

White Paper

Correcting the inappropriate noise impact conclusions of Massport's environment disclosures regarding Hanscom Field

Updated February, 2023

Introduction

The noise data presented by Massport in their Environmental Status and Planning Reports (ESPR) is extensive but their findings of "No Impact" of this noise on the historic and natural resources are arbitrary and without foundation in science, law, or common sense. This White Paper suggests a more appropriate criteria for assessing noise impact which, if applied, would substantially alter the conclusions of the ESPR. This paper was written in 2005, but the analysis and conclusions still hold. Moreover, efforts are underway to establish a more accurate alternative noise measurement model in the FAA Reauthorization Act coming up in September of 2023, a critical review and updating process that occurs approximately every five years.

Use of 65db DNL as a criterion for impact significance

The ESPR concludes that there currently is no "significant impact" on the natural and historic resources in the Hanscom area. In the scenario analysis, it further concludes that under the maximum 2015 High Growth Scenario that significant impact will be limited to only a single historic building. This entire conclusion rests on a single sentence in the report on page 10-14:

"Currently, noise exposure levels created by aircraft overflying the park are all less than 65db DNL, which the FAA considers as the onset of significant impact."

The entire conclusions of this report related to noise impacts are based on this one number, 65db DNL. Considering the overarching importance of this number, very little explanation of it is provided in the report. We believe this number is applied inappropriately and that the use of a more appropriate value would dramatically alter the conclusions of the report.

In the ESPR, Massport cites Federal Airline Regulations (FAR) Part 150 as the source for the 65db level. It is important to recognize the following points regarding this:

- The 65db DNL level is specifically cited as the level for "compatibility with residential land use". No value is cited or present in FAR part 150 for "compatibility" or significant impact in relation to National Parks, National Wildlife Refuges, or historic or natural sites.

- The words "significant impact" do not occur anywhere in FAR part 150. The plain meaning of the words "compatibility with residential land use" is this: suitable for human habitation in residential dwellings. FAR part 150 does not describe "significant impact" nor does it imply that the same levels should be used to assess significance of impact for residences as are used for natural or historic sites.
- The only Federal regulations that specify significance of impact in a National Park environment are the regulations promulgated in response to The National Parks Overflights Act of 1987 and subject to the final decision of the US Court of Appeals on August 16, 2002 in the case of United States Air Tour Association vs FAA.
- Recent science suggests that the 65db DNL value as an assessment even for residential land use is too high.
- International standards and regulations, and the majority of U.S. Federal agencies specify lower values for significance of noise impact than 65db DNL, and indicate that lower standards should be used for outdoor recreational sites and for non-urban sites.

The Hanscom Field Noise Workgroup found that Massport's use of the 65db DNL level as a criteria to determine significance of impact in the prior GEIR was improper and recommended in the Workgroup report that this criteria not be used in the ESPR. In particular, the workgroup specified that other Federal and international impact levels be reviewed and considered, and that a clarification distinguishing impact level criteria for residential use from the levels for natural and historic sites was needed. No discussion or response is included in the ESPR.

For the first time in this ESPR Massport does provide some indication of the need to adjust impact levels based on ambient sound level. The graph D-1 in Appendix D does indicate that impact is a function of ambient sound level. However there is no discussion of this in the text, nor do the conclusions recognize this.

Massport's interest in the selection of the level to be used for assessing significance of impact is not dispassionate. The ability of Massport to develop Hanscom Field unimpeded by further environmental review or mitigation may depend on the selection of this criteria, placing great pressure on the Massport contractor creating the report to use a high value as the impact level used. The fact that conclusions of this report with regard to noise impact are inconsistent with the following public professional comments made by Massport's own noise consultant suggests that the selection of impact levels in the ESPR was not objective.

Background of 65db DNL criteria

The logical background of the 65db DNL value as a Federally recognized mitigation level for residential areas is described by Massport's noise consultant HMMH in the 1992 paper "LDN, Necessary but Not Sufficient". The following points are critical to understand and are summarized:

- The selection of 65db was not strictly based on science but was a decision "incorporating all the economic, technological, and other considerations that are always part of the political process"
- By adopting 65db as the standard it allowed the government to focus first on the "most serious noise problems"
- When the 65db DNL standard was adopted the attainment of the EPA 55db DNL value for residential use was considered "infeasible". It would not be economically feasible to use lower EPA levels because it was believed that in many cases "the sources of noise are deemed to have too valuable a role to be able to completely control the noise they produce".
- Massport's noise consultant states: "We judge it folly to stand before a room full of concerned citizens, show a map with noise contours of only 65db DNL and above and say that there is no adverse effect outside the contour"
- The consultant cautions: "It does not follow from the history of the levels document or from common experience, that once all incompatibilities, as identified by 65db DNL are eliminated, all adverse effects will be eliminated. But that is the implication of any noise analysis that ignores land uses exposed to below 65db DNL".

Related standards for impact significance

The ESPR omits the fact that 65db DNL is not the only, or even the most common, standard for noise impact used by the Federal government. Furthermore, no scientific or international body recommends this standard. Most Federal and International standards for the assessment of noise do use the DNL scale but they specify a lower standard for impact significance.

The following tables summarize the noise impact significance standards used by various Federal, scientific, and international bodies. In Table 1, the known agencies using the 65db DNL standard for residential use are shown.

Table 1: Agencies specifying criteria of 65db DNL

	Residential noise impact Standard	Natural or Historic park noise impact standard
FAA	65db DNL: Incompatible with residential land use	180min Time Above 8dbA below ambient: Remote park areas 180min Time Above 3dbA above ambient: Developed park areas

DOD	65db DNL: Significant Noise Impact	Advise use of a normalization factor to reduce threshold to account for low ambient or sensitive receptors (USAF)
HUD	65db DNL: Unacceptable for housing	None

Note that the USAF suggests the use of a normalization factor to account for low ambient conditions (USAF, 1957 Land Use Planning Guide). Note also that the FAA has a dramatically different standard for noise impact in a National Park. This standard is 3000 times lower in sound energy than the 65db DNL standard. The explanation and interpretation of this standard are provided in Appendix A.

In Table 2, agencies using lower standards for the assessment of significant impact are shown.

Table 2: Agencies and Organizations specifying criteria less than 65db DNL

	Residential noise impact Standard	Natural or Historic park noise impact standard
World Health Organization	50db DNL: Maximum to prevent serious annoyance 55db DNL: Serious Annoyance and unhealthy environment	Advise use of reduced thresholds to account for low ambient or sensitive receptors
Commonwealth of Massachusetts	10dbA above ambient: what constitutes noise as a condition of air pollution DEP 90-001 (note: ambient is on the order of 30-45dbA in Hanscom communities) (note: this is not a DNL metric)	None
EPA	45db DNL: Quiet suburban or rural community 55db DNL: level required to protect health and welfare	Advise use of a normalization factor to reduce threshold to account for low ambient or sensitive receptors
Federal Energy Regulatory Commission	55db DNL: Maximum limit for noise in residential environment	None
Federal Transit Administration	50db DNL: Impact for an existing 40db DNL environment	Specifies reduced thresholds to account for low ambient or sensitive receptors
Federal Railroad Administration	50db DNL: Impact for an existing 40db DNL environment	None

Surface Transportation Board	50db DNL: Impact for an existing 40db DNL environment	None
National Research Council	40db DNL: Full environmental review required for existing 45db DNL environment 55db DNL: Serious noise impact	Specifies reduced thresholds to account for low ambient or sensitive receptors
ANSI	55db DNL: Significant impact	None
EC Country Regulations	45db DNL: No new residential construction permitted in some countries	None
World Bank	55db DNL: Noise limit for any new development	None
OECD	50db DNL: Significant impact in rural environment 55db DNL: Significant Impact urban environment	Advise use of a normalization factor to reduce threshold to account for low ambient or sensitive receptors

Note that this list contains 12 standard bodies that use a lower standard than the FAA 65db DNL criteria. The World Health Organization and the National Research Council should be considered the primary authorities on acceptable levels of pollutants because they are scientific organizations charged with this type of standard setting. Both of these agencies specify 55db DNL as a level of significant impact, and further they both suggest even lower levels for lower ambient conditions or sensitive noise receptors.

Placing DNL values in perspective It is helpful to put the 65db DNL criteria into context. In Figure 1, a vertical scale of DNL values is annotated with various regulatory thresholds.

To appreciate the magnitude of the vertical scale, it is important to understand the following mathematical facts:

- Every 10db in the vertical scale represents a factor of 10 in noise energy: 10db = 10X; 20db = 100X; 30db = 1000X.
- Doubling the aircraft operations at an airfield, keeping the mix constant, only increases the DNL value by 3db. To achieve a 10db increase in DNL for a given aircraft mix requires 8X the number of operations.

Hanscom would need to go to 1,600,000 operations before the sites currently experiencing 55db DNL would experience the 65db level that Massport claims should be used as the criteria for impact. This would be almost 3 times the number of operations of Logan Airport. Arguing that this is the criterion for "significant impact" is not sane or reasonable.

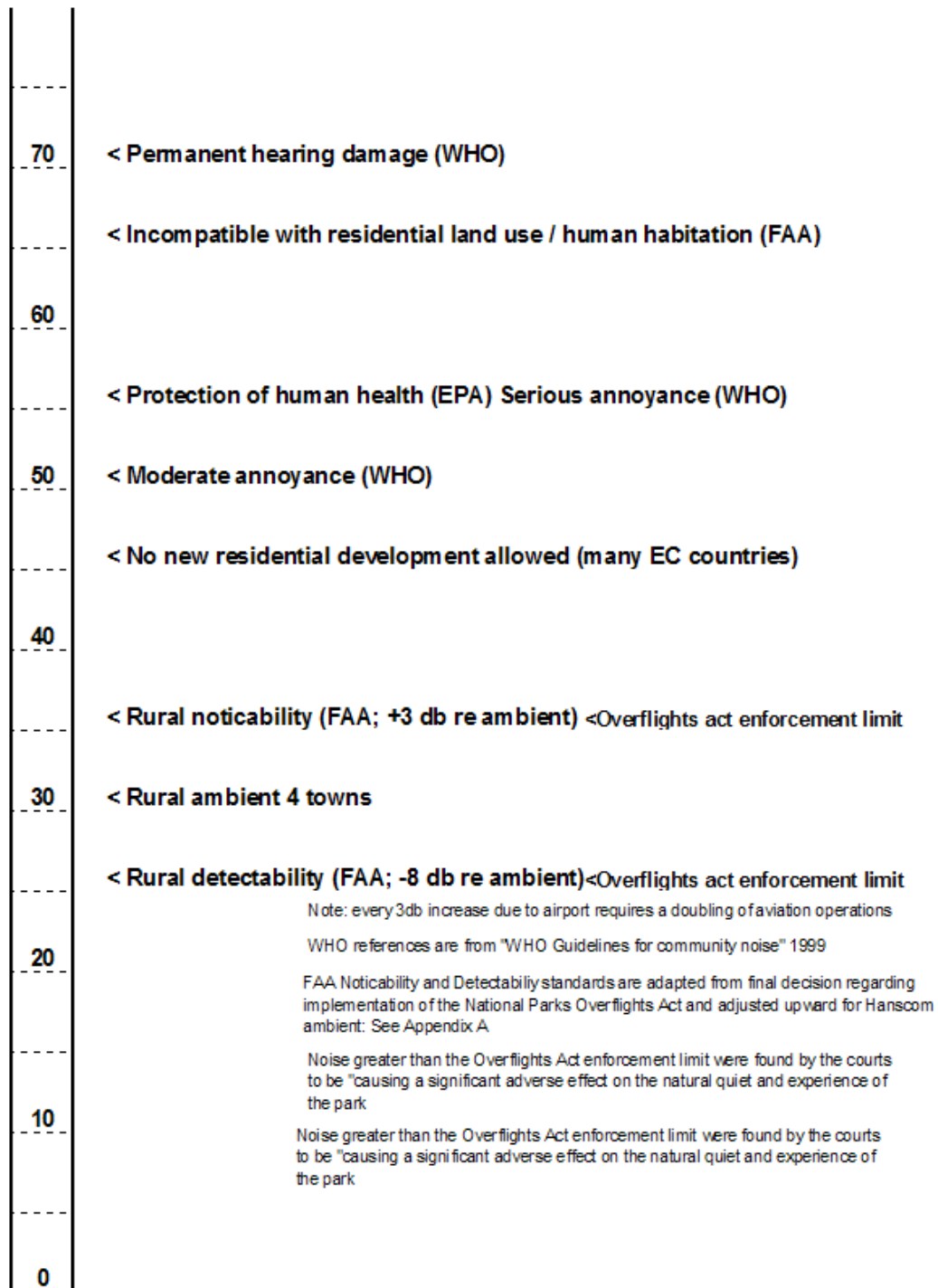
The ESPR uses a criteria which is only 5db away from the level which the WHO classifies as the level at which the onset of hearing damage begins. It is 15db, or 30 times higher in

noise energy, than the 50db standard which is prescribed by scientific and regulatory bodies for rural residential environments.

Furthermore, the use of the 65db DNL criteria for significant impact in National or State Parks and Wildlife Refuges is completely inconsistent with any regulatory standard and is much higher than even the only FAA regulation for noise in a National Park.

Figure 1: Scale of DNL with regulatory citations and reference values

**Noise Level
DNL**



Appropriate standard for impact significance

In adopting an appropriate standard for assessing impact levels in the Hanscom environment the following factors must be incorporated:

- No Federal or international regulations or standards specify or imply that the noise level for significant impact is or should be the same for residential use as it is for natural and historic sites such as National Parks or Wildlife Refuges.
- All federal and international standards that refer to levels for significance of noise impact at natural and historic sites specify that these values are lower than the impact levels for residential land use.
- All the science indicates that impact levels depend on the background sound level, and are lower in rural locations than in urban locations.

The available data and standards suggest that the following criteria would be appropriate for assessment of impact significance in the Hanscom vicinity:

Residential “significant impact”	50db +/-5db DNL	This level is based on Federal and international standards, which range from 40db Leq in the EC up to 55db DNL unadjusted urban residential level by the EPA. It accounts for the significantly lower ambient sound level present in the Hanscom area when contrasted with typical airport locations. The largest amount of standards work in literature and regulation is based on the DNL metric. Standard setting bodies proscribing this level include: EPA, FTA, FHWA, FERC, NRC, WHO, ANSI, World Bank, and the OECD.
Residential “significant impact” alternate method	30min Time Above 55dbA	This level has good correlation with the observed pattern of noise complaints in the Hanscom Area, it is already data that exists in the ESPR, and the Noise Workgroup recommends it.
Natural and Historic “significant impact”	40-45db DNL	This level comprehends the additional sensitivity to noise of natural and historic sites when compared with residential areas. It accounts for the significantly lower ambient sound level present in the Hanscom area when contrasted with typical

		airport locations. References: EPA normalization factors 1974, ISO std 1996.
Natural and Historic “significant impact” Alternate method	180min Time Above 40-45db	This level is based on applying the only standards in US Federal law regarding assessment of noise impact in a National Park environment. It accounts for the ambient sound level present at Hanscom. In specific application the db value may need to be adjusted up or down based on local ambient sound level.

For residential and natural/historic impact assessment, two alternate methods are described. It is likely that the alternate methods will provide results similar to, but not exactly the same as, the described DNL method in the Hanscom environment. In particular, the DNL method is more sensitive to very loud events with a low frequency of occurrence, while the TA method is more sensitive to total event count.

Figure 2: Noise impact area using the TA method

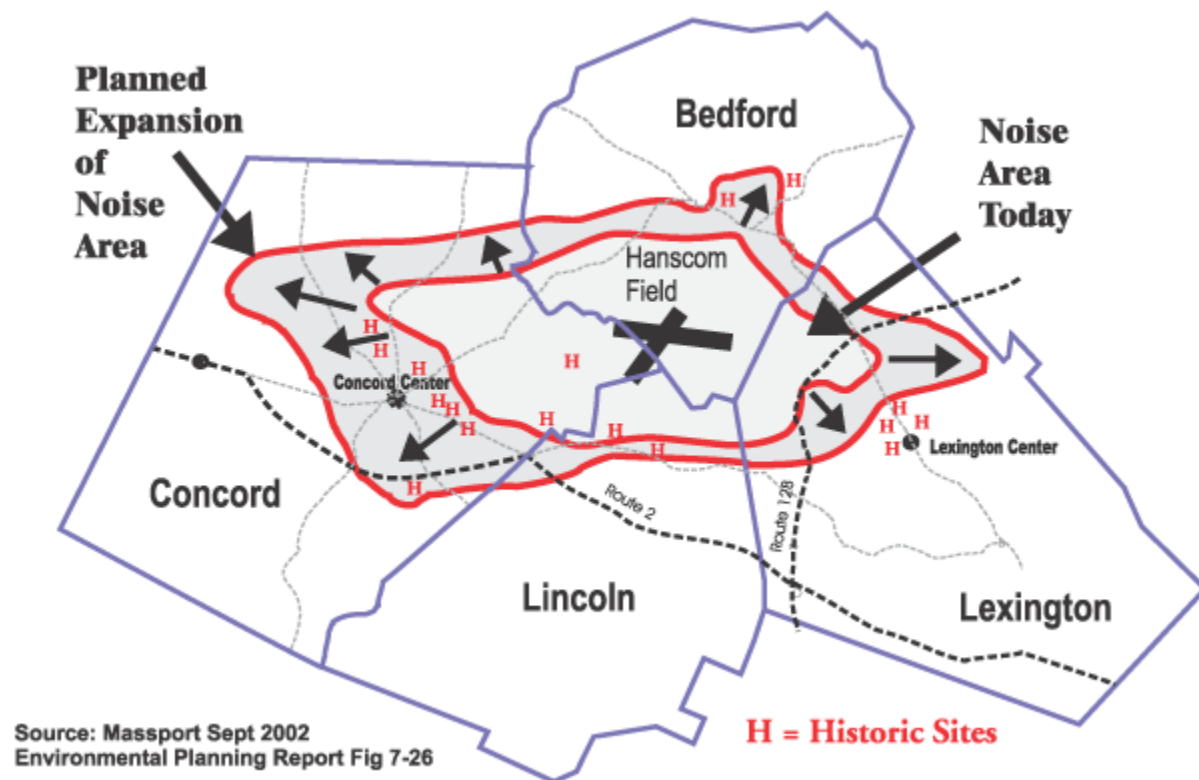


Figure 2 shows that Massport's own data using the TA method show that the noise impacts on Historic sites will be increased significantly under Massport airport growth plans. This figure was generated by the noise report in 2002. It is not current, but can still be

generated any time Massport runs the noise model, but Massport has declined to produce it in subsequent reports.

The use of these criteria would not substantially alter the detailed data presented in the ESPR. However, it would dramatically alter the conclusions based on that data. We suggest that the report conclusions be deemed not valid unless adjusted using the above criteria for assessment of noise impact.

Conclusion

We have demonstrated that:

- The conclusions of the ESPR are dependent on the selection of 65db DNL as a threshold for significant impact.
- The application of the 65db DNL criteria is not founded in science: The World Health Organization, EPA, NRC, ANSI, World Bank, OECD, FTA, FTWA, FERC, MEPA, and even Massport's own noise consultants do not support the use of this value to assess impact. They all specify a lower value and many stipulate a value that is decreased when the ambient sound level decreases.
- The application of the 65db DNL criteria is not founded in law: While FAA does use 65db DNL as a threshold to define "incompatibility with residential land use", nowhere does any law suggest 65db DNL as an appropriate level to assess significance of impact on natural or historic sites. In fact the only US regulation relating to noise impact on a national park specifies a noise level on the order of 30db, 3000 times lower in sound energy level than 65db.
- The application of the 65db DNL criteria is not founded on common sense: The ESPR provides no explanation for the fact that the official stewards of the historic and natural sites claim significant noise impacts already exist. It provides no explanation for the fact that Hanscom Field has more noise complaints filed than Logan Airport. It ignores the fact that the ambient sound level at Hanscom is lower than many other airport locations and that the sensitivity of people to a noise increases when the background sound level is lower. The ESPR model fails to provide agreement with the actual impact described by officials and citizens. Through the use of inappropriate impact assessment criteria, the ESPR ignores reality and attempts to define it out of existence.

We have provided alternative criteria for the assessment of impact, which are based on science, law, and common sense. The application of these criteria would provide a truthful and accurate disclosure of the current impact and of the future noise impact of Hanscom Field on natural, historical, and residential sites.

Appendix A:

Grand Canyon impact level

The impact levels established for the Grand Canyon National Park are not expressed in DNL, and some assumptions are needed to refer them to DNL values. Note that in the Grand Canyon it was found that DNL was not an appropriate metric, similar to the findings by the Hanscom Field Noise Workgroup that DNL is not an appropriate metric. Nevertheless, it is possible to make rough conversions between noise impact metrics, as was required to create Figure 1.

The Grand Canyon rules were established in accordance with a 1987 Congressional Act to:

"...provide for substantial restoration of the natural quiet and experience of the park and protection of public health and safety from adverse effects associated with aircraft overflights"

A noise methodology to establish standards for measuring significance of impact for a National Park are established in 64 Fed Reg at 3971. In summary, two impact levels are defined:

- Remote Park Area Impact Level: This level is established at 8db below ambient sound level and is the level at which aircraft become audible. The aircraft sound is to be below this level for at least 75% of the time. This level of impact significance applies to remote areas of the park.
- Developed Park Area Impact Level: This level is established at 3db above ambient sound level and is the level at which aircraft noise becomes noticeable such that people become distracted by it. The aircraft sound is to be below this level for at least 75% of the time. This level of significance applies to "the more developed areas of the park, where people are engaged in activities other than contemplation".

Note that these standards do not specific impact levels, but establish levels relative to the ambient sound environment. The need to adjust the significant impact level with ambient background is consistent with the recommendations of the Hanscom Field Noise Workgroup and of most Noise Professionals, including Massport's own noise consultants HMMH . For a given environment, it is possible to estimate the DNL values that correspond to the impact levels established by this Federal regulation.

Using the Integrated Noise Model, the impact areas described by this regulation could be determined for Hanscom Field. Absent this analysis, it is possible to roughly estimate the DNL values corresponding to impact significance for a National Park environment.

The ambient sound level in the Hanscom area, as measured by L90, varies depending on location but in the rural areas is on the order of 30-35 db. Therefore, for significant impact

in "remote" areas the appropriate noise contour would be the Time Above 28db 180min contour (180 = 25% of a 12hr std day as defined in the regulations) For significant impact in the "more developed" areas the appropriate noise contour would be the Time Above 38db 180 min contour. These contours are not available in the ESPR; however it is possible to roughly estimate their size using the data in the report. Comparison of the TA 65 and TA55 contours in the ESPR shows rough equivalence in terms of enclosed area for the year 2000 30min TA55 contour and the 90min TA65 contour. This establishes a rough relationship of 3x in duration for every 10db TA. Using this relationship the "remote" impact level TA contour area would be extrapolated to be approximately equal to a 13min TA55 contour, and the "more developed" impact area would be approximately equal to a 40min TA55 contour. While these contours are not in the draft ESPR, a 30min TA55 is included, from which the approximate size of the 13 and 40 minute contours can be estimated. The "more developed" impact area thus obtained would be significantly larger than 55db DNL contour, the lowest DNL reported in the ESPR.

Note that this analysis is based on shifting the impact levels up due to the higher background levels in the Hanscom environment. The actual dbA levels used to assess impact in the Grand Canyon are lower by at least 10db, and the corresponding DNL values used are also at least 10db lower.

The noise impact standards resulting from the National Parks Overflights Act express impacts relative to ambient sound level. These standards can be rationally applied to National Park sites and other noise sensitive sites surrounding Hanscom Field including Great Meadows National Wildlife Refuge, Walden Pond, and large conservation areas like Estabrook Woods. Such application would utilize Time Above contours, and not DNL contours, to describe impact areas. In a discussion of impact limited to utilizing the DNL metric, the Overflights Act standard can be approximated in two parts: a DNL approximately 5db greater than the background ambient sound level for remote areas, and a DNL approximately 15db greater than the background ambient sound level for more developed park areas (where background ambient is measured, as prescribed in the regulation, by L90).

The Integrated Noise Model is fully capable of predicting impact areas as defined in the Overflights Act. Such analysis would provide a more accurate description of the impacts than the estimation and extrapolation contained in this appendix. Nevertheless, absent this analysis the impact areas can be estimated, and these estimates are much better than the arbitrary use of 65db DNL for determining impact.

Appendix B:

WHO impact levels

The WHO noise levels on Figure 1 are not exact DNL values because the WHO document expresses noise levels using the Leq scale, which is nearly, but not exactly, the DNL scale. DNL is computed by using Leq daytime values, but nighttime Leq values are given a 10db increase prior to averaging. Therefore, if the DNL is mainly due to daytime noise, then Leq and DNL are approximately equal. If the DNL were dominated by nighttime noise, then the

DNL would be 10db higher than the Leq value. This means that placing Leq values on the DNL scale as in Figure one is only accurate if the DNL is dominated by daytime noise. Primary contribution to DNL from daytime noise is a realistic assumption for the Hanscom environment. However, the existence and expansion of nighttime operations at Hanscom changes this assumption. A detailed analysis using the Integrated Noise Model could be used to provide a more exact placement of the Leq WHO values on the chart of Figure 1. It is expected that such analysis would result in moving the corresponding WHO impact levels up by less than 2db. Summary: the WHO impact levels are not exactly expressed in DNL, but the error for Hanscom Field will be only a few db.

https://saveourheritage.com/WP_noise.htm