
Appendix 6

Noise Monitoring and Mitigation Plan

(reprint from Section 2.13 of the
Project EMPGM)

NOISE CONTROL AND MITIGATION PLAN

The Noise Control and Mitigation Plan (NCMP) reflects guidelines and procedures outlined in EAC T04-01, Table 1, Section 7.1.4, Owner's Commitments and Responsibilities, Section 7.1.4, Volume 3, Section C of the Application for an Environmental Assessment Certificate and *Guidelines For The Control of Construction Noise Impacts* (April, 2004). The DB Contractor has retained the services of Wakefield Acoustics Ltd. (WAL) to advise on noise control issues, implement a noise monitoring program in accordance with these items and participate in public consultations as required.

Timely completion of the Project will require that substantial amounts of work be carried out during nighttime closure periods between 22:00 and 06:00 hours. This nighttime work (e.g., drilling, blasting, rock loading and hauling) will be required to minimize potential impacts of traffic closures during daylight periods. The DB Contractor realizes that when heavy construction must be conducted at night, the potential for community disturbance and negative reaction is enhanced due to the potential for the disturbance of indoor relaxation and sleep. A variety of the noise mitigation measures are presented in this NCMP, which may be applied individually or in combination to reduce construction related noise at the receiver. However, timely completion of scheduled works (i.e., reducing the overall duration of activity) can also be considered as a form of mitigation.

The NCMP will focus on noise-sensitive enclaves including West Vancouver, Lions Bay, Britannia Beach, IR#24 and urban Squamish. In this regard, the NCMP includes a set of noise management protocols to control construction noise emissions, minimize community impacts and promote community acceptance of unavoidable noise.

These protocols are based on the notion that noise control measures can be applied at the source, along the pathway from the source to the receiver (i.e., residences or other noise sensitive land uses) or at the receiver. Any one or a combination of these measures presented below can be utilized to achieve effective noise impact mitigation. Noise mitigation considerations for the Project are outlined below. Noise mitigation strategies will be developed in consultation with DB Contractor's noise specialist (WAL) to ensure that noise management issues are addressed appropriately. Further detail on these measures will be provided in the EMPs, as they are developed.

Specific noise monitoring, management and mitigation measures will be developed in consultation with the Squamish Nation for construction activities near IR24 (south of Squamish). The EMP for DB8 will address these measures.

MEASUREMENT AND MITIGATION OF NOISE EMISSIONS OF CONSTRUCTION ACTIVITIES AND EQUIPMENT NOISE AT THE SOURCE

Table 1 provides maximum noise emission levels that can generally be expected from new equipment or used equipment in good condition. These levels, updated in 2005 from the April 2004 Guidelines, are meant to provide guidance in limiting overall construction noise emissions by identifying excessively noisy pieces of equipment for quieting and/or rescheduling or relocating. If any piece of equipment is found to significantly exceed (i.e., by 2 dBA or more) the levels of Table 10, appropriate noise mitigation measures (either at the source and/or along the sound path) will be taken to bring the noise emissions back in line with those expected of similar equipment in new condition or good repair.

Table 1 Guidelines for maximum noise emissions during nighttime hours.

Construction Equipment Type	Maximum Sound Noise Level (L_{max}) in dBA Measured at Distance of 15 m
Air Compressor	80
Backhoe	80
Concrete Truck/Mixer	85
Crane, Mobile	85
Dozer	85
Dump Trucks	84
Generator	82
Grader	85
Hoe Ram	90
Jackhammer*	85
Loader	85
Paver	85
Rock Drill (Pneumatic)	93
Rock Drill (Hydraulic)	88
Roller	80
Miscellaneous Trucks	84

The following noise measurements and mitigation measures shall be carried out in order to limit the noise emissions of heavy equipment to be used during nighttime construction activities and thereby minimize disturbance of adjacent communities:

- All heavy mobile equipment and ancillary powered equipment to be used during nighttime hours at locations within 500 m of residences or other receptors having sensitivity to nighttime noise will have their noise emission levels measured at a standard setback distance of 15m in the direction of maximum noise emissions as relevant to the particular noise receptors involved.

- In all cases the measured noise levels will be compared to the suggested maximum nighttime noise levels provided in Table 10.
- Equipment noise emission measurements will be conducted within five working days of the initial use on the Project of heavy equipment for nighttime construction activities within 500m of noise sensitive receptors. These measurements shall be repeated on at least a semiannual basis for equipment that will continue to be used for nighttime work within 500m of noise sensitive receptors.
- Noise emission measurements will be made within five working days of the arrival at the site of any additional or replacement of heavy equipment intended for use in ongoing nighttime construction activities within 500 m of a noise sensitive receptor. This requirement could be postponed if the equipment had been in use elsewhere on the Project and had been tested within the previous six months or was new and had a manufacturer's noise emission rating in compliance with the suggested maximum levels of Table 10.
- WAL staff will in most cases, conduct equipment noise emission measurements. However, subject to WAL's approval, the environmental monitoring staff that are more regularly on site and can respond more promptly may also conduct them. WAL staff will provide monitoring staff with appropriate training in this regard. Situations in which this approach might be appropriate would include the arrival of a new piece of equipment on a site of ongoing night work and the imminent occurrence of a unique construction activity for which there is insufficient time for WAL staff to reach the site.

Noise control measures that may be carried out "at the source" include:

- maintaining all construction equipment in good working condition in order to minimize general noise emissions;
- implementing management and education controls to raise and maintain the awareness of equipment operators of the need to minimize noise emissions when working near (within 500 m) residential areas;
- when practical, shutting down heavy equipment when not in active use, rather than letting it idle for long periods; and
- minimizing or eliminating the use of back-up beepers and blasting horn signals during nighttime construction activities providing there is compliance with BC Worker's Compensation Board requirements.

These and other measures are outlined in guidelines provided in Section 7.13 and Section 7.1.4, Volume 3, Section C of the Application for an Environmental Assessment Certificate.

Additional approaches to source noise control, which may be considered, involve the allocation and scheduling of pieces of equipment with similar functions but differing noise emissions. These include:

- when feasible, utilize the quietest type or model of equipment and/or construction technique to do a particular job with similar efficiency;
- when more than one piece of equipment is available to do the same job, use the quietest piece for nighttime work and/or in locations closest to noise sensitive receptors; and
- if noise emissions from a particular piece of equipment cannot practically be brought into line with the guidelines provided in Table 10, restrict to the extent possible, its use to daytime hours only and/or to locations remote from noise sensitive receptors.

Mitigation of Noise Along the Pathway

Should noise mitigation measures at the source be impractical or inadequate, a reduction of noise to levels in the neighbourhood of 5 to 15 dBA may be achieved at the receiver through effective blocking, shielding of the noise path with noise barriers or the relocation of noisier activities or equipment to a more opportune location (i.e., farther away or where shielded by natural or human-made features).

Key pathway noise control measures include:

- locating and orienting stationary equipment (e.g., generators and compressors) so that natural noise screening/dampening features such as rock outcroppings or cut slopes are utilized to prevent noise from traveling directly from the sources(s) to adjacent noise sensitive areas; and
- when feasible, utilizing temporary noise barriers (e.g., rock/dirt piles) to obstruct the direct sound pathway between source and receptor.

Management and Education

Communications-related mitigation measures should be directed at the local residents (receivers) in order to minimize negative community response to noise created by the nighttime construction work that is vital to the on-time completion of the Project. Receiver mitigation methods are based on increasing the awareness and knowledge of local residents about the Project and responding to their concerns as promptly and effectively as possible. The DB Contractor will establish and maintain lines of communication with all communities and residents groups that may be impacted by construction noise in order to:

- inform potentially affected communities well in advance of the timing and likely duration of all major construction phases (particularly those to be conducted during nighttime) and of any changes in these plans;
- notify communities well in advance of any particularly noisy activities that are anticipated (e.g., rock drilling, blasting, pile driving);
- field “concerns/complaints” via the site office – residents will be able to inform the contractor of their construction noise concerns by telephone on a 24-hour basis. The site office telephone number and responsible personnel will be provided to local residents during work notification; and
- in collaboration with WAL, resolve noise concern/complaint situations in a timely fashion, by considering all practicable means to mitigate noise impacts, either through changes of work schedule, use of alternative construction techniques, quieting and/or relocation of key equipment or the construction of effective temporary noise barriers.

Noise Monitoring Program

A community noise monitoring program will be conducted by WAL on a regular basis to:

- measure and record construction noise levels over representative time periods at residential or other noise-sensitive receivers as a means of documenting the receiver’s noise exposures (particularly at night) and facilitating response to noise complaints received; duration and timing of measurements will be sufficient to be representative of the conditions (including weather conditions) that would be most likely to lead to community complaints;
- quantify/document the effectiveness of any noise abatement measures; and
- measure and record ambient noise levels (e.g., highway and railway) for baseline comparison.

Monitoring of noise from ongoing construction operations will be carried out at the following times:

- within three days of the start of nighttime construction activities that have significant noise generation potential to within 1000 m of a particular residential enclave or other noise sensitive receiver;
- within three days of a significant change in the noise output of a nighttime construction operation in a particular area, for example, as a result of the commencement of a new noise-making activity or the introduction of different types of noisy equipment;

- within three days of the implementation of significant noise mitigation measure(s) in locations where noise concerns/complaints have been expressed/received; and
- within two days of the receipt of new community complaints/concerns about nighttime noise from recently introduced construction activities. Ongoing complaints about noise issues previously addressed or in the process of being addressed by the DB Contractor would generally not warrant noise monitoring.

An interim letter report will be prepared following each noise monitoring session briefly outlining the monitoring results and any immediate noise mitigation strategies that may be implemented in the short-term. The interim report will be submitted to the Province within 3 working days of the monitoring session.

A final report, describing in further detail the measurement methodology and results will recommend, with supporting rationale, whether or not noise mitigation and/or follow-up noise monitoring is warranted for specific locations. If further monitoring is warranted, a methodology and timing will be proposed. Noise monitoring reports, communications with local residents and resulting mitigation measures will be submitted to the Environmental Manager and Segment Project Manager for subsequent forwarding to the Province. The final report will be submitted to the Province within 10 working days of the monitoring session.