise over the course of a day.

The train noise emitted from the Santa Clara/13th Street and Stockton Avenue ventilation shafts would be minimal. There would be *no impact* from this source of operational noise and no mitigation is required.

Newhall Maintenance Facility

As described under Impact BART Extension NOI-1, the Newhall Maintenance Facility tracks were studied in 2006 as part of the preliminary engineering design process. The maintenance facility and storage yard tracks location and usage have not changed significantly since 2006.

Therefore, the previous noise analysis (ATS Consultants 2006a,b) conclusions remain valid, and there would be *no impact* from train activity within the Newhall Maintenance Facility, nor would there be noise impacts from facility activity.

Impact BART Extension NOI-4: Temporarily or periodically increase ambient noise levels

Construction

As discussed under Impact BART Extension NOI-1, construction could temporarily increase noise levels and result in a significant noise impact if nighttime construction were to occur. Potential impacts on ambient noise levels due to nighttime construction could occur at the Alum Rock/28th Street Station, and both the east and west options for the Downtown San Jose Station. The construction of the 13th Street and Stockton Avenue Ventilation Facility could also temporarily increase ambient noise levels and result in a significant noise impact. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce this impact to a *less-than-significant* level.

Operation

There would be no temporary ambient noise impacts from operations. Refer to Impact BART Extension NOI-3 for permanent ambient noise impacts from BART Extension operation.

Impact BART Extension NOI-5: Expose people in the area to excessive airport noise

Construction

The Mineta San Jose International Airport is near the alignment. However, construction workers would not be permanently located near the airport during construction. All construction work near the BART Extension would be transient by nature. As such, there would be *no impact*.

Operation

The Mineta San Jose International Airport is near the alignment. However, no people would be permanently located near the airport due to operation of the BART Extension. All users of the BART Extension would be transient by nature. As such, there would be *no impact*.

6.12.5.3 BART Extension with TOJD Alternative

The TOJD includes construction of commercial and residential buildings in the vicinity of the four stations and the two ventilation facilities.

Impact BART Extension + TOJD NOI-1: Expose persons to or generate noise in excess of local or agency standards

Construction

Alum Rock/28th Street Station

Construction noise impacts associated with TOJD at this site would be greater than those for construction of the Alum Rock/28th Street Station, as described under Impact BART Extension NOI-1 due to the more extensive construction above ground. This impact is therefore considered to be significant. However, implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce both BART Extension and TOJD noise impacts to a *less-than-significant* level.

Santa Clara and 13th Streets Ventilation Facility

Residences are located to the north and adjacent to the site. Construction noise impacts associated with TOJD at this site would be similar to those for construction of the BART Extension ventilation facility since both would be enclosed within the same building. This impact is therefore considered to be significant because the BART Extension construction noise impacts were considered significant. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce this impact to a *less-than-significant* level.

Downtown San Jose Station (East and West Options)

There are existing residences near both the east and west station options. Construction noise impacts associated with TOJD at this site would be greater than those for construction of the Downtown San Jose Station, as described under Impact BART Extension NOI-1. This is due to more extensive aboveground construction. This impact is therefore considered to be significant. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce both BART Extension and TOJD noise impacts, but the residual impact would be *significant and unavoidable*.

Diridon Station (South and North Options)

There are commercial uses, churches, or multi-family residences in proximity to the construction area for the Diridon Station South or North Options. Construction noise impacts associated with TOJD at this site would be greater than those for construction of the Diridon Station, as described under Impact BART Extension NOI-1. This is due to more extensive aboveground construction. This impact is therefore considered to be significant. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce both BART Extension and TOJD impacts, but the residual impact would be *significant and unavoidable*.

Stockton Avenue Ventilation Facility

Existing residences are located to the southwest and across Stockton Avenue. Construction noise impacts associated with TOJD at this site would be similar to those for construction of

the BART Extension ventilation facility, as both which would be enclosed within the same building. This impact is therefore considered to be significant because the BART Extension construction noise impacts were considered significant. However, implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce this impact to a *less-than-significant* level.

Santa Clara Station

The closest noise sensitive receptors are multi-family residences and a hotel approximately 400 feet from the construction area. These uses are also across the existing railroad tracks. Construction noise impacts associated with TOJD at this site would be greater than those for construction of the Santa Clara Station, as described under Impact BART Extension NOI-1. This is due to more extensive aboveground construction. However, the construction noise would not exceed the threshold. Therefore, noise impacts would be *less than significant*.

Newhall Maintenance Facility

The nearest multi-family residential use and hotel are approximately 400 feet from the construction area. The noise threshold would not be exceeded at any sensitive receptors. Therefore, *less-than-significant* impacts from noise are projected during construction of the maintenance facility.

Operation

Operation impacts for the BART Extension are discussed under Impact BART Extension NOI-1. No significant additional operational noise impacts are anticipated from TOJD operations. For these reasons, impacts from operation of the BART Extension and TOJD would be *less than significant with mitigation* related to excess noise levels.

Impact BART Extension + TOJD NOI-2: Expose persons to or generate excessive groundborne vibration or groundborne noise

Construction

Construction impacts associated with the BART Extension with TOJD would be greater than those for construction of only the BART Extension facilities.

Residences within 50 feet of the tunnel centerline could be affected by TBM vibration during tunnel construction, and by muck train removal of the soil excavated during construction. This impact is therefore considered to be significant. Construction of the TOJD would include pile driving that could result in significant groundborne vibration impacts. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce both BART Extension and TOJD groundborne vibration and noise impacts to a *less-than-significant* level.

Operation

BART Extension operations would result in groundborne noise impacts as described above and in Chapter 4, Section 4.12. Implementation of Mitigation Measure NV-B would reduce this impact to a *less-than-significant* level.

Impact BART Extension + TOJD NOI-3: Permanently increase ambient noise levels in the vicinity

Construction

Construction impacts are temporary by nature and would not result in any permanent increase in ambient noise levels. Refer to Impact BART Extension + TOJD NOI-4 for temporary ambient noise level impacts.

Operation

Operation impacts for the BART Extension are discussed under BART Extension NOI-3. No additional significant operational noise impacts are anticipated from TOJD operations. For these reasons, impacts from operation of the BART Extension with TOJD Alternative would be *less than significant* related to a permanent increase ambient noise levels in the vicinity.

Impact BART Extension + TOJD NOI-4: Temporarily or periodically increase ambient noise levels

Construction

Construction impacts on ambient noise levels associated with TOJD would be greater to those for construction of the BART Extension. Refer to Impact BART Extension NOI-4 for analysis of the construction impacts of the BART Extension. This impact is considered to be significant. Implementation of Mitigation Measures NV-CNST-A through NV-CNST-O would reduce both BART Extension and TOJD ambient noise impacts, but impacts would remain *significant and unavoidable* for the Downtown San Jose (East and West Options) and Diridon (South and North Options) Stations.

Operation

There would not be a significant increase in ambient noise levels due to operation of the TOJD along with the BART Extension. There would be *no impact*.

Impact BART Extension + TOJD NOI-5: Expose people in the area to excessive airport noise

Construction

The Mineta San Jose International Airport is near the alignment. However, construction workers would not be permanently located near an airport during construction. All

construction work near the BART Extension and TOJD would be transient by nature. As such, there would be *no impact*.

Operations

The Mineta San Jose International Airport is near the alignment. The Comprehensive Land Use Plan for Mineta San Jose International Airport includes several policies that pertain to noise compatibility and are relevant to the BART Extension with TOJD Alternative. The Comprehensive Land Use Plan summarizes land use compatibility standards from the General Plan for the impact area of Mineta San Jose International Airport. These standards include prohibiting "any significant new residential development in the adverse noise environment created by the San José International Airport (65 CNEL and over)." Policy N-4 states:

> No residential or transient lodging construction shall be permitted within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL and there are no outdoor patios or outdoor activity areas associated with the residential portion of a mixed use residential project or a multi-unit residential project.

Residential uses proposed as part of TOJD could be exposed to noise from the airport in excess of 65 CNEL. This impact is therefore considered to be significant. Implementation of Mitigation Measure NV-C would reduce this impact to a *less-than-significant* level.

Mitigation Measure NV-C: Implement Acoustical Design of Residential Uses

Residential uses proposed as part of joint development will be designed so that noise exposure complies with applicable noise standards in the Mineta San Jose International Airport Comprehensive Land Use Plan. Measures that can be implemented include but are not limited to installation of noise-reducing treatments in new buildings such as the following.

- High-performance, sound-rated double-glazed windows.
- Sound-rated doors.
- Sound-rated exterior wall construction.
- Special acoustical details for vents.
- Acoustical caulking at all exterior façade penetrations.
- Sound-rated roof and ceiling constructions.
- Adequate mechanical ventilation so that windows and doors may be kept closed at the discretion of the building occupants to control environmental noise intrusion.

6.12.6 CEQA Conclusion

The BART Extension Alternative would have a *less-than-significant impact,* a *less-than-significant impact after mitigation,* or a *significant and unavoidable impact* (for construction noise impacts in the vicinity of the Downtown San Jose [East and West Options] and Diridon [South and North Options] Stations) under CEQA depending on the location. Mitigation

measures are provided to reduce BART Extension Alternative noise and vibration impacts. The BART Extension with TOJD Alternative would have greater construction impacts than the BART Extension Alternative because of the more extensive aboveground construction activities and below ground activities such as pile driving. However, mitigation measures would reduce these construction noise impacts to a *less-than-significant* level except at the Downtown San Jose (East and West Options) and Diridon (South and North Options) Stations. Operational noise and vibration impacts for both the BART Extension Alternative and the BART Extension with TOJD Alternative would be *less than significant with mitigation*.

This page intentionally left blank.