Appendix N

Noise Technical Report for the East-West Connector Project

DRAFT

Noise Technical Report for the East-West Connector Project

Prepared for:

T.Y. LIN INTERNATIONAL
1111 Broadway, Suite 2150
Oakland, CA 94607
Contact: Francis Lo
510/457-3030

Prepared by:

ICF Jones & Stokes
268 Grand Avenue
Oakland, CA 94610-4724
Contact: Kate Giberson
408/434-2244

July 2008

ICF Jones & Stokes. 2008. Noise Technical Report for the East-West Connector Project. DRAFT. July. (ICF J&S 00703.07). Oakland, CA. Prepared for: T.Y. LIN INTERNATIONAL, Oakland, CA.

Contents

List of Tables and Figures

List of Acronyms and Abbreviations

BART	Bay Area Rapid Transit District
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	decibels
dBA	A-weighted sound level
EIR	environmental impact report
EIS	environmental impact statement
FHWA	Federal Highway Administration
Hz	hertz
I-880	Interstate 880
L_{XX}	percentile-exceeded sound level
lbs/ft^2	pounds per square foot
L_{dn} or DNL	Day-Night Average Sound Level
L_{eq}	equivalent sound level
L_{max} and L_{min}	maximum and minimum sound level
LT	long-term
mph	miles per hour
project or proposed project	East-West Connector Project
SR 238	State Route 238
ST	short-term
TNM 2.5	Traffic Noise Model Version 2.5
UPRR	Union Pacific Railroad

Introduction

The East-West Connector Project (project or proposed project) is a 2.6-mile roadway project that combines widening existing roadways and constructing a new roadway segment to provide improved east-west access between Interstate 880 (I-880) on the west and Mission Boulevard (State Route 238 [SR 238]) on the east in southern Alameda County (Figure 1).

This report presents the results of the noise study that was conducted for the project. The report has been prepared in support of environmental review for the project pursuant to the California Environmental Quality Act (CEQA). The Alameda County Transportation Authority is the lead agency for the project and is preparing an Environmental Impact Report (EIR) to comply with CEQA.

Within this report, the environmental setting section presents the fundamentals of environmental noise and presents the results of noise measurements conducted at the site. The regulatory setting section provides a discussion of policies and standards applicable to the project. A summary of the results of traffic noise modeling conducted for the project and an evaluation of the potential impacts resulting from the project are presented in the impacts analysis section. Mitigation measures are presented to reduce potentially significant noise impacts.

Project Description

The 2.6-mile project alignment extends between a location northeast of the I-880 and Decoto Road ramps on the west and the intersection of Mission Boulevard and Appian Way on the east. The proposed project includes constructing a new 1.3-mile-long roadway on the east portion of the alignment (between Paseo Padre Parkway and Mission Boulevard), widening 1.3 miles of existing roadways (Decoto Road and Paseo Padre Parkway), and making other improvements along the 2.6-mile alignment. Other improvements include signalizing existing intersections, modifying intersection lane configurations, widening Fremont Boulevard and Mission Boulevard near their intersections with the project's main roadway alignment, and realigning Quarry Lakes Drive southwest of the existing residence located just off Quarry Lakes Drive (35261 Alvarado Niles Road), and resulting in the roadway's edge being approximately 220 feet southwest of the house. The project alignment, including the realignment options, is depicted in Figure 2.

Construction of the new roadway segment would require construction of an underpass beneath the existing Bay Area Rapid Transit District (BART) tracks

and the Union Pacific Railroad (UPRR) tracks. During construction of this segment, shooflies (temporary realignment of the railroad tracks) would be installed adjacent to the existing tracks to ensure rail operation is not interrupted.

Source: TY Lin International 2008.

00703.07 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

Figure 1
Project Location

00703.07 Noise Report (8-08)

ICF Jones & Stokes
an ICF International Company

Figure 2a
Noise Measurement Locations, Pt. 1

LEGEND

- ST-19 Short Term Monitoring Locations
- LT-2 Long Term Monitoring Locations
- M-17 Modeling Monitoring Locations
- Existing Sound Walls

00703.07 Noise Report (7-08)

ICF Jones & Stokes
an ICF International Company

Figure 2b
Noise Measurement Locations, Pt. 2

LEGEND

- ST-19 Short Term Monitoring Locations
- LT-2 Long Term Monitoring Locations
- M-17 Modeling Monitoring Locations
- Existing Sound Walls

00703.07 Noise Report (7-08)

ICF Jones & Stokes
an ICF International Company

Figure 2c
Noise Measurement Locations, Pt. 3

LEGEND

- ST-19 Short Term Monitoring Locations
- LT-2 Long Term Monitoring Locations
- M-17 Modeling Monitoring Locations
- Existing Sound Walls

00703.07 Noise Report (7-08)

ICF Jones & Stokes
an ICF International Company

Figure 2d
Noise Measurement Locations, Pt. 4

Environmental Setting

Fundamentals of Environmental Noise

Noise is generally defined as *unwanted sound*. It may be loud, unpleasant, unexpected, or undesired sound typically associated with human activity that interferes with or disrupts normal noise-sensitive ongoing activities of others. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance and suitability of the noise in a particular setting, the time of day and type of activity during which the noise occurs, and the sensitivity of the individual. The response to vibration is similar. First, the vibration needs to be of sufficient magnitude to be perceived, and then it typically would have to interfere with a desirable activity to cause annoyance.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium such as air that are sensed by the human ear. Sound is generally characterized by frequency and intensity. Frequency describes the sound's pitch and is measured in hertz (Hz); intensity describes the sound's level, volume, or loudness and is measured in decibels (dB). Sound frequency is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates at a certain number of times per second. Vibration of the drum skin at a rate of 100 times (or cycles) per second generates a sound pressure wave that is said to be oscillating at 100 Hz, and this pressure oscillation is perceived as a tonal pitch of 100 Hz. Sound frequencies between 20 Hz and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency and may therefore be referred to as a *pure tone*. However, most sounds heard in the environment do not consist of a single frequency but rather a broad band of frequencies differing in individual sound levels. The method commonly used to quantify environmental sounds consists of evaluating all the frequencies of a sound according to a weighting system that reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This frequency-dependent modification is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

A sound level of 0 dBA is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

In general, human sound perception in a community environment is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving sound level. Because of the logarithmic scale of the decibel unit, sound levels cannot be added or subtracted arithmetically. A simple rule of thumb is useful in dealing with sound levels. If a sound's physical intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example, 60 dB plus 60 dB equals 63 dB, and 80 dB plus 80 dB equals 83 dB. However, as mentioned earlier, a perception of doubling of sound level requires about a 10-decibel increase.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a mixture of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. A single descriptor called the L_{eq} (equivalent sound level) is used to describe the average acoustical energy in a time-varying sound. L_{eq} is the energy-mean A-weighted sound level present or predicted to occur during a specified interval. It is the "equivalent" constant sound level that a given source would need to produce to equal the fluctuating level of measured sound. It is often desirable to also know the range of acoustic levels of the noise source being measured. This is accomplished through the L_{max} and L_{min} noise descriptors. They represent the root-mean-square maximum and minimum obtainable noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location represents the quietest moment occurring during the measurement period and is often called the *acoustic floor* for that location. Likewise, the loudest momentary sound during the measurement is represented by L_{max}.

To describe the time-varying character of environmental noise, the statistical noise descriptors L_{10}, L_{50}, and L_{90} (or other percentile values) may be used. They are the noise levels equaled or exceeded 10, 50, and 90 percent, respectively, of the time during the measured interval. The percentile descriptors are most commonly found in nuisance noise ordinances to allow for different noise levels for various portions of an hour. For example, the L_{50} value would represent 30 minutes of an hour period, the L_{25} would be associated with 15 minutes of an hour, and so on. Of particular interest in this analysis are other descriptors of noise that are commonly used to help determine noise/land use compatibility and to predict an average community reaction to adverse effects of environmental noise, including traffic-generated and industrial noise. One of the most universal descriptors is the Day-Night Average Sound Level (DNL or L_{dn}). As recommended by the state health department and state planning law, planning agencies use this descriptor. The L_{dn} noise metric represents a 24-hour period and applies a time-weighted factor designed to penalize noise events that occur

during nighttime hours, when relaxation and sleep disturbance is of more concern than during daytime hours. Noise occurring during the daytime hours between 7:00 a.m. and 10:00 p.m. receives no penalty. Noise occurring between 10:00 p.m. and 7:00 a.m. is penalized by adding 10 dB to the measured level. In California, the use of the Community Noise Equivalent Level (CNEL) descriptor is permitted. CNEL is identical to L_{dn} except CNEL adds a 5 dB penalty for noise occurring during evening hours between 7:00 p.m. and 10:00 p.m.

Existing Noise Environment

Land Uses

The East-West Connector Project extends through the cities of Fremont and Union City. Land uses around the project area consist primarily of residential and open space areas along the new roadway segment, as well as some commercial, industrial, park uses, and a church. The land uses along the roadways to be widened are primarily commercial and residential.

Noise Monitoring Survey

A noise monitoring survey was performed from April 8 to 17, 2008, to establish baseline noise conditions and to identify noise sensitive receptors in the vicinity of the project alignment. Five long-term (24+ hour) and 26 short-term (10- to 20-minute) measurements were conducted. The long-term (LT) and short-term (ST) monitoring locations are shown in Figure 2). Sound level measurements were conducted using Larson Davis Model 700 and 812 Sound Level Meters, set to slow time response and using A-Weighting (dBA). Traffic volume counts were conducted concurrent to the short-term noise measurements.

Long Term Measurements

Measurement LT-1 was located about 90 feet from the center of Decoto Road, west of Ozark River Way. The primary noise source at this location was traffic along Decoto Road, which was calculated to generate a noise level of 71 dBA L_{dn} at the measurement location. The hourly trend in noise levels at LT-1 is displayed graphically in Figure 3.

Measurement LT-2 was located about 90 feet from the center of Paseo Padre Parkway, south of Wyndam Drive. A noise level of 69 dBA L_{dn}, generated primarily by traffic along Paseo Parkway, was calculated to occur at the measurement location. Figure 4 shows the hourly trend in noise levels at LT-2.

Measurement LT-3 was located just off Clover Drive, at the location of homes adjacent to the proposed new roadway alignment near Old Alameda Creek. Noise levels in this location were low, generated primarily by distant

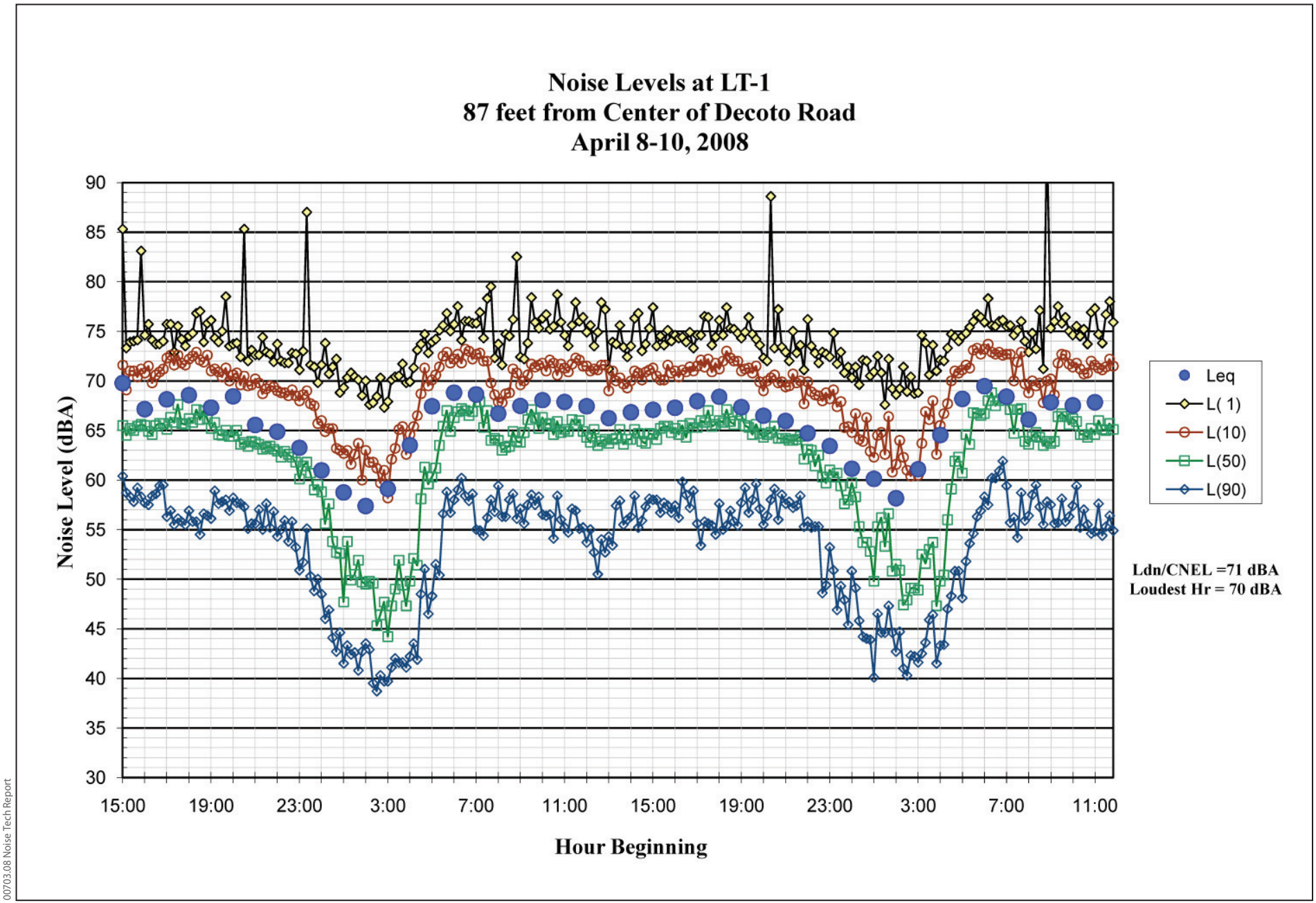
construction and transportation noise sources, including train horns and airplanes, and by natural noises, including birds and wind in the surrounding foliage. The day-night average noise level at this location was calculated to be 56 dBA L_{dn}. Figure 5 shows the hourly trend in noise levels at LT-3.

Measurement LT-4 was located about 40 feet from the UPRR tracks and about 110 feet from the center of the two BART tracks, to the south of the Alvarado-Niles Road overcrossing. The UPRR tracks are elevated by about 6 feet above the grade at the measurement location. The primary noise source at this location was BART trains, which pass by the site at regular intervals, about 1 train every 4 minutes during daytime hours. Occasional airplanes and freight trains also generate intermittent high noise levels. Based on the BART train schedule (available online), a total of 266 BART trains pass by the site each weekday; with 188 trains during daytime hours (7:00 a.m. to 7:00 p.m.), 28 trains during evening hours (7:00 a.m. to 10:00 p.m.), and 50 trains during nighttime hours (10:00 p.m. to 7:00 a.m.). There are no BART trains scheduled between the hours of 1:15 a.m. and 4:05 a.m. Maximum noise levels generated during BART train passbys typically ranged from 65 to 75 dBA L_{max}. Freight trains generated similar maximum noise levels and passed by the site during all hours, including late night and early morning hours. Aircraft generated lower noise levels, in the range of 50 to 60 dBA L_{max}. Based on review of the data, the 24-hour average calculated noise level was 60 dBA L_{dn} on weekdays (April 10 to 11, 2008), 58 dBA L_{dn} on Saturday (April 12, 2008), and 56 dBA L_{dn} on Sunday (April 13, 2008). The hourly trend in noise levels at LT-4 is displayed graphically in Figure 6.

Measurement LT-5 was located about 110 feet from the UPRR tracks, at the residential setback along King Avenue. Background noise levels at this location were generated by distant transportation noise sources, including traffic and aircraft. Freight trains typically generated maximum noise levels in the range of 70 to 80 dBA L_{max}. Based on overview of the data, approximately 2 train operations occurred per hour, including nighttime and early morning hours. The 24-hour average noise level at this location ranged from 62 to 66 dBA L_{dn}, depending on the number of nighttime train operations. The hourly trend in noise levels at LT-5 is displayed graphically in Figure 7.

Short-Term Measurements

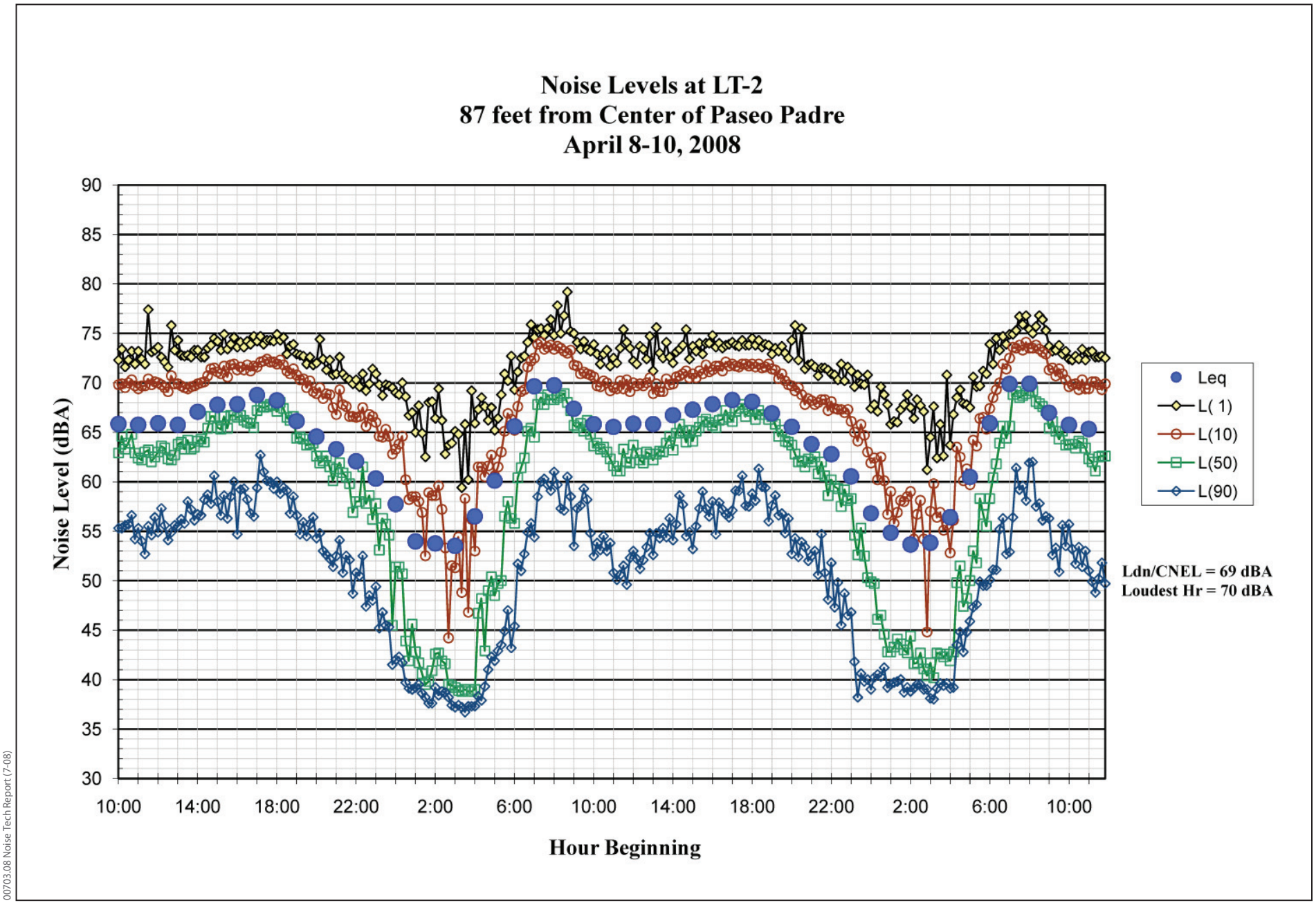
The 26 attended short-term measurements were conducted at locations representative of noise sensitive receptors along the project alignment to establish the existing baseline noise conditions and for use in calibrating the noise model. Measurements were conducted at a height of 5 feet above the surrounding ground. Meteorological conditions during the short-term measurements consisted of clear to overcast skies with temperatures ranging from 56 to 84ºF and winds speeds from 0 to 4 miles per hour (mph). The results of the sound level measurements are summarized in Table 1.



00703.08 Noise Tech Report

ICF Jones & Stokes
an ICF International Company

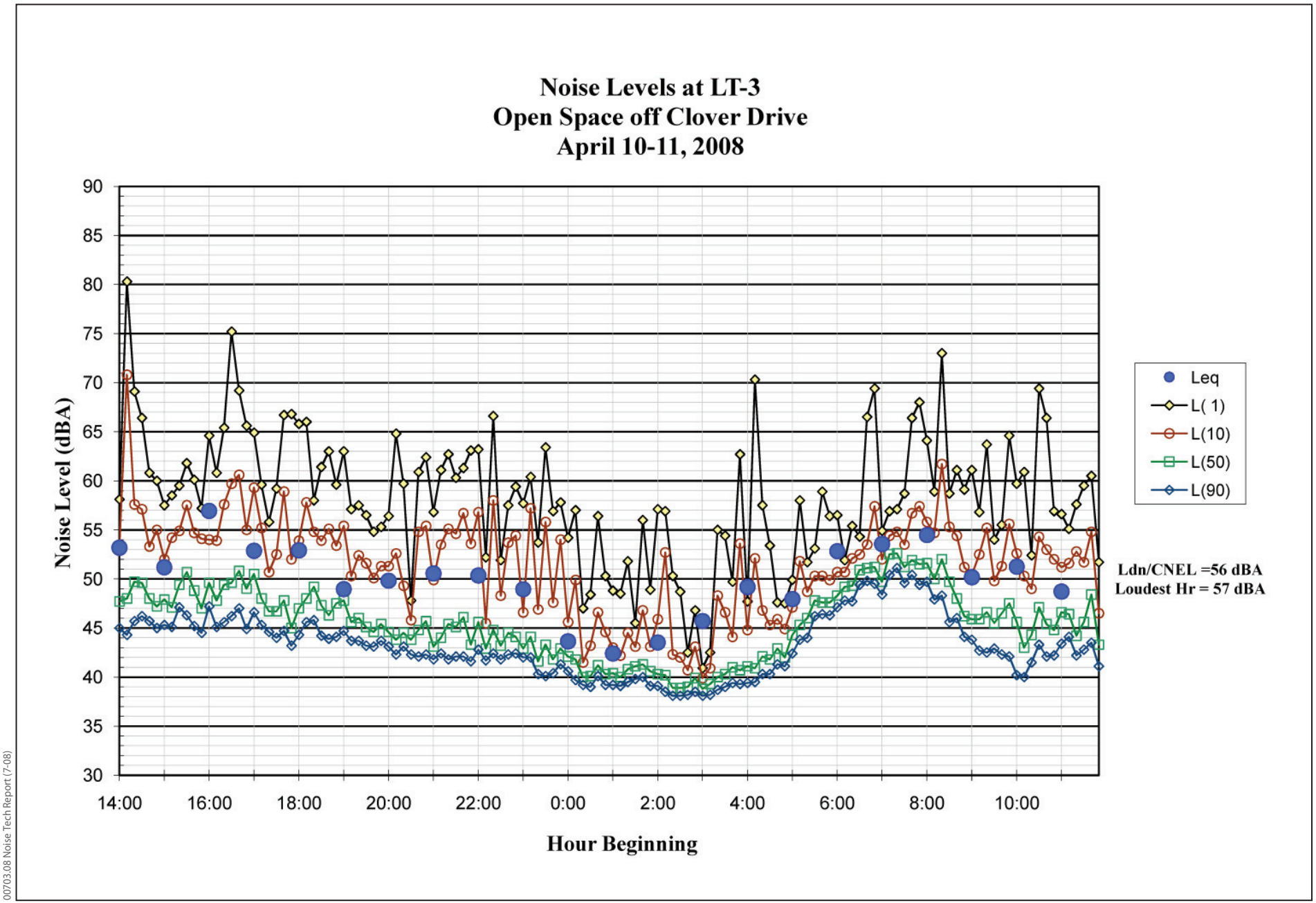
Figure 3
Noise Levels at Monitoring Location LT-1



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

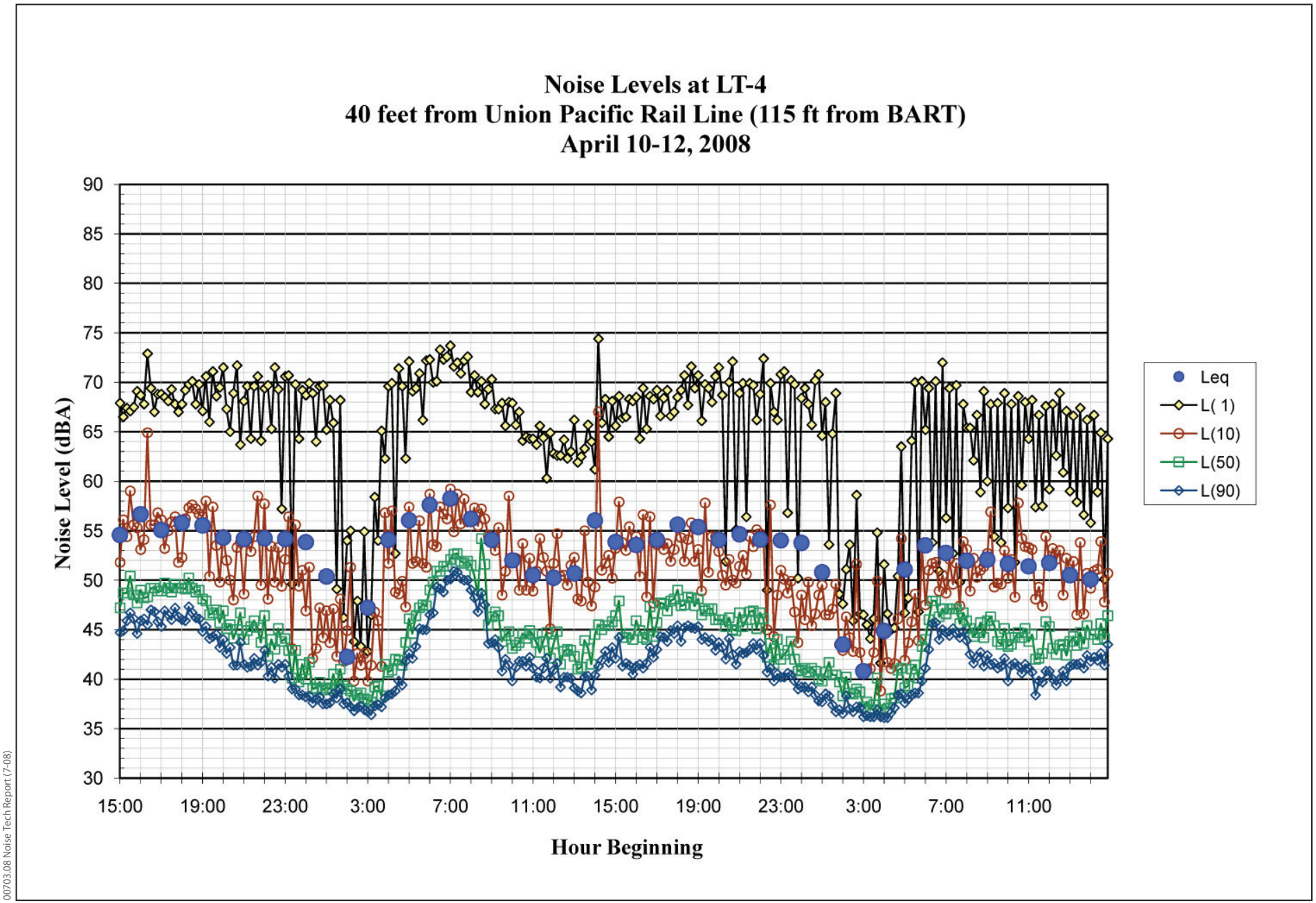
Figure 4
Noise Levels at Monitoring Location LT-2



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

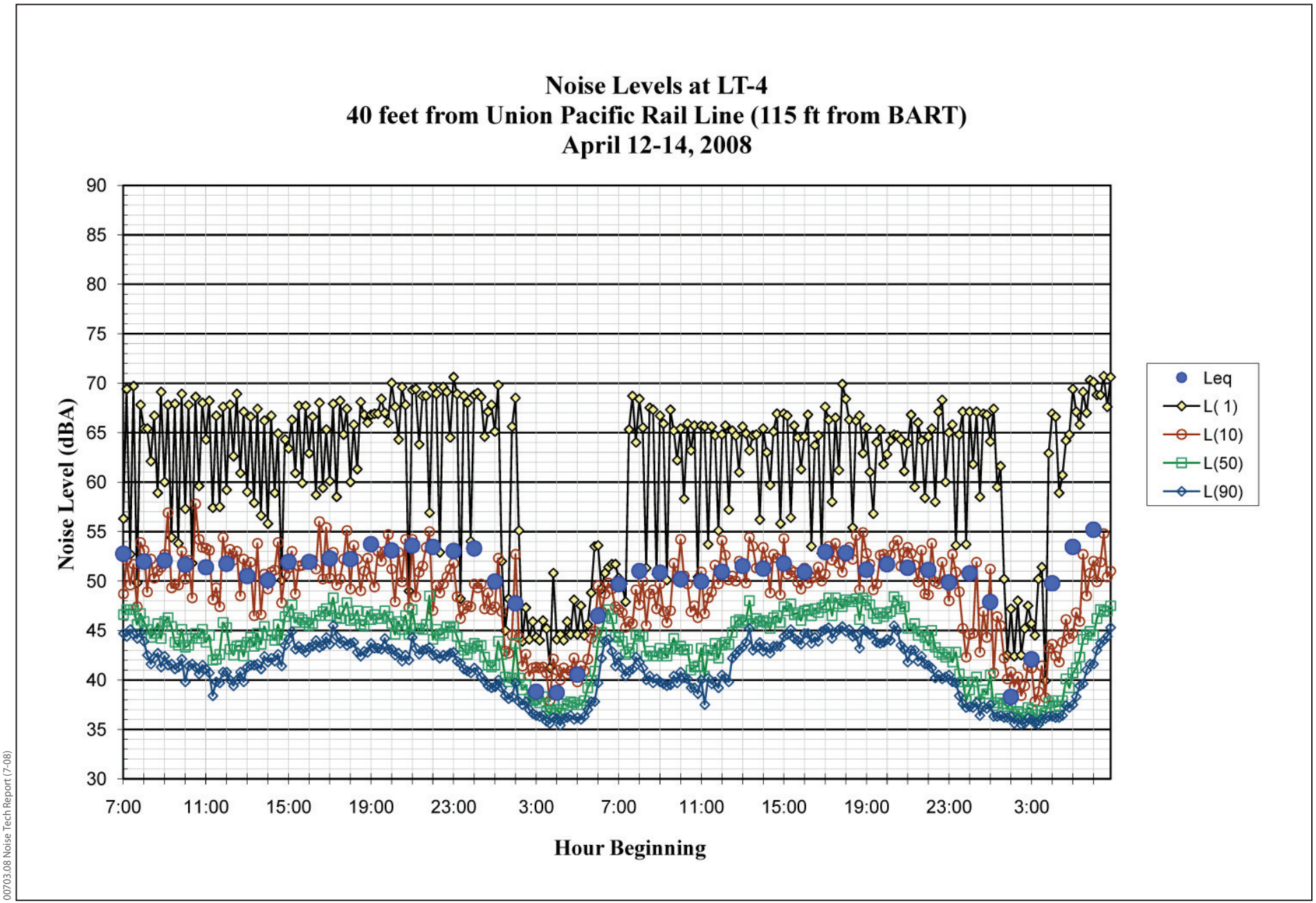
Figure 5
Noise Levels at Monitoring Location LT-3



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

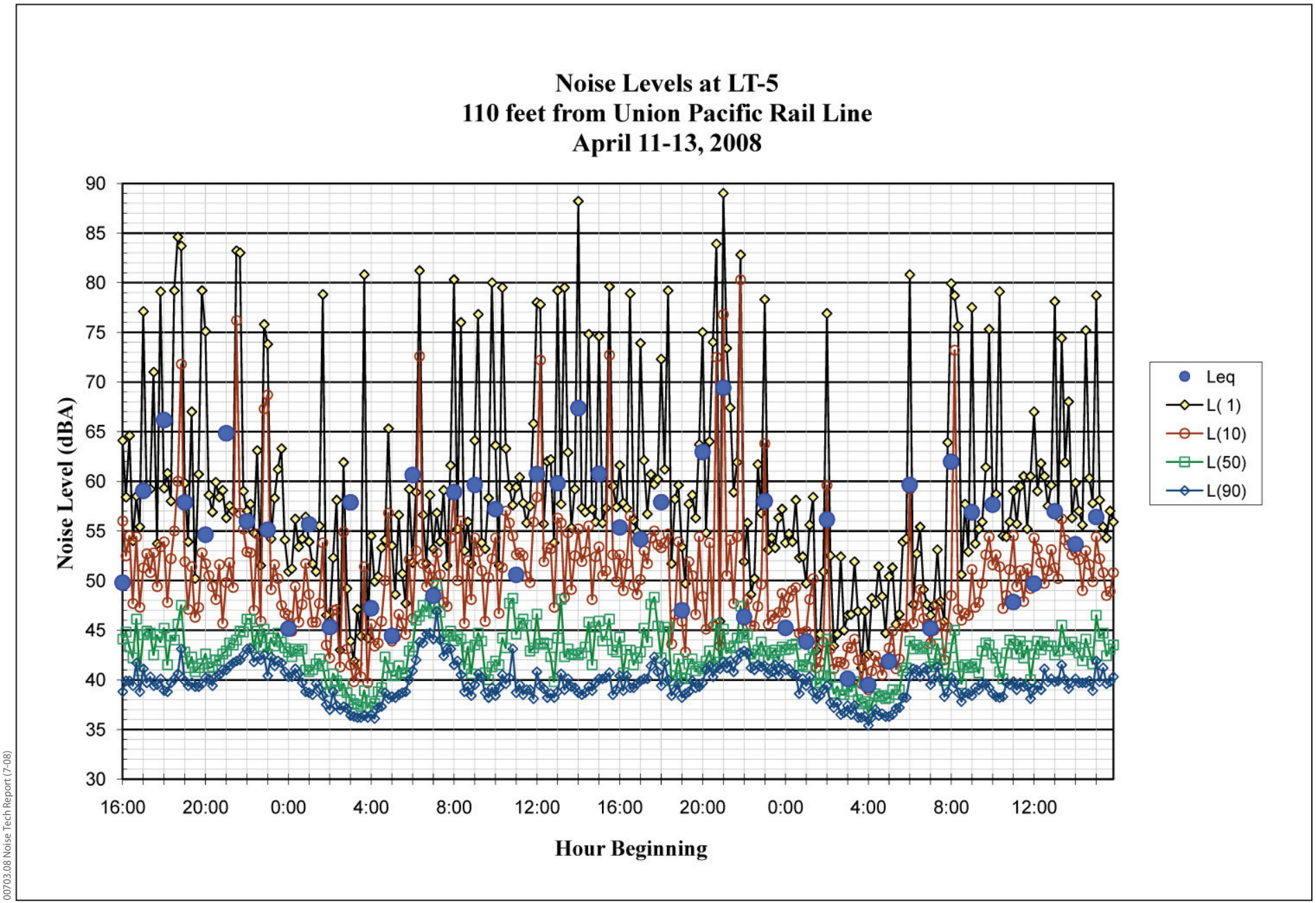
Figure 6a
Noise Levels at Monitoring Location LT-4, Part I



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

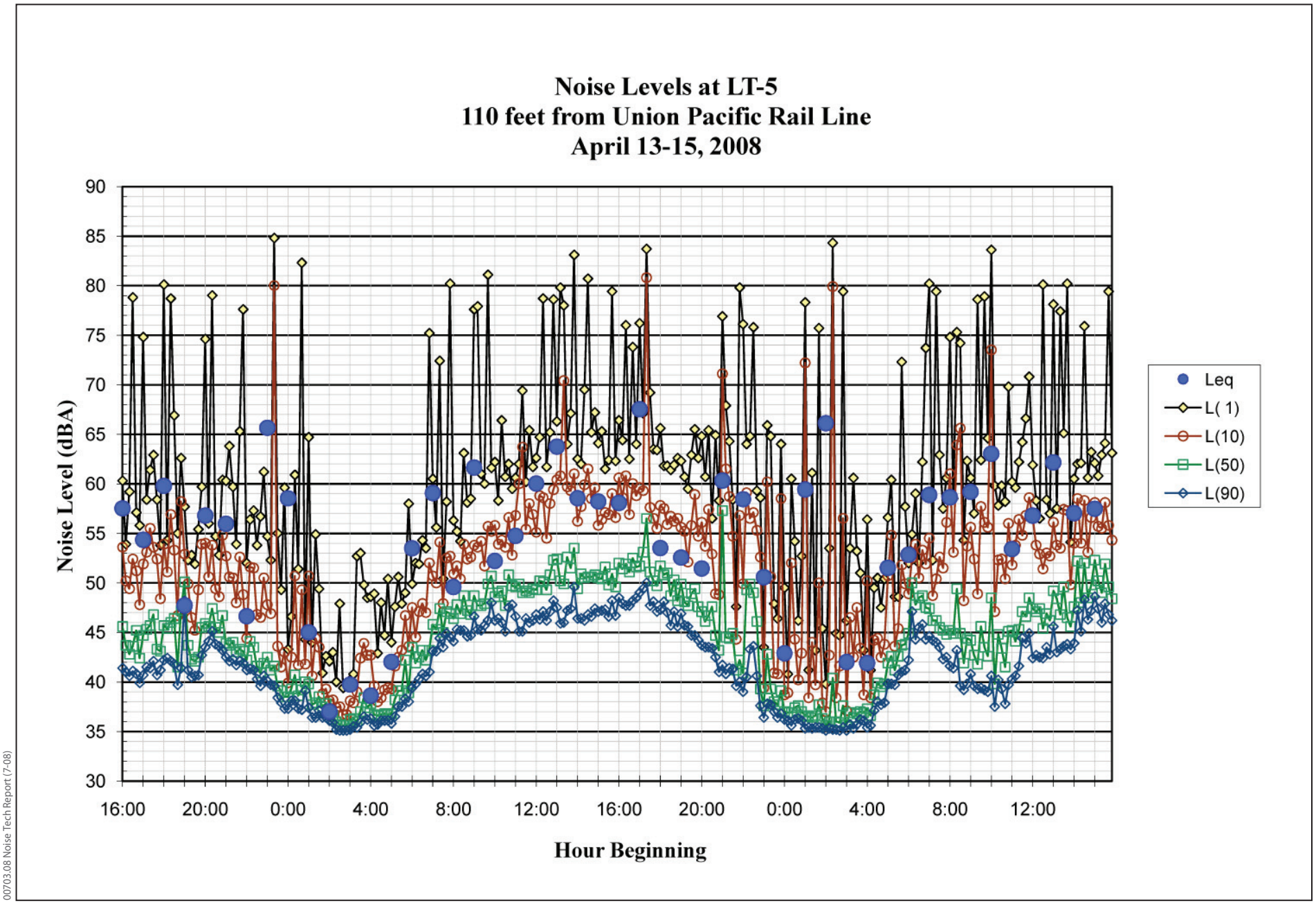
Figure 6b
Noise Levels at Monitoring Location LT-4, Part II



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

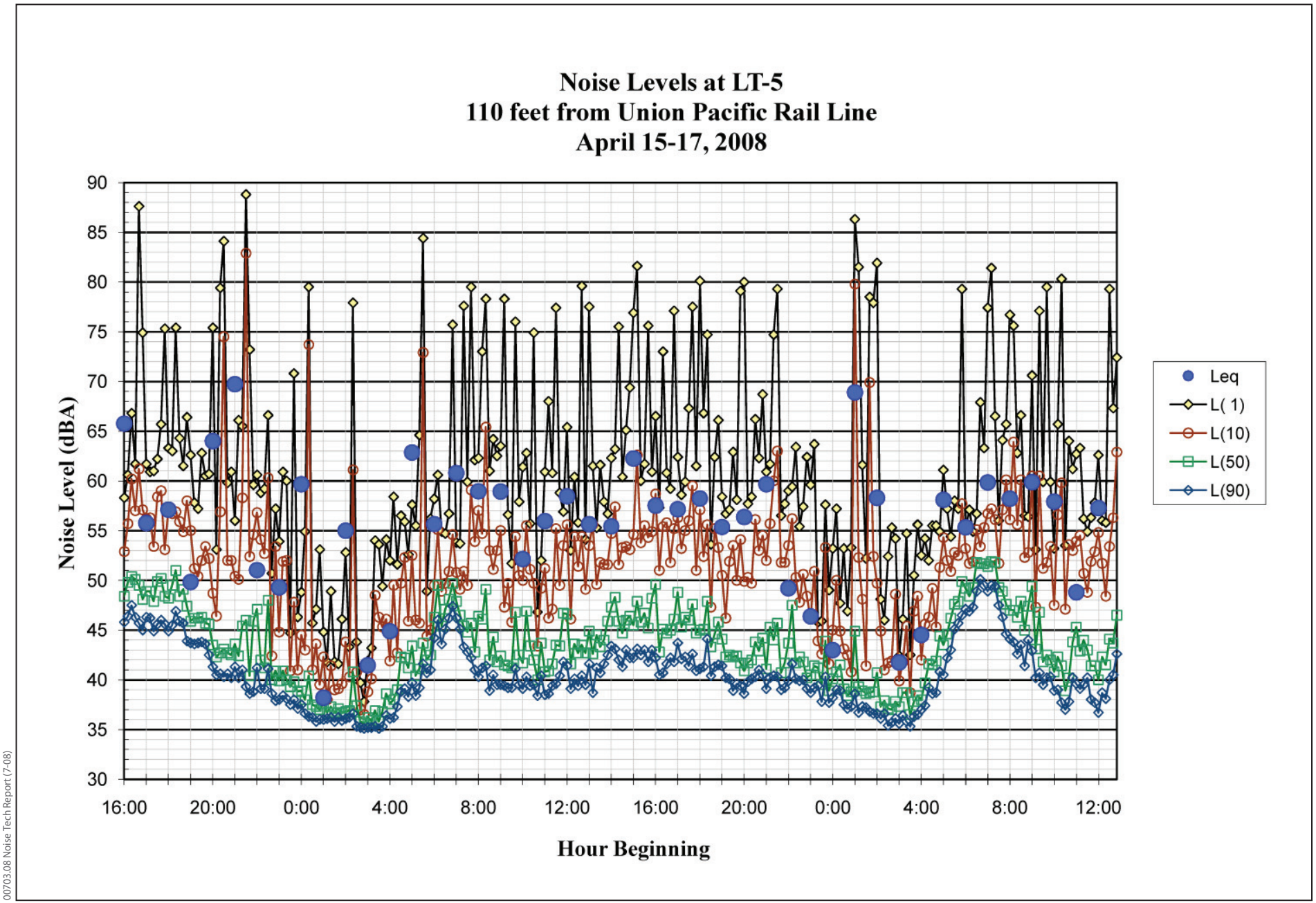
Figure 7a
Noise Levels at Monitoring Location LT-5, Part I



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

Figure 7b
Noise Levels at Monitoring Location LT-5, Part II



00703.08 Noise Tech Report (7-08)

ICF Jones & Stokes
an ICF International Company

Figure 7c
Noise Levels at Monitoring Location LT-5, Part III

Table 1. Baseline Noise Measurements

Site ID	Measurement Location (Date, Time)	Acoustical Shielding	Primary Noise Source	Measurement Results (dBA)			
				L_{eq}	L_{90}	L_{50}	L_{10}
ST-1	Backyard of 4318 Calypso Terrace (4/8/2008, 11:00–11:20 a.m.)	7-foot high wall	Traffic on Decoto Road	60	54	58	63
ST-2	Setback of 4194 Decoto Road (4/8/2008, 11:00–11:20 a.m.)	None	Traffic on Decoto Road	69	57	67	73
ST-3	Setback of 34930 Seal Rock Terrace (4/8/2008, 11:30–11:50 a.m.)	3-foot high wall	Traffic on Decoto Road	63	55	61	66
ST-4	Setback of 34821 Fremont Blvd (4/8/2008, 11:30–11:50 a.m.)	None	Traffic on Fremont Blvd	61	54	60	64
ST-5	Setback of 3853 Decoto Road (4/8/2008, 1:20–1:40 p.m.)	None	Traffic on Decoto Road	70	56	66	75
ST-6	Backyard of 34996 Silverlock Court (4/10/2008, 10:20–10:40 a.m.)	10-foot high wall	Traffic on Decoto Road	57	50	55	60
ST-7	Backyard of 35120 Ramblewood Ct (4/8/2008, 1:20–1:40 p.m.)	8-foot high wall	Traffic on Decoto Road	58	51	57	62
ST-8	Setback of 3425 Decoto Road (4/10/2008, 10:20–10:40 a.m.)	None	Traffic on Decoto Road	64	50	61	68
ST-9	Backyard of 3255 Cade Drive (4/10/2008, 11:00–11:20 a.m.)	5-foot high wall	Traffic on Paseo Padre Pkwy	57	49	55	61
ST-10	Setback of 3198 Waugh Place (4/10/2008, 11:00–11:20 a.m.)	None	Traffic on Paseo Padre Pkwy	63	48	60	67
ST-11	Backyard of 35540 Dee Place (4/10/2008, 11:40–12:00 p.m.)	5-foot high wall	Traffic on Paseo Padre Pkwy	53	44	51	56
ST-12	Paseo Padre Parkway (4/10/2008, 11:40–12:00 p.m.)	None	Traffic on Paseo Padre Pkwy	70	55	65	75
ST-13	Backyard of 2723 Oaktree Court (4/11/2008, 12:50–1:00 p.m.)	None	Traffic on Paseo Padre Pkwy	48	43	48	51
ST-14	Side of 35583 Chaplin Drive (4/10/2008, 3:20–3:40 p.m.)	None	Aircraft, birds, residential noises	50	44	47	53
ST-15	Side of 35607 Barnard Drive (4/10/2008, 3:20–3:40 p.m.)	None	Distant traffic, aircraft, roosters, residential noises	53	47	50	56
ST-16[1]	Arroyo Park (4/11/2008, 9:50–10:10 a.m.)	None	Distant/local traffic, aircraft, train horns, residential noises	50	41	45	54
ST-17	Quarry Lakes Drive (4/10/2008, 2:30–2:50 p.m.)	None	Distant traffic, aircraft, roosters, residential noises	59	46	55	64
ST-18	Setback of 35509 Monterra Circle (4/10/2008, 2:30–2:50 p.m.)	7-foot high wall	Traffic on Alvarado Niles Road	54	47	52	57
ST-19	Setback of 1071 Tourmaline Terrace (4/11/2008, 4:20–4:40 p.m.)	12-foot high berm	Distant traffic, BART	44	38	40	47

Site ID	Measurement Location (Date, Time)	Acoustical Shielding	Primary Noise Source	Measurement Results (dBA)			
				L_{eq}	L_{90}	L_{50}	L_{10}
ST-20	Backyard of 34770 Klondike Drive (4/11/2008, 3:35–3:55 Pp.m.	7-foot high wall	Aircraft, BART	60	35	40	53
ST-21	End of Chesapeake Court (4/11/2008, 12:10–12:30 p.m.)	8-foot high wall	Distant traffic, aircraft, construction, birds	48	41	44	52
ST-22[1]	Dog Park off 7th Street (4/11/2008, 12:10–12:30 p.m.)	None	Traffic on Mission Boulevard and 7th Street	58	49	56	61
ST-23[1]	Park off Wildflower Lane (4/11/2008, 10:50–11:10 a.m.)	10-foot high wall	Traffic on Mission Blvd, aircraft, residential noises	57	49	55	60
ST-24	Apartments off Mission Blvd (4/11/2008, 10:50–11:10 a.m.)	7-foot high wall	Traffic on Mission Blvd, aircraft, residential noises	63	48	60	67
ST-25	34864 Mission Blvd, Bldg M (4/11/2008, 11:30–11:50 a.m.)	6-foot high wall	Traffic on Mission Boulevard	58	49	57	62
ST-26	Setback of 149 Black Mountain Cir (4/11/2008, 11:30–11:50 a.m.)	None	Traffic on Mission Boulevard	69	55	67	73

[1] This receptor location would be subject to neighborhood park thresholds; all others are subject to residential thresholds.

Regulatory Setting

The State of California, the City of Union City, and the City of Fremont have each established plans and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies are contained in: (1) the State CEQA Guidelines, Appendix G, (2) the City of Union City General Plan, (3) the Union City Community Noise Ordinance, and (4) the City of Fremont General Plan.

State Regulations

California Environmental Quality Act

CEQA contains the following guidelines to evaluate the significance of noise impacts attributable to a proposed project. Based on the CEQA Guidelines, a proposed project would have a significant impact on the noise environment if it would result:

- Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies;
- Expose persons to or generate excessive ground borne vibration or ground borne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Be located within an airport land use plan area or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels; or
- Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels.

Of these guidelines, items (a), (c), and (d) are applicable to the proposed project and were considered in the analysis presented in this report. Guideline (b) is applicable to the project, particularly with respect to the temporary railroad relocations that are required to construct the project's grade separations, but a

separate vibration analysis is being prepared, and the issue is not addressed in this report. Guidelines (e) and (f) are not applicable because the project is not located in the vicinity of any public airport or private airstrip.

Local Regulations

City of Union City General Plan, Health and Safety Element

The City of Union City's Health and Safety Element includes noise policies to "protect public health and welfare by minimizing excessive noise" (City of Union City 2002). Based on Table HS-2 in the General Plan (not shown), noise exposure would be considered "normally acceptable" if exterior noise levels do not exceed 60 dBA CNEL at residences or transient lodgings, and 70 dBA CNEL at playgrounds or neighborhood parks. The interior noise standard for residences is specified as 45 dBA CNEL. The following policies would be applicable to the proposed project.

HS-C.1.6 ...Require, where necessary and feasible, the inclusion of noise mitigation measures in the design of new roadway projects in Union City. …Appropriate mitigation measures should be included in any final project plans.

HS-C.1.5 The City shall minimize potential transportation noise through the proper design of street circulation, coordination of routing, and other traffic control measures.

HS-C.1.7 To minimize the impacts of stationary noise, the City shall limit construction activities between the hours of 8:00 a.m. and 8:00 p.m. on Monday through Friday, 9:00 a.m. and 8:00 p.m. on Saturdays, and Sundays and holidays, between 10:00 a.m. and 6:00 p.m.

Union City Community Noise Ordinance

Section 9.40.053 of the Union City Municipal Code addresses noise from construction. Construction operations that occur between the hours of 8:00 a.m. and 8:00 p.m. on Monday through Friday, 9:00 a.m. and 8:00 p.m. on Saturdays, and 10:00 a.m. and 6:00 p.m. on Sundays and holidays are exempt from the provisions of the Noise Ordinance, if they meet at least one of the following noise limitations.

A. No individual piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet. If the device is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close to 25 feet from the equipment as possible.

B. The noise level at any point outside the property plane of the project shall not exceed 86 dBA.

City of Fremont General Plan, Health and Safety Element

The City of Fremont's Health and Safety Element includes noise policies to provide "an acceptable noise level throughout the community" (City of Fremont, 1991). Based on Figure 10-11 [not shown here] in the General Plan and Policy HS 8.1.1, the maximum acceptable noise level for new residential areas where outdoor use is a major consideration (e.g., backyards in single family housing developments and recreation areas in multi-family housing projects) is 60 dBA L_{dn}. However, an L_{dn} of 65 dBA may be permitted at the discretion of the City Council, and an outdoor noise exposure criterion of 70 dBA L_{dn} is established in areas where the noise source is a railroad. The interior noise standard for new housing units is specified as 45 dBA L_{dn}. The following policies would be applicable to the proposed project.

HS 8.1.2 Protect the noise environment in existing residential areas. In general, the City will require the evaluation of mitigation measures for projects under the following circumstances.

- The project would cause the L_{dn} to increase by 3 dBA or more
- An increase would result in an L_{dn} greater than 60 dBA
- The L_{dn} already exceeds 60 dBA
- The project has the potential to generate significant adverse community response

HS 8.1.6 Design city streets to reduce noise levels in adjacent areas. Continue to require sound walls, earth berms, setbacks and other noise reduction techniques as conditions of development approval.

City of Fremont Municipal Code

Section 8-2205 of the Fremont Municipal Code establishes limitations in construction hours occurring within the city. For projects located within 500 feet of residences, lodging facilities, nursing homes or inpatient hospitals, construction is limited to occurring between 7:00 a.m. and 7:00 p.m., Monday through Friday, and between 9:00 a.m. and 6:00 p.m. on Saturdays and holidays. Sunday construction is not allowed. For projects located beyond 500 feet of the facilities named above, weekday construction hours are limited to 6:00 a.m. to 10:00 p.m., and Saturday, Sunday, and holiday hours are limited to 8:00 a.m. to 8:00 p.m. All project-related construction occurring within the boundaries of the City of Fremont would occur within at least 500 feet of residences. Therefore, the more restrictive hours limitations would apply. The city has the authority to modify these hours under several circumstances, including "When the project is located in a right-of-way or easement or on publicly-owned property, and such modified hours, on balance, will minimize disruption to the community as a whole, such as to facilitate the orderly flow of traffic or to reduce negative impacts on commercial or residential activity."

Potential Impacts and Recommended Mitigation

Methodology

Traffic noise levels were predicted using the Federal Highway Administration (FHWA) Traffic Noise Model Version 2.5 (TNM 2.5). Three-dimensional representations of roadways, shielding features (e.g., topography and buildings), noise barriers, ground type, and receivers were developed using CAD drawings, aerials, and topographic contours provided by T.Y.LIN International and input into the traffic noise model. Noise levels were modeled in TNM 2.5 using the "Average" pavement type, as specified in the Caltrans Protocol. Traffic noise was evaluated under existing conditions, year 2035 no-project conditions, and year 2035 with-project conditions. Morning and afternoon peak hour traffic volumes under existing and design-year (2007 and 2035) conditions were provided by Dowling Associates, Inc. for input into the traffic noise model. Percentages of vehicles (automobiles, medium trucks, and heavy trucks) and site conditions (terrain or structural shielding and ground propagation characteristics) were based on observations made during the site visit and review of aerial maps of the area. Traffic speeds were modeled as 5 mph above posted limits, based on observations made during the site visit. Based on the noise monitoring survey, the L_{dn} noise level was typically within about 1 dBA of the loudest hour, which occurred during either the AM or PM peak hour depending on the location of the receptor with respect to the direction of travel of the adjacent roadway. As a result, both AM and PM peak hour traffic volumes were assessed using the model. The higher of the modeled noise level results between the AM and PM peak hour traffic volumes were used to estimate the L_{dn} noise levels.

To validate the accuracy of the model, a program called TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. For each receiver, traffic volumes counted during the short-term measurement periods were normalized to 1-hour volumes and input into the model to simulate the noise source strength at the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and if additional calibration of the model was necessary.

Calculations assume an ambient background noise level of about 55 dBA L_{dn} based on noise measurements conducted in areas located away from any major traffic, railroad, or other noise sources. The ambient noise level in the area

results primarily from aircraft, distant traffic and rail operations, and natural noises such as birds and wind. The ambient background noise level of 55 dBA L_{dn} was added[1] to the modeled TNM levels to result in an overall L_{dn} noise level at each receptor.

Significance Criteria

This analysis uses significance thresholds that represent a combination of the Fremont and Union City noise standards and the more conservative of the two where they differ. The significance thresholds are described below.

It should be noted that different significance thresholds were used for the noise analysis in the 1995 noise study prepared by Parsons Engineering Science, Inc., and the 2002 environmental impact statement/environmental impact report (EIS/EIR) that was prepared for the Route 84 Realignment Project (a previous version of the proposed project). The EIS/EIR was prepared pursuant to Caltrans/FHWA guidelines and, therefore, used significance thresholds maintained by those agencies. However, due to the absence of primary Caltrans authority from this project, it is appropriate to use significance thresholds consistent with the local planning guidelines.

Traffic Noise Increases—Exterior

The proposed project is considered to result in a significant traffic noise impact at existing offsite noise sensitive uses if it would:

- Result in a noise increase of 3 dBA or more where the resulting exterior noise levels with project traffic would exceed the noise and land use compatibility thresholds (60 dBA L_{dn}[2] for residences and 70 dBA L_{dn} for parks); or
- Cause exterior noise levels at noise sensitive uses to exceed the exterior noise and land compatibility thresholds in areas that would maintain noise levels below these thresholds under no-project conditions.

In both cases the increase in noise is based on comparing project and no-project conditions within the same time frame.

[1] Note that because of the logarithmic scale of the decibel unit, sound levels cannot be added or subtracted arithmetically. Using the logarithmic decibel scale, 55 dB plus 55 dB equals 58 dB, and 70 dB plus 55 dB equals 70 dB.

[2] Union City uses "CNEL" for their noise threshold, while Fremont uses L_{dn}. These are very similar rating systems used to estimate noise averages over a 24-hour period. L_{dn} and CNEL values differ by less than 1 dB and for the purposes of simplicity and compliance with generally accepted industry standards. L_{dn} is used in this assessment.

Traffic Noise Increases—Interior

An interior noise impact would be considered significant where interior noise levels are anticipated to exceed 45 dBA L_{dn} The proposed project is considered to result in a significant traffic noise impact at existing offsite noise sensitive uses if it would:

- Result in a noise increase of 3 dBA or more where the resulting noise levels inside residences with project traffic would exceed 45 dBA L_{dn}; or
- Cause noise levels inside residences to exceed 45 dBA L_{dn} in areas that would maintain noise levels below these thresholds under no-project conditions.

Construction Noise

A construction noise impact would be considered significant if noise-generating construction activities located within 500 feet of residences would occur outside of the construction hours specified in the City of Union City noise ordinance (8:00 a.m. to 8:00 p.m. Monday through Friday, 9:00 a.m. to 8:00 p.m. Saturday, 10:00 a.m. to 6:00 p.m. Sunday and Holidays).

Potential Impacts and Mitigation

The East West Connector Project would widen and improve portions of Decoto Road and Paseo Padre Parkway and construct a new roadway between Paseo Padre Parkway and Mission Boulevard. Construction of the project and the shoofly (temporary realignment of the freight and BART railroad lines to allow for the construction of under crossings under the tracks) would generate short term increases in noise at nearby noise sensitive receptors. Operational traffic noise increases would result along the widened roadways when closer to noise sensitive uses and along the new roadway segment where adjacent to existing residences.

Construction Noise

Impact: Exposure of Off-Site Noise Sensitive Land Uses to Short-Term Construction Noise

Construction of the proposed project would require the use of heavy equipment that could generate high noise levels in the immediate project area. Construction is anticipated to occur from 2010 and 2015. Widening of the existing roadway segments is anticipated to take approximately 18 months, and construction of new roadway segments is anticipated to take about 24 months. Construction of the new roadway underpass structures and shooflys for the BART and UPRR

tracks along the Niles and Oakland subdivisions to accommodate the construction of the new roadway at the segments where it would cross under the tracks is anticipated take place intermittently over a period of 2 to 3 years. The impact associated with the temporary increase in railroad noise levels during the realignment is addressed separately in the subsequent impact assessment. Although the overall project construction would take place over a multi-year period, noisy construction activities would typically be limited to a few weeks in duration for any one location. During construction of the project, construction activities would take place within 50 feet from adjacent noise sensitive land uses. Construction activities are anticipated to primarily occur during daytime hours, as specified by the Union City and Fremont noise ordinances. However, it is anticipated that construction of portions of the temporary realignment of the BART tracks would occur between the hours of 1:15 a.m. and 4:05 a.m. when there are no BART trains scheduled, in order to minimize the impacts of construction on BART operations.

Examples of equipment used for roadway construction include concrete mixers, bulldozers, backhoes, and heavy trucks. Typical noise levels from this type of equipment are provided in Table 2.

Table 2. Typical Construction Noise Levels

Equipment	Typical Noise Level (dBA) 50 feet from Source
Grader	85
Bulldozers	85
Truck	88
Loader	85
Roller	74
Air Compressor	81
Backhoe	80
Pneumatic Tool	85
Paver	89
Concrete Pump	82

Source: Federal Transit Administration 2006.

Based on the types of construction activities and equipment required for the proposed project, noise levels at 15 meters (50 feet) from the center of construction activities would generally range from 80 to 85 dBA during peak periods. Because not all of the equipment would be operating at the same time or for the entire day, the hourly average L_{eq} from project construction would be substantially lower. Hourly average noise levels during active construction periods would typically range from 75 to 80 dBA L_{eq} at a distance of 50 feet. Noise produced by construction equipment typically attenuates over distance at a rate of about 6 dB per doubling of distance. Noise levels are typically further reduced by 5 to 10 dBA where shielding is provided by intervening walls or structures located between the construction and noise sensitive uses.

Hourly average construction noise levels could reach more than 10 dBA above ambient noise levels at some locations, particularly at locations adjacent to the new roadway segment construction where existing ambient noise levels are low, and noise levels would be as high as 55 dBA L_{eq} inside homes (assuming the windows are shut), with maximum interior noise levels of up to 60 dBA at the closest residences. The noise levels could be high enough to interfere with conversation in backyards and possibly inside homes. During other phases of construction, noise levels would be lower but would still potentially interfere with indoor and outdoor activities.

Although any increase in the background noise level due to project construction would be temporary, construction could potentially occur outside of the hours specified in the cities' noise ordinances, as necessary to minimize disruption of traffic on existing roads. This impact is considered significant but, along the majority of the project alignment, could be reduced to a less than significant level with implementation of mitigation listed below. Where work on the temporary BART realignment requires nighttime work, most of which would occur adjacent to or in the vicinity of residences and which may occur as close as 10 feet to the nearest residence, the impact of nighttime construction noise on adjacent residences would be significant and unavoidable

Mitigation: Employ Measures to Reduce Construction Noise to Comply with Applicable Construction Noise Standards

The construction contractor shall employ measures to reduce construction noise such that noise from construction activity does not violate applicable construction noise standards. Measures that can be implemented to reduce construction noise to acceptable levels include, but are not limited to, the following.

- For construction occurring within the City of Fremont, limit construction to between 7:00 a.m. to 7:00 p.m. Monday through Friday, and to 9:00 a.m. to 6:00 p.m. on Saturdays and holidays, and prohibit construction on Sunday, as stated in the Fremont Municipal Code. If deviation from these limitations is necessary in order to minimize disruption of traffic on existing roads, coordinate with the Fremont City Manager's Office to gain official approval for such work, as allowed in the Fremont Municipal Code.
- For construction occurring within the City of Union City, limit all construction activities, including loading and unloading of materials and on-site truck movements, to the hours between 8:00 a.m. and 8:00 p.m.., Monday through Friday; 9:00 a.m. to 8:00 p.m. Saturday; 10:00 a.m. to 6:00 p.m. Sunday and Holidays, as stated in the Union City Municipal Code.
- Use available noise suppression devices and techniques, including:
  - Equipping all internal combustion engine-driven equipment with mufflers, air-inlet silencers, and any other shrouds, shields, or other noise-reducing features that are in good operating condition and appropriate for the equipment.

- Utilizing "quiet" models of air compressors and other stationary noise sources where such technology exists.
- Utilizing electrically powered equipment instead of pneumatic or internal combustion powered equipment, where feasible.
- Using of noise-producing signals, including horns, whistles, alarms, and bells, for safety warning purposes only.
- Locating stationary noise-generating equipment, construction parking, and maintenance areas as far as reasonable from sensitive receptors when sensitive receptors adjoin or are near the construction project area.
- Prohibiting unnecessary idling of internal combustion engines (i.e., in excess of five minutes).
- Placing temporary barriers or enclosure around stationary noise-generating equipment when located near noise sensitive areas.
- Ensuring that project-related public address or music systems are not audible at any adjacent receptor.
- Notifying adjacent residents in advance of construction work.

Impact: Exposure of Off-Site Noise Sensitive Land Uses to Short-Term Increases in Railroad Noise

Construction of the project would include the shoofly for the BART and UPRR tracks along the Niles and Oakland subdivisions to accommodate the construction of the new roadway at the segments where it would cross under the tracks. Each of the temporary track realignments is anticipated to be in place for 36 weeks. At the time this noise study was prepared, final plans for the shoofly alignment have not yet been prepared, and three alternatives are being considered for the temporary realignment of the Niles Subdivision. During construction of the under pass structures, the Niles Subdivision freight line tracks would be temporarily realigned up to 30 feet to the southwest of the existing tracks under Alternative 1 (about 70 feet from the closest residence). Under the Niles Subdivision Alternative 2, the construction would be carried out in stages with the tracks first realigned up to 10 feet to the northeast (about 15 feet from the closest house) and then realigned up to 40 feet to the southwest of the existing tracks (about 60 feet from the closest residence). Under Alternative 3, the construction would also be carried out in stages with the tracks first being realigned up to 15 feet to the northeast with the closest residence to be relocated and then up to 40 feet to the southwest of the existing tracks (about 60 feet from the closest residence). The Oakland Subdivision freight line tracks would be temporarily realigned 25 feet to the northeast (about 15 feet from the closest residence) and 42 feet to the southwest of the existing tracks (about 90 feet from the closest residence). The BART tracks would be temporarily realigned 70 feet to the northeast (about 55 feet from the closest residence). The closest noise sensitive receptors are currently located within 50 to 100 feet on either side of the existing alignments of these railroad lines. Assuming a worst-case scenario for work on the Niles Subdivision tracks, the temporary realignments would bring

the tracks to distances of about 15 feet from residences to the northeast of the Niles and Oakland Subdivision freight lines (including an assumption of Alternative 2 or 3, the worst-case scenarios for the Niles Subdivision), about 90 feet from residences to the southwest of the Oakland freight line, and about 55 feet from residences to the northeast of the BART tracks.

As a result of the track realignment, freight train noise levels are predicted to increase by 4 to 10 dBA at these residences, and BART noise levels are predicted to increase by about 7 dBA at the closest residence to the northeast. Maximum exterior noise levels of 80 to 100 dBA L_{max} would be anticipated at the closest residences, with maximum noise levels of 55 to 75 dBA L_{max} inside homes (assuming standard California construction with windows closed). Noise levels at ground level in areas that are shielded behind sound barriers would be lower. Although railroad movements are relatively short in duration, maximum noise levels generated during passbys are high and would be expected to interfere with conversations in backyards and inside homes. Late night rail operations, depending on the construction of the affected homes, could cause sleep disturbance. The construction of the shooflies and grade separation structures is addressed in the previous impact discussion.

Each railroad realignment would be in place for a period of approximately 36 weeks. Although the realignment of the tracks would be temporary, railroad operations would occur at the same frequency and times of day as existing operations, including nighttime and early morning operations. These operations would occur outside of the construction hours specified by the City of Union City (8:00 a.m. to 8:00 p.m. Monday through Friday, 9:00 a.m. to 8:00 p.m. Saturday, 10:00 a.m. to 6:00 p.m. Sunday and Holidays). This impact is considered significant. Rail-related noise increases could be reduced with implementation of the following mitigation. Although the mitigation measures would reduce the impact, train operations would continue to occur outside of the construction hours specified by the City of Union City noise ordinance. In addition, the temporary barriers are not expected to completely eliminate the substantial increases in noise associated with locating the tracks closer to residences, and would not bring them to within acceptable levels. Therefore, this impact is considered to be significant and unavoidable.

Mitigation: Employ Measures to Reduce Noise Associated with the Temporary Realignment of Railroad Tracks

The following measures shall be incorporated into the project contract specifications to reduce noise impacts associated with the temporary realignment of the railroad tracks at the Niles and Oakland Subdivisions.

- Construct temporary barriers along the track realignments. Existing 7- to 8-foot barriers are located between many of the adjacent residences and the existing tracks. The temporary barriers should be constructed to the height necessary to break the line of sight between train locomotive exhaust stacks and backyard receiver locations (5 feet above the ground).

- Notify adjacent residents in advance of the realignment scheduling and locations.

Operational Noise

With the construction of the East-West Connector Project, noise sensitive uses in and around the project area are predicted to be exposed to increased traffic noise resulting from operation of the project which includes the widening of and improvements to Decoto Road and Paseo Padre Parkway, the construction of a new roadway segment between Paseo Padre Parkway and Mission Boulevard (New Roadway), and the realignment of Quarry Lakes Drive. Table 3 summarizes:

- the calculated L_{dn} noise levels at measured and modeled receiver locations in the vicinity of the project alignment under Existing 2007, 2035 No Project, and 2035 with Project traffic conditions; and
- the calculated traffic noise increases, including the increase of 2035 No Project and 2035 with Project compared to the 2007 Existing conditions and the project generated increase resulting from the project alignment and associated traffic conditions under the same time period (i.e., 2035 No Project vs. 2035 with Project).

Noise monitoring and modeling locations identified in Table 3 are representative of receptors along the project alignment. However, noise impacts would not be limited to these specific monitoring/modeling locations and would occur throughout the residential area that is represented by these locations. Calculations assume an ambient background noise level of about 55 dBA L_{dn} based on noise measurements conducted in areas located away from any major traffic, railroad, or other noise sources. The ambient noise level in the area results primarily from aircraft, distant traffic and rail operations, and natural noises such as birds and wind.

Table 3. Predicted Traffic Noise Levels and Impacts

		Calculated L_{dn} Noise Level (dBA)			Increase over 2007 Existing[2]		Project Noise	Impact	
Receiver ID[1]	Receiver Location	2007 Existing	2035 No Build	2035 Build	2035 No Build	2035 Build	Increase[2] over 2035 No Build	Project[3]	Cumulative[4]
LT-1	90 feet from Center of Decoto Road	72	74	75	2	3	1	LTS	NC
LT-2	90 feet from Center of Paseo Padre Parkway	68	70	72	2	4	2	LTS	C
LT-3	Open Space near Clover Drive	55	56	57	0	2	2	LTS	NC
ST-1	Backyard of 4318 Calypso Terrace	64	65	66	2	3	1	LTS	NC

Receiver ID[1]	Receiver Location	Calculated L_{dn} Noise Level (dBA)			Increase over 2007 Existing[2]		Project Noise Increase[2] over 2035 No Build	Impact	
		2007 Existing	2035 No Build	2035 Build	2035 No Build	2035 Build		Project[3]	Cumulative[4]
ST-2	Setback of 4194 Decoto Road	73	74	76	1	3	2	LTS	C
ST-3	Setback of 34930 Seal Rock Terrace	71	73	74	2	3	1	LTS	NC
ST-4	Setback of 34821 Fremont Blvd	65	67	68	2	3	0	LTS	NC
ST-5	Setback of 3853 Decoto Rd	74	76	78	2	4	2	LTS	C
ST-6	Backyard of 34996 Silverlock Court	61	63	64	2	3	1	LTS	C
ST-7	Backyard of 35120 Ramblewood Ct	64	66	67	2	3	1	LTS	NC
ST-8	Setback of 3425 Decoto Rd	70	72	73	2	3	1	LTS	C
ST-9	Backyard of 3255 Cade Dr	63	65	67	2	3	2	LTS	C
ST-10	Setback of 3198 Waugh Pl	67	69	71	2	3	1	LTS	C
ST-11	Backyard of 35540 Dee Pl	60	62	63	1	3	2	LTS	C
ST-12	Paseo Padre Parkway	71	73	73	2	2	1	LTS	NC
ST-13	Backyard of 2723 Oaktree Court	59	60	61	1	3	2	LTS	C
ST-14	Side of 35583 Chaplin Dr	56	56	61	0	5	5	S	C
ST-15	Side of 35607 Barnard Dr	55	56	57	0	1	1	LTS	NC
ST-16[6]	Arroyo Park	56	56	60	0	4	4	LTS	NC
ST-17	Quarry Lakes Drive	63	65	58	2	-5	-7	LTS	NC
ST-18	Setback of 35509 Monterra Circle	58	59	61	1	4	2	LTS	C
ST-19	Setback of 1071 Tourmaline Terrace	55	56	58	0	2	2	LTS	NC
ST-20	Backyard of 34770 Klondike Drive	56	57	57	0	1	1	LTS	NC
ST-21	End of Chesapeake Court	57	57	61	1	4	4	S	C
ST-22[6]	Dog Park off 7th Street	65	67	70	2	5	3	LTS	NC

Receiver ID[1]	Receiver Location	Calculated L_{dn} Noise Level (dBA)			Increase over 2007 Existing[2]		Project Noise Increase[2] over 2035 No Build	Impact	
		2007 Existing	2035 No Build	2035 Build	2035 No Build	2035 Build		Project[3]	Cumulative[4]
ST-23[6]	Park off Wildflower Lane	61	62	62	2	2	0	LTS	NC
ST-24	Apartments off Mission Blvd	68	70	70	1	2	0	LTS	NC
ST-25	34864 Mission Blvd, Bldg M	64	65	65	2	2	0	LTS	NC
ST-26	Setback of 149 Black Mountain Cir	72	74	74	2	2	0	LTS	NC
M-1	Front of Residence on Decoto Road	73	74	76	1	3	2	LTS	C
M-2	Front of Residence on Belvedere Terrace	71	73	74	2	3	1	LTS	C
M-3	Backyard of Residence on Fremont Boulevard	64	65	66	1	2	1	LTS	NC
M-4	Front of Residence on Fremont Boulevard	71	73	73	2	2	1	LTS	NC
M-5	Backyard of Residence on Decoto Road	66	68	69	2	3	1	LTS	NC
M-6	Backyard of Residence on Decoto Road	66	68	69	2	3	1	LTS	C
M-7	Side of Residence on Paseo Padre Parkway	63	65	67	2	3	2	LTS	C
M-8	Backyard of Residence on Paseo Padre Parkway	64	66	67	2	3	2	LTS	C
M-9	Backyard of Residence on Paseo Padre Parkway	71	73	73	2	3	1	LTS	NC
M-10	Backyard of Residence on Daisy Street	56	57	59	1	3	2	LTS	NC
M-11	Backyard of Residence on Begonia Street	56	56	68	0	12	12	S	C
M-12	Front of Residence on Dominici Drive	58	59	61	1	3	2	LTS	C
M-13	Side of Residence on Chaplin Drive	56	56	66	0	10	9	S	C
M-14	Side of Residence on Osprey Drive	57	58	61	1	3	2	LTS	C
M-15	35261 Alvarado Niles Rd[5]	56	57	58	1	2	2	LTS	NC

Receiver ID[1]	Receiver Location	Calculated L_{dn} Noise Level (dBA)			Increase over 2007 Existing[2]		Project Noise Increase[2] over 2035 No Build	Impact	
		2007 Existing	2035 No Build	2035 Build	2035 No Build	2035 Build		Project[3]	Cumulative[4]
M-16	Backyard of Residence on Gold Street	55	56	59	1	3	3	I	NC
M-17	Setback of Townhomes on Tourmaline Terrace	55	56	58	1	3	2	LTS	NC
M-18	Backyard of Residence on Sandburg Drive	56	57	60	1	4	4	I	NC
M-19	Backyard of Residence on Cascades Circle	59	60	62	1	3	2	LTS	C
M-20	Backyard of Residence on Cascades Circle	63	65	65	2	2	0	LTS	NC

1 Receiver ID: LT=Measured Long-term Location, ST=Measured Short-Term Location, M= Modeled Location

2 Discrepancies may occur due to rounding.

3 Impact Type: S = Significant Impact, Exterior Noise, I = Significant Impact, Interior Noise, LTS = less than significant

4 Impact Type: C = Project would contribute to a significant cumulative noise impact, NC =Project would not contribute to significant cumulative noise impact

5 35261 Alvarado Niles Road is the latest known address for the Peterson Farm house, located west of and accessed by Quarry Lakes Drive.

6 This receptor location would be subject to neighborhood park thresholds; all others are subject to residential thresholds.

Impact: Exposure of Noise Sensitive Land Uses to Increased Traffic Noise

No Action Alternative

Under the No Action Alternative, the East-West Connector Project would not be constructed and the existing roadway network would remain. However, traffic volumes would increase over time as the area is built out. As indicated in Table 3, traffic noise levels are predicted to increase by 0 to 2 dBA at noise sensitive uses adjacent to the project alignment due to traffic volume increases on the existing roads anticipated to occur between the 2007 and 2035, regardless of whether or not the project is implemented. In addition, many of the noise sensitive land uses are currently exposed to or are predicted to be exposed to noise levels exceeding the exterior noise and land compatibility thresholds (60 dBA L_{dn} for residences and 70 dBA L_{dn} for parks) under 2007 Existing and 2035 No Project traffic conditions.

Proposed Project

Existing Roadways (Decoto Road and Paseo Padre Parkway)

The proposed project would widen and improve existing roadway segments along Decoto Road and Paseo Padre Parkway. Similar to the No Action Alternative, many of the noise sensitive land uses would continue to be exposed to noise levels exceeding the exterior noise and land compatibility thresholds (60 dBA L_{dn} for residences and 70 dBA L_{dn} for parks) under 2035 Project traffic conditions (see Table 3). However, these increases are primarily the result of existing and cumulative traffic increases (see No Action Alternative discussion). The project itself is not predicted to result in traffic noise increases of 3 dBA or greater at any noise sensitive uses as a result of the widening and improvements of the existing roadway segments. This impact is therefore considered to be a less-than-significant impact along existing roadways.

New Roadway

Existing noise sensitive land uses located along the alignment of the new roadway segment are predicted to be exposed to traffic noise increases of up to 10 dBA above 2007 Existing levels, the majority of which would be associated with the operation of the project roadway. Existing ambient noise levels at most of these receptors are between 55 and 60 dBA L_{dn}. The project is predicted to result in the exposure of some of these land uses to noise levels exceeding the exterior noise and land compatibility thresholds (60 dBA L_{dn} for residences and 70 dBA L_{dn} for parks).

Table 3 identifies the four representative receivers where operation of the proposed project is predicted to result in significant noise impacts. Three receivers (ST-14, M-11, and M-13) are located along the new roadway segment between Paseo Padre Parkway and Alvarado-Niles Road. There are no existing sound walls located along these residences. An additional significant noise impact was identified for one receiver (ST-21) which is located along the alignment of the new roadway segment between Alvarado Niles Road and Mission Boulevard and shielded behind an existing 8 foot high sound barrier.

To reduce traffic noise levels in this portion of the proposed road, noise barriers could be erected within the roadway corridor itself, or along the property boundaries of the affected residences. Accordingly, noise barrier analysis was conducted for barriers located near the edge of pavement of the new roadway segment along the alignment between Paseo Padre Parkway and Alvarado Niles Road, as indicated in Figure 8 and for barriers located along the residential property lines (as shown in Figure 9). Tables 4 and 5 summarize the results of the preliminary edge of pavement barrier and residential property line barrier analysis, respectfully, for representative receivers located along the alignment that currently do not have noise barriers. As discussed above, noise levels indicated in Tables 4 and 5 assume an ambient noise level of about 55 dBA L_{dn}. Ambient noise from aircraft, distant traffic and rail operations, and natural noises such as birds and wind would not be reduced with the construction of barriers. As a result, overall noise reductions at receptor locations are lower than traffic noise reductions provided by the noise barriers. For the edge of pavement barriers, the barrier heights are relative to the elevation of the roadway. For

example, for an area where the roadway is proposed to be constructed 4 feet below grade, a 10-foot-high barrier could be constructed by placing a 6-foot-high sound wall on top of the existing grade. For the residential property line barriers, the barrier heights are relative to the terrain at the location of the barrier. For example, if the elevation at the barrier location is 2 feet above the elevation of the roadway, a 6-foot-high barrier designates that a 6 foot high sound wall would be required at the existing elevation of the residence, regardless of how far below grade the road is proposed in the respective area. Receivers that would comply with the applicable noise land compatibility thresholds with the presence of the respective noise barriers are indicated by shaded cells. Non-shaded cells indicate locations where the respective noise-barrier heights are not sufficient to bring levels down below the thresholds.

Table 4. Predicted Noise Reduction by Barrier Height Relative to the Roadway Elevation for Edge of Pavement Barriers

Receiver ID[1]	Receiver Location	No Wall, L_{dn}, dBA	6-Foot High Wall		8-Foot High Wall		10-Foot High Wall	
			L_{dn}, dBA	I.L[1]	L_{dn}, dBA	I.L[1]	L_{dn}, dBA	I.L[1]
ST-14	Side of 35583 Chaplin Drive	61	59	2	59	2	58	3
M-11	Backyard of Residence on Begonia Street	68	63	5	61	7	60	8
M-13	Side of Residence on Chaplin Drive	66	62	4	61	5	60	6

[1] I.L.: Barrier Insertion Loss, the noise reduction provided by insertion of the barrier.

Based on preliminary noise modeling for edge of pavement barriers, noise barriers with heights up to 10 feet above the roadway elevation, located along the new roadway alignment between Paseo Padre Parkway and Alvarado-Niles Road (see Figure 8), would reduce noise levels at receivers in this area to comply with the applicable noise and land use compatibility thresholds. As described above, the total barrier height may be achieved through the construction of a sound wall on top of elevated fill. Noise levels at receivers located along the alignment of the new roadway between Alvarado Niles Road and Mission Boulevard would not be affected by the construction of this barrier.

LEGEND

8ft Proposed Sound Barriers

* Based on Preliminary modeling results

** Indicated barrier heights are relative to the adjacent roadway elevation.

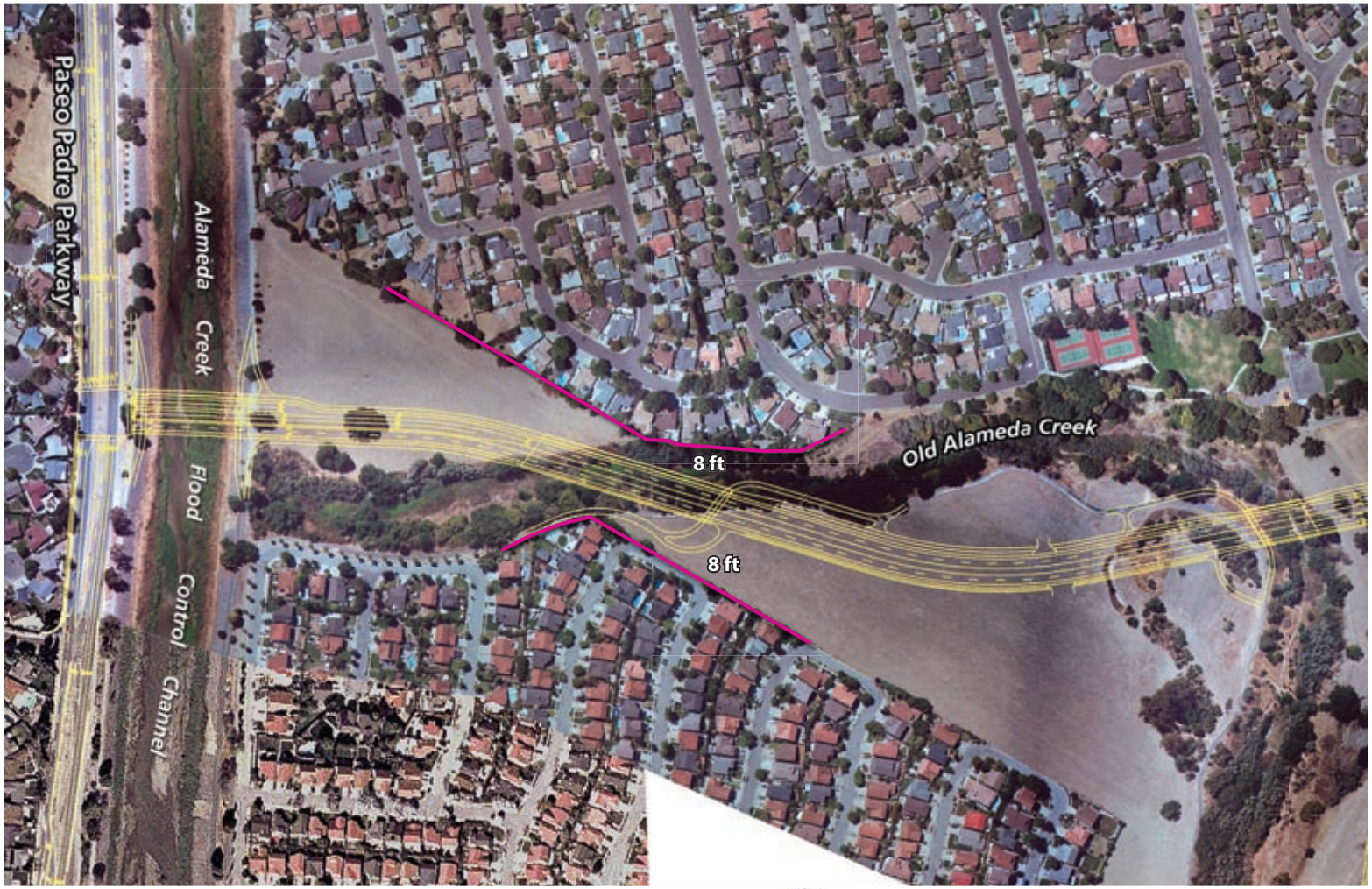
NORTH

300′ 0′ 300′ 600′

00703.07 Noise (9-08)

ICF Jones & Stokes
an ICF International Company

Figure 8
Configuration of Recommended Barriers, if Located at Roadway Edge of Pavement



LEGEND

8ft Proposed Sound Barriers

* Based on Preliminary modeling results

** Indicated barrier heights are relative to the adjacent roadway elevation.

NORTH

300′ 0′ 300′ 600′

00703.07 Noise (9-08)

ICF Jones & Stokes
an ICF International Company

Figure 9
Configuration of Recommended Barriers, if Located at Residential Property Lines

Table 5. Predicted Noise Reduction by Barrier Height Relative to the Elevation of the Terrain at the Barrier Location for Property Line Barriers

Receiver ID[1]	Receiver Location	No Wall, L_{dn}, dBA	6-Foot High Wall		8-Foot High Wall		10-Foot High Wall	
			L_{dn}, dBA	I.L[1]	L_{dn}, dBA	I.L[1]	L_{dn}, dBA	I.L[1]
ST-14	Side of 35583 Chaplin Drive	61	**59**	**2**	**58**	**3**	**58**	**3**
M-11	Backyard of Residence on Begonia Street	68	62	6	**60**	**8**	**59**	**9**
M-13	Side of Residence on Chaplin Drive	66	61	5	**60**	**6**	**59**	**7**

[1] I.L.: Barrier Insertion Loss, the noise reduction provided by insertion of the barrier.

Based on preliminary noise modeling for the residential property line barriers, 8-foot high noise barriers, located along the residential property lines between Paseo Padre Parkway and Quarry Lakes Drive, are predicted to reduce noise levels at receivers in this area to comply with the applicable noise and land use compatibility thresholds (see Figure 9). Noise levels at receivers located along the alignment of the new roadway between Alvarado Niles Road and Mission Boulevard would not be affected by the construction of these barriers.

Increased noise levels along the western new roadway segment, between Paseo Padre Parkway and Alvarado-Niles Road, would result in a significant impact. Implementation of the mitigation below would reduce the impact to a less-than-significant level. Without the mitigation, the impact would remain significant.

A significant noise impact was identified for one receiver (ST-21), located in the existing residential area south of the new roadway's eastern segment, between Alvarado Niles Road and Mission Boulevard. While analysis at other receivers near ST-21 did not predict significant noise impacts at other receivers near ST-21, traffic on the new roadway is estimated to increase noise at this location by 4 dBA over the 2035 no-build scenario, bringing the L_{dn} to 61 dBA—one dBA over the threshold. This location already features an existing 8-foot high sound barrier. Raising the sound barrier to 10 feet is predicted to adequately mitigate noise levels at this location to meet the 60-dBA L_{dn} threshold under the 2035 build scenario. Alternately, paving the new roadway with a 'quiet' pavement type such as a porous Open-Grade Asphalt Concrete with fine aggregate size could also reduce this to a less than significant level. Noise modeling was conducted in TNM consistent with the Caltrans Protocol, which specifies that the 'Average' pavement type be selected. A prior study found a 5 dBA reduction in traffic noise levels with the rehabilitation of a major arterial roadway with a speed limit of 35 mph using a quiet pavement overlay (Donavan, 2004). Based on this study and similar studies (I&R 2004 & Rymer 2005) conducted on roadways with higher travel speeds, it is estimated that a 3 to 4 dBA reduction below the TNM average pavement could be achieved through the use of 'quiet' pavement surfaces on roadways with moderate travel speeds (35 mph).

Mitigation: Implement Traffic Noise Reduction Treatments along the New Roadway between Paseo Padre Parkway and Alvarado-Niles Road

The project applicant shall perform a detailed noise study, conducted by a qualified acoustical professional, during the final design stage of the project to define reasonable and feasible noise mitigation for the residences along the new roadway segment between Paseo Padre Parkway and Alvarado-Niles Road. Mitigation measures may include, but are not limited to, the following:

- Construct noise barriers or berms to protect existing residential land uses from noise levels that exceed established thresholds. Based on preliminary traffic noise modeling, eight- to 10-foot-high barriers relative to the elevation of the New Roadway between Paseo Padre Parkway and Alvarado-Niles Road, as indicated in Figure 8, would be sufficient to maintain noise levels below the exterior noise and land compatibility thresholds if sound walls are constructed within the roadway alignment. Alternately, eight foot high barriers relative to the elevation of the terrain at the residential property lines, as indicated in Figure 9, would also be sufficient to maintain noise levels below the exterior noise and land compatibility thresholds. To be effective, barriers must be constructed with a solid material with no gaps in face of the wall or at the base. Openings or gaps between barrier materials or the ground substantially decrease the effectiveness of the sound barrier. Suitable materials for barrier construction should have a minimum surface weight of 4 pounds per square foot (lbs/ft^2) (such as one-inch thick wood, masonry block, concrete, or metal).
- Pave the new roadway with "quiet" pavement types such as porous Open-Grade Asphalt Concrete with fine aggregate size.

Mitigation: Improve Traffic Noise Reduction Treatments at the affected residence along the New Roadway between Alvarado-Niles Road and Mission Boulevard

The project applicant shall perform a detailed noise study, conducted by a qualified acoustical professional, during the final design stage of the project to define reasonable and feasible noise mitigation for the residences near ST-21. Mitigation measures may include but are not limited to the following:

- Retrofitting existing or constructing new noise barriers to protect existing residential land uses from noise levels that exceed established thresholds. Based on preliminary traffic noise modeling, an increase in the existing barrier height from 8 feet to 10 feet would be sufficient to maintain noise levels below the exterior noise and land compatibility thresholds. To be effective, barriers must be constructed with a solid material with no gaps in face of the wall or at the base. Openings or gaps between barrier materials or the ground substantially decrease the effectiveness of the sound barrier. Suitable materials for barrier construction should have a minimum surface

weight of 4 lbs/ft^2 (such as one-inch thick wood, masonry block, concrete, or metal).

- Paving the new roadway with "quiet" pavement types such as porous Open-Grade Asphalt Concrete with fine aggregate size.

Impact: Increased Interior Noise Levels along New Roadway Segment

Standard California residential construction typically provides about 15 dBA of exterior-to-interior noise reduction with windows partially open, and about 25 dBA of exterior-to-interior noise reduction with windows closed, assuming typical California residential construction. As a result, the interior noise standard of 45 dBA L_{dn} for residences would typically be met if the exterior noise levels do not exceed the exterior noise and land compatibility threshold of 60 dBA L_{dn}. The incorporation of forced air mechanical ventilation systems (air conditioning) in residential units is considered sufficient to allow occupants the option of maintaining windows in the closed position, which would allow residences exposed to exterior levels of up to 70 dBA L_{dn} to achieve the interior noise standard. For residences exposed to exterior noise levels exceeding 70 dBA L_{dn}, sound rated construction methods could be needed to reduce interior noise levels to 45 dBA L_{dn}.

Noise barriers are proposed as mitigation to reduce exterior noise levels at residential development along the proposed alignment between Paseo Padre Parkway and Alvarado-Niles Road, but would not be effective at reducing noise levels at upper level facades of buildings. As a result of the proposed project, exterior noise levels are predicted to exceed 60 dBA L_{dn} at upper stories at the three receivers along the new roadway segment between Paseo Padre Parkway and Alvarado-Niles Road identified in Table 3 (ST-14, M-11 and M-13) and three receptors along the south side of the new roadway segment between Alvarado Niles Road and Appian Way (ST-21, M-16, and M-18). Since exterior noise levels for these homes are predicted to range from 60 to 68 dBA L_{dn}, interior noise levels could be controlled to meet the 45 dBA L_{dn} interior threshold by maintaining windows in the closed position. However, it is not known if these residences currently have forced air mechanical ventilation systems. This impact is considered to be significant but could be reduced to a less than significant level with implementation of the mitigation presented below.

Mitigation: Implement Traffic Noise Reduction Treatments along the New Roadway between Paseo Padre Parkway and Mission Boulevard

The project applicant shall perform a survey of existing residences adjacent to the new roadway alignment, in locations as described below, to identify residences that currently do not have forced air mechanical ventilation systems:

- Residences located in the first row of homes and within 300 feet of the center of the new roadway alignment between Paseo Padre Parkway and Quarry Lakes Drive, as represented by receptors ST-14, M-11 and M-13.
- Residences located in the first row of homes along the south side of the new roadway segment between Alvarado Niles Road and Appian Way, as represented by receptors ST-21, M-16, and M-18.

For any locations that do not feature such a system, a noise study conducted by a qualified acoustical professional shall be conducted during the final design stage of the project to define reasonable and feasible noise mitigation for any impacted residences that do not currently have forced air mechanical ventilation. Mitigation measures may include, but are not limited to, providing forced air ventilation systems to residences, so that windows may be kept closed at the occupant's discretion to control noise.

Cumulative Impacts

The proposed project is considered to contribute to a significant cumulative noise impact at noise sensitive locations where the project-related increase is at least 1 dBA and the predicted noise level exceeds the exterior noise land compatibility standard (60 dBA L_{dn} for residences and 70 dBA L_{dn} for parks).

Construction of the project is predicted to contribute 1 dBA or more to traffic noise levels at most noise sensitive receptor locations along the project alignment, including the existing roadway and new roadway segments. In addition to the four receptors identified to result in significant impacts under the project impact section, the project would also contribute to significant cumulative noise impacts at five additional receptors locations, as identified in Table 3. Noise increases at receivers along the new roadway would result in the same traffic noise impacts as those identified and addressed under the project impact section of this document. Extending the noise barriers indentified under the project impact section to provide shielding for these additional receptors would reduce the cumulative noise impacts in at receptors this area. The project would also contribute to significant cumulative noise impacts in noise sensitive areas along the existing roadway segments on Decoto Road, Paseo Padre Parkway, and Alvarado-Niles Road. Implementation of the proposed project is therefore considered to contribute to a significant cumulative noise impact. Implementation of the following mitigation would reduce this impact to a less-than-significant level. However because there are currently no mechanisms in place for pooling funds to mitigate cumulative noise impacts, there is little or no certainty that these measures would be implemented. This impact is therefore considered to be significant and unavoidable.

Mitigation: Implement Traffic Noise Reduction Treatments

The project applicant shall contribute to pooled city funds for both Union City and Fremont to implement traffic noise reduction treatments at existing residential areas. With use of this pooled fund, the cities would perform studies, conducted by qualified acoustical professionals, to define reasonable and feasible noise mitigation for noise sensitive receptors that are predicted to be exposed to traffic noise increases that exceed the noise significance thresholds. Mitigation measures could include the following.

- Construct new or larger noise barriers or berms to protect existing residential land uses where reasonable and feasible.
- Implement alternative noise reduction techniques, such as installing traffic calming measures to slow traffic, coordinating routing and other traffic control measures, and/or re-paving the streets with "quiet" pavement types such as porous Open-Grade Asphalt Concrete with fine aggregate size.
- Provided building sound insulation such as sound rated windows and doors on a case-by-case basis as a method of reducing noise levels in interior spaces of affected residences. This method would be applicable where the construction of sound barriers is not found to be feasible and interior noise levels inside residences are anticipated to exceed 45 dBA L_{dn}.

References

Printed References

De Leuw, Cather & Co., 2002, Route 84 Realignment Project Final Environmental Impact Statement and Section 4(f) Evaluation., January 2002, Prepared for California Department of Transportation and Federal Highway Administration.

Dowling Associates, Inc., DRAFT Technical Memorandum for I-880 – SR238 East-West Connector Traffic Forecasts, Appendix D, March 20, 2008, Prepared for Alameda County Transportation Authority via TY Lin International.

City of Union City. 2002. General Plan. February. Health and Safety Element.

City of Union City Community Noise Ordinance, Section 9.40.053

City of Fremont. 1991. General Plan. May. Health and Safety Element.

Parsons Engineering Science, Inc., 1995, Route 84 Realignment Project Noise Impact Assessment Report, May 1995, Prepared for California Department of Transportation via De Leuw, Cather & Co.

Donavan, Paul, Pavement Rehabilitation and Traffic Noise Reduction along an Arterial Street, Proceedings of Noise-Con 2004, Baltimore, MD, July 2004.

Illingworth & Rodkin, Inc., I-80 Davis OGAC Pavement Noise Study 7th Year Summary Report, Prepared for California Department of Transportation Division of Environmental Analysis, December 2005.

Rymer, Bruce, California Tests Show Pavement Selection Influences Noise Levels, Hot Mix Aspalt Technology Magazine, November/December 2005.