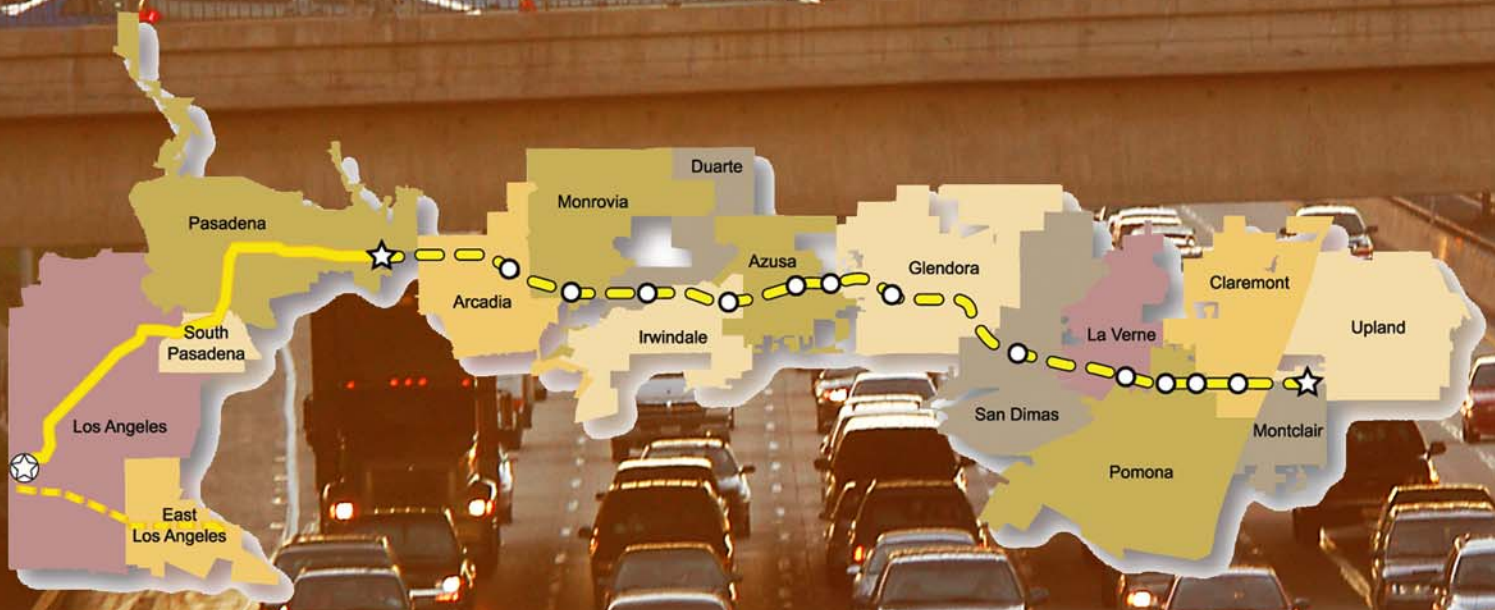
Gold Line Phase II
Pasadena to Montclair - Foothill Extension

Final Environmental Impact Report

(SCH No. 200361157)
February 2007

Volume 2, Book 2: FEIR



METRO GOLD LINE FOOTHILL EXTENSION

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Readers' Guidance:

This chapter reflects changes in impact analysis from that reported in the Draft EIR/EIS in April 2004. Please note that the although this Final EIR is being issued in order to take actions under the California Environmental Quality Act, the chapter also includes discussions of impacts under the National Environmental Policy Act (NEPA). The Construction Authority has opted to retain these NEPA discussions for the readers of and commenters on the Draft environmental document. In the future, the federal lead agency, the Federal Transit Administration, may issue a Final Environmental Impact Statement (Final EIS).

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3-11 NOISE AND VIBRATION

Changes Since the Draft EIS/EIR

Subsequent to the release of the Draft EIS/EIR in April 2004, the Gold Line Phase II project has undergone several updates:

Name Change: To avoid confusion expressed about the terminology used in the Draft EIS/EIR (e.g., Phase I; Phase II, Segments 1 and 2), the proposed project is referred to in the Final EIS/EIR as the Gold Line Foothill Extension.

Selection of a Locally Preferred Alternative and Updated Project Definition: Following the release of the Draft EIS/EIR, the public comment period, and input from the cities along the alignment, the Construction Authority Board approved a Locally Preferred Alternative (LPA) in August 2004. This LPA included the Triple Track Alternative (2 LRT and 1 freight track) that was defined and evaluated in the Draft EIS/EIR, a station in each city, and the location of the Maintenance and Operations Facility. Segment 1 was changed to extend eastward to Azusa. A Project Definition Report (PDR) was prepared to define refined station and parking lot locations, grade crossings and two rail grade separations, and traction power substation locations. The Final EIS/EIR and engineering work that support the Final EIS/EIR are based on the project as identified in the Final PDR (March 2005), with the following modifications. Following the PDR, the Construction Authority Board approved a Revised LPA in June 2005. Between March and August 2005, station options in Arcadia and Claremont were added.

Changes in the Discussions: To make the Final EIS/EIR more reader-friendly, the following format and text changes have been made:

Discussion of a Transportation Systems Management (TSM) Alternative has been deleted since the LPA decision in August 2004 eliminated it as a potential preferred alternative.

Discussions of the LRT Alternatives have eliminated the breakout of the two track configurations used in the Draft EIS/EIR (Double Track and Triple Track). The Final EIS/EIR reports the impacts of a modified triple track configuration (2 LRT tracks and 1 freight track with two rail grade separations) but focuses on the phasing/geographic boundaries included in the LPA decisions.

Two LRT alternatives in the Final EIS/EIR are discussed under the general heading "Build Alternatives," and are defined as:

1. Full Build (Pasadena to Montclair) Alternative: This alternative would extend LRT service from the existing Sierra Madre Villa Station in Pasadena through the cities of Arcadia, Monrovia, Duarte, Irwindale, Azusa, Glendora, San Dimas, La Verne, Pomona, and Claremont, terminating in Montclair. The cities from Pasadena to Azusa are also referred to in the Final EIS/EIR as Segment 1. The cities from Glendora to Montclair are also referred to in the Final EIS/EIR as Segment 2. Key changes from the Draft EIS/EIR are the inclusion of Azusa in Segment 1, the elimination of the Pacific Electric right-of-way option between Claremont and Montclair, the inclusion of a 24-acre Maintenance and Operations facility in Irwindale (the site is smaller than in the Draft EIS/EIR), and the addition of two rail grade separations. Note that the Maintenance and Operations Facility is located in Segment 1 but is part of the Full Build Alternative. In other words, it would not be constructed as an element of the Build LRT to Azusa Alternative (described below). The length of the alternative is

approximately 24 miles. One station (and parking) would be located in each city, except for Azusa, which would have two. There are two options for the station locations in Arcadia and Claremont. Segment 1 would include 2 LRT tracks throughout and 1 freight track between the Miller Brewing Company in Irwindale and the eastern boundary of Azusa. The freight track that now exists west of Miller Brewing, which serves a single customer in Monrovia, would be removed from service following relocation of that customer by the City of Monrovia. Segment 2 would include two LRT tracks throughout and 1 freight track between the eastern boundary of Azusa and Claremont. In Claremont, the single freight track joins up with the double Metrolink tracks (which are also used for freight movement) and continues through to Montclair (and beyond). This alternative also includes two railroad grade separations (in Azusa and in Pomona) so that LRT tracks would pass above the at-grade freight track. These allow the LRT and freight services to operate independently (thus eliminating the time-constrained double track option discussed in the Draft EIS/EIR). Implementation of the alternative would include relocation of the existing freight track within the rail right-of-way, but there would be no changes in the service provided to customers. The alternative includes 8 new traction power substations in Segment 2, as well as the 8 in Segment 1.

2. Build LRT to Azusa Alternative: This alternative (also referred to as Segment 1) would extend LRT service from the existing Sierra Madre Villa Station in Pasadena through the cities of Arcadia, Monrovia, Duarte, Irwindale, and to the eastern boundary of Azusa. (The main change from the Draft EIS/EIR is the inclusion of the City of Azusa.) The length of the alternative is approximately 11 miles. One station (and parking facility) would be located in each city, except for Azusa, which would have two. There are two options for the station location in Arcadia. Segment 1 would include two LRT tracks throughout and 1 freight track between the Miller Brewing Company in Irwindale and the eastern boundary of Azusa. The freight track that now exists west of Miller Brewing, which serves a single customer in Monrovia, would be removed from service following relocation of that customer by the City of Monrovia. This alternative also includes the railroad grade separation in Azusa so that LRT tracks would pass above the at-grade freight track. This allows the LRT and freight services to operate independently (thus eliminating the time-constrained double track option discussed in the Draft EIS/EIR). Implementation of the alternative would include relocation of the existing freight track within the rail right-of-way, but there would be no changes in the service provided to customers. The alternative also includes 8 new traction power substations.

As in the Draft EIS/EIR, impact forecasts use 2025 conditions, except for traffic impacts, which reflects a 2030 forecast based on the recently adopted 2004 SCAG Regional Transportation Plan. In addition, the forecast year was changed from 2025 to 2030.

Summary of Impacts

No noise and vibration impacts have been identified for the No Build Alternative

Noise and vibration impacts were determined using the Federal Transit Administration's methodology and criteria. Impacts predictions and proposed mitigation are based on August 2005 engineer level designs that are subject to further design refinement. During Final Design, data that affects the impact predictions may change, such as the precise locations and grade of rails, switch locations, and the placement of grade crossing warning devices. Accordingly, it is important to note that the determination

of impacts and specific mitigation measures reported herein will be subject to refinement. For instance, the height of a proposed soundwall may change as a result design refinements.

For the Build Alternatives, it is estimated that residential land uses within 125 feet of the alignment would have the potential for temporary construction noise impacts. Mitigation measures, including limited work to between 7 AM and 6 PM, adhering to local noise, establishing property-line noise limits, and noise monitoring, would reduce potential construction noise impacts.

For the Full Build (Pasadena to Montclair) Alternative, noise impacts are predicted at a total of ~~1,266~~496 residences (either single-family or multi-family residential dwelling units), four hotels, two schools, and four medical buildings over the 24-mile length (Segments 1 and 2). Mitigation measures, including ~~soundwalls~~ sound barrier walls and sound insulation of some residences, are expected to reduce levels to below the impact thresholds. ~~Potential vibration~~ Vibration impacts ~~were~~ are ~~identified~~ predicted at 267 residences. Mitigation measures, including ballast mats, shredded tires, or other resilient track support systems are expected to reduce vibration impacts to below the impact threshold at all but 88 locations. All but five of these residual impacts are predicted on the second floor of the residence.

For the ~~Build Alternative to Maintenance Facility~~ Build LRT to Azusa Alternative, noise impacts are predicted at a total of ~~309~~ 229 residences (either single-family or multi-family residential dwelling units), one hotel, and one school ~~over the 9 mile length (~~in Segment 1~~ only) would be exposed to noise impacts~~. Mitigation measures, including sound walls and sound insulation of some residences, ~~is expected to~~ would reduce ~~impacts~~ noise levels to below the impact thresholds. ~~Potential vibration~~ Vibration impacts ~~were identified is~~ predicted at ~~575~~ 158 residences. Mitigation measures, including ballast mats, shredded tires, or other resilient track support systems, ~~are expected to~~ would reduce ~~impacts~~ vibration levels to below the impact threshold at all but 61 locations. All but five of these residual impacts are predicted on the second floor of the residence.

3-11.1 Existing Conditions

a. Noise Basics

Noise is typically defined as unwanted or undesirable sound, where sound is characterized by small air pressure fluctuations above and below the atmospheric pressure. The basic parameters of environmental noise that affect human subjective response are (1) intensity or level, (2) frequency content and (3) variation with time. The first parameter is determined by how greatly the sound pressure fluctuates above and below the atmospheric pressure, and is expressed on a compressed scale in units of decibels. By using this scale, the range of normally encountered sound can be expressed by values between 0 and 120 decibels. On a relative basis, a 3-decibel change in sound level generally represents a noticeable change, whereas a 10-decibel change in sound level would typically be perceived as a doubling (or halving) in the loudness of a sound.

The frequency content of noise is related to the tone or pitch of the sound, and is expressed based on the rate of the air pressure fluctuation in terms of cycles per second (called Hertz and abbreviated as Hz). The human ear can detect a wide range of frequencies from about 20 Hz to 17,000 Hz. However, because the sensitivity of human hearing varies with frequency, the A-weighting system is commonly used when measuring environmental noise to provide a single number descriptor that correlates with human subjective response. Sound levels measured using this weighting system are called "A-weighted" sound levels, and are expressed in decibel notation as "dBA." The A-weighted sound level is widely accepted by acousticians as a proper unit for describing environmental noise.

Because environmental noise fluctuates from moment to moment, it is common practice to condense all of this information into a single number, called the "equivalent" sound level (Leq). Leq can be thought of as the steady sound level that represents the same sound energy as the varying sound levels over a specified time period (typically 1 hour or 24 hours). Often the Leq values over a 24-hour period are used to calculate cumulative noise exposure in terms of the Day-Night Sound Level (Ldn). Ldn is the A-weighted Leq for a 24-hour period with an added 10-decibel penalty imposed on noise that occurs during the nighttime hours (between 10 p.m. and 7 a.m.). Many surveys have shown that Ldn is well correlated with human annoyance, and therefore this descriptor is widely used for environmental noise impact assessment. **Figure 3-11.1** provides examples of typical noise environments and criteria in terms of Ldn. While the extremes of Ldn are shown to range from 35 dBA in a wilderness environment to 85 dBA in noisy urban environments, Ldn is generally found to range between 55 dBA and 75 dBA in most communities. This range was found to be true for the Foothill Extension corridor, based upon actual noise measurements where Ldns ranged from 55 dBA to 65 dBA. As shown in Figure 3-11.1, this spans the range between an "ideal" residential environment and the threshold for an unacceptable residential environment according to U.S. federal agency criteria.

b. Existing Noise Conditions

Noise-sensitive land uses along the project corridor and near the proposed maintenance facility were first identified based on preliminary alignment drawings, aerial photographs, and visual surveys. Areas adjacent to the proposed ~~Phase II~~ Foothill Extension alignment include single-family residences and multi-family residences along with some non-residential (commercial) and institutional land uses. Adjacent uses are currently exposed to noise from traffic (I-210 and other local streets), freight trains, and Metrolink commuter trains.

Existing ambient noise levels along the corridor were characterized through direct measurements at ~~26~~ 28 sites along the proposed alignment made during the period from October 6 through October 10, 2003 and later on May 24 and July 11, 2005. Estimating existing noise exposure is an important step in the noise impact assessment since, as indicated below, the thresholds for noise impact are based on the existing levels of noise exposure. The measurements included both long-term (typically 24-hour) and short-term (1-hour) monitoring of the A-weighted sound level at representative noise-sensitive locations.

All of the measurement sites were located in noise-sensitive areas, and were selected to represent a range of existing noise conditions along the corridor. **Figures 3-11.2** through **3-11.4** show the general location of the ~~18~~ 20 long-term monitoring sites along the ~~Phase II~~ Foothill Extension (LT-1 through LT-~~18~~ 20) and eight short-term monitoring sites (ST-1 through ST-8). Measurements were conducted within each city along the proposed alignment, except for Montclair. Data for Montclair was derived from nearby measurements in Claremont and Upland. As seen in Figures 3-11.2 through 3-11.4, the measurement sites were spaced approximately 1 mile apart.

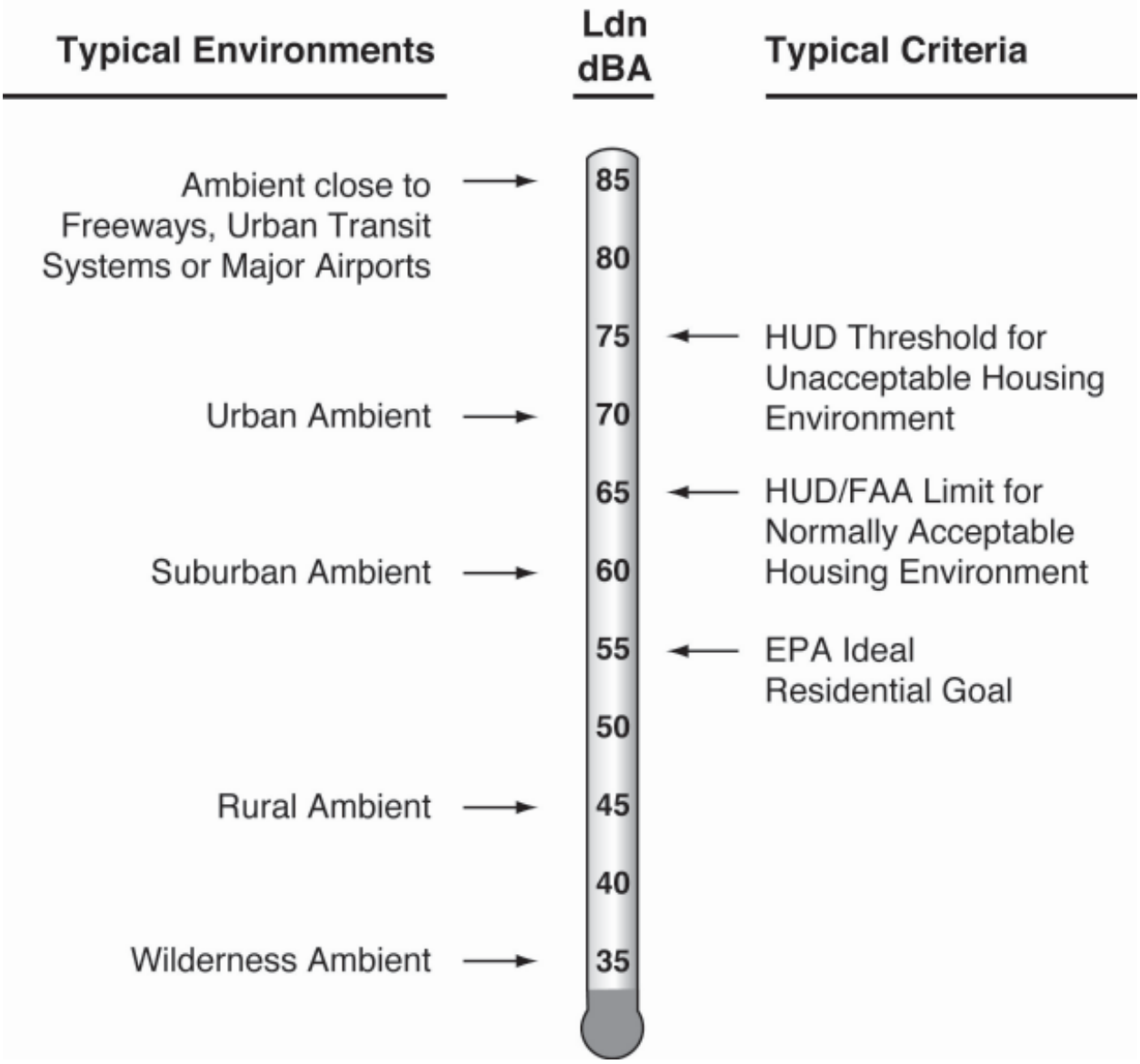


Figure 3-11.1: Examples of Typical Outdoor Noise Exposure

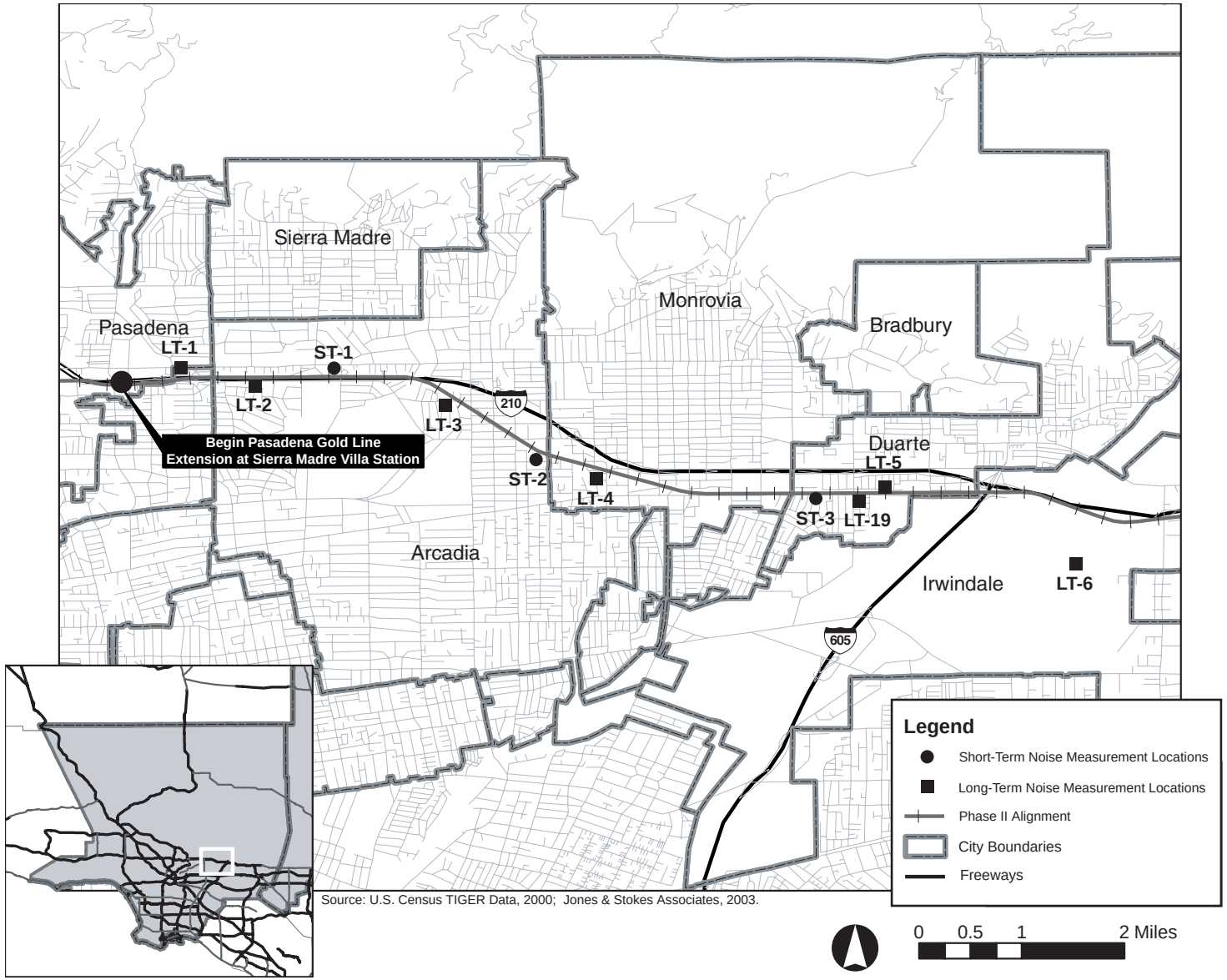


Figure 3-11.2: Ambient Noise Monitoring Locations (1 of 3)

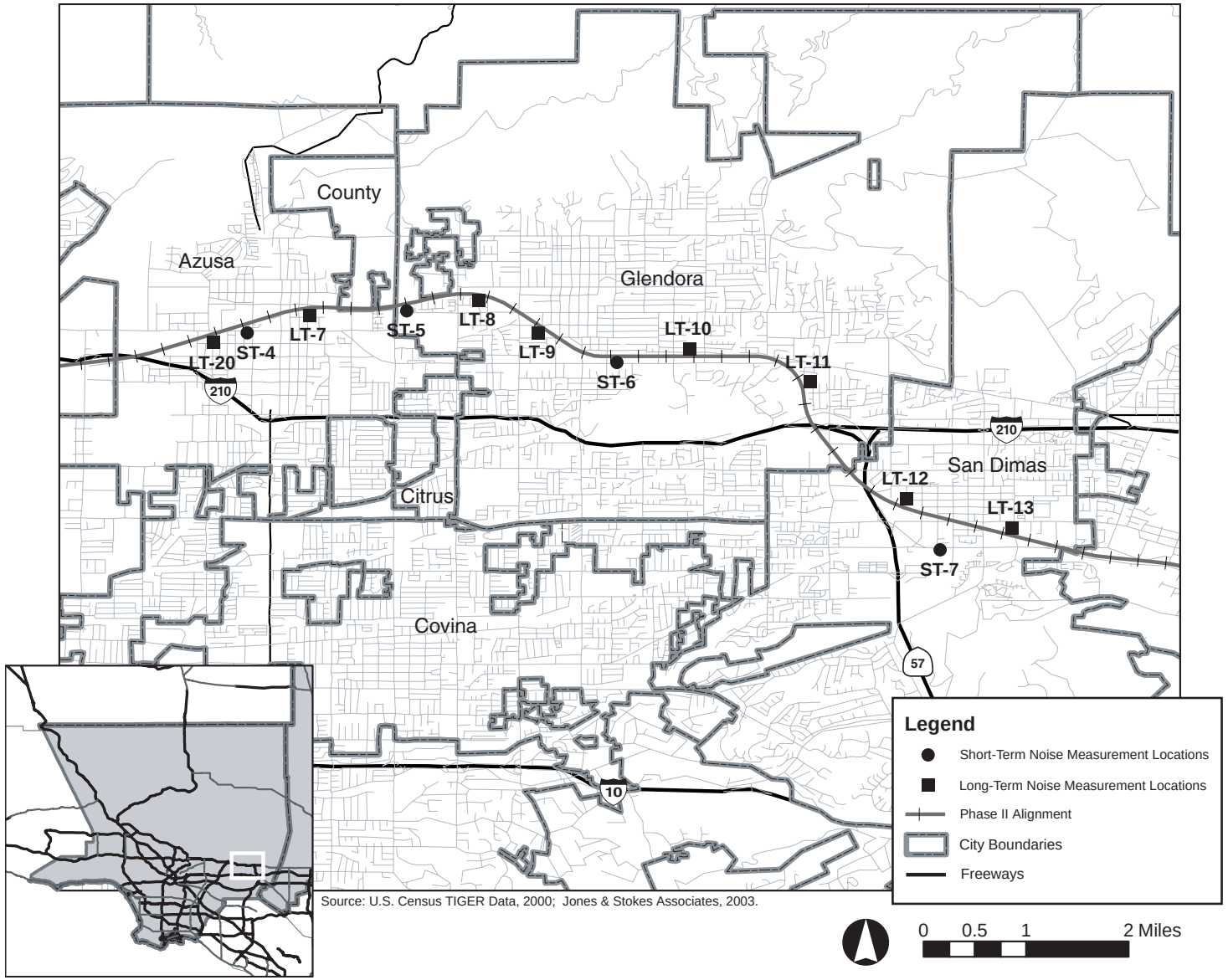


Figure 3-11.3: Ambient Noise Monitoring Locations (2 of 3)

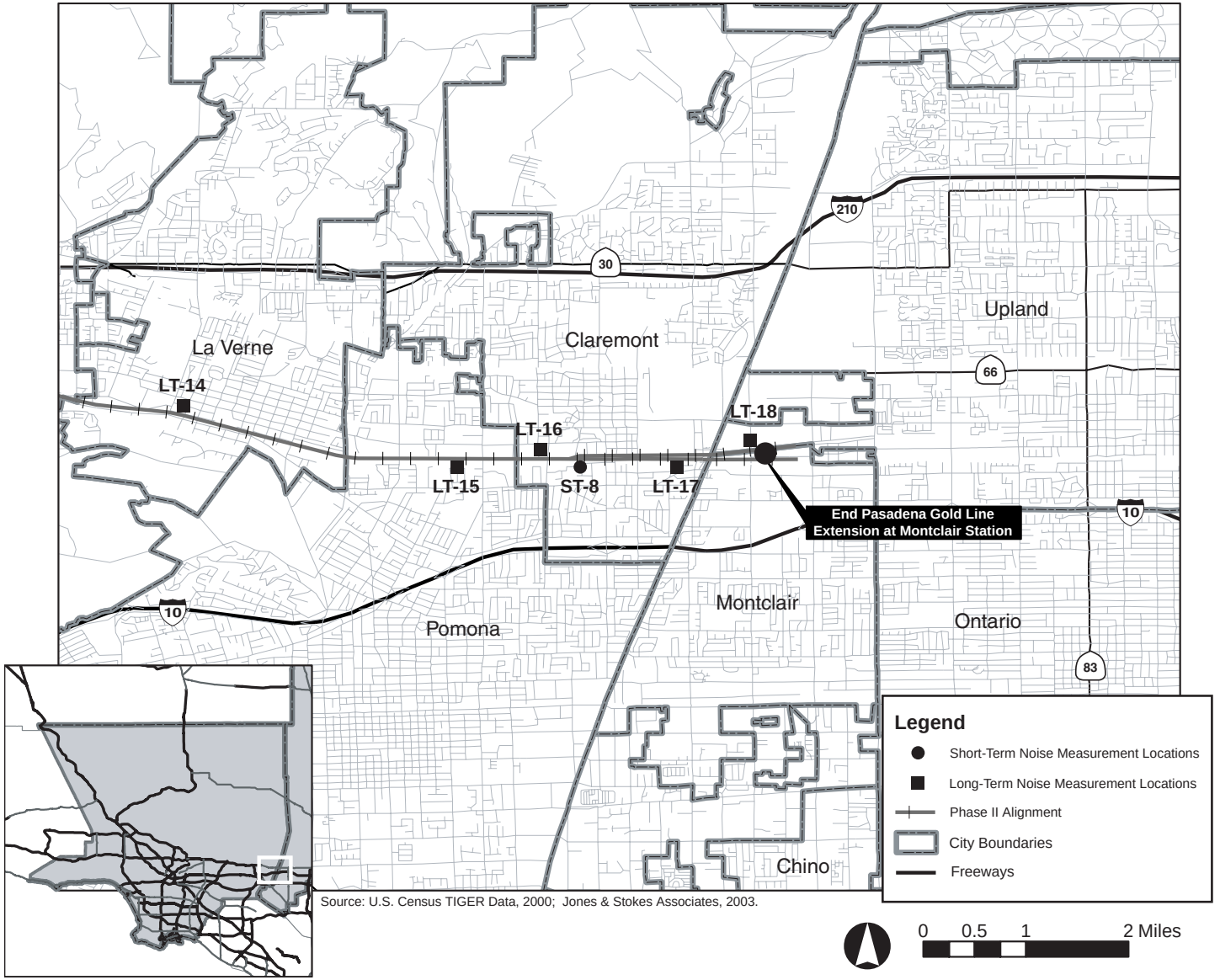


Figure 3-11.4: Ambient Noise Monitoring Locations (3 of 3)

TABLE 3-11.1
SUMMARY OF EXISTING AMBIENT NOISE MEASUREMENTS

Site No.	Measurement Location Description	City	Start of Measurement		Meas. Time (hrs)	Noise Exposure (dBA)	
			Date	Time		Ldn	Leq
LT-1	3740 Arbeleda Street	Pasadena	10/6/03	10:00	24	64	--
LT-2	1025 Catalpa Road	Arcadia	10/6/03	10:00	24	65	--
LT-3	107 Santa Ynez Drive	Arcadia	10/6/03	12:00	24	60	--
LT-4	1525 Alamitas Avenue	Monrovia	10/6/03	12:00	24	60	--
LT-5	1480 Three Ranch Road	Duarte	10/6/03	13:00	24	57	--
LT-6	Proposed Maintenance Facility	Irwindale	10/6/03	14:00	24	59	--
LT-7	Azusa Senior Center	Azusa	10/7/03	11:00	24	65	--
LT-8	167 Lowell Avenue	Glendora	10/7/03	11:00	24	55	--
LT-9	Presbyterian Hospital	Glendora	10/7/03	15:00	24	58	--
LT-10	948 Lemon Avenue	Glendora	10/7/03	13:00	24	55	--
LT-11	655 Remuda Drive	Glendora	10/7/03	13:00	24	60	--
LT-12	The Lakes at Raintree Village Apartments	San Dimas	10/7/03	15:00	24	60	--
LT-13	Sunnyside Senior Apartments	San Dimas	10/8/03	12:00	24	65	--
LT-14	1638 1st Street	La Verne	10/8/03	14:00	24	65	--
LT-15	2655 Deodar Road	Pomona	10/8/03	13:00	24	62	--
LT-16	Mountain Village Senior Apartments	Claremont	10/8/03	14:00	24	62	--
LT-17	417 Elder Drive	Claremont	10/9/03	14:00	24	65	--
LT-18	Montclair Park-n-Ride Facility	Upland/Montclair	10/9/03	14:00	24	63	--
LT-19	1802 Broadland	Duarte	7/11/05	15:00	24	64	--
LT-20	Vernon Avenue	Azusa	5/25/05	13:00	24	60	--
ST-1	Latter Day Saints Church	Arcadia	10/9/03	6:16	1	--	73
ST-2	Bonita Park/ Serendipity School	Arcadia	109/03	7:43	1	--	53
ST-3	Aloysia Moore Park	Duarte	10/10/03	7:54	1	--	61
ST-4	St. Augustine Medical Center	Azusa	10/10/03	8:01	1	--	66
ST-5	Calvary Lutheran Church	Glendora	10/9/03	16:43	1	--	51
ST-6	Foothill Christian Preschool	Glendora	10/9/03	15:32	1	--	52
ST-7	Pioneer Park	San Dimas	10/9/03	16:23	1	--	56
ST-8	Keck Graduate Institute	Claremont	10/9/03	15:03	1	--	58

LT – Long-term noise measurement (24 hours) at residential locations, Ldn
ST – Short-term noise measurement (1hour) at institutional locations, Leq
Sources: Harris, Miller, Miller & Hanson, 2003; ATS Consulting, LLC, 2005

At each site, the measurement microphone was positioned to characterize the exposure of the site to the dominant noise sources in the area. For example, microphones were located at the approximate setback lines of the receptors from adjacent roads or rail lines, and were positioned to avoid acoustic shielding by landscaping, fences or other obstructions. The results of the existing ambient noise measurements are summarized in Table 3-11.1 and the measurement sites are described below. Detailed noise data are included in the Noise and Vibration Technical Report in the Appendices.

Site LT-1 was located north of the proposed alignment, at 3740 Arbeleda Street, in Pasadena. The microphone was located in the backyard of the single-family residence. Traffic on I-210 was the dominant source of noise at this site. The measured Ldn at this site was 64 dBA.

Site LT-2 was located south of the proposed alignment, at 1025 Catalpa Road, in Arcadia. The microphone was located in the backyard of the single-family residence. Dominant sources of noise at this site included traffic on I-210 and Colorado Boulevard. The measured Ldn at this site was 65 dBA.

Site LT-3 was located south of the proposed alignment, at 107 Santa Ynez Drive, in Arcadia. The microphone was located in the backyard of the single-family residence. Traffic on I-210, local traffic on Colorado Boulevard, and aircraft activity all contributed to the noise environment at this location. The measured Ldn at this site was 60 dBA.

Site LT-4 was located south of the proposed alignment at 1525 Alamitas Avenue, in Monrovia. The microphone was placed in the backyard of a single-family residence. Traffic on I-210 and other local roads contributed to the noise environment. The measured Ldn at this site was 60 dBA.

Site LT-5 was located north of the proposed alignment at 1480 Three Ranch Road, Duarte. The microphone was located in the backyard of the single-family residence. Noise sources at this site included distant traffic on I-210 and local traffic on Duarte Avenue. The measured Ldn at this site was 57 dBA.

Site LT-6 was located south of the proposed alignment at the Miller Brewing Company Facility, in Irwindale. The microphone was located near the proposed maintenance facility site. Activities at the brewing facility and aircraft contributed to the noise environment. The measured Ldn at this site was 59 dBA.

Site LT-7 was located south of the proposed alignment at the Azusa Senior Center, in Azusa. The microphone was located at the edge of the parking lot, next to the rail corridor. Local traffic, aircraft, and activities at the Senior Center contributed to the noise environment. The measured Ldn at this site was 65 dBA.

Site LT-8 was located south of the proposed alignment at 167 Lowell Avenue, in Glendora. The microphone was located in the backyard of the single-family residence. Aircraft, local activities, and local street traffic contributed to the noise environment. The measured Ldn at this site was 55 dBA.

Site LT-9 was located south of the proposed alignment at the Presbyterian Hospital, in Glendora. The microphone was placed next to the Medical Arts Building. Local traffic, aircraft, and hospital activities contributed to the noise environment at this site. The measured Ldn at this site was 58 dBA.

Site LT-10 was located south of the proposed alignment at 948 Lemon Avenue, in Glendora. The microphone was located in the backyard of a single-family residence. Traffic on local streets and aircraft contributed to the noise environment at this site. The measured Ldn at this site was 55 dBA.

Site LT-11 was located south of the proposed alignment at 655 Remuda Drive, in Glendora. The microphone was located in the yard of the residence. Local traffic, aircraft and distant highway noise contributed to the noise environment at this site. The measured Ldn at this site was 60 dBA.

Site LT-12 was located north of the proposed alignment at the Lakes at Raintree Village Apartments, in San Dimas. The microphone was located next to the parking lot of the apartment complex. Traffic on I-210 and other local traffic contributed to the noise environment. The measured Ldn at this site was 60 dBA.

Site LT-13 was located north of the proposed alignment at the Sunnyside Senior Apartments, in San Dimas. The microphone was located next to the parking lot of the apartment complex. Local traffic and distant highway noise contributed to the noise environment at this location. The measured Ldn at this site was 65 dBA.

Site LT-14 was located north of the proposed alignment at 1638 1st Street, in La Verne. The microphone was located in the yard of a single-family residence. Local traffic and Metrolink trains on the existing alignment were the dominant sources of noise at this location. The measured Ldn at this site was 65 dBA.

Site LT-15 was located south of the proposed alignment at 2655 Deodar Road, in Pomona. The microphone was located in the yard of a single-family residence. Metrolink trains, street traffic and other local noise sources contributed to the noise environment at this location. The measured Ldn at this site was 62 dBA.

Site LT-16 was located north of the proposed alignment at the Mountain Village Senior Apartments, in Claremont. The microphone was located next to the parking lot of the apartment complex. Metrolink trains and grade crossing noise (horns) were the dominant sources of noise at this location. The measured Ldn at this site was 62 dBA.

Site LT-17 was located south of the proposed alignment at 417 Elder Drive, in Claremont. The microphone was located in the yard of a single-family residence. Metrolink trains and grade crossing noise (horns) were the dominant sources of noise at this location. The measured Ldn at this site was 65 dBA.

Site LT-18 was located north of the proposed alignment at the Montclair Park-n-Ride Facility, in Upland/Montclair. The microphone was located to the north of the Park-n-Ride facility near the location of the proposed residential development. Park-n-Ride traffic, local traffic and Metrolink trains were the dominant sources of noise at this location. The measured Ldn at this site was 63 dBA.

Site LT-19 was located south of the proposed alignment in Duarte. The microphone was located in the backyard of a single-family residence on the southeast corner of Broadland Avenue and Duarte Road. The primary noise source in this area is vehicle traffic on Duarte Road. The measured Ldn was 64 dBA.

Site LT-20 was in the side yard of a residence at the north end of Vernon Street, south of the proposed alignment in the City of Azusa. The primary noise is existing freight traffic on the adjacent railroad track, which is on an embankment, approximately 10 to 15 feet above the adjacent ground elevation. Excluding two non-representative nighttime train passbys, the Ldn was 60 dBA.

Site ST-1 was located north of the proposed alignment at the Latter Day Saints Church, in Arcadia. Traffic on I-210 dominated the noise environment at this site. The measured one-hour Leq at this site was 73 dBA.

Site ST-2 was located south of the proposed alignment at the Bonita Park/Serendipity School, in Arcadia. Local traffic contributed to the noise environment at this site. The one-hour Leq at this site was 53 dBA.

Site ST-3 was located south of the proposed alignment at the Aloysia Moore Park, in Duarte. Traffic on Duarte Avenue dominated the noise environment at this site. The one-hour Leq at this site was 61 dBA.

Site ST-4 was located south of the proposed alignment at the St. Augustine Medical Center, in Azusa. Traffic on Foothill Boulevard and Orange Avenue dominated the noise environment at this site. The one-hour Leq at this site was 66 dBA.

Site ST-5 was located south of the proposed alignment at the Calvary Lutheran Church, in Glendora. Traffic on Foothill Boulevard and other local noise sources contributed to the noise environment at this site. The one-hour Leq at this site was 51 dBA.

Site ST-6 was located south of the proposed alignment at the site of the future Foothill Christian Preschool, in Glendora. Traffic on local roads dominated the noise environment at this site. The one-hour Leq at this site was 52 dBA.

Site ST-7 was located south of the proposed alignment at the Pioneer Park, in San Dimas. Local traffic was the main contribution to the noise environment at this site. The one-hour Leq at this site was 56 dBA.

Site ST-8 was located south of the proposed alignment at the Keck Graduate Institute, in Claremont. Metrolink trains and freight trains were the dominant noise sources at this site. The one-hour Leq at this site was 58 dBA.

3-11.1.2 Vibration

a. Vibration Basics

Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position that can be described in terms of displacement, velocity or acceleration. Because sensitivity to vibration typically corresponds to the amplitude of vibration velocity within the low-frequency range of most concern for environmental vibration (roughly 5-100 Hz), velocity is the preferred measure for evaluating ground-borne vibration from transit projects.

The most common measure used to quantify vibration amplitude is the peak particle velocity (PPV), defined as the maximum instantaneous peak of the vibratory motion. PPV is typically used in monitoring blasting and other types of construction-generated vibration, since it is related to the stresses experienced by building components. Although PPV is appropriate for evaluating building damage, it is less suitable for evaluating human response, which is better related to the average vibration amplitude. Thus, ground-borne vibration from transit trains is usually characterized in terms of the root mean square (rms) vibration velocity level, in decibels (VdB), with a reference quantity of one micro-inch per second. VdB is used in place of dB to avoid confusing vibration decibels with sound decibels.

Figure 3-11.5 illustrates typical ground-borne vibration levels for common sources as well as criteria for human and structural response to ground-borne vibration. As shown, the range of interest is from approximately 50 to 100 VdB, from imperceptible background vibration to the threshold of damage. Although the approximate threshold of human perception to vibration is 65 VdB, annoyance is usually not significant unless the vibration exceeds 70 VdB.

b. Existing Vibration Conditions

Significant sources of existing ground-borne vibration along the project corridor are the freight trains and Metrolink trains operating along portions of the corridor. The Burlington Northern Santa Fe (BNSF) railroad operates daily service along the corridor as far west as the Miller Brewing Facility in Irwindale. On a less frequent basis, freight rail service now extends west to Myrtle Avenue in Monrovia; this service will end when the single customer that is served in Monrovia is relocated. In part of Segment 2, Metrolink trains operate within the same right-of-way as would be used for LRT operations, from just west of Cambridge Avenue in Claremont to the project terminus at the Montclair TransCenter. Metrolink currently operates approximately 34 daily trips along this section of the corridor. In addition to measuring the vibration levels from the existing freight trains, the vibration measurements for this project focused on characterizing the vibration propagation ~~characteristics~~ of the soil at representative locations.

~~Eight~~ Eleven vibration testing sites (V-1 though V-~~8~~ 11), at the locations shown in **Figures 3-11.6** through **3-11.8**, were selected to represent a range of soil conditions in areas along the corridor that include a significant number of vibration-sensitive receptors. During the period from October 6 through October 10, 2003, ground-borne vibration propagation tests were conducted at sites V-1 through V-8 ~~each of these sites~~ by ~~impacting~~ dropping a weight onto the ground and measuring the input force and corresponding ground vibration response at various distances. The resulting force-response transfer function can be combined with the known input force characteristics of the Pasadena Gold Line LRT vehicle (which were also measured as a part of this project, along the existing Phase I corridor) to predict future vibration levels at locations along the project corridor.

Supplementary tests were performed at three sites (V-9 through V-11) in July 2005 to collect more site-specific data. These tests procedures were similar to those performed at Sites V-1 through V-8. In addition to measuring outdoor levels, measurements were also taken inside the residences. A comparison of outdoor vs. indoor levels provides an estimate of how buildings might respond to train-generated vibration (e.g., by amplifying or attenuating outdoor vibration levels).

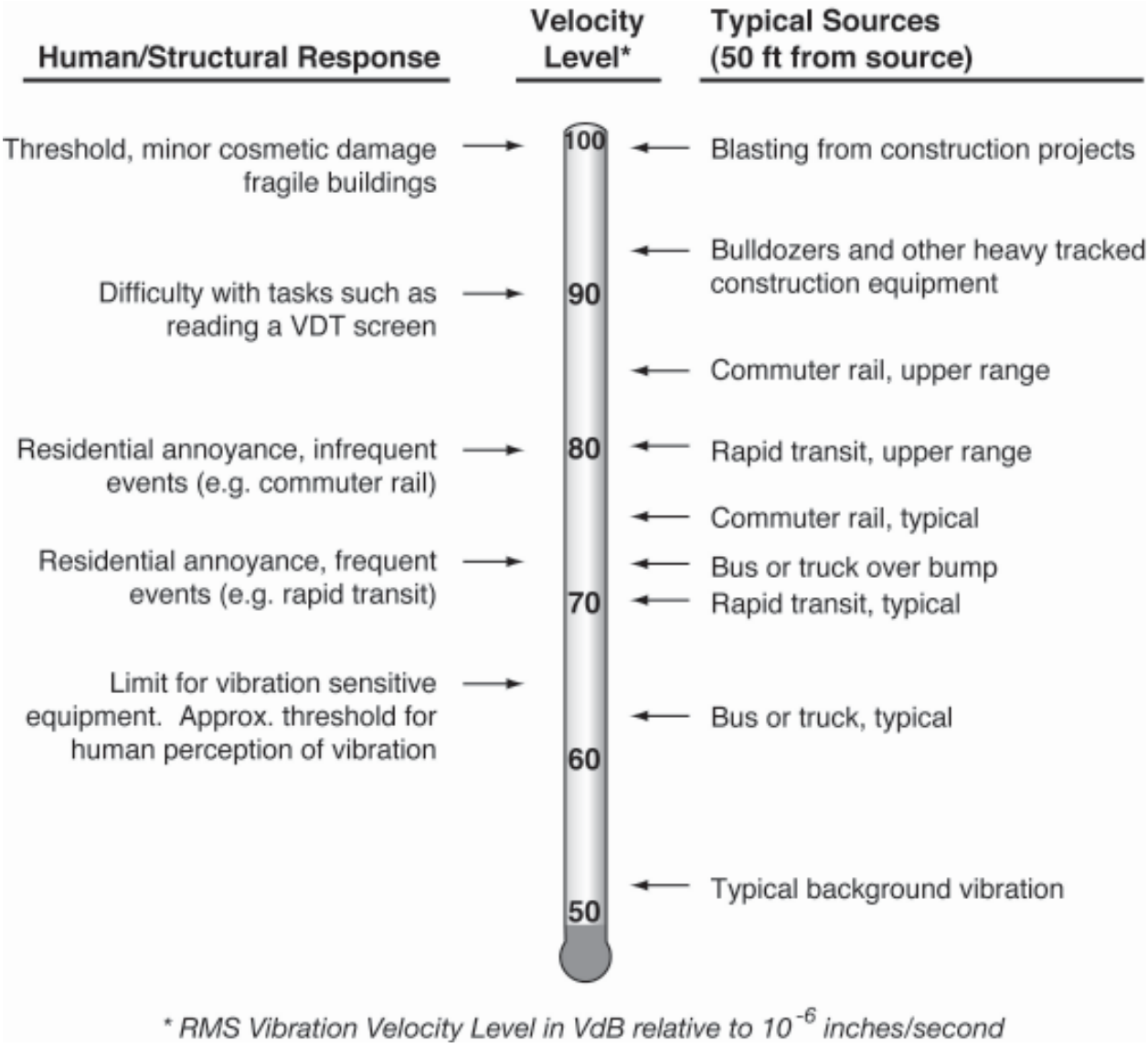


Figure 3-11.5: Typical Ground-Borne Vibration Levels and Criteria

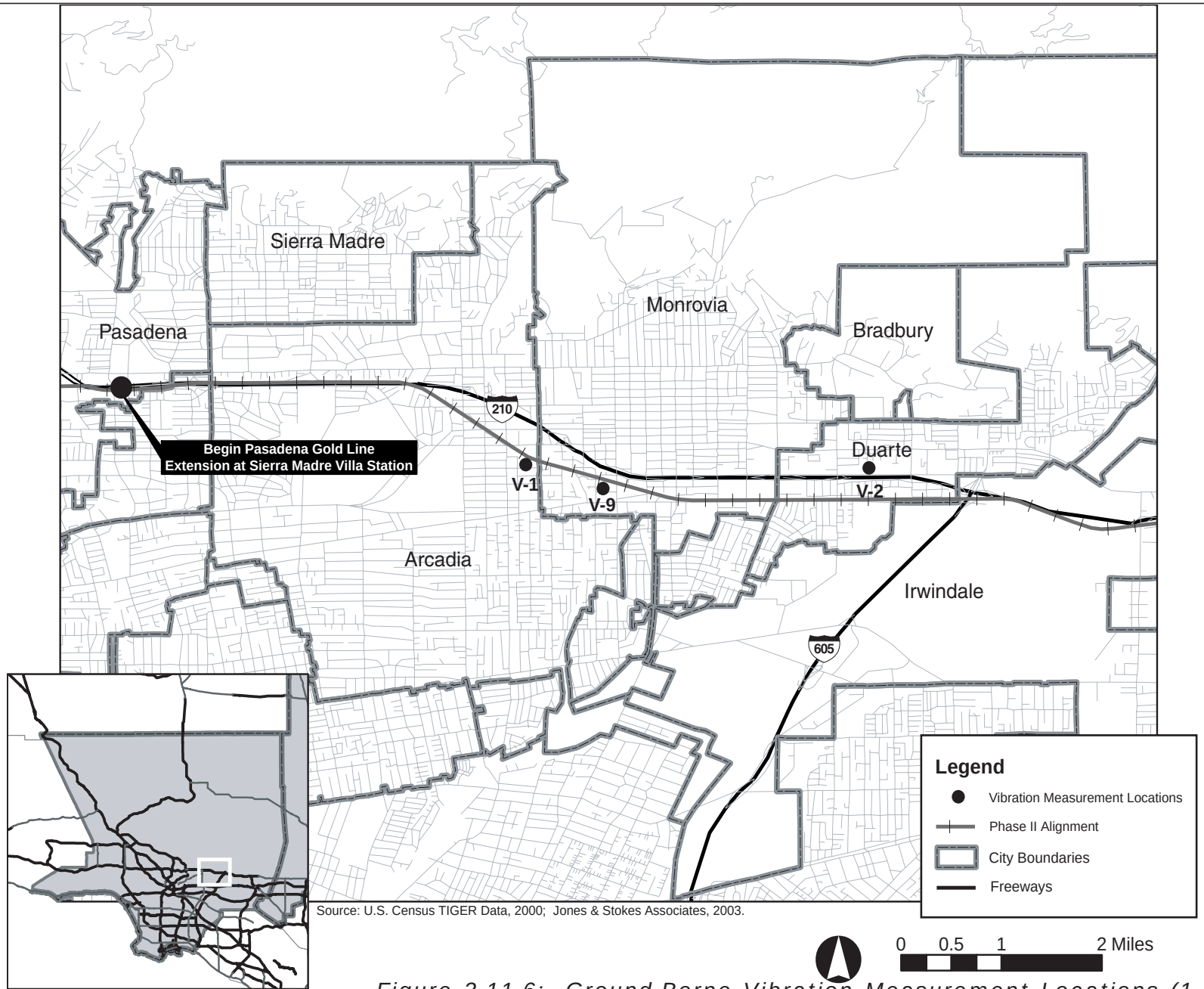


Figure 3-11.6: Ground-Borne Vibration Measurement Locations (1 of 3)

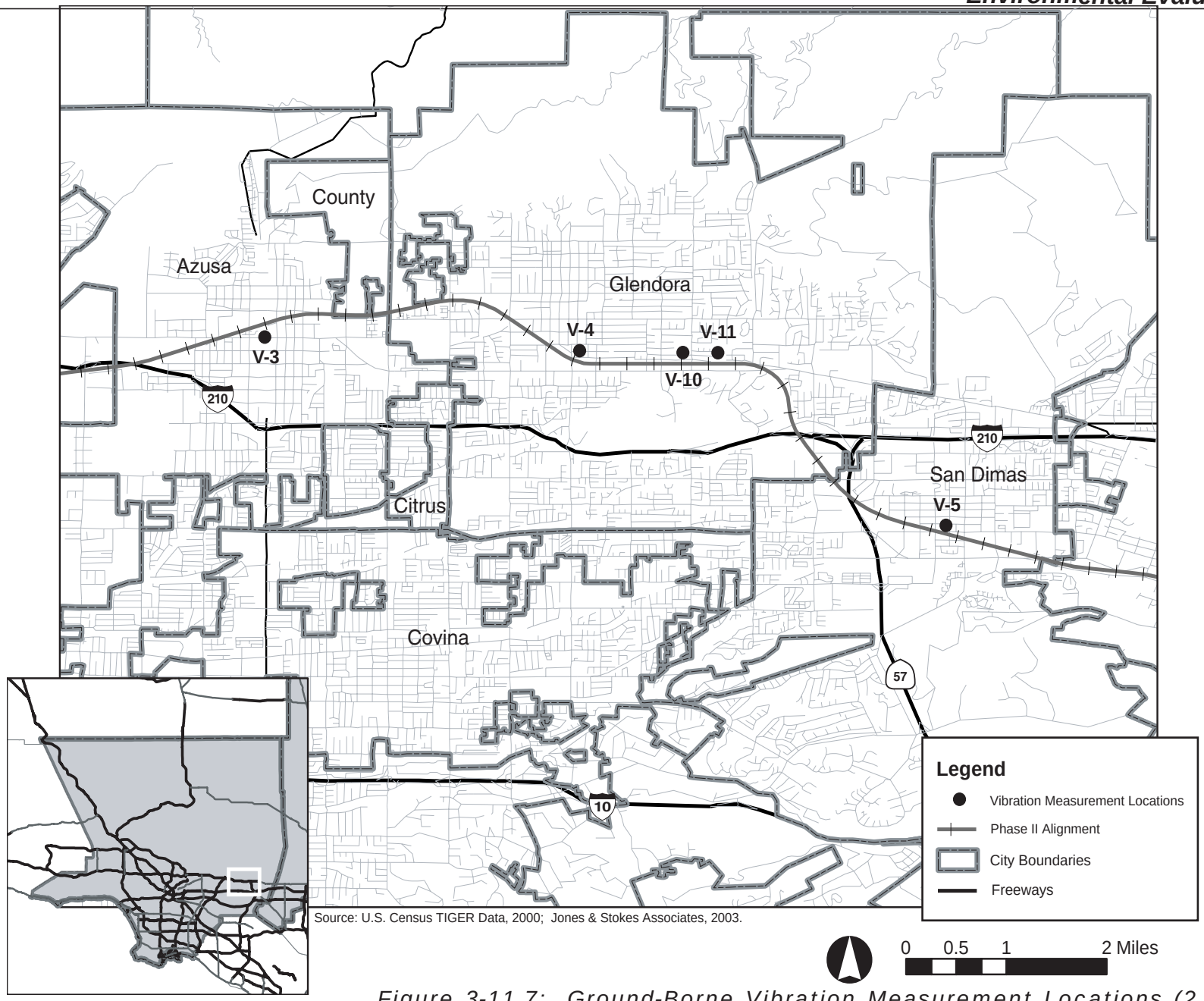


Figure 3-11.7: Ground-Borne Vibration Measurement Locations (2 of 3)

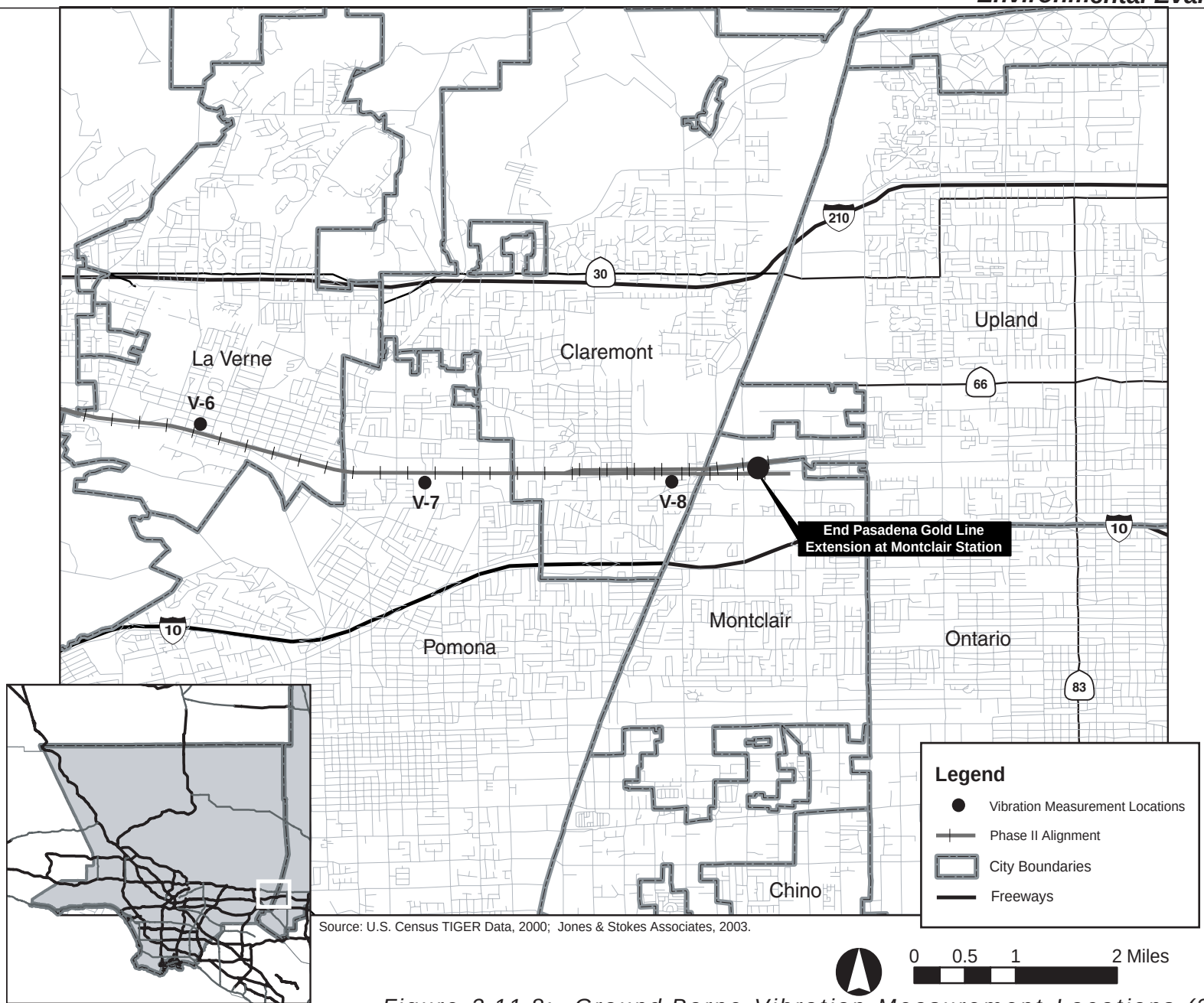


Figure 3-11.8: Ground-Borne Vibration Measurement Locations (3 of 3)

The vibration propagation test sites are described below. Detailed results of the measurements are included in the Noise and Vibration Technical Report.

Site V-1 was located south of the proposed alignment at the Serendipity School, in Arcadia. This site is representative of the vibration-sensitive receptors in the western portion of the proposed alignment from the start of the ~~Phase II~~ Foothill Extension project in Pasadena to the proposed Monrovia Station.

Site V-2 was located north of the proposed alignment at the corner of Three Ranch Road and Cinco Robles, in Duarte. This site is representative of vibration-sensitive receptors between the Monrovia Station and the maintenance facility in Irwindale.

Site V-3 was located south of the proposed alignment at the Azusa Senior Center, Azusa. This site is representative of vibration-sensitive receptors from the maintenance facility in Irwindale and North Grand Avenue in Glendora.

Site V-4 was located north of the proposed alignment at the Corner of Lemon Avenue and Minnesota Avenue, in Glendora. This site is representative of vibration-sensitive sites from North Grand Avenue in Glendora to the I-210 in Glendora.

Site V-5 was located south of the proposed alignment at the corner of Lone Vista Avenue and Railway Avenue, in San Dimas. This site is representative of vibration-sensitive sites between the I-210 in Glendora and San Dimas Canyon Road.

Site V-6 was located north of the proposed alignment at the corner of 1st Street and Park Avenue, in La Verne. This site is representative of vibration-sensitive sites between San Dimas Canyon Road and Fulton Road in La Verne.

Site V-7 was located south of the proposed alignment at the Palomares Park, in Pomona. This site is representative of vibration-sensitive sites between Fulton Road and Mountain Avenue in Claremont. In addition, vibration measurements of existing Metrolink trains were also performed at this location.

Site V-8 was located south of the proposed alignment at the corner of East Green Street and Dartmouth Road, in Montclair. This site is representative of vibration-sensitive sites from Mountain Avenue to the eastern end of the alignment. In addition, vibration measurements of existing Metrolink trains were also performed at this location.

Site V-9 was located south of the proposed alignment and west of Magnolia Avenue, in Monrovia. Both outdoor and indoor measurements were taken to characterize the building response. This residence is slab-on-grade construction. In the frequency range of interest, the vibration levels were generally 1 to 5 VdB lower inside the house.

Site V-10 was located north of the proposed alignment, west of Loraine Street, in Glendora. Measurements were taken both inside and outside the house to determine building response. The first floor of this residence is suspended (i.e., there is a crawl space between the floor and the ground). Measurement data indicates that there is very little difference in the outdoor vibration levels relative to the indoor vibration levels at this location over the frequency range of interest.

Site V-11 was located north of the proposed alignment, east of Loraine Street, in Glendora. As with site V-10, this residence also has a suspended first floor and there was very little difference between the outdoor and indoor levels.

3-11.2 Environmental Impacts

3-11.2.1 Evaluation Methodology

a. Noise Impact Assessment Methodology

The Foothill Extension project is assumed to be constructed under a Design-Build scenario. Construction noise could vary greatly depending on the construction process, type and condition of equipment used, and layout of the construction site. Since it would be speculative to predict construction noise given so many variables, no assessment of construction period noise was conducted. To provide noise limitations during construction, the Construction Authority will impose noise limitations by land use type. See Section 3-15.3.1.

Operating period noise levels from the ~~Phase II~~ Foothill Extension ~~Project noise levels~~ were ~~projected~~ predicted based on noise measurements of the existing Pasadena Gold Line LRT vehicles, the operating plan provided by ~~Manuel Padron & Associates~~ the Construction Authority, and the ~~prediction model specified in the~~ FTA guidance manual. Significant factors are summarized below:

- Based on the vehicle noise measurements, the predictions assume that a two car 180-foot long vehicle operating at ~~30~~ 40 mph on ballast and tie track with continuous welded rail generates an SEL of ~~maximum noise level of 76~~ 82.8 dBA at a distance of 50 feet from the track centerline.[3] This reference noise level is used in the projections and is adjusted for the actual speed of the train and the distance to the noise-sensitive receptors at all locations. For higher speeds, the noise levels would be higher, and for lower speeds, the noise levels would be lower.
- LRT trains on the Gold Line Foothill Extension would likely operate between 4:30 AM and ~~2~~1:30 AM.[1] The operating plan for LRT service specifies 10-minute peak-hour headways (6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM) with three-car train consists along Segment 1 and two-car train consists along Segment 2. Headways during the off-peak base period are estimated to be 20 minutes ~~and early morning/late night headways of 20 minutes~~ with two-car trains consists in both Segment 1 and Segment 2.~~would operate most of the day, with three-car trains in peak periods.~~
- ~~Peak hour operations would occur between 6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM. Early morning/late night operations will occur between 4:30 AM and 6:00 AM and 10:00 PM and 12:30 AM, and base service will occur during all other time periods. The average number of cars per train would be three cars during peak hours, two cars during base service, and two cars during evening service.~~
- Vehicle operating speeds are assumed to be a maximum of 55 mph.
- The noise projections near grade crossings account for noise from light rail vehicle (LRV) audible warning devices and crossing bells~~, and in the area east of LaVerne, the audible warning devices of Metrolink and freight trains~~. The projections are based on noise measurements made on the Phase I of the Metro Gold Line light rail system in 2003 and 2005. The noise projections assume

[3] SEL is the Sound Exposure Level, which is a measure of the cumulative sound energy of a single event. The SEL is used to predict the Ldn from operation of the Metro Gold Line Foothill Extension.

[1] The last departures from downtown would typically be at 12:30 a.m.; some trains would be moving up until about 2:30 a.m. to reach the Maintenance and Operating Facility.

that the LRV audible warning device generates a noise level of ~~76~~ 85 dBA at ~~50~~ 100 feet from the track for a five second period in advance of the grade crossing or 300 feet from the grade crossing, whichever is shorter. ~~approach each crossing~~. The bells are estimated to generate a noise level of ~~67~~ 75 dBA at ~~50~~ 10 feet for 15 seconds prior to each train. In addition, to account for the intrusive character of the ~~whistles and~~ bells, a 5 dB penalty was applied to noise levels from this source, consistent with ~~in accordance~~ with FTA ~~procedures~~ guidance. It should be noted that these assumptions, in combination, produce a worst-case scenario for impacts and these reported results are subject to change during further design refinement. Changes to the analysis could occur as the result of modifications to the LRT operating assumptions or from on on-going discussions with the California Public Utilities Commission about sounds levels required for warning devices and the circumstances under which warning devices must be sounded.

b. Vibration Impact Assessment Methodology

The Foothill Extension project is assumed to be constructed under a Design-Build scenario. Construction noise could vary greatly depending on the construction process, type and condition of equipment used, and layout of the construction site. Since it would be speculative to predict construction vibration given so many variables, no assessment of construction period vibration was conducted. To provide vibration limitations during construction, the Construction Authority will impose vibration limitations by land use type. See Section 3-15.3.1.

The potential vibration impact from LRT operation was assessed on an absolute basis using the FTA criteria. The following factors were used in determining potential vibration impacts along the Gold Line Foothill Extension:

- Vibration source levels were based on measurements made on the P2000 light rail vehicle, which operates on Phase I of the Metro Gold Line
- Vibration propagation tests were conducted at eight sites along the corridor near sensitive receptors. These tests measured the response of the ground to an input force. The results of these tests were combined with the vibration source level measurements to provide ~~projections~~ predictions of vibration levels from vehicles operating on the Metro Gold Line Foothill Extension.
- Vibration tests were conducted at three sites along the corridor at sensitive receptors to determine how residential buildings respond to ground-borne vibration.
- Vehicle operating speeds are based on speed profiles provided by the Construction Authority.

3-11.2.2 Impact Criteria

a. NEPA Impact Criteria

Construction Period Criteria

There are no specific construction period impact criteria defined under NEPA. The Foothill Extension project is assumed to be constructed under a Design-Build scenario. Construction noise could vary greatly depending on the construction process, type and condition of equipment used, and layout of the construction site. To provide noise limitations during construction, the Construction Authority will impose noise limitations by land use type. See Section 3-15.3.

Operational Period Transit Noise Criteria

Noise impact for this project is based on the criteria defined in the U. S. Federal Transit Administration (FTA) guidance manual *Transit Noise and Vibration Impact Assessment* (FTA Report DOT-T-95-16, April 1995). The FTA noise impact criteria are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. Although higher transit noise levels are allowed in neighborhoods with high levels of existing noise, smaller increases in total noise exposure are allowed with increasing levels of existing noise.

The FTA Noise Impact Criteria group noise sensitive land uses into the following three categories:

- Category 1: ~~Buildings or~~ Tracts of land where quiet is an essential element of their intended purpose (There are no Category 1 lands in the Foothill Extension study corridor.)
- Category 2: Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
- Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches and certain parks and recreational facilities.

Ldn is used to characterize noise exposure for residential areas (Category 2). For other noise sensitive land uses, such as outdoor amphitheaters and school buildings (Categories 1 and 3), the maximum 1-hour Leq during the facility's operating period is used.

There are two levels of impact included in the FTA criteria. The interpretation of these two levels of impact is summarized below:

- Severe: Severe noise impacts are considered "significant" as this term is used in the National Environmental Policy Act (NEPA) and implementing regulations.[2] Noise mitigation would normally be specified for severe impact areas unless there is no practical method of mitigating the noise.
- Impact: In this range of noise impact, sometimes referred to as moderate impact, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.

The noise impact criteria are summarized in Table 3-11.2. The first column shows the existing noise exposure and the remaining columns show the additional noise exposure from the transit project that would cause either moderate or severe impact. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by the transit project. Table 3-11.3 expresses the same criteria in terms of the increase in total or cumulative noise that can occur in the overall noise environment before impact occurs. If the ~~projected~~ predicted noise levels were less than the allowable increment, no impact would result. As seen in Table 3-11.3, the higher the ambient noise level, the smaller the increment of noise generated by a project can be before an impact or severe impact would occur.

[2] The California Environmental Quality Act (CEQA) does not specify impact criteria for noise. The thresholds determining the significance of impacts under CEQA for this project are based on the FTA criteria. The noise impact criteria of individual cities do not apply.

TABLE 3-11.2
FTA NOISE IMPACT CRITERIA

Existing Noise Exposure Leq or Ldn	Project Noise Exposure Impact Thresholds, Ldn or Leq (dBA)			
	Category 1 or 2 Sites		Category 3 Sites	
	Impact	Severe Impact	Impact	Severe Impact
<43	Amb.+10	Amb.+15	Amb.+15	Amb.+20
43	52	58	57	63
44	52	59	57	64
45	52	59	57	64
46	52	59	57	64
47	52	59	57	64
48	53	59	58	64
49	53	59	58	64
50	53	60	58	65
51	54	60	59	65
52	54	60	59	65
53	54	60	59	65
54	55	61	60	66
55	55	61	60	66
56	56	62	61	67
57	56	62	61	67
58	57	62	62	67
59	57	63	62	68
60	58	63	63	68
61	58	64	63	69
62	59	64	64	69
63	60	65	65	70
64	60	66	65	71
65	61	66	66	71
66	61	67	66	72
67	62	67	67	72
68	63	68	68	73
69	64	69	69	74
70	64	69	69	74
71	65	70	70	75
72	65	71	70	76
73	65	72	70	77
74	65	72	70	77
75	65	73	70	78
76	65	74	70	79
77	65	75	70	80
>77	65	75	70	80

TABLE 3-11.2
FTA NOISE IMPACT CRITERIA

Existing Noise Exposure Leq or Ldn	Project Noise Exposure Impact Thresholds, Ldn or Leq (dBA)			
	Category 1 or 2 Sites		Category 3 Sites	
	Impact	Severe Impact	Impact	Severe Impact

Notes: Ldn is used for land uses where nighttime sensitivity is a factor;
Maximum 1-hour Leq is used for land use involving only daytime activities.
Category 1: Buildings or parks where quiet is an essential element of their purpose.
Category 2: Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches and active parks.
Source: Federal Transit Administration, April 1995.

TABLE 3-11.3
CUMULATIVE NOISE LEVEL INCREASE ALLOWED BY FTA CRITERIA

Existing Noise Exposure Leq or Ldn	Impact Threshold for Increase in Cumulative Noise Exposure (dBA)			
	Category 1 or 2 Sites		Category 3 Sites	
	Impact	Severe Impact	Impact	Severe Impact
45	8	14	12	19
46	7	13	12	18
47	7	12	11	17
48	6	12	10	16
49	6	11	10	16
50	5	10	9	15
51	5	10	8	14
52	4	9	8	14
53	4	8	7	13
54	3	8	7	12
55	3	7	6	12
56	3	7	6	11
57	3	6	6	10
58	2	6	5	10
59	2	5	5	9
60	2	5	5	9
61	1.9	5	4	9
62	1.7	4	4	8
63	1.6	4	4	8
64	1.5	4	4	8
65	1.4	4	3	7
66	1.3	4	3	7
67	1.2	3	3	7
68	1.1	3	3	6
69	1.1	3	3	6
70	1.0	3	3	6
71	1.0	3	3	6
72	0.8	3	2	6
73	0.6	2	1.8	5
74	0.5	2	1.5	5
75	0.4	2	1.2	5

Notes: Ldn is used for land uses where nighttime sensitivity is a factor;
Maximum 1-hour Leq is used for land use involving only daytime activities.
Category 1: Buildings or parks where quiet is an essential element of their purpose.
Category 2: Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches and active parks.
Source: Federal Transit Administration, April 1995.

Ground-Borne Vibration Criteria

The FTA ground-borne vibration impact criteria are based on land use and train frequency, as shown in Table 3-11.4. There are some buildings, such as concert halls, recording studios and theaters, which can be very sensitive to vibration but do not fit into any of the three categories listed in Table 3-11.4. Due to the sensitivity of these buildings, they usually warrant special attention during the environmental assessment of a transit project. Table 3-11.5 shows the criteria for acceptable levels of ground-borne vibration for various types of special buildings.

It should also be noted that Tables 3-11.4 and 3-11.5 include separate FTA criteria for ground-borne noise, the "rumble" that can be radiated from the motion of room surfaces in buildings due to ground-borne vibration. Although expressed in dBA, which emphasizes the more audible middle and high frequencies, the criteria are set significantly lower than for airborne noise to account for the annoying low-frequency character of ground-borne noise. Because airborne noise often masks ground-borne noise for above ground (i.e. at-grade or elevated) rail systems, ground-borne noise criteria are primarily applied to subway operations where airborne noise is not a factor. Therefore, ground-borne noise impacts were not assessed for the ~~above-grade transit system planned along the Phase II~~ Foothill Extension, ~~ground-borne noise criteria would be applied only to buildings that have sensitive interior spaces that are well insulated from exterior noise.~~

TABLE 3-11.4
GROUND-BORNE VIBRATION AND NOISE IMPACT CRITERIA

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[3]	65 VdB[3]	(-4)	(-4)
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:

1. "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
4. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: Federal Transit Administration, April 1995.

TABLE 3-11.5
GROUND-BORNE VIBRATION AND NOISE IMPACT CRITERIA FOR SPECIAL BUILDINGS

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Concert Halls	65 VdB	65 VdB	25 dBA	25 dBA
TV Studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Notes:
1. "Frequent Events" is defined as more than 70 vibration events per day. Most transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example consider locating a commuter rail line next to a concert hall. If no commuter trains will operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

Source: Federal Transit Administration, April 1995.

b. CEQA Impact Criteria

There are no noise and vibration impact criteria specified in CEQA. The Construction Authority has chosen to use the FTA noise and vibration criteria for the ~~Phase II~~ Foothill Extension project since this is a federally sponsored environmental analysis.

3-11.2.3 Construction-Period Impacts

a. No Build Alternative

The only project in the No Build Alternative that would be expected to generate construction-period impacts is the planned Eastside Extension. Construction-period noise impacts are addressed in the LACMTA environmental document for that project. The proposed increase in Gold Line service frequency following completion of the Eastside Extension does not include any construction elements, and thus would generate no construction-period noise. Increases in bus service included in the No Build Alternative do not include substantial construction and would likely generate only short-term construction noise from possible construction of bus shelters or shelter improvements.

b. Build Alternatives

Temporary noise and vibration during construction of an LRT project have the potential of being intrusive to residents near the construction sites. The Foothill Extension project is assumed to be constructed under a Design-Build scenario. Construction noise could vary greatly depending on the construction process, type and condition of equipment used, and layout of the construction site. Under a Design-Build process, many of these factors are usually left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction noise. Overall, construction noise levels are governed primarily by the

noisiest pieces of equipment. For most construction equipment, the engine, which is usually diesel, is the dominant noise source. This is particularly true of engines without sufficient muffling. For special activities such as impact pile driving and pavement breaking, noise generated by the actual process dominates. Construction activities that could cause intrusive vibration include pile driving, vibratory compaction, jackhammers, and use of tracked vehicles such as bulldozers. Please refer to the updated Noise and Vibration Technical Report in the Appendices for more detail about construction noise and vibration. To provide noise limitations during construction, the Construction Authority will impose noise limitations by land use type. See Section 3-15.3.

Phase I — The Cities Affected and the Effects

There are no elements of the Build (LRT) alternatives in the cities of Los Angeles, South Pasadena, or west of the Sierra Madre Villa Station in Pasadena, so there would be no construction-period noise. Increases in LRT operations in those cities are attributable to increases that LACMTA would implement following construction of the Eastside Extension. More frequent headways through Phase I cities would occur before implementation of the Foothill Extension operating plan.

Foothill Extension, Segment 1 — The Cities Affected and the Effects

The cities in Segment 1 are Pasadena, Arcadia, Monrovia, Duarte, and Irwindale. Based on the criteria and noise projections presented in the updated Noise and Vibration Technical Report, and assuming that construction noise is reduced by 6 dB for each doubling of distance from the center of the site, screening distances for potential construction noise impact can be estimated. These estimates suggest that the potential for construction noise impact will be minimal for commercial and industrial land use, with impact screening distances of 70 feet and 40 feet, respectively. Even for residential land use, the potential for temporary construction noise impact would be limited to locations within about 125 feet of the corridor. To provide noise limitations during construction, the Construction Authority will impose noise limitations by land use type. See Section 3-15.3.

Foothill Extension, Segment 2 — The Cities Affected and the Effects

The cities in Segment 2 are ~~Azusa~~, Glendora, San Dimas, La Verne, Pomona, Claremont, Montclair, and Upland. Based on the criteria and noise projections presented in the Noise and Vibration Technical Report, and assuming that construction noise is reduced by 6 dB for each doubling of distance from the center of the site, screening distances for potential construction noise impact can be estimated. These estimates suggest that the potential for construction noise impact will be minimal for commercial and industrial land use, with impact screening distances of 70 feet and 40 feet, respectively. Even for residential land use, the potential for temporary construction noise impact would be limited to locations within about 125 feet of the corridor. To provide noise limitations during construction, the Construction Authority will impose noise limitations by land use type. See Section 3-15.3.

Summary of Construction Impacts for Full Build (Pasadena to Montclair) Alternative

For the Full Build (Pasadena to Montclair) Alternative, residential land uses within 125 feet of the alignment would have the potential for temporary construction noise impacts under the Triple Track Full Build (Pasadena to Montclair) Alternative.

Summary of Construction Impacts for Build LRT to Azusa Alternative

For the Build LRT to Azusa Alternative, residential land uses within 125 feet of the alignment would have the potential for temporary construction noise impacts.

3-11.2.4 Long-Term Impacts

a. No Build Alternative

Phase I — The Cities Affected and the Effects

The only elements of the No Build Alternative that would be expected to result in long-term noise or vibration impacts in a Phase I city would result from the Eastside Extension. These impacts in Los Angeles are addressed in the Draft Supplemental Environmental Impact Statement/Draft Subsequent Environmental Impact Report (FTA and LACMTA 2001). The planned increase in service frequency through the Phase I area that is planned by LACMTA is not subject to NEPA analysis. LACMTA's increase in service is statutorily exempt from CEQA (§21080(b) 10).

Foothill Extension, Segment 1 — The Cities Affected and the Effects

The No Build Alternative does not include any elements that result in long-term noise or vibration impacts for ~~Phase II~~ Foothill Extension, Segment 1 cities.

Foothill Extension, Segment 2 — The Cities Affected and the Effects

The No Build Alternative does not include any elements that would result in any long-term noise or vibration impacts for ~~Phase II~~ Foothill Extension, Segment 2 cities.

b. Build Alternatives

Noise Analysis

For the Build Alternatives, detailed comparisons of the existing and future noise levels are presented in Table 3-11.6, Table 3-11.7, Table 3-11.10, and Table 3-11.11. Table 3-11.6 includes results for the Category 2 receptors along Segment 1 of the Foothill Extension (Pasadena to Azusa) with both daytime and nighttime sensitivity to noise (e.g. residences, hotels and hospitals). Table 3-11.7 is a listing of all Category 3 receptors along Segment 1, consisting of institutional sites that are not sensitive to nighttime noise (e.g. schools, churches, parks and medical offices). Table 3-11.10 includes results for the Category 2 receptors along Segment 2 (Glendora to Montclair) ~~portion of the alignment with both daytime and nighttime sensitivity to noise (e.g. residences, hotels and hospitals)~~. And Table 3-11.11 is a listing of all Category 3 receptors along Segment 2 of the Foothill Extension. ~~portion of the alignment, consisting of institutional sites that are not sensitive to noise at night (e.g. schools, churches, parks and medical offices).~~ Written descriptions follow the tables of the general locations where noise impacts are predicted. ~~Maps showing the location of sensitive receptors potentially affected by noise are included in the Noise and Vibration Technical Report in the Appendices.~~ See Figures 3-11.9 through 3-11.21 for the locations of noise impacts; these are also the same locations where mitigation would be provided.

Each table includes table includes:

- Location of the representative receivers (*City* and *Group No.*) and the approximate engineering station (*Eng. Station*) for the representative receiver. Grouping is based on the location by City and then the direction of service. Engineering stations are shown on the Plan and Profile maps in Volume 4. Land uses along the westbound (WB) direction are generally north of the tracks while land uses along the eastbound direction (EB) are generally south of the tracks.

- The location of each receiver relative to the Gold Line in terms of the travel direction of the near track (*Dir.*) and distance to the centerline of the near track (*Dist., ft*).
- Train Speed (*Speed, mph*).
- The existing noise level based on the measurement data (*Exist. Ldn*).
- The relevant impact thresholds based on the existing Ldn (*Impact and Severe*).
- The predicted noise level from the project (*Project Ldn*).
- The type of impact (*Type*) and the number of impacts (*No. Impact*) and severe impacts (*No. Severe*) in dwelling units.

~~In addition to the civil station (as shown on maps in Volume 2), distance to the near track and proposed LRT speed, each table includes the existing noise level, the projected noise level from LRT operations and the impact criteria for each receptor or receptor group. Based on a comparison of the predicted project noise level with the impact criteria, the impact category is listed, along with the predicted total noise level and projected noise increase due to the introduction of LRT service. Tables 3-11.6 and 3-11.10 also include an inventory of the number of impacts and severe impacts at each sensitive receptor location.~~

Vibration Analysis

For the Build Alternatives, the estimated root mean square (RMS) velocity levels (VdB re 1 micro-in./sec.) for sensitive receptors at representative distances are provided in Table 3-11.8, Table 3-11.9, Table 3-11.12, and Table 3-11.13. These tables summarize the results of the analysis in terms of anticipated ~~exceedances~~ vibration impacts based on the FTA criteria for "frequent events" (defined as more than 70 events per day). The criteria are discussed in more detail in Section 3-11.2.2.

Vibration-sensitive locations along the alignment are generally the same as the noise-sensitive locations discussed above. For Segment 1 of the Foothill Extension, Category 2 land uses are listed in Table 3-11.8 and Category 3 land uses are listed in Table 3-11.9. V~~ibration-sensitive locations along the alignment are listed in~~ Table 3-11.12 ~~for Category 2 land use~~ and Table 3-11.13 include Category 2 and Category 3 land uses for Segment 2, respectively. Similar to the noise-prediction tables, each vibration table lists pertinent information relating to the location of the vibration-sensitive receptor and the train speed along with the predicted vibration level and the number of impacts. The groupings of vibration-sensitive receptors are the same as in noise analysis. ~~the locations, the civil station, the distance to the near track, and the projected LRT speed at each location~~. In addition, the predicted project vibration level and the impact criterion level are indicated along with the number of impacts projected for each receptor or receptor group. Written descriptions of the general locations where vibration impacts are predicted follow the tables. Maps showing the locations of the sensitive receptors affected by vibration are included in the updated Noise and Vibration Technical Report in the Appendices, Volume 5.

Phase I — The Cities Affected and the Effects

Noise impacts for Phase I of the Gold Line were evaluated by LACMTA in studies that preceded the proposed Foothill Extension project using the maximum passby noise levels, or Lmax.[4] Existing service in Phase I uses 2-car train consists. Future service levels when the Eastside LRT Extension project begins operation in 2009 would include 3-car train consists in Phase 1 cities. As a result of this change arising from implementing the Eastside LRT operating plan, Lmax noise levels at the residences closest to the corridor would increase by ~~substantially~~ less than 1 dBA, which is an imperceptible difference. Changes in the frequency of service would not affect Lmax.

The Gold Line Foothill Extension would not result in noise impacts in Phase I cities, since the Operating Plan for the ~~Phase II~~ Foothill Extension is ~~dictated by~~ consistent with the LACMTA's Eastside LRT Extension's Operating Plan that would apply to all Phase I cities, and which would be implemented before the Foothill Extension project is constructed.

Foothill Extension, Segment 1 — The Cities Affected and the Effects

Noise

Table 3-11.6 lists the noise impacts for Category 2 land use for the ~~Phase II~~ Foothill Extension; Segment 1 cities Written descriptions of the locations where noise impacts are predicted follow the table. See **Figures 3-11.9 through 3-11.21** for the locations of noise impacts; these are also the same locations where mitigation would be provided.

[4] LACTC, Metro Pasadena Project, "Design & Performance Criteria," 1992.

TABLE 3-11.6 NOISE IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [4]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Pasadena	EB	1	853+50	232	55	64	48	60	66	None	0	0
Pasadena	EB	2	861+70	321	55	64	46	60	66	None	0	0
Pasadena	WB	1	854+00	205	55	64	49	60	66	None	0	0
Total: Pasadena											**0**	**0**
Arcadia	EB	1	868+70	346	55	65	45	61	66	None	0	0
Arcadia	EB	2	910+00	322	55	65	48	61	66	None	0	0
Arcadia	EB	3	939+00	141	55	65	52	61	66	None	0	0
Arcadia	EB	4	946+50	125	55	65	53	61	66	None	0	0
Arcadia	EB	5	952+00	153	55	65	51	61	66	None	0	0
Arcadia	EB	6	960+50	58	55	60	63	58	63	Impact	13	0
Arcadia	EB	7	974+00	136	55	60	57	58	63	None	0	0
Arcadia	EB	8	1020+00	48	55	60	64	58	63	Severe	0	7
Arcadia	WB	1	872+00	180	55	65	50	61	66	None	0	0
Arcadia	WB	2	877+00	320	55	65	46	61	66	None	0	0
Arcadia	WB	3	888+00	140	55	65	52	61	66	None	0	0
Arcadia	WB	4	894+00	170	55	65	50	61	66	None	0	0
Arcadia	WB	5	902+00	180	55	65	50	61	66	None	0	0
Arcadia	WB	6	908+00	210	55	65	49	61	66	None	0	0
Arcadia	WB	7	915+00	210	55	65	49	61	66	None	0	0
Arcadia	WB	8	925+00	160	55	65	51	61	66	None	0	0
Arcadia	WB	9	928+00	260	55	65	47	61	66	None	0	0
Arcadia	WB	10	935+00	130	55	65	52	61	66	None	0	0
Arcadia	WB	11	943+00	130	55	65	52	61	66	None	0	0

TABLE 3-11.6 NOISE IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [4]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Arcadia	WB	12	970+00	30	55	60	67	58	63	Severe	0	8
Arcadia	WB	13	975+00	80	55	60	61	58	63	Impact	4	0
Arcadia	WB	14	1002+00	65	41	60	59	58	63	Impact	1	0
Total: Arcadia											**18**	**15**
Monrovia	EB	1	1025+00	54	55	60	63	58	63	Impact	5	0
Monrovia	EB	2	1031+50	64	55	60	62	58	63	Impact	8	0
Monrovia	EB	3	1043+00	32	55	60	72	58	63	Severe	0	11
Monrovia	EB	4	1049+00	38	55	60	71	58	63	Severe	0	3
Monrovia	EB	5	1051+00	57	55	60	58	58	63	Impact	2	0
Monrovia	EB	6	1053+00	47	55	60	64	58	63	Severe	0	3
Monrovia	EB	7	1054+50	90	55	60	61	58	63	Impact	1	0
Monrovia	EB	8	1056+00	29	55	60	68	58	63	Severe	0	12
Monrovia	EB	9	1060+00	47	55	60	65	58	63	Severe	0	5
Monrovia	EB	10	1062+00	47	55	60	64	58	63	Severe	0	4
Monrovia	EB	11	1067+00	30	55	60	67	58	63	Severe	0	4
Monrovia	EB	12	1069+00	30	54	60	68	58	63	Severe	0	1
Monrovia	WB	1	1036+00	100	55	60	59	58	63	Impact	1	0
Monrovia	WB	2	1043+00	60	55	60	63	58	63	Impact	7	0
Monrovia	WB	3	1046+50	62	55	60	68	58	63	Severe	0	12
Monrovia	WB	4	1051+00	40	55	60	71	58	63	Severe	0	9
Monrovia	WB	5	1054+90	40	55	60	66	58	63	Severe	0	4
Monrovia	WB	6	1058+00	50	55	60	65	58	63	Severe	0	1
Total: Monrovia											**24**	**70**

TABLE 3-11.6 NOISE IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [4]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Duarte	EB	1	1130+00	120	55	64	59	60	66	None	0	0
Duarte	EB	2	1136+00	120	55	64	58	60	66	None	0	0
Duarte	EB	3	1149+00	120	55	64	58	60	66	None	0	0
Duarte	EB	4	1153+00	120	55	64	59	60	66	None	0	0
Duarte	EB	5	1160+00	120	55	64	58	60	66	None	0	0
Duarte	EB	6	1164+00	145	55	64	56	60	66	None	0	0
Duarte	WB	1	1142+50	100	55	57	59	56	62	Impact	7	0
Duarte	WB	2	1150+50	110	55	57	53	56	62	None	0	0
Duarte	WB	3	1156+00	130	55	57	58	56	62	Impact	6	0
Duarte	WB	4	1163+50	115	55	57	58	56	62	Impact	8	0
Duarte	WB	5	1168+00	70	55	57	61	56	62	Impact	13	0
Duarte	WB	6	1175+00	70	41	57	59	56	62	Impact	7	0
Total: Duarte											**41**	**0**
Azusa	EB	1	1341+00	110	54	60	60	58	63	Impact	3	0
Azusa	EB	2	1343+00	174	53	60	57	58	63	None	0	0
Azusa	EB	3	1346+00	42	55	60	65	58	63	Severe	0	3
Azusa	EB	4	1350+00	16	55	60	71	58	63	Severe	0	3
Azusa	EB	5	1355+00	78	55	60	61	58	63	Impact	1	0
Azusa	EB	6	1358+00	30	55	60	67	58	63	Severe	0	20
Azusa	EB	7	1363+00	25	55	60	68	58	63	Severe	0	5
Azusa	EB	8	1367+00	40	55	60	66	58	63	Severe	0	5
Azusa	EB	9	1385+00	123	38	60	56	58	63	None	0	0
Azusa	EB	10	1387+00	71	43	60	61	58	63	Impact	2	0

TABLE 3-11.6 NOISE IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [4]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Azusa	EB	11	1388+50	52	47	60	64	58	63	Severe	0	2
Azusa	EB	12	1392+00	52	51	60	64	58	63	Severe	0	6
Azusa	EB	13	1394+00	68	53	60	61	58	63	Impact	3	0
Azusa	EB	14	1397+00	123	55	60	58	58	63	None	0	0
Azusa	EB	15	1421+00	100	33	60	55	58	63	None	0	0
Azusa	EB	16	1422+00	155	28	60	50	58	63	None	0	0
Azusa	EB	17	1426+00	78	20	60	52	58	63	None	0	0
Azusa	WB	1	1368+00	60	47	60	63	58	63	Impact	1	0
Azusa	WB	2	1369+50	120	44	60	57	58	63	None	0	0
Azusa	WB	3	1383+50	125	42	60	57	58	63	None	0	0
Azusa	WB	4	1386+00	125	49	60	57	58	63	None	0	0
Azusa	WB	5	1393+50	70	55	60	63	58	63	Impact	6	0
Azusa	WB	6	1394+50	60	55	60	62	58	63	Impact	2	0
Total: Azusa											**18**	**44**
TOTAL: SEGMENT 1											**101**	**129**

[1] Near track direction: EB = towards Montclair; WB = towards Pasadena

[2] Receivers are first grouped within each City and then by direction. See the Noise and Vibration Technical Report in the Appendices for maps showing the receiver groups

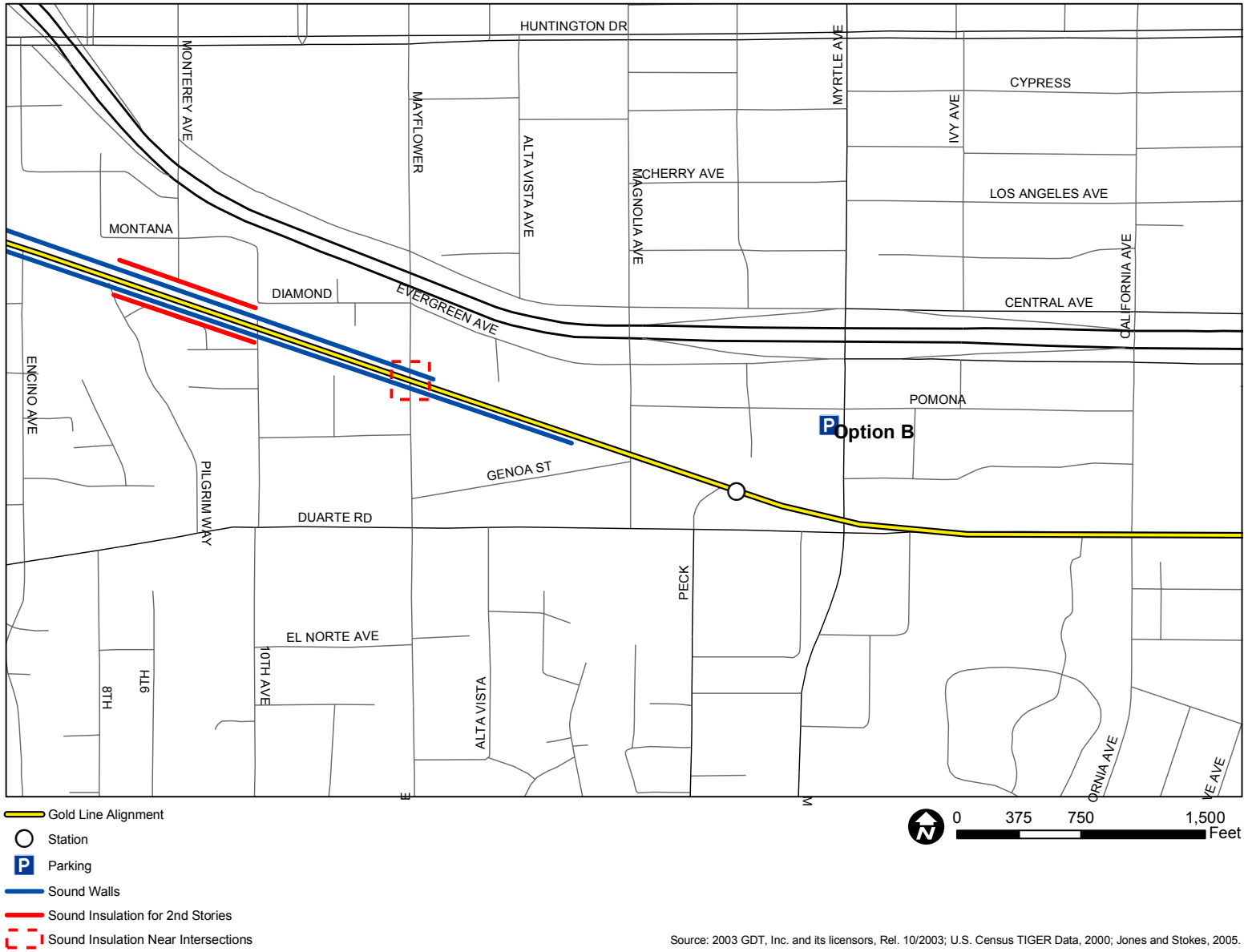
[3] Distance to near track

[4] All sound levels are A-weighted decibels, dBA

Source: ATS Consulting, LLC, 2005.

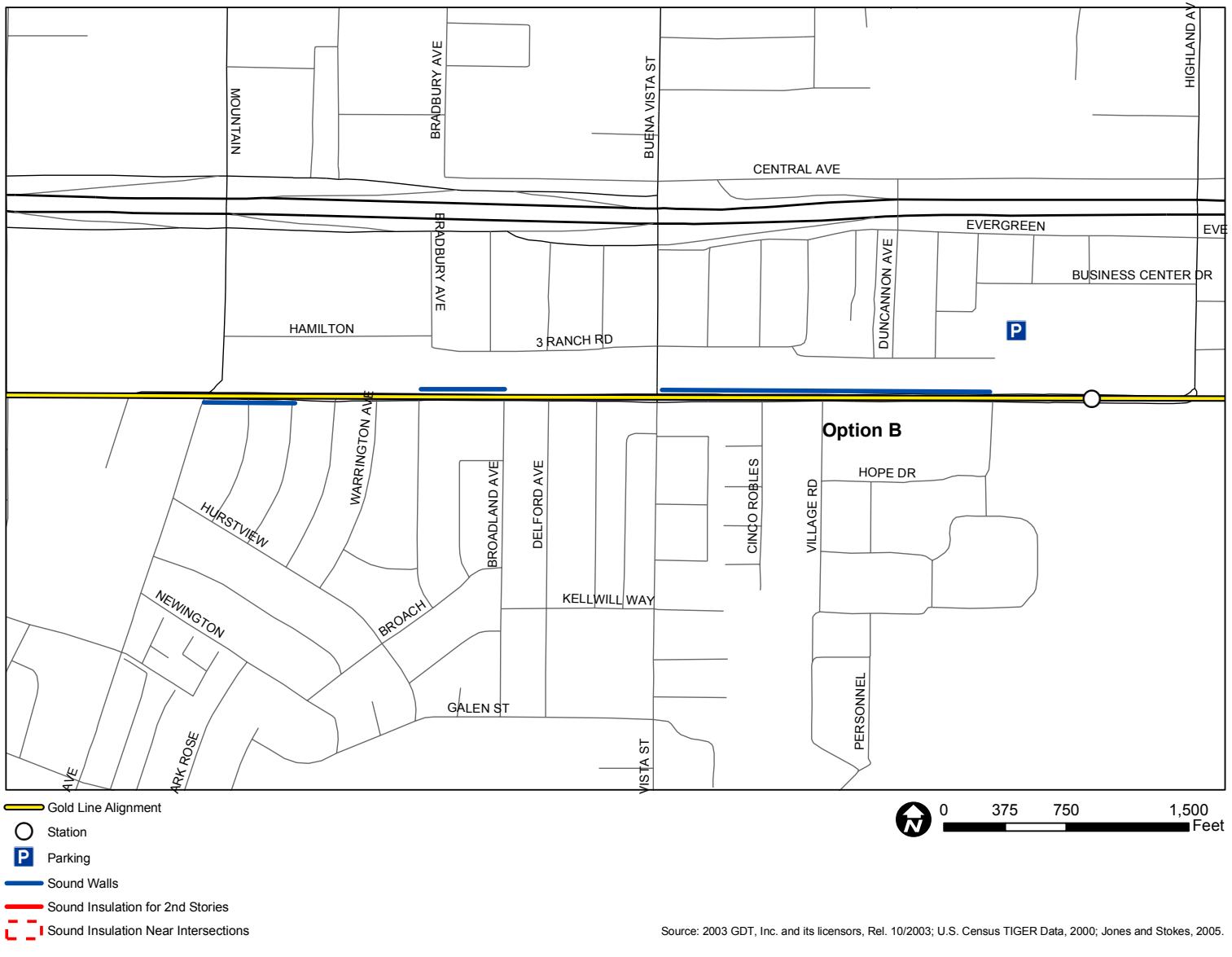
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.9: Locations of Noise Impact and Mitigation (1 of 13)



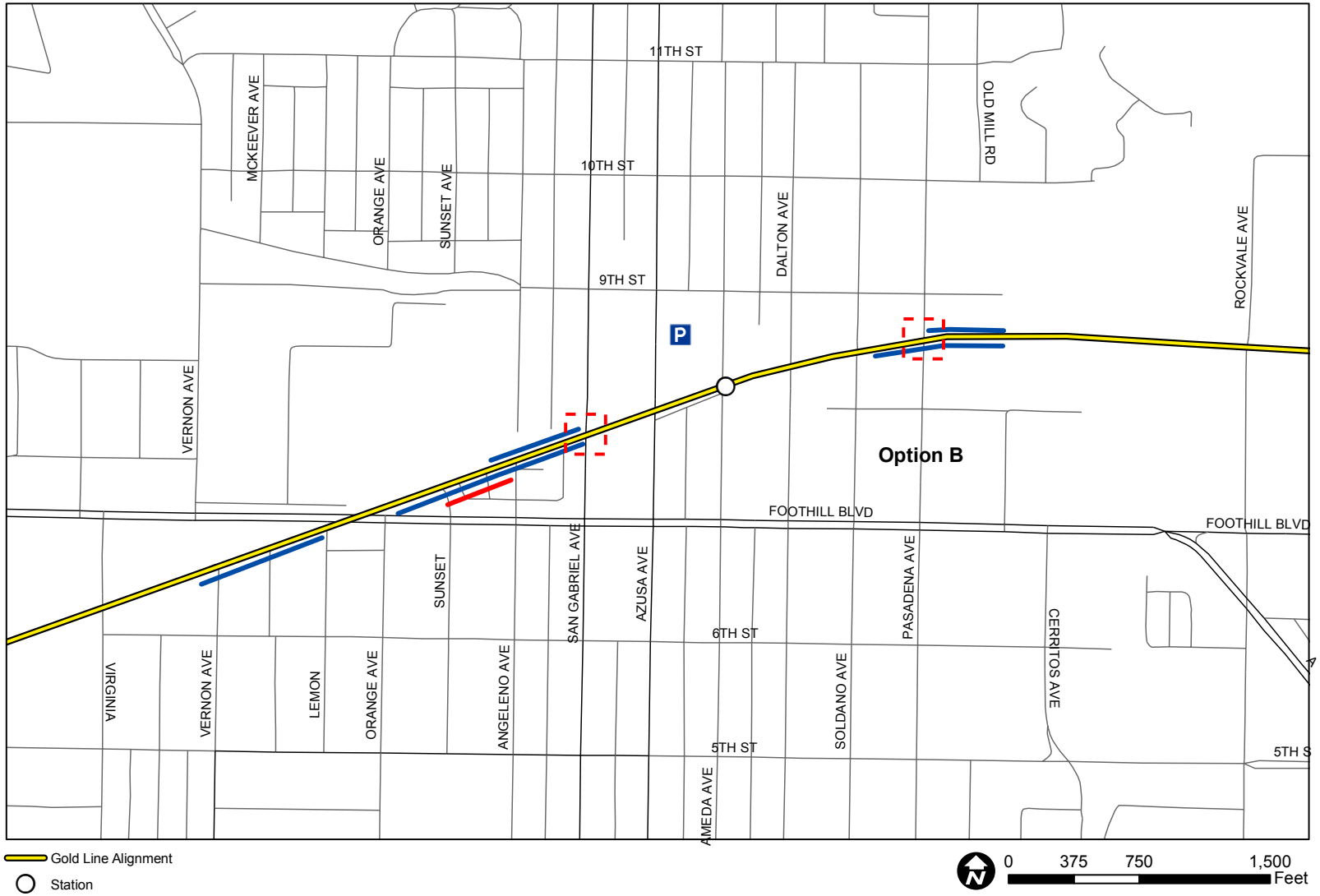
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.10: Locations of Noise Impact and Mitigation (2 of 13)



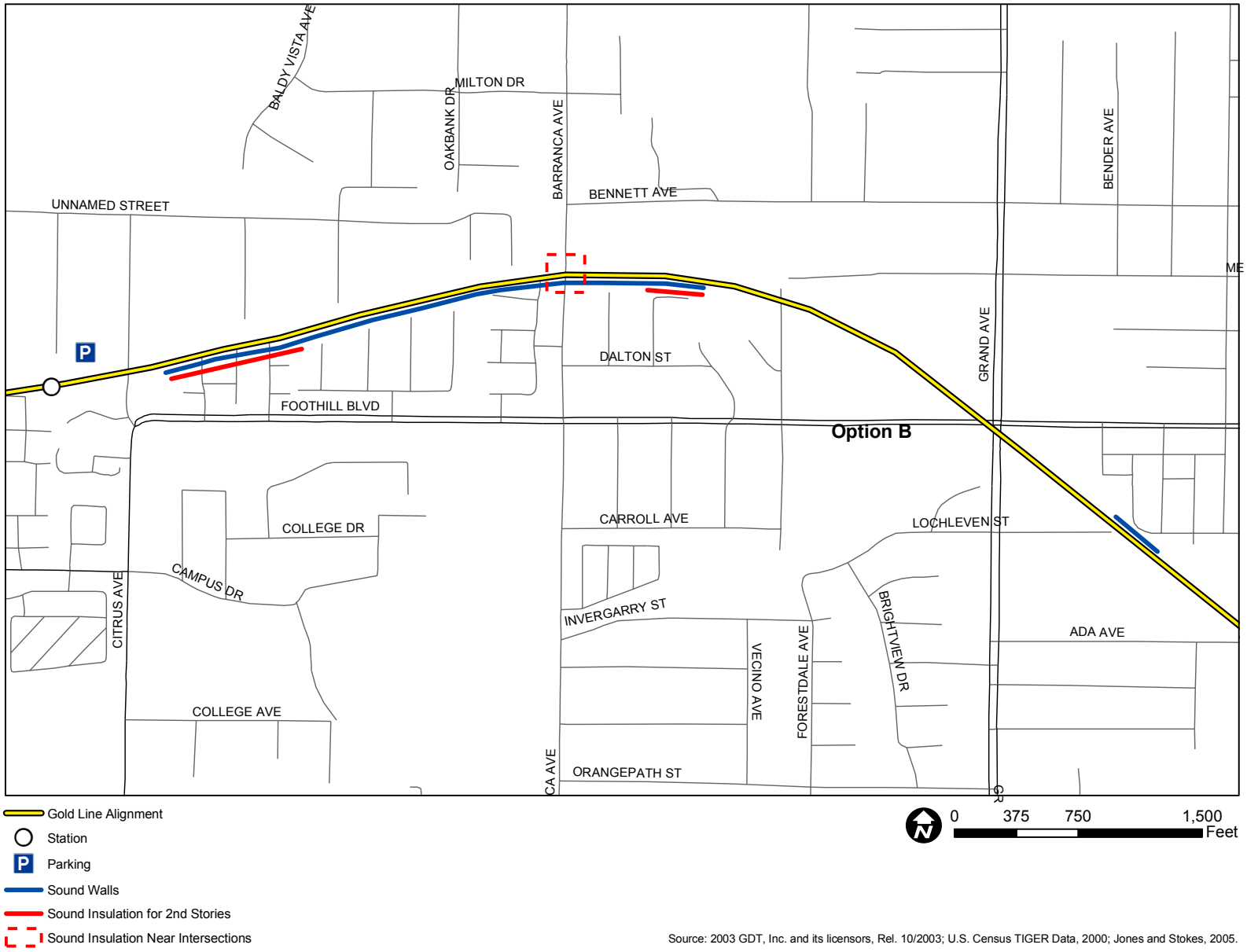
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.11: Locations of Noise Impact and Mitigation (3 of 13)



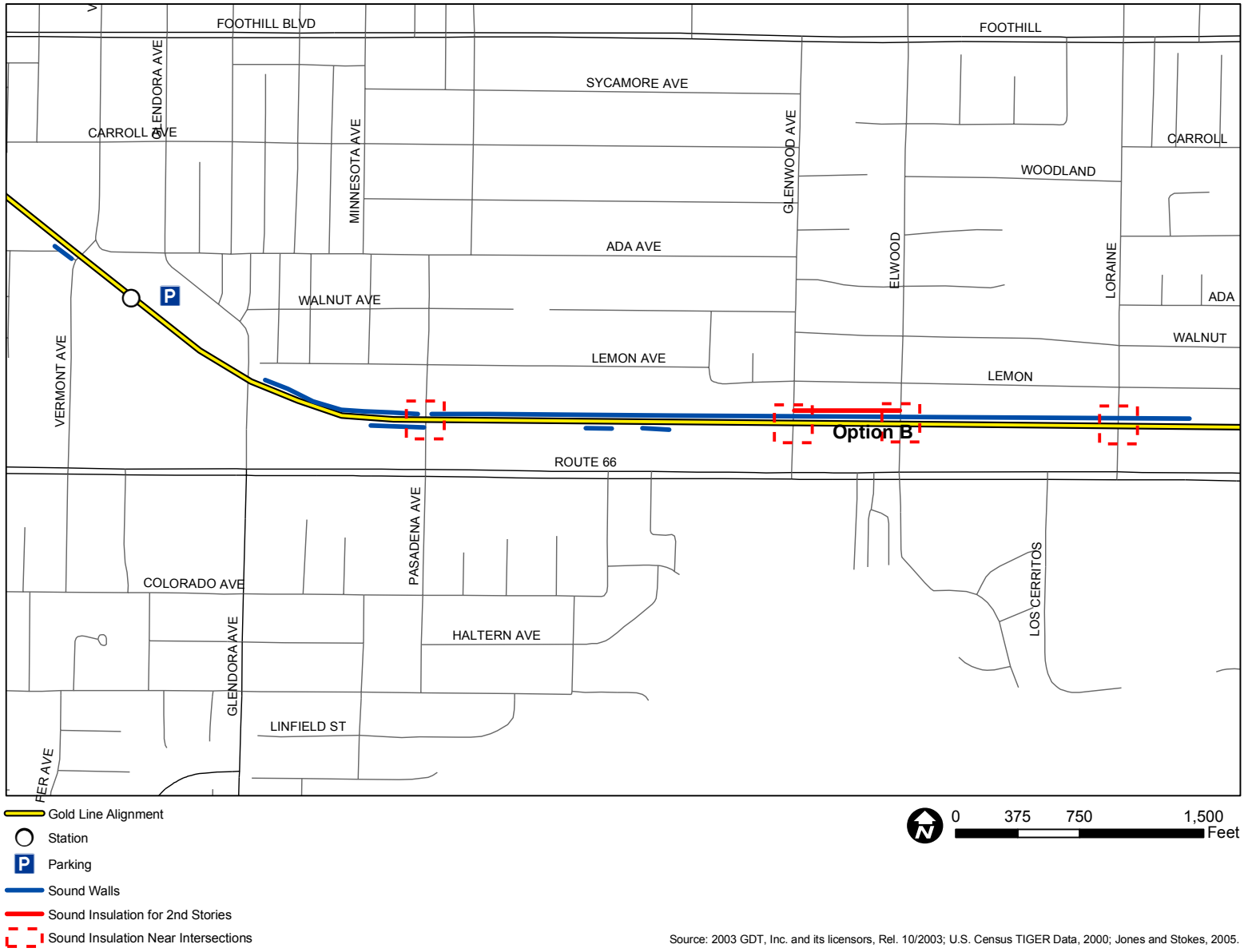
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.12: Locations of Noise Impact and Mitigation (4 of 13)



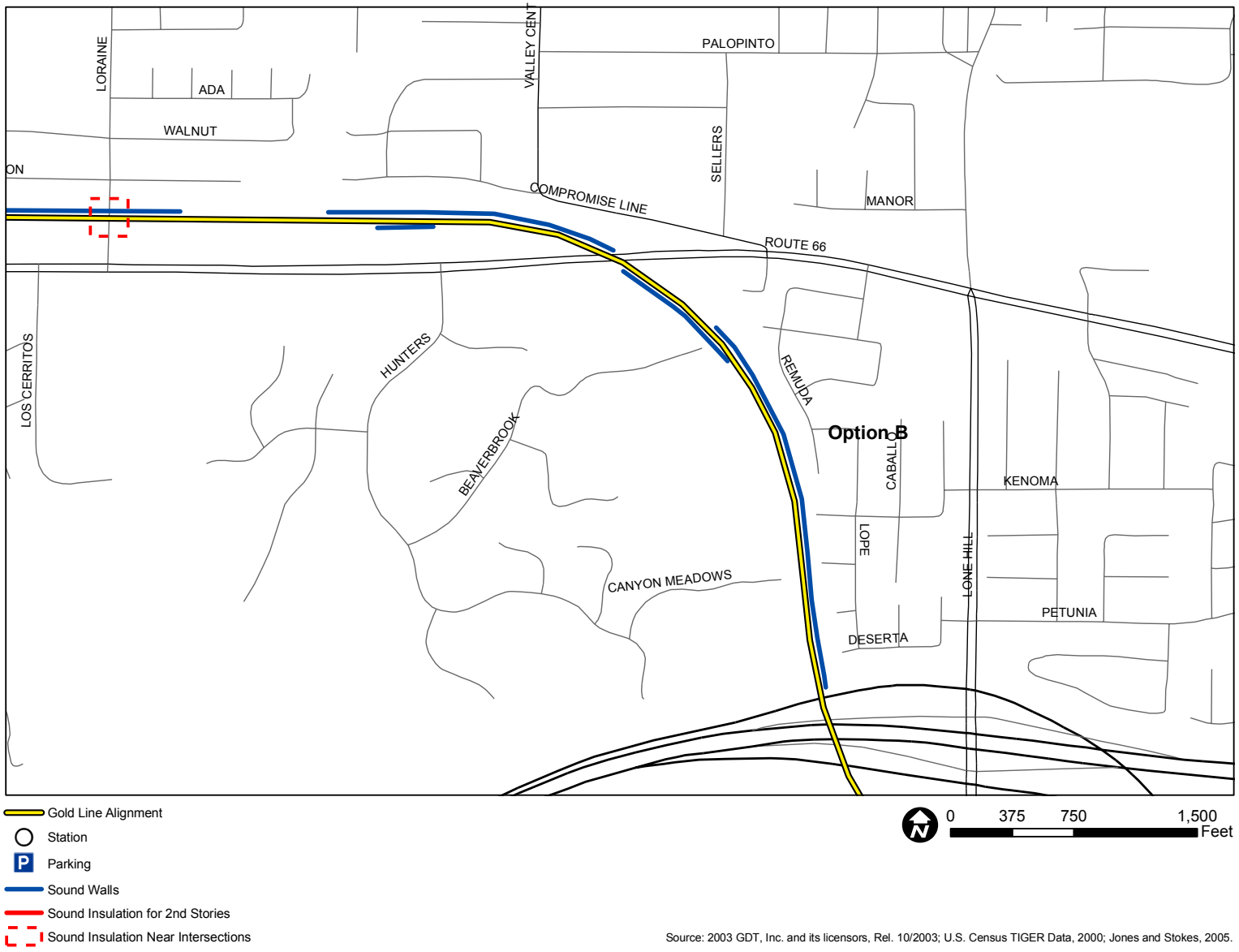
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.13: Locations of Noise Impact and Mitigation (5 of 13)



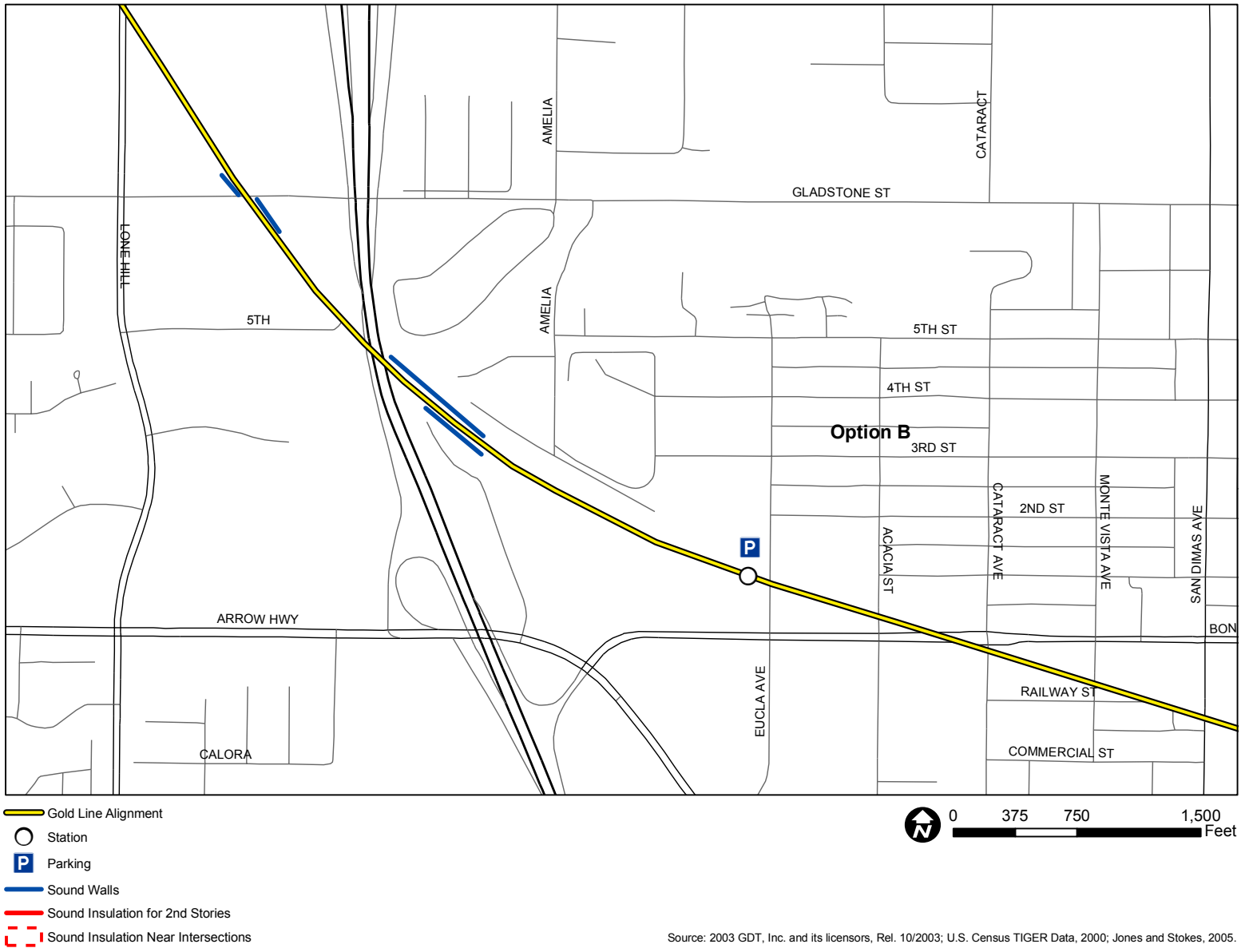
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.14: Locations of Noise Impact and Mitigation (6 of 13)



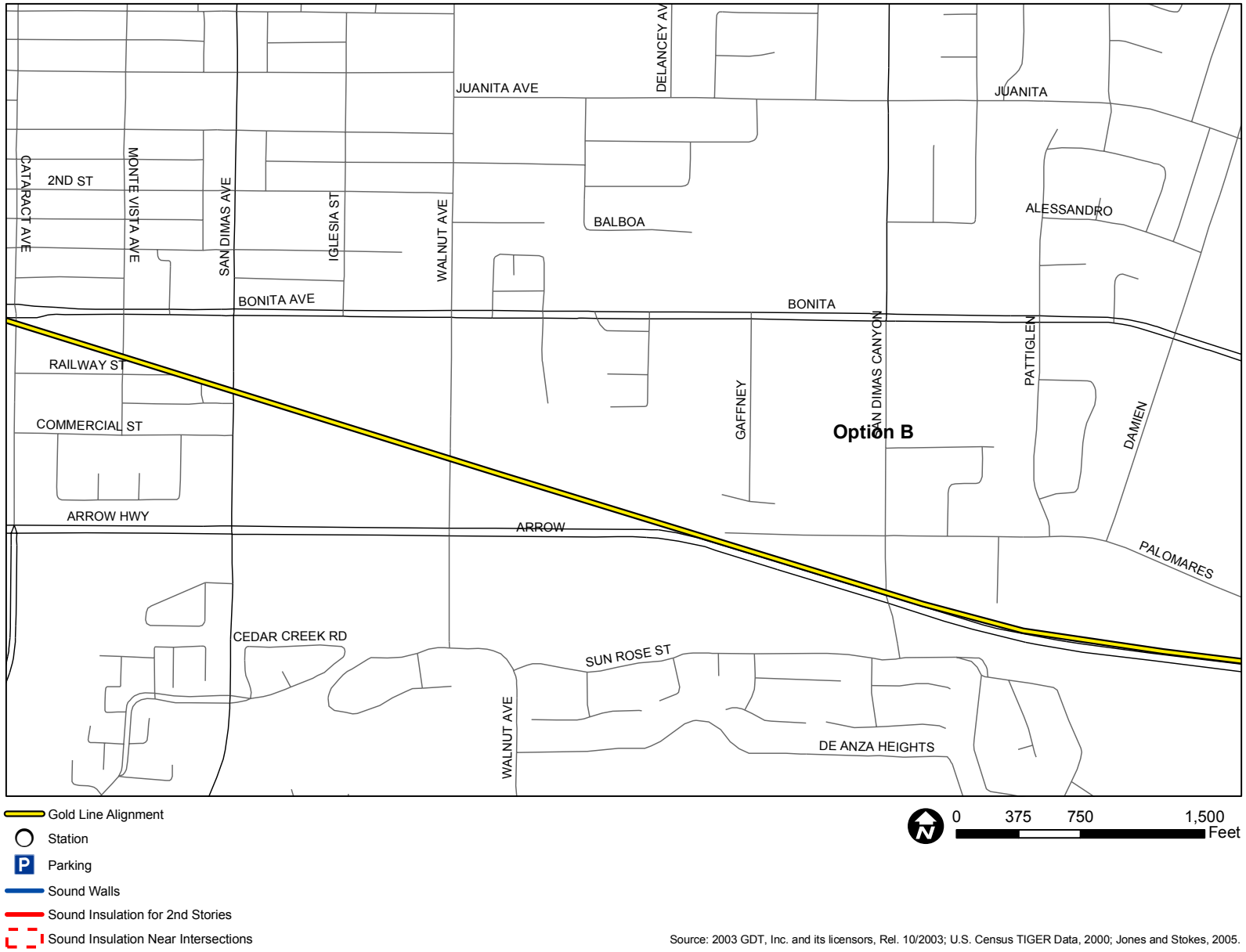
Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.15: Locations of Noise Impact and Mitigation (7 of 13)



Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.16: Locations of Noise Impact and Mitigation (8 of 13)

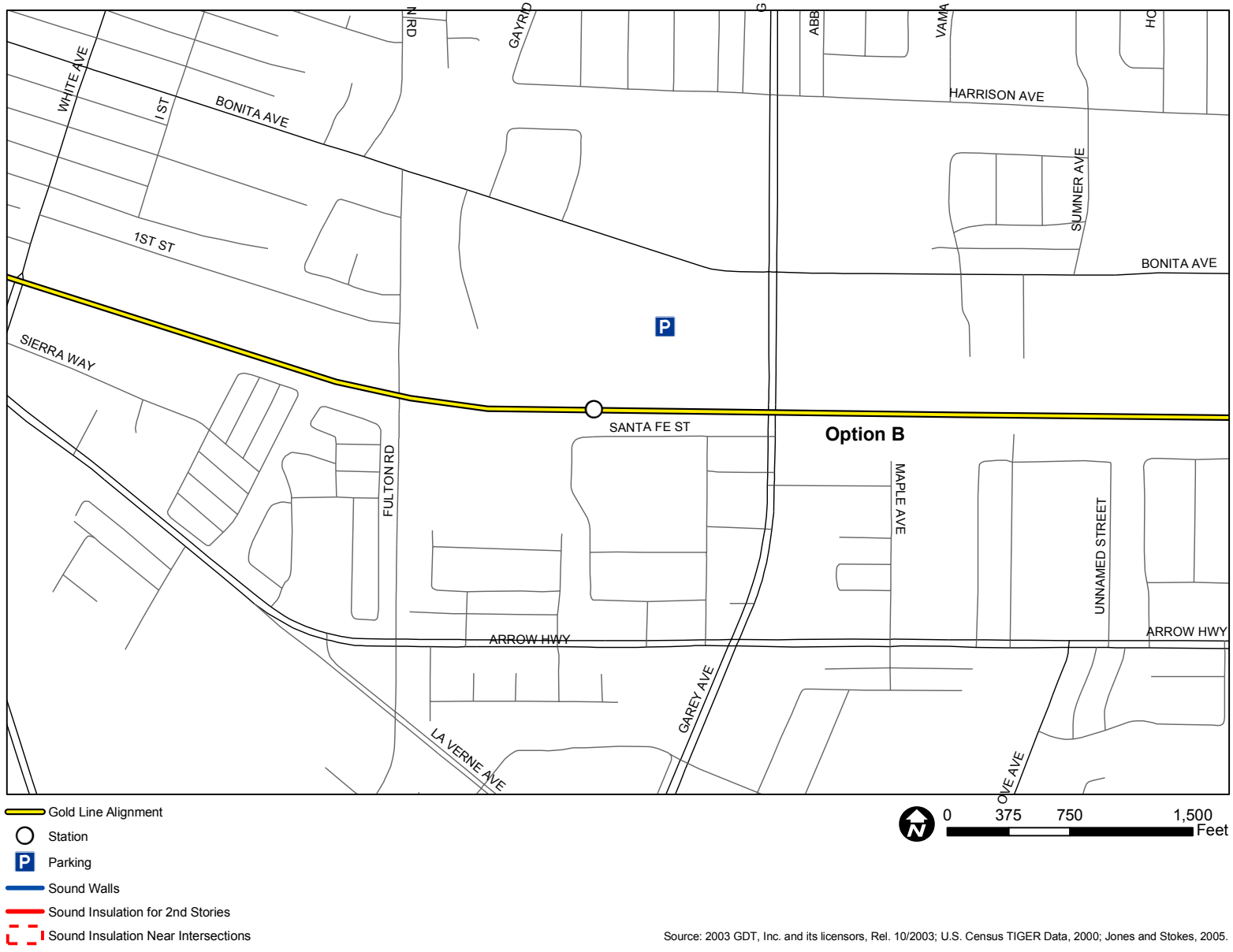


Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.17: Locations of Noise Impact and Mitigation (9 of 13)

Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.18: Locations of Noise Impact and Mitigation (10 of 13)

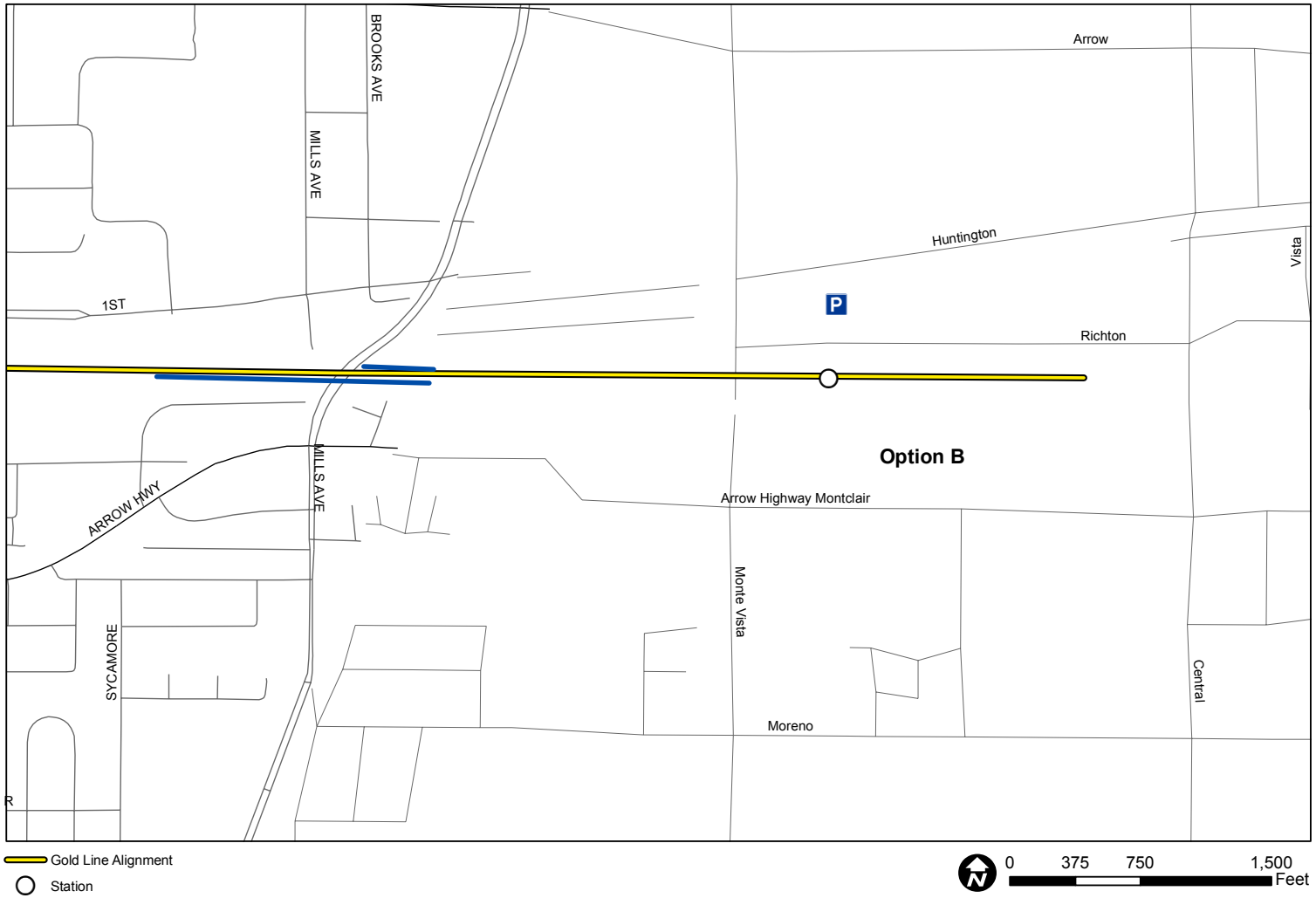


Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.19: Locations of Noise Impact and Mitigation (11 of 13)

Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.20: Locations of Noise Impact and Mitigation (12 of 13)



Source: 2003 GDT, Inc. and its licensors, Rel. 10/2003; U.S. Census TIGER Data, 2000; Jones and Stokes, 2005.

Figure 3-11.21: Locations of Noise Impact and Mitigation (13 of 13)

The following are brief descriptions of the noise impacts at Category 2 land use by City:

- Pasadena: The Foothill Extension would be within in the median of the I-210 freeway from the Sierra Madre Villa Station to the eastern city limits. Impacts are not predicted within the City of Pasadena due to the large distance between the tracks and the closest residences (>150 feet) and the high ambient noise levels (approximately 64 dBA Ldn).

- Arcadia: Potential noise impacts are predicted at 32 residences and one hotel in the City of Arcadia. The majority of the predicted noise impacts are south of the alignment between I-210 and N. Colorado Blvd and between Huntington Drive and the eastern city limits.

- Monrovia: Potential noise impacts are predicted at 94 residences in the City of Monrovia. Impacts are generally predicted south of the alignment between the western city limits and Magnolia Avenue and north of the alignment between the Santa Anita Wash and Mayflower Avenue.

- Duarte: In the City of Duarte, noise impacts are predicted at 41 single-family residences. Potential noise impacts are generally located south of the tracks near Mountain Avenue and along the north side of the alignment east of Mountain Avenue to the Duarte Station.

- Irwindale: There are no noise-sensitive receptors located along the corridor within the City of Irwindale. Therefore, noise impacts are not predicted.

- Azusa: Potential noise impacts are predicated at 62 residences in the City of Azusa. South of the tracks, impacts are generally predicted at residences located between Virginia Avenue and N. San Gabriel Boulevard and from N. Dalton Boulevard to approximately 800 feet east of N. Pasadena Avenue. North of the tracks, noise impacts are predicted just west of N. San Gabriel Boulevard and from N. Pasadena Avenue east approximately up to 500 feet east of N. Pasadena Avenue.

Similar to the Category 2 analysis, an assessment of noise impact for Category 3 receptors was also conducted for Segment 1 of the Foothill Extension. Note that FTA guidance is that active-use parks (parks with playgrounds, sports fields, etc.) are not noise sensitive. This assessment was based on a comparison of the existing ambient noise level with the predicted project noise levels in terms of the peak transit hour Leq. Table 3-11.7 lists the noise impacts for institutional receptors. ~~However, the only Category 3 locations with the potential for noise impact are parks used for sports and other active recreation. Because of their land-use, they are not considered noise sensitive. Therefore, there are no Category 3 noise impacts for Phase II, Segment 1.~~

TABLE 3-11.7 NOISE IMPACTS FOR CATEGORY 3 LAND USES – SEGMENT 1 CITIES

City	Land Use	I.D. [1]	Dir. [2]	Eng. Station	Dist., Ft [3]	Speed, mph	Existing Leq [4]	Project Leq [4]	Impact Threshold, Leq [4]		Impact
									Impact	Severe	
Arcadia	Church	A	WB	916+00	330	55	73	49	70	77	None
Arcadia	School	B	EB	1014+00	75	55	53	60	59	65	Impact
Monrovia	Cemetery	C	EB	1100+00	291	50	61	49	63	69	None
Monrovia	Church	D	EB	1110+50	105	55	61	57	63	69	None
Duarte	Park	E	EB	1143+50	110	55	61	56	63	69	None
Duarte	Park	F	EB	1167+00	110	55	61	56	63	69	None
Duarte	Conf. Facility	G	EB	1170+50	180	55	61	53	63	69	None
Azusa	Medical, Day-Use	H	EB	1356+00	70	55	66	60	66	72	None
Azusa	Museum	I	EB	1380+00	50	10	66	58	66	72	None
Azusa	University	J	EB	1415+00	110	52	66	56	66	72	None

[1] These receivers are identified by a letter in maps in the updated Noise and Vibration Technical Report in the Appendices

[2] Near track direction: EB = towards Montclair; WB = towards Pasadena

[3] Distance to near track

[4] All sound levels are A-weighted decibels, dBA

Source: ATS Consulting, LLC, 2005.

As can be seen, noise levels are predicted to be below the impact thresholds at all locations except for the school (Serendipity Day School) in Azusa.

~~The following are brief descriptions of each Category 3 land use area where impact was calculated:~~

~~Alameda: South of the rail alignment between Alameda Avenue and Dalton Avenue in Azusa, the Azusa Historical Museum would be exposed to noise impact. This museum would be subject to impacts due to its proximity to the rail lines (80 feet), the speed of the LRT vehicles, and the exposure to audible warning signals (bells and whistles) at the Dalton Avenue grade crossing.~~

~~Pasadena: South of the rail alignment west of Palm Drive in Azusa, one school building at Azusa Pacific University would be exposed to noise impact. This school would be subject to impact due to its proximity to the rail lines (102 to 120 feet), the speed of the LRT vehicles, and the exposure to audible warning signals (bells and whistles) at the Palm Drive grade crossing.~~

Vibration

Table 3-11.8 lists the vibration impacts for Category 2 land use for the Foothill Extension Segment 1 cities.

TABLE 3-11.8 VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., Ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.
Pasadena	EB	1	853+50	232	55	59	No	0
Pasadena	EB	2	861+70	321	55	56	No	0
Pasadena	WB	1	854+00	205	55	60	No	0
Total: Pasadena								**0**
Arcadia	EB	1	868+70	346	55	55	No	0
Arcadia	EB	2	910+00	322	55	59	No	0
Arcadia	EB	3	939+00	141	55	64	No	0
Arcadia	EB	4	946+50	125	55	65	No	0
Arcadia	EB	5	952+00	153	55	63	No	0
Arcadia	EB	6	960+50	58	55	78	Yes	13
Arcadia	EB	7	974+00	136	55	64	No	0
Arcadia	EB	8	1020+00	48	55	80	Yes	7
Arcadia	WB	1	872+00	180	55	62	No	0
Arcadia	WB	2	877+00	320	55	56	No	0
Arcadia	WB	3	888+00	140	55	64	No	0
Arcadia	WB	4	894+00	170	55	62	No	0
Arcadia	WB	5	902+00	180	55	62	No	0
Arcadia	WB	6	908+00	210	55	60	No	0
Arcadia	WB	7	915+00	210	55	60	No	0
Arcadia	WB	8	925+00	160	55	63	No	0

TABLE 3-11.8 VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., Ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.
Arcadia	WB	9	928+00	260	55	58	No	0
Arcadia	WB	10	935+00	130	55	65	No	0
Arcadia	WB	11	943+00	130	55	65	No	0
Arcadia	WB	12	970+00	30	55	80	Yes	8
Arcadia	WB	13	975+00	80	55	70	No	0
Arcadia	WB	14	1002+00	65	41	66	No	0
Total: Arcadia								**28**
Monrovia	EB	1	1025+00	54	55	74	Yes	5
Monrovia	EB	2	1031+50	64	55	72	No	0
Monrovia	EB	3	1043+00	32	55	94	Yes	11
Monrovia	EB	4	1049+00	38	55	87	Yes	3
Monrovia	EB	5	1051+00	57	55	73	Yes	2
Monrovia	EB	6	1053+00	47	55	75	Yes	3
Monrovia	EB	7	1054+50	90	55	69	No	0
Monrovia	EB	8	1056+00	29	55	80	Yes	2
Monrovia	EB	9	1060+00	47	55	80	Yes	12
Monrovia	EB	10	1062+00	47	55	80	Yes	5
Monrovia	EB	11	1067+00	30	55	85	Yes	4
Monrovia	EB	12	1069+00	30	54	85	Yes	4
Monrovia	WB	1	1036+00	100	55	67	No	0
Monrovia	WB	2	1043+00	60	55	73	Yes	7
Monrovia	WB	3	1046+50	62	55	87	Yes	12
Monrovia	WB	4	1051+00	40	55	87	Yes	9
Monrovia	WB	5	1054+90	40	55	77	Yes	4
Monrovia	WB	6	1058+00	50	55	74	Yes	1
Total: Monrovia								**84**
Duarte	EB	1	1130+00	120	55	66	No	0
Duarte	EB	2	1136+00	120	55	66	No	0
Duarte	EB	3	1149+00	120	55	66	No	0
Duarte	EB	4	1153+00	120	55	66	No	0
Duarte	EB	5	1160+00	120	55	66	No	0
Duarte	EB	6	1164+00	145	55	64	No	0
Duarte	WB	1	1142+50	100	55	67	No	0
Duarte	WB	2	1150+50	110	55	66	No	0
Duarte	WB	3	1156+00	130	55	65	No	0
Duarte	WB	4	1163+50	115	55	66	No	0

TABLE 3-11.8 VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 1 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., Ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.
Duarte	WB	5	1168+00	70	55	71	No	0
Duarte	WB	6	1175+00	70	41	69	No	0
Total: Duarte								**0**
Azusa	EB	1	1341+00	110	54	61	No	0
Azusa	EB	2	1343+00	174	53	57	No	0
Azusa	EB	3	1346+00	42	55	71	No	0
Azusa	EB	4	1350+00	16	55	81	Yes	3
Azusa	EB	5	1355+00	78	55	65	No	0
Azusa	EB	6	1358+00	30	55	85	Yes	20
Azusa	EB	7	1363+00	25	55	87	Yes	5
Azusa	EB	8	1367+00	40	55	77	Yes	5
Azusa	EB	9	1385+00	123	38	67	No	0
Azusa	EB	10	1387+00	71	43	69	No	0
Azusa	EB	11	1388+50	52	47	73	Yes	2
Azusa	EB	12	1392+00	52	51	78	Yes	6
Azusa	EB	13	1394+00	68	53	76	Yes	3
Azusa	EB	14	1397+00	123	55	70	No	0
Azusa	EB	15	1421+00	100	33	63	No	0
Azusa	EB	16	1422+00	155	28	57	No	0
Azusa	EB	17	1426+00	78	20	61	No	0
Azusa	WB	1	1368+00	60	47	71	No	0
Azusa	WB	2	1369+50	120	44	64	No	0
Azusa	WB	3	1383+50	125	42	68	No	0
Azusa	WB	4	1386+00	125	49	69	No	0
Azusa	WB	5	1393+50	70	55	71	No	0
Azusa	WB	6	1394+50	60	55	73	Yes	2
Total: Azusa								**46**
TOTAL: SEGMENT 1								**158**

Notes:

[1] Near track direction: EB = towards Montclair; WB = towards Pasadena

[2] Receivers are first grouped within each City and then by direction. See the Noise and Vibration Technical Report in The Appendices for maps showing the receiver groups

[3] Distance to near track

[4] Vibration Velocity Level, re 1µin/sec

[5] Impact threshold is 72 VdB

Source: ATS Consulting, LLC, 2005.

The following are brief descriptions of each Category 2 land use area where an impact is forecasted:

Arboleda / Corte Calle: Both north and south of the rail alignment between station numbers 34+00 and 41+00 in Pomona, 15 single-family homes would be exposed to vibration impact. These homes are located approximately 200 to 240 feet away from the near track. This vibration impact would be due to the proximity of the homes to the near track, the speed of the LRT vehicles as well as the efficient vibration propagation characteristics of the ground in this area.

Foothill / Catalapa: Both north and south of the rail alignment between station numbers 52+00 and 161+00 in Arcadia, 152 single-family homes and 40 multi-family residences would be exposed to vibration impact. These homes are located 50 to 250 feet away from the near track. This vibration impact would be due to the proximity of the homes to the near track, the speed of the LRT vehicles as well as the efficient vibration propagation characteristics of the ground in this area.

2nd Avenue: North of the rail alignment at station number 185+00, two hotels would be exposed to vibration impact. The Hilton Hotel and the Springhill Suites Hotel are located 210 and 80 feet away from the near track, respectively. These hotels would be exposed to vibration impact due to the proximity to the near track, the speed of the LRT vehicles as well as the efficient vibration propagation characteristics of the ground in this area.

3rd Avenue: South of the rail alignment just east of the Rancho High School in Arcadia, 34 multi-family residences would be exposed to vibration impact. This vibration impact would be due to the proximity of the homes to the near track (40 to 130 feet), the speed of the LRT vehicles as well as the efficient vibration propagation characteristics of the ground in this area.

Contented / Genoa: Both north and south of the rail alignment between 5th Avenue and Genoa Street in Monrovia, 313 residences would be exposed to vibration impact. These include 182 multi-family residences and 131 single-family homes. This vibration impact would be due to the proximity of the homes to the near track (22 to 240 feet), the speed of the LRT vehicles as well as the efficient vibration propagation characteristics of the ground in this area.

Hamilton: North of the rail alignment east of Buena Vista Street in Duarte, 21 single-family homes would be exposed to noise impact. These homes are all first row homes located 44 to 90 feet away from the near track. This vibration impact would be due to the proximity of the homes to the near track, the speed of the LRT vehicles as well as the efficient vibration propagation characteristics of the ground in this area.

Virginia / San Gabriel: South of the rail alignment between station numbers 523+00 and 553+00 in Azusa, 41 single-family homes and 20 multi-family residences would be exposed to vibration impact. North of the rail alignment just west of San Gabriel Avenue in Azusa, three single-family homes and 16 multi-family residences also would be exposed to vibration impact. These homes are located approximately 40 to 140 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.

Dalton / Azusa Citrus Station: From Dalton Avenue to the Azusa Citrus Station in Azusa, eight single-family homes and 243 multi-family homes would be exposed to vibration impact. One hundred twenty-nine of the multi-family residences are future proposed residences that are expected to be constructed on the north side of the alignment. These homes were modeled similar to the existing multi-family residences just east of Pasadena Avenue on the north side of the alignment. This existing development has three residences per building. The homes in this area are approximately 40 to 130 feet away from the

~~near track. The vibration impact of these homes would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Azusa Citrus Station / Lowell: From the Azusa Citrus Station to Lowell Street in Glendora on both sides of the alignment, 115 multi-family residences and 37 single-family homes would be exposed to vibration impact. These homes are located 60 to 140 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~ Following is a discussion of vibration impacts by City. For the most part, the locations of vibration impacts are similar to those for noise impacts along Segment 1.

- Pasadena: The Gold Line will be within in the median of the I-210 freeway from the Sierra Madre Villa Station to the eastern city limits. Impacts are not predicted within the City of Pasadena due to the large distance between the tracks and the closest residences (>150 feet).

- Arcadia: Vibration impacts are predicted at 20 single-family and 8 multi-family residences in the City of Arcadia. The majority of impacts are predicted south of the tracks between I-210 and N. Colorado Blvd and between Huntington Drive and the eastern city limits.

- Monrovia: Vibration impacts are predicted at 47 single-family and 37 multi-family residences in the City of Monrovia. Impacts are generally predicted south of the tracks between the western city limits and Magnolia Avenue and north of the tracks between the Santa Anita Wash and the Mayflower Avenue.

- Duarte: Vibration impacts are not predicted at Category 2 land uses in the City of Duarte. The adjacent residences are far enough away from the tracks so that the vibration levels are predicted to be below the impact threshold of 72 VdB.

- Irwindale: There are no vibration-sensitive receptors located along the corridor within the City of Irwindale. Therefore, vibration impacts are not predicted.

- Azusa: Vibration impacts are predicated at 17 single-family and 29 four multi-family residences in the City of Azusa. South of the tracks, impacts are generally predicted at residences located from just west of Vernon Avenue to Lemon Avenue, from Foothill Boulevard to N. San Gabriel Boulevard, and from N. Dalton Avenue to approximately 800 feet east of N. Pasadena Avenue. North of the tracks, vibration impacts are predicted just west of N. San Gabriel Boulevard and from N. Pasadena Avenue approximately up to 500 feet east of N. Pasadena Avenue.

Similar to the Category 2 analysis, an assessment of vibration impact for Category 3 receptors was also conducted for the ~~Phase II~~ Foothill Extension, Segment 1 cities. **Table 3-11.9** lists the vibration impacts for Category 3 land use for the Foothill Extension Segment 1 cities. As can be seen, no impacts are predicted at any of the locations.

TABLE 3-11.9. VIBRATION IMPACTS FOR CATEGORY 3 LAND USES – SEGMENT 1 CITIES

City	Land Use	I.D. [1]	Dir. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
								Y/N	No.
Arcadia	Church	A	WB	916+00	330	55	55	No	0
Arcadia	School	B	EB	1014+00	75	55	71	No	0
Monrovia	Church	D	EB	1110+50	105	55	67	No	0
Duarte	Conf. Facility	G	EB	1170+50	180	55	62	No	0
Azusa	Medical, Day-Use	H	EB	1356+00	70	55	71	No	0
Azusa	Museum	I	EB	1380+00	50	10	59	No	0
Azusa	University	J	EB	1415+00	110	52	55	No	0

[1] These receivers are identified by a letter in maps in the Noise and Vibration Technical Report in the Appendices
[2] Near track direction: EB = towards Montclair; WB = towards Pasadena
[3] Distance to near track
[4] Vibration Velocity Level, re 1µin/sec
[5] Impact threshold is 75 VdB.
Source: ATS Consulting, LLC, 2005.

Foothill Extension, Segment 2 — The Cities Affected and the Effects

Noise

Table 3-11.10 lists the noise impacts for Category 2 land use for the ~~Phase II~~ Foothill Extension, Segment 2 LRT Triple Track configuration. Written descriptions of the locations where impacts are predicted follow the table. Locations of these impacts are shown on Figures 3-11.9 to 3-11.21.

TABLE 3-11.10. NOISE IMPACTS CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [c]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Glendora	WB	1	1454+00	150	55	58	54	57	62	None	0	0
Glendora	WB	2	1494+00	80	54	58	60	57	62	Impact	2	0
Glendora	WB	3	1499+00	180	46	58	53	57	62	None	0	0
Glendora	WB	4	1522+50	58	55	55	62	55	61	Severe	0	7
Glendora	WB	5	1527+00	58	55	55	63	55	61	Severe	0	4
Glendora	WB	6	1530+50	48	55	55	65	55	61	Severe	0	5
Glendora	WB	7	1540+00	65	55	55	61	55	61	Severe	0	27
Glendora	WB	8	1549+00	71	55	55	62	55	61	Severe	0	5
Glendora	WB	9	1553+00	105	55	55	59	55	61	Impact	4	0
Glendora	WB	10	1555+50	105	55	55	59	55	61	Impact	4	0
Glendora	WB	11	1559+00	87	55	55	61	55	61	Impact	4	0
Glendora	WB	12	1564+00	87	55	55	59	55	61	Impact	7	0
Glendora	WB	13	1568+00	87	55	55	61	55	61	Impact	4	0
Glendora	WB	14	1572+50	81	55	55	61	55	61	Severe	0	5
Glendora	WB	15	1576+00	78	55	55	60	55	61	Impact	9	0
Glendora	WB	16	1584+50	100	55	55	58	55	61	Impact	12	0
Glendora	WB	17	1595+00	80	55	60	60	58	63	Impact	7	0
Glendora	WB	18	1599+00	110	55	60	58	58	63	Impact	7	0
Glendora	WB	19	1616+00	80	55	60	60	58	63	Impact	28	0
Glendora	WB	20	1624+00	80	55	60	60	58	63	Impact	9	0
Glendora	EB	1	1434+00	50	46	55	62	55	61	Severe	0	12
Glendora	EB	2	1444+00	50	55	55	63	55	61	Severe	0	14
Glendora	EB	3	1452+00	65	55	55	63	55	61	Severe	0	5

TABLE 3-11.10. NOISE IMPACTS CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [c]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Glendora	EB	4	1457+00	55	55	55	64	55	61	Severe	0	4
Glendora	EB	5	1461+00	48	55	55	63	55	61	Severe	0	7
Glendora	EB	6	1504+00	90	40	58	58	57	62	Impact	2	0
Glendora	EB	7	1538+00	55	55	58	62	57	62	Impact	2	0
Glendora	EB	8	1542+00	78	55	55	60	55	61	Impact	1	0
Glendora	EB	9	1587+00	78	55	55	60	55	61	Impact	1	0
Glendora	EB	10	1610+00	60	55	60	62	58	63	Impact	4	0
Glendora	EB	11	1626+00	75	55	60	55	58	63	None	0	0
Glendora	EB	12	1664+00	45	55	60	65	58	63	Severe	0	4
Total: Glendora											**107**	**99**
San Dimas	WB	1	1668+00	90	55	60	61	58	63	Impact	3	0
San Dimas	WB	2	1680+00	87	55	60	59	58	63	Impact	4	0
San Dimas	WB	3	1682+00	61	55	60	62	58	63	Impact	4	0
San Dimas	WB	4	1691+00	162	50	65	49	61	66	None	0	0
San Dimas	WB	5	1740+00	78	55	65	55	61	66	None	0	0
San Dimas	WB	6	1745+00	103	55	65	56	61	66	None	0	0
San Dimas	WB	7	1766+00	100	55	65	58	61	66	None	0	0
San Dimas	WB	8	1770+00	120	55	65	52	61	66	None	0	0
San Dimas	WB	9	1773+00	226	55	65	53	61	66	None	0	0
San Dimas	EB	1	1686+00	35	55	65	65	61	66	Impact	1	0
San Dimas	EB	2	1701+00	154	26	60	49	58	63	None	0	0
San Dimas	EB	3	1705+00	78	25	60	54	58	63	None	0	0
Total: San Dimas											**12**	**0**

TABLE 3-11.10. NOISE IMPACTS CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [c]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
La Verne	WB	1	1805+00	150	55	65	56	61	66	None	0	0
La Verne	WB	2	1817+00	84	55	65	61	61	66	Impact	4	0
La Verne	WB	3	1821+00	65	55	65	61	61	66	Impact	9	0
La Verne	WB	4	1826+00	78	55	65	61	61	66	Impact	6	0
La Verne	WB	5	1829+00	78	55	65	62	61	66	Impact	5	0
La Verne	WB	6	1832+00	81	55	65	60	61	66	None	0	0
La Verne	WB	7	1850+00	100	37	65	57	61	66	None	0	0
La Verne	WB	8	1867+00	100	55	62	60	59	64	Impact	2	0
La Verne	EB	1	1784+00	239	55	65	52	61	66	None	0	0
La Verne	EB	2	1877+00	162	55	65	55	61	66	None	0	0
La Verne	EB	3	1889+00	103	55	65	58	61	66	None	0	0
La Verne	EB	4	1892+00	123	55	65	58	61	66	None	0	0
Total: La Verne											**26**	**0**
Pomona	WB	1	1964+00	84	55	62	55	59	64	None	0	0
Pomona	WB	2	1968+00	65	55	62	56	59	64	None	0	0
Pomona	EB	1	1929+00	195	55	62	54	59	64	None	0	0
Pomona	EB	2	1943+00	160	55	62	56	59	64	None	0	0
Pomona	EB	3	1967+00	230	55	62	53	59	64	None	0	0
Total: Pomona											**0**	**0**
Claremont	WB	1	1972+00	84	55	62	55	59	64	None	0	0
Claremont	WB	2	1978+00	39	55	62	66	59	64	Severe	0	12
Claremont	WB	3	1982+00	97	55	62	57	59	64	None	0	0
Claremont	WB	4	1984+00	132	55	62	52	59	64	None	0	0

TABLE 3-11.10. NOISE IMPACTS CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Exist. Ldn [c]	Project Ldn [4]	Impact Threshold, Ldn [4]		Impacts		
								Impact	Severe	Type	No. Impact	No. Severe
Claremont	WB	5	1989+00	40	55	62	57	59	64	None	0	0
Claremont	WB	6	2048+00	58	55	65	63	61	66	Impact	2	0
Claremont	EB	1	1970+00	174	55	62	55	59	64	None	0	0
Claremont	EB	2	1974+00	180	55	62	54	59	64	None	0	0
Claremont	EB	3	1978+00	185	55	62	55	59	64	None	0	0
Claremont	EB	4	2008+00	87	36	62	58	59	64	None	0	0
Claremont	EB	5	2037+00	136	55	65	56	61	66	None	0	0
Claremont	EB	6	2043+00	120	55	65	59	61	66	None	0	0
Claremont	EB	7	2047+00	84	55	65	61	61	66	Impact	8	0
Total: Claremont											**10**	**12**
Montclair	--	--	--	--	--	--	--	--	--	--	**0**	**0**
TOTAL: SEGMENT 2											**155**	**111**

[1] Near track direction: EB = towards Montclair; WB = towards Pasadena

[2] Receivers are first grouped within each City and then by direction. See the Noise and Vibration Technical Report in the Appendices for maps showing the receiver groups

[3] Distance to near track

[4] All sound levels are A-weighted decibels, dBA

Source: ATS Consulting, LLC, 2005.

Following is a more detailed discussion of noise impacts for Category 2 land uses by City in Segment 2:

- Glendora: The majority of noise impacts in Segment 2 are located in the City of Glendora, including 190 single-family residences, 14 multi-family residences, and two hotels. Impacts are generally predicted south of the alignment from Citrus Avenue to approximately 800 feet east of Barranca Parkway and near Vermont Avenue. Impacts north of the alignment are predicted near Washington Avenue and Carroll Avenue and the segment from Glendora Avenue to the I-210 Freeway.

- San Dimas: In the City of San Dimas, potential noise impacts are predicted at 11 single-family residences and one motel. Impacts are generally predicted along both directions of the tracks between SR 57 and Amelia Avenue.

- La Verne: Potential noise impacts are predicted at 26 single-family residences in the City of La Verne. Impacts are generally predicted north of the tracks between the Wheeler Avenue and B Street.

- Pomona: Noise impacts are not predicted at any Category 2 land uses in the City of Pomona. The adjacent residences are either far enough away from the tracks or are shielded by existing walls and structures so that the estimated noise levels are below the impact thresholds.

- Claremont: Potential noise impacts at Category 2 land uses in the City of Claremont include 10 single-family and 12 multi-family residential dwelling units. Areas where predicted noise levels exceed the impact thresholds are north of the tracks between Indian Hill and the Claremont Station, south of the tracks between Elder Drive and Claremont Boulevard, and both sides of the tracks immediately east of Claremont Boulevard.

- Montclair: There are no noise-sensitive land uses adjacent to the tracks within the City of Montclair. Therefore, noise impacts are not predicted.

~~The following are brief descriptions of each Category 2 land use area where a noise impact was calculated:~~

~~6th / Lime: On the south side of the rail alignment between Virginia Avenue and Foothill Boulevard in Azusa, 11 single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (70 to 140 feet) and the speed of the LRT vehicles. Single-family homes near Virginia Avenue would also be exposed to audible warning devices (bells and whistles) at the grade crossing.~~

~~Foothill / San Gabriel: On the south side of the rail alignment between Foothill Boulevard and San Gabriel Avenue in Azusa, 20 multi-family residences and two single-family homes would be exposed to noise impact. An additional 9 single-family homes would be exposed to severe noise impact in this area. The noise impacts would be due to the proximity of these residences to the tracks (80 to 124 feet) and the speed of the LRT vehicles. Single-family homes near Gabriel Avenue would also be exposed to audible warning devices (bells and whistles) at the grade crossing.~~

~~San Gabriel: North of the rail alignment just west of San Gabriel Avenue, one single-family home and 16 multi-family residences would be exposed to noise impact. The one single-family home would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (20 to 70 feet), the speed of the LRT vehicles and exposure to audible warning devices (bells and whistles) at the grade crossing.~~

~~Dalton / Pasadena: South of the rail alignment between Dalton Avenue and Pasadena Avenue in Azusa, four single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (70 feet), the speed of the LRT vehicles and exposure to audible warning devices (bells and whistles) at Pasadena Avenue grade crossing.~~

~~Pasadena / Palm: North and south of the rail alignment between Pasadena Avenue and Palm Drive in Azusa, 87 future multi-family residences are expected to be exposed to noise impact. These residences are expected to be constructed on the north side of the rail alignment between station numbers 578+00 and 602+00. They are modeled after the existing multi-family residences just to the west of these future homes that have three residences per building and are located 40 feet from the near track. Twenty-four additional multi-family residences located south of the alignment just east of Pasadena Avenue would be exposed severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (40 to 80 feet), the speed of the LRT vehicles. The residences near Pasadena Avenue and Palm Drive also would be exposed to audible warning devices (bells and whistles) at the grade crossings.~~

~~Palm: North and south of the rail alignment just east of Palm Drive in Azusa, 24 multi-family residences would be exposed to noise impact. Twelve of these residences north of the alignment are expected to be constructed in the future as part of a planned development. Residences just east of these homes where an impact is predicted near Azusa Station are not exposed to noise impact due to decreased train speeds in this area near the station. The noise impacts would be due to the proximity of these residences to the tracks (80 to 100 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at the grade crossing.~~

~~Barranca: North and south of the rail alignment east of the Azusa Station to Barranca Avenue in Glendora, 115 multi-family residences would be exposed to severe noise impact. Eighty-seven of these residences are located north of the alignment along an expected future housing development. These future residences are modeled after the existing multi-family residences at 575+00 that have three residences per building and are located 40 feet from the near track. Twenty nine single-family homes would also be exposed to noise impact in this area, 17 of which would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (60 to 140 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at the Barranca Avenue grade crossing.~~

~~Marcile: Just east of Barranca Avenue south of the alignment in Glendora, five single-family homes would be exposed to noise impact and an additional 10 single-family homes would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (80 to 130 feet) and the speed of the LRT vehicles.~~

~~Vermont: Just west of Vermont Avenue south of the rail alignment in Glendora, four single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (80 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at the Vermont Avenue grade crossing.~~

~~Glendora: North of the rail alignment between Glendora Avenue and Pasadena Avenue in Glendora, six single-family homes would be exposed to noise impact and five single-family homes would be exposed to severe noise impact. Four multi-family residences would be exposed to noise impact and 12 multi-family residences would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (20 to 100 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at both the Glendora Avenue and Pasadena Avenue grade crossings.~~

~~Lemon: North of the rail alignment between Pasadena Avenue and Glenwood Avenue in Glendora, 10 single-family homes would be exposed to noise impact and 28 homes are exposed to severe noise impact. Impact extends along the entire first row set of homes in this area. South of the rail alignment at station number 721+00, one single-family home would be exposed to severe noise impact and at 725+00 the Guest Inn Hotel would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (20 to 164 feet) and the speed of the LRT vehicles. Homes near Pasadena Avenue and Glenwood Avenue also would be exposed to audible warning devices (bells and whistles) at the grade crossings.~~

~~Glenwood: North of the rail alignment between Glenwood Avenue and Elwood Avenue in Glendora, eight single-family homes would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (54 to 74 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at both the grade crossings.~~

~~Elwood: North of the rail alignment between Elwood Avenue and Loraine Avenue in Glendora, 15 single-family homes in the first row would be exposed to severe noise impact. The severe noise impacts would be due to the proximity of these residences to the tracks (30 to 44 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at both the grade crossings.~~

~~Loraine: North and south of the rail alignment between Lorraine Avenue and the Alosta Avenue overpass in Glendora, 13 single-family homes would be exposed to noise impact and an additional 39 homes would be exposed to severe noise impact. One hotel on the south side of the alignment at station number 770+00 also would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (20 to 180 feet) and the speed of the LRT vehicles. Some homes near Loraine Avenue would be exposed to audible warning devices (bells and whistles) at the grade crossing.~~

~~Alosta: South of the rail alignment just east of Alosta Avenue in Glendora, four single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (124 to 140 feet) and the speed of the LRT vehicles.~~

~~Remuda: North of the rail alignment between station numbers 795+00 and 815+00 in Glendora, two single-family homes would be exposed to noise impact and 25 single-family homes would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (40 to 90 feet) and the speed of the LRT vehicles.~~

~~Canyon Meadows: South of the rail alignment at station number 810+00 on Canyon Meadows Lane in Glendora, two single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (110 feet) and the speed of the LRT vehicles.~~

~~Gladstone (west): At station number 848+00 just west of Gladstone Avenue in Glendora, one single-family home would be exposed to noise impact and one single-family home would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (84 to 120 feet), the speed of the LRT vehicles, and audible warning devices (bells and whistles) at the Gladstone Avenue grade crossing.~~

~~Gladstone (east): Just east of Gladstone Avenue in San Dimas north and south of the rail alignment, four multi-family residences would be exposed to noise impact and eight multi-family housing units would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (60 to 164 feet), the speed of the LRT vehicles, and audible warning devices (bells and whistles) at the Gladstone Avenue grade crossing.~~

~~Highland: Just east of the Route 57 overpass on the north and south sides of the rail alignment in San Dimas, five single-family homes would be exposed to severe noise impact and 32 multi-family residences in four buildings would be exposed to noise impact. The Red Roof Inn on the south side of the alignment at station number 870+00 would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (50 to 140 feet) and the speed of the LRT vehicles.~~

~~Eucla: South of the rail alignment west of Eucla Avenue in San Dimas, the Extended Stay American Hotel would be exposed to noise impact and the Comfort Suites Hotel would be exposed to severe noise impact. The noise impacts would be due to the proximity of these hotels to the tracks (100 to 160 feet) and the speed of the LRT vehicles. The Comfort Suites Hotel would be exposed to audible warning devices (bells and whistles) at the Eucla Avenue grade crossing.~~

~~Walnut: North of the rail alignment between San Dimas Avenue and Walnut Avenue in San Dimas, 64 multi-family residences would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (60 to 90 feet) and the speed of the LRT vehicles. The residences near Walnut Avenue also would be exposed to audible warning devices (bells and whistles) at the grade crossing.~~

~~Wheeler: North of the rail alignment between Wheeler Avenue and B Street in La Verne, 30 single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (36 to 60 feet) and the speed of the LRT vehicles. The residences near Wheeler Avenue, A Street, and B Street also would be exposed to audible warning devices (bells and whistles) at the grade crossings.~~

~~University of La Verne: North of the rail alignment just west of Fairplex Drive in La Verne, 24 dormitories in two buildings would be exposed to noise impact. The noise impacts would be due to the proximity of these dormitories to the tracks (80 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at the grade crossing.~~

~~White: Just west of White Avenue on the north side of the rail alignment in La Verne, three single-family homes would be exposed to noise impact. Impacts at these homes would be due to the proximity to the near tracks (70 feet), the speed of the LRT vehicles, and audible warning signals (bells and whistles) at the grade crossing.~~

~~Sierra: South of the rail alignment west of Fulton Road in La Verne, four single-family homes would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks (140 feet), the speed of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at the Fulton Road grade crossing.~~

~~Bonita: North of the rail alignment at station number 1147+00 in Pomona, 24 multi-family residences in three buildings would be exposed to noise impact. The noise impacts would be due to the proximity of these residences to the tracks and the speed of the LRT vehicles.~~

~~Cambridge: North and south of the rail alignment between station number 1149+00 and Cambridge Avenue in Claremont, 48 multi-family residences would be exposed to noise impact and eight multi-family residences would be exposed to severe noise impact. The noise impacts would be due to the proximity of these residences to the tracks (90 to 140 feet) and the speed of the LRT vehicles. The eight multi-family residences with severe noise impact also would be exposed to audible warning devices (bells and whistles) at the Cambridge Avenue grade crossing.~~

~~Cambridge / Bucknell: North of the rail alignment between Cambridge Avenue and Bucknell Avenue in Claremont, 108 multi-family residences would be expected to be exposed to noise impact. Eighty-eight of the 108 multi-family residences would be expected to be constructed in a new housing development in this area. The future residences are modeled similar to the existing multi-family housing that has 20 residences in three buildings. The noise impacts would be due to the proximity of these residences to the tracks (60 to 100 feet) and the speed of the LRT vehicles. The existing residences near Cambridge Avenue also would be exposed to audible warning devices (bells and whistles) at the grade crossing.~~

~~Claremont (west, Baseline): North and south of the rail alignment just west of Claremont Boulevard in Claremont, nine single-family homes would be exposed to noise impact under the Baseline Option of the Triple Track configuration. This option has the LRT rail lines continuing to the north side of the Montclair TransCenter. These nine homes would be exposed to noise impact due to the relocation of the rail lines in this area. These homes also would be exposed to audible warning devices (bells and whistles) at the Claremont Boulevard grade crossing.~~

~~Claremont (east, Baseline): North and south of the rail alignment just east of Claremont Boulevard in Montclair, 16 single-family homes would be exposed to noise impact under the Baseline Option of the Triple Track configuration. This option has the LRT rail lines continuing to the north of the Montclair TransCenter. These nine homes would be exposed to noise impact due to the relocation of the rail lines in this area. Homes near Claremont Boulevard also would be exposed to audible warning devices (bells and whistles) at the grade crossing.~~

~~Monte Vista (Baseline): East of Monte Vista Avenue on the north side of the rail alignment between station numbers 1257+00 and 1268+00 in Montclair, five future single-family homes would be expected to be exposed to noise impact. These homes are planned as a future housing development in the area. The impact of these homes would be due to the location of the near rail lines in this area (80 feet) and the presence of crossovers near the Montclair LRT Station (North). These future single-family homes are modeled after the location of existing single-family homes just east of Claremont Boulevard.~~

~~Claremont (Option H): Just east of Claremont Boulevard on the north and south sides of the rail alignment in Montclair, 10 single-family homes would be exposed to noise impact under Option H of the Triple Track configuration. Option H would extend LRT service along the existing Metrolink line to an LRT station in the south side of the Montclair TransCenter. These 10 homes would be exposed to noise impact due to the proximity to the tracks (60 to 80 feet), the speeds of the LRT vehicles, and exposure to audible warning devices (bells and whistles) at the Claremont Boulevard grade crossing.~~

Similar to the Category 2 analysis, an assessment of noise impact for Category 3 receptors was also conducted for the Foothill Extension Segment 2 cities. Note that FTA guidance is that active-use parks (parks with playgrounds, sports fields, etc.) are not considered noise-sensitive. ~~Although Category 3 includes park lands, since they are all used for sports and other active recreation, they would not be considered as noise-sensitive and are not included in the evaluation.~~ This assessment was based on a comparison of the existing ambient noise level with the predicted project noise levels in terms of the peak transit hour Leq. **Table 3-11.11** lists the noise impacts for institutional receptors. As can be seen, noise impacts are predicted at the three medical buildings and one preschool in Glendora.

TABLE 3.11-11. NOISE IMPACTS FOR CATEGORY 3 LAND USES – SEGMENT 2 CITIES

City	Land Use	I.D. [1]	Dir. [2]	Eng. Stn.	Dist., ft [3]	Speed, mph	Existing Leq [4]	Project Leq [4]	Impact Threshold, Leq [4]		Impact
									Impact	Severe	
Glendora	Church	A	EB	1430+00	110	38	51	57	59	65	None
Glendora	Medical, Day-Use	B	EB	1489+00	50	55	61	63	63	69	Impact
Glendora	Pre-School	C	EB	1526+00	60	50	52	62	59	65	Impact
Glendora	Medical, Day-Use	D	EB	1528+00	50	53	52	63	59	65	Impact
La Verne	University	E	WB	1847+00	35	44	61	63	63	68	None
Claremont	University	F	EB	1993+00	200	55	58	54	62	67	None

[1] These receivers are identified by a letter in maps in the Noise and Vibration Technical Report in the Appendices

[2] Near track direction: EB = towards Montclair; WB = towards Pasadena

[3] Distance to near track

[4] All sound levels are A-weighted decibels, dBA

Source: ATS Consulting, LLC, 2005.

~~The following are brief descriptions of each Category 3 land use area where impact was calculated:~~

~~Alameda: South of the rail alignment between Alameda Avenue and Dalton Avenue in Azusa, the Azusa Historical Museum would be exposed to noise impact. This museum would be subject to impacts due to its proximity to the rail lines (80 feet), the speed of the LRT vehicles, and the exposure to audible warning signals (bells and whistles) at the Dalton Avenue grade crossing.~~

~~Pasadena: South of the rail alignment west of Palm Drive in Azusa, one school building at Azusa Pacific University would be exposed to noise impact. This school would be subject to impact due to its proximity to the rail lines (102 to 120 feet), the speed of the LRT vehicles, and the exposure to audible warning signals (bells and whistles) at the Palm Drive grade crossing.~~

~~Foothill / Vermont: Between Foothill Boulevard and Vermont Avenue on the north and south sides of the rail alignment in Glendora, two medical buildings would be exposed to noise impact, one senior center educational building would be exposed to severe noise impact, and one medical building would be exposed to severe noise impact. These buildings are subject to impact due to their proximity to the rail lines (44 to 76 feet) and the speed of the LRT vehicles. The medical building north Foothill Boulevard also would be exposed to audible warning signals (bells and whistles) at the Foothill Boulevard and Grand Avenue grade crossing.~~

~~Pasadena (future): South of the rail alignment to the west of Pasadena Avenue in Glendora, a future preschool and future medical building would be exposed to noise impact. These buildings would be subject to impact due to their proximity to the rail lines (80 to 90 feet), the speed of the LRT vehicles and their exposure to audible warning signals (bells and whistles) at Pasadena Avenue grade crossing.~~

~~University of La Verne: Between B Street and Fairplex Drive north of the rail alignment at the University of La Verne a school building would be exposed to noise impact. This school building would be subject to impact due to their proximity to the near track (20 and 70 feet), the speed of the LRT vehicles, and audible warning signals (bells and whistles) at D Street~~.

Vibration

Table 3-11.12 lists the vibration impacts for Category 2 land use in Segment 2 of the Foothill Extension. Written descriptions of the locations where vibration impacts are predicted follow the table.

TABLE 3-11.12. VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.
Glendora	WB	1	1454+00	150	55	63	No	0
Glendora	WB	2	1494+00	80	54	70	No	0
Glendora	WB	3	1499+00	180	46	60	No	0
Glendora	WB	4	1522+50	58	55	73	Yes	7
Glendora	WB	5	1527+00	58	55	73	Yes	4
Glendora	WB	6	1530+50	48	55	75	Yes	5
Glendora	WB	7	1540+00	65	55	72	No	0
Glendora	WB	8	1549+00	71	55	71	No	0

TABLE 3-11.12. VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.
Glendora	WB	9	1553+00	105	55	72	No	0
Glendora	WB	10	1555+50	105	55	72	No	0
Glendora	WB	11	1559+00	87	55	69	No	0
Glendora	WB	12	1564+00	87	55	69	No	0
Glendora	WB	13	1568+00	87	55	69	No	0
Glendora	WB	14	1572+50	81	55	70	No	0
Glendora	WB	15	1576+00	78	55	70	No	0
Glendora	WB	16	1584+50	100	55	67	No	0
Glendora	WB	17	1595+00	80	55	70	No	0
Glendora	WB	18	1599+00	110	55	66	No	0
Glendora	WB	19	1616+00	80	55	70	No	0
Glendora	WB	20	1624+00	80	55	70	No	0
Glendora	EB	1	1434+00	50	46	78	Yes	12
Glendora	EB	2	1444+00	50	55	74	Yes	14
Glendora	EB	3	1452+00	65	55	72	No	0
Glendora	EB	4	1457+00	55	55	74	Yes	4
Glendora	EB	5	1461+00	48	55	80	Yes	7
Glendora	EB	6	1504+00	90	40	71	No	0
Glendora	EB	7	1538+00	55	55	74	Yes	2
Glendora	EB	8	1542+00	78	55	70	No	0
Glendora	EB	9	1587+00	78	55	70	No	0
Glendora	EB	10	1610+00	60	55	73	Yes	4
Glendora	EB	11	1626+00	75	55	70	No	0
Glendora	EB	12	1664+00	45	55	76	Yes	4
Total: Glendora								**63**
San Dimas	WB	1	1668+00	90	55	69	No	0
San Dimas	WB	2	1680+00	87	55	69	No	0
San Dimas	WB	3	1682+00	61	55	72	Yes	4
San Dimas	WB	4	1691+00	162	50	62	No	0
San Dimas	WB	5	1740+00	78	55	70	No	0
San Dimas	WB	6	1745+00	103	55	67	No	0
San Dimas	WB	7	1766+00	100	55	67	No	0
San Dimas	WB	8	1770+00	120	55	66	No	0
San Dimas	WB	9	1773+00	226	55	59	No	0
San Dimas	EB	1	1686+00	35	55	83	Yes	1
San Dimas	EB	2	1701+00	154	26	62	No	0
San Dimas	EB	3	1705+00	78	25	68	No	0

TABLE 3-11.12. VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.
Total: San Dimas								**5**
La Verne	WB	1	1805+00	150	55	63	No	0
La Verne	WB	2	1817+00	84	55	69	No	0
La Verne	WB	3	1821+00	65	55	72	No	0
La Verne	WB	4	1826+00	78	55	70	No	0
La Verne	WB	5	1829+00	78	55	70	No	0
La Verne	WB	6	1832+00	81	55	70	No	0
La Verne	WB	7	1850+00	100	37	69	No	0
La Verne	WB	8	1867+00	100	55	67	No	0
La Verne	EB	1	1784+00	239	55	59	No	0
La Verne	EB	2	1877+00	162	55	63	No	0
La Verne	EB	3	1889+00	103	55	67	No	0
La Verne	EB	4	1892+00	123	55	65	No	0
Total: La Verne								**0**
Pomona	WB	1	1964+00	84	55	69	No	0
Pomona	WB	2	1968+00	65	55	72	No	0
Pomona	EB	1	1929+00	195	55	61	No	0
Pomona	EB	2	1943+00	160	55	63	No	0
Pomona	EB	3	1967+00	230	55	64	No	0
Total: Pomona								**0**
Claremont	WB	1	1972+00	84	55	69	No	0
Claremont	WB	2	1978+00	39	55	77	Yes	12
Claremont	WB	3	1982+00	97	55	68	No	0
Claremont	WB	4	1984+00	132	55	65	No	0
Claremont	WB	5	1989+00	40	55	82	Yes	20
Claremont	WB	6	2048+00	58	55	73	Yes	2
Claremont	EB	1	1970+00	174	55	62	No	0
Claremont	EB	2	1974+00	180	55	62	No	0
Claremont	EB	3	1978+00	185	55	61	No	0
Claremont	EB	4	2008+00	87	36	70	No	0
Claremont	EB	5	2037+00	136	55	64	No	0
Claremont	EB	6	2043+00	120	55	71	No	0
Claremont	EB	7	2047+00	84	55	74	Yes	8
Total: Claremont								**42**
Montclair	--	--	--	--	--	--	--	**0**
TOTAL: SEGMENT 2								**110**

TABLE 3-11.12. VIBRATION IMPACTS FOR CATEGORY 2 LAND USES – SEGMENT 2 CITIES

City	Dir. [1]	Group No. [2]	Eng. Station	Dist., ft. [3]	Speed, mph	Predicted Level, VdB [4]	Impacts [5]	
							Y/N	No.

[1] Near track direction: EB = towards Montclair; WB = towards Pasadena

[2] Receivers are first grouped within each City and then by direction. See the Noise and Vibration Technical Report in the Appendices for maps showing the receiver groups

[3] Distance to near track

[4] Vibration Velocity Level, re 1µin/sec

[5] Impact threshold is 72 VdB

Source: ATS Consulting, LLC, 2005.

Following is a discussion of vibration impacts for Category 2 land uses by City in Segment 2. For the most part, the locations of vibration impacts are similar to those for noise impacts along Segment 2.

~~Virginia / San Gabriel: South of the rail alignment between station numbers 523+00 and 553+00 in Azusa, 41 single family homes and 20 multi-family residences would be exposed to vibration impact. North of the rail alignment just west of San Gabriel Avenue in Azusa, three single-family homes and 16 multi-family residences also would be exposed to vibration impact. These homes are located approximately 40 to 140 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Dalton / Azusa Citrus Station: From Dalton Avenue to the Azusa Citrus Station in Azusa, eight single-family homes and 243 multi-family homes would be exposed to vibration impact. One hundred twenty-nine of the multi-family residences are future proposed residences that are expected to be constructed on the north side of the alignment. These homes were modeled similar to the existing multi-family residences just east of Pasadena Avenue on the north side of the alignment. This existing development has three residences per building. The homes in this area are approximately 40 to 130 feet away from the near track. The vibration impact of these homes would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Azusa Citrus Station / Lowell: From the Azusa Citrus Station to Lowell Street in Glendora on both sides of the alignment, 115 multi-family residences and 37 single-family homes would be exposed to vibration impact. These homes are located 60 to 140 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

- Glendora: The majority of vibration impacts in Segment 2 are located in the City of Glendora, including 49 single-family residences and 14 multi-family residences. Impacts are generally predicted south of the alignment from Citrus Avenue to approximately 800 feet east of Barranca Parkway and approaching W. Gladstone Street and north of the alignment from Glendora Avenue to approximately 750 feet east of S. Pasadena Avenue.

- San Dimas: In the City of San Dimas, potential vibration impacts are limited to four single-family residences and one hotel. Impacts are generally limited to both sides of the tracks between SR 57 and Amella Avenue.

- La Verne: Vibration impacts are not predicted at Category 2 land uses in the City of La Verne. The adjacent residences are far enough away from the tracks so that the vibration levels are predicted to be below the impact threshold of 72 VdB.

- Pomona: Vibration impacts are not predicted at Category 2 land uses in the City of Pomona. The adjacent residences are far enough away from the tracks so that the vibration levels are predicted to be below the impact threshold of 72 VdB.

- Claremont: Potential vibration impacts at Category 2 land uses in the City of Claremont include two single-family residences and 40 multi-family residences. Areas where predicted vibration levels exceed the impact thresholds are north of the tracks from just west of Cambridge Avenue to approximately 800 feet west of between Indian Hill Boulevard and just east of Claremont Boulevard.

- Montclair: There are no vibration-sensitive land uses adjacent to the tracks within the City of Montclair. Therefore, vibration impacts are not predicted.

~~Grande: In between Grande Avenue and Vermont Avenue at station number 677+00 on the north side of the alignment and at 688+00 on the south side of the alignment, eight multi-family residences and four single-family homes, respectively, would be exposed to vibration impact. These homes are located 100 feet away from the near track. The vibration impact of these homes would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Glendora / I-210: North and south of the rail alignment between Glendora Avenue and the I-210 off ramp in Glendora, 175 single-family homes, 10 multi-family residences, and two hotels would be exposed to vibration impact. These homes and hotels are located 30 to 120 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Gladstone: At station number 848+00 on the south side of the rail alignment in Glendora, two single-family homes would be exposed to vibration impact. These homes are 64 and 100 feet away from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Wheeler / B: From Wheeler Street to B Street on the north side of the alignment in La Verne, 30 single-family homes would be exposed to vibration impact. These homes are 36 to 60 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Garey: North of the rail alignment at station number 1105+00 in Pomona, 54 multi-family residences in three buildings would be exposed to vibration impact. These residences are located 160 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Roderick: South of the rail alignment at station number 1127+00 in Pomona, six single-family homes would be exposed to vibration impact. These residences are located 150 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Bonita: North of the rail alignment at station number 1147+00 in Pomona, 24 multi-family residences in three buildings would be exposed to vibration impact. These residences are located 110 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Cambridge (west): West of Cambridge Avenue on the north and south sides of the rail alignment in Claremont, 68 multi-family residences would be exposed to vibration impact. These residences are located 40 to 150 feet from the near track. The vibration impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.~~

~~Cambridge (east): East of Cambridge Avenue between station numbers 1168+00 and 1180+00 on the north side of the alignment in Claremont, 88 future multi-family residences would be expected to be exposed to vibration impact. This future housing development is modeled after the existing multi-family housing just east of Cambridge Avenue. The vibration impact would be due to the proximity of the homes to the near track (60 feet) and the speed of the LRT vehicles.~~

~~Claremont (west): Just west of Claremont Boulevard on the south side of the rail alignment in Claremont, two single-family homes would be exposed to vibration impact for the Baseline Option under the Triple Track configuration. These homes are located 80 feet from the near track. The vibration impact would be due to the proximity of the homes to the relocated near track and the speed of the LRT vehicles.~~

~~Claremont (east): East of Claremont Boulevard on both the north and the south side of the rail alignment in Montclair, 21 single-family homes would be exposed to vibration impact for the Baseline Option under the Triple Track configuration. These homes are located 70 to 90 feet from the relocated near tracks. The vibration impact would be due to the proximity of the homes to the relocated near track and the speed of the LRT vehicles.~~

~~Monte Vista (future): North of the rail alignment between station numbers 1257+00 and 1268+00 in Montclair, 15 future single-family residences would be expected to be impacted by vibration in the Baseline Option. These homes are modeled after the existing single-family homes just east of Claremont Boulevard. They are located approximately 80 feet from the near track. The vibration impact would be due to the proximity of the homes to the relocated near track and the speed of the LRT vehicles.~~

~~Claremont (east, Option H): East of Claremont Boulevard on the north and south side of the rail alignment in Montclair, eight multi-family residences and two single-family residences would be exposed to vibration impact. These homes are located 60 to 80 feet from the near track. The vibrati~~on impact would be due to the proximity of the homes to the near track and the speed of the LRT vehicles.

Table 3-11.13 lists the predicted vibration impacts for Category 3 land use for the ~~Phase II~~ Foothill Extension, Segment 2 LRT Triple Track configuration. As can be seen, not impacts are predicted at any of the vibration-sensitive locations

TABLE 3-11.13. VIBRATION IMPACTS FOR CATEGORY 3 LAND USES – SEGMENT 2 CITIES

City	Land Use	I.D.[1]	Dir.[2]	Eng. Station	Dist., ft[3]	Speed, mph	Predicted Level, VdB[4]	Impacts [5]	
								Y/N	No.
Glendora	Church	A	EB	1430+00	110	38	63	No	0
Glendora	Medical, Day-Use	B	EB	1489+00	50	55	74	No	0
Glendora	Pre-School	C	EB	1526+00	60	50	74	No	0
Glendora	Medical, Day-Use	D	EB	1528+00	50	53	72	No	0

TABLE 3-11.13. VIBRATION IMPACTS FOR CATEGORY 3 LAND USES – SEGMENT 2 CITIES

City	Land Use	I.D.[1]	Dir.[2]	Eng. Station	Dist., ft[3]	Speed, mph	Predicted Level, VdB[4]	Impacts [5]	
								Y/N	No.
La Verne	University	E	WB	1847+00	35	44	77	No [6]	0
Claremont	University	F	EB	1993+00	200	55	74	No	0

[1] These receivers are identified by a letter in maps in the Noise and Vibration Technical Report in the Appendices
[2] Near track direction: EB = towards Montclair; WB = towards Pasadena
[3] Distance to near track
[4] Vibration Velocity Level, re 1µin/sec
[5] Impact threshold is 75 VdB
[6] Although the predicted level exceeds the threshold, given that this is a large formerly industrial building, it is likely that the existing structure will provide at least 2-3 VdB of attenuation.
Source: ATS Consulting, LLC, 2005.

~~The following are brief descriptions of each Category 3 land use area where an impact was calculated:~~

- ~~Lime: South of the rail alignment at station number 538+00 in Azusa, a medical building would be exposed to vibration impact. This building is located 100 feet from the near track. The vibration impact would be due to the proximity of the building to the near track and the speed of the LRT vehicles.~~
- ~~Grande: East of Grande Avenue from station numbers 670+00 to 679+00, three medical buildings and one school building would be exposed to vibration impact. These buildings are located 50 to 60 feet from the near track. The vibration impacts would be due to the proximity of the buildings to the near track and the speed of the LRT vehicles.~~
- ~~Pasadena (future): West of Pasadena Avenue on the south side of the alignment in Glendora, a future medical building and a future preschool would be expected to be impacted by vibration. These future buildings are estimated to be 60 to 70 feet from the near track. The vibration impact of these buildings would be due to the proximity of the buildings to the near track and the speed of the LRT vehicles.~~
- ~~University of La Verne: North of the rail alignment at station number 1080+00, one school building at the University of La Verne would be exposed to vibration impact. This building is located 20 feet from the near track. The vibration impact would be due to the proximity of the building to the near track and the speed of the LRT vehicles.~~

Summary of Impacts for Full Build (Pasadena to Montclair) Alternative

For Segments 1 and 2 combined, there are ~~744~~ 256 ~~residences~~ Category 2 land uses that are exposed to noise impact and an additional ~~532~~ 240 ~~residences~~ Category 2 land uses that are exposed to severe noise impact. This includes 380 single-family residences, 112 multi-family residential buildings, and four hotels. There are a total of ~~1575~~ 268 ~~residences~~Category 2 land uses, including 139 single-family residences, 128 multi-family residential buildings, and one hotel that are exposed to vibration impact. ~~Of this total, 554 residences were located in areas where the vibration measurements indicated efficient propagation conditions resulting in greater than normal number of impacts.~~ For Category 3 land uses, there are ~~four~~ two schools and four outpatient medical facilities that are exposed to noise impact ~~and one school that is exposed to severe noise impact~~. ~~The schools exposed to noise impact include a senior~~

~~center and a future preschool. There are also three medical buildings and a museum that are exposed to noise impact and one school that is exposed to severe noise impact. There are also~~. ~~-~~No vibration impacts are predicted for Category 3 land uses. ~~areas that include four schools and five medical buildings.~~

Summary of Impacts for Build LRT to Azusa Alternative

For Segment 1 of the Triple Track configuration, there are ~~127~~ 101 ~~residences~~ Category 2 land uses exposed to noise impact and an additional ~~182~~ 129 ~~residences~~ land uses that are exposed to severe noise impact. This includes 151 single-family residences, 78 multi-family residential buildings, and one hotel. There are a total of ~~575~~ 158 Category 2 land uses ~~homes that are also~~ exposed to vibration impact. This includes 84 single-family residences and 74 multi-family residential buildings. ~~Of this total, 554 residences were located in areas where the vibration measurements indicated efficient propagation conditions resulting in greater than normal number of impacts.~~ No vibration impacts are predicted for Category 3 land uses for this alternative. ~~For Category 3 land use, there is one school that would be exposed to noise impact. This school is also exposed to vibration impact.~~

3-11.2.5 Cumulative Impacts

The Southern California Association of Governments' (SCAG) 2004 Regional Transportation Plan (RTP) Final Program EIR is the most applicable certified planning document that provides a regional cumulative impact assessment for transportation improvements (including the proposed project) through the year 2030. SCAG's RTP analysis indicates significant/adverse cumulative ambient noise increases could occur. Noise level increases resulting from the proposed project, while mitigated, would fall within the context of the cumulative noise increase indicated in the RTP EIR. While the proposed project could result in remainder vibration impacts, such impacts would be highly localized and would neither contribute to a cumulative effect nor be compounded by vibration from other regional transportation projects within the RTP framework.~~Metrolink commuter rail service on the San Bernardino Line is part of the existing noise and vibration environment in the Foothill Extension project area between La Verne and Montclair. Under the No-Build Alternative, Metrolink would continue to provide service as needed and there would be no cumulative impacts associated with the project. Metrolink service does not extend west of LaVerne in the Foothill Extension right-of-way. Under the Full Build (Pasadena to Montclair) Alternative, the only areas with potential cumulative noise and vibration impacts associated with the Foothill Extension would occur in Segment 2, east of Pomona. Relocation of the Metrolink and freight tracks within the right-of-way could slightly increase the noise exposure and vibration levels experienced by adjacent land use. The slight change in noise and vibration levels resulting from minor track shifts would be insignificant with respect to existing conditions. In Claremont, the location of Metrolink tracks has been accounted for in the impact analysis and development of mitigation measures. When added to the proposed LRT operations, the impacts would not change from those predicted as long term impacts.~~

3-11.2.6 Impacts Addressed by Regulatory Compliance

a. Construction Period Impacts

Impacts that would arise from construction of any of the alternatives were identified in Section 3-11.2.3, above. Elimination or reduction of these construction period impacts would occur through two steps, as follows: (1) compliance with local, state or federal regulations or permits that have been developed by agencies to manage construction impacts, to meet legally established environmental impact criteria or thresholds, and/or to ensure that actions occurring under agency approvals or permits are in compliance with laws and policies, and (2) implementation of the proposed alternatives with additional construction period mitigation measures defined in Section 3-11.3.1. Following is a discussion of the construction

period impacts for each of the alternatives that would be addressed by the first step, regulatory compliance.

No Build Alternative

For the No Build Alternative, only the planned construction of the Eastside LRT Extension would include construction-period noise impacts. These impacts are addressed in the Draft Supplemental Environmental Impact Statement/Draft Subsequent Environmental Impact Report for that project (FTA and LACMTA 2001). The other elements of the No Build Alternative include only minor construction activities for such items as new or improved bus shelters. Construction or improvements to shelters would typically require only a few days work. These short-term construction activities would not be expected to generate substantial amounts of noise. Other than the Eastside LRT construction in Los Angeles, no other construction period impacts noise impacts that would be adverse under NEPA or significant under CEQA would be expected in the other cities in Phase I or in any of the cities in the Foothill Extension. It is assumed that any construction would occur during daytime hours, and under typical contractor conditions that include measures to limit the noise generated by equipment, which is consistent with local noise ~~ordinance~~ requirements.

Build Alternatives

There are no specific state or federal regulations concerning noise generated by construction activities. The FTA guidance manual offers some information on construction noise levels and mitigation options, which are discussed in more detail in the accompanying noise and vibration technical report.

At the local level, many cities and towns, including some along the ~~Phase II~~ Foothill Extension, have sections in their General Plans related to noise, and in some cases to construction noise specifically. These noise sections are typically guidance aimed at reducing noise within communities.

On March 17, 2005, the Metro Gold Line Construction Authority Board adopted a policy that project construction conform to the noise requirements in each city in Segment 1 and Segment 2. These requirements generally limit construction activities to daytime hours and certain days of the week (e.g., construction is often precluded on Sundays and National holidays without a variance from the local jurisdiction). Some local noise requirements may also include equipment or property line noise limits.

Limiting construction activities to weekday daytime hours (generally from 7 AM to 6 PM), and employing typical measures for minimizing noise during construction, requirements combined with the mitigation described in Section 3-11.3.1, would mitigate all construction noise impacts.

Phase I — The Cities Affected and the Results of Regulatory Compliance

The cities in Phase I are Los Angeles, South Pasadena, and Pasadena. There are no elements of the Build Alternatives in the cities of Los Angeles, South Pasadena or in Pasadena west of the Sierra Madre Villa Station, so there would be no construction period impacts associated with the Foothill Extension project and no regulatory compliance.

Summary of Construction Period Impacts for Full Build (Pasadena to Montclair) Alternative, Addressed by Regulatory Compliance

Limiting construction activities to weekday daytime hours (usually 7 AM to 6 PM), employing typical construction period noise-limiting practices, and adhering to local noise requirements, ~~combined with the mitigation recommendations below in Section 3-11.3.1, will mitigate all construction noise impacts for~~

~~the cities in Segments 1 and 2~~. would be likely to mitigate construct period impacts. Since regulatory compliance could still result in some impacts, mitigation measures would also be imposed. See Section 3-11.3.1. Local noise requirements are included in the General plans of the cities of Arcadia, Irwindale, Azusa, Glendora, San Dimas, LaVerne, Claremont and Montclair.

Summary of Construction Period Impacts for Build LRT to Azusa Alternative Addressed by Regulatory Compliance

Construction period impacts in Segment 1 cities would likely be mitigated by limiting construction activities to weekday daytime hours (usually 7 AM to 6 PM), employing typical construction period noise-limiting practices, and adhering to local noise requirements, ~~combined with the mitigation recommendations below in Section 3-11.3.1~~. would be likely to mitigate construct period impacts. Since regulatory compliance could still result in some impacts, mitigation measures would also be imposed. See Section 3-11.3.1. Local noise requirements are included in the General Plans of the cities of Arcadia, Irwindale, and Azusa.

b. Long Term Impacts

Long term impacts associated with the alternatives were identified in Section 3-11.2.4, above. Elimination or reduction of these long-term impacts would occur through two steps, as follows: (1) compliance with local, state or federal regulations or permits that have been developed by agencies to manage ~~construction~~ long-term impacts, to meet legally established environmental impact criteria or thresholds, and/or to ensure that actions occurring under agency approvals or permits are in compliance with laws and policies. (2) implementation of the proposed alternatives with additional mitigation measures defined in Section 3-11.3.2. Following is a discussion of the long-term impacts for each of the alternatives that would be addressed by the first step, regulatory compliance.

The No Build Alternative does not include any elements that would result in long-term noise impacts and thus no regulatory compliance is required. There are no elements of the Build Alternatives that result in long-term noise impacts after mitigation and thus no regulatory compliance is required. Additionally, there are no federal or state regulations pertaining to noise and/or vibration impacts from LRT operations. The California Public Utilities Commission (CPUC) General Orders requires the sounding of at-grade warning devices during LRT operation. The effect of the General Orders has been included in the noise impact analysis.

Corridor cities are exploring the possible implementation of quiet zones, wherein the sounding of some at-grade warning devices might be eliminated. If quiet zones are developed, a new noise impact analysis will need to be performed. A reduction or elimination of the noise generated by at-grade warning devices (e.g., train horns) could result in fewer noise impacts than reported herein and/or a change in mitigation.

3-11.3 Mitigation

3-11.3.1 Construction Period Mitigation Measures

Section 3-11.2.6a identified construction period impacts for which compliance with local, state, and federal regulations, permits, or similar types of requirements would eliminate or reduce such impacts. The following sections identify ~~potential~~ mitigation measures that would ~~need to~~ be implemented in order to address any remaining impacts (i.e., impacts that would still exist after regulatory compliance). The combination of regulatory compliance and these construction period mitigation measures would result in the reduction of construction period impacts to levels that would be not adverse under NEPA and less than significant under CEQA.

a. No Build Alternative

Other than the planned Eastside LRT Extension, the No Build Alternative does not require construction-period noise and vibration mitigation measures. These measures are defined in the environmental document for that project. It is assumed that construction of other elements of the No Build Alternative would occur during daytime hours, and under typical contractor conditions that include measures to limit the noise generated by equipment, and no further mitigation measures would be required.

b. Build Alternatives Construction Period Mitigation

Phase I — The Cities Affected and Proposed Measures

The Foothill Extension does not include any elements in the cities of Los Angeles, South Pasadena or in Pasadena west of the Sierra Madre Villa Station. No construction period measures are required.

Foothill Extension, Segment 1 — The Cities Affected and Proposed Measures

The cities in the Foothill Extension Segment 1 are Pasadena, Arcadia, Monrovia, Duarte, Irwindale, and Azusa. In addition to the noise reduction that would result from voluntary regulatory compliance, the following measure shall be implemented:

N-1 The Construction Authority shall develop specific residential property line noise limits to be included in the construction specifications for this project and require that contractors perform noise monitoring during construction to verify compliance with the limits.

~~Require that contractors performing perform noise monitoring during construction to verify compliance with the limits. This approach allows the contractor flexibility to meet the noise limits in the most efficient and cost-effective manner. Experience suggests that community annoyance with construction noise will be minimal if: the Resident Engineer is committed to minimizing excessive noise; noise monitoring is performed to verify compliance with the noise limits; and a complaint resolution procedure is in place to rapidly address any problems that may develop. Avoiding vibration impacts during construction can be achieved through numeric limits in the construction specifications. The noise Noise and Vibration Technical Report in the Appendices has more detail about construction activities, impact criteria, noise level limits and mitigation strategies.~~

N-2 The Construction Authority shall implement a complaint resolution procedure, including a contact person and telephone number, to rapidly resolve any construction noise problems.

Foothill Extension, Segment 2 — The Cities Affected and Proposed Measures

The cities in the Foothill Extension Segment 2 are ~~Azusa~~, Glendora, San Dimas, La Verne, Pomona, Claremont, Montclair, and Upland. The mitigation measures for these cities are the same as described for Segment 1.

3-11.3.2 Long Term Mitigation

Section 3-11.2.6 identified long-term impacts for which compliance with local, state and federal regulations, permits, or similar types of requirements would eliminate or reduce such impacts. The following sections identify ~~potential~~ mitigation measures that would ~~need to~~ be implemented in order to address any remaining impacts (i.e., impacts that would still exist after regulatory compliance). The combination of regulatory compliance and these mitigation measures would result in the reduction of long term impacts to levels that would be not adverse under NEPA and less than significant under CEQA at most locations.

a. No Build Alternative

The No Build Alternative does not require long-term noise and vibration mitigation measures because no long-term impacts were identified for this alternative.

b. Build Alternatives

There are no elements of the Foothill Extension Build Alternatives in the Phase I cities of Los Angeles, South Pasadena or Pasadena. The following measures would apply in Foothill Extension Segment 1 and Segment 2 cities only.

Noise Impact Mitigation

N-3 The Construction Authority shall employ noise reduction strategies to further reduce noise abatement achieved through voluntary regulatory compliance. The Authority shall erect noise barriers, employ building sound insulation, and modify at-grade audible warning devices and operations (subject to CPUC approval). Final design, locations, and extent of implementation of each of these noise-reducing strategies shall be determined during Final Design of the project such that the FTA noise abatement criteria is most effectively achieved.

The noise reduction measures listed in mitigation measure N-3 are described in greater detail below. Preliminary locations and dimensions of soundwalls are presented along with candidate sites for building insulation. The mitigation implementation process that will follow in the Final Design phase is also discussed.

~~Mitigation measures for reducing noise impacts from LRT operations are described below. During Preliminary Engineering, more detailed noise impact analysis would be conducted to determine where and how these potential measures would be most effectively used to reduce impacts to less than the impact threshold. For instance, the final definition of the length and height of a noise barrier at a specific location would need to account for topography (the elevation of the LRT compared to the affected property), distance from track to property border, track curvature, any changes in assumptions about LRT~~

~~operating speed, whether or not the location is also influenced by the sounding of at-grade warning devices, etc.~~

- **Noise Barriers -** This is a common approach to reducing noise impacts from surface transportation sources. The primary requirements for an effective noise barrier are that (1) the barrier must be high enough and long enough to break the line-of-sight between the sound source and the receiver, (2) the barrier must be of an impervious material with a minimum surface density of 4 lb/sq. ft., and (3) the barrier must not have any gaps or holes between the panels or at the bottom. Because numerous materials meet these requirements, the selection of materials for noise barriers is usually dictated by aesthetics, durability, cost, and maintenance considerations. Depending on the proximity of the barrier to the tracks and on the track elevation, transit system noise barriers typically range in height from between four and eight feet above the top-of-rail. **Tables 3-11.14** and **3-11.17** indicate the approximate noise barrier locations, lengths, and side of track for Segment 1 and Segment 2, respectively. The locations of noise barriers are shown on Figures 3-11.9 through 3-11.24.

- **Building Sound Insulation -** Sound insulation of residences and institutional buildings to improve the outdoor-to-indoor noise reduction has been widely applied around airports and has seen limited application for transit projects. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where noise barriers are not feasible or desirable, and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dBA) can often be achieved by adding an extra layer of glazing to the windows, by sealing any holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air-conditioning so that windows do not need to be opened. **Tables 3-11.15** and **3-11.18** indicate areas that may be candidates for sound insulation for Segment 1 and Segment 2, respectively. The locations of sound insulation are shown on Figures 3-11.9 through 3-11.24.

- **Modifications to At-grade Warning Devices and Operations -** Subject to approval on a case-by-case basis by the CPUC, warning devices or their operation may be modified to reduce noise levels and community annoyance in the vicinity of at-grade crossings. Modifications to the audible devices include installing shrouds on the crossing bells and using the lower sound level on-vehicle audible device. For example, a simple half-round piece of 16-gauge stainless steel attached to the back of a crossing bell can substantially reduce the amount of noise that is radiated into the community while maintaining industry standard noise levels at pedestrian locations. Also, switching from the 85-dBA horns to the 75-dBA quacker would provide a noticeable reduction in LRV noise levels near the grade crossings.

❑ The mitigation implementation process

As discussed in Section 3-11.2.2, FTA states that in implementing noise impact criteria, severe impacts should be mitigated unless there are no practical means to do so. At the moderate impact level, more discretion should be used, and other project-specific factors should be included in the consideration of mitigation. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-to-indoor sound insulation, and the cost-effectiveness of mitigating noise to more acceptable levels.

Impacts predictions and proposed mitigation are based on August 2005 engineer level designs that are subject to further design refinement. During Final Design, data that affects the impact predictions may change, such as the precise locations and grade of rails, switch locations, and the placement of grade crossing warning devices. Accordingly, it is important to note that the determination of impacts and

specific mitigation measures reported herein will be subject to refinement. For instance, the height of a proposed soundwall may change as a result of design refinements.

Based on the results of the updated noise assessment, mitigation measures have been identified. The primary mitigation measure would be the construction of sound barrier walls to shield areas where impact is predicted. **Tables 3-11.14** and **3-11.17** indicate the approximate noise barrier locations, lengths, and side of track ~~as well as the number of moderate and severe impacts that would be reduce~~d for Segment 1 and Segment 2, respectively. Because sound walls must stop at intersections, the effectiveness of the walls is limited near grade crossings due to noise "leaks" around the ends of the walls. In addition, it may not be feasible or cost-effective to protect some second floors of noise-sensitive receptors with a sound barrier wall. ~~However, because barriers would not be practical for shielding receptors near grade crossings from the train and warning signal noise~~, Therefore, sound insulation ~~may need to~~ would be applied to specific locations.

Tables 3-11.15 and **3-11.18** indicate areas ~~that may be candidates~~ for sound insulation for Segment 1 and Segment 2, respectively. The approximate locations of noise mitigation are shown in Figures 3-11.9 through 3-15.2: The figures indicate locations where soundwalls will be built and where sounds insulation installed. The latter would be needed near at-grade intersections where a break in soundwalls would have to occur, and for second story windows. Note that implementation of sound insulation requires permission of property owners to allow access to the interior of their properties for noise measurements and construction.

A number of residential areas on the corridor have existing noise barriers/privacy walls. The updated noise impact analysis did not ~~include~~ assume that the ~~any noise reduction from~~ existing walls along the corridor would provide any noise reduction. The existing barriers were not included because it is not possible to assess the effectiveness of any barriers/privacy walls without more detailed plan and profile mapping of the corridor and individual site visits and surveys. In addition, many of the walls may not be effective as noise barriers due to construction, height, or any gaps that are present. During the Final Design of the project, the effectiveness of the existing barriers/privacy walls ~~should~~ will be assessed and incorporated into final mitigation measure specifications. It may be determined that a number of the existing barriers are effective for mitigation, or that some may only need to be repaired or raised slightly to provide the appropriate level of noise reduction. Thus, the final implementation of noise wall mitigation listed in **Tables 3-11.14** and **3-11.17** and shown on the figures could range from new noise barriers to slight modifications of existing walls to no action needed to provide adequate noise reduction.

Vibration Impact Mitigation

N-4 The Construction Authority shall employ vibration reduction strategies to further reduce vibration abatement achieved through voluntary regulatory compliance. The Authority shall employ strategies such as ballast mats, shredded tire or recycled rubber chip underlay, relocation of crossovers, and special trackwork. Final design, locations, and extent of implementation of each of these vibration-reducing strategies shall be determined during Final Design of the project such that FTA criteria is most effectively achieved.

The vibration reduction measures listed in mitigation measure N-4 are described in greater detail below. Preliminary locations for vibration mitigation are presented along with the mitigation implementation process that will follow in the Final Design phase

~~. Mitigation measures for reducing vibration impacts from LRT operations are described below. In general, vibration mitigation measures would occur with the rail right-of-way, rather than on private property.~~

- ~~**LRT Speed Reductions in Sensitive Areas** – Speed reductions will always lower ground-borne vibration levels, but they are not always a feasible vibration control measure because of the negative impact on the LRT operating schedule and ridership. Thus, their impact on the operating schedule will need to be evaluated with respect to their potential vibration mitigation benefits.~~ **Ballast Mats -** A ballast mat consists of a pad made of rubber or rubber-like material placed on an asphalt or concrete base with the normal ballast, ties and rail on top. The reduction in ground-borne vibration provided by a ballast mat is strongly dependent on the frequency content of the vibration and design and support of the mat.
- **Shredded Tire or Recycled Rubber Chip Underlay -** A 12-inch-thick resilient layer of shredded tires or recycled rubber chips placed beneath the sub-ballast layer of standard open ballast and tie track could be incorporated into the track design. This mitigation method would provide results similar to ballast mats, and would also be strongly dependent on the frequency content of the vibration. This approach has not been tested and is not currently being used on any operational light rail transit system. Both Denver Regional Transit and Santa Clara Valley Transportation Authority are constructing new lines where shredded tire underlay is being used for vibration mitigation.
- ~~. **Floating Slabs -** Floating slabs consist of thick concrete slabs supported by resilient pads on a concrete foundation; the tracks are mounted on top of the floating slab. Most successful floating slab installations are in subways, and their use for at-grade track is less common. Although floating slabs are designed to provide vibration reduction at lower frequencies than ballast mats, they are extremely expensive~~
- **Relocation of Crossovers or Special Trackwork -** Because the impacts of wheels over rail gaps at track crossover locations increases vibration by about 10 VdB, crossovers are a major source of vibration impact when they are located in sensitive areas. If crossovers cannot be relocated away from residential areas, another approach is to use spring-rail or moveable point frogs in place of standard rigid frogs at turnouts. These devices allow the flangeway gap to remain closed in the main traffic direction for revenue service trains.
- ~~**Property Acquisitions or Easements** – Additional options for avoiding vibration impacts (as well as noise impacts) are for the transit agency to purchase residences where severe impact are predicted or to acquire easements for such residences by paying the homeowners to accept the future train vibration conditions. These approaches are usually taken only in isolated cases where other mitigation options are infeasible, impractical, or too costly.~~

Vibration impacts that exceed FTA criteria are considered to be significant and warrant mitigation, if reasonable and feasible. **Tables 3-11.16** and **3-11.19** indicate the civil stations along the corridor where mitigation would be implemented to reduce the vibration levels, for Segment 1 and Segment 2, respectively. At a minimum, mitigation would require the installation of ballast mat, shredded tire, or other resilient track support system.~~should be incorporated into the final design~~ The final determination for the exact type of mitigation to be implemented will be made during Final Design phase of the project. Further studies during the final design, which could include site-specific vibration to verify model assumption and building response, may also determine that vibration mitigation is not needed in some areas. Specifically, incorporating more detailed information regarding the LRV, track design, and building response may result in predicted levels below 72 VdB at locations where impacts are currently predicted. ~~However, more extensive mitigation may be required to adequately reduce the vibration levels to below the FTA vibration impact criterion. In addition, localized speed reductions may reduce vibration levels to below the FTA vibration impact criterion. Vibration mitigation will be addressed in more detail during final design.~~

Phase I — The Cities Affected and Measures

Since there is no noise and vibration impacts in Phase I cities as a result of the Foothill Extension project, no mitigation measures are proposed. Increases is service frequency in Phase I cities would be a result of the LACMTA operation plan for LRT service subsequent to completion of the Eastside Extension.

Foothill Extension, Segment 1 — The Cities Affected and Measures

Noise

Mitigation measure N-3 applies to Segment 1 of the Foothill Extension. **Table 3-11.14** lists the locations for noise barrier mitigation along Segment 1 of the Gold Line Foothill Extension, including the barrier length and height (above top-of-rail), in feet. ~~Specific detail of noise barriers, including the height, would be determined during Preliminary Engineering, when more information is available.~~ At most locations, the noise barriers will reduce the noise levels to below the FTA noise impact criteria.

Table 3-11.15 lists locations of sound insulation for noise mitigation along Segment 1 of the Foothill Extension. Sound insulation would be warranted where noise barriers would not be practical or cost effective, primarily near grade crossings and for some second stories. Although the intent of sound insulation is to reduce forecasted noise to less than the impact threshold, there may be circumstances where impacts cannot be reduced to less than the threshold, such as close proximity to a grade crossing.

TABLE 3-11.14. SOUND BARRIER LOCATIONS AND DIMENSIONS – SEGMENT 1 CITIES

City	Wall No.	Dir. [1]	Engineering Station**		Length, ft.	Height, ft. [2]
			Start	Stop		
Arcadia	1	EB	956+50	966+00	950	4
Arcadia	2	EB	1011+50	1023+00	1,150	4
Arcadia	3	WB	966+75	974+00	725	4
Arcadia	4	WB	1000+50	1004+50	400	4
Total: Arcadia					**3,225**	
Monrovia	1	EB	1023+00	1034+50	1,150	4
Monrovia	2	EB	1036+00	1040+00	400	4
Monrovia	3	EB	1040+00	1048+00	800	8
Monrovia	4	EB	1048+00	1051+50	350	4
Monrovia	5	EB	1051+50	1057+00	550	6
Monrovia	6	EB	1058+00	1063+25	525	8
Monrovia	7	EB	1065+75	1069+25	350	6
Monrovia	8	WB	1035+00	1037+00	200	4
Monrovia	9	WB	1037+00	1042+50	550	4
Monrovia	10	WB	1042+50	1047+50	500	6
Monrovia	11	WB	1047+50	1053+50	600	6
Monrovia	12	WB	1053+50	1056+75	325	6
Total: Monrovia					**6,425**	

TABLE 3-11.14. SOUND BARRIER LOCATIONS AND DIMENSIONS – SEGMENT 1 CITIES

City	Wall No.	Dir. [1]	Engineering Station**		Length, ft.	Height, ft. [2]
			Start	Stop		
Duarte	1	EB	1129+50	1133+00	350	6
Duarte	3	WB	1141+00	1146+00	500	6
Duarte	4	WB	1155+75	1176+75	2,100	6
Total: Duarte					**2,950**	
Azusa	1	EB	1345+00	1353+00	800	4
Azusa	2	EB	1357+50	1363+50	600	6
Azusa	3	EB	1363+50	1369+00	550	6
Azusa	4	EB	1386+00	1389+50	350	6
Azusa	5	EB	1390+25	1399+50	925	6
Azusa	6	WB	1365+75	1369+50	375	6
Azusa	7	WB	1390+75	1395+25	450	6
Total: Azusa					**4,050**	
TOTAL: SEGMENT 1					**16,650**	

[1] EB = towards Montclair; WB = towards Pasadena

[2] Heights are listed as above top-of-rail.

** Engineering stations are shown in the Plan and Profile Drawings in Volume 4.

Source: ATS Consulting, LLC, 2005.

Note that it is assumed that the walls will extend up to the sidewalk at any grade crossings. If a step-down in the wall for line-of-sight purposes is required approaching the grade crossing, then either Plexiglas panels would be installed to fill the step-downs or additional sound insulation would provided at the residence where the step-down is proposed.

TABLE 3-11.15. LOCATIONS FOR RESIDENTIAL SOUND INSULATIONS – SEGMENT 1 CITIES

City	Direction [1]	Group No. [2]	Engineering Station**	# of Residences
Grade Crossings [3]				
Monrovia	EB	8	1056+50	1
Monrovia	EB	9	1058+00	4
Monrovia	WB	5	1056+50	1
Monrovia	WB	6	1058+50	1
Azusa	EB	8	1369+00	1
Azusa	EB	11	1390+00	1
Azusa	EB	12	1391+00	2
Azusa	WB	5	1391+00	1
Total: Grade Crossings				**12**

TABLE 3-11.15. LOCATIONS FOR RESIDENTIAL SOUND INSULATIONS – SEGMENT 1 CITIES

City	Direction [1]	Group No. [2]	Engineering Station**	# of Residences
Second Stories [4]				
Monrovia	EB	3	1043+00	11
Monrovia	EB	11	1067+00	4
Monrovia	WB	2	877+00	12
Azusa	EB	7	1363+00	5
Total: Second Stories				**32**
TOTAL-SEGMENT 1				**44**

[1] Near track direction: EB = towards Montclair; WB = towards Pasadena

[2] Refer to the maps in the Noise and Vibration Technical Report in the Appendices for locations of the receiver groups.

[3] Refers to individual residences.

[4] Include all residences with second stories within grouping.

** Engineering stations are shown in the Plan and Profile Drawings in Volume 4.

Source: ATS Consulting, LLC, 2005.

More details regarding the sound insulation are provided in the Noise and Vibration Technical Report in the appendix.

In order to eliminate the added noise from the crossovers between engineering stations 1045+00 and 1050+00 in the City of Monrovia, the crossover can be relocated to a non noise-sensitive area. Alternatively, movable point frogs should be installed that close the gaps in the rail. This will minimize impact noise created when the wheel crosses the flangeway gap.

Although the crossing bells do not generally contribute to noise impacts, they are often a source of community annoyance due to their tonal and repetitive character. With the approval of the MTA and CPUC, noise "shrouds" should be installed on all bells in residential areas. These shrouds should be similar to those designed at tested by the Authority for application in the City of Los Angeles and City of South Pasadena.

Vibration

Mitigation measure N-4 applies to Segment 1 of the Foothill Extension. **Table 3-11.16** lists the locations for potential vibration mitigation along Segment 1 of the Foothill Extension, including the length of mitigation in track feet. At a minimum, vibration mitigation would require the installation of ballast mats, shredded tires, or other resilient track support system. It is assumed that moveable point frogs will be installed at the crossovers between engineering stations 1045+00 and 1050+00 in the City of Monrovia, as recommended for noise mitigation. ~~However, more extensive mitigation may be required to adequately reduce the vibration levels to below the FTA vibration impact criterion. Specific recommendations on vibration mitigation will be addressed in more detail during final design.~~

TABLE 3-11.16. VIBRATION MITIGATION LOCATIONS – SEGMENT 1 CITIES

City	Engineering Station**		Length	Residual Impacts
	Start	End		
Pasadena	--	--	--	--
Arcadia	957+00	966+00	900	0
Arcadia	967+00	971+00	400	0
Arcadia	1017+00	1022+50	550	0
Total: Arcadia			**1,850**	**0**
Monrovia	1022+50	1034+00	1,150	0
Monrovia	1035+50	1057+00	2,150	11
Monrovia	1058+00	1062+50	450	17
Monrovia	1065+50	1069+25	375	8
Total: Monrovia			**4,125**	**36**
Irwindale	--	--	--	--
Azusa	1345+00	1352+50	750	0
Azusa	1357+50	1368+50	1,100	25
Azusa	1387+50	1390+00	250	0
Azusa	1390+50	1395+25	475	0
Total: Azusa			**2,575**	**25**
TOTAL: SEGMENT 1			**8,550**	**61**

Note: It is assumed that mitigation will be placed under both the near and far tracks.
** Engineering stations are shown in the Plan and Profile Drawings in Volume 4.
Source: ATS Consulting, LLC, 2005.

Foothill Extension, Segment 2 — The Cities Affected and Proposed Measures

Noise

Mitigation measure N-3 also applies to Segment 2 of the Foothill Extension. **Table 3-11.17** lists the preliminary locations for potential noise barrier mitigation along Segment 2 of the Foothill Extension, including the approximate barrier length and height (above top-of-rail), in feet. At most locations, the noise barriers reduce the noise levels to below the FTA noise impact criteria.

Table 3-11.18 lists locations of sound insulation along Segment 2 of the Foothill Extension. Sound insulation would be provided where noise barriers would not be practical or cost effective, primarily near grade crossings and for some second stories. insulation would be necessary. ~~Although the intent of sound insulation is to reduce forecasted noise to less than the impact threshold, there may be circumstances where impacts cannot be reduced to less than the threshold, such as a property in close proximity to an at-a grade crossing~~.

TABLE 3-11.17. SOUND BARRIER LOCATIONS AND DIMENSIONS – SEGMENT 2 CITIES

City	Wall No.	Dir. [1]	Engineering Station**		Length, ft.	Height, ft. [2]
			Start	Stop		
Glendora	1	EB	1430+50	1438+00	750	6
Glendora	2	EB	1438+00	1454+25	1,625	6
Glendora	3	EB	1455+00	1463+50	850	6
Glendora	4	WB	1493+00	1496+50	350	6
Glendora	5	EB	1503+00	1504+75	175	6
Glendora	6	WB	1518+00	1528+50	1,050	8
Glendora	7	EB	1524+50	1528+25	375	6
Glendora	8	WB	1529+00	1550+50	2,150	8
Glendora	9	EB	1537+00	1539+00	200	6
Glendora	10	EB	1541+25	1543+00	175	6
Glendora	11	WB	1551+00	1557+00	600	8
Glendora	12	WB	1557+50	1570+00	1,250	8
Glendora	13	WB	1571+00	1579+50	850	8
Glendora	14	WB	1583+50	1593+00	950	8
Glendora	15	WB	1593+00	1602+00	900	4
Glendora	16	EB	1586+50	1589+00	250	6
Glendora	17	EB	1603+50	1611+50	800	6
Glendora	18	WB	1611+00	1617+00	600	16
Glendora	19	WB	1617+00	1632+00	1,500	14
Glendora	20	EB	1663+50	1665+25	175	6
Total: Glendora					**15,575**	
San Dimas	1	WB	1667+00	1670+00	300	6
San Dimas	2	WB	1678+50	1684+00	550	4
San Dimas	3	EB	1683+00	1689+00	600	4
Total: San Dimas					**1,450**	
La Verne	1	WB	1815+25	1827+00	1,175	6
La Verne	2	WB	1827+75	1833+50	575	6
Total: La Verne					**1,750**	
Pomona	--	--	--	--	--	--
Claremont	1	WB	1975+00	1979+25	425	6
Claremont	2	EB	2005+50	2009+50	400	6
Claremont	3	EB	2033+00	2044+00	1,100	6
Claremont	4	WB	2046+25	2049+50	325	6
Claremont	5	EB	2046+00	2049+00	300	6
Total: Claremont					**2,550**	
Montclair	--	--	--	--	--	--
TOTAL: SEGMENT 2					**21,325**	

[1] EB = towards Montclair; WB = towards Pasadena

[2] Heights are listed as above top-of-rail.

** Engineering stations are shown in the Plan and Profile Drawings in Volume 4.

Source: ATS Consulting, LLC, 2005.

Note that it is assumed that the walls will extend up to the sidewalk at any grade crossings. If a step-down in the wall for line-of-sight purposes is required approaching the grade crossing, then either Plexiglas panels should be installed to fill the step-downs or additional sound insulation should provided at the residence where the step-down is proposed.

TABLE 3-11.18. LOCATIONS FOR RESIDENTIAL SOUND INSULATIONS – SEGMENT 2 CITIES

City	Direction [1]	Group No. [2]	Engineering Station**	# of Residences
Grade Crossings [3]				
Glendora	EB	3	1454+00	1
Glendora	EB	4	1455+50	1
Glendora	WB	5	1528+00	1
Glendora	WB	6	1529+50	1
Glendora	WB	8	1550+00	1
Glendora	WB	11	1558+00	1
Glendora	WB	14	1571+00	1
Claremont	WB	2	1979+00	2
Total: Grade Crossings				**9**
Second Stories [4]				
Glendora	WB	9	1553+00	4
Glendora	WB	10	1555+50	4
Glendora	EB	1	1434+00	12
Glendora	EB	5	1461+00	7
Total: Second Stories				**27**
TOTAL-SEGMENT 2				**36**

Notes:
[1] Near track direction: EB = towards Montclair; WB = towards Pasadena
[2] Refer to the maps in the Noise and Vibration Technical Report in the Appendices for locations of the receiver groups
[3] Refers to individual residences
[4] Include all residences with second stories within group
** Engineering stations are shown in the Plan and Profile Drawings in Volume 4.
Source: ATS Consulting, LLC, 2005.

More details regarding the sound insulation are provided in the Noise and Vibration Technical Report in the appendix.

In order to eliminate the added noise from the crossovers between engineering stations 1573+00 and 1576+00 in the City of Glendora, the crossover can be relocated to a non noise-sensitive area. Alternatively, movable point frogs should be installed that close the gaps in the rail. This will minimize any impact noise created when the wheel crosses the flangeway gap.

Although the crossing bells do not generally contribute to noise impacts, they are often a source of community annoyance due to their tonal and repetitive character. With the approval of the MTA and

CPUC, noise "shrouds" should be installed on all bells in residential areas. These shrouds should be similar to those designed at tested by the Authority for application in the City of Los Angeles and the City of South Pasadena.

Vibration

Mitigation measure N-4 also applies to Segment 2 of the Foothill Extension. **Table 3-11.19** lists the locations for vibration mitigation along Foothill Extension Segment 2, including the approximate length of mitigation in feet. At a minimum, vibration mitigation would require the installation of ballast mats, shredded tires, or other resilient track support systems. It is assumed that moveable point frogs will be installed at the crossovers between engineering stations 1045+00 and 1050+00 in the City of Monrovia, as recommended for noise mitigation.

~~However, more extensive mitigation may be required to adequately reduce the vibration levels to below the FTA vibration impact criterion. Specific recommendations on vibration mitigation will be addressed in more detail during Preliminary Engineering.~~

TABLE 3-11.19. VIBRATION MITIGATION LOCATIONS – SEGMENT 2

City	Engineering Station**		Length	Residual Impacts
	Start	End		
Glendora	1431+00	1454+00	2,300	0
Glendora	1455+00	1463+50	850	7
Glendora	1519+75	1536+50	1,675	0
Glendora	1663+00	1665+25	225	0
Total: Glendora			**5,050**	**7**
San Dimas	1681+00	1688+50	**750**	**0**
La Verne	--	--	--	--
Pomona	--	--	--	--
Claremont	1974+00	1979+25	525	0
Claremont	1986+50	1997+50	1,100	20
Claremont	2046+00	2050+00	400	0
Total: Claremont			**2,025**	**20**
Montclair	--	--	--	--
TOTAL: SEGMENT 2			7,825	**27**

Note: It is assumed that mitigation will be placed under both the near and far tracks.
** Engineering stations are shown in the Plan and Profile Drawings in Volume 4.
Source: ATS Consulting, LLC, 2005.

Summary of Long-Term Mitigation Measures for Full Build (Pasadena to Montclair) Alternative,

For Segments 1 and 2, a total of ~~44,800~~ 37,975 linear-feet of sound barrier walls would be constructed to mitigate predicted noise impacts. In addition, up to and ~~286~~ 80 residences require would receive sound

insulation. Vibration mitigation measures would be provided for ~~51,500~~ 16,375 track feet within Segments 1 and 2. alignment would provide mitigation for the 1,575 identified vibration impacts.

Summary of Long-Term Mitigation Measures for Build LRT to Azusa Alternative

For Segment 1, a total of ~~15,700~~ 16,650 feet of sound barrier walls are would be built to mitigate ~~263~~ predicted noise impacts. In addition, up to ~~46~~ 44 residences would receive sound insulation. Vibration mitigation would be provided along ~~18,900~~ 8,550 track-feet of the alignment in Segment 1.

3-11.4 Impact Results with Mitigation

The following sections report the result of complying with regulatory requirements and proposed mitigation measures. The intent of this section is to summarize where identified impacts have been eliminated or reduced to less than adverse/less than significant levels, or whether there may be residual impacts.

3-11.4.1 Construction Period

Construction period impacts would be eliminated or reduced to less than adverse/less than significant levels by adhering to local noise requirements, constructing during daytime hours, following typical contractor conditions that include measures to limit the noise generated by equipment as discussed in Section 3-11.2.6, and the additional measures to mitigate impacts identified in Section 3-11.3.1. As a result of these conditions, construction period impacts would be not adverse under NEPA and not significant under CEQA.

a. No Build Alternative

For the No Build Alternative, only the planned construction of the Eastside LRT Extension would include construction-period noise impacts. These impacts are addressed in the Draft Supplemental Environmental Impact Statement/Draft Subsequent Environmental Impact Report for that project (FTA and LACMTA 2001). For the other elements of the No Build Alternative it is assumed that any construction would occur during daytime hours, and under typical contractor conditions that include measures to limit the noise generated by equipment. Under this work approach, coupled with the additional measures to mitigate impacts identified in Section 3-11.3.1 would result in construction period impacts that would be not adverse under NEPA and not significant under CEQA.

b. Build Alternatives

Phase I — The Cities Affected and the Results of Construction Period Mitigation Measures

Phase I includes the cities of Los Angeles, South Pasadena and Pasadena. There are no elements of the Foothill Extension in these cities in Phase I. There would be no construction period noise and vibration impacts in Phase I cities as a result of the Foothill Extension, so no mitigation measures are required.

Summary of Results of Construction Period Mitigation Measures for Full Build (Pasadena to Montclair) Alternative

Per policy adopted by the Construction Authority in March 2005, construction would adhere to local noise ordinance requirements, occur during daytime hours, and would include typical contractor conditions to limit the noise generated by equipment. As a result of this approach, coupled with the additional measures to mitigate impacts identified in Section 3-11.3.1, adverse construction noise impacts under NEPA and significant construction noise impacts under CEQA are not predicted at any of the cities in Foothill Extension Segments 1 and 2.

Summary of Results of Construction Period Mitigation Measures for Build LRT to Azusa Alternative

Construction period impacts would be eliminated or reduced to less than adverse/less than significant levels Build LRT Azusa Alternative. Per policy adopted by the Construction Authority in March 2005, construction would adhere to local noise requirements, occur during daytime hours, and would include typical contractor conditions to limit the noise generated by equipment. As a result of this approach, coupled with the additional measures to mitigate impacts identified in Section 3-11.3.1, adverse construction noise impacts under NEPA and significant construction noise impacts under CEQA are not predicted at any of the cities in Foothill Extension Segment 1.

3-11.4.2 Long Term

a. No Build Alternative

No long-term impacts were identified for the No Build Alternative and thus no mitigation measures were required. Impacts would remain as less than adverse under NEPA and less than significant under CEQA.

b. Build Alternatives

Phase I — The Cities Affected and the Results of Long Term Mitigation Measures

Phase I includes the cities of Los Angeles, South Pasadena and Pasadena. No long-term effects on the noise or vibration environments in Phase I cities were identified as a result of the Foothill Extension and thus no mitigation was required. Impacts would remain less than adverse under NEPA and less than significant under CEQA.

Summary of Results of Long Term Mitigation Measures for Full Build (Pasadena to Montclair) Alternative

For cities in Segments 1 and 2 of the Full Build (Pasadena to Montclair) Alternative, predicted noise impacts would be mitigated by the proposed noise mitigation measures. There is the potential for 88 residual vibration impacts after implementation of the listed vibration mitigation measures. All but five of these residual impacts are predicted on the second story of the residences. As noted earlier, more detailed, site-specific testing would occur during Final Design for vibration impact analysis. The listed mitigation measures could eliminate vibration impacts, but it is possible that impacts in excess of the FTA criterion could occur. Accordingly, under CEQA, the Construction Authority would need to adopt a Statement of Overriding Considerations.

Summary of Results of Construction Period Mitigation Measures for Build LRT to Azusa Alternative

For cities in Segment 1 of the Build LRT to Azusa Alternative, predicted noise impacts can be mitigated by the listed mitigation measures. There is the potential for 61 residual vibration impacts after implementation of the listed vibration mitigation measures. Al but five of these residual are predicted on the second story of the residences. As noted earlier, more detailed, site-specific testing would occur during Final Design for vibration impact analysis. The listed mitigation measures could eliminate vibration impacts, but there is a statistical possibility that impacts in excess of the FTA criterion could occur. Accordingly, under CEQA, the Construction Authority would need to adopt a Statement of Overriding Considerations.