Appendix D
Environmental Noise Assessment

AREAS 3 AND 4 SPECIFIC PLAN EIR NOISE AND VIBRATION ASSESSMENT NEWARK, CALIFORNIA

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INTRODUCTION

This report presents the results of the noise and vibration assessment prepared for the Areas 3 and 4 Specific Plan EIR in the City of Newark, California. The Specific Plan project would develop up to 1,260 residential units, a 600-student elementary school, and an 18-hole golf course. This assessment presents the fundamentals of noise and vibration for those unfamiliar with acoustical terminology, provides a discussion of policies and standards applicable to sensitive uses proposed by the project, summarizes the results of measurements made on and around the project site, and evaluates impacts resulting form the project in terms of noise and land use compatibility, vibration compatibility, permanent noise level increases resulting from project generated traffic, and temporary noise level increases resulting form project construction activities. Mitigation is presented to reduce significant noise impacts resulting from the project to less than significant levels.

SETTING

Fundamentals of Environmental Acoustics

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its loudness. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. *A decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level or dBA.* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level*, *CNEL*, is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level*, L_{dn}, is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Fundamentals of Groundborne Vibration

Railroad operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains, and the type of railroad track. People's response to ground vibration has been correlated best with the velocity of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is 1 x 10^{-6} in./sec. RMS, which equals 0 VdB, and 1 in./sec. equals 120 VdB. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.

Typical background vibration levels in residential areas are usually 50 VdB or lower, well below the threshold of perception for most humans. Perceptible vibration levels inside residences are attributed to the operation of heating and air conditioning systems, door slams and foot traffic. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside residences. Table 3 illustrates some common sources of vibration and the association to human perception or the potential for structural damage.

One of the problems with developing suitable criteria for groundborne vibration is the limited research into human response to vibration and more importantly human annoyance inside buildings. However, experience with rapid transit systems over the last few decades has developed rational vibration limits that can be used to evaluate human annoyance to groundborne vibration. These criteria are primarily based on experience with passenger train operations, such as rapid transit and commuter rail systems. The main difference between passenger and freight operations is the time duration of individual events; a passenger train lasts few seconds whereas a long freight train may last several minutes, depending on speed and length. Although these criteria are based on shorter duration events reflected by passenger trains, they are also used in this assessment to evaluate the potential of vibration annoyance on the site due to large freight trains.

TABLE 1 Definitions of Acoustical Terms Used in this Report

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. 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.
Equivalent Noise Level, Leq	The average A-weighted noise level during the measurement period. The hourly Leq used for this report is denoted as dBA $L_{eq[h]}$.
Day-Night Level, L_{dn}	L_{dn} is the equivalent noise level for a continuous 24-hour period with a 10-decibel penalty imposed during nighttime and morning hours (10:00 pm to 7:00 am).
Community Noise Exposure Level, CNEL	CNEL is the equivalent noise level for a continuous 24-hour period with a 5-decibel penalty imposed in the evening (7:00 pm to 10:00 pm) and a 10-decibel penalty imposed during nighttime and morning hours (10:00 pm to 7:00am)
L_1, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which 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.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
	120 dBA	
Jet fly-over at 300 meters		Rock concert
	110 dBA	
Pile driver at 20 meters	100 dBA	
		Night club with live music
	90 dBA	
Large truck pass by at 15 meters		
	80 dBA	Noisy restaurant
		Garbage disposal at 1 meter
Gas lawn mower at 30 meters	70 dBA	Vacuum cleaner at 3 meters
Commercial/Urban area daytime		Normal speech at 1 meter
Suburban expressway at 90 meters	60 dBA	
Suburban daytime		Active office environment
	50 dBA	
Urban area nighttime		Quiet office environment
	40 dBA	
Suburban nighttime		
Quiet rural areas	30 dBA	Library
		Quiet bedroom at night
Wilderness area	20 dBA	Quiet recording studio
	10 dBA	
Threshold of human hearing	0 dBA	Threshold of human hearing

TABLE 3 Typical Levels of Groundborne Vibration

Human/Structural Response	Velocity Level, VdB (re 1µinch/sec, RMS)	Typical Events (50 –foot setback)
Threshold, minor cosmetic damage	100	Pile driving, vibratory compaction equipment
		Heavy tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as reading a video or computer screen	90	
		Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, frequent events		Commuter rail, typical Bus or truck over bump or on rough roads
	70	Rapid transit, typical
Approximate human threshold of perception to vibration		Buses, trucks and heavy street traffic
	60	
		Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

Source: Illingworth & Rodkin, Inc. and U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006,FTA-VA-90-1003-06.

Regulatory Criteria - Noise

The State of California and the City of Newark establish guidelines, regulations, and policies designed to limit noise exposure at noise sensitive land uses. Appendix G of the State CEQA Guidelines, the State of California Building Code, and the City of Newark General Plan present the following:

State CEQA Guidelines. The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. CEQA asks whether the proposed project would result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies?

- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?

- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public use airport, would the project expose people residing or working in the project area to excessive noise levels?

- For a project located within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

City of Newark General Plan. The Noise Element of the City of Newark General Plan identifies noise and land use compatibility standards for various land uses. These standards are intended to provide compatible land uses throughout the community as related to environmental noise. Residential land uses are considered "normally acceptable" in exterior noise environment of 60 dBA L_{dn} or less. Interior noise levels attributable to exterior noise sources shall be maintained at or below 45 dBA L_{dn}.

Regulatory Criteria – Vibration

The City of Newark has not identified quantifiable vibration limits that can be used to evaluate the compatibility of land uses with the respect to groundborne vibration. Although there are no local standards that control allowable vibration levels in new residential development, the U.S. Department of Transportation has developed vibration impact assessment criteria for evaluating vibration impacts associated with transit projects.[1] The Federal Transit Administration (FTA) has proposed vibration impact criteria, based on maximum overall levels for a single event. The impact criteria for groundborne vibration are shown in Table 4. Note that there are criteria for frequent events (more than 70 events of the same source per day), occasional events (30 to 70 vibration events of the same source per day), and infrequent events (less than 30 vibration events of the same source per day).

TABLE 4 Groundborne Vibration Impact Criteria

Land Use Category	Groundborne Vibration Impact Levels (VdB re 1 µinch/sec, RMS)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1 Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2 Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3 Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research should always require detailed evaluation to define the acceptable vibration levels. Ensuring low vibration levels in a building requires special design of HVAC systems and stiffened floors.

Source: U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006, FTA-VA-90-1003-06.

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[1] U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006, FTA-VA-90-1003-06.

Existing Noise Environment

Areas 3 and 4 are located west of Cherry Street, generally between Mowry Avenue and Stevenson Boulevard, in the City of Newark. The Union Pacific Railroad extends in a north-south direction and separates Area 3 from Area 4. Land uses in the vicinity of the project site include wetlands and industrial uses to the northwest, residential uses and Newark Memorial High School to the north, industrial uses to the southeast, and wetlands to the west.

Portions of Areas 3 and 4 are currently developed. The northernmost portion of Area 3 is developed with community facilities including the Sillman Recreation Complex (aquatic center, softball field, and soccer play fields), Ohlone College, and Newark Fire Station 3. The southernmost portion of Area 3 is developed with mostly vacant commercial and industrial buildings. The northernmost section of Area 4 is currently developed with a Pick-n-Pull self-service auto dismantling facility.

Railroad trains and vehicular traffic along the local roadway network are the predominant noise sources affecting the noise environment of Areas 3 and 4. Ambient noise measurements were made over a 30-hour period at two locations from September 6, 2006 to September 7, 2006. Noise measurements were made at three additional locations between September 24, 2008 and September 25, 2008. Figure 1 shows the approximate noise monitoring locations.

Noise measurement location LT-1 was approximately 100 feet from the UPRR at the north end of Area 3. This location was selected to quantify noise levels generated by railroad trains. Hourly average noise levels typically ranged from 47 dBA L_{eq} to 72 dBA L_{eq} during the noise monitoring survey. The large variation in hourly average noise levels was dependent on whether or not trains passed during the hour. Maximum noise levels generated by railroad train warning whistles were routinely 90 to 100 dBA L_{max} at this location with four excursions above 100 dBA L_{max}. A review of the noise data gathered at this location indicates that approximately 30 trains passed the site in a 24-hour period. The day-night average noise level at location LT-1 was 70 dBA L_{dn}.

Noise measurement location LT-2 was approximately 55 feet from the center of Cherry Street west of Newark Memorial High School. This measurement was made to quantify noise levels generated by vehicular traffic along Cherry Street. Hourly average noise levels typically ranged from 63 dBA L_{eq} to 74 dBA L_{eq} during the day and from 55 dBA L_{eq} to 71 dBA L_{eq} at night. The day-night average noise level at location LT-2 was 73 dBA L_{dn}.

Noise measurement location LT-3 quantified traffic noise levels at a distance of 80 feet from the center of Stevenson Boulevard east of Cherry Street. Hourly average noise levels typically ranged from 66 dBA L_{eq} to 72 dBA L_{eq} during the day and from 59 dBA L_{eq} to 70 dBA L_{eq} at night. The day-night average noise level at location LT-3 was 73 dBA L_{dn}.

Noise measurement location LT-4 was made approximately 80 feet from the center of Stevenson Boulevard west of Cherry Street to quantify noise levels generated by vehicular traffic along Stevenson Boulevard. Hourly average noise levels typically ranged from 56 dBA L_{eq} to 65 dBA L_{eq} during the day and from 51 dBA L_{eq} to 63 dBA L_{eq} at night. The day-night average noise level at location LT-4 was 65 dBA L_{dn}. Noise data gathered at the long-term sites are summarized in Appendix 1.

Short-term noise measurements were made at three additional positions in and around the project area. Short-term noise measurement location ST-1 was approximately 90 feet from the center of Cherry Street near Stevenson Boulevard. The average-equivalent noise level from 12:10 p.m. to 12:20 p.m. on September 6, 2006 was 66 dBA L_{eq}. A comparison of the data measured at ST-1 and the data gathered at LT-2 during the 12:00 p.m. hour indicates that the day-night average noise level at ST-1 is approximately 68 dBA L_{dn}. Short-term noise measurement location ST-2 was south of the project site approximately 430 feet from the Quickcrete Concrete Batch Plant south of Stevenson Boulevard. The average-equivalent noise level measured on September 6, 2006 was 58 dBA L_{eq}. The day-night average noise level resulting from the operation of concrete batch plant at Quickcrete is estimated to be less than 60 dBA L_{dn} at Areas 3 and 4. Short-term noise measurement location ST-3 was approximately 120 feet from office buildings along Eureka Drive. The average-equivalent noise level measured on September 24, 2008 was 50 dBA L_{eq}. The day-night average noise level resulting from office operations is estimated to be 50 dBA L_{dn}.

Figure 1 **Noise and Vibration Measurement Locations**

Existing Vibration Environment

Vibration measurements were made on Thursday, September 7, 2006 at two positions east of the Union Pacific Railroad. Three sets of railroad tracks are located in the vicinity of Mowry Avenue including two through tracks and one spur track. Position V-1 was approximately 65 feet from the easternmost through-track. Position V-2 was an additional 50 feet east of Position V-1 and 115 feet from the easternmost through-railroad track. The two different setbacks were used to evaluate the change in ground vibration levels with distance from the tracks.

Vibration levels were only measured in the vertical axis because ground vibration resulting from railroad trains is typically most dominant on this axis. The instrumentation used to make the measurements included a Sony Digital Audio Tape Recorder (DAT) and seismic grade, low noise accelerometers firmly fixed to the ground. This system is capable of accurately measuring very low vibration levels. Vibration levels were measured at ground level and were representative of vibration levels that would shake a building's foundation.

Vibration measurements were made during the passage of two Amtrak passenger trains. These trains were observed to travel at speeds of approximately 30 mph through the project area. Vibration levels measured at each measurement position during train passby events are summarized in Table 4. Vibration levels were approximately 75 VdB at a distance of 80 feet and 71 VdB at 115 feet to 130 feet (distances to easternmost and westernmost through-track, respectively) during train passbys.

TABLE 5 Results of Vibration Measurements

Activity	Vibration Level (VdB re 1µinch/sec, RMS)		Comments
	Position V-1	Position V-2	
SB Amtrak (3:03 p.m.)	75 VdB	71 VdB	East Track - 30 mph
NB Amtrak (3:45 p.m.)	--	71 VdB	West Track - 30 mph

Notes:

Position V-1 – 80 feet from active UPRR track.
Position V-2 – 115-130 feet from the active UPRR track.

PROJECT IMPACTS AND MITIGATION MEASURES

Significance Criteria

- A significant impact would be identified for a proposed land use if it would be exposed to noise levels exceeding the City's established guidelines for noise and land use compatibility. For the proposed project, a significant impact would be identified if noise-sensitive receivers would be exposed to noise levels exceeding the City's established guidelines for "normally acceptable" noise and land use compatibility.

- A significant noise impact would result if the project would locate vibration sensitive land uses in areas where vibration levels from freight trains or commuter trains exceeds 75 VdB for "occasional" vibration events (30 to 70 vibration events of the same source per day).

- According to CEQA, a significant noise impact would result if noise levels increase substantially at existing noise-sensitive land uses (e.g., residences) as a result of the project. A substantial increase to noise levels would occur if the project resulted in an increase of 3 dBA L_{dn} or greater at noise-sensitive land uses where noise levels already exceed 60 dBA L_{dn}.

- Significant noise impacts would result from construction if noise levels were sufficiently high to interfere with speech, sleep, or normal residential activities. Construction-related hourly average noise levels received at noise-sensitive land uses exceeding 60 dBA L_{eq}, and at least 5 dBA L_{eq} above the ambient, would be considered significant if such noise levels lasted more than one year in duration.

Impact 1: **Noise and Land Use Compatibility.** Future residential uses developed at the project site would be exposed to exterior noise levels greater than 60 dBA L_{dn}, which exceeds the noise and land use compatibility standards presented in the City of Newark's General Plan. Interior noise levels would be expected to exceed 45 dBA L_{dn} without the incorporation of noise insulation features into the project's design. **This is a significant impact.**

The project proposes three different land use areas for Area 4. Area 3 proposes one land use area for development. Area 3 consists of residential units throughout the site with an elementary school adjacent to Cherry Street. Area 4 proposes a 100 acre Golf Course area that could include open space and continued agricultural operations, a 91 acre residential or golf course area that could include a combination of the two along with open space and continued agricultural areas, and a 125 acre residential area that could include open space and continued agricultural operations.

Future Exterior Noise Environment: Area 3

The noise environment at the project site currently exceeds the City's normally acceptable noise standard for exterior noise levels at residential and educational uses (60 dBA L_{dn}) as a result of traffic along the local roadway network. Future noise levels at a distance of 100 feet from the center of Cherry Street (nearest residential units) would be approximately 71 dBA L_{dn}. Future noise levels at a distance of 100 feet from the center of Stevenson Boulevard, west of Cherry Street/Boyce Road, are also projected to reach 71 dBA L_{dn}.

A review of the land use plan indicates that it is possible for private rear yard areas to be located immediately adjacent to Cherry Street and Stevenson Boulevard. Noise levels in residential outdoor use areas that are affected by transportation noise are required to be maintained at or below 60 dBA L_{dn} to be considered "normally acceptable". The overall day-night average noise level in the outdoor use areas of residential uses along Cherry Street and Stevenson Boulevard would be approximately 71 dBA L_{dn} and would exceed the City's "normally acceptable" exterior noise standards. This is a significant impact.

Noise barriers could be constructed to reduce noise levels in the rear yards of homes adjacent to Cherry Street and Stevenson Boulevard. Preliminary barrier calculations indicate that soundwalls approximately 11 feet high (relative to residential pad elevations) would be required along Cherry Street and Stevenson Boulevard to reduce noise levels in the rear yards to "normally acceptable" levels (at or below 60 dBA L_{dn}). Table 6 summarizes the future exterior noise levels of homes along Cherry Street and Stevenson Boulevard assuming noise barrier heights ranging between 6 feet and 11 feet. Noise barriers are not typically considered for elementary schools due to security and safety reasons.

Table 6: Future Exterior L_{dn} Noise Levels (dBA) With Mitigation

Noise Source	No Barrier	6 ft.	7 ft.	8 ft.	9 ft.	10 ft.	11 ft.
Cherry St & Stevenson Blvd	71	65	64	63	62	61	60

Stationary noise sources in the project vicinity such as Quickcrete and Newmark Memorial High School's football stadium were not found to generate noise levels greater than 60 dBA L_{dn} and would not be considered noise sources that would be incompatible with proposed residential development. Quickcrete is located over 800 feet from Area 3 and approximately 1,400 feet from Area 4. Quickcrete does not work at night or evening hours but they do start some prepping and non-noise generating operations as early as 3 am. Noise levels at the nearest proposed uses would be approximately 53 dBA L_{eq} at Area 3. Newark Memorial High School's football stadium is located about 1,300 feet from Area 3. Football games would be expected to generate noise levels of approximately 52 to 54 dBA L_{eq}. L_{dn} noise levels on days where football games would occur could reach 55 dBA L_{dn} . Noise levels from operations at Quickcrete and the football stadium could be audible at residential receivers proposed at the nearest portions of Areas 3 and 4, but would not exceed 60 dBA L_{dn}.

The location of outdoor use areas at the proposed elementary school that would benefit from a lowered noise level are not known at this time. A combination of noise barriers, setbacks, and site planning are methods for reducing exterior noise levels in noise sensitive outdoor use areas. Preliminary calculations indicate that noise sensitive outdoor use areas would have to be located approximately 540 feet from Cherry Street in order to achieve an exterior noise level of 60 dBA L_{dn}.

While this EIR evaluates the overall suitability of this site for an elementary school use, the specific design of the school has not yet been prepared and would be subject to individual environmental review and approval. Future development of the school would be subject to specific school site and construction requirements set by the State and would be reviewed and approved by Division of the State Architect.

Future Exterior Noise Environment: Area 4

The noise environment at portions of Area 4 currently exceeds the City's normally acceptable noise standard for exterior noise levels at residential uses (60 dBA L_{dn}) as a result of railroad noise along the UPRR. Existing noise levels at a distance of 100 feet from the center of the UPRR (nearest possible residential units) are approximately 70 dBA L_{dn}. This measurement location was near an at-grade crossing near the intersection of Mowry Avenue where trains were blowing their warning whistles. As part of the project, a bridge would be constructed over the UPRR at Stevenson Boulevard. This would allow trains to pass noise sensitive receptors in Area 4 without having to sound their warning whistles. Future noise levels at a distance of 100 feet from the center of the UPRR (nearest possible residential units) would be approximately 67 dBA L_{dn}.

A review of the Area 4 land use plan indicates that it is possible for private rear yard areas to be located immediately adjacent to the UPRR north and south of Stevenson Boulevard. The overall day-night average noise level in the outdoor use areas of residential uses along the UPRR would be approximately 67 dBA L_{dn} and would exceed the City's "normally acceptable" exterior noise standards.

Noise barriers could be constructed to reduce noise levels in the yards of homes adjacent to the UPRR. Preliminary barrier calculations indicate that a soundwall 8 feet high would be required at the residential property line to reduce noise levels in the rear yards to "normally acceptable" levels (at or below 60 dBA L_{dn}). Table 7 summarizes the future exterior noise levels of homes adjacent to the UPRR assuming various barrier heights.

Table 7: Future Exterior L_{dn} Noise Levels (dBA) With Mitigation

Noise Source	No Barrier	6 ft. Barrier	7 ft. Barrier	8 ft. Barrier
UPRR	67	62	61	60

Stationary noise sources in the Area 4 vicinity primarily include the TCRDF. Since June 2007, the TCRDF has been closed to the public. The TCRDF is expected to reach capacity and no longer accept landfill waste from the Fremont Transfer Station by mid-2009. While the concrete recycling facility and corporation yard will continue to operate post-closure of the landfill, no additional waste deposits will occur on the top and sides of the landfill. Post-closure, the entire landfill will be capped with a multiple layer cover system. Therefore, waste hauling trucks will no longer be a noise source on the top and sides of the landfill.

Noise sources from the TCRDF were not found to generate noise levels greater than 60 dBA L_{dn} and would not be considered a noise source that would be incompatible with the proposed residential development. However, during certain meteorological conditions or operations at the site (i.e., backup beepers), noise could be audible and considered annoying to residents located along the southern edge of Area 4. Residential units located along this southern edge of the project site could be provided with some form of forced-air mechanical ventilation so that windows could be kept closed at the occupant's discretion to control noise.

Interior Noise Environment: Area 3

Future noise levels at the project site would require that residential and educational units be designed to control interior noise levels to 45 dBA L_{dn} or less. Standard construction provides approximately 15 dBA of exterior to interior noise reduction assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior day-night average noise levels are 65 dBA L_{dn} or less, interior noise levels can typically be maintained below City standards (45 dBA L_{dn}) with the incorporation of forced air mechanical ventilation systems in residential and educational units. These systems allow the occupant the option of controlling noise by maintaining the windows shut. Where noise levels exceed 65 dBA L_{dn}, forced-air mechanical ventilation systems and sound-rated building elements are normally required.

To achieve the necessary noise reduction to meet the requirements of the City of Newark's interior noise standard, some form of forced air mechanical ventilation, satisfactory to the local building official, would be required at units with direct line-of-sight to Cherry Street or Stevenson Boulevard. Given the anticipated exterior noise level at first-row residential and educational units proposed along Cherry Street and Stevenson Boulevard, it may also be necessary to provide sound-rated windows and doors at second story exposures to maintain interior noise levels at or below 45 dBA L_{dn}. Interior noise levels would vary depending on the design of the building (relative window area to wall area) and construction materials and methods. Although the City interior noise standard is not applicable to public schools, 45 dBA L_{dn} is a recommended interior noise level goal for educational facilities. An acoustical analysis should be prepared during detailed design to describe the noise insulation features that have been included in the design of the project to maintain interior noise levels at acceptable levels. Preliminary calculations indicate that the incorporation of a suitable form of mechanical ventilation system and moderate performance sound-rated windows (STC 28-30) would be sufficient to achieve the interior noise level standard at units with the highest projected exterior noise exposure.

Interior Noise Environment: Area 4

Future noise levels at the project site would require that residential units be designed to control interior noise levels to 45 dBA L_{dn} or less. To achieve the necessary noise reduction to meet the requirements of the City of Newark's interior noise standard, some form of forced air mechanical ventilation, satisfactory to the local building official, would be required at units directly adjacent to the railroad. Given the anticipated exterior noise level at first-row residential units proposed along the railroad, it may also be necessary to provide sound-rated windows and doors at potential second story exposures to maintain interior noise levels at or below 45 dBA L_{dn}. Preliminary calculations indicate that the incorporation of a suitable form of mechanical ventilation system and moderate performance sound-rated windows (STC 28-30) would be sufficient to achieve the interior noise level standard at units with the highest projected exterior noise exposure.

Mitigation Measures:

The following mitigation measures shall be included in the project to reduce the impact to a less-than-significant level:

- Noise barriers shall be constructed to reduce noise levels at private use areas along Cherry Street, Stevenson Boulevard, and the railroad. To be effective, the barriers should be constructed solidly over the entire surface and at the base. Openings or gaps between barrier materials or the ground decrease the reduction provided by a noise barrier. Suitable material for barrier construction should have a minimum surface weight of 3 lbs./ft^2. (such as one-inch think wood, masonry block, concrete, or metal). Preliminary barrier designs are shown in Appendix 2 and 3. The final design of noise barriers shall be completed during project-level review when detailed site plans and grading plans are available.

- Project-specific acoustical analyses are required so that the design of the residential and educational units will be sufficient to adequately reduce interior noise levels to 45 dBA L_{dn} or lower. Building sound insulation requirements would need to include the provision of forced-air mechanical ventilation for all new units with direct line of sight to significant transportation noise sources or railroad lines in the project vicinity, so that windows could be kept closed at the occupant's discretion to control noise. Special building sound insulation treatments may be required. These treatments would include, but are not limited to, sound rated windows and doors, sound rated wall constructions, acoustical caulking, protected ventilation openings, etc. Preliminary calculations indicated that second story residential units would require sound rated windows and doors with ratings ranging from STC 28-30 to assure that the 45 dBA L_{dn} interior standard is met. The specific determination of what treatments are necessary would be determined on a unit-by-unit basis. The results of the analysis, including the description of the necessary noise control treatments to achieve acceptable noise levels inside the living units, shall be submitted to the City along with the building plans and approved prior to issuance of a building permit.

Impact 2: **Generation of Excessive Noise Levels**. Noise-generating uses within the Area 3 & 4 Specific Plan are not anticipated to generate noise levels in excess of 60 dBA L_{dn}. **This is a less-than significant impact.**

The Area 3 portion of the project includes the development of an elementary school in an area adjacent to proposed residential land uses. The School would generate noise when students arrive and depart as well as when outdoor activity areas are used. It is not anticipated, given the activities outlined above, that noise from the elementary school would cause any adverse noise impacts upon future noise sensitive receptors in the area.

Mitigation Measures: **None Required**

Impact 3: **Groundborne Vibration.** Residential land uses are proposed approximately 100 feet from railroad tracks located to the east of Area 4. Vibration levels generated by railroad trains are not expected to exceed 75 VdB. **This is a less-than-significant impact.**

Railroad trains are a source of groundborne vibration when receivers are located close to the tracks. The U.S. Department of Transportation, Federal Transit Administration, (FTA) has developed vibration impact assessment criteria for evaluation vibration impacts associated with rapid transit projects.[2] The Criterion for groundborne vibration impacts is 75 VdB for occasional events (30 to 70 vibration events of the same source per day). Based on the measured vibration data, the nearest residential units would not be exposed vibration levels greater than 75 VdB. Vibration levels will not exceed the FTA guidelines at the nearest residential units to the railroad. This is a less-than-significant impact.

Mitigation Measures: **None Required**

Impact 4: **Off-site Project-Generated Traffic Noise.** The proposed project will generate an increase in traffic volumes along area roadways. The calculated increase in traffic would not result in a substantial increase in traffic noise at nearby receivers. **This is a less-than-significant impact.**

Project generated traffic noise level increases were calculated by comparing existing plus project to existing traffic volumes. A total of 55 intersections surrounding the project site were analyzed. A review of the project's traffic study indicates that the proposed project will generate a slight increase in vehicular traffic on the local roadway network. The addition of project traffic would increase noise levels by 2 dBA L_{dn} or less. A traffic noise increase of less than 3 dBA L_{dn} is not typically perceptible and is not considered substantial. This is a less-than-significant impact.

Mitigation Measures: **None Required**

Impact 5: **Cumulative Traffic Noise.** The proposed project would measurably contribute to significant cumulative traffic noise increases. **This is a significant impact.**

The project would result in a significant cumulative traffic noise impact if existing sensitive receivers would be exposed to cumulative traffic noise level increases greater than 3 dBA L_{dn} above existing traffic noise levels and if the project would make a "cumulatively considerable" contribution to the overall traffic noise level increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA L_{dn} or more attributable solely to the proposed project. Cumulative traffic noise levels are calculated to increase substantially along roadways serving the project site because of cumulative growth forecast in local General Plans. The cumulative noise impacts to sensitive receptors along the affected roadway segments are described below.

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[2] U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May 2006.

Cumulative traffic noise levels are anticipated to increase by 3 dBA L_{dn} as a result of cumulative plus project conditions along Cherry Street between Stevenson Boulevard and Mowry Avenue. 1 dB of the 3 dB increase can be attributed to the project. This would result in a significant cumulative impact at receivers east of Cherry Street between Stevenson Boulevard and Mowry Avenue.

Cumulative traffic noise levels are anticipated to increase by 4 dBA L_{dn} as a result of cumulative plus project conditions along Stevenson Boulevard between Cherry Street and Cedar Boulevard. 2 dB of the 4 dB increase can be attributed to the project. This would result in a significant cumulative impact at receivers north of Stevenson Boulevard between Cherry Street and Cedar Boulevard.

Mitigation Measures:

Noise reduction methods include the following:

- New or larger noise barriers could reduce noise levels by 5 dBA L_{dn}. Final design of such barriers, including an assessment of their feasibility and reasonableness, should be complete during project level review.

- Sound insulation treatments to the buildings, such as sound rated windows and doors, could reduce noise levels in interior spaces.

- In addition, alternative noise reduction techniques should be considered in coordination with the city of Newark. Such techniques could include: installation of traffic calming measures to slow traffic; coordination of routing and other traffic control measures; repaving the affected roadways with "quiet" pavement types such as Open-Grade Asphalt Concrete. Opportunities to lower noise levels through pavement surface treatments could only be identified after an assessment of the current roadway surface with respect to noise.

Mitigation Discussion:

A combination of mitigation measures such as the repaving of affected roadways, the replacement or construction of noise barriers, traffic calming, and sound insulation could be implemented to reduce the effects of cumulative plus project traffic noise at affected residential units in the vicinity of the project site.

Case studies have shown that the replacement of dense grade asphalt (standard type) with open-grade or rubberized asphalt can reduce traffic noise levels along residential-type streets by 2 to 3 dBA. A possible noise reduction of 2 dBA would be expected using conservative engineering assumptions.

Single-family and multi-family residential receivers east of Cherry Street and north of Stevenson Boulevard could be provided with new or larger noise barriers to provide the additional necessary noise attenuation in private outdoor use areas. Typically, increasing the height of an existing barrier results in about 1 dBA of attenuation per 1 foot of additional barrier height. The design of such noise barriers would require additional analysis.

Traffic calming could also be implemented along affected roadways to reduce noise levels expected under the cumulative plus project traffic scenario. Each 5 mph reduction in average speed provides approximately 1 dBA of noise reduction on an average basis (L_{eq}/ L_{dn}). Traffic calming measures that regulate speed improve the noise environment by smoothing out noise levels.

Residential receivers along affected roadways could be provided sound insulation treatments if further study finds that interior noise levels within the affected residential units would exceed 45 dBA L_{dn} assuming cumulative plus project traffic conditions. Treatments to the home may include the replacement of existing windows and doors with sound-rated windows and doors and the provision of a suitable form of forced-air mechanical ventilation to allow the occupants the option of controlling noise to by closing the windows. The specific treatments for each affected residential unit would be identified on a case-by-case basis.

Significance After Mitigation:

Each of these mitigation measures involves other non-acoustical considerations. Other engineering issues may dictate continued use of dense grade asphalt. Noise barriers and sound insulation treatments must be done on private property necessitating agreements with each property owner. Therefore, it may not be reasonable or feasible to reduce project-generated traffic noise at all affected receivers. The impact would be considered significant and unavoidable.

Impact 6: **Construction Noise.** A portion of Area 3 is bordered by existing residential land uses to the east. Noise generated by construction activities at the site would not be expected to adversely affect adjacent land uses provided standard construction noise controls are implemented at the site and the cumulative duration of significant noise-producing activities is limited to one year or less. **This is a less-than-significant impact.**

Construction activities generate considerable amounts of noise. Construction-related noise levels are normally highest during the demolition phase and during the construction of project infrastructure. These phases of construction require heavy equipment that normally generates the highest noise levels over extended periods of time. Typical hourly average construction generated noise levels are about 81 dBA to 88 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.) Construction-related noise levels are normally less during building erection, finishing, landscaping phases. There would be variations in construction noise levels on a day-to-day basis depending on the actual activities occurring at the site. Construction generated noise levels drop off at a rate of about 6 dBA per doubling of distance between the source and receptor. The nearest existing residential receivers are about 190 feet from the project site. Hourly average noise levels would range from 69 to 76 dBA L_{eq} during the busiest construction periods along the perimeter of the site. Shielding by barriers or buildings would provide an additional 5 to 10 decibels of attenuation at distant receptors.

Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise generating activities, and the distance between construction noise sources and noise sensitive receptors. Construction noise impacts primarily occur when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction durations last over extended periods of time. Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive uses in the project vicinity for a period greater than one year, the impact would be considered significant.

Grading and the construction of project infrastructure would be completed first. Residential units and the elementary school at Area 3 would then be constructed. Development of Area 4 would proceed after Area 3. It is unknown at this time if the golf course or residential units in Area 4 would be constructed first. As construction moves away from noise-sensitive receptors or indoors, noise levels generated by construction will be lower. Noise generated by demolition, grading, infrastructure improvements and the construction of units nearest Cherry Street would not be expected to exceed ambient noise levels at receivers to the east by more than 5 dBA L_{eq} for a period greater than one year.

Significant noise impacts do not normally occur when standard construction noise control measures are enforced at the project site and when the duration of the noise generating construction period at a particular receiver or group of receivers is limited to one construction season (typically one year) or less. Construction noises associated with projects of this type are disturbances that are necessary for the construction or repair of buildings and structures in urban areas. Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life.

The following standard controls are assumed to be included in the project:

- Restrict noise-generating activities at the construction site or in areas adjacent to the construction site to the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, and between 8:00 a.m. to 5:00 p.m. on Saturdays. Construction shall be prohibited on Sundays and holidays.

- Equip all internal combustion engine driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

- Utilize "quite" air compressors and other stationary noise sources where technology exists.

- Route all construction traffic to and from the project site via designated truck routes where possible. Prohibit construction related heavy truck traffic in residential areas where feasible.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

- The contractor shall prepare and submit to the City for approval a detailed construction plan identifying the schedule for major noise-generating construction activities.

- Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem be implemented. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

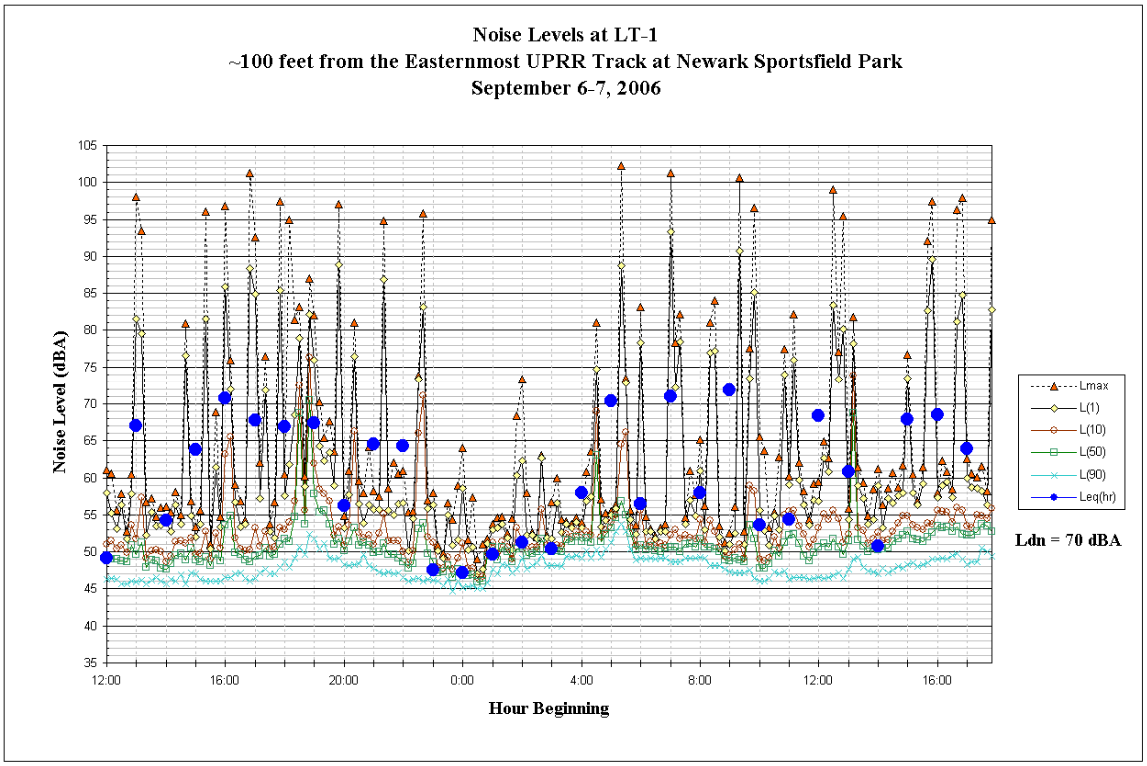
With the incorporation of these standards measures, the noise impact resulting from project construction would be considered less-than-significant.

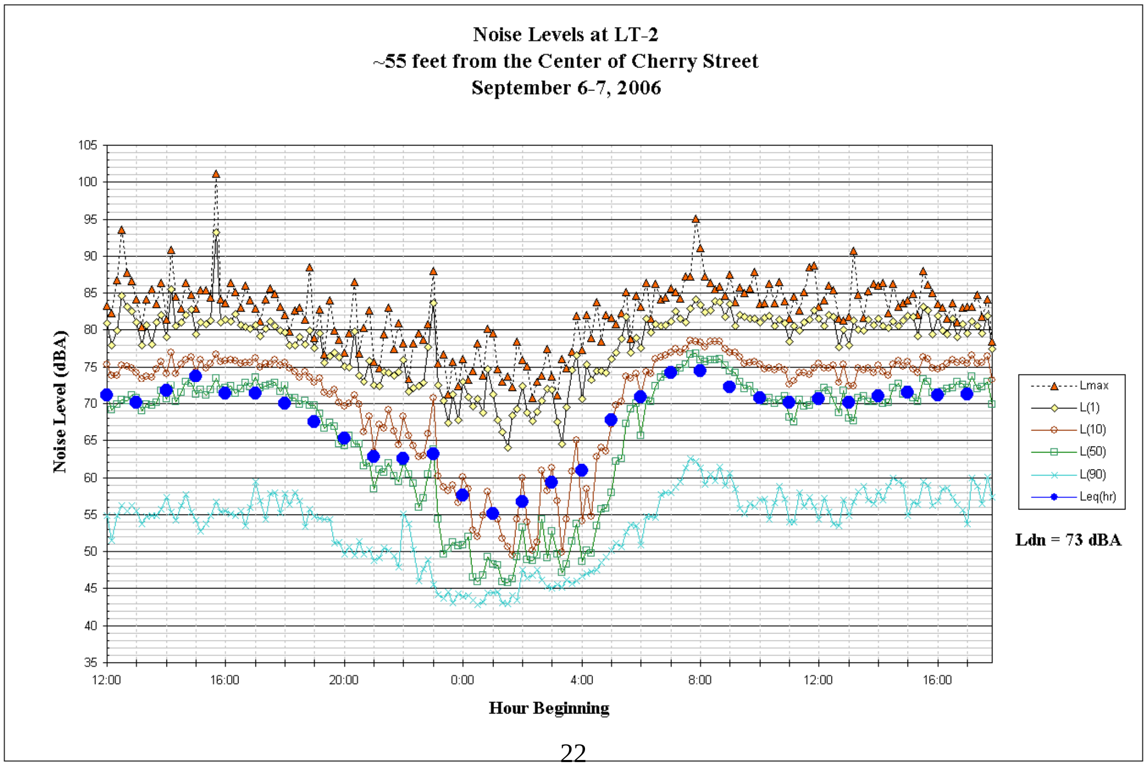
Mitigation Measures: **No additional measures are required.**

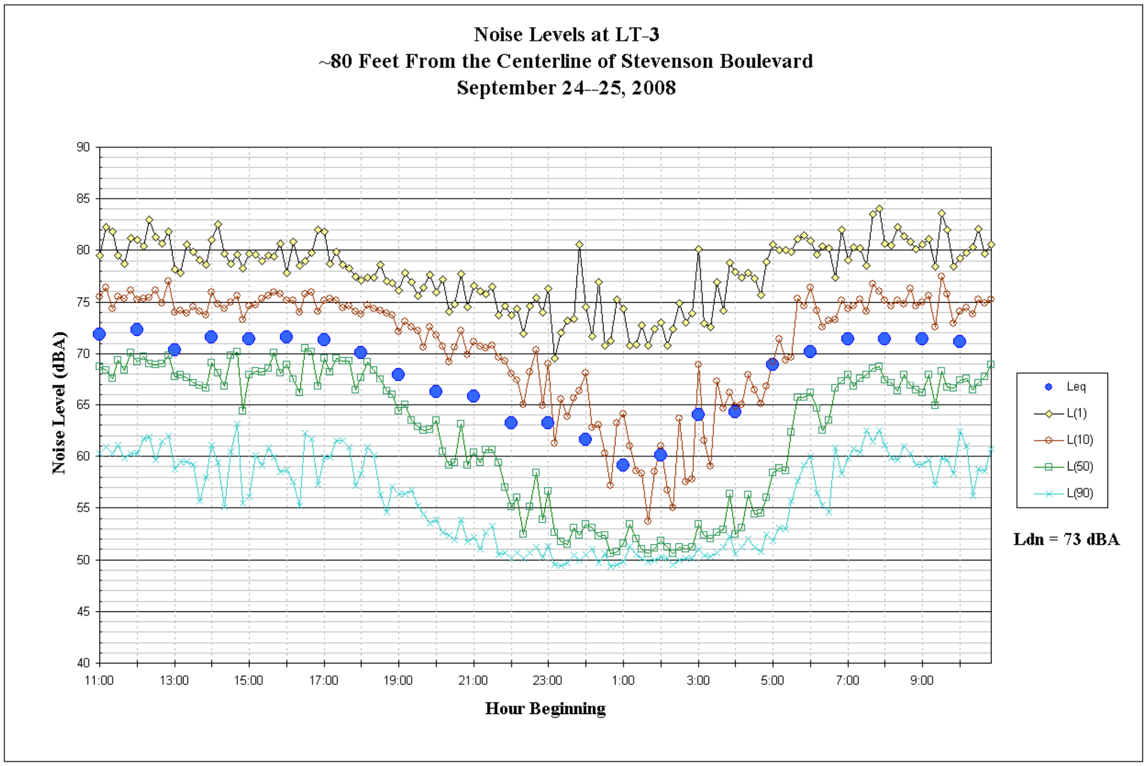
Impact 6: **Noise and Land Use Compatibility (Aircraft).** The exterior noise environment at the project site resulting from intermittent aircraft noise would be considered compatible with proposed sensitive uses. **This is a less-than-significant impact.**

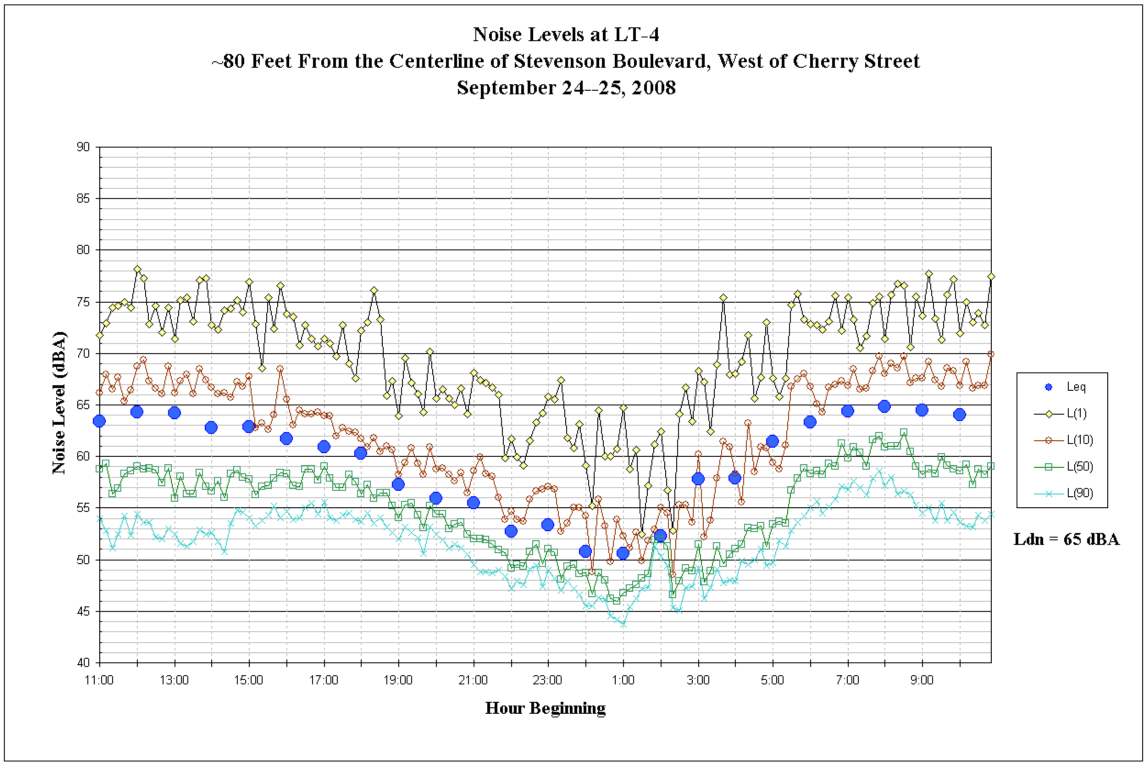
The project site is not located within two miles of an airport or within an airport land use plan area and would not be exposed to excessive noise from aircraft.

Appendix 1: Daily Trend in Noise Levels

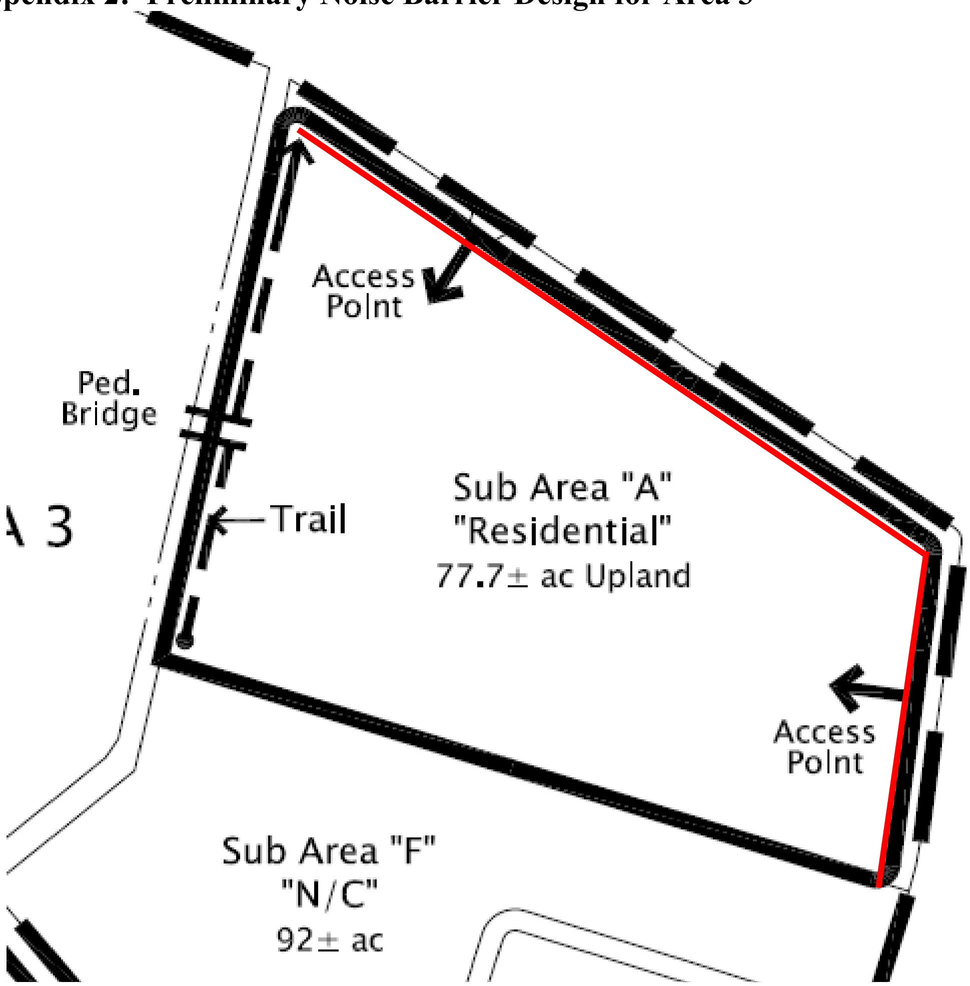





Noise Levels at LT-3
~80 Feet From the Centerline of Stevenson Boulevard
September 24--25, 2008
Noise Level (dBA)
Hour Beginning
Leq
L(1)
L(10)
L(50)
L(90)
Ldn = 73 dBA


Noise Levels at LT-4
~80 Feet From the Centerline of Stevenson Boulevard, West of Cherry Street
September 24--25, 2008
Noise Level (dBA)
Hour Beginning
Leq
L(1)
L(10)
L(50)
L(90)
Ldn = 65 dBA

Appendix 2: Preliminary Noise Barrier Design for Area 3



Appendix 3: Preliminary Noise Barrier Design for Area 4