*APPENDIX J*

# *NOISE BACKGROUND INFORMATION*

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# J: Noise Analysis

This Appendix provides the background information regarding the noise analysis. This information includes noise metrics and the methodology used to model the aircraft noise exposure at Bob Hope "Hollywood Burbank" Airport.

## J.1 NOISE MEASUREMENT AND THE EFFECTS OF NOISE ON PEOPLE

Noise is defined as unwanted sound. In other words, noise is sound that disturbs routine activities or quiet, and/or causes feelings of annoyance. Whether sound is interpreted as pleasant (e.g., music), or unpleasant (e.g., jackhammer) depends largely on the listener's current activity, past experience, and attitude toward the source.

Sound is transmitted by alternating compression and decompression in air pressure. These relatively small changes in atmospheric pressure are called sound waves. The measurement and human perception of sound involves two physical characteristics—intensity and frequency. Intensity is a measure of the strength or magnitude of the sound vibrations and is expressed in terms of the sound pressure level (SPL). The higher the SPL, the more intense is the perception of that sound. The other characteristic is sound frequency or "pitch"—the speed of vibration. Frequencies are expressed in terms of cycles per second or hertz (Hz). Low frequency sounds might be characterized as a rumble or roar, while high frequency sounds are typified by sirens or screeches. Noise analysis accounts for both of these characteristics in the units used to measure sound.

*Sound Level Intensity*

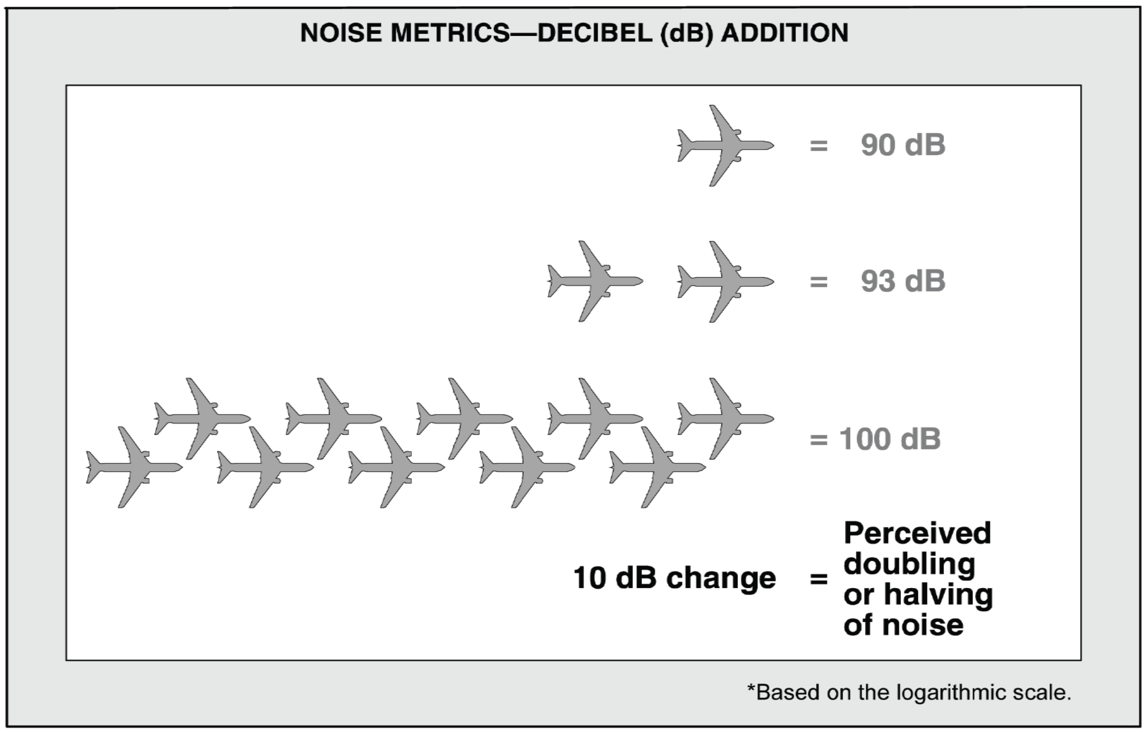
The human ear is sensitive to an extremely wide range of sound intensity, which covers a relative scale of 1 to 100,000,000. Representation of sound intensity using a linear index becomes difficult because of this wide range. The decibel (dB), a logarithmic measure of the magnitude of sound, expresses this range of energy levels using a smaller range of values. For most purposes, sound levels between 0 dB, the approximate threshold of hearing, and 130 dB, the threshold of pain, represent the range of interest.

As a logarithmic unit of measurement, the decibel can't be added or subtracted linearly, as shown in **Figure J-1**. Some simple guidelines for understanding changes in noise levels follow.

- If two sounds of the same level are added, the sound level increases by approximately 3 dB. For example: 60 dB + 60 dB = 63 dB.

- The sum of two sounds of a different level is only slightly higher than the louder level. For example: 60 dB + 70 dB = 70.4 dB.
- Sound from a "point source," such as an aircraft, decreases approximately 6 dB for each doubling of distance.
- Although the human ear can detect a sound change as faint as 1 dB, the typical person does not perceive changes of less than approximately 3 dB.
- A 10 dB change in sound level is perceived by the average person as a doubling, or halving, of the sound's loudness.

*Figure J-1*
*Decibel Addition*

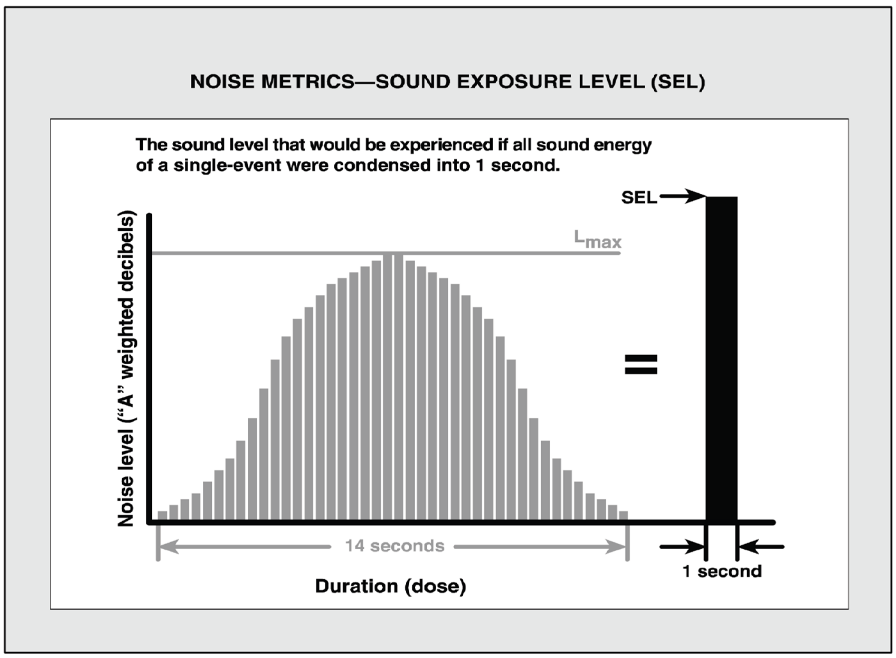



Humans are most sensitive to frequencies near the normal range of speech communications. "A-weighting" reflects this sensitivity by emphasizing midrange frequencies and de-emphasizing high and low frequencies. The A-weighted decibel (dBA) provides a better prediction of human reaction to environmental noise than the un-weighted decibel and is the metric most frequently used in noise compatibility planning.

*The SEL Metric*

The sound exposure level (SEL) is the total sound energy of a single sound event. By accounting for both intensity and duration, the SEL allows us to compare the "annoyance" of different events. **Figure J-2** shows that the SEL for a single noise event is higher than its maximum level (Lmax). One way to understand SEL is to think of it as the sound level you would experience if all of the sound energy of a sound event occurred in one second.

*Figure J-2*
*Sound Exposure Level*

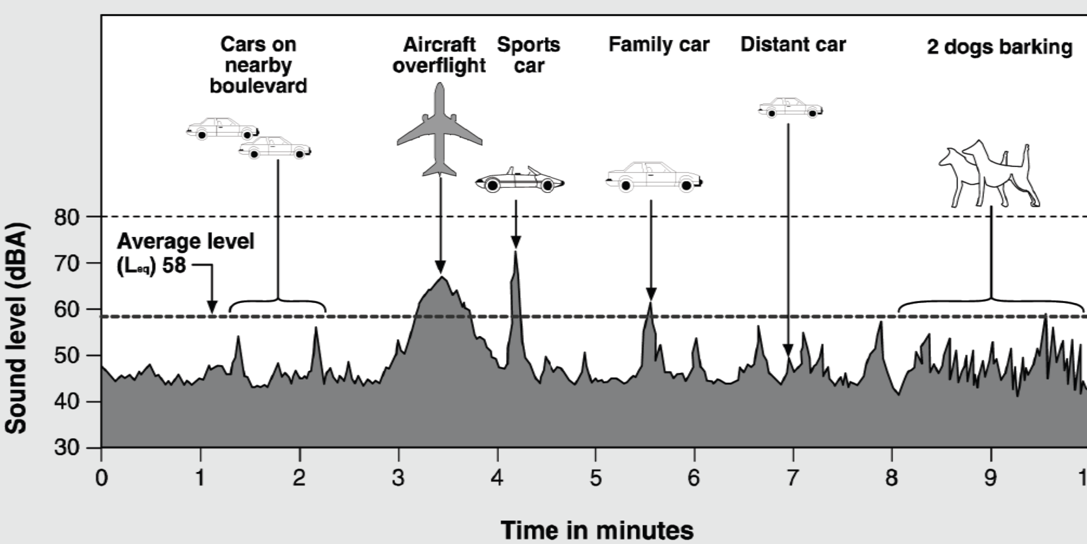



*Multiple Noise Sources*

People experience a wide range of noise sources at varying intensities depending on local conditions. **Figure J-3** plots a hypothetical history of sound levels in a typical suburban neighborhood on a normal or "quiet" afternoon. A typical background, or residential, sound level in the absence of any identifiable noise sources, is approximately 45 dBA. About three-quarters of the time, the sound level is 50 dB or less. The highest sound level, caused by a nearby sports car, is approximately 70 dB, while an aircraft generates a maximum sound level of about 68 dB. Studies have shown that human response to noise involves both the maximum level and its duration. For example, the aircraft in this case is not as loud as the sports car, but the aircraft sound lasts longer. For most people, the aircraft overflight would be more annoying than the sports car event.

The number of events can be an important consideration in estimating the effect of noise. One way to describe this factor might be to count the number of events exceeding SEL 80 dB, plus the number that exceed SEL 75 dB, plus the number that exceed SEL 70 dB, etc. A more efficient way to describe both the number of such events, and the sound exposure level of each is the time-average of the total sound energy over a specified period, referred to as the equivalent sound level (Leq). Research indicates that community reaction to noise corresponds to the total acoustic energy that is represented by the Leq. In the example shown in **Figure J-3**, the Leq is roughly 58 dB. This measurement accounts for all of the sound energy during the sample period and provides a single-number descriptor.

*Figure J-3*
*Comparative Noise Levels*

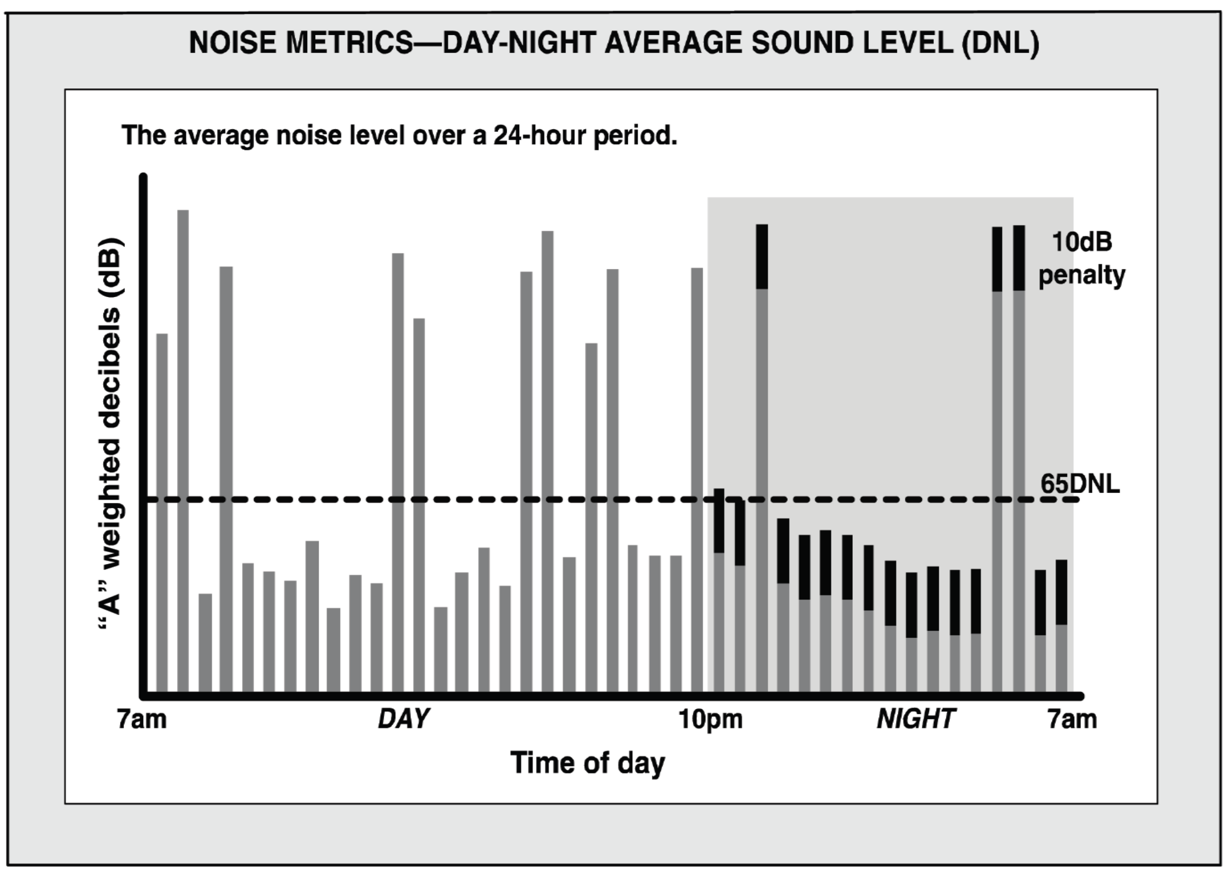



Source: United States Environmental Protection Agency, *Protective Noise Levels, Condensed Version of EPA Levels Document,* November 1978.

*Time of Day Considerations – The CNEL Noise Metric*

People are normally more sensitive to intrusive sound events at night, and the background sound levels are normally lower at night because of decreased human activity. Therefore, noise events during the nighttime hours are likely to be more annoying than noise events at other times. To account for these factors, the Community Noise Equivalent Level (CNEL) adds about a 4.8dBA penalty to events occurring between the evening hours of 7-10pm and a 10 dBA penalty to events occurring between 10:00 PM and 7:00 AM (see **Figure J-4**). In essence, the CNEL is the 24-hour equivalent sound level (or Leq 24), including this 4.8 evening and 10 nighttime dBA penalty. This penalty means that one evening sound event is equivalent to about 3 daytime events at the same level and one nighttime sound event is equivalent to 10 daytime events of the same level. Noise models calculate CNEL by incorporating the SELs of individual aircraft operations experienced at a given location during an annual average day (total annual operations divided by 365) with a 4.8dBA penalty for events occurring between the evening hours and a 10 dBA penalty for those operations occurring during the nighttime hours.

*Figure J-4*
*Day-Night Average Sound Level*



The U.S. Environmental Protection Agency (USEPA) has designated the DNL as the principal metric for airport noise analysis.[1] DNL is widely accepted as the best available single metric to describe aircraft noise exposure. The FAA requires use of the annual DNL in aircraft noise exposure analyses and noise compatibility planning.[2]

## J.2 RUNWAY AND TAXIWAY USE

Runway use is generally influenced by the prevailing wind direction and available approach procedures and can be readily predicted based on equipment requirements. Taxiway use is based on convenience and availability.

Based on communication with airport and airport traffic control tower (ATCT) staff, it was determined that the Proposed Acton would not result in changes to runway use. **Table J-1** provides the runway use at the Airport.

*Table J-1*
*Runway Use at Bob Hope "Hollywood Burbank" Airport*

| Runway | Air Carrier/Cargo | Turboprop/ Business Jet | General Aviation | Military |
|---|---|---|---|---|
| **Departures** | | | | |
| **8** | 0% | 0.5% | 30.25% | 0.00% |
| **26** | 0.5% | 1.5% | 4.75% | 1.5% |
| **15** | 96% | 94% | 53.5% | 95% |
| **33** | 3.5% | 4% | 11.5% | 3.5% |
| **Arrivals** | | | | |
| **8** | 86% | 75% | 56% | 85% |
| **26** | 0% | 4% | 8% | 0% |
| **15** | 10% | 18% | 32% | 10% |
| **33** | 4% | 3% | 4% | 5% |

Source: Burbank-Glendale-Pasadena Airport Authority, 2019.
Prepared by: RS&H, 2020

[1] U.S. Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, U.S. EPA Report No. 550/9-74-004, 1974.

[2] Federal Aviation Administration, Federal Aviation Regulations Part 150, Airport Noise Compatibility Planning, Appendix A, 1984.

## J.3 FLIGHT TRACK USE

The flight tracks used in the noise analysis for arrival, departure, and touch-and-go and training tracks are presented in **Figure J-5**, **Figure J-6**, and **Figure J-7**, respectively. These flight tracks account for the FAA ban on Runway 8 departures by aircraft over 12,500 pounds. Note that there are, on a routine basis, departures on Runway 8 by aircraft weighing less than 12,500 pounds.

## J.4 FLEET MIX

**Table J-2** presents the fleet mix for all study years examined as part of the EIS.

*Figure J-5*
*Arrival Flight Tracks*

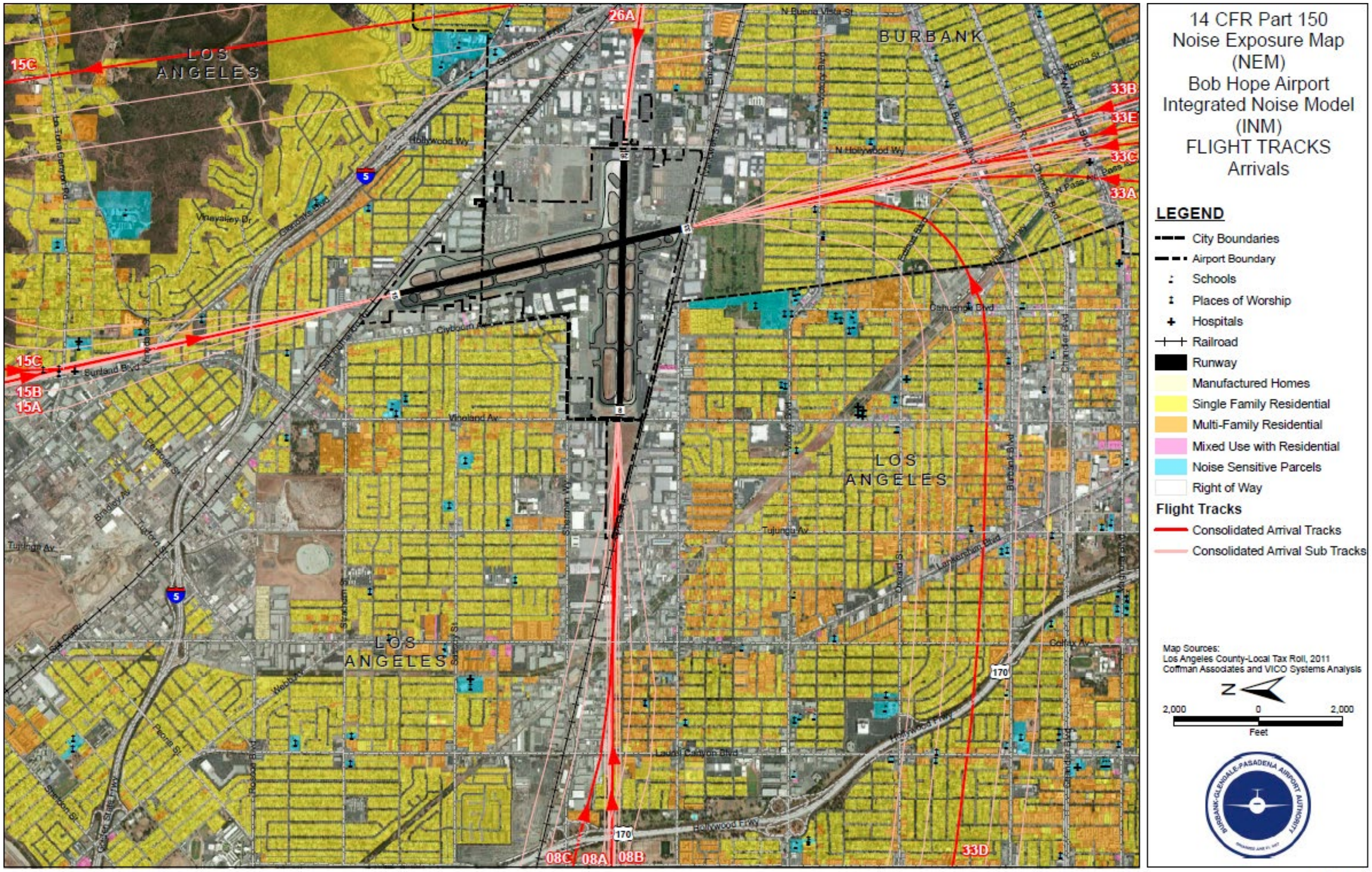



Exhibit 3D
Existing and Future Arrival Flight Tracks

*Figure J-6*
*Departure Flight Tracks*


Exhibit 3E
Existing and Future Departure Tracks

*Figure J-7*
*Touch and Go and Training Flight Tracks*

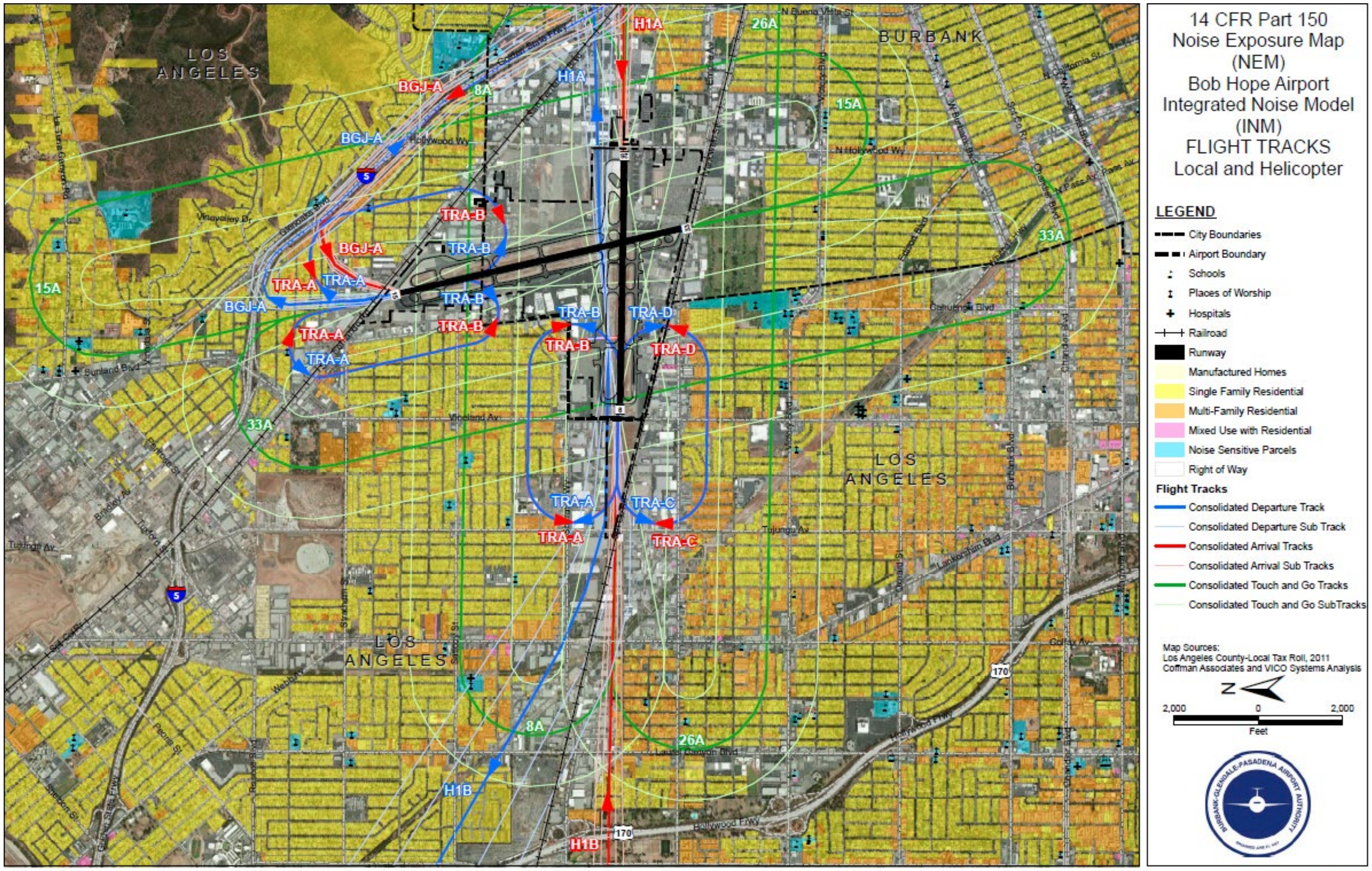



Exhibit 3F
Existing and Future Helicopter and Training Flight Tracks

*Table J-2*
*Fleet Mix*

| Aircraft Type | Replacement/ Model Input ID | 2019 | 2024 | 2029 |
|---|---|---|---|---|
| **Air Carrier User Class** | | | | |
| 737900 | 737800 | 0.00% | 0.49% | 0.50% |
| EMB-175 | EMB175 | 0.00% | 0.98% | 0.99% |
| 737-800 | 737800 | 0.73% | 9.77% | 9.91% |
| A-320 | A320-211 | 1.68% | 1.47% | 1.49% |
| MD-80 | MD82 | 0.87% | 0.00% | 0.00% |
| 737-300 | 737300 | 0.71% | 0.00% | 0.00% |
| 737-700 | 737700 | 22.58% | 17.09% | 17.34% |
| 737-500 | 737500 | 0.36% | 0.00% | 0.00% |
| A319 | A319-131 | 0.74% | 2.93% | 2.97% |
| CRJ 900 | CRJ9-ER | 2.18% | 2.93% | 2.97% |
| Dash-8 | DHC830 | 0.00% | 0.00% | 0.00% |
| CRJ 700 | CRJ701 | 3.28% | 0.98% | 0.99% |
| CRJ 200 | CL601 | 3.28% | 0.00% | 0.00% |
| **Air Taxi and General Aviation** | | | | |
| Cessna Citation I | CNA500 | 0.19% | 0.19% | 0.19% |
| Cessna Citation III | CIT3 | 0.16% | 0.17% | 0.16% |
| MU-300 Diamond | MU3001 | 0.54% | 0.55% | 0.54% |
| Cessna Citation II | CNA55B | 0.56% | 0.57% | 0.56% |
| Cessna Excel/Ultra | CNA560XL | 1.38% | 1.39% | 1.38% |
| Cessna Citation X | CNA750 | 0.67% | 0.67% | 0.67% |
| Cessna Mustang | CNA510 | 0.32% | 0.32% | 0.32% |
| Cessna Sovereign | CNA680 | 0.33% | 0.34% | 0.33% |
| Canadair Challenger | CL600 | 1.52% | 1.53% | 1.52% |
| Lear 30/40/50 Series | LEAR35 | 1.69% | 1.70% | 1.69% |
| Lear 20 Series | LEAR25 | 0.00% | 0.00% | 0.00% |
| Falcon 20 | FAL20 | 0.00% | 0.00% | 0.00% |

| Aircraft Type | Replacement/ Model Input ID | 2019 | 2024 | 2029 |
|---|---|---|---|---|
| **Air Taxi and General Aviation (continued)** | | | | |
| Gulfstream II/III | GIIB | 0.00% | 0.00% | 0.00% |
| Gulfstream IV | GIV | 1.37% | 1.38% | 1.37% |
| Gulfstream V | GV | 1.06% | 1.07% | 1.06% |
| Astra 1125 | IA1125 | 0.51% | 0.51% | 0.51% |
| Falcon 50 | F10062 | 0.09% | 0.09% | 0.09% |
| 737-700 | 737700 | 0.12% | 0.12% | 0.12% |
| EMB-145 | EMB145 | 0.09% | 0.09% | 0.09% |
| 757-200 | 757PW | 0.07% | 0.08% | 0.07% |
| Single Eng. Piston Fixed Wing | GASEPF | 7.40% | 7.45% | 7.39% |
| Single Engine Piston Var | GASEPV | 7.40% | 7.45% | 7.39% |
| Multi Engine Piston | BEC58P | 1.32% | 1.33% | 1.32% |
| Single Turbo Prop | CNA208 | 2.11% | 2.13% | 2.11% |
| Twin Turbo Prop | CNA441 | 3.70% | 3.72% | 3.70% |
| Twin Turbo Prop | DHC6 | 1.85% | 1.86% | 1.85% |
| Helicopter | R44 | 0.87% | 0.88% | 0.87% |
| Helicopter | H500D | 0.87% | 0.88% | 0.87% |
| Helicopter | SA350D | 5.98% | 6.03% | 5.98% |
| **Air Cargo** | | | | |
| 767-400 | 767400 | 0.05% | 0.05% | 0.05% |
| A-300 | A300-622R | 0.97% | 0.86% | 0.84% |
| 757-200 | 757PW | 0.02% | 0.02% | 0.02% |
| B-1900 | 1900D | 0.29% | 0.26% | 0.25% |
| Lear 35 | LEAR35 | 0.38% | 0.34% | 0.33% |
| SA227 | SA227 | 1.15% | 1.02% | 1.00% |
| King Air 200 | BEC200 | 0.30% | 0.26% | 0.26% |
| Beech 99 | BEC99 | 0.70% | 0.62% | 0.60% |
| PA-31 | PA31 | 0.80% | 0.71% | 0.70% |

| Aircraft Type | Replacement/ Model Input ID | 2019 | 2024 | 2029 |
|---|---|---|---|---|
| **Air Cargo (continued)** | | | | |
| Beech Baron 58 | BEC58P | 0.15% | 0.14% | 0.13% |
| **General Aviation - Local** | | | | |
| Single Engine Piston Fixed | GASEPF | 3.16% | 3.18% | 3.16% |
| Single Engine Piston Var | GASEPV | 3.16% | 3.18% | 3.16% |
| Multi-Engine Piston | BEC58P | 1.58% | 1.59% | 1.58% |
| Helicopter | R22 | 7.91% | 7.96% | 7.91% |
| **Military** | | | | |
| Fighter | F16A | 0.13% | 0.12% | 0.12% |
| Helicopter | S70 | 0.67% | 0.59% | 0.58% |

Source: Burbank-Glendale-Pasadena Airport Authority
Prepared by: RS&H, 2020

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