Appendix A

Supplemental Helicopter Noise Study

CALIFORNIA NORTHSTATE UNIVERSITY MEDICAL CENTER

SM&W Project #19028AS

Supplemental Helicopter Noise Study

Prepared for:

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EXECUTIVE SUMMARY

1. This report describes the potential noise impacts on the surrounding community due to helicopter operations at the proposed project at 9700 West Taron Drive in Elk Grove, CA.
2. This report is provided in supplement to the original study (SM&W report dated 4/1/2020) in order to capture updates to the proposed helicopter flight path to address comments raised regarding wildlife habitat at the Stone Lakes National Wildlife Refuge. A minor change in the helipad location at the proposed building is also included.
3. The project site is located at the intersection of Interstate 5 (I-5) and Elk Grove Blvd at the existing shopping center and California Northstate University buildings. The new helipad would be located on the roof of the proposed new hospital tower.
4. The site is surrounded by a mix of commercial uses, residential (mostly single-family homes), and the Stone Lakes National Wildlife Refuge. The surrounding neighborhoods include community uses such as local schools and outdoor recreation areas.
5. The existing primary sources of noise in the area are traffic on I-5 as well as local traffic on Elk Grove Blvd and smaller collector streets. According to the Elk Grove General Plan, noise levels in this area range from 60 to 70+ dBA Ldn.
6. Noise from proposed helicopter operations was assessed against Federal, State, and Local regulations and policies. A secondary assessment for sleep disturbance, not required by these regulations, was also carried out at the nearby residences.
7. According to information provided to SM&W, helicopter operations are expected to occur on average 4 times per month, and as many as 6 times per month.
8. A computer noise model of the proposed helicopter flight paths, helicopter models, and anticipated flight frequency was constructed using the Aviation Environmental Design Tool (AEDT) which is issued and approved by the Federal Aviation Administration (FAA) for aircraft noise analysis in the US.
9. The AEDT model was used to predict annualized long-term noise metrics (Ldn, CNEL) used to assess helicopter noise against Federal, State, and Local thresholds, as well as single-event criteria for sleep disturbance. No exceedances of any of these thresholds were detected.

INTRODUCTION

This report describes the potential noise impacts on the surrounding community due to helicopter operations at the proposed project at 9700 West Taron Drive in Elk Grove, CA. The project includes a new medical center and teaching hospital on the existing campus of California Northstate University (CNU). The helipad is proposed for development as part of the hospital building.

This report is provided in supplement to the original study (SM&W report dated 4/1/2020) in order to capture updates to the planned helicopter flight path to accommodate wildlife habitat at the Stone Lakes National Wildlife Refuge. A minor change in the helipad location at the proposed building is also included.

EXISTING NOISE ENVIRONMENT

SITE DESCRIPTION

The project site is located at the intersection of Interstate 5 (I-5) and Elk Grove Blvd at the existing shopping center and California Northstate University buildings. The new helipad is proposed on the roof of the east tower of the new hospital. The existing sources of noise in the area are traffic on I-5 as well as local traffic on Elk Grove Blvd and smaller collector streets. The site is surrounded by a mix of commercial uses, residential (mostly single family homes), and the Stone Lakes National Wildlife Refuge. The surrounding neighborhoods include community uses such as local schools and outdoor recreation areas. An overview map of the area is provided in Figure 1 below and each area is described in the sections below.

(A) EXISTING CNU CAMPUS

This is a commercial area bordered by I-5, Elk Grove Blvd, and W Taron Drive and includes the existing CNU College of Medicine, the Stone Lake Landing shopping center, and other commercial uses. All buildings are considered low-rise (3 stories or less). This area is considered relatively noisy due to traffic on I-5 and Elk Grove Blvd as well as local traffic accessing the parking lots and continuing into the adjacent residential areas. A solid sound wall is installed between the highway and most of the CNU college buildings. This area includes some noise from commercial equipment but is generally only noticeable in the innermost areas, as the highway is the predominant source of noise.

(B) COMMERCIAL ON ELK GROVE BLVD

This is a small commercial area along Elk Grove Blvd and split across Harbour Point Drive. Besides typical commercial restaurants retail and gas, this area includes some noise sensitive uses such as the Holiday Inn Express and Merryhill Preschool both located along Maritime Drive. All buildings are considered low-rise (3 stories or less). Noise sources are similar to area A above, such as local traffic and noise associated with commercial uses. No sound walls are installed in this area.

(C) MARITIME OFFICE PLAZA

This area includes an office park and a self-storage facility located directly against I-5 and provides a buffer from this primary noise source to the adjacent residential neighborhoods. All buildings are considered low-rise (3 stories or less) and most are only a single story. No sound walls are installed in this area. Station 75 of the Cosumnes Fire Department is also located in this area, along the border of the nearby residential neighborhoods.

(D) RESIDENTIAL LAGUNA WEST (NEAR I-5)

This residential development includes a mix of 1 and 2 story single-family homes. A solid sound-wall is installed between I-5 and the immediately adjacent residences, however the 2nd stories still have a clear line of sight to the highway traffic due to the limited wall height. Highway traffic is clearly audible in this neighborhood.

(E) RESIDENTIAL LAGUNA WEST (INTERIOR)

This is a collection of neighborhoods located mostly away from the highway and primary arterial roads; it is relatively quiet due to limited local traffic. These neighborhoods are mostly comprised

of 1 and 2 story single-family homes but include some multi-family buildings closer to Elk Grove Blvd. Joseph Sims and Stone Lake elementary schools, and River City Early Learning Center are located in this area, as well as multiple outdoor recreation areas.

(F) RESIDENTIAL STONE LAKE COMMUNITY

Similar to Laguna West, this residential neighborhood contains a mix of 1 and 2 story single family homes with some multi-family buildings. Highway noise is clearly audible within a few blocks of the border with I-5, while the inner areas have lower ambient noise levels. A solid sound-wall is installed between I-5 and the immediately adjacent residences, however the 2nd stories still have clear line of sight to the highway traffic due to the limited wall height. Community uses in this area include Elliott Ranch Elementary, Stonelake Clubhouse and multiple outdoor recreation areas.

(G) STONE LAKES NATIONAL WILDLIFE REFUGE

This is an undeveloped and protected wildlife area managed by the U.S. Fish and Wildlife Service reaching over 6,000 acres. Near the project site, this area abuts I-5 as well as the Stone Lake Community neighborhood.

The study area[1] is currently exposed to noise levels in the range of 60 to 70+ dBA Ldn (as defined in Appendix A) due to Interstate 5 and local streets. A map of current noise exposure in the area, extracted from the City of Elk Grove General Plan, is provided in Figure 2 below and is based on measurements and predictions of local traffic noise in the area.

[1] Study area refers to the area where helicopter noise levels are either measured or predicted in this analysis. The study area includes all acoustically sensitive receivers within approximately 1.5 miles of the proposed helipad.

65 **Figure 1:** Area Map (Source: Google Earth)

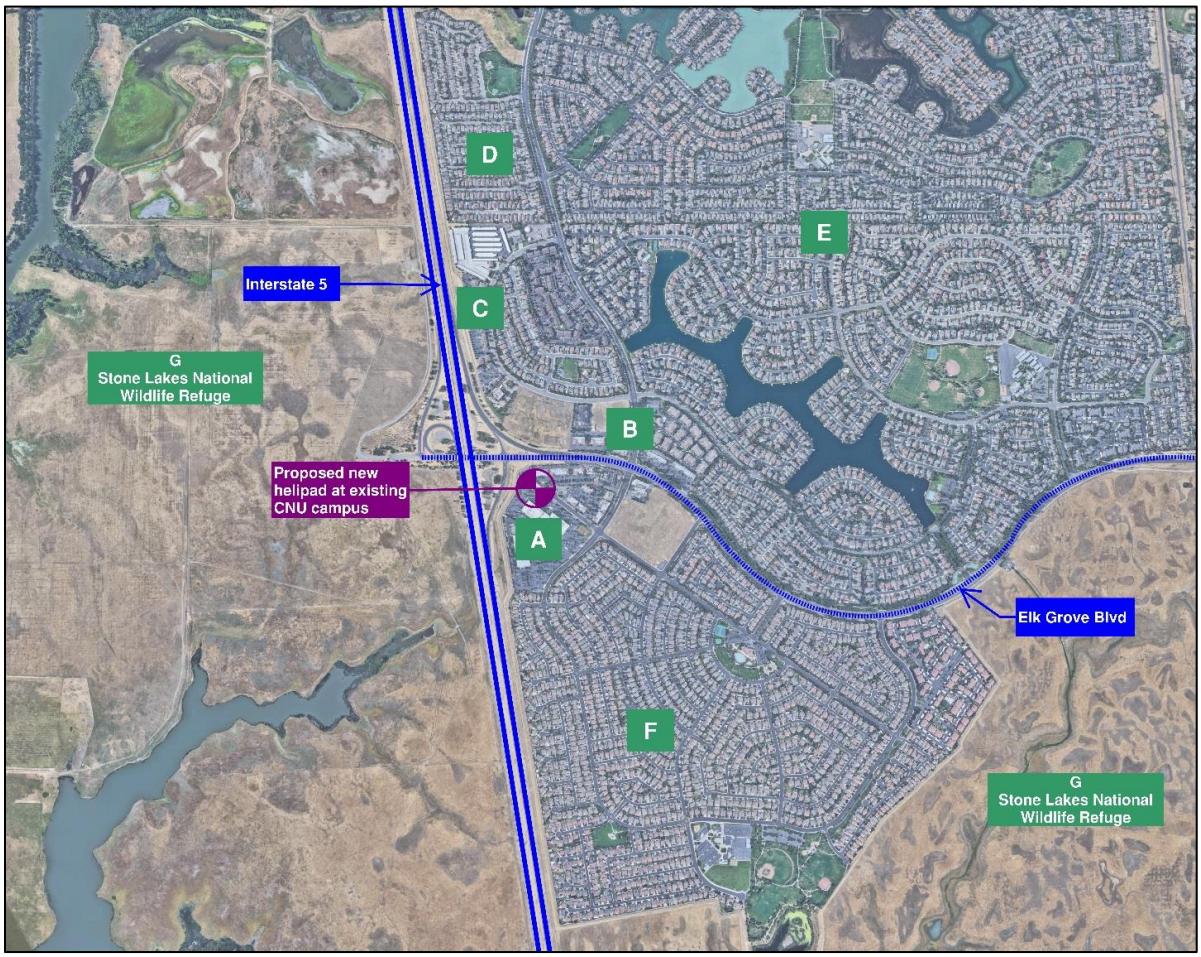


Figure 2: Existing Noise Levels (Source: City of Elk Grove, General Plan Update DEIR, July 2018)

NOISE CRITERIA

The noise criteria used to assess noise from future helicopter operations are summarized here and described in detail in the sections below.

- Federal Standards 65 dBA Ldn
- California Standards 65 dBA CNEL
- Elk Grove General Plan 60 dBA Ldn
- Sleep Disturbance 89 dBA SEL/SENEL
- Wildlife 60 dBA Ldn or CNEL

Refer to Appendix A for definitions of common acoustical terms.

FEDERAL STANDARDS

The Federal Aviation Administration (FAA) is responsible for regulating aircraft noise at the federal level. According to their standards (Code of Federal Regulations, Part 150 Title 14), annualized (i.e. average over a typical year) aircraft noise is considered compatible with all land uses, provided it is less than 65 dBA Ldn.

CALIFORNIA STANDARDS

The Aeronautics Division of the California Department of Transportation (CALTRANS) is responsible for regulating aircraft noise at the state level. According to their standards (California Code of Regulations, Title 21, Division 2.5, Chapter 6), annualized aircraft noise is considered compatible with all land uses, provided it is less than 65 dBA CNEL.

CITY OF ELK GROVE GENERAL PLAN

Chapter 8 of the City's general plan includes criteria for transportation noise impacts on various land uses. According to the guidelines in Table 8-3, transportation noise would be considered compatible with occupied land uses if levels are below 60 dBA Ldn.

Policy N-2-2 also outlines acceptable increases in noise level depending on the existing noise exposure:

- *Where existing ambient noise levels are **less than 60 dB Ldn** at the outdoor activity areas of noise-sensitive uses, a **+5 dB Ldn increase** in noise levels shall be considered significant; and*
- *Where existing ambient noise levels range **between 60 and 65 dB Ldn** at the outdoor activity areas of noise-sensitive uses, a **+3 dB Ldn increase** in noise levels shall be considered significant; and*
- *Where existing ambient noise levels are **greater than 65 dB Ldn** at the outdoor activity areas of noise-sensitive uses, a **+1.5 dB Ldn increase** in noise levels shall be considered significant. Public roadway improvements to alleviate traffic congestion and safety hazards shall utilize FHWA noise standards to allow a reasonable dollar threshold per dwelling to be used in the evaluation and abatement of impacts.*

According to the Elk Grove General Plan (General Plan Update DEIR, Figure 5.10-2, July 2018) the existing noise exposure near the project area ranges from as low as 60 dBA Ldn to 70+ dBA Ldn. Based on the most conservative interpretation of the general plan requirements, helicopter noise alone should be limited to the levels shown in the table below. Noise levels are expressed on a logarithmic scale (decibel), where adding two 60 dB sound sources to an existing 60 dB source would create a 63-dB noise level (not 150 dB). Hence, if the existing noise level is 66 dB, the maximum additional noise level would be 62 dB to limit the increase below 1.5 dB.

Table 1 Maximum Allowable Helicopter Noise Based on the Elk Grove General Plan

Existing Ambient Noise Level	Allowable Increase	Maximum Allowable Helicopter Noise
60 to 65 dBA Ldn	3 dB	60 dBA Ldn
66 dBA Ldn	1.5 dB	62 dBA Ldn

The most restrictive criterion (60 dBA Ldn) has been used for assessment against the city's requirements.

SLEEP DISTURBANCE

For environmental noise screening purposes, the commonly accepted metric for assessing sleep disturbance is an outdoor Single Event Noise Exposure Level (SENEL) exceeding 89 dBA. The equivalent 89 dBA SEL is used for noise modeling purposes. This is based on achieving an indoor noise level of 65 dBA SENEL, which according to interim guidelines published by the Federal Interagency Committee on Aviation Noise (FICAN, issued June 1997) corresponds to a maximum 5% of the population potentially awakened, and assuming the receiving building construction provides typical outdoor-to-indoor noise reduction of 24 dB.

IMPACTS TO WILDLIFE

There is currently limited research and no widely accepted thresholds of significance for assessing the impact of helicopter noise on wildlife. In the interim, environmental analysis in California typically uses 60 dBA continuous noise as a threshold (Caltrans Report, The Effects of Highway Noise on Birds dated 9/30/2007) and therefore a 24-hour average noise level (Ldn or CNEL) inclusive of the associated penalties represents a conservative assessment.

The applicant is proposing to alter the helicopter flight path to maximize the distance to the Stone Lakes National Wildlife Refuge. This is being done in response to community comments on the Biological Resources section of the Draft EIR regarding exposure of special status species to helicopter noise. While the comments request further consideration of biological impacts, no specific or quantifiable noise criteria was suggested. This analysis therefore relies on the criteria described above and relied upon in the original noise study.

NOISE ANALYSIS

A computer noise model of the proposed helicopter flight paths, helicopter models, and anticipated flight frequency was constructed using the Aviation Environmental Design Tool (AEDT) which is issued and approved by the Federal Aviation Administration (FAA) for aircraft noise analysis in the US. This software creates a 3D model of the surrounding area and outputs noise contours based on annualized helicopter flight operations. Please note that AEDT is considered a conservative and basic noise model as it does not take into account acoustic shielding provided by buildings in the area or other ambient noise sources (traffic, etc.). AEDT noise modeling was performed by KB Environmental Sciences, Inc. based on the information noted below and results were provided to SM&W for inclusion in this report.

NOISE MODEL INPUTS

A separate model of the proposed future helicopter flight conditions from the new hospital was constructed. The helipad was located at the following approximate location:

- Latitude: N 38 24' 29.27
- Longitude: W 121 28' 49.00
- Height: 221 ft AMSL

The following flight scenarios were provided to SM&W to model a range of possible flight operations spanning from a "normal" month to the worst case ("busy") month. Flights were distributed evenly between the north and south approaches.

- Normal: 4 landings per month
- Busy: 6 landings per month

The following helicopter models and flight distributions were provided to SM&W for modeling noise from the new helipad.

- Airbus H-135: ~90%
- Airbus H-130: ~5%
- Airbus H-145: ~5%

Out of these models, AEDT only includes the EC-130 (now re-named the H-130), however this is considered an appropriate approximation of overall helicopter noise exposure given the H-135 is considered quieter than the H-130, and the H-135 accounts for almost all anticipated flights. A helicopter other than those listed above may on a special occasion request approval to utilize the CNUMC helistop, but such operations are expected to be few and far between.

AEDT requires helicopter operations to be input separately for day, evening and nighttime in order to appropriately calculate annualized noise metrics consistent with FAA, state, and local criteria. The following anticipated flight distribution was provided to SM&W for modeling purposes:

- Day (7am-7pm): 80%
- Evening (7pm-10pm): 15%
- Night (10pm-7am): 5%

The vertical flight path was modeled using a standard rate of descent/climb out (500 feet per minute).

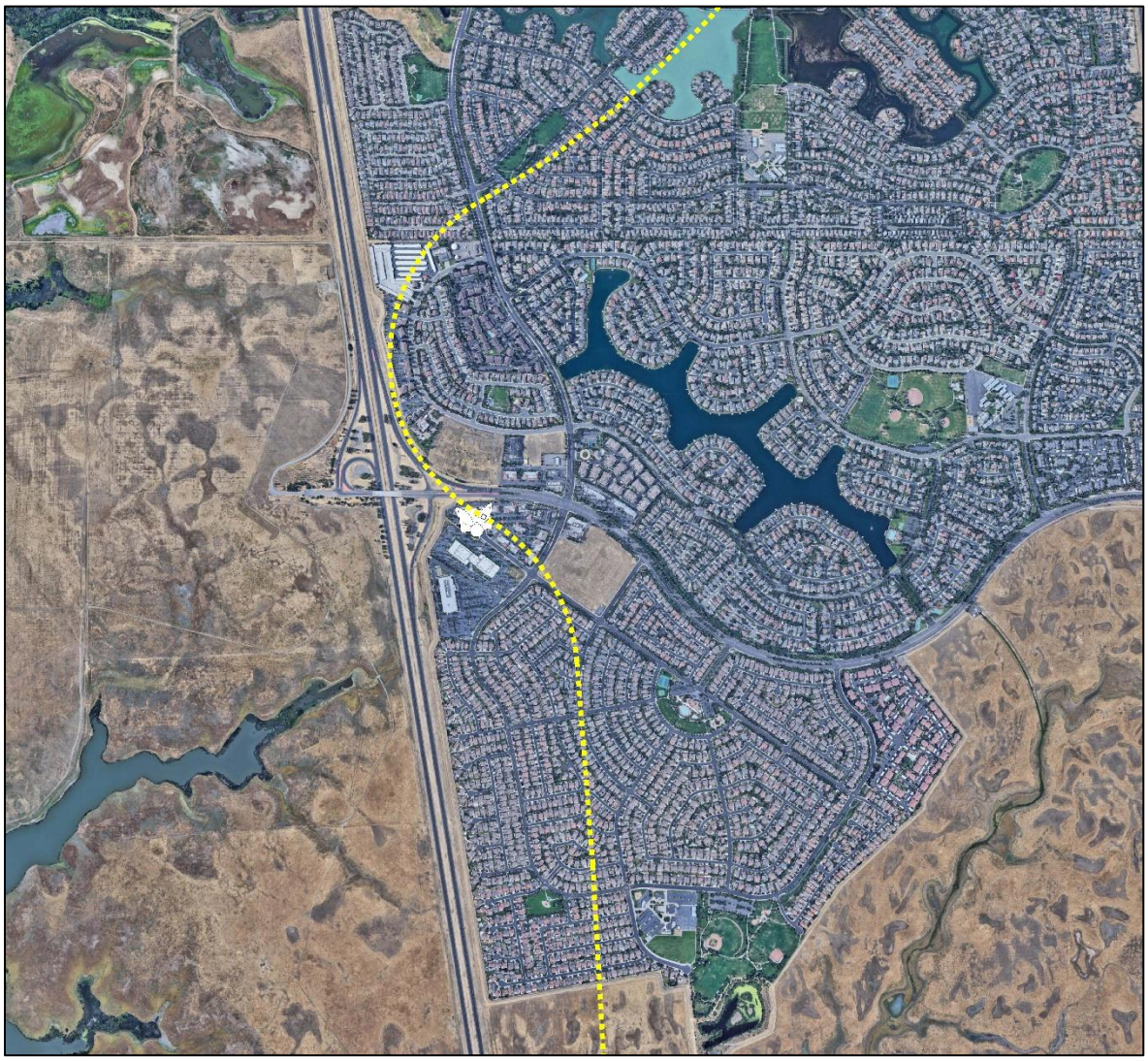
Based on the anticipated flight operations described above, the following annualized operations were used for the noise model, consistent with FAA requirements.

Table 2 Annualized Helicopter Operations used in the Model

Condition	Direction	Helicopter Model	Substituted Model	Operations			
				Day	Evening	Night	TOTAL
Normal	North	Airbus H-135	EC 130	0.0526	0.0099	0.0033	0.0658
		Airbus H-130					
		Airbus H-145					
	South	Airbus H-135	EC 130	0.0526	0.0099	0.0033	0.0658
		Airbus H-130					
		Airbus H-145					
Busy	North	Airbus H-135	EC 130	0.0789	0.0148	0.0049	0.0986
		Airbus H-130					
		Airbus H-145					
	South	Airbus H-135	EC 130	0.0789	0.0148	0.0049	0.0986
		Airbus H-130					
		Airbus H-145					

In order to address concerns raised about the potential for helicopter operations to impact the Stone Lake Wildlife Refuge, the currently proposed flight path would no longer follow I-5 and instead would travel further east of I-5. The revised flight path is shown in Figure 3 below, alongside the previously proposed flight path for reference.

Figure 3: Proposed Helicopter Flight Path (modified from Google Earth)



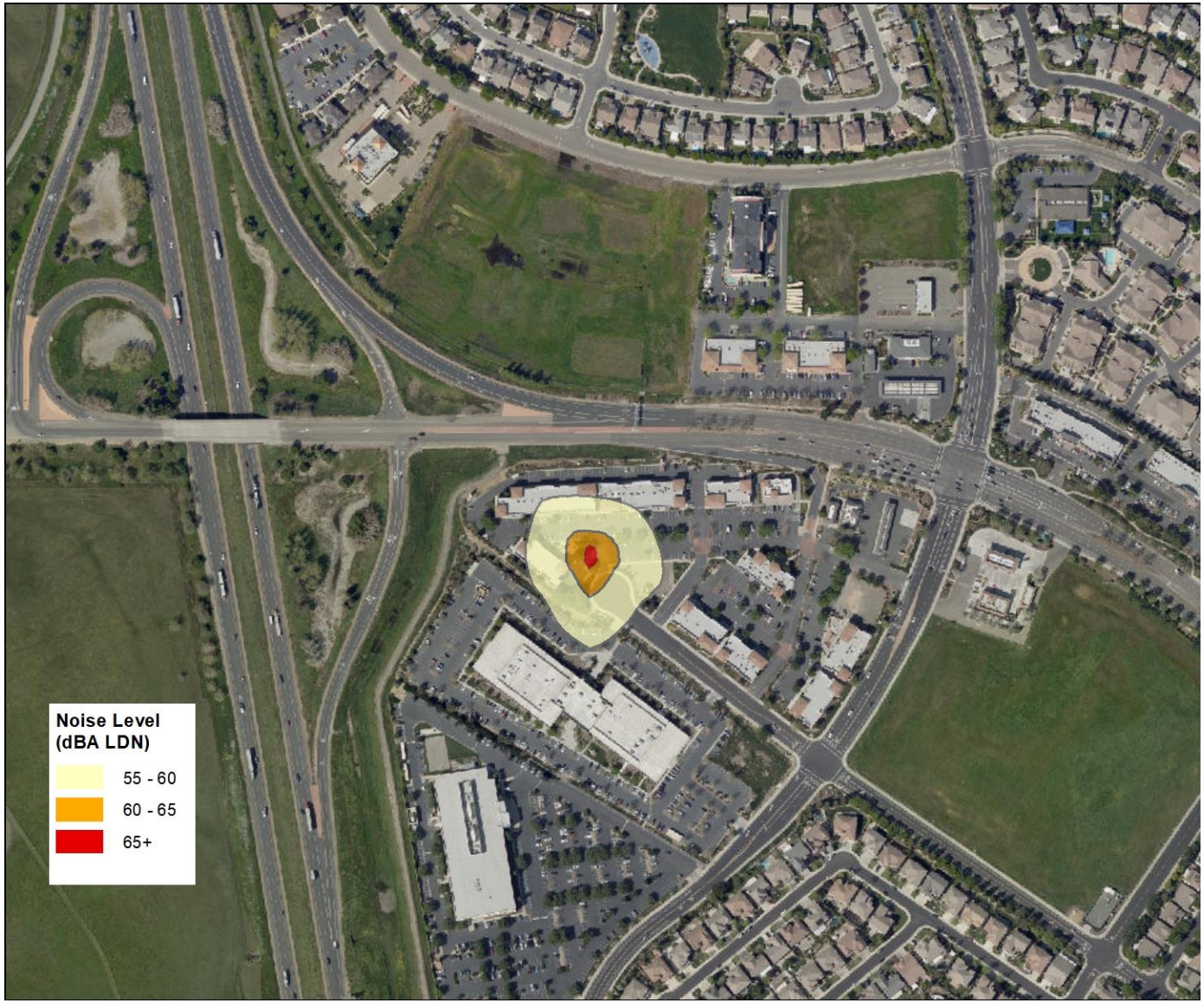
MODELING RESULTS

The resulting noise contours for each of these scenarios for both 24-hour average noise (Ldn, CNEL) and single event noise (SEL) are provided in the following contours.

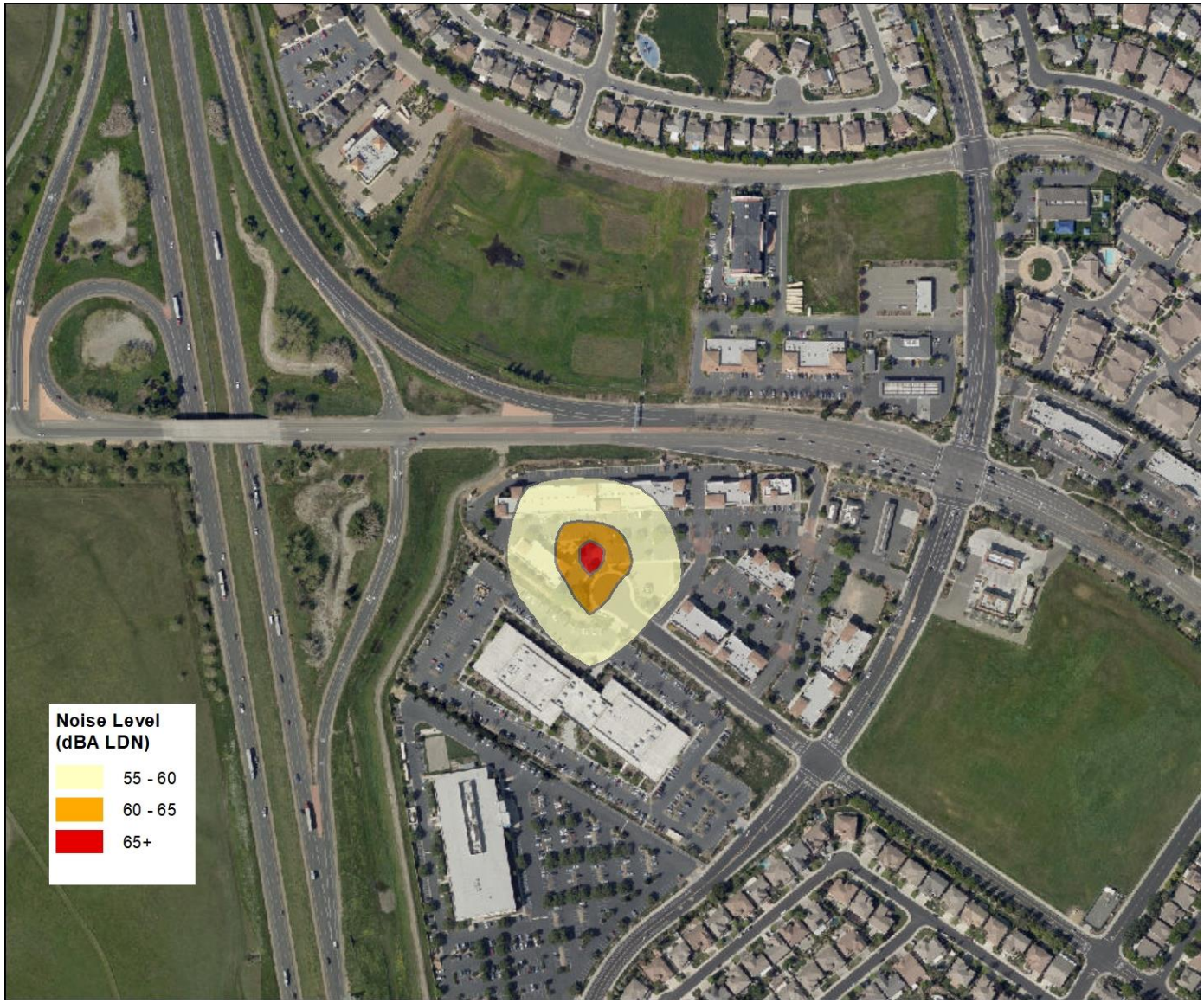
No exceedances of the screening criteria were found.

- Helicopter noise is predicted to be at or below 60 dBA Ldn/CNEL in all areas and would, therefore, be compatible with Federal, State, and local requirements (60 or 65 Ldn or CNEL, see Criteria section above).
- Single event levels up to 90 dBA SEL were limited to the future California Northstate University campus site, and the commercial area north of Elk Grove Blvd. Residential uses nearest the new hospital are located marginally within the 85 dBA SEL contour, and levels were noticeably lower at all other residential uses.

Ldn Contour – Normal

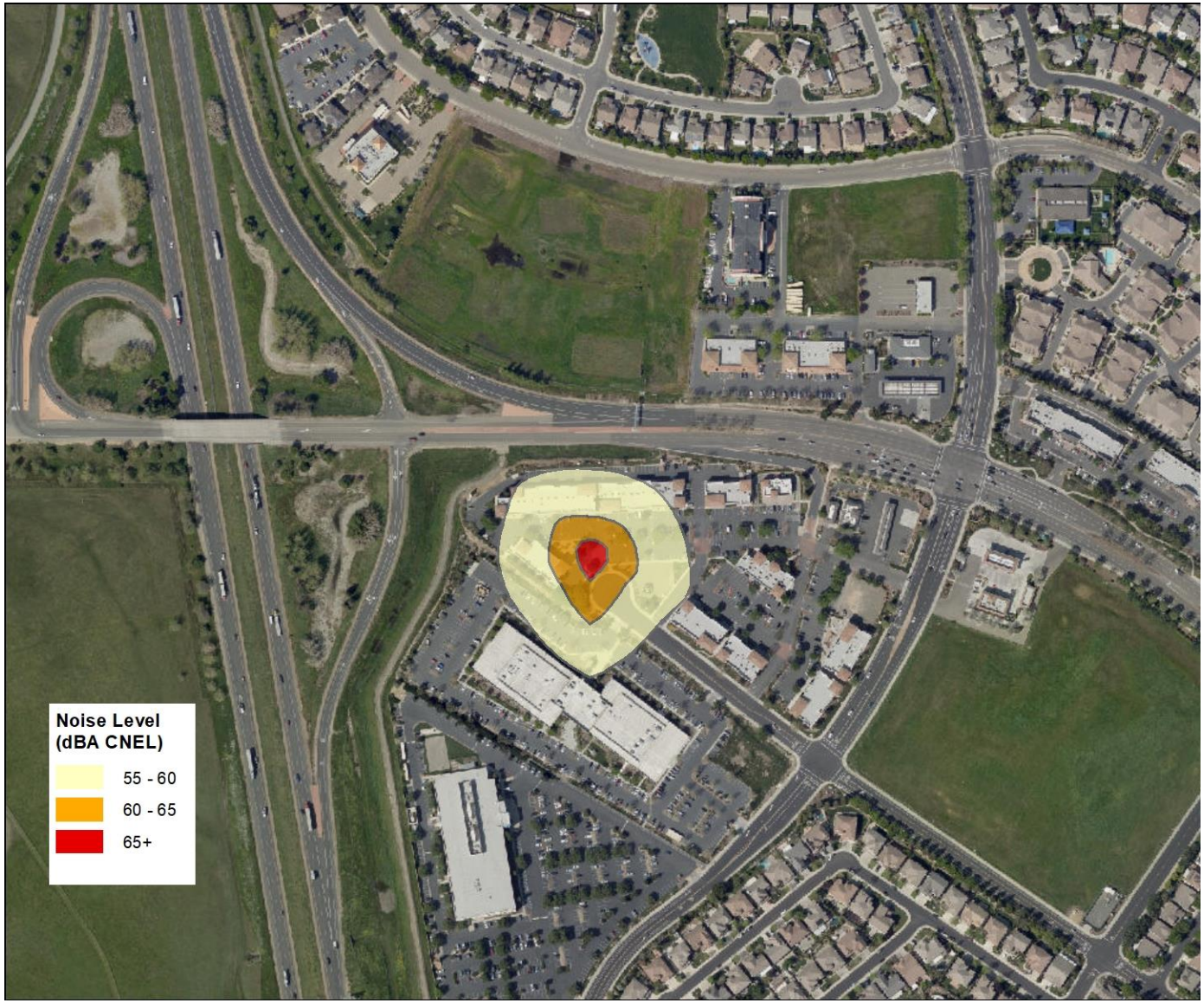


Ldn Contour – Busy

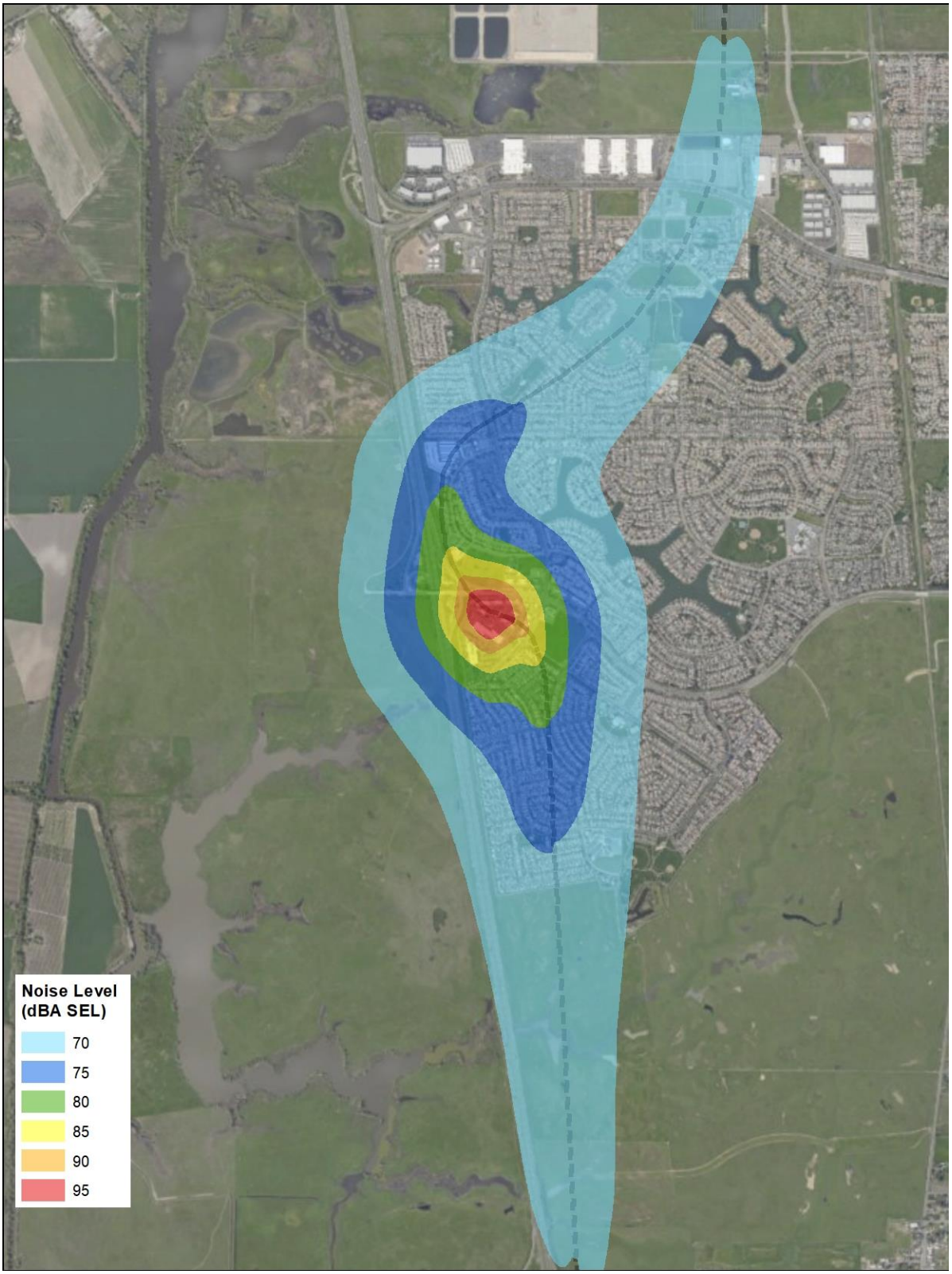


CNEL Contour – Normal

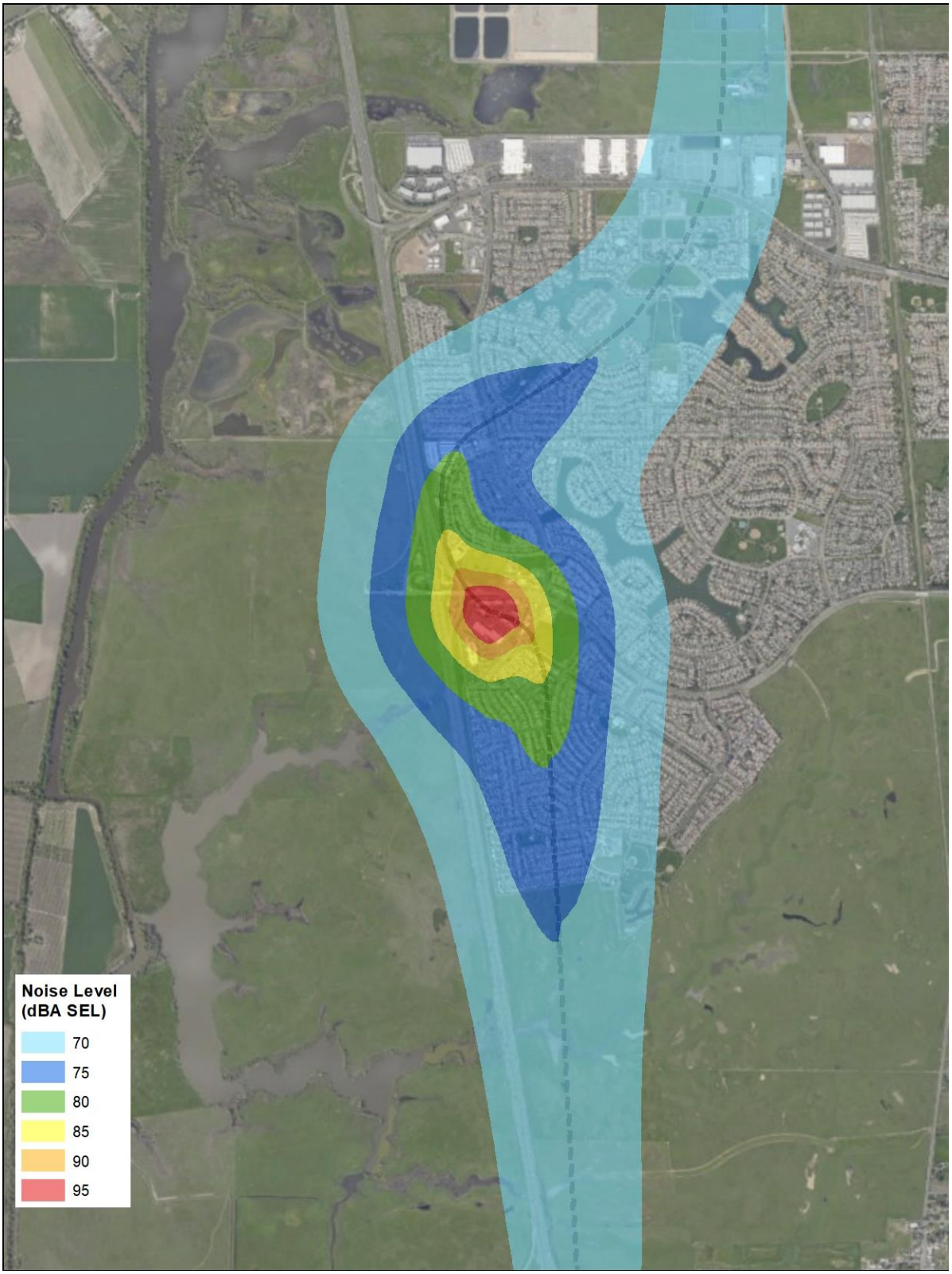
CNEL Contour – Busy



SEL Contour – Normal



SEL Contour – Busy



CONCLUSIONS

230 The modeled helicopter noise described in the section above show that the proposed helicopter operations would be within Federal, State and Local thresholds. No additional mitigation is necessary due to the changes in flight path.

APPENDIX A

DEFINITIONS OF COMMON ACOUSTICAL TERMS

A WEIGHTING is the decibel scale for sound level measurements using the "A" weighted network of a sound level meter and is denoted as "dBA." The A-weighted network is shaped to correspond to the response of the human ear so that the results correlate approximately with human perception. It is the accepted standard for environmental noise measurements.

AMBIENT NOISE (see also Background Noise) is the sound pressure level associated with a given environment. It is a composite of sounds from near and far. For the purpose of measuring a specific noise source, it is the sound pressure level of all sources excluding the specific sound source being measured.

BACKGROUND NOISE (also Ambient Noise) is the sound pressure level associated with given environment. For the purpose of measuring indoor ambient noise, the dominant component of the noise is caused by the HVAC system.

COMMUNITY NOISE EQUIVALENT LEVEL (CNEL) similar to the DNL (see below) except that an additional penalty of 5 dB is added during evening hours (7 PM to 10 PM) and is typically, but not exclusively used by the State of California to report general environmental noise rather than DNL.

DAY-NIGHT LEVEL (L_{dn} or DNL) is the A-weighted equivalent continuous sound exposure level for a 24-hour period with a 10 dB adjustment added to the sound levels occurring during nighttime hours (10 PM to 7 AM). Ldn is typically used by regulating agencies to report general environmental noise.

$$L_{dn} = [(L_d + 10 \text{ Log}_{10} 15) \,\&\, (L_n + 10 + 10 \text{ Log}_{10} 9)] - 10 \log_{10} 24$$

Where L_d = Leq for the daytime
L_n = Leq for the nighttime
& = decibel addition

DECIBEL or properly decibel scale is the scale that measures sound level pressure (or other quality of interest) defined as 20 times the logarithm of the ratio of the sound level pressure (or other quality) to a standard reference level that by convention has been selected to approximate the threshold of hearing The standard reference in the U.S. is 0 decibel equals a pressure of 0.0002 Micro bar. The abbreviation for decibel is dB.

ENVIRONMENTAL NOISE, contrary to its original meaning referring to natural noise, has become known as the noise in the outdoor environment from transportation systems, machinery or other manmade sources.

FREQUENCY is the pitch of sound and refers to the cyclical variations per unit time. Noise can be composed of sound from the entire spectrum of frequencies. Frequency is expressed in cycles per second or Hertz. This is abbreviated Hz.

INTEGRATED OR EQUIVALENT SOUND LEVEL is the A-weighted equivalent continuous sound exposure level for a defined time. This is abbreviated $L_{eq\ (time)}$.

OCTAVE BAND is the range of sound frequencies whose lower limit frequency is half the upper limit frequency (one octave). Octave bands are identified by the geometric mean frequency or center between the lower limit and the upper limit.

OUTDOOR INDOOR TRANSMISSION CLASS (OITC) is the single number rating system to classify the transmission loss of materials used for environmental noise isolation rather than reporting the levels at separate frequency bands. For environmental noise, this rating system is preferred over STC because it was specifically designed to address transportation noise using an average transportation noise spectrum. OITC ratings are calculated from measured values of transmission loss in 1/3 octave bands, according to ASTM Standard E 1332.

SOUND EXPOSURE LEVEL (SEL) is the perceived loudness of a single noise event and is dependent on the noise level as well as the duration. This is calculated by adding all the noise energy over the duration

of the event, expressed in decibels referenced to a time period of 1-second. SEL can only be field measured if the start and end times of a specific noise event are known.

SINGLE EVENT NOISE EXPOSURE LEVEL (SENEL) is similar to the SEL metric in that it illustrates the perceived loudness of a single noise event using level and duration. However, the duration is not the full event time, but the time period where the noise level is within 10 dB of the maximum level which is then expressed in decibels referenced to a time period of 1-second. SENEL is easily field measured by sound level meters with an SENEL function or manually calculated during post-processing if the noise level time record is retained.

SOUND LEVEL METER is an instrument to measure sound pressure levels in dB. Various features are incorporated into an instrument to select specific sound frequency bands, integrate pressure over time and display minimum, mean, and peak levels.

SOUND PRESSURE LEVEL (SPL) is the ratio, expressed in decibels, of the mean-square sound pressure level to a reference mean-square sound pressure level that by convention has been selected to approximate the threshold of hearing (0.0002 Microbar in the U.S.)

SOUND TRANSMISSION CLASS (STC) is the established single number rating system to classify the transmission loss of materials rather than reporting the levels at separate frequency bands. The rating system was originally designed to address speech isolation and is derived from measured values of transmission loss, according to ASTM E 413. It is not appropriate for use in environmental noise isolation applications because the STC rating does not sufficiently take into account the low frequencies that predominate in transportation noise. Two materials with the same STC rating may achieve very different levels of transportation noise isolation.

TRANSMISSION LOSS is a measure of the sound insulation of a material stated in decibels. Generally, the transmission losses of materials are given in standard 1/3 octave band intervals.