



Portable Noise Monitor Report

Prepared by: Aircraft Noise Office

For: Saratoga Ave., San Diego, CA

January 26, 2023

Portable Noise Monitoring Summary

? WHEN WAS NOISE MEASURED

December 19 – 29, 2022



	S	M	T	W	T	F	S
December 2022		19	20	21	22	23	24
	25	26	27	28	29		

 Partial measurement (setup / takedown) days.

 Full (24-hour) measurement days.

✈ HOW MANY NOISE EVENTS OCCURRED



MOST FREQUENT AIRCRAFT FLIGHTS DURING THE MEASUREMENT PERIOD

Rank	Aircraft Type	Airport ID
1	B738 	SAN
2	A321 	SAN
3	B739 	SAN
4	B737 	SAN

💡 CONCLUSION

During the 9 full (24-hour) day measurement period, the Community Noise Equivalent Level (CNEL) from aircraft noise* was 62.1 decibels (dB), while the CNEL from community noise was 54.1 dB.

The FAA and State of California's threshold for land use compatibility is an aircraft CNEL of 65 dB.

*Aircraft CNEL only includes operations from SAN.

Aircraft CNEL	Community CNEL	Total CNEL
62	54	63

Introduction

Aircraft noise at the San Diego International Airport (SAN) has been monitored since the 1970s.

The Airport Noise and Operations Monitoring System (ANOMS) collects, analyzes, and processes data from several sources of information. The sources include noise events from 23 permanent Remote Monitoring Terminals (RMT's), Federal Aviation Administration (FAA) radar data, weather data, and noise complaints.

The purpose of the Portable Noise Monitoring program is to provide additional aircraft noise information beyond the Airport Authority's 23 RMT's. This information augments overall ANOMS data collection.

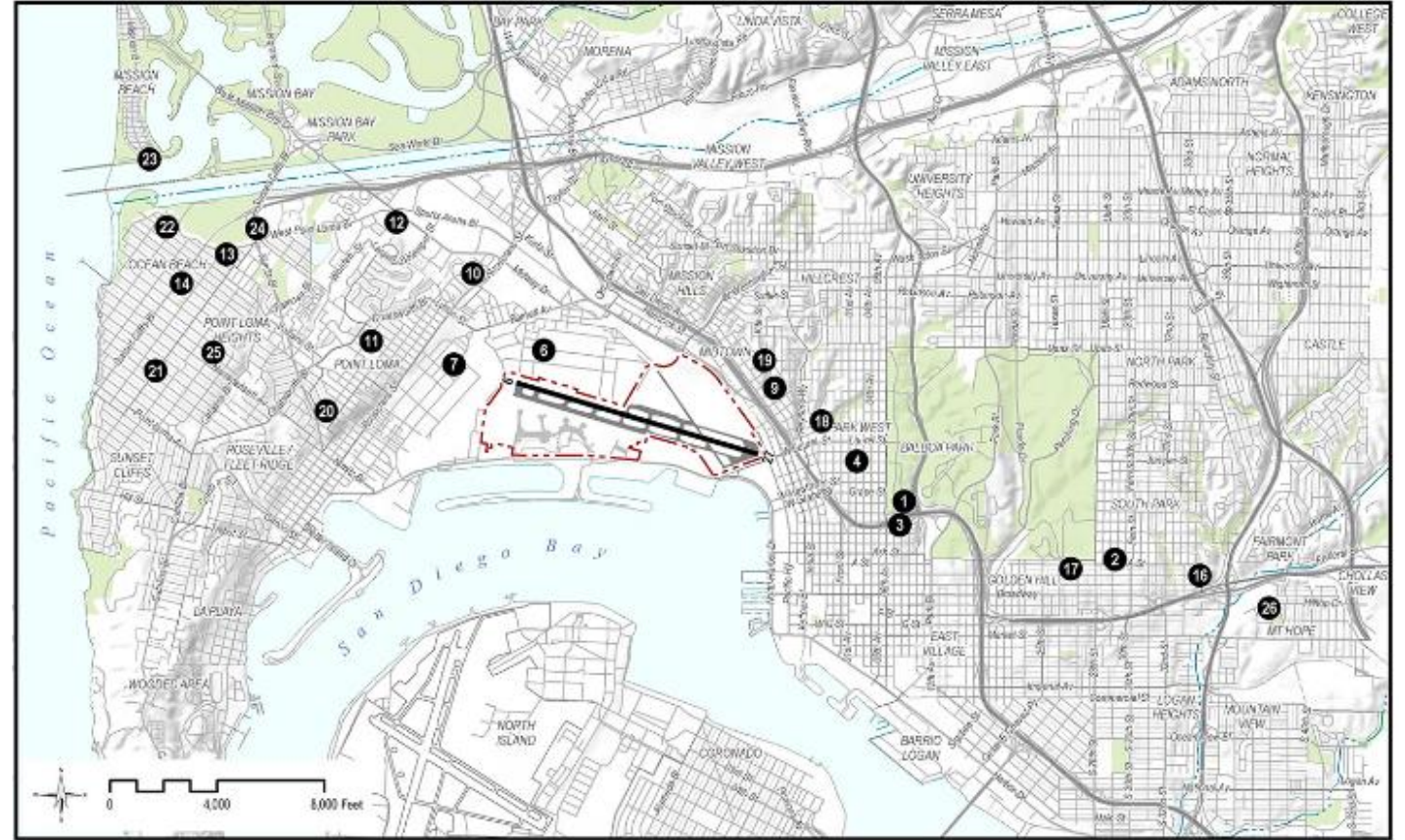


Figure 1. Map of the 23 permanent RMT locations at SAN, San Diego, CA.

Location

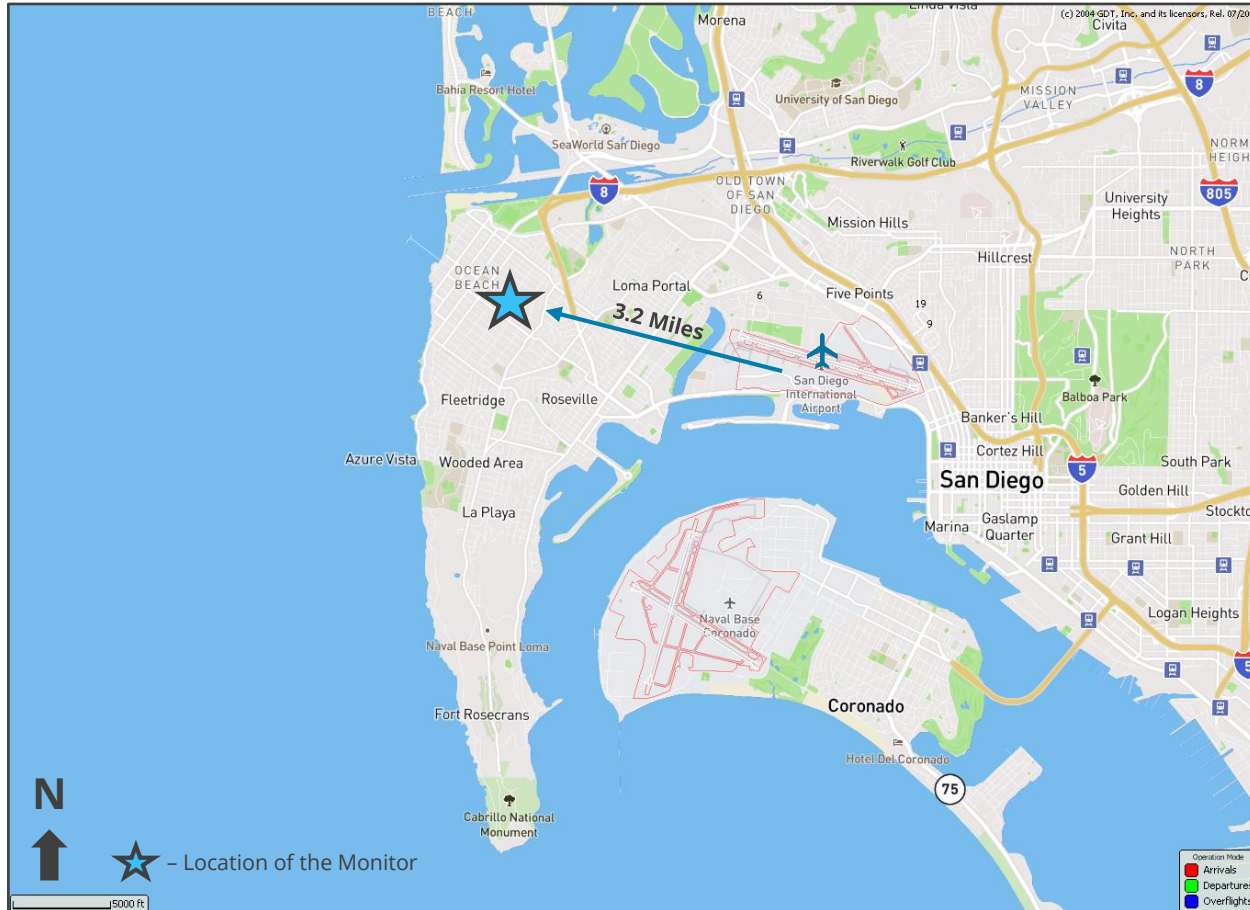


Figure 2. Map of the Portable Noise Monitoring location during December 19 – 29, 2022.

Location: Saratoga Avenue, San Diego, CA 92107.

Dates of Monitoring: December 19 – 29, 2022.

Distance from SAN: The monitor was located approximately 3.2 miles west-northwest from the center of the Airport.

On-Site Set Up: The noise monitor was placed in the backyard of a private and secure property. The monitor operated continuously during the entire 11-day measurement period. First and last days were partial measurement days, used for setup and take-down. The monitor was placed on a soft grass lawn surface, to reduce sound reverberation. Microphone was approximately six feet above the ground, and was obstruction free.



Figure 3. Portable Monitor at Location.

Methodology

Measurements were taken using a B&K Class I, 2250 Sound Level Meter.* The meter is a 'precision' grade analyzer, which was calibrated prior to the test.

The following baseline thresholds were established: 65 dBA for Daytime (7:00 a.m. – 10:00 p.m.), 62 dBA for Evening (07:00 p.m. – 10:00 p.m.) and 60 dBA for Nighttime (10:00 p.m. – 7:00 a.m.). The baseline threshold levels were established to match the nearest permanent RMT. For a sound event to register, the Equivalent Continuous Sound Level (LEQ) needed to exceed the corresponding threshold, and last for a pre-determined minimum duration of time, which was 10 sec, 12 sec, and 14 sec for Daytime, Evening, and Nighttime respectively. The maximum duration was 60 seconds and an event would be discarded beyond that time. For consistency, the portable monitor clock was synchronized to the same source used by ANOMS. The sound level meter recorded the following information about each noise event: date, time, duration, and noise levels.



Figure 4. B&K Class I, 2250 Sound Level Meter and associated field equipment.

Note: <https://www.bksv.com/en/instruments/handheld/sound-level-meters/2250-series/type-2250-l>

* This meter meets Class I American National Institute Standards, Inc. (ANSI) S1.4:2014

Noise Definitions

Noise by definition is unwanted sound. There are many ways to describe noise (metrics) however, the most commonly relied on metric is the **decibel (dB)**.

A-weighting (dBA) is used to adjust (filter) for frequency range of human hearing.

A number of factors affect sound, including, weather, ground effects, as well as human reaction to the noise source.

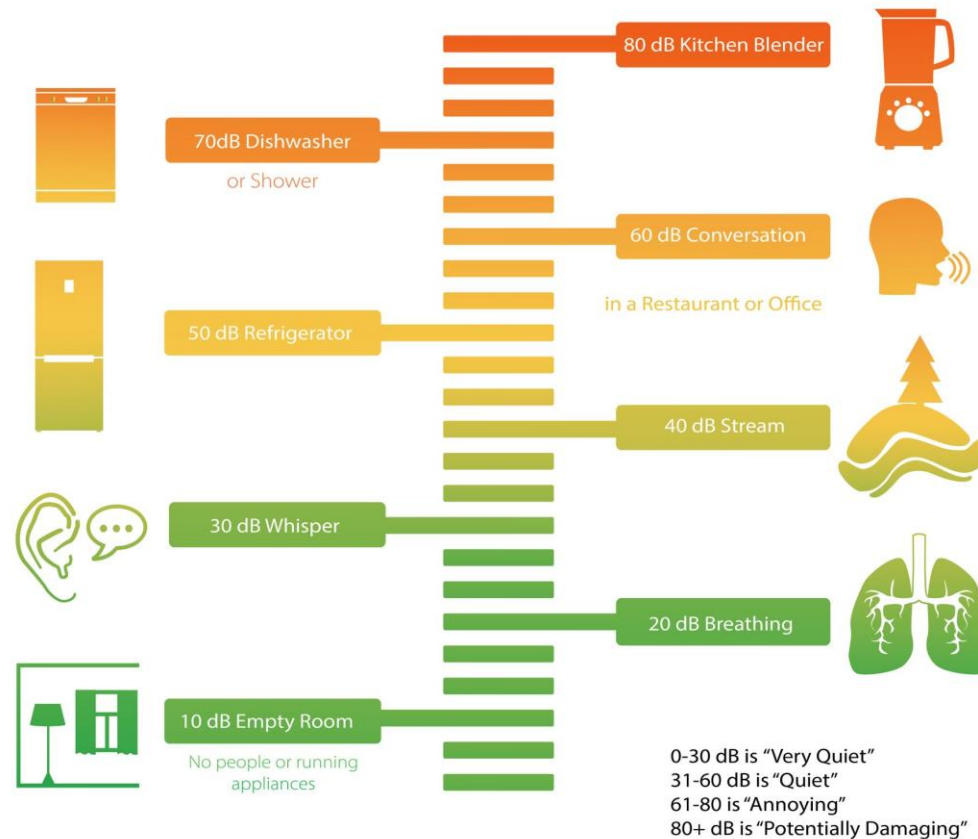


Figure 5. Common Sound Levels.

Source: <https://www.sylvane.com/blog/how-loud-is-a-decibel/>

Noise Definitions (cont.)

SEL – The most common measure of cumulative noise exposure for a single aircraft flyover is the Sound Exposure Level (SEL). Mathematically, it is the sum of the sound energy over the duration of a noise event – one can think of it as an equivalent noise event with a one-second duration.

Lmax – Maximum Sound Level is a measurement of the peak level of a sound event.

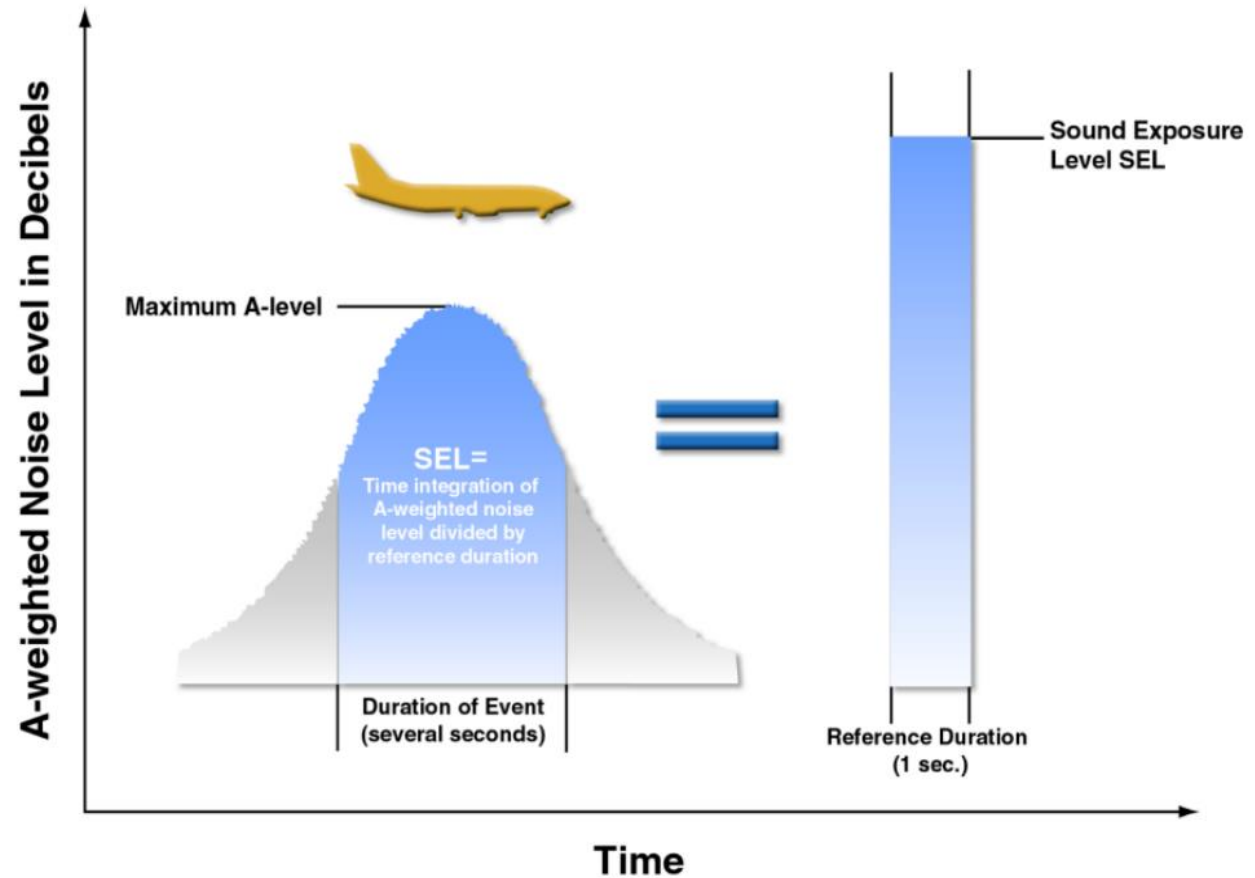


Figure 6. Sound Exposure Level and Maximum Sound Level.
Source: Brown-Buntin Associates, Inc.

Metrics

The FAA and other federal agencies have established land use compatibility guidelines based on the Community Noise Equivalent Level (CNEL). CNEL is a weighted average of noise level over a 24-hour period. For CNEL calculation, a penalty of 5 dBA is added between 7 p.m. – 10 p.m. for evening hours, and a penalty of 10 dBA is added for the nighttime hours of 10 p.m. – 7 a.m.

The logic behind these applied penalties is that residents are usually more sensitive to noise at night and during evening hours. CNEL is frequently used in regulations of airport noise impact on the surrounding community. A CNEL (for aircraft noise) exceeding 65 dBA is generally considered a threshold for land use compatibility.

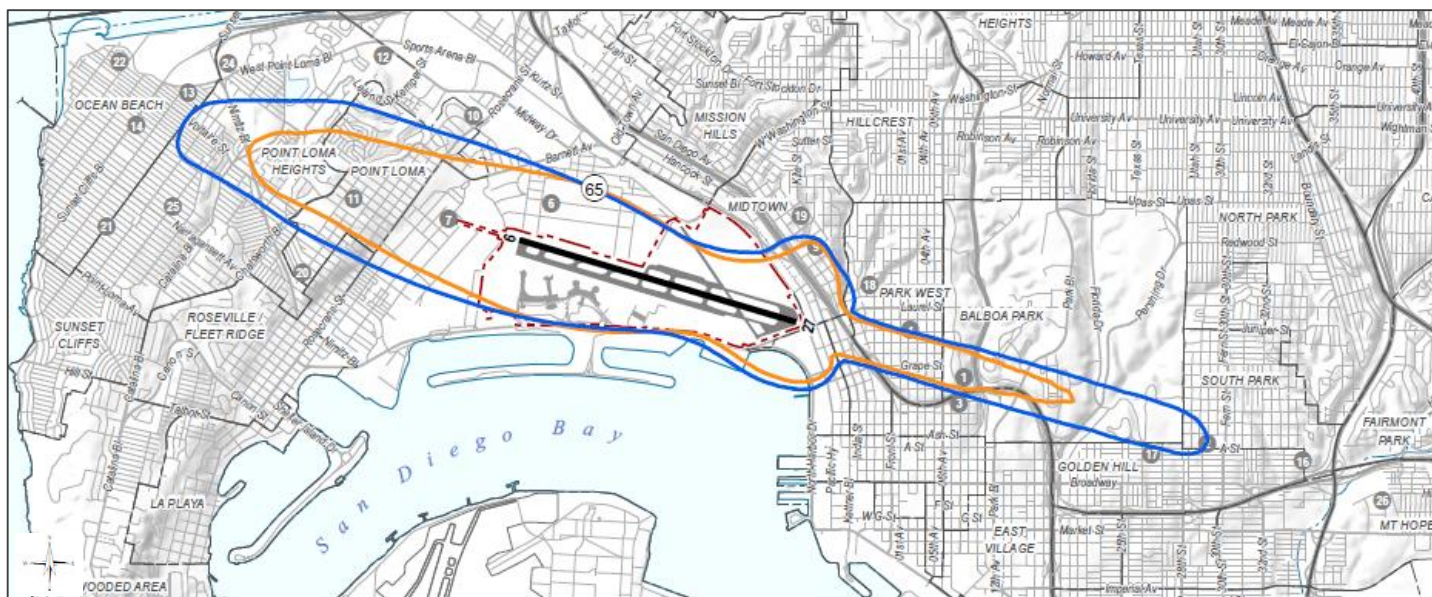


Figure 7. Example of CNEL contour; Source: 3rd Quarter 2022, State of California Quarterly Noise Report for SAN.

Aircraft Operations

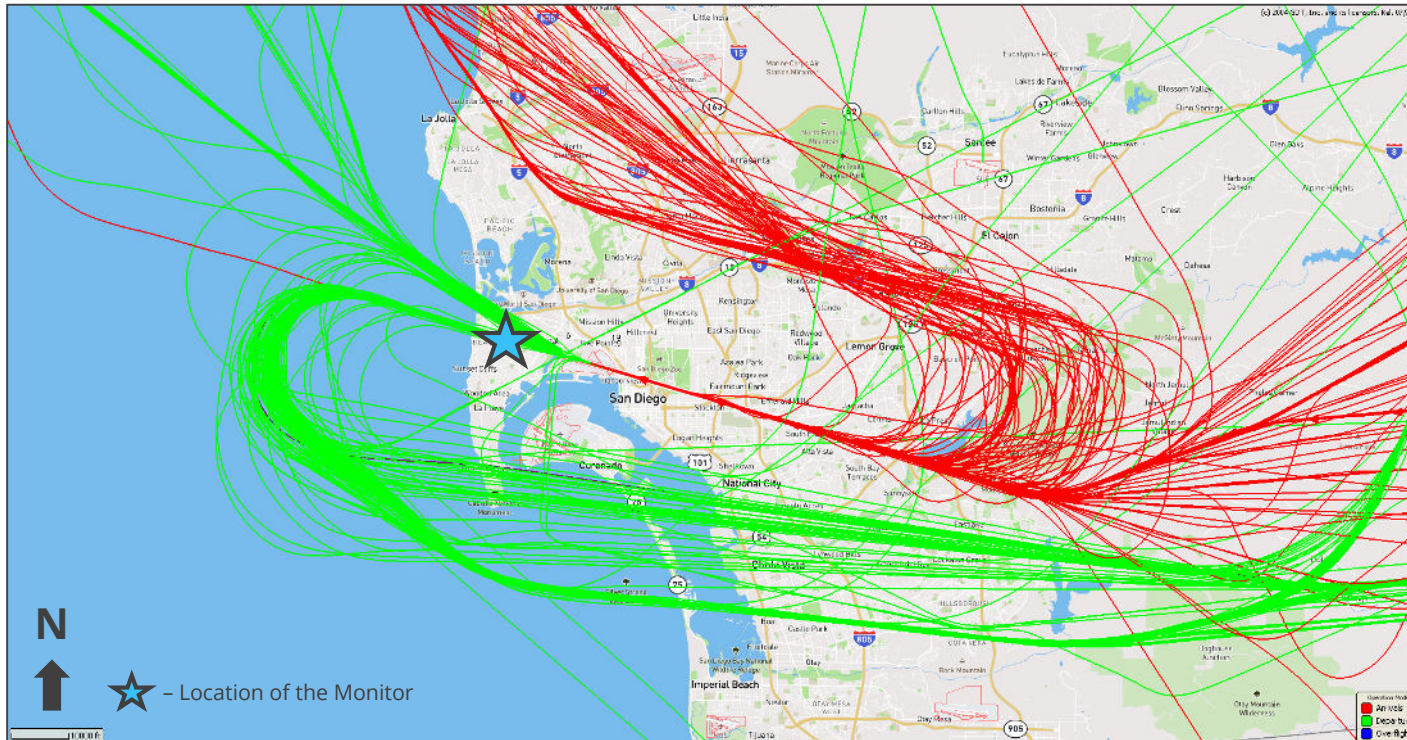


Figure 8. Flight Tracks during an average day in the testing period.
Location: Saratoga Ave., San Diego, CA.
Source: ANOMS.

Aircraft at SAN typically operate in a "west flow" pattern, where they arrive from the east and depart to the west. During inclement weather or high wind conditions, aircraft might operate in a reverse flow, departing to the east and arriving from the west, however this "east flow" pattern is infrequent and represents approximately 1.7% of the total annual operations.

During the full 9-day measurement period, there were 4,097 total SAN operations: 2,046 Arrivals, and 2,044 Departures. Seven flights were diverted due to inclement weather conditions. The average number of flights per day was 455.

Flight tracks in Figure 8 are a sample of a "typical" day taken from December 22, 2022, and represent 506 flights.

Daily Noise Event Data

SAN Aircraft				Non-SAN Aircraft			Community		
Date	Noise Events (quantity)	Average SEL (dB)	Average Lmax (dB)	Noise Events (quantity)	Average SEL (dB)	Average Lmax (dB)	Noise Events (quantity)	Average SEL (dB)	Average Lmax (dB)
12/20/2022	187	85	77	0	0	0	0	0	0
12/21/2022	199	85	77	3	77	66	4	82	72
12/22/2022	167	86	78	1	89	75	0	0	0
12/23/2022	175	85	76	0	0	0	0	0	0
12/24/2022	111	86	77	0	0	0	0	0	0
12/25/2022	97	85	77	1	81	72	0	0	0
12/26/2022	127	85	77	0	0	0	0	0	0
12/27/2022	167	86	77	0	0	0	0	0	0
12/28/2022	169	86	77	0	0	0	1	81	71

Figure 9. Daily noise events averages.
Location: Saratoga Ave., San Diego, CA.
Source: ANOMS.

Note: Full 24-hour days of measurements are displayed. Partial measurement (setup / takedown) days are not shown. Quantity "zero" noise events and average levels indicate that those were not registered by the Sound Level Meter.

Loudest Aircraft Noise Events

Aircraft Type	Airline	Event Date / Time	Airport	SEL (dB)	Lmax (dB)	Altitude ¹ at Lmax (Feet MSL ²)
A321	American Airlines	12/28/2022 @ 9:53 PM	San Diego International Airport	92.4	80.8	1,880
A321	Delta Air Lines	12/25/2022 @ 2:42 PM	San Diego International Airport	91.7	82.2	2,225
B738	United Airlines	12/28/2022 @ 2:28 PM	San Diego International Airport	91.3	83.1	1,786
B739	United Airlines	12/22/2022 @ 7:06 PM	San Diego International Airport	91.1	82.8	1,414
A321	American Airlines	12/27/2022 @ 6:36 AM	San Diego International Airport	91	81.5	1,940
B739	United Airlines	12/28/2022 @ 8:23 AM	San Diego International Airport	91	83.3	1,451
A321	jetBlue Airways	12/22/2022 @ 6:58 AM	San Diego International Airport	90.9	80.2	2,385
B738	Sun Country Airlines	12/22/2022 @ 8:53 PM	San Diego International Airport	90.9	83.5	1,556
B738	Alaska Airlines	12/26/2022 @ 7:37 AM	San Diego International Airport	90.8	82.2	1,598
B739	Alaska Airlines	12/28/2022 @ 8:34 AM	San Diego International Airport	90.8	82	1,788

Figure 10. Loudest aircraft noise events December 20 - 28, 2022.

Location: Saratoga Ave., San Diego, CA.

Altitude¹ – at which Lmax was registered.

MSL² – Above Mean Sea Level.

Source: ANOMS.

Noise Summary

In general, there are three sources of emitted energy, as it relates to sound measurements.

SAN Aircraft is sound solely attributed to aircraft operating at SAN.

Non-SAN Aircraft sound is measured for all “other” aircraft that do not operate in or out of SAN.

Community sound, also known as Ambient, includes sound events from all other sources such as vehicular traffic, landscaping activities, conversations, construction activities, kids playing, etc.

Date	Daily SAN Aircraft CNEL (dB)
12/20/2022	62
12/21/2022	63
12/22/2022	63
12/23/2022	61
12/24/2022	60
12/25/2022	60
12/26/2022	61
12/27/2022	63
12/28/2022	64

Figure 11. Daily Aircraft CNEL Levels for Saratoga Ave., San Diego, CA.
Source: ANOMS.

Noise Event Breakdown	
SAN Aircraft	1,399
Community	5
Non-SAN Aircraft	5

Figure 13. Registered Noise Events for Saratoga Ave., San Diego, CA.
Source: ANOMS.

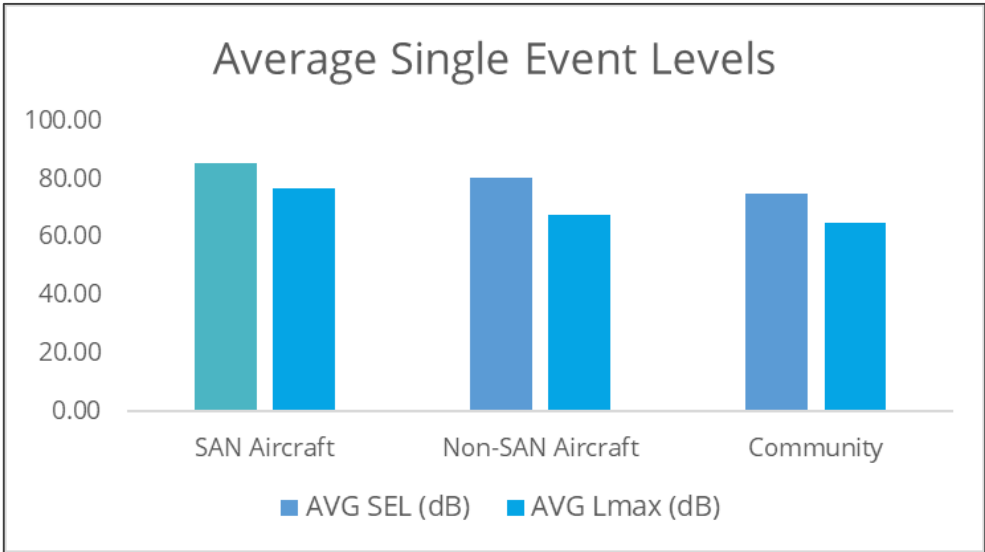
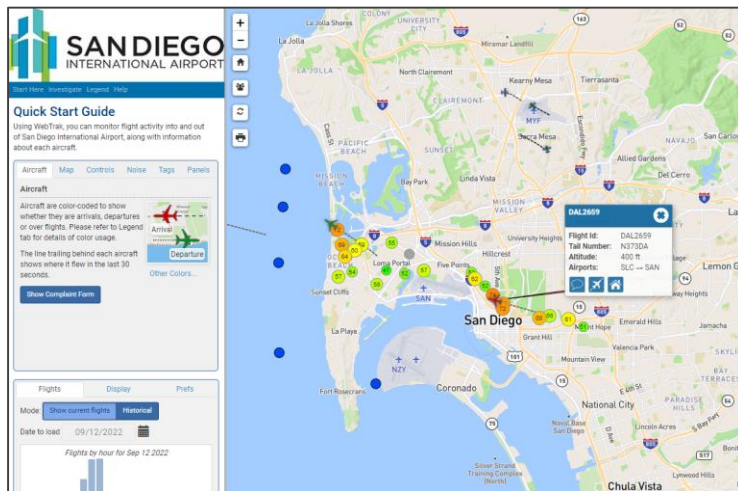


Figure 12. Average Single Event Levels for Saratoga Ave., San Diego, CA.
Source: ANOMS.

Additional Resources

If you have any additional questions about the information in this report, or any other aircraft noise related concerns, please contact our Aircraft Noise Office at **619-400-2660** and ask for a Noise Specialist. For additional information you can review aircraft flight tracks, file a noise complaint, or attend an Airport Noise Advisory Committee (ANAC) meeting.



If you want to research an aircraft, you can view the near-real time flight tracks on our website:

<https://webtrak.emsbk.com/san>



Three ways to file a complaint:

1. On the Web:
<https://webtrak.emsbk.com/san>
2. Through the Mobile App:
<https://viewpoint-app.emsbk.com/san4/login>
3. By telephone: 619-400-2799

Learn more about what efforts have been done to reduce aircraft noise in the community or voice a concern about aircraft noise by attending a quarterly **Airport Noise Advisory Committee meeting**.

More information can be found on our website:

<https://www.san.org/Aircraft-Noise/Initiatives>