Noise Impact of the Vancouver Island Motorsport Circuit:

Results of the Sahtlam Noise Monitoring Project

a report by the

Sahtlam Neighbourhood Association

August 2019

Background

In April 2016, the Vancouver Island Motorsport Circuit (VIMC) opened its doors, and residents living in the Sahtlam region of Duncan began experiencing intrusive noise. The sounds of high-performance engines and squealing tires disrupted the quiet rural ambience of this residential neighbourhood, robbing citizens of the peaceful enjoyment of their properties and interfering with their daily lives at home. The Sahtlam Neighbourhood Association (SNA) was formed in response to this development.

In July 2017, VIMC submitted a rezoning application to the Municipality of North Cowichan for a planned expansion of their motorsports facility that would triple the size of the current track. In 2019, as part of the ongoing application process, North Cowichan staff asked the SNA for information that could help assess the impact of noise from VIMC on the surrounding neighbourhood. Specifically, they requested data from a 2018 community noise monitoring project that was conducted by the SNA with assistance from BKL Acoustical Consultants.

This report presents information from the noise monitoring project in the context of a discussion around appropriate noise limits for VIMC.

prepared by:
Mariah Wallener, PhD
Director, Sahtlam Neighbourhood Association
August 26, 2019

Introduction

The degree of intrusiveness of a particular sound depends in part on the type of sound and its loudness.[1] With regard to type of sound, some sounds are less intrusive than others. For example, compare the sound of bird song with that of a leaf blower — even at the same volume, the former is generally considered a pleasant sound that can decrease stress, while the latter is generally considered unpleasant and a potential cause of stress.

The relationship between loudness and intrusiveness is very much dependent on the level of background noise, or *ambient noise*, in the environment. For example, in a crowded city square (high ambient noise) the sound of a cell phone ringing will not be intrusive to those nearby, but in a public library (low ambient noise) that same cell phone becomes intrusive, even if the volume and distance to the listener remain the same. Thus, when discussing noise limits for a particular source, it is critical that we also consider ambient noise levels at the affected points of reception. Accordingly, in 2018 the SNA implemented a community noise monitoring project, guided by BKL Acoustical Consultants.

The purpose of this report is to present data from the noise monitoring project and to discuss the results in the context of proposed noise limits for VIMC. The goal is to inform North Cowichan staff and council about noise conditions in our neighbourhood, the current impact of activities at VIMC, and the potential impact of expanded facilities in the context of the current rezoning application.

[1] *loudness* is the perception of a particular sound pressure level and depends on physiological and psychological factors as well as the physics of sound; for the purposes of this report we will consider loudness as equivalent to sound pressure level in A-weighted decibels (the weighting factor attempts to adjust for how the human brain perceives loudness)

Methods

BKL Consultants was hired by the SNA to provide equipment, guidance, and expertise for the community noise monitoring project. A professionally maintained and calibrated 01dB DUO digital sound level meter was delivered to us specifically for this project, along with detailed instructions on how to set up and use the device. In addition to decibel readings, the sound level meter automatically recorded audio whenever sound levels exceeded 35 dB; this information was used to identify sources of noise.

Noise monitoring took place between March 23 and April 2 of 2018 at four residential locations near VIMC (see below). The sound level meter was affixed to a tripod with a vertical mount and placed in an open area, with the back of the device facing in the direction of VIMC. Photos were taken of the monitor setup at each location.

A logbook was maintained throughout the project to record details such as height from the ground (tripod mount), distance to the nearest building, air temperature, and weather conditions. In addition, operators took notes on various sources of noise whenever possible, referring to the time displayed on the sound level meter.

Recordings took place during daytime hours, and the device was stored indoors and charged overnight. Data was analyzed using dBTrait software provided by BKL Acoustical Consultants.

Recording Sites

Four recording locations were chosen based on noise impact from VIMC and ability to access the property throughout the project period (see Figure 1, below). They are: 6231 Mina Drive, 4242 Sahtlam Road, 4195 Sahtlam Road, and 4190 Sahtlam Road.

Figure 1. Map showing VIMC (green) and the four recording sites (red) for the Sahtlam noise monitoring project: 6231 Mina Drive and 4242, 4195, and 4190 Sahtlam Road. [Note: top of image is North]

6231 Mina Drive

Mina Drive is a cul-de-sac located directly across Highway 18 from the entrance to VIMC and is the closest residential street to the track. The house at #6231 is located at the southeast end of Mina Drive, 425 m from VIMC (nearest track edge)[2] and at an

[2] all stated distances from the track were calculated using Google Earth

elevation of 115 m.[3] The sound level meter was placed on a flat grassy spot south of the main house, 19.5 feet east of the greenhouse.[4]

4242 Sahtlam Road

Sahtlam Road is a dead-end street that runs parallel to Highway 18, south of VIMC and Mina Drive. The house at #4242 lies at the end of the road, 900 m from VIMC (nearest track edge) and at an elevation of 120 m, which is the highest elevation on Sahtlam Road. The sound level meter was placed at the top of the gravel driveway, 38 feet north of the front porch of the house.

4195 Sahtlam Road

The house at #4195 is located 755 m from VIMC (nearest track edge) at an elevation of 95 m. The sound level meter was placed on a flat grassy area 23.5 feet from (and perpendicular to) the northeast-facing wall of the main house.

4190 Sahtlam Road

The house at #4190 is located 930 m from VIMC (nearest track edge) at an elevation of 90 m. The sound level meter was placed on a flat gravel driveway 50 feet from (and perpendicular to) the southwest-facing wall of the RV storage building.

Sample Selection

Audio and sound level data from recordings at the four locations were reviewed using dBTrait software to identify and confirm sources of noise and to select samples for analysis. Only recordings taken between 8:30 am and 5:00 pm (business hours for VIMC) were used.

[3] all elevations are in metres above sea level and were obtained from either (a) plans submitted by VIMC as part of the application package and made available on the North Cowichan website, or (b) topographical maps provided by North Cowichan via their interactive GIS mapping website (https://maps.northcowichan.ca/mnc_public/)

[4] distances from the nearest building were measured directly at the site

Samples for ambient noise analysis were selected from various times of day (within the hours noted above) to portray a thorough picture of the sound level environment at the recording sites. We chose 1-hour periods for analysis of ambient noise wherever possible. All such samples were free of track noise, as confirmed by operator notes and review of audio recordings.

To demonstrate the impact of track noise, samples were selected from recordings collected on March 31, when track activity at VIMC was clearly audible at the recording locations and visually confirmed at the source. On this day, the auto club "Speed Fanatics" had booked the track for a speed day event, and track noise persisted throughout most of the day. Because track sessions were limited to approximately 20 minutes per group, we were unable to obtain a continuous 1-hour sample of track noise. Nevertheless, to provide a direct comparison with ambient noise data, we also analysed a 1-hour sample that included break period intervals.

Data Analysis

The main goal of the Sahtlam Noise Monitoring Project was to characterize ambient noise in the neighbourhood. This information was then used to calculate the noise impact of a representative track day at VIMC. To achieve both aims, we followed a widely used standard for assessment of environmental noise: BS 4142 - Methods for Rating and Assessing Industrial and Commercial Sound.[5] This method relies on two decibel metrics: LAeq and LA90.[6]

As a brief review, sound pressure level (loudness[7]) is typically measured in decibels (dB). The decibel scale is referenced to the threshold for human hearing and the manner

[5] https://hayesmckenzie.co.uk/news/what-is-bs4142
[6] the "A" indicates A-weighted decibels; see Footnote 1
[7] see Footnote 1

in which the human ear perceives sound pressure. Accordingly, the decibel scale has a logarithmic, rather than linear, distribution where each increase of 10 decibels is roughly equivalent to a perceived doubling of loudness. Modern digital sound level meters can measure and record hundreds of decibel readings per minute, and this data can be analysed by the device using various algorithms. The resulting noise metrics can be used to convey useful information about environmental noise conditions in the recording area. As noted above, the two noise metrics used for this project were LAeq and LA90.

The equivalent sound level, or LAeq, is a way of expressing sounds that vary over time in terms of a single number.[8] It can be helpful to think of LAeq as an average sound level, although this is not entirely accurate from a mathematical perspective. LAeq is generally accompanied by an indicator of the time period over which the calculations were made. BS 4142 recommends a period of 1 hour depending on the stability of the noise source and interference from other sources.

LA90 is a percentile decibel level that corresponds to the noise level that was exceeded for 90% of the measurement period (see Figure 2, below). It can be viewed as the "usual low" for a given sound environment, because it excludes the less frequent lows (i.e., those that occur less than 10% of the time). We used LA90 to characterize ambient noise in our neighbourhood. This is an established metric for representing background levels in a particular noise environment (e.g., a neighbourhood) for the assessment of noise impacts from industrial operations,[9] including industrial projects here in British Columbia.[10] In addition, use of LA90 is consistent with the concept of *predictable worst*

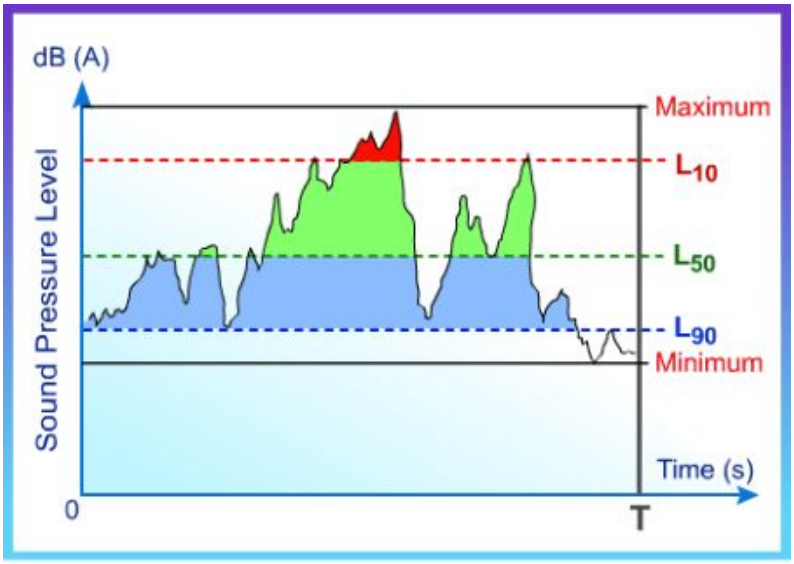
[8] equivalent sound level is the constant noise level that would result in the same total sound energy being produced over a given period

[9] https://pulsarinstruments.com/en/post/what-are-ln-values-and-how-are-they-used

[10] Blackwater Gold Project: Noise 2011-2012 Baseline Report, prepared by AMEC Environment and Infrastructure for New Gold Inc, Vancouver. Retrieved on August 10, 2019 from http://s1.q4cdn.com/240714812/files/documents_properties/blackwater/NewGold_BL_Noise_130628_Final1%20(2).pdf

case noise impact,[11] which refers to the fact that the impact of a specific noise source (e.g., noise from a nearby factory) must be measured against the lowest noise levels in the affected area, otherwise the source will only be compliant some of the time.

Figure 2: Illustration of percentile noise levels. L90 is shown in blue.



Having selected samples for analysis, we followed the methods described in BS 4142 to evaluate the impact of track noise from VIMC at a particular recording site using LAeq and LA90. First, we determined LAeq at the recording site during a period of track activity at VIMC. Next, LAeq for ambient noise at the recording site was subtracted from the former to yield the "specific noise level". We used the lowest LAeq from the selection of ambient noise samples, in keeping with the principle of *predictable worst case noise impact* (see above). The specific noise level was compared to LA90 at the recording site to determine the *degree of impact*.[12] As per BS 4142, a difference of 5 dBA indicates an "adverse impact", while a difference of 10 dBA or more indicates a "significant adverse impact".

[11] e.g., NPC 300 - Ontario Environmental Noise Guidelines
[12] BS 4142 also calls for the addition of a decibel "penalty correction" based on the tonal quality of the sound, which is added to the specific noise level before comparison with LA90; in order to simplify the analysis process, we did not use penalty corrections in our calculations

Results

Data Selection

Several 1-hour samples were selected for analysis to determine ambient noise levels at each of the four recording sites. We aimed to choose samples from different times of day whenever possible in order to present a more thorough characterization of sound levels at the recording sites. In addition, we chose samples that were free of significant contamination noise, such as the operator and other persons speaking while standing next to the microphone, or heavy equipment (tractors, chainsaws) being used within 100 metres of the recording site. In total, we analysed 22 samples representing over 21 hours of ambient noise monitoring.

To determine the impact of track activity, we selected samples from recordings taken on March 31 when the “Speed Fanatics” club was using the track. In keeping with the habitual pattern for this type of activity at VIMC, less experienced drivers used the track in the morning, while the most advanced driver groups used the track in the afternoon. We obtained recordings at two separate locations during the same afternoon session of advanced drivers, starting at 4242 Sahtlam Road and then quickly moving the monitor to 6231 Mina Drive while the same group was still on the track. Thus, we were able to obtain noise readings for the same activity at two separate locations. As noted above, track sessions typically lasted around 20 minutes, and selected samples were restricted to this period. For comparison, we also analysed a 1-hour recording from that day, which included a couple of break periods.

Data Analysis Results

Table 1 shows the results of ambient noise data analysis for the four recording sites.

Table 1: Results of Ambient Noise Data Analysis

location	date	time	LA90	LAeq[a]
6231 Mina Dr	Sun Mar 25	09:58:16 - 10:50:53	38	45
		12:53:50 - 13:53:32	39	47
		15:25:52 - 16:25:34	40	45
	Mon Mar 26	09:25:35 - 10:25:24	38	45
		10:25:49 - 11:25:38	40	46
		11:26:54 - 12:26:43	39	47
		14:24:41 - 15:24:30	40	47
4242 Sahtlam Rd	Fri Mar 23	11:30:09 - 12:30:01	30	41
	Sat Mar 24	08:32:43 - 09:31:56	32	39
		09:31:44 - 10:30:57	32	45
		11:06:56 - 12:06:09	31	44
4195 Sahtlam Rd	Sat Mar 24	13:22:17 - 14:22:25	33	41
		15:44:01 - 16:44:09	26	36
	Tue Mar 27	10:40:23 - 11:40:50	31	38
	Mon Apr 2	09:06:53 - 10:06:39	31	40
		10:15:19 - 11:15:05	31	44
4190 Sahtlam Rd	Wed Mar 28	14:00:50 - 15:00:08	30	40
		16:01:00 - 17:00:18	33	41
	Thu Mar 29	13:29:05 - 14:29:19	33	38
		14:30:18 - 15:30:32	33	38
		15:31:19 - 16:31:33	27	40
		11:42:58 - 12:42:58	30	42

Note: all sound levels are in A-weighted decibels, rounded to the nearest whole number

[a] equivalent sound level for the sample period

During the preparation of this report, the VIMC rezoning application was released to the public. For the first time, VIMC proposed a noise limit that was not based on LAeq. Instead, they proposed a noise limit in units of LA20.[13] Accordingly, we added LA20 to the decibel metrics for analysis of track recordings in order to contribute to the discussion on appropriate noise limits for VIMC. Table 2 shows noise level analysis results for recordings made on March 31 when there was a track day event at VIMC.

Table 2: Results of Track Day Noise Data Analysis

location	Session[a]	time	LAeq[b]	LA20
4242 Sahtlam Rd	1	11:33:28 - 11:49:04	51	53
	2	13:04:49 - 13:28:17	52	53
6231 Mina Dr	2	13:36:58 - 13:58:24	56	57
	3	14:11:31 - 14:30:00	57	58
	2 - 3[c]	13:36:58 - 14:35:56	55	57

Note: all sound levels are in A-weighted decibels, rounded to the nearest whole number

[a] numbers identify sample recordings for the purposes of this report; they have no other significance

[b] equivalent sound level for the sample period

[c] this one-hour sample includes break periods (see Discussion below)

Table 3 shows the results of noise impact analysis (see Methods, above) at the two locations where both track noise and ambient noise were measured. For noise impact calculations at 4242 Sahtlam Road, we used data from track session 2 (see Table 2), which was the loudest session in the recording for 4242 Sahtlam Road on that day. That same session was captured a short time later at 6231 Mina Drive and used to calculate the noise impact for that location. We also determined the noise impact for session 3, which was the loudest session at that location. Finally, we calculated the noise impact

[13] see page 81 of Agenda for Regular Council Meeting, August 21, 2019; northcowichan.ca

at 6231 Mina Drive using the 1-hour sample from that recording to compare results with those of shorter sample selections.

Table 3: Noise Impact Assessment Results

Location	Session (from Table 2)	LAeq (track noise)	LAeq (ambient noise)	Specific Noise Level[a]	LA90 (ambient noise)	Noise Impact
4242 Sahtlam Rd	2	52	39	52	30	**22**
6231 Mina Dr	2	56	45	56	38	**18**
	3	57	45	57	38	**19**
	2 - 3	55	45	55	38	**17**

Note: all sound levels are in A-weighted decibels, rounded to the nearest whole number

[a] addition and subtraction of logarithmically distributed numbers does not follow the same rules as that for normally distributed numbers; to perform the subtraction calculations for specific noise level, we used an online logarithmic calculator[14]

[14] https://www.noisemeters.com/apps/db-calculator/

Discussion

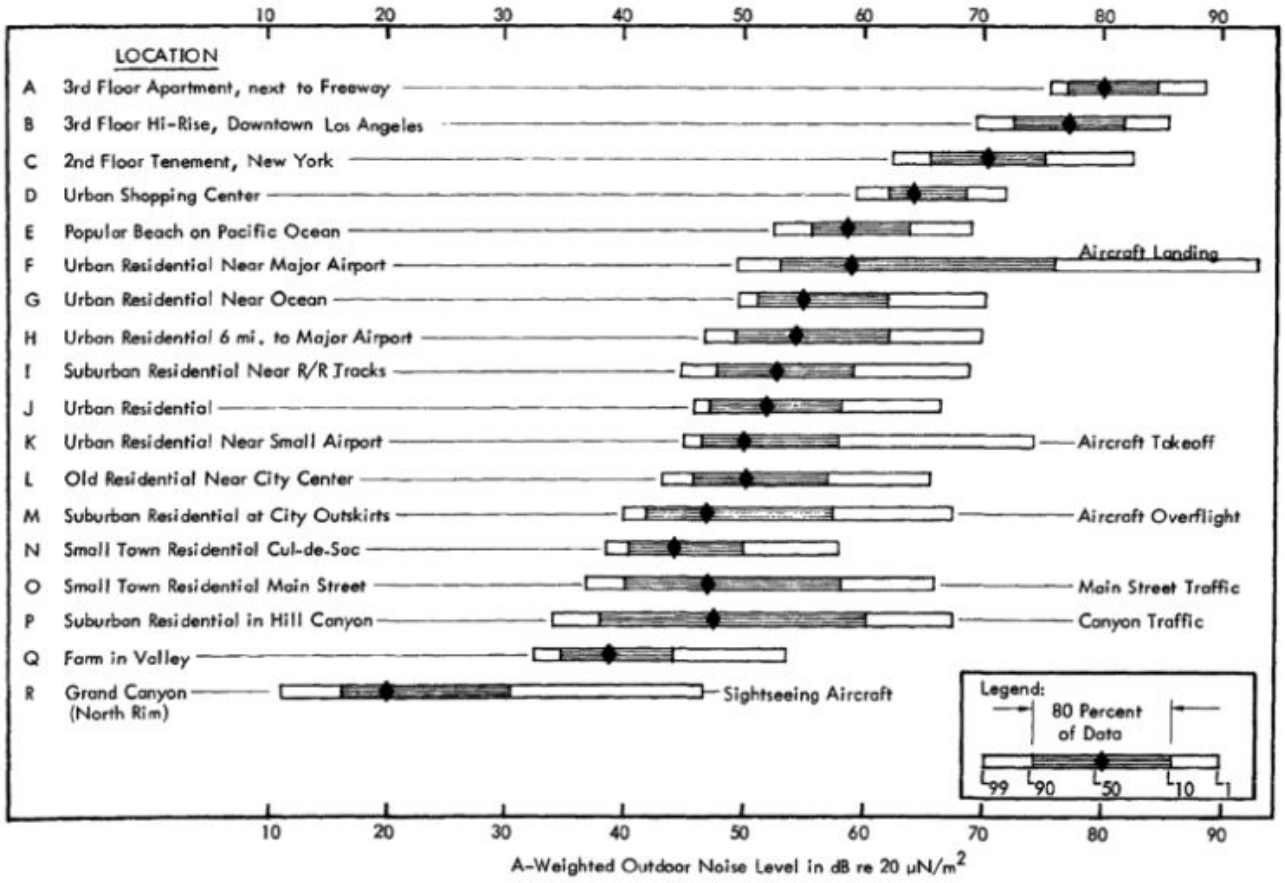
Ambient Noise Levels

At 6231 Mina Drive, ambient noise levels (LA90) from 7 samples recorded on 2 different days (one weekend, one weekday) ranged from 38 to 40 dB. On Sahtlam Road, ambient noise levels recorded on 6 different days from three locations ranged from 26 to 33 dB.

To provide some context for these results, Figure 3 shows examples of LA90 levels in various environments. From this it can be seen that LA90 values on Mina Drive are consistent with that of "small town residential", while values on Sahtlam Road lie somewhere between parkland ("north rim of the Grand Canyon") and pastoral ("farm in valley").

Figure 3: A-weighted sound levels at 18 locations in the United States.[15] Each bar on the right shows LAmin (left end of the bar), LA90 (left end of the shaded part of the bar), LA50 (black diamond), LA10 (right end of the shaded part of the bar), and LAmax (right end of the bar). The list is in order from loudest (3rd floor apartment next to Freeway, LA90 ~ 75 dB) to quietest (north rim of the Grand Canyon, LA90 ~ 15)

[15] Source: *Community Noise*, a report by the US Environmental Protection Agency; publication number NTID 300.3, December 31, 1971; as cited in Architectural Acoustics: Principles and Practice, by William J. Cavanaugh, Gregory C. Tocci, and Joseph A. Wilkes, Figure 3.2.; retrieved from Google Books



Noise Impact of VIMC

Given the low ambient noise environment at the recording sites, it is not surprising that track noise had a significant negative impact. We were able to calculate noise impact at two recording sites using the methods of BS 4142 (Methods for Rating and Assessing Industrial and Commercial Sound; see Footnote 5). The site with the greatest noise impact from track activity at VIMC was at 4242 Sahtlam Road, with an impact factor of 22 dB. According to BS 4142, an impact factor of more than 10 dB indicates a significant adverse impact. Thus, our results show that track noise is highly intrusive and disruptive at this location.

The noise impact factor at 6231 Mina Drive was slightly lower. For session 2 (see Table 2), which is the same session used to calculate noise impact at 4242 Sahtlam Road, the impact factor was 18 dB. A later session that day (session 3; see Table 2) was more intrusive, with an impact factor of 19 dB. Finally, to address concerns about the differences in sample duration, we used a one-hour sample from the track day recording to calculate noise impact at 6231 Mina Drive. This sample included one 10-minute break period and the first 5 minutes of a second break period. The noise impact factor was 17 dB. Using any of these calculations, it is clear that noise from the speed day at VIMC had a significant adverse impact on the sound environment at this location.

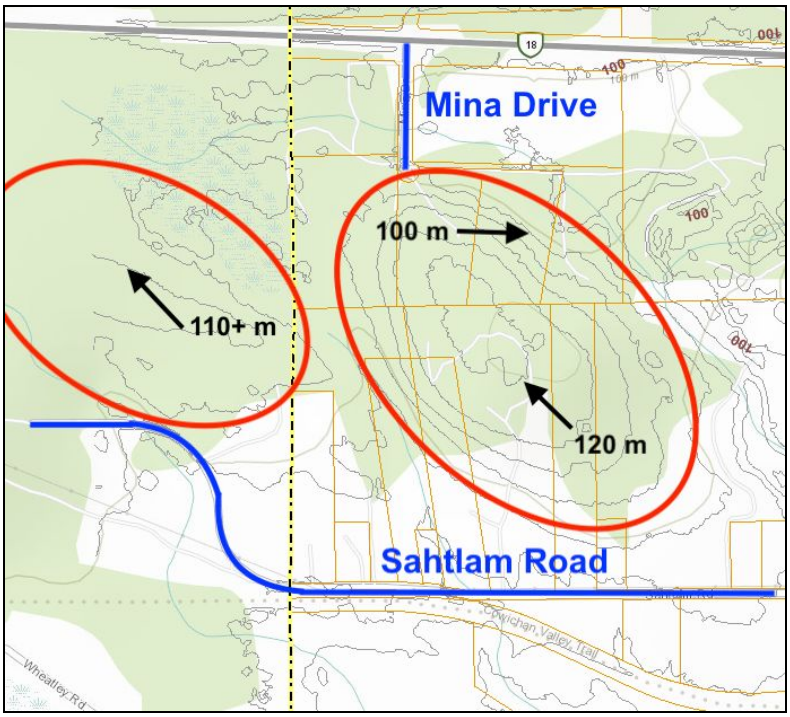
An important finding is that the noise impact was greater at 4242 Sahtlam Road than at 6231 Mina Drive, despite the fact that the former is almost 1 km away from VIMC (900 m). In comparison, 6231 Mina Drive is 425 metres away from VIMC. Normally, one would expect the greatest noise impact to be at the location closest to the noise source. So why does the impact of noise from VIMC get worse farther away from the track? The answer has to do with Highway 18 and the local topography.

Topographical Factors

Mina Drive lies directly off Highway 18 and therefore traffic noise contributes significantly to ambient noise at this location. Nevertheless, the property at 6231 Mina Drive sits above Highway 18 at an elevation of 115 m (the highway is at 100 m). This likely explains the low ambient noise levels at this recording site (38 - 40 dB). At the other recording sites in the 4100 and 4200 block sections of Sahtlam Road, highway noise is barely audible, as evidenced by the very low ambient noise levels (26 - 33 dB). In other words, the level of highway noise drops significantly between Mina Drive and Sahtlam Road.

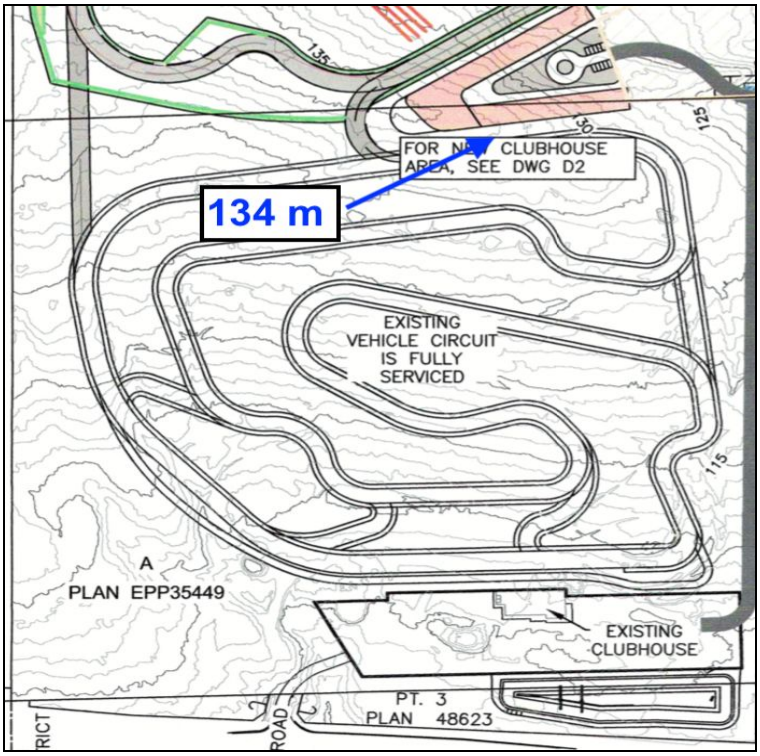
This rapid attenuation of highway noise over distance is due to the local topography. As shown in Figure 4 (below), two hills 120 metres in elevation sit between Mina Drive and Sahtlam Road. These hills act as natural barriers against noise from Highway 18, which sits at an elevation of 100 metres.

Figure 4: Topography of the region between Highway 18 and the western end of Sahtlam Road. Red ovals indicate hills. [Note: contour lines for the hill on the left are not completely shown on this North Cowichan map because that portion lies in Area E of the CVRD].



In contrast, the existing VIMC track reaches an elevation of 134 metres (see Figure 5 below), well above the natural sound barriers created by the hills shown in Figure 4. Consequently, track noise has a direct path to the end of Sahtlam Road and elevated points further south.

Figure 5: Topography of existing VIMC track. Maximum elevation is shown in blue.

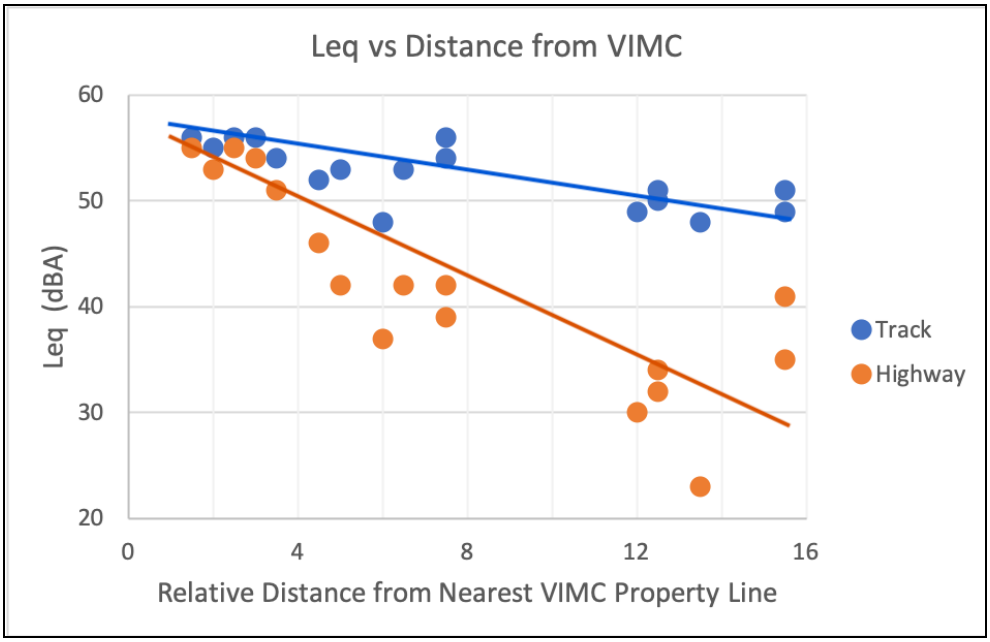


The net result of these topographical features is that traffic noise diminishes significantly as one moves south from Highway 18, while track noise is subjected to far less attenuation.

This fact was clearly demonstrated in the VIMC expert noise reports submitted as part of the rezoning application.[16] Figure 6 (below) shows data for estimated highway noise and track noise from one of those noise modelling studies. The points of reception are arranged in order of relative distance from VIMC. Highway noise attenuates significantly with distance, from a high of 55 dB to a low of 23 dB, resulting in a net 32 dB decrease. In contrast, over that same distance, track noise decreases by only 8 dB (from a high of 56 dB to a low of 48 dB).

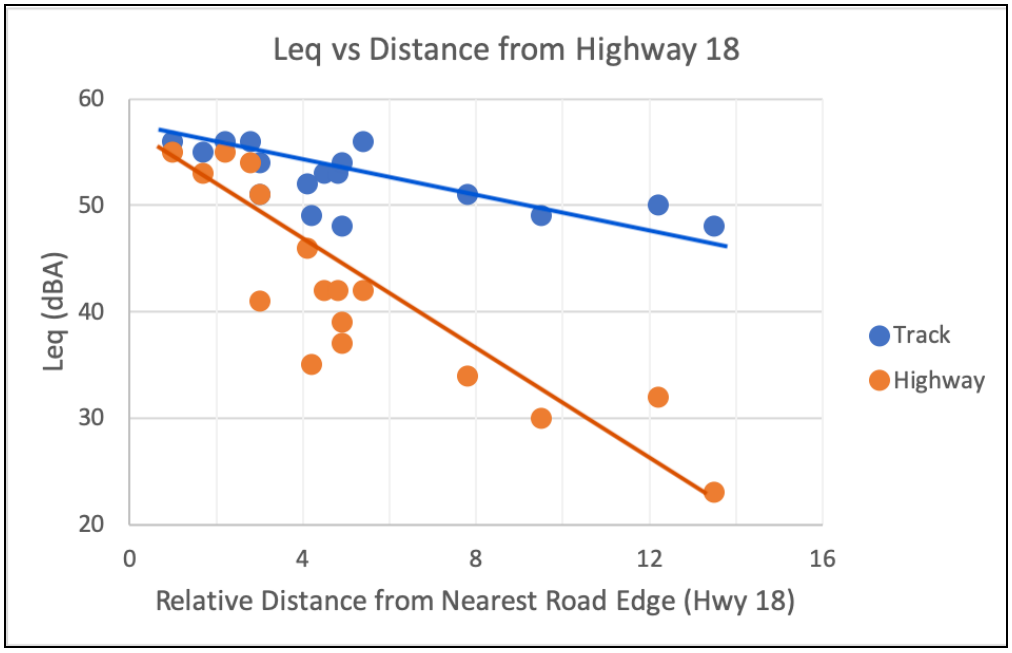
[16] Report No. 6154.1G01-17 dated September 26, 2017 and Report No. 6154.1G03-17 dated October 2, 2018; both reports are by BeSB GMBH Berlin

Figure 6: Data from the VIMC noise study by BeSB GMBH Berlin dated September 26, 2017 (Report No. 6154.1G01-17). Each pair of markers (one red and one blue) represents one of 17 points of reception where equivalent sound levels (Leq) during operation were estimated using a computer model of track activity and sound propagation. Points of reception are arranged in order of relative distance from the nearest track edge at VIMC (x-axis). Markers show estimated LAeq (y-axis) for a busy member day at VIMC (blue circles) and highway noise (red circles). Lines show data trends as distance from VIMC increases. Note that highway noise drops significantly with distance from VIMC, while track noise remains elevated.



For most of the points of reception in the VIMC studies, distance to the nearest track edge at VIMC was approximately the same as distance to the nearest road edge on Highway 18. However, for a few sites this was not the case. Therefore, Figure 7 (see below) shows the same data as Figure 6, but arranged in order of relative distance to Highway 18. The results show that the pattern is maintained: highway noise drops significantly with distance, while track noise does not.

Figure 7: Data from the VIMC noise study by BeSB GMBH Berlin dated September 26, 2017 (Report No. 6154.1G01-17). Each pair of markers (one red and one blue) represents one of 17 points of reception where equivalent sound levels (LAeq) during operation were estimated using a computer model of track activity and sound propagation. Points of reception are arranged in order of relative distance from the nearest road edge of Highway 18 (x-axis). Markers show estimated Leq (y-axis) for a busy member day at VIMC (blue circles) and highway noise (red circles). Lines show data trends as distance from VIMC increases. Note that highway noise drops significantly with distance from VIMC, while track noise remains elevated.



These results show that the impact of track noise, defined as the difference between ambient noise and track noise at a given point of reception, actually *increases* as one moves away from VIMC, at least over the geographic area covered in the VIMC noise modelling studies. This was demonstrated in our noise monitoring project, where the noise impact factor was greater at 4242 Sahtlam Road (900 m from VIMC) than at 6231 Mina Drive (425 m from VIMC): 22 dB vs 19 dB, respectively.

The effect of topography on relative noise propagation has significant implications for noise mitigation efforts. Racetracks are typically built on a flat plane, meaning sounds propagate equally in all directions. Sound limits established at the closest points of reception will necessarily result in noise protection for sites further away from such a track. However, this is not the case with VIMC.

Neighbourhood Noise Monitoring

The difference in transmission of highway noise and track noise with distance (see Figures 6 and 7 above) explains why the VIMC “neighbourhood monitoring station” is completely ineffective as a means of gauging the impact of track noise on the surrounding community.

Historically, VIMC has used 6278 Mina Drive as the site of a neighbourhood monitoring station. This property is the *most* impacted by traffic noise from Highway 18, being situated immediately adjacent to the road and at the same elevation. Accordingly, ambient noise at this location is higher than at any other residential location around VIMC at which sound level measurements or estimates have been made. As shown by the left-most markers in Figures 6 and 7, the VIMC noise study found virtually no difference between estimated highway noise (LAeq = 55 dB) and estimated track noise (LAeq = 56 dB) at this location. VIMC has used this to support their claims that noise from the circuit has no effect on the surrounding neighbourhood.

In stark contrast to this difference of 1 dB (LAeq) at 6278 Mina Drive, the same VIMC study showed that the difference between track noise and highway noise on Hillcrest Road was 25 dB (third set of markers from the right in Figure 6, fourth set of markers from the right in Figure 7). From this, it becomes apparent that VIMC’s neighbourhood

monitoring station consistently and grossly underestimates the impact of track noise on the surrounding community because it is the *least affected* by track noise.

Noise Limits Proposed by VIMC

Cowichan Valley Regional District Noise Bylaw

Since 2016,[17] VIMC has repeatedly held up CVRD Noise Bylaw #3723 as a standard for acceptable noise limits. Irrespective of the fact that this bylaw was never intended to regulate industrial noise, VIMC has repeatedly misinterpreted and misrepresented the contents of this bylaw. Since this issue comes up repeatedly in discussions around noise limits, we felt the need to address these inconsistencies here.

The CVRD noise bylaw first defines the type of noise as being either continuous or non-continuous. Noise from VIMC fits the definition of continuous noise, which is "any noise or noises, other than Construction Noise, continuing for a period, or periods, totalling 3 minutes or more in any 15 minute period". Note that this definition says nothing about noise levels during the 15 minute period - it simply classifies a given sound as continuous if it persists for more than the specified time period.

Next, the bylaw establishes noise limits for the different types of sound. For continuous noise, the limit during daytime hours is a single maximum decibel level of 60 dBA. This is an Lmax, *not* an Leq. The bylaw refers to the limit as a "sound level", the definition of which is "the meter reading or recording in decibels using an A-weighted network", and which "shall not be exceeded". It is also worth mentioning that for residential noise, the decibel readings at the point of reception multiplied by 2 must not exceed 60 dB (section 6.1.2.a).

[17] RWDI report dated October 26, 2016

Despite the above, VIMC has repeatedly claimed to be compliant with the CVRD Noise Bylaw while referring to noise levels in terms of LAeq. For example, in the RWDI report commissioned by VIMC (see Footnote 17, above), noise levels from track activity are presented as LAeq and then compared directly with the CVRD noise limit, which is a maximum noise level. This is not an “apples to apples” comparison. An average sound level - even over five minutes - can represent wild fluctuations in volume. Without knowing the maximum noise levels produced by VIMC during the RWDI study, it is not possible to say that VIMC was compliant with the CVRD noise bylaw. And yet this claim has been repeated in the subsequent noise studies by BeSB GMBH Berlin: “According to [the relevant noise bylaw of the neighboring community of Cowichan Valley Regional District], for so-called continuous noise an average sound level of LAeq,op = 60 dBA should not be exceeded”. Again this is FALSE. Nowhere in the CVRD noise bylaw does it state that 60 dB is an Leq.

Using an average allows VIMC to mask the true impact of the maximum sound levels that are generated during track activity and which are experienced by residents. Despite repeated requests by the SNA, VIMC has refused to publicize Lmax values from their noise monitor.

Equivalent Sound Level

As the change in VIMC’s proposed noise limit metrics is recent, and given their long history of using LAeq instead, it is helpful to discuss the LAeq results from this project in the context of previous noise limit proposals from VIMC of 60 dB LAeq.

The noise impact factors at 6231 Mina Drive and 4242 Sahtlam Road (19 and 22 dB, respectively) were double the limit that indicates a significant adverse impact. The corresponding track day LAeq values at those locations were 57 and 52 dB, respectively. Thus, it is clear that at 52 dB Leq, track noise is already at a level that

produces a severe adverse impact at both locations. Accordingly, noise limits of 60 dB LAeq will produce an even higher degree of noise impact and are therefore unacceptable.

New Proposed Noise Limits

At the time of this writing, North Cowichan published the completed VIMC rezoning application, which includes a "commitment letter" from VIMC dated August 6, 2019. In this letter, VIMC proposes a noise limit of "LA20,15 min max = 59 dB". LA20 is a percentile noise level: an L20 of 59 dB means that noise is above this level for 20% of the time (see Figure 2, page 9). The "15 min max" subtext indicates that the time period for calculating LA20 cannot be greater than 15 minutes.

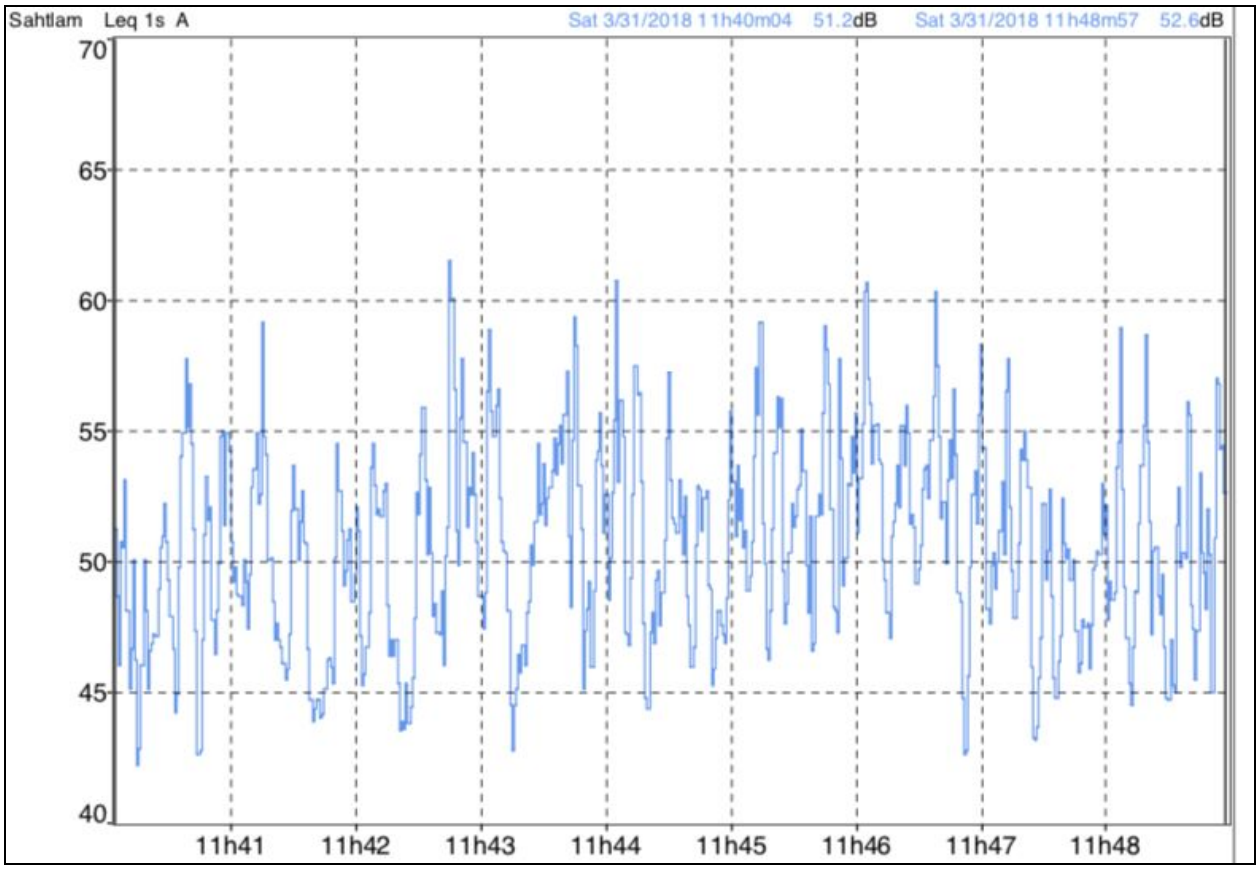
What VIMC is proposing is that for 80%, or 12 minutes, of any 15-minute period, noise levels must be below 59 dB. Conversely, for 3 out of every 15 minutes there are **no noise limits**, and VIMC can make as much noise as they like during that time. Note also that the 3-minute period does not have to be 3 consecutive minutes. Thus, within any 15-minute period, noise levels can fluctuate above 59 dB *several times*, so long as the total duration does not add up to more than 3 minutes. To understand the significance of this, we must examine the noise profile of track activity at VIMC at points of reception in the neighbourhood.

Characteristics of Track Noise

When discussing the impact of intrusive noise, it is important to understand the experience of the listener. Listeners experience variations in sound levels in *real time*, they do not experience an "average sound level". This is particularly true when it comes to noise from VIMC, due to the characteristics of track noise.

Figure 8 shows a sample recording of track noise from 4242 Sahtlam Road on Mar 31. Note the repeating pattern of peaks and valleys, which correspond to engine acceleration and deceleration as well as noise from screeching tires. There are approximately 4 such peaks every minute.

Figure 8: Decibel time history from track activity at 4242 Sahtlam Road.



According to the latest sound limits proposed by VIMC, some of these peaks could reach amplitudes of 95 dB or more and still be compliant. In the example shown in Figure 8 (above), each peak lasts approximately 10 seconds, so there could be 6 noise spikes of an unlimited volume within a 5-minute sample of this recording without violating the proposed noise limits.

For Sahtlam residents out working in their gardens on a quiet sunny weekend morning, those 6 spikes of high-volume noise, occurring more than once per minute, would be highly intrusive and disruptive. The overall average noise exposure would not matter, nor would it matter that the other noise peaks didn't exceed 59 dB.

With respect to the other 12 minutes in the VIMC proposed noise limits, we examined LA20 from samples of track noise recordings from the Speed Fanatics event. As shown in Table 2 (see above), LA20 ranged from 53 dB at 4242 Sahtlam Road to 58 dB at 6231 Mina Drive. Given that the noise impact factors at these locations were twice the limit for a significant adverse noise impact (as per BS 4142), it is clear that an LA20 of 59 dB would do nothing to alleviate the negative noise impact of VIMC, and would in fact be louder than the noise experienced by residents on March 31, 2018.

Limitations

This project took place in the spring, when noise levels from birdsong and outdoor activities are higher. This is expected to elevate ambient noise levels relative to the colder months (recall that VIMC boasts of being "Canada's only year-round track"), resulting in a higher noise impact factor outside the warmer seasons.

We analyzed over 25 hours of noise recordings in our community, but at only 4 different locations within a 10-day period, and on only 1 day of high-impact track activity. It's possible that the noise impact would be even higher at other sites in the neighbourhood (such as the residences on Hillcrest Road), during different times of the year, under different weather conditions, and when different track activities are taking place at VIMC.

Conclusions

As Mayor and Council consider the VIMC rezoning application, the impact of track noise on the surrounding community is one of the foremost issues. VIMC has had ample opportunity to present their side of the debate over whether they produce intrusive noise and which noise limits would be appropriate. Their latest offering is a percentile decibel limit of LA20,15 min = 59 dB, meaning noise levels must be below 59 dB for 12 out of any 15-minute period, but for the remaining 3 minutes there would be no noise limits at all.

The results of the Sahtlam Noise Monitoring Project show that such a noise limit would result in a severe adverse noise impact for the surrounding community. Earlier proposals for a noise limit of 60 dB LAeq are equally unacceptable. This is due to the fact that our community has very low ambient noise levels, as shown by our data, despite claims by VIMC that we are subjected to heavy traffic noise from Highway 18 and other nearby industrial operations. In fact, our community prides itself on being a peaceful and quiet rural neighbourhood.[18]

The results of our noise monitoring project show that ambient noise on Sahtlam Road ranges from 26 to 33 dB. To put that in perspective, a maximum noise limit for VIMC of 60 dB (as in the much-touted and equally misinterpreted CVRD Noise Bylaw) means track noise would be over 8 times as loud as ambient noise.[19] Clearly, the CVRD Noise Bylaw is not appropriate for industrial noise, and particularly motorsport noise, which may explain why such noise is excluded from these regulations.

In addition, due to the topography of the track and surrounding area, noise from VIMC travels much farther than noise from Highway 18. This results in a unique situation

[18] in last year's CVRD survey of Sahtlam residents, the Sahtlam Local Area Planning Committee found that the top two descriptors people used to describe this region were "rural" and "quiet/peaceful"
[19] Note that every increase of 10 dB is a perceived doubling of loudness

whereby sites farther away from VIMC are more heavily impacted by track noise than sites closer to the track. This renders the VIMC “neighbourhood noise monitoring station” at 6278 Mina Drive worthless as a means of gauging the impact of track noise on area residents. Importantly, plans for the proposed track expansion would bring the new track up to an even higher elevation on the slopes of Mount Prevost, which can reasonably be expected to worsen the situation.

In their rhetoric, VIMC has repeatedly put forward the argument that noise conditions in our neighbourhood “could be worse”, based on hypothetical business operations that may or may not ever set up shop in the industrial zone. This is a type of *logical fallacy* known as “relative privation”[20] and has no place in constructive dialogue. Residents of Sahtlam are tired of hearing that VIMC is a good option because other imagined options could be worse.

Notwithstanding the fact that motorsports noise is distinct from industrial noise in many ways, the sounds of racing cars and squealing tires are completely inconsistent with the natural ambience of any residential neighbourhood, let alone one in a rural area. In his 2016 ruling on the Motoplex Speedway,[21] BC Supreme Court Justice Rogers wrote the following:

> *The noise of racing engines is the antithesis of the kind of gentle background sounds that residents of a rural subdivision can reasonably expect to hear in their neighbourhood.*

The residents of Sahtlam understand this all too well.

[20] https://www.logicallyfallacious.com/tools/lp/Bo/LogicalFallacies/155/Relative-Privation
[21] 469238 BC Ltd v Okanagan Aggregates; 2016 BCSC 721. Retrieved on August 20, 2019 from https://www.bccourts.ca/jdb-txt/sc/16/07/2016BCSC0721.htm

As North Cowichan Council moves forward with this application, it is our sincere wish that decisions be made based on solid, scientific evidence rather than rhetoric and statistical sleights of hand. The results of the Sahtlam Noise Monitoring Project show that ambient noise levels in the surrounding community are low, and the negative impact of track noise from VIMC is severe.

Since the fight against track noise began over three years ago, residents have donated thousands of hours and tens of thousands of dollars in an effort to preserve the use and enjoyment of their properties in a much-beloved community. Please ensure that the decisions you make today do not create expensive problems for a future council and resident population to deal with.

We thank you for your time and consideration.