

September 26, 2018

Ken Buckley  
Email: [toground@rcn.com](mailto:toground@rcn.com)  
Sent via Email

Rama Seshu ("Ram") Tangirala, Ph.D.  
Chief, Monitoring and Assessment Branch  
Air Quality Division  
DC Department of Energy and Environment  
Washington DC 20002  
Email: [rama.tangirala@dc.gov](mailto:rama.tangirala@dc.gov)

Dear Dr. Tangirala,

Thank you for the opportunity to comment on the DCA **AIRPLANE NOISE ASSESSMENT, PHASE 2 FINAL REPORT**. Section 6.8 of the report , Supplemental Metrics, lists the following:

- Maximum A-weighted Sound Levels (MXAL): A measure of the maximum sound level during an aircraft flyover.
- Sound Exposure Level (SEL): A measure of duration and magnitude of a single noise event in A-weighted decibels;
- Equivalent Sound Level ( $L_{eq}$ ): The average noise level over a specified time, such as school hours;
- Time Above (TA or TAL): The amount of time that a noise event exceeds a maximum decibel level (MXAL) threshold;
- Number of Events (N-Level, NA, or NAL): The number of noise events above a maximum decibel level threshold during a specified period;
- Rattle: The low frequency noise effects on loose items and building elements.
- Sleep Interference: The percent of the population awakened in a specific interior noise environment;
- Learning: The noise effects of aircraft noise on children's learning. (p55)

The report later states

- *"While the public may relate well to these metrics, only the last two, sleep interference and learning, have scientific standing. These metrics, like the DNL, were developed from scientific research into the noise exposure effects on humans, and have documented procedures published by the American National Standards Institute (ANSI). (p56)"* I agree with the further assertion in the report noting that *"noise annoyance is known to vary considerably among individuals. While a certain percent of the population is highly annoyed with a particular noise environment, the remaining percent is not. (p56)"*

As I discussed with you after the September 20 public meeting, I was disappointed that the

report does not elaborate its discussion (or cite specific references) on the potential effect of aircraft noise on the health, welfare, and performance of DC students. The discussion in section **6.13 Classroom Noise Analysis** appears to recognize that the effect of aircraft noise on student attention and cognitive abilities is well documented by numerous studies. The report, however, does not reference any of these studies or provide meaningful analysis on these important issues. I found several studies and will cite three references later in my comments.

### **Treating the area between NMT #4 to NMT #6 as a contiguous noise corridor rather than discrete points-of-presence**

At the September 20 public meeting, the consultants emphasized that noise annoyance is subjective and is difficult to put forward as a stand-alone issue to the FAA. The bulk of the metrics in this report, however, seem to primarily focus on noise as ***annoyance to residents (quality of life degradation) by its reiterative comparison of the relative measures at the various measuring points-of-presence. Worse yet, is the tendency of the report to label minor differences as “significant.”*** When the term “significant” is used to describe differences in metrics, it implies a measurable statistical differentiation, often expressed as a standard deviation. The term should not be used carelessly because it detracts from the quality of the findings in the report. As an illustrative instance, on page 46, the report asserts from table 5-5:

- *“The most significant increase is from NMT #6 from a DNL of 53.8 dBA in 2010 to 57.3 dBA in 2016. (p 46).”* The difference is the largest spread, but it not significant from other observed increases. It appears to be a “stretch” to assert that an increase of 3.5 dBA at NMT #6 is more “significant,” although marginally higher, than the 3.4 dBA increase between 2010 and 2016 at NMT #4.

As I reviewed the well documented metrics presented in the report, it struck me that the individual monitored noise level measures and number flyovers vary, for the most part, only slightly (and not significantly) across the monitoring points-of-presence (including the 2017 & 2018 intermediate measures) between NMT #6 to NMT #4. By focusing on differences between the metrics of the individual monitoring points, the report could inadvertently creates divisions between adjacent neighborhoods - “who has it worse.” Consequently, treating the 3-4 miles of airspace between NMT #6 to NMT #4 as a contiguous “**noise corridor**” affecting all communities along the path facilitates the holistic evaluation/application of any recommended mitigations. Certainly the measures in Figures 4-3 as well as most of the latter measurements in the 6-series and 8-series Figures support this view. It is counter productive to artificially separate Georgetown and the Palisades as competing jurisdictions.

### **Detrimental effect of airplane noise on student earning**

Viewing the airspace between NMT#6 and NMT#4 as a community “noise corridor” reinforces the issue that the aircraft noise is affecting 100K+ residents. More importantly, this view supports concerns on how aircraft noise in this contiguous “corridor” appears to have a

potentially broad systemic detrimental effect on student learning. The following primary and secondary schools are located within the “NMT #6 and NMT #4 noise corridor:”

- Key Elementary School at 5001 Dana Pl NW
- Our Lady of Victory Catholic School at 4755 Whitehaven Parkway NW
- St. Patrick’s Episcopal School at 4700 Whitehaven Parkway NW
- River School at 4880 MacArthur Blvd NW
- Lab School at 4759 Reservoir Road NW
- Georgetown Day School (lower and middle grades) at 4530 MacArthur Blvd NW
- Georgetown Visitation 1524 35<sup>th</sup> St. NW
- Montessori School of Washington at 4380 MacArthur Blvd NW
- Hyde Addison Elementary School 3219 O St NW
- Hardy Middle School 1819 35<sup>th</sup> St. NW
- Duke Ellington School of Arts 3500 R St. NW
- Washington International School 1690 36<sup>th</sup> St. NW
- The Children’s House of Montessori 3133 Dumbarton St. NW
- The Field School 2301 Foxhall Rd. NW
- The French Maternal School 3115 P St. NW
- Georgetown Montessori School 1041 Wisconsin Ave NW
- Holy Trinity School 1325 36<sup>th</sup> St. NW

The first reference I will cite is from the Airport Cooperative Research Program (ACRP) project of the National Academies of Sciences, Engineering, and Medicine published the *Effects of Aircraft Noise on Student Learning – ACRP Educators’ Handbook* as a guidance on evaluating learning issues ([http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_webdoc\\_034EducatorsHandbook.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_webdoc_034EducatorsHandbook.pdf)). The guidance cites several reference studies that should be reviewed in conjunction with the DC AIRPLANE NOISE ASSESSMENT report. The ACRP guidance explains how aircraft noise is thought to be responsible for affecting student learning through a range of conditions:

- *Speech interference – Elevated noise levels can cause difficulty in students understanding the teacher or each other, causing them to use part of their attention for*

*hearing what is being said, rather than focusing on the content.*

- *Interruptions – In situations where noise is characterized by loud, individual events such as aircraft overflights (as opposed to less intense but more continuous sources such as road traffic), it may be necessary for a speaker to stop speaking until the event has passed. This negatively affects the attention of the listeners.*
- *More subtle effects can include learned helplessness, in which students feel they are not in control of their environment; and annoyance, which can lead to stress responses.*

The report also provides a practical reference for non-professionals on noise measurements that the DC AIRPLANE NOISE ASSESSMENT report should cite to help the public better understand the context of the myriad metrics. As an example, in the case of section **6.13 Classroom Noise Analysis**, including the excerpts below would help ground the observed measures at schools to relatable noise events and provide a context for analysis.

*To understand how much a classroom might be affected by noise, it helps to have some numbers.*

- *Sound is measured in decibels (dB), which is a logarithmic scale of sound energy. Some typical sound levels are 25 dB for ambient sound in a rural setting at night; 65 dB for normal speech at a distance of 3 feet; and 95 dB inside a subway train.*
- *A difference of 3 dB corresponds to a factor of 2 in sound energy. A 10 dB difference corresponds to a factor of 10 in sound energy.*
- *The recommended background sound level for an unoccupied classroom is 35 dB.*
- *The recommended speech-to-noise ratio is 15 dB, so, for example, if speech is at 65 dB, the noise in the occupied classroom should not exceed 50 dB.*

Using this context, the analysis in section 6.13.1 would be less esoteric to a reader by providing context to the 35 dBA unoccupied ANSI standard. Given the large number of schools in the “noise corridor”, it seems a disservice to city residents (especially parents), however, that noise was not measured at DC primary or secondary public schools; only Georgetown Day School, Georgetown University, and Georgetown Visitation. This cannot be considered a representative sample of schools by any stretch. Nonetheless, Table 6-7 registers several instances where measured noise in empty classrooms exceeded 35 dBA. Section 6.13.2 appears to acknowledge that ANSI classroom noise levels were exceeded in the study, and in fact notes dBA readings exceeding 50 dBA, but does not provide any reference framework, analysis, or conjecture. Let me provide my own. If such readings are observed with frequency in schools across the NMT #4 to NMT #6 corridor, then aircraft noise is potentially a systemic problem (not an annoyance) with implications on the health, welfare, and performance of DC students. This issue should not be hidden from parents and the report should urge the city to undertake a more fulsome evaluation of possible cognitive implications.

The second reference I will cite is from the International Journal of Environmental Research and

Public Health *Noise in Schools: A Holistic Approach to the Issue* by Pamela Woolner and Elaine Hall (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2954580/>). Key findings from this study noted:

- *Of particular concern for education is the reliable finding, which fits with the laboratory results, that chronic noise exposure impairs cognitive functioning [see 12 for an overview]. Studies have found associations between noisy environments and reading problems [13–15], deficiencies in pre-reading skills [16] and more general cognitive deficits [17]. There is the implication that in addition to interfering with processing on each occasion, the environmental noise may be contributing to developmental problems, particularly with speech and language and with reading. These studies imply that either living in a home or attending a school near a source of on-going noise will increase the likelihood of a child having educational difficulties. Clearly those attending neighbourhood schools are likely to experience raised noise levels from the same source at both home and school. Shield and Dockrell make this point in their review of research concerning noise experienced by school students [12, p. 102], also noting that many such children suffer other problems of deprivation, presumably because noisy residential areas are not desirable places to live.*
- *Recent research, however, into the problem of noise in the school environment has tended to centre on the potentially more widespread problem of students struggling to learn because of noise generated within the school itself. In their surveys of external and internal noise in urban primary schools, Shield and Dockrell comment that ‘during lessons it was normally not possible to hear external noises’ [18, p. 734] and the noise levels they report just outside these urban schools were frequently lower than might have been expected due to schools being located in side streets or separated from roads by playgrounds.*

The third reference is a study from LANCET *Aircraft and road traffic noise and children's cognition and health: a cross-national study* **Volume 365, ISSUE 9475**, P1942-1949, June 04, 2005 **Prof SA Stansfeld, PhD**, researched aircraft noise effects in Europe. (<http://calmtheskies.org/wp-content/uploads/2015/10/lancet-noise-childrens-cognition-Article.pdf>) Some of the key conclusions of the effect of aircraft noise on young students include:

- *Our findings indicate that a chronic environmental stressor—aircraft noise—could impair cognitive development in children, specifically reading comprehension. Schools exposed to high levels of aircraft noise are not healthy educational environments.*
- *An effect of aircraft noise on readings consistent with previous findings. Exposure to aircraft noise has been related to impairments of children's cognition in terms of reading comprehension, long-term memory, and motivation. Tasks that involve central processing and language comprehension, such as reading, attention, problem solving, and memory seem most affected by exposure to noise.*
- *A 5 dB difference in aircraft noise was equivalent to a 2-month reading delay in the*

*UK and a*

- *1-month reading delay in the Netherlands.*
- *In the Netherlands and*
- *Spain, a 20 dB increase in aircraft noise was associated with a decrement of one-eighth of an SD [standard deviation] on the reading test; in the UK the decrement was one-fifth of an SD.*

These research citations are only a sample of many that I found and I encourage the authors and DC sponsors of the DC AIRPLANE NOISE ASSESSMENT report to research and reference relevant studies to support the need to 1) further evaluate the effect of aircraft noise on student learning as possible DC health, welfare and performance issues; and 2) pressure the MWAA and the FAA to mitigate noise that disrupts student learning. The detrimental effect of aircraft noise on student learning is serious and not a **quality of life issue**. At a minimum, the observed presence of excessive aircraft noise in classrooms and its potential implications on student learning should be shared with educators and parents. The city should consider undertaking a collaborative program with its educator community to measure aircraft noise at other schools to determine if this is a systemic problem in schools located between NMT #4 and NMT #6. Further, the city may need to plan initiatives (such as sound proofing) that would reduce the noise levels in classrooms as well as raising the issue to the FAA and MWAA.

Kind Regards,

Ken Buckley