Attributes of a 21st Century Noise Report

James Allerdice

vianair

Marie-Jo Fremont

Concerned Residents of Palo Alto

With contributions from Darlene Yaplee, Aviation-Impacted Communities Alliance (AICA)

Agenda

- Goal & key questions to address in 21st century noise report
- Attributes of report
- Noise reporting examples
- Conclusion and next steps

Goal and Key Questions to Address

- Goal: Enhance current reporting to better reflect noise exposures of impacted communities and provide user-friendly information that is more actionable

- Key questions:
  - How many overflights over a location and how loud are they?
  - Which noise events are counted? All traffic? All airports?
  - Is ambient noise level considered?
  - How accurate are the noise levels reported?

21st Century Noise Report - Attributes

- Reflection of communities' lived experience
  - DNL and non-DNL metrics
  - Data averaging obscures true noise exposure
- Comprehensive noise reporting
- Informative, actionable, user-friendly content

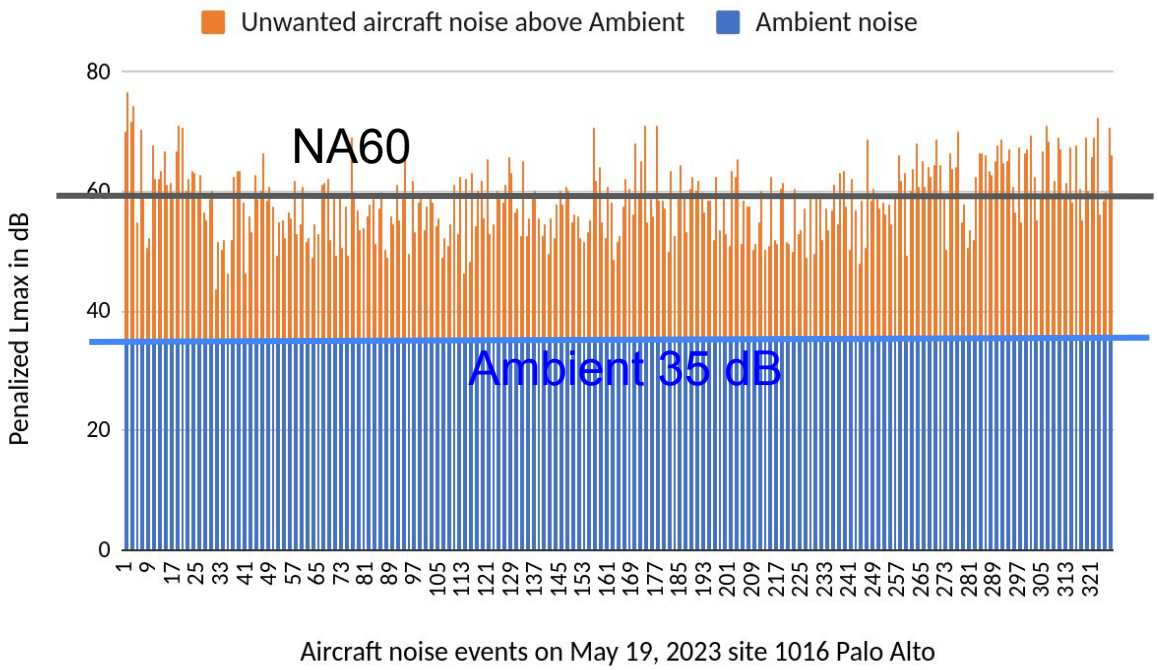
How to Achieve Attributes (1 of 2)

Attributes	Means to Achieve
Lived experience of communities	● Additional community-centric metrics ○ N-Above, N-Above-Ambient, Total Noise Index using penalized peak noise ● Distinct reporting: ○ Day and Night ○ Peak Day and Average Day of Period ○ Airport, Arrivals/Departures, Procedure

Penalized Peak Noise level (Lmax):

- DNL has a 10 dB night penalty for noise events between 10pm and 7am. California also adds a 5 dB evening penalty between 7 and 10pm and uses CNEL instead of DNL.
- Similarly, community-centric metrics should have similar penalties.

Community-centric Metrics



Source: ANE 2024 presentation Representing Aircraft Noise Impacts – A Community Perspective by Marie-Jo Fremont

- N-Above (NA): count noise events above a certain level of decibels (like 60 dB)
- N-Above-Ambient (NAA): count all noise events above ambient (count orange bars)
- Total Noise Index (TNI): add up all NAA values (add up heights of all orange bars)

How to Achieve Attributes (2 of 2)

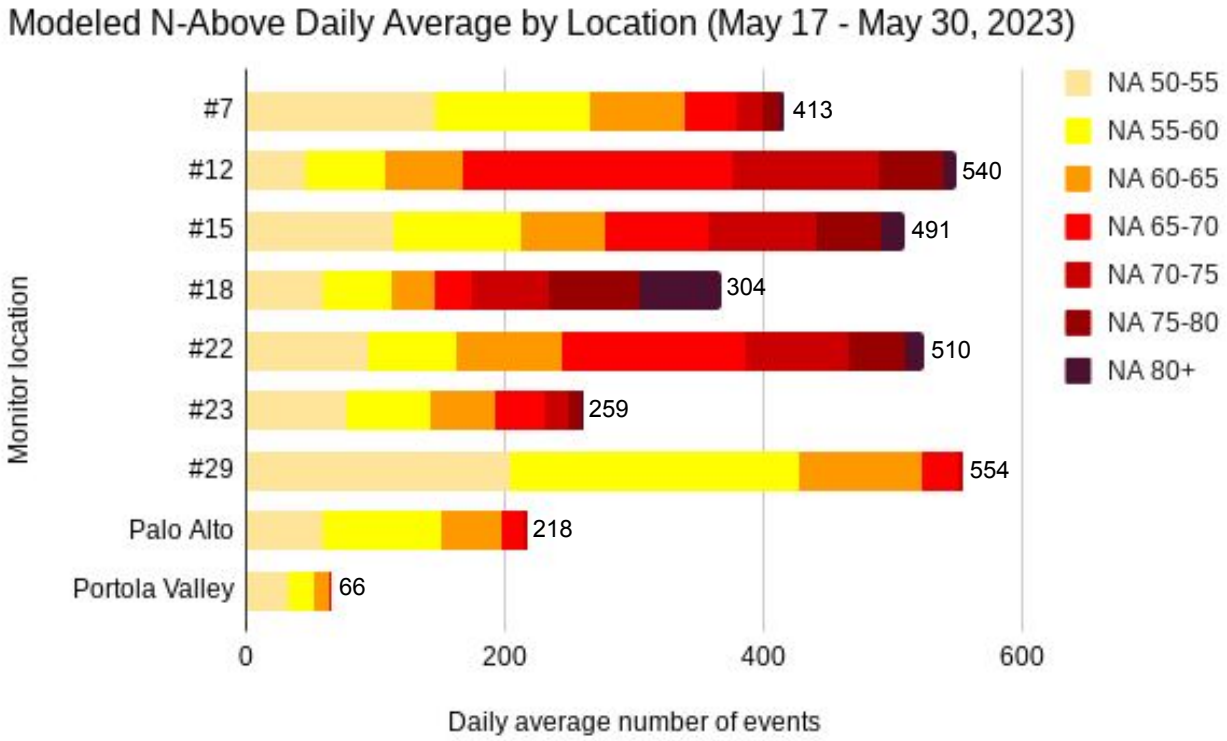
Attributes	Means to Achieve
Comprehensive noise reporting	• N-Above noise contours in addition to DNL contours • Start at NA50 and in 5 dB increments
Informative, actionable, user-friendly content	• Understandable and synthesized content (graphs, maps) • Trends

SFO Monitor Locations Used - May 17-May 30, 2023

Monitor	City/Town
#7	Brisbane
#12	Foster City
#15	South San Francisco
#18	Daly City
#22	San Bruno
#23	San Francisco
#29	San Mateo
#1016	Palo Alto
#978	Portola Valley

Data source: SFO airport

N-Above –modeled noise data



- N-Above based on Lmax values penalized for time of occurrence (night and evening)
- Noise events caused by General Aviation traffic **not** represented due to lack of SWIM data. Noise events for Palo Alto and Portola Valley for example are **undercounted**.

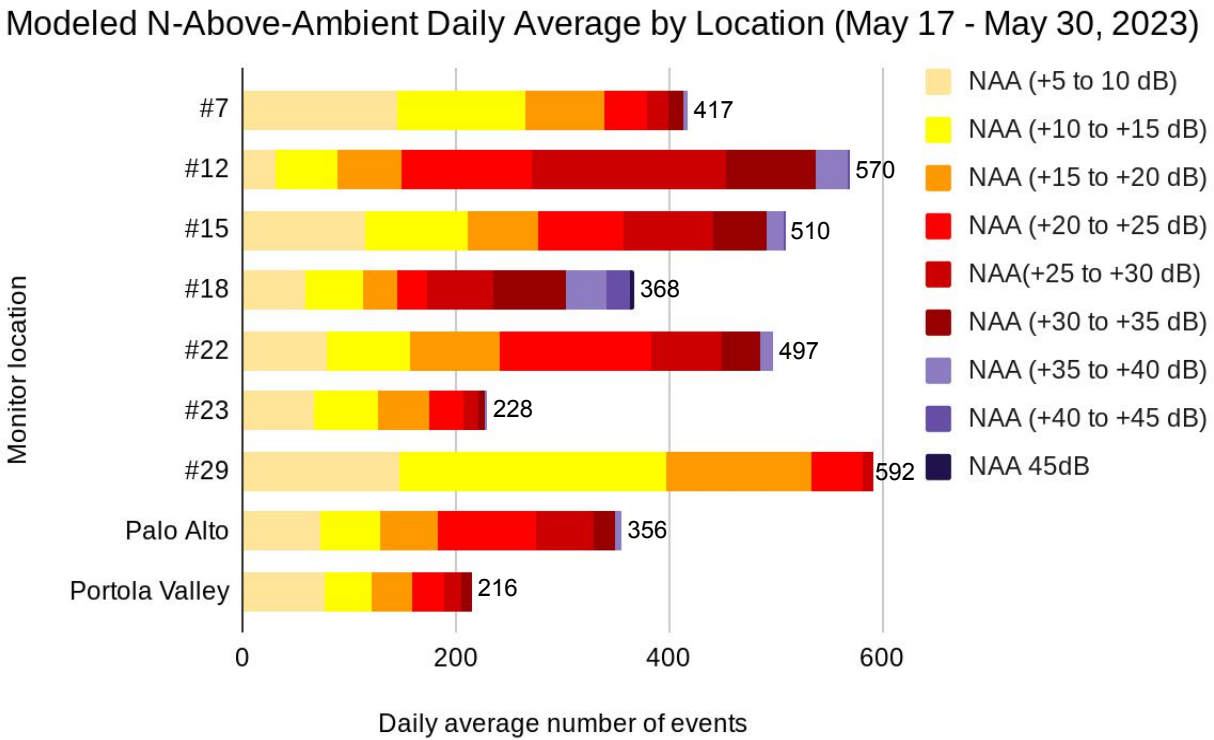
Ambient Noise Levels at Monitor Locations

Monitor	City / Township	Average Actual Ambient Noise (dBA)
#7	Brisbane	45
#12	Foster City	42
#15	South San Francisco	45
#18	Daly City	45
#22	San Bruno	46
#23	San Francisco	47
#29	San Mateo	43
#1016	Palo Alto	34
#978	Portola Valley	31

Data sources: SFO reports, SFO RT packet Dec 2023 (p 18)

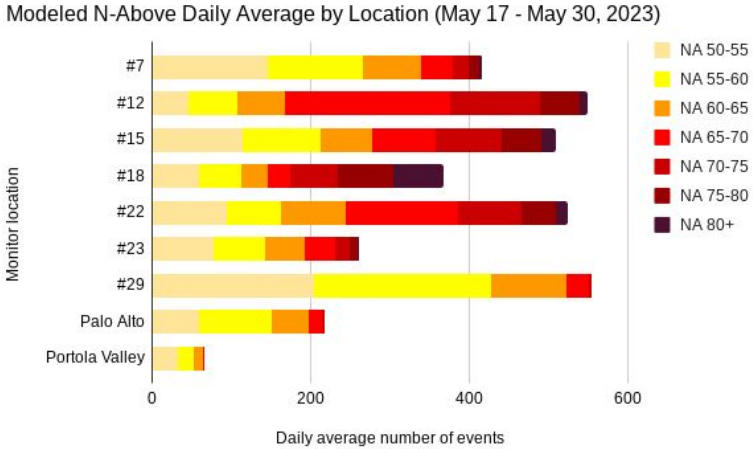
- Actual ambient noise levels based on SFO reports
  - L90 metric (noise exceeded 90% of the time) starting in summer 2023
  - 17 months data average for SFO permanent monitors (Aug 2023 - Dec 2024)
  - Six 2-week periods average for temporary monitor #1016 between Sep 2023 and October 2024
  - Five 2-week periods for temporary monitor #978 between Aug 203 and Sep 2024
  - Average ambient noise varies little from month to month
- Urban or suburban locations, which today are assumed to have ambient noises of 65 dB and 55 dB, respectively

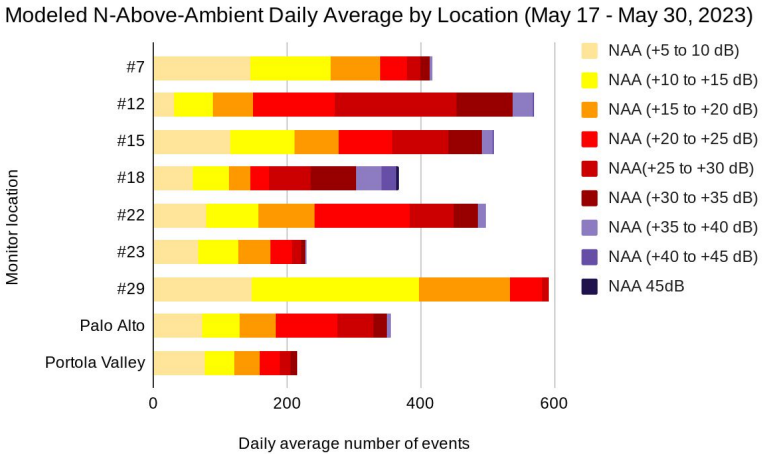
N-Above-Ambient –modeled noise data



- N-Above based on Lmax values penalized for time of occurrence (night and evening)
- Noise events caused by General Aviation traffic **not** represented due to lack of SWIM data. Noise events for Palo Alto and Portola Valley for example are **undercounted**.

N-Above and N-Above-Ambient Differences





- The lower the ambient noise, the higher the NAA count
  - NA started counting noise events above 50 dB
  - Example: Palo Alto had 218 N-Above noise events and 356 N-Above-Ambient noise events at least 5 dB above ambient because ambient noise level was 34 dB.
- N-Above-Ambient better reflects communities' experience of aircraft noise

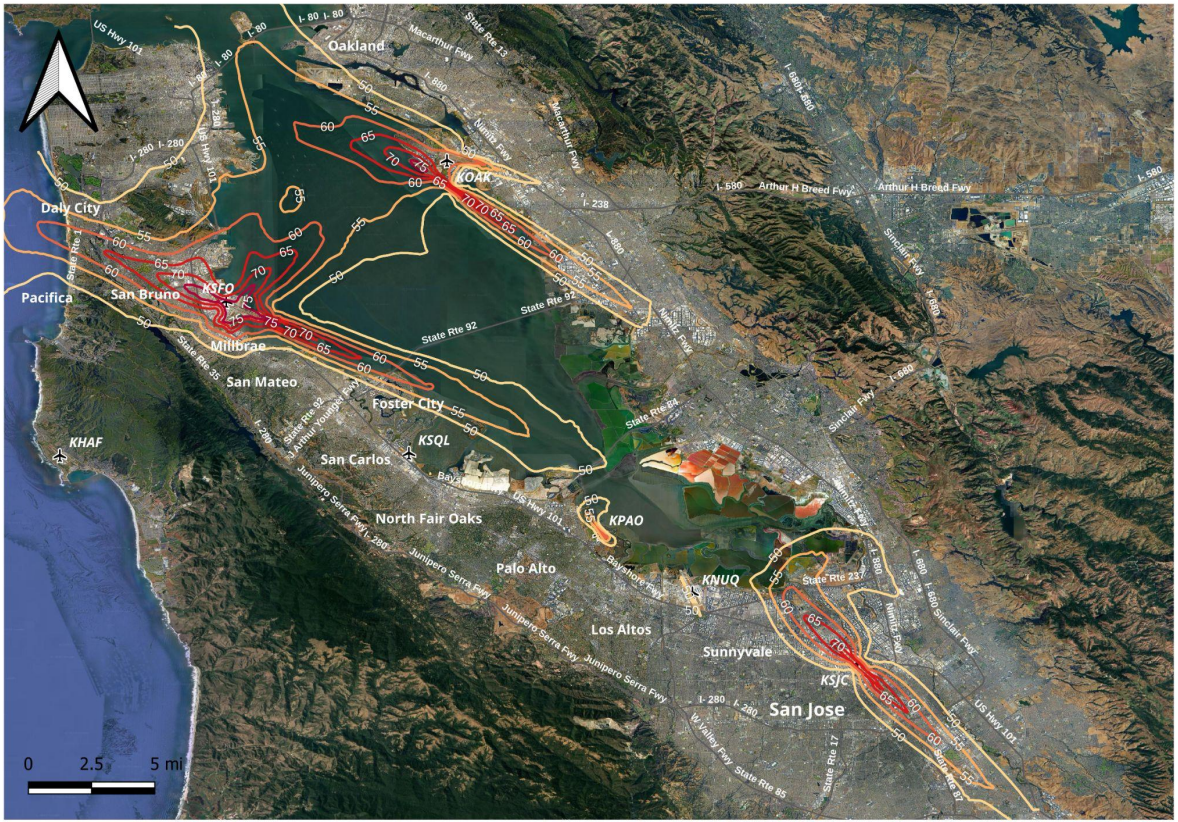
Total Noise Index (TNI)

- Synthesis of N-Above-Ambient data
  - Add up differences between Penalized Lmax and ambient noise for all events
- Cumulative noise exposure of all noise events that exceeded ambient noise levels
- Great to to compare impacted areas and detect changes

Monitor	City / Township	Daily Average TNI (in dBA) May 17-May 30, 2023
#7	Brisbane	6139
#12	Foster City	13819
#15	South San Francisco	9866
#18	Daly City	8974
#22	San Bruno	9896
#23	San Francisco	3990
#29	San Mateo	8286
#1016	Palo Alto	6791
#978	Portola Valley	3433

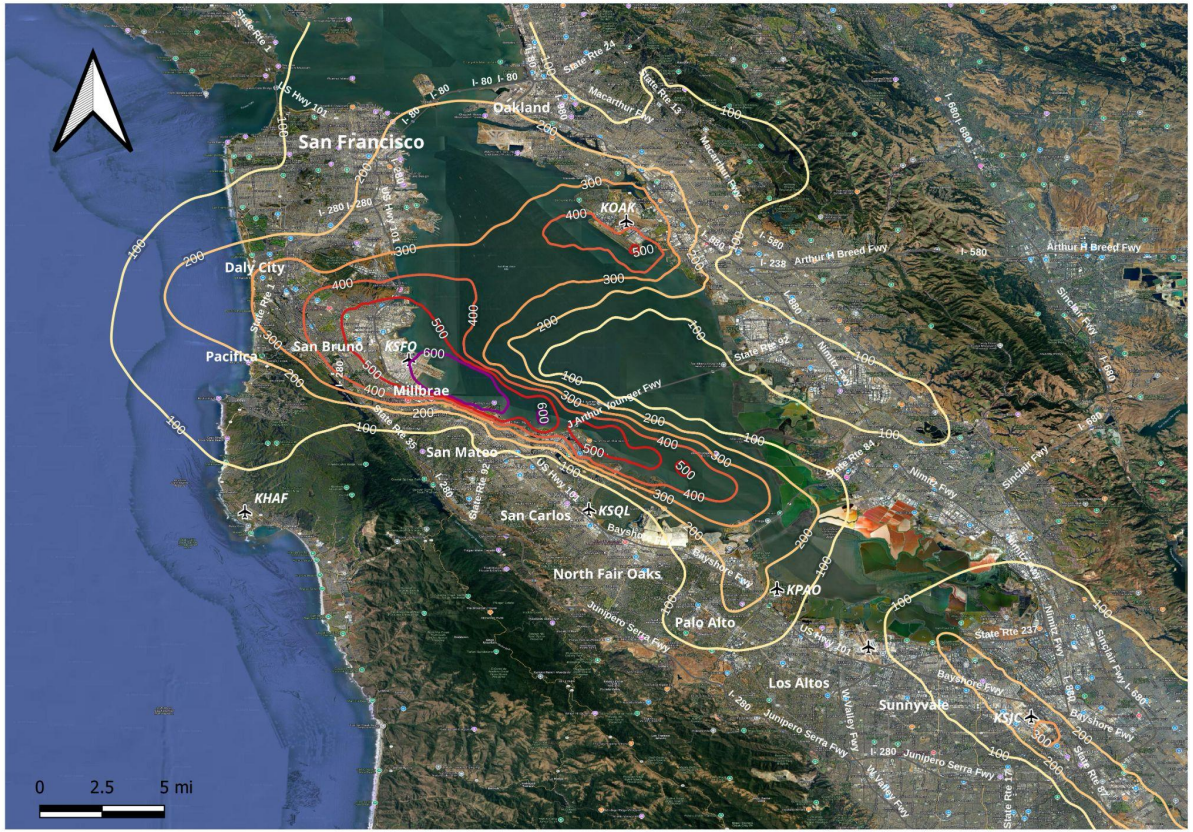
Notes: Noise events caused by GA traffic **not** represented due to lack of SWIM data. Therefore TNI values for Palo Alto and Portola Valley for example are **undercounted**.

CNEL contour –modeled data



- Daily average for May 17 - May 30, 2023
- 3 commercial airports (SFO, OAK, SJC)
- CNEL contours do not reveal how many aircraft overfly communities and how loud they are

N-Above 50 dB Contours –modeled data



- Daily average for May 17 - May 30, 2023
- 3 commercial airports (SFO, OAK, SJC)
- NA contours show how many aircraft above a certain noise level overfly communities

N-Above 60 dB Contours –modeled data

- Daily average for May 17 - May 30, 2023
- 3 commercial airports (SFO, OAK, SJC)

Advancing Noise Monitoring: Virtual vs. Physical Monitors

- Calibration & validation
  - Modeled noise levels vs. actual noise levels – calibration pending
  - Collaboration with SFO team for validation
- Potential impact
  - If successful, Virtual Monitors could be adopted by Airports, FAA, and other ANSPs
  - Unknown if airports can use AIP funding for Virtual Monitors like for physical monitors
- Advantages of virtual monitors
  - Lower cost & greater flexibility
  - Wider coverage than physical monitors
  - Complement to physical monitors (if modeling accuracy is high)
  - Immediate feedback during Flight Procedure Design Sessions
  - Readily available and customizable monthly reporting for airports and communities
- Key question: how good is good enough?
  - Accuracy of modeled data vs. recorded physical data
  - ADS-B: Potential to enhance modeling with aircraft broadcast data (e.g., flap settings, gear extension, etc.)
  - FOQA (Flight Operational Quality Assurance) data
  - **Better Data - Better Model!**

Conclusion

GOAL: Enhance current reporting to better reflect noise exposures of impacted communities and provide user-friendly information that is more actionable

Reporting attributes	Examples shown	Not shown
Lived experience of communities	● N-Above ● N-Above-Ambient ● Total Noise Index	● Distinct reporting: ○ Day and Night ○ Peak Day and Average Day of Period ○ Airport, Arrivals/Departures, Procedure
Comprehensive reporting	● N-Above noise contours in addition to DNL contours	
Informative, actionable, user-friendly content	● Understandable and synthesized content (graphs, maps)	● Trends ● Specific potential actions

Next Steps

- Today, airports with noise monitors can report for each monitor location:
  - N-Above
  - N-Above-Ambient
  - Total Noise Index
  - For accuracy purposes, use ANEEM methodology to detect noise events
- All airports can report N-Above contours in addition to DNL contours
  - DNL contours (except for DNL 65 sometimes) and NA contours are modeled contours
  - Must calibrate noise modeling against actual noise recordings to improve modeling accuracy
- Costs:
  - One-time set up costs and recurring production costs
- Benefits:
  - Better representation of noise exposures and answers to key community questions
  - Enhanced engagement & communication –more understandable and actionable

Thank you!