NOISE IMPACT ANALYSIS

THE PRESERVE

CITY OF STOCKTON, CALIFORNIA

LSA

April 2006

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INTRODUCTION

This noise impact analysis has been prepared to evaluate the potential noise impacts and mitigation measures associated with the Atlas Tract/The Preserve project in the City of Stockton (City), San Joaquin County, California. This report is intended to satisfy the City's requirement for a project-specific final noise impact analysis by examining the impacts of the proposed noise-sensitive uses on site and evaluating the mitigation measures incorporated as part of the project design.

Project Description

The project proposes a General Plan Amendment, Rezoning, Vesting Tentative Tract Map, Development Agreement, Master Development Plan, and Planned Residential Development Plan. Development of The Preserve will include the master planning of approximately 360 acres of residential development, consisting of single-family residential lots (approximately 1,156 units), cluster residential (approximately 355 units) and condominiums (approximately 258 units). In addition, 12.5 acres will be devoted to an easement park, 10.0 acres will be developed as a school site, and 1.25 acres will be developed as a fire station. The project site will also contain 14.59 acres of local park area and 54.18 acres of open space and levees. A 10.74-acre wetland feature is also planned within the power line easement that will serve to improve the water quality of project runoff and provide flood control storage. A separate levee improvement project, administered by Reclamation District 21-26, will surround the site on three sides, providing 100-year flood protection. The project will develop a trails system on top of the levees once the levee improvement project is complete.

The project is located to the west of I-5 and south of Bear Creek within the City of Stockton jurisdictional boundaries. The project site is bounded on the north by Bear Creek, on the west and south by Mosher Slough, and on the east by the existing Twin Creeks Estates (approximately 1,200 feet west of Interstate 5 [I-5]). Local roadways from the project site will connect with Twin Creeks Estates via Otto Drive and Spanos Park West via Trinity Parkway. Land uses within the project area include existing residences to the east. Figure 1 shows the project location and Figure 2 shows the project's site plan.

Methodology Related to Noise Impact Assessment

Evaluation of noise impacts associated with a proposed project typically includes the following:

- Determine the short-term construction noise impacts on off-site noise-sensitive uses
- Determine the long-term noise impacts, including vehicular traffic, on on-site and off-site noise-sensitive uses

Figure 1: Project Location Map

Figure 2: Site Plan

- Determine the required mitigation measures to reduce short- and long-term noise impacts from all sources

This noise impact analysis utilizes the City's noise standards, including the City's Noise Element and Municipal Code, as thresholds against which potential noise impacts are evaluated.

Characteristics of Sound

Sound is increasing to such disagreeable levels in the environment that it can threaten quality of life. Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves, combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units, such as inches or pounds, decibels are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 decibels (dB) are 10 times more intense than 1 decibel, 20 decibels are 100 times more intense, and 30 decibels are 1,000 times more intense. Thirty decibels represent 1,000 times more acoustic energy than one decibel. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 decibels. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10-decibel increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately six decibels for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source, such as highway traffic or railroad operations, the sound decreases three decibels for each doubling of distance in a hard site environment. Line source noise, when produced

within a relatively flat environment with absorptive vegetation, decreases four and one-half decibels for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoyance effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoyance aspects of intermittent noise.

Another noise scale often used together with the L_{max} in noise ordinances for enforcement purposes is noise standards in terms of percentile noise levels. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first is audible impacts, which refers to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3.0 dB or greater, since this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise level of less than 1.0 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Psychological and Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is

called the threshold of pain. A sound level of 160–165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying less developed areas.

Table A lists "Definitions of Acoustical Terms," and Table B shows "Common Sound Levels and Their Noise Sources." Table C shows "Land Use Compatibility for Exterior Community Noise" recommended by the California Department of Health, Office of Noise Control.

EXISTING CONDITIONS

Sensitive Land Uses in the Project Vicinity

Sensitive receptors include residences, schools, hospitals, and similar uses that are sensitive to noise. Based on an aerial photo, existing sensitive land uses within the project area include residences. Existing residences are located to the east of the proposed project site. These sensitive land uses may potentially be affected by noise generated during on-site construction.

Overview of the Existing Noise Environment

Existing Traffic Noise. The primary existing noise sources in the project area are transportation facilities. Traffic on Eight Mile Road, Hammer Lane, Trinity Parkway, Mariners Drive, and other local streets is a steady source of ambient noise in the project vicinity. The Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the project site. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry, to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The existing average daily traffic (ADT) volumes in the area were taken from the *Atlas Tract EIR Traffic Impact Analysis* (Fehr & Peers Transportation Consultants, January 2006). The resultant noise levels are weighted and summed over 24-hour periods to determine the CNEL values. Table D provides the existing (2005) plus approved project traffic noise levels adjacent to roadway segments in the project vicinity. These noise levels represent worst-case scenarios, which assume that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and the model printouts are provided in Appendix A.

As shown in Table D, traffic noise along Trinity Parkway and Askland Drive is generally moderate to moderately low. Along Trinity Parkway south of McAuliffe Way, the 65 and 60 dBA CNEL impact zones extend 84 and 175 feet from the centerline, respectively. Along Askland Drive north of Otto Drive, the 65 and 60 dBA CNEL impact zones extend 77 and 160 feet from the centerline, respectively. The 70 dBA CNEL impact zones along Trinity Parkway south of McAuliffe Way and Askland Drive north of Otto Drive are confined within the roadway right-of-way.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of level that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control 1991.

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near jet engine	140	Deafening	128 times as loud
Civil defense siren	130	Threshold of pain	64 times as loud
Hard rock band	120	Threshold of feeling	32 times as loud
Accelerating motorcycle at a few feet away	110	Very loud	16 times as loud
Pile driver; noisy urban street/heavy city traffic	100	Very loud	8 times as loud
Ambulance siren; food blender	95	Very loud	
Garbage disposal	90	Very loud	4 times as loud
Freight cars; living room music	85	Loud	
Pneumatic drill; vacuum cleaner	80	Loud	2 times as loud
Busy restaurant	75	Moderately loud	
Near freeway auto traffic	70	Moderately loud	Reference level
Average office	60	Quiet	½ as loud
Suburban street	55	Quiet	
Light traffic; soft radio music in apartment	50	Quiet	¼ as loud
Large transformer	45	Quiet	
Average residence without stereo playing	40	Faint	⅛ as loud
Soft whisper	30	Faint	
Rustling leaves	20	Very faint	
Human breathing	10	Very faint	Threshold of hearing
	0	Very faint	

Source: Compiled by LSA Associates, Inc., 2004.

Table C: Land Use Compatibility for Exterior Community Noise

Land Use Category	Noise Range (L_{dn} or CNEL), dB			
	I	II	III	IV
Passively used open spaces	50	50–55	55–70	70+
Auditoriums, concert halls, amphitheaters	45–50	50–65	65–70	70+
Residential: low-density single-family, duplex, mobile homes	50–55	55–70	70–75	75+
Residential: multifamily	50–60	60–70	70–75	75+
Transient lodging: motels, hotels	50–60	60–70	70–80	80+
Schools, libraries, churches, hospitals, nursing homes	50–60	60–70	70–80	80+
Actively used open spaces: playgrounds, neighborhood parks	50–67	—	67–73	73+
Golf courses, riding stables, water recreation, cemeteries	50–70	—	70–80	80+
Office buildings, business commercial and professional	50–67	67–75	75+	—
Industrial, manufacturing, utilities, agriculture	50–70	70–75	75+	—

Source: Office of Noise Control, California Department of Health 1976.

Noise Range I—Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Noise Range II—Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Noise Range III—Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Noise Range IV—Clearly Unacceptable: New construction or development should generally not be undertaken.

Table D: Existing (2005) Plus Approved Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 Feet from Centerline of Outermost Lane
Eight Mile Road					
Eight Mile Road west of Regatta Drive	6,030	< 50[1]	58	117	63.2
Eight Mile Road east of Regatta Drive	15,080	< 50	100	212	67.2
Eight Mile Road west of Trinity Parkway	21,730	63	127	269	68.8
Eight Mile Road east of Trinity Parkway	60,030	116	246	528	73.2
Otto Drive					
Between Askland Drive and Mariners Drive	13,250	< 50	77	160	65.3
Hammer Lane					
Between Askland Drive and Mariners Drive	1,200	< 50	< 50	< 50	54.9
East of Mariners Drive	30,460	70	133	278	68.2
Trinity Parkway					
South of Eight Mile Road	42,900	75	162	348	71.9
North of McAuliffe Way	26,130	59	118	251	68.3
South of McAuliffe Way	15,150	< 50	84	175	65.9
Askland Drive					
North of Otto Drive	13,250	< 50	77	160	65.3
Mariners Drive					
North of Otto Drive	2,200	< 50	< 50	< 50	57.6
Between Otto Drive and Whitewater Lane	15,050	< 50	65	139	66.0
Between Whitewater Lane and Blackswain Place	14,130	< 50	62	134	65.7
Between Blackswain Place and Surgeon Road	14,180	< 50	62	134	65.7
South of Surgeon Road	15,450	< 50	82	176	67.5
North of Hammer Lane	22,260	< 50	104	225	69.1
South of Hammer Lane	9,400	< 50	59	127	65.3
Regatta Drive					
South of Eight Mile Road	9,450	< 50	59	127	65.4

Source: LSA Associates, Inc., April 2006.

[1] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.

Thresholds of Significance

A project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas of conflict with adopted environmental plans and goals of the community in which it is located (Guidelines for the implementation of the California Environmental Quality Act, Appendix G, Public Resources Code §15000–15387). The applicable noise standards governing the project site are the criteria in the City's Noise Element of the General Plan and the Municipal Code.

City of Stockton Noise Standards

Noise Element of the General Plan. Applicable policies and standards governing environmental noise in the City of Stockton are set forth in the Noise Element of the General Plan. The goals of the Noise Element, compiled under the mandate of Section 65302(f) of the California Government Code and guidelines prepared by the California Department of Health Services (DHS), are to ensure that all areas of the City are free from excessive noise and that appropriate maximum levels are adopted for residential, commercial, and industrial areas; to reduce new noise sources to the maximum extent possible; to reduce, to the maximum extent possible, the impact of noise within the City; and to ensure that land uses are compatible with the related noise characteristics of those uses. The following summarizes the City's noise standards.

NOI-a The General Plan of the City of Stockton considers that new residential development shall not be allowed where the ambient noise level due to locally regulated noise sources (i.e., all noise sources other than roadway, railroad, and aircraft noise) will exceed the noise level standards as set forth in Table E.

Each of the noise level standards specified in Table E shall be reduced by five dBA for simple tone noises, noises consisting of primarily speech or music, or for recurring impulsive noises.

Table E: Exterior Noise Level Standards for Locally Regulated Noise Sources

Noise Level Descriptor	Daytime (7:00 a.m.–10:00 p.m.)	Nighttime (10:00 p.m. –7:00 a.m.)
Hourly L_{eq}, dBA	55	45
Maximum level, L_{max}, dBA	75	65

Source: City of Stockton, November 1998

NOI-b The compatibility of proposed projects with existing and future noise levels due to traffic on public roadways, railroad line operations, and aircraft in flight shall be evaluated by comparison to Table F.

Table F: Land Use Compatibility for Community Noise Environments

Land Use Category	Community Noise Exposure (dBA L_{dn} or CNEL)			
	Normally Acceptable[1]	**Conditionally Acceptable**[2]	**Normally Unacceptable**[3]	**Clearly Unacceptable**[4]
Residential	50–60	60–70	70–75	75–85
Transient Lodging - Motels, Hotels	50–60	60–70	70–80	80–85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50–60	60–70	70–80	80–85
Auditoriums, Concert Halls, Amphitheatres, Sport Arenas	N/A	50–75	N/A	75–85
Playgrounds, Neighborhood Parks	50–70	N/A	70–75	75–85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50–75	N/A	75–80	80–85
Office Buildings, Business Commercial and Professional	50–67.5	67.5–75	75–85	N/A
Industrial, Manufacturing Utilities, Agriculture	50–70	70–80	80–85	N/A

Source: City of Stockton, November 1998

NOI-c New development of residential land uses will not be permitted in areas exposed to existing or projected exterior noise levels exceeding 60 dBA L_{dn}/CNEL or the standards of Table F unless the project design includes effective mitigation measures to reduce noise to the following levels:

1. For noise due to traffic on public roadways, railroad line operations, and aircraft in flight: 60 dBA L_{dn}/CNEL or less in outdoor activity areas, and 45 dBA L_{dn}/CNEL or less in indoor areas. Where it is not possible to reduce exterior noise to 60 dBA L_{dn}/CNEL or less by incorporating a practical application of the best available noise-reduction technology, an exterior noise level of up to 65 dBA L_{dn}/CNEL will be allowed. Under no circumstances will interior noise levels be permitted to exceed 45 dBA L_{dn}/CNEL with the windows and doors closed.

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1 Normally Acceptable - Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

2 Conditionally Acceptable - New construction of development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems of air conditioning, will normally suffice.

3 Normally Unacceptable - New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and the needed noise insulation features included in the design.

4 Clearly Unacceptable - New construction or development should generally not be undertaken.

2. For noise from sources other than roadways, railroads, and aircraft, comply with the performance standards contained in Table F.

NOI-d Noise produced by commercial uses shall not exceed 75 dBA L_{dn}/CNEL at the nearest property line.

NOI-e Noise produced by industrial uses shall not exceed 80 dBA L_{dn}/CNEL at the nearest property line.

NOI-f The Office of Noise Control under the California Health and Safety Code has promulgated a 45 dBA CNEL standard for interior noise levels of multifamily residential units. The City also enforces building sound transmission and indoor fresh air ventilation requirements specified in Chapter 35 of the Uniform Building Code.

Municipal Code. Section 16-340.030 of the City's Municipal Code limits construction hours across residential property lines.

Construction Noise. Operating or causing the operation of tools or equipment on private property used in alteration, construction, demolition, drilling, or repair work between the hours of 10:00 p.m. and 7:00 a.m. so that the sound creates a noise disturbance across a residential property line, except for emergency work of public service utilities, is prohibited.

IMPACTS AND MITIGATION MEASURES

Short-Term Construction Related Impacts

Short-term noise impacts would be associated with the excavation, grading, and erection of buildings on site during construction of the proposed project. Construction-related short-term noise levels would be higher than existing ambient noise levels in the project area today but would no longer occur once project construction is completed.

Two types of short-term noise impacts could occur during construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the project site would incrementally increase noise levels on site access roads. As shown in Table G, there will be a relatively high single-event noise exposure potential at a maximum level of 86 dBA L_{max} with trucks passing at 50 feet. However, the projected construction traffic will be minimal when compared to the existing traffic volumes on Trinity Parkway and Askland Drive. Therefore, short-term construction-related worker commutes and equipment transport noise impacts would not be substantial.

The second type of short-term noise impact is related to noise generated during excavation, grading, and construction on site. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on site. Therefore, the noise levels vary as construction progresses. Despite the variety in the types and sizes of construction equipment, similarities in the

Table G: Typical Construction Equipment Noise Levels

Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 Feet)	Suggested Maximum Sound Levels for Analysis (dBA at 50 Feet)
Pile Drivers, 12,000 to 18,000 ft-lb/blow	81–96	93
Rock Drills	83–99	96
Jack hammers	75–85	82
Pneumatic Tools	78–88	85
Pumps	74–84	80
Dozers	77–90	85
Scrapers	83–91	87
Haul Trucks	83–94	88
Cranes	79–86	82
Portable Generators	71–87	80
Rollers	75–82	80
Tractors	77–82	80
Front-End Loaders	77–90	86
Hydraulic Backhoe	81–90	86
Hydraulic Excavators	81–90	86
Graders	79–89	86
Air Compressors	76–89	86
Trucks	81–87	86

Source: Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987.

dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table G lists the maximum noise levels recommended for noise impact assessments for typical construction equipment based on a distance of 50 feet between the equipment and a noise receptor. Typical maximum noise levels range up to 91 dBA L_{max} at 50 feet during the noisiest construction phases. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backfillers, bulldozers, draglines, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three or four minutes at lower-power settings.

Construction of the proposed project is expected to require the use of on-site scrapers, bulldozers, water trucks, and pickup trucks. Based on the information in Table G, the maximum noise level generated by each scraper is assumed to be 87 dBA L_{max} at 50 feet from the scraper. Each bulldozer would also generate 85 dBA L_{max} at 50 feet. The maximum noise level generated by water trucks and pickup trucks is approximately 86 dBA L_{max} at 50 feet from these vehicles. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, the worst-case combined noise level during this phase of construction would be 91 dBA L_{max} at a distance of 50 feet from the active construction area. The closest existing residences in the vicinity of the project area are located approximately 150 feet from the project construction area. The closest residences may be subject to short-term noise reaching 82 dBA L_{max}, generated by construction activities near the project boundary. Compliance with the hours specified in the City's Municipal Code regarding construction activities will result in a less than significant noise impact on adjacent noise-sensitive land uses.

Long-Term Traffic Noise Impacts

The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the project site. The resultant noise levels were weighted and summed over a 24-hour period in order to determine the CNEL values. The existing and future traffic volumes (Fehr & Peers Transportation Consultants, January 2006) for roadway segments in the project vicinity were used in the traffic noise impact analysis. Table H shows the Existing (2005) Plus Approved Projects with project traffic noise levels adjacent to roadway segments in the project vicinity. Tables I and J show the 2025 with and without project traffic noise levels adjacent to roadway segments in the project vicinity. Tables K and L show the 2035 with and without project traffic noise levels adjacent to roadway segments in the project vicinity. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and the model printouts are provided in Appendix A.

Off-site Traffic Noise Impacts. Tables H, J, and L show that all roadways within the project vicinity would have a traffic noise level increase less than 3 dBA. This increase in noise levels would not be perceptible by the human ear in an outdoor environment. Therefore, no significant traffic noise impact would occur on off-site, noise-sensitive land uses. No mitigation measures for off-site, noise-sensitive land uses would be required.

On-Site Traffic Noise Impacts. The proposed project includes residences, parks, a school, and a fire station. With the exception of the proposed school and fire station, these land uses are proposed adjacent to Askland Drive and Otto Drive. As shown in Table L, the 2035 with project traffic noise levels would continue to be moderate along Askland Drive and Otto Drive within the project area.

Based on the typical sound level reductions of buildings identified in Protective Noise Levels, Condensed Version of EPA Levels Document (November 1978, EPA-550/9-79-100), standard building construction in Southern California would provide 24 dBA (the national average is 25 dBA) or more in noise reduction from exterior-to-interior with windows and doors closed. With windows and doors open, the exterior-to-interior noise reduction drops to 12 dBA (the national average is 15 dBA) or more. Building structures that would be exposed to exterior noise exceeding 69 dBA CNEL would exceed the interior noise standard of 45 dBA CNEL with windows and doors closed and would require building facade upgrades such as double-paned windows. Also, building structures that would be exposed to exterior noise exceeding 57 dBA CNEL would exceed the interior noise standard of 45 dBA CNEL with windows and doors open and would require mechanical ventilation systems such as air-conditioning.

Based on Table L, the following distances from the roadway centerline could potentially impact the proposed land uses along Askland Drive and Otto Drive:

Askland Drive. If outdoor active use areas such as backyards, patios, or balconies are proposed within 65 feet of the Askland Drive centerline, they would be exposed to a traffic noise level exceeding 65 dBA CNEL, and mitigation to reduce exterior noise levels would be required. A sound barrier with a minimum height of 10 feet is required along Askland Drive to provide noise attenuation for outdoor active use areas within the 70 dBA CNEL impact zone.

If outdoor active use areas such as backyards, patios, or balconies are proposed between 65 and 133 feet from the Askland Drive centerline, they would be exposed to a traffic noise level exceeding 65 dBA CNEL, and mitigation to reduce exterior noise levels would be required. A sound barrier with a minimum height of eight feet is required along Askland Drive to provide noise attenuation for outdoor active use areas within the 65–70 dBA CNEL impact zone.

If outdoor active use areas such as backyards, patios, or balconies are proposed between 133 and 282 feet from the Askland Drive centerline, they would be exposed to a traffic noise level exceeding 60 dBA CNEL, and mitigation to reduce exterior noise levels would be required. A sound barrier with a minimum height of six feet is required along Askland Drive to provide noise attenuation for outdoor active use areas within the 60–65 dBA CNEL impact zone.

If residential structures are proposed within 76 feet of the Askland Drive centerline and have no intervening structures between them, they would be exposed to a traffic noise level exceeding 69 dBA CNEL. With windows closed, interior noise levels at these residences would potentially exceed the interior noise standard of 45 dBA CNEL (i.e., 70 dBA - 24 dBA = 46 dBA). Therefore, building facade upgrades such as double-paned windows would be required.

Table H: Existing (2005) Plus Approved Project Plus Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 Feet from Outermost Lane	Change from No Project Level (dBA)
Eight Mile Road						
Eight Mile Road west of Regatta Drive	6,030	< 50[1]	58	117	63.2	0.0
Eight Mile Road east of Regatta Drive	15,080	< 50	100	212	67.2	0.0
Eight Mile Road west of Trinity Parkway	21,730	63	127	269	68.8	0.0
Eight Mile Road east of Trinity Parkway	62,800	120	254	544	73.4	0.2
Otto Drive						
West of Askland Drive	13,820	< 50	79	165	65.5	NA
Between Askland Drive and Mariners Drive	22,970	< 50	109	230	67.7	2.4
Hammer Lane						
Between Askland Drive and Mariners Drive	1,200	< 50	< 50	< 50	54.9	0.0
East of Mariners Drive	40,120	80	158	334	69.4	1.2
Trinity Parkway						
South of Eight Mile Road	45,670	78	168	363	72.2	0.3
North of McAuliffe Way	30,280	64	130	276	68.9	0.6
South of McAuliffe Way	19,300	< 50	98	205	67.0	1.1
Askland Drive						
North of Otto Drive	17,500	< 50	92	192	66.5	1.2
Mariners Drive						
North of Otto Drive	2,200	< 50	< 50	< 50	57.6	0.0
Between Otto Drive and Whitewater Lane	24,725	< 50	90	194	68.1	2.1
Between Whitewater Lane and Blackswain Place	23,810	< 50	88	189	68.0	2.3
Between Blackswain Place and Surgeon Road	23,860	< 50	88	189	68.0	2.3
South of Surgeon Road	25,130	53	113	244	69.6	2.1
North of Hammer Lane	31,920	62	133	286	70.7	1.6
South of Hammer Lane	9,400	< 50	59	127	65.3	0.0
Regatta Drive						
South of Eight Mile Road	9,450	< 50	59	127	65.4	0.0

Source: LSA Associates, Inc., April 2006.

[1] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.

Table I: 2025 Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 Feet from Centerline of Outermost Lane
Eight Mile Road					
Eight Mile Road west of Regatta Drive	13,400	< 50[1]	97	197	65.9
Eight Mile Road east of Regatta Drive	16,650	< 50	110	227	66.9
Eight Mile Road west of Trinity Parkway	29,940	80	158	334	69.4
Eight Mile Road east of Trinity Parkway	58,650	118	244	520	72.3
Otto Drive					
Between Askland Drive and Mariners Drive	17,145	< 50	91	190	66.5
Hammer Lane					
Between Askland Drive and Mariners Drive	16,020	< 50	87	182	66.2
East of Mariners Drive	26,150	65	121	252	67.6
Trinity Parkway					
South of Eight Mile Road	34,890	66	141	303	71.0
North of McAuliffe Way	35,460	70	144	307	69.6
South of McAuliffe Way	25,460	58	116	246	68.2
Askland Drive					
North of Otto Drive	25,270	58	116	245	68.1
South of Otto Drive	12,220	< 50	74	152	65.0
North of Hammer Lane	12,920	< 50	76	158	65.2
South of Hammer Lane	4,400	< 50	< 50	80	60.5
Mariners Drive					
North of Otto Drive	2,500	< 50	< 50	< 50	58.2
Between Otto Drive and Whitewater Lane	8,130	< 50	< 50	92	63.3
Between Whitewater Lane and Blackswain Place	8,130	< 50	< 50	92	63.3
Between Blackswain Place and Surgeon Road	8,330	< 50	< 50	94	63.4
South of Surgeon Road	9,430	< 50	59	127	65.4
North of Hammer Lane	8,630	< 50	56	120	65.0
South of Hammer Lane	4,200	< 50	< 50	74	61.8
Regatta Drive					
South of Eight Mile Road	3,650	< 50	< 50	68	61.2

Source: LSA Associates, Inc., April 2006.

[1] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.

Table J: 2025 Plus Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 Feet from Outermost Lane	Change from No Project Level (dBA)
Eight Mile Road						
Eight Mile Road west of Regatta Drive	13,400	< 50[1]	97	197	65.9	0.0
Eight Mile Road east of Regatta Drive	16,650	< 50	110	227	66.9	0.0
Eight Mile Road west of Trinity Parkway	29,940	80	158	334	69.4	0.0
Eight Mile Road east of Trinity Parkway	59,900	119	247	528	72.4	0.1
Otto Drive						
West of Askland Drive	13,840	< 50	80	165	65.5	NA
Between Askland Drive and Mariners Drive	26,070	59	118	250	68.3	1.8
Hammer Lane						
Between Askland Drive and Mariners Drive	17,610	< 50	92	193	66.6	0.4
East of Mariners Drive	28,770	68	128	268	68.0	0.4
Trinity Parkway						
South of Eight Mile Road	36,140	67	144	310	71.2	0.2
North of McAuliffe Way	38,090	73	151	322	69.9	0.3
South of McAuliffe Way	28,090	61	124	263	68.6	0.4
Askland Drive						
North of Otto Drive	27,900	61	123	262	68.6	0.5
South of Otto Drive	14,500	< 50	82	170	65.7	0.7
North of Hammer Lane	15,200	< 50	84	175	65.9	0.7
South of Hammer Lane	5,090	< 50	< 50	87	61.2	0.7
Mariners Drive						
North of Otto Drive	2,500	< 50	< 50	< 50	58.2	0.0
Between Otto Drive and Whitewater Lane	9,160	< 50	< 50	100	63.8	0.5
Between Whitewater Lane and Blackswain Place	9,160	< 50	< 50	100	63.8	0.5
Between Blackswain Place and Surgeon Road	9,360	< 50	< 50	102	63.9	0.5
South of Surgeon Road	10,460	< 50	63	136	65.8	0.4
North of Hammer Lane	9,660	< 50	60	129	65.5	0.5
South of Hammer Lane	4,200	< 50	< 50	74	61.8	0.0
Regatta Drive						
South of Eight Mile Road	3,650	< 50	< 50	68	61.2	0.0

Source: LSA Associates, Inc., April 2006.

[1] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.

Table K: 2035 Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 Feet from Centerline of Outermost Lane
Eight Mile Road					
Eight Mile Road west of Regatta Drive	36,700	95	183	382	69.7
Eight Mile Road east of Regatta Drive	43,940	104	204	430	70.5
Eight Mile Road west of Trinity Parkway	55,520	118	237	502	71.5
Eight Mile Road east of Trinity Parkway	76,120	141	290	619	72.9
Otto Drive					
East of Shima Tract Parkway	14,840	< 50[1]	83	173	65.8
West of Askland Drive	22,620	< 50	108	228	67.7
Between Askland Drive and Mariners Drive	31,415	65	133	283	69.1
Hammer Lane					
Between Askland Drive and Mariners Drive	39,310	75	154	328	70.1
East of Mariners Drive	52,490	93	188	398	70.6
Trinity Parkway					
South of Eight Mile Road	33,940	64	138	298	70.9
North of McAuliffe Way	33,800	68	140	297	69.4
South of McAuliffe Way	29,100	63	127	269	68.7
Askland Drive					
North of Otto Drive	27,900	61	123	262	68.6
South of Otto Drive	16,700	< 50	89	187	66.3
North of Hammer Lane	32,660	72	139	291	68.5
South of Hammer Lane	24,290	63	116	240	67.2
Mariners Drive					
North of Otto Drive	1,600	< 50	< 50	< 50	56.2
Between Otto Drive and Whitewater Lane	8,280	< 50	< 50	94	63.4
Between Whitewater Lane and Blackswain Place	8,280	< 50	< 50	94	63.4
Between Blackswain Place and Surgeon Road	8,480	< 50	< 50	95	63.5
South of Surgeon Road	9,580	< 50	60	128	65.4
North of Hammer Lane	11,280	< 50	67	143	66.1
South of Hammer Lane	4,700	< 50	< 50	80	62.3
Regatta Drive					
South of Eight Mile Road	12,550	< 50	58	123	65.2

Source: LSA Associates, Inc., April 2006.

[1] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.

Table L: 2035 Plus Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 Feet from Outermost Lane	Change from No Project Level (dBA)
Eight Mile Road						
Eight Mile Road west of Regatta Drive	36,840	95	183	383	69.7	0.0
Eight Mile Road east of Regatta Drive	44,050	104	205	431	70.5	0.0
Eight Mile Road west of Trinity Parkway	55,750	118	238	504	71.5	0.0
Eight Mile Road east of Trinity Parkway	77,110	142	293	624	72.9	0.0
Otto Drive						
East of Shima Tract Parkway	15,420	< 50[1]	85	177	66.0	0.2
West of Askland Drive	35,850	71	145	309	69.7	2.0
Between Askland Drive and Mariners Drive	43,860	80	165	353	70.5	1.4
Hammer Lane						
Between Askland Drive and Mariners Drive	40,400	76	157	334	70.2	0.1
East of Mariners Drive	54,100	94	191	406	70.7	0.1
Trinity Parkway						
South of Eight Mile Road	34,960	66	141	303	71.0	0.1
North of McAuliffe Way	36,220	71	146	311	69.7	0.3
South of McAuliffe Way	32,490	67	136	289	69.2	0.5
Askland Drive						
North of Otto Drive	31,290	65	133	282	69.1	0.5
South of Otto Drive	19,100	< 50	97	204	66.9	0.6
North of Hammer Lane	34,720	74	144	303	68.8	0.3
South of Hammer Lane	25,260	64	119	246	67.4	0.2
Mariners Drive						
North of Otto Drive	1,600	< 50	< 50	< 50	56.2	0.0
Between Otto Drive and Whitewater Lane	8,800	< 50	< 50	97	63.6	0.2
Between Whitewater Lane and Blackswain Place	8,800	< 50	< 50	97	63.6	0.2
Between Blackswain Place and Surgeon Road	9,000	< 50	< 50	99	63.7	0.2
South of Surgeon Road	10,100	< 50	62	133	65.7	0.3
North of Hammer Lane	11,800	< 50	69	147	66.3	0.2
South of Hammer Lane	4,770	< 50	< 50	81	62.4	0.1
Regatta Drive						
South of Eight Mile Road	11,290	< 50	67	143	66.1	0.1
Shima Tract Parkway						
North of Otto Drive	13,560	< 50	61	130	65.5	0.1
South of Otto Drive	12,890	< 50	59	126	65.3	0.1

Source: LSA Associates, Inc., April 2006.

[1] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.

If residential structures are proposed within 447 feet of the Askland Drive centerline and have no intervening structures between them, they would be exposed to a traffic noise level exceeding 57 dBA CNEL. With windows open, interior noise levels at these residences would potentially exceed the interior noise standard of 45 dBA CNEL (i.e., 58 dBA - 12 dBA = 46 dBA). Therefore, mechanical ventilation systems such as air-conditioning would be required to ensure that windows can remain closed for a prolonged period of time.

Otto Drive. If outdoor active use areas such as parks, backyards, patios, or balconies are proposed between 80 and 165 feet from the Otto Drive centerline, they would be exposed to a traffic noise level exceeding 65 dBA CNEL, and mitigation to reduce exterior noise levels would be required. A sound barrier with a minimum height of 10 feet is required along Otto Drive to provide noise attenuation for outdoor active use areas within the 70 dBA CNEL impact zone.

If outdoor active use areas such as parks, backyards, patios, or balconies are proposed between 80 and 165 feet from the Otto Drive centerline, they would be exposed to a traffic noise level exceeding 65 dBA CNEL, and mitigation to reduce exterior noise levels would be required. A sound barrier with a minimum height of eight feet is required along Otto Drive to provide noise attenuation for outdoor active use areas within the 65–70 dBA CNEL impact zone.

If outdoor active use areas such as parks, backyards, patios, or balconies are proposed between 165 and 353 feet from the Otto Drive centerline, they would be exposed to a traffic noise level exceeding 60 dBA CNEL, and mitigation to reduce exterior noise levels would be required. Therefore, a sound barrier with a minimum height of six feet is required along Otto Drive to provide noise attenuation for outdoor active use areas within the 60–65 dBA CNEL impact zone.

If residential structures are proposed within 93 feet of the Otto Drive centerline and have no intervening structures between them, they would be exposed to a traffic noise level exceeding 69 dBA CNEL. With windows closed, interior noise levels at these residences would potentially exceed the interior noise standard of 45 dBA CNEL (i.e., 70 dBA - 24 dBA = 46 dBA). Therefore, building facade upgrades such as double-paned windows would be required.

If residential structures are proposed within 559 feet of the Otto Drive centerline and have no intervening structures between them, they would be exposed to a traffic noise level exceeding 57 dBA CNEL. With windows open, interior noise levels at these residences would potentially exceed the interior noise standard of 45 dBA CNEL (i.e., 58 dBA - 12 dBA = 46 dBA). Therefore, mechanical ventilation systems such as air-conditioning would be required to ensure that windows can remain closed for a prolonged period of time.

Mitigation Measures

Construction Impacts. Construction of the proposed project would potentially result in relatively high noise levels and annoyance at the closest residences. The following measures would reduce short-term construction-related noise impacts resulting from the proposed project:

- During all project site excavation and on-site grading, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.

- The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
- During all project site construction, the construction contractor shall limit all construction-related activities to the hours of 7:00 a.m. to 10:00 p.m. on weekdays and weekends.

Traffic Noise Impacts. The following mitigation measures shall be implemented for the proposed project.

Exterior Noise. The following mitigation measure is required for outdoor active use areas:

- A sound barrier with a minimum height of 10 feet shall be required to protect outdoor active use areas such as parks, backyards, patios, and balconies associated with Villages A, D, E, F, G, H, I, J, K, L, N, and O for the following areas:
  - Within 65 feet of the Askland Drive centerline
  - Within 80 feet of the Otto Drive centerline
- A sound barrier with a minimum height of eight feet shall be required to protect outdoor active use areas such as parks, backyards, patios, and balconies associated with Villages A, D, E, F, G, H, I, J, K, L, N, and O for the following areas:
  - Within 133 feet of the Askland Drive centerline
  - Within 165 feet of the Otto Drive centerline
- A sound barrier with a minimum height of six feet shall be required to protect outdoor active use areas such as parks, backyards, patios, and balconies associated with Villages A, D, E, F, G, H, I, J, K, L, N, and O for the following areas:
  - Within 282 feet of the Askland Drive centerline
  - Within 353 feet of the Otto Drive centerline

Interior Noise. To meet the City's 45 dBA CNEL interior noise standard, the following mitigation measures will be required:

- Building facade upgrades such as double-paned windows with a Sound Transmission Class higher than standard construction for the proposed residential structures that have no intervening structures associated with Villages A, D, E, F, G, H, I, J, K, L, N, and O for the following areas:
  - Within 76 feet of the Askland Drive centerline
  - Within 93 feet of the Otto Drive centerline

- Air-conditioning systems for the proposed residential structures that have no intervening structures associated with Villages A, D, E, F, G, H, I, J, K, L, N, and O for the following areas:
  - Within 447 feet of the Askland Drive centerline
  - Within 559 feet of the Otto Drive centerline

Level of Significance after Mitigation

With implementation of the identified mitigation measures, potential long-term noise impacts would be reduced to below a level of significance.

REFERENCES

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APPENDIX A

FHWA TRAFFIC NOISE MODEL PRINTOUTS