Noise Study Report
Interstate 205/Lammers Road Interchange Project

City of Tracy

San Joaquin County, California

10-SJ-205-KP3.8/R8.5 (PM2.6/R5.1)

EA0H910K

Prepared by the

State of California Department of Transportation

June 2010

For individuals with sensory disabilities, this document is available in Braille, large print, on audiocassette, or computer disk. To obtain a copy in one of these alternate formats, please call or write to Caltrans, Attn: Javier Almaguer, San Joaquin Environmental Management Branch, 2015 East Shields Avenue Suite # 100, Fresno, CA 93726-5248; (559) 243-8255 Voice, or use the California Relay Service TTY number, (559) 488-4066.

Noise Study Report

City of Tracy
San Joaquin County, California
10-SJ-205 (PM 2.6/R5.1)
EA10-0H9100
June 2010

Prepared By: _____ Date: 6/24/10
Jason Volk
ICF International

Approved By: _____ Date: 1/12/11
Ken Romero, Branch Chief
Environmental
District 6, Central Region

Interstate 205/Lammers Road Interchange Project
Noise Study Report (June 2010)
Errata, September 2011

Note: Where necessary in this errata sheet, omitted text is struck out and new or replaced text is underlined, to indicate specific changes to the original document.

Alternative 1 was removed from consideration in August 2011 when it was determined not to be a geometrically viable alternative. Alternative 1 does not meet the interchanging spacing requirement per the Highway Design Manual Topic 501.3, "The minimum Interchange spacing shall be one mile urban areas, two miles in rural areas, and two miles between freeway-to-freeway interchanges and local street interchanges." The available spacing between the existing partial Eleventh Street interchange and the proposed Lammers Road interchange would be only 0.8 mile. This deficiency was acknowledged and a mandatory design exception was sought. The exception was declined due to limited discussion regarding extenuating circumstances that prevented the alternative from achieving the required spacing and the existence of an alternative that did meet the spacing requirement (Alternative 5A).

Therefore the following changes are made:

Cover: Change Post miles in title

10-SJ-205-~~KP3.8/R8.5 (PM2.6/R5.1)~~PM2.5/R4.9

Page 1: 2. Change text in first paragraph, third line:
" auxiliary lane "from ~~Post Mile 2.6 to R5.1~~ Post Mile 2.5 to R4.9 on I-205 . . . ."

Throughout Document: Disregard description of, analysis of and reference to Alternative 1 throughout document.

Interstate 205/Lammers Road Interchange Project
Noise Study Report (June 2010)
Errata, February 2011

Note: Omitted text is struck out. New or replaced text is underlined.

Page 5: Replace Figure 1 with attached Figure 1

Page 7: Revise Alternative 1, Park and Ride description as follows:

> *Park and Ride facilities*. Park and Ride facilities would be provided in the southwest quadrant of ~~vicinity of the project near~~ the Commerce Way and Lammers Road intersection as part of a planned commercial development.

Page 8: Alternative 5A, Park and Ride descriptions as follows:

> *Park and Ride Facilities.* 1-acre Park and Ride facilities would be provided in the vicinity of the project at the ~~northwest~~ northeast corner of the Commerce Way and 11th Street intersection.

Page 19: Replace Figure 2 with attached Figure 2

Page 31: Replace Figure 4 with attached Figure 4

Page 35: Replace Figure 5 with attached Figure 5

Executive Summary

Purpose of Noise Report

This noise study report discusses potential noise impacts and related noise abatement measures associated with the construction and operation of the Interstate 205/Lammers Road Interchange Project in San Joaquin County. This report has been prepared to comply with 23 Code of Federal Regulations (CFR) 772, "Procedures for Abatement of Highway Traffic Noise," and California Department of Transportation (Caltrans) noise analysis policy as described in the *Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction, Retrofit Barrier Projects* (Protocol).

Project Description and Alternatives

The City of Tracy's proposed Interstate 205 (I-205)/Lammers Road Interchange Project (proposed project) is located within the City of Tracy Sphere of influence, just outside the city limits, in San Joaquin County. The proposed project would reconstruct or eliminate the existing interchange at 11th Street/I-205 to provide full ramp movements at a new location. The proposed project includes two build alternatives and a no build alternative. The two build alternatives include Alternative 1: New Spread Diamond Interchange at Lammers Road and Alternative 5A: Modified 11th Street Partial Cloverleaf Interchange.

Alternative 1—Spread Diamond Interchange

This alternative would provide a new interchange at Lammers Road over I-205, with four new connection points to I-205. The existing partial 11th Street interchange to and from I-205 west would be retained. Lammers Road would be realigned as a six-lane arterial/expressway north of 11th Street with an overcrossing at I-205 and would extend north and realign with Byron Road. A spread diamond (Type L-2) interchange would be constructed for Lammers Road at I-205 approximately 0.8 mile east of the 11th Street interchange and 1.0 miles west of the Grant Line Road interchange. The Lammers Road overcrossing would be designed to accommodate the future widening of I-205 to ten lanes.

Alternative 5A—Partial Cloverleaf Interchange

This alternative would construct a new partial cloverleaf interchange to replace the existing 11th Street ramps on I-205. The new interchange would be located approximately 2.3 miles east of the Mountain House Parkway interchange and 1.6 miles west of the Grant Line Road interchange. An auxiliary lane in the westbound

direction along I-205 would connect the westbound Grant Line Road on-ramp to the westbound 11th Street exit ramp. Grant Line Road would be realigned and extended to connect with 11th Street north of I-205. 11th Street would be realigned and extended to curve northwest of Lammers Road and connect with Byron Road north of I-205. The 11th Street Overcrossing would be designed to accommodate the future widening of I-205 to ten lanes. The existing 11th Street westbound on-ramp overcrossing would be demolished.

No-Build Alternative

The No-Build Alternative assumes that existing infrastructure conditions at the project site and on the freeway system would remain, with the exception of programmed improvements on SJCOG's RTP Tier 1 list. There would be no construction of a new interchange, nor associated ramps and infrastructure. Lammers Road would terminate north of I-205 at Grant Line Road and would not connect with its southern segment at Lammers Road and 11th Street. Local road improvements would be built to serve future development in the urban reserves north and south of I-205.

Land Use and Terrain

Single-family and multifamily home residences and recreational outdoor areas were identified as Activity Category B land uses per 23 CFR 772. Activity Category C uses in the study area include commercial and industrial areas. Terrain in the area is mostly flat, apart from a segment of I-205 which is raised above surrounding terrain on a structure in the vicinity of the Byron Road/Lammers Road intersection.

Existing Noise Levels

A field noise investigation was conducted to describe and document existing noise conditions. The Federal Highway Administration (FHWA) Traffic Noise Prediction Model Version 2.5 was used in this analysis to evaluate traffic noise conditions for existing and design-year (2035) conditions. Existing noise levels under worst-hour conditions ranged from 52 to 70 dBA L_{eq}.

Residential subdivisions adjacent to Lammers Road and Byron Road have existing masonry walls along property frontage that are effective as noise barriers. There is also an existing noise barrier located at eastbound I-205 edge-of-shoulder that provides shielding from traffic noise to residential areas south of I-205.

Predicted Future Noise Levels

Under Project Alternative 1, noise-sensitive receiver locations are predicted to be exposed to design-year traffic noise levels of up to 76 dBA L_{eq}. Noise levels under Project Alternative 1 are predicted to be up to 21 dB higher than existing conditions.

Under Project Alternative 5A, noise-sensitive receiver locations are predicted to be exposed to design-year traffic noise levels of up to 72 dBA L_{eq}. Noise levels under Project Alternative 5A are predicted to be up to 10 dB higher than existing conditions.

Traffic Noise Impacts

The traffic noise impact assessment indicates that the proposed project would result in traffic noise impacts as defined in 23 CFR 772 at residential areas within the project area. Modeling results indicate that predicted traffic noise levels under design-year conditions for both project Alternatives 1 and 5A approach or exceed the Noise Abatement Criteria of 67 dBA-L_{eq}(h) for Activity Category B land uses at first-row residences. A substantial increase in noise levels over existing conditions (i.e., an increase of 12 dB or greater) is also identified for several receiver locations under Alternative 1. No substantial increases were identified under Alternative 5A. No impacts are predicted to occur at Activity Category C land uses under either project alternative. A total of 23 residences are predicted to be impacted under Alternative 1; 29 residences are predicted to be impacted under Alternative 5A.

Noise Abatement Considered

As stated in the Protocol, noise abatement is only considered where frequent human use occurs and where a reduced noise level would be of benefit. In general, frequent human use is considered to occur at exterior locations where people are exposed to highway noise for at least one hour on a regular basis. As an extension of this concept, impacts are only assessed in detail at locations where frequent human use occurs and where a reduced noise level would be of benefit. Accordingly, impact assessment focuses on locations with defined outdoor activity areas, such as residential backyards, common-use areas at multifamily facilities, and parks with defined activity areas (e.g., playgrounds and picnic tables).

A total of four noise barriers were evaluated under Alternative 1, and three noise barriers were evaluated under Alternative 5A. At a maximum height of 16 feet, each was found to provide at least 5 decibels (dB) of noise reduction at impacted noise-

sensitive receivers in the study area. The following noise barriers were found to be feasible from an acoustical perspective:

- Noise Barrier B (Alternative 1 only)—near Von Sosten Road
- Noise Barriers C-1 and C-2 (Alternatives 1 and 5A)—Lammers Road/11th Street
- Noise Barrier D (Alternative 1 only)—Alternative 1/Northbound I-205 on-ramp
- Noise Barrier F (Alternative 5A only)—Alternative 5A/Northbound I-205 on-ramp

A preliminary noise abatement design for each barrier and a range of barrier heights has been evaluated for preliminary feasibility and reasonableness allowances as described in the Protocol.

Areas Where Noise Abatement is Not Feasible

Noise Barrier A was evaluated for impacted residences along Grant Line Road west of Byron Road. The barrier was found to be not feasible because it would not provide at least 5 dB of noise reduction.

Construction

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans Standard Specifications Section 14-8 and applicable local noise standards.

Table of Contents

Executive Summary i
Table of Contents v
List of Figures vi
List of Tables vi
List of Abbreviated Terms vii
Noise Impact Technical Report 1
Introduction 1
Project Description 3
Fundamentals of Traffic Noise 9
Federal Regulations and State Policies 14
Study Methods and Procedures 17
Existing Noise Environment 23
Future Noise Environment, Impacts, and Considered Abatement 27
CEQA Impacts 38
Construction Noise 39
References 40
Appendix A. Traffic Data 41
Appendix B. Existing and Design-Year Conditions With and Without Project 45
Appendix C. Caltrans Reasonableness Worksheets 47
Appendix D. Barrier Analysis 83
Appendix E. Field Data 87

List of Figures

Figure 1 Project Location 5
Figure 2 Noise Monitoring Locations 19
Figure 3 Long-Term Noise Monitoring at Site LT-1. September 10–17, 2009 25
Figure 4 Noise Prediction Sites and Evaluated Noise Barriers Alt 1 31
Figure 5 Noise Prediction Sites and Evaluated Noise Barriers Alt 5A 35

List of Tables

Table 1 Typical A-Weighted Noise Levels 11
Table 2 Activity Categories and Noise Abatement Criteria 15
Table 3 Summary of Short-Term Measurements 24
Table 4 Summary of Long-Term Monitoring, LT-1 25
Table 5 Modeled Existing Noise Levels 26
Table 6 Comparison of Measured to Predicted Sound Levels in the TNM Model ... 27
Table 7 Summary of Reasonableness Determination Data—Noise Barrier B 30
Table 8 Summary of Reasonableness Determination Data—Noise Barrier C-1 33
Table 9 Summary of Reasonableness Determination Data—Noise Barrier C-2 34
Table 10 Summary of Reasonableness Determination Data—Noise Barrier D 37
Table 11 Summary of Reasonableness Determination Data—Noise Barrier F 38
Table 12 Construction Equipment Noise 39
Table A.1 Total Vehicles—Existing/No Build 41
Table A.2 Total Vehicles—Project Alternative 1 42
Table A.3 Total Vehicles—Project Alternative 5A 43

List of Abbreviated Terms

ADT	average daily traffic
BMPs	best management practices
CAD	computer aided drafting
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of Tracy
CNEL	Community Noise Equivalent Level
dB	decibels
dBA	A-weighted decibels
FHWA	Federal Highway Administration
Hz	Hertz
I-205	Interstate 205
I-5	Interstate 5
I-580	Interstate 580
kHz	kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
L_{eq}[h]	1-hour A-weighted equivalent sound level
L_{max}	Maximum Sound Level
LOS	levels of service
L_{xx}	Percentile-Exceeded Sound Level
[µPa	micro-Pascals
mph	miles per hour
NAC	Noise Abatement Criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	noise study report
PM	Post Mile
proposed project	Interstate 205/Lammers Road Interchange Project
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
RTP	Regional Transportation Plan
SJCOG	San Joaquin Council of Government
SPL	sound pressure level
SR 120	State Route 120
SR 99	State Route 99
TeNS	Caltrans Technical Noise Supplement
TNM 2.5	FHWA Traffic Noise Model Version 2.5
US 50	U.S. Highway 50

Noise Impact Technical Report

Introduction

The California Department of Transportation (Department), in cooperation with the City of Tracy (City), proposes to construct a new interchange at Lammers Road and the auxiliary lane from Post Mile (PM) 2.6 to R5.1 on Interstate 205 (I-205) between the 11th Street and Grant Line Road interchanges in northwest Tracy. This project is being undertaken to enhance traffic circulation and improve regional connectivity in the northwest portion of the City. The proposed project would construct a new interchange on I-205. Eastbound and westbound auxiliary lanes would be constructed to improve merge/change movements. Two build alternatives are being considered in the environmental study phase: including Alternative 1—Spread Diamond Interchange at Lammers Road, and Alternative 5A—Partial Cloverleaf Interchange at Lammers Road. The No-Build Alternative is also being considered.

This project is included in the 2007 Federal Statewide Transportation Improvement Program and in the San Joaquin Council of Government's (SJCOG's) 2007 Regional Transportation Plan (RTP) Tier 1 financially constrained list. Funding is proposed from a variety of sources, including the San Joaquin County Measure K Renewal sales tax program, and local Public Facility Fees generated by ongoing development, direct developer contribution, and federal grants. This project is considered a Type I Project, because it is a highway capacity-increasing project. Therefore a noise study report is required under the requirements of 23 CFR 772.

The purpose of this noise study report (NSR) is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 Code of Federal Regulations [CFR] 772) "Procedures for Abatement of Highway Traffic Noise," which provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards.

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (California Department of Transportation 2006) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing NSRs. Noise impacts associated with this project under the National Environmental Policy Act (NEPA) and the

California Environmental Quality Act (CEQA) will be evaluated in the project's environmental assessment and environmental impact report, respectively.

The purposes of the proposed project are:

- to provide additional connectivity to I-205 to serve the increase in forecasted traffic demand at surrounding interchanges, and
- to improve regional mobility by connecting a planned regional arterial road with I-205.

The proposed new Lammers Road interchange is needed to improve local access to I-205 and to connect planned regional arterials with I-205 and to provide interregional connectivity. The project is needed because northwest Tracy has been experiencing, and is expected to continue to experience, substantial traffic growth—both locally from new area development and regionally from adjacent communities such as Mountain House and Tracy Gateway.

Traffic volumes on 11th Street and Grant Line Road have been increasing over the last several years. Currently, traffic volumes are approximately 113,000 average daily traffic (ADT) on Route 205 west of 11th Street, 95,000 ADT on Route 205 east of 11th Street, 26,000 ADT on 11th Street east of I-205, and 21,000 ADT on Grant Line Road east of Naglee Road. The City is anticipating development in the project vicinity that would contribute to significantly increased traffic volumes. Development projects currently approved include Tracy Gateway, Mountain House, and those in the Naglee/Grant Line Road area. Future traffic models project that by 2035, traffic would be approximately 186,000 ADT on I-205 west of 11th Street and would increase to 56,000 ADT on 11th Street east of I-205 and 30,000 ADT on Grant Line Road east of Naglee Road. The new interchange would be needed to maintain or improve levels of service (LOS) at the intersections of 11th Street/Lammers Road and Grant Line Road/Naglee Road.

This connection would provide alternative routes to I-205 for local traffic. The proposed interchange is currently identified in the San Joaquin County Regional Transportation Plan as a Tier 1 project and in the City of Tracy Roadway Master Plan as a Principal Arterial. The Lammers Road alignment and new interchange with I-205 is planned to connect from the future Golden Valley Parkway (currently Middle Road) north of I-205 to Interstate 580 (I-580) south of Tracy.

This Lammers Road regional connection would serve north–south access in the western portion of the Tracy urban area and provide an alternative means of access to future east–

west connections. This additional access would result in a substantial area-wide reduction in daily vehicle hours of delay. The implementation of the project could potentially reduce the daily vehicle hours of delay by up to 66 percent.

Project Description

Background

I-205 is a short, well-travelled freeway connecting the Central Valley of California with the San Francisco Bay Area. On its eastern end, it connects to Interstate 5 (I-5) and State Route 120 (SR 120), a freeway that connects I-5 and State Route 99 (SR 99). On its western end, I-205 connects to I-580, which is the main route into the San Francisco Bay Area from the center of the Central Valley.

I-205 provides direct access to the western portion of the City of Tracy, a growing bedroom community and transportation hub. I-205 primarily functions to channel commuter and freight traffic from the north (Stockton and Sacramento), east (Manteca, Oakdale, Sonora), and south (Modesto, Merced) to the Bay Area via I-580 and the Altamont Pass. I-205 replaced U.S. Highway 50 (US 50), and the original route of US 50 through Tracy is now part of Business Loop I-205. Due to its role as a commuter and freight route, the previous four-lane configuration for I-205 at the eastern end was inadequate to handle traffic demands and was widened in 2009 to include two more lanes. I-205 within the project limits is currently a six-lane freeway (three mixed-flow lanes in each direction) from I-580 to I-5.

The City of Tracy conducted a comprehensive traffic analysis to assess the current and projected traffic needs based on long-term demand and its General Plan. Fehr & Peers Transportation consultants (traffic consultants to the City) prepared a traffic model for design horizon year 2035 utilizing a blend of the City's traffic model and the SJCOG modeling tools. In addition to the traffic forecasts, Fehr & Peers completed an analysis of the traffic conditions to analyze traffic levels of service and establish project geometry (i.e., roadway design) for the interchange.

Year 2035 traffic forecasts were used to determine required geometrics (design, capacity, signalization, storage lengths, etc.) for several reasons. First, Caltrans' *Highway Design Manual* requires that the project design meet a minimum of a 20-year design horizon to maximize the capital expenditure. Second, the SJCOG projections utilize a 20-year horizon. Third, the City of Stockton recently approved their long-term General Plan program defining the City's land use objectives for a 2035 horizon. Figure 1 shows the project vicinity.

Alternatives

This section describes the proposed action and the build alternatives that have been developed by a multi-disciplinary and multi-agency Project Development Team. Project Development Team members consist of Caltrans staff representing design, traffic operations, environmental and right-of-way disciplines, as well as representatives of project stakeholders. These stakeholders include the City of Tracy Public Works Department and the SJCOG. The Project Development Team recommended the alternatives to address the project's purpose and need, while avoiding or minimizing environmental impacts. Major features used for comparison include project cost, level of service and other traffic data, and specific environmental impacts.

For the proposed project, the build alternatives focus on the various interchange alternatives being considered and reviewed. Two build alternatives and a No-Build alternative have gone forward for evaluation in this document. This section describes the alternatives under consideration, explains why other alternatives were dropped from further consideration, and provides a comparison of how the alternatives meet the project's purpose and need, while considering input from other public agencies and the public.

No-Build Alternative

The No Build Alternative assumes that existing infrastructure conditions at the project site and on the freeway system would remain, with the exception of programmed improvements on SJCOG's RTP Tier 1 list. There would be no construction of a new interchange, nor associated ramps and infrastructure. Lammers Road would terminate north of I-205 at Grant Line Road and would not connect with its southern segment at Lammers Road and 11th Street. Local road improvements would be built to serve future development in the urban reserves north and south of I-205.

Build Alternatives

Alternative 1—Spread Diamond Interchange

This alternative would provide a new interchange at Lammers Road over I-205, with four new connection points to I-205. The existing partial 11th Street interchange ramps to and from I-205 west would be retained. Lammers Road would be realigned as a six-lane arterial/expressway north of 11th Street with an overcrossing at I-205 and would extend north to Grant Line Road and realign with Byron Road. A spread diamond (Type L-2) interchange would be constructed for Lammers Road at I-205 approximately 1 mile east of the 11th Street interchange and 1.2 miles west of the Grant Line Road interchange.

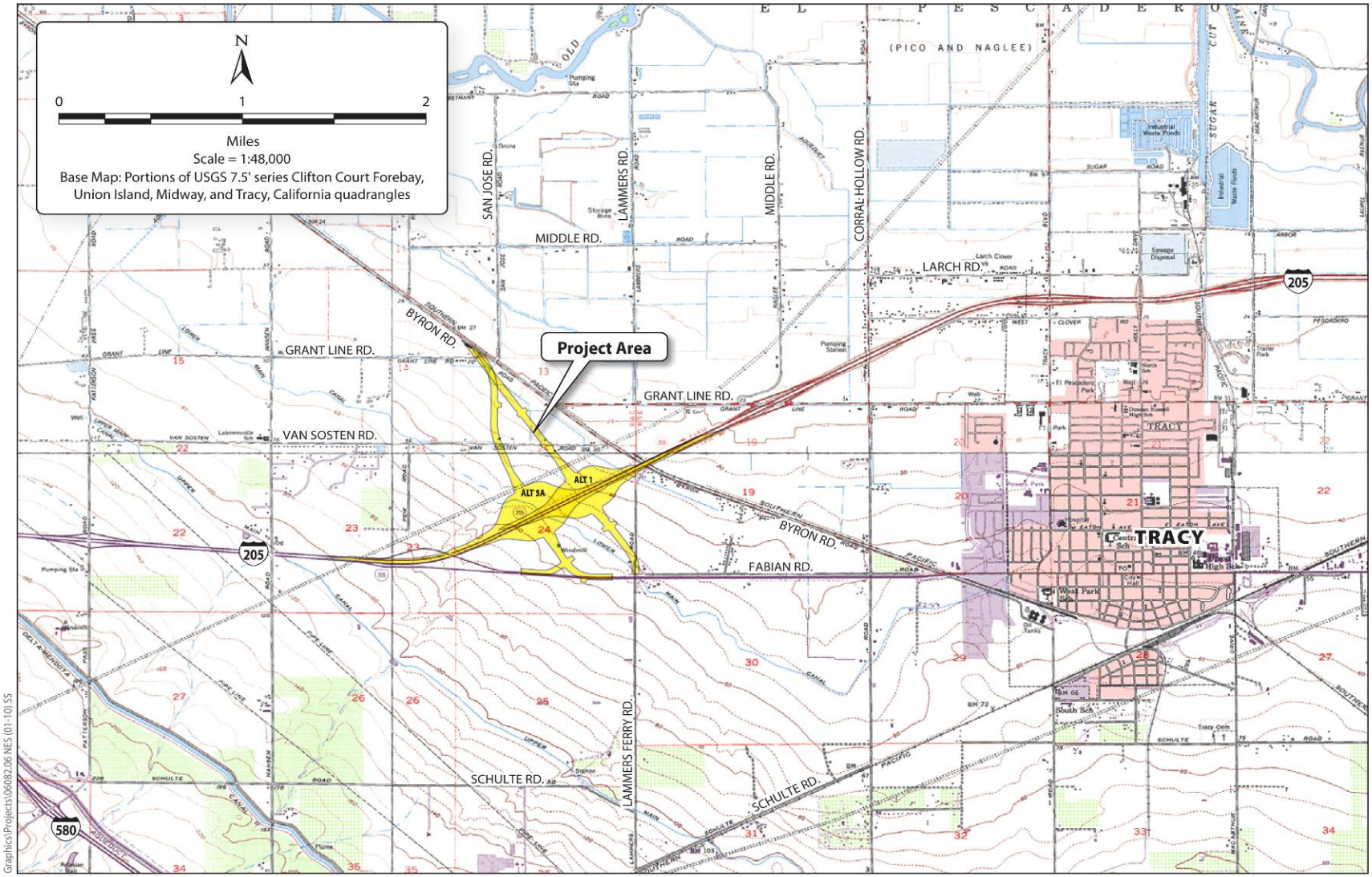

Figure 1 Project Location

Auxiliary lanes would connect the ramps between Lammers Road and Grant Line Road in each direction. Local road improvements would include:

- Realignment and extension of Grant Line Road over Byron Road to connect with Lammers Road north of I-205.
- Extension of Commerce Way north of 11th Street to connect with the new alignment of Lammers Road south of I-205.
- Revised access to the Westgate neighborhood currently served by the existing Lammers Road.
- Local road north of I-205 to connect Lammers Road and Byron Road.

Structures. The Lammers Road overcrossing would be designed to accommodate the future widening of I-205 to ten lanes.

Local Streets. Modifications would be required for various local streets to accommodate the new interchange. Local streets would be impacted temporarily during construction to accommodate contractor access and complete construction tasks.

Pedestrian and Bicycle Facilities. Pedestrian facilities would be provided across I-205 on both sides of Lammers Road in conformity with the City's General Plan.

Drainage. Additional drainage improvements are required along the mainline due to the increase in paved surfaces and subsequent runoff. Drainage improvements include, but are not limited to, surface and subsurface drains and retention ditches along the auxiliary lanes between Lammers and Grant Line Roads. Retention basins within the interchange area would be constructed to accommodate the storm runoff from the interchange ramps. There are no surface water bodies that are located within the project area, and hence no treatment best management practices (BMPs) are required for the project.

Park and Ride facilities. Park and Ride facilities would be provided in the vicinity of the project near the Commerce Way and Lammers Road intersection as part of a planned commercial development.

Landscaping. Standard landscaping would be provided within the new interchange improvements, which may include trees and shrubs in accordance with Caltrans allowances. Along I-205, erosion control would be provided on embankment side slopes and ditches. Other landscaping would be provided in accordance with mitigation requirements (e.g., due to the loss of existing trees within the I-205 corridor). Replacement landscaping may occur at an offsite location.

Alternative 5A—Partial Cloverleaf Interchange

This alternative would construct a new partial cloverleaf interchange to replace the existing 11th Street ramps on I-205. The new interchange would be located approximately 2.3 miles east of the Mountain House Parkway interchange and 1.6 miles west of the Grant Line Road interchange. An auxiliary lane in the westbound direction along I-205 would connect the westbound Grant Line Road on-ramp to the westbound 11th Street exit ramp. Local road improvements would include:

- Realignment and extension of 11th Street to curve to the north west of Lammers Road to connect to Byron Road north of I-205.
- Realignment and extension of Grant Line Road over Byron road to connect with 11th Street north of I-205.
- Local road north of I-205 to connect 11th Street and Byron Road.

Structures. The 11th Street Overcrossing would be designed to accommodate the future widening of I-205 to ten lanes. The existing 11th Street westbound on-ramp overcrossing would be demolished.

Local Streets. Modifications would be required for various local streets to accommodate the new interchange. Local streets would be impacted temporarily during construction to accommodate contractor access and complete construction tasks.

Pedestrian and Bicycle Facilities. Pedestrian facilities would be provided to cross I-205 on both sides of 11th Street in conformity with the City's General Plan.

Drainage. Additional drainage improvements are required among the mainline due to the increase in paved surfaces and subsequent runoff. Drainage improvements include, but are not limited to, surface and subsurface drains and retention ditches along the auxiliary lanes and basins within the interchange area. There are no surface water bodies located within the project area, and hence no treatment BMPs are required for the project.

Park and Ride Facilities. 1-acre Park and Ride facilities would be provided in the vicinity of the project at the northwest corner of the Commerce Way and 11th Street intersection.

Landscaping. Standard landscaping would be provided within the new interchange improvements which may include trees and shrub in accordance with Caltrans allowances. Along I-205, erosion control would be provided on embankment side slopes and ditches. Other landscaping would be provided in accordance with mitigation requirements (e.g., due to the loss of existing trees within the I-205 corridor). Replacement landscaping may occur at an off-site location.

Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to the Caltrans Technical Noise Supplement (TeNS) (California Department of Transportation 2009), a technical supplement to the Protocol available on Caltrans' Web site (http://www.dot.ca.gov/hq/env/noise/pub/Final_TeNS_Nov2009.pdf).

Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. *Noise* is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

Continuous sound can be described by *frequency* (pitch) and *amplitude* (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hz. The audible frequency range for humans is generally between 20 and 20,000 Hz (20 kHz).

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred-billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this huge range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 mPa.

Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB—rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an “A-weighted” sound level (expressed in units of dBA) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA. Table 1 describes typical A-weighted noise levels for various noise sources.

Table 1 Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 1998.

Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency ("pure-tone") signals in the midfrequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound would generally be perceived as barely detectable.

Noise Descriptors

Noise in our daily environment fluctuates over time. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis.

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (L_{eq}[h]) is the energy average of A-weighted sound levels occurring during a 1-hour period, and is the basis for Noise Abatement Criteria used by Caltrans and FHWA.
- **Percentile-Exceeded Sound Level (L_{xx}):** L_{xx} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time).
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period.
- **Day-Night Level (L_{dn}):** L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.
- **Community Noise Equivalent Level (CNEL):** Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors.

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

Ground Absorption

The propagation path of noise from a highway to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees between the source and the receiver), an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance.

Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receiver is rarely effective in reducing noise because it does not create a solid barrier.

Federal Regulations and State Policies

NEPA and CEQA provide the broad basis for analyzing highway traffic noise effects. The intent of these laws is to promote the general welfare and to foster a healthy environment.

Federal Regulations

As noted earlier, federal guidelines for assessing traffic noise are contained in 23 CFR 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." These regulations constitute the federal noise standard. Projects complying with this standard are also in compliance with the requirement stemming from NEPA.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) is a federal law that establishes environmental policy for the nation, provides an interdisciplinary framework for federal agencies to prevent environmental damage, and contains action-forcing procedures to ensure that federal agency decision-makers take environmental factors into account. Under NEPA, impacts and measures to mitigate adverse impacts must be identified, including the identification of impacts for which no mitigation or only partial mitigation is available. The FHWA regulations discussed below constitute the federal noise standard. Projects complying with this standard are also in compliance with the requirements stemming from NEPA.

23 CFR Part 772

For highway transportation projects with FHWA involvement, the Federal-Aid Highway Act of 1970 and the associated implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23 CFR 772, projects are categorized as Type I or Type II projects. FHWA defines a *Type I project* as a proposed federal or federal-aid highway project for the construction of a highway on a new location or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes. A *Type II project* is a noise barrier retrofit project that involves no changes to highway capacity or alignment.

Type I projects include those that create a completely new noise source, as well as those that increase the volume or speed of traffic or move the traffic closer to a receiver. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or widening an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels, such as striping, lighting, signing, and landscaping projects, are not considered Type I projects. Because the proposed project involves the construction of a new interchange, it is a Type I project.

Under 23 CFR 772, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor "consider" noise abatement before adoption of the final NEPA document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772, occur when the predicted noise level in the design year approaches or exceeds the Noise Abatement Criteria (NAC) specified in 23 CFR 772, or a predicted noise level substantially exceeds the existing noise level (a *substantial* noise increase). 23 CFR 772 does not specifically define the terms *substantial increase* or *approach;* however, these criteria are defined in the Protocol, as described below.

Table 2 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

Table 2 Activity Categories and Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level (dBA-L_{eq}[h])	Description of Activities
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals
C	72 Exterior	Developed lands, properties, or activities not included in categories A or B above
D	–	Undeveloped lands
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category E) is used as the basis for determining a noise impact.

There may be situations where "severe" traffic noise impacts exist or are expected but the abatement measures listed in 23 CFR 772.13(c) are not feasible or reasonable. A severe noise impact is considered to occur when predicted exterior noise levels equal or exceed 75 dBA-L_{eq}(h) or are 30 dB or more above existing noise levels. In these instances, noise abatement measures other than those listed in 23 CFR 772.13(c) must be considered. Such measures are considered "unusual and extraordinary" abatement measures and may include measures such as constructing noise barriers that have an estimated construction cost that exceeds the reasonableness allowance or providing interior abatement in residential units. Unusual and extraordinary abatement proposed on a federal-aid project is subject to approval by FHWA on a case-by-case basis. When noise abatement is provided on public or private properties consistent with this policy, an agreement must be entered into with the owner of the subject property that specifies that Caltrans is not responsible for any future costs of operating or maintaining the noise abatement measures. Unusual and extraordinary abatement must reduce noise by at least 5 dB to be considered feasible from an acoustical perspective.

State Regulations and Policies

California Environmental Quality Act

CEQA is the foundation of environmental law and policy in California. The main objectives of CEQA are to disclose the significant environmental effects of proposed activities to decision-makers and the public and to identify ways to avoid or reduce those effects by requiring implementation of feasible alternatives or mitigation measures. Under CEQA, a substantial noise increase as defined in 23 CFR 772 may result in a significant impact; if so, the noise increase must be mitigated or identified as a noise impact for which it is likely that no or only partial mitigation is available. Specific economic, social, environmental, legal, and technological conditions can make mitigation measures for noise infeasible.

Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the Protocol are the same as those specified in 23 CFR 772. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dB. The Protocol also states that a sound level is considered to approach the NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The TeNS to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA-L_{eq}(h) in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the "approach or exceed" NAC criterion for FHWA Activity Category E for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA-L_{eq}(h). If the noise levels exceed 52 dBA-L_{eq}(h) prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

Study Methods and Procedures

Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receiver Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use type, Activity Category as defined in Table 2, and the extent of frequent human use. As stated in the Protocol, noise abatement is only

considered for areas of frequent human use that would benefit from a lowered noise level. Although all developed land uses are evaluated in this analysis, the focus is on locations of frequent human use. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards and common use areas at multifamily residences. The geometry of the project relative to nearby existing and planned land uses was also identified.

Short-term measurement locations were selected to represent each major land use area within the project area. Long-term measurement sites were selected to capture the diurnal traffic noise-level pattern in the project area. Short-term measurement locations and several other locations where measurements were not taken were selected to serve as representative modeling locations.

Field Measurement Procedures

A field noise study was conducted in accordance with recommended procedures in TeNS. The following is a summary of the procedures used to collect short- and long-term sound level data.

Short-Term Measurements

Short-term monitoring was conducted at eight locations on Thursday, September 10, 2009, using Larson Davis Model LD-812 (serial numbers 0430 and 0239) Type 1 sound level meters. Short-term monitoring locations are identified in Figure 2.

During the short-term measurements, field staff attended each meter. At all locations, noise levels were measured at a height of approximately 5 feet above the ground and at least 10 feet from structures. The selected sites were primarily affected by traffic noise from I-205, Lammers Road, and other local roadways. Noise measurements of 15 minutes in duration were conducted at all measurement sites in the project area. Noise levels were collected during the measurement period were logged, and dominant noise sources observed during each measurement period were identified and logged. The calibration of the meter was checked before and after the measurement. Overall noise levels for each measurement location were then calculated from raw data.

Traffic on I-205 and local roadways was classified and counted by direction concurrent with short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. An *automobile* was defined as a vehicle with two axles and four tires designed primarily to carry passengers. Small vans and light trucks were included in this category. *Medium-duty trucks* included all cargo vehicles with two axles and six tires. *Heavy-duty trucks* included all vehicles with three or more axles.

Figure 2 Noise Monitoring Locations

Long-Term Measurements

Long-term monitoring was conducted at one location (marked LT-1 in Figure 2) using a Larson-Davis Model LD-720 Type 2 (serial number 0506) sound level meter. The purpose of this measurement was to quantify the daily trend in noise levels throughout a 24-hour period and identify the peak traffic noise hour or "loudest" hour. The results of this measurement were used to describe variations in sound levels throughout the day, rather than absolute sound levels at a specific receptor of concern. The long-term sound level data was collected over 1 week of consecutive 24-hour periods from September 10 to 17, 2009.

Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Three-dimensional representations of roadways, shielding features (e.g., topography and buildings), noise barriers, ground type, and receivers were developed using computer aided drafting (CAD) drawings, aerials, and topographic contours provided by the City and input into the traffic noise model.

Traffic noise was evaluated under existing (2006), design-year (2035) no-project conditions, and design-year with Alternatives 1 and 5A conditions. Loudest-hour traffic volumes, vehicle classification percentages, and traffic speeds under existing and design-year conditions were provided by Fehr & Peers (2009) for input into the traffic noise model. The highest average traffic volumes on I-205 are predicted to occur during p.m. hours; therefore p.m. peak hour traffic volumes were used in the model. Tables in Appendix A (Traffic Data) summarize the traffic volumes and the assumptions used for modeling existing and design-year conditions with and without the project alternatives.

To validate the accuracy of the model, 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. These normalized volumes were assigned to the corresponding project area roadways 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 whether additional calibration of the model was necessary.

Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receiver locations where predicted design-year noise levels are at least 12 dB greater than existing noise levels, or where predicted design-year noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at impacted receiver locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to intercept the line-of-sight from the exhaust stack of a truck to the first tier of receivers, as required by Chapter 1100 of the *Highway Design Manual*. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations. The noise study report presents the reasonable allowance for benefited residences. Cost of noise abatement is calculated and explained in the Noise Abatement Decision Report (NADR). The overall reasonableness of noise abatement is determined by considering factors such as cost; absolute predicted noise levels; predicted future increase in noise levels; expected noise abatement benefits; build date of surrounding residential development along the highway; environmental impacts of abatement construction; opinions of affected residents; input from the public and local agencies; and social, legal, and technological factors.

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. A cost-per-residence allowance is calculated for each benefited residence (i.e., residences that receive at least 5 dB of noise reduction from a noise barrier). The 2009 base allowance is $31,000. Additional allowance dollars are added to the base allowance based on absolute noise levels, the increase in noise levels resulting from the proposed project, achievable noise reduction, and the date of building construction in the area. Total allowances are calculated by multiplying the cost-per-residence by the number of benefited residences. If the total allowance for all evaluated noise barriers is more than 50 percent of the estimated construction cost of the Lammers Road project, the allowance per residence is modified to a reduced value.

Existing Noise Environment

Existing Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Single-family residences, multifamily residences, schools, hotels, and places of worship were identified as Activity Category B land uses in the project area. Commercial and industrial uses in the area are Activity Category C land uses.

As required by the Protocol, although all developed land uses are evaluated in this analysis, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards and common use areas at multifamily residences.

Noise-sensitive receivers in the project area consist entirely of Activity Category B land uses. North of I-205, these are primarily agricultural uses and open space, with sparsely populated single-family residences and commercial uses. South of I-205, there are several residential subdivisions, apartment buildings, and outdoor use areas, including a ballfield in the eastern quadrant of the I-205/Byron Road underpass. The area west of the existing Lammers Road is primarily open space. The Tracy Gateway Business Park is scheduled for development in the southwest quadrant of the 11th Street/Lammers Road intersection.

There are several existing sound walls in the project area. The Westgate subdivision is bounded by a 6-foot privacy wall adjacent to Lammers Road and 11th Street. An existing noise barrier with a nominal height of 14 feet extends along the eastbound side of I-205 from the Byron Road underpass to the Grant Line Road exit, beyond the study area eastern limit.

Noise Measurement Results

The existing noise environment in the project area is characterized below, based on short- and long-term noise monitoring that was conducted.

Short-Term Monitoring

Table 3 summarizes the results of the short-term noise monitoring conducted in the project area. Temperature, wind speed, and humidity were recorded manually during the short-term monitoring session using a Kestrel 3000 portable weather station. During the short-term measurements, wind speeds typically ranged from 1–4 miles per hour (mph) under clear skies. Temperatures were in the range of 85–103°F, with 31 percent relative humidity.

Table 3 Summary of Short-Term Measurements

Location	Address	Start Time	Duration (minutes)	Measured L_{eq}
ST-1	Von Sosten Road near Byron Road	10:11 a.m.	15	54.5
ST-2	Von Sosten Road	10:38 a.m.	15	59.3
ST-3	Lammers Road at Feteira Way	12:59 p.m.	15	62.7
ST-4	Lammers Road at Westgate Drive	12:59 p.m.	15	61.8
ST-5	Near West Grant Line Road	2:29 p.m.	15	50.5
ST-6	Near West Grant Line Road	2:29 p.m.	15	44.9
ST-7	Lammers Road near I-205	3:12 p.m.	15	62.5
ST-8	End of Ormonde Court; Lammers Road near I-205	3:12 p.m.	15	67.6

Short-term measurement sites ST-1 and ST-2 were located close to Von Sosten Road. Noise levels are louder at position ST-2, even though it is located further that ST-1 from the busiest roads in the study area, Byron Road and I-205. Though infrequent, traffic from intermittent vehicle passbys on Von Sosten Road contributed most significantly to the measurements at ST-1 and ST-2. Vehicle noise source characteristics from each individual passby can vary greatly by vehicle, especially when measured close to the source. This is the likely reason why measured levels at ST-2 are louder than levels at ST-1.

Long-Term Monitoring

Long-term monitoring location LT-1 was situated in the southwest quadrant of the 11th Street/Lammers Road intersection, approximately 350 feet from the center of Lammers Road, 140 feet from the center of 11th Street, and about 3 feet above the surrounding ground (see Figure 2 above). The purpose of the measurement was to characterize ambient noise levels in the study area. The average loudest-hour sound level measured was 65.8 dBA-L_{eq}(h) during the 2:00 p.m. hour. The measured day-night level was 68.9 L_{dn}. Table 4 and the following graph (Figure 3) summarize the results of the long-term monitoring.

Existing Noise Levels

The existing noise environment in the study area is dominated by noise from traffic traveling on I-205 and local roadways, and occasional aircraft overflights. Table 5 summarizes the modeling results for existing worst-hour traffic noise conditions.

Table 4 Summary of Long-Term Monitoring, LT-1

Hour Beginning	Seven-Day Average (dBA, L_{eq}[h])	Difference from Loudest Hour (dB)
12 a.m.	62.0	-3.8
1 a.m.	60.3	-5.5
2 a.m.	58.8	-7.0
3 a.m.	58.7	-7.1
4 a.m.	61.8	-4.1
5 a.m.	63.3	-2.5
6 a.m.	63.9	-1.9
7 a.m.	64.4	-1.4
8 a.m.	63.0	-2.8
9 a.m.	61.8	-4.0
10 a.m.	62.0	-3.8
11 a.m.	62.0	-3.8
12 p.m.	61.0	-4.8
1 p.m.	61.7	-4.1
2 p.m.	62.8	-3.0
3 p.m.	63.5	-2.3
4 p.m.	65.0	-0.8
5 p.m.	65.3	-0.5
6 p.m.	**65.8**[a]	**0.0**[a]
7 p.m.	65.8	0.0
8 p.m.	65.5	-0.3
9 p.m.	64.9	-0.9
10 p.m.	63.9	-1.9
11 p.m.	63.2	-2.6

[a] Worst-hour noise level.

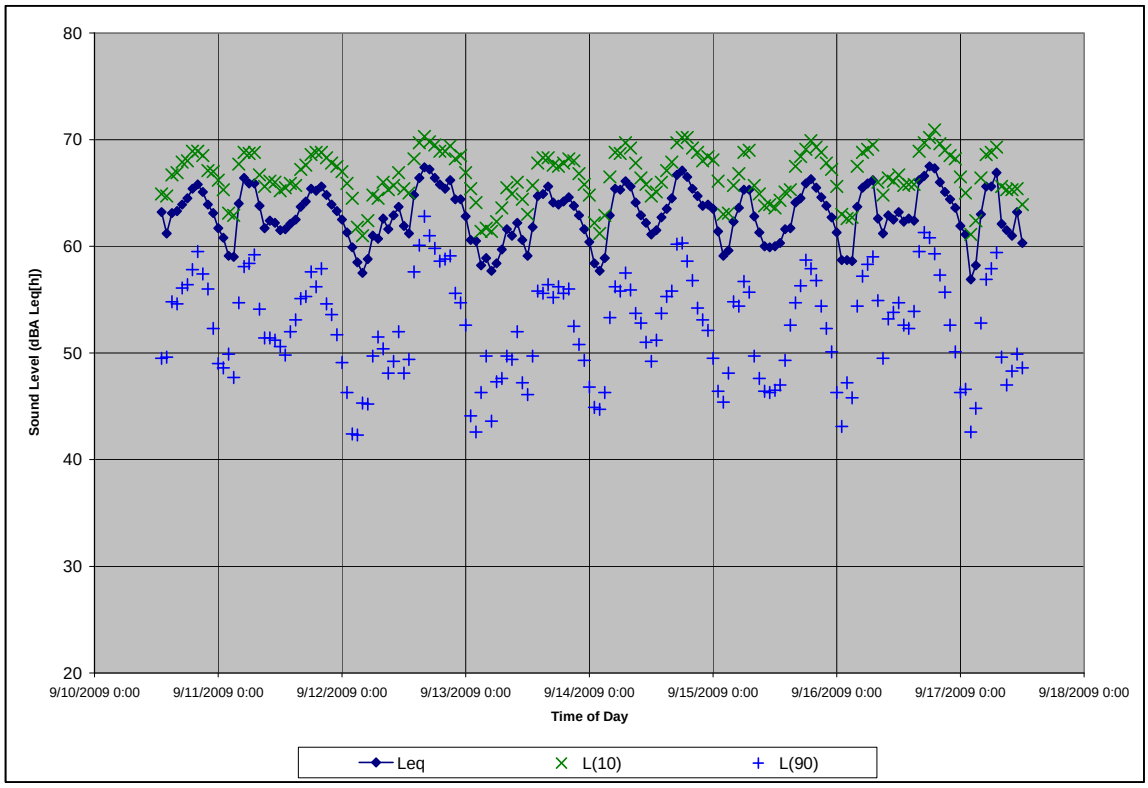

Figure 3 Long-Term Noise Monitoring at Site LT-1. September 10–17, 2009

Table 5 Modeled Existing Noise Levels

Receiver Location	Noise Activity Category	Land Use	Location	Dwelling Units	Existing dBA L_{eq}(h)
R-01	B (67)	Residential	Von Sosten Road	1	62
R-02	B (67)	Residential	Von Sosten Road	2	55
R-03	B (67)	Residential	Von Sosten Road	1	55
R-04	B (67)	Residential	Von Sosten Road	2	55
R-05	B (67)	Residential	Von Sosten Road	1	52
R-06	B (67)	Residential	Von Sosten Road	2	52
R-07	B (67)	Residential	Byron Road north of I-205	3	63
R-08	B (67)	Residential	Byron Road north of I-205	1	60
R-09	B (67)	Residential	W Grant Line Road	2	59
R-10	B (67)	Residential	W Grant Line Road	1	59
R-11	B (67)	Residential	W Grant Line Road	1	53
R-12	B (67)	Residential	W Grant Line Road	1	53
R-13	B (67)	Residential	11th St/Lammers Road	1	68
R-14	B (67)	Residential	11th St/Lammers Road	1	69
R-15	B (67)	Residential	11th St/Lammers Road	1	70
R-16	B (67)	Residential	East of Lammers Road	64	57
R-17	B (67)	Residential	East of Lammers Road	11	55
R-18	B (67)	Residential	East of Lammers Road	15	55
R-19	B (67)	Residential	East of Lammers Road	40	58
R-20	B (67)	Residential	East of Lammers Road	28	59
R-21	B (67)	Residential	Lammers Road/I-205	1	68
R-22	B (67)	Residential	Lammers Road/I-205	1	67
R-23	B (67)	Residential	Lammers Road/I-205	1	68
R-24	B (67)	Residential	Lammers Road/I-205	1	69
R-25	B (67)	Residential	Lammers Road/I-205	1	70
R-26	B (67)	Residential	Lammers Road/I-205	1	69
R-27	B (67)	Residential	Ormonde Court	2	63
R-28	B (67)	Residential	Ormonde Court	2	63
R-29	B (67)	Residential	Ormonde Court	1	62
R-30	B (67)	Residential	Ormonde Court	1	66
R-31	B (67)	Residential	Ormonde Court	2	65
R-32	B (67)	Residential	Ormonde Court	1	62
R-33	B (67)	Residential	Byron Road south of I-205	1	66
R-34	B (67)	Residential	Byron Road south of I-205	2	65
R-35	B (67)	Residential	Byron Road south of I-205	5	63
R-36	B (67)	Residential	Byron Road south of I-205	1	64
R-37	B (67)	Residential	Byron Road south of I-205	0	62

Noise Model Calibration

The FHWA Traffic Noise Model, TNM 2.5, was used to compare measured traffic noise levels to modeled noise levels at field measurement locations (Table 6). The digitized roadway, barrier, receiver, and building row locations were input into the traffic noise model for calibration. Traffic counts conducted simultaneously with noise measurements were normalized to 1-hour traffic volumes. These hourly traffic volumes were put into the model for calibration. Traffic volumes were classified into three vehicle types, as detailed in Section 5.2.1: (1) automobiles, (2) medium-duty trucks (typically trucks with two axles and more than four wheels), and (3) heavy-duty trucks (typically trucks with more than two axles).

As shown in Table 6, predicted sound levels were found to deviate from measured sound levels within a range of -2.5 to +2.6 dB. In general, modeled sound level predictions using counted traffic are considered to be in reasonable agreement if they are within 3 dB of measured sound levels. Therefore, predicted noise levels are within a range of reasonable agreement with measured noise levels, and no calibration factors were applied to prediction locations in the TNM model for this project.

Table 6 Comparison of Measured to Predicted Sound Levels in the TNM Model

Location	Measured Sound Level (dBA)	Predicted Sound Level (dBA)	Predicted minus Measured (dB)
ST-1	54.5	56.6	+ 2.1
ST-2	59.3	58.4	- 0.9
ST-3	62.7	62.3	- 0.4
ST-4	61.8	60.4	- 1.4
ST-5	50.5	53.1	+ 2.6
ST-6	44.9	45.9	+ 1.0
ST-7	62.5	61.5	- 1.0
ST-8	67.6	65.1	- 2.5

Future Noise Environment, Impacts, and Considered Abatement

Future Noise Environment and Impacts

Appendix B summarizes the traffic noise modeling results for existing and design-year conditions with and without the project. Predicted design-year traffic noise levels under each project alternative are compared to existing conditions. This comparison identifies traffic noise impacts caused by a substantial increase in noise over existing conditions under 23 CFR 772. Impacts are indicated by alternative and type of impact in the rightmost two columns of the table.

Modeling results in Appendix B indicate that predicted traffic noise levels for the design-year with-project conditions approach or exceed the NAC of 67 dBA-L_{eq}(h) for Activity Category B land uses at first-row residences within the project area. A substantial increase in noise levels over existing conditions is also identified for several receiver locations under Alternative 1. Therefore, traffic noise impacts are predicted to occur under both project alternatives, and noise abatement must be considered.

Each noise barrier was evaluated for feasibility based on achievable noise reduction. For each noise barrier found to be acoustically feasible, reasonable cost allowances were calculated. Worksheets C-1 to C-36 in Appendix C summarize the reasonable cost allowance calculations, based on the allowance calculation procedure identified in the

Protocol. Tables in Appendix D summarize results at individual noise-sensitive receiver locations for each noise barrier studied in this report.

For any noise barrier to be considered reasonable from a cost perspective the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier should include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, and retaining walls. Construction cost estimates are not provided in this NSR, but are presented in the NADR. The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document before public review of the project. The NADR is prepared by the project engineer after completion of the NSR and prior to publication of the draft environmental document. The NADR includes noise abatement construction cost estimates that have been prepared and signed by the project engineer based on site-specific conditions. Construction cost estimates are compared to reasonableness allowances in the NADR to identify which wall configurations are reasonable from a cost perspective.

The design of noise barriers presented in this report is preliminary only and has been conducted at a level appropriate for environmental review but not for final design of the project. The opinions of the impacted residents collected during the environmental review process would be a major consideration in reaching a final decision on the reasonableness of abatement measures to be provided.

Preliminary information on the physical location, length, and height of evaluated noise barriers is provided in this report. Noise barriers were evaluated for wall heights from 6 to 16 feet. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of the noise abatement will be made upon completion of the project design.

As stated above, none of the Activity Category C land uses in the project area have areas of frequent human use that would benefit from a lowered noise level. Accordingly, noise abatement has not been evaluated at any Activity Category C land uses in the project area. All areas evaluated for abatement are Activity Category B land uses.

The following is a discussion of noise abatement considered within the project area. As described above, noise abatement is considered in locations where predicted traffic noise

levels approach or exceed the FHWA NAC, or are predicted to result in a substantial increase in noise levels over existing conditions.

Noise Barrier A (Alternatives 1 and 5A)

Noise modeling results shown in Appendix B indicate that residences along West Grant Line Road are predicted to approach or exceed the Activity Category B NAC of 67 dBA-L_{eq}(h) under both project alternatives. Additionally, residences are predicted to be exposed to a substantial increase in noise levels over existing conditions under Alternative 1. Traffic noise impacts are predicted to occur at a total of five residences under Alternative 1, and a total of three residences under Alternative 5A in this area. Noise Barrier A was designed along the edge-of-shoulder of Lammers Road under Alternative 1 and was evaluated for feasibility to benefit receiver locations R-09 through R-12 along West Grant Line Road (refer to Figure 4).

Detailed modeling analysis of Noise Barrier A indicates that a barrier up to 16 feet high would result in a total noise reduction of less than 5 dB at noise-sensitive first-row receiver locations. Therefore Barrier A is not feasible from an acoustical perspective. A noise barrier along the West Grant Line Road right-of-way is also not a feasible option, because the residential properties require driveway access to Grant Line Road. To be acoustically effective, noise barriers must be continuous along the frontage of impacted properties. Therefore, noise barriers under both Alternatives are not considered to be a feasible noise abatement option for residences along West Grant Line Road.

Noise Barrier B (Alternative 1 only)

Traffic noise modeling results in Appendix B indicate that traffic noise levels at three residences along Von Sosten Road are predicted to approach or exceed the Activity Category B NAC of 67 dBA-L_{eq}(h) under Alternative 1. Two residences, represented by receiver R-02 (refer to Figure 4) are predicted to be exposed to a substantial increase in noise levels under Alternative 1. Traffic noise impacts are therefore predicted to occur in this area. One impacted residence, R-01, is located near Byron Road, and requires driveway access to Von Sosten Road, which, in turn, would require access to Lammers Road under Alternative 1. To be acoustically effective, noise barriers must be continuous along the frontage of impacted properties. Therefore, noise barriers are not considered to be a feasible noise abatement option for the residence at receiver location R-01.

Noise Barrier B was designed along the edge-of-shoulder of Lammers Road under Alternative 1 and was evaluated for feasibility to benefit residential locations at receiver R-02. Noise Barrier B was evaluated at this location for wall heights in the range of 6 to 14 feet. Figure 4 shows the location of Noise Barrier B. Reasonable allowance calculation sheets are provided in Appendix C. Table 7 summarizes the barrier evaluation.

Table 7 Summary of Reasonableness Determination Data—Noise Barrier B

Predicted Sound Level without Barrier					
Design-Year Noise Level, dBA-L_{eq}(h)	76				
Design-Year Noise Level minus Existing Noise Level	21				
Design Year with Barrier	**H = 6 feet**	**H = 8 feet**	**H = 10 feet**	**H = 12 feet**	**H = 14 feet**
Barrier Noise Reduction, dB	6	7	9	10	11
Number of Benefited Residences	2	2	2	2	2
New Highway or More than 50% of Residences Predate 1978	YES	YES	YES	YES	YES
Reasonable Allowance per Benefited Residence	$55,000	$55,000	$57,000	$57,000	$57,000
Total Reasonable Allowance	$110,000	$110,000	$114,000	$114,000	$114,000

Under Alternative 1, receiver R-02 is predicted to be exposed to a noise level of 76 dBA-L_{eq}(h). Barrier B would provide at least 5 dB of noise reduction and would reduce traffic noise levels to 70 dBA L_{eq} at this location at a height of 6 feet (see Appendix D).

The design-year traffic noise level at receiver R-02 is predicted to exceed 75 dBA L_{eq}(h). This location is therefore predicted to be exposed to a severe traffic noise impact as defined in the Protocol. Noise abatement that is not reasonable and feasible as defined in the Protocol may be considered for severe traffic noise impacts on a case-by-case basis. This type of abatement is called *extraordinary abatement*. In the event that this barrier is not determined to be reasonable from a cost perspective, it may be considered for extraordinary abatement. In the event the noise barrier is found to be *not feasible*, interior residential sound insulation of individual homes may be considered as an option for extraordinary abatement. Residential noise insulation may reduce interior traffic noise levels by 5 dB or more, depending on the existing construction of the home.

Figure 4 Noise Prediction Sites and Evaluated Noise Barriers Alt 1

Noise Barriers C-1 and C-2 (Alternatives 1 and 5A)

The traffic noise modeling results in Appendix B indicate that traffic noise levels are predicted to approach or exceed the Activity Category B NAC of 67 dBA-L_{eq}(h) at single-family residences adjacent to the 11th Street/Lammers Road intersection on the south side of 11th Street. Traffic noise impacts are predicted to occur at three residences in this area (R-13, R-14, and R-15). No noise barriers are currently located in this area. Noise Barriers C-1 and C-2 are located within the right-of-way at the southwest and southeast quadrants of the intersection and both would provide shielding from traffic noise on 11th Street and Lammers Road. Each of these barriers were evaluated for feasibility at wall heights in the range of 6 to 16 feet. Reasonable allowance calculation sheets are provided in Appendix C. Barrier C-1 would benefit one residence at a height of 14 feet. Barrier C-2 would benefit two residences at a height of 8 feet. Tables 8 and 9 summarize the calculated reasonable allowances for each barrier. The barriers are shown in both Figures 4 and 5.

Table 8 Summary of Reasonableness Determination Data—Noise Barrier C-1

Predicted Sound Level without Barrier						
Design-Year Noise Level, dBA-L_{eq}(h)	73					
Design-Year Noise Level minus Existing Noise Level	4					
Design Year with Barrier	**H = 6 feet**	**H = 8 feet**	**H = 10 feet**	**H = 12 feet**	**H = 14 feet**	**H = 16 feet**
Barrier Noise Reduction, dB	1	2	3	4	5	5
Number of Benefited Residences	0	0	0	0	1	1
New Highway or More than 50% of Residences Predate 1978	YES	YES	YES	YES	YES	YES
Reasonable Allowance per Benefited Residence	$47,000	$47,000	$47,000	$47,000	$47,000	$47,000
Total Reasonable Allowance	N/A	N/A	N/A	N/A	$47,000	$47,000

Table 9 Summary of Reasonableness Determination Data— Noise Barrier C-2

Predicted Sound Level without Barrier						
Design-Year Noise Level, dBA-L_{eq}(h)	72					
Design-Year Noise Level minus Existing Noise Level	4					
Design Year with Barrier	**H = 6 feet**	**H = 8 feet**	**H = 10 feet**	**H = 12 feet**	**H = 14 feet**	**H = 16 feet**
Barrier Noise Reduction, dB	7	7	8	9	10	10
Number of Benefited Residences	1	2	2	2	2	2
New Highway or More than 50% of Residences Predate 1978	YES	YES	YES	YES	YES	YES
Reasonable Allowance per Benefited Residence	$49,000	$49,000	$49,000	$51,000	$51,000	$51,000
Total Reasonable Allowance	$49,000	$98,000	$98,000	$102,000	$102,000	$102,000

Noise Barrier D (Alternative 1 only)

The traffic noise modeling results in Appendix B indicate that traffic noise levels are predicted to approach or exceed the Activity Category B NAC of 67 dBA-L_{eq}(h) at single-family residences adjacent to existing Lammers Road south of the I-205 intersection. Under Alternative 1, traffic noise impacts are predicted to occur at 12 residences in this area represented by R-21 through R-26, R-30, R-31, R-33 and R-34 in Figure 4. An existing noise barrier with a nominal height of 6 feet surrounds residences at Ormonde Court, and a 14-foot barrier extends along the eastbound I-205 edge of shoulder. The design for Noise Barrier D extends west from the terminus of the existing barrier along eastbound I-205 and along the proposed I-205 eastbound onramp under Alternative 1. Noise Barrier D was evaluated for feasibility at this location at wall heights in the range of 10 to 14 feet refer to design manual for height restrictions of barriers along shoulder (maximum allowable wall heights are reduced for barriers with footings located at the edge of the roadway shoulder). Reasonable allowance calculation sheets are provided in Appendix C. Barrier D would benefit up to five residences at a height of 14 feet. Table 10 summarizes the calculated reasonable allowances for Barrier D. Barrier D is shown in Figure 4.

Figure 5 Noise Prediction Sites and Evaluated Noise Barriers Alt 5A

Table 10 Summary of Reasonableness Determination Data— Noise Barrier D

Predicted Sound Level without Barrier					
Design-Year Noise Level, dBA-L_{eq}(h)	70				
Design-Year Noise Level minus Existing Noise Level	2				
Design Year with Barrier	**H = 6 feet**	**H = 8 feet**	**H = 10 feet**	**H = 12 feet**	**H = 14 feet**
Barrier Noise Reduction, dB	3	4	6	7	7
Number of Benefited Residences	0	0	1	5	5
New Highway or More than 50% of Residences Predate 1978	YES	YES	YES	YES	YES
Reasonable Allowance per Benefited Residence	$45,000	$45,000	$47,000	$47,000	$47,000
Total Reasonable Allowance	n/a	n/a	$47,000	$235,000	$235,000

Noise Barrier F (Alternative 5A only)

The traffic noise modeling results in Appendix B indicate that traffic noise levels are predicted to approach or exceed the Activity Category B NAC of 67 dBA-L_{eq}(h) at single-family residences adjacent to existing Lammers Road south of the I-205 intersection. Under Alternative 5A, traffic noise impacts are predicted to occur at 22 residences in this area represented by R-21 through R-28, R-30, R-31, and R-33 through R-36 in Figure 5. An existing noise barrier with a nominal height of 6 feet surrounds residences at Ormonde Court, and a 14-foot barrier extends along the eastbound I-205 edge-of-shoulder. The design for Noise Barrier F extends west from the terminus of the existing barrier along eastbound I-205 up to the proposed I-205 eastbound on-ramp under Alternative 5A. Noise Barrier F was evaluated for feasibility at this location at wall heights in the range of 8 to 14 feet refer to design manual for height restrictions of barriers along shoulder (maximum allowable wall heights are reduced for barriers with footings located at the edge of the roadway shoulder). Reasonable allowance calculation sheets are provided in Appendix C. Barrier F would benefit up to 10 residences at a height of 14 feet. Table 11 summarizes the calculated reasonable allowances for Barrier F. Noise Barrier F is shown in Figure 5.

Table 11 Summary of Reasonableness Determination Data—Noise Barrier F

Predicted Sound Level without Barrier					
Design-Year Noise Level, dBA-L_{eq}(h)	72				
Design-Year Noise Level minus Existing Noise Level	5				
Design Year with Barrier	**H = 6 feet**	**H = 8 feet**	**H = 10 feet**	**H = 12 feet**	**H = 14 feet**
Barrier Noise Reduction, dB	4	5	5	7	8
Number of Benefited Residences	0	1	3	5	10
New Highway or More than 50% of Residences Predate 1978	YES	YES	YES	YES	YES
Reasonable Allowance per Benefited Residence	$47,000	$47,000	$47,000	$49,000	$49,000
Total Reasonable Allowance	n/a	$47,000	$141,000	$245,000	$490,000

CEQA Impacts

CEQA requires a comparison of existing to design-year with-project conditions to assess whether a proposed project would have a significant noise impact. If a proposed project is determined to have a significant noise impact under CEQA, the act dictates that mitigation measures be incorporated into the project unless such measures are not feasible.

In Appendix B, predicted future noise levels under each project alternative are compared with existing conditions to determine the significance of traffic noise impacts under CEQA. For this project, Caltrans considers traffic noise impacts to be significant if future noise levels increase by 12 dB or more over existing noise conditions. Appendix B also includes Future No-Build noise levels (i.e., noise levels that are expected in the future if the project is not constructed) so that one can understand the direct effect of the project.

The results in Appendix B indicate that a total of 7 residences are predicted to be exposed to a substantial this term is used for NEPA increase in noise levels (i.e., a 12-dB increase over existing noise levels) under Project Alternative 1. No residences are predicted to be exposed to a substantial increase in noise levels under Project Alternative 5A. Significant noise impacts are therefore predicted to occur under Alternative 1. Noise impacts under Alternative 5A are considered to be less than significant.

Barrier analyses were conducted for all residences predicted to be exposed to substantial increases in noise levels, discussed above in Sections 7.2.1 and 7.2.2. Noise Barrier A was evaluated for 5 of the residences, but was found to be not feasible. Noise Barrier B would provide at least 5 dB of noise reduction to 2 impacted residences.

Construction Noise

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Construction noise from Caltrans projects is controlled by Caltrans *Standard Specifications* Section 14-8.02, "Environmental Stewardship—Noise Control," which states that noise levels generated during construction shall comply with applicable local, state, and federal regulations and that all equipment shall be fitted with adequate mufflers according to the manufacturers' specifications (California Department of Transportation 2009). In addition, the specification states that construction noise levels from job site activities occurring between the hours of 9 p.m. and 6 a.m. should not exceed 86 dBA at 50 feet.

Table 12 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 70–90 dB at a distance of 50 feet, and noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance.

Table 12 Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)
Scrapers	89
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82

Source: Federal Transit Administration 2006.

No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans *Standard Specifications* Section 14-8.02 and applicable local noise standards. Construction noise would be short-term, intermittent, and overshadowed by local traffic noise. Further, implementing the following measures would minimize the temporary noise impacts from construction.

- All equipment will have sound-control devices that are no less effective than those provided on the original equipment. No equipment will have an unmuffled exhaust.
- As directed by Caltrans, the contractor will implement appropriate additional noise mitigation measures, including changing the location of stationary construction equipment, turning off idling equipment, rescheduling construction activity, notifying adjacent residents in advance of construction work, and installing acoustic barriers around stationary construction noise sources.

References

Caltrans. 1998. Technical Noise Supplement. October. Sacramento, CA: Environmental Program, Noise, Air Quality, and Hazardous Waste Management Office. Sacramento, CA. Available: (http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf).

———. 2006. Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects. August. Sacramento, CA.

———. 2009. Technical Noise Supplement. November. Sacramento, CA: Environmental Program, Noise, Air Quality, and Hazardous Waste Management Office. Sacramento, CA. Available: <http://www.dot.ca.gov/hq/env/noise/pub/Final_TeNS_Nov2009.pdf>.

Federal Highway Administration. 1998a. FHWA Traffic Noise Model, Version 1.0 User's Guide. January. FHWA-PD-96-009. Washington D.C.

———. 1998b. FHWA Traffic Noise Model, Version 1.0. February. FHWA-PD-96-010. Washington D.C.

Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment. (FTA-VA-90-1003-06.) Office of Planning, Washington, DC. Prepared by Harris Miller Miller & Hanson, Inc. Burlington, MA.

Fehr & Peers. 2009. Final Operations Report for the I-205/Lammers Road Interchange *Project*. May.

Appendix A. Traffic Data

Table A.1 Total Vehicles—Existing/No Build

	Existing: Lammers Rd/ 11th St.	Existing: Byron Rd/ Grant Line Rd.	No Build: Lammers Rd/ 11th St.	No Build: Lammers Rd./ Byron Rd. Connector	No Build: Lammers Rd./ Grant Line Rd.
WEST LINK (Total)	**2291**	**0**	**3480**	**970**	**1900**
-WB (Leave)	367	0	890	470	930
-EB (Approach)	1924	0	2590	500	970
EAST LINK (Total)	**2307**	**1267**	**4170**	**4600**	**5070**
-EB (Leave)	1852	771	2720	2160	2600
-WB (Approach)	455	496	1450	2440	2470
NORTH LINK (Total)	**481**	**978**	**2810**	**3670**	**1530**
-NB (Leave)	318	326	1210	1990	870
-SB (Approach)	163	652	1600	1680	660
SOUTH LINK (Total)	**487**	**817**	**2940**	**0**	**3660**
-SB (Leave)	246	434	1880	0	1680
-NB (Approach)	241	383	1060	0	1980

Table A.2 Total Vehicles—Project Alternative 1

	Project Alt. 1: Lammers Rd./ I-205 WB offramp	Project Alt. 1: Lammers Rd./ I-205 EB on-ramp	Project Alt. 1: Lammers Rd./ Commerce Way	Project Alt. 1: Lammers Rd./ 11th St.	Project Alt. 1: Lammers Rd./ Byron Connector	Project Alt. 1: Lammers Rd./ Grant Line Rd.	Project Alt. 1: Lammers Rd./ Von Sosten Rd.
WEST LINK (Total)	**280**	**330**	**2840**	**2850**	**760**	**2540**	**720**
-WB (Leave)	280	0	950	620	330	1290	320
-EB (Approach)	0	330	1890	2230	430	1250	400
EAST LINK (Total)	**1340**	**2140**	**1910**	**3580**	**1320**	**4420**	**1300**
-EB (Leave)	0	2140	930	2480	490	2520	470
-WB (Approach)	1340	0	980	1100	830	1900	830
NORTH LINK (Total)	**6430**	**6290**	**7240**	**5030**	**6150**	**3290**	**5850**
-NB (Leave)	3140	2540	3910	2310	3220	1680	3290
-SB (Approach)	3290	3750	3330	2720	2930	1610	2560
SOUTH LINK (Total)	**6290**	**7220**	**5030**	**4020**	**6430**	**5850**	**6150**
-SB (Leave)	3750	3310	2720	2330	3290	2560	2930
-NB (Approach)	2540	3910	2310	1690	3140	3290	3220

Table A.3 Total Vehicles—Project Alternative 5A

	Project Alt. 5A: 11th St./ I-205 WB offramp	Project Alt. 5A: 11th St./ I-205 EB on-ramp	Project Alt. 5A: Lammers Rd./ 11th St.	Project Alt. 5A: 11th St./ Byron Connector	Project Alt. 5A: 11th St./ Von Sosten Rd.	Project Alt. 5A: 11th St./ Grant Line Rd.	Project Alt. 5A: 11th St./ Commerce Way	Project Alt. 5A: 11th St./ Tracy Gateway
WEST LINK (Total)	**230**	**2530**	**3080**	**2400**	**520**	**1620**	**4180**	**4840**
-WB (Leave)	230	860	1010	930	210	1000	1680	2170
-EB (Approach)	0	1670	2070	1470	310	620	2500	2670
EAST LINK (Total)	**2110**	**1650**	**3460**	**3010**	**2110**	**2930**	**2050**	**3080**
-EB (Leave)	730	1650	2270	1320	770	1870	1040	2070
-WB (Approach)	1380	0	1190	1690	1340	1060	1010	1010
NORTH LINK (Total)	**4890**	**5510**	**2360**	**3580**	**5830**	**5000**	**7490**	**0**
-NB (Leave)	2380	2480	970	2180	3640	2630	3890	0
-SB (Approach)	2510	3030	1390	1400	2190	2370	3600	0
SOUTH LINK (Total)	**5510**	**7490**	**2140**	**4890**	**3580**	**5830**	**4840**	**3080**
-SB (Leave)	3030	3600	1270	2510	1400	2190	2670	1260
-NB (Approach)	2480	3890	870	2380	2180	3640	2170	1820

Truck Percentages/Speed

	Medium	Heavy	Speed (mph)
I-205	3.6%	8.4%	70
Byron	3.0%	4.0%	45
Lammers	1.0%	1.0%	50
Von	1.0%	1.0%	35
Grant Line	1.0%	1.0%	35

Appendix B. Existing and Design-Year Conditions With and Without Project

Receiver Location	Noise Activity Category	Location	Dwelling Units	Existing dBA $L_{eq}(h)$	Future No Build dBA $L_{eq}(h)$	Future Increase over Existing dB	Future Project Alt 1 dBA $L_{eq}(h)$	Future Increase over Existing dB	Future Project Alt 5A dBA $L_{eq}(h)$	Future Increase over Existing dB	Impacts NAC	Impacts Substantial Increase	Noise Barriers Evaluated
R-01	B	Von Sosten Road	1	62	63	+ 1	**67**	+ 5	**69**	+ 7	Alts 1 & 5A		
R-02	B	Von Sosten Road	2	55	56	+ 1	**76**	**+ 21**	62	+ 7	Alt 1	Alt 1	B
R-03	B	Von Sosten Road	1	55	56	+ 1	n/a[a]	n/a[a]	65	+ 10			
R-04	B	Von Sosten Road	2	55	56	+ 1	61	+ 6	65	+ 10			
R-05	B	Von Sosten Road	1	52	56	+ 4	58	+ 6	n/a[a]	n/a[a]			
R-06	B	Von Sosten Road	2	52	57	+ 5	58	+ 6	58	+ 6			
R-07	B	Byron Road north of I-205	3	63	64	+ 1	63	0	63	0			
R-08	B	Byron Road north of I-205	1	60	60	0	n/a[a]	n/a[a]	n/a[a]	n/a[a]			
R-09	B	W Grant Line Road	2	59	70	+ 11	**74**	**+ 15**	**67**	+ 8	Alts 1 & 5A	Alt 1	A
R-10	B	W Grant Line Road	1	59	71	**+ 12**	**72**	**+ 13**	**67**	+ 8	Alts 1 & 5A	Alt 1	A
R-11	B	W Grant Line Road	1	53	66	**+ 13**	65	**+ 12**	61	+ 8		Alt 1	A
R-12	B	W Grant Line Road	1	53	68	**+ 15**	65	**+ 12**	61	+ 8		Alt 1	A
R-13	B	11th St/Lammers Road	1	68	69	+ 1	**72**	+ 4	**69**	+ 1	Alts 1 & 5A		C-1
R-14	B	11th St/Lammers Road	1	69	70	+ 1	**73**	+ 4	**70**	+ 1	Alts 1 & 5A		C-2
R-15	B	11th St/Lammers Road	1	70	71	+ 1	**71**	+ 1	**70**	0	Alts 1 & 5A		C-2
R-16	B	East of Lammers Road	64	57	59	+ 2	62	+ 5	58	+ 1			
R-17	B	East of Lammers Road	11	55	60	+ 5	65	+ 10	59	+ 4			
R-18	B	East of Lammers Road	15	55	61	+ 6	59	+ 4	61	+ 6			
R-19	B	East of Lammers Road	40	58	64	+ 6	61	+ 3	64	+ 6			
R-20	B	East of Lammers Road	28	59	64	+ 5	61	+ 2	64	+ 5			
R-21	B	Lammers Road/I-205	1	68	70	+ 2	**70**	+ 2	**71**	+ 3	Alts 1 & 5A		D, F
R-22	B	Lammers Road/I-205	1	67	69	+ 2	**68**	+ 1	**70**	+ 3	Alts 1 & 5A		D, F
R-23	B	Lammers Road/I-205	1	68	70	+ 2	**68**	0	**70**	+ 2	Alts 1 & 5A		D, F
R-24	B	Lammers Road/I-205	1	69	71	+ 2	**69**	0	**72**	+ 3	Alts 1 & 5A		D, F
R-25	B	Lammers Road/I-205	1	70	72	+ 2	**69**	- 1	**72**	+ 2	Alts 1 & 5A		D, F
R-26	B	Lammers Road/I-205	1	69	71	+ 2	**69**	0	**72**	+ 3	Alts 1 & 5A		D, F
R-27	B	Ormonde Court	2	63	66	+ 3	64	+ 1	**66**	+ 3	Alt 5A		F
R-28	B	Ormonde Court	2	63	65	+ 2	64	+ 1	**66**	+ 3	Alt 5A		F
R-29	B	Ormonde Court	1	62	64	+ 2	63	+ 1	65	+ 3			
R-30	B	Ormonde Court	1	66	68	+ 2	**66**	0	**69**	+ 3	Alts 1 & 5A		D, F
R-31	B	Ormonde Court	2	65	67	+ 2	**66**	+ 1	**68**	+ 3	Alts 1 & 5A		D, F
R-32	B	Ormonde Court	1	62	64	+ 2	63	+ 1	65	+ 3			
R-33	B	Byron Road south of I-205	1	66	69	+ 3	**67**	+ 1	**70**	+ 4	Alts 1 & 5A		D, F
R-34	B	Byron Road south of I-205	2	65	67	+ 2	**66**	+ 1	**68**	+ 3	Alts 1 & 5A		D, F
R-35	B	Byron Road south of I-205	5	63	64	+ 1	64	+ 1	**66**	+ 3	Alt 5A		F
R-36	B	Byron Road south of I-205	1	64	65	+ 1	65	+ 1	**66**	+ 2	Alt 5A		F
R-37	B	Byron Road south of I-205	0	62	63	+ 1	63	+ 1	65	+ 3			

[a] Indicates that the property associated with this receiver location will be taken under this project alternative.

Appendix C. Caltrans Reasonableness Worksheets

WORKSHEET C-1
CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	A		Height: 6 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	74 dBA	Check	
69 dBA or less:	Add $ 2,000		
70-74 dBA:	Add $ 4,000	√	$4,000
75-78 dBA:	Add $ 6,000		
More than 78 dBA:	Add $ 8,000		
2) "Build" VS Existing Noise Levels (Choose One)	15 dBA	Check	
Less than 3 dBA:	Add $ 0		
3-7 dBA:	Add $ 2,000		
8-11 dBA:	Add $ 4,000		
12 dBA or more:	Add $ 6,000	√	$6,000
3) Achievable Noise Reduction (Choose One)	1 dBA	Check	
Less than 6 dBA:	Add $ 0	√	$0
6-8 dBA:	Add $ 2,000		
9-11 dBA:	Add $ 4,000		
12 dBA or more:	Add $ 6,000		
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one:	Add $10,000	√	$10,000
NO on both:	Add $ 0		
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-2

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	A		Height: 8 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	74 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	15 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	2 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-3

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	A		Height: 10 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	74 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	15 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	2 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-4

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	A		Height: 12 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	74 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	15 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	2 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-5

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	A		Height: 14 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	74 dBA	Check	
69 dBA or less:	Add $ 2,000		
70-74 dBA:	Add $ 4,000	√	$4,000
75-78 dBA:	Add $ 6,000		
More than 78 dBA:	Add $ 8,000		
2) "Build" VS Existing Noise Levels (Choose One)	15 dBA	Check	
Less than 3 dBA:	Add $ 0		
3-7 dBA:	Add $ 2,000		
8-11 dBA:	Add $ 4,000		
12 dBA or more:	Add $ 6,000	√	$6,000
3) Achievable Noise Reduction (Choose One)	2 dBA	Check	
Less than 6 dBA:	Add $ 0	√	$0
6-8 dBA:	Add $ 2,000		
9-11 dBA:	Add $ 4,000		
12 dBA or more:	Add $ 6,000		
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one:	Add $10,000	√	$10,000
NO on both:	Add $ 0		
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-6

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	A		Height: 16 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	74 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	15 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	2 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-7

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	B		Height: 6 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	75.7 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ □ √ □	$6,000
2) "Build" VS Existing Noise Levels (Choose One)	21 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	6 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$55,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$110,000

WORKSHEET C-8

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	B		Height: 8 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	75.7 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ □ √ □	$6,000
2) "Build" VS Existing Noise Levels (Choose One)	21 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	7 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$55,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$110,000

WORKSHEET C-9

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	B		Height: 10 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	75.7 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ □ √ □	$6,000
2) "Build" VS Existing Noise Levels (Choose One)	21 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	9 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ √ □	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$57,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$114,000

WORKSHEET C-10

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	B		Height: 12 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	75.7 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ □ √ □	$6,000
2) "Build" VS Existing Noise Levels (Choose One)	21 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	10 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ √ □	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$57,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$114,000

WORKSHEET C-11

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	B		Height: 14 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	75.7 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ □ √ □	$6,000
2) "Build" VS Existing Noise Levels (Choose One)	21 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	11 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ √ □	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$57,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$114,000

WORKSHEET C-12

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	B		Height: 16 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	75.7 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ □ √ □	$6,000
2) "Build" VS Existing Noise Levels (Choose One)	21 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ □ √	$6,000
3) Achievable Noise Reduction (Choose One)	11 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ √ □	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$57,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$114,000

WORKSHEET C-13

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-1		Height: 6 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	73.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	1 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ ☐ ☐ ☐	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-14

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-1		Height: 8 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	73.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	2 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-15

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-1		Height: 10 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	73.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	3 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ ☐ ☐ ☐	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-16

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-1		Height: 12 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	73.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	4 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-17

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-1		Height: 14 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	73.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	5 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ ☐ ☐ ☐	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			1
Total Unmodified Reasonable Allowance			$47,000

WORKSHEET C-18

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-1		Height: 16 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	73.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	5 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			1
Total Unmodified Reasonable Allowance			$47,000

WORKSHEET C-19

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-2		Height: 6 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	7 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$49,000
Number of Benefited Residences			1
Total Unmodified Reasonable Allowance			$49,000

WORKSHEET C-20

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-2		Height: 8 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	7 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$49,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$98,000

WORKSHEET C-21

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-2		Height: 10 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	8 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$49,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$98,000

WORKSHEET C-22

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-2		Height: 12 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	9 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ √ □	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$102,000

WORKSHEET C-23

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-2		Height: 14 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	10 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ ☐ √ ☐	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$102,000

WORKSHEET C-24

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	C-2		Height: 16 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	4 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	10 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ □ √ □	$4,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$51,000
Number of Benefited Residences			2
Total Unmodified Reasonable Allowance			$102,000

WORKSHEET C-25

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	D		Height: 6 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	70.2 dBA	Check	
69 dBA or less:	Add $ 2,000		
70-74 dBA:	Add $ 4,000	√	$4,000
75-78 dBA:	Add $ 6,000		
More than 78 dBA:	Add $ 8,000		
2) "Build" VS Existing Noise Levels (Choose One)	2 dBA	Check	
Less than 3 dBA:	Add $ 0	√	$0
3-7 dBA:	Add $ 2,000		
8-11 dBA:	Add $ 4,000		
12 dBA or more:	Add $ 6,000		
3) Achievable Noise Reduction (Choose One)	3 dBA	Check	
Less than 6 dBA:	Add $ 0	√	$0
6-8 dBA:	Add $ 2,000		
9-11 dBA:	Add $ 4,000		
12 dBA or more:	Add $ 6,000		
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one:	Add $10,000	√	$10,000
NO on both:	Add $ 0		
Unmodified Reasonable Allowance Per Residence			$45,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-26

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	D		Height: 8 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	70.2 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	2 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
3) Achievable Noise Reduction (Choose One)	4 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$45,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-27

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	D		Height: 10 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	70.2 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	2 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
3) Achievable Noise Reduction (Choose One)	6 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			1
Total Unmodified Reasonable Allowance			$47,000

WORKSHEET C-28
CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	D		Height: 12 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	70.2 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	2 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
3) Achievable Noise Reduction (Choose One)	7 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			5
Total Unmodified Reasonable Allowance			$235,000

WORKSHEET C-29

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	D		Height: 14 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	70.2 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	2 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ ☐ ☐ ☐	$0
3) Achievable Noise Reduction (Choose One)	7 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			5
Total Unmodified Reasonable Allowance			$235,000

WORKSHEET C-30

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	D		Height: 16 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	70.2 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	2 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
3) Achievable Noise Reduction (Choose One)	8 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			6
Total Unmodified Reasonable Allowance			$282,000

WORKSHEET C-31

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	E		Height: 6 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	5 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	4 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ ☐ ☐ ☐	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			0
Total Unmodified Reasonable Allowance			$0

WORKSHEET C-32

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	E		Height: 8 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	5 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	5 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ □ □ □	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			1
Total Unmodified Reasonable Allowance			$47,000

WORKSHEET C-33

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	E		Height: 10 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	5 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	5 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	√ ☐ ☐ ☐	$0
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$47,000
Number of Benefited Residences			3
Total Unmodified Reasonable Allowance			$141,000

WORKSHEET C-34

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	E		Height: 12 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	5 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	7 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$49,000
Number of Benefited Residences			5
Total Unmodified Reasonable Allowance			$245,000

WORKSHEET C-35

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	E		Height: 14 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	☐ √ ☐ ☐	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	5 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
3) Achievable Noise Reduction (Choose One)	8 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	☐ √ ☐ ☐	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ ☐	$10,000
Unmodified Reasonable Allowance Per Residence			$49,000
Number of Benefited Residences			10
Total Unmodified Reasonable Allowance			$490,000

WORKSHEET C-36

CALCULATION OF REASONABLE ALLOWANCE

PROJECT: Lammers Road/I-205 Interchange	PROJECT LOCATION: Tracy, CA		Date: 11/25/2009
NOISE BARRIER I.D. & LOCATION:	E		Height: 16 ft.
NOISE ANALYST: Volk			
Base Allowance (2006 Dollars)			$31,000
1) Absolute Noise Levels (Choose One)	72.4 dBA	Check	
69 dBA or less: 70-74 dBA: 75-78 dBA: More than 78 dBA:	Add $ 2,000 Add $ 4,000 Add $ 6,000 Add $ 8,000	□ √ □ □	$4,000
2) "Build" VS Existing Noise Levels (Choose One)	5 dBA	Check	
Less than 3 dBA: 3-7 dBA: 8-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
3) Achievable Noise Reduction (Choose One)	8 dBA	Check	
Less than 6 dBA: 6-8 dBA: 9-11 dBA: 12 dBA or more:	Add $ 0 Add $ 2,000 Add $ 4,000 Add $ 6,000	□ √ □ □	$2,000
4) Either New Construction Or Pre-date 1978? (Choose Yes or No)	YES		
YES on either one: NO on both:	Add $10,000 Add $ 0	√ □	$10,000
Unmodified Reasonable Allowance Per Residence			$49,000
Number of Benefited Residences			11
Total Unmodified Reasonable Allowance			$539,000

Appendix D. Barrier Analysis

Barrier Analysis of Project Traffic Noise Level (dBA-Leq[h])

Barrier ID	Position	Existing Traffic Noise Level	Design Year with Project Traffic Noise Level	Design Year with Project minus Existing	Design Year with Project Traffic Noise Level with X-Foot Barrier					
					6 Foot	8 Foot	10 Foot	12 Foot	14 Foot	16 Foot
A	W14	59	74	+ 15	73	72	72	72	72	72
	W15	59	72	+ 13	72	72	72	72	72	72
	W16	58	71	+ 13	71	71	71	71	71	71
	W17	53	65	+ 12	64	64	64	64	64	64
	W18	53	65	+ 12	65	65	65	65	65	65
B	W02	56	69	+ 13	67	67	66	65	65	65
	W03	55	76	+ 21	70	69	67	66	65	65
C	S03	70	71	+ 1	64	64	63	62	61	61
	S02	69	73	+ 4	69	67	66	64	63	62
	S01	68	72	+ 4	71	70	69	68	67	67
	L02	69	70	+ 1	64	63	62	61	61	60
D	S56	68	70	+ 2	67	66	64	63	63	62
	S57	67	68	+ 1	66	65	64	63	62	62
	S58	68	68	+ 1	66	66	64	63	62	62
	S59	69	69	0	67	66	65	64	64	64
	S60	70	69	- 1	66	65	65	64	64	64
	S61	69	69	0	67	66	66	66	66	66
	S62	63	64	+ 1	63	63	62	61	61	60
	S63	63	64	+ 1	63	63	63	61	61	61
	S64	63	64	+ 1	63	63	62	61	61	60
	S65	62	64	+ 1	62	62	62	60	60	60
	S66	62	63	+ 1	62	62	61	60	60	59
	S67	61	62	+ 1	61	61	61	60	59	59
	S68	61	62	+ 1	61	61	60	60	59	59
	S69	60	62	+ 1	61	60	60	59	59	58
	S70	66	66	+ 1	65	65	64	63	63	63
	S71	65	66	+ 1	64	64	63	62	62	62
D	S72	62	64	+ 1	62	62	61	60	59	59
	S73	62	63	+ 2	62	62	61	59	59	59
	S74	62	63	+ 1	62	62	61	60	60	59
	S75	61	63	+ 1	61	61	60	59	59	58
	S76	60	61	+ 1	60	60	59	58	58	57
	S77	60	61	+ 1	60	59	59	58	57	57
	S78	59	61	+ 1	60	59	59	58	57	57

Barrier ID	Position	Existing Traffic Noise Level	Design Year with Project Traffic Noise Level	Design Year with Project minus Existing	Design Year with Project Traffic Noise Level with X-Foot Barrier					
					6 Foot	8 Foot	10 Foot	12 Foot	14 Foot	16 Foot
	S79	58	60	+ 1	59	59	58	57	57	57
	S80	66	67	+ 1	66	66	65	64	64	64
	S81	65	66	+ 1	65	65	64	64	64	64
	S82	63	64	+ 1	63	63	63	62	62	62
	S83	64	65	+ 1	64	64	64	64	64	64
	M07	67	68	+ 1	66	66	65	63	62	62
	M08	68	69	+ 1	67	67	66	66	65	65
E	W13	60	69	+ 10	62	62	61	60	60	60
F	S56	68	71	+ 3	69	69	66	64	63	63
	S57	67	70	+ 3	68	68	66	65	64	64
	S58	68	70	+ 3	68	68	66	65	64	64
	S59	69	72	+ 3	70	68	67	67	67	67
	S60	70	72	+ 2	68	67	67	67	66	66
	S61	69	72	+ 3	69	69	69	68	68	68
	S62	63	66	+ 3	65	65	65	64	63	63
	S63	63	66	+ 3	65	65	64	63	63	62
	S64	63	66	+ 3	64	64	64	62	62	62
	S65	62	66	+ 3	64	63	63	62	61	61
	S66	62	65	+ 3	63	63	63	61	61	61
	S67	61	64	+ 3	63	62	62	61	60	60
	S68	61	64	+ 3	62	62	62	60	60	60
	S69	60	63	+ 3	62	61	61	60	60	59
	S70	66	69	+ 3	67	67	66	66	65	65
	S71	65	68	+ 3	67	66	65	65	64	64
F	S72	62	66	+ 3	64	64	62	61	61	60
	S73	62	65	+ 3	63	63	61	61	60	60
	S74	62	65	+ 3	63	63	62	61	60	60
	S75	61	64	+ 3	63	62	62	60	60	60
	S76	60	63	+ 3	62	61	61	59	59	58
	S77	60	63	+ 3	61	61	61	59	58	58
	S78	59	63	+ 3	61	61	60	59	58	58
	S79	58	62	+ 3	60	60	59	58	57	57
	S80	66	70	+ 4	69	69	68	67	67	67
	S81	65	68	+ 3	67	67	66	66	66	66
	S82	63	66	+ 3	65	64	64	63	63	63
	S83	64	66	+ 2	65	65	65	65	65	65
	M07	67	71	+ 3	68	67	67	64	63	63
	M08	68	72	+ 5	71	71	71	71	70	70

Barrier ID	Position	Number of Units Represented	Barrier Insertion Loss						Number of Benefited Receivers					
			6-foot	8-foot	10-foot	12-foot	14-foot	16-foot	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
A	W14	0	1	2	2	2	2	2	**0**	**0**	**0**	**0**	**0**	**0**
	W15	3	0	0	0	0	0	0						
	W16	0	0	0	0	0	0	0						
	W17	1	1	1	1	1	1	1						
	W18	1	0	0	0	0	0	0						
B	W02	0	2	2	3	4	4	4	**2**	**2**	**2**	**2**	**2**	**2**
	W03	2	6	7	9	10	11	11						
C	S03	1	7	7	8	9	10	10	**1**	**2**	**2**	**2**	**3**	**3**
	S02	1	4	6	7	9	10	11						
	S01	1	1	2	3	4	5	5						
	L02	0	6	7	8	9	9	10						
D	S56	1	3	4	6	7	7	8	**0**	**0**	**1**	**5**	**5**	**6**
	S57	1	2	3	4	5	6	6						
	S58	1	2	2	4	5	6	6						
	S59	1	2	3	4	5	5	5						
	S60	1	3	4	4	5	5	5						
	S61	1	2	3	3	3	3	3						
	S62	2	1	1	2	3	3	4						
	S63	0	1	1	1	3	3	3						
	S64	2	1	1	2	3	3	4						
	S65	0	2	2	2	4	4	4						
	S66	1	1	1	2	3	3	4						
	S67	1	1	1	1	2	3	3						
	S68	1	1	1	2	2	3	3						
	S69	1	1	2	2	3	3	4						
	S70	1	1	1	2	3	3	3						
	S71	2	2	2	3	4	4	4						
	S72	0	2	2	3	4	5	5						
	S73	1	1	1	2	4	4	4						
	S74	1	1	1	2	3	3	4						
	S75	1	2	2	3	4	4	5						

Barrier ID	Position	Number of Units Represented	Barrier Insertion Loss						Number of Benefited Receivers					
			6-foot	8-foot	10-foot	12-foot	14-foot	16-foot	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
D	S76	1	1	1	2	3	3	4						
	S77	1	1	2	2	3	4	4						
	S78	1	1	2	2	3	4	4						
	S79	1	1	1	2	3	3	3						
	S80	1	1	1	2	3	3	3						
	S81	1	1	1	2	2	2	2						
	S82	1	1	1	1	2	2	2						
	S83	1	1	1	1	1	1	1						
	M07	0	2	2	3	5	6	6						
	M08	0	2	2	3	3	4	4						
E	W13	1	7	7	8	9	9	9	**1**	**1**	**1**	**1**	**1**	**1**
F	S56	1	2	2	5	7	8	8	**0**	**1**	**3**	**5**	**10**	**11**
	S57	1	2	2	4	5	6	6						
	S58	1	2	2	4	5	6	6						
	S59	1	2	4	5	5	5	5						
	S60	1	4	5	5	5	6	6						
	S61	1	3	3	3	4	4	4						
	S62	2	1	1	1	2	3	3						
	S63	0	1	1	2	3	3	4						
	S64	2	2	2	2	4	4	4						
	S65	0	2	3	3	4	5	5						
	S66	1	2	2	2	4	4	4						
	S67	1	1	2	2	3	4	4						
	S68	1	2	2	2	4	4	4						
	S69	1	1	2	2	3	3	4						
	S70	1	2	2	3	3	4	4						
	S71	2	1	2	3	3	4	4						
	S72	0	2	2	4	5	5	6						
	S73	1	2	2	4	4	5	5						
	S74	1	2	2	3	4	5	5						
	S75	1	1	2	2	4	4	4						
	S76	1	1	2	2	4	4	5						
	S77	1	2	2	2	4	5	5						
F	S78	1	2	2	3	4	5	5						
	S79	1	2	2	3	4	5	5						
	S80	1	1	1	2	3	3	3						
	S81	1	1	1	2	2	2	2						
	S82	1	1	2	2	3	3	3						
	S83	1	1	1	1	1	1	1						
	M07	0	3	4	4	7	8	8						
	M08	0	1	1	1	1	2	2						

Appendix E. Field Data

Lammers Road 2/23/2010 14:51

Site #1	Von Sosten	Overall Leq	:	54.5 dBA
		Subset (no X) Leq	:	54.5 dBA
		Subset (no V or X) Leq	:	54.5 dBA
Site #2	Von Sosten	Overall Leq	:	59.3 dBA
		Subset (no X) Leq	:	59.3 dBA
		Subset (no V or X) Leq	:	59.3 dBA
Site #3	Lammers	Overall Leq	:	62.7 dBA
		Subset (no X) Leq	:	62.7 dBA
		Subset (no V or X) Leq	:	62.7 dBA
Site #4	Lammers	Overall Leq	:	61.8 dBA
		Subset (no X) Leq	:	61.8 dBA
		Subset (no V or X) Leq	:	61.8 dBA
Site #5	Grant Line	Overall Leq	:	52.9 dBA
		Subset (no X) Leq	:	50.3 dBA
		Subset (no V or X) Leq	:	50.5 dBA
Site #6	Grant Line	Overall Leq	:	46.3 dBA
		Subset (no X) Leq	:	44.8 dBA
		Subset (no V or X) Leq	:	44.9 dBA
Site #7	I-205	Overall Leq	:	62.5 dBA
		Subset (no X) Leq	:	62.5 dBA
		Subset (no V or X) Leq	:	62.5 dBA
Site #8	I-205	Overall Leq	:	67.6 dBA
		Subset (no X) Leq	:	67.6 dBA
		Subset (no V or X) Leq	:	67.6 dBA

overall = All sources, including contaminated minutes
subset (no X) = All sources, excluding contaminated minutes
subset (no V or X) = Traffic only, excluding contaminated minutes

Lammers Road

metric = Leq
units = dBA

2/23/2010 14:53

	Site #1	Von Sosten			Site #2	Von Sosten			Site #3	Lammers			Site #4	Lammers	
No.	minute	Leq	.v/x	No.	minute	Leq	.v/x	No.	minute	Leq	.v/x	No.	minute	Leq	.v/x
1	10:11	54.6		1	10:38	57.2		1	12:59	60.2		1	12:57	62.0	
2	10:12	52.8		2	10:39	58.7		2	13:00	63.3		2	12:58	60.4	
3	10:13	57.2		3	10:40	53.6		3	13:01	65.0	v	3	12:59	63.4	v
4	10:14	55.2		4	10:41	55.7		4	13:02	61.6	v	4	13:00	62.1	v
5	10:15	54.4		5	10:42	52.2		5	13:03	62.0		5	13:01	59.0	
6	10:16	53.7		6	10:43	58.1		6	13:04	61.6		6	13:02	59.2	
7	10:17	54.5		7	10:44	59.6		7	13:05	57.7		7	13:03	57.0	
8	10:18	56.8		8	10:45	56.0		8	13:06	61.1	v	8	13:04	58.4	v
9	10:19	55.6		9	10:46	61.0		9	13:07	62.7		9	13:05	62.6	
10	10:20	52.0		10	10:47	61.2		10	13:08	63.9		10	13:06	61.4	
11	10:21	44.4		11	10:48	61.0		11	13:09	63.9		11	13:07	64.3	
12	10:22	51.8		12	10:49	62.7		12	13:10	61.4		12	13:08	61.0	
13	10:23	54.9		13	10:50	58.8		13	13:11	63.4		13	13:09	64.4	
14	10:24	54.5		14	10:51	61.4		14	13:12	65.0		14	13:10	60.1	
15	10:25	54.7		15	10:52	59.8		15	13:13	63.1		15	13:11	64.1	
16				16				16				16			
17				17				17				17			
18				18				18				18			
19				19				19				19			
20				20				20				20			
21				21				21				21			
22				22				22				22			
23				23				23				23			
24				24				24				24			
25				25				25				25			
26				26				26				26			
27				27				27				27			
28				28				28				28			
29				29				29				29			
30				30				30				30			

Lammers Road

2/23/2010 14:53

	Site #5	Grant Line			Site #6	Grant Line			Site #7	I-205			Site #8	I-205	
No.	minute	Leq	.v/x	No.	minute	Leq	.v/x	No.	minute	Leq	.v/x	No.	minute	Leq	.v/x
1	14:29	51.3		1	14:27	40.1		1	15:12	60.8		1	15:09	66.9	
2	14:30	47.4		2	14:28	40.6		2	15:13	63.6		2	15:10	70.3	
3	14:31	49.6		3	14:29	42.7		3	15:14	60.6		3	15:11	66.6	
4	14:32	52.2		4	14:30	43.5		4	15:15	63.3		4	15:12	62.9	
5	14:33	50.5		5	14:31	44.8		5	15:16	63.1		5	15:13	72.0	
6	14:34	51.7		6	14:32	46.6		6	15:17	61.7		6	15:14	66.9	
7	14:35	47.3		7	14:33	40.2		7	15:18	60.3		7	15:15	66.9	
8	14:36	48.0	v	8	14:34	41.1		8	15:19	62.0		8	15:16	63.3	
9	14:37	50.4		9	14:35	43.6		9	15:20	61.5		9	15:17	67.1	
10	14:38	49.3		10	14:36	42.8		10	15:21	62.3		10	15:18	66.2	
11	14:39	50.2		11	14:37	50.3		11	15:22	67.6		11	15:19	64.7	
12	14:40	52.8		12	14:38	47.6		12	15:23	62.5		12	15:20	69.3	
13	14:41	49.1		13	14:39	41.6	v	13	15:24	59.7		13	15:21	67.9	
14	14:42	49.5	v	14	14:40	46.3	v	14	15:25	61.0		14	15:22	66.8	
15	14:43	61.6	x	15	14:41	53.3	x	15	15:26	60.6		15	15:23	65.9	
16				16				16				16			
17				17				17				17			
18				18				18				18			
19				19				19				19			
20				20				20				20			
21				21				21				21			
22				22				22				22			
23				23				23				23			
24				24				24				24			
25				25				25				25			
26				26				26				26			
27				27				27				27			
28				28				28				28			
29				29				29				29			
30				30				30				30			

Lammers Noise Monitoring Data, 9/10/2009

		Start Time	Counted				Normal					Weather				
Site	Road		A	M	H	Min	A	M	H	Speed		Temp	Sky	Wind	Humid	File
1	Von Sosten	10:11	14	1	0	10	84	6	0	40		85F	Clr	3-5 mph	40%	C1
1	I-205 NB	10:11	123	3	26	10	738	18	156	65						C1
1	I-205 SB	10:11	195	5	35	10	1170	30	210	65						C1
2	Von Sosten	10:38	17	0	0	10	102	0	0	40						C2
2	I-205 NB	10:38	141	3	31	10	846	18	186	65						C2
2	I-205 SB	10:38	178	4	63	10	1068	24	378	65						C2
3	Lammers	12:59	95	0	1	15	380	0	4	40		98F	Clr	1-2 mph	25%	C3-4
3	I-205 NB	12:59	251	8	50	15	1004	32	200	65						C3-4
3	I-205 SB	12:59	251	8	50	15	1004	32	200	65						C3-4
4	Lammers	12:59	95	0	1	15	380	0	4	40						C3-4
4	I-205 NB	12:59	251	8	50	15	1004	32	200	65						C3-4
4	I-205 SB	12:59	251	8	50	15	1004	32	200	65						C3-4
5	Byron	14:29	92	3	4	12	460	15	20	50		103F	Clr	1-4 mph	31%	C5-6
5	Grant Line	14:29	26	0	0	12	130	0	0	40						C5-6
6	Byron	14:29	92	3	4	12	460	15	20	50						C5-6
6	Grant Line	14:29	26	0	0	12	130	0	0	40						C5-6
7	Lammers	15:12	104	1	0	15	416	4	0	40						C7-8
7	I-205 NB	15:12	912	18	83	15	3648	72	332	65						C7-8
7	I-205 SB	15:12	507	29	54	15	2028	116	216	65						C7-8
8	Lammers	15:12	104	1	0	15	416	4	0	66						C7-8
8	I-205 NB	15:12	912	18	83	15	3648	72	332	67						C7-8
8	I-205 SB	15:12	507	29	54	15	2028	116	216	68						C7-8