Aviation Impacts Solutions Summit: Part 2
Noise and Health
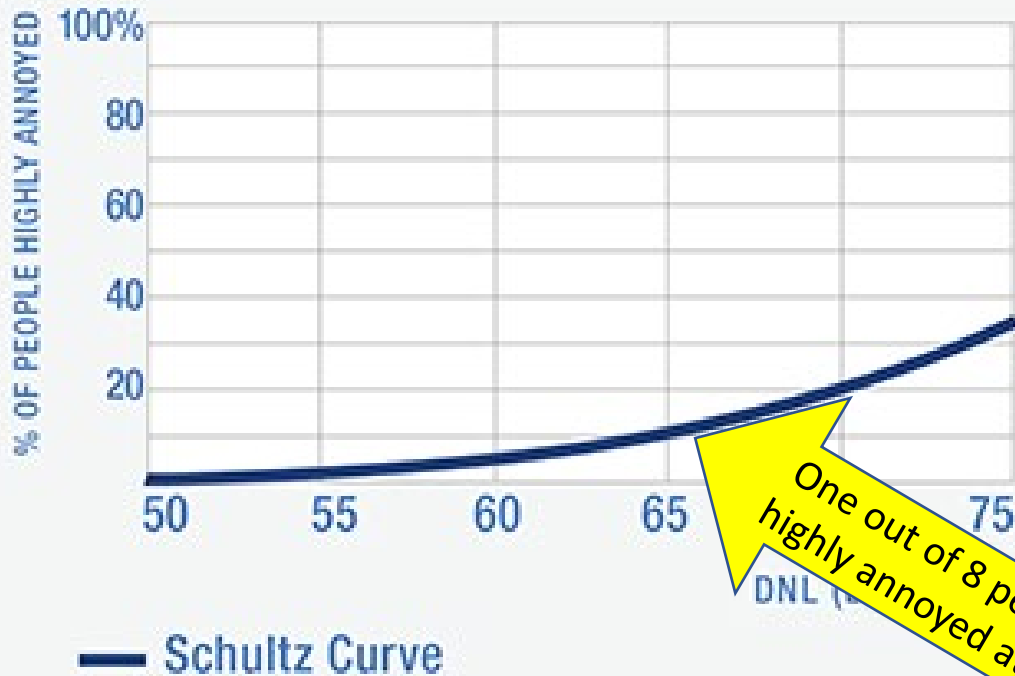
Reasons Not to Love DNL65

Presented by:
Cindy L. Christiansen, PhD
A founding member of the Aviation-Impacted Communities Alliance (AICA) and BOS Fair Skies

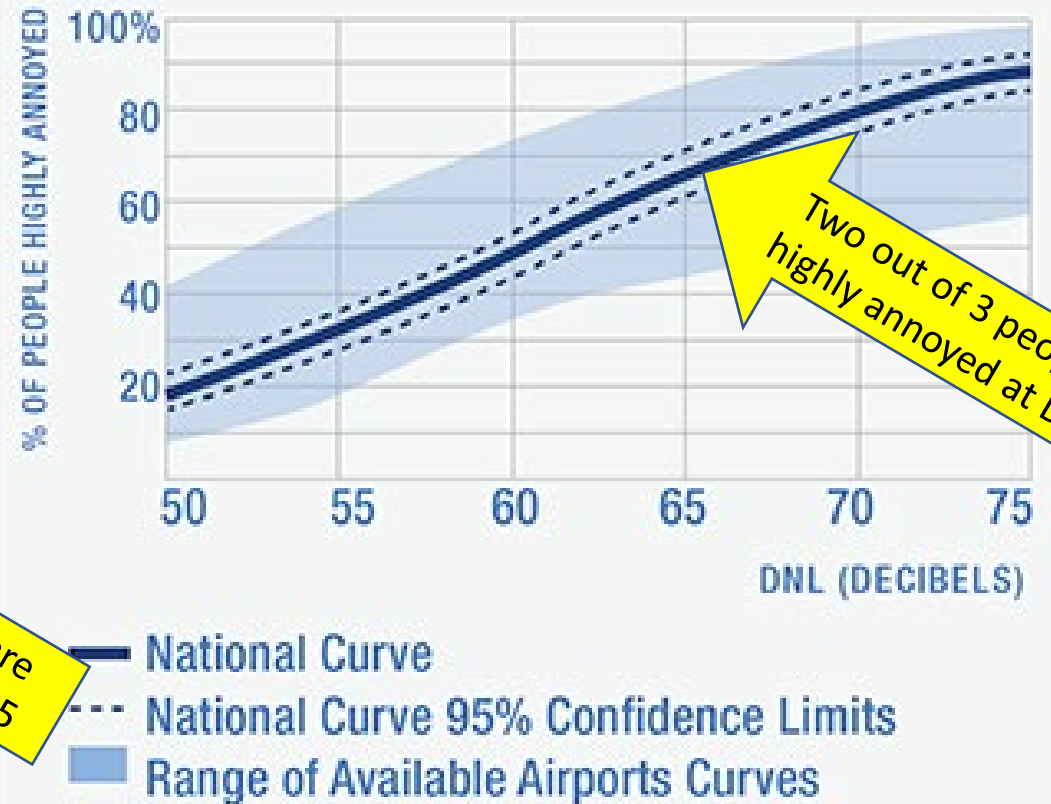# The Neighborhood Environmental Survey (NES) Study Tells Us Most People Don't Love DNL65

FAA Uses This Graphic to Explain How to Reach a DNL65

But, how loud is the Aviation Noise Event for these SEL values?

1 EVENT/DAY SEL 114.4 dBA = DNL 65

SEL 114.4 dBA – could burst your eardrum

10 EVENTS/DAY SEL 104.4 dBA = DNL 65

SEL 104.4 dBA – large jet departure over the airport

100 EVENTS/DAY SEL 94.4 dBA = DNL 65

SEL 94.4 dBA – large jet departure a few miles from the airport
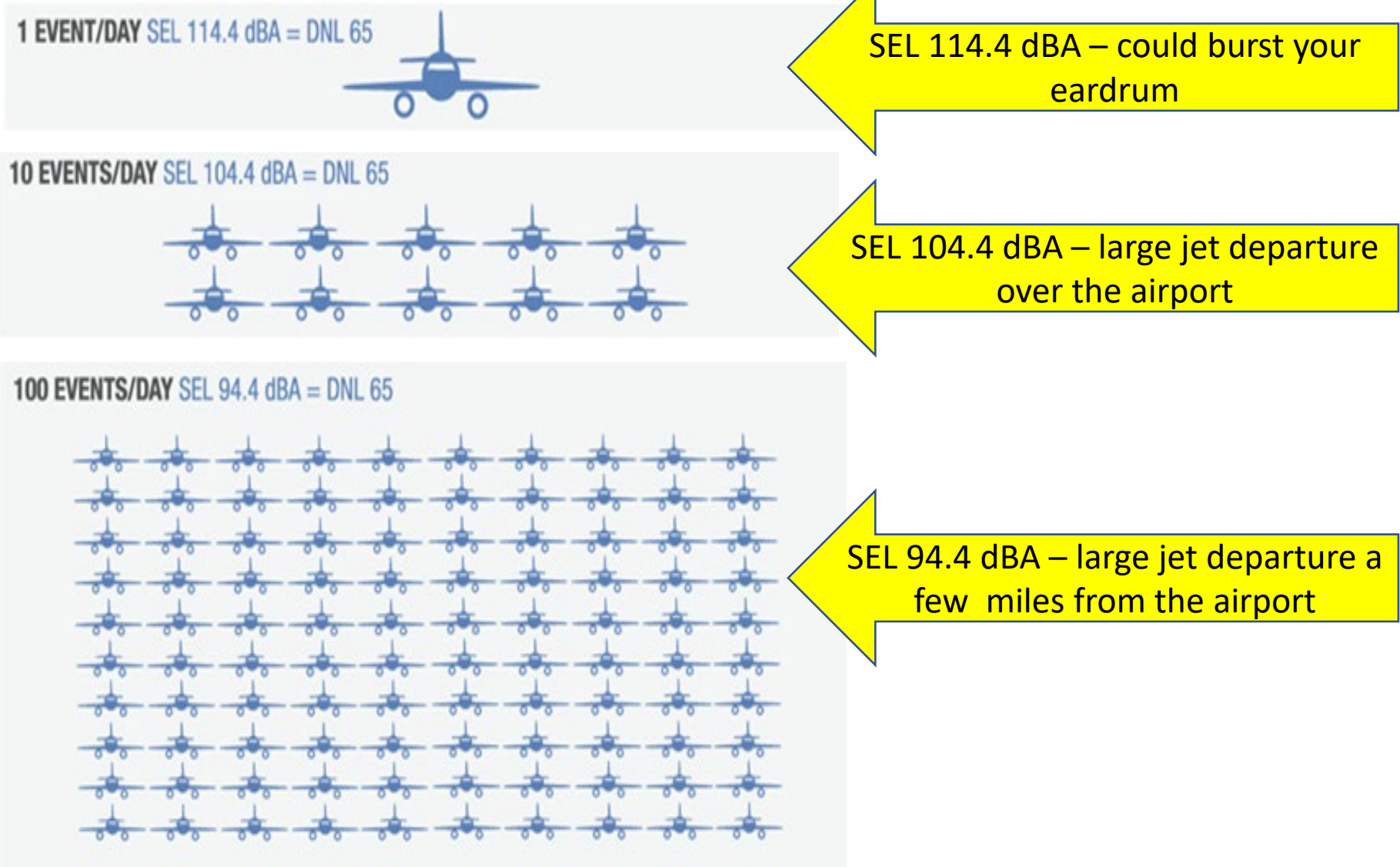
Notes:
- DNL65 is FAA's "significant noise level"
- SEL = Sound Equivalent Level for a single noise event
- **SEL is approx. max dBA + 10**

FAA's Incomplete Picture of DNL 65
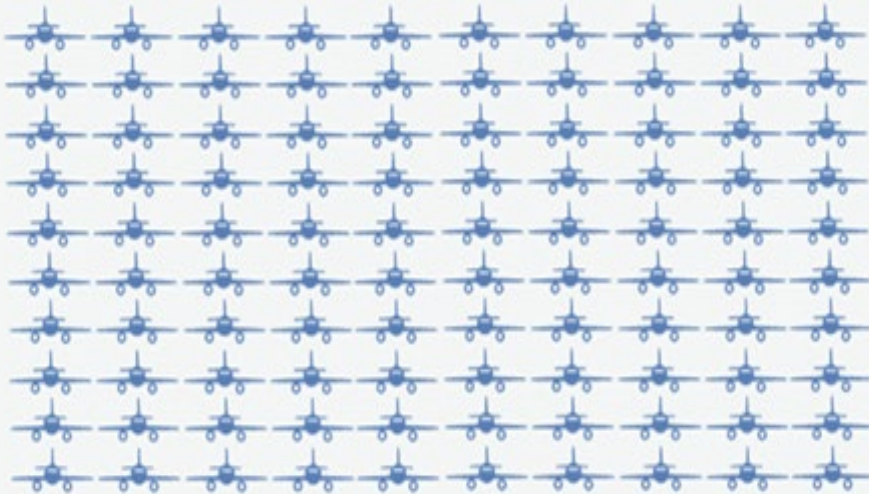
What the FAA does not want you to know

1 EVENT/DAY SEL 114.4 dBA = DNL 65

10 EVENTS/DAY SEL 104.4 dBA = DNL 65

100 EVENTS/DAY SEL 94.4 dBA = DNL 65

Number of Operations to Obtain 65 DNL in the NextGen-Created Common Scenario of Communities with Substantive Noise Complaints

1,000 EVENTS/DAY SEL 84.4 dBA = DNL 65

DNL65

https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/
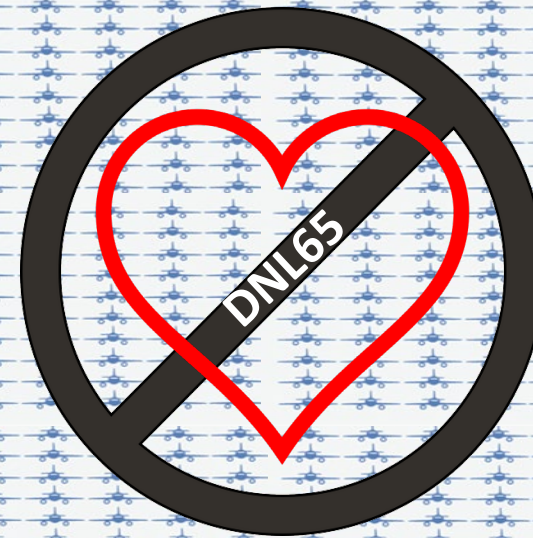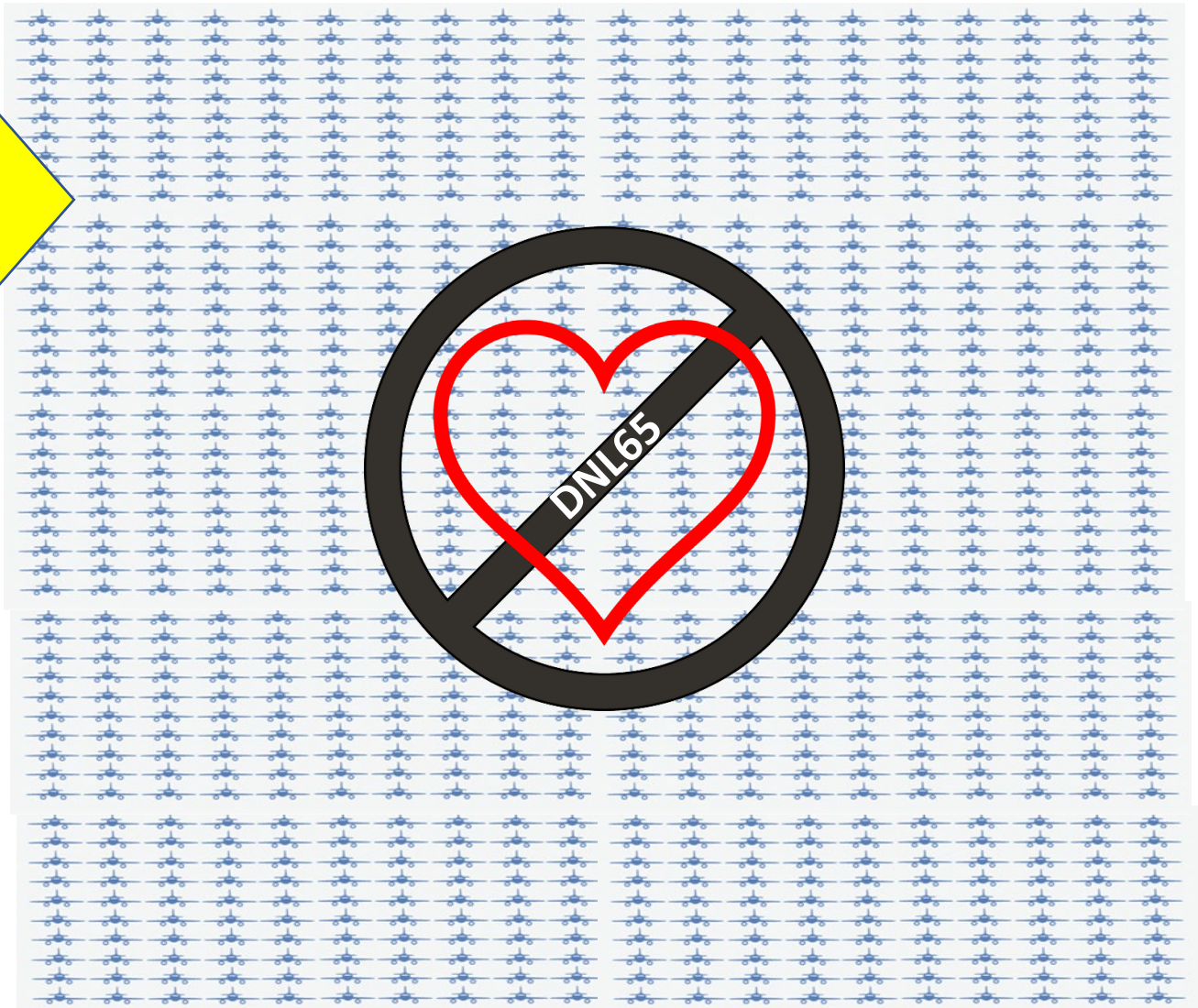
A Sonic Boom Example

"Since most supersonic flight testing could be expected to take place during the day, **it would take 80 daytime Concorde-level booms per day in a single location to raise ambient DNL from 63.5 to 65.**"

The FAA could add 79 sonic booms/day to a location that already has an aviation DNL of 63.5 and there still would not be "Significant Impact".

- **That is 28,835 booms/year at a single location.**

DNL65

So What's Going On?

- DNL increases slowly when the number of events is already high

- Example (1) Start with 10 SEL=80 events (DNL= 40.6)
  - Add 20 SEL=80 events, **DNL increases by 4.8**
- Example (2) Start with 100 SEL=80 events (DNL = 50.6)
  - Add 20 SEL=80 events, **DNL increases by 0.8**.

DNL BY NUMBER OF EVENTS BY SEL

— DNL(SEL=70) — DNL(SEL=75) — DNL(SEL=80) — DNL(SEL=85) — DNL(SEL=90)
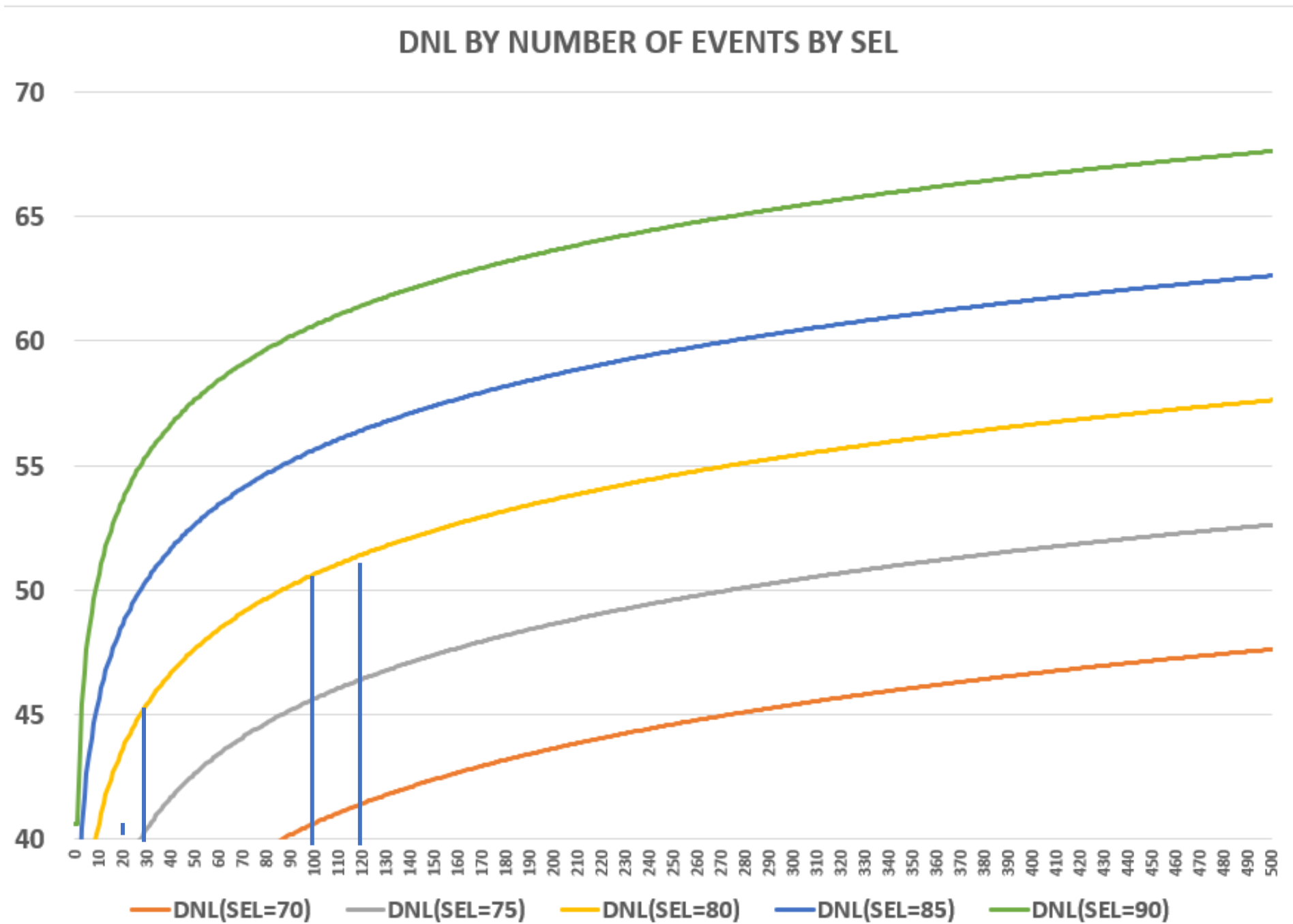
Could We Learn to Love DNL60 or DNL55?

Probably Not

o   What is your current DNL?

   o   Need to see DNL60 and DNL55 noise contours

o   How precise are the modeled DNL estimates?

   o   Precision of estimates dwindles at lower DNL levels

o   NES shows that the Threshold for Significance needs to be <DNL50 to reach a 12% Highly Annoyed level.

If your noise events hover around SEL=80, your location would need just under 300 events/day to reach DNL55

DNL BY NUMBER OF EVENTS BY SEL

DNL(SEL=70) — DNL(SEL=75) — DNL(SEL=80) — DNL(SEL=85) — DNL(SEL=90)
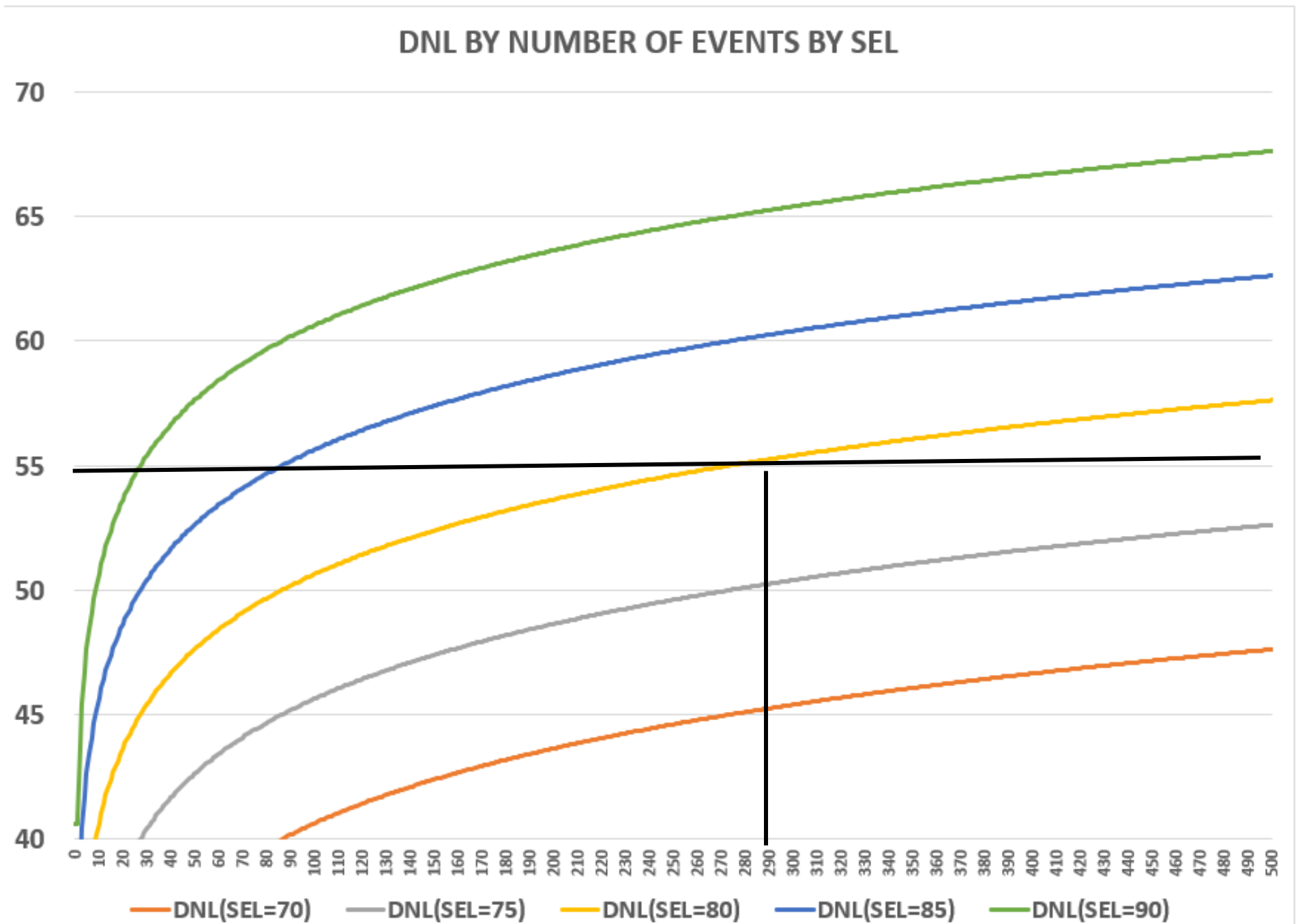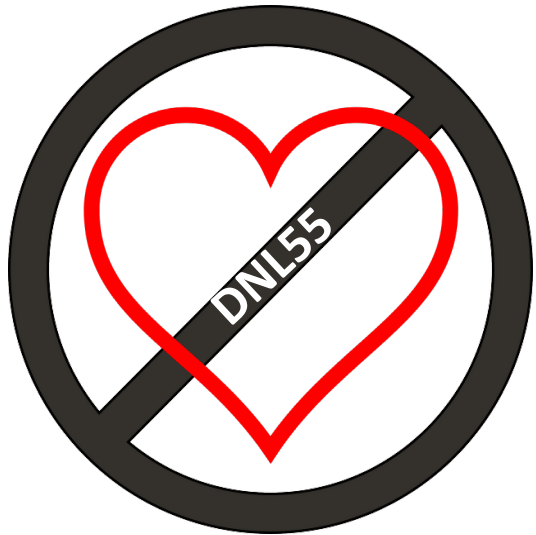
Following are Supplement Slides (not used in the presentation)

These might be helpful if one wants to do other 'multiplier' calculations. I've also included some information on the margin of error for DNL modeled estimates.

Multiplier needed to reach 75, 65, 60, and 55 DNL at some Boston Logan noise monitor locations; 2017 data

Hull, as an example, would need 4 times the aviation noise events experienced at the monitor's location to be considered significant at 65 DNL.

| From Table 6-9   Measured; Boston Logan International Airport 2017 ESPR Environmental Report | Distance from Logan Airport (miles) | 2017 Measured Aircraft (DNL) | 2017 (Runway 4R was closed for part of 2017) | | | |
Location			Multiplier needed to reach DNL = 75	Multiplier needed to reach DNL = 65	Multiplier needed to reach DNL = 60	Multiplier needed to reach DNL = 55
Winthrop – Bayview and Grandview	1.6	71.1	2.5			
Revere – Bradstreet and Sales	2.4	68.3	4.7			
Winthrop – Somerset near Johnson	0.8	64.8	10.5	1.05		
Winthrop – Loring Road near Court	1.0	64.5	11.2	1.1		
Winthrop – Harborview and Faun Bar	1.9	63.9	12.9	1.3		
East Boston High School	1.9	63.8	13.2	1.3		
Chelsea – Admiral's Hill	2.8	62.3	18.6	1.9		
East Boston – Bayswater near	1.3	61.3	23.4	2.3		
East Boston – Bayswater near Annavoy	1.3	60.6	27.5	2.8		
Revere – Carey Circle	5.3	60.6	27.5	2.8		
South Boston – B and Bolton	2.9	60.0	31.6	3.2		
Hull – Hull High School near Channel	6.0	59.0	39.8	4.0	1.3	
South Boston – Day Blvd. near Farragut	2.5	58.6	43.7	4.4	1.4	
South End – Andrews Street	3.7	58.1	49.0	4.9	1.5	
Winthrop – Morton and Amelia	1.6	57.9	51.3	5.1	1.6	
Roxbury – Boston Latin Academy	5.3	56.1	77.6	7.8	2.5	
Dorchester – Myrtlebank near Hilltop	6.3	55.6	87.1	8.7	2.8	
Everett – Tremont near Prescott	4.5	55.4	91.2	9.1	2.9	
Medford – Magoun near Thatcher	6.0	55.0	100.0	10.0	3.2	
East Boston – Selma and Orient	1.8	54.0	125.9	12.6	4.0	1.3
Lynn – Pond and Towns Court	8.4	51.9	204.2	20.4	6.5	2.0
East Boston – Piers Park	1.5	51.5	223.9	22.4	7.1	2.2
Jamaica Plain – Southbourne Road	7.7	50.6	275.4	27.5	8.7	2.8
Milton – Cunningham Park near Fullers	8.1	48.0	501.2	50.1	15.8	5.0

How much would the current aviation noise events have to increase in order to reach a DNL of 65 dBA?

Example for a location with a current DNL = 56.1

1. Subtract the current DNL from the FAA's threshold, e.g., 65 (65 - 56.1 = 8.9)
2. Divide the difference by 10 (8.9/10 = 0.89)
3. Calculate 10 raised to the value from Step #2. (using a calculator, $10^{0.89}$ = 7.8)

CONCLUSION. It would take 7.8 times the number of current aviation noise events before the FAA would consider aviation noise to be significant at this location.

Suppose this location currently experiences 100 aviation events/day on average. It would take 7.8 times 100, 780/day, to reach a DNL of 65 at this location.

Most airports are not able to handle an increase like this, making it extremely unlikely for this location to ever have "significant" aviation noise.

The calculations to find the multiplier are easy to do on a calculator

$$M = 10^{(X/10)}$$

M is the multiplier

X is the difference of current DNL from the DNL required for significance

Multiply the current aviation events by M to understand what it would take before the FAA would say the aviation noise is significant.

Some statements by Fidell and Mestre, and my comments

- When asked about the Margin of Error (MoE) for the DNL estimates, they provided this information:

1. Precision of estimates depends on the data.

2. In 1985 the margin of error around the 65 DNL was about ±5 dB.

3. Now, with good data, the margin of error is about ±1.5 dB @ 65 DNL, ±3 @ 60 DNL, ±5 around 55 DNL and **might be ±10 dB at ≤ 50 DNL**

   - My comment: Regarding #3, WOW!!! Policy decisions that affect the public's health and quality of life should never be based on a estimates with this much uncertainty.