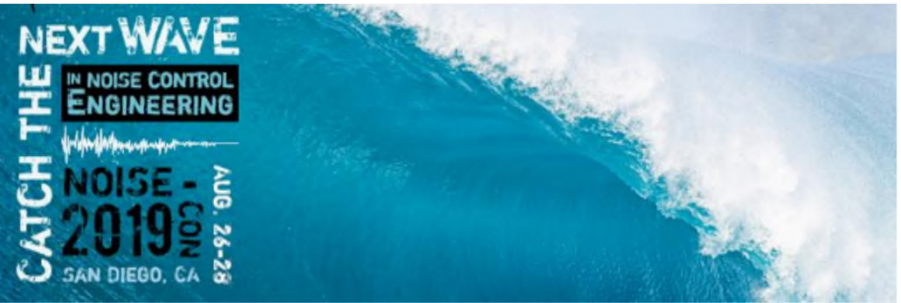
Weather Effects on the Propagation of Aircraft Noise

Joseph J. Czech, PE

Harris Miller Miller & Hanson Inc.



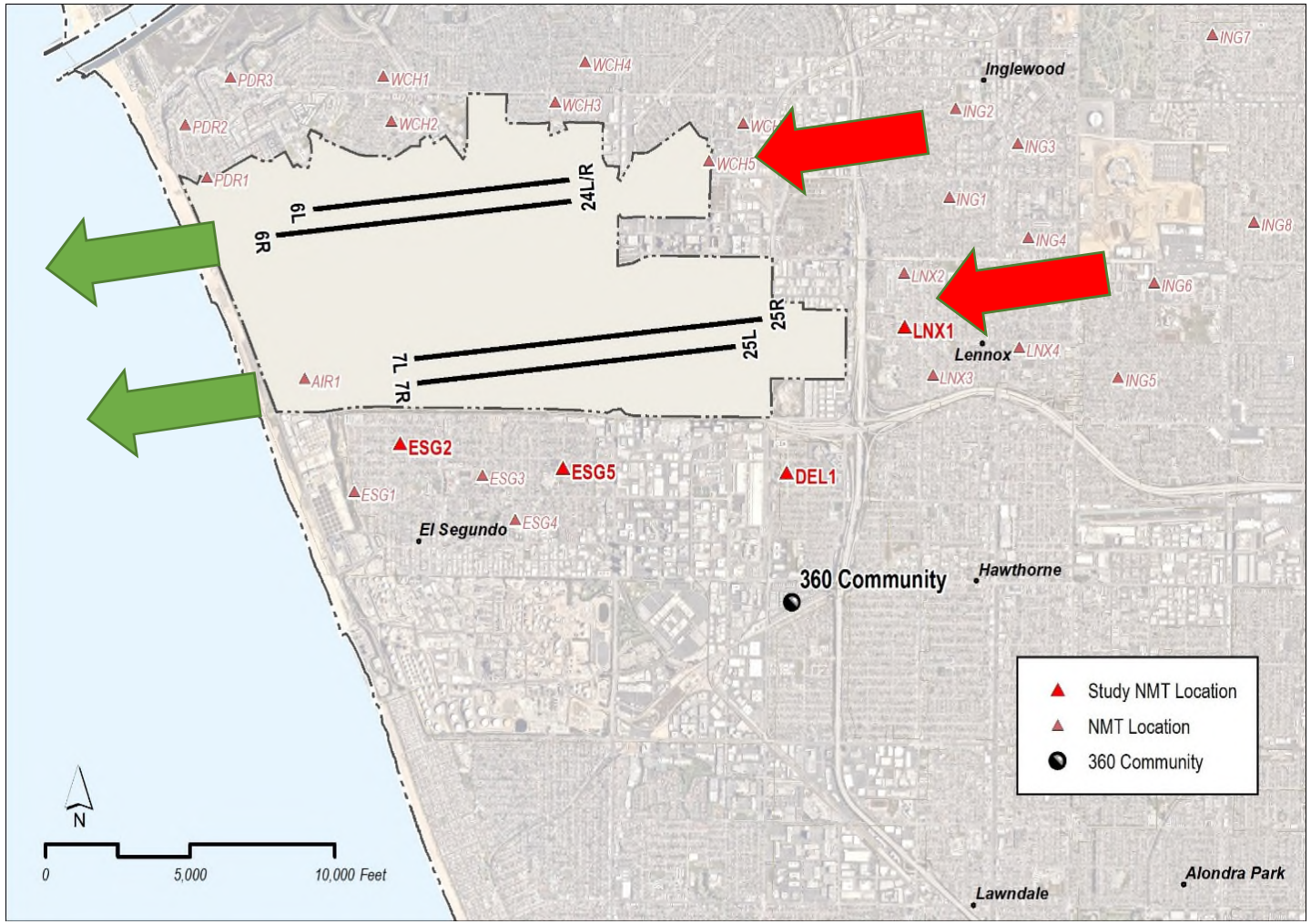
Outline

- Motivation and Objective
- Background
- Discussion of Analysis/Results
- Conclusions

Motivation and Objective

- The ThreeSixty at South Bay Community (360 Community) November 2017 memo to the Los Angeles International Airport/ Community Noise Roundtable
- Work Item A15: Aircraft Noise Affecting ThreeSixty at South Bay Community
- LAWA contracts with HMMH to determine the cause(s) of the perceived increase in aircraft noise in the 360 Community and, if feasible, make noise reduction recommendations

Background


PDR3
WCH1
WCH4
PDR2
WCH2
WCH3
WCH5
PDR1
24L/R
6L
6R
25R
25L
7L
7R
AIR1
ESG2
ESG5
ESG3
ESG1
ESG4
DEL1
El Segundo
360 Community
Inglewood
ING7
ING2
ING3
ING1
ING8
ING4
LNX2
ING6
LNX1
Lennox
LNX4
LNX3
ING5
Hawthorne
Lawndale
Alondra Park
N
0
5,000
10,000 Feet
Study NMT Location
NMT Location
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 – not discussed today
  - C-weighted levels – not discussed today

Background – What else was examined?

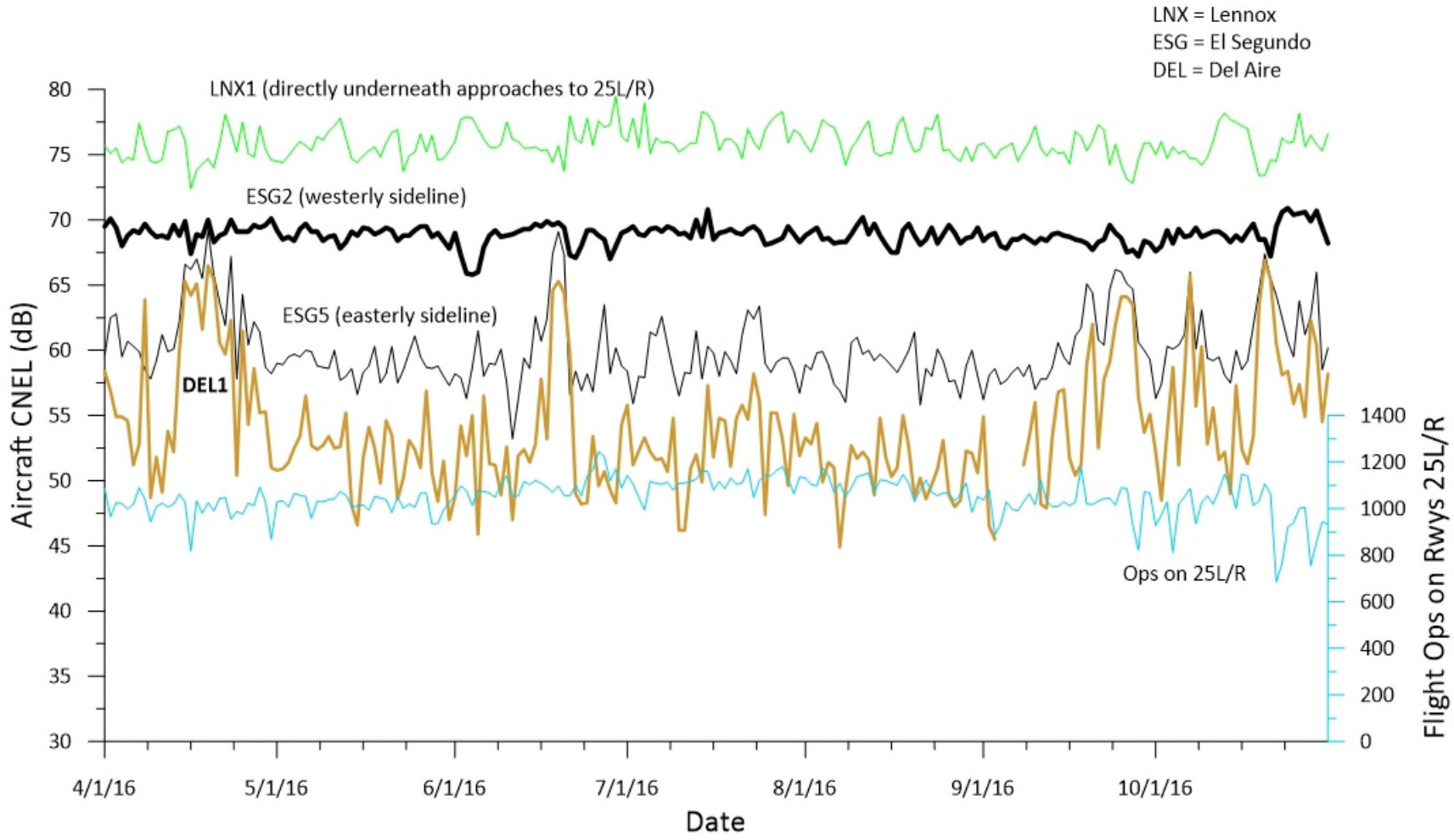
- Operational data for LAX [LAWA/FAA]
  - Flight operations on Runways 25L/R
  - Runway closure (and flow condition) – not discussed today
  - Run-ups – not discussed today
- Weather data (LAWA, NOAA, and SCAQMD)
  - Temperature
  - Daily temperature inversion
  - Wind direction and speed
  - Relative humidity – not discussed today

***NOAA** = National Oceanic and Atmospheric Administration*

***SCAQMD** = South Coast Air Quality Management District*

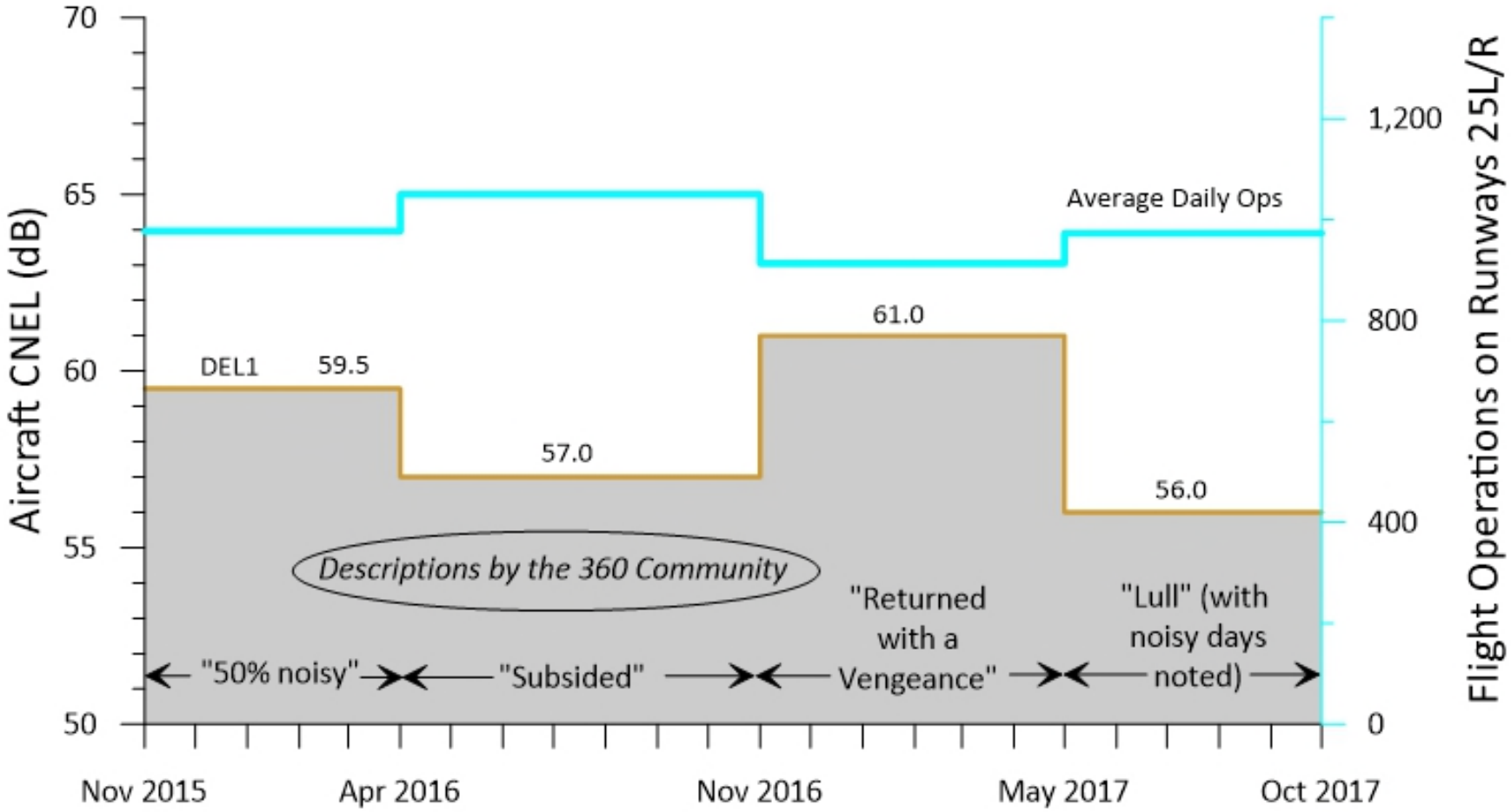
Noise & Flight Ops

Example/Portion of Past Period (2015-2017)



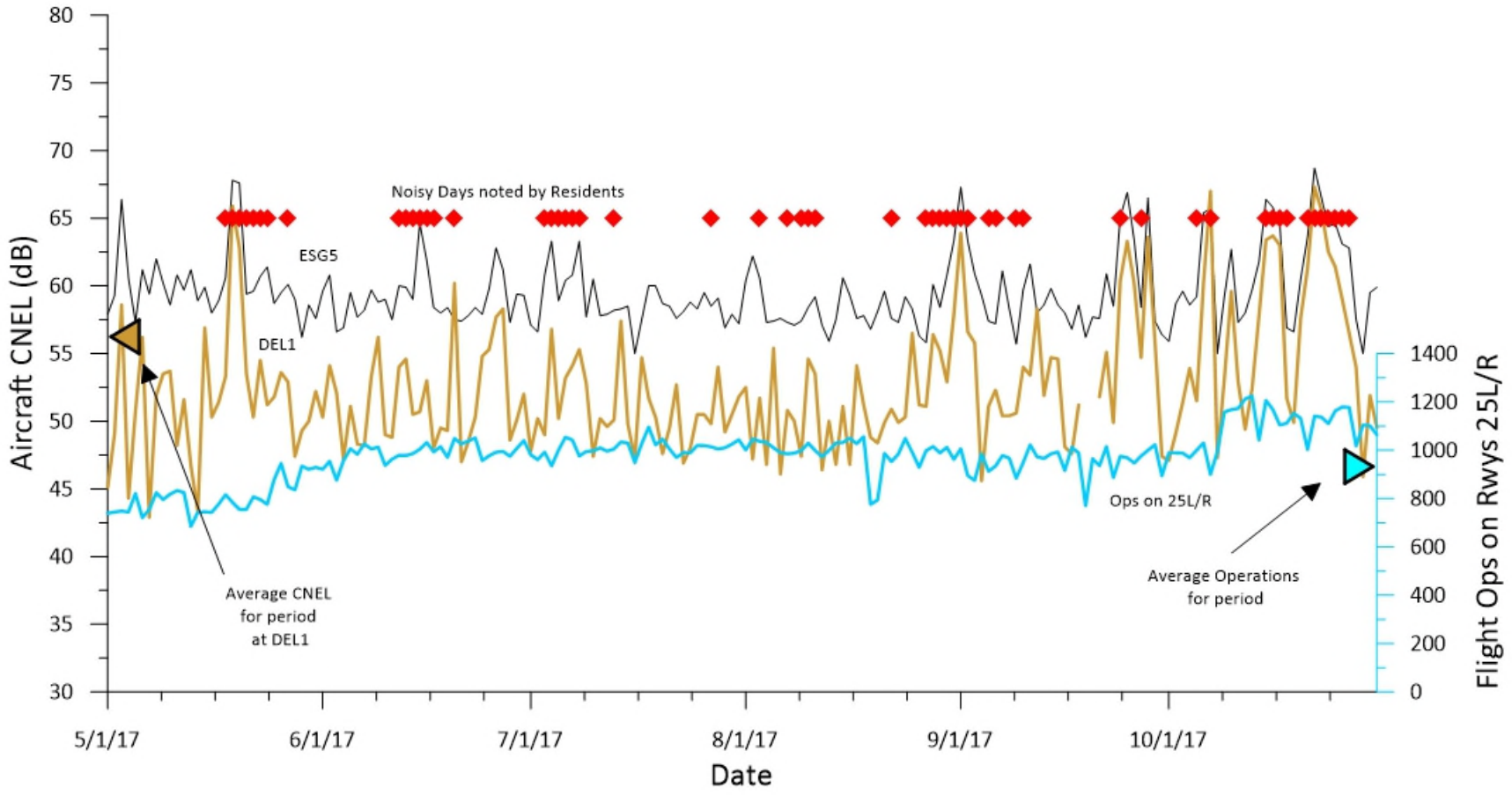
Noise & Flight Ops

Past Period (2015-2017) – Aggregates

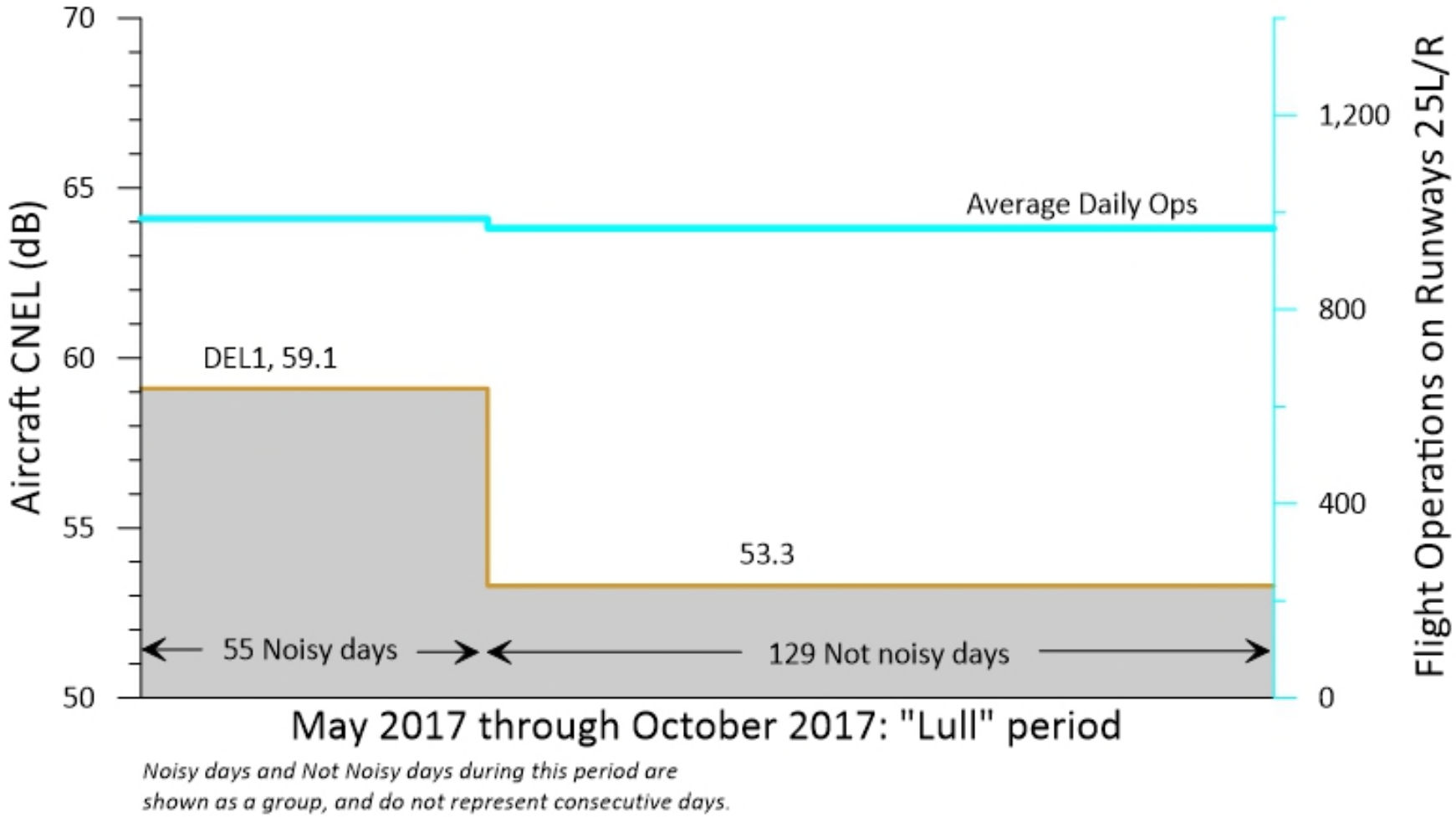


Noise & Flight Ops

"Lull" Period (May-Oct 2017)



“Lull” Period’s Noise Days & Not Noisy Days



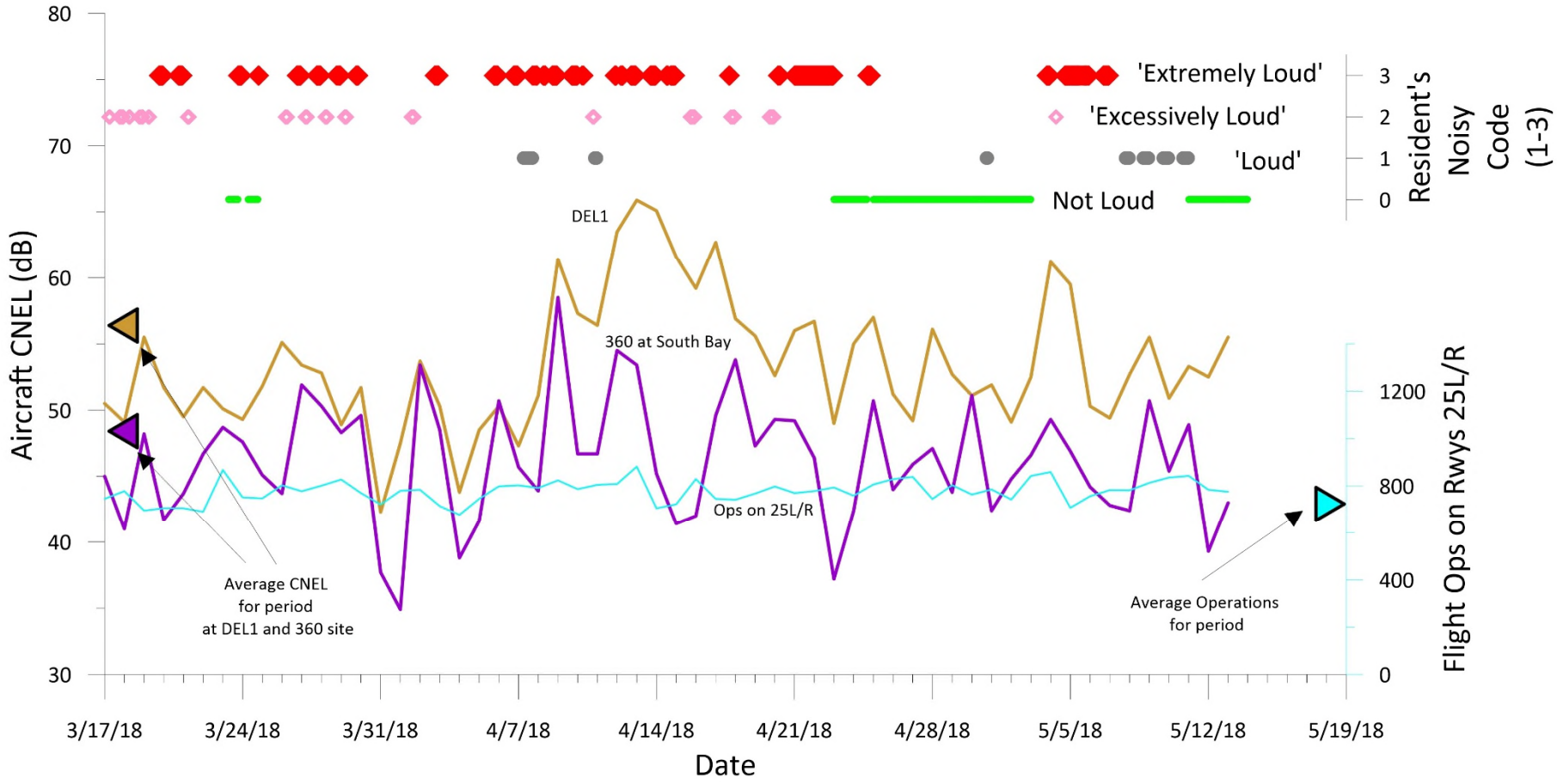
Noisy days and Not Noisy days during this period are shown as a group, and do not represent consecutive days.

On-Site Measurements at 360 Community

- March 17 – May 13, 2018
- Rooftop of resident
- 1-second equivalent sound levels (A & C)
- Weather data collected (15-minute averages)
- Noise observations by resident volunteer:
  - Relatively Quiet/Not Loud = 0
  - Loud = 1
  - Extremely Loud = 2
  - Excessively Loud = 3

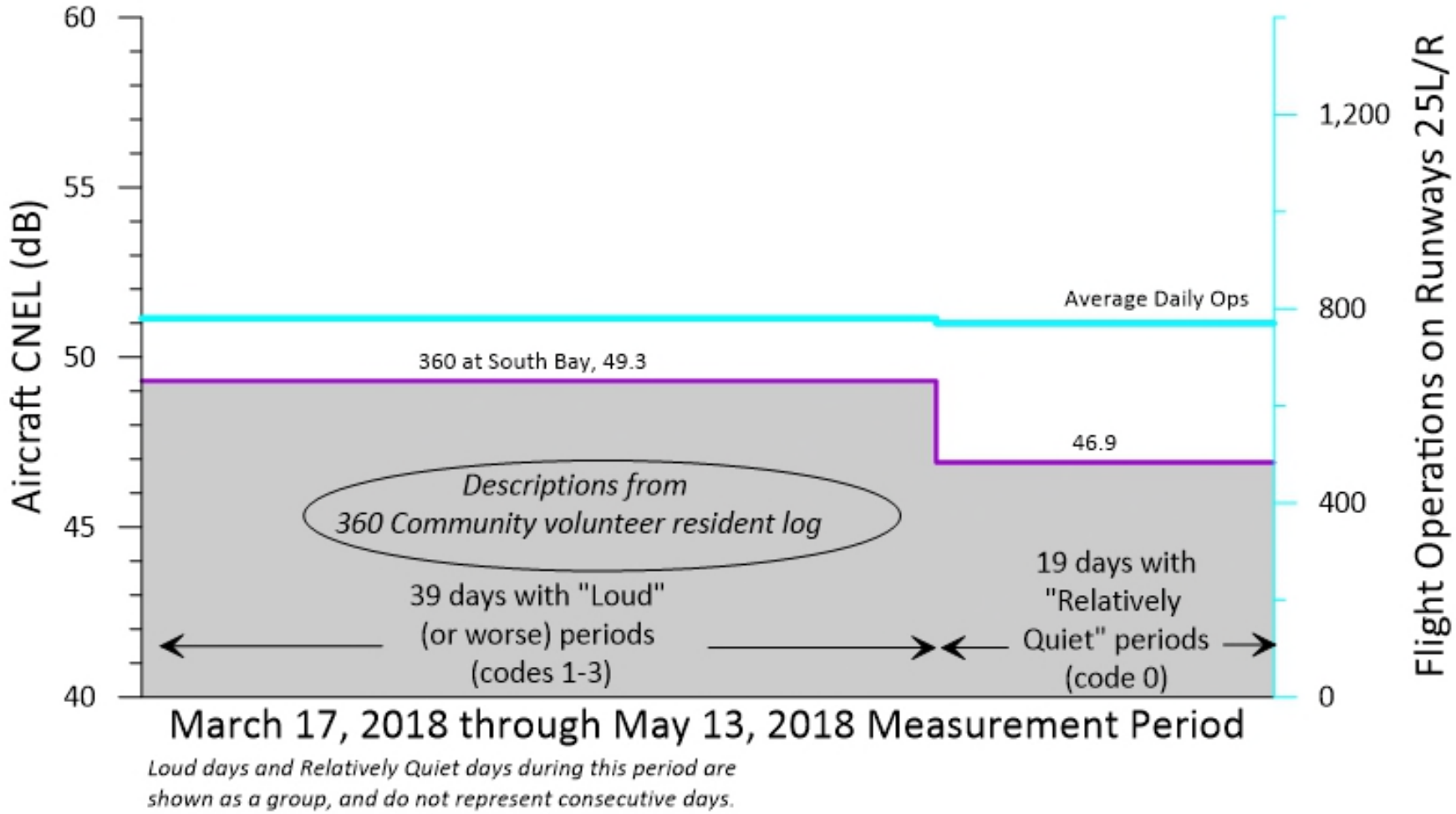
Noise & Flight Ops

Measurement Period (Mar-May 2018)



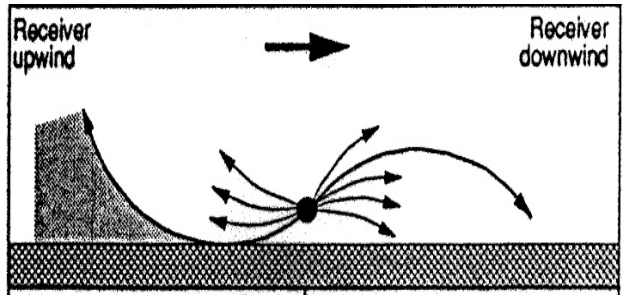
Noise & Flight Ops

Measurement Period – Aggregates

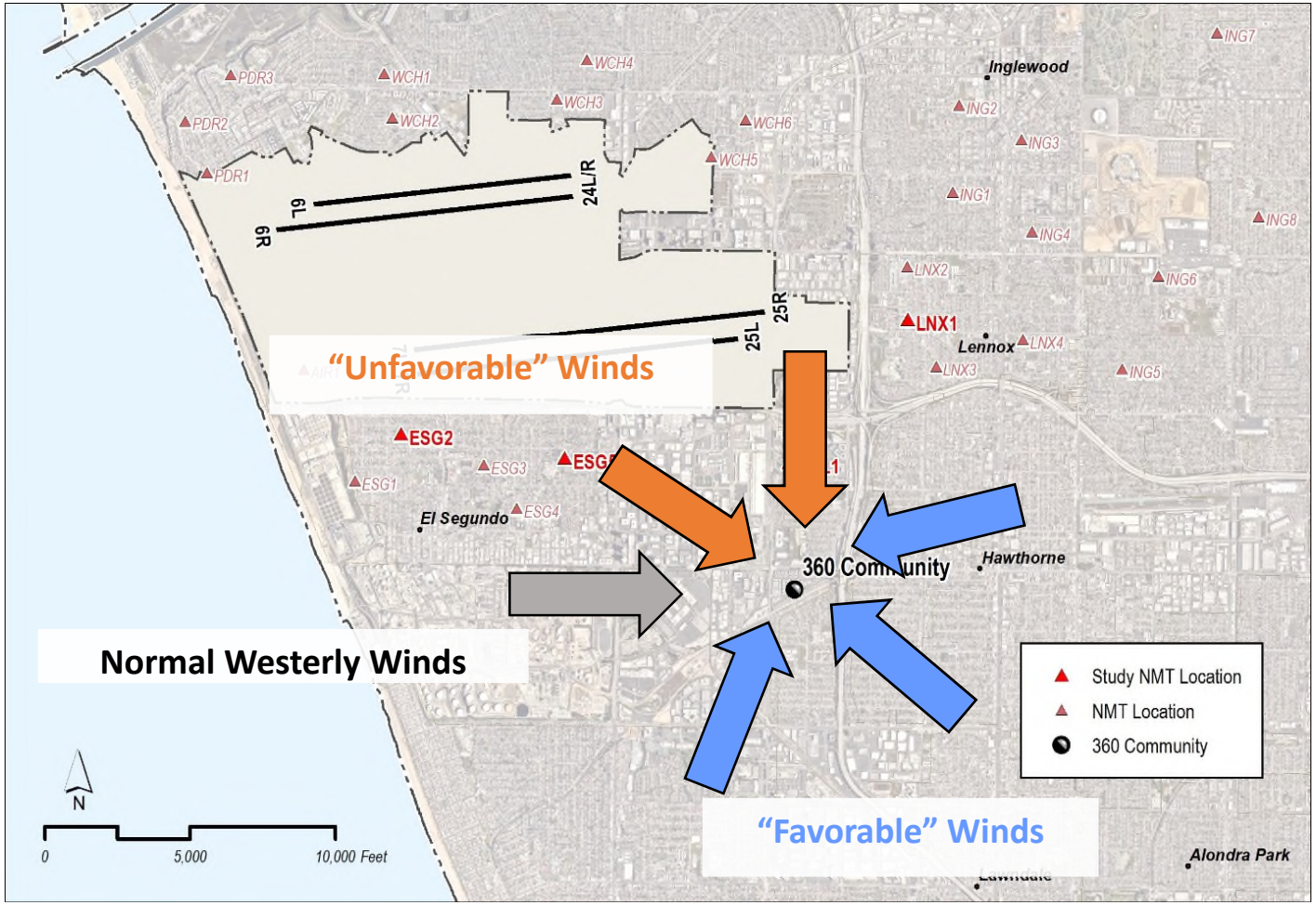


Loud days and Relatively Quiet days during this period are shown as a group, and do not represent consecutive days.

Influence of Wind on Sound Propagation at 360 Community



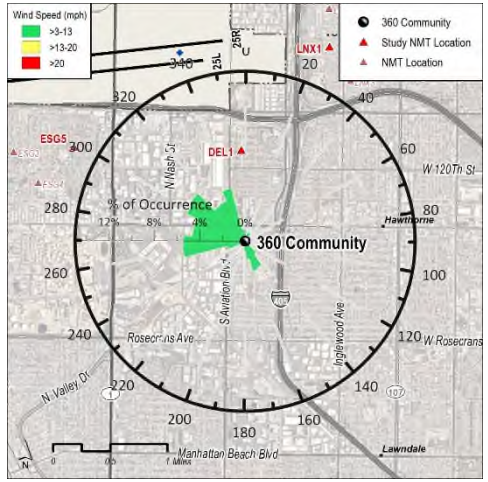
Source: Ver and Beranek 2018



Wind Roses

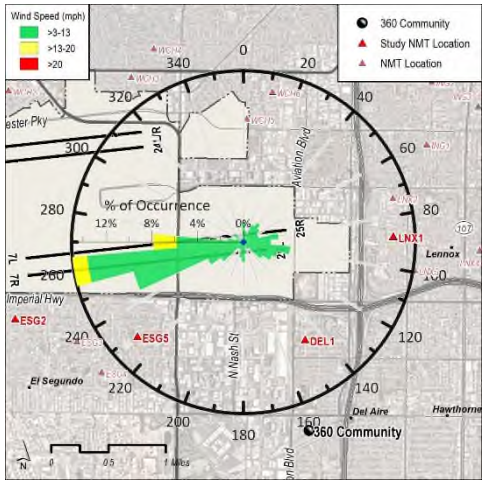
October 2017 at LAX

- Not Noisy Days

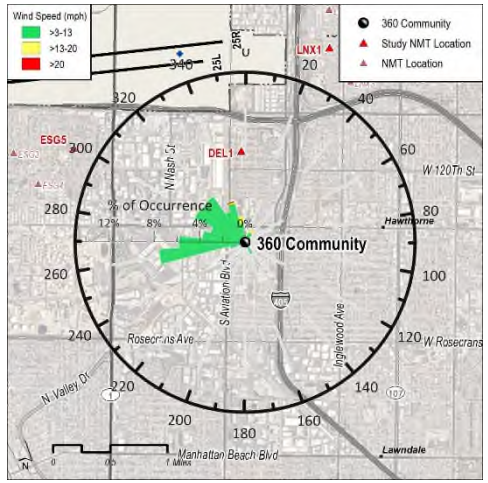


- Quiet Periods

Measurement Period at 360



- Noisy Days



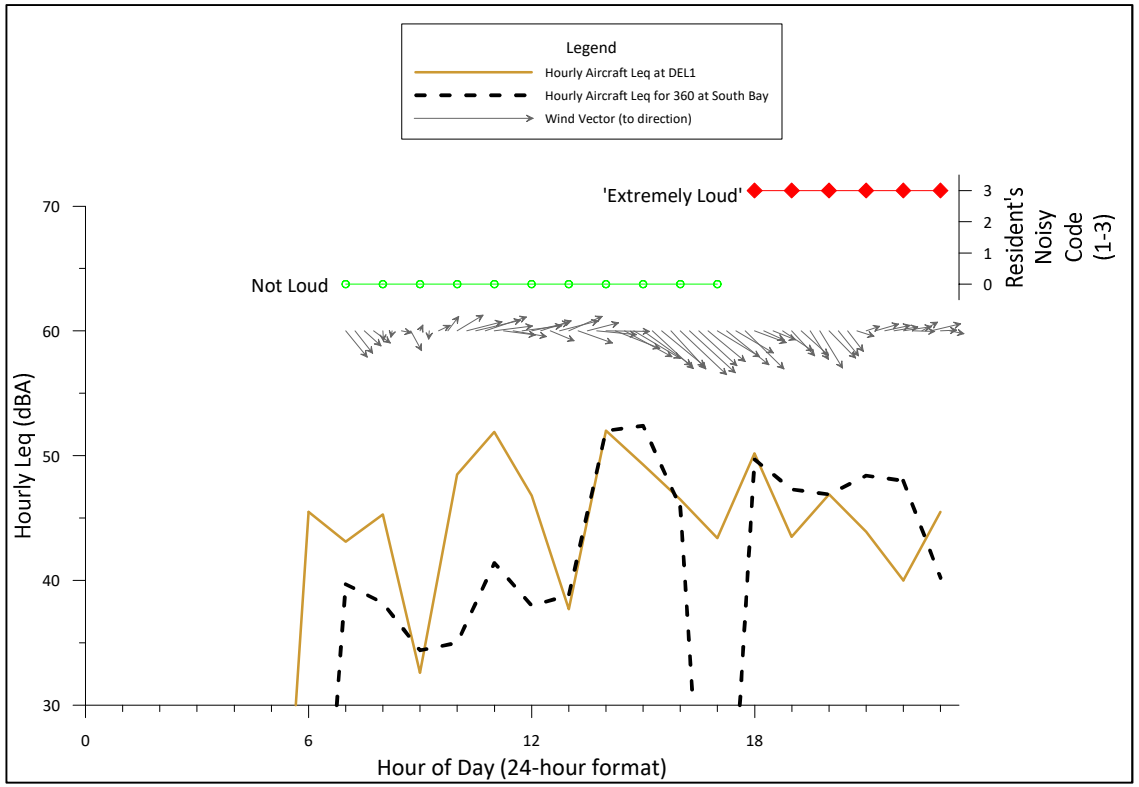
- Loud Periods

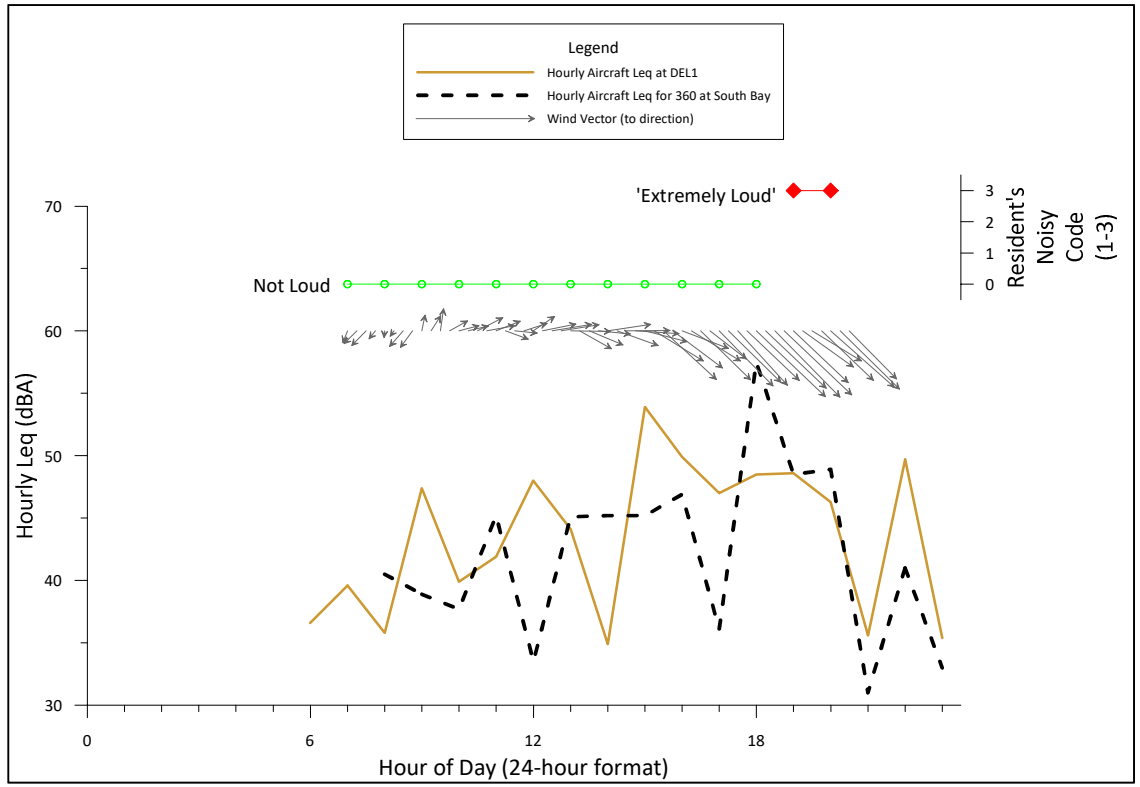
Increase in Unfavorable Winds

Period	Type of Day or Period	Type of Wind (at least 3 mph) Favorable	Un-favorable	Normal Westerly	Total
Days of October 2017 at LAX	'Not Noisy'	45%	5%	50%	100%
	'Noisy'	38%	14%	48%	100%
Measurement Periods at 360 at South Bay	'Relatively Quiet'	18%	49%	33%	100%
	'Loud'	5%	55%	40%	100%

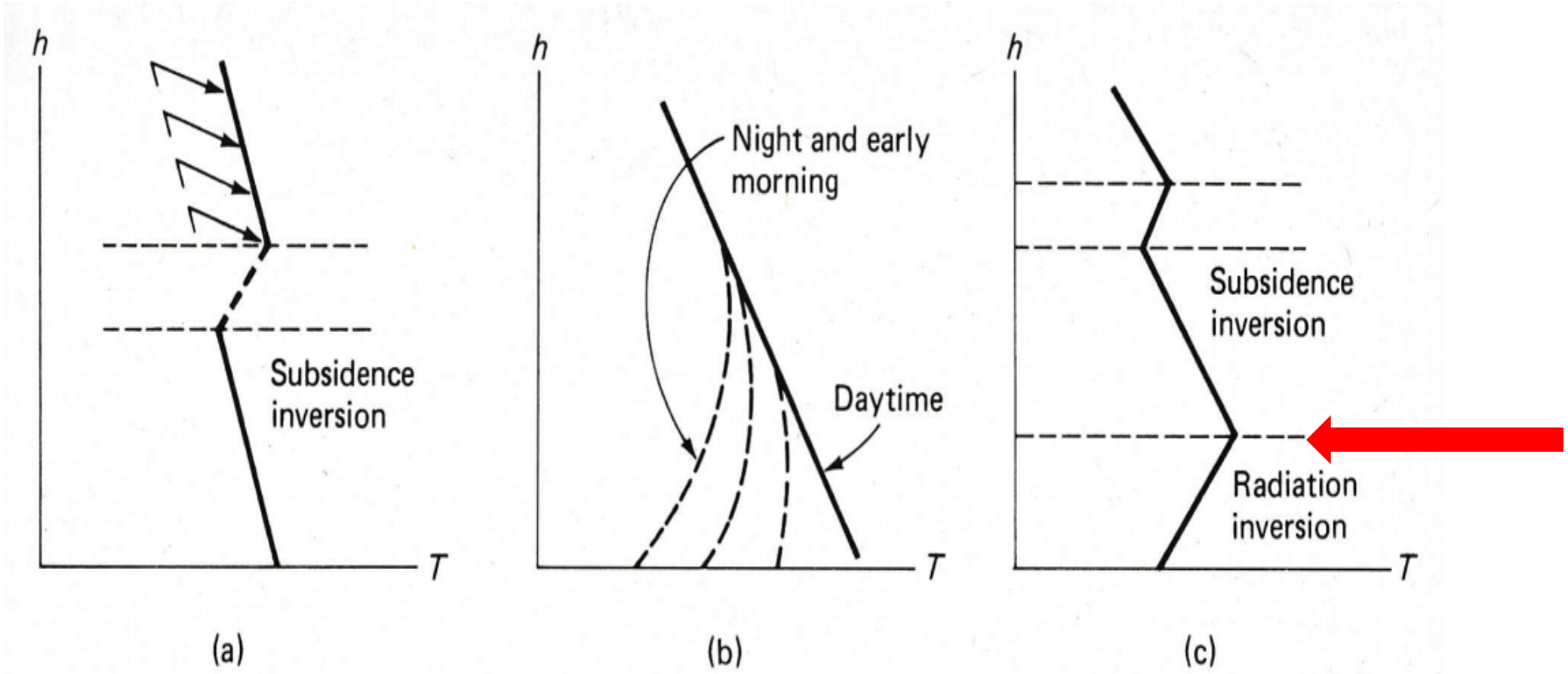
Wind Conditions at 360 during Reported Sudden Changes in Noise

March 23 & 24, 2018





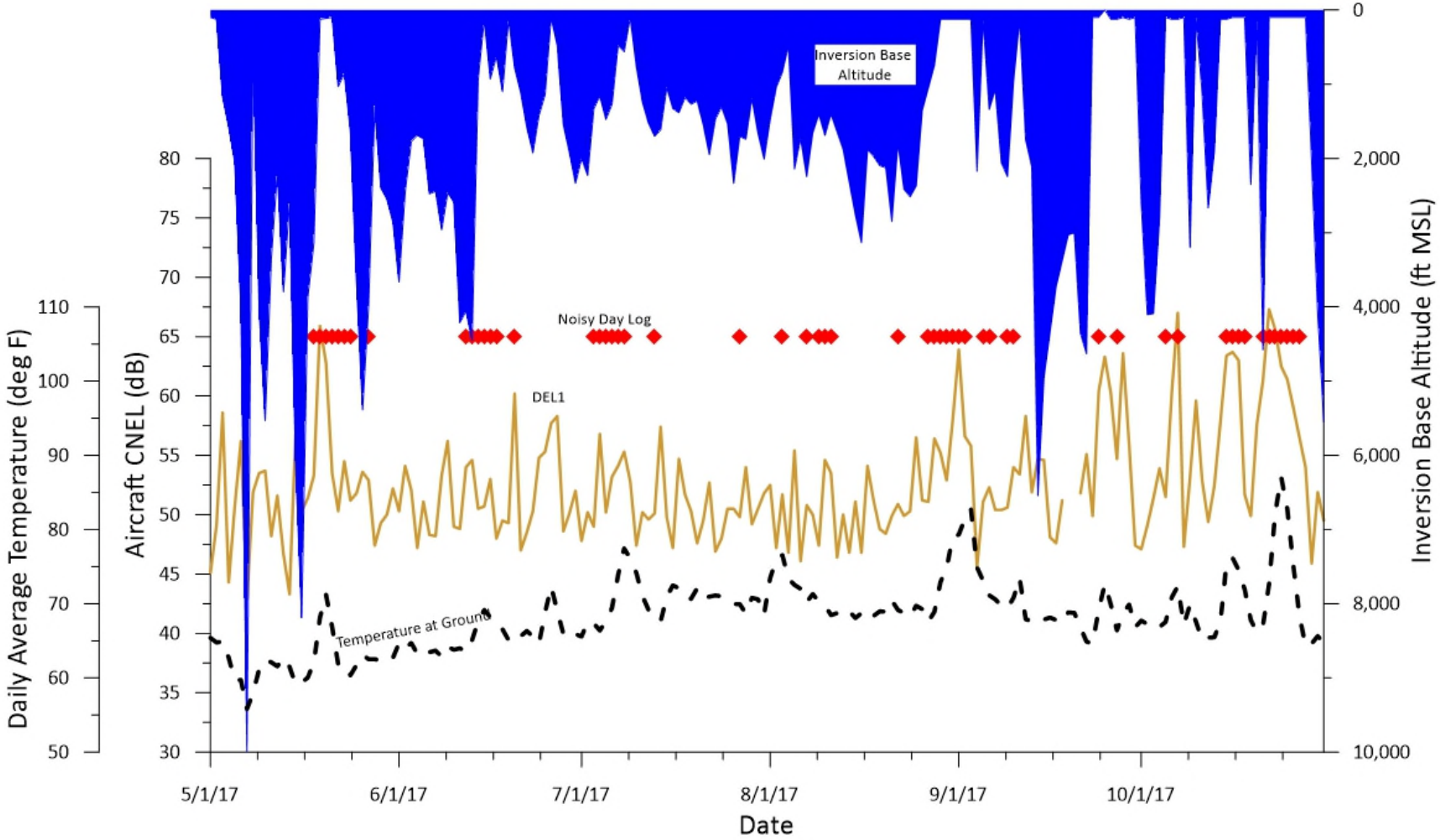
Temperature Inversions and Inversion Base Altitude



Subsidence Radiative Combination

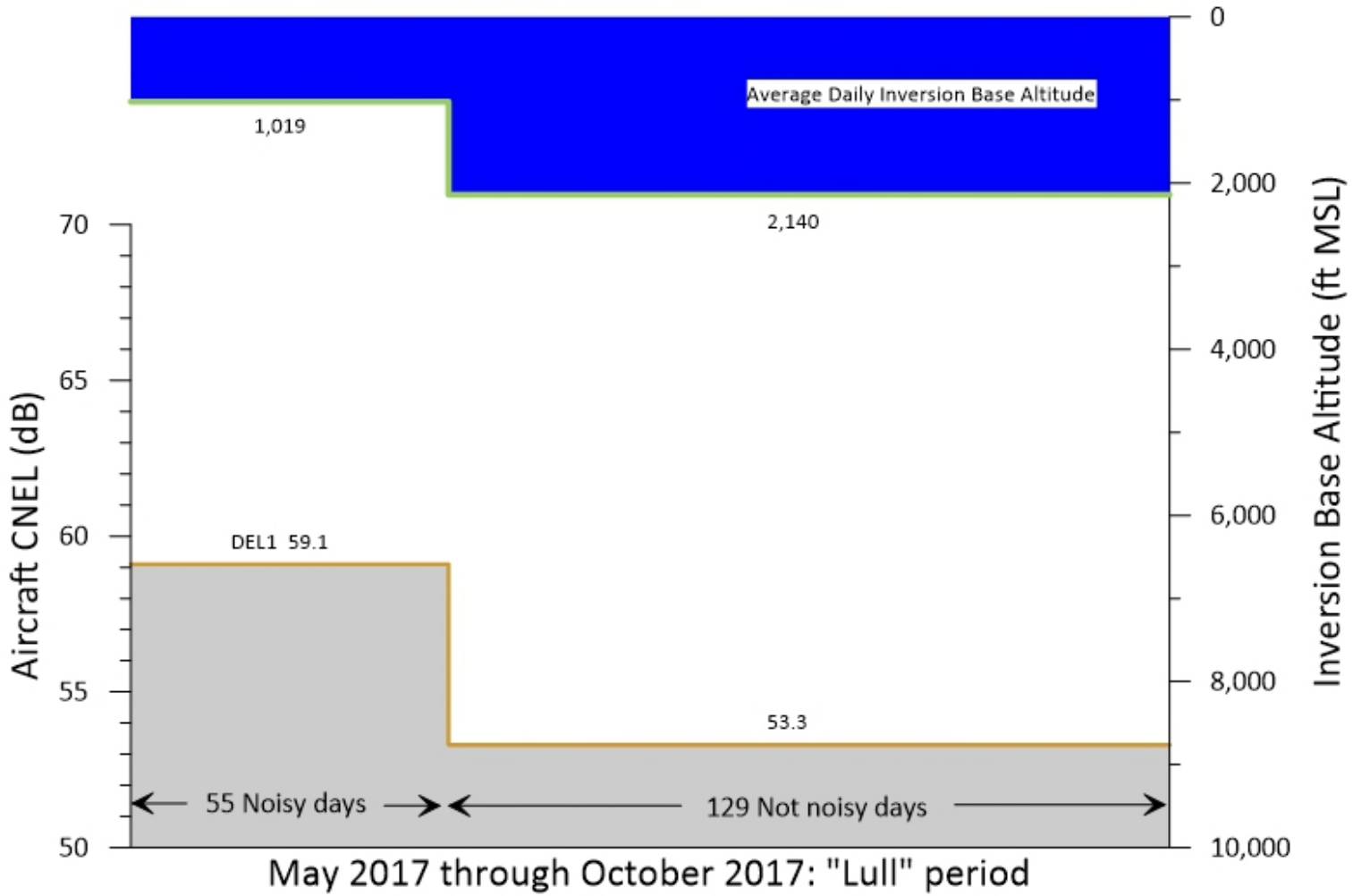
Noise & Weather

“Lull” Period

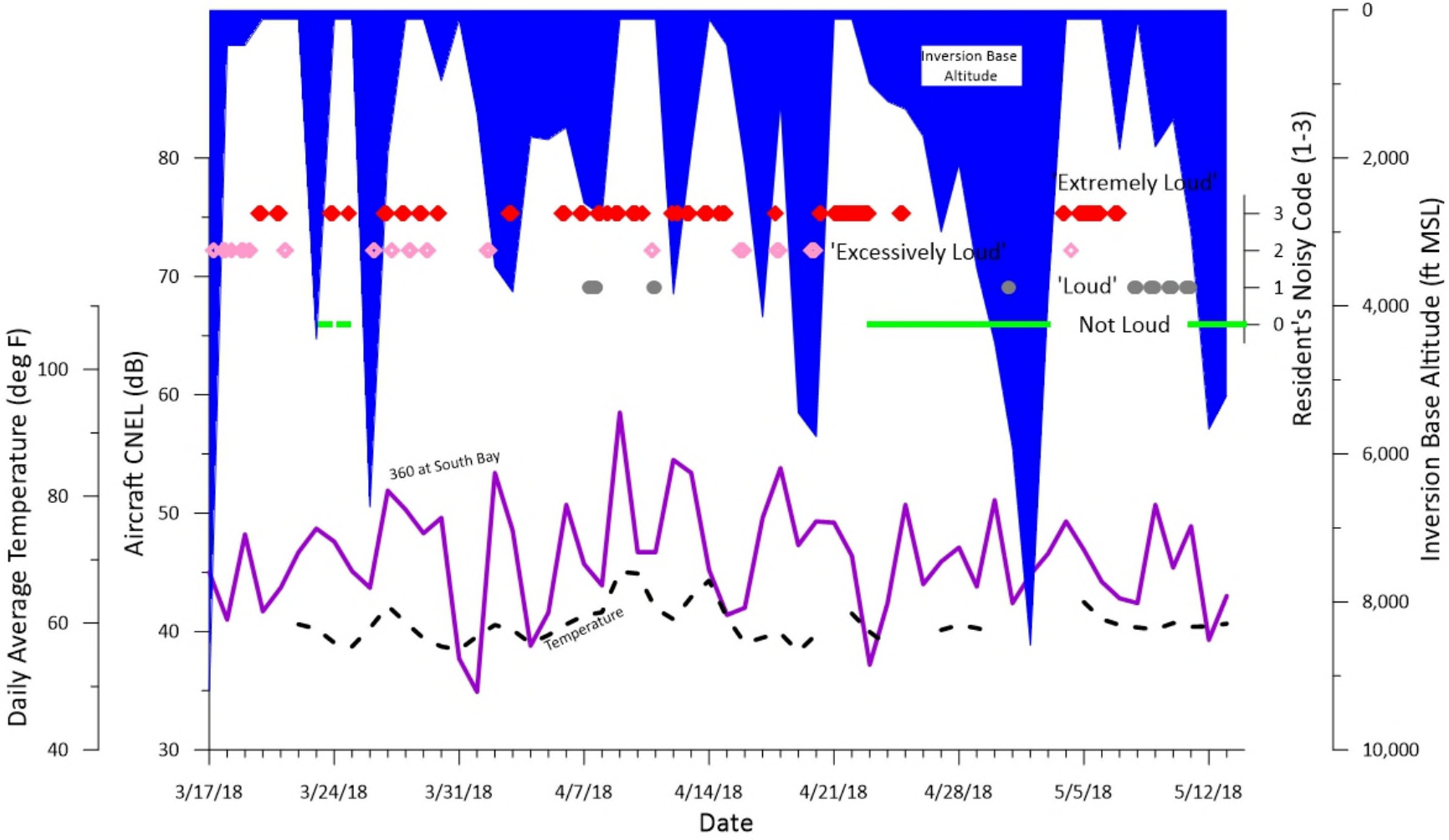


Noise & Inversion

“Lull” Period - Aggregates

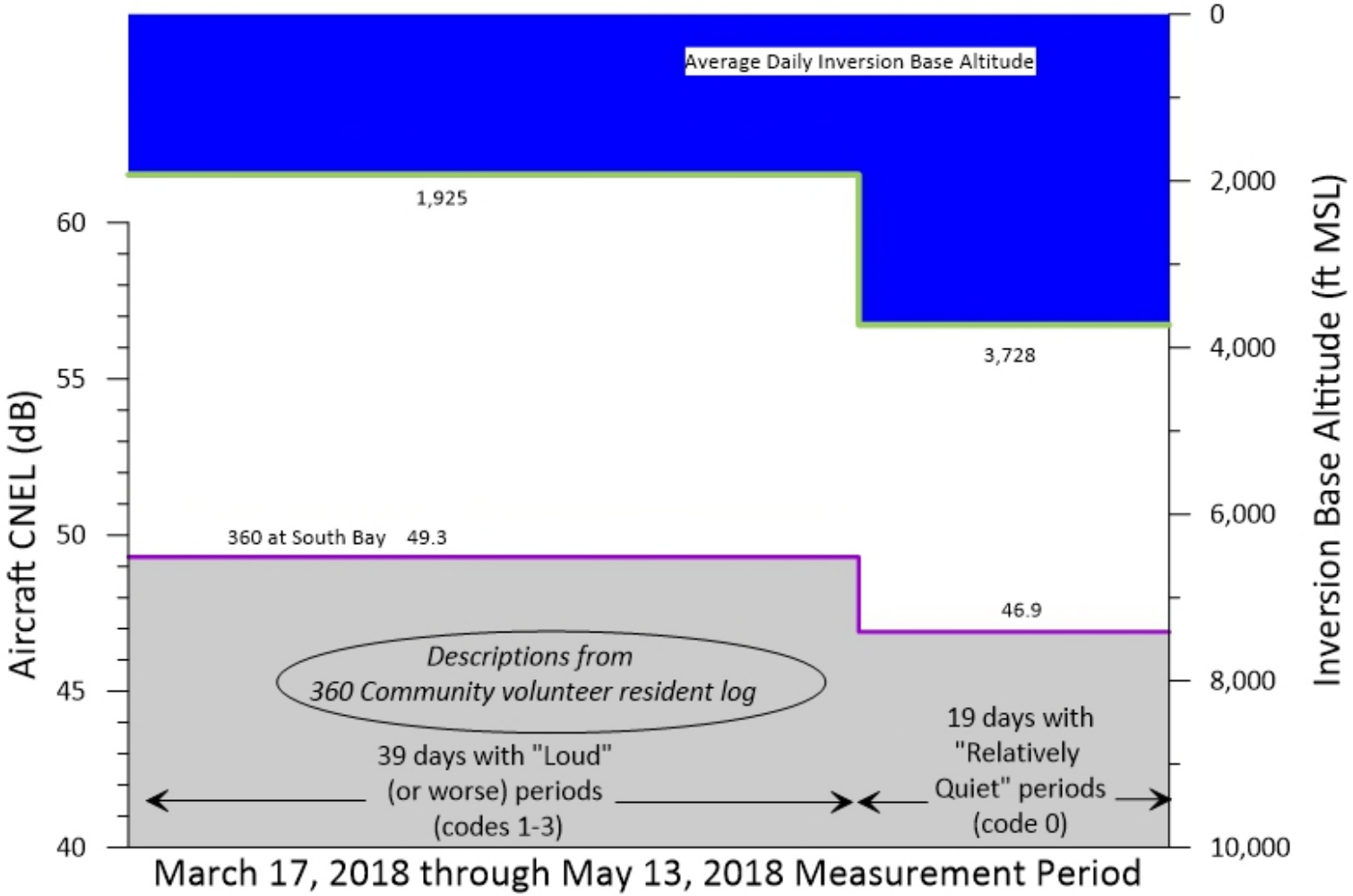


Noise & Weather for Measurement Period



Noise & Inversion for Measurement Period

Aggregates



Conclusions

- Periods of increased noise levels (measured and observed) 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 (or with runway closures, flow condition, or run-up activity)
- There are no feasible noise-reducing measures to mitigate weather-related increases in aircraft noise in the Community
- It is likely other communities near LAX experience similar weather-related increases and decreases in aircraft noise

Thank you for listening!

Joe Czech
310-738-5943
jczech@hmmh.com

www.hmmh.com