

ASSESSMENT AND MITIGATION OF COMMUNITY NOISE IMPACTS FROM MAJOR HIGHWAY PROJECTS – A PROPONENT’S APPROACH

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1. THE B.C. MoT NOISE POLICY

In 1989 the B.C. Ministry of Transportation (MoT) first adopted a policy to address traffic noise impacts at residences and schools associated with projects involving new or substantially-upgraded Provincial highways. Strictly speaking, the policy applies only to freeway and expressway projects. However, it has been used on some MoT projects that do not fully qualify as controlled access highways. In addition, the policy has been used as a guideline on projects sponsored by the BC Transportation Financing Authority (BCTFA) and the Greater Vancouver Transportation Authority (TransLink).

The MoT policy for noise impacts at residences contains a mitigation eligibility scale which permits larger project related noise increases where pre-project (or baseline) noise levels are lower. In its initial form, this policy included a “hard” upper limit of $L_{eq}(24)$ 65 dBA so that if, in the design year, the overall community noise level due to highway traffic and all other ongoing sources equaled or exceeded 65 dBA, mitigation would be considered. In 1993, the policy (Ref. 1) was revised and the 65 dBA limit was replaced with a maximum 3 dBA increase criteria. This change was made principally because the MoT policy was intended to focus on project-related noise impacts rather than function as a “retrofit policy”- that is, one which attempts to correct for historically high traffic noise levels. Further, it had been recognized that such a hard limit could require mitigation even for minor highway improvements (such as slight widenings or realignments, or traffic diversions) that would result in only very small noise impacts. This approach was consistent with that in use in Australia at the time and that which was adopted in 1995 by the U.S Department of Transportation (Ref. 2) in regards to transit noise.

Figure 2.1 provides a graphical representation of the revised MoT noise policy. The horizontal axis shows the pre-project noise environment expressed in terms of the $L_{eq}(24)$ and usually established through measurement. The vertical axis shows the predicted post-project noise environment (10-years after project completion), established either through a “baseline adjustment” approach or modeling using either manual or computer methods depending on the project scale, complexity and design/assessment stage.

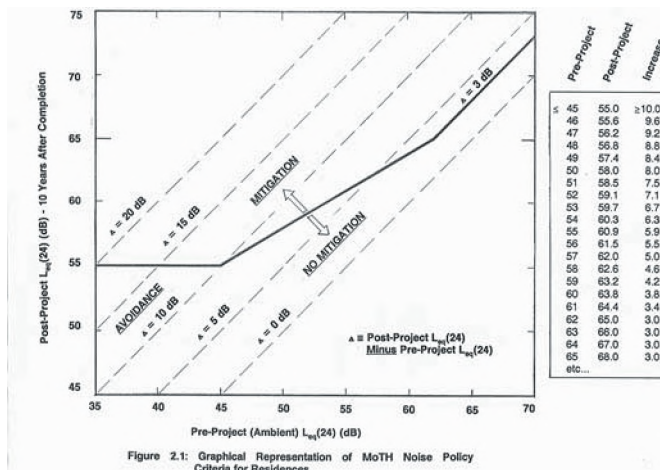


Figure 2.1: Graphical Representation of MoTH Noise Policy Criteria for Residences

2. MoT POLICY RATIONALE

Figure 2.1 indicates that mitigation will not be considered where the combined post-project noise environment does not reach 55 dBA. This minimum mitigation threshold was included for two reasons. Firstly, agencies such as the Canada Mortgage and Housing Corporation (CMHC) and the U.S. Environmental Protection Agency (EPA) consider an average noise environment of 55 dBA or less to be fully compatible with residential land use. Secondly, it is generally not possible to effectively mitigate highway traffic noise at these levels since they tend only to be reached at quite large distances (100 m or more) from highways where traditional roadside noise barriers do not perform well. Where pre-project noise levels are very low (less than 45 dBA), as, for example, where a new highway is planned in a rural area (such as the Inland Island Highway developed on Vancouver Island in the 1990’s), large increases in average noise levels are therefore possible. However, to the extent possible, these impacts are “avoided” through route selection and the use of natural land forms and forested areas as noise buffers.

At post-project levels between 55 and 65 dBA, the allowable growth in noise due to a project decreases steadily from 10 dBA (where pre-project levels is 45 dBA) to 3 dBA where pre-project levels are 62 dBA or more. This sliding scale was adopt to reflect the philosophy that it would be inequitable for the Ministry, in proving necessary highway improvements, to expose those living in areas with high pre-

project noise levels to noise increases of the same magnitude as those living in quieter areas. This approach is consistent with many studies which have shown that the effects of intrusive noise on speech intelligibility, sleep quality and annoyance do not grow steadily with the level of the noise - rather they begin to increase more and more rapidly as noise levels exceed a threshold of about 60 dBA.

3. APPLICATION OF MoT POLICY

It is acknowledged that both the measurement of baseline community noise levels and the prediction of future levels are not exact procedures. As a result, the mitigation criteria of Figure 2.1 are not interpreted rigidly. Rather, mitigation is considered, and carried out where it can be shown to be effective (i.e., achieve at least a 5 dBA average noise reduction), economically feasible (benchmark cost per household of \$15,000 in 1993 dollars) and widely accepted by directly affected residents, wherever the appropriate criterion is “approached or exceeded”. In practice, for purposes of environmental impact assessments and during the early stages of project design, mitigation is considered to be “potentially” warranted (subject to confirmation during detailed design) whenever predicted post-project levels are within 1.5 dBA of the relevant criterion.

Mitigation measures may include the traditional roadside noise barriers (walls), earth berms or berm-wall combinations. Depending on the situation, other less obvious approaches such as “quiet pavements” or the limitation of posted speeds, may be applied, either as “impact avoidance” measures (i.e. to prevent mitigation criteria from being exceeded) or as mitigation measures - either on their own or in combination with noise barriers.

Ultimately, the decision to mitigate is made by MoT project management upon weighing many factors including cost-effectiveness, impacts on other aspects of the project, community expectations and, in the case of B.C. Environmental Assessment Office and/or Canadian Environmental Assessment Agency reviewed projects, input from relevant federal and provincial agencies.

4. EFFECTIVENESS OF MoT POLICY

It may be argued that the effectiveness of a highway noise impact mitigation policy such as that developed by the B.C. MoT may best be judged by its track record in providing mitigation where significant project-related impacts have been forecast while limiting mitigation costs to what is affordable within the project budget. Since the revised MoT policy was adopted in 1993 there have been several major highway projects to which it has been applied. In general, it has been found that where growing traffic demands have warranted the construction of a entirely new controlled access highway or the undertaking of major highway improvements, the policy has resulted in mitigation measures being both warranted and carried out.

With new highways, the potential for substantial noise increases is obvious and policy mitigation criteria have been frequently exceeded. Whether active mitigation (barriers) occurs, tends to depend on the density of populated areas along the new highway alignment and their proximity to it. With highway upgrading projects, it has been found that noise increases sufficient to warrant mitigation are generally forecast. These increases result from a combination of widening, increased traffic volumes over time (10 to 15 years) and, in some cases, increased average vehicle speed due to the freeing of congestion associated with insufficient highway capacity. Some examples are cited below.

4.1 Completed Highway Projects

- *Inland Island Highway* (new highway) - mitigation generally not warranted as numbers of residences were small and setbacks large,
- *Nanaimo Bypass* (new highway) – extensive use of noise walls since in places route passed close to existing communities on outskirts of Nanaimo,
- *Victoria Approaches* (upgrade) – highway widening and development of three new interchanges on TCH north of Victoria resulted in extensive use of barriers,
- *Westview Interchange* (upgrade) – last stoplight on TCH in Greater Vancouver area replaced with diamond interchange - resulted in extensive use of barriers,
- *Duke Point Highway* (new highway) –access to B.C. Ferry terminal located near heavy industrial park south of Nanaimo. Quiet pavement (OGA) and earth berms used to mitigate impacts at scattered rural residences.

4.2 Planned Highway Projects

Several major highway projects are now being planned to address increasing traffic congestion and improve U.S. border access for commercial traffic within the Greater Vancouver area. These include the South Fraser Perimeter Road (primarily a truck route) tying in with ferry and border crossing links, three “Border Infrastructure Program” projects involving Highways 10, 15 and 91/91A, the widening of the TCH between Surrey and Vancouver including the twinning of the Port Mann Bridge over the Fraser River, a New Fraser River Crossing between Surrey/Langley and Pitt Meadows/Maple Ridge. In addition, Highway 99 (Sea to Sky Highway) between Vancouver and Whistler is to be upgraded prior to the 2010 Winter Olympics. It is expected that all of these projects will include some noise impact mitigation measures based on assessment under the MoT noise policy.

REFERENCES

1. “Revised Policy for Mitigating the Effects of Traffic Noise from Freeways and Expressways”, B.C. Ministry of Transportation & Highways, Highway Environment Branch, November 1993.
2. “Transit Noise and Vibration Impact Assessment”, U.S. Dept. of Transportation, Federal Transit Admin., April 1995.