

Fullerton - Roosevelt Focused Noise Analysis

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August 27, 2013

FULLERTON ROOSEVELT RESIDENTIAL PROJECT FOCUSED NOISE ANALYSIS

1.0 Methodology

The following analysis provides a discussion on the fundamentals of sound, examines Federal, State, and City noise guidelines and policies, reviews noise levels at the site and existing receptor locations, and evaluates potential noise impacts associated with the Proposed Project. Modeled traffic noise levels are based upon vehicle data contained in the traffic-projections provided by TEP as included in *The Olson Company Fullerton - Roosevelt Residential Project in Fullerton Traffic Impact Study* (August 2013) (*Traffic Study*). In accordance with the *Traffic Study*, the project would add 101 average daily trips (ADT) to the roadways. This evaluation was prepared in conformance with local standards and utilizes procedures and methodologies as specified by Caltrans and the Federal Highway Administration. The evaluation of noise impacts associated with a Proposed Project includes:

- Reviewing existing ambient noise levels including traffic-noise modeling in the project area,
- Determining the noise impacts associated with site development,
- Determining the long-term noise impacts from project-related traffic, and
- Determining the long-term noise impacts from off-site noise on site occupants.

The generation of noise associated with the implementation of the Proposed Project would occur in the short-term with site preparation and construction activities and over the long-term from transportation-related noise sources associated with the proposed development. This noise assessment addresses noise impacts by discussing the current noise environment, analyzing impacts associated with proposed land use including mobile-source noise, and evaluating construction equipment noise.

The Caltrans Sound32 version of the FHWA Highway Traffic Noise Prediction Model is used to evaluate traffic-related noise conditions in the project area. 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 resultant noise levels are weighted and summed over 24-hour periods to determine the Community Noise Equivalent Level (CNEL) values. These data are then compared with obtained field data and used in the assessment of impacts in this analysis.

2.0 Existing Conditions

2.1 Noise Definitions

Sound is a pressure wave transmitted through the air. It is described in terms of loudness or amplitude (measured in decibels), frequency or pitch (measured in Hertz [Hz] or cycles per second), and duration (measured in seconds or minutes). The standard unit of measurement of the loudness of sound is the decibel (dB).

The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all and are “felt” more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Typical human hearing can detect changes in sound levels of approximately 3 dBA under normal conditions. Changes of 1 to 3 dBA are detectable under quiet, controlled conditions, and changes of less than 1 dBA are usually indiscernible. A change of 5 dBA is discernable to most people in an exterior environment while a change of 10 dBA is perceived as a doubling (or halving) of the sound.

Noise is defined as unwanted sound, and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. Based on these known adverse effects of noise, the federal government, the State of California, and many local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

2.2 Noise Measurement Scales

Several rating scales (or noise “metrics”) exist to analyze adverse effects of noise, including traffic-generated noise, on a community. These scales include the equivalent noise level (Leq), the community noise equivalent level (CNEL), and the day-night noise level (Ldn). Leq is a measurement of the sound energy level averaged over a specified time period (usually 1 hour). Leq represents the amount of variable sound energy received by a receptor over a time interval in a single numerical value. For example, a 1-hour Leq noise level measurement represents the average amount of acoustic energy that occurred in that hour.

Unlike the Leq metric, the CNEL noise metric is based on 24 hours of measurement. CNEL also differs from Leq in that it applies a time-weighted factor designed to emphasize noise events that occur during the evening and nighttime hours (when quiet time and sleep disturbance is of particular concern). Noise occurring during the daytime period (7:00 AM to 7:00 PM) receives no penalty. Noise produced during the evening time period (7:00 PM to 10:00 PM) is penalized by 5 dBA, while nighttime noise (10:00 PM to 7:00 AM) is penalized by 10 dBA.

The Ldn noise metric is similar to the CNEL metric except that the period from 7:00 PM to 10:00 PM receives no penalty. Both the CNEL and Ldn metrics yield approximately the same 24-hour value (within about 0.5 dBA) with the CNEL being the more restrictive (i.e., its calculation results in a higher value) of the two.

2.3 Vibration Fundamentals

Vibration is a trembling, quivering, or oscillating motion of the earth. Like noise, vibration is transmitted in waves, but in this case through the earth or solid objects. Unlike noise, vibration is typically of a frequency that is felt rather than heard.

Vibration can be either natural as in the form of earthquakes, volcanic eruptions, sea waves, landslides, etc., or man-made as from explosions, the action of heavy machinery or heavy vehicles such as trucks or trains. Both natural and man-made vibration may be continuous such as from operating machinery, or transient as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude may be characterized in three ways including displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position and for the purposes of soil displacement is typically measured in inches or millimeters. Particle velocity is the rate of speed at which soil particles move in inches per second or millimeters per second. Particle acceleration is the rate of change in velocity with respect to time and is measured in inches per second per second or millimeters per second per second. Typically, particle velocity (measured in inches or millimeters per second) and/or acceleration (measured in gravities) are used to describe vibration. Table 1 presents the human reaction and effects on buildings exposed to various levels of *continuous* vibration.

Table 1
HUMAN REACTION TO TYPICAL VIBRATION LEVELS

<i>Vibration Level Peak Particle Velocity (inches/second)</i>	<i>Human Reaction</i>	<i>Effect on Buildings</i>
0.006 - 0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to

		which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people.	Virtually no risk of “architectural” damage to normal buildings
0.20	Vibrations annoying to people in buildings.	Threshold at which there is a risk to “architectural” damage to normal dwelling – houses with plastered walls and ceilings
0.4 – 0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking by bridges	Vibrations at a greater level than normally expected from traffic, but would cause “architectural” damage and possibly minor structural damage

Source: Caltrans 2002.

Vibrations also vary in frequency and this affects perception. Typical construction vibrations fall in the 10 to 30 Hz range and usually occur around 15 Hz. Traffic vibrations exhibit a similar range of frequencies. However, due to their suspension systems, city buses often generate frequencies around 3 Hz at high vehicle speeds. It is more uncommon, but possible, to measure traffic frequencies above 30 Hz.

The way in which vibration is transmitted through the earth is called propagation. Propagation of earth borne vibrations is complicated and difficult to predict because of the endless variations in the soil through which waves travel. There are three main types of vibration propagation; surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground’s surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a “push-pull” fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or “side-to-side and perpendicular to the direction of propagation.”

As vibration waves propagate from a source, the energy is spread over an ever-increasing area such that the energy level striking a given point is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and void spaces. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

2.4 Regulatory Background

To limit population exposure to physically and/or psychologically damaging, as well as intrusive noise levels, the federal government, the State of California, various County governments, and most municipalities in the State have established standards and ordinances to control noise.

Federal Government

Occupational Health and Safety

The federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the USEPA. Noise exposure of this type is dependent on work conditions and is addressed through a facility’s Health and Safety Plan. The construction of the project will be subject to these OSHA limitations and all workers would receive appropriate training, hearing protection, and breaks, accordingly, ensuring that they are not exposed to harmful noise levels. Adherence to these OSHA requisites would ensure that these impacts remain less than significant and noise in the workplace will not be addressed further in this study.

Housing and Urban Development

The US Department of Housing and Urban Development (HUD) has set a goal of 45 dBA Ldn as a desirable maximum interior standard for residential units developed under HUD funding. (This level is also generally accepted within the State of California.) While HUD does not specify acceptable exterior noise levels, standard construction of residential dwellings constructed under Title 24 standards typically provide 20 dBA of attenuation with the windows closed. Based on this premise, the exterior Ldn should not exceed 65 dBA.

State of California

The California Office of Noise Control has set acceptable noise limits for sensitive uses. Sensitive-type land uses, such as homes and schools, are “normally acceptable” in exterior noise environments up to 65 dBA CNEL and “conditionally acceptable” in areas up to 70 dBA CNEL. A “conditionally acceptable” designation implies that new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements for each land use type is made and needed noise insulation features are incorporated in the design. By comparison, a “normally acceptable” designation indicates that standard construction can occur with no special noise reduction requirements.

Applicable interior standards for new multi-family dwellings are governed by Title 24 of the California Administrative Code. These standards require that acoustical studies be performed prior to construction in areas that exceed 60 dBA Ldn. Such studies are required to establish measures that will limit interior noise to no more than 45 dBA Ldn and this level has been applied to many communities in California.

City of Fullerton

The Noise Element within City of Fullerton’s General Plan (February 2012) provides noise-related land use compatibility guidelines. The Element references the California standard for single family and duplex dwellings of 50 – 60 CNEL as “normally acceptable” and 55 – 70 dBA CNEL as “conditionally acceptable.” The Noise Element notes, “In project specific analyses, each community must decide the level of noise exposure its residents are willing to tolerate within a limited range of values below the known levels of health impairment. Therefore, the City may use their discretion to determine which noise levels are considered acceptable or unacceptable, based on land use, project location, and other project factors.” Additionally, the General Plan notes that new residential development, which exceeds the “normally acceptable” standard shall included mitigation in project design including the use of sound walls, double-thickness glass, and extra insulation in building construction.

The Noise Element goes on to present significance criteria for an increase in noise. The City suggests that an impact would be significant if a project increases the ambient level by 5.0dBA or more where the ambient level is below 60 dBA CNEL, or increases this level by 3.0 dBA or more where the ambient level exceeds 60 dBA CNEL.

Stationary noise sources are regulated though the City of Fullerton Municipal Code, Chapter 15.90. NOISE STANDARDS AND REGULATION, which sets both day and night maximum allowable noise levels for residential land uses by designating “Noise zones.” As noted in Section 15.90.020, “Definitions,” Noise Zone 1 includes all residential properties. Section 15.90.030, “Noise standards,” sets allowable levels for residential areas and other sensitive land uses including “any private or public school, hospital, residential care facility for the elderly, and religious institution.” Table 2 presents the applicable noise standards as set forth in Section 15.90.030. Note that if the ambient noise levels exceed the levels included in the table, the allowable noise shall be increased to reflect the ambient conditions. It must also be noted that by law, the City does not regulate pre-empted noise sources (such as motor vehicles when operating on public roads). Furthermore, it should be noted that these standards only apply to residential and sensitive land uses and do not apply to commercial and industrial zoned-properties that the City does not place standards on. However, Section 15.40.080 notes that the noise from any industrial use shall not exceed the noise limitation set forth in Section 15.90.030 (i.e., the levels set forth in Table 2) at any residential use.

Table 2
CITY OF FULLERTON STATIONARY SOURCE NOISE STANDARDS¹

Noise Zone	Location	Time Period	30 min/hr	15 min/hr	5 min/hr	1 min/hr	Any Time
1	Exterior	7:00 AM-10:00 PM	55	60	65	70	75
		10:00 PM-7:00 AM	50	55	60	65	70
	Interior	7:00 AM-10:00 PM	55	60	65	70	75
		10:00 PM-7:00 AM	45	50	55	60	65

¹ Values are in dBA.

The City realizes that the some sources of noise are difficult to control and therefore provides exemption for these types of noise. Of relevance to the project, Section 15.90.040, “Activities exempt from standards,” exempts:

- Noise from vehicles on public streets.

Additionally, Section 15.90.050 “Activities and special provisions” exempts:

- Noise sources associated with construction, repair, remodeling, or grading of any real property, provided the activities take place between the hours 7:00 AM and 8:00 PM except on Sunday or a City-recognized holiday, and
- Noise sources associated with the maintenance of real property provided the activities take place between the hours 7:00 AM and 8:00 PM on any day except Sunday or a City-recognized holiday.

2.5 Existing Noise Environment

Field Measurements

The project site is located within the south central portion of the City of Fullerton. The site is accessed from both South Roosevelt and Rosslynn Avenues, east of Euclid Street. The project site is located along the northeast side of Fullerton Relief Channel. The southwest side of the channel includes a masonry wall of approximately 16 feet in height.

The parcel is currently occupied by the *Redeemer Alliance Church* and *Little Lambs Preschool*. The project is a residential land use and is sensitive in nature. The area to the southwest of the channel is currently under development as three-story town-homes with commercial land uses also located along Euclid north of the channel. Single-family residential units are located immediately to the north and south, and to the east across South Jefferson/Rosslynn Avenue. The BN&SF Railroad easement lies approximately 1,000 feet north of the parcel’s northern border.

A field survey was conducted on Wednesday, August 21, 2013 to determine ambient noise levels in the project area. The study included three noise readings all obtained on-site. During the study, noise monitoring was conducted using a Quest Technologies Model 2900 Type 2 Integrating/logging Sound Level Meter. The unit meets the American National Standards Institute Standard S1.4-1983 for Type 2, International Electrotechnical Commission Standard 651-1979 for Type 2, and International Electro-technical Commission Standard 651-1979 for Type 2 sound level meters. The unit was field calibrated at 10:09 AM using a Quest Technologies QC-10 calibrator immediately prior to the first set of readings. The calibration unit meets the requirements of the American National Standards Institute Standard S1.4-1984 and the International Electrotechnical Commission Standard 942: 1988 for Class 1 equipment. The accuracies of the meter and calibrator are maintained through a program established through the manufacturer and traceable to the National Bureau of Standards. The calibration of the meter was rechecked at 11:18 AM after the final reading and no meter “drift” was noted. The results of the field study are included in Table 3 and summarized below. Monitoring locations are included in Figure 1. Note that the commercial uses portrayed in Figure 1 to the southwest of the project

site no longer exist and that area is currently being developed as three-story town-homes that effectively shield the project site from Euclid Street traffic noise.

Table 3
NOISE LEVEL MEASUREMENTS¹

Monitoring Location	Leq (dBA)	L₀₂ (dBA)	L₀₈ (dBA)	L₂₅ (dBA)	L₅₀ (dBA)	Lmin (dBA)	Lmax (dBA)
NR-1	49.1	54.9	50.6	48.9	47.4	42.2	63.2
NR-2	49.4	53.3	51.4	50.3	48.8	44.4	60.0
NR-3	56.2	59.6	58.3	57.0	55.7	51.3	64.4

¹ The Leq represents the equivalent sound level and is the numeric value of a constant level that over the given period of time transmits the same amount of acoustic energy as the actual time-varying sound level. The L₀₂, L₀₈, L₂₅, and L₅₀ are the levels that are exceeded 2, 8, 25, and 50 percent of the time, respectively. Alternatively, these values represent the noise level that would be exceeded for 1, 5, 15, and 30 minutes during a 1-hour period if the readings were extrapolated out to an hour's duration. The Lmin and Lmax represent the minimum and maximum root-mean-square noise levels obtained over a period of 1 second during the measurement.

NR-1

This reading was taken on-site 20 feet south of the northeastern property line and 20 feet west of the Rosslynn Avenue curb line. (South Jefferson becomes Rosslynn just north of the project site's northern property line). Single-family residential units are located immediately north of the monitored location as well as across Jefferson/Rosslynn. The 15-minute reading began at 10:14 AM. The dominant source of noise was from the ongoing construction just on the other side of the channel and traffic traveling along Euclid Street. A train horn was heard in the background.

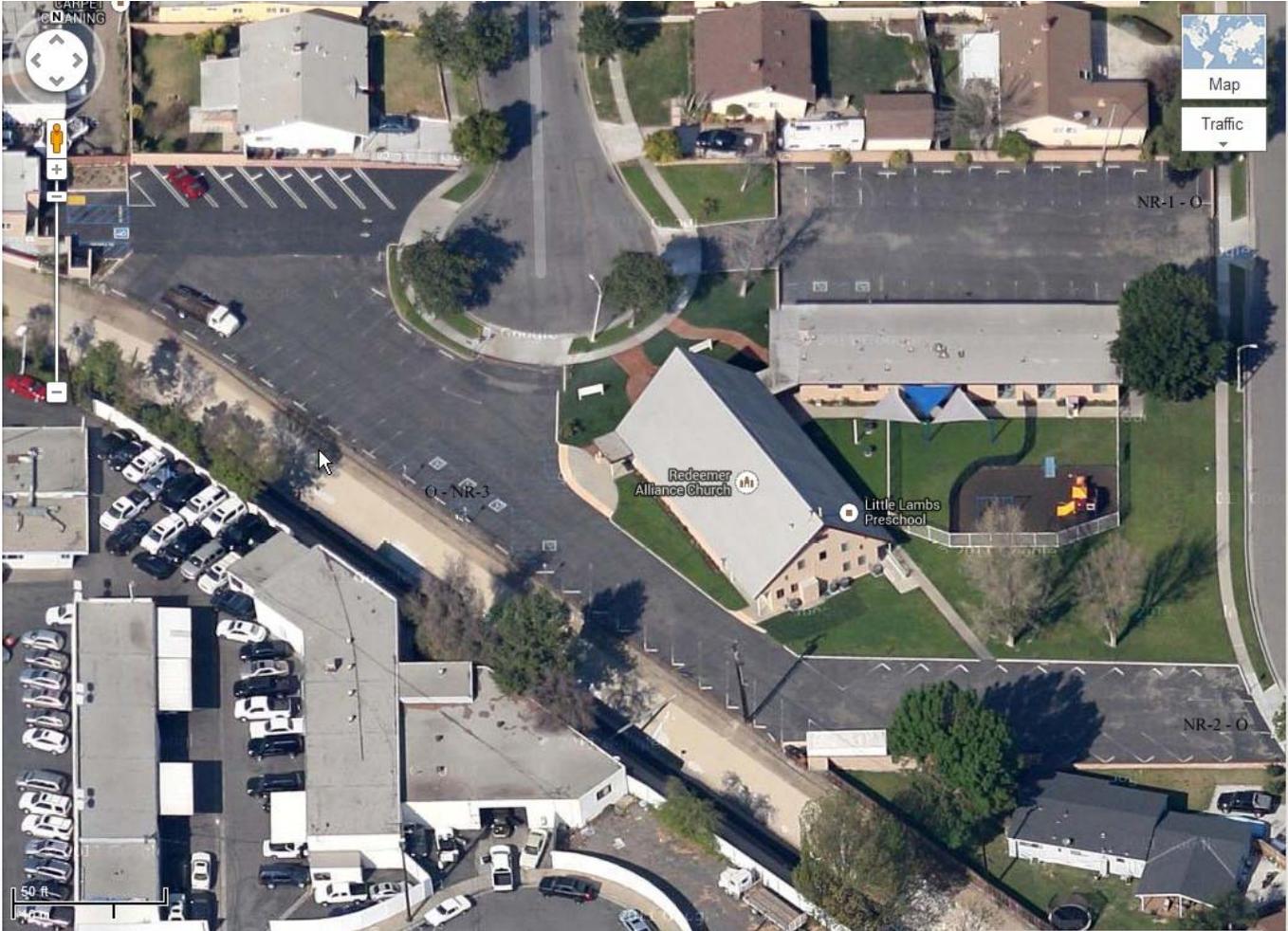
NR-2

This reading was obtained on-site 20 feet north of the southeastern property line and 20 feet west of the Rosslynn Avenue curb line. The 15-minute reading began at 11:34 AM. Again, the dominant source of noise was from the ongoing construction to the west. Lesser sources of noise included aircraft, a passing car on Rosslynn, a dog barking across Rosslynn, and a leaf blower in the background.

NR-3

This reading was obtained on-site, 5-feet east along the southwest fence line toward the central portion of the site. From here a compressor and backhoe were audible just beyond the channel and wall, as well as the use of both hand and power tools used in the construction of the town-homes though out the area that was previously commercial shown in Figure 1. Some noise associated with traffic along Euclid Street was also audible coming through that area where the channel passes under Euclid Street. Additionally, a helicopter flew though the area to the south. Finally, the sound of a shop vacuum and high speed buffer were noted at the "Speedway Auto" facility located along Euclid Street immediately northwest of the project. The 15-minute reading was started at 11:01 AM.

Figure 1
NOISE LEVEL MONITORING LOCATIONS



Modeling of Existing Noise

In order to assess the potential for project-generated noise impacts, it is necessary to determine the noise currently generated by vehicles traveling through the project area. Unfortunately, construction of the three-story town-homes on the west side of the channel provided the dominant noise source during the field study. Some noise associated with traffic along Euclid Street was audible at the northwest portion of the site, but even here construction noise prevailed.

In the absence of this construction, traffic along Euclid would dominate the site. Because of the presence of the approximately 16-foot high wall along the channel, as well as the shielding that will be provided by the residential units currently being constructed to the west, traffic modeling for Euclid Street would not be expected to provide a high correlation with on-site noise, which, in the lack of construction noise, would be substantially reduced from modeling predictions.

Still, on-site noise monitoring can be used to project existing noise levels and if these levels, even with the inclusion of the ongoing construction noise, are found to be within regulatory levels, a finding of no significant impact may be assessed.

If we assume that the noise of the day is primarily influenced by traffic, it follows that the traffic patterns of the day can be used to predict the noise for any given hour of the day relative to any other hour of the day, or the day as an entirety. The EMFAC2007 computer model distributed by the California Air Resources Board and used in the CalEEMod for the Air Quality analysis projects the traffic levels, including the ratio of automobiles, medium trucks, and heavy trucks, for each hour of a typical 24-hour weekday for each county in California.

To determine the CNEL noise level produced by this traffic, the percentage contribution from each hour of traffic was determined from an Orange County, year-2015 run of the EMFAC2007 computer model. The ratio of each hour of traffic to the total daily traffic volume was then calculated. Traffic between the hours of 7:00 PM and 10:00 PM was assigned a 5-dBA penalty and traffic predicted between 10:00 PM and 7:00 AM was assigned a 10-dBA penalty. The resultant noise associated with each hour was logarithmically summed and averaged to determine a CNEL associated with the total Orange County traffic volume, calculated in thousands of trip miles per day (i.e., 82,529).

The Sound32 Noise Model considers four main parameters in its calculations. These include the speed of the vehicles, the ratio of the vehicles (autos, medium trucks, and heavy trucks), the roadway logistics (distance that traffic is observed as it approaches/leaves, curvature of the road, etc.), and the volume of vehicles. A reasonable worst-case assumes a straight road, and countless iterations of the model have shown that after about 750 feet, vehicles do not add measurably to the modeled noise levels. Therefore, a distance of 1,500 feet (750 feet in either direction) and speed of 35 mph, the posted speed limit along Euclid Street, were used in the modeling effort. A drop off factor of 4.5 dBA per doubling of the distance, characteristic of traffic along “soft sites” was used in the model.

Noise measurement NR-3 was obtained during the 11:00 AM hour. The reading had an Leq of 56.2 dBA. The EMFAC2007 projects that for Orange County, the 11:00 AM hour includes 5.90 percent of the daily total traffic. If it is assumed that the ambient noise follows the traffic patterns of the day, noise from the 11:00 AM hour can be compared with the overall CNEL and a relation can be determined.

In accordance with Sound32 noise modeling using data from the EMFAC2007 model, at a speed of 35 mph, the CNEL for the entirety of Orange County traffic (i.e., 82,529 vehicles) as calculated at a distance of 50 feet from the centerline of travel would be 75.5 dBA. The 11:00 AM traffic volume and vehicle mix would produce a 1-hour Leq value of 72.9 dBA, also as measured at a distance of 50 feet from the centerline of travel. Therefore, it may be inferred that noise during the 11:00 AM hour is 2.6-dBA less than the overall CNEL (i.e., $75.5 \text{ dBA} - 72.9 \text{ dBA} = 2.6 \text{ dBA}$). If noise reading NR-3 (i.e., 56.2 dBA Leq) were also extrapolated to the 24-hour period, its CNEL is calculated at 58.8 dBA (i.e., $56.2 \text{ dBA} + 2.6 \text{ dBA} = 58.8 \text{ dBA}$) *including the construction noise*. Therefore, onsite noise is under the 65-dBA CNEL threshold for sensitive land uses.

This exercise was extended to noise readings NR-1 and NR-2. The EMFAC2007 projects that for Orange County, the 10:00 AM hour includes 4.69 percent of the daily total traffic and this volume and mix would produce a 1-hour Leq value of 72.3 dBA as measured at a distance of 50 feet from the centerline of travel. Therefore, it may be inferred that noise during the 10:00 AM hour is 3.2-dBA less than the overall CNEL (i.e., $75.5 \text{ dBA} - 72.3 \text{ dBA} = 3.2 \text{ dBA}$). If reading NR-1 (i.e., 49.1 dBA Leq) were also extrapolated to the 24-hour period, the CNEL is calculated at 52.3 dBA (i.e., $49.1 \text{ dBA} + 3.2 \text{ dBA} = 52.3 \text{ dBA}$). Similarly, if reading NR-2 (i.e., 49.4 dBA Leq) were also extrapolated to the 24-hour period, the CNEL is calculated at 52.6 dBA (i.e., $49.4 \text{ dBA} + 3.2 \text{ dBA} = 52.6 \text{ dBA}$). Again, onsite noise is under the 65-dBA CNEL threshold for sensitive land uses.

2.6 Sensitive Receptors

Some land uses are considered more sensitive to noise than others due to the types of population groups or activities involved. Sensitive receptors include residential areas and other sensitive land uses including any private or public school, hospital, residential care facility for the elderly, and religious institutions.

The project is residential and is sensitive to the ambient noise in the area. The nearest sensitive land uses are the homes that border the site to the north and south, and those across Rossllyn Avenue to the east.

3.0 Thresholds of Significance

The City of Fullerton Noise Element references the California standard for single family and duplex dwellings of 50 – 60 CNEL as “normally acceptable” and 65 – 70 dBA CNEL as “conditionally acceptable.” A CNEL of 70 – 75 is “normally unacceptable.” However, the Noise Element also notes, “In project specific analyses, each community must decide the level of noise exposure its residents are willing to tolerate within a limited range of values below the known levels of health impairment. Therefore, the City may use their discretion to determine which noise levels are considered acceptable or unacceptable, based on land use, project location, and other project factors.” Additionally, the General Plan notes that new residential development, which exceeds the “normally acceptable” standard shall include mitigation in project design including the use of sound walls, double-thickness glass, and extra insulation in building construction.

For stationary sources, the applicable noise standards include criteria established by local as well as any State regulations applicable to the proposed project. Mobile-source noise (i.e., vehicle noise) is preempted from local regulation but is still subject to CEQA review using the threshold values included in the City Noise Element for the level of increase for a significant noise impact. The element notes that in the case where the ambient noise is less than 60 dBA CNEL, an increase of 5 dBA CNEL would represent a substantial increase. In the case where the ambient noise exceeds 60 dBA CNEL, an increase of 3 dBA represents a substantial increase.

3.1 State CEQA Guidelines

In order to assist in determining whether a project will have a significant effect on the environment, the CEQA Guidelines identify criteria that may be deemed to constitute a substantial or potentially substantial adverse change in physical conditions. According to Appendix G of the California Environmental Quality Act (CEQA) Guidelines, a project will normally have a significant adverse environmental impact on noise if the following apply:

- *Would the project 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?*
- *Would the project result in exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?*
- *Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?*
- *Would the project result in 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 airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*
- *For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?*

4.0 Environmental Impacts

The generation of noise associated with the proposed project would occur over the short-term for demolition, site preparation, and construction activities. In addition, noise would result from the long-term operation of the project. Both short-term and long-term noise impacts associated with the project are examined in this analysis. For ease of the reader, the included analysis follows the outline of the CEQA Checklist.

4.1 Project Potential for 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

On-Site Impacts

Less than Significant Impact An impact could be significant if the project would site a sensitive land use in a location where noise levels would exceed the appropriate standards. The existing City of Fullerton Noise Element sets a goal level of 60 dBA CNEL as “normally acceptable” for residential use noise intrusion. The City Noise Element allows for a “conditionally acceptable” exterior noise level of up to 70 dBA CNEL so long as the dwellings are fitted with the appropriate noise reduction measures. Levels of over 70 dBA CNEL, which would include most of the project site, are “generally unacceptable.” Under these special cases, this maximum may be increased so long as interior levels do not exceed 45 dBA CNEL.

As discussed in Section 2.5, above, onsite noise measurements can be used to determine ambient levels by comparing the noise from that hour with the overall traffic patterns of the day. If noise reading NR-3 (i.e., 56.2 dBA Leq) were extrapolated to the 24-hour period, the CNEL is calculated at 58.8 dBA *including the ongoing construction noise*, and onsite noise is under the 65-dBA threshold as well as the City’s goal of 60 dBA CNEL for sensitive land uses. As such the impact to the proposed onsite residents is less than significant.

Similarly, if this exercise is extended to noise readings NR-1 and NR-2, the CNELs are calculated at 52.3 and 52.6 dBA, respectively. Again, onsite noise is under the 65-dBA CNEL threshold and 60-dBA CNEL goal for sensitive land uses and the impact to the proposed onsite residents is less than significant.

4.2 Project Potential to Result in Exposure of Persons to or Generation of Excessive Ground Borne Vibration or Ground Borne Noise Levels

Less than Significant Impact The City of Fullerton requires that vibration not be perceptible beyond the property line. With respect to construction, Caltrans notes that ground borne vibration is typically associated with blasting operations, the use of pile drivers, and large-scale demolition activities, none of which are anticipated for the construction or operation of the project. As such, no excessive ground borne vibrations would be created by the proposed project and any potential impacts of the project on off-site receptors are less than significant.

4.3 Project Potential to Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity Above Levels Existing Without the Project

Less than Significant Impact Long-term impacts could be significant if the project creates activity or generates a volume of traffic that would substantially raise the ambient noise levels. As discussed above, the project area does not exceed 60 dBA CNEL and in accordance with the City of Fullerton’s Noise Element, a substantial increase is defined as 5 dBA CNEL.

In accordance with the *Traffic Study*, the project would add 101 average daily trips (ADT). The greatest increase would occur along West Avenue where the project would add 40 ADT to the 484 ADT projected along this road.

$$\text{Noise Increase} = 10 \times \log(484 + 40) / 484 = 0.3 \text{ dBA CNEL}$$

An increase of 0.3-dBA CNEL in traffic noise is well under the 5-dBA threshold, and does not represent a significant impact. When added to the other ambient noise sources in the project area, the actual level of increase would be even less.

4.4 Project Potential to Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity Above Levels Existing Without the Project

Less than Significant Impact Two types of noise impacts could occur during the construction phase. First, the transport of workers and equipment to the construction site would incrementally increase noise levels along site access roadways. However, any increase in noise would be less than 1 dBA when averaged over a 24-hour period, and would therefore have a less than significant impact on noise receptors along the truck routes.

The second type of impact is related to noise generated by on-site construction operations and existing local residents would be subject to elevated noise levels due to the operation of on-site construction equipment. Construction activities are carried out 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 levels surrounding the construction site as work progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow noise ranges to be categorized by work phase. Table 4 lists typical construction equipment noise levels recommended for noise impact assessment at a distance of 50 feet.

Table 4
NOISE LEVELS GENERATED BY TYPICAL CONSTRUCTION EQUIPMENT

<i>Type of Equipment</i>	<i>Average Sound Levels Measured (dBA at 50 feet)</i>
Pile Drivers,	101
Rock Drills	98
Jack Hammers	88
Pneumatic Tools	85
Pumps	76
Dozers	80
Front-End Loaders	79
Hydraulic Backhoe	85
Hydraulic Excavators	82
Graders	85
Air Compressors	81
Trucks	91

Source: Noise Control for Buildings and Manufacturing Plants, BBN 1971.

Noise ranges have been found to be similar during all phases of construction, although the actual construction of the structures tends to be somewhat less than that from grading. The grading and site preparation phase tends to create the highest noise levels, because the noisiest construction equipment is found in the earthmoving equipment category. This category includes excavating machinery (backfillers, bulldozers, draglines, front loaders, etc.) and earthmoving and compacting equipment (compactors, scrapers, graders, etc.) Typical operating cycles may involve 1 or 2 minutes of full power operation followed by 3 to 4 minutes at lower power settings. Noise levels at 50 feet from earthmoving equipment range from 73 to 96 dBA while Leq noise levels range up to about 89 dBA. The later construction of structures is somewhat reduced from this value and the physical presence of the structure may break up line-of-sight noise propagation.

Composite construction noise is best characterized by Bolt, Beranek, and Newman (USEPA December 31, 1971). In their study construction noise for earthwork related to residential development is presented as 88 dBA Leq when measured at a distance of 50 feet from the construction effort. This value takes into account both the number of pieces and spacing of the heavy equipment used in the construction effort. In later phases during building construction, noise levels are typically reduced from this value and the physical structures further break up line of sight noise. However, as a worst-case scenario, the 88-dBA-value is used to assess the impact of construction.

The operation of such equipment would result in the generation of both steady and episodic noise significantly above the ambient levels currently experienced near the project site. The noise produced from construction decreases at a rate of approximately 6 dBA per doubling of distance. Therefore, at 100 feet the noise levels would be about 6 dBA less or 82 dBA Leq. Similarly, at 200 feet the noise levels would be 12 dBA less or 76 dBA Leq. The most proximate existing residential uses are those located immediately to the north and south that border on the site with their structures on the order of 25 feet from the proximate passing equipment. Additionally, residential units are located immediately across Rosslynn Avenue at a distance of about 50 feet and noise levels could be on the order of 88 dBA Leq or greater at the most proximate homes.

However, during the vast majority of the construction period, noise levels at the proximate residents would considerably lower due to lower power settings and sound attenuation provided by longer distances and the acoustic shielding provided by walls and structures. In light of the area, this range of noise levels is typically considered acceptable during daytime hours and in fact; such construction was ongoing immediately west of the project site during the field study.

As noted, Section 15.90.050 of the City of Fullerton Municipal Code exempts the noise sources associated with construction, repair, remodeling, or grading of any real property, provided the activities take place between the hours 7:00 AM and 8:00 PM except on Sunday or a City-recognized holiday. The Applicant would adhere to the Code and shall include the following measures as project commitments:

- Demolition and construction activities shall be restricted to between the hours of 7:00 AM and 8:00 PM Monday through Saturday. This is to include any staging and warm-up of equipment.
- All construction equipment engines shall be properly tuned and muffled according to manufacturers' specifications.
- Staging and construction activities whose specific location on the project site may be flexible (e.g., operation of compressors and generators, cement mixing, general truck idling, etc.) shall be conducted as far as possible from the residential land uses located to the north, south, and across Rosslenn Avenue.
- To avoid truck noise through the local neighborhood, all truck and vendor access shall be from Roosevelt Avenue via West Avenue.
- Two weeks prior to the commencement of construction at the project site, notification shall be provided to the adjacent residential uses disclosing the construction schedule, including the various types of activities and equipment that would be occurring throughout the duration of the construction period. This notification shall also provide a contact name and phone number for residents to call for construction noise-related complaints. All reasonable concerns shall be rectified within 24 hours of receipt.

4.5 Project Potential to Expose People Residing or Working in the Project Area to Excessive Noise Levels From a Public Airport or Public Use Airport

Less than Significant Impact The Fullerton Municipal Airport is located along Commonwealth Avenue approximately 2 miles to the west of the project site. The Environmental Evaluation for the 2004 Fullerton Airport Master Plan show that in the year 2023, the airport's 60 dBA CNEL noise contour could extend eastwards as far as Gilbert Avenue, located about 1.5 miles to the west. No significant impacts would result from the implementation of the proposed project.

4.6 Project Potential to Expose People Residing or Working in the Project Area to Excessive Noise Levels From a Private Airstrip

Less than Significant Impact The project site is not located within the immediate vicinity of any private airstrip. The Northrop Anaheim Heliport is located approximately 1.2 miles to east and the project would not be subject to excessive noise from aircraft or helicopter operations.

5.0 References

California Air Resources Board, EMFAC2007 Computer Model, Version 2.3, November 1, 2006

Caltrans, Sound2000 Noise Prediction Model, Version 3.3, 2000

Caltrans, *Technical Noise Supplement*, October 1998

Caltrans, *Transportation Related Earthborne Vibrations*, February 20, 2002

City of Fullerton, *General Plan*, February 2012

City of Fullerton, *Municipal Code*, September 2012

Department of Transportation, *Transit Noise and Vibration Impact Assessment*, Final Report, April 1995

Housing and Urban Development, *The Noise Guidebook*, March 1985.

TEP, *Fullerton-Roosevelt, An Olsen Company Residential Subdivision in Fullerton, California*, August 2013

U.S. Environmental Protection Agency, Bolt, Beranek, and Newman. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, December 31, 1971.

APPENDIX A
SOUND32 NOISE MODELING FOR ORANGE COUNTY TRAFFIC NOISE FOR VARIOUS PERIODS

Formatted Input
 **** Sound 2000 (Caltrans Version of Stamina2/Optima) ****

INPUT DATA FILE :
 DATE : 8/27/2013

ROOSEVELT-FULLERTON - DAY @ 35 MPH

=====

TRAFFIC DATA

LANE NO.	AUTO		MEDIUM TRKS		HEAVY TRKS		DESCRIPTION
	VPH	MPH	VPH	MPH	VPH	MPH	
1	5036	35	238	35	52	35	ALL LANES

=====

LANE DATA

LANE NO.	SEG. NO.	GRADE COR.	X			Y			SEGMENT DESCRIPTION	LANE DESCRIPTION
1	1	N	-50.0	-50.0	-750.0	750.0	0.0	0.0	ALL LANES	

=====

RECEIVER DATA

REC NO.	X	Y	Z	ID
1	0.0	0.0	5.0	

=====

DROP-OFF RATES

LANE No.	RECEIVER NO.
1	1
1	4.5

=====

sound32.out

SOUND32 - RELEASE 07/30/91, MODIFIED 04/22/00

TITLE:
 ROOSEVELT-FULLERTON - DAY @ 35 MPH

BASED ON FHWA-RD-108 AND
 CALIFORNIA REFERENCE ENERGY MEAN EMISSION LEVELS

RECEIVER	LEQ

72.7	

Formatted Input
 **** sound 2000 (Caltrans Version of Stamina2/Optima) ****

INPUT DATA FILE : C:\Program Files\Project2000\OC 2015 DAY.s32
 DATE : 8/27/2013

ROOSEVELT-FULLERTON - EVENING @ 35 MPH

=====

TRAFFIC DATA

LANE NO.	AUTO		MEDIUM TRKS		HEAVY TRKS		DESCRIPTION
	VPH	MPH	VPH	MPH	VPH	MPH	
1	2853	35	81	35	27	35	ALL LANES

=====

LANE DATA

LANE NO.	SEG. NO.	GRADE COR.	X	Y	Z	SEGMENT DESCRIPTION	LANE DESCRIPTION
1	1	N	-50.0	-750.0	0.0		ALL LANES
			-50.0	750.0	0.0		

=====

RECEIVER DATA

REC NO.	X	Y	Z	ID
1	0.0	0.0	5.0	REC 1

=====

DROP-OFF RATES

LANE No.	RECEIVER NO.
1	1
1	4.5

=====

sound32.out

SOUND32 - RELEASE 07/30/91, MODIFIED 04/22/00

TITLE:
 ROOSEVELT-FULLERTON - EVENING @ 35 MPH

BASED ON FHWA-RD-108 AND
 CALIFORNIA REFERENCE ENERGY MEAN EMISSION LEVELS

RECEIVER	LEQ
REC 1	69.7

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 **** Sound 2000 (Caltrans Version of Stamina2/Optima) ****

INPUT DATA FILE : C:\Program Files\Project2000\OC 2015 EVENING.s32
 DATE : 8/27/2013

ROOSEVELT-FULLERTON - NIGHT @ 35 MPH

=====

TRAFFIC DATA

LANE NO.	AUTO		MEDIUM TRKS		HEAVY TRKS		DESCRIPTION
	VPH	MPH	VPH	MPH	VPH	MPH	
1	963	35	79	35	38	35	ALL LANES

=====

LANE DATA

LANE NO.	SEG. NO.	GRADE COR.	X	Y	Z	SEGMENT DESCRIPTION	LANE DESCRIPTION
1	1	N	-50.0	-750.0	0.0		ALL LANES
			-50.0	750.0	0.0		

=====

RECEIVER DATA

REC NO.	X	Y	Z	ID
1	0.0	0.0	5.0	REC 1

=====

DROP-OFF RATES

LANE No.	RECEIVER NO.
1	1
1	4.5

=====

sound32.out

SOUND32 - RELEASE 07/30/91, MODIFIED 04/22/00

TITLE:
 ROOSEVELT-FULLERTON - NIGHT @ 35 MPH

BASED ON FHWA-RD-108 AND
 CALIFORNIA REFERENCE ENERGY MEAN EMISSION LEVELS

RECEIVER	LEQ
REC 1	67.8

APPENDIX B
SOUND32 NOISE CALCULATIONS FOR 2015 ORANGE COUNTY TRAFFIC VOLUMES

This spreadsheet uses the projections generated by the Caltrans Sound32 noise model and calculates the CNEL @ 50 feet as well as the distances to the 70, 65, and 60 dBA CNEL using soft site modeling. This sheet represents the existing setting. The calculation is:

$$CNEL = 10 * \text{LOG}(((12 * 10^{(\text{Day}/10)}) + (3 * 10^{((\text{Evening}+5)/10)}) + (9 * 10^{((\text{Night}+10)/10)})) / 24)$$

<i>Speed</i>	<i>Daytime Leq</i>	<i>Evening Leq</i>	<i>Night Leq</i>	<i>CNEL for 82,529 ADT (dBA @ 50 Feet)</i>
35	72.7	69.7	67.8	75.5

APPENDIX C
SOUND32 NOISE MODELING FOR THE 10:00 AM AND 11:00 AM LEQ TRAFFIC VOLUMES

Formatted Input
 **** Sound 2000 (Caltrans Version of Stamina2/Optima) ****

INPUT DATA FILE : C:\Program Files\Project2000\OC 2015 NIGHT.s32
 DATE : 8/27/2013

ROOSEVELT-FULLERTON - 10:00 AM @ 35 MPH

=====

TRAFFIC DATA

LANE NO.	AUTO		MEDIUM TRKS		HEAVY TRKS		DESCRIPTION
	VPH	MPH	VPH	MPH	VPH	MPH	
1	3549	35	254	35	68	35	ALL LANES

=====

LANE DATA

LANE NO.	SEG. NO.	GRADE COR.	X			Y			SEGMENT DESCRIPTION	LANE DESCRIPTION
1	1	N	-50.0	-750.0	0.0	-50.0	750.0	0.0	ALL LANES	

=====

RECEIVER DATA

REC NO.	X	Y	Z	ID
1	0.0	0.0	5.0	REC 1

=====

DROP-OFF RATES

LANE NO.	RECEIVER NO.
1	1
1	4.5

=====

sound32.out

SOUND32 - RELEASE 07/30/91, MODIFIED 04/22/00

TITLE:
 ROOSEVELT-FULLERTON - 10:00 AM @ 35 MPH

BASED ON FHWA-RD-108 AND
 CALIFORNIA REFERENCE ENERGY MEAN EMISSION LEVELS

RECEIVER	LEQ
REC 1	72.3

Formatted Input
 **** Sound 2000 (Caltrans Version of Stamina2/Optima) ****

INPUT DATA FILE : C:\Program Files\Project2000\OC 2015 NIGHT.s32
 DATE : 8/27/2013

ROOSEVELT-FULLERTON - 11:00 AM @ 35 MPH

=====

TRAFFIC DATA

LANE NO.	AUTO		MEDIUM TRKS		HEAVY TRKS		DESCRIPTION
	VPH	MPH	VPH	MPH	VPH	MPH	
1	4520	35	277	35	70	35	ALL LANES

=====

LANE DATA

LANE NO.	SEG. NO.	GRADE COR.	X			Y			SEGMENT DESCRIPTION	LANE DESCRIPTION
1	1	N	-50.0	-50.0	-750.0	750.0	0.0	0.0	ALL LANES	

=====

RECEIVER DATA

REC NO.	X	Y	Z	ID
1	0.0	0.0	5.0	REC 1

=====

DROP-OFF RATES

LANE No.	RECEIVER NO.
1	1
1	4.5

=====

sound32.out

SOUND32 - RELEASE 07/30/91, MODIFIED 04/22/00

TITLE:
 ROOSEVELT-FULLERTON - 11:00 AM @ 35 MPH

BASED ON FHWA-RD-108 AND
 CALIFORNIA REFERENCE ENERGY MEAN EMISSION LEVELS

RECEIVER	LEQ
REC 1	72.9