4.10 Noise

4.10.1 Aircraft Noise

4.10.1.1 Introduction

The analysis presented in this section addresses aircraft noise levels associated with aviation activity at LAX under 2009 conditions and under future (2025) conditions with and without the SPAS alternatives that relate to airfield operations; specifically, Alternatives 1 through 7. Alternatives 8 and 9 focus on ground access improvements and are, therefore, not addressed further in this section as they will not affect aircraft operations and noise. The effects of aircraft noise on surrounding communities are presented primarily in terms of the total area, population, residences, and other non-residential noise-sensitive facilities such as schools and places of worship within various noise exposure contours, estimated for each scenario based on average annual day (AAD) aircraft operations at LAX in the 2009 conditions and in future (2025) year conditions. Additionally, the analysis presented in this section addresses potential changes in aircraft noise levels as related to single event noise at nighttime (i.e., nighttime awakening) and speech interference at schools. Throughout this section, all noise levels are provided for outdoor conditions, unless stated specifically to be interior noise levels.

The information presented below includes an overview of the analysis methodology, description of 2009 aircraft noise conditions, delineation of the thresholds of significance used in aircraft noise impacts, identification of the LAX Master Plan commitments and mitigation measures that apply to aircraft noise impacts, analysis of the impacts associated with each SPAS alternative, discussion of mitigation measures for significant impacts, and conclusions regarding level of significance. Detailed technical data developed in conjunction with the analysis presented below is contained in Appendix J1, *Aircraft Noise*. Appendix J1 also provides explanations of key technical concepts associated with evaluating aircraft noise, a description of the computer noise model - the Federal Aviation Administration (FAA) Integrated Noise Model (INM), and descriptions of the technical assumptions used in the aircraft noise analysis.

4.10.1.1.1 General Characteristics of Aircraft Noise

In order to understand results from a noise analysis, a foundation in the basics of sound and metrics used to measure it should be established first. This section describes the physics of sound, the methods used to measure sound level and impact, and the effects of noise on humans.

Sound, when transmitted through the air and upon reaching our ears, may be perceived as desirable or unwanted. People normally refer to noise as unwanted sound. Because the response to sound is subjective, individuals have different perceptions, sensitivities, and reactions to noise. Loud sounds may bother some people, while others may be bothered by certain rhythms or frequencies of sound. Sounds that occur during sleeping hours are usually considered to be more objectionable than those that occur during waking hours and hours of activity (typically daytime).

Aircraft noise originates from both the engines and the airframe of an aircraft, but the engines are, by far, the more significant source of noise.

Meteorological conditions affect the transmission of sound through the air. Wind speed and direction, and the temperature immediately above ground level, cause diffraction[557] and displacement of sound waves. Humidity and temperature materially affect the transmission of air-to-ground sound through absorption associated with the instability and viscosity of the air.

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557 Diffraction is change in the directions and intensities of a group of waves after passing by an obstacle or through an aperture whose size is approximately the same as the wavelength of the waves.

4.10.1.1.2 Noise Descriptors

Noise levels are measured using a variety of scientific metrics. As a result of extensive research into the characteristics of aircraft noise and human response to that noise, standard noise descriptors have been developed for aircraft noise exposure analyses. The descriptors used in this noise analysis are described below.

A-Weighted Sound Pressure Level (dBA): The decibel (dB) is a unit used to describe sound pressure level. When expressed in dBA, the sound has been filtered to reduce the effect of very low and very high frequency sounds, much as the human ear filters sound frequencies. Without this filtering, calculated and measured sound levels would include events that the human ear cannot hear (e.g., dog whistles and low frequency sounds, such as the groaning sounds emanating from large buildings with changes in temperature and wind). With A-weighting, calculations and sound monitoring equipment approximate the sensitivity of the human ear to sounds of different frequencies.

Some common sounds on the dBA scale are listed in **Table 4.10.1-1**. As shown in **Table 4.10.1-1**, the relative perceived loudness of a sound doubles for each increase of 10 dBA, although a 10-dBA change in the sound level corresponds to a factor of 10 change in relative sound energy.

Table 4.10.1-1

Common Sounds On The A-Weighted Decibel Scale

Sound	Sound level (dBA)	Relative loudness (approximate)	Relative sound energy
Rock music, with amplifier	120	64	1,000,000
Thunder, snowmobile (operator)	110	32	100,000
Boiler shop, power mower	100	16	10,000
Orchestral crescendo at 25 feet, noisy kitchen	90	8	1,000
Busy street	80	4	100
Interior of department store	70	2	10
Ordinary conversation, 3 feet away	60	1	1
Quiet automobiles at low speed	50	1/2	.1
Average office	40	1/4	.01
City residence	30	1/8	.001
Quiet country residence	20	1/16	.0001
Rustle of leaves	10	1/32	.00001
Threshold of hearing	0	1/64	.000001

Source: U.S. Department of Housing and Urban Development, Aircraft Noise Impact--Planning Guidelines for Local Agencies, 1972; Ricondo & Associates, Inc., September 2009.

In general, humans find a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving sound level. Because of the logarithmic scale of the decibel unit, sound levels cannot be added or subtracted arithmetically. If a sound's physical intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example, 60 dB plus 60 dB equals 63 dB, 80 dB plus 80 dB equals 83 dB. However, where ambient noise levels are high in comparison to a new noise source, there will be a small change in noise levels. For example, 70 dB ambient noise levels are combined with a 60 dB noise source the resulting noise level equals 70.4 dB.

Maximum Noise Level (L_{max}): L_{max} is the maximum or peak sound level during a noise event. The metric only accounts for the instantaneous peak intensity of the sound, and not for the duration of the event. As an aircraft passes by an observer, the sound level increases to a maximum level and then decreases. Some sound level meters measure and record the maximum or L_{max} level.

Sound Exposure Level (SEL): SEL, expressed in dBA, is a time integrated measure, expressed in decibels, of the sound energy of a single noise event at a reference duration of one second. The sound level is integrated over the period that the level exceeds a threshold. Therefore, SEL accounts for both the maximum sound level and the duration of the sound. The standardization of discrete noise events into a one-second duration allows calculation of the cumulative noise exposure of a series of noise events that occur over a period of time. Because of this compression of sound energy, the SEL of an aircraft noise event is typically 7 to 12 dBA greater than the L_{max} of the event. SELs for aircraft noise events depend on the location of the aircraft relative to the noise receptor, the type of operation (landing, takeoff, or overflight), and the type of aircraft. The SEL concept is depicted in **Figure 4.10.1-1**.

Equivalent Continuous Noise Level (L_{eq}): L_{eq} is the sound level, expressed in dBA, of a steady sound which has the same A-weighted sound energy as the time-varying sound over the averaging period. Unlike SEL, L_{eq} is the average sound level for a specified time period (e.g., 24 hours, 8 hours, 1 hour, etc.) L_{eq} is calculated by integrating the sound energy from all noise events over a given time period and applying a factor for the number of events.[558] L_{eq} can be expressed for any time interval, for example the L_{eq} representing an averaged level over an 8 hour period would be expressed as $L_{eq(8)}$.

Day-Night Average Sound Level (DNL): DNL, formerly referred to as L_{dn}, is expressed in dBA and represents the noise level over a 24-hour period. Because environmental noise fluctuates over time, DNL was devised to relate noise exposure over time to human response. DNL is a 24-hour average of the hourly L_{eq}, but with penalties to account for the increased sensitivity to noise events that occur during the more sensitive nighttime periods. Specifically, DNL penalizes noise 10 dB during the nighttime time period (10:00 p.m. to 7:00 a.m.). The U.S. Environmental Protection Agency (USEPA) introduced the metric in 1976 as a single number measurement of community noise exposure. The FAA adopted DNL as the noise metric for measuring cumulative aircraft noise under Federal Aviation Regulations (FAR) Part 150, Airport Noise Compatibility Planning. The Department of Housing and Urban Development, the Veterans Administration, the Department of Defense, the United States Coast Guard, and the Federal Transit Administration have also adopted DNL for measuring cumulative noise exposure.

DNL is used to describe existing and predicted noise exposure in communities in an airport environs based on the average daily operations over the year and the average annual operational conditions at an airport. Therefore, at a specific location near an airport, the noise exposure on a particular day is likely to be higher or lower than the annual average noise exposure, depending on the specific operations at an airport on that day. DNL is widely accepted as the best available method to describe aircraft noise exposure and is the noise descriptor required for aircraft noise exposure analyses and land use compatibility planning under FAR Part 150 and for environmental assessments for airport improvement projects (FAA Order 10501.E).

Community Noise Equivalent Level (CNEL): CNEL, expressed in dBA, is the standard metric used in California to represent cumulative noise exposure. The metric provides a single-number description of the sound energy to which a person or community is exposed over a period of 24 hours similar to DNL. CNEL includes penalties applied to noise events occurring after 7:00 p.m. and before 7:00 a.m., when noise is considered more intrusive. The penalized time period is further subdivided into evening (7:00 p.m. through 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.). When a noise event occurs in the evening, a penalty of 4.77 dBA is added to the nominal sound level (equivalent to a three-fold increase in aircraft operations). A 10 dBA penalty is added to nighttime noise events (equivalent to a ten-fold increase in aircraft operations).

The CNEL metric used for this aircraft noise analysis is based on an AAD of aircraft operations, generally derived from data for a calendar year. An AAD activity profile is computed by adding all aircraft operations occurring during the course of a year and dividing the result by 365. As such, AAD does not reflect activities on any one specific day, but represents average conditions as they occur during the course of the year.

558 See FAA Order 5050.4B, Page 8, Section 9, Paragraph "n" for FAA's acceptance of the CNEL metric as a suitable substitute for the Day-Night Average Sound Level (DNL).

The evening weighting is the only difference between CNEL and DNL. For purposes of aircraft noise analysis in the State of California, the FAA recognizes the use of CNEL.

Time Above (TA): TA measures the amount of time (in minutes) a source emits a noise that exceeds a designated threshold level. For instance, the threshold could be outdoor speech interference. TA is therefore both a single event and a cumulative metric.

4.10.1.1.3 Effects of Noise on Humans

Noise, often described as unwanted sound, is known to have several adverse effects on humans. These noise effects may include hearing loss (not a factor with typical community noise), communication interference, sleep interference, physiological responses, and annoyance. Many of the impacts described in this section are described in greater detail in the ACRP *Synthesis 9, Effects of Aircraft Noise: Research Update on Selected Topics*,[559] published in 2008. Each of these potential noise impacts on people are briefly discussed in the following narrative:

> Hearing Loss is generally not a concern in community noise problems, even very near a major airport or a major freeway. Environmental noise does not have an effect on hearing threshold levels particularly due to the fact that environmental noise does not approximate occupational noise exposures in heavy industry, very noisy work environments with long-term exposure, or certain very loud recreational activities such as target shooting, motorcycle or automobile racing, etc. The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dBA for 8 hours per day to protect from hearing loss (higher limits are allowed for shorter duration exposures). Noise levels in neighborhoods, even in very noisy neighborhoods, are not sufficiently loud to cause hearing loss.
>
> *Communication Interference* includes speech interference and interference with activities such as watching television. Normal conversational speech is in the range of 60 to 65 dBA and any noise in this range or louder may interfere with speech. There are specific methods of describing speech interference as a function of distance between speaker and listener and voice level. **Figure 4.10.1-2** shows the relation of quality of speech communication with respect to various noise levels.
>
> *Sleep Disturbance* is one of the causes of annoyance due to noise. Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter stages, and cause awakening. Noise may even cause awakening, which a person may or may not be able to recall.
>
> Extensive research has been conducted on the effect of noise on sleep disturbance. Some years ago (1981), the National Association of Noise Control Officials[560] published data on the probability of sleep disturbance with various single event noise levels. Based on laboratory experiments conducted in the 1970s, this data indicated noise exposure at 75 dBA interior noise level event could cause noise induced awakening in 30 percent of the cases.
>
> However, more recent research from England[561,562] has shown that the probability for sleep disturbance is less than what had been reported in earlier research. These recent field studies were conducted during the 1990s and used more sophisticated data collection techniques. These field studies indicate that awakenings can be expected at a much lower rate than had been expected based on earlier laboratory studies. This research showed that once a person was

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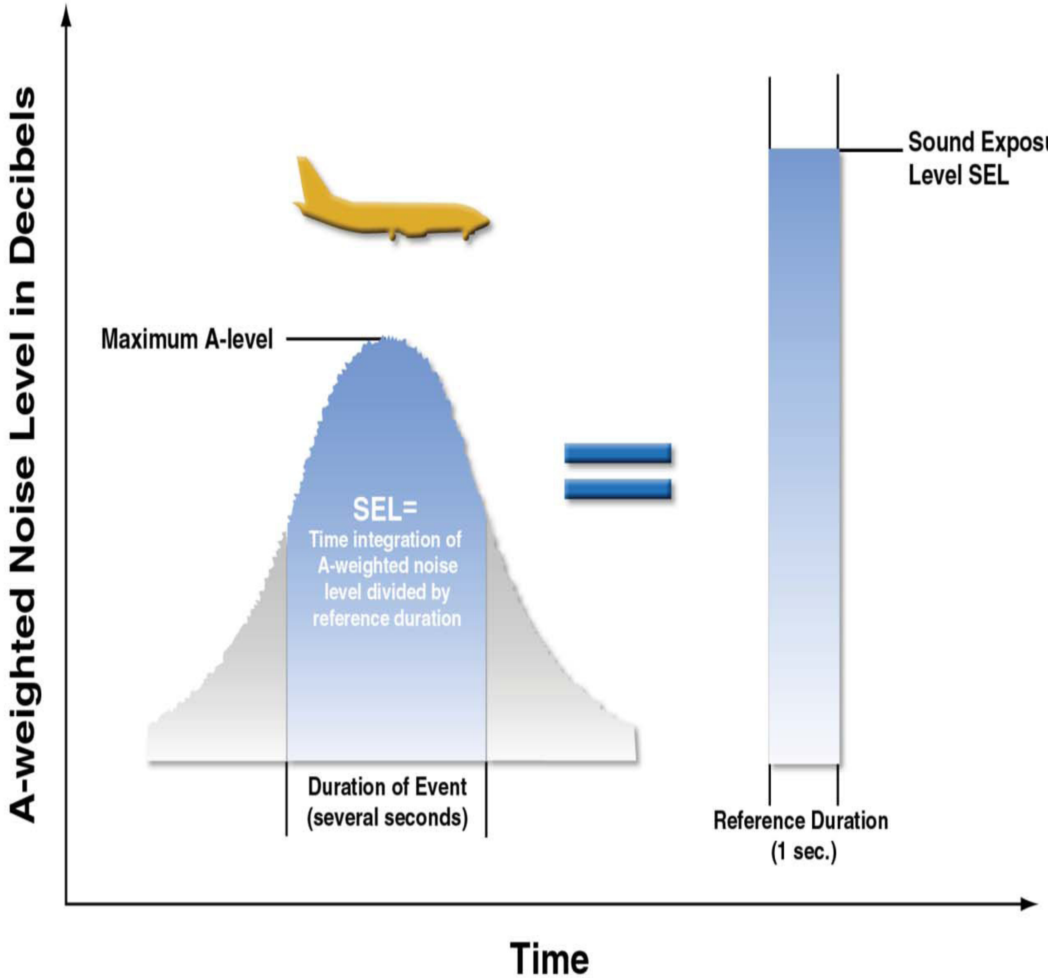
559 Airport Cooperative Research Program (ACRP), "Effects of Aircraft Noise: Research Topic on Selected Topics," 2008.

560 National Association of Noise Control Officials, "Noise Effects Handbook," 1981.

561 Department of Transportation, "Report of a Field Study of Aircraft Noise and Sleep Disturbance," Department of Safety, Environment and Engineering Civil Aviation Authority, December 1992.

562 Horne J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond, "A Field Study Of Sleep Disturbance: Effects Of Aircraft Noise And Other Factors On 5,742 Nights Of Actimetrically Monitored Sleep In A Large Subject Sample," Sleep, 1994 Mar; 17(2):146-59.



Source: Brown-Buntin Associates, Inc., November 2004.
Prepared by: Ricondo & Associates, Inc., February 2012.

LAX Specific Plan Amendment Study Draft EIR	Sound Exposure Level Concept	Figure 4.10.1-1

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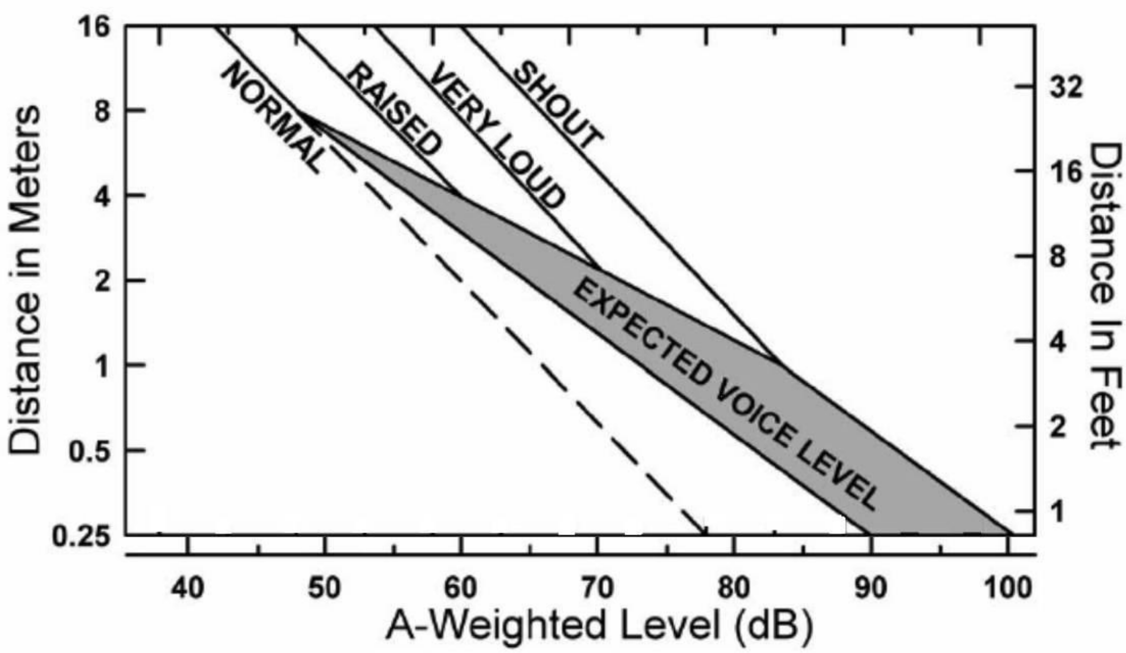

Prepared by: CDM Smith, 2012.

LAX Specific Plan Amendment Study Draft EIR	Speech Interference Levels	Figure 4.10.1-2

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asleep, it is much more unlikely that they will be awakened by a noise. The significant difference in the recent English study is the use of actual in-home sleep disturbance patterns as opposed to laboratory data that had been the historic basis for predicting sleep disturbance. Some of this research has been criticized because it was conducted in areas where subjects had become habituated to aircraft noise. On the other hand, some of the earlier laboratory sleep studies were criticized because of the extremely small sample sizes of most laboratory studies and because the laboratory was not necessarily a representative sleep environment. The 1994 British sleep study compared the various causes of sleep disturbance using in-home sleep studies. This field study assessed the effects of nighttime aircraft noise on sleep in 400 people (211 women and 189 men; 20-70 years of age; one per household) habitually living at eight sites adjacent to four U.K. airports, with different levels of night flying. The main finding was that only a minority of aircraft noise events affected sleep, and, for most subjects, that domestic and other non-aircraft factors have much greater effects. As shown in **Figure 4.10.1-3**, aircraft noise was a minor contributor among a host of other factors that lead to awakening response.

The Federal Interagency Committee on Noise (FICON) in 1992 in a document entitled *Federal Interagency Review of Selected Airport Noise Analysis Issues*[563] recommended an interim dose-response curve for sleep disturbance based on laboratory studies of sleep disturbance. In June of 1997, the Federal Interagency Committee on Aviation Noise (FICAN) updated the FICON recommendation with an updated graph/curve (equating SEL to probability of awakening) based on the more recent in-home sleep disturbance studies which show lower rates of awakening compared to the laboratory studies.[564] The FICAN recommended a curve based on the upper limit of the data presented and, therefore, considers the curve to represent the "maximum percent of the exposed population expected to be behaviorally awakened," or the "maximum awakened." FICAN recommendation is shown in **Figure 4.10.1-4**. This is a very conservative approach. A more common statistical curve for the data points reflected in **Figure 4.10.1-4**, for example, would indicate a 10 percent awakening rate at a level of approximately 100 dB SEL, while the "maximum awakened" curve reflected in **Figure 4.10.1-4** shows the 10 percent awakening rate being reached at 80 dB SEL. More recently, in 2008 FICAN modified its recommendations to include a more recent procedure for estimating awakenings from nighttime noise which shows that significantly higher noise levels are required for a population habituated to nighttime noise.[565] That relationship is shown later in **Figure 4.10.1-10**. However, as described in greater detail in Section 4.10.1.2.3.1, this curve is still considered conservative in that it does not include the cases in which no awakenings were observed in certain noise exposure intervals. These cases include three in the Denver field studies, in which no awakenings were observed in 3 dB-wide sound exposure level (LAE) intervals centered at 91, 94, and 97 dB. Given exclusion of these data points, the probability of awakening at a specific SEL level may be even less than the values shown in **Figure 4.10.1-10**. Please see Section 4.10.1.2.3.1 for discussion of research between potential physiological/health effects and sleep disturbance.

Physiological Responses are those measurable effects of noise on people that are realized as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent is not known to which these physiological responses cause harm or are a sign of harm. Generally, physiological responses are a reaction to a loud short-term noise such as a rifle shot or a very loud jet overflight.

Health effects from noise have been studied around the world for nearly thirty years. Scientists have attempted to determine whether high noise levels can adversely affect human health apart

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563 Federal Interagency Committee on Noise (FICON), August 21, 1992.

564 Federal Interagency Committee on Aircraft Noise (FICAN). (The full FICAN report can be found on the internet at www.fican.org.)

565 American National Standards Institute (ANSI), "Quantities and Procedures for Description and Measurement of Environmental Sound-- Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes," ANSI S12.9-2000/Part 6, 2008.

from auditory damage. These research efforts have covered a broad range of potential impacts from cardiovascular response from fetal weight to mortality. While a relationship between noise and health effects seems plausible, it has yet to be convincingly demonstrated--that is, shown in a manner that can be repeated by other researchers while yielding similar results.

While annoyance and sleep/speech interference have been acknowledged, health effects, if they exist, are associated with a wide variety of other environmental stressors. Isolating the effects of aircraft noise alone as a source of long-term physiological change has proved to be nearly impossible. In a review of 30 studies conducted worldwide between 1993 and 1998,[566] a team of international researchers concluded that, while some findings suggest that noise can affect health, improved research concepts and methods are needed to verify or discredit such a relationship. The team of international researchers called for more study of the numerous environmental and behavioral factors than can confound, mediate, or moderate survey findings. Until science refines the research process, a direct link between aircraft noise exposure and non-auditory health effects remains to be demonstrated. Recent studies by Eriksson (2007) and Jarup (2007 HYENA study) have reported higher rates of hypertension with increasing aircraft noise levels. The Hyena study identified the effect occurred only for nighttime aircraft noise. In a 2010 journal article Fidell, et al.,[567] reviewed the current science on predicting sleep disturbance and its effects and concluded:

> Epidemiological evidence does not yet support either reliable prediction of noise-induced sleep disturbance, or well informed policy debate, much less a plausible technical rationale for regulatory action. The practical, population level implications of noise-induced sleep disturbance and its consequences remain poorly understood due to design and other limitations of field studies of noise-induced sleep disturbance already undertaken, and to limitations of the statistical analyses performed to date. Published relationships used to assess the probability or prevalence of noise-induced awakening remain highly uncertain and unhelpfully imprecise. Considerable caution must be exercised in extrapolating conclusions about sleep disturbance that have been inferred from the behavior of relatively small and purposive samples of people living near a few airports to wider populations.

Annoyance is the most difficult of all noise responses to describe. Annoyance is an individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability. The level of annoyance, of course, depends on the characteristics of the noise (i.e., loudness, frequency, time, and duration), and how much activity interference (e.g., speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Personal sensitivity to noise varies widely. It has been estimated that two to ten percent of the population is highly susceptible to annoyance from any noise not of their own making, while approximately twenty percent are unaffected by noise. Attitudes are affected by the relationship between the person and the noise source (e.g., is it our dog barking or the neighbor's dog?). Whether we believe that someone is trying to abate the noise will also affect our level of annoyance.

There is no current research to suggest that there is a better metric than DNL to relate to annoyance. **Figure 4.10.1-5** relates DNL noise levels to community response from two of these surveys. One of the survey curves presented in **Figure 4.10.1-5** is the well-known Schultz Curve.

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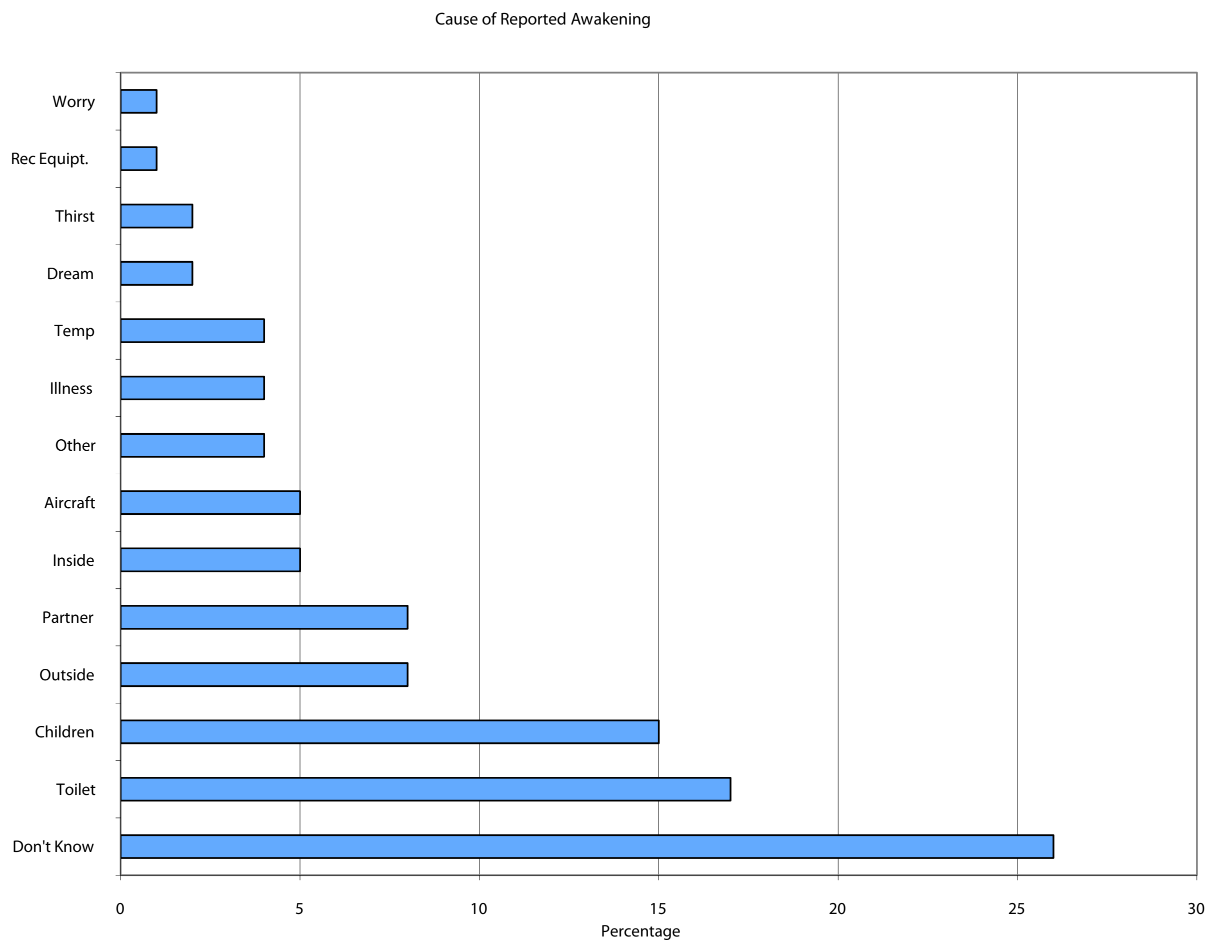
566 Lercher P., S.A. Stansfield, S.J. Thompson, "Non Auditory Health Effects of Noise; Review of the 1993-1998 Period," Noise Effects-98 Conference Proceedings, p. 213, 1998.

567 Fidell S., B. Tabachnick, K. Peasons, "The State of the Art of Predicting Noise-Induced Sleep Disturbance In Field Settings," Noise and Health, Volume 12, Issue 47, p. 77-90, 2010.



Prepared by: CDM Smith, 2012.

LAX Specific Plan Amendment Study Draft EIR	Causes and Prevalence of All Awakenings	Figure 4.10.1-3

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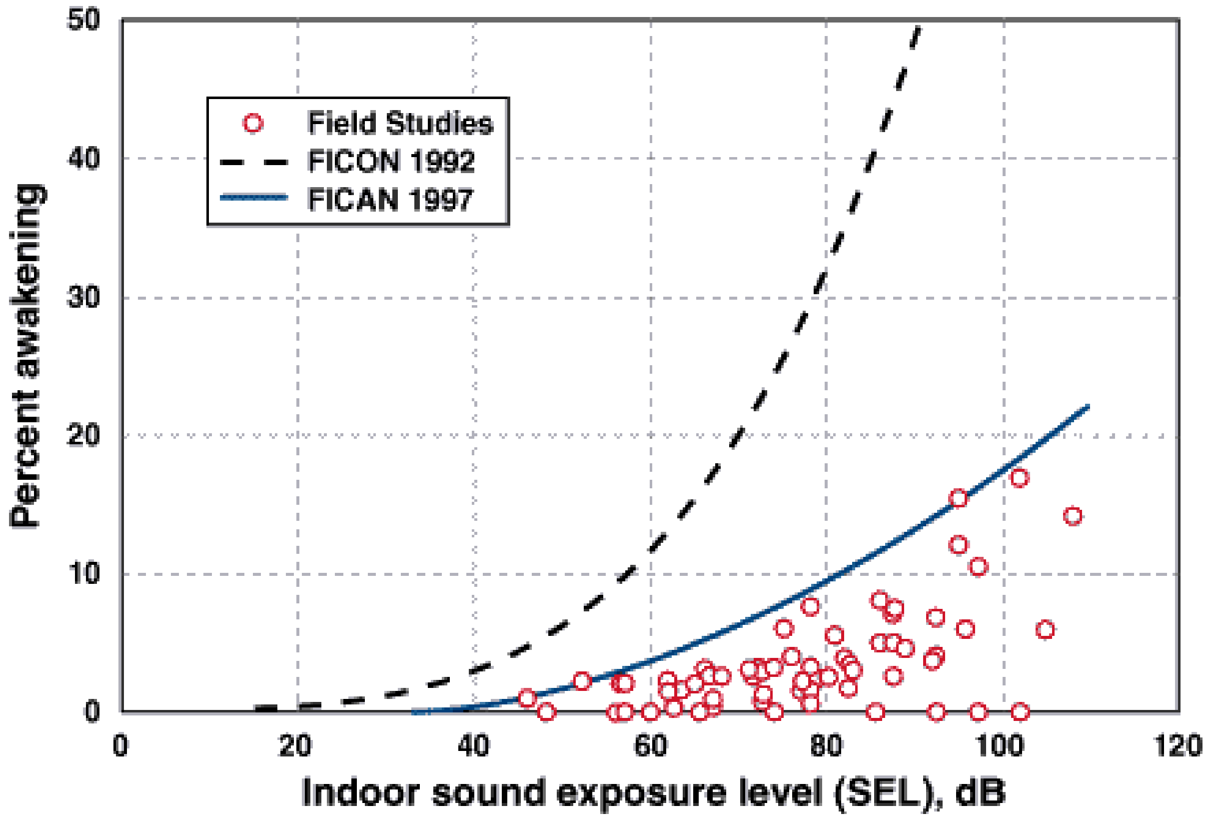

Prepared by: CDM Smith, 2012.

FICON Recommended Sleep Disturbance Curve

Figure 4.10.1-4

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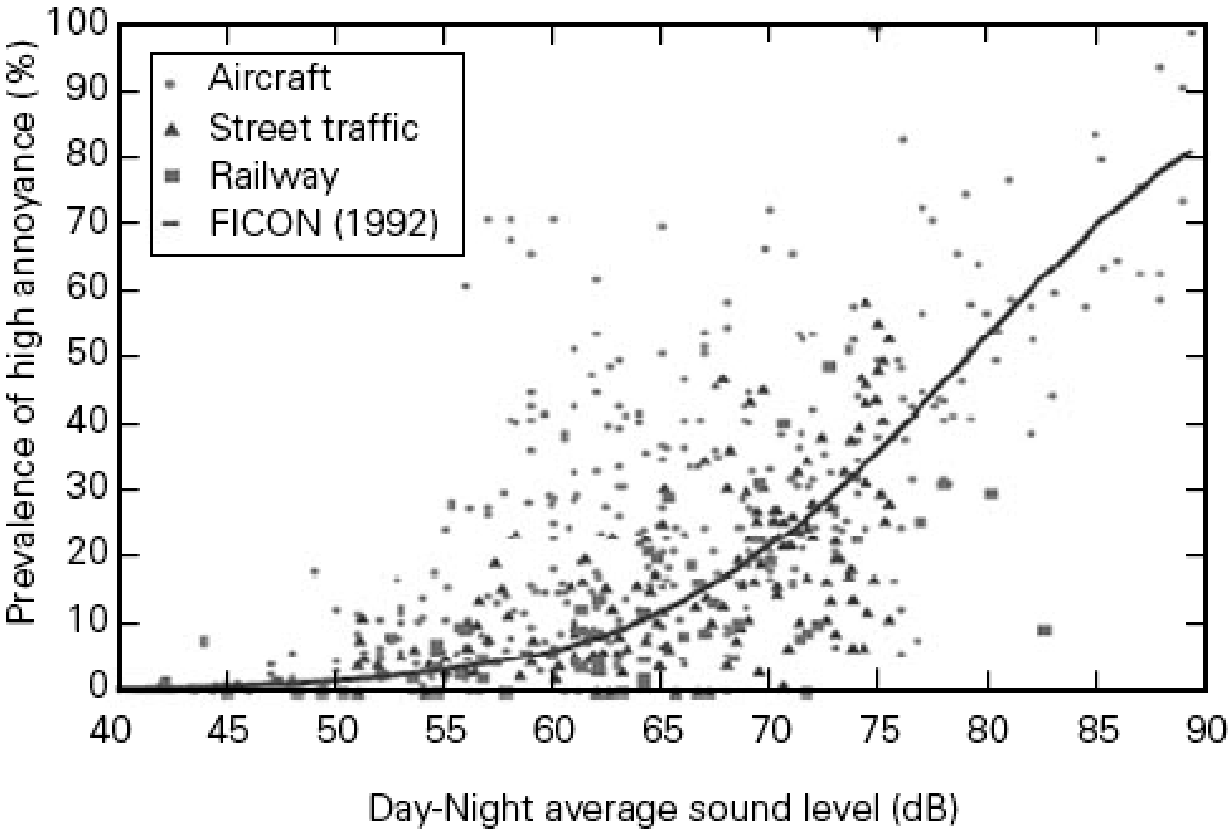

Prepared by: CDM Smith, 2012.

LAX Specific Plan Amendment Study Draft EIR	Schultz Curve	Figure 4.10.1-5

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It displays the percent of a populace that can be expected to be annoyed by various DNL values for residential land use with outdoor activity areas. At 65 DNL, the Schultz Curve predicts approximately 14 percent of the exposed population reporting themselves to be "highly annoyed." At 60 DNL, this decreases to approximately eight percent of the population.

The Schultz Curve and recent updates include data having a very wide range of scatter with communities near some airports reporting much higher percentages of population highly annoyed at these noise exposure levels. For example, under contract to the FAA, Bolt Beranek & Newman conducted community attitude surveys in the residential areas south of John Wayne Airport in Orange County in 1981 as part of a study of possible "power cutback" departure procedures. That study concluded that the surveyed population had more highly annoyed individuals at various noise levels than would be predicted by the Schultz Curve. When plotted similar to the Schultz Curve, this survey indicated the populations in these areas were approximately 5 dB more sensitive to noise than the average population predicted by the Schultz Curve. While the precise reasons for this increased noise sensitivity were not identified, it is possible that non-acoustic factors, including political or the socio-economic status of the surveyed population may have played an important role in increasing the sensitivity of this community during the period of the survey. Annoyance levels have never been correlated statistically to single event noise exposure levels in airport-related studies.

4.10.1.1.4 Aircraft Noise Analysis Approach and Modeling

The methodology for analyzing noise from most transportation or community noise sources, including aircraft, follows a generally accepted process that includes the application of a computer model to estimate noise levels and compare them to those for baseline conditions and future alternatives. The aircraft noise modeling analysis methodology outlined in FAR Part 150, Airport Noise Compatibility Planning, and FAA Environmental Desk Reference for Airport Actions (Chapter 17, Sections 6(c) and 6(f)) were followed, where applicable.

There are two means of evaluating aircraft noise: noise modeling and noise measurements. LAWA currently operates an Aircraft Noise and Operations Monitoring Systems (ANOMS) that continuously measures noise in the surrounding communities. A substantial expansion and upgrade to this system, in compliance with LAX Master Plan Mitigation Measure MM-LU-5, Upgrade and Expand Noise Monitoring Program, was completed in 2010. These noise levels are reported to Los Angeles County, in compliance with the State Noise Standards. Noise contours are developed by LAWA for use in these Quarterly Reports, and utilizing the noise level data from the now 39 noise monitors that are part of the LAX ANOMS system.

As there are no means to measure future noise levels, computer models are used to predict those future conditions. For consistency, modeled data is also used to reflect the current conditions, thereby assuring consistency when comparing the future alternatives to 2009 conditions. This is a standard approach planners and engineers use to evaluate future growth and "what-if" scenarios at an airport. Analytical noise models such as the INM provide mathematical predictions of aircraft noise levels within the community, and the use of the INM is widely accepted for future planning efforts. Appendix J1-1, *Aircraft Noise Technical Analysis*, provides a description of the INM, including an overview of the model, its reliability, and the types of input data and assumptions associated with running the model.

Modeled aircraft CNEL noise exposure maps are used as planning tools to allow the comparison of different scenarios of operations over a broad geographical area. For the purposes of this CEQA analysis, the principal use for the aircraft noise modeling was to develop the baseline (2009) conditions and the future (2025) conditions at buildout of the SPAS alternatives. The aircraft noise analysis completed for the SPAS EIR is intended and designed to delineate how the baseline (2009) noise conditions would change under each SPAS alternative. The analysis of each SPAS alternative includes an anticipated increase in future passenger activity at LAX, which is forecast to increase from approximately 56.5 million annual passengers (MAP) in 2009 to 78.9 MAP by 2025. Future (2025) CNEL noise exposure contour mapping for SPAS alternatives was developed as a tool to assist in the assessment of aircraft noise impacts around the airport as compared to baseline (2009) conditions. CNEL calculations provide valid comparisons between different future conditions as long as consistent assumptions and basic data are used for all calculations. CNEL comparisons show anticipated changes in aircraft noise exposure over time and identify the potential effects of various alternatives on anticipated aircraft noise exposure. However, a line drawn on a map does not imply that a particular noise condition exists on one side of the line and not on the other. For the purposes of this analysis, CNEL calculations are best viewed as a means for comparing noise effects, not for precisely defining them relative to specific parcels of land.

4.10.1.2 Noise Analysis Methodology

Aircraft noise under the CNEL significance threshold in Section 4.10.1.4.1 was assessed using noise exposure contours and grid point analyses for areas surrounding the airport, and location-specific analyses for specific noise-sensitive uses. It is important to note that while the aircraft noise impacts analysis includes comparisons of the future (2025) noise levels associated with each SPAS alternative compared to baseline (2009) conditions, the vast majority of the change in future (2025) conditions compared to baseline (2009) conditions is attributable to growth in activity anticipated to occur at LAX by 2025 under all alternatives. As such, the noise analysis presented in this section includes: (1) a delineation of the impacts of future (2025) aircraft noise levels associated with each SPAS alternative compared to baseline (2009) conditions; and (2) a delineation of future (2025) aircraft noise levels associated with each SPAS alternative that proposes modifications to the north airfield, such as relocation of a runway, compared to future (2025) aircraft noise levels calculated to occur if there were no material improvements to the existing north airfield. Regarding the latter form of comparison, Alternatives 1 through 3 and 5 through 7 each involve notable modifications to the north airfield, such as relocating Runway 6L/24R or 6R/24L, taxiway modifications, and in some cases addition of a centerfield parallel taxiway, whereas Alternative 4 only includes a runway extension for Runway Safety Area (RSA)[568] compliance purposes, which would not materially change the operating conditions of the existing airfield. As such, the future (2025) aircraft noise levels associated with Alternative 4 are used as the basis to compare the future aircraft noise levels of each of the other SPAS alternatives (i.e., Alternative 4 represents a "Future (2025) Conditions Without Airfield Improvements" scenario;[569] also referred to as "2025 'No Additional Improvements' Conditions"). In short, the former type of comparison will indicate how the baseline (2009) conditions would change in the future with each SPAS alternative, which includes the natural growth in airport activity common to all alternatives, whereas the latter type of comparison is intended to focus on only those changes in aircraft noise characteristics that are attributable to the airfield modifications specific to each alternative under cumulative conditions (i.e., the alternatives' contribution).[570] The latter type comparison is provided for the cumulative analysis and to assist the public and decision-makers in better discerning the differences between the SPAS alternatives.

4.10.1.2.1 Noise Exposure Contours

Aircraft noise was presented graphically as contour lines connecting points of equal noise exposure. Noise levels are higher within each contour interval moving toward the center of the noise source (the airport). The noise exposure contours were overlaid on maps of noise-sensitive land uses surrounding the airport to determine the areas and land uses exposed to significant noise.

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568 RSA's are only provided for "reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." (FAA Advisory Circular 150/5300-13, "Airport Design")

569 The "Future (2025) Conditions Without Airfield Improvements" is the same as Alternative 4, which is equivalent to not changing the airfield, but includes the same fleet mix and operational levels forecasted for Alternative 1 in 2025.

570 Both the project level analysis and the cumulative analysis account for the fact that the commercial aircraft fleet now operating in the United States is generally much quieter that the earlier aircraft fleets based on the Congressional mandate that new aircraft comply with strict noise level standards (i.e., Stage 4 certification) and older noisier aircraft (Stage 1 and Stage 2)be retired from operation (14 CFR Part 36). This is evidenced by the fact that the 65 CNEL contours for LAX under current and future conditions are generally smaller than the 65 CNEL for LAX from two decades ago even though the number of daily aircraft operations back then were comparatively lower.

CNEL noise contours and other noise computations (including single events) were developed for the 2009 conditions and future (2025) conditions using INM, Version 7.0b. The projected acreage, number of residences, noise-sensitive uses, and population within each noise contour were calculated by overlaying the noise contours into a Geographic Information System (GIS) land use database of the environs.

The INM requires the compilation of extensive information about how the airport operates (for existing conditions) or is expected to operate (for future conditions). The model requires the integration of an assortment of data relating to airfield geometry, weather conditions, number and type of aircraft operations, time of day of aircraft operations, aircraft fleet mix, runway use patterns, flight tracks, and other data and assumptions associated with each scenario. Information regarding the inputs to the INM for 2009 conditions and future (2025) conditions is summarized below, with more detailed information provided in Appendix J1-1, *Aircraft Noise Technical Analysis*.

4.10.1.2.2 Grid Point Analysis

The INM also has the capability to generate aircraft noise levels at regularly spaced or individually defined grid points. Such information supplements the analysis provided by noise exposure contours. This EIR analysis provides a comprehensive list of grid points, including a set of regularly spaced points throughout the aircraft noise study area, and the locations of identified non-residential noise-sensitive facilities, such as schools, places of worship, hospitals, nursing homes "hospital convalescent," parks, and libraries. Table 1 in Appendix J1-2, *Grid Point Noise Levels*, lists the grid point types and locations. The locations, by type, are also illustrated in **Figure 4.10.1-6** through **Figure 4.10.1-9**. The locations of residential sensitive receptors can be seen in **Figure 4.10.1-12** later on in this section.

Supplemental noise metrics were calculated for 179 points (over land and off-airport only) distributed on a regularly spaced grid with an interval of 3,000 feet (**Figure 4.10.1-6**), and at 501 individual locations of noise-sensitive uses (**Figure 4.10.1-7** through **Figure 4.10.1-9**). The grid points represent 147 schools, 2 hospitals, 35 convalescent and nursing homes, 7 libraries, 32 parks and 278 places of worship.

4.10.1.2.3 Single Event Aircraft Noise Exposure

Similar to the aircraft noise analysis completed for the LAX Master Plan, as presented in the LAX Master Plan Final EIR, the aircraft noise analysis completed for the SPAS EIR includes an evaluation of the effects of single event aircraft noise relative to the potential for increased aircraft activity (i.e., number of arriving or departing flights) occurring at night to result in increased nighttime awakenings (sleep disturbance), and relative to potential disruption of classrooms and the educational process from overflights of additional aircraft during school hours.

4.10.1.2.3.1 Nighttime Awakenings

Introduction

The issue of nighttime awakening and sleep disturbance induced by aircraft noise, particularly single event noise (i.e., "flyovers"), has been the subject of numerous studies over the past two decades. This issue has also been considered within the context of CEQA, including the CEQA decision *Berkeley Keep Jets Over the Bay v. Board of Port Commissioners* (2001) 91 Cal.App.4th 1344. Although the court directed that the significance of single event noise effects be addressed in an EIR, there was no established basis for defining or assessing the significance of single event aircraft noise on sleep disturbance.

The issue of nighttime awakenings associated with transportation-related noise, including aircraft noise, continues to be studied and is of substantial interest to aviation noise scientific and regulatory communities. To date, however, there are still no proven or widely-accepted methods for predicting aircraft noise-induced awakenings or for defining significant impacts. Presented below is an overview of the types of studies completed over the past two decades that are related to transportation noise-induced sleep disturbance, illustrating the complexities and uncertainties associated with this issue, and a brief discussion of a sleep awakenings prediction methodology provided by the American National Standards

Institute (ANSI). The subject ANSI standard does not fully address or overcome the complexities and uncertainties associated with attempting to predict nighttime awakenings resulting from aircraft noise, as briefly described below, but was nevertheless considered in the analysis of nighttime awakening impacts associated with the SPAS project. As also noted below, another method and metric for addressing nighttime single event aircraft noise was also considered in the impacts analysis.

Overview of Transportation Noise-Induced Sleep Disturbance Studies

Provided below is an brief overview of some of the key transportation noise-induced sleep disturbance studies completed since the 1990s, characterizing the complex nature of, and uncertainties associated with, this issue, particularly as related to development of a methodology for predicting nighttime awakenings.

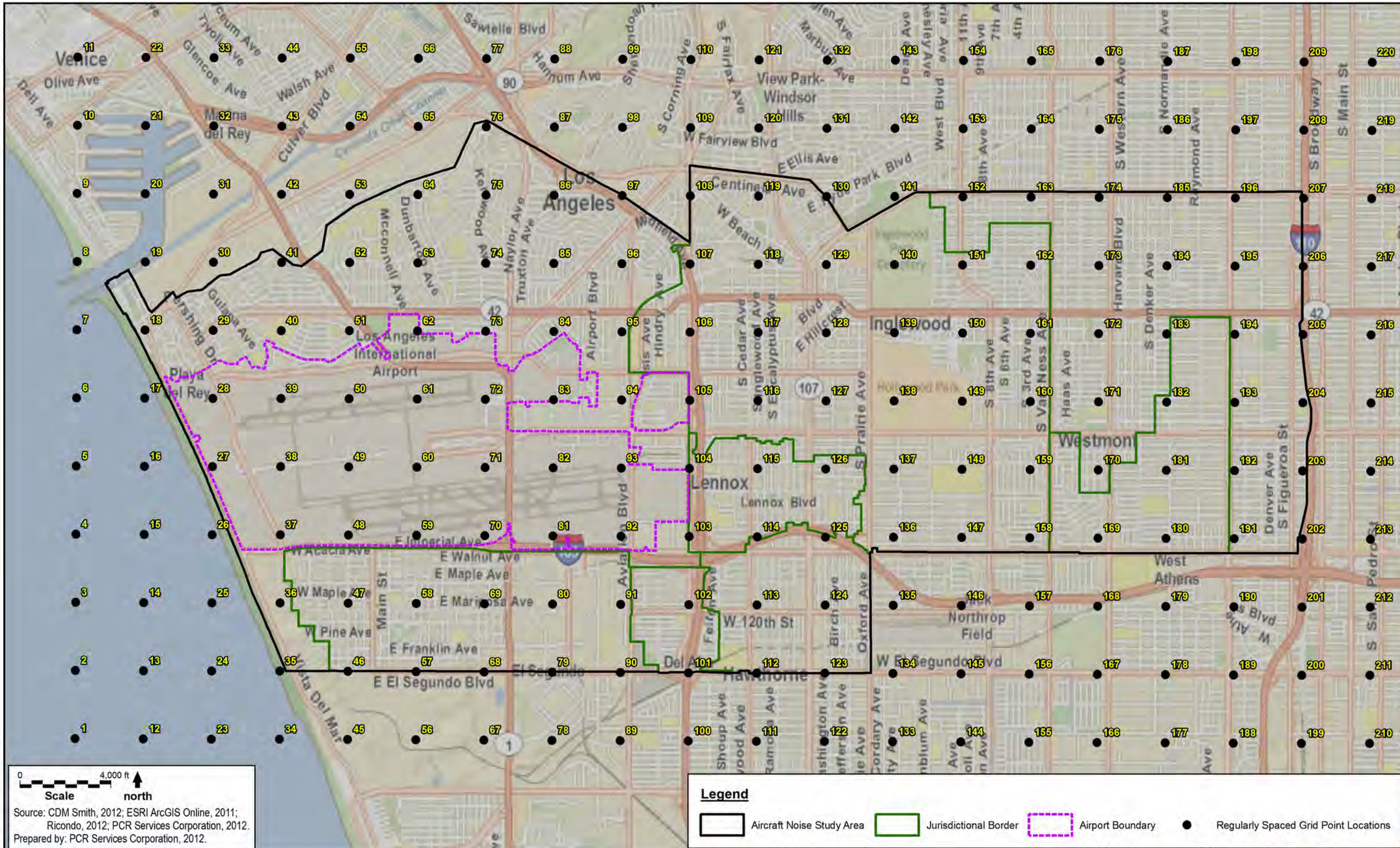
Large scale field studies of transportation noise-induced sleep disturbance did not begin until the 1990s. Prior to this time, most studies of noise-induced sleep disturbance were conducted under laboratory conditions. In a typical laboratory study, a small number of test subjects slept for a few nights in unfamiliar quarters, in an unfamiliar noise environment, often while wearing highly intrusive electrodes. A typical field study, on the other hand, involves larger numbers of people, sleeping at home in their own beds for periods of weeks or longer, while provided with much less cumbersome response apparatus.

Laboratory and field studies of noise-induced sleep disturbance differ not only in scale, but also in methods, analytic goals, and applicability to real-world settings. A common goal for laboratory studies is to document subtle, moment-by-moment changes in electroencephalographic (brain wave) patterns during exposure to unfamiliar sounds. A common goal for field studies is to count numbers of people who behaviorally confirm full waking consciousness following exposure to familiar occurring sounds.

A study completed by Pearsons, Barber, Tabachnick, and Fidell in 1995 was the first to document that the findings of laboratory-based studies of sleep disturbance differed markedly from those of field studies.[571] The differences were so pronounced, in fact, that the study concluded:

> The differences observed between findings of laboratory and field studies call into question dosage-response relationships in common use for environmental assessment purposes. In particular, the current analyses strongly suggest that the laboratory results from which such relationships have been derived may not be applicable to prediction of sleep disturbance effects in community settings.

[571] Pearsons K., D. Barber, B.G. Tabachnick, S. Fidell, "Predicting noise- induced sleep disturbance," The Journal of the Acoustical Society of America, Volume 97, 1995, pp. 331-338.



LAX Specific Plan Amendment Study Draft EIR	Regularly Spaced Grid Point Locations	Figure 4.10.1-6

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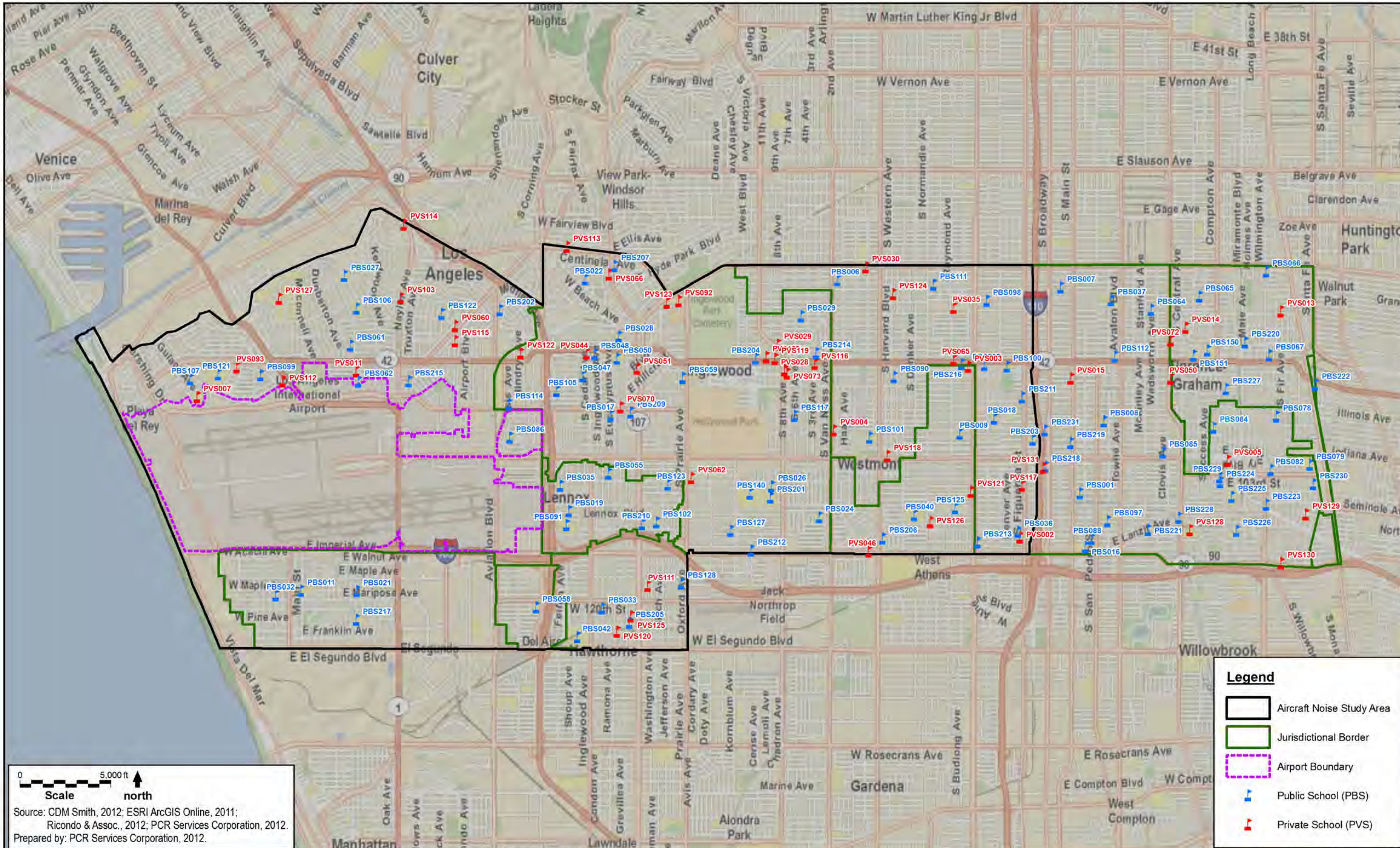

LAX Specific Plan Amendment Study Draft EIR	Noise-Sensitive Public Facilities - Schools	Figure 4.10.1-7

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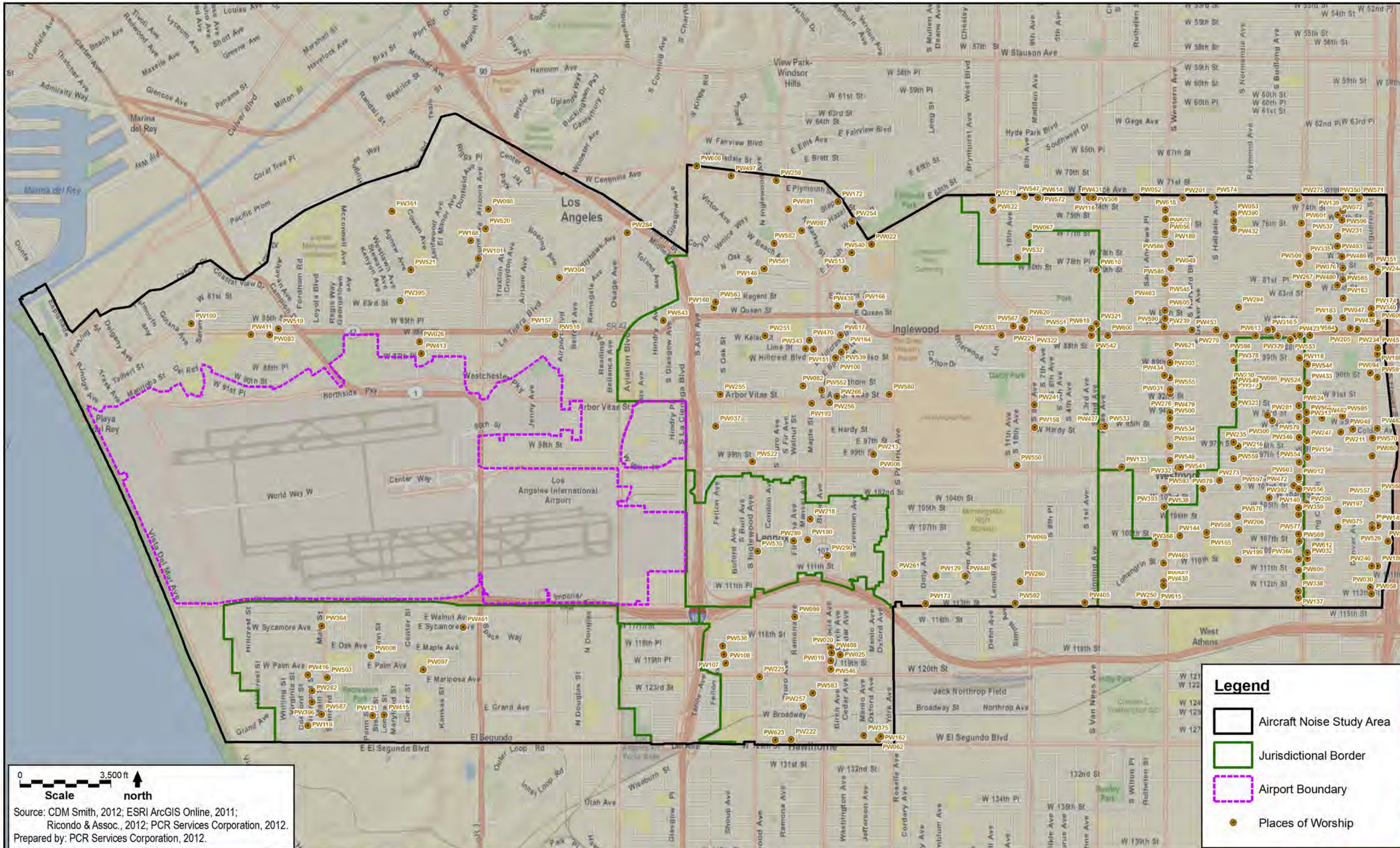

LAX Specific Plan Amendment Study Draft EIR	Noise-Sensitive Public Facilities - Places of Worship	Figure 4.10.1-8

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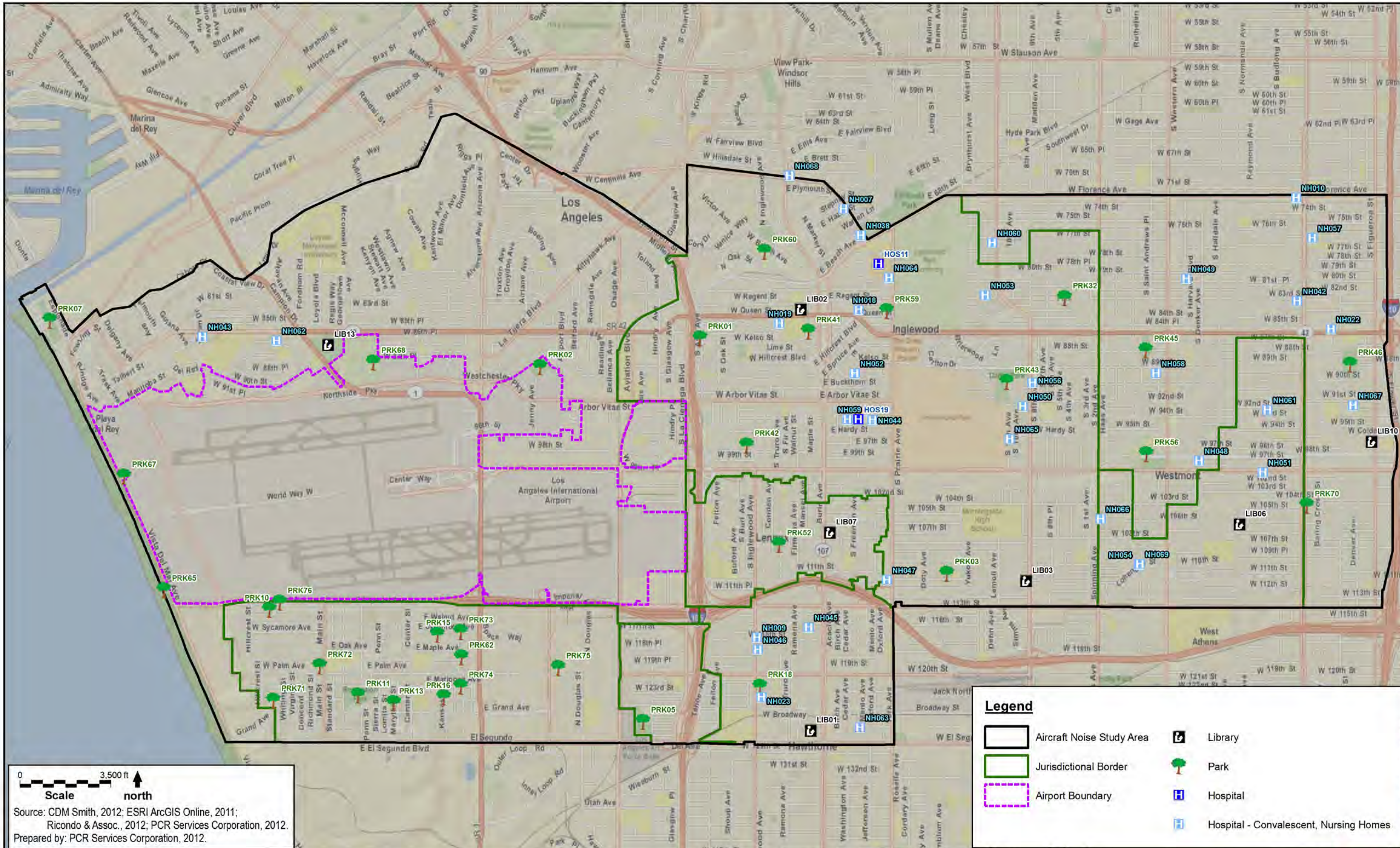

LAX Specific Plan Amendment Study Draft EIR

Noise-Sensitive Public Facilities - Miscellaneous Uses

Figure 4.10.1-9

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The principal field studies and analyses of aircraft noise-related sleep disturbance conducted since the early 1990s include those of Ollerhead et al., (1992),[572] Fidell et al., (1995, 2000),[573,574] and Passchier-Vermeer et al., (2003).[575] Recent peer-reviewed meta-analyses of technical literature include those of Michaud et al., (2007)[576] and of Fidell et al., (2010).[577] The latter review concluded that:

> Epidemiological evidence does not yet support either reliable prediction of noise-induced sleep disturbance, or well-informed policy debate, much less a plausible technical rationale for regulatory action. The practical, population-level implications of noise-induced sleep disturbance and its consequences remain poorly understood due to design and other limitations of field studies of noise-induced sleep disturbance already undertaken, and to limitations of the statistical analyses performed to date. Published relationships used to assess the probability or prevalence of noise-induced awakening remain highly uncertain and unhelpfully imprecise. Considerable caution must be exercised in extrapolating conclusions about sleep disturbance that have been inferred from the behavior of relatively small and purposive samples of people living near a few airports to wider populations.

Nighttime awakenings occur independent of noise. Fidell, et al.,[578] provided the following summary of night awakenings:

> Depending on the definition adopted for "awakening," people may awaken for reasons having nothing to do with noise many times per night, at moments which may or may not closely coincide in time with the occurrence of noise events. According to Basner et al., people exhibit an average of 21 electro physiologically detectable arousals per hour of sleep, or about 144 spontaneous arousals per night. Counting both shifts from deeper to lighter sleep states and momentary awakenings, Ollerhead et al., reported about 45 "awakenings or arousals" per night, of which only 40% were thought to represent even momentary awakenings. People commonly attain full waking consciousness two or three times per night for reasons having nothing to do with noise exposure.

ANSI Methodology for Predicting Noise-Induced Sleep Disturbance

A U.S. national standard last revised in 2008 by ANSI[579] identifies a method for predicting probabilities of awakening due to multiple noise events over the course of an entire night (i.e., between 10:00 p.m. and 7:00 a.m.). ANSI is based in part upon the curve showing the relationship between SEL noise levels and

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572 Ollerhead, J., C. Jones, R. Cadoux, A. Woodley, B.J. Atkinson, J. Horne, et al., "Report of a field study of aircraft noise and sleep disturbance," London: Department of Safety, Environment and Engineering, Civil Aviation Authority, 1992.

573 Fidell, S., K. Pearsons, R. Howe, L. Silvati, and D. Barber, "Field study of noise induced sleep disturbance", The Journal of the Acoustical Society of America, Volume 98, 1995, pp. 1025-1033.

574 Fidell, S., K. Pearsons, B. Tabachnick, and R. Howe, "Effects on sleep disturbance of changes in aircraft noise near three airports", The Journal of the Acoustical Society of America, Volume 107, 2000, pp. 2535-2547.

575 Passchier-Vermeer, W., "Night-time noise events and awakening," TNO Inro Report No. 2003-32, 2000, pp. 1-61.

576 Michaud, D., S. Fidell, K. Pearsons, K. Campbell, and S. Keith, "Review of field studies of aircraft noise-induced sleep disturbance," The Journal of the Acoustical Society of America, Volume 121, 2000, pp. 32-41.

577 Fidell, S., B. Tabachnick, and K. Pearsons, "The state of the art of predicting noise-induced sleep disturbance in field settings," Noise Health, Volume 12(47), 2010, pp. 77-87.

578 Fidell, S., B. Tabachnick, and K. Pearsons, "The state of the art of predicting noise-induced sleep disturbance in field settings," Noise Health, Volume 12(47), 2010, pp. 77-87.

579 American National Standards Institute (ANSI), "Quantities and Procedures for Description and Measurement of Environmental Sound-- Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes," ANSI S12.9-2000/Part 6, 2008.

probability of awakening shown in **Figure 4.10.1-10.**[580] This curve was not developed based solely on aircraft noise but also included other sources besides aircraft. The data forming the curve was based on 75 data points associated with awakening due to aircraft noise intrusions in bedrooms, and 16 data points for other transportation noise sources.

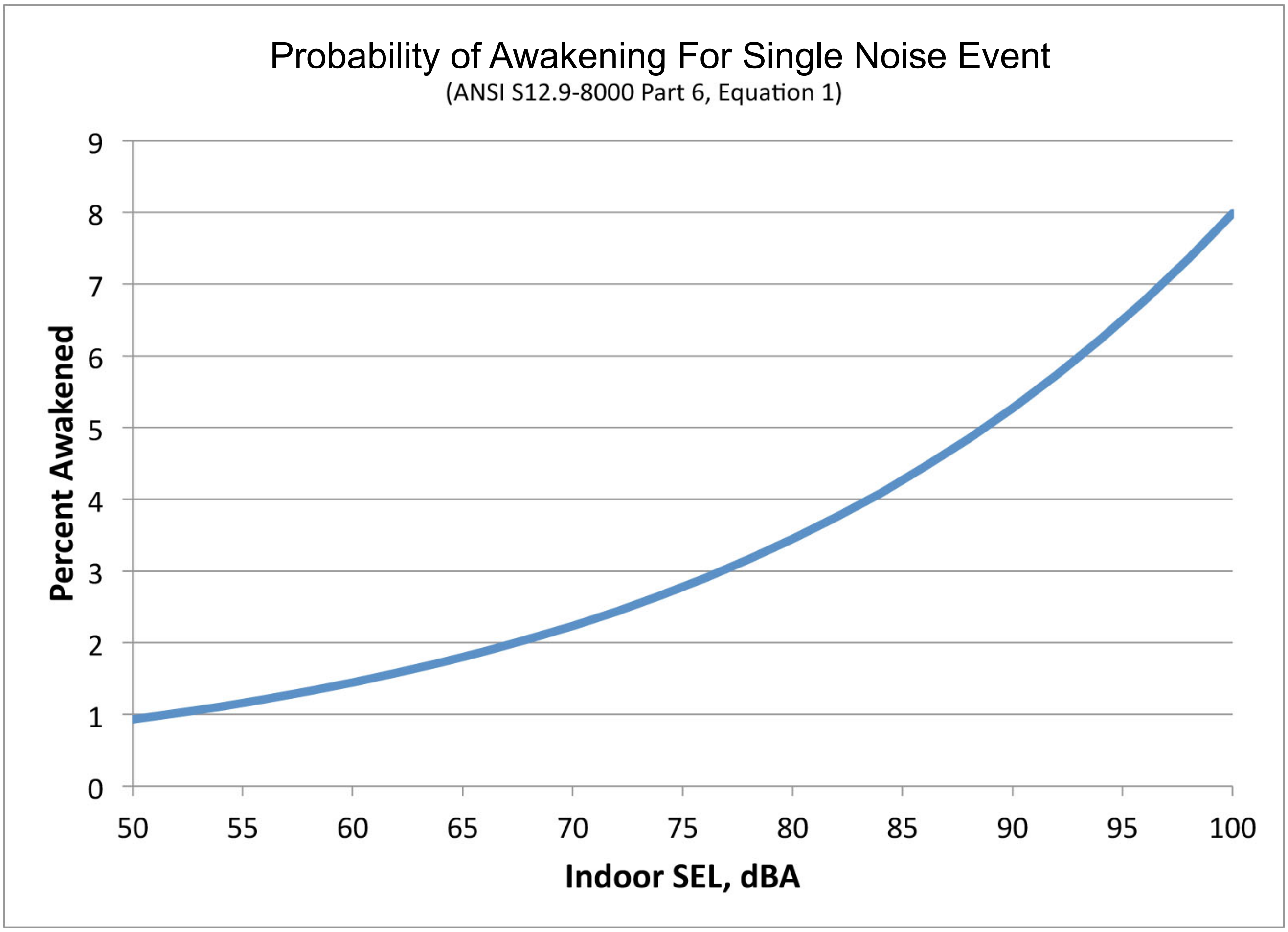
The first step of the ANSI methodology predicts the probability of awakening from knowledge of the indoor single event A-weighted sound exposure level of a noise source, such as an individual aircraft operation/single flyover. The second step accounts for the change in sleep sensitivity over the course of the night, based upon the time since retiring. The standard accounts for sleep sensitivity changes during the night but explicitly notes that "…the sleeper sensitivity effect needs to be replicated in other experiments and by other researchers before it can be included in a standard." The third step calculates the probability of awakening at least once per night due to an entire distribution of individual noise events (aircraft operation/flyover) over the course of the entire night. This last step combines the changes in probability of awakening from each individual aircraft operation.

The ANSI methodology does not address the uncertainty associated with computing the probability of awakening once per night from a whole night of exposure. Such uncertainty includes not only the uncertainty of each SEL exposure from each aircraft operation and the combined uncertainty of all SEL exposures from a full night of operations, but also the uncertainty of the ANSI Equation 1 for predicting the probability of awakening. No study has confirmed that aircraft noise events, as applied to awakening, are independent events (i.e., no study has confirmed that the probability of awakenings from multiple noise events is cumulative/additive of the probability of awakening from individual stand-alone noise events).

Like many standards, ANSI's sleep standard contains only limited information about the rationale underlying its prediction equations, and confidence intervals of predictions derived from its predictive equations. There are a number of questions and concerns within the scientific community regarding the certainty, accuracy, and applicability of, those methods in their current form. It is anticipated that as this subject area continues to be studied and additional data become available, the ANSI methods will be updated and refined or revised.

Notwithstanding the technical questions and concerns regarding the ANSI standard for predicting nighttime awakenings, the evaluation of single event noise impacts presented in this section includes utilization of the ANSI methods as a relative basis of comparison between the impacts associated with each SPAS alternative. There is currently no technical or scientific basis for determining a quantitative threshold of significance relative to the change in the probability of nighttime awakenings provided under the ANSI methodology, nor is there a scientific basis for selecting a particular percentage change in the probability of awakening as being the point where a significant impact would occur. As discussed above in the section entitled "Overview of Transportation Noise-Induced Sleep Disturbance Studies," there is no clear relationship between sleep disturbance and health/physiological effects. The ANSI method for predicting the probability of awakenings was, nevertheless, considered in assessing whether implementation of the SPAS alternatives would result in a substantial increase in the probability of awakenings. The following describes how awakening probabilities calculated using the ANSI standard were presented as contours and population tables to characterize the impact of each alternative.

580 Equation 1 of the standard is the product of a regression analysis, but one which excluded all cases in which no awakenings were observed in certain noise exposure intervals. These cases include three in the Denver field studies, in which ***no*** awakenings were observed in 3 dB-wide sound exposure level (L_{AE}) intervals centered at 91, 94, and 97 dB. Given exclusion of these data points, the probability of awakening at a specific SEL level may be less. Use of this figure therefore results in a conservative analysis.



ANSI Equation 1 Showing Percent of Population Awakened As a Function of Indoor Sound Exposure Level

Figure 4.10.1-10

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Awakening Probability Contours

Based on the assumptions and formulas within the ANSI standard, notwithstanding the aforementioned technical questions and uncertainties associated with this method, the INM and post-processor were utilized to calculate awakening probabilities at regularly-spaced intervals across a large grid area. These calculations provided the basis to plot awakening probability contours around the airport. Awakening probability contours were developed for 2009 conditions and for each alternative at buildout in 2025.[581] For each alternative, a set of difference contours were calculated for each of three probabilities of awakenings - 25 percent probability, 50 percent probability, and 75 percent probability, with each set delineating the probability contour that would occur with implementation of a particular SPAS alternative compared to the probability contour that would occur if there were no airfield improvements. The difference area between the two contours was shaded either yellow, indicating that implementation of the alternative would result in an increase in the probability of awakening, or was shaded green, indicating that implementation of the alternative would result in a decrease in the probability of awakening. The use of three evenly-spaced intervals of probability (25-, 50-, and 75-percent) provided an overall basis to depict the general geographic direction and relative magnitude of change in probability of awakening attributable to the alternative.

The development of comparison contours depicting changes in the probabilities of awakenings for conditions with and without a proposed alternative focused on airfield operations in 2025, at buildout of the SPAS alternatives, when the number of daily airfield operations would be greater than those in 2009 (i.e., 1,937 daily operations estimated for 2025 compared to 1,493 daily operations in 2009). Therefore, for the purposes of the sleep disturbance analysis, 2025 Without Alternative is used as the baseline, which is considered conservative given the increase in non-project related growth between 2009 and 2025. As discussed on page 4-4, there is growth anticipated to occur irrespective of adoption of a SPAS alternative due to regional population, housing, and employment growth. This approach allows LAWA to delineate the impacts caused by the SPAS alternatives.[582] This comparison provides the alternatives' contribution to cumulative impacts and provides the alternatives' project level impacts under the nighttime awakening significance threshold provided in Section 4.10.1.4.2.

The airfield configuration of 2025 Without Alternative is effectively the same as that of 2009 conditions. The nature and extent to which the airfield configuration of each alternative differs from the configuration that exists today, as may influence aircraft noise impacts, are the same relative to being measured against 2009 conditions or being measured against 2025 Without Alternative. As such, the nature, direction, and magnitude of changes in probability of awakenings presented in the impacts analysis for the comparison of probability contours for conditions in 2025 with and without airfield improvements are considered to be representative of the changes and impacts that would occur relative to 2009 conditions with and without airfield improvements.

581 Alternatives 1 through 7 were included in the noise modeling. Alternatives 8 and 9 focus on ground access improvements and do not include airfield modification; hence, those two alternatives were not included in the modeling.

582 As discussed under CEQA Guidelines Section 15358(a), "effects" and "impacts" are defined as "direct or primary effects which are *caused by* the project and occur at the same time and place…Indirect or secondary effects which are *caused by* the project and are later in time or farther removed in distance, but are still reasonably foreseeable . . ."

Given that there is no technical or scientific basis for determining the significance of quantitative awakening probabilities or changes to those probabilities, a substantial increase in the probability of nighttime awakenings under the significance threshold (see Section 4.10.1.4.2) was assessed by LAWA based on a qualitative review and input from LAWA's noise experts.[583]

Awakening Probability Population Tables

Using a GIS program, the awakening probability contours described above were combined with a land use database to estimate the residential population occurring within each of the three contour areas (i.e., estimated number of people within a contour of probability of awakening at least once during the night for a whole night's exposure to single event aircraft noise at night). The affected population is counted within each probability contour and the differences computed for each alternative. The differences are represented by the population within each probability contour for conditions with implementation of a particular alternative compared to the population within each contour for conditions without implementation of the alternative. The resultant estimations are considered to provide, for illustrative purposes, a general indication of whether there would be substantial changes in the affected populations of selected probability contours (i.e., 25 percent, 50 percent, and 75 percent probability of awakening) (see Section 4.10.1.4.2).

4.10.1.2.3.2 Classroom Disruption

The evaluation of potential aircraft noise impacts associated with the LAX Master Plan included an analysis of potential classroom disruption (i.e., speech interference and students ability to study). Such analysis is also provided herein relative to the SPAS alternatives, using the same methodology. As described in Section 4.1.2.1.3.2 of the LAX Master Plan Final EIR, the subject analysis addresses classroom disturbance relative to three types of noise metrics, including L_{max}, L_{eq}, and TA decibel levels. The metrics describe the peak noise level heard during a period of time (typically an individual noise event); the un-penalized average noise level present during a period of time; and the amount of time the noise level at a given location exceeds a specific decibel level, respectively. Schools that were exposed to interior single event maximum noise levels of 55 dBA and 65 dBA, as well as to hourly average noise levels of 35 dBA $L_{eq(h)}$[584] or more during typical school hours (8:00 a.m. and 4:00 p.m.) were identified. Details related to the rationale for, and determinations of, the impact thresholds are provided in Technical Report S-C, *Supplemental Aircraft Noise Technical Report*, of the LAX Master Plan Final EIR. A summary of the research based upon literary research conducted for the LAX Master Plan Final EIR is provided below.

Aircraft noise interfering with speech communication is a primary cause of annoyance to individuals on the ground. The quality of speech communication is also important in classrooms, offices, and industrial settings. This type of disruption may cause fatigue and vocal strain for individuals who attempt to communicate over the noise. Depending on the setting, different noise levels can cause various levels of

583 LAWA's noise experts include Mr. Vincent Mestre, P.E., with over 35 years experience in noise control and acoustical engineering, including numerous airport projects and aircraft noise studies. Mr. Mestre completed the synthesis report for the Airport Cooperative Research Program of the National Academies entitled *Effects of Aircraft Noise: Research Update on Selected Topics* and also completed research studies for the Volpe DOT Research Center on updating the dose response relation between noise and the percent of population highly annoyed (‘updates Schultz curve'). Mr. Mestre is the Co-chair of SAE A-21 Committee on aircraft noise and emissions which is responsible for standards on aircraft noise modeling and measurement. Also assisting in providing technical input related to nighttime awakening was Dr. Sanford Fidell, an internationally recognized noise expert with over 44 years experience in psychoacoustic research, modeling of transportation noise exposure and its effects on individuals and communities, and aircraft noise consulting. Dr. Fidell has provided consulting services to community, airport and government agencies involved in aircraft noise controversies and assessments and disclosures of aircraft noise impacts, and has also consulted both domestically and abroad on land use planning related to aircraft noise regulation. Dr. Fidell has published scores of research and tutorial papers in archival journals, half a dozen handbook chapters, and numerous technical reports over the last few decades. LAWA's evaluation of whether there would be a substantial increase in the probability of nighttime awakenings was also supported by Mr. Anthony Skidmore, AICP, with over 32 years experience in the preparation of environmental impact reports/statements, including for airport projects, and in the preparation of community noise impacts evaluations.

584 L_{eq}(h): hourly average sound level.

speech intelligibility. As a result, no accepted thresholds of significance for speech interference exist. Due to the public sensitivity to speech interference, considerable research continues to be conducted, particularly in the area of classroom acoustics and the effect of noise on learning. In the Levels Document, the USEPA (1974)[585] identified a goal of an indoor 24-hour average level ($L_{eq(24)}$) of 45 dBA. The goal was selected based on the intelligibility of sentences during steady noise. For an average adult with normal hearing and fluency in the language, steady background sound levels indoors of up to 45 dBA L_{eq} were expected to allow 100 percent intelligibility of sentences. The same analysis yielded 99 percent sentence intelligibility for background levels at or below 54 dBA L_{eq}, and yielded less than 10 percent intelligibility for background levels above 73 dBA L_{eq}. The function used in the Levels Document proved to be especially sensitive to changes in sound level between 65 dBA and 75 dBA. For example, a 1 dBA increase in background sound level from 70 dBA to 71 dBA yields a 14 percent decrease in sentence intelligibility. No threshold required to preserve speech intelligibility in the classroom was established in the USEPA Study.

The thresholds are further discussed below and in Section 4.10.1.4. As noted above, research addressed steady noise. One of LAWA's criteria was based on a steady noise approach. This approach was taken from a 2004 standard published by ANSI for interior classroom noise.

Because aircraft noise is intermittent, a second threshold was needed to reflect how aircraft noise events might interrupt spoken communication among small and large group instruction. Classroom learning experience is sometimes captured by large group lectures and by one-on-one or small group discussions. The intermittent noise criteria included two different thresholds. For one of the thresholds, it was assumed that the teacher must be heard approximately 20 feet away (large group) as though in a lecture to a large group of students. The second threshold applied to small group communication where the distance the voice must carry was assumed to be approximately 6 feet (small group).

These three thresholds (steady noise levels, intermittent noise for large group and intermittent noise for small groups) were applied to the typical classroom day of 8:00 a.m. to 4:00 p.m. in the LAX environs, and incorporated two different noise metrics, $L_{eq(8)}$ (average over 8 hours) and L_{max}, each of which is defined in 4.10.1.1.2. The steady noise threshold uses the eight-hour Equivalent Sound Level ($L_{eq(8)}$) while the two intermittent noise thresholds (for large and small group communication) use L_{max}. The thresholds are defined as follows:

- Steady Noise Threshold: The ANSI standard was designed to keep interfering steady-state noise at or below an hourly L_{eq} of 35 dBA in the classroom. The threshold applied to mechanical equipment installed within the classroom, such as an air conditioner. As stated in the LAX Master Plan Final EIR, LAWA concluded that arriving aircraft frequently pass over schools located under the approach path. During arrival peak periods, aircraft noise levels can become steady occurrences. Therefore, LAWA approved the use of the ANSI standard as a preliminary threshold of significance. To convert this standard to an exterior sound level, LAWA used pre- and post-measurement data collected as part of its school sound insulation efforts. The data reflected an average 29 dBA outside-to-inside noise reduction with windows closed. Therefore, adding 29 dBA to 35 dBA yields an exterior threshold of 64 dBA hourly $L_{eq(8)}$.
- Intermittent Noise Thresholds: Two thresholds were established for intermittent noise exposure in the classroom. Both were based on an August 1992 report published by the Federal Interagency Committee on Noise (FICON), a precursor to Federal Interagency Committee on Aviation Noise (FICAN). The FICON report showed that, at a distance of 20 feet (the large group criterion), the in-classroom noise level should not exceed an L_{max} of 55 dBA. At a distance of 6 feet (the small group criterion), the threshold increases to 65 dBA L_{max}. An exterior L_{max} threshold was calculated by adding 29 dBA to the large and small group criteria. The addition of classroom attenuation with windows closed yielded an exterior L_{max} threshold of 84 dBA for large group instruction and 94 dBA L_{max} for small group instruction.

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585 U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974.

To quantify the duration of the noise impact in terms of classroom disruption during the school day, the TA supplemental metric was used for each threshold. TA supplemental metric reports the number of minutes for each school day (8:00 a.m. to 4:00 p.m.) that the threshold levels were exceeded for more than three seconds. The analysis was conducted for each of the schools in the noise-sensitive receptors list.

The noise levels at schools were computed by the grid analysis option of the INM to estimate the noise levels above or below the three types of metrics described above at school locations during typical school hours (i.e., between 8:00 a.m. and 4:00 p.m.). INM calculations of the three types of noise metrics specific to each of the school location grid points were modeled for Alternatives 1 through 4. The modeling results associated with those alternatives reflect local changes in aircraft noise levels resulting from various options for reconfiguring the north airfield, including one that moves Runway 6L/24R northward (i.e., Alternative 1), one that moves Runway 6R/24L southward (i.e., Alternative 3), one that does not move either runway but has other improvements (i.e., Alternative 2), and one that does not propose any notable airfield improvements other than meeting RSA requirements (i.e., Alternative 4). Based on review of the INM results for Alternatives 1 through 4, the classroom disruption impacts for Alternatives 5 through 7, which propose additional variations on the northward or southward relocation of runways within the north airfield, were estimated. The estimation of classroom disruption impacts for Alternatives 5 through 7 also included review and comparison of the CNEL contours for Alternatives 1 through 4, and evaluation of how the differences in the school disruption impacts between those alternatives correlated to the differences in the CNEL contours. The differences between the CNEL contours for Alternatives 1 through 4, as well as an evaluation of how the CNEL contours specific to Alternative 5, Alternative 6, and Alternative 7 compared to those of Alternatives 1 through 4, were also taken into consideration in estimating the classroom disturbance impacts for Alternatives 5 through 7.

4.10.1.3 Baseline (2009) Conditions

For the purposes of the CNEL significance threshold in Section 4.10.1.4.1, the baseline (2009) conditions reflect aircraft noise levels associated with the airfield and operational parameters that existed in the Calendar Year 2009, based on an entire year's worth of operational data compiled to determine the average annual operating condition for that calendar year. Calendar Year 2009 was used for the analysis as a full calendar year of aircraft operations data was required for the aircraft noise analysis and the complete 2010 data were not available at the time when the SPAS EIR noise analysis commenced. A detailed description of the data and assumptions used to develop the noise exposure contours, such as the average daily number of aircraft operations, the aircraft fleet mix and its distribution throughout the day, the current utilization of the runways, the location of the flight paths leading to and from the runways, and the distribution of flight operations on those flight paths, is provided in Appendix J1-1, *Aircraft Noise Technical Analysis*.

4.10.1.3.1 Baseline (2009) Conditions - CNEL Aircraft Noise Exposure

This section presents the CNEL noise exposure contours representing the baseline (2009) conditions.

LAX operates in west flow approximately 98 percent of the time. During west flow, aircraft arrive from the east (traveling to the west) and depart from the airport in a westerly direction. Therefore, in west flow, takeoffs are routed to the west of the airport, with the climb out portion of the takeoff occurring mostly over the ocean. For most aircraft, the climb phase, which utilizes higher engine thrust, is the noisiest phase of flight. Furthermore, during the late night hours (midnight to 6:30 a.m.) Over-Ocean procedures are in place that route both arrivals and departures over the ocean. These procedures have been in place since the early 1970s. Therefore, aircraft noise levels are much higher west of the airport over the ocean than over the populated areas to the east.

Almost 7,767 acres, or 74.4 percent of the area within the 2009 65 CNEL noise exposure contour, is ocean waters and airport property, which are compatible with aircraft noise (see Section 4.9, *Land Use* *and Planning*). **Figure 4.10.1-11** presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated for baseline (2009) conditions. **Figure 4.10.1-12** depicts the noise exposure contours for baseline (2009) conditions, and indicates the types of uses located with the 65 CNEL or higher.

The total acreage over land within the baseline (2009) conditions noise exposure contours, as well as the total acreage over land excluding airport property (referred to as "Off-Airport Area"), is presented in **Table 4.10.1-2**. Approximately 6,307 acres are exposed to 65 CNEL and higher, of which 2,674 acres are off-airport. The number of people and residences exposed to aircraft noise of 65 CNEL and higher was determined for the baseline (2009) conditions by overlaying the 2009 CNEL noise exposure contours over the GIS base map and year 2010 U.S. Census population data. Approximately 28,112 residents (99 percent of all the population exposed to 65 CNEL and higher) are located in areas exposed to aircraft noise between 65 and 75 CNEL. The remaining 1 percent (326 residents) are located within the area exposed to 75 CNEL and higher. The distribution of residential dwellings in areas exposed to 65 to 75 CNEL is about the same as the population distribution for the various aircraft noise exposure areas.

Table 4.10.1-2

Aircraft Noise Exposure by Noise Level Range - Baseline (2009) Conditions

Noise Level Range	Total Acreage Over Land	Off-Airport Area (Acres)	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
65-70 CNEL	2,803	2,000	8,128	20,939	41
70-75 CNEL	1,921	625	2,065	7,173	11
75+ CNEL	1,584	49	78	326	1
Total (above 65 CNEL)	**6,307**	**2,674**	**10,271**	**28,438**	**53**

Notes:

The population and dwelling unit counts are both estimates based on 2010 U.S. Census figures.
Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (acreage, population, and dwelling values).

Table 4.10.1-3 lists the noise-sensitive facilities that are exposed to noise levels at or higher than 65 CNEL under baseline (2009) conditions, which include schools, places of worship, convalescence hospitals, parks, and a library. As shown, there are a total of 53 non-residential noise-sensitive facilities exposed to noise levels higher than 65 CNEL.

Table 4.10.1-3

Aircraft Noise Above 65 CNEL - Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL
Population	**28,438**
Dwelling Units	**10,271**
Non-Residential Noise-Sensitive Facilities	
Schools	21
Places of Worship	21
Hospitals	0
Convalescent Hospitals	2
Parks	8
Libraries	1
Total Non-Residential Noise-Sensitive Facilities	**53**

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (acreage, population, and dwelling values).

4.10.1.3.1.1 65 CNEL Contour

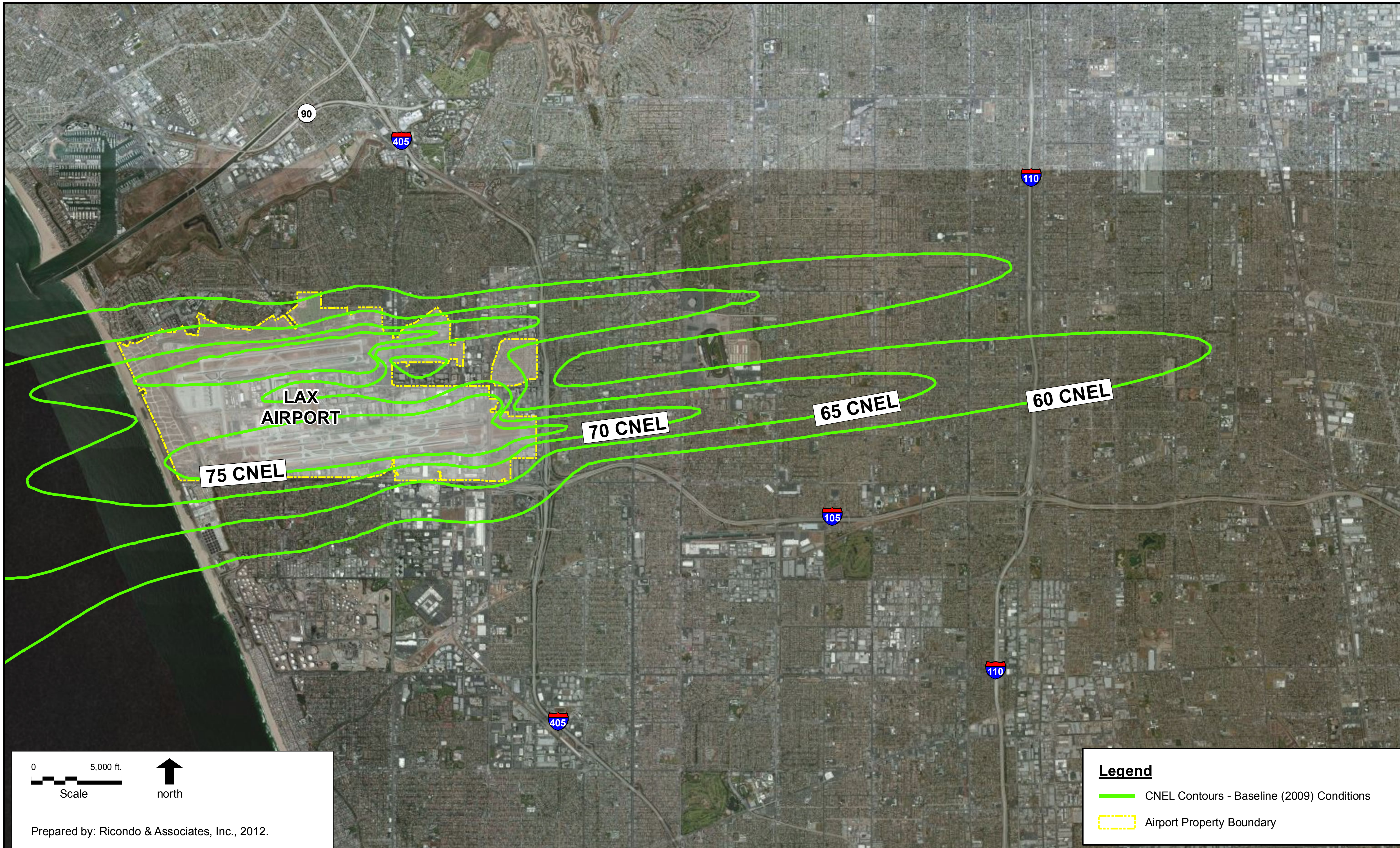
The portion of the baseline (2009) conditions 65 CNEL noise exposure contour to the east of the north airfield (attributed to aircraft approaches to Runways 24L and 24R) extends approximately 11,900 feet east of Interstate 405 (I-405) and ends 1,000 feet west of Crenshaw Boulevard. The 65 CNEL noise exposure contour to the east of the south airfield (attributed to aircraft approaches to Runways 25L and 25R) extends approximately 21,400 feet beyond I-405 and ends just beyond South Normandie Avenue. West of I-405, the noise exposure contour widens in comparison to the one to the east of I-405, extending 3,100 feet south of Runway 7R/25L and 1,900 feet north of Runway 6L/24R. The portion of the 65 CNEL noise exposure contour associated with high thrust levels used to initiate aircraft takeoff mostly occurs over airport property and extends slightly beyond Westchester Parkway to the north and W. Palm Avenue to the south. Portions of El Segundo, Inglewood, Lennox, Los Angeles, and Westchester are within the 65 CNEL noise exposure contour.

4.10.1.3.1.2 70 CNEL Contour

The baseline (2009) conditions 70 CNEL noise exposure contour is similar in shape, but smaller in area than the 65 CNEL noise exposure contour. To the east of the south airfield, the 70 CNEL noise exposure contour extends approximately 8,400 feet east of I-405, in the vicinity of South Doty Avenue. The baseline (2009) conditions 70 CNEL noise exposure contour east of the north airfield extends to the western edge of I-405. West of the I-405, the northern portion of the 70 CNEL noise exposure contour falls primarily over airport property and other properties compatible with aircraft noise. Between the spikes in the 70 CNEL noise exposure contour resulting from aircraft approaches to LAX (aligned with the runways) and west of I-405, the land use is designated as commercial. On the south side of the airport, the noise exposure contour remains north of I-105 between I-405 and Sepulveda Boulevard. However, west of Sepulveda Boulevard, the noise exposure contour extends farther south, encompassing residential areas of El Segundo.

4.10.1.3.1.3 75 CNEL Contour

The portion of the baseline (2009) conditions 75 CNEL noise exposure contour associated with aircraft approaches to the south airfield extends approximately 900 feet east of I-405, over a residential area in Lennox. East of the north airfield, the 75 CNEL noise exposure contour extends across compatible land uses up to Jenny Avenue, or 4,100 feet east of Runway 24R. The remainder of the noise exposure contour to the east of the airport is entirely over airport and compatibly developed property.



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CNEL Contours Overview
Baseline (2009) Conditions

Figure
4.10.1-11

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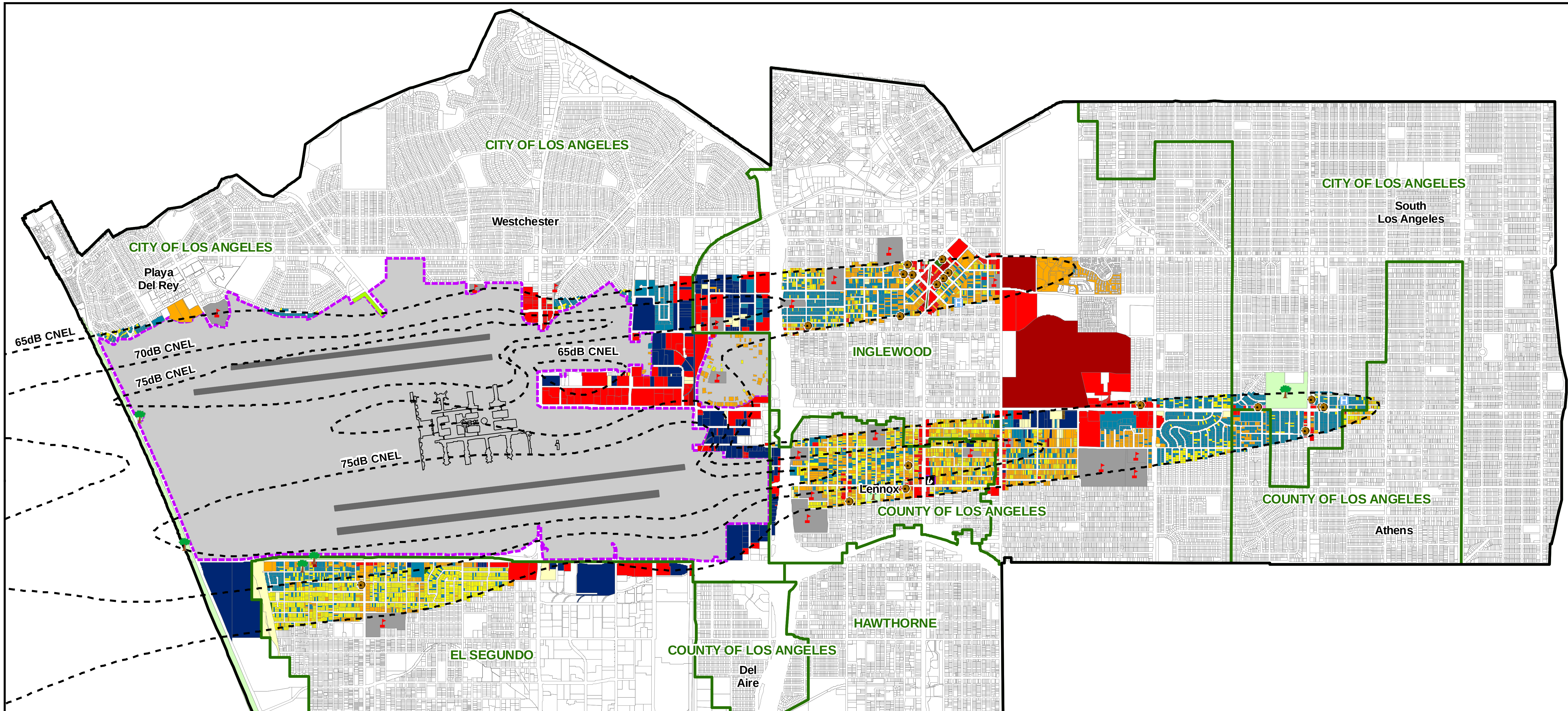

Legend

- School
- Places of Worship
- Hospital
- Hospital - Convalescent, Nursing Homes
- Library
- Park
- Single Family Residential
- Multiple Family Residential
- Mobile Home
- School
- Places of Worship
- Hospital
- Hospital - Convalescent, Nursing Homes
- Library
- Park
- Commercial
- Industrial
- Government
- Cemetery
- Compatible with Title 21
- Does Meet Title 24 Requirements
- Recreation
- Vacant, Assumed Vacant
- Runways
- Airport Boundary
- 2009 65, 70, or 75 CNEL Contour
- Aircraft Noise Study Area
- Jurisdictional Border

0 3,500 ft
Scale north

Source: CDM Smith, 2012; ESRI ArcGIS Online, 2011;
Ricondo & Assoc., 2012; PCR Services Corporation, 2012.
Prepared by: PCR Services Corporation, 2012.

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Baseline (2009) Conditions - Noise Exposure Contours

Figure
4.10.1-12

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4.10.1.3.2 Single Event Aircraft Noise Exposure

In addition to the CNEL noise exposure contours prepared for baseline (2009) conditions, a grid point analysis of single event aircraft noise was conducted for nighttime awakenings and classroom disruption, and the results are presented below.

4.10.1.3.2.1 Nighttime Awakenings Environmental Setting

The ANSI sleep disturbance method was used to compute contours of probability of awakening at least once per night for whole night exposure to aircraft operations. **Figure 4.10.1-13** shows the contours that represent a 25 percent, 50 percent, and 75 percent probability of awakening at least once per night for 2009 environmental setting. There are 170,612, 38,666, and 5,466 people within these contour areas, respectively. Any higher probability contours could have been plotted showing a contour that is very close to the airport, or lower probability contours that would have shown a much larger contour.

4.10.1.3.2.2 Classroom Disruption

Schools are disrupted by both an overflight of a single aircraft, which can disrupt speech, and by the general intrusiveness of noise that elevates the ambient noise level within the school, which can disrupt learning. The location and name of all of the schools included in this analysis is provided in Table 3 in Appendix I-2, *Land Use Incompatibility Tables*. To establish baseline (2009) noise exposure conditions and the geographic scope of the analysis, schools that were exposed to the following conditions were identified in this analysis:

- Interior single event maximum aircraft noise levels (L_{max}) of 55 dBA and 65 dBA lasting more than three seconds; or
- Peak hour average noise levels of 35 dBA $L_{eq(h)}$ or greater.

Table 4.10.1-4 presents the number of public and private schools within the airport environs that are exposed to the above mentioned exterior noise under baseline (2009) conditions. There were no schools exposed to interior L_{max} noise levels above 65 dBA. The name and location of these affected schools associated with interior single L_{max} noise levels of 55 dBA and peak hour average noise levels at or higher than 35 dBA $L_{eq(h)}$ are provided in **Table 4.10.1-5** and **Table 4.10.1-6**, respectively.

Table 4.10.1-4

Schools Exposed to Single Event Noise Levels Under Baseline (2009) Conditions

Impact Category	Number of Schools
Exposure > 55 dBA (L_{max})	
Number of Public Schools	6
Number of Private Schools	2
Average Number of Events/School	26
Average Seconds/Event	2
Exposure > 65 dBA (L_{max})	
Number of Public Schools	0
Number of Private Schools	0
Exposure > 35 dBA ($L_{eq(h)}$)	
Number of Public Schools	13
Number of Private Schools	9

Source: Ricondo & Associates, Inc., 2012 (INM grid results); PCR, 2012 (school database).

Table 4.10.1-5

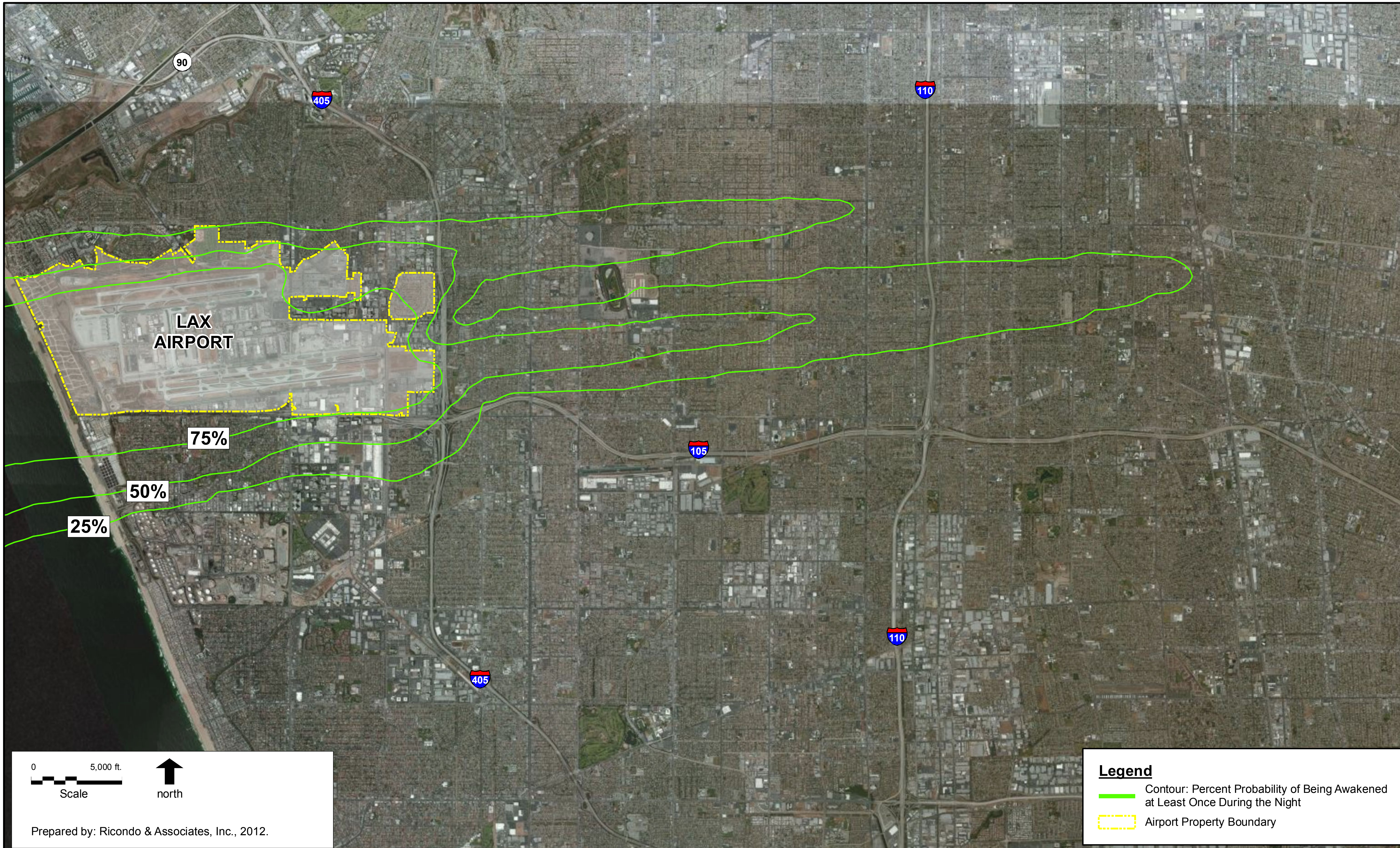
Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels During the Average School Day (8:00 a.m. - 4:00 p.m.) Under Baseline (2009) Conditions

				2009		
Grid ID	**School**	**X Coord**	**Y Coord**	**TA-84**	**Events**	**Avg. D**
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.8	23.8	2.0
PBS035	Felton Elementary School	1.2997	-0.0854	0.3	20.0	0.9
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.8	14.5	3.3
PBS105	Oak Street Elementary School	1.2636	0.7715	1.4	27.4	3.1
PBS114	Animo Leadership High School	0.8325	0.6503	1.3	32.0	2.4
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.0	51.3	2.3
	Private Schools					
PVS051	Inglewood Christian School	1.9923	0.9699	0.3	7.1	2.5
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.3	30.2	2.6

Notes:

TA-84 = Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels L_{max} which equates to an interior noise level of 55 dBA L_{max} at indicated school.
Events = number of events to which the site is exposed on an average annual school day that exceed 84 dBA.
Avg. D = average duration of each event in seconds during the average annual school day that exceeds 84 dBA L_{max}.

Source: Ricondo & Associates, Inc., 2012 (INM grid modeling results); PCR, 2012 (school database).



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ANSI Awakening Probability Contours: 2009 Conditions

Figure 4.10.1-13

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Table 4.10.1-6

Hourly Equivalent Noise Level at LAX Area Schools With Exceedance of ANSI 35 $L_{eq(h)}$ Thresholds During the Average School Day (8:00 a.m. - 4:00 p.m.) Under Baseline (2009) Conditions

Grid ID	School	X Coord	Y Coord	8 Hour L_{eq} Values[1] 2009
	Public Schools			
PBS019	Buford Elementary School	1.378	-0.3156	39
PBS026	Clyde Woodworth Elementary School	3.2132	-0.0849	37
PBS035	Felton Elementary School	1.2997	-0.0854	38.8
PBS047	Hillcrest Continuation High School	1.5006	0.9081	38.6
PBS055	Jefferson Elementary School	1.7352	0.0244	35.9
PBS059	Kelso Elementary School	2.4049	0.8944	37.8
PBS062	Westchester - Emerson Community Adult School	-0.5332	0.85	35.4
PBS105	Oak Street Elementary School	1.2636	0.7715	40.8
PBS114	Animo Leadership High School	0.8325	0.6503	40.7
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	40.9
PBS140	Morningside High School	3.0171	-0.1508	36
PBS204	Animo Inglewood Charter High School	3.0643	1.0732	36
PBS214	Century Academy for Excellence	3.6132	1.1228	35
	Private Schools			
PVS007	Saint Bernard High School	-1.9924	0.7052	36.1
PVS028	Anthony's Preschool	3.3292	0.9651	35.5
PVS051	Inglewood Christian School	1.9923	0.9699	37.7
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	39.9
PVS073	Morningside Early Childhood Center/Tijay Renee Academy	3.3499	0.9384	35.2
PVS108	Faith Lutheran Church and Preschool	3.161	1.0864	35.9
PVS116	A Bright Beginning CDC	3.603	1.0285	35.1
PVS118	California Technical University High School	4.2623	0.1938	36.3
PVS119	Children's Enrichment Center	3.241	1.07	35.9

[1] Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

Source: Ricondo & Associates, Inc., 2012 (INM grid results); PCR, 2012 (school database).

4.10.1.4 Thresholds of Significance for Aircraft Noise

4.10.1.4.1 CNEL

A significant aircraft noise impact would occur if the direct and indirect changes to aircraft operations patterns in the environment that may be caused by the particular SPAS alternative would result in the following future condition:

- Noise-sensitive areas are exposed to 65 CNEL or greater with at least a 1.5 CNEL increase.

This threshold is derived from the L.A. CEQA Thresholds Guide. Analysis presented below under this significance threshold is typically referenced as the "Aircraft Noise" analysis or the "CNEL" analysis.

4.10.1.4.2 Nighttime Awakenings

In evaluating potential nighttime awakenings impacts associated with the SPAS alternatives, a significant impact is considered to occur if:

- Implementation of a SPAS alternative results in a substantial increase in the probability of nighttime awakenings.

Estimating the probability of awakening using the ANSI methodology and assumptions, which, in combination with the INM and other related software programs, delineates the geographic area for a selected probability percentage (i.e., the geographic limits where the probability of being awakened at least one time during the night due to aircraft noise), and provides a basis to quantitatively assess the changes in affected populations resulting from implementation of an alternative. Given that there is no technical or scientific basis for determining the quantitative significance of awakening probabilities or changes to those probabilities, a substantial increase in the probability of nighttime awakenings was assessed by LAWA based on input from, and a qualitative review of the difference contours and population tables, by LAWA's noise experts. Analysis presented below under this significance threshold is typically referenced as the "nighttime awakening" analysis, "SEL" analysis, "Single Event Aircraft Noise Exposure" analysis, or "sleep disturbance" analysis.

4.10.1.4.3 Classroom Disruption

Although there is currently no conclusive data to establish a proven statistical relationship between the aircraft noise levels generated during a single aircraft overflight event and the ability of children to learn in the classroom, the thresholds of significance developed for the LAX Master Plan Final EIR are utilized herein for the evaluation of the SPAS alternatives. As such, a significant impact relative to classroom disruption is considered to occur when:

- Schools are newly exposed to exterior noise levels during school hours sufficient to result in interior noise levels of 55 dBA L_{max}, which can cause momentary disruption of speech intelligibility in classroom teaching situations (an assumed distance between the speaker and listener of 20 feet), and an interior noise level of 65 dBA L_{max}, which can momentarily disrupt speech intelligibility in small group and one-on-one teaching situations (assumed to be at 6 feet). In each case, exposure is measured as having a time above the threshold noise level of three seconds or more during the school day. At LAX, the thresholds of significance for speech interference at schools equate to exterior single event maximum noise levels of 84 dBA for general classroom teaching and 94 dBA for small group learning occurring during school hours, defined as between 8:00 a.m. and 4:00 p.m.
- Schools are newly exposed to exterior noise levels during school hours sufficient to result in sustained interruption of classroom teaching through interior noise levels in excess of 35 $L_{eq(h)}$ during an hour. At LAX, the threshold of significance equates to an exterior hourly noise level during school hours of 64 dBA of $L_{eq(h)}$.

Analysis presented below under this significance threshold is typically referenced as "classroom disruption" analysis.

4.10.1.5 Applicable LAX Master Plan Commitments and Mitigation Measures

The airport has a long history of addressing concerns related to aircraft noise. Many noise concerns were addressed in the airport's adopted Part 150 Noise Compatibility Program of 1985. The program includes 28 measures approved by the FAA. Of these, seven are directly related to the abatement of aircraft noise levels. The remaining 21 measures relate to the implementation of a program to monitor flight operations, provide for programs to mitigate noise in residences and other noise-sensitive uses, propose land use management measures to enhance compatibility, and call for further study of funding mechanisms or airfield modifications. This section addresses only those measures that are directly related to the abatement of aircraft noise through operation or source noise control. Mitigation of impacts at the land uses is discussed in Section 4.9, *Land Use and Planning*. The airport also has implemented noise mitigation measures that pre-date the 1985 Part 150 program. The operational elements of the current noise abatement program are:

- Use preferred inboard runways for departures and arrivals and interior parallel Taxiways C and E during the hours between 10:00 p.m. and 7:00 a.m. This measure is intended to move nighttime noise to the interior of the airfield and away from noise-sensitive areas adjacent to the airport to the north and south.
- Weather permitting, between the hours of midnight and 6:30 a.m., use Over-Ocean procedures. These procedures call for arrivals to be made from the west and departures to the west over Santa Monica Bay during the most sensitive night hours.
- Conduct departures to the west along the runway heading until reaching the coastline. The measure has been the subject of continuing concern to assure better compliance to achieve the desired effect.
- Ban the use of SuperSonic Transport (SST) aircraft at the airport. This measure was originally adopted to eliminate the potential use of the airport by the Concorde and other proposed SST aircraft.
- Restrict run-up activity (i.e., routine aircraft engine maintenance tests that require the operation of an engine at high power for extended periods) between 11:00 p.m. and 6:00 a.m. unless specific approval is granted by airport management.
- Allow the use of reduced thrust departures during west flow operations (i.e., aircraft land and takeoff in a westerly direction). Reduced thrust departures are takeoffs conducted with less than maximum power settings during the takeoff roll and initial climb portion of the operation (until the aircraft reaches approximately 1,000 feet Above Field Elevation (AFE) altitude). The intent of this measure is primarily to reduce noise along the sides of the runways while the aircraft is on the ground or in the first stage of climb.
- Discourage the use of reduced thrust departures during east flow operations (i.e., aircraft land and takeoff in an easterly direction).
- Encourage the use of departure cutback procedures in accordance with FAA Advisory Circular 91-53A. Thrust cutback procedures are techniques that initiate thrust reductions from takeoff power to a lower level (maximum climb thrust or less) during the climb between 1,000 and 3,000 feet AFE. The intent of the measure is to reduce the loudness of aircraft in the off-airport areas most severely affected by aircraft noise.
- Continue the use of tug and tow procedures (i.e., aircraft are towed by a ground surface vehicle while aircraft engines are off) in the Imperial Terminal area. The Imperial Terminal is a small area west of Sepulveda Boulevard, north of the I-105. The use of tug and tow procedures is expected to be continued under all future alternatives where applicable.

As appropriate, all of the above measures have been incorporated into the assumed operating conditions of the baseline (2009) conditions and would be continued with the future (2025) conditions.

As part of the LAX Master Plan, LAWA adopted one commitment and two mitigation measures pertaining to aircraft noise in the Alternative D Mitigation Monitoring and Reporting Program (MMRP). The one commitment and two mitigation measures designed to address aircraft noise impacts associated with the LAX Master Plan are also applicable to the SPAS alternatives and were considered in the aircraft noise analyses herein.

- **N-1. Maintenance of Applicable Elements of Existing Aircraft Noise Abatement Program.**

  All components of the current airport noise abatement program that pertain to aircraft noise will be maintained.

- **MM-N-4. Update the Aircraft Noise Abatement Program Elements as Applicable to Adapt to the Future Airfield Configuration.**

  When existing runways are relocated or reconstructed as part of the Master Plan, the aircraft noise abatement actions associated with those runways shall be modified and re-established as appropriate to assure continuation of the intent of the existing program.

- **MM-N-5. Conduct Part 161 Study to Make Over-Ocean Procedures Mandatory.**

  A 14 CFR Part 161 Study shall be initiated to seek federal approval of a locally-imposed Noise and Access Restriction on departures to the east during Over-Ocean Operations, or when Westerly Operations remain in effect during the Over-Ocean Operations time period.

Relative to LAX Master Plan Commitment N-1, this noise analysis includes assumptions related to the existing noise abatement program based on its application as of 2009 and continuation of the program into future (2025) conditions. For LAX Master Plan Mitigation Measure MM-N-4, updates to existing aircraft noise abatement program elements would be developed specific to the selected runway relocation/reconfiguration. Regarding LAX Master Plan Mitigation Measure MM-N-5, the Part 161 Study is in process, but not yet completed at the time of this analysis. As such, the approach used in the SPAS EIR analysis for modeling future year noise exposure levels assumes the same percentage of flights complying with the existing Over-Ocean program that were identified for 2009. This assumption provides a conservative approach related to noise modeling the Over-Ocean noise abatement measure and does not presuppose the outcome of the Part 161 review process by the FAA, which, if approved, would result in lower nighttime noise levels than presented herein for future (2025) conditions. The Part 161 Study seeks federal approval of a locally-imposed Noise and Access Restriction on departures to the east during Over-Ocean operations, or when Westerly operations remain in effect during the Over-Ocean operations time period.

4.10.1.6 Impacts Analysis

As described above in Section 4.10.1.2, regarding the aircraft noise analysis methodology, the evaluation of aircraft noise impacts (under the threshold provided in Section 4.10.1.4.1) includes a comparison of aircraft noise levels associated with completion of each SPAS alternative by 2025 to the aircraft noise levels associated with baseline (2009) conditions. Passenger activity levels at LAX between 2009 and 2025 are forecast to increase from approximately 56.5 MAP to 78.9 MAP for all SPAS alternatives, which would be accompanied by an increase in the number of daily flights at LAX, as well as an anticipated change in the fleet mix (i.e., size and types of aircraft) during that time. As shown in **Table 4.10.1-7**, the number of average annual daily aircraft operations is forecasted to increase from 1,493 in 2009 to 1,937 in 2025, which applies to all SPAS alternatives. The number of heavy (aircraft weighing over 300,000 pounds, identified as "SWB" (Small Wide-Body Aircraft), "LWB" (Large Wide-Body Aircraft), and "NLA" (New Large Aircraft) in **Table 4.10.1-7**) jet operations in 2025 is projected to increase to 441 on an average day from 239 in 2009, while the number of non-jet (i.e., propeller) aircraft operations in 2025 is projected to decrease to 148 on an average day from 158 in 2009. The proportion of light jets in the fleet mix would shrink slightly in 2025 as compared to 2009.

Table 5 in Appendix J1-1, *Aircraft Noise Technical Analysis*, shows the allocation of operations, by aircraft category, to the north and south airfields for baseline (2009) conditions and for future (2025) conditions with each alternative.

The following impacts analysis provides for each alternative a discussion of operational conditions assumed as part of the alternative and a comparison of the future (2025) aircraft noise levels of the alternative to the baseline (2009) noise levels with respect to CNEL noise exposure contours, and classroom disruption. Also provided, for the purpose of calculating the alternatives' contribution to cumulative impacts, is a comparison of the future (2025) aircraft noise levels of each alternative involving airfield improvements to the future (2025) aircraft noise levels that would otherwise occur without such improvements. Discussion of the nighttime awakening methodology is provided in Section 4.10.1.2.3.1.

4.10.1.6.1 Alternative 1

The improvements to the north airfield under Alternative 1, operating in conjunction with the existing configuration of the south airfield, along with the forecasted growth in activity at LAX by 2025 would change the airport's 2009 noise exposure pattern. The following considerations contributing to the noise exposure pattern for Alternative 1 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would be less in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Relocation of Runway 6L/24R 260 feet north of its existing location.
- Extension of Runway 24L end 1,250 feet east of existing location.
- An anticipated shift of 15 percent of the small wide-body aircraft operations from the south airfield to the north airfield, as facilitated by the north airfield and terminal improvements. Those and other assumptions regarding runway utilization proportions are shown in Appendix J1-1, *Aircraft Noise Technical Analysis*.
- Provision of additional Runway 6L/24R high-speed runway exits.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.
- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.
- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.
- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet mean sea level (MSL). With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The first two of these factors would result in a general increase in the overall size of the Alternative 1 noise exposure contour in 2025, as compared to 2009 conditions, because more total noise energy would be generated within the airport environs on an average day with an increase in aircraft operations, and particularly heavy jet aircraft operations. The 260 feet northward relocation of Runway 6L/24R for landings on Runway 24R is expected to change the arrival and landing noise 260 feet north compared to 2009 conditions. The relocation of the high-speed runway exits for landings on Runway 24R would provide additional exits for heavy aircraft to use when landing on Runway 24R, as the current locations of the exits preclude heavy aircraft from using them. This change is not expected to increase the overall size of the CNEL noise exposure contours, because aircraft would be able to exit with reduced reverse thrust. The Runway 24L extension of 1,250 feet to the east is expected to move start-of-takeoff roll noise levels to the northwest and northeast behind the runway end, and slightly increase due to the additional small wide-body departures from Runway 24L. With the extension, the enhanced balance of small wide-body aircraft departures between the south and north airfields is expected to decrease start-of-takeoff roll noise from Runway 25R to the east.

Table 4.10.1-7

Forecast Daily Aircraft Operations (2025)

Condition	Aircraft Operations by Category[1]								Percent of Annual Operations							
	NJT	SJT	SNB	LNB	SWB	LWB	NLA	Total	NJT	SJT	SNB	LNB	SWB	LWB	NLA	Total
2009 Conditions	158	259	630	207	87	151	1	1,493	11%	17%	42%	14%	6%	10%	0%	100%
Future (2025) Conditions (All SPAS Alternatives)	148	344	741	263	218	194	29	1,937	8%	18%	38%	14%	11%	10%	2%	100%

Notes:

NJT = Non-Jet Aircraft
SJT = Small Jet Aircraft
SNB = Small Narrow-Body Aircraft
LNB = Long Narrow-Body Aircraft
SWB = Small Wide-Body Aircraft
LWB = Large Wide-Body Aircraft
NLA = New Large Aircraft
Totals may not add to 100 percent due to rounding.

1 Data represents an AAD of operation (annual traffic/365).

Source: Ricondo & Associates, Inc., 2011 SIMMOD output files and 2011 INM output files.

Figure 4.10.1-14 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 1 in 2025.

4.10.1.6.1.1 Comparison of Alternative 1 Aircraft Noise and Baseline (2009) Conditions

The noise exposure contours for Alternative 1 2025 Conditions are depicted in **Figure 4.10.1-15** The area depicted by the magenta line indicates areas newly exposed to increases larger than 1.5 decibels and above 65 CNEL dBA. The most notable change from the baseline (2009) conditions to Alternative 1 conditions is attributable to the projected growth in aircraft activity from 2009 to 2025. As the number of aircraft operations grows, it is expected that the area exposed to significant levels of aircraft noise will grow as well. While the noise exposure contours for Alternative 1 are larger in comparison to baseline (2009) conditions, the overall shape of the contours remains similar. With the 260-foot shift of Runway 6L/24R to the north, the 65 CNEL noise exposure contour for the north airfield is expected to expand more to the north than to the south, particularly with respect to the north side along the arrival path to Runway 6L/24R.

The following provides a geographic description of the Alternative 1 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

The Alternative 1 65 CNEL noise exposure contours east of I-405 would extend approximately 3,500 feet farther east than under the baseline (2009) conditions. The 65 CNEL noise exposure contour resulting from aircraft using the north airfield would extend to South 2nd Avenue and from aircraft using the south airfield would extend to South Hoover Street. The increase in the area exposed to aircraft noise to the east of the airport would largely result from the increase in aircraft operations and assumed change in fleet mix from 2009 to 2025. The north airfield 65 CNEL noise exposure contour east of I-405 is also expected to extend approximately 260 feet farther north as a result of the relocation of Runway 6L/24R.

West of I-405, the Alternative 1 65 CNEL noise exposure contour would widen along the approach to the north runways as a result of the north shift in Runway 6L/24R, the increase in operations, an increase in the proportion of aircraft using the north airfield, and changing fleet mix. The 65 CNEL noise exposure contour along the approach to the south runways also widens to a lesser extent and can be attributed to the increase in operations.

The noise pattern along the departure sections to the north and south airfields would be wider under the Alternative 1 than the baseline (2009) conditions, which is attributable to the north shift in Runway 6L/25R and the larger number of departures in 2025.

70 CNEL Contour

The reasons for changes in the Alternative 1 70 CNEL noise exposure contours as compared to baseline (2009) conditions are the same as those defined above for the 65 CNEL noise exposure contour. The north airfield 70 CNEL noise exposure contour extends just beyond South Cedar Street east of I-405. The south airfield 70 CNEL noise exposure contour extends slightly beyond England Avenue. East of I-405, the 70 CNEL noise exposure contours extend beyond West Westchester Parkway on the north and to South Sycamore Avenue on the south.

75 CNEL Contour

The 75 CNEL noise exposure contours for Alternative 1 exhibit the same patterns as baseline (2009) conditions, but for the north airfield, the 75 CNEL noise exposure area shifted northward matching the relocation of Runway 6L/24R and the westward extension of Runway 6R/24L. The additional length of Runway 6L/24R allows for additional heavy aircraft departures, slightly increasing the size of the 75 CNEL noise exposure contour departure area, but the 75 CNEL noise exposure contour still remains on airport property.

Affected Noise-Sensitive Uses

Table 4.10.1-8 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 1, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-8**, the Alternative 1 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 13,160 people, 4,370 additional dwelling units, and 43 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.

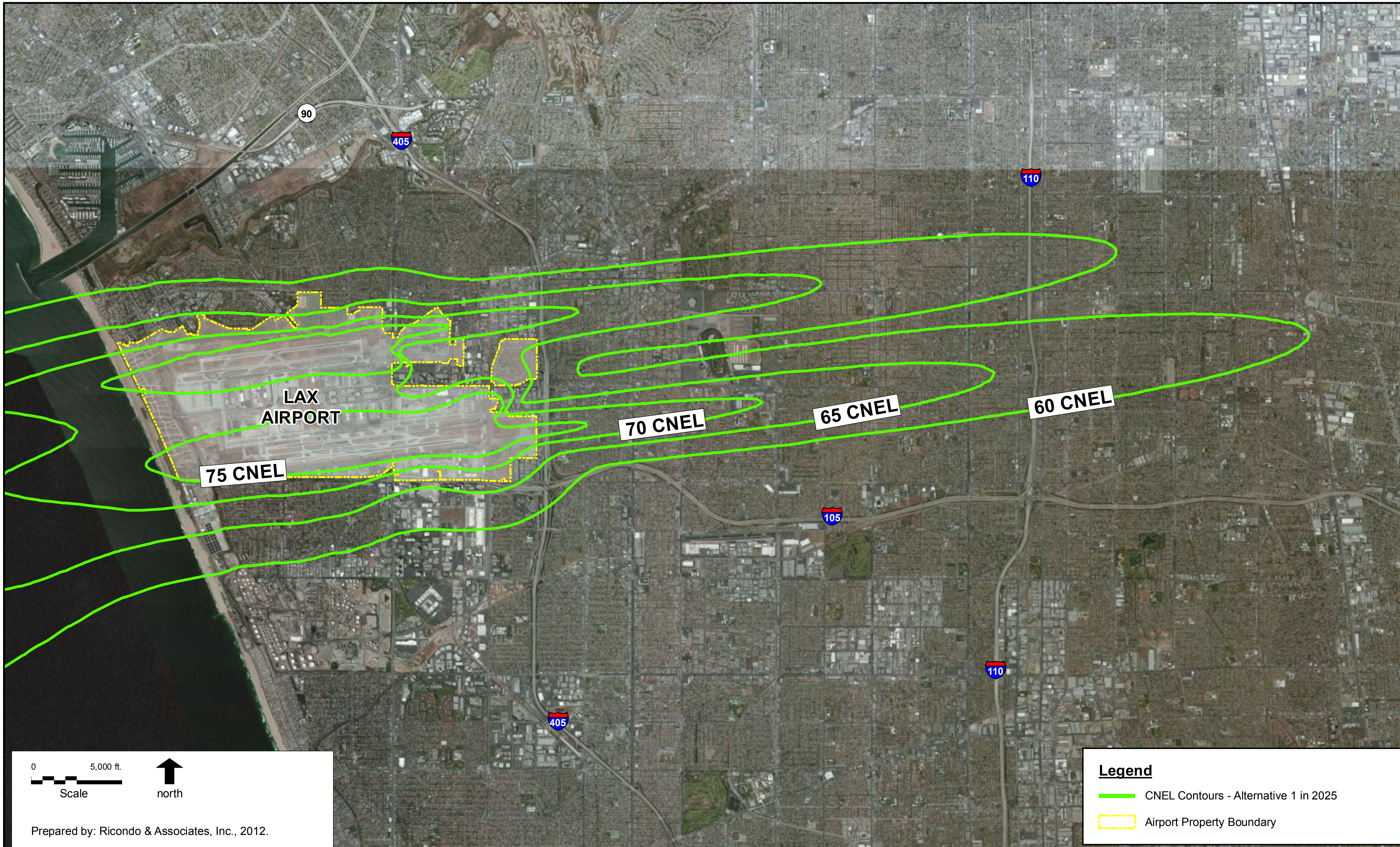
Table 4.10.1-8

**Alternative 1 Noise Exposure Effects -
Comparisons to Baseline (2009) Conditions
and to 2025 "No Additional Improvements" Conditions**

Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
Alternative 1 (2025) Noise Exposure					
65-70 CNEL	3,502	2,973	11,113	29,914	75
70-75 CNEL	2,227	930	3,409	11,186	18
75 > CNEL	2,028	99	119	498	3
65 ≥ CNEL	**7,757**	**4,002**	**14,641**	**41,598**	**96**
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	700	974	2,985	8,975	34
70-75 CNEL	306	304	1,344	4,013	7
75 > CNEL	445	50	41	172	2
65 ≥ CNEL	**1,450**	**1,329**	**4,370**	**13,160**	**43**
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions[1,2]					
65-70 CNEL	-8	14	--162	-1,047	-3
70-75 CNEL	-25	-4	-66	-176	0
75 > CNEL	45	5	-5	-21	1
65 ≥ CNEL	**12**	**15**	**-233**	**-1,244**	**-3**

1 A positive value indicates that the future alternative increases the number of impacts; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.
2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.
3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).



CNEL Contours Overview
Alternative 1 in 2025

Figure
4.10.1-14

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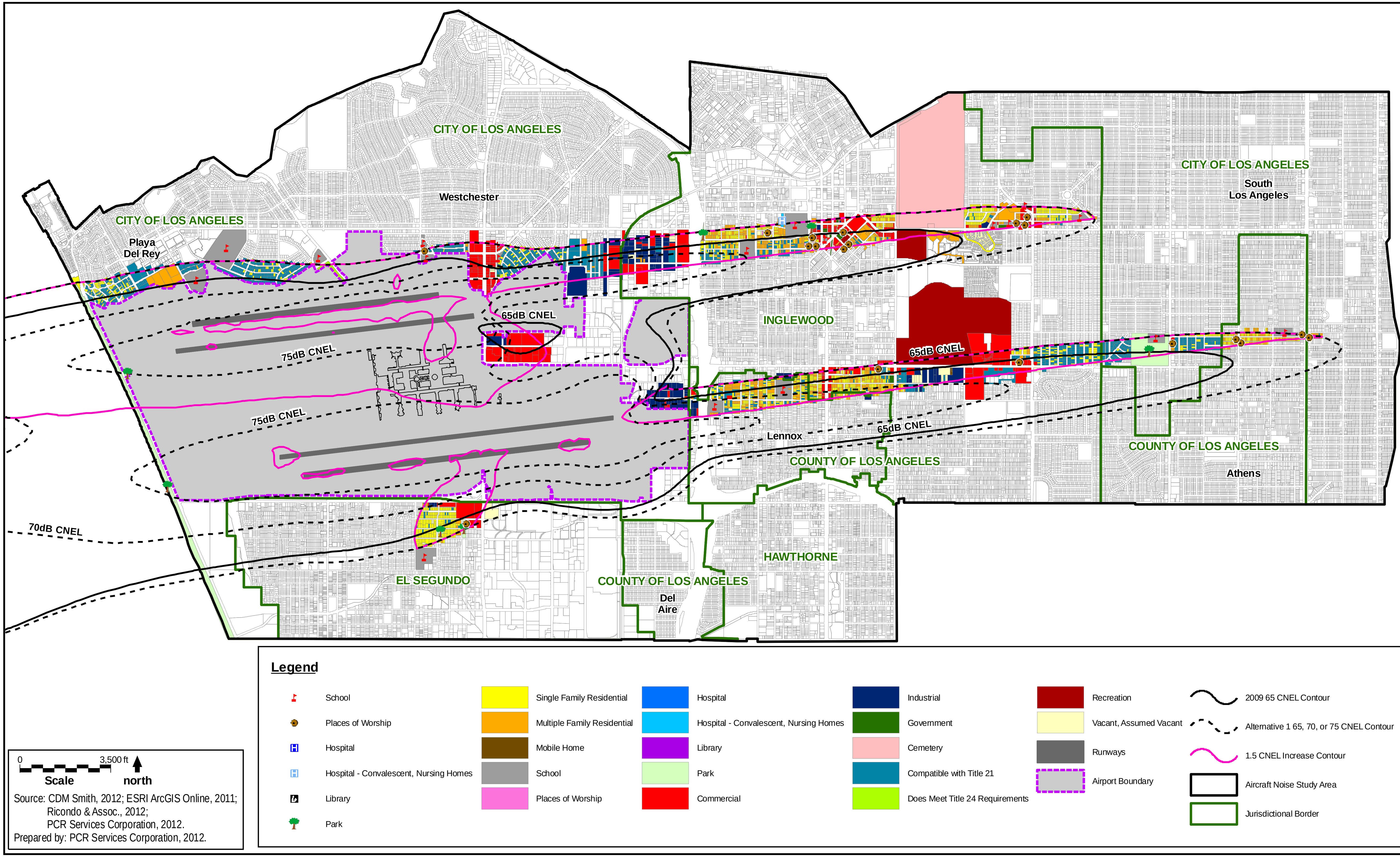

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Alternative 1 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-15

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For the purposes of the cumulative analysis, **Table 4.10.1-8** also provides a comparison between the aircraft noise exposure levels associated with Alternative 1 in 2025 and the aircraft noise exposure levels projected to occur in 2025 without additional improvements to the north airfield (i.e., "2025 'No Additional Improvements' Conditions"). The comparison between Alternative 1 (2025) to 2025 "No Additional Improvements" is used to identify the alternative's contribution to cumulative impacts. Based on that comparison, implementation of Alternative 1 would result in 1,244 fewer people, 233 fewer dwelling units, and 3 less non-residential noise-sensitive facilities being exposed to 65 CNEL or higher aircraft noise levels in 2025 than would otherwise occur with no modifications to the north airfield.

Table 4.10.1-9 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-9** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase, and therefore impacts would be significant.

Table 4.10.1-9

Significant Noise Impacts - Alternative 1
Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 1
Population	13,608
Dwelling Units	5,296
Non-Residential Noise-Sensitive Facilities	
Schools	19
Places of Worship	19
Hospitals	0
Convalescent Hospitals	1
Parks	9
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**48**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

As illustrated in **Figure 4.10.1-15**, the significant impacts would be located principally along the approach to the north and south airfield. Within this area are an estimated 5,296 dwellings and 13,608 residents, as well as 48 non-residential noise-sensitive facilities, including 19 schools, 19 places of worship, 9 parks, and 1 convalescent hospital.

While there would also be increases in existing noise levels in areas beyond the 65 CNEL contour (i.e., areas with exterior noise levels less than 65 dBA CNEL), such increases would not rise to the level of being a significant impact. Relative to cumulative impacts, **Table 4.10.1-10** discloses the population, dwellings, and non-residential noise-sensitive facilities that would, as a result of Alternative 1, experience increases of 1.5 CNEL or higher within the 65 CNEL noise exposure contour, as compared to 2025 "No Additional Improvements" Conditions. Based on that comparison, an estimated 538 dwellings and 1,127 residents, as well as 5 non-residential noise-sensitive facilities, including 2 schools, 1 place of worship, and 2 parks would be affected.

Table 4.10.1-10

Noise Impacts of Alternative 1
Compared to 2025 "No Additional Improvements" Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 1
Population	1,127
Dwelling Units	538
Non-Residential Noise-Sensitive Facilities	
Schools	2
Places of Worship	1
Hospitals	0
Convalescent Hospitals	0
Parks	2
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**5**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

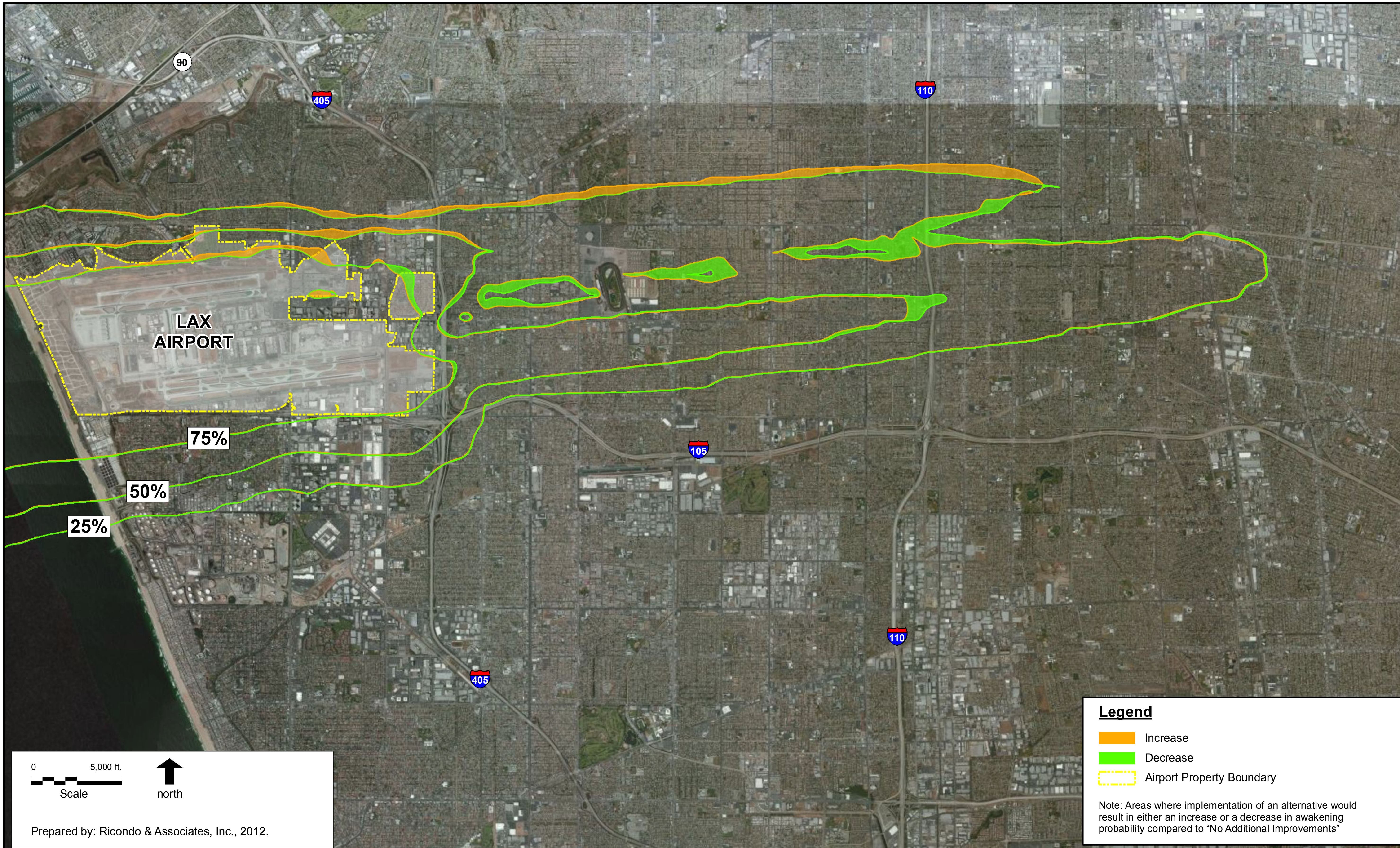
4.10.1.6.1.2 Single Event Aircraft Noise Exposure

In addition to the CNEL noise exposure contours prepared for Alternative 1, a grid point analysis of single event aircraft noise was conducted to determine potential significant impacts associated with nighttime awakenings and classroom disruption. The results are presented below.

4.10.1.6.1.2.1 Nighttime Awakenings

The analysis for Alternative 1 provides additional discussion of methodology which is also applicable to the nighttime awakenings analyses for the other alternatives.

The awakening probability contours, estimated using the ANSI method (see Section 4.10.1.2.3.1), representing a 75 percent chance, a 50 percent chance, and a 25 percent chance of awakening at least once per night for Alternative 1 at buildout in 2025 are shown in **Figure 4.10.1-16**. Also shown in **Figure 4.10.1-16** are the equivalent percentage contours estimated to occur in 2025 if no airfield improvements were implemented (i.e., 2025 Without Alternative). Specifically, where the probability of awakening contour associated with aircraft operations under Alternative 1 extends beyond the equivalent contour associated with operations under the existing airfield configuration, the difference area (i.e., the area between the two contours) shaded in yellow represents an increase in the probability of awakening. Conversely, where the probability of awakening contour associated with Alternative 1 contracts and does not extend as far as the equivalent contour associated with the existing airfield configuration, the difference area shaded in green represents a decrease in the probability of awakening. The depiction of contours for the three different probabilities of awakenings (75 percent, 50 percent, and 25 percent) is intended to provide an overall indication of generally where and how the probability of sleep awakenings would change with implementation of Alternative 1. Changes in the intervening areas (i.e., areas beyond and between the 75 percent and 50 percent contours, and beyond and between the 50 percent and 25 percent contours) would generally follow the same trends as shown in **Figure 4.10.1-16**. While the color shading shown in **Figure 4.10.1-16** delineates the contribution of Alternative 1 to change in the cumulative probability of awakening, the general nature, direction, and change in the probability of awakenings shown in the figure is also generally representative of the changes that would occur under Alternative 1 to the 2009 contours shown in **Figure 4.10.1-13**.



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ANSI Awakening Probability Contours:
Alternative 1 Compared to 2025 "No Additional Improvements" Conditions

Figure
4.10.1-16

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As shown in **Figure 4.10.1-16**, there would be a slight increase in the probability of awakenings in areas towards the north, decreases in the probability of awakenings in the central areas east of the airport along the flight paths between the north airfield and the south airfield, and a negligible change in the probability of awakenings in areas towards the southeast and south. **Table 4.10.1-11** indicates the project's contribution to cumulative changes in affected population within each of the three probability of awakenings contours under Alternative 1. The changes shown in the table represent the populations that would occur within each probability contour with implementation of the airfield improvements proposed under Alternative 1 compared to the populations that would otherwise be within each probability contour if there were no airfield improvements (i.e., 2025 With Alternative vs. 2025 Without Alternative). That latter population, against which the alternative's impact is measured, includes 6,074 people within the 75 percent probability contour, 69,429 people within the 50 percent probability contour, and 260,088 people within the 25 percent probability contour. **Table 4.10.1-11** shows an overall net decrease in population within the three probability contours evaluated.

Table 4.10.1-11

Alternative 1's Contribution to the Cumulative Change in Affected Population for 75 Percent, 50 Percent, and 25 Percent Probability of Awakening At Least Once - Alternative 1 Compared to 2025 "No Additional Runway Improvements"

	Probability of Awakening at Least Once During the Night			
Alternative 1	**75%**	**50%**	**25%**	**Average**
Change in Affected Population - Increase or (Decrease)	(210)	(984)	(5,843)	
Percent Change in Affected Population - Increase or (Decrease)	(3.46%)	(1.42%)	(2.25%)	(2.37%)

Note:

Numbers in parentheses () are negative (i.e., a decrease in affected population).

Source: Ricondo & Associates, 2012.

Based on the information presented above, implementation of Alternative 1 would not result in a substantial increase in the probability of nighttime awakenings under the project level and cumulative analyses; therefore, the impact would be less than significant and the project's contribution to cumulative impacts would not be cumulatively considerable (i.e., less than significant).

4.10.1.6.1.2.2 Classroom Disruption

Baseline (2009) conditions related to school facilities and classroom disruption is provided in **Tables 4.10.1-4**, **4.10.1-5**, and **4.10.1-6**. The numbers of schools that would exceed the thresholds of significance for classroom disruption, as defined in Section 4.10.1.4.3, under Alternative 1 are presented in **Table 4.10.1-12**. Under Alternative 1, as compared to baseline (2009) conditions, one additional school is projected to be newly exposed at the 55 interior dBA (L_{max}), which relates to momentary disruption of speech intelligibility, and the overall number of individual noise events at schools would increase. **Table 4.10.1-13** provides the names and locations of the schools that would be exposed to single noise events above 55 interior dBA. The school identified in bold text, Jefferson Elementary School, would be newly exposed to average number of daily events and duration above 55 interior dBA, as compared to baseline (2009) conditions, and impacts would therefore be significant.

Table 4.10.1-12

**Schools Exposed to Single Event Noise Levels -
Alternative 1 Compared to Baseline (2009) Conditions**

Impact Category	Alternative 1 Exposed	Compared to Baseline (2009) Conditions: Net Change	Newly Exposed - Impacted
Exposure ≥ 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	2	0	0
Average Number of Events/School	32	6	N/A
Average Seconds/Event	2	0	N/A
Exposure ≥ 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure ≥ 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	20	7	7
Number of Private Schools	10	1	1

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

Table 4.10.1-13

**Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels -
Alternative 1 During the Average School Day (8:00 a.m. - 4:00 p.m.)**

Grid ID	School	X Coord	Y Coord	Alternative 1: TA-84	Events	Avg. D
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	27.7	1.5
PBS035	Felton Elementary School	1.2997	-0.0854	1.7	57.2	1.8
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.9	23.2	2.3
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.7**	**27.5**	**1.5**
PBS105	Oak Street Elementary School	1.2636	0.7715	1.1	25.2	2.6
PBS114	Animo Leadership High School	0.8325	0.6503	0.2	22.8	0.5
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.2	57.2	2.3
	Private Schools					
PVS051	Inglewood Christian School	1.9923	0.9699	0.2	6.4	1.9
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.9	37.9	3.0

Notes:

TA-84 = Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels (L_{max}), which equates to an interior noise level of 55 dBA (L_{max}) at indicated school.
Events = number of events to which the site is exposed on an average annual school day that exceed 84 dBA (L_{max}).
Avg. D = average duration of each event in seconds during the average annual school day that exceeds 84 dBA (L_{max}).
School(s) identified in bold text would be newly exposed to significant impacts.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

No schools would be newly exposed above 65 interior dBA (L_{max}) speech interference Levels under Alternative 1.

The assessment of the number of schools that would experience interior dBA $L_{eq(h)}$ levels equal to or higher than 35 dBA $L_{eq(h)}$ in the classroom indicates that under Alternative 1, seven public schools and one private school would be newly exposed to this level as compared to baseline (2009) conditions. **Table 4.10.1-14** provides the names and locations of the schools that would be exposed to noise levels above 35 $L_{eq(h)}$, and therefore impacts would be significant.

Table 4.10.1-14

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 1 During the Average School Day (8:00 a.m. - 4:00 p.m.)

				8 Hour L_{eq} Values[1]
Grid ID	**School**	**X Coord**	**Y Coord**	**Alternative 1**
	Public Schools			
PBS009	95th Street Preparatory School	4.9156	0.4002	35.1
PBS050	Inglewood High School	1.809	1.0683	36.6
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.84	0.3486	35.3
PBS101	Manhattan Place Elementary School	4.1002	0.3601	35.6
PBS107	Paseo del Rey Magnet School	-2.0558	0.8652	35
PBS201	Albert Monroe Middle School	3.2061	-0.1862	35.2
PBS215	Wish Charter Elementary	-0.0775	0.853	38.3
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	34

1 Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

4.10.1.6.2 Alternative 2

The improvements to the north airfield under Alternative 2, albeit minimal, operating in conjunction with the existing configuration of the south airfield, along with the forecasted growth in activity at LAX by 2025 would change the airport's 2009 noise exposure pattern. The following considerations contributing to the noise exposure pattern for Alternative 2 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would shrink slightly in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Relocation of high-speed exits for landings on Runway 6L/24R.
- Extension of Runway 24L end to the east 1,250 feet.
- An anticipated shift of 15 percent of the small wide-body aircraft operations from the south airfield to the north airfield due to the extension of Runway 24L.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.

- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.
- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.
- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet MSL. With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The first two of these factors would result in a general increase in the overall size of the Alternative 2 noise exposure contour in 2025, as compared to 2009 conditions, because more total noise energy would be generated within the airport environs on an average day with an increase in aircraft operations, and particularly heavy jet aircraft operations. The relocation of the two runway exits for landings on Runway 24R would provide additional exits for heavy aircraft to use when landing on Runway 24R, as the current locations of the exits preclude heavy aircraft from using them. This change is not expected to increase the overall size of the CNEL noise exposure contours, because aircraft would be able to exit with reduced reverse thrust. The Runway 24L extension of 1,250 feet to the east is expected to move start-of-takeoff roll noise levels to the northwest and northeast behind the runway end, and slightly increase due to the additional small wide-body departures from Runway 24L. With the extension, the enhanced balance of small wide-body aircraft departures between the south and north airfields is expected to decrease start-of-takeoff roll noise from Runway 25R to the east.

Figure 4.10.1-17 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 2 in 2025.

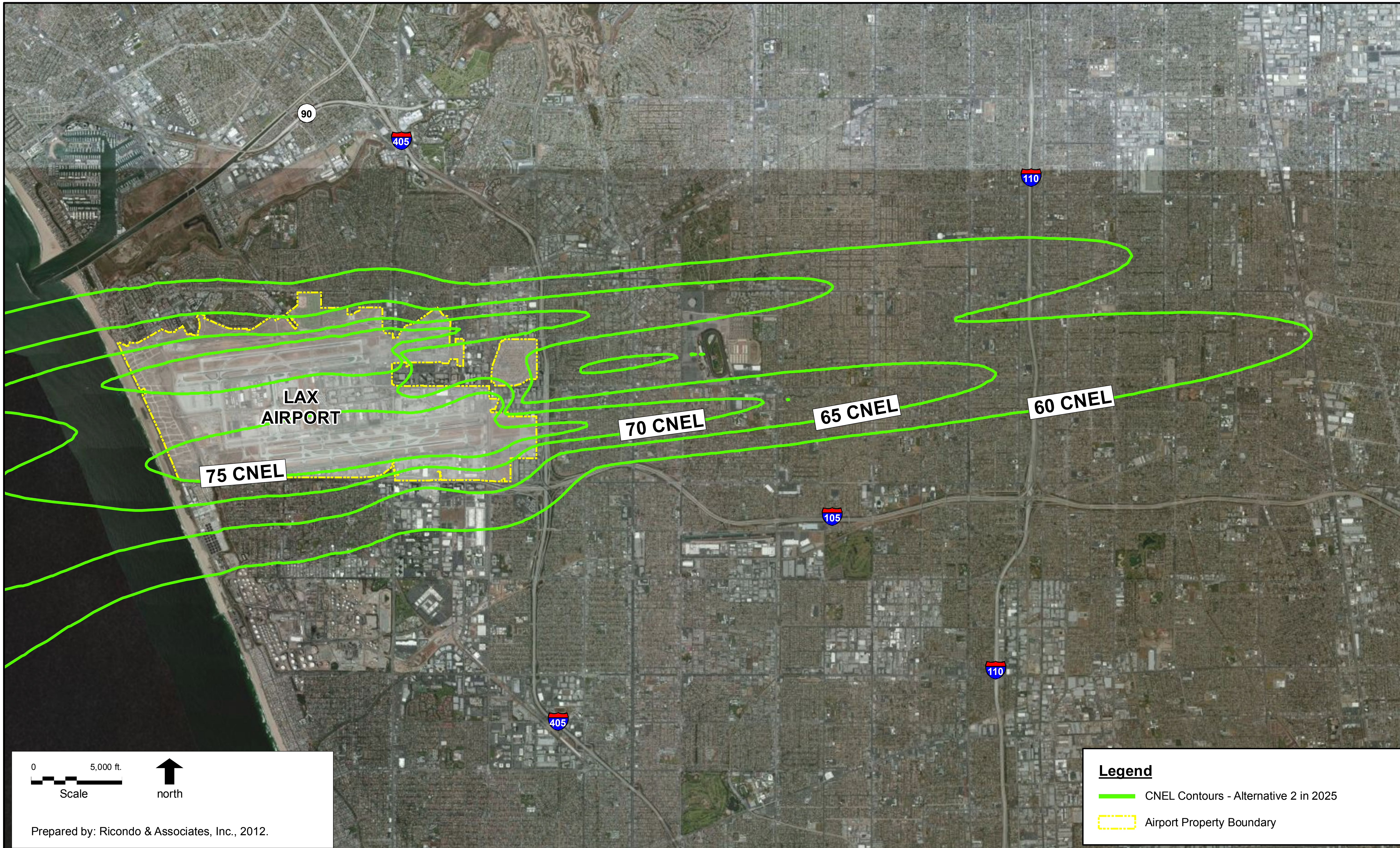
4.10.1.6.2.1 Comparison of Alternative 2 Aircraft Noise and Baseline (2009) Conditions

Changes in noise exposure under Alternative 2 in comparison to baseline (2009) conditions are depicted in **Figure 4.10.1-18**. The area depicted by the magenta line indicates areas newly exposed to increases larger than 1.5 decibels and above 65 CNEL dBA. The most notable change from the baseline (2009) conditions to Alternative 2 conditions is attributable to the projected growth in aircraft activity from 2009 to 2025. As the number of aircraft operations grows, it is expected that the area exposed to significant levels of aircraft noise will grow as well. While the noise exposure contours for Alternative 2 are larger in comparison to baseline (2009) conditions, the overall shape of the contours remains similar.

The following provides a geographic description of the Alternative 2 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

The Alternative 2 65 CNEL noise exposure contour east of the airport is associated with the approach to the south airfield and would extend 3,500 feet farther east than under the baseline (2009) conditions (see **Figure 4.10.1-18**). The Alternative 2 65 CNEL noise exposure contour associated with the approach to the north airfield would extend approximately 4,000 feet farther east compared to the baseline (2009) conditions. The future 65 CNEL noise exposure contour extensions to the east of I-405 would widen in comparison to baseline (2009) conditions, while west of I-405, the 2025 Alternative 2 noise exposure contour would increase between approximately 200 to 700 feet in all directions as compared to baseline (2009) conditions.



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CNEL Contours Overview
Alternative 2 in 2025

Figure
4.10.1-17

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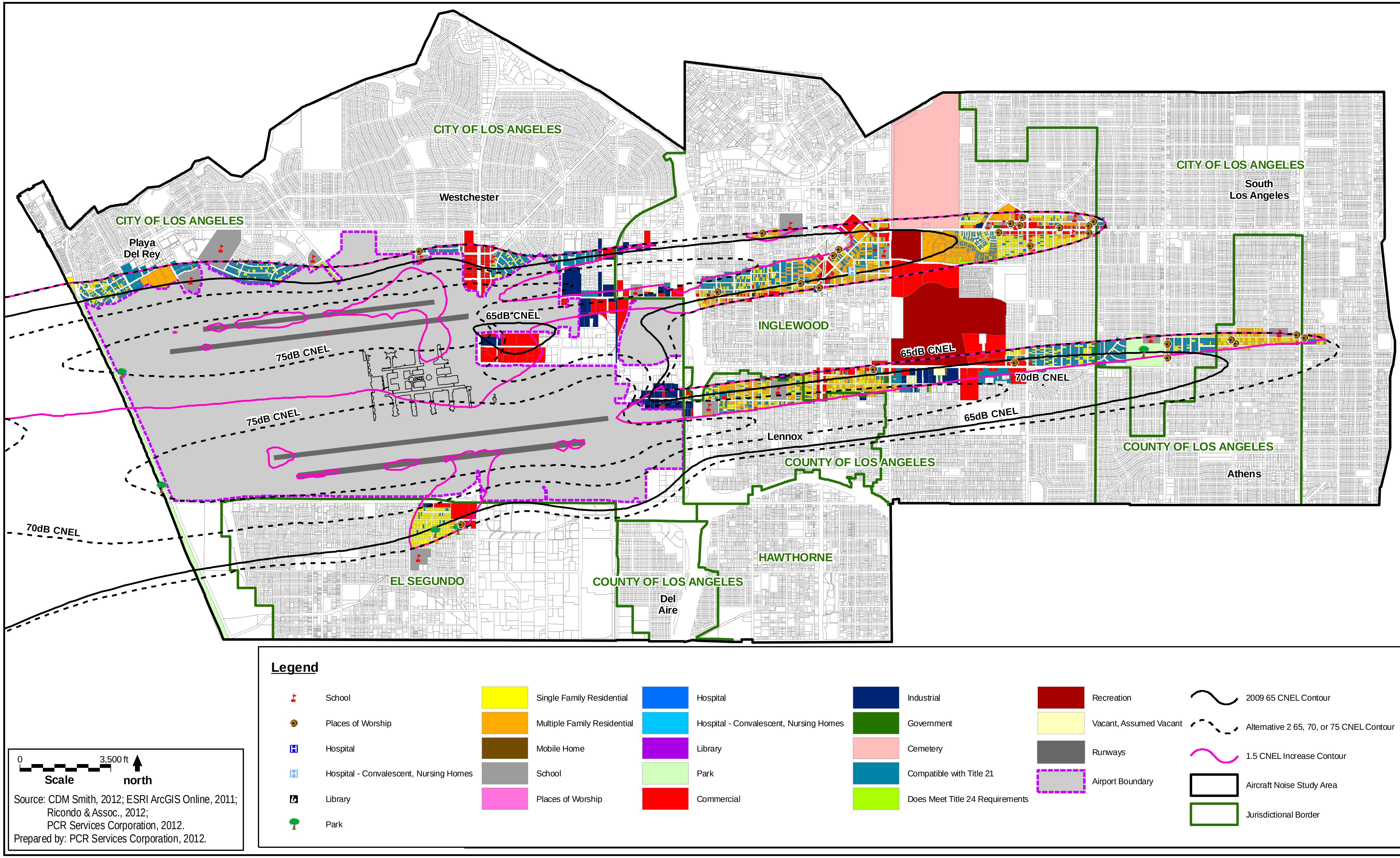

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Alternative 2 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-18

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70 CNEL Contour

The Alternative 2 70 CNEL noise exposure contour associated with the approach to the north airfield extends beyond I-405, (ending just beyond Inglewood Avenue) an additional 3,000 feet in comparison to baseline (2009) conditions, and the portion of the noise exposure contour associated with approaches to the south airfield extend an additional 3,500 feet in comparison to baseline (2009) conditions (ending at Woodworth Avenue).

75 CNEL Contour

The Alternative 2 75 CNEL noise exposure contour remains located primarily on airport property and to the west, extends just beyond the coastline. To the east, the portion of the 75 CNEL noise exposure contour associated with approaches to the north airfield extends approximately 400 feet beyond Airport Boulevard, while the portion of the 75 CNEL noise exposure contour associated with approaches to the south airfield ends in the vicinity of Inglewood Avenue, extending approximately 1,200 feet beyond the comparable contour under baseline (2009) conditions.

Overall, the 65+ CNEL noise exposure contours would expand under the Alternative 2 in comparison to baseline (2009) conditions, which is primarily attributable to the projected growth in aircraft activity from 2009 to 2025. The overall shape of the contours remains similar to baseline (2009) conditions, as there would be no notable modifications to the runway locations.

Affected Noise-Sensitive Uses

Table 4.10.1-15 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 2, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-15**, the Alternative 2 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 14,039 people, 4,531 additional dwelling units, and 44 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.

Table 4.10.1-15

Alternative 2 Noise Exposure Effects -
Comparisons to Baseline (2009) Conditions and to 2025 "No Additional Improvements" Conditions

Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise Sensitive Facilities
Alternative 2 (2025) Noise Exposure					
65-70 CNEL	3,498	2,958	11,253	30,719	77
70-75 CNEL	2,267	942	3,430	11,260	17
75 > CNEL	1,992	97	119	498	3
65 ≥ CNEL	**7,757**	**3,998**	**14,802**	**42,477**	**97**
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	695	959	3,125	9,780	36
70-75 CNEL	346	317	1,365	4,087	6
75 > CNEL	409	48	41	172	2
65 ≥ CNEL	**1,450**	**1,324**	**4,531**	**14,039**	**44**
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions[1,2]					
65-70 CNEL	-13	0	-22	-242	-1
70-75 CNEL	16	9	-45	-102	-1
75 > CNEL	9	2	-5	-21	0
65 ≥ CNEL	**12**	**11**	**-72**	**-365**	**-2**

1 A positive value indicates that the future alternative increases the number of impacts over the baseline (2009) conditions; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.

2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.

3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

For the purposes of the cumulative analysis, **Table 4.10.1-15** also provides a comparison between the aircraft noise exposure levels associated with Alternative 2 in 2025 and the aircraft noise exposure levels projected to occur in 2025 without improvements to the north airfield (i.e., "2025 'No Additional Improvements' Conditions"). The comparison between Alternative 2 (2025) to 2025 "No Additional Improvements" is used to identify the alternative's contribution to cumulative impacts. Based on that comparison, implementation of Alternative 2 would result in 365 fewer people, 72 fewer dwelling units, and 2 less non-residential noise-sensitive facilities being exposed to 65 CNEL or higher aircraft noise levels in 2025 than would otherwise occur with no modifications to the north airfield.

Table 4.10.1-16 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-16** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase, and therefore impacts would be significant.

Table 4.10.1-16

Significant Noise Impacts - Alternative 2
Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 2
Population	18,035
Dwelling Units	6,797
Non-Residential Noise-Sensitive Facilities	
Schools	20
Places of Worship	25
Hospitals	0
Convalescent Hospitals	1
Parks	7
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**53**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

As illustrated in **Figure 4.10.1-18**, the significant impacts would be located principally along the approach to the north and south airfield. Within this area are an estimated 6,797 dwellings and 18,035 residents, as well as 53 non-residential noise-sensitive facilities, including 20 schools, 25 places of worship, 7 parks, and 1 convalescent hospital.

While there would also be increases in existing noise levels in areas beyond the 65 CNEL contour (i.e., areas with exterior noise levels less than 65 dBA CNEL), such increases would not rise to the level of being a significant impact. Relative to cumulative impacts, **Table 4.10.1-17** discloses the population, dwellings, and non-residential noise-sensitive facilities that would, as a result of Alternative 2, experience increases of 1.5 CNEL or higher within the 65 CNEL noise exposure contour, as compared to 2025 "No Additional Improvements" Conditions. Based on that comparison, there would be no change in the population, dwelling units, or non-residential noise-sensitive parcels exposed.

Table 4.10.1-17

Noise Impacts of Alternative 2
Compared to 2025 "No Additional Improvements" Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 2
Population	0
Dwelling Units	0
Non-Residential Noise-Sensitive Facilities	
Schools	0
Places of Worship	0
Hospitals	0
Convalescent Hospitals	0
Parks	0
Libraries	
Total Non-Residential Noise-Sensitive Facilities	**0**

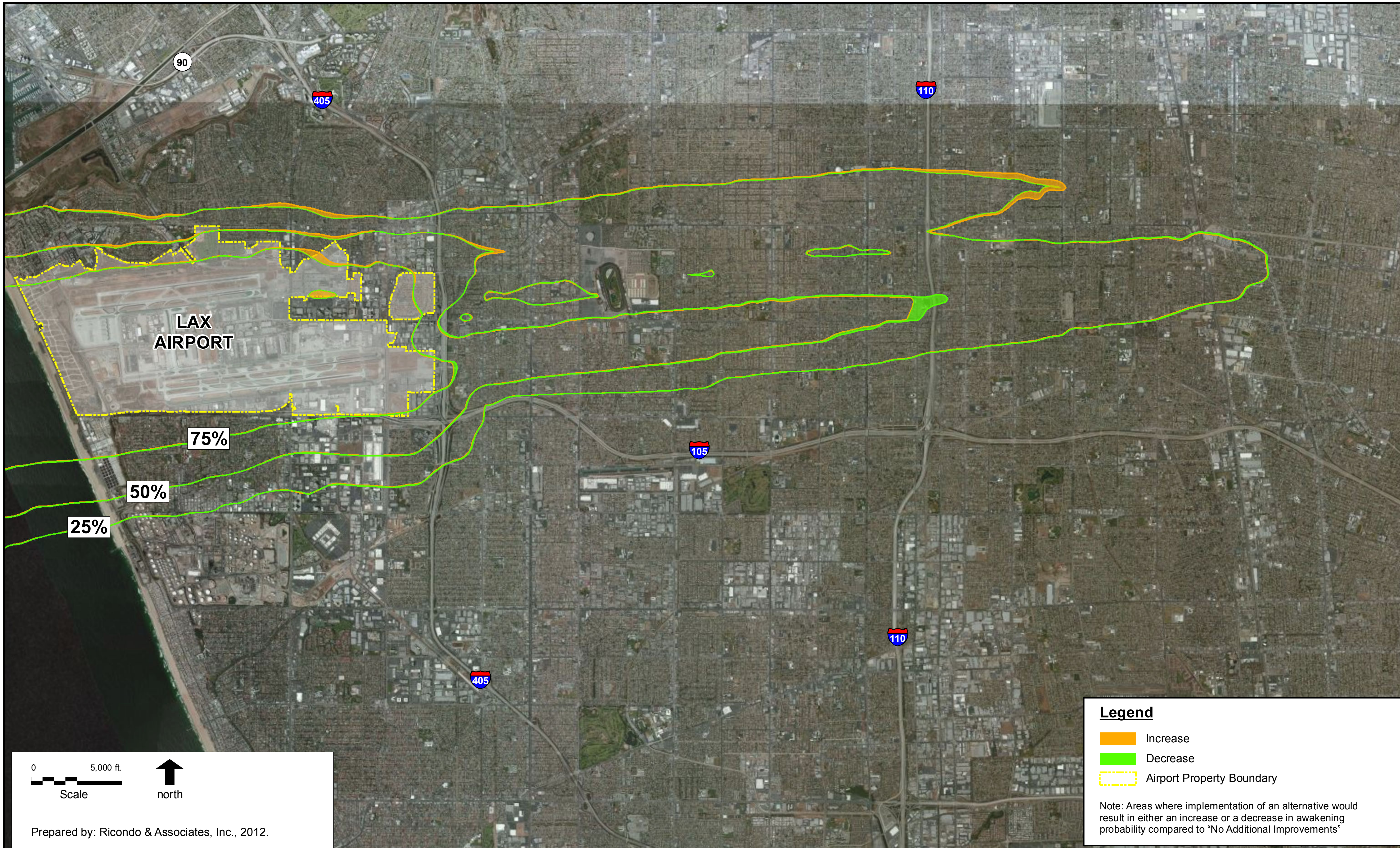
Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

4.10.1.6.2.2 Single Event Aircraft Noise Exposure

In addition to the CNEL noise exposure contours prepared for Alternative 2, a grid point analysis of single event aircraft noise was conducted to determine potential significant impacts associated with nighttime awakenings and classroom disruption. The results are presented below.

4.10.1.6.2.2.1 Nighttime Awakenings

The awakening probability contours, estimated using the ANSI method, representing a 75 percent chance, a 50 percent chance, and a 25 percent chance of awakening at least once per night for Alternative 2 at buildout in 2025 are shown in **Figure 4.10.1-19**. Also shown in **Figure 4.10.1-19** are the equivalent percentage contours estimated to occur in 2025 if no airfield improvements were implemented (i.e., 2025 Without Alternative), and the difference areas specific to each contour (i.e., shaded areas indicate the contribution of Alternative 2 to cumulative impacts associated with changes in the probability of awakenings). Changes in the intervening areas (i.e., areas beyond and between the 75 percent and 50 percent contours, and beyond and between the 50 percent and 25 percent contours) would generally follow the same trends as shown in **Figure 4.10.1-19**. While the color shading shown in **Figure 4.10.1-19** delineates the contribution of Alternative 2 to change in the cumulative probability of awakening, the general nature, direction, and change in the probability of awakenings shown in the figure is also generally representative of the changes that would occur under Alternative 2 to the 2009 contours shown in **Figure 4.10.1-13**.



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ANSI Awakening Probability Contours:
Alternative 2 Compared to 2025 "No Additional Improvements" Conditions

Figure
4.10.1-19

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As shown in **Figure 4.10.1-19**, there would be slight increases in the probability of awakenings for some areas to the north and northeast, decreases in the probability of awakenings to the east along the flight paths associated with the south airfield, and negligible changes to the southeast and south.[586] **Table 4.10.1-18** indicates the project's contribution to cumulative changes in affected population within each of the three probability of awakenings contours under Alternative 2. The changes shown in the table represent the populations that would occur within each probability contour with implementation of the airfield improvements proposed under Alternative 2 compared to the populations that would otherwise be within each probability contour if there were no airfield improvements (i.e., 2025 With Alternative vs. 2025 Without Alternative). That latter population, against which the alternative's impact is measured, includes 6,074 people within the 75 percent probability contour, 69,429 people within the 50 percent probability contour, and 260,088 people within the 25 percent probability contour. **Table 4.10.1-18** shows for Alternative 2 a slight (1.2 percent) overall net increase in population within the three probability contours evaluated.

Table 4.10.1-18

Alternative 2's Contribution to the Cumulative Change in Affected Population for 75 Percent, 50 Percent, and 25 Percent Probability of Awakening At Least Once - Alternative 2 Compared to 2025 "No Additional Runway Improvements"

	Probability of Awakening at Least Once During the Night			
Alternative 2	**75%**	**50%**	**25%**	**Average**
Change in Affected Population - Increase or (Decrease)	194	(390)	2,740	
Percent Change in Affected Population - Increase or (Decrease)	3.19%	(0.56%)	1.05%	1.23%

Note:

Numbers in parentheses () are negative (i.e., a decrease in affected population).

Source: Ricondo & Associates, 2012.

Based on the information presented above, implementation of Alternative 2 would not result in a substantial increase in the probability of nighttime awakenings under the project level and cumulative analyses; therefore, the impact would be less than significant and the project's contribution to cumulative impacts would not be cumulatively considerable (i.e., less than significant).

4.10.1.6.2.2.2 Classroom Disruption

Baseline (2009) conditions related to school facilities and classroom disruption is provided in **Tables 4.10.1-4**, **4.10.1-5**, and **4.10.1-6**. The numbers of schools that would exceed the thresholds of significance for classroom disruption, as defined in Section 4.10.1.4.3, under Alternative 2 are presented in **Table 4.10.1-19**.

[586] Although Alternative 2 would not relocate either Runway 6L/24R or Runway 6R/24L and does not include a centerfield parallel taxiway, it would include the eastward extension of Runway 6R/24L by 1,250 feet. This would result in a shift of some operations from the south airfield to the north airfield, which would contribute to changes in probabilities of awakening.

Table 4.10.1-19

Schools Exposed to Single Event Noise Levels -
Alternative 2 Compared to Baseline (2009) Conditions

Impact Category	Alternative 2 Exposed	Compared to Baseline (2009) Conditions	
		Net Change	Newly Exposed - Impacted
Exposure ≥ 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	1	-1	0
Average Number of Events/School	40	14	N/A
Average Seconds/Event	2	0	N/A
Exposure ≥ 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure ≥ 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	20	7	7
Number of Private Schools	11	2	2

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

Although under Alternative 2 the same total number of schools would have classrooms exposed to interior L_{max} noise levels above 55 dBA as compared to baseline (2009) conditions, this alternative would result in one public school being newly exposed and one private school no longer exposed. **Table 4.10.1-20** provides the names and locations of the schools that would be exposed to single noise events above 55 interior dBA. The school identified in bold text, Jefferson Elementary School, would be newly exposed to average number of daily events and duration above 55 interior dBA, as compared to baseline (2009) conditions, and impacts would therefore be significant.

Table 4.10.1-20

Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels - Alternative 2 During the Average School Day (8:00 a.m. - 4:00 p.m.)

				Alternative 2		
Grid ID	School	X Coord	Y Coord	TA-84	Events	Avg. D
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	27.8	1.5
PBS035	Felton Elementary School	1.2997	-0.0854	1.7	57.4	1.8
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.4	8.3	2.9
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.7**	**27.7**	**1.5**
PBS105	Oak Street Elementary School	1.2636	0.7715	1.6	46.7	2.1
PBS114	Animo Leadership High School	0.8325	0.6503	1.6	54.1	1.8
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.3	57.4	2.4
	Private Schools					
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.9	38.0	3.0

Notes:

TA-84 = Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels (L_{max}), which equates to an interior noise level of 55 dBA (L_{max}) at indicated school.
Events = number of events to which the site is exposed on an average annual school day that exceed 84 dBA (L_{max}).
Avg. D = average duration of each event in seconds during the average annual school day that exceeds 84 dBA (L_{max}).
School(s) identified in bold text would be newly exposed to significant impacts.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

No schools would be newly exposed above 65 interior dBA (L_{max}) speech interference Levels under Alternative 2.

The assessment of the number of schools that would experience interior dBA $L_{eq(h)}$ levels equal to or higher than 35 dBA $L_{eq(h)}$ in the classroom indicates that under Alternative 2, nine additional schools would be affected in comparison to baseline (2009) conditions. **Table 4.10.1-21** provides the names and locations of the schools that would be exposed to noise levels above 35 $L_{eq(h)}$.

Table 4.10.1-21

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 2 During the Average School Day (8:00 a.m. - 4:00 p.m.)

				8 Hour L_{eq} Values[1]
Grid ID	School	X Coord	Y Coord	Alternative 2
	Public Schools			
PBS009	95th Street Preparatory School	4.9156	0.4002	35.2
PBS050	Inglewood High School	1.809	1.0683	35.2
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.84	0.3486	35.5
PBS101	Manhattan Place Elementary School	4.1002	0.3601	35.6
PBS107	Paseo del Rey Magnet School	-2.0558	0.8652	35
PBS201	Albert Monroe Middle School	3.2061	-0.1862	35.2
PBS215	Wish Charter Elementary	-0.0775	0.853	37.4
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	35.3
PVS070	Wiz Child Development Center	1.8439	0.6266	35.6

1 Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

4.10.1.6.3 Alternative 3

The improvements to the north airfield under Alternative 3, operating in conjunction with the existing configuration of the south airfield, along with the forecasted growth in activity at LAX by 2025 would change the airport's noise exposure pattern compared to the 2009 condition. The following considerations contributing to the noise exposure pattern for Alternative 3 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would be reduced in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Runway 6L/24R would remain at its present location and alignment, but would be lengthened to 10,420 feet through the addition of 1,495 feet on the west end, and be widened to 200 feet. These improvements would continue to allow it to be used primarily as an arrival runway during both east and west traffic flows, although it would accommodate some departures during peak departure periods or during closure of other runways for maintenance or construction.
- Runway 6R/24L would be relocated 340 feet south of its present alignment and extended 1,280 feet to the east and 135 feet to the west to achieve a total length of 11,700 feet. These improvements would continue to allow the runway to be used primarily as a departure runway during both east and west traffic flows, although it would accommodate some landings during peak arrival periods or during closure of other runways for maintenance or construction. This extension would also accommodate heavy wide-body aircraft and enhance the balance of all wide-body departures between the north and south airfield.

- An anticipated shift of 12 percent of all of the wide-body aircraft operations from the south airfield to the north airfield, due to the extension of Runway 24L with the intent to enhance the balance of operations between the two airfields to accommodate forested operational demand levels.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.
- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.
- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.
- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet MSL. With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The projected increase in the absolute number of average day operations and the increase of the size of aircraft projected to operate at the airport would result in a change in the area exposed to aircraft noise. Due to the increase in operations, greater total noise energy levels would be generated in 2025 as compared to 2009 conditions, resulting in an increase in the total area exposed to 65 CNEL or higher levels of aircraft noise. The relocation of Runway 24L to the south would cause the south side of the noise exposure contour to widen east of the north runway by the amount of the shift, whereas the retention of Runway 24R on its present alignment would cause the north edge of the approach noise exposure contour to remain virtually unchanged from its current position. The noise exposure contour near La Tijera and Manchester Boulevards would shift slightly east with the relocation of the east end of Runway 24L to the east, reflecting the start-of-takeoff thrust from that location.

Figure 4.10.1-20 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 3 in 2025.

4.10.1.6.3.1 Comparison of Alternative 3 Aircraft Noise and Baseline (2009) Conditions

Changes in noise exposure under Alternative 3 in comparison to baseline (2009) conditions are depicted in **Figure 4.10.1-21**. The area depicted by the magenta line indicates areas newly exposed to increases larger than 1.5 decibels and above 65 CNEL dBA. The most notable changes from the baseline (2009) conditions would occur along the portion of the noise exposure contours associated with the approach to the north airfield. The relocation of Runway 6R/24L to the south under Alternative 3 would resulting in a widening of the contour associated with operations using the north airfield. The departure noise from Runway 6R/24L is expected to decrease north of the airport due to the runway's relocation to the south. Although, the forecasted operational growth is the primary cause for the notable change from baseline (2009) conditions, the relocation of Runway 6R/24L 340 feet to the south does contribute to the change, but only to the south side along the departure area adjacent to Runway 6R/24L.

The following provides a geographic description of the Alternative 3 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

Due to imbalances in the gating of the airfield (i.e., under Alternative 3, a greater number of gates would be located on the south side of the Central Terminal Area (CTA) than on the north side), the north airfield would be better able to handle arrivals, as the south airfield has increased departures. Increased use of the north airfield for landings would extend the portion of the 65 CNEL noise exposure contour associated with the forecasted growth in operations and approaches to the north airfield by approximately 6,000 feet (to the east) in comparison to baseline (2009) conditions (see **Figure 4.10.1-21**). The portion of the noise exposure contour associated with approaches to the south airfield would be extended by 1,500 feet under Alternative 3 in comparison to baseline (2009) conditions, primarily attributed to the forecasted growth in the number of operations anticipated to occur by 2025, for all future scenarios, compared to 2009. The baseline (2009) conditions 65 CNEL noise exposure contour near La Tijera and Manchester Boulevards would shift east under Alternative 3 with the relocation of the east end of Runway 24L to the east, primarily attributed to start-of-takeoff roll thrust of aircraft departing Runway 24L.

70 CNEL Contour

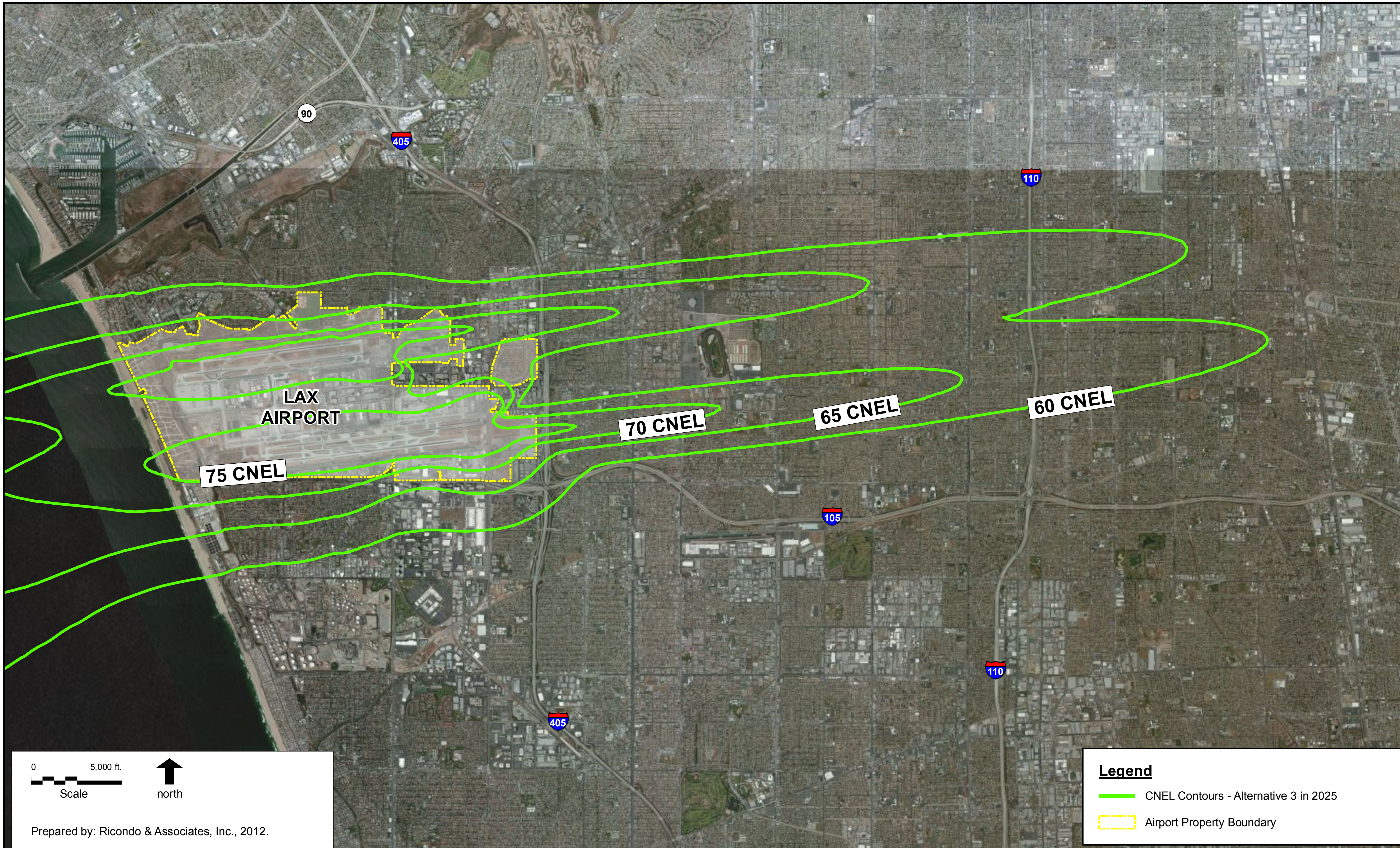
The approach 70 CNEL noise exposure contour portion associated with the north airfield extends beyond the end point of the baseline (2009) conditions contour ending just prior to South Grevillea Avenue. The north approach 70 CNEL noise exposure contour portion nearly doubles in width until it reaches the boundaries of the airport. The south airfield approach 70 CNEL noise exposure contour portion grows at a reduced rate, extending approximately 1,000 feet beyond the baseline (2009) conditions contour. Adjacent to the airport, the 70 CNEL noise exposure contours remain on airport property to the north and extends as far south as W. Sycamore Street, approximately 300 feet beyond the baseline (2009) conditions noise exposure contour. This is primarily due to the forecasted growth in operations compared to the baseline (2009) conditions.

75 CNEL Contour

The 75 CNEL noise exposure contour exhibits the same patterns associated with both the 65 and 70 CNEL noise exposure contours. To the south, the 75 CNEL noise exposure contour parallels Imperial Highway, beginning at the approach end of Runway 25L and continuing to the coast. The north airfield approach 75 CNEL noise exposure contour portion extends approximately 1,000 feet beyond the baseline (2009) conditions 75 CNEL noise exposure contour portion, ending near Reading Avenue.

Affected Noise-Sensitive Uses

Table 4.10.1-22 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 3, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-22**, the Alternative 3 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 13,156 people, 4,508 additional dwelling units, and 45 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.



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CNEL Contours Overview
Alternative 3 in 2025

Figure
4.10.1-20

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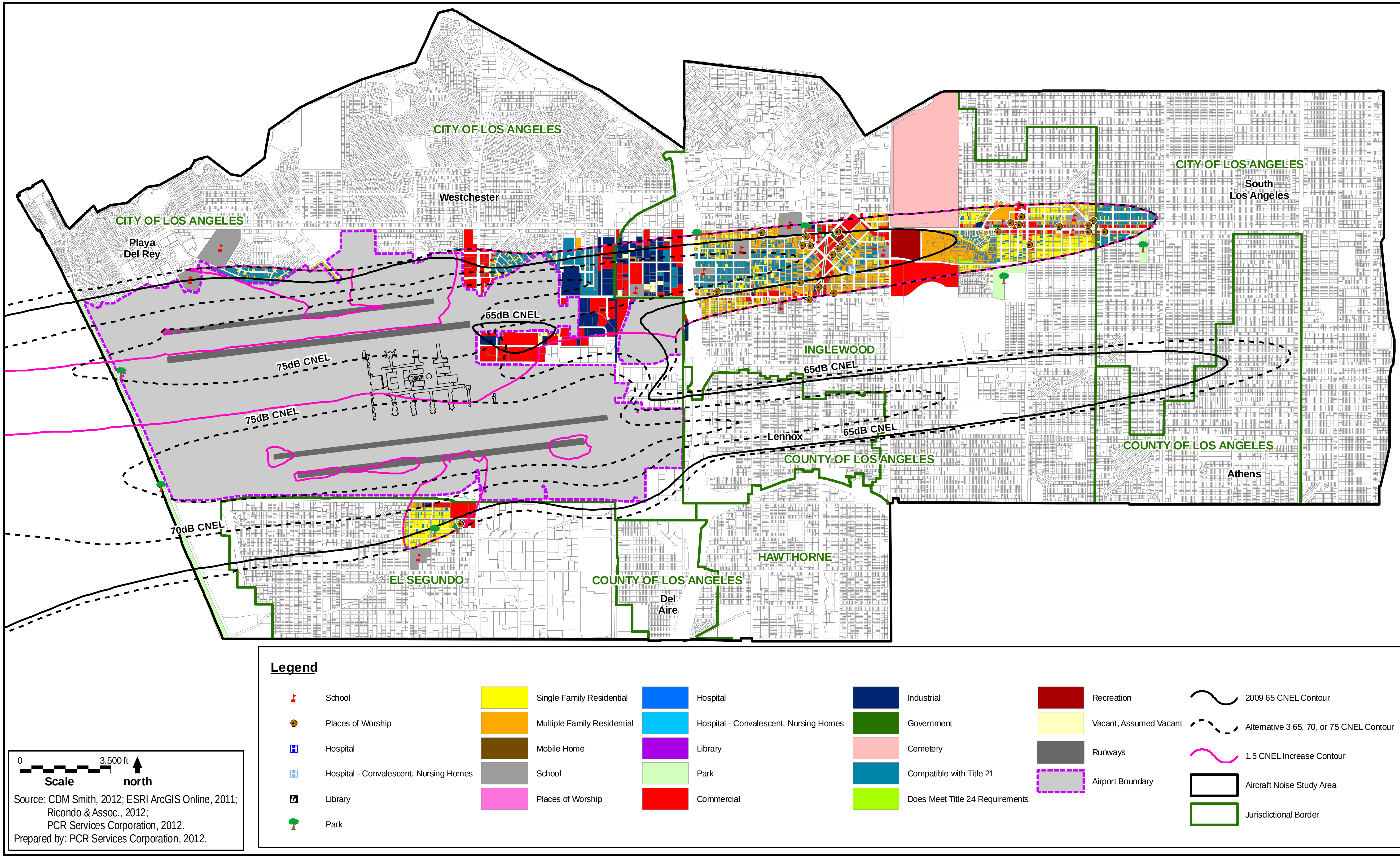

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Alternative 3 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-21

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Table 4.10.1-22

Alternative 3 Noise Exposure Effects - Comparisons to Baseline (2009) Conditions and to 2025 "No Additional Improvements" Conditions

Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
Alternative 3 (2025) Noise Exposure					
65-70 CNEL	3,492	2,931	11,832	31,653	81
70-75 CNEL	2,134	915	2,888	9,694	14
75 > CNEL	2,068	98	59	247	3
65 ≥ CNEL	7,694	3,944	14,779	41,594	98
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	689	931	3,704	10,714	40
70-75 CNEL	213	290	823	2,521	3
75 > CNEL	484	49	-19	-79	2
65 ≥ CNEL	1,386	1,270	4,508	13,156	45
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions[1,2]					
65-70 CNEL	-19	-28	557	692	3
70-75 CNEL	-117	-19	587	-1,668	-4
75 > CNEL	85	4	-65	-272	0
65 ≥ CNEL	-52	-43	-95	-1,248	-1

1 A positive value indicates that the future alternative increases the number of impacts over the baseline (2009) conditions; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.
2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.
3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

For the purposes of the cumulative analysis, **Table 4.10.1-22** also provides a comparison between the aircraft noise exposure levels associated with Alternative 3 in 2025 and the aircraft noise exposure levels projected to occur in 2025 without improvements to the north airfield (i.e., "2025 'No Additional Improvements' Conditions"). The comparison between Alternative 3 (2025) to 2025 "No Additional Improvements" is used to identify the alternative's contribution to cumulative impacts. Based on that comparison, implementation of Alternative 3 would result in 1,248 fewer people, 95 fewer dwelling units, and one less non-residential noise-sensitive facilities being exposed to 65 CNEL or higher aircraft noise levels in 2025 than would otherwise occur with no modifications to the north airfield.

Table 4.10.1-23 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-23** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase, and therefore impacts would be significant.

Table 4.10.1-23

Significant Noise Impacts - Alternative 3
Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 3
Population	15,099
Dwelling Units	5,884
Non-Residential Noise-Sensitive Facilities	
Schools	20
Places of Worship	24
Hospitals	0
Convalescent Hospitals	1
Parks	10
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**55**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage and non-residential noise-sensitive facilities; GIS spatial analysis).

As illustrated in **Figure 4.10.1-21**, the significant impacts would be located principally along the approach to the north and south airfield. Within this area are an estimated 5,884 dwellings and 15,099 residents, as well as 55 non-residential noise-sensitive facilities, including 20 schools, 24 places of worship, 10 parks, and 1 convalescent hospital.

While there would also be increases in existing noise levels in areas beyond the 65 CNEL contour (i.e., areas with exterior noise levels less than 65 dBA CNEL), such increases would not rise to the level of being a significant impact.

Relative to cumulative impacts, **Table 4.10.1-24** discloses the population, dwellings, and non-residential noise-sensitive facilities that would, as a result of Alternative 3, experience increases of 1.5 CNEL or higher within the 65 CNEL noise exposure contour, as compared to 2025 "No Additional Improvements" Conditions. Based on that comparison, an estimated 888 dwellings and 2,812 residents, as well as five non-residential noise-sensitive facilities, including two schools and three places of worship would be affected.

Table 4.10.1-24

Noise Impacts of Alternative 3
Compared to 2025 "No Additional Improvements" Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 3
Population	2,812
Dwelling Units	888
Non-Residential Noise-Sensitive Facilities	
Schools	2
Places of Worship	3
Hospitals	0
Convalescent Hospitals	0
Parks	0
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**5**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

4.10.1.6.3.2 Single Event Aircraft Noise Exposure

In addition to the CNEL noise exposure contours prepared for Alternative 3, a grid point analysis of single event aircraft noise was conducted to determine potential significant impacts associated with nighttime awakenings and classroom disruption. The results are presented below.

4.10.1.6.3.2.1 Nighttime Awakenings

The awakening probability contours, estimated using the ANSI method, representing a 75 percent chance, a 50 percent chance, and a 25 percent chance of awakening at least once per night for Alternative 3 at buildout in 2025 are shown in **Figure 4.10.1-22**. Also shown in **Figure 4.10.1-22** are the equivalent percentage contours estimated to occur in 2025 if no airfield improvements were implemented (i.e., 2025 Without Alternative), and the difference areas specific to each contour (i.e., shaded areas indicate the contribution of Alternative 3 to cumulative impacts associated with changes in the probability of awakenings). Changes in the intervening areas (i.e., areas beyond and between the 75 percent and 50 percent contours, and beyond and between the 50 percent and 25 percent contours) would generally follow the same trends as shown in **Figure 4.10.1-22**. While the color shading shown in **Figure 4.10.1-22** delineates the contribution of Alternative 3 to change in the cumulative probability of awakening, the general nature, direction, and change in the probability of awakenings shown in the figure is also generally representative of the changes that would occur under Alternative 3 to the 2009 contours shown in **Figure 4.10.1-13**.

As shown in **Figure 4.10.1-22**, there would be increases in the probability of awakenings along the northeastern and eastern edges of contours for the north airfield, decreases in the probability of awakenings along the eastern edges of the contours for the south airfield, and negligible changes to the south. **Table 4.10.1-25** indicates the project's contribution to cumulative changes in affected population within each of the three probability of awakenings contours under Alternative 3. The changes shown in the table represent the populations that would occur within each probability contour with implementation of the airfield improvements proposed under Alternative 3 compared to the populations that would otherwise be within each probability contour if there were no airfield improvements (i.e., 2025 With Alternative vs. 2025 Without Alternative). That latter population, against which the alternative's impact is measured, includes 6,074 people within the 75 percent probability contour, 69,429 people within the 50 percent probability contour, and 260,088 people within the 25 percent probability contour. **Table 4.10.1-25** shows for Alternative 3 a slight (2.9 percent) overall net increase in population within the three probability contours evaluated.

Table 4.10.1-25

Alternative 3's Contribution to the Cumulative Change in Affected Population for 75 Percent, 50 Percent, and 25 Percent Probability of Awakening At Least Once - Alternative 3 Compared to 2025 "No Additional Runway Improvements"

	Probability of Awakening at Least Once During the Night			
Alternative 3	**75%**	**50%**	**25%**	**Average**
Change in Affected Population - Increase or (Decrease)	1,242	(10,884)	10,544	
Percent Change in Affected Population - Increase or (Decrease)	20.45%	(15.68%)	4.05%	2.94%

Note:

Numbers in parentheses () are negative (i.e., a decrease in affected population).

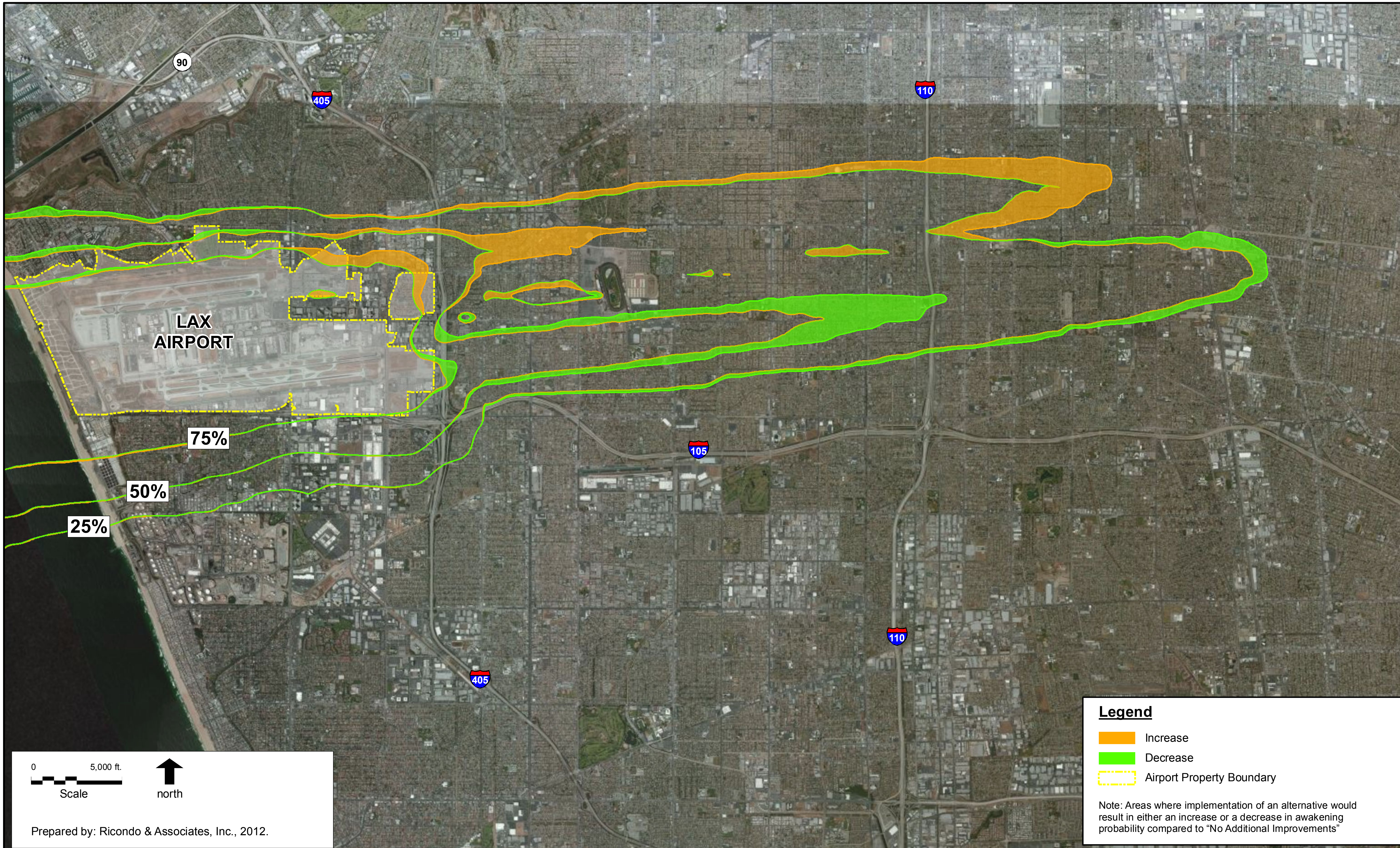
Source: Ricondo & Associates, 2012.

Based on the information presented above, implementation of Alternative 3 would not result in a substantial increase in the probability of nighttime awakenings under the project level and cumulative analyses; therefore, the impact would be less than significant and the project's contribution to cumulative impacts would not be cumulatively considerable (i.e., less than significant).

4.10.1.6.3.2.2 Classroom Disruption

Baseline (2009) conditions related to school facilities and classroom disruption is provided in **Tables 4.10.1-4**, **4.10.1-5**, and **4.10.1-6**. The numbers of schools that would exceed the thresholds of significance for classroom disruption, as defined in Section 4.10.1.4.3, under Alternative 3 are presented in **Table 4.10.1-26**. **Table 4.10.1-27** provides the names and locations of the schools that would be exposed to single noise events above 55 interior dBA. The school identified in bold text, Jefferson Elementary School, would be newly exposed to average number of daily events and duration above 55 interior dBA, as compared to baseline (2009) conditions, and impacts would therefore be significant.

No schools are predicted to experience a 65 interior dBA (L_{max}) level of noise.



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ANSI Awakening Probability Contours: Alternative 3 Compared to 2025 "No Additional Improvements" Conditions

Figure 4.10.1-22

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Table 4.10.1-26

Schools Exposed to Single Event Noise Levels - Alternative 3 Compared to Baseline (2009) Conditions

Impact Category	Alternative 3 Exposed	Compared to Baseline (2009) Conditions: Net Change	Compared to Baseline (2009) Conditions: Newly Exposed - Impacted
Exposure ≥ 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	1	-1	0
Average Number of Events/School	33	7	N/A
Average Seconds/Event	2	0	N/A
Exposure ≥ 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure ≥ 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	18	5	5
Number of Private Schools	11	2	2

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

Table 4.10.1-27

Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels - Alternative 3 During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	Alternative 3: TA-84	Alternative 3: Events	Alternative 3: Avg. D
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	23.5	1.8
PBS035	Felton Elementary School	1.2997	-0.0854	0.7	32.2	1.3
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.5	10.3	2.9
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.3**	**12.3**	**1.5**
PBS105	Oak Street Elementary School	1.2636	0.7715	2.1	52.0	2.4
PBS114	Animo Leadership High School	0.8325	0.6503	2.1	52.0	2.4
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	1.9	50.7	2.2
	Private Schools					
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.0	29.76	2.0

Notes:

TA-84 = Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels (L_{max}), which equates to an interior noise level of 55 dBA (L_{max}) at indicated school.
Events = number of events to which the site is exposed on an average annual school day that exceed 84 dBA (L_{max}).
Avg. D = average duration of each event in seconds during the average annual school day that exceeds 84 dBA (L_{max}).
School(s) identified in bold text would be newly exposed to significant impacts.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

The assessment of the number of schools that would experience interior dBA $L_{eq(h)}$ levels equal to or higher than 35 dBA $L_{eq(h)}$ in the classroom indicates that under Alternative 3, five public schools and two private school would be newly exposed to this level as compared to baseline (2009) conditions.

Table 4.10.1-28 provides the names and locations of the schools that would be exposed to noise levels above 35 $L_{eq(h)}$.

Table 4.10.1-28

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 3 During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	8 Hour L_{eq} Values[1] Alternative 3
	Public Schools			
PBS017	Beulah Payne Elementary School	1.7544	0.5526	35.4
PBS050	Inglewood High School	1.809	1.0683	35.4
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.84	0.3486	36.1
PBS209	Century Community Charter	1.9349	0.5799	35.4
PBS215	Wish Charter Elementary	-0.0775	0.853	36.9
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	35.6
PVS070	Wiz Child Development Center	1.8439	0.6266	37.1

1 Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

4.10.1.6.4 Alternative 4

Under Alternative 4, the only improvement for the north airfield would be the easterly extension of Runway 6R/24L for RSA compliance only. The following considerations contributing to the noise exposure pattern for Alternative 4 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would shrink slightly in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Extension of Runway 24L end to the east 835 feet for RSA compliance.
- An anticipated shift of 5 percent of the wide-body aircraft operations from the south airfield to the north airfield.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.
- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.
- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.

- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet MSL. With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The projected increase in the absolute number of average day operations between 2009 and 2025 would, by itself, result in a change in the area exposed to aircraft noise, and the increase of the size of aircraft projected to operate at the airport. Consequently, greater total noise energy levels would be generated in 2025 as compared to 2009 conditions, resulting in an increase in the total area exposed to 65 CNEL or higher levels of aircraft noise.

Figure 4.10.1-23 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 4 in 2025.

4.10.1.6.4.1 Comparison of Alternative 4 Aircraft Noise and Baseline (2009) Conditions

The noise exposure contours for Alternative 4 are illustrated in **Figure 4.10.1-24**. The noise exposure contours are anticipated to increase in size as the future fleet mix is heavier and the number of operations increases. The only airfield improvement associated with this alternative would be an 835-foot eastward extension of Runway 6R/24L required for RSA compliance; consequently, future (2025) changes in noise exposure associated with Alternative 4, compared to baseline (2009) conditions, is essentially due to increased operations and not changes to the airport operating environment.

The following provides a geographic description of the Alternative 4 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

The area of the 65 CNEL noise exposure contour would grow in proportion to the baseline (2009) conditions contour. Both the north airfield and south airfield approach 65 CNEL noise exposure contours to the east of the airport increase approximated 4,000 feet. The 65 CNEL noise exposure contour also widens along the approach associated with the landings to the north airfield, which results in new population, dwellings, and non-residential noise-sensitive facilities being within the 65 CNEL noise exposure contour as compared to baseline (2009) conditions. The 65 CNEL noise exposure contours adjacent to the airport associated with departures increase up to 700 feet to the north and south of the airport. The portion of the north airfield 65 CNEL noise exposure contour, west of Lincoln Boulevard extends approximately 900 feet to the north.

70 CNEL Contour

The area of the 70 CNEL noise exposure contour would grow in proportion to the baseline (2009) conditions contour. The north airfield approach 70 CNEL noise exposure contour to the east of the airport extends an additional 2,600 feet beyond the baseline (2009) conditions 70 CNEL noise exposure contour. The south airfield approach 70 CNEL noise exposure contour to the east of the airport increase approximated 3,800 feet beyond the baseline (2009) conditions 70 CNEL noise exposure contour. The 70 CNEL noise exposure contour also widens along the approach associated with the landings to the south airfield, which results in new population, dwellings, and non-residential noise-sensitive facilities being within the 70 CNEL noise exposure contour as compared to baseline (2009) conditions. The 70 CNEL noise exposure contours adjacent to the airport extend north to W. 92nd Street and as far south as W. Sycamore Street.

75 CNEL Contour

As with the 65 and 70 CNEL noise exposure contours, the growth associated with this alternative remains proportional to the baseline (2009) conditions. The north airfield approach 75 CNEL noise exposure contour extends just beyond Airport Boulevard to the east and the south airfield approach 75 CNEL noise exposure contour extends just beyond Inglewood Avenue. The north airfield 75 CNEL noise exposure contour adjacent to the airport remains on airport property while the south airfield 75 CNEL noise exposure contour extends south to Imperial Highway.

Affected Noise-Sensitive Uses

Table 4.10.1-29 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 4, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-29**, the Alternative 4 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 14,404 people, 4,603 additional dwelling units, and 46 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.

Table 4.10.1-29

Alternative 4 Noise Exposure Effects - Comparison to Baseline (2009) Conditions

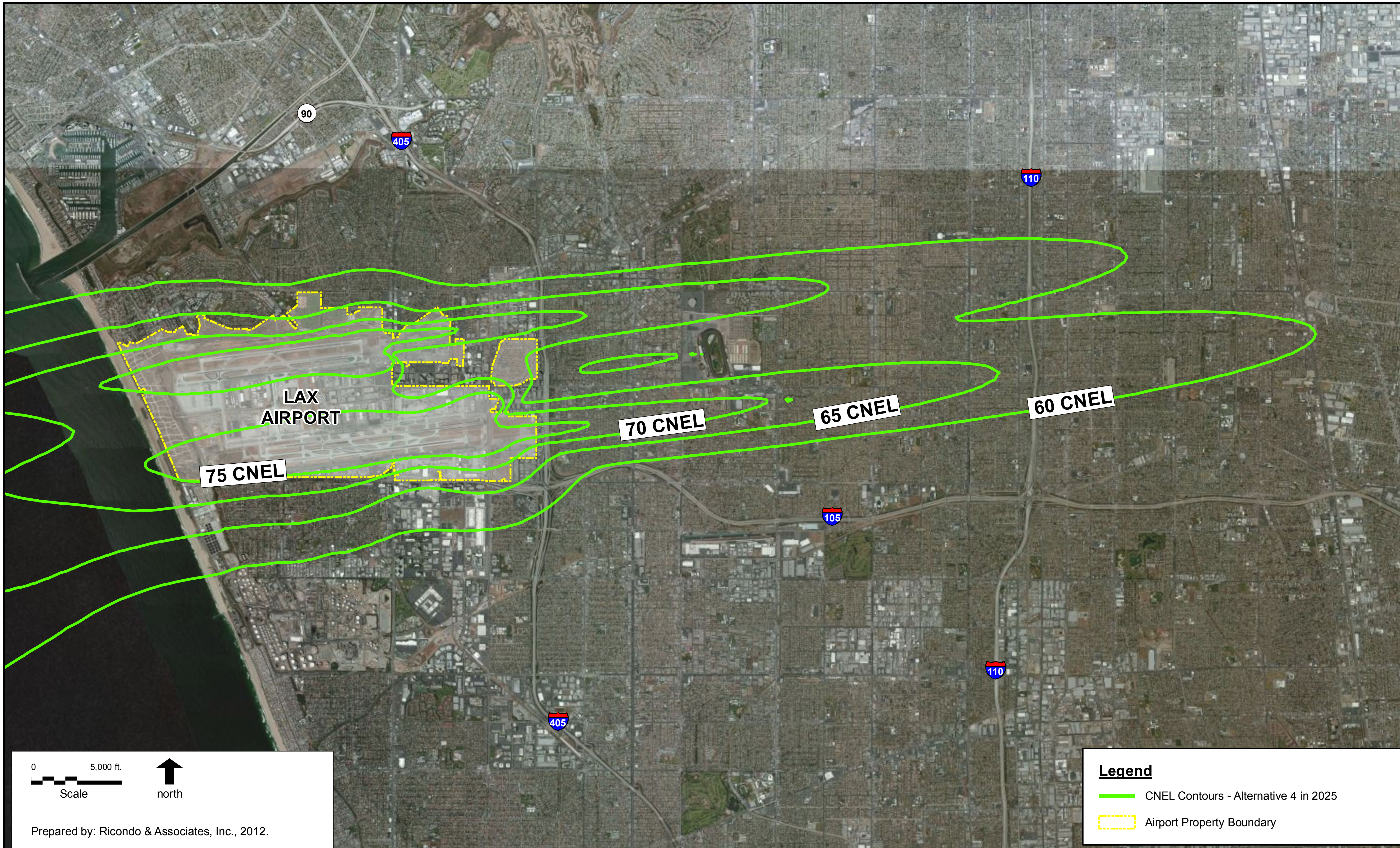
Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
Alternative 4 (2025) Noise Exposure					
65-70 CNEL	3,511	2,959	11,275	30,961	78
70-75 CNEL	2,251	933	3,475	11,362	18
75 > CNEL	1,984	95	124	519	3
65 ≥ CNEL	**7,745**	**3,987**	**14,874**	**42,842**	**99**
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	708	959	3,147	10,022	37
70-75 CNEL	331	308	1,410	4,189	7
75 > CNEL	400	46	46	193	2
65 ≥ CNEL	**1,438**	**1,313**	**4,603**	**14,404**	**46**

1 A positive value indicates that the future alternative increases the number of impacts over the baseline (2009) conditions; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.

2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.

3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).



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CNEL Contours Overview
Alternative 4 in 2025

Figure
4.10.1-23

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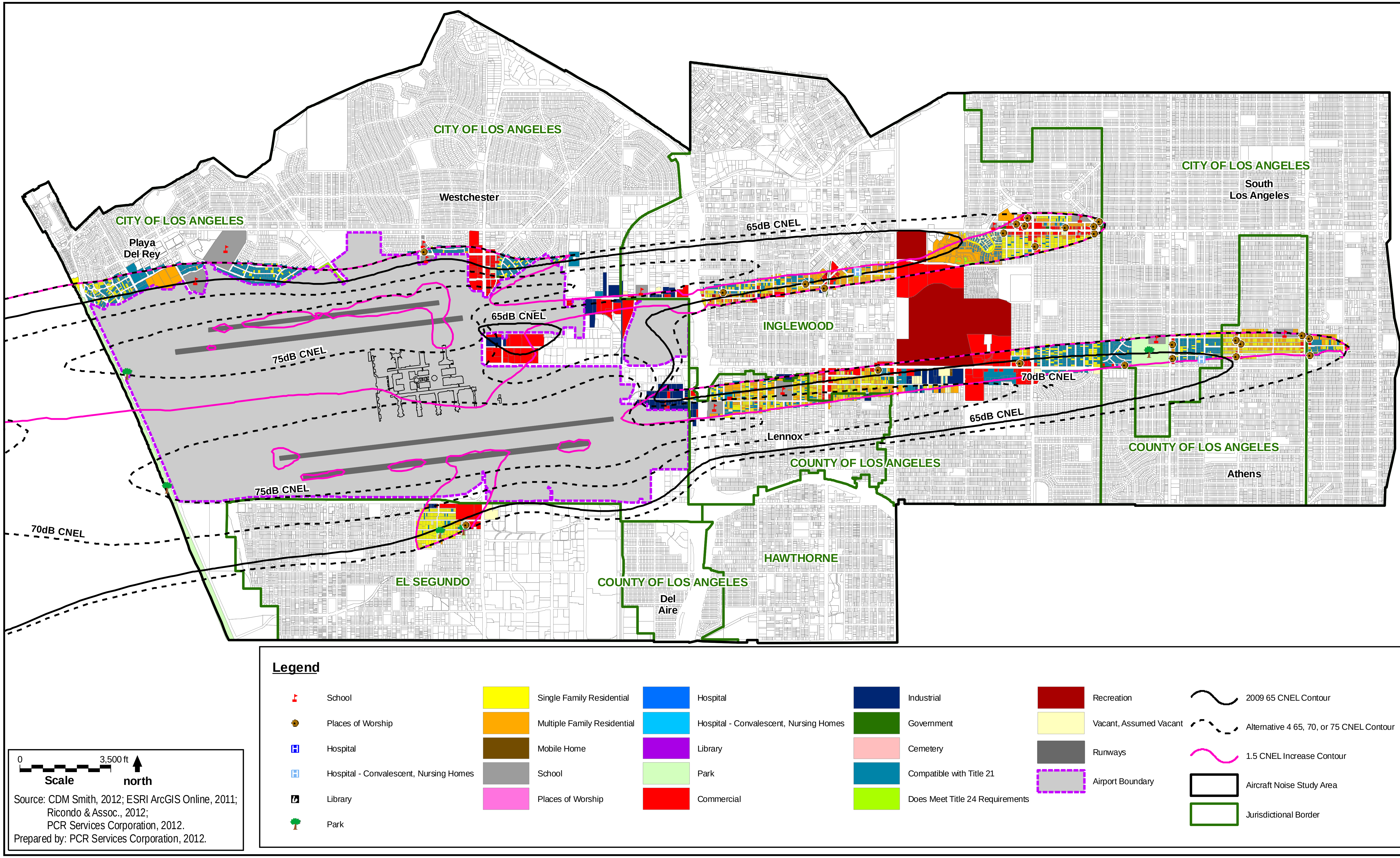

Source: CDM Smith, 2012; ESRI ArcGIS Online, 2011; Ricondo & Assoc., 2012; PCR Services Corporation, 2012.
Prepared by: PCR Services Corporation, 2012.

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Alternative 4 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-24

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Alternative 4 would have no contribution to cumulative impacts given that this alternative does not propose any airfield improvements that would change operations in the future (2025); hence, there would be no difference in aircraft noise exposure levels in 2025 with or without implementation of Alternative 4.

Table 4.10.1-30 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-30** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase. As indicated in **Table 4.10.1-30**, Alternative 4 would expose 16,661 people, 6,020 dwelling units, and 51 non-residential noise-sensitive facilities, including 17 schools, 25 places of worship, 7 parks, and 2 convalescent hospitals, to a significant impact relative to aircraft noise exposure, compared to baseline (2009) conditions.

Table 4.10.1-30

Significant Noise Impacts - Alternative 4
Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase
	Alternative 4
Population	16,661
Dwelling Units	6,020
Non-Residential Noise-Sensitive Facilities	
Schools	17
Places of Worship	25
Hospitals	0
Convalescent Hospitals	2
Parks	7
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**51**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

4.10.1.6.4.2 Single Event Aircraft Noise Exposure

In addition to the CNEL noise exposure contours prepared for Alternative 4, a grid point analysis of single event aircraft noise was conducted to determine potential significant impacts associated with nighttime awakenings and classroom disruption. The results are presented below.

4.10.1.6.4.2.1 Nighttime Awakenings

Under Alternative 4 there would be no runway improvements other than for RSA compliance, which would not alter typical daily operations in the north airfield. As such, there would not be a change in the probability of nighttime awakenings under Alternative 4.

4.10.1.6.4.2.2 Classroom Disruption

Baseline (2009) conditions related to school facilities and classroom disruption is provided in **Tables 4.10.1-4**, **4.10.1-5**, and **4.10.1-6**. The numbers of schools that would exceed the thresholds of significance for classroom disruption, as defined in Section 4.10.1.4.3, under Alternative 4 are presented in **Table 4.10.1-31**.

Table 4.10.1-31

Schools Exposed to Single Event Noise Levels - Alternative 4 Compared to Baseline (2009) Conditions

Impact Category	Alternative 4 Exposed	Compared to Baseline (2009) Conditions: Net Change	Compared to Baseline (2009) Conditions: Newly Exposed - Impacted
Exposure > 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	1	-1	0
Average Number of Events/School	40	14	N/A
Average Seconds/Event	2	0	N/A
Exposure > 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure > 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	20	7	7
Number of Private Schools	11	2	2

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

Although under this alternative the same total number of schools would have classrooms exposed to interior L_{max} noise levels above 55 dBA as compared to baseline (2009) conditions, the alternative would result in one public school being newly exposed and one private school no longer exposed. **Table 4.10.1-32** provides the names and locations of the schools that would be exposed to single noise events above 55 interior dBA. The school identified in bold text, Jefferson Elementary School, would be newly exposed to average number of daily events and duration above 55 interior dBA, as compared to baseline (2009) conditions, and impacts would therefore be significant.

Table 4.10.1-32

Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels - Alternative 4 During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	Alternative 4: TA-84	Alternative 4: Events	Alternative 4: Avg. D
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	27.5	1.5
PBS035	Felton Elementary School	1.2997	-0.0854	1.8	58.0	1.9
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.4	8.5	2.8
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.6**	**28.0**	**1.3**
PBS105	Oak Street Elementary School	1.2636	0.7715	1.7	47.1	2.2
PBS114	Animo Leadership High School	0.8325	0.6503	1.7	53.9	1.9
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.2	57.3	2.3
	Private Schools					
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.9	37.8	3.0

Notes:

TA-84 = Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels (L_{max}), which equates to an interior noise level of 55 dBA (L_{max}) at indicated school.
Events = number of events to which the site is exposed on an average annual school day that exceed 84 dBA (L_{max}).
Avg. D = average duration of each event in seconds during the average annual school day that exceeds 84 dBA (L_{max}).
School(s) identified in bold text would be newly exposed to significant impacts.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

No schools would be newly exposed above 65 interior dBA (L_{max}) speech interference Levels under Alternative 4.

The assessment of the number of schools that would experience interior dBA $L_{eq(h)}$ levels equal to or higher than 35 dBA $L_{eq(h)}$ in the classroom indicates that under Alternative 4, nine additional schools would be affected in comparison to baseline (2009) conditions. **Table 4.10.1-33** provides the names and locations of the schools that would be exposed to noise levels above 35 $L_{eq(h)}$.

Table 4.10.1-33

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 4 During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	8 Hour L_{eq} Values[1] Alternative 4
	Public Schools			
PBS009	95th Street Preparatory School	4.9156	0.4002	35.2
PBS050	Inglewood High School	1.8090	1.0683	35.1
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.8400	0.3486	35.5
PBS101	Manhattan Place Elementary School	4.1002	0.3601	35.7
PBS107	Paseo del Rey Magnet School	-2.0558	0.8652	35.1
PBS201	Albert Monroe Middle School	3.2061	-0.1862	35.2
PBS215	Wish Charter Elementary	-0.0775	0.8530	36.4
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	35.3
PVS070	Wiz Child Development Center	1.8439	0.6266	35.6

1 Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (school location and name database; GIS spatial analysis).

4.10.1.6.5 Alternative 5

The improvements to the north airfield under Alternative 5, operating in conjunction with the existing configuration of the south airfield, along with the forecasted growth in activity at LAX by 2025 would change the airport's 2009 noise exposure pattern. The following considerations contributing to the noise exposure pattern for Alternative 5 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would be less in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Relocation of Runway 6L/24R 350 feet north of its existing location.
- Extension of Runway 24L end 1,250 feet east of existing location.
- An anticipated shift of 15 percent of the small wide-body aircraft operations from the south airfield to the north airfield, as facilitated by the north airfield and terminal improvements.

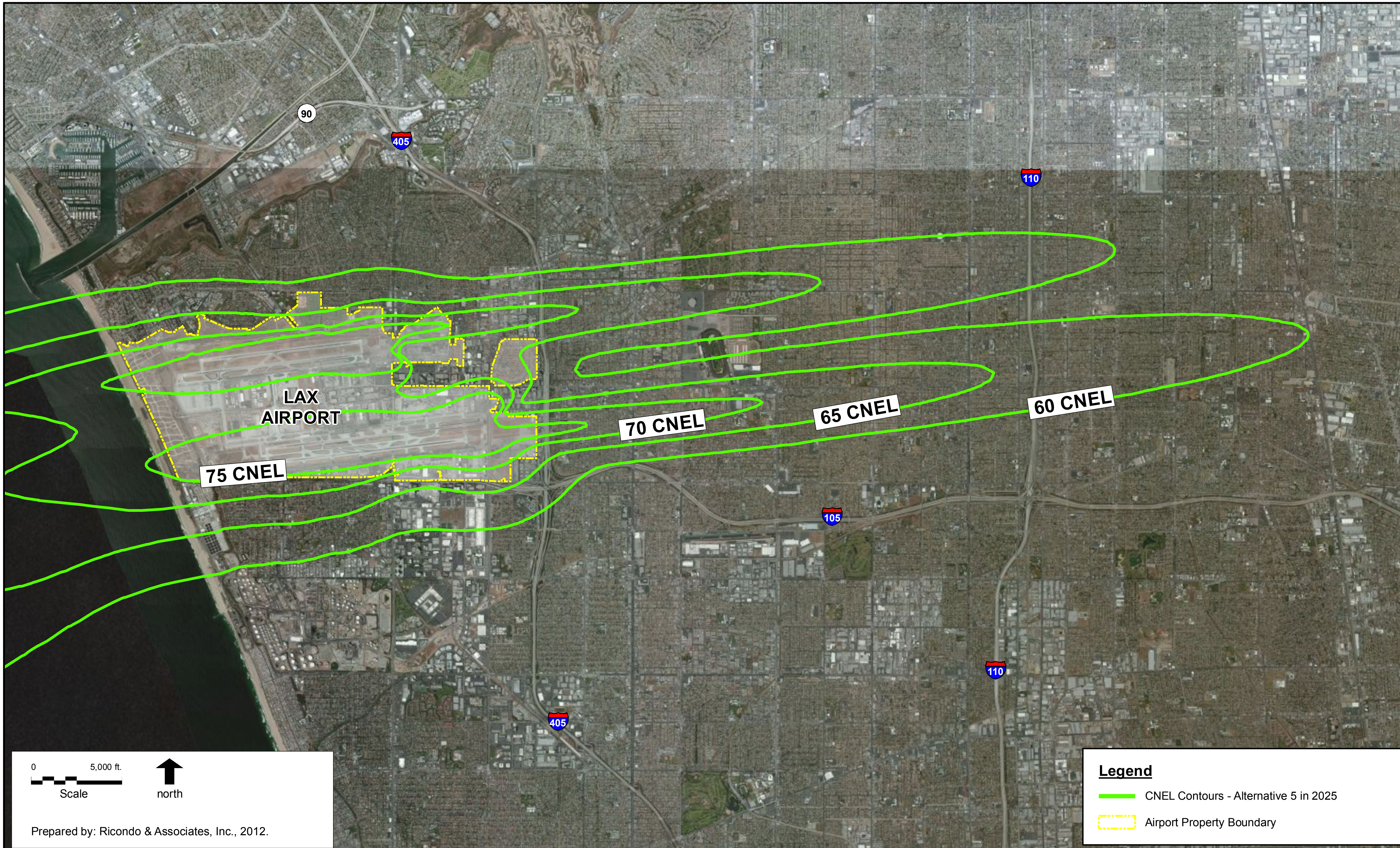
- Provision of additional Runway 6L/24R high-speed runway exits.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.
- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.
- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.
- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet MSL. With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The first two of these factors would result in a general increase in the overall size of the Alternative 5 noise exposure contour in 2025, as compared to 2009 conditions, because more total noise energy would be generated within the airport environs on an average day with an increase in aircraft operations, and particularly heavy jet aircraft operations. The 350 feet northward relocation of Runway 6L/24R for landings on Runway 24R is expected to change the arrival and landing noise 350 feet north compared to 2009 conditions. The location of the high-speed runway exits for landings on Runway 24R would provide additional exits for heavy aircraft to use when landing on Runway 24R, as the current locations of the exits preclude heavy aircraft from using them. This change is not expected to increase the overall size of the CNEL noise exposure contours, because aircraft would be able to exit with reduced reverse thrust. The Runway 24L extension of 1,250 feet to the east is expected to move start-of-takeoff roll noise levels to the northwest and northeast behind the runway end, and slightly increase due to the additional small wide-body departures from Runway 24L. With the extension, the enhanced balance of small wide-body aircraft departures between the south and north airfields is expected to decrease start-of-takeoff roll noise from Runway 25R to the east.

Figure 4.10.1-25 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 5 in 2025.

4.10.1.6.5.1 Comparison of Alternative 5 Aircraft Noise and Baseline (2009) Conditions

The noise exposure contours for Alternative 5 2025 Conditions are depicted in **Figure 4.10.1-26** The area depicted by the magenta line indicates areas newly exposed to increases larger than 1.5 decibels and above 65 CNEL dBA. The most notable change from the baseline (2009) conditions to Alternative 5 conditions is attributable to the projected growth in aircraft activity from 2009 to 2025. As the number of aircraft operations grows, it is expected that the area exposed to significant levels of aircraft noise will



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CNEL Contours Overview
Alternative 5 in 2025

Figure
4.10.1-25

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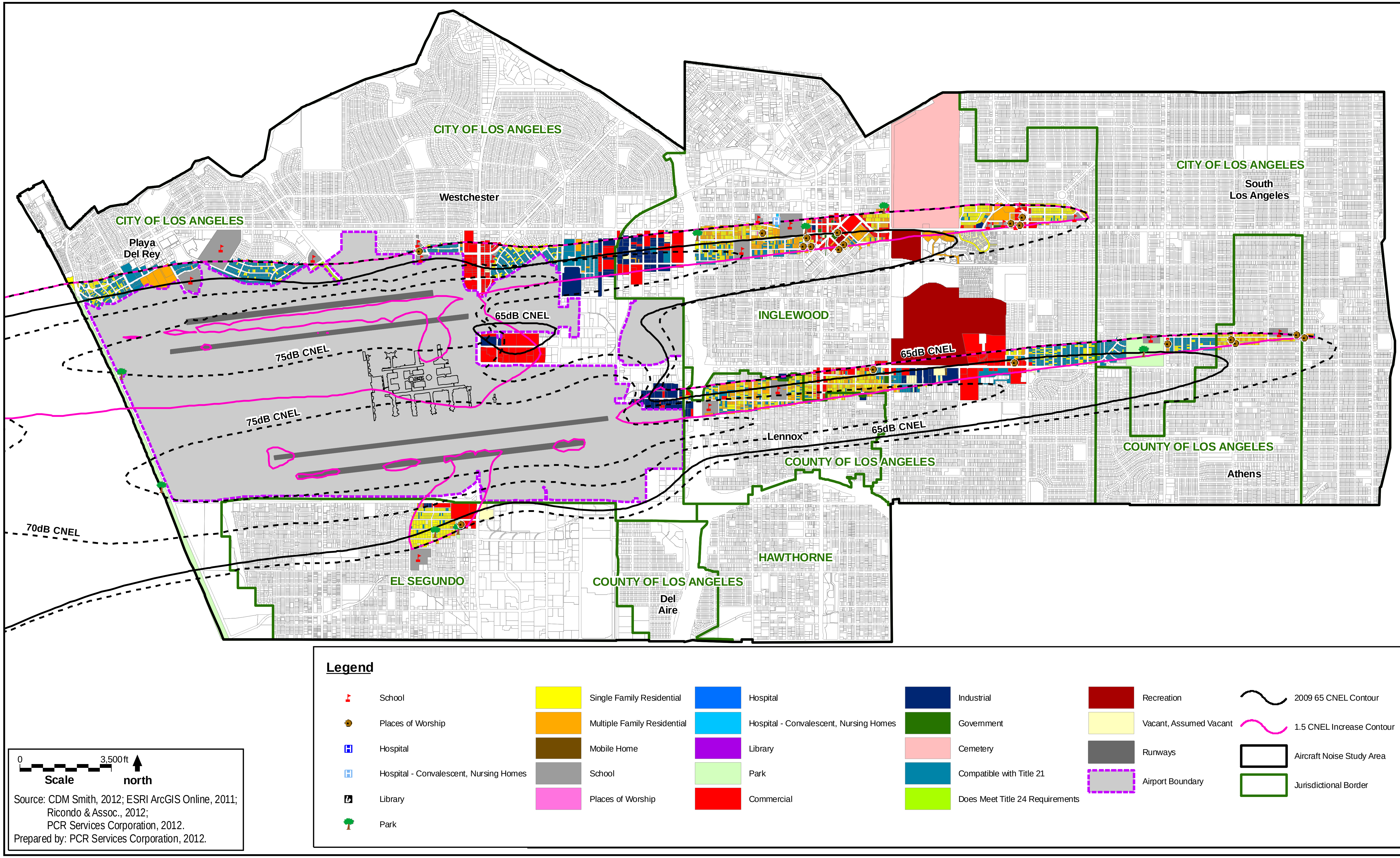

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Alternative 5 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-26

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grow as well. While the noise exposure contours for Alternative 5 are larger in comparison to baseline (2009) conditions, the overall shape of the contours remains similar. With the 350-foot shift of Runway 6L/24R to the north, the 65 CNEL noise exposure contour for the north airfield is expected to expand more to the north than to the south, particularly with respect to the north side along the arrival path to Runway 6L/24R.

The following provides a geographic description of the Alternative 5 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

The Alternative 5 65 CNEL noise exposure contours east of I-405 would extend approximately 3,500 feet farther east than under the baseline (2009) conditions. The 65 CNEL noise exposure contour resulting from aircraft using the north airfield would extend to South 2nd Avenue and from aircraft using the south airfield would extend to South Hoover Street. The increase in the area exposed to aircraft noise to the east of the airport would largely result from the increase in aircraft operations and assumed change in fleet mix from 2009 to 2025. The north airfield 65 CNEL noise exposure contour east of I-405 is also expected to extend approximately 350 feet farther north as a result of the relocation of Runway 6L/24R.

West of I-405, the Alternative 5 65 CNEL noise exposure contour would widen along the approach to the north runways as a result of the north shift in Runway 6L/24R, the increase in operations, an increase in the proportion of aircraft using the north airfield, and changing fleet mix. The 65 CNEL noise exposure contour along the approach to the south runways also widens to a lesser extent and can be attributed to the increase in operations.

The noise pattern along the departure sections to the north and south airfields would be wider under the Alternative 5 than the baseline (2009) conditions, which is attributable to the north shift in Runway 6L/25R and the larger number of departures in 2025.

70 CNEL Contour

The reasons for changes in the Alternative 5 70 CNEL noise exposure contours as compared to baseline (2009) conditions are the same as those defined above for the 65 CNEL noise exposure contour. The north airfield 70 CNEL noise exposure contour extends just beyond South Cedar Street east of I-405. The south airfield 70 CNEL noise exposure contour extends slightly beyond England Avenue. East of I-405, the 70 CNEL noise exposure contours extend beyond West Westchester Parkway on the north and to South Sycamore Avenue on the south.

75 CNEL Contour

The 75 CNEL noise exposure contours for Alternative 5 exhibit the same patterns as baseline (2009) conditions, but for the north airfield, the 75 CNEL noise exposure area shifted northward matching the relocation of Runway 6L/24R and the westward extension of Runway 6R/24L. The additional length of Runway 6L/24R allows for additional heavy aircraft departures, slightly increasing the size of the 75 CNEL noise exposure contour departure area, but the 75 CNEL noise exposure contour still remains on airport property.

Affected Noise-Sensitive Uses

Table 4.10.1-34 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 5, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-34**, the Alternative 5 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 12,861 people, 4,315 additional dwelling units, and 41 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.

Table 4.10.1-34

**Alternative 5 Noise Exposure Effects -
Comparisons to Baseline (2009) Conditions
and to 2025 "No Additional Improvements" Conditions**

Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
Alternative 5 (2025) Noise Exposure					
65-70 CNEL	3,511	2,986	11,045	29,583	73
70-75 CNEL	2,215	929	3,420	11,213	18
75 > CNEL	2,045	103	121	503	3
65 ≥ CNEL	**7,771**	**4,018**	**14,586**	**41,299**	**94**
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	708	986	2,917	8,644	32
70-75 CNEL	294	304	1,355	4,040	7
75 > CNEL	461	54	43	177	2
65 ≥ CNEL	**1,464**	**1,344**	**4,315**	**12,861**	**41**
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions[1,2]					
65-70 CNEL	0	27	-230	-1,378	-5
70-75 CNEL	-36	-4	-55	-149	0
75 > CNEL	61	8	-3	-16	0
65 ≥ CNEL	**26**	**31**	**-288**	**-1,543**	**-5**

1 A positive value indicates that the future alternative increases the number of impacts over the baseline (2009) conditions; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.

2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.

3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

For the purposes of the cumulative analysis, **Table 4.10.1-34** also provides a comparison between the aircraft noise exposure levels associated with Alternative 5 in 2025 and the aircraft noise exposure levels projected to occur in 2025 without additional improvements to the north airfield (i.e., "2025 'No Additional Improvements' Conditions"). The comparison between Alternative 5 (2025) to 2025 "No Additional Improvements" is used to identify the alternative's contribution to cumulative impacts. Based on that comparison, implementation of Alternative 5 would result in 1,543 fewer people, 288 fewer dwelling units, and 5 less non-residential noise-sensitive facilities being exposed to 65 CNEL or higher aircraft noise levels in 2025 than would otherwise occur with no modifications to the north airfield.

Table 4.10.1-35 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-35** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase, and therefore impacts would be significant.

Table 4.10.1-35

Significant Noise Impacts - Alternative 5
Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase
	Alternative 5
Population	13,773
Dwelling Units	5,408
Non-Residential Noise-Sensitive Facilities	
Schools	20
Places of Worship	19
Hospitals	0
Convalescent Hospitals	1
Parks	10
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**50**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

As illustrated in **Figure 4.10.1-26**, the significant impacts would be located principally along the approach to the north and south airfield. Within this area are an estimated 5,408 dwellings and 13,773 residents.

While there would also be increases in existing noise levels in areas beyond the 65 CNEL contour (i.e., areas with exterior noise levels less than 65 dBA CNEL), such increases would not rise to the level of being a significant impact.

Relative to cumulative impacts, **Table 4.10.1-36** discloses the population, dwellings, and non-residential noise-sensitive facilities that would, as a result of Alternative 5, experience increases of 1.5 CNEL or higher within the 65 CNEL noise exposure contour, as compared to 2025 "No Additional Improvements" Conditions. Based on that comparison, an estimated 603 dwellings and 1,821 residents, as well as 3 non-residential noise-sensitive facilities, including 1 school, 1 place of worship, and 1 convalescent/nursing home would be affected.

Table 4.10.1-36

Noise Impacts of Alternative 5
Compared to 2025 "No Additional Improvements" Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 5
Population	1,821
Dwelling Units	603
Non-Residential Noise-Sensitive Facilities	
Schools	1
Places of Worship	1
Hospitals	0
Convalescent Hospitals	1
Parks	0
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**3**

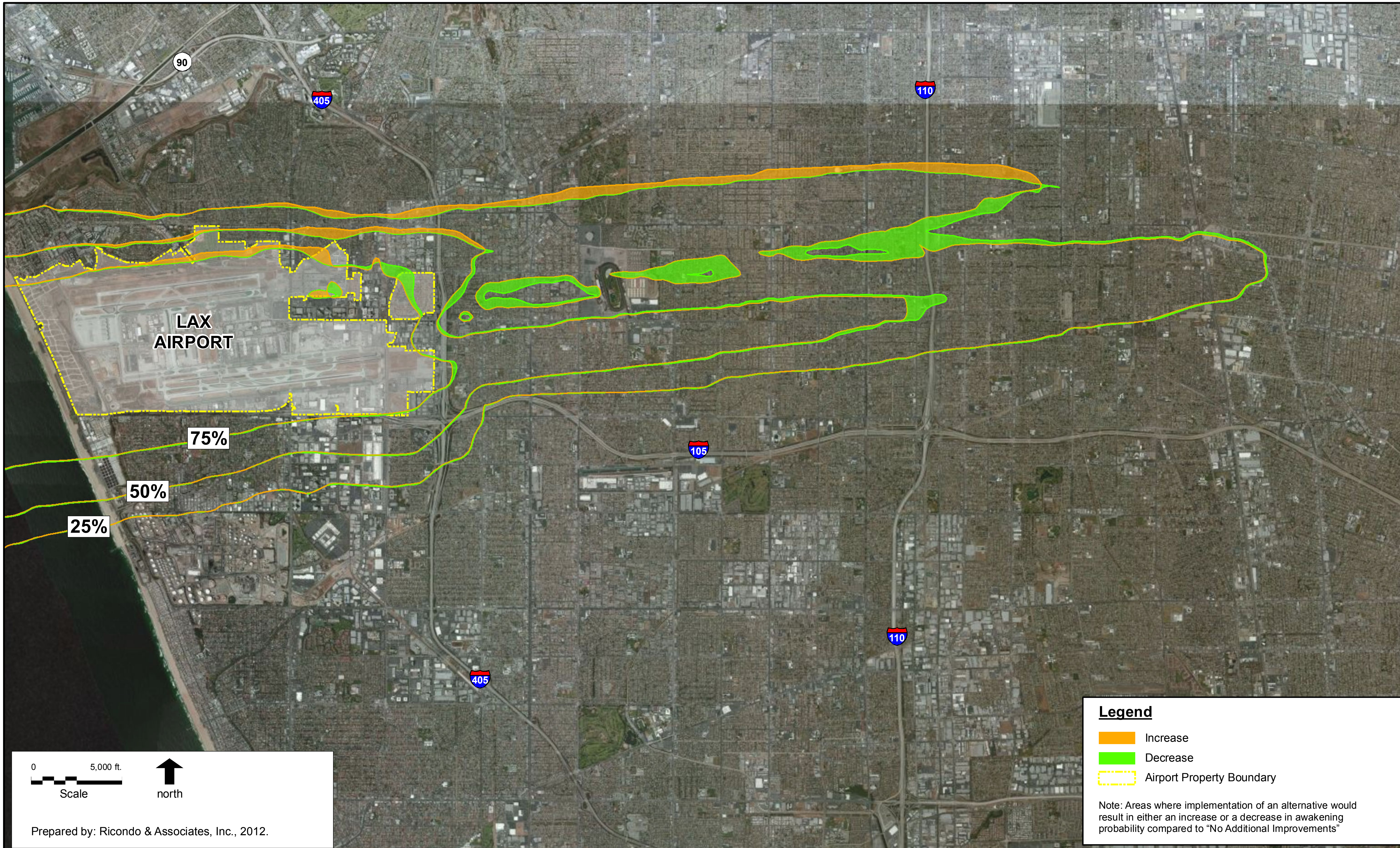
Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

4.10.1.6.5.2 Single Event Aircraft Noise Exposure

4.10.1.6.5.2.1 Nighttime Awakenings

The awakening probability contours, estimated using the ANSI method, representing a 75 percent chance, a 50 percent chance, and a 25 percent chance of awakening at least once per night for Alternative 5 at buildout in 2025 are shown in **Figure 4.10.1-27**. Also shown in **Figure 4.10.1-27** are the equivalent percentage contours estimated to occur in 2025 if no airfield improvements were implemented (i.e., 2025 Without Alternative), and the difference areas specific to each contour (i.e., shaded areas indicate the contribution of Alternative 5 to cumulative impacts associated with changes in the probability of awakenings). Changes in the intervening areas (i.e., areas beyond and between the 75 percent and 50 percent contours, and beyond and between the 50 percent and 25 percent contours) would generally follow the same trends as shown in **Figure 4.10.1-27**. While the color shading shown in **Figure 4.10.1-27** delineates the contribution of Alternative 5 to change in the cumulative probability of awakening, the general nature, direction, and change in the probability of awakenings shown in the figure is also generally representative of the changes that would occur under Alternative 5 to the 2009 contours shown in **Figure 4.10.1-13**.

As shown in **Figure 4.10.1-27**, there would be increases in the probability of awakenings to the north and northeast, decreases in the probability of awakenings to the east along the flight paths associated with the south airfield, and negligible changes to the southeast and south. **Table 4.10.1-37** indicates the project's contribution to cumulative changes in affected population within each of the three probability of awakenings contours under Alternative 5. It should be noted that while implementation of Alternative 5 would result in an increased probability of awakenings in areas north and northeast of the airport, as shown in **Figure 4.10.1-27**, the overall decrease in affected population shown in **Table 4.10.1-37** is attributable to the fact that the residential coverage and density in areas east of the airport, where Alternative 5 would result in a decrease in the probability of awakenings, are higher than in the areas to the north and northeast. The changes shown in the table represent the populations that would occur within each probability contour with implementation of the airfield improvements proposed under



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ANSI Awakening Probability Contours:
Alternative 5 Compared to 2025 "No Additional Improvements" Conditions

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Alternative 5 compared to the populations that would otherwise be within each probability contour if there were no airfield improvements (i.e., 2025 With Alternative vs. 2025 Without Alternative). That latter population, against which the alternative's impact is measured, includes 6,074 people within the 75 percent probability contour, 69,429 people within the 50 percent probability contour, and 260,088 people within the 25 percent probability contour. **Table 4.10.1-37** shows for Alternative 5 a net decrease in population within the three probability contours evaluated.

Table 4.10.1-37

Alternative 5's Contribution to the Cumulative Change in Affected Population for 75 Percent, 50 Percent, and 25 Percent Probability of Awakening At Least Once - Alternative 5 Compared to 2025 "No Additional Runway Improvements"

Alternative 5	Probability of Awakening at Least Once During the Night: 75%	50%	25%	Average
Change in Affected Population - Increase or (Decrease)	(210)	(1,363)	(6,830)	
Percent Change in Affected Population - Increase or (Decrease)	(3.46%)	(1.96%)	(2.63%)	(2.68%)

Note:

Numbers in parentheses () are negative (i.e., a decrease in affected population).

Source: Ricondo & Associates, 2012.

Based on the information presented above, implementation of Alternative 5 would not result in a substantial increase in the probability of nighttime awakenings under the project level and cumulative analyses; therefore, the impact would be less than significant and the project's contribution to cumulative impacts would not be cumulatively considerable (i.e., less than significant).

4.10.1.6.5.2.2 Classroom Disruption

As described in the methodology section, classroom disruption impacts for Alternatives 5 through 7 were estimated based on a review of the INM single event noise grid point modeling results for Alternatives 1 through 4, a review and comparison of the CNEL contours for Alternatives 1 through 4 relative to those single event noise grid point modeling results, and a comparison of the CNEL contours specific to each of Alternatives 5 through 7. As can be seen in comparing the three sets of tables related to school disruption presented for each of the four alternatives addressed above, there is very little difference in impacts between Alternatives 1 through 4.

INM results regarding schools exposed to single event noise levels greater than or equal to an L_{max} of 55 dBA, 65 dBA, and 35 dBA are presented above in **Tables 4.10.1-12** (Alternative 1), **4.10.1-19** (Alternative 2), **4.10.1-26** (Alternative 3), and **4.10.1-31** (Alternative 4). In comparison to baseline (2009) conditions, all four of the alternatives would result in one public school being newly exposed to an L_{max} of $\geq$55 dBA, none would be exposed to an L_{max} of $\geq$65 dBA, and between seven and nine schools would be newly exposed to an L_{max} of $\geq$35 dBA (seven under Alternative 3, eight under Alternative 1, and nine under Alternatives 2 and 4). Based on a review of those data and a review the noise contours for Alternative 5 compared to Alternatives 1 through 4, the impacts associated with Alternative 1 are considered to be generally representative of impacts likely to occur under Alternative 5. **Table 4.10.1-38** presents those results.

Table 4.10.1-38

Schools Exposed to Single Event Noise Levels - Alternative 5 Compared to Baseline (2009) Conditions

Impact Category	Alternative 5 Exposed	Compared to Baseline (2009) Conditions[1] Net Change	Newly Exposed - Impacted
Exposure $\geq$ 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	2	0	0
Average Number of Events/School	32	6	N/A
Average Seconds/Event	2	0	N/A
Exposure $\geq$ 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure $\geq$ 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	20	7	7
Number of Private Schools	10	1	1

[1] Classroom disruption impacts for Alternative 5 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

School disruption impacts related to the average number of daily events and average event duration (in seconds) above 55 dBA (interior) are also similar between Alternatives 1 through 4, with all of them resulting in one additional school - Jefferson Elementary School - being newly impacted in comparison to baseline (2009) conditions. INM results for that analysis are presented above in **Tables 4.10.1-13** (Alternative 1), **4.10.1-20** (Alternative 2), **4.10.1-27** (Alternative 3), and **4.10.1-32** (Alternative 4). Similar to above, the impacts associated with Alternative 1 are considered to be generally representative of those that would likely occur under Alternative 5. **Table 4.10.1-39** delineates those impacts.

Table 4.10.1-39

Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels - Alternative 5 (Estimated) During the Average School Day (8:00 a.m. - 4:00 p.m.)

				Alternative 5[1]		
Grid ID	**School**	**X Coord**	**Y Coord**	**TA-84**	**Events**	**Avg. D**
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	27.7	1.5
PBS035	Felton Elementary School	1.2997	-0.0854	1.7	57.2	1.8
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.9	23.2	2.3
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.7**	**27.5**	**1.5**
PBS105	Oak Street Elementary School	1.2636	0.7715	1.1	25.2	2.6
PBS114	Animo Leadership High School	0.8325	0.6503	0.2	22.8	0.5
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.2	57.2	2.3
	Private Schools					
PVS051	Inglewood Christian School	1.9923	0.9699	0.2	6.4	1.9
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.9	37.9	3.0

[1] Classroom disruption impacts for Alternative 5 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

Regarding school disruption associated with schools newly exposed to ANSI 35 $L_{eq(h)}$ thresholds, compared to baseline (2009) conditions, the impacts are generally similar between Alternatives 1 through 4, as can be seen in **Tables 4.10.1-14** (Alternative 1), **4.10.1-21** (Alternative 2), **4.10.1-28** (Alternative 3), and **4.10.1-33** (Alternative 4). The most notable difference is that Alternative 3 would impact two additional schools (Beulah Payne Elementary School and Century Community Charter) and three fewer schools (95th Street Preparatory School, Manhattan Place Elementary School, and Albert Monroe Middle School) compared to the other three alternatives. Those differences in school impacts are consistent with the differences in CNEL contours between Alternative 3 and the other alternatives. As can be seen in comparing the 65 CNEL contour for Alternative 3 (**Figure 4.10.1-21**) with those of the other alternatives (**Figures 4.10.1-15**, **4.10.1-18**, and **4.10.1-24**), implementation of Alternative 3 would result in more newly exposed noise-sensitive areas along the southern edge of the contour for the north airfield, which is where the two additional exposed schools under Alternative 3 are located, whereas Alternatives 1, 2, and 4 would result in more newly exposed noise-sensitive areas along the northern edge of the contour for the south airfield, which is where the three additional exposed schools under the other three alternatives are located. Similar to above, the impacts associated with Alternative 1 are considered to be generally representative of those that would likely occur under Alternative 5. **Table 4.10.1-40** delineates those impacts.

Table 4.10.1-40

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 5 (Estimated) During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	8 Hour L_{eq} Values[1] Alternative 5[2]
	Public Schools			
PBS009	95th Street Preparatory School	4.9156	0.4002	35.1
PBS050	Inglewood High School	1.809	1.0683	36.6
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.84	0.3486	35.3
PBS101	Manhattan Place Elementary School	4.1002	0.3601	35.6
PBS107	Paseo del Rey Magnet School	-2.0558	0.8652	35
PBS201	Albert Monroe Middle School	3.2061	-0.1862	35.2
PBS215	Wish Charter Elementary	-0.0775	0.853	38.3
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	34

[1] Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

[2] Classroom disruption impacts for Alternative 5 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

4.10.1.6.6 Alternative 6

The improvements to the north airfield under Alternative 6, operating in conjunction with the existing configuration of the south airfield, along with the forecasted growth in activity at LAX by 2025 would change the airport's 2009 noise exposure pattern. The following considerations contributing to the noise exposure pattern for Alternative 6 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would be less in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Relocation of Runway 6L/24R 100 feet north of its existing location.
- Extension of Runway 24L end 1,250 feet east of existing location.
- An anticipated shift of 15 percent of the small wide-body aircraft operations from the south airfield to the north airfield, as facilitated by the north airfield and terminal improvements.
- Provision of additional Runway 6L/24R high-speed runway exits.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.
- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.

- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.
- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet MSL. With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The first two of these factors would result in a general increase in the overall size of the Alternative 6 noise exposure contour in 2025, as compared to 2009 conditions, because more total noise energy would be generated within the airport environs on an average day with an increase in aircraft operations, and particularly heavy jet aircraft operations. The 100 feet northward relocation of Runway 6L/24R for landings on Runway 24R is expected to change the arrival and landing noise 100 feet north compared to 2009 conditions. The location of the high-speed runway exits for landings on Runway 24R would provide additional exits for heavy aircraft to use when landing on Runway 24R, as the current locations of the exits preclude heavy aircraft from using them. This change is not expected to increase the overall size of the CNEL noise exposure contours, because aircraft would be able to exit with reduced reverse thrust. The Runway 24L extension of 1,250 feet to the east is expected to move start-of-takeoff roll noise levels to the northwest and northeast behind the runway end, and slightly increase due to the additional small wide-body departures from Runway 24L. With the extension, the enhanced balance of small wide-body aircraft departures between the south and north airfields is expected to decrease start-of-takeoff roll noise from Runway 25R to the east.

Figure 4.10.1-28 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 6 in 2025.

4.10.1.6.6.1 Comparison of Alternative 6 Aircraft Noise and Baseline (2009) Conditions

The noise exposure contours for Alternative 6 2025 Conditions are depicted in **Figure 4.10.1-29** The area depicted by the magenta line indicates areas newly exposed to increases larger than 1.5 decibels and above 65 CNEL dBA. The most notable change from the baseline (2009) conditions to Alternative 6 conditions is attributable to the projected growth in aircraft activity from 2009 to 2025. As the number of aircraft operations grows, it is expected that the area exposed to significant levels of aircraft noise will grow as well. While the noise exposure contours for Alternative 6 are larger in comparison to baseline (2009) conditions, the overall shape of the contours remains similar. With the 100-foot shift of Runway 6L/24R to the north, the 65 CNEL noise exposure contour for the north airfield is expected to expand more to the north than to the south, particularly with respect to the north side along the arrival path to Runway 6L/24R.

The following provides a geographic description of the Alternative 6 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

The Alternative 6 65 CNEL noise exposure contours east of I-405 would extend approximately 3,500 feet farther east than under the baseline (2009) conditions. The 65 CNEL noise exposure contour resulting from aircraft using the north airfield would extend to South 2nd Avenue and from aircraft using the south airfield would extend to South Hoover Street. The increase in the area exposed to aircraft noise to the east of the airport would largely result from the increase in aircraft operations and assumed change in fleet mix from 2009 to 2025. The north airfield 65 CNEL noise exposure contour east of I-405 is also expected to extend approximately 100 feet farther north as a result of the relocation of Runway 6L/24R.

West of I-405, the Alternative 6 65 CNEL noise exposure contour would widen along the approach to the north runways as a result of the north shift in Runway 6L/24R, the increase in operations, an increase in the proportion of aircraft using the north airfield, and changing fleet mix. The 65 CNEL noise exposure contour along the approach to the south runways also widens to a lesser extent and can be attributed to the increase in operations.

The noise pattern along the departure sections to the north and south airfields would be wider under the Alternative 6 than the baseline (2009) conditions, which is attributable to the north shift in Runway 6L/25R and the larger number of departures in 2025.

70 CNEL Contour

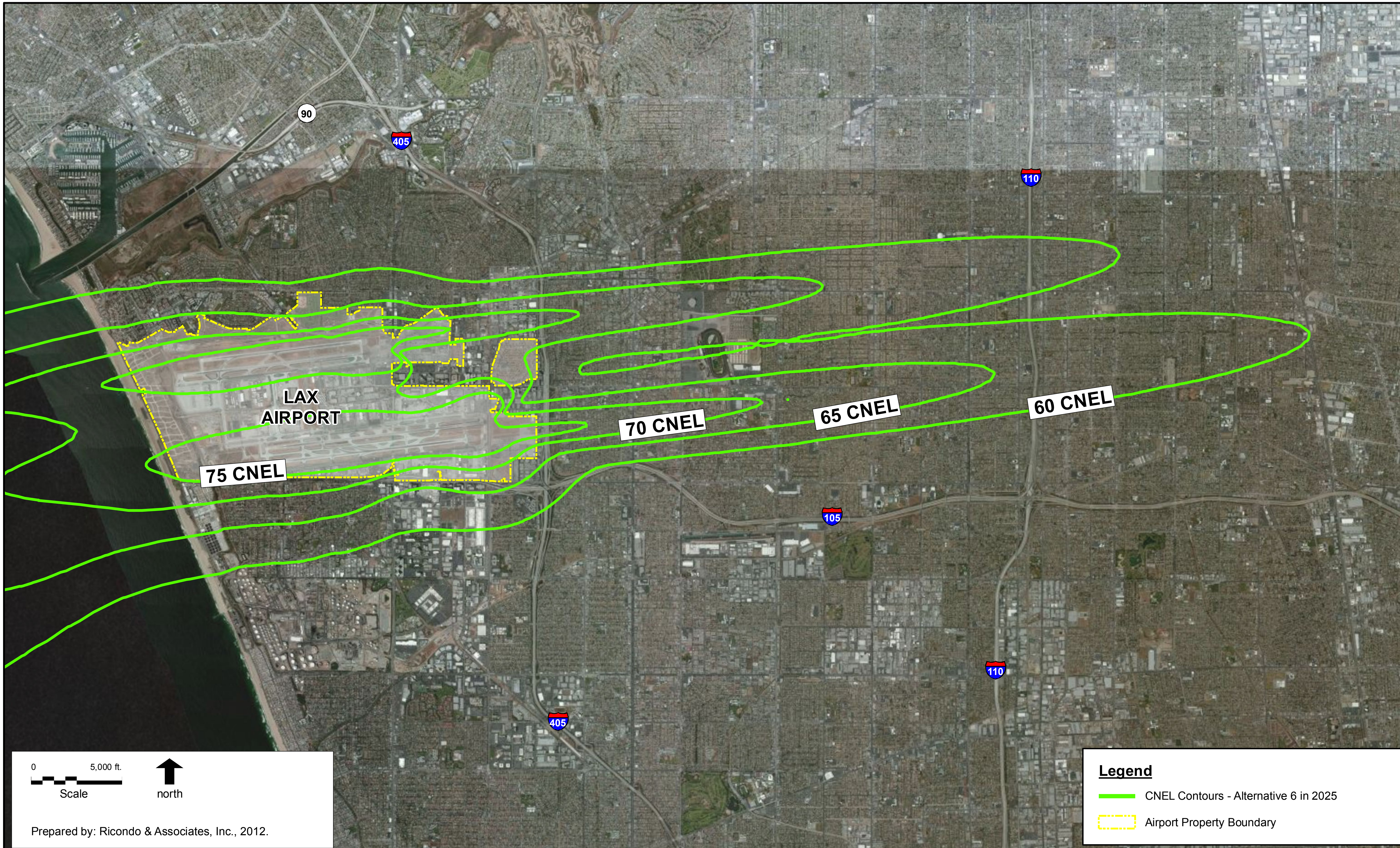
The reasons for changes in the Alternative 6 70 CNEL noise exposure contours as compared to baseline (2009) conditions are the same as those defined above for the 65 CNEL noise exposure contour. The north airfield 70 CNEL noise exposure contour extends just beyond South Cedar Street east of I-405. The south airfield 70 CNEL noise exposure contour extends slightly beyond England Avenue. East of I-405, the 70 CNEL noise exposure contours extend beyond West Westchester Parkway on the north and to South Sycamore Avenue on the south.

75 CNEL Contour

The 75 CNEL noise exposure contours for Alternative 6 exhibit the same patterns as baseline (2009) conditions, but for the north airfield, the 75 CNEL noise exposure area shifted northward matching the relocation of Runway 6L/24R and the westward extension of Runway 6R/24L. The additional length of Runway 6L/24R allows for additional heavy aircraft departures, slightly increasing the size of the 75 CNEL noise exposure contour departure area, but the 75 CNEL noise exposure contour still remains on airport property.

Affected Noise-Sensitive Uses

Table 4.10.1-41 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 6, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-41**, the Alternative 6 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 13,607 people, 4,462 additional dwelling units, and 42 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.



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CNEL Contours Overview
Alternative 6 in 2025

Figure
4.10.1-28

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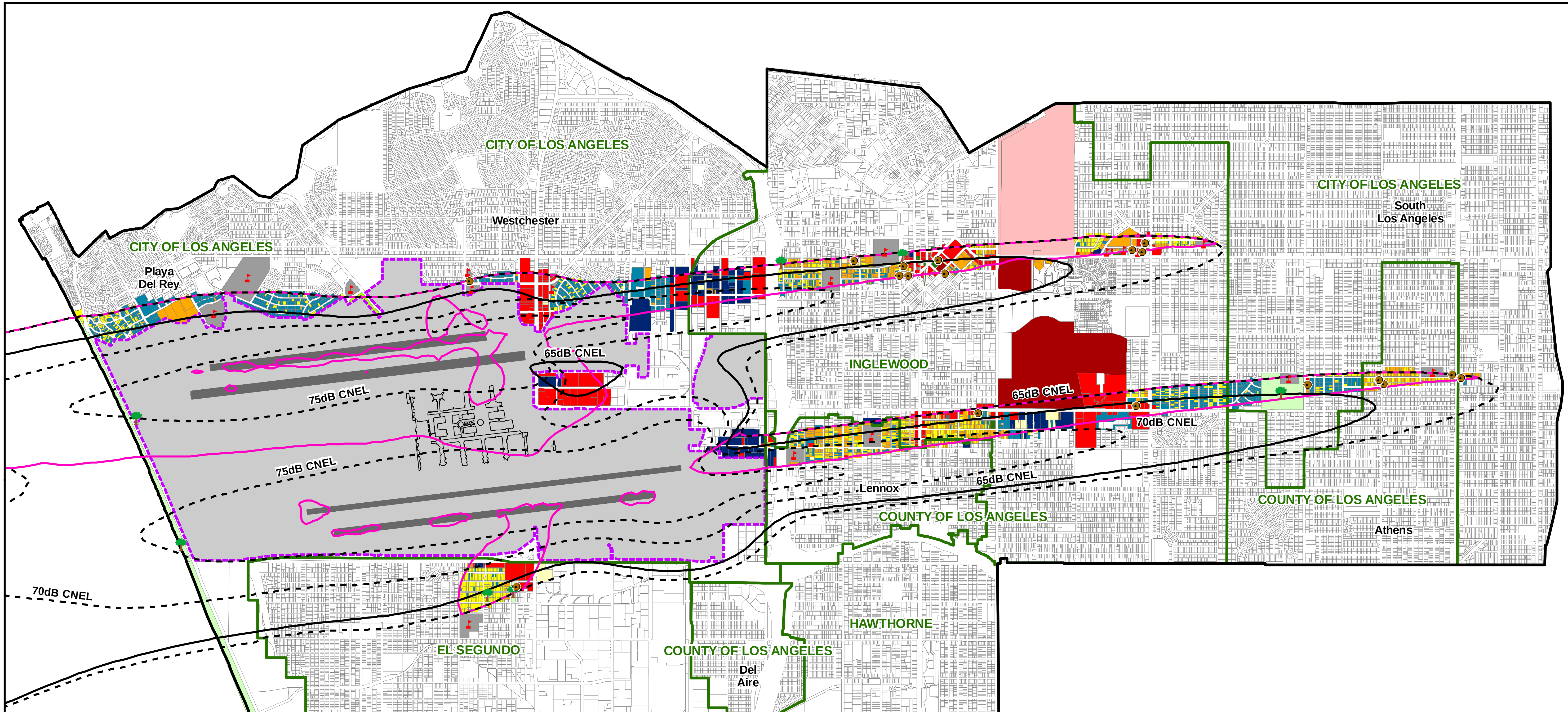

Legend

School	Single Family Residential	Hospital	Industrial	Recreation	2009 65 CNEL Contour
Places of Worship	Multiple Family Residential	Hospital - Convalescent, Nursing Homes	Government	Vacant, Assumed Vacant	1.5 CNEL Increase Contour
Hospital	Mobile Home	Library	Cemetery	Runways	Aircraft Noise Study Area
Hospital - Convalescent, Nursing Homes	School	Park	Compatible with Title 21	Runways	Jurisdictional Border
Library	Places of Worship	Commercial	Does Meet Title 24 Requirements	Airport Boundary	
Park					

0 3,500 ft

Scale north

Source: CDM Smith, 2012; ESRI ArcGIS Online, 2011;
Ricondo & Assoc., 2012;
PCR Services Corporation, 2012.
Prepared by: PCR Services Corporation, 2012.

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Alternative 6 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-29

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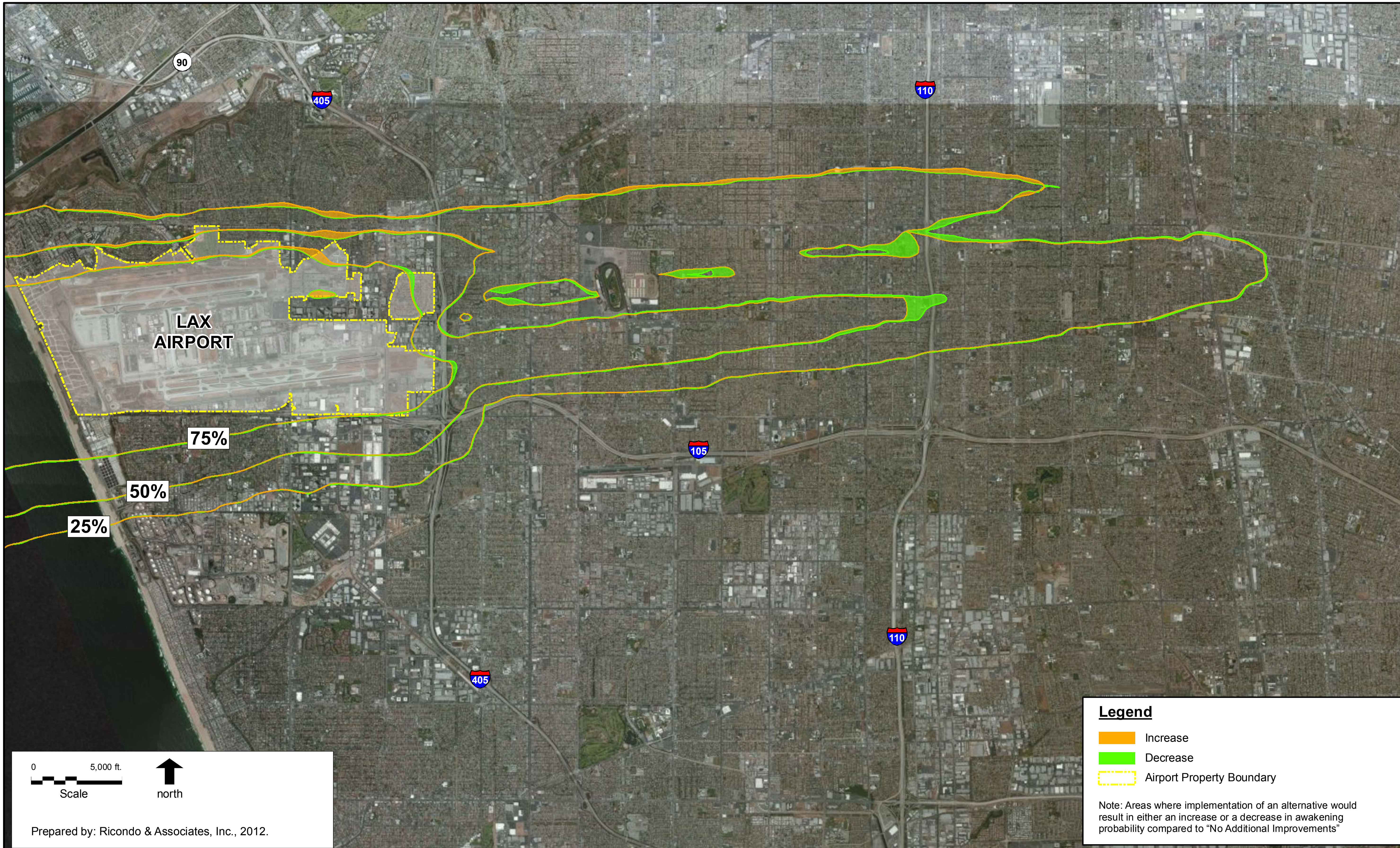

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ANSI Awakening Probability Contours:
Alternative 6 Compared to 2025 "No Additional Improvements" Conditions

Figure
4.10.1-30

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Table 4.10.1-41

Alternative 6 Noise Exposure Effects - Comparisons to Baseline (2009) Conditions and to 2025 "No Additional Improvements" Conditions

Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
Alternative 6 (2025) Noise Exposure					
65-70 CNEL	3,489	2,955	11,231	30,424	76
70-75 CNEL	2,249	931	3,383	11,123	16
75 > CNEL	2,002	97	119	498	3
65 ≥ CNEL	**7,740**	**3,983**	**14,733**	**42,045**	**95**
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	686	955	3,103	9,485	35
70-75 CNEL	328	306	1,318	3,950	5
75 > CNEL	418	48	41	172	2
65 ≥ CNEL	**1,433**	**1,309**	**4,462**	**13,607**	**42**
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions[1,2]					
65-70 CNEL	-22	-4	-44	-537	-2
70-75 CNEL	-2	-2	-92	-239	-2
75 > CNEL	18	2	-5	-21	0
65 ≥ CNEL	**-5**	**-4**	**-141**	**-797**	**-4**

1 A positive value indicates that the future alternative increases the number of impacts over the baseline (2009) conditions; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.

2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.

3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

For the purposes of the cumulative analysis, **Table 4.10.1-41** also provides a comparison between the aircraft noise exposure levels associated with Alternative 6 in 2025 and the aircraft noise exposure levels projected to occur in 2025 without additional improvements to the north airfield (i.e., "2025 'No Additional Improvements' Conditions"). The comparison between Alternative 6 (2025) to 2025 "No Additional Improvements" is used to identify the alternative's contribution to cumulative impacts. Based on that comparison, implementation of Alternative 6 would result in 797 fewer people, 141 fewer dwelling units, and 4 less non-residential noise-sensitive facilities being exposed to 65 CNEL or higher aircraft noise levels in 2025 than would otherwise occur with no modifications to the north airfield.

Table 4.10.1-42 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-42** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase, and therefore impacts would be significant.

Table 4.10.1-42

Significant Noise Impacts - Alternative 6
Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase
	Alternative 6
Population	12,705
Dwelling Units	4,879
Non-Residential Noise-Sensitive Facilities	
Schools	18
Places of Worship	18
Hospitals	0
Convalescent Hospitals	0
Parks	9
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**45**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

As illustrated in **Figure 4.10.1-29**, the significant impacts would be located principally along the approach to the north and south airfield. Within this area are an estimated 4,879 dwellings and 12,705 residents.

While there would also be increases in existing noise levels in areas beyond the 65 CNEL contour (i.e., areas with exterior noise levels less than 65 dBA CNEL), such increases would not rise to the level of being a significant impact.

Relative to cumulative impacts, **Table 4.10.1-43** discloses the population, dwellings, and non-residential noise-sensitive facilities that would, as a result of Alternative 6, experience increases of 1.5 CNEL or higher within the 65 CNEL noise exposure contour, as compared to 2025 "No Additional Improvements" Conditions. Based on that comparison, there would be no change in the population, dwelling units, or non-residential noise-sensitive parcels exposed.

Table 4.10.1-43

Noise Impacts of Alternative 6 Compared to 2025 "No Additional Improvements" Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 6
Population	0
Dwelling Units	0
Non-Residential Noise-Sensitive Facilities	
Schools	0
Places of Worship	0
Hospitals	0
Convalescent Hospitals	0
Parks	0
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**0**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

4.10.1.6.6.2 Single Event Aircraft Noise Exposure

4.10.1.6.6.2.1 Nighttime Awakenings

The awakening probability contours, estimated using the ANSI method, representing a 75 percent chance, a 50 percent chance, and a 25 percent chance of awakening at least once per night for Alternative 6 at buildout in 2025 are shown in **Figure 4.10.1-30**. Also shown in **Figure 4.10.1-30** are the equivalent percentage contours estimated to occur in 2025 if no airfield improvements were implemented (i.e., 2025 Without Alternative), and the difference areas specific to each contour (i.e., shaded areas indicate the contribution of Alternative 6 to cumulative impacts associated with changes in the probability of awakenings). Changes in the intervening areas (i.e., areas beyond and between the 75 percent and 50 percent contours, and beyond and between the 50 percent and 25 percent contours) would generally follow the same trends as shown in **Figure 4.10.1-30**. While the color shading shown in **Figure 4.10.1-30** delineates the contribution of Alternative 6 to change in the cumulative probability of awakening, the general nature, direction, and change in the probability of awakenings shown in the figure is also generally representative of the changes that would occur under Alternative 6 to the 2009 contours shown in **Figure 4.10.1-13**.

As shown in **Figure 4.10.1-30**, there would be a slight increase in the probability of awakenings in areas towards the north, decreases in the probability of awakenings in the central areas east of the airport along the flight paths between the north airfield and the south airfield, and a negligible change in the probability of awakenings in areas towards the southeast and south. **Table 4.10.1-44** indicates the project's contribution to cumulative changes in affected population within each of the three probability of awakenings contours under Alternative 6. The changes shown in the table represent the populations that would occur within each probability contour with implementation of the airfield improvements proposed under Alternative 6 compared to the populations that would otherwise be within each probability contour if there were no airfield improvements (i.e., 2025 With Alternative vs. 2025 Without Alternative). That latter population, against which the alternative's impact is measured, includes 6,074 people within the 75 percent probability contour, 69,429 people within the 50 percent probability contour, and 260,088 people within the 25 percent probability contour. **Table 4.10.1-44** shows for Alternative 6 a net decrease in population within the three probability contours evaluated.

Table 4.10.1-44

Alternative 6's Contribution to the Cumulative Change in Affected Population for 75 Percent, 50 Percent, and 25 Percent Probability of Awakening At Least Once - Alternative 6 Compared to 2025 "No Additional Runway Improvements"

	Probability of Awakening at Least Once During the Night			
Alternative 6	**75%**	**50%**	**25%**	**Average**
Change in Affected Population - Increase or (Decrease)	(200)	(703)	(1,971)	
Percent Change in Affected Population - Increase or (Decrease)	(3.29%)	(1.01%)	(0.76%)	(1.69%)

Note:

Numbers in parentheses () are negative (i.e., a decrease in affected population).

Source: Ricondo & Associates, 2012.

Based on the information presented above, implementation of Alternative 6 would not result in a substantial increase in the probability of nighttime awakenings under the project level and cumulative analyses; therefore, the impact would be less than significant and the project's contribution to cumulative impacts would not be cumulatively considerable (i.e., less than significant).

4.10.1.6.6.2.2 Classroom Disruption

As described in the methodology section, classroom disruption impacts for Alternatives 5 through 7 were estimated based on a review of the INM single event noise grid point modeling results for Alternatives 1 through 4, a review and comparison of the CNEL contours for Alternatives 1 through 4 relative to those single event noise grid point modeling results, and a comparison of the CNEL contours specific to each of Alternatives 5 through 7. As can be seen in comparing the three sets of tables related to school disruption presented for each of the four alternatives addressed above, there is very little difference in impacts between Alternatives 1 through 4.

INM results regarding schools exposed to single event noise levels greater than or equal to an L_{max} of 55 dBA, 65 dBA, and 35 dBA are presented above in **Tables 4.10.1-12** (Alternative 1), **4.10.1-19** (Alternative 2), **4.10.1-26** (Alternative 3), and **4.10.1-31** (Alternative 4). In comparison to baseline (2009) conditions, all four of the alternatives would result in one public school being newly exposed to an L_{max} of $\geq$55 dBA, none would be exposed to an L_{max} of $\geq$65 dBA, and between seven and nine schools would be newly exposed to an L_{max} of $\geq$35 dBA (seven under Alternative 3, eight under Alternative 1, and nine under Alternatives 2 and 4). Based on a review of those data and a review the noise contours for Alternative 6 compared to Alternatives 1 through 4, the impacts associated with Alternative 1 are considered to be generally representative of impacts likely to occur under Alternative 6. **Table 4.10.1-45** presents those results.

Table 4.10.1-45

Schools Exposed to Single Event Noise Levels - Alternative 6 Compared to Baseline (2009) Conditions

Impact Category	Alternative 6 Exposed	Compared to Baseline (2009) Conditions[1] Net Change	Newly Exposed - Impacted
Exposure $\geq$ 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	2	0	0
Average Number of Events/School	32	6	N/A
Average Seconds/Event	2	0	N/A
Exposure $\geq$ 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure $\geq$ 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	20	7	7
Number of Private Schools	10	1	1

[1] Classroom disruption impacts for Alternative 6 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

School disruption impacts related to the average number of daily events and average event duration (in seconds) above 55 dBA (interior) are also similar between Alternatives 1 through 4, with all of them resulting in one additional school - Jefferson Elementary School - being newly impacted in comparison to baseline (2009) conditions. INM results for that analysis are presented above in **Tables 4.10.1-13** (Alternative 1), **4.10.1-20** (Alternative 2), **4.10.1-27** (Alternative 3), and **4.10.1-32** (Alternative 4). Similar to above, the impacts associated with Alternative 1 are considered to be generally representative of those that would likely occur under Alternative 6. **Table 4.10.1-46** delineates those impacts.

Table 4.10.1-46

Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels - Alternative 6 (Estimated) During the Average School Day (8:00 a.m. - 4:00 p.m.)

				Alternative 6[1]		
Grid ID	**School**	**X Coord**	**Y Coord**	**TA-84**	**Events**	**Avg. D**
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	27.7	1.5
PBS035	Felton Elementary School	1.2997	-0.0854	1.7	57.2	1.8
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.9	23.2	2.3
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.7**	**27.5**	**1.5**
PBS105	Oak Street Elementary School	1.2636	0.7715	1.1	25.2	2.6
PBS114	Animo Leadership High School	0.8325	0.6503	0.2	22.8	0.5
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.2	57.2	2.3
	Private Schools					
PVS051	Inglewood Christian School	1.9923	0.9699	0.2	6.4	1.9
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.9	37.9	3.0

[1] Classroom disruption impacts for Alternative 6 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

Regarding school disruption associated with schools newly exposed to ANSI 35 $L_{eq(h)}$ thresholds, compared to baseline (2009) conditions, the impacts are generally similar between Alternatives 1 through 4, as can be seen in **Tables 4.10.1-14** (Alternative 1), **4.10.1-21** (Alternative 2), **4.10.1-28** (Alternative 3), and **4.10.1-33** (Alternative 4). The most notable difference is that Alternative 3 would impact two additional schools (Beulah Payne Elementary School and Century Community Charter) and three fewer schools (95th Street Preparatory School, Manhattan Place Elementary School, and Albert Monroe Middle School) compared to the other three alternatives. Those differences in school impacts are consistent with the differences in CNEL contours between Alternative 3 and the other alternatives. As can be seen in comparing the 65 CNEL contour for Alternative 3 (**Figure 4.10.1-21**) with those of the other alternatives (**Figures 4.10.1-15**, **4.10.1-18**, and **4.10.1-24**), implementation of Alternative 3 would result in more newly exposed noise-sensitive areas along the southern edge of the contour for the north airfield, which is where the two additional exposed schools under Alternative 3 are located, whereas Alternatives 1, 2, and 4 would result in more newly exposed noise-sensitive areas along the northern edge of the contour for the south airfield, which is where the three additional exposed schools under the other three alternatives are located. Similar to above, the impacts associated with Alternative 1 are considered to be generally representative of those that would likely occur under Alternative 6. **Table 4.10.1-47** delineates those impacts.

Table 4.10.1-47

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 6 (Estimated) During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	8 Hour L_{eq} Values[1] Alternative 6[2]
	Public Schools			
PBS009	95th Street Preparatory School	4.9156	0.4002	35.1
PBS050	Inglewood High School	1.809	1.0683	36.6
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.84	0.3486	35.3
PBS101	Manhattan Place Elementary School	4.1002	0.3601	35.6
PBS107	Paseo del Rey Magnet School	-2.0558	0.8652	35
PBS201	Albert Monroe Middle School	3.2061	-0.1862	35.2
PBS215	Wish Charter Elementary	-0.0775	0.853	38.3
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	34

1 Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

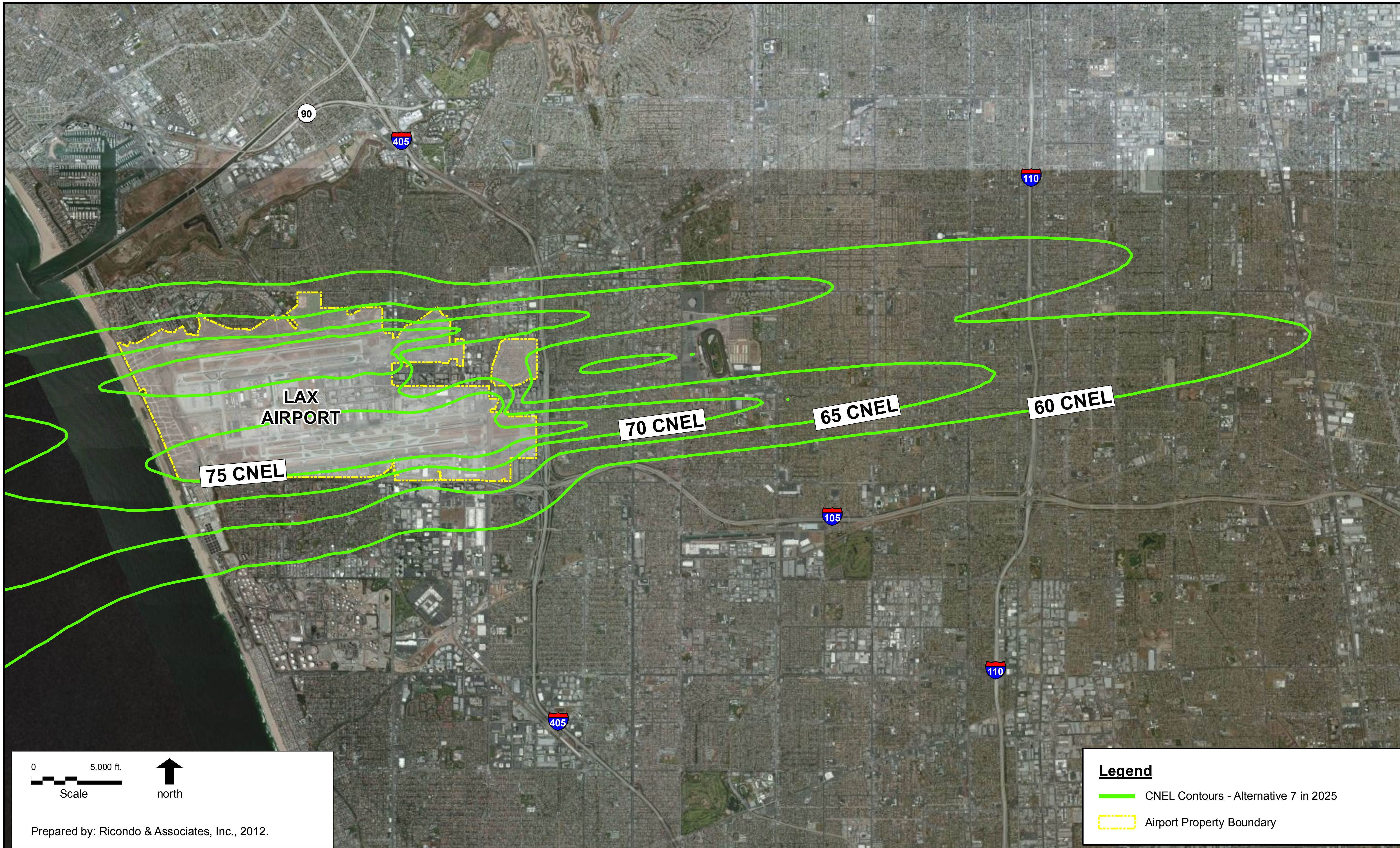
2 Classroom disruption impacts for Alternative 6 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

4.10.1.6.7 Alternative 7

The improvements to the north airfield under Alternative 7, operating in conjunction with the existing configuration of the south airfield, along with the forecasted growth in activity at LAX by 2025 would change the airport's 2009 noise exposure pattern. The following considerations contributing to the noise exposure pattern for Alternative 7 in 2025 include the following:

- An increase in the number of daily aircraft operations from 1,493 in 2009 to 1,937 in 2025.
- The number of average day heavy jet operations would increase from 239 in 2009 to 441 in 2025, while the number of average day propeller aircraft operations would decrease from 158 in 2009 to 148 in 2025. The proportion of light jets in the fleet mix would be less in 2025 as compared to 2009. See **Table 4.10.1-7** for specific details regarding the fleet mix.
- Relocation of Runway 6R/24L 100 feet south of its existing location.
- Extension of Runway 24L end 1,250 feet east of existing location.
- An anticipated shift of 15 percent of the small wide-body aircraft operations from the south airfield to the north airfield, as facilitated by the north airfield and terminal improvements.
- Provision of additional Runway 6L/24R high-speed runway exits.
- As in existing conditions, consistent with the airport's current Preferential Runway Use Policy, inboard Runways 6R/24L and 7L/25R would be used principally for takeoffs, and outboard Runways 6L/24R and 7R/25L would be used principally for landings.
- As assumed in the analysis of 2009 conditions and reflected in the airport's current Preferential Runway Use Policy, the inboard runways would be preferred for both landings and takeoffs between 10:00 p.m. and 7:00 a.m. to abate noise over communities north and south of the airport when demand levels are low.



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CNEL Contours Overview
Alternative 7 in 2025

Figure
4.10.1-31

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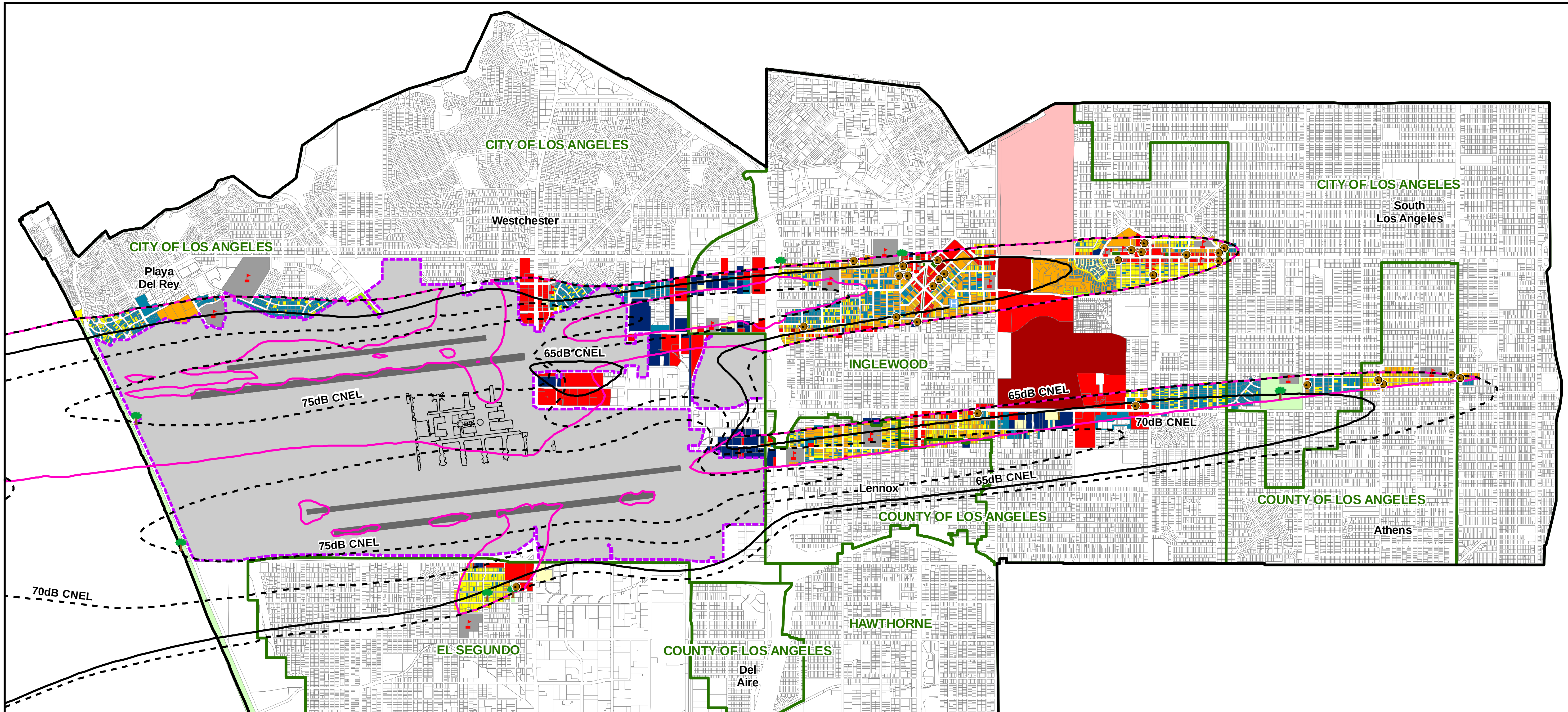

Legend

School	Single Family Residential	Hospital	Industrial	Recreation	2009 65 CNEL Contour
Places of Worship	Multiple Family Residential	Hospital - Convalescent, Nursing Homes	Government	Vacant, Assumed Vacant	1.5 CNEL Increase Contour
Hospital	Mobile Home	Library	Cemetery	Runways	Aircraft Noise Study Area
Hospital - Convalescent, Nursing Homes	School	Park	Compatible with Title 21	Airport Boundary	Jurisdictional Border
Library	Places of Worship	Commercial	Does Meet Title 24 Requirements		
Park					

0 3,500 ft
Scale north

Source: CDM Smith, 2012; ESRI ArcGIS Online, 2011; Ricondo & Assoc., 2012; PCR Services Corporation, 2012.
Prepared by: PCR Services Corporation, 2012.

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Alternative 7 vs. Baseline (2009) Conditions - 1.5 CNEL or Higher Increase within the 65 CNEL or Higher Contour

Figure
4.10.1-32

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- As assumed in the analysis of 2009 conditions, between midnight and 6:30 a.m., current Over-Ocean procedures would be used, weather permitting, to abate noise over communities east of the airport. Aircraft using Over-Ocean procedures typically land on Runway 6R and take off on Runway 25R, but can also land on Runway 7L and take off on Runway 24L.
- Turboprop aircraft departing to the west would not turn to the east/southeast below 3,000 feet MSL. With this measure, turboprop aircraft would reach higher altitudes and over the water before they turn south and then back to the east over the communities immediately south of the airport. The effects of this measure would be beyond the contours of significant noise exposure.

The first two of these factors would result in a general increase in the overall size of the Alternative 7 noise exposure contour in 2025, as compared to 2009 conditions, because more total noise energy would be generated within the airport environs on an average day with an increase in aircraft operations, and particularly heavy jet aircraft operations. The 100 feet southward relocation of Runway 6L/24R for landings on Runway 24R is expected to change the arrival and landing noise 100 feet south compared to 2009 conditions. The location of the high-speed runway exits for landings on Runway 24R would provide additional exits for heavy aircraft to use when landing on Runway 24R, as the current locations of the exits preclude heavy aircraft from using them. This change is not expected to increase the overall size of the CNEL noise exposure contours, because aircraft would be able to exit with reduced reverse thrust. The Runway 24L extension of 1,250 feet to the east is expected to move start-of-takeoff roll noise levels to the northwest and northeast behind the runway end, and slightly increase due to the additional small wide-body departures from Runway 24L. With the extension, the enhanced balance of small wide-body aircraft departures between the south and north airfields is expected to decrease start-of-takeoff roll noise from Runway 25R to the east.

Figure 4.10.1-31 presents the overall CNEL contours, ranging from 60 CNEL to 75 CNEL, estimated at buildout of Alternative 7 in 2025.

4.10.1.6.7.1 Comparison of Alternative 7 Aircraft Noise and Baseline (2009) Conditions

The noise exposure contours for Alternative 7 2025 Conditions are depicted in **Figure 4.10.1-32**. The area depicted by the magenta line indicates areas newly exposed to increases larger than 1.5 decibels and above 65 CNEL dBA. The most notable change from the baseline (2009) conditions to Alternative 7 conditions is attributable to the projected growth in aircraft activity from 2009 to 2025. As the number of aircraft operations grows, it is expected that the area exposed to significant levels of aircraft noise will grow as well. While the noise exposure contours for Alternative 7 are larger in comparison to baseline (2009) conditions, the overall shape of the contours remains similar. With the 100-foot shift of Runway 6R/24L to the south, the 65 CNEL noise exposure contour for the north airfield is expected to expand slightly more to the south half of the north airfield than to the north.

The following provides a geographic description of the Alternative 7 noise exposure contours compared to baseline (2009) conditions.

65 CNEL Contour

The Alternative 7 65 CNEL noise exposure contours east of I-405 would extend approximately 3,500 feet farther east than under the baseline (2009) conditions. The 65 CNEL noise exposure contour resulting from aircraft using the north airfield would extend to South 2nd Avenue and from aircraft using the south airfield would extend to South Hoover Street. The increase in the area exposed to aircraft noise to the east of the airport would largely result from the increase in aircraft operations and assumed change in fleet mix from 2009 to 2025. The north airfield 65 CNEL noise exposure contour east of I-405 is also expected to extend approximately 100 feet farther south as a result of the relocation of Runway 6L/24R.

West of I-405, the Alternative 7 65 CNEL noise exposure contour would widen along the approach to the north runways as a result of the south shift in Runway 6L/24R, the increase in operations, an increase in the proportion of aircraft using the north airfield, and changing fleet mix. The 65 CNEL noise exposure contour along the approach to the south runways also widens to a lesser extent and can be attributed to the increase in operations.

The noise pattern along the departure sections to the north and south airfields would be wider under the Alternative 7 than the baseline (2009) conditions, which is attributable to the south shift in Runway 6L/25R and the larger number of departures in 2025.

70 CNEL Contour

The reasons for changes in the Alternative 7 70 CNEL noise exposure contours as compared to baseline (2009) conditions are the same as those defined above for the 65 CNEL noise exposure contour. The north airfield 70 CNEL noise exposure contour extends just beyond Inglewood Avenue east of I-405. The south airfield 70 CNEL noise exposure contour extends slightly beyond England Avenue. East of I-405, the 70 CNEL noise exposure contours extend beyond West Westchester Parkway on the north and to South Sycamore Avenue on the south.

75 CNEL Contour

The 75 CNEL noise exposure contours for Alternative 7 exhibit the same patterns as baseline (2009) conditions, but for the north airfield, the 75 CNEL noise exposure area shifted southward matching the relocation of Runway 6L/24R and the westward extension of Runway 6R/24L. The additional length of Runway 6L/24R allows for additional heavy aircraft departures, slightly increasing the size of the 75 CNEL noise exposure contour departure area, but the 75 CNEL noise exposure contour still remains on airport property.

Affected Noise-Sensitive Uses

Table 4.10.1-48 provides an overview of the land area, population, dwellings, and number of non-residential noise-sensitive facilities within the CNEL noise exposure contours associated with Alternative 7, as well as the differences between these facilities' exposure to aircraft noise compared to baseline (2009) conditions. As indicated in **Table 4.10.1-48**, the Alternative 7 scenario would result in a net increase of the land area within the 65 CNEL noise exposure contours, as well as increase in the number of dwellings, population, and non-residential noise-sensitive facilities located within the 65 CNEL (or higher) noise exposure contours. Specifically, an additional 13,891 people, 4,485 additional dwelling units, and 42 additional non-residential noise-sensitive facilities are expected to be exposed to 65 CNEL or higher noise exposure levels, compared to baseline (2009) conditions.

Table 4.10.1-48

Alternative 7 Noise Exposure Effects -
Comparisons to Baseline (2009) Conditions
and to 2025 "No Additional Improvements" Conditions

Noise Level Range	Total Acreage Over Land[3]	Off-Airport Area (Acres)[3]	Total Dwellings	Estimated Population	Non-Residential Noise-Sensitive Facilities
Alternative 7 (2025) Noise Exposure					
65-70 CNEL	3,491	2,925	11,240	30,660	76
70-75 CNEL	2,215	936	3,397	11,171	18
75 > CNEL	2,011	100	119	498	3
65 ≥ CNEL	**7,717**	**3,961**	**14,756**	**42,329**	**95**
Change from Baseline (2009) Conditions[1,2]					
65-70 CNEL	688	925	3,112	9,721	35
70-75 CNEL	294	311	1,332	3,998	5
75 > CNEL	427	51	41	172	2
65 ≥ CNEL	**1,410**	**1,287**	**4,485**	**13,891**	**42**
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions[1,2]					
65-70 CNEL	-20	-34	-35	-301	-2
70-75 CNEL	-36	3	-78	-191	-2
75 > CNEL	27	5	-5	-21	0
65 ≥ CNEL	-28	-26	-118	-513	-4

1 A positive value indicates that the future alternative increases the number of impacts over the baseline (2009) conditions; a negative number indicates that the future alternative decreases the number of impacts. The number indicates the net difference. Some areas would experience increased noise while other areas would experience a decrease in noise levels. Section 4.9, *Land Use and Planning*, details the number of noise-sensitive uses newly exposed to 65 CNEL or higher noise levels.

2 Population and dwelling information is reported using a year 2010 U.S. Census data base for CNEL comparisons.

3 Acreage totals may not add due to rounding.

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

For the purposes of the cumulative analysis, **Table 4.10.1-48** also provides a comparison between the aircraft noise exposure levels associated with Alternative 7 in 2025 and the aircraft noise exposure levels projected to occur in 2025 without additional improvements to the north airfield (i.e., "2025 'No Additional Improvements' Conditions"). The comparison between Alternative 7 (2025) to 2025 "No Additional Improvements" is used to identify the alternative's contribution to cumulative impacts. Based on that comparison, implementation of Alternative 7 would result in 513 fewer people, 118 fewer dwelling units, and 4 less non-residential noise-sensitive facilities being exposed to 65 CNEL or higher aircraft noise levels in 2025 than would otherwise occur with no modifications to the north airfield.

Table 4.10.1-49 details the numbers of residential and other noise-sensitive facilities that would be exposed to aircraft noise levels in excess of the threshold of significance for CNEL, as defined in Section 4.10.1.4.1. Specifically, these noise-sensitive uses would be exposed to 65 CNEL or greater with at least a 1.5 CNEL increase as compared to baseline (2009) conditions. The totals shown in **Table 4.10.1-49** not only include the noise-sensitive receptors that would be newly exposed to 65 CNEL or greater with at least a 1.5 CNEL increase, but also those that are currently/already exposed to 65 CNEL or higher and would experience at least a 1.5 CNEL increase, and therefore impacts would be significant.

Table 4.10.1-49

Significant Noise Impacts - Alternative 7 Compared to Baseline (2009) Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase
	Alternative 7
Population	19,482
Dwelling Units	7,325
Non-Residential Noise-Sensitive Facilities	
Schools	20
Places of Worship	28
Hospitals	0
Convalescent Hospitals	1
Parks	9
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**58**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

As illustrated in **Figure 4.10.1-32**, the significant impacts would be located principally along the approach to the north and south airfield. Within this area are an estimated 7,325 dwellings and 19,482 residents.

While there would also be increases in existing noise levels in areas beyond the 65 CNEL contour (i.e., areas with exterior noise levels less than 65 dBA CNEL), such increases would not rise to the level of being a significant impact.

Relative to cumulative impacts, **Table 4.10.1-50** discloses the population, dwellings, and non-residential noise-sensitive facilities that would, as a result of Alternative 1, experience increases of 1.5 CNEL or higher within the 65 CNEL noise exposure contour, as compared to 2025 "No Additional Improvements" Conditions. Based on that comparison, there would be no change in the population, dwelling units, or non-residential noise-sensitive parcels exposed.

Table 4.10.1-50

Noise Impacts of Alternative 7
Compared to 2025 "No Additional Improvements" Conditions

	Exposed to ≥ 65 CNEL and 1.5 CNEL Increase Alternative 7
Population	0
Dwelling Units	0
Non-Residential Noise-Sensitive Facilities	
Schools	0
Places of Worship	0
Hospitals	0
Convalescent Hospitals	0
Parks	0
Libraries	0
Total Non-Residential Noise-Sensitive Facilities	**0**

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

4.10.1.6.7.2 Single Event Aircraft Noise Exposure

4.10.1.6.7.2.1 Nighttime Awakenings

The awakening probability contours, estimated using the ANSI method, representing a 75 percent chance, a 50 percent chance, and a 25 percent chance of awakening at least once per night for Alternative 7 at buildout in 2025 are shown in **Figure 4.10.1-33**. Also shown in **Figure 4.10.1-33** are the equivalent percentage contours estimated to occur in 2025 if no airfield improvements were implemented (i.e., 2025 Without Alternative), and the difference areas specific to each contour (i.e., shaded areas indicate the contribution of Alternative 7 to cumulative impacts associated with changes in the probability of awakenings). Changes in the intervening areas (i.e., areas beyond and between the 75 percent and 50 percent contours, and beyond and between the 50 percent and 25 percent contours) would generally follow the same trends as shown in **Figure 4.10.1-33**. While the color shading shown in **Figure 4.10.1-33** delineates the contribution of Alternative 7 to change in the cumulative probability of awakening, the general nature, direction, and change in the probability of awakenings shown in the figure is also generally representative of the changes that would occur under Alternative 7 to the 2009 contours shown in **Figure 4.10.1-13**.

As shown in **Figure 4.10.1-33**, there would be slight increases in the probability of awakenings in some areas to the north and northeast, decreases in the probability of awakenings in the central areas east of the airport along the flight paths associated with the south airfield, and slight changes in the probability of awakenings in areas towards the southeast and south. **Table 4.10.1-51** indicates the project's contribution to cumulative changes in affected population within each of the three probability of awakenings contours under Alternative 7. The changes shown in the table represent the populations that would occur within each probability contour with implementation of the airfield improvements proposed under Alternative 7 compared to the populations that would otherwise be within each probability contour if there were no airfield improvements (i.e., 2025 With Alternative vs. 2025 Without Alternative). That latter population, against which the alternative's impact is measured, includes 6,074 people within the 75 percent probability contour, 69,429 people within the 50 percent probability contour, and 260,088 people within the 25 percent probability contour. **Table 4.10.1-51** shows for Alternative 7 a net decrease in population within the three probability contours evaluated.

Table 4.10.1-51

Alternative 7's Contribution to the Cumulative Change in Affected Population for 75 Percent, 50 Percent, and 25 Percent Probability of Awakening At Least Once - Alternative 7 Compared to 2025 "No Additional Runway Improvements"

	Probability of Awakening at Least Once During the Night			
Alternative 7	**75%**	**50%**	**25%**	**Average**
Change in Affected Population - Increase or (Decrease)	(127)	(1,100)	2,357	
Percent Change in Affected Population - Increase or (Decrease)	(2.09%)	(1.58%)	0.91%	(0.92%)

Note:

Numbers in parentheses () are negative (i.e., a decrease in affected population).

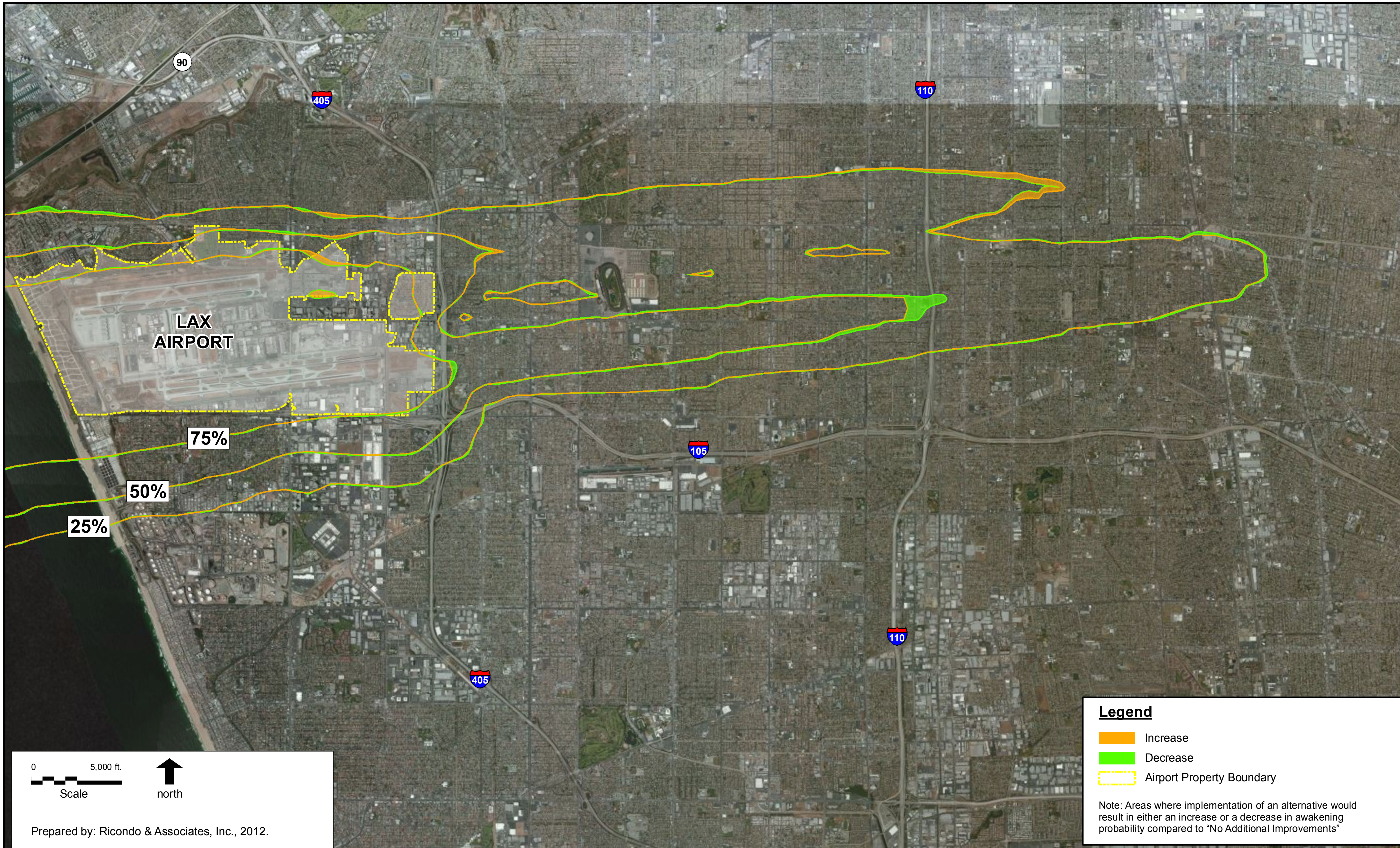
Source: Ricondo & Associates, 2012.

Based on the information presented above, implementation of Alternative 7 would not result in a substantial increase in the probability of nighttime awakenings under the project level and cumulative analyses; therefore, the impact would be less than significant and the project's contribution to cumulative impacts would not be cumulatively considerable (i.e., less than significant).

4.10.1.6.7.2.2 Classroom Disruption

As described in the methodology section, classroom disruption impacts for Alternatives 5 through 7 were estimated based on a review of the INM single event noise grid point modeling results for Alternatives 1 through 4, a review and comparison of the CNEL contours for Alternatives 1 through 4 relative to those single event noise grid point modeling results, and a comparison of the CNEL contours specific to each of Alternatives 5 through 7. As can be seen in comparing the three sets of tables related to school disruption presented for each of the four alternatives addressed above, there is very little difference in impacts between Alternatives 1 through 4.

INM results regarding schools exposed to single event noise levels greater than or equal to an L_{max} of 55 dBA, 65 dBA, and 35 dBA are presented above in **Tables 4.10.1-12** (Alternative 1), **4.10.1-19** (Alternative 2), **4.10.1-26** (Alternative 3), and **4.10.1-31** (Alternative 4). In comparison to baseline (2009) conditions, all four of the alternatives would result in one public school being newly exposed to an L_{max} of $\geq$55 dBA, none would be exposed to an L_{max} of $\geq$65 dBA, and between seven and nine schools would be newly exposed to an L_{max} of $\geq$35 dBA (seven under Alternative 3, eight under Alternative 1, and nine under Alternatives 2 and 4). Based on a review of those data and a review the noise contours for Alternative 7 compared to Alternatives 1 through 4, the impacts associated with Alternative 1 are considered to be generally representative of impacts likely to occur under Alternative 7. **Table 4.10.1-52** presents those results.



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ANSI Awakening Probability Contours:
Alternative 7 Compared to 2025 "No Additional Improvements" Conditions

Figure
4.10.1-33

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Table 4.10.1-52

Schools Exposed to Single Event Noise Levels - Alternative 7 Compared to Baseline (2009) Conditions

Impact Category	Alternative 7 Exposed	Compared to Baseline (2009) Conditions[1] Net Change	Newly Exposed - Impacted
Exposure ≥ 55 dBA (L_{max})			
Number of Public Schools	7	1	1
Number of Private Schools	2	0	0
Average Number of Events/School	32	6	N/A
Average Seconds/Event	2	0	N/A
Exposure ≥ 65 dBA (L_{max})			
Number of Public Schools	0	0	0
Number of Private Schools	0	0	0
Exposure ≥ 35 dBA ($L_{eq(h)}$)			
Number of Public Schools	20	7	7
Number of Private Schools	10	1	1

[1] Classroom disruption impacts for Alternative 7 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

School disruption impacts related to the average number of daily events and average event duration (in seconds) above 55 dBA (interior) are also similar between Alternatives 1 through 4, with all of them resulting in one additional school - Jefferson Elementary School - being newly impacted in comparison to baseline (2009) conditions. INM results for that analysis are presented above in **Tables 4.10.1-13** (Alternative 1), **4.10.1-20** (Alternative 2), **4.10.1-27** (Alternative 3), and **4.10.1-32** (Alternative 4). Similar to above, the impacts associated with Alternative 1 are considered to be generally representative of those that would likely occur under Alternative 7. **Table 4.10.1-53** delineates those impacts.

Table 4.10.1-53

Average Daily Minutes Above Threshold, Average Number of Daily Events, and Average Event Duration (in Seconds) Above 55 Interior dBA Speech Interference Levels - Alternative 7 (Estimated) During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	Alternative 7[1] TA-84	Alternative 7[1] Events	Alternative 7[1] Avg. D
	Public Schools					
PBS019	Buford Elementary School	1.378	-0.3156	0.7	27.7	1.5
PBS035	Felton Elementary School	1.2997	-0.0854	1.7	57.2	1.8
PBS047	Hillcrest Continuation High School	1.5006	0.9081	0.9	23.2	2.3
PBS055	**Jefferson Elementary School**	**1.7352**	**0.0244**	**0.7**	**27.5**	**1.5**
PBS105	Oak Street Elementary School	1.2636	0.7715	1.1	25.2	2.6
PBS114	Animo Leadership High School	0.8325	0.6503	0.2	22.8	0.5
PBS123	Dolores Huerta Elementary School	2.2755	-0.0716	2.2	57.2	2.3
	Private Schools					
PVS051	Inglewood Christian School	1.9923	0.9699	0.2	6.4	1.9
PVS062	Training and Research Foundation - Inglewood Southside	2.4891	-0.0125	1.9	37.9	3.0

[1] Classroom disruption impacts for Alternative 7 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

Regarding school disruption associated with schools newly exposed to ANSI 35 $L_{eq(h)}$ thresholds, compared to baseline (2009) conditions, the impacts are generally similar between Alternatives 1 through 4, as can be seen in **Tables 4.10.1-14** (Alternative 1), **4.10.1-21** (Alternative 2), **4.10.1-28** (Alternative 3), and **4.10.1-33** (Alternative 4). The most notable difference is that Alternative 3 would impact two additional schools (Beulah Payne Elementary School and Century Community Charter) and three fewer schools (95th Street Preparatory School, Manhattan Place Elementary School, and Albert Monroe Middle School) compared to the other three alternatives. Those differences in school impacts are consistent with the differences in CNEL contours between Alternative 3 and the other alternatives. As can be seen in comparing the 65 CNEL contour for Alternative 3 (**Figure 4.10.1-21**) with those of the other alternatives (**Figures 4.10.1-15**, **4.10.1-18**, and **4.10.1-24**), implementation of Alternative 3 would result in more newly exposed noise-sensitive areas along the southern edge of the contour for the north airfield, which is where the two additional exposed schools under Alternative 3 are located, whereas Alternatives 1, 2, and 4 would result in more newly exposed noise-sensitive areas along the northern edge of the contour for the south airfield, which is where the three additional exposed schools under the other three alternatives are located. Similar to above, the impacts associated with Alternative 1 are considered to be generally representative of those that would likely occur under Alternative 7. **Table 4.10.1-54** delineates those impacts.

Table 4.10.1-54

Hourly Equivalent Noise Level at LAX Area Schools Newly Exposed to ANSI 35 $L_{eq(h)}$ Thresholds - Alternative 7 (Estimated) During the Average School Day (8:00 a.m. - 4:00 p.m.)

Grid ID	School	X Coord	Y Coord	8 Hour L_{eq} Values[1] Alternative 7[2]
	Public Schools			
PBS009	95th Street Preparatory School	4.9156	0.4002	35.1
PBS050	Inglewood High School	1.809	1.0683	36.6
PBS086	Bright Star Secondary Charter Academy and Stella Middle Charter Academy	0.84	0.3486	35.3
PBS101	Manhattan Place Elementary School	4.1002	0.3601	35.6
PBS107	Paseo del Rey Magnet School	-2.0558	0.8652	35
PBS201	Albert Monroe Middle School	3.2061	-0.1862	35.2
PBS215	Wish Charter Elementary	-0.0775	0.853	38.3
	Private Schools			
PVS029	K. Anthony Elementary School	3.2633	1.1998	34

1 Noise levels are computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels for exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

2 Classroom disruption impacts for Alternative 7 estimated to be comparable to those of Alternative 1 - see text discussion.

Source: CDM Smith, 2012.

4.10.1.6.8 Comparison of Aircraft Noise Impacts - All Alternatives

Table 4.10.1-55 provides a comparison of the noise exposure impacts of each alternative within the 65 CNEL or higher noise exposure contour for 2025. The density of the population is not constant across the area exposed to noise above 65 CNEL or higher; consequently; while the area of exposure may be similar among alternatives, the numbers of persons, dwellings or non-residential noise-sensitive facilities may vary.

Table 4.10.1-55

Total Aircraft Noise Exposure Effects - All Alternatives in 2025
Comparisons to Baseline (2009) and to 2025 "No Additional Improvements" Conditions

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Acres Off the Airport	4,002	3,998	3,944	3,987	4,018	3,983	3,961
Dwellings	14,641	14,802	14,779	14,874	14,586	14,733	14,756
Population	41,598	42,477	41,594	42,842	41,299	42,045	42,329
Non-Residential Noise-Sensitive Facilities	96	97	98	99	94	95	95
Population Exposed to 65≥ CNEL:							
Change from Baseline (2009) Conditions	13,160	14,039	13,156	14,404	12,861	13,607	13,891
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions	-1,244	-365	-1,248	N/A	-1,543	-797	-513
Dwellings Exposed to 65≥ CNEL:							
Change from Baseline (2009) Conditions	4,370	4,531	4,508	4,603	4,315	4,462	4,485
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions	-233	-72	-95	N/A	-288	-141	-118
Non-Residential Noise-Sensitive Facilities Exposed to 65≥ CNEL:							
Change from Baseline (2009) Conditions	43	44	45	46	41	42	42
Cumulative Contribution - Change from 2025 "No Additional Improvements" Conditions	-3	-2	-1	N/A	-5	-4	-4

Source: Ricondo & Associates, Inc., 2012 (CNEL noise exposure contours; PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

Table 4.10.1-55 provides a summary of the population, dwellings, and non-residential noise-sensitive facilities that would be within the 65 CNEL or higher noise exposure contour with the implementation of the various alternatives compared to baseline (2009) conditions. Alternative 5 would result in the least change in number of dwellings exposed to 65 CNEL or higher noise levels (4,315), followed in order by the Alternative 1 (4,370), Alternative 6 (4,462), Alternative 7 (4,485), Alternative 3 (4,508), Alternative 2 (4,531), and Alternative 4 (4,603).

Table 4.10.1-56 summarizes the significant impacts (i.e., increases of 1.5 CNEL and higher within the 65 CNEL and higher noise exposure contour) associated with each alternative relative to the baseline (2009) conditions. Overall, Alternative 6 would result in the lowest numbers of dwellings, population, and non-residential noise-sensitive facilities experiencing increases of 1.5 CNEL and higher within the 65 CNEL and higher noise exposure contour and Alternative 7 would result in the highest numbers of such impacts. The numbers of impacts associated with the other alternatives would fall between those of Alternatives 7 and 6. In general, there is not a substantial difference between the alternatives relative to significant noise impacts.

Table 4.10.1-56

Increase of 1.5 CNEL Within 65 CNEL Compared to Baseline (2009) Conditions

Effect Category	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Dwellings	5,296	6,797	5,884	6,020	5,408	4,879	7,325
Population	13,608	18,035	15,099	16,661	13,773	12,705	19,482
Non-Residential Noise-Sensitive Facilities	48	53	55	51	50	45	58

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

Table 4.10.1-57 provides a comparative summary of the numbers of newly impacted schools that are potentially newly exposed to single event noise above the temporary thresholds of significance developed for this analysis of the alternatives.

Table 4.10.1-57

Classroom Disruption Impacts of All Alternatives

	Baseline (2009) Conditions	Alternative						
		1	2	3	4	5	6	7
Schools - Exposure to Interior Noise of								
$\geq$ 55 dBA L_{max}	8	9	8	8	8	9	9	9
$\geq$ 65 dBA L_{max}	0	0	0	0	0	0	0	0
$\geq$ 35 dBA $L_{eq(h)}$	22	30	31	29	31	30	30	30

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (population, dwelling unit and school databases; GIS spatial analysis).

In each alternative only one additional school is newly exposed to the 55 dBA L_{max} level. The school, Jefferson Elementary School, is the same in each of the alternatives. With regard to noise exposure at or above 35 dBA $L_{eq(h)}$, Alternative 3 has the smallest increase (7 schools newly exposed), followed by Alternatives 1, 5, 6, and 7 (8 schools newly exposed). Alternatives 2 and 4 newly expose 9 schools.

Table 4.10.1-58 provides a comparative summary of percentage change in overall population exposed to the probability of being awakened at least once during the night by single event noise, based on 75-, 50-, and 25-percent change probability contours.

Table 4.10.1-58

Awakening Probability Impacts of All Alternatives

	Alternative						
	1	2	3	4	5	6	7
Contribution to the Cumulative Change in Population Exposed to Probability of Awakening Compared to 2025 "No Additional Runway Improvements"[1]	-2.4%	1.2%	2.9%	NC	-2.7%	-1.7%	-0.9%

Notes:

NC = No change in probability

[1] Based on average percent change in population for 25-, 50-, and 75-percent probability of awakening contours for each alternative in 2025, compared to 2025 conditions without airfield improvements. Negative numbers indicate a reduction in probability of awakening and positive numbers indicate an increase in probability of awakening.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (population, dwelling unit and school databases; GIS spatial analysis).

As indicated in **Table 4.10.1-58**, none of the alternatives would result in a substantial increase in the probability of awakenings; therefore, none of the alternatives would result in a significant impact relative to sleep awakenings.

4.10.1.7 Mitigation Measures

This section begins with an overview of noise abatement techniques. It continues with a discussion of the potential use of noise abatement techniques at LAX to reduce the impacts of the SPAS alternatives.

The abatement and mitigation of aircraft noise may be accomplished in two general ways: 1) by reducing the loudness of the noise source or increasing the distance of the noise source from the receptor on the ground or 2) by modifying the receptor to make it less affected by noise. This section discusses potential abatement of noise by modifications of the noise source. Section 4.9, *Land Use and Planning*, discusses the modification of the noise-sensitive receptors for noise mitigation.

The DOT/FAA Aviation Noise Abatement Policy of 1976, the Airport Safety and Noise Abatement Act of 1979, and the Airport Noise and Capacity Act of 1990 (Pub. L. No. 101-508, 104 Stat. 1388, as recodifed at 49 U.S.C. 47521 et seq.; 14 CFR Part 161) outline the framework for a coordinated approach to noise abatement and mitigation of noise impacts. Responsibilities are shared among the airport users, aircraft manufacturers, airport proprietors, federal and state governments, and local governments of communities near the airport. Noise abatement measures should reduce noise impacts; comply with federal, state, and local law; and be safe for aircraft operators, passengers, and residents under the routes of flight.

This section is concerned with noise abatement measures that would alter the use or configuration of airspace, runways, flight tracks, and airport facilities to reduce or shift the location of noise. These techniques produce either of two effects: the reduction of the overall size of the noise exposure contours or the shift of noise contours to more compatible areas.

Reduction of Aircraft Noise Levels

To reduce the overall noise levels around an airport, it is necessary to reduce the total sound energy emitted by the aircraft. The responsibility for the reduction of aircraft noise at the source has been assumed by the federal government. Congress has established aircraft noise certification levels requiring the manufacturers of new aircraft types to comply with established noise limits. To date, four noise certification stages have been established - Stages 1 through 4.[587] New aircraft types must now comply with the Stage 4 certification standards. Congress has also adopted legislation requiring the retirement of the oldest and loudest aircraft types (Stages 1 and 2) from the commercial aircraft fleet.

Airport operators can try to achieve additional direct noise reductions through the limited means available to them. These include the recommended modification of aircraft operating procedures, the reduction of the number of aircraft operations, the shift in operations from more to less sensitive times of the day, or the replacement of relatively loud aircraft with quieter aircraft. The first option requires the cooperation of pilots and aircraft operators. The latter three options may occur through voluntary adjustments made by aircraft operators but can only be mandated through the adoption of local airport regulations.

Modification of Aircraft Operating Procedures

Aircraft can be operated in many different configurations which can result in differing noise levels on the ground. These configurations relate to engine power settings, flap settings, and rates of climb and descent. Variations in these parameters, all of which directly affect the performance of the aircraft, are made by pilots to ensure flight safety in different weather conditions and based on aircraft loads. Under federal law, the pilot in command is ultimately responsible for the safe operation of the aircraft. Accordingly, aircraft operating procedures are the responsibility of the pilot - a responsibility that cannot be superseded by any local regulation. It is possible for airport operators to coordinate with aircraft operators in establishing voluntary measures for operating aircraft so as to reduce noise exposure. In fact, LAWA has previously established policies promoting the use of operating procedures that can reduce noise, as described in Section 4.10.1.5. Those include reduced thrust departures and noise abatement departure profiles. It is not legally possible for an airport operator or local government to formalize these operating procedures, and it is difficult to verify the degree to which the procedures are being used. Thus, mandatory modifications of aircraft operating procedures are not feasible.

Airport Operating Regulations

Local regulations would be needed to implement mandatory reductions in airport operations, shifts in flight schedules, or changes in aircraft permitted to operate at the airport. With the adoption of the Airport Noise and Capacity Act of 1990, Congress required that airport operators could adopt such regulations only upon completion of a detailed study of the potential impacts of and alternatives to the proposed regulations. In most cases, the regulations can be adopted only after explicit FAA approval of the proposed restrictions.[588] Before the FAA will consider a proposal to adopt a noise or access restriction, the airport sponsor must complete an analysis in compliance with 14 CFR Part 161. The analysis must demonstrate that the proposed restriction would meet the following six statutory conditions:

- Condition 1: The restriction is reasonable, nonarbitrary, and nondiscriminatory.
- Condition 2: The restriction does not create an undue burden on interstate or foreign commerce.
- Condition 3: The proposed restriction maintains safe and efficient use of the navigable airspace.
- Condition 4: The proposed restriction does not conflict with any existing Federal statute or regulation.
- Condition 5: The applicant has provided adequate opportunity for public comment on the proposed restriction.
- Condition 6: The proposed restriction does not create an undue burden on the national aviation system.[589]

In accordance with LAX Master Plan Mitigation Measure MM-N-5, LAWA is currently preparing a 14 CFR Part 161 Study for LAX, seeking federal approval of a locally-imposed Noise and Access Restriction on

587 14 Code of Federal Regulations (CFR) Part 36.

588 Any restrictions that would affect aircraft complying with the Stage 3 noise certification requirements of 14 CFR Part 36 can be adopted only after FAA approval of the proposed restriction. See 14 CFR Part 161, Notice and Approval of Airport Noise and Access Restrictions, Subpart D.

589 14 Code of Federal Regulations (CFR) Part 161, Section 161.305.

departures to the east during Over-Ocean Operations, or when Westerly Operations remain in effect during the Over-Ocean Operations time period.

Shifting Noise to Compatible Areas

Because of obstacles to the direct reduction of aircraft noise levels, it is more effective for airport operators to focus on the noise abatement methods that shift noise from sensitive areas (such as residential neighborhoods) to compatible areas (such as industrial areas). This can be accomplished through changes in runway use and arrival or departure routes or through facility changes on the airport itself, such as the modification of runways or the construction of noise barriers.

Runway Use and Flight Route Changes

The use of particular runways for aircraft landings and takeoffs is dictated by several factors, including the length of the runway, the runway gradient (or slope), the instrument approach procedures available to the runway, the minimum departure climb requirements from the runway, and the wind and weather. It is possible to establish runway use programs that encourage the use of runways that direct aircraft over compatible land uses and away from noise-sensitive areas, although allowances for exceptions must be made in recognition of the many other factors influencing the selection of runways for safe flight operations. LAWA previously established and currently implements the Preferential Runway Use Policy to reduce aircraft noise impacts to noise-sensitive uses (i.e., aircraft departures typically occurring on the inboard runways and aircraft arrivals typically occurring on the outboard runways, thereby placing the noisier of the two types of operations away from noise-sensitive uses).

Subject to certain limitations, aircraft routes can also be altered so that aircraft tend to fly over compatible areas and away from the most noise-sensitive areas. However, numerous constraints on the design of flight routes must be considered before changes are made. In large metropolitan areas with multiple airports, the volume of aircraft alone creates serious constraints. Flight routes must be designed to ensure the safe separation of aircraft and to ensure that arrivals and departures from each airport can be made safely and with relative efficiency. The control of aircraft in flight is the responsibility of the FAA. Thus, if airport operators desire to pursue changes in aircraft flight routes, they must coordinate with the FAA in undertaking the studies required to determine if the modifications are feasible.

Airport Facilities

The construction and alteration of airport facilities can either directly or indirectly affect noise levels off the airport. Noise barriers, for example, can reduce the noise from aircraft ground operations that are heard off airport property. LAWA has already constructed noise barriers along the northern edge of the airport to reduce runway noise impacts to noise-sensitive uses to the north. Additionally, the LAX Master Plan and the LAX Noise Variance from the state include provisions for the future installation of two ground run-up enclosures at LAX. Changes in runway length can alter noise patterns, as can the construction of new runways. The construction of taxiways can alter runway use by making the use of a given runway more convenient and safer for aircraft operators. Alternatives 1, 2, 3, 5, 6, and 7 include high-speed exists for arriving aircraft to exit from the runway and transition onto a taxiway that directs aircraft away from noise-sensitive uses located to the north. Other airport facility improvements that serve to reduce aircraft noise impacts include the electrification of all passenger gates at LAX, along with the installation of pre-conditioned (i.e., cooled) air systems, to reduce the need for parked aircraft to operate the on-board auxiliary power unit (i.e., turbine engine that provides power and cooling to the aircraft).

The following summarizes the mitigation evaluation for each alternative.

Alternative 1

Alternative 1 would entail a northbound shift of the centerlines of Runways 6L/24R. Relocated Runway 6L/24R is planned 260 feet north of the existing Runway 24R centerline. The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and*

Planning. To continue noise abatement techniques, new/replacement procedures are assumed for westerly departures from each relocated runway end to ensure that aircraft reach the coastline before making turns.

Alternative 2

Alternative 2 would maintain current north airfield runways, but provide an extension to the east for Runways 6R/24L. The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and Planning*. To continue noise abatement techniques, new/replacement procedures are assumed for westerly departures from each relocated runway end to ensure that aircraft reach the coastline before making turns.

Alternative 3

The extension of Runway 24L would shift the 65 CNEL contour to the east, into an area not exposed to levels of 65 CNEL under baseline (2009) conditions. The retention of the existing runway end as a takeoff initiation position for aircraft capable of using the available runway length for departure (9,100 feet) would not substantially relieve that increase (refer to Appendix D, *Aircraft Noise Technical Report*, of the LAX Master Plan Final EIR). The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and Planning*.

Alternative 4

Alternative 4 would maintain the existing north airfield runways. The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and Planning*.

Alternative 5

Alternative 5 would entail a northbound shift of the centerlines of Runways 6L/24R. Relocated Runway 6L/24R is planned 350 feet north of the existing Runway 24R centerline. The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and Planning*. To continue noise abatement techniques, new/replacement procedures are assumed for westerly departures from each relocated runway end to ensure that aircraft reach the coastline before making turns.

Alternative 6

Alternative 6 would entail a northbound shift of the centerlines of Runways 6L/24R. Relocated Runway 6L/24R is planned 100 feet north of the existing Runway 24R centerline. The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and Planning*. To continue noise abatement techniques, new/replacement procedures are assumed for westerly departures from each relocated runway end to ensure that aircraft reach the coastline before making turns.

Alternative 7

Alternative 7 would entail a southbound shift of the centerlines of Runways 6R/24L. Relocated Runway 6R/24L is planned 100 feet south of the existing Runway 24L centerline. The noise abatement measures presented in Section 4.10.1.5 would continue to be implemented, as would all other current measures. Land use measures to mitigate noise impacts are identified and discussed in Section 4.9, *Land Use and Planning*. To continue noise abatement techniques, new/replacement procedures are assumed for westerly departures from each relocated runway end to ensure that aircraft reach the coastline before making turns.

4.10.1.8 Level of Significance After Mitigation

Although LAX Master Plan Commitment N-1 and LAX Master Plan Mitigation Measure MM-N-4 would reduce aircraft noise impacts compared with conditions that would exist without those measures, they cannot fully mitigate the noise impacts associated with implementation of any of the SPAS alternatives. Further, no other operational noise abatement measures are available to fully mitigate the noise impacts of the SPAS alternatives.

Table 4.10.1-59 summarizes the number of dwellings and noise-sensitive facilities subject to significant noise impacts for each alternative.

Table 4.10.1-59

Increase of 1.5 CNEL Within 65 CNEL Compared to Baseline (2009) Conditions

Effect Category	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Dwellings	5,296	6,797	5,884	6,020	5,408	4,879	7,325
Non-Residential Noise-Sensitive Facilities	48	53	55	51	50	45	58

Source: Ricondo & Associates, Inc., 2012 (1.5 CNEL or higher noise exposure contours); PCR, 2012 (population, dwelling unit, acreage, and non-residential noise-sensitive facilities; GIS spatial analysis).

Table 4.10.1-60 summarizes the increase in schools subject to significant single event noise exposure for each alternative.

Table 4.10.1-60

Additional Schools Exposed to Significant Noise Impacts for Each Alternative
2025 Noise Exposure

	Alternative						
	1	2	3	4	5[1]	6[1]	7[1]
Schools - Exposure to Interior Noise of							
≥ 55 dBA L_{max}	1	0	0	0	1	1	1
≥ 65 dBA L_{max}	0	0	0	0	0	0	0
≥ 35 dBA $L_{eq(h)}$	8	9	7	9	8	8	8

1 Classroom disruption impacts for Alternatives 5, 6, and 7 are estimated to be comparable to those of Alternative 1.

Source: Ricondo & Associates, Inc., 2012 (INM school location exterior noise levels); PCR, 2012 (population, dwelling unit and school databases; GIS spatial analysis).

As described in Section 4.9, *Land Use and Planning*, LAX Master Plan Mitigation Measure MM-LU-1, Implement Revised Aircraft Noise Mitigation Program, would incorporate all eligible dwellings and non-residential noise-sensitive facilities that are newly exposed to noise levels 65 CNEL or higher into the Aircraft Noise Mitigation Program (ANMP) to mitigate the significant noise impacts described in **Table 4.10.1-59**.

LAX Master Plan Mitigation Measures MM-LU-3, Conduct Study of the Relationship Between Aircraft Noise Levels and the Ability of Children to Learn, and MM-LU-4, Provide Additional Sound Insulation for Schools Shown by MM-LU-3 to be Significantly Impacted by Aircraft Noise, would ultimately serve to mitigate adverse noise impacts on schools presented in **Table 4.10.1-60**.

Together, the LAX Master Plan noise and land use mitigation measures are intended to fully mitigate the significant noise impacts that would be caused by the SPAS alternatives. Because the land use mitigation measures would take several years to fully implement, it is possible that significant noise impacts would be experienced in the area after implementation of the selected SPAS alternative but before the mitigation measures are fully implemented. Thus, significant and unavoidable interim noise impacts would be experienced over an indeterminate period of time. In addition, as further discussed in Section 4.9, *Land Use and Planning*, certain residential uses with outdoor private habitable areas, or parks would be newly exposed to noise levels of 75 CNEL or higher. These noise impacts would also be significant and unavoidable.

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