Work Item A15:
Aircraft Noise Affecting ThreeSixty at South Bay Community

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Presented to LAX/Community Noise Roundtable

September 12, 2018

Hawthorne, CA

Outline

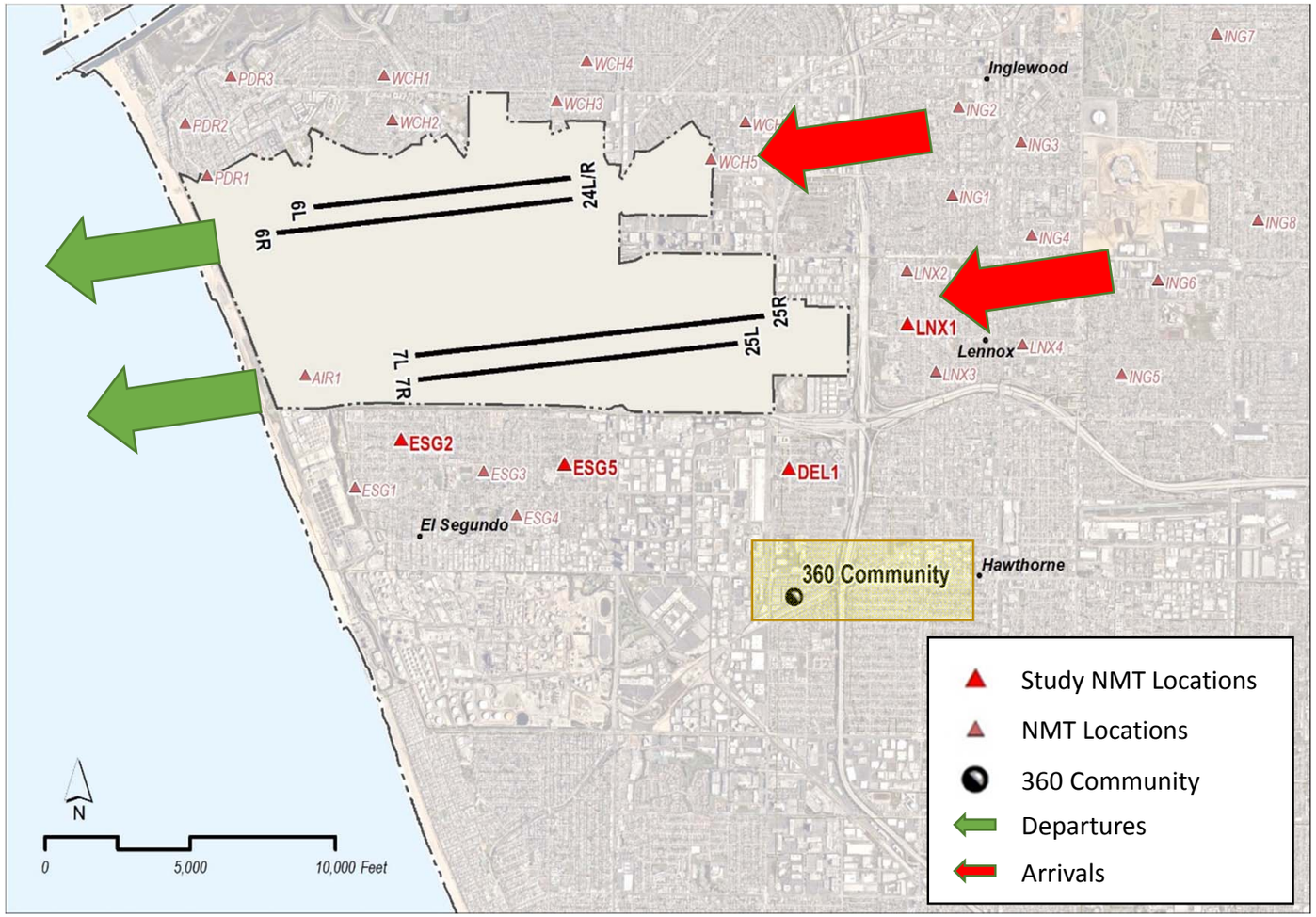
- Objective and Scope
- Background
  - General information
  - What was examined
- Discussion of Results
- Conclusions

Objective and Scope of Project

- Objective
  - To determine the cause(s) of the perceived increase in aircraft noise in the 360 Community and, if feasible, make noise reduction recommendations

- Scope
  - Investigate past periods of perceived increases in aircraft noise
  - Assist LAWA with noise and weather measurements on-site at the 360 Community
  - Analyze noise and weather measurement data
  - Generate conclusions/recommendations

Background



- LAX Runways
- Typical Operational Flow
- Relevant Permanent Noise Monitors
- Location of 360 Community

Background - what was examined?

- Noise observations by 360 Community
  - Past period (2015 – 2017)
  - Current period (March – May 2018; on-site measurements)

- Noise levels *(LAWA)*
  - Daily aircraft Community Noise Equivalent Level (CNEL)
  - Hourly Equivalent Sound Level*
  - C-weighted levels*

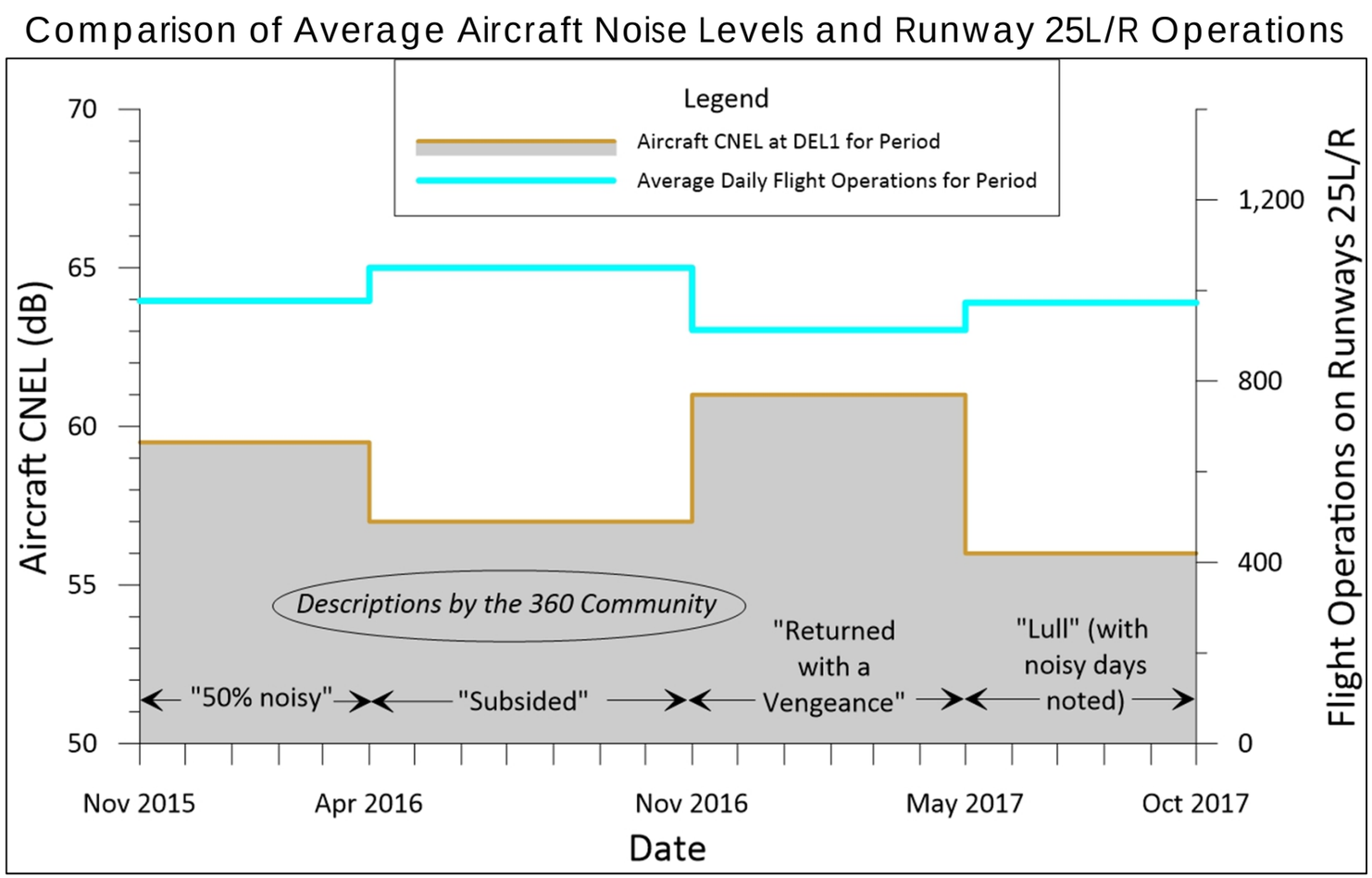
- Operational data for LAX *(LAWA/FAA)*
  - Flight operations on Runways 25L/R
  - Runway closure (and flow condition)*
  - Run-ups*

- Weather data *(LAWA, NOAA and SCAQMD)*
  - Temperature
  - Daily temperature inversion
  - Wind direction and speed
  - Relative humidity*

*Less significant and are not discussed in this presentation.

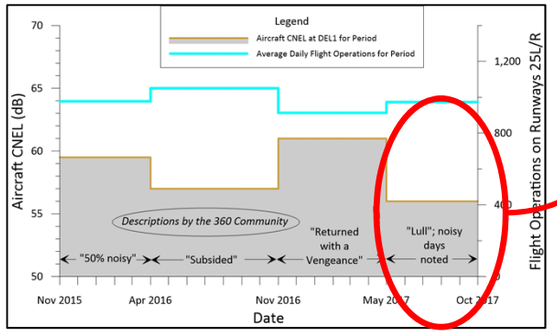
NOAA = National Oceanic and Atmospheric Administration
SCAQMD = South Coast Air Quality Management District

Noise and Flight Operations: Past Period 2015-2017



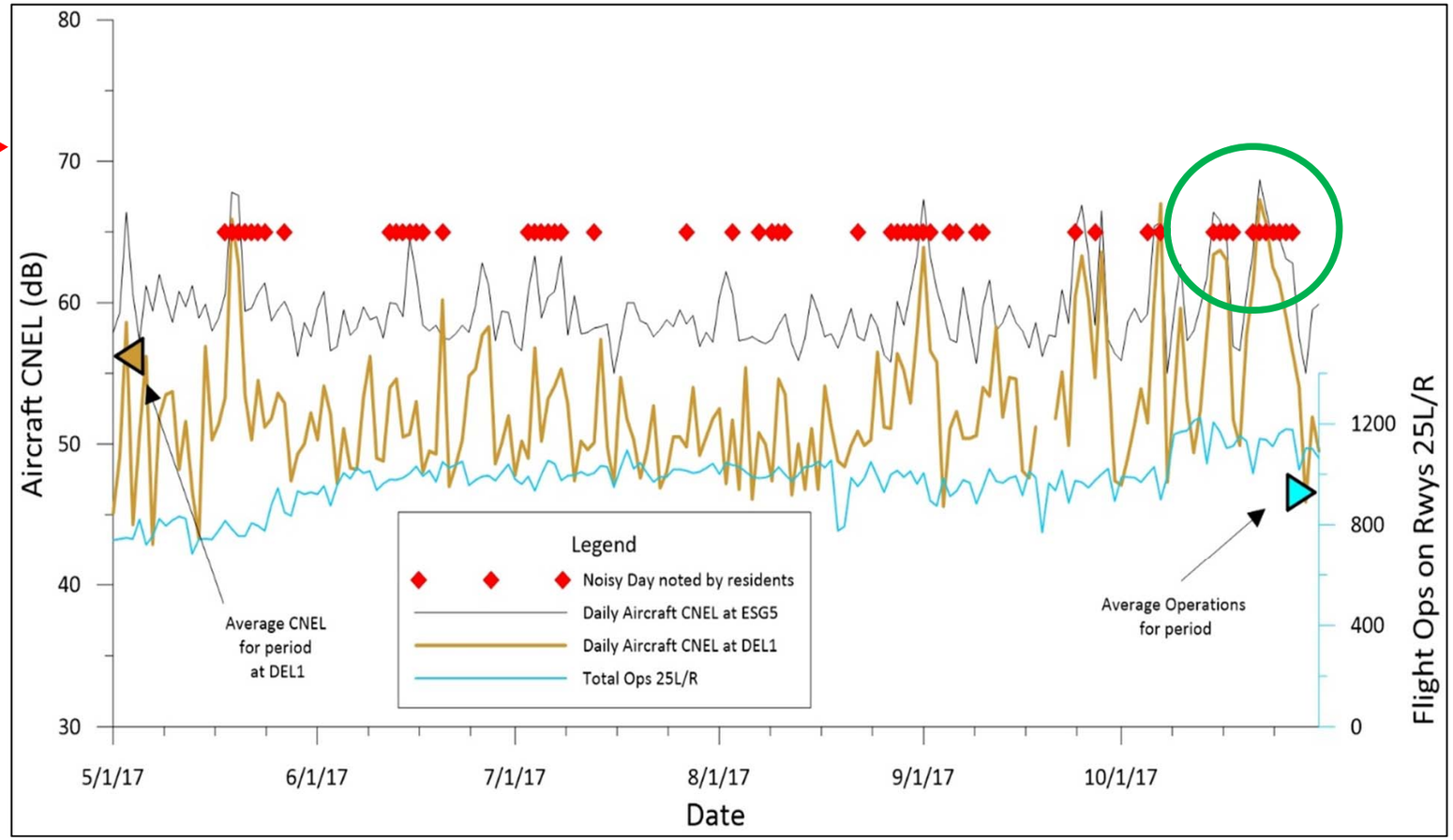
- Seasonal increases and decreases in measured aircraft noise levels at DEL1 **agreed** with 360 Community's observations
- Operations on runways 25L/R **trended oppositely**
  - That is, people noted greater noise when there were fewer operations and vice versa

Noise and Flight Operations: “Lull” Period (May – October 2017)



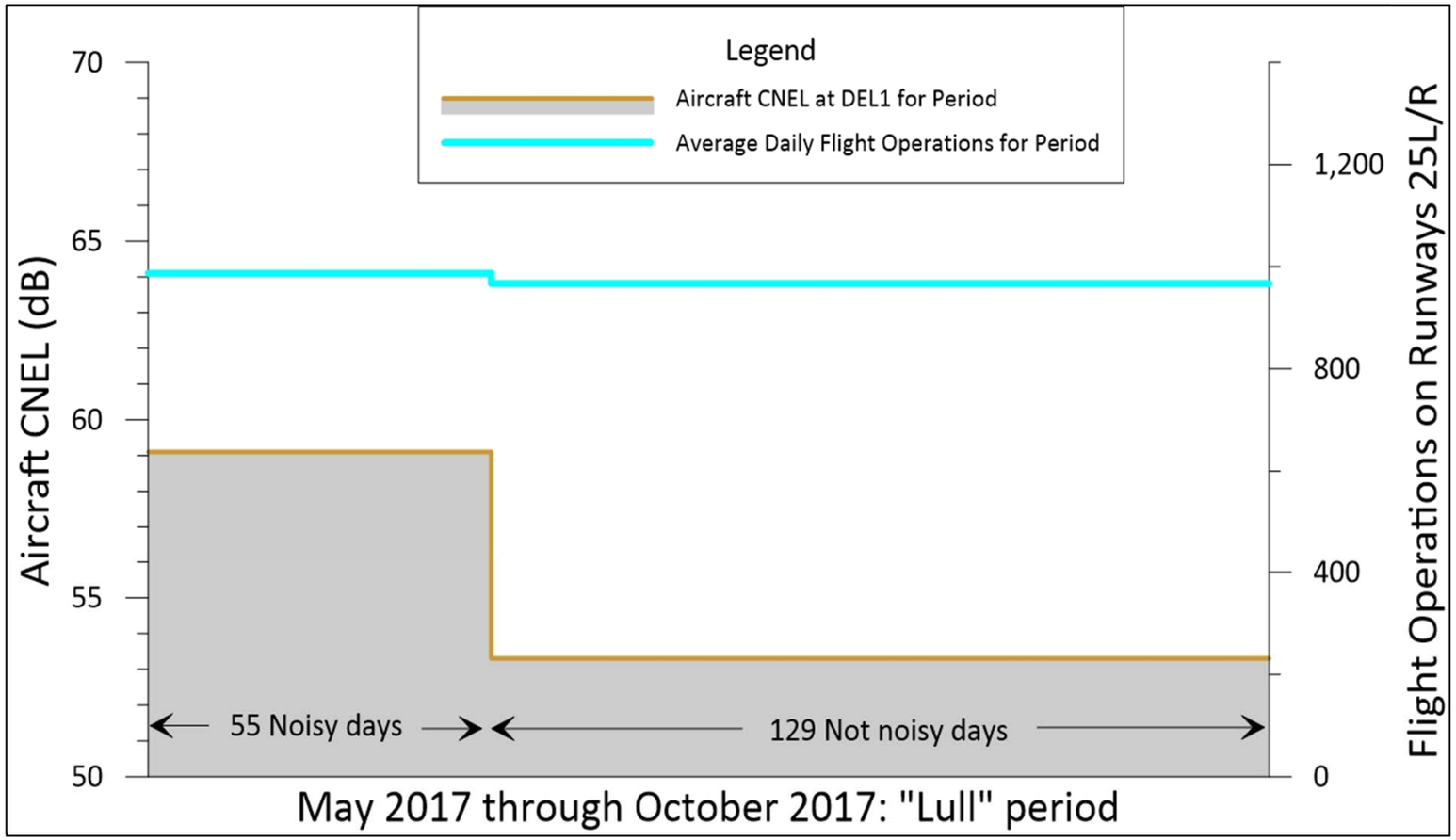
- 55 “noisy” days reported by 360 Community during “Lull” period

Comparison of Daily Aircraft Noise Levels and Runway 25L/R Operations



Noise and Flight Operations: “Lull” Period (May – October 2017)

Comparison of Average Aircraft Noise Levels and Runway 25L/R Operations



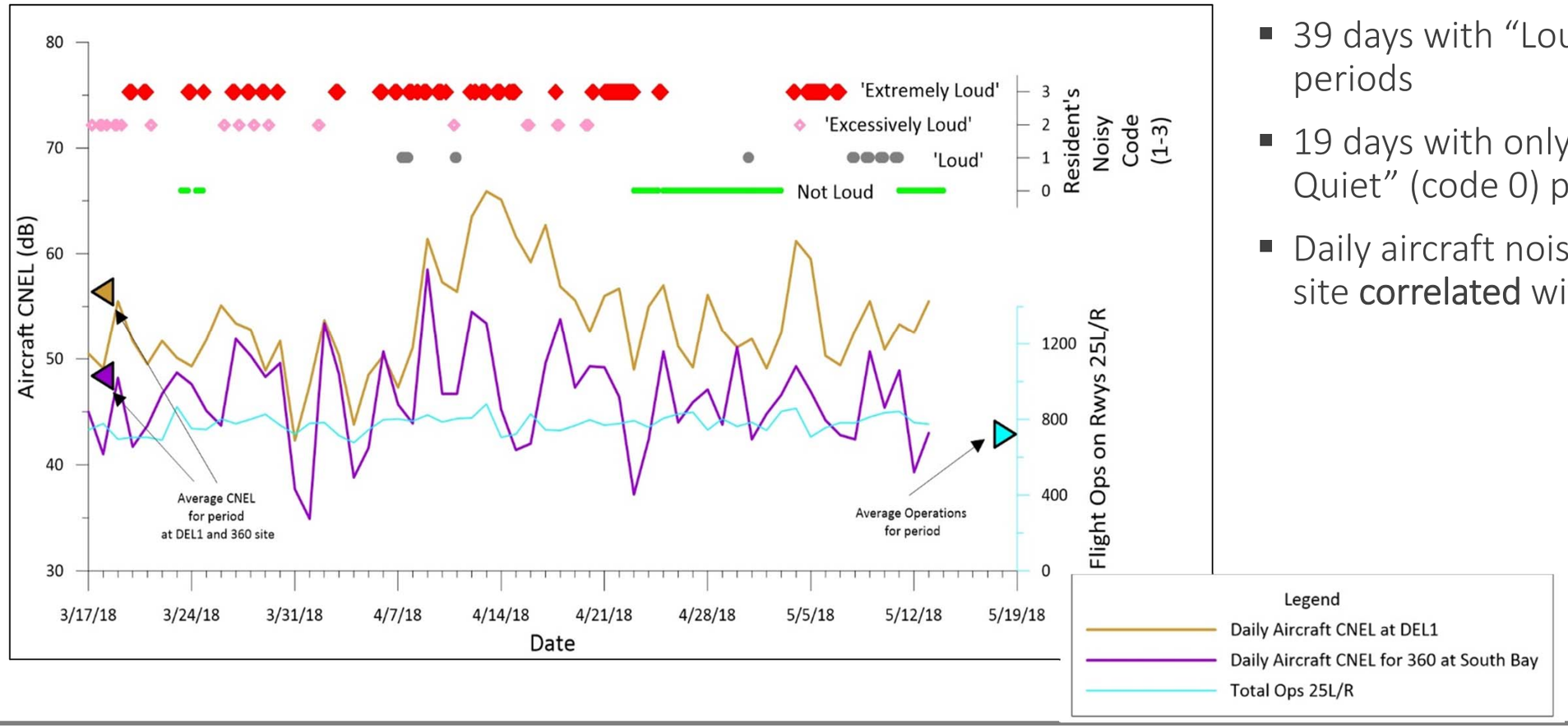
- Average noise at DEL1 was 6 dB higher on the 55 “noisy days”
- Negligible change in average aircraft operations between “noisy” and “quiet” days (987 and 967, respectively)
  - Did not account for the change in noise observations and measured noise levels

On-Site Measurements at 360 Community

- Approximately 2 Months (March 17 – May 13, 2018)
- 5440 Strand Avenue rooftop
- Noise data collected:
  - 1-second equivalent sound levels
  - A-weighted and C-weighted
- Weather data collected (15-minute averages):
  - Temperature
  - Relative humidity
  - Wind direction and speed
- Noise observations collected by resident volunteer:
  - Relatively Quiet/Not Loud = 0
  - Loud = 1
  - Extremely Loud = 2
  - Excessively Loud = 3

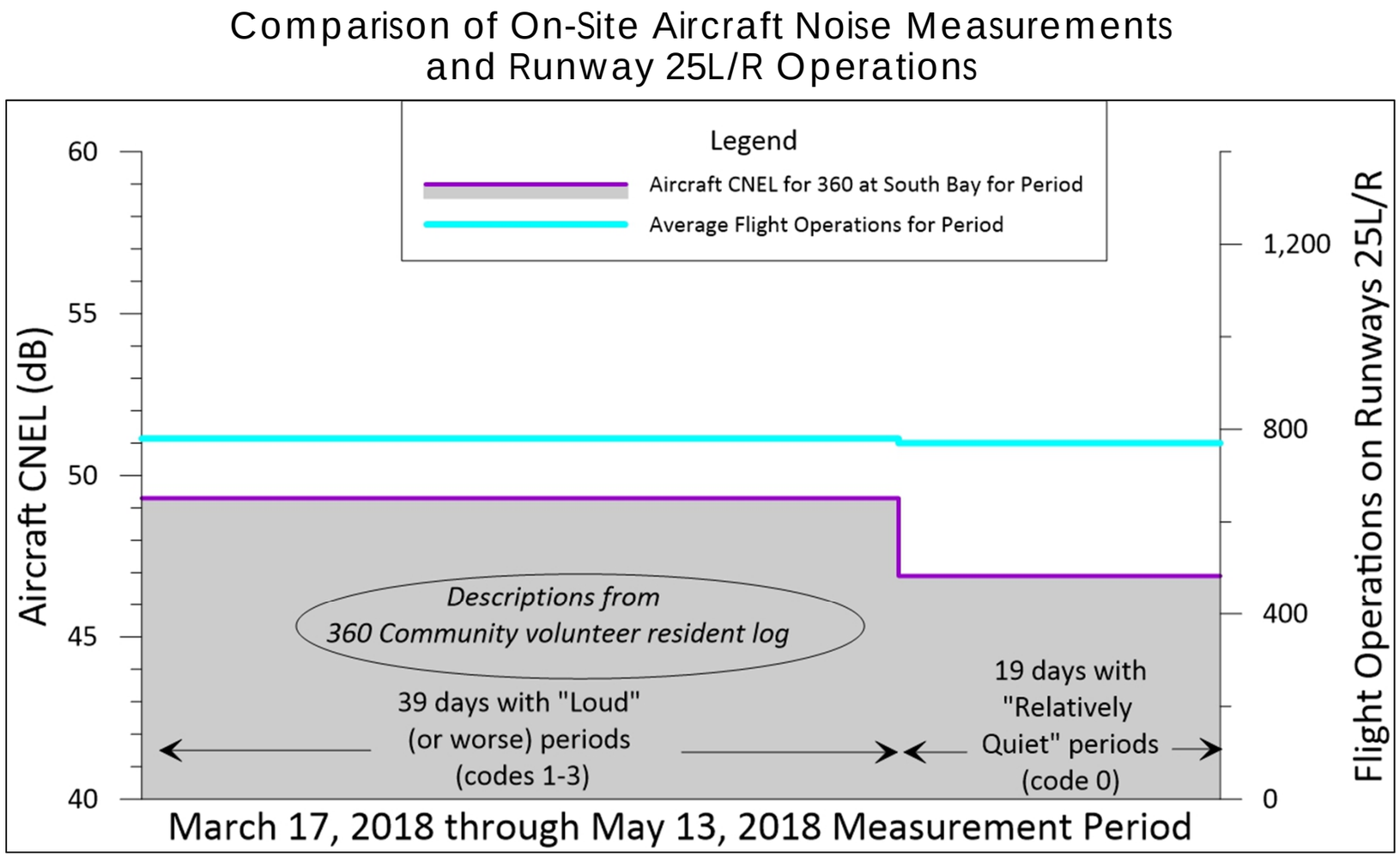
Noise and Flight Operations: Current Period (March-May 2018)

Comparison of Noise Observations, Noise Measurements, and Runway 25L/R Operations



- 39 days with “Loud” (code 1-3) periods
- 19 days with only “Relatively Quiet” (code 0) periods
- Daily aircraft noise at the 360 site **correlated** with DEL1

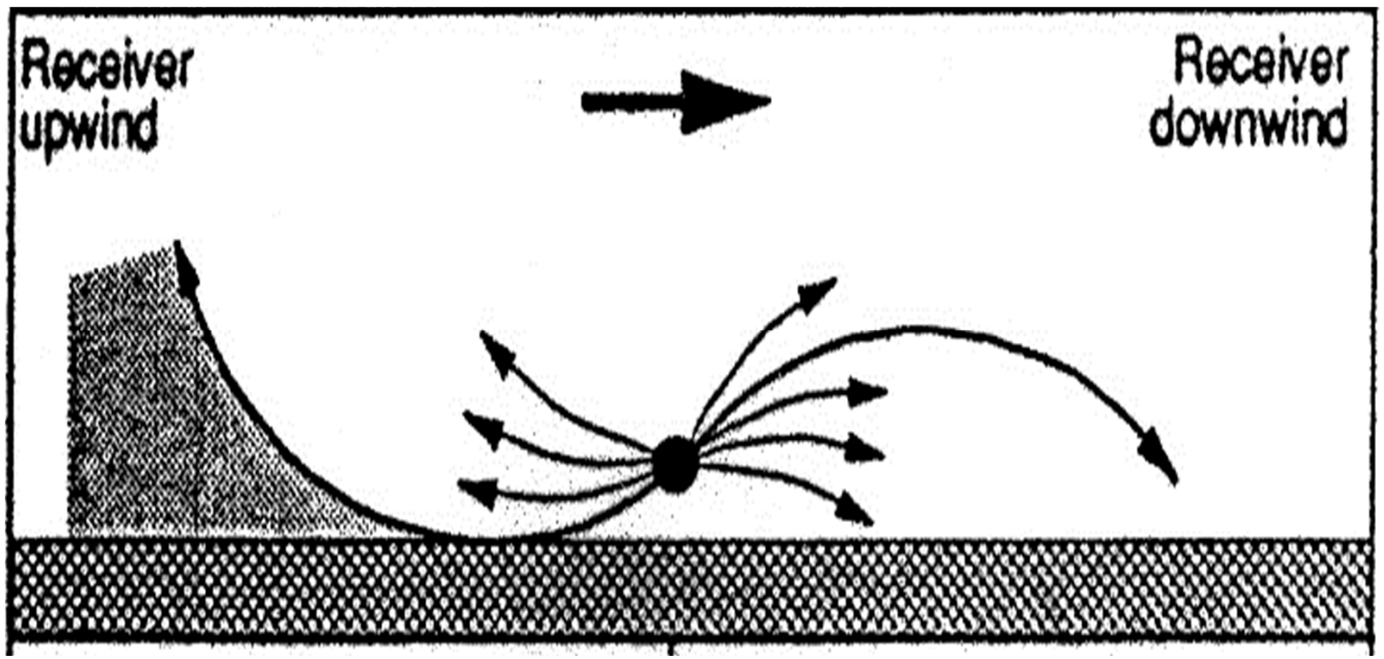
Noise and Flight Operations: Current Period (March-May 2018)



- Average aircraft noise at 360 site was 2 dB higher on the 39 days having “loud” periods
- Negligible change in average aircraft operations between days with “loud” and “relatively quiet” periods (780 and 770, respectively)
  - Did not account for the change in noise observations and measured noise levels

Influence of Wind on Sound Propagation

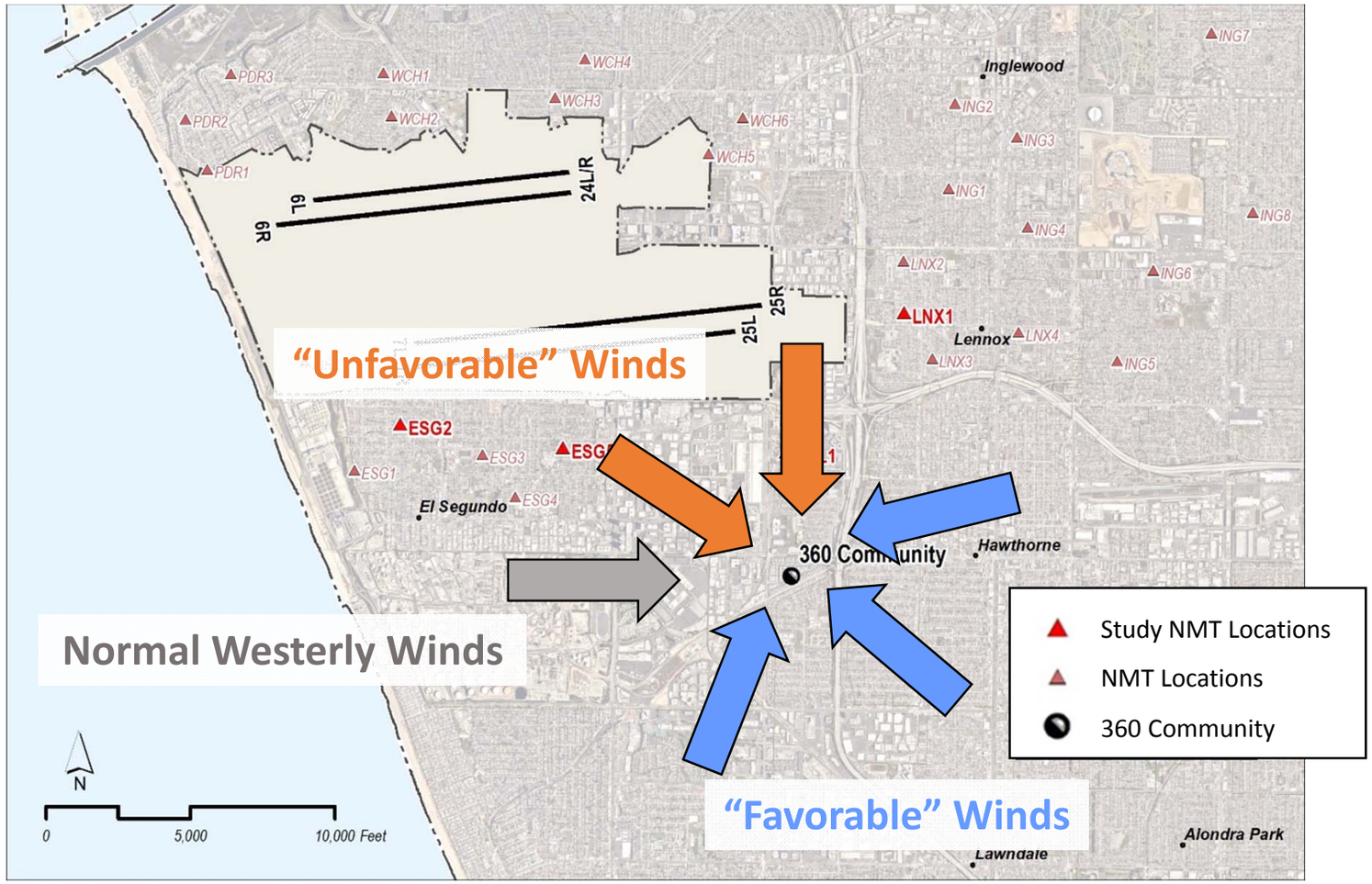
Less noise



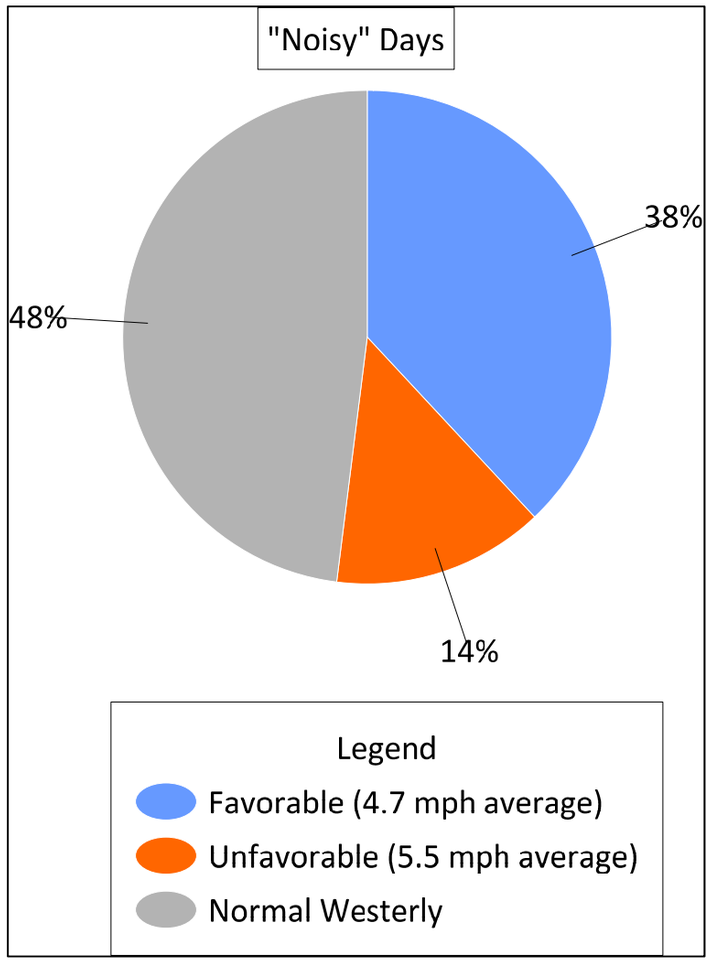
More noise

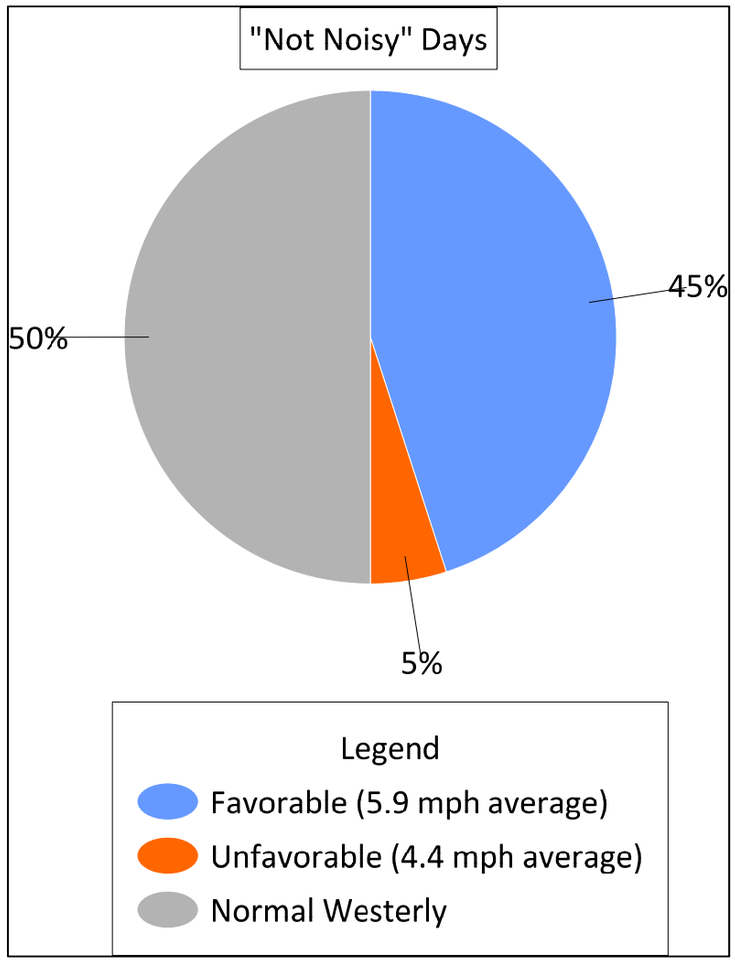
Source: Ver and Beranek 2018

Influence of Wind on Sound Propagation at 360 Community



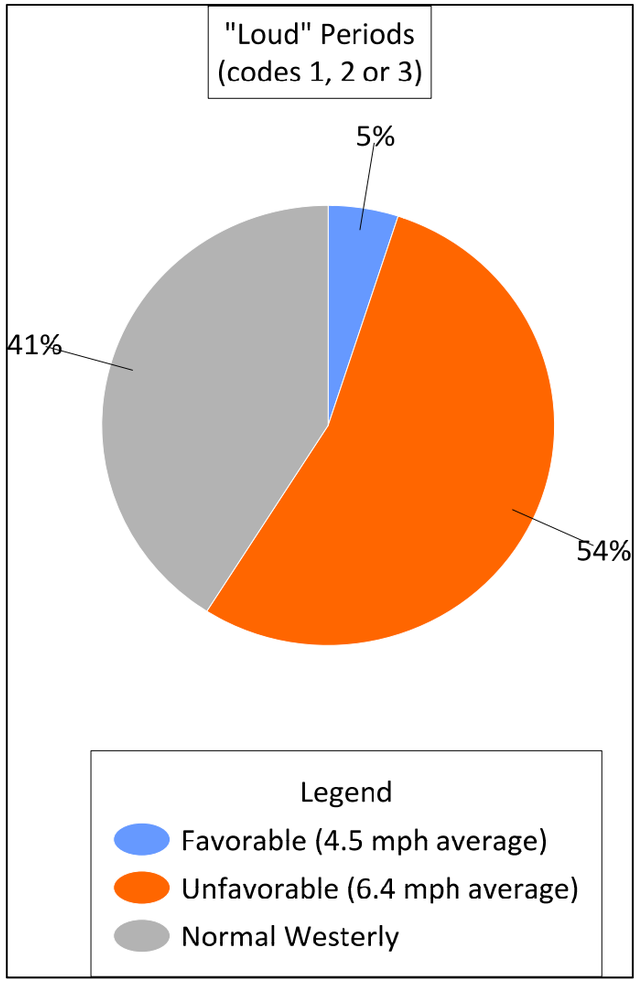
Wind Conditions at LAX: October 2017 ("Lull" Period)

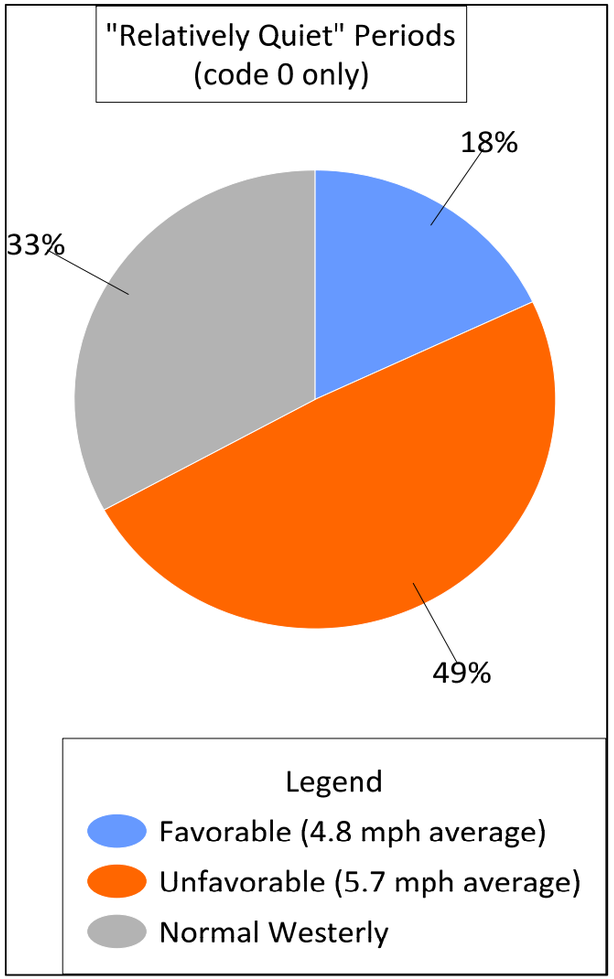




- Community-observed 'noisy' days had more and stronger unfavorable winds than 'not noisy' days

Wind Conditions at 360 Community: Current Period (March-May 2018)

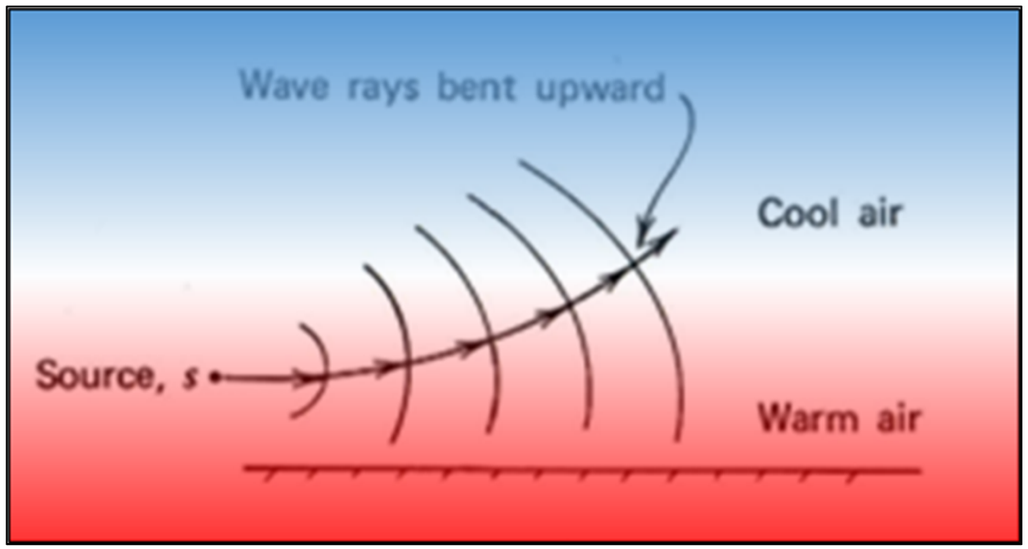




- Loud periods had more and stronger unfavorable winds than quiet periods.
- Quiet periods had more favorable winds than loud periods

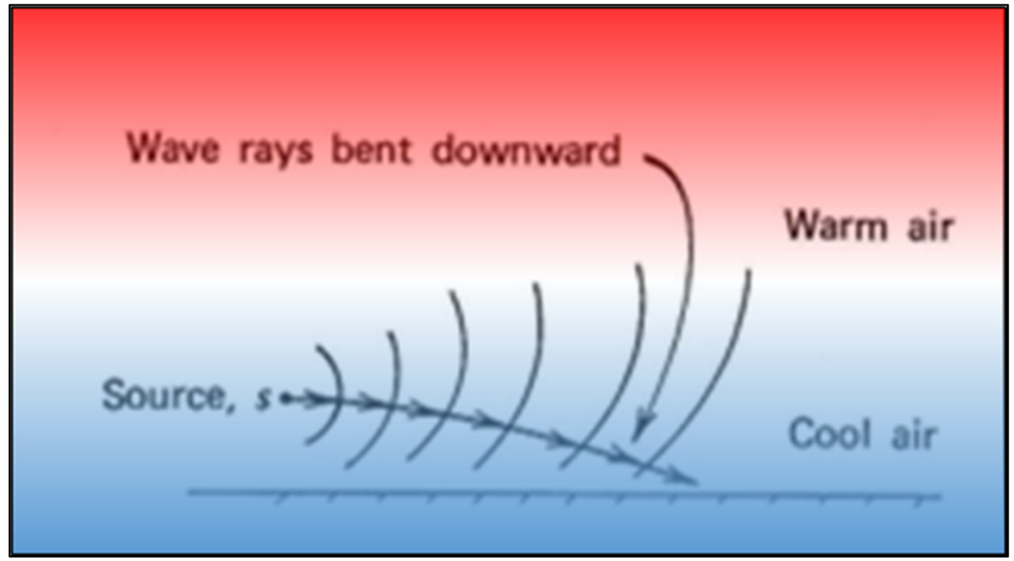
Influence of Temperature Inversion on Sound Propagation

Standard Atmosphere



- Cooler air with increasing altitude
- Sound bends up and away from ground

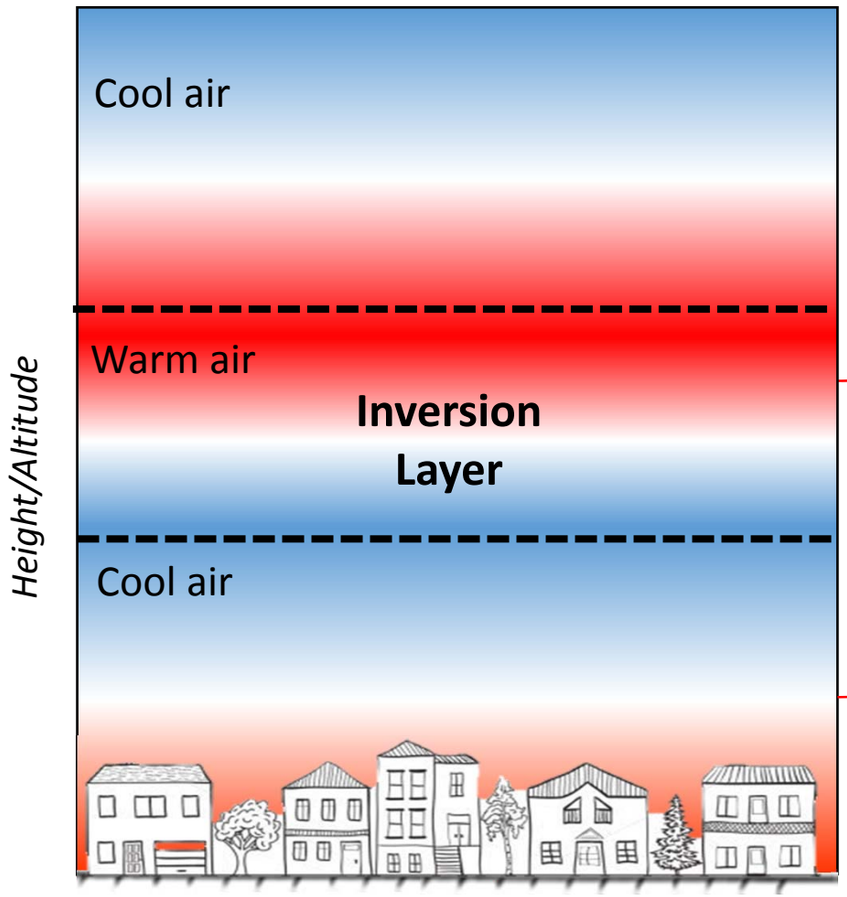
Temperature Inversion



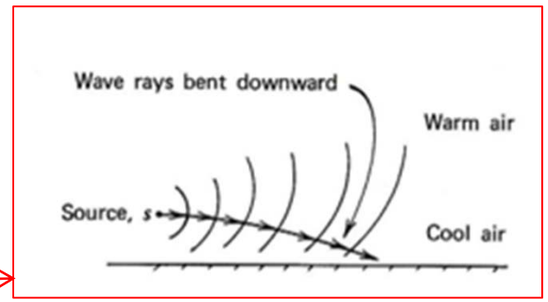
- *Warmer* air with increasing altitude
- Sound bends down toward the ground

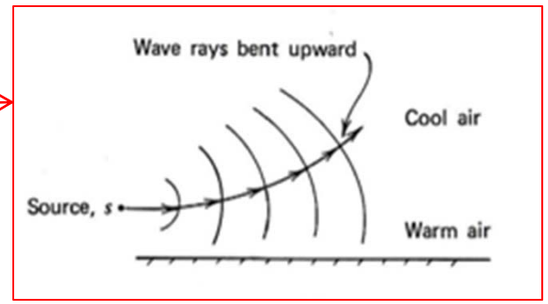
Source: Wark and Warner 1981; Cuniff 1977

Inversion Base Altitude Affects Sound Propagation



Inversion Base Altitude



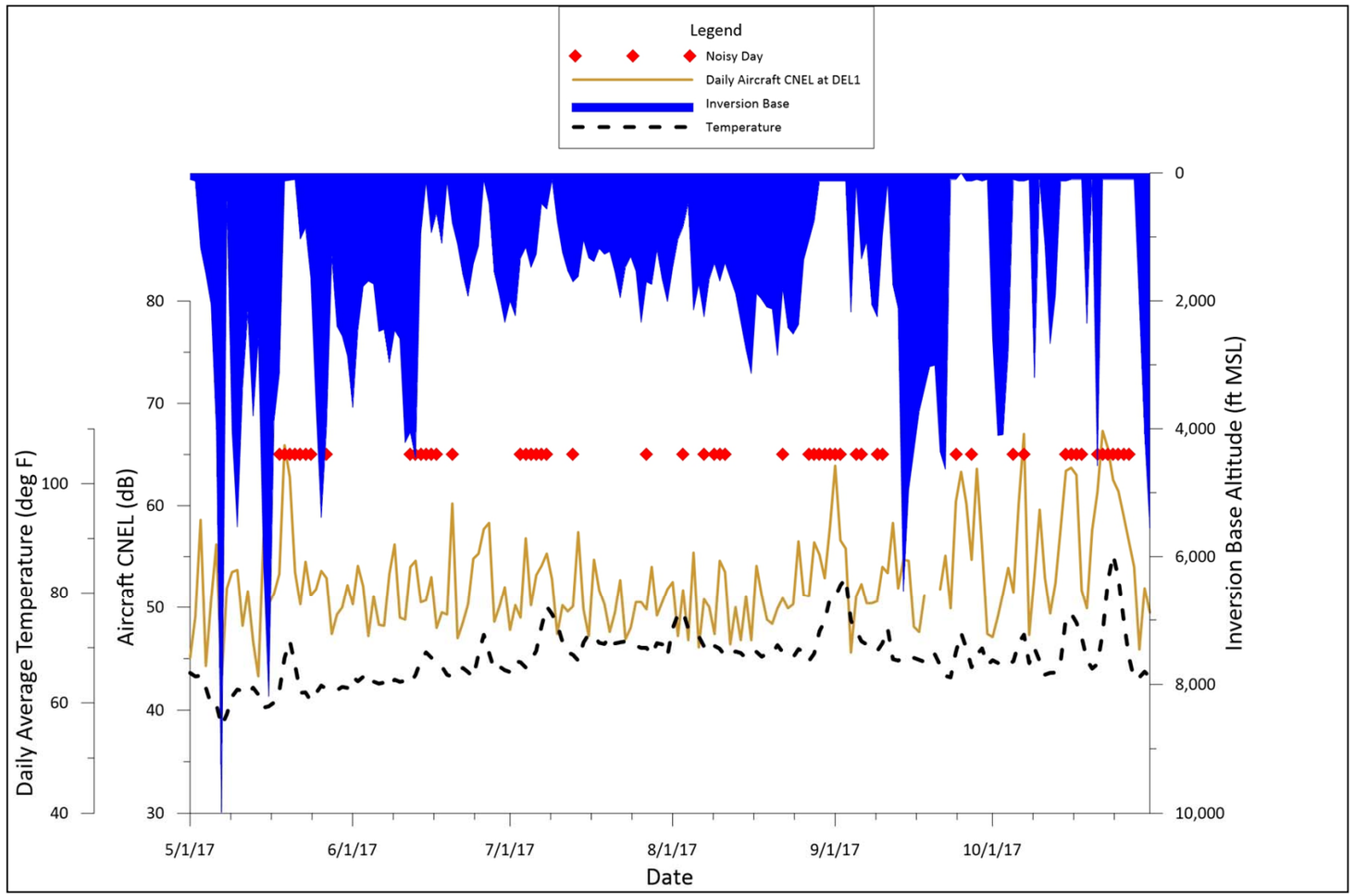


Lower Inversion Layer means more noise refracted to ground/community

Source: Wark and Warner 1981; Cuniff 1977

Noise and Weather: "Lull" Period (May – October 2017)

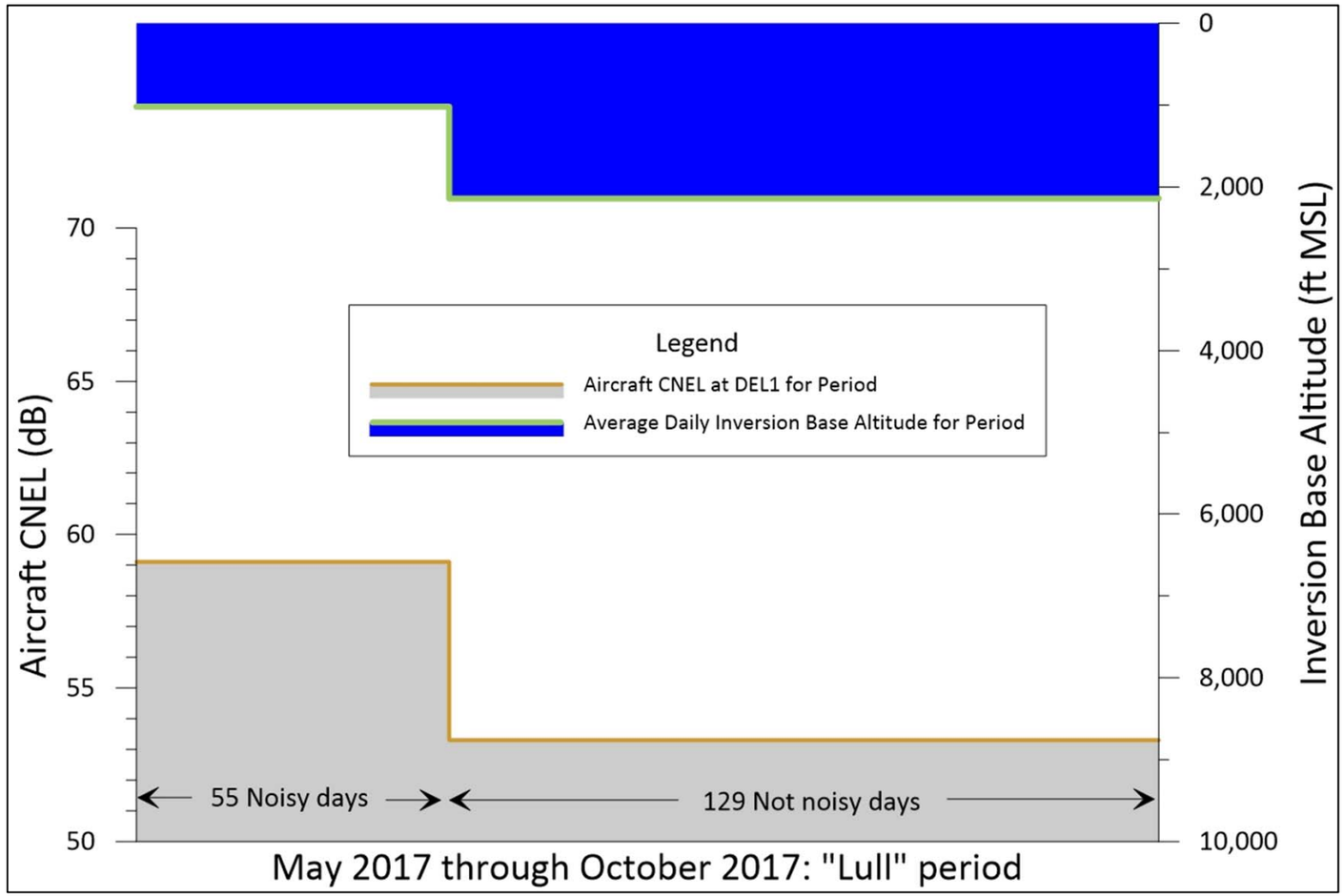
Comparison of Noise Observations, Aircraft Noise Measurements, and Weather



- Most community-observed 'noisy' days show:
  - Increased noise levels at DEL1
  - Lower inversion base altitudes
  - Higher temperatures

Noise and Weather: “Lull” Period (May – October 2017)

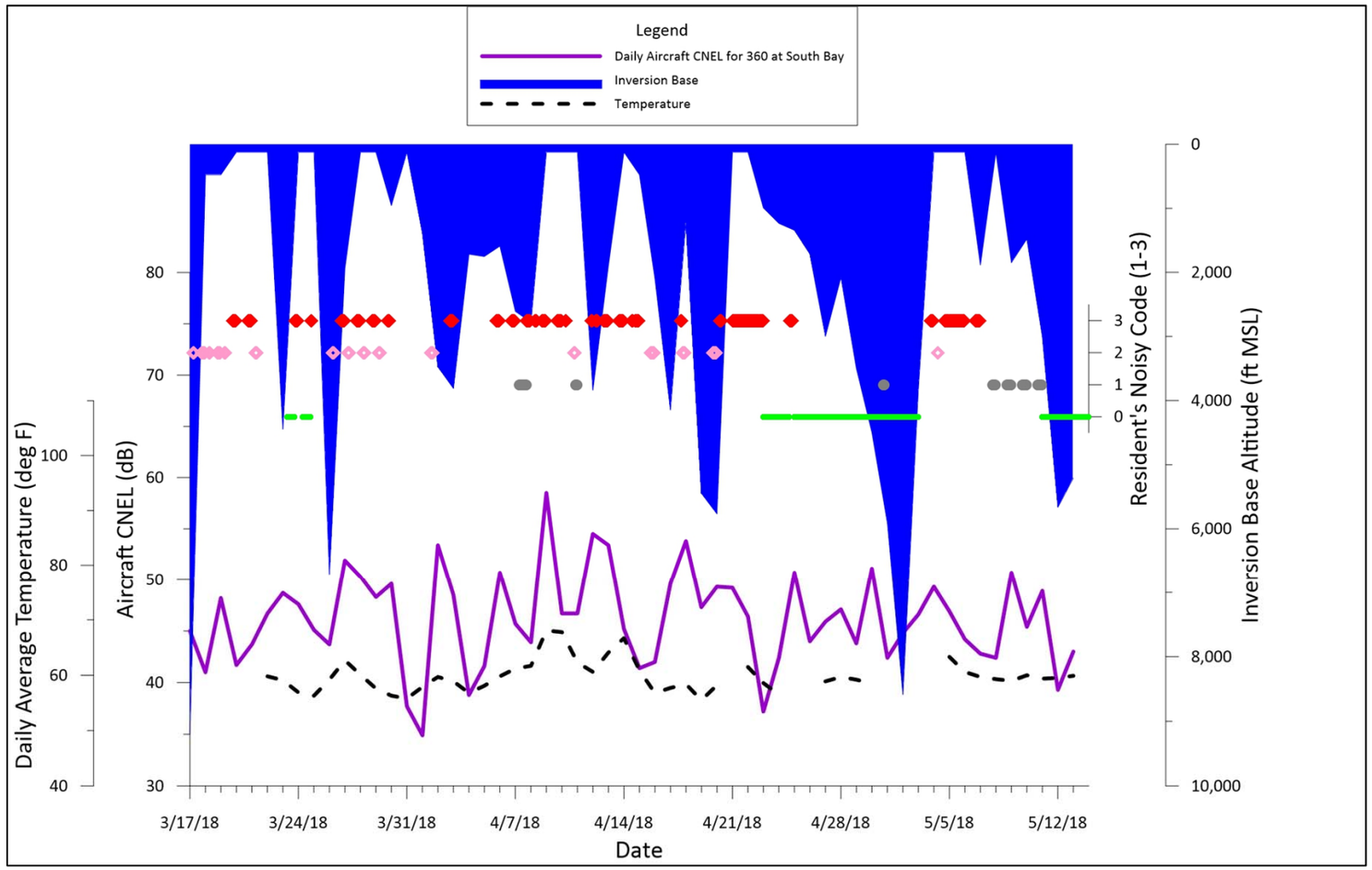
Comparison of Average Aircraft Noise Levels and Inversion Base Altitudes



- Aircraft noise levels measured at DEL1 during community-observed ‘noisy’ days were greater than aircraft noise during ‘not noisy’ days
- Inversion base altitudes were nearly twice as low on community-observed ‘noisy’ days as on ‘not noisy’ days.

Noise and Weather: Current Period (March-May 2018)

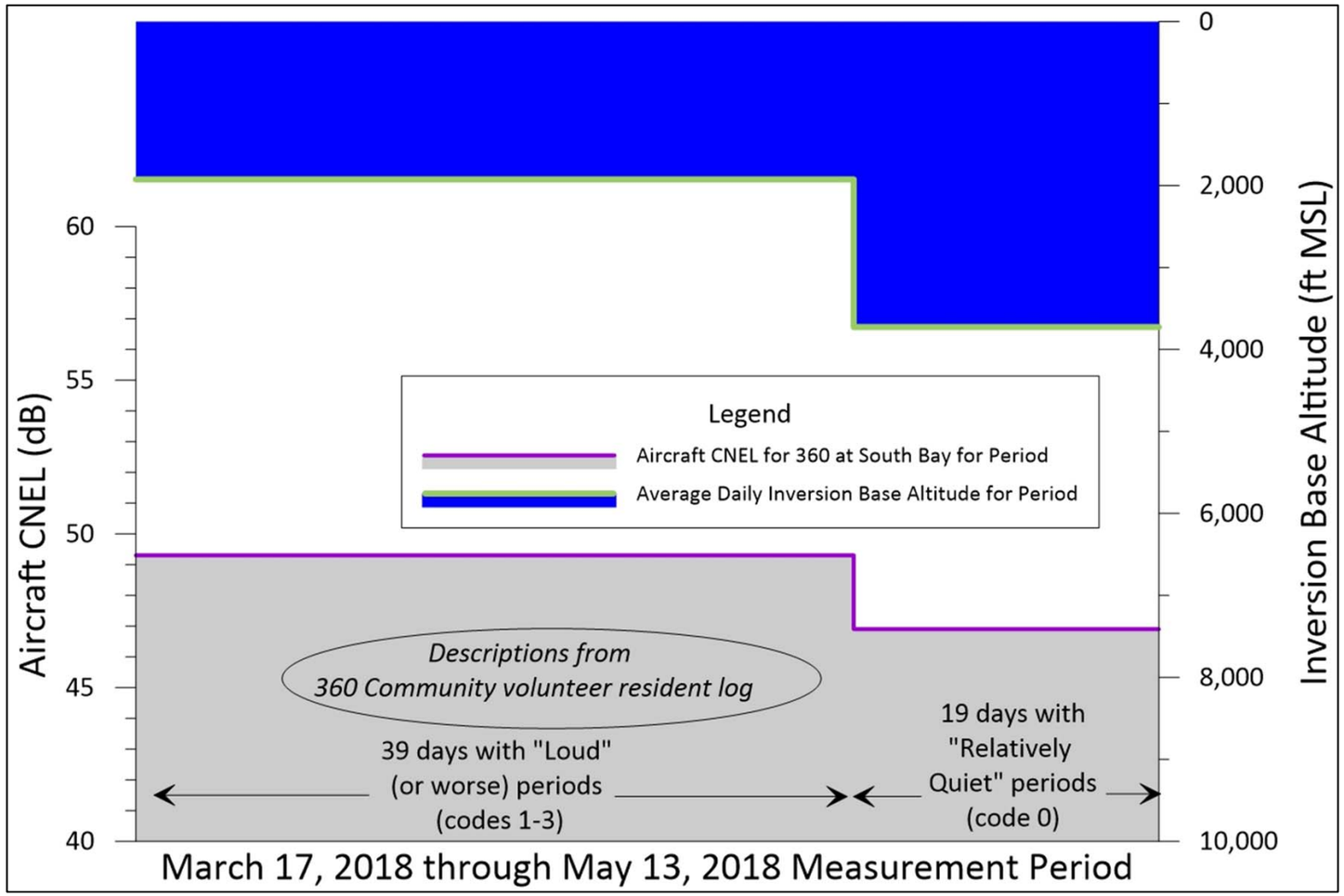
Comparison of Noise Observations, Aircraft Noise Measurements, and Weather



- Similar to 'lull' time frame, most loud periods logged by 360 resident show:
  - Increased noise levels
  - Lower inversion base altitudes
  - Higher temperatures

Noise and Weather: Current Period (March-May 2018)

Comparison of Average Aircraft Noise Levels and Inversion Base Altitudes



- Similar to the “lull” time frame, inversion base altitudes were lower on days with ‘loud’ periods than on days with ‘quiet’ periods

Conclusions

- Periods of increased noise levels (measured and observed) at 360 Community were primarily due to:
  - Lower inversion base altitudes
  - More frequent and/or stronger winds from the north/northwest
- Changes in aircraft noise levels did not correlate with the number of flight operations
- There are no feasible noise-reducing measures to mitigate weather-related increases in aircraft noise in the 360 Community
- It is likely that other communities near LAX experience similar weather-related increases and decreases in aircraft noise