



Clerk's Report

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Report To: General Government Committee
Date of Meeting: May 29, 2017
Report Number: CLD-014-17 **Resolution:** GG-283-17
File Number: **By-law Number:**
Report Subject: Noise By-law Limits Pertaining to Gun Clubs

Recommendations:

It is recommended that the Committee choose either:

Option A

1. That Report CLD-014-17 be received for information; and
2. That all interested parties listed in Report CLD-014-17 and any delegations be advised of Council's decision.

OR

Option B

1. That Report CLD-014-17 be received;
2. That subsection 3.1.1 (a) of Clarington's Noise By-law 2007-071 be amended to reduce the maximum noise level of a shooting range from 70 dBAI to 60 dBAI Logarithmic Mean Impulse Sound Level (L_{LM}) at the point of reception for any shooting range which began operation prior to January 1, 1980;
3. That staff prepare a by-law to make such amendment to Noise By-law 2007-071 for presentation to Council on June 12, 2017; and
4. That all interested parties listed in Report CLD-014-17 and any delegations be advised of Council's decision.

Report Overview

Residents in the area of the Orono Fish and Hunt Club (OFHC) report that they are continuing to have issues with the noise levels emanating from the OFHC. This Report details the OFHC, provincial and municipal actions that have been taken since the matter was last considered by Council, explains existing regulations governing gun clubs in general and gun clubs within the Municipality of Clarington and provides choices for Committee going forward. .

1. Background

Earlier Municipal Key Actions:

In 2011, Council amended Noise By law 2007-071 to limit levels of noise emanating from gun clubs. (See Report CLD-017-11, being Attachment 1 to this Report.) Effectively, the By-law amendment set the noise level maximum that was set out in the Provincial recommended Guidelines NPC-232. However, as is explained in 2.1 below, the methods of measuring noise levels are different. The limits set out in By-law 2007-071 are,

- a maximum noise level of 70 dBAI if the gun club was operating before January 1, 1980; and
- a maximum noise level of 50 dBAI if the gun club began to operate after January 1, 1980.

These amendments were implemented in response to concerns raised by some area residents. In September 2011 and September 2012, before Council considered Report CLD-017-11, mediated meetings were held involving the area residents and members of the Orono Fish and Hunt Club (OFHC). As well, input was received from the Chief Firearms Officer and from acoustical consultants. See Attachments 2-5 of this Report, being Reports CLD-024-11, CLD-033-11, CLD-007-12 and CLD-027-12.

Earlier OFHC Key Actions:

In response to the resident concerns expressed during the 2011/2012 period, the OFHC voluntarily implemented a number of noise mitigation measures, including,

- Discontinued professional shooting (RCMP, MNR CP Rail).
- Limited regular shooting days to Wednesdays and Sundays.

- Resident notification protocol for any shooting events outside of Sundays and Wednesdays
- Installed berms: on the east side at height of 5.6 meters, with a second on the east side at a height of 7-9 metres; on the north berms (Backstops) are also at heights 5.1 meters at the 25 Yard Range, 5.7 meters at the 50 Yard Range, and 7.5 meters at the 100 Yard Range. (See Attachment 6 to this Report being Ministry of Community Safety and Correctional Services July 30, 2015 inspection.)

Note, all berms are in excess of the RCMP requirements for licensing and recommended berm heights by Swallow acoustics as detailed in Report CLD-033-11.

- Installed insulated shooting stations.

OFHC reports they continually look for sound mitigation measures including further grass seeding to assist in the reduction of noise.

Residents' More Recent Concerns:

In the summer of 2016 residents again raised concerns regarding the levels of sound emanating from OFHC. More specifically, some residents believe they are experiencing health issues, problems with their animals including behaviour and health issues, and shaking windows on their house as a result of the gun fire. Residents also sought clarification of legislation, regulations, by-laws and the concept of "grandfathering".

Municipal Actions in Response to more recent concerns:

This Report details the steps taken by staff in response to their concerns, the research findings, and testing results as compared to the results from previous testing.

Note this report deals only with Municipal response to OFHC as no complaints have been received concerning shooting activities at the Pineridge Target Sports Club since 2012

2. Discussion

2.1 Gun Club / Shooting Range Regulations and Noise

Federal Regulation:

It is the responsibility of the Chief Firearms Officer (CFO) to license and regulate firearm ranges under federal regulations. The purpose of licensing is to ensure safe firearms

practices are being followed. The CFO does not regulate sound relating to outdoor or indoor ranges.

Currently both outdoor ranges are in compliance with CFO regulations. The OFHC serves 300 members and Pineridge serves 200 members; with approximately 30% of both clubs being Clarington residents. Firearm ranges provide a safe environment for sporting enthusiasts and members of law enforcement agencies to discharge firearms.

Provincial Involvement:

The MOECC is responsible for protecting clean and safe air, land and water to ensure healthy communities, ecological protection and sustainable development for present and future generations. In fulfilling their role, the MOECC ensures the sources of emissions to the environment are adequately controlled to prevent the potential for adverse effects, and this includes noise emissions to the environment.

To assist in understanding, and presumably to assist in the regulating of noise emissions, the MOECC established noise guidelines.

The MOECC's NPC-232 Sound Level Limits for Stationary Sources in Class 3 Areas (Rural) directly referenced gun clubs and set maximum noise levels based on how long the gun club was in existence. It read as follows:

For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (LLM), is:

- 70 dBAI if the gun club were operating before January 1, 1980; or
- 50 dBAI if the gun club began to operate after January 1, 1980; or
- the LLM prior to expansion, alteration or conversion.

In 2013, NPC-232 was replaced with NPC-300 as the new Noise Guidelines for Stationary Sources. As stated by the MOECC, NPC-300 is a guideline and is intended to be used by municipalities as such; in particular when considering making land use planning decisions and when drafting or reviewing noise by-laws. Note, that the MOECC does not currently regulate gun clubs. See Section 3 of this Report. The levels set in NPC-300 are based on the average of the total number of impulses recorded in an hour. According to the MOECC, the OFHC is considered a Class 3 Area. Charts 1 and 2 below

are excerpts from NPC-300 which show the NPC-300 Class 3 Area Guidelines for impulsive sounds.

Chart 1

NPC-300 - Table B-3
Exclusion Limit Values for Impulsive Sound Level (L_{LM}, dBAI)
Outdoor Points of Reception

Time of Day	Actual Number of Impulses in Period of One-Hour	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 23:00	9 or more	50	50	45	55
	7 to 8	55	55	50	60
	5 to 6	60	60	55	65
	4	65	65	60	70
	3	70	70	65	75
	2	75	75	70	80
	1	80	80	75	85

Chart 2

NPC-300 - Table B-4
Exclusion Limit Values for Impulsive Sound Level (L_{LM}, dBAI)
Plane of Window – Noise Sensitive Spaces (Day/Night)

Actual Number of Impulses in Period of One-Hour	Class 1 Area (07:00–23:00)/ (23:00–07:00)	Class 2 Area (07:00–23:00)/ (23:00–07:00)	Class 3 Area (07:00–19:00)/ (19:00–07:00)	Class 4 Area (07:00–23:00)/ (23:00–07:00)
9 or more	50/45	50/45	45/40	60/55
7 to 8	55/50	55/50	50/45	65/60
5 to 6	60/55	60/55	55/50	70/65
4	65/60	65/60	60/55	75/70
3	70/65	70/65	65/60	80/75
2	75/70	75/70	70/65	85/80
1	80/75	80/75	75/70	90/85

Municipal Regulation:

Gun Club noise levels detailed in Clarington’s Noise By-law 2007-071 were amended in 2011 based on the levels set out in the guidelines in place at that time - in NPC-232,- but were set as maximums and not logarithmic mean. The two existing gun clubs have been in existence well before 1980, and therefore,

During non-curfew times, any noise emanating from the use of a shooting range shall not exceed:

- (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980; ...

To be clear, By-law 2007-071, as amended in 2011, sets out a maximum level of 70 dBAI per each shot fired, whereas NPC-300 (the Guideline established in 2013) sets out a maximum level based on the average of the total shots fired within an hour. Chart 3 below depicts the shots recorded at 7606 Leskard Rd. during the 2017 controlled test. This sample set of recordings demonstrates how the two measuring methods differ.

Chart 3

Shot #	Impulse Sound Level (dBAI)	Comply with By-law 2007-071?	Logarithmic Mean Measurement
1	55	Yes	Logarithmic mean level is 61.1 dBAI
2	58	Yes	
3	54	Yes	
4	53	Yes	
5	55	Yes	
6	57	Yes	
7	51	Yes	
8	52	Yes	
9	51	Yes	
10	66	Yes	
11	66	Yes	
12	69	Yes	
13	63	Yes	
14	57	Yes	
15	58	Yes	
16	51	Yes	
17	51	Yes	

Note in the sample results above from the controlled test results and are not necessary indicative of levels experienced during regular operations. These sample results shows no violation of the current maximum limit of 70 dBAI in By-law 2007-071 and confirms, based on this sample, that a maximum limit of 60 dBAI L_{LM} is more restrictive than the existing limit.

The logarithmic mean is calculated using the following formula:

$$L_{LM} = 10 \log ([10^{(Imp1/10)} + 10^{(Imp2/10)} + \dots] / \text{number of impulses})$$

Where Imp1, Imp2, etc are the impulsive sound levels measured.

The arithmetic mean is calculated using the following formula:

$$\text{Arithmetic Mean} = (Imp1 + Imp2 + \dots) / \text{number of impulses}$$

2.2 General Noise Levels

General noise level limitations can be found in various documents. Not to diminish the reported impact of the noise of gun fire by some of the area residents, but rather to add context and to assist in understanding noise levels, Chart 4 below describes how Worker Safety and Insurance Board (WSIB) rates noise levels, and Chart 5 describes the sound pressure levels of sounds encountered in daily life.

Chart 4
Worker Safety and Insurance Board (WSIB)

Common Sounds	Decibel Levels dB(A)	Harm
Rock concert, jet takeoff, gun shot	120 to 140	Damaging
Chainsaw, air gun, portable stereo, dance club, boiler room, sandblasting	100 to 120	Damaging
Power tools, motorcycle, headphones, snowmobile, manufacturing plant, lawnmower, hydraulic press, pneumatic drill	90 to 100	Harmful
Dishwasher, computer room, subway, busy restaurant or kitchen	75 to 90	Irritating
City traffic, hair dryer, office equipment, cell phone	70 to 90	Irritating
Countryside with rustling leaves	20 to 50	Safe

Section 139 O.Reg 381/15 Noise, under *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1, places the duty on the employer to protect workers.

2. (1) Every employer shall take all measures reasonably necessary in the circumstances to protect workers from exposure to hazardous sound levels.

...

(4) Without limiting the generality of subsections (1) and (2), every employer shall ensure that no worker is exposed to a sound level greater than an equivalent sound exposure level of 85 dBA, $L_{ex,8}$. [Where $L_{ex,8}$ is the equivalent sound exposure level in 8 hours.]

Chart 5

Typical Sound Pressure Level Encountered in Daily Life

Sound Pressure Level dB(A)	Sound Pressure Level dB(A)	Subjective Evaluation
140	Jet engine	Deafening
130	Jet aircraft during takeoff (300 ft. away)	Painful
120	"Hard rock" band (with electronic amplification)	Onset of pain
107	Air hammer	Temporary hearing Loss
100	Crowd noise at football game	Very loud
92	Heavy city traffic	Very loud
80	Ringing alarm clock (at 2 ft.)	Very loud
70	B-757 aircraft cabin during flight	Loud
65	Busy restaurant or canteen	Loud
60	Conversational Speech	Moderate
5	Window air conditioner	Moderate
34	Soft whisper (at 5 ft.)	Faint
20	Rustling leaves	Very faint
10	Human breathing	Very faint

The 1999 RCMP Shooting Range and Sound document states the range of sound levels for limited community reaction is between 50 dBAI- 70 dBAI for firearms. (See Attachment 7, RCMP Shooting Ranges and Sound.)

Charts 4 and 5 above speak specifically to common sounds other than impulse noises. It is understandable that the impact of stationary noise (ie noises at a steady level such as a lawn mower) is much different than the impact of impulse noise such as gun fire. Therefore, it would be understandable that the recommended noise limits should also be

different. According to Guido F. Smoorenburg, “evaluation of impulse noise, in particular shooting noise, with regard to annoyance,” *Internoise*, 81, pp.779-782. 44 indicates that the “threshold for annoyance” due to impulsive noise is from 60 to 65 dBA (fast), which corresponds to approximately 65 to 70 dBAI. These references specify that the range of sound levels for limited community reaction to the sound of firearms is between 50 dBAI and 70 dBAI.”

3. Municipal Investigations and Consultation Actions

The Municipality retained professional acoustic consultants to conduct testing in early September 2016. In consultation with local residents, special events were determined to be of highest concern and random testing was preferred over an arranged “controlled” test in cooperation with OHFC. Chart 6 below shows the results of the October 22, 2016 test. Attachment 8 to this Report is the full May 12, 2017 Swallow Thornton Tomasetti Testing Report.

Chart 6
October 22, 2016 Test Results

Address	Recorded Noise Level	
7560 Leskard Road	55	Shooting noise faintly audible
	53	Shooting noise faintly audible.
	52	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	57	Shooting noise faintly audible. Includes noise from leaves rustling
7685 Leskard Road	51	Ambient
	53	Shooting noise barely audible.
	54	Shooting noise barely audible.
	55	Shooting noise barely audible.
	53	Shooting noise barely audible.
	59	Shooting noise barely audible.
54	Shooting noise barely audible.	
7150 Leskard Road	50	Ambient
	54	Shooting noise barely audible.
	51	Shooting noise barely audible.
7506 Leskard Road	53	Shooting noise barely audible
	60	Shooting noise faintly audible.
	57	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	53	Shooting noise faintly audible.

There were few shots heard during the testing conducted in October 2016, which is inconsistent with what has been described and experienced by the residents as continuous firearm discharges. Attachment 8 is the full Swallow Thornton Tomasetti Report dated May 17, 2017.

There appeared (through several emails received from some residents) to be confusion regarding legislation, regulations, guidelines and apparent “grandfathering”. Staff therefore researched the history of this matter and facilitated a meeting with some area residents, members of the OFHC board, an MOECC representative, and Councillors Partner and Woo. In response to the question of how the Guideline limits were set and if any clubs have achieved these limits, the MOECC representative provided the following response:

The NPC-300 impulsive limits are not specifically intended for gun clubs, although the municipality could use these limits for determining the likelihood of generating adverse effects. We are not aware of whether any gun clubs are operating in accordance with the NPC-300 impulsive limits because we don't regulate them. It would depend on the site-specific conditions.

Further meetings were held with the MOECC, some area residents, the OFHC and the Pineridge Target Sports Club to better understand the issues at hand, and receive interpretation of NPC guidelines and outline the process being taken.

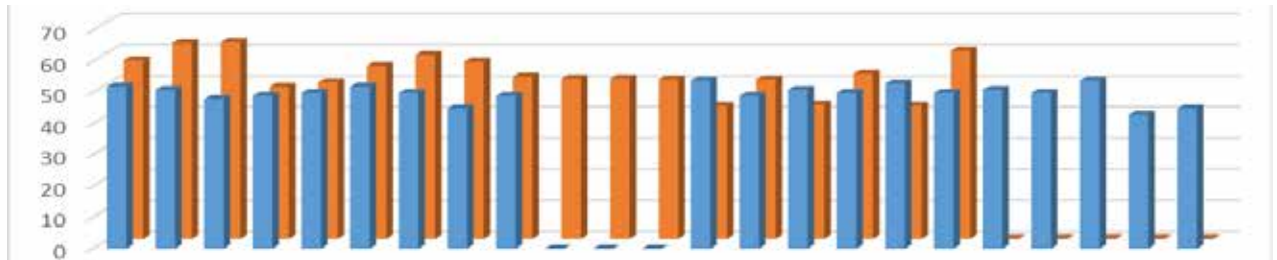
To better understand the magnitude of the noise impact of the OFHC, correspondence was sent to all surrounding residents of the OFHC (approximately 100 properties). Residents were requested to advise staff of any concerns they have regarding noise from OFHC. Of the 15 responses received, 7 raised concerns about the levels of noise or that levels have not been reduced.

Discussions with OFHC members were held to seek their continued participation in determining the levels of sounds. With their agreement, a “controlled” test was conducted. With the participation of the OFHC the test was conducted under similar conditions to that in 2012. This approach was chosen such that the results from the 2017 test could be compared to the 2012 test to determine if the mitigation measures implemented by the OFHC have had any success in reducing noise levels. The same firearms were used with the exception of the 375 H&H Magnum in 2017 which was the closet match used to the SAKO .478 Magnum used in 2012. These are both firearms which may be seldom used at the firing range if used at all. Two additional firearms were tested in 2017 that were not in 2012. The 375 H&H Magnum was removed from the March 2017 firing after identifying a safety issue. The locations selected were chosen using the properties that had the highest levels recorded in 2012. Weather conditions were similar with a more general wind from southwest compared to a south wind in 2012.

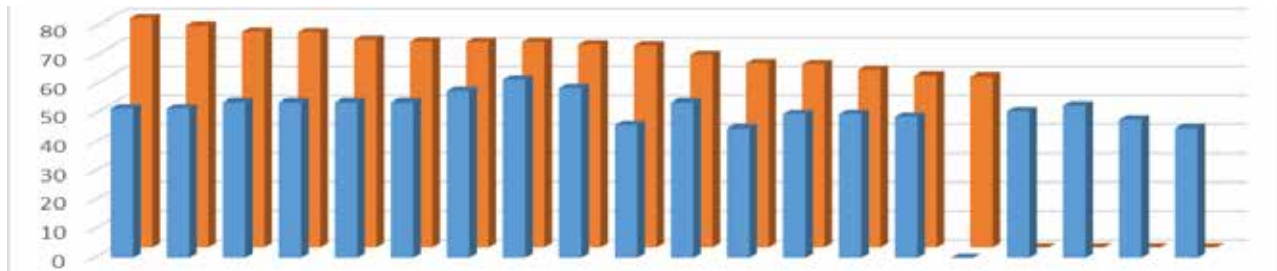
**Graph 1 – 2012 / 2017 Test Results Comparison
 (by address)**

The following graphs show the results from 2012 (in orange) and 2017 (in blue) of the shots fired at each of the locations. Where there is only one coloured bar, it means that there is no corresponding comparator. (See Attachment 9 for the March 23, 2017 Test Results Report and Attachment 10 for the 2012/2017 Test Results Comparison.)

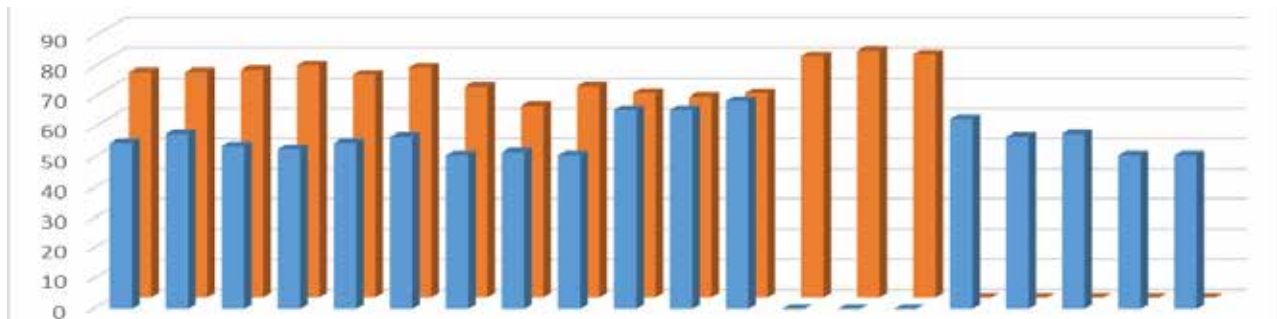
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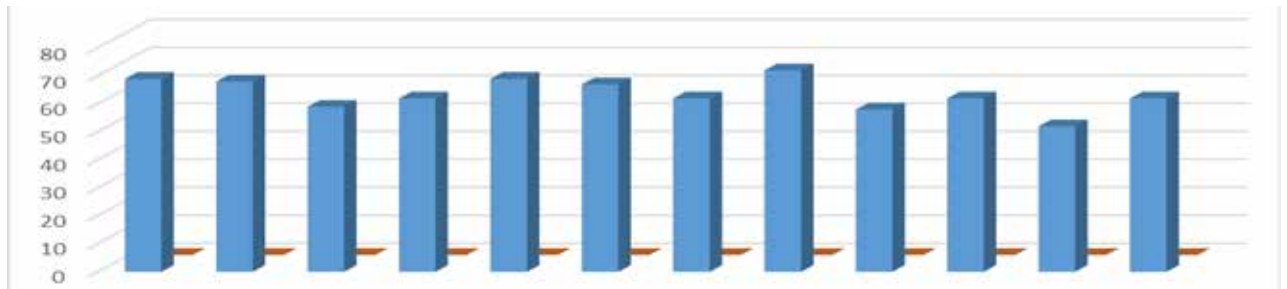
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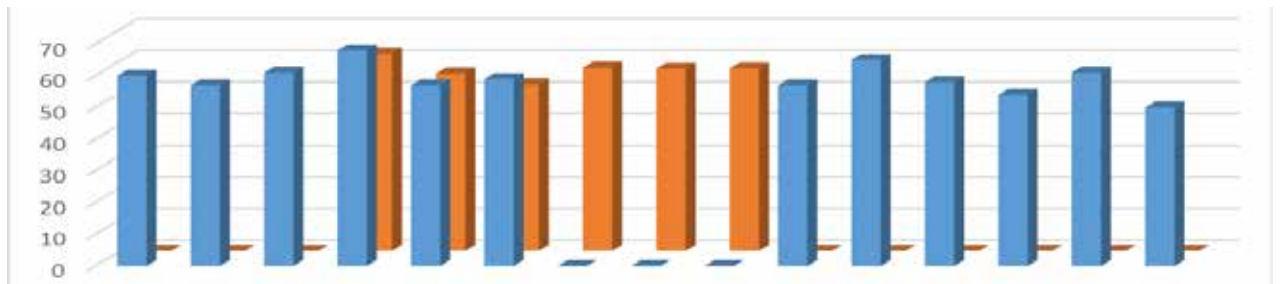
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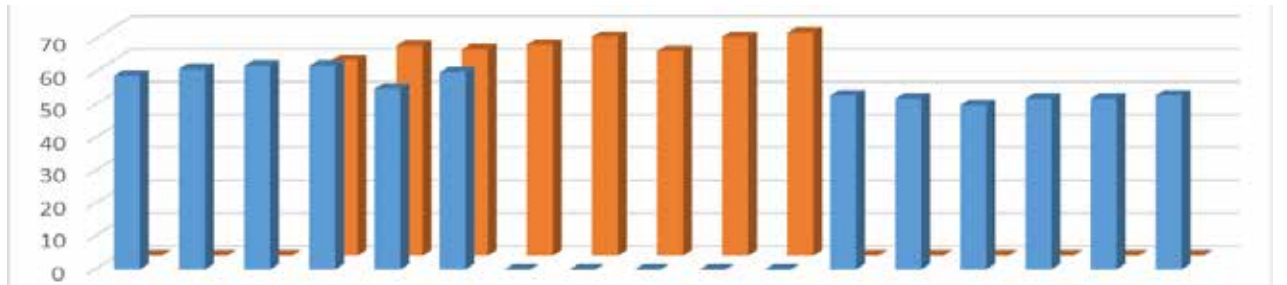
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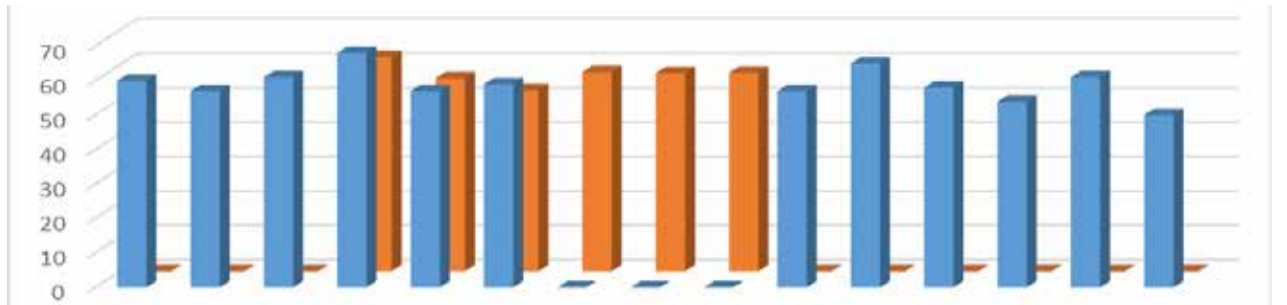
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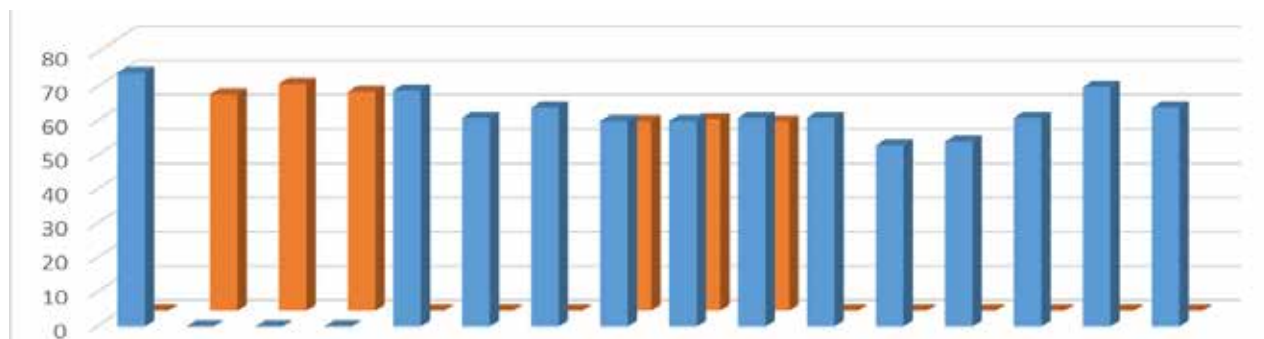
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7506
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7580
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With the exception of one location a reduced level of noise has occurred. Also of note is that in testing of 2017, one identified property directly south of the club registered levels of low 50 dBAI compared to the low 60 dBAI in 2012.

Over the past few weeks, an area resident has documented and recorded shooting noise levels using a hand held phone application. The average of discharges within a 2hr period on each of the days recorded totalled approximately 380 discharges per day. This Report does not include the resident's sound level measurements because the equipment and recording application have not been calibrated.

4. Area Municipalities

Clarington is not alone in addressing resident concerns related to noise emanating from gun clubs. In 2014, the Township of Uxbridge amended their Noise By-law to gradually decrease the permitted sound level over 2 years.

2.13 Every Licence issued to a Shooting Range existing prior to this By-law coming into force and effect shall be subject to the following maximum noise level requirements:

COMPLIANCE PERIOD	MAXIMUM NOISE LEVEL
As OF AUGUST 31, 2015	maximum of 60 dBAI
As OF AUGUST 31, 2016	maximum of 50 dBAI

2.14 Every Licence issued to a new Shooting Range established following this By-law coming into force and effect shall be subject to a maximum noise level of 45 dBAI effective immediately upon issuance of Licence.

In July 2015, the Uxbridge gun club (Uxbridge Shooting Sports Inc.) filed an Application with Ontario Superior Court of Justice seeking to quash Uxbridge's By-law. In the Application, the Uxbridge gun club alleged, amongst many things, that the prescribed noise levels were impossible to achieve. The Township of Uxbridge has since amended their By-law in February 2017.

2.13 Every Licence issued to a Shooting Range existing prior to this By-law coming into force and effect shall be subject to the following maximum sound level requirements:

Maximum Sound Level

A maximum of 60 dBAI Logarithmic Mean Impulse Sound Level (L_{LM})

2.15 Every Licence issued to a new Shooting Range established following this By-law coming into force and effect shall be subject to a maximum noise level of 45 dBAI effective immediately upon issuance of Licence.

Douro Dummer, Cavan Monaghan, and Port Hope currently have outdoor ranges. None of these municipalities regulate the levels of noise. Staff from these municipalities report that there have not been any concerns brought to their attention to require regulatory intervention from a by-law perspective.

5. Changing Landscape

Some area residents have raised concerns that the 407 construction will increase the level of noise with the clearing of trees and changing of the landscape. This could be an ongoing issue until the completion of the 407. Since the March testing was conducted the OFHC reported that another large area of trees were removed to the east of the club.

A document written by Swallow acoustics for the RCMP identifies high traffic areas (major highways) as an ideal location for gun clubs. The average background noise from major highways falls between 60-70 dBAI, generally assisting in burying the noise emanating from gun club into the highway background noise.

Additional items are identified in the RCMP document Ranges and Sound and Noise Management for Outdoor ranges. Ranging from natural barriers to Berms and enclosures, the OFHC and Pineridge clubs have implemented some the measures and are continually working to improve.

6. Enforcement Considerations

6.1 Testing Approach

Investigation and enforcement of noise related matters fall within the scope of our Municipal Law Enforcement Division. Calls related to noise are prioritized based on existing call volumes and issues. Noise related files generally take a considerable amount of staff time as they often require numerous site visits.

To date, the Municipal Law Enforcement staff have relied on the services of acoustical consultants to test for noise (whether it be relative to guns or other noises such as air conditioners). The consultants have the necessary equipment and are trained experts to calibrate and test. While not physically testing, Clarington enforcement staff usually attend the testing sites alongside the consultants. Depending on the issue, the costs of monitoring the levels of sound to the Municipality through an acoustic consultant can become exuberant. In this particular case, a total of \$16,500 has been expended for the sound tests and the results reports between 2011 and 2017.

Although not terribly often, there are occasions where a noise related issue may be more quickly resolved if we have in-house noise testing equipment and expertise. Staff are currently researching equipment, software and training options and expect to be including this in the 2018 budget submission. In the meantime, expert consultants will be relied on for any sound testing requirements.

6.2 Method to Setting Noise Limits

As explained in Section 2 above, Clarington's current Noise By-law sets the noise regulations based on a maximum level. NPC-300 sets the noise regulations based on the logarithmic mean average based on number of bursts over a period of time.

The method of regulating does not impact the enforcement activities. For either method, the person testing (whether it be a consultant or a trained enforcement officer) would be expected to attend the property/properties and register the impulses over a set period of time (eg. 1 hour) to get a full understanding of the noise impact.

6.3 Possible By-law Change

If Council wishes to follow Uxbridge's example and change the existing noise limits for shooting ranges in Clarington, Noise By-law 2007-071 would need to be amended, and staff recommend that the maximum be set based on logarithmic mean as is currently included in NPC-300 rather than a set maximum level as set out in By-law 2007-071. To

implement such a new regulation, the following resolution (stated as Option 2 in the Recommendations section of this Report) would be appropriate:

1. That Report CLD-014-17 be received;
2. That sub-section 3.1.1 (a) of Clarington's Noise By-law 2007-071 be amended to reduce the maximum noise level of a shooting range from 70 dBAI to 60 dBAI Logarithmic Mean Impulse Sound Level (L_{LM}) at the point of reception for any shooting range which began in operation prior to January 1, 1980;
3. That staff prepare a by-law to make such amendment to Noise By-law 2007-071 for presentation to Council on June 12, 2017; and
4. That all interested parties listed in Report CLD-014-17 and any delegations be advised of Council's decision.

Proceeding with this option may present risks to the Municipality. These same risks and challenges are being addressed through the court proceedings in Uxbridge.

7. Concurrence


This report has been reviewed by the Municipal Solicitor who concurs with the recommendations.

8. Conclusion

By-law 2007-071 sets a maximum noise level for shooting ranges of 70 dBAI. Despite a number of mitigating measures employed by the OFHC, some area residents near the OFHC express great concern with the noise emanating from the gun club and do not agree with the current allowable maximum noise level. Staff presents the foregoing information to Council in consideration of options in assessing Clarington's existing noise level regulations pertaining to shooting ranges.

9. Strategic Plan Application

Not applicable.

Submitted by: 
C. Anne Greentree,
Municipal Clerk

Reviewed by: 
Curry Clifford, MPA, CMO
Interim CAO

Staff Contact: Duncan Anderson, Manager of Municipal Law Enforcement, 905-623-3379 ext. 2110 or danderson@clarington.net

Attachment 1 – Report CLD -017-11

Attachment 2 – Report CLD-024-11

Attachment 3 – Report CLD-033-11

Attachment 4 – Report CLD-007-12

Attachment 5 – Report CLD-027-12

Attachment 6 - 2015 Ministry of Community Safety and Corrections July 30th Range Inspection

Attachment 7 - RCMP Shooting Ranges and Sound

Attachment 8 - May 12, 2017 Swallow Thornton Tomasetti Report 22 2 1

Attachment 9 - Orono Fish and Hunt Club April 28, 2017

Attachment 10 - Comparative Tests

Attachment 11 - October 2017 Results Summary in Logarithmic Mean

List of interested parties to be notified of Council's decision is on file in the Clerk's Department.

Meeting: GENERAL PURPOSE AND ADMINISTRATION COMMITTEE

Date: June 27, 2011

Resolution#: GPA-462-11 **By-law#:** 2011-068
(See Changes in July 4th Cond. Minutes)

Report#: CLD-017-11

File#:

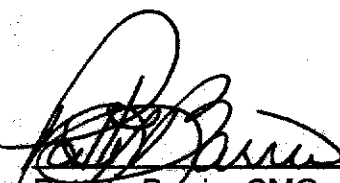
Subject: AMENDMENTS TO NOISE BY-LAW

RECOMMENDATIONS:

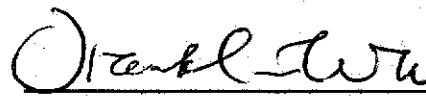
It is respectfully recommended that the General Purpose and Administration Committee recommend to Council the following:

1. THAT Report CLD-017-11 be received;
2. THAT the amendment to the Noise By-law attached to Report CLD-017-11 be forwarded to Council for approval; and
3. THAT the interested parties listed in Report CLD-017-11 be advised of Council's actions

Submitted by:


Paul L. Barrie, CMO
Municipal Clerk

Reviewed by:


Franklin Wu,
Chief Administrative Officer

PAB/lc

Pursuant to the GPA Resolution (#GPA-406-11) approved by Council on June 7th, 2011, Staff were directed to, *“review the current Noise By-law 2007-071 and, where appropriate, update the language and provisions of the By-law as they relate to the regulation of noise coming from shooting ranges within the Municipality.”*

In order to undertake this review Staff have looked into the history of the changes to the Clarington Noise By-law.

1.0 SHOOTING RANGES

1.1 BACKGROUND

In 1985 Staff were requested to examine the need for a comprehensive noise by-law. On March 20th, 1985 Council invited the public to submit their comments on the proposed by-law. Among the responses received were requests from the Union Rod and Gun Club and the Orono Fish and Hunt Club requesting that they be exempted from the By-law. For reasons unknown the By-law never went forward until July 31st, 1987. At that time, the requests from the Union Rod and Gun Club and the Orono Fish and Hunt Club were approved and included in the by-law. An exemption was also provided for the Marksmen Club of Oshawa.

In 1989 more amendments were requested and Council repealed the By-law and replaced it with By-law 89-184. This by-law carried forward the noise exemption for the shooting ranges and added a curfew of 11:00 p.m. to 7:00 a.m. from Sunday night to Saturday morning. On Saturday the curfew began at 11:00 p.m. and ran through to 9:00 a.m. on Sunday. Provided that the ranges observed the curfew hours, they were free to conduct their business without impediment.

In 1994 new complaints forced a change to the operation of the Marksmen Club. The outdoor range was being used by the Durham Regional Police for training purposes. An environmental Noise Assessment Study was conducted on their outdoor shotgun range.

The firm of Howe Gastmeier Chapnik Limited was retained by the Municipality to conduct the testing.

Because the outdoor range had been constructed after 1980 it was required to meet the then current Ministry of Environment and Energy (MOEE) standard of 50 dBAI. Testing showed that the existing exterior berming and shielding had reduced the noise levels to between 67 to 73 dBAI. The firm concluded that there would be no further action that the Club could take that would bring the sound level down to the required 50 dBAI. As a result the exterior noise exemption for the Marksmen Club was deleted from the By-law but the overall exemption, which also regulated noise from the indoor range remained in place. Since both the Orono Fish and Hunt Club and the Union Rod and Gun Club predated the 1980 standard, they had only to achieve a level of 70 dBAI to comply with MOEE standards.

In 1997 specific noise restrictions and criteria were imposed by the Municipality to deal with increasing concerns at the Mosport Park race tracks. These amendments required the track operator to meet specific noise levels and required detailed testing procedures. In 2004 those levels were repealed.

In 2007 the entire by-law was overhauled to modify and update enforcement procedures. At that time there was no intent to alter the direction or application of the existing provisions of the by-law. Among those provisions were the existence of the curfew provisions and the overall exemption for the existing shooting ranges. Other than the Marksmen Club the exemptions were intended to continue.

A review of the 2007 by-law was conducted in relation to the latest GPA Resolution and shows that there was an unintended oversight. The overnight curfew was maintained but the wording of the exemption was not included.

This year Staff have received complaints from citizens in the area of the Orono Fish and Hunt Club concerning the ongoing noise from the range. The range is currently used by

the members of the Gun Club and the local detachment of the Royal Canadian Mounted Police as their training range. This increase in use has resulted in higher than normal complaints from the neighbours.

1.2 INVESTIGATION AND COMMENT

Section 4 of Newcastle By-law 87-131 stated in part,

the by-law shall not apply to a person who permits or causes the emission of sound connection with any of the traditional, festive, religious activities and such other activities listed hereunder: ...

- f) Orono Fish and Hunt Club, shooting range;*
- g) Union Rod and Gun Club, shooting range;*
- h) the Marksmen Club of Oshawa, shooting range;...*

The 1989 By-law, 89-184 created a set of curfew times for the ranges to ensure overnight peace and quiet. It also stated in Section 5,

It is noted that noises emanating from such operations shall not be considered a violation when said operations are carried on outside the time periods set out by a curfew.

This overriding exemption does not appear in the current Noise By-law 2007-071. The staff report (CLD-010-07) which accompanied By-law 2007-071 made no reference to the deletion of the noise exemption; however it did itemize other changes which were proposed in the by-law.

While the exemption had originally existed for all ranges, it is within Council's scope of authority to remove the exemption thus placing the ranges on the same level of enforcement as any other activity in the Municipality save and except those industries for which 24 hour operation is a necessary fact.

In 1978 the Ministry of the Environment produced a document called "*Model Municipal Noise Control By-law: Final Report*". This set the upper limit for noise emanating from a shooting range in a rural setting at 70 dBAI. This was adopted as the standard province-wide. The level was reduced in 1980 to 50 dBAI however the previous level was recognized as still valid for pre-existing facilities.

In 1995 the Ministry produced Publication NPC-232, "*Sound Level Limits For Stationary Sources in Class 3 Areas (Rural)*". Section 8(2) of the publication states:

8. SOUND LEVEL LIMITS - SPECIFIC IMPULSIVE SOUNDS

(2) *For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), is:*

- *70 dBAI if the gun club were operating before January 1, 1980; or*
- *50 dBAI if the gun club began to operate after January 1, 1980*

The proposed amendment will establish a maximum noise level for the existing ranges of 70 dBAI in accordance with the Ministry's guidelines and 50 dBAI for any new ranges which may come along.

1.3 CURFEW

Currently the ranges all have a curfew of 11:00 p.m. For many young families this is long after the bedtime of the children. The ranges are not set up for ongoing night-time operations. Staff are recommending that the curfew on night-time operations begin at 9:00 p.m during the week and 4 p.m. on Sundays.

2.0 CONSTRUCTION NOISE CURFEW

2.1 BACKGROUND

Currently the Noise By-law sets a construction noise curfew time of 11:00 p.m. until 7:00 a.m. the following day, Monday through Saturday, 11:00 p.m. Saturday night until 10:00 a.m. Sunday and 5:00 p.m. on Sunday until 7:00 a.m. Monday morning. The By-law goes on to state:

- 3.3 *A noise curfew shall apply to any noise from any excavation or construction work whatsoever, including the erection, demolition, alteration or repair of any building;*
- (b) *except in the case of urgent necessity and then only under prior authorization from the Municipality.*
- 3.4 *During the time when construction, excavation or demolition work is permitted on Sunday as outlined in Section 3.3 above, such work shall not include the operation of any mechanically powered excavation or earth moving equipment.*

2.2 COMMENT

During the review Staff have come to the conclusion that 11:00 p.m. is too late to allow construction noise to continue. Staff are therefore recommending that the termination time be reduced to 9:00 p.m. This would still allow the homeowner to undertake work in the evenings after returning from their daytime job while not severely impacting the neighbours.

Staff do note that there is a need to provide an exemption for construction noise during the non-curfew times to prevent frivolous complaints and have added an exemption similar to that which formally existed for the gun ranges.

3.0 CONCLUSION

While the outdoor exemptions for the Orono Fish and Hunt Club, the Union Rod and Gun Club and the indoor range at the Marksmen Club have existed for several years it has always been a special status not enjoyed by other groups within the Municipality. The removal of that status and the imposition of maximum sound levels will make for a more tranquil environment for the neighbours surrounding the three clubs.

If a new range is started anywhere in Clarington, the operators will have to comply with the lower noise level standard. The imposition of a lower sound level for any new ranges is in accordance with the Ministry of the Environment's "*Publication NPC 232*" for operations which began after January 1st 1980.

The imposition of the 9:00 p.m. curfew for construction noise will help to better regulate construction activities within the Municipality, while the exemption during normal business hours will allow companies to work without undue municipal interference.

It is therefore recommended that the by-law attached hereto be forwarded to Council for passage.

Interested Parties:

Todd Newman, Orono Fish and Hunt Club

Union Rod and Gun Club

The Marskmen Club

THE CORPORATION OF THE MUNICIPALITY OF CLARINGTON

BY-LAW 2011-

Being a By-law amend Noise By-law 2007-071

WHEREAS Section 129 of *the Municipal Act, 2001*, S.O. 2001, Chapter 25 states that a local municipality may prohibit and regulate noise;

AND WHEREAS The Council of the Corporation of the Municipality of Clarington deems it appropriate to amend By-law 2007-071, which is a by-law to regulate noise levels within the Municipality of Clarington;

NOW THEREFORE the Council of the Corporation of the Municipality of Clarington enacts as follows:

1. Section 1.1 of By-law 2007-071 is deleted in its entirety and replaced with the following:

No person shall ring any bell, blow or sound any horn or cause the same to be rung, blown or sounded, or shout or create, cause or permit any unusual or excessive noises which, at the point of reception, are likely to disturb any other inhabitant of the Municipality of Clarington.

2. Section 3.1 of By-law 2007-071 is deleted in its entirety and replaced with the following:

3.1 A noise curfew shall apply to the following shooting ranges within the Municipality of Clarington:

- (a) the Orono Fish and Hunt Club;
- (b) the Union Rod and Gun Club; and
- (c) the Marksman Club of Oshawa.

This curfew shall be from 9:00 p.m. until 8:00 a.m. the following day (Monday through Saturday), 9:00 p.m. Saturday until 10:00 a.m. Sunday, and 4:00 p.m. Sunday until 8:00 a.m. Monday.

- 3.1.1 During non-curfew times, any noise emanating from the use of a shooting range shall not exceed:

- (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980; or
- (b) 50 dBAI at the point of reception for any shooting range which began operation after January 1st 1980.

2.0 Section 3.3 of By-law 2007-071 is deleted in its entirety and replaced with the following:

3.3 A noise curfew shall apply to any noise from any excavation or construction work whatsoever, including the erection, demolition, alteration or repair of any building from 9:00 p.m. until 7:00 a.m. the following day, (Monday through Saturday), 9:00 p.m. Saturday until 10:00 a.m. Sunday, and from 4:00 p.m. Sunday until 7:00 a.m. Monday.

3.3.1 For the purposes of this by-law, noise related to construction work shall be interpreted to include the starting, idling and warming up of any truck or mechanically powered excavation or earth moving equipment.

3.3.2 Noises emanating from the operations described in sections 3.3 and 3.3.1 shall not be considered to be a violation under this by-law when said operations are carried on outside the time periods set out by a curfew.

3.3.3 Notwithstanding any other provision to contrary, Council may authorize construction work to be carried on outside the curfew restrictions set out in this By-law only in the case of urgent necessity and then only under prior authorization from Council.

3.0 Should any section, clause or provision of this By-law be declared by a court of competent jurisdiction to be invalid, the same shall not affect the validity of this By-law as a whole or any part thereof, other than the part so declared to be invalid.

4.0 The provisions of this by-law shall come into full force and effect immediately upon its final passing by Council.

BY-LAW read and passed in open session this th day of July, 2011

Mayor

Municipal Clerk

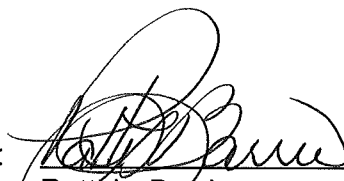
Meeting: GENERAL PURPOSE AND ADMINISTRATION COMMITTEE
Date: Sept. 12, 2011 **Resolution#:** *GPA-556-11* **By-law#:**
Report#: CLD-024-11 **File#:**
Subject: RESULTS OF MEDIATION MEETING - SHOOTING CLUB NOISE

RECOMMENDATIONS:

It is respectfully recommended that the General Purpose and Administration Committee recommend to Council the following:

1. THAT Report CLD-024-11 be received;
2. THAT an expenditure not to exceed \$5,800.00 be approved, the funds to come from Account # 19-191-00000-7161 By-law Enforcement – Professional Fees, to retain the services of Swallow Acoustic Consultants Ltd.; and
3. THAT all interested parties listed in Report CLD-024-11 be advised of Council's decision.

Submitted by:


Patti L. Barrie
Municipal Clerk

Reviewed by:


Franklin Wu
Chief Administrative Officer

PLB/LDC

BACKGROUND AND COMMENT

On July 4, 2011 Council passed By-law 2011-068, amending the Noise By-law. This amendment affects the gun clubs and their users by redefining the times of operation for the clubs. At that time, Council passed a resolution which reads, in part:

"THAT the shooting clubs, law enforcement agencies, area residents and staff communicate on how they can move forward on this matter to meet the limits as set forth in the proposed draft by-law in items 1 and 2 with an effective date of September 19, 2011;"

Subsequent to Council passing this resolution, staff arranged a meeting with the affected parties. In order to deal fairly and openly with all sides, staff retained the services of an outside mediator, Valerie Hazlett Parker, a solicitor and trained mediator with several years experience. All involved parties were asked to submit a brief of their concerns which would be distributed to the other individuals attending the meeting. Only one participant, Ms. Nancy Wilson, forwarded any documentation. Ms. Hazlett Parker and all parties were supplied with copies of these documents as well as background material from staff.

On August 16th this year, a meeting was convened at the Municipal Administrative Centre. Present were representatives from the Leskard community, the Union Rod and Gun Club, the Orono Fish and Hunt Club, the Marksmen Club of Oshawa, the RCMP, the Canadian Pacific Railway Police, the Chief Firearms Officer, the Ministry of Natural Resources' Bear Response Team and Municipal Clerks' Department staff.

The main issue centered on the Orono club and the increased use of the facilities by the various enforcement agencies. Local residents stated that they did not have an issue with the "regular users" of the club or the original frequency of the shooting. The problems arose when the enforcement agencies began to use the facility for training of their officers. At that point the intensity, frequency and volume of the noise increased dramatically. Where residents had been used to the Club being used only two days each week, Wednesday and Sunday, they were now listening to the sound of shooting five and six days for several weeks at a time.

The mediator focused the discussion on how the gun clubs planned to deal with the concerns of the residents. Representatives from the Union Rod and Gun Club stated that they had installed large sound attenuation berms around the property and done tree planting along the berms. The trees help break up the sound waves and the berms absorb and deflect the sound waves.

The representative from the Orono club stated that the club is in the process of purchasing an unopened road allowance along the east side of the property to be used to construct a large berm to absorb and deflect the sound travelling east toward the hamlet of Leskard.

According to the representative, studies conducted by the National Association of Shooting Ranges have shown that the berms will decrease the noise levels by approximately 10 decibels. In addition, they will be installing noise baffles around the pistol range itself and in the area of the targets to absorb some of the sound at its source.

Several residents voiced the concern that the 70 decibel level that was established by By-law 2011-068 is too high and want it reduced to 50 decibels. There is a new draft guideline in the preparation stage at the Ministry of the Environment which, if left unchanged, would recommend a noise level of 50 decibels irrespective of when a gun club or shooting range first operated. This document entitled **NPC-300** is a draft document only and, if approved, would form part of the Provincial Guidelines. As such, it is not enforceable legislation. It is only a guideline, as NPC-232 currently is, which can be considered by municipalities when making land use planning decisions and/or regulating noise limits through noise by-laws.

A concern was raised about the frequency of shooting on the range. It was felt by several residents that if the range was going to be allowed legal non-conforming status then the members have to abide by the terms and use of the range as it was first established, that being shooting only twice each week. This view is not correct. Legal non-conforming status speaks only to the land use, not the hours or days of operation. The Orono Fish and Hunt Club existed at its' current location prior to the enacting of the first Clarke Township Zoning By-law, therefore it has a right to continue operation. Zoning regulations do not speak to frequency, intensity of use or times of operation, simply whether or not the use is permitted on the land.

The clubs indicated that they are open to having their sound levels monitored and would also like to conduct independent monitoring on the neighbouring properties to determine the effectiveness of their efforts. Also, the Orono club advised that they would address the matter of reducing the hours of operation with their Board of Directors and perhaps shorten the times available to the enforcement agencies.

All parties agreed that, in the case of the Orono Fish and Hunt club a firm schedule of use would be most helpful to the area residents so that they can plan their activities around the use of the range and thereby minimize the impact on their lives.

At the conclusion of the meeting several of the residents stayed behind to talk privately with the Orono representatives. A schedule will be drawn up of all Orono's shooting activities for the year and made available to the local residents.

CONCURRENCE

This Report has been reviewed by Nancy Taylor, Director of Finance/Treasurer and Andrew Allison, Municipal Solicitor, who concur with the recommendations.

CONCLUSION

Ms Hazlett Parker prepared a report for staff on the meeting.

In her conclusion Ms Hazlett Parker stated:

“After lengthy discussions and statements made by everyone present, who wished to be heard, a number of agreements were reached. They include the following:

- 1. Neighbouring residents of the Orono Fish and Hunt Club will allow Gun Club members onto their properties to conduct sound tests. They agreed that after the meeting they would exchange contact information so that this could be organized directly.*
- 2. The Orono Fish and Hunt Club will give advance notice of special events to nearby residents as far in advance as possible.*
- 3. The Orono Fish and Hunt Club is in the process of acquiring a properly calibrated sound meter from Cameco, which they will use under various weather conditions, to take sound reading.*
- 4. The Representative for the Orono Fish and Hunt Club would take to his Board the possibility of reducing the hours of operation of the Orono Fish and Hunt Club.”*

The process of purchasing the abandoned road allowance is proceeding through the Engineering Services Department as per Municipal procedure. A report to that effect is being considered by the General Purpose and Administration Committee on September 12, 2011.

It is staff's opinion that the meeting and the use of an independent mediator were helpful in bringing both sides together and will lead to better relations and a general improvement for all concerned.

With regard to the noise levels at the range, staff have contacted Swallow Acoustic Consultants Ltd. to arrange for them to conduct sound monitoring in the area when the range is in use. This will provide staff with a baseline for measuring the current noise levels and the effects of any future work done by the club to reduce the noise. The cost of the sound monitoring is estimated at \$5,800 and will require a few weeks to complete. The Municipal Law Enforcement Division is prepared to retain the firm to conduct the monitoring however the cost exceeds the funds currently available in the Division's Operating Budget. Staff are therefore seeking approval for this expense.

CONFORMITY WITH STRATEGIC PLAN – Not applicable

STAFF CONTACT: Len Creamer, Manager, Municipal Law Enforcement

LIST OF INTERESTED PARTIES TO BE ADVISED OF COUNCIL'S DECISION

Ard Neiman	Resident
Ron Alldred	Orono Fish & Hunt Club
Tony Bernardo	Orono Fish & Hunt Club
John Baker	The Marksmen Club of Oshawa
Karen McArthur	Resident
Nancy Wilson	Resident
Alan Risebrough	Resident
Elizabeth Macleod	Resident
Bruce Blight	Resident
Rick Roddy	President Orono Fish & Hunt Club
Brady Hooker	Vice-President Orono Fish & Hunt Club
Kelly Adams	Resident
Steve Cody	RCMP
Shelly Richards	Resident
Lynne Richards	Resident
Sue Richards	Resident
Ron Kirst	CP Rail Police
Tammy Gould	Resident
Paul Young	Union Rod and Gun Club
Hank Krawczyk	Chief Firearms Office

REPORT MUNICIPAL CLERK'S DEPARTMENT

Meeting: GENERAL PURPOSE AND ADMINISTRATION COMMITTEE

Date: November 28, 2011 **Resolution#:** *GPA-675-11* **By-law#:**

Report#: CLD-033-11 **File#:**

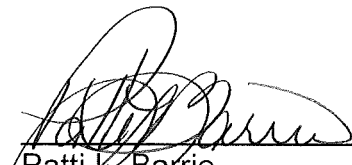
Subject: RESULTS OF NOISE INVESTIGATION , ORONO FISH AND HUNT CLUB

RECOMMENDATIONS:


It is respectfully recommended that the General Purpose and Administration Committee recommend to Council the following:

1. THAT Report CLD-033-11 be received; and
2. THAT all interested parties listed in Report CLD-033-11 be advised of Council's decision.

Submitted by:


Patti L. Barrie,
Municipal Clerk

Reviewed by:


Franklin Wu,
Chief Administrative Officer

PLB/LDC

1. BACKGROUND

At the General Purpose and Administration Committee meeting held on September 12, 2011 Resolution GPA-556-11 was passed, authorizing the expenditure of up to \$5,800.00 to retain the services of Swallow Acoustic Consultants Ltd. (SACL) to determine the current sound levels of operations at the Orono Fish and Hunt Club.

Staff attended a number of properties on September 20 and October 6 in the company of Aaron Wood of SACL. Mr. Wood is an Engineer and he was in attendance to take sound readings from surrounding properties to determine whether or not the existing sound levels of the Club meet or exceed the permitted 70 dBAI limit established in By-law 2001-071, as amended.

2. INVESTIGATION

For the purposes of obtaining sound readings staff and Mr. Wood attended six properties and obtained readings while the RCMP was conducting their training exercises. The community members who spoke at the Mediation meeting held on August 16th had identified the level of noise emanating from the RCMP training as being the most disturbing. The properties where the readings were taken are indicated on the map attached to this report as Page 6 of Attachment #1.

3. DIFFERING INTERPRETATIONS

SACL raised a concern with the difference in the wording between the Clarington Noise By-law and the standard as set out in the Ministry of the Environment's publication NPC-232 "Sound Level Limits for Stationary Sources in Class 3 Areas (Rural), October 1995".

Section 3.1.1 of the By-law states that:

"During non-curfew times, any noise emanating from the use of a shooting range shall not exceed:

- (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980 or (b) 50 dBAI at the point of reception for any shooting range which began operation after January 1st 1980."*

while Section 8.(2) of the MOE noise publication states that:

"For impulsive sound...from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (LLM), is...70 dBAI if the gun club were operating before January 1, 1980..."

The subtle difference between the two documents is that Clarington's by-law sets a maximum permitted noise level of 70 dBAI. The MOE standard can be interpreted that a single impulsive sound occurrence can exceed the maximum level of 70 dBAI as long as the average over a number of readings does not exceed 70 dBAI limit.

The more stringent 70 dBAI limit in the Clarington by-law was applied to assess the compliance.

4. RESULTS

The initial results of the readings showed that two of the test sites minimally exceeded the permitted limit, however when these readings were extrapolated to provide a "Worst Case Scenario" the numbers increased into the mid 70s for three of the test properties (ie, one additional property).

In their report, SACL provides two possible solutions:

1. Limit the number of shooters at any one time to no more than three people; or
2. Construct acoustic barriers or berms along the north, east and south boundaries of the property. These barriers would vary in height from 2 metres along the south property line to a maximum of 5 metres on the north-east.

The Orono Fish and Hunt Club have indicated that they are prepared to proceed with the second solution noted above. Their intent is to purchase the unopened road allowance which runs north and south along the east side of their property. Once the land is acquired they will construct a berm of sufficient size to reduce and contain the noise.

The Club is currently in discussion with Engineering Services to acquire the land. The following items have already been completed:

- The formal Application for Road Closure and Conveyance has been received.
- Consent for the proposed closure from all other property owners situated adjacent to the subject road allowance has been obtained.
- The application fee of \$250 has been paid.
- The plan of survey required to prepare the deed has been received.
- All municipal departments, other governments and outside agencies have now endorsed the road closure in principle.
- Initial formal approval from Municipal Council has been obtained.

The following items remain outstanding:

- The Municipality will require payment of \$3,500 + HST for the cost of an appraisal of the land value. The appraisal will be prepared by a certified property appraiser who has been retained by the Municipality.
- The Municipality must advertise the proposed road closure in local newspapers.
- The Municipality must prepare by-laws to legally close the road and convey ownership.
- Payment for the land value as well as all legal, advertising and other costs associated with the closure and conveyance must be paid to the Municipality.
- The Club must retain the services of a lawyer to complete the final land transfer.
- The Club must pay any land transfer tax.
- The Club must complete any other terms or conditions deemed necessary by the Director of Engineering Services.

5. CONCURRENCE

This report has been reviewed by Andy Allison, Municipal Solicitor and Tony Cannella, Director of Engineering Services, who concur with the recommendations.

6. CONCLUSION

The results of the Noise Study have shown that there is a problem which must be dealt with by the Orono club. As noted above, they have indicated a willingness to work to correct the problem. Should that not occur, staff are prepared to initiate proceedings against the Club.

CONFORMITY WITH STRATEGIC PLAN – Not Applicable

Staff Contact: Len Creamer, Manager, Municipal Law Enforcement

Attachments:

Attachment 1 - Swallow Noise Report

List of interested parties to be advised of Council's decision:

Ard Neiman
Ron Alldred, President, Orono Fish and Hunt Club
Tony Bernardo
Karen McArthur
Nancy Wilson
Alan Risebrough
Elizabeth MacLeod
Bruce Blight
Rick Roddy, President, Union Rod & Gun Club
Brady Hooker, Vice-President, Union Rod & Gun Club
Kelly Adams
Steve Cody
Shelly Richards
Lynne & Sue Richards
Ron Kirst, Canadian Pacific Railway Police
Tammy Gould
Paul and Sharon Young, Union Rod & Gun Club
Orono Fish and Hunt Club
The Marksmen Club
Jeremy Ross
Dianne Vetzal
Mike Box
Dean Link
Keith Linton
Tammy Gould
Anne Ball
Al Risebrough
Greg Farrant, Ontario Federation of Anglers & Hunters

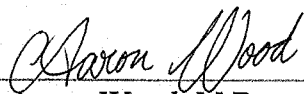


Noise Study Report
Gun Club
3292 Concession Road 7
Clarington, Ontario

Prepared for

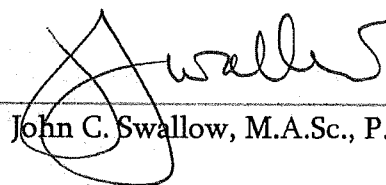
The Municipality of Clarington
40 Temprence Street
Bowmanville, ON L1C 3A6

Prepared by

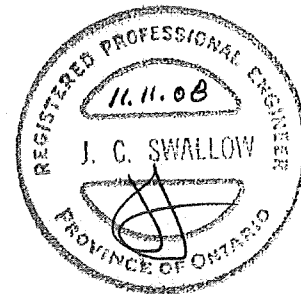


Aaron Wood, M.Eng.

Approved by



John C. Swallow, M.A.Sc., P.Eng.



Swallow Acoustic Consultants Ltd.

366 Revus Avenue, Unit 23
Mississauga, ON L5G 4S5
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November 8, 2011
B1-128

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1. INTRODUCTION

The Municipality of Clarington has retained the services of Swallow Acoustic Consultants Ltd (SACL) to prepare an Acoustic Assessment Report for an existing gun club at 3292 Concession Road 7 in Clarington, Ontario. The area surrounding the site is generally farm lands. There are residences around 600 metre away at the northeast and south of the gun club. An area map showing the location of the gun club is provided in [Figure 1](#).

The assessment was required by the Municipality to assist in investigating the noise complaints filed against the gun club operation.

2. FACILITY DESCRIPTION

The gun club is located approximately 700 metres north of Concession Road 7, and 600 metres east of Leskard Road. The gun club is approximately 140 meters in length (north to south) and 110 meters in width (east to west). A map showing the layout of the gun club is provided in [Figure 2](#). It includes a 25-metre range, a 50-metre range, a 100-metre range, and a trap shooting area near the centre of the gun club. The 25-metre one has 12 shooting targets, the most among the 3 ranges. The 12 targets are shown in [Figure 3](#).

With regard to the noise complaints, SACL learned the following information from the Municipality:

- 1) The gun club has been operated since 1960s;
- 2) The nearby residents used to tolerate the noise from the gun club, until
- 3) In recent years since the gun club hosted RCMP shooting training.
- 4) The residents complained that the RCMP shooting training was significantly more annoying than the operation of the gun club before its hosting the training, because the training often involved a team of officers shooting simultaneously, rather than amateurs shooting separately.

3. NOISE SOURCES

SACL conducted site visits on September 20 and October 6, 2011. There were about 20 RCMP officers on site for training sessions on September 20 and 14 officers on October 6. Each day they were divided into two teams.

On September 20, SACL staff eye-witnessed one team was for shooting which occupied 8 of the 10 shooting positions of a range. A photo of the 10 shooting positions is provided as [Figure 4](#). A photo of officers in shooting positions is provided in [Figure 5](#). The other team was out of the shooting ranges, conducting non-shooting training activities. The major noise sources were officers firing their pistols simultaneously.

On October 6, SACL staff heard the sound of shooting while measuring noise impact at residences along Leskard Road and Concession Road 7. When SACL staff arrived at the gun club around lunch time, the officers were having their snacks. SACL learned the number of officers and the dividing them into two teams from conversing with an RCMP officer on site.

4. POINTS OF RECEPTION

The critical points of reception (PORs), where the noise impacts are expected to be greatest, occurs at the nearest noise sensitive land use. We learned from the Municipality of Clarington that the residents of the PORs in [Table 1](#) complained most of the noise from the gun club. The locations of the PORs are also indicated in [Figure 1](#).

Table 1: PORs

ID	Address	Distance to Gun Club (m)	Note
POR1	7506 Leskard Road	520	Backyard, 30 metres from the house
POR2	7580 Leskard Road	610	Backyard, 30 metres from the house
POR3	7606 Leskard Road	620	Backyard, 30 metres from the house
POR4	7782 Leskard Road	1050	Backyard, property line, 20 metres from the house
POR5	7685 Leskard Road	840	Front yard, 30 metres from the house
POR6	3283 Concession Road 7	630	Backyard, 30 metres from the house

5. SOUND LEVEL LIMIT

Section 3.1.1 of the Corporation of the Municipality of Clarington By-law 2011-068 states that:

During non-curfew times, any noise emanating from the use of a shooting range shall not exceed: (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980 or (b) 50 dBAI at the point of reception for any shooting range which began operation after January 1st 1980.

Section 8.(2) of the Ontario Ministry of the Environment noise publication NPC-232 “*Sound Level Limits for Stationary Sources in Class 3 Areas (Rural), October 1995*” states that:

For impulsive sound...from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), is...70 dBAI if the gun club were operating before January 1, 1980...

There is a subtle difference between the 70 dBAI in Clarington by-law and MOE noise publication. The wording of “*shall not exceed...70 dBAI*” can be interpreted that it is the

maximum impulsive sound level that is allowed by the by-law. The wording of “*Logarithmic Mean Impulse Sound Level (L_{LM}), is...70 dBAI*” can be interpreted that a single impulsive sound occurrence can exceed the maximum level of 70 dBAI as long as the “*logarithmic mean (a type of averaging algorithm) impulse sound level*” meets the 70 dBAI limit. Alternatively speaking, the limit is Clarington by-law can be interpreted to be more stringent than the MOE limit.

The more stringent 70 dBAI limit in the Clarington by-law is selected to assess the compliance. A copy of the by-law and two pages of the MOE NPC-232 are provided in [Appendix A](#).

6. SOUND LEVEL MEASUREMENTS

6.1 Instrumentation

Sound level measurements were taken in the afternoon of September 20, 2011 and in the morning of October 6, 2010 with a Bruel & Kjaer hand-held analyzer type 2250, serial number 2630269. It was calibrated before and after measurements with a Bruel & Kjaer sound calibrator type 4231, serial number 2623794. A wind shield was used during all outdoor measurements.

6.2 Meteorology

There was no precipitation during site visits. The wind was less than 5 kilometers per hours. The temperature was about 20 degree Celsius during September 20 site visit, about 15 degree Celsius during October 6 site visit. The atmospheric pressure was about 100 kilopascals. The humidity was about 80%.

6.3 Measurements

Sound level measurements were taken at the gun club at about 100 meters behind 8 RCMP officers firing pistols simultaneously and at about 20 meters behind one officer firing one pistol for 20 shots. Sound level measurements were also taken at critical receptors POR1-6.

7. WORST-CASE SCENARIO

We assume that the worst-case scenario is 12 RCMP officers shooting simultaneously because (a) the range with most targets have 12 targets, consequently 12 shooting positions; (b) the RCMP shooting noise is the most complained activity; and (c) due to safety concerns, there will be no other shooting while RCMP training is underway.

8. NOISE IMPACTS AT CRITICAL RECEPTORS

The maximum impulsive sound levels measured at critical receptors during RCMP officers' shooting are listed in [Table 2](#).

Table 2: Maximum Impulsive Sound Levels at PORs

Location	Measurement (dBAI)	Worst-case Prediction (dBAI)	Compliance
POR1	66.7	69.7	Yes
POR2	71.1	74.1	No
POR3	65.0	68.0	Yes
POR4	66.8	69.8	Yes
POR5	72.4	75.4	No
POR6	69.9	72.9	No

For each location in Table 2, the maximum impulsive sound level of the worst-case prediction is 3 dB higher than that of the measurement. The reason for the 3 dB difference is explained below.

Sound level measurements were taken at the site of the gun club on September 20, 2011. The measured maximum impulsive sound levels are listed in Table 3.

Table 3: Maximum Impulsive Sound Levels Gun Club

ID	Distance (m)	Level (dBAI)	Note
L1a	98	101.0	Measured behind 8 RCMP officers shooting simultaneously
L2a	21	105.1	Measured behind 1 RCMP officers firing 20 shots continuously
L1b	100	100.8	L1a extrapolated to 100 meters
L2b	100	91.5	L2a extrapolated to 100 meters

It can be seen in Table 3 that the difference between L1b and L2b is 9.3 dBAI, which corresponds well with the relationship that doubling the number of same sources will increase the sound level by 3 dB at same distance under same acoustical condition; reversely, halving the number of same sources will reduce the sound level by 3 dB at same distance under same acoustical condition.

During the site visit on October 6, 2011, SACL staff learned that there were 14 officers equally divided into 2 teams, each with 7 officers. We assumed that there were 5 to 6 officers in a team firing simultaneously, with 1 or 2 officers in the team as instructors. Since the 25-meter range in the club has 12 shooting positions, we assume that in Table 2 the predicted worst-case sound levels should be approximately 3 dB higher than those of measurements.

9. NOISE CONTROL MEASURE

Since there is non-compliance in Table 2, we recommend the gun club choose either of the following noise control options.

Option 1: Acoustic Barriers

Acoustic barriers or berms shall be built along the north, east and south boundaries of the gun club to fully block the line-of-site between the gun club and POR1-6. The acoustic

barriers shall be made of durable material, with minimum surface density of 20 kg/m², structurally sound, appropriate to wind and snow load, designed and constructed without cracks or gaps. Any gaps under the barriers necessary for drainage purpose shall be minimized and localized. The recommended locations and minimum heights of the barriers in Figure 6 are based on elevations of the gun club and POR1-6 in Google Earth. It is recommended that when elevation information or contour maps of the study area are available from another source, they should be submitted to an acoustical consultant for review.

Option 2: Operational Changes

No more than 3 people in the shooting range shall fire their guns simultaneously. Preferably they should fire consecutively, one after one. The reasoning for this option is explained below:

As stated in the last paragraph of Section 8, it was assumed that 5 to 6 officers in a team firing simultaneously during the site visit on October 6, 2011. The highest impulsive sound level measured during site visit is 72.4 dBAI at POR5, which is less than 3 dB higher than the limit of 70 dBAI. By reducing the number of people firing simultaneously to 3 (about half of the assumed 5 to 6 officers), the sound levels at PORs are expected to be lowered by approximately 3 dB as described in the last second paragraph of Section 8.

10. CONCLUSION

SACL conducted a noise study of the gun club at 3292 Concession Road 7, Clarington, Ontario. Based on measured sound levels (see Table 2 in Section 8) at critical receptors regarding the impulsive sound of the most complained RCMP officers' firing pistols together, it is predicted that noise impacts will not be totally in accordance with the sound level limit of 70 dBAI in the Clarington By-law 2011-068, under worst-case scenario (described in Section 7). Therefore it is recommended that the noise control measure (described in Section 9) should be implemented.



Figure 1: Locations of Gun Club and PORs

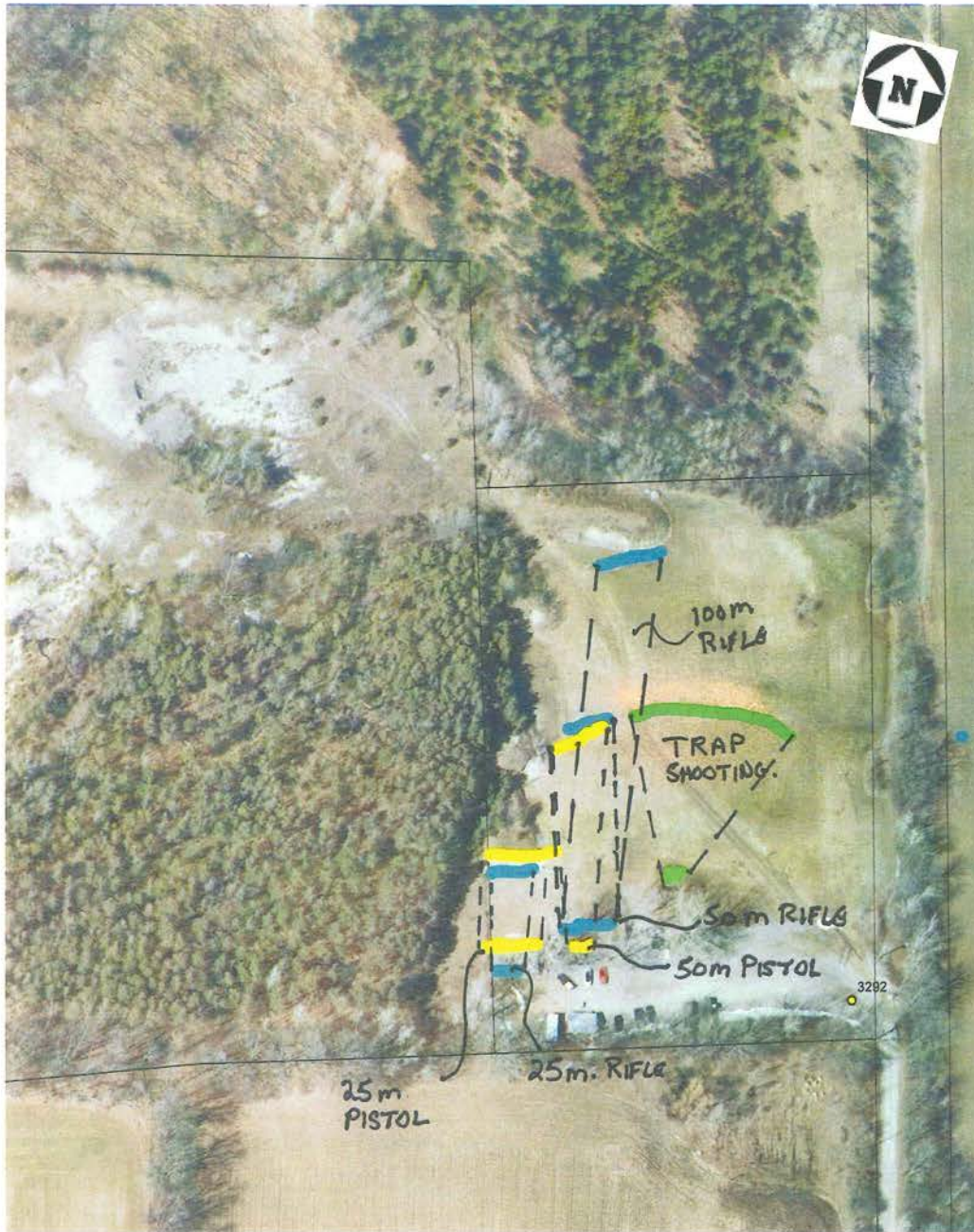


Figure 2: Gun Club Layout



Figure 3: 12 Targets of 25-metre Range



Figure 4: 10 RCMP Shooting Positions



Figure 5: RCMP Officers Shooting Together



Figure 6: Barrier Heights and Locations

Appendix A: Clarington By-law and MOE Noise Guideline

THE CORPORATION OF THE MUNICIPALITY OF CLARINGTON

BY-LAW 2011-068

Being a By-law to amend Noise By-law 2007-071

WHEREAS Section 129 of the *Municipal Act, 2001*, S.O. 2001, Chapter 25 states that a local municipality may prohibit and regulate noise;

AND WHEREAS The Council of the Corporation of the Municipality of Clarington deems it appropriate to amend By-law 2007-071, which is a by-law to regulate noise levels within the Municipality of Clarington;

NOW THEREFORE the Council of the Corporation of the Municipality of Clarington enacts as follows:

1. Section 1.1 of By-law 2007-071 is deleted in its entirety and replaced with the following:

No person shall ring any bell, blow or sound any horn or cause the same to be rung, blown or sounded, or shout or create, cause or permit any unusual or excessive noises which, at the point of reception, are likely to disturb any other inhabitant of the Municipality of Clarington.

2. Section 3.1 of By-law 2007-071 is deleted in its entirety and replaced with the following:

3.1 A noise curfew shall apply to the following shooting ranges within the Municipality of Clarington:



- (a) the Orono Fish and Hunt Club;
- (b) the Union Rod and Gun Club; and


This curfew shall be from 9:00 p.m. until 8:00 a.m. the following day (Monday through Saturday), 9:00 p.m. Saturday until 10:00 a.m. Sunday, and 4:00 p.m. Sunday until 8:00 a.m. Monday.

3.1.1 During non-curfew times, any noise emanating from the use of a shooting range shall not exceed:

- (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980; or
- (b) 50 dBAI at the point of reception for any shooting range which began operation after January 1st 1980.

- 3.1.2 Notwithstanding section 3.1 above, all approved indoor shooting ranges within the Municipality shall be exempt from the noise curfew.
3. Section 3.3 of By-law 2007-071 is deleted in its entirety and replaced with the following:
- 3.3 A noise curfew shall apply to any noise from any excavation or construction work whatsoever, including the erection, demolition, alteration or repair of any building from 9:00 p.m. until 7:00 a.m. the following day, (Monday through Saturday), 9:00 p.m. Saturday until 10:00 a.m. Sunday, and from 4:00 p.m. Sunday until 7:00 a.m. Monday.
- 3.3.1 For the purposes of this by-law, noise related to construction work shall be interpreted to include the starting, idling and warming up of any truck or mechanically powered excavation or earth moving equipment.
- 3.3.2 Noises emanating from the operations described in sections 3.3 and 3.3.1 shall not be considered to be a violation under this by-law when said operations are carried on outside the time periods set out by a curfew.
- 3.3.3 Notwithstanding any other provision to contrary, appropriate staff may authorize construction work to be carried on outside the curfew restrictions set out in this By-law only in the case of urgent necessity and then only under prior authorization from appropriate staff.
4. The provisions of this by-law shall come into full force and effect on the 19th day of September 2011.
- BY-LAW read and passed in open session this 4th day of July, 2011
- _____
- A. Foster, Mayor
- _____
- Patti L. Barrie, Municipal Clerk

	<h1 style="margin: 0;">Ontario</h1>	
	<i>MINISTRY OF THE ENVIRONMENT</i>	
	<p>(2) Approval of Stationary Sources The One Hour Equivalent Sound Level (L_{eq}) and/or the Logarithmic Mean Impulse Sound Level (L_{LM}) produced by the stationary sources shall be obtained by measurement or prediction. The estimation of the L_{eq} and/or L_{LM} of the stationary source under impact assessment shall reflect the principle of "predictable worst case" noise impact. The "predictable worst case" noise impact occurs during the hour when the difference between the predicted sound level produced by the stationary source and the background sound level of the natural environment is at a maximum.</p>	
6.	<p>PROCEDURES</p> <p>All sound level measurements of the One Hour Equivalent Sound Level (L_{eq}) and the Logarithmic Mean Impulse Sound Level (L_{LM}) shall be made in accordance with Reference [3].</p> <p>All sound level measurements of the One Hour Ninetieth Percentile Sound Level (L_{90}) shall be made using a Sound Level Meter capable of measuring percentile sound levels. The meter shall meet the applicable requirements for an Integrating Sound Level Meter of Reference [2]. The measurements shall be carried out following procedures for the measurement of varying sound described in Reference [3].</p> <p>Sound from existing adjacent stationary sources may be included in the determination of the background hourly sound levels L_{eq} and L_{90}; if such stationary sources are not under consideration for noise abatement by the Municipality or the Ministry of Environment and Energy.</p>	
7.	<p>SOUND LEVEL LIMITS - GENERAL</p> <p>(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), is the lower of:</p> <ul style="list-style-type: none"> • the background One Hour Equivalent Sound Level (L_{eq}) obtained pursuant to Section 5; and • the background One Hour Ninetieth Percentile Sound Level (L_{90}) plus 15 dB, i.e. $L_{90} + 15$ dB, obtained pursuant to Section 5. <p>(2) For sound from a stationary source, including Quasi-Steady Impulsive Sound but not including other impulsive sound, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the One Hour Equivalent Sound Level (L_{eq}), is the lower of:</p> <ul style="list-style-type: none"> • the background One Hour Equivalent Sound Level (L_{eq}) obtained pursuant to Section 5; and • the background One Hour Ninetieth Percentile Sound Level (L_{90}) plus 10 dB, i.e. $L_{90} + 10$ dB, obtained pursuant to Section 5. 	
8.	<p>SOUND LEVEL LIMITS - SPECIFIC IMPULSIVE SOUNDS</p> <p>(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is an industrial metal working operation (including but not limited to forging, hammering, punching, stamping, cutting, forming and moulding), the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), is 60 dBAI, if the stationary source were operating before January 1, 1980, and otherwise is 50 dBAI.</p> <p>(2) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), is:</p>	
<p>Publication NPC-232 - 6 - October 1995</p>		

	<h2 style="margin: 0;">Ontario</h2>										
			<i>MINISTRY OF THE ENVIRONMENT</i>								
<p style="font-size: 2em; margin: 0;">>></p> <ul style="list-style-type: none"> • 70 dBAI if the gun club were operating before January 1, 1980; or • 50 dBAI if the gun club began to operate after January 1, 1980; or • the L_{LM} prior to expansion, alteration or conversion. <p>(3) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is not a blasting operation in a surface mine or quarry, characterized by impulses which are so infrequent that they cannot normally be measured using the procedure for frequent impulses of Reference [3], the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the impulse sound level, is 100 dBAI.</p> <p>9. SOUND LEVEL LIMITS - PEST CONTROL DEVICES</p> <p>(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a pest control device employed solely to protect growing crops, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), is 70 dBAI.</p> <p>(2) For sound, including Quasi-Steady Impulsive Sound but not including other impulsive sound, from a pest control device employed solely to protect growing crops, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the One Hour Equivalent Sound Level (L_{eq}), is 60 dBA.</p> <p>10. PROHIBITION - PEST CONTROL DEVICES</p> <p>The operation of a pest control device employed solely to protect growing crops is prohibited during the hours of darkness, sunset to sunrise.</p> <p>11. PRE-EMPTION</p> <p>The least restrictive sound level limit of Sections 8, 9 and 10 applies.</p> <p>12. EXCLUSION</p> <p>No restrictions apply to any stationary source resulting in a One Hour Equivalent Sound Level (L_{eq}) or a Logarithmic Mean Impulse Sound Level (L_{LM}), at a point of reception within 30 m of a dwelling or a camping area, lower than the minimum values for that time period, as specified in Table 232-1.</p>											
<p>TABLE 232-1 Minimum Values of One Hour L_{eq} or L_{LM} by Time of Day</p>											
<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Time of Day</th> <th style="padding: 5px;">One Hour L_{eq} (dBA) or L_{LM} (dBAI)</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">0700 - 1900</td> <td style="padding: 5px;">45</td> </tr> <tr> <td style="padding: 5px;">1900 - 2300</td> <td style="padding: 5px;">40</td> </tr> <tr> <td style="padding: 5px;">2300 - 0700</td> <td style="padding: 5px;">40</td> </tr> </tbody> </table>				Time of Day	One Hour L_{eq} (dBA) or L_{LM} (dBAI)	0700 - 1900	45	1900 - 2300	40	2300 - 0700	40
Time of Day	One Hour L_{eq} (dBA) or L_{LM} (dBAI)										
0700 - 1900	45										
1900 - 2300	40										
2300 - 0700	40										
<p>May 21, 1999</p>											
Publication NPC-232		- 7 -									
		October 1995									

Appendix B: Measurements Raw Data

No.	Lmax (dBA)	Address	Note	Date
1	101.0	3292 Concession Rd 7	8 officers shooting together	Sept 20, 2011
2	99.4	3292 Concession Rd 7	8 officers shooting together	Sept 20, 2011
3	105.1	3292 Concession Rd 7	1 officer firing 20 shots	Sept 20, 2011
4	66.7	7506 Leskard Rd	POR1	Sept 20, 2011
5	55.9	7506 Leskard Rd	POR1	Sept 20, 2011
6	69.9	3283 Concession Rd 7	POR6	Sept 20, 2011
7	61.3	3283 Concession Rd 7	POR6	Sept 20, 2011
8	68.2	7580 Leskard Rd	POR2	Oct 6, 2011
9	70.7	7580 Leskard Rd	POR2	Oct 6, 2011
10	71.1	7580 Leskard Rd	POR2	Oct 6, 2011
11	60.2	7606 Leskard Rd	POR3	Oct 6, 2011
12	65.0	7606 Leskard Rd	POR3	Oct 6, 2011
13	59.2	7782 Leskard Rd	POR4	Oct 6, 2011
14	65.9	7782 Leskard Rd	POR4	Oct 6, 2011
15	66.8	7782 Leskard Rd	POR4	Oct 6, 2011
16	65.1	7685 Leskard Rd	POR5	Oct 6, 2011
17	72.4	7685 Leskard Rd	POR5	Oct 6, 2011
18	65.1	7685 Leskard Rd	POR5	Oct 6, 2011
19	53.4	3283 Concession Rd 7	POR6	Oct 6, 2011
20	57.0	3283 Concession Rd 7	POR6	Oct 6, 2011
21	57.2	3283 Concession Rd 7	POR6	Oct 6, 2011

————— The End —————


REPORT MUNICIPAL CLERK'S DEPARTMENT

Meeting: GENERAL PURPOSE AND ADMINISTRATION COMMITTEE
Date: February 27, 2012 **Resolution#:** BPA-007-12 **By-law#:** N/A
Report#: CLD-007-12 **File#:**
Subject: RESULTS OF SOUND TESTING AT ORONO FISH AND HUNT CLUB


RECOMMENDATIONS:

It is respectfully recommended that the General Purpose and Administration Committee recommend to Council the following:

1. THAT Report CLD-007-12 be received; and
2. THAT all interested parties listed in Report CLD-007-12 be advised of Council's decision.

Submitted by: 
Patti L Barrie, CMO
Municipal Clerk

Reviewed by:


Franklin Wu,
Chief Administrative Officer

PLB/LC

1. BACKGROUND

At the December 5, 2011 meeting, Council received and approved Report CLD-033-11 concerning the work and test results from the acoustical engineering firm of Swallow Acoustic Consultants Ltd. conducted at the Orono Fish and Hunt Club at 3292 Concession Rd. 7 in Leskard. Council went on to direct Staff to conduct additional testing in cooperation with the Gun Club using higher caliber weapons.

2. INVESTIGATION

Staff contacted Swallow Acoustics Consultants Ltd. and Ron Aldread from the Orono Fish and Hunt Club to coordinate a time and availability of the rifles to be tested. This time there were to be five different firearms tested with the intent of determining the possible "worst case scenario" of noise from the range. The weapons chosen for this set of tests were:

1. SAKO manufactured 6.5X55 mm. (.264 caliber) bolt action rifle
2. SAKO .458 caliber bolt action rifle
3. Lee-Enfield .303 caliber bolt action military rifle
4. Winchester 12 gauge shotgun
5. Winchester 20 gauge shotgun

In order to get the widest possible impact of the sound from the range, staff attended nine properties in Leskard to obtain readings. The attached report from Swallow Acoustic Consultants Ltd. shows the properties and their location relative to the Orono club.

Due to the number of properties involved and the variety of firearms being tested, the entire testing process took two days. On January 9th and 10th the Municipal Clerk, the Manager of the Municipal Law Enforcement Division and a representative from the Orono club accompanied the sound engineer to the nine properties while another MLEO remained at the Club to record which firearms were being used. It quickly became evident that the shotguns and the 6.5X55 mm. were generating noise levels well below the 70 dBAI level specified in the by-law and these guns were removed from further testing. The final sets of readings were conducted using the .303 caliber Lee Enfield and the .458 caliber SAKO. The .458 is the rifle often referred to by the residents as the "elephant gun".

Prior to the commencement of the tests, staff noted that there has been much work done to the firing booths at the range. They are now enclosed on three sides and ROXUL sound insulation has been applied to the walls and roof, resulting in a significant reduction in the noise levels recorded. Several of the residents were present when the testing was conducted on their properties and many commented on the reduced levels of sound.

Throughout the testing process, the Club has shown a willingness to work with staff to find a resolution to this situation. In order to meet Council's requirements for caliber of weapons to be tested, Mr. Aldread canvassed his members to acquire the weapons, and in the case of the .458 rifle in particular, both the rifle and the ammunition had to be borrowed from another individual since Mr. Aldread no longer owns one himself.

The Club has also been working diligently with the Municipality to acquire the land necessary to construct the berm along the east property line. Engineering Services will be bringing forward their own Report on closure and conveyance of the unopened road allowance along the east boundary of the property. Once obtained, the berm will be constructed on the road allowance.

3. RESULTS

A review of the Report prepared by Swallow Acoustic shows that two properties did not exceed 57.1 dBAI, (highest ambient level 76.7 dBAI), five properties reached the 60 dBAI level with the highest of them being 68.3, (highest ambient level 82.7dBAI), one property hit a maximum of 79.3 dBAI (ambient 61.4 dBAI) and one achieved 81.7 dBAI (ambient 59.6 dBAI). In total, seven of the nine properties tested did not exceed the permitted maximum of 70 dBAI yet the ambient noise level on three properties did exceed the 70 dBAI limit.

Previous discussions with the engineers have indicated a probable decrease in the range of 5 to 10 decibels through the installation of the berm along the east side of the property. If the effects of the berm are consistent with anticipated results, the noise readings for most of the firearms should be reduced to below the 70 dBAI limit set out in the by-law.

The one firearm to reach the highest level in each test was the SAKO .458 caliber rifle. This is a rifle that is not common with club members and we have been advised that it is no longer being fired at the range.

4. CONCURRENCE

This Report has been reviewed by the Director of Engineering Services Department who concurs with the contents of the Report.

5. CONCLUSION

This Report is submitted in order to provide the results of the noise testing Council requested to be conducted at the Orono Fish and Hunt Club. Staff appreciates the cooperation received from the area residents and the club in attempting to resolve the concerns brought forward.

It should also be noted that the club has reduced its shooting schedule and are now shooting on their original schedule of Sundays and Wednesdays only, with no outside groups using the range.

It respectfully recommended that the report be received and that all interested parties be advised of Council's decision.

CONFORMITY WITH STRATEGIC PLAN – Not Applicable

Staff Contact: Len Creamer, Manager, Municipal Law Enforcement

Attachments:

Attachment 1 - Swallow Acoustic Consultants Ltd. Noise Report

List of interested parties to be advised of Council's decision:

Ard Neiman
Ron Alldred, President, Orono Fish and Hunt Club
Tony Bernardo
Nancy Wilson
Alan Risebrough
Elizabeth MacLeod
Bruce Blight
Kelly Adams
Shelly Richards
Lynne & Sue Richards
Tammy Gould
Jeremy Ross
Anne Ball

February 14, 2012

The Municipality of Clarington
40 Temprence Street
Bowmanville, ON L1C 3A6

Attn: Len Creamer

Via email to lcreamer@clarington.net

Re: Report - Measurements of Impulsive Noise - Orono Gun Club

Dear Len,

SACL conducted two site visits on January 9 and 10, 2011 to measure noise impact on several residences due to gun firings at the Orono Gun Club at 3292 Concession Road 7, Clarington, Ontario.

Sources

The impulsive noise sources are five long guns firing separately (not simultaneously) at the gun club. A summary of the sources is provided in Table 1.

Table 1: Impulsive Noise Sources

ID	Name	Description
G1	Gun #1	SAKO 6.5 x 55 Rifle
G2	Gun #2	SAKO .458 Magnum Rifle
G3	Gun #3	Lee-Enfield #4 303 British Rifle
G4	Gun #4	Winchester 12 GA Shotgun
G5	Gun #5	Winchester 20 GA shotgun

Receptors

The impulsive noise receptors are residences in the vicinity of the gun club. The locations of the receptors are listed in Table 2 and indicated in Figure 1.

Table 2: Impulsive Noise Receptors

ID	Address	Note
A	3282 Concession Rd 7	Backyard, 30 m from house
B	7374 Leskard Rd	Backyard, 30 m from house
C	7606 Leskard Rd	Backyard, 30 m from house
D	7782 Leskard Rd	Backyard, property line, 20 m from house
E	7685 Leskard Rd	Front yard, 30 m from house
F	7580 Leskard Rd	Backyard, 30 m from house
G	7560 Leskard Rd	Backyard, 30 m from house
H	7535 Leskard Rd	Front yard, property line, 15 m from house
I	7506 Leskard Rd	Backyard, 30 m from house



Figure 1: Location of Receptors

Limit

According to Section 3.1.1 of the Corporation of the Municipality of Clarington By-law 2011-068, the impulsive sound level limit for the gun club is 70 dBAI at the receptors.

Instrumentation

Sound level measurements were taken on January 9 and 10, 2011 with a Bruel & Kjaer (B&K) hand held analyzer (type 2250, serial number 2630269). It was calibrated before

and after measurements with a B&K sound calibrator (type 4231, serial number 2623794). A windshield was mounted on the analyzer during all measurements.

Weather Conditions

There was no precipitation during site visits. The wind speed was less than 10 km/hr generally from south. The temperature was about 2 °C. The atmospheric pressure was about 101 kPa. The humidity was about 75%.

Measurements

Impulsive sound level measurements were taken at 9 receptors (A to I). The measurement results are shown in Tables 3 to 11.

Table 3: Impulsive Sound Levels at Receptor A

ID	Sound Level (dBAI)	Note
A1a	57.2	Gun #1
A1b	62.7	Gun #1
A1c	63.0	Gun #1
A2a	59.0	Gun #2
A2b	56.8	Gun #2
A2c	52.0	Gun #2
A2d	51.4	Gun #2
A2e	51.4	Gun #2
A2f	51.1	Gun #2
A3a	48.7	Gun #3
A3b	50.1	Gun #3
A3c	55.4	Gun #3
A4a	52.9	Gun #4
A4b	42.6	Gun #4
A4c	60.3	Gun #4
A5a	42.6	Gun #5
A5b	51.1	Gun #5
A5c	43.0	Gun #5
Aka	67.4	Background noise: traffic; no gun firing
Akb	61.8	Background noise: light conversation in the middle of backyard, 10 to 15 m from B&K analyzer; no gun firing

Table 3 shows that all measured impulsive sound levels at receptor A are below the limit of 70 dBAI. The last two readings ("Aka" and "Akb") in Table 3 are background noise measured without gun firings, using the same algorithm of measuring impulsive sound levels due to gun noise. It can be noted that the noise impact of gun firings is not significant compared to background noise.

Table 4: Impulsive Sound Levels at Receptor B

ID	Sound Level (dBAI)	Note
B-a	71.1	Guns #1, 2 and 3 fired out of order
B-b	79.3	
B-c	77.0	
B-d	63.5	
B-e	63.8	
B-f	59.2	
B-g	59.5	
B-h	66.8	
B-i	71.2	
B-j	74.8	
B-k	71.1	
B-l	74.6	
B-m	69.9	
B-n	70.2	
B-o	71.9	
Bka	61.4	Background noise: traffic; no gun firing

Table 4 shows that the measured impulsive sound levels at receptor B due to firings of guns #1, 2, and 3 exceed the limit of 70 dBAI. Although guns #4 and 5 are not included, it can be learned from the following Table 5 that sound levels due to guns #1, 2 and 3 are higher than those due to guns #4 and 5.

Table 5: Impulsive Sound Levels at Receptor C

ID	Sound Level (dBAI)	Note
C1a	74.6	Gun #1
C1b	74.6	Gun #1
C1c	75.4	Gun #1
C2a	79.9	Gun #2
C2b	81.7	Gun #2
C2c	80.5	Gun #2
C3a	76.9	Gun #3
C3b	73.8	Gun #3
C3c	76.1	Gun #3
C4a	67.8	Gun #4
C4b	66.5	Gun #4
C4c	67.7	Gun #4
C5a	69.9	Gun #5
C5b	63.5	Gun #5
C5c	70.0	Gun #5
Cka	59.6	Background noise; no gun firing
Ckb	53.7	Background noise; no gun firing
Ckc	53.4	Background noise; no gun firing

Table 5 shows that the measured impulsive sound levels at receptor C due to firings of guns #1, 2, and 3 exceed the limit of 70 dBAI. It can be seen that sound levels due to guns #2 and 3 are higher than those due to other guns. Therefore Tables 6 to 10 focus on the noise of guns #2 and 3.

Table 6: Impulsive Sound Levels at Receptor D

ID	Sound Level (dBAI)	Note
D2a	55.8	Gun #2; with noise from foot steps
D2b	47.8	Gun #2
D2c	48.0	Gun #2
D3a	45.1	Gun #3
D3b	44.5	Gun #3
D3c	46.6	Gun #3
Dka	56.1	Background noise: light conversation; no gun firing

Table 6 shows that the measured impulsive sound levels at receptor D due to firings of guns are all below the limit of 70 dBAI.

Table 7: Impulsive Sound Levels at Receptor E

ID	Sound Level (dBAI)	Note
E2a	57.8	Gun #2
E2b	57.5	Gun #2
E2c	57.6	Gun #2
E3a	62.2	Gun #3; traffic noise audible
E3b	56.0	Gun #3
E3c	52.6	Gun #3
Eka	67.6	Background noise: light conversation; plane noise; no gun firing
Ekb	59.1	Background noise: traffic; no gun firing

Table 7 shows that the measured impulsive sound levels at receptor E due to firings of guns are all below the limit of 70 dBAI.

Table 8: Impulsive Sound Levels at Receptor F

ID	Sound Level (dBAI)	Note
F2a	63.2	Gun #2
F2b	66.4	Gun #2
F2c	64.0	Gun #2
F3a	55.4	Gun #3
F3b	56.0	Gun #3
F3c	55.3	Gun #3
Fka	79.3	Background noise: light conversation (owner of the house offered coffee); no gun firing
Fkb	82.7	

Table 8 shows that the measured impulsive sound levels at receptor F due to firings of guns are all below the limit of 70 dBAI.

Table 9: Impulsive Sound Levels at Receptor G

ID	Sound Level (dBAI)	Note
G2a	66.6	Gun #2
G2b	62.3	Gun #2
G2c	66.6	Gun #2
G2d	67.9	Gun #2; top of slope*
G3a	59.5	Gun #3
G3b	64.0	Gun #3
G3c	62.8	Gun #3
G3d	64.2	Gun #3; top of slope*
Gka	72.1	Background noise: traffic; no gun firing.

*Note: Since the house is on top of a slope and the measurement location (30 m away from the house) is down the slope, we also measured the gun noise on top of the slope, a few metres from the house.

Table 9 shows that the measured impulsive sound levels at receptor G due to firings of guns are all below the limit of 70 dBAI.

Table 10: Impulsive Sound Levels at Receptor H

ID	Sound Level (dBAI)	Note
H2a	55.9	Gun #2
H2b	57.1	Gun #2
H2c	57.6	Gun #2
H2d	55.8	Gun #2
H3a	56.5	Gun #3
Hka	76.7	Background noise: traffic; no gun firing

Table 10 shows that the measured impulsive sound levels at receptor H due to firings of guns are all below the limit of 70 dBAI. The reason for Table 10's including only one reading of the noise of gun #3 is that the gun was out of ammunition. However the measurements at receptors D to G (Tables 6 to 9) indicate that the noise of gun #2 is louder than that of gun #3. Therefore if the noisiest gun #2 meets the limit of 70 dBAI, all other guns meet the limit.

Table 11: Impulsive Sound Levels at Receptor I

ID	Sound Level (dBAI)	Note
I2a	60.0	Gun #2
I2b	59.7	Gun #2
I2c	59.5	Gun #2
I3a	67.7	Gun #2, top of slope*
I3b	68.3	Gun #2, top of slope*
I3c	66.3	Gun #2, top of slope*
Ika	60.9	Background noise; no gun firing
Ikb	59.4	

*Note: Since the house is on top of a slope and the measurement location (30 m away from the house) is down the slope, we also measured the gun noise on top of the slope, a few metres from the house.

Table 11 shows that the measured impulsive sound levels at receptor I due to firings of guns are all below the limit of 70 dBAI.

Summary

Reviewing the impulsive sound level measurements at Receptors A to I (Tables 3 to 11), it can be seen that the noise impact at most receptors meets the limit of 70 dBAI. However, the noise impact exceeds the limit of 70 dBAI at Receptors B and C. The highest measured impulsive sound level is 81.7 dBAI at Receptor C (7606 Leskard Rd) due to firing of gun #2 (sound level ID "C2b"), approximately 12 dBAI higher than the limit of 70 dBAI.

Discussion

Considering that the noise of gun firing is directional and that the land between the gun club and receptors is not flat (thus the terrain likely provides various sound attenuation effects at receptors), it is understandable that the sound levels measured at receptors do not have linear relationship with the distances between the gun club and receptors. For receptors B and C, the measured sound levels clearly exceed the limit. It is likely that the terrain provides little or no sound attenuation to the two receptors.

In Section 8 of our noise study report dated November 8, 2011 (project code B1-128), the sound level of 8 RCMP officers shooting simultaneously follows the acoustical rule of "3 dB increase with doubling the number of noise sources". During the site visits on January 9 and 10, 2012, the measured sound levels are due to guns firing separately (one by one). If several people fired together, the noise impact might become higher than the measured sound levels. However, amateurs firing guns together may not necessary become firing simultaneously; ie, the gun shots may still be separate (although close to each other) in time. Therefore it is likely that, with amateurs firing, simultaneous firing will be very rare. This possible effect is no longer a concern in this report.

Recommendations

Since the terrain makes significant difference with regard to noise impact, we recommend that a contour map (preferably in AutoCAD .DXF format) of the study area be provided to us for further noise study.

Since the sound level measurements show as high as approximately 12 dBAI exceedance over the limit of 70 dBAI, we recommend that noise control measures should be studied so that the noise impact of the gun club meets the limit of 70 dBAI. SACL successfully designed local noise control measures at each gun firing position for a previous project regarding the noise impact of another gun club.

Concluding Comments

We thank you for the opportunity of conducting site visits and taking sound level measurements early this month. We are looking forward to cooperating with you in further study. If you have any questions regarding this letter, please do not hesitate to call the undersigned. Our contact information can be found at the bottom of this page.

Yours truly,
Swallow Acoustic Consultants Ltd.



Aaron Wood, M.Eng.

Reviewed by



John C. Swallow, M.A.Sc., P.Eng.

REPORT CLERK'S DEPARTMENT

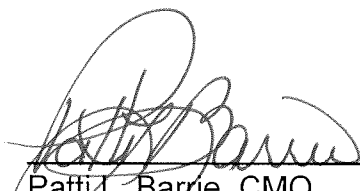
Meeting: GENERAL PURPOSE AND ADMINISTRATION COMMITTEE
Date: September 10, 2012 **Resolution#:** *GPA-428-12* **By-law#:**
Report#: CLD-027-12 **File#:**
Subject: **NOISE TESTING AT UNION ROD AND GUN CLUB**

RECOMMENDATIONS:


It is respectfully recommended that the General Purpose and Administration Committee recommend to Council the following:

1. THAT Report CLD-027-12 be received; and
2. THAT all interested parties listed in Report CLD-027-12 be advised.

Submitted by:


Patti L. Barrie, CMO
Municipal Clerk

Reviewed by:


Franklin Wu
Chief Administrative Officer

PLB/LDC

1. BACKGROUND

At the regular meeting of Council held on March 26, 2012, Resolution #C-107-12, was passed. This Resolution involved a request for Staff to investigate the noise levels resulting from the regular operations of the Union Rod and Gun Club located at 3796 Concession Rd 3 Newcastle.

The services of Swallow Acoustic Consultants Ltd were retained to conduct testing on the sound levels emanating from the Club property during routine operations. Swallow had previously tested the sound levels at the Orono Fish and Hunt Club.

2. COMMENTS

The concerns over the noise levels broke down into two specific issues. The first involved the use of the range by Ontario Power Generation (OPG) for the firearms training of its security force. The second issue was the use of the range by the members themselves and the increase in frequency and duration of the shooting.

On May 17th this year staff attended at the range along with a Sound Consultant from Swallow Acoustic. That day members of OPG's Security Force were conducting training and qualification firing. With the co-operation of both OPG and the Gun Club arrangements were made to monitor and record the sound levels from their shooting.

The firearms used were the standard issue weapons used by OPG Security, a 10 mm. Glock pistol and a .223 caliber rifle. Over the course of the testing the officers fired the weapons in separate relays so that individual recordings could be made of both sound levels.

Tests were conducted at four separate properties near the gun range; these were 3770 Concession Road 3, 3025 Moffat Road, 3755 Concession Road 3 and 3795 Concession Road 3. Each of these property owners had requested that testing be undertaken. These properties are indicated on the maps in the attached reports.

On July 31st a second round of testing was conducted. This time the testing was conducted using 12 gauge shotguns and a .338 caliber rifle. The .338 is a ballistic match for the .458 caliber rifle. The .458 is the largest caliber rifle which can legally be discharged on the Union Club's range. It is not one which is commonly used at the club and the .338 was available.

Sound readings were again conducted at the same four properties as before. The results of the testing are listed below.

3. TEST RESULTS

The first tests produced two sets of results, one for the pistols and one for the rifles. The pistols ranged from a low of 47.4 dBAI at 3795 Concession Rd. 3 to a high of 55.2 dBAI at 3770 Concession Rd. 3. The rifle results varied from 49.5 dBAI at 3755 Concession Rd 3 to 61.2 dBAI at 3770 Concession Rd. 3

The findings of the shooting on July 31st also produced two sets of results. The first were for the shotgun. The shotgun was fired from the new trap range which had been built at the direction of the Chief Firearms Officer for Ontario. The readings were recorded as a low of 48.1 dBAI at 3025 Moffat Road and a high of 58.7 dBAI at 3770 Concession Road 3. One set of readings was inconclusive since a crow sitting in a nearby tree was cawing and producing a louder sound level than that of the shotgun on several tries. The rifle results also varied from a low of 50.6 at 3025 Moffat Road to a high of 60.1 dBAI at 3770 Concession Road 3.

4. **CONCURRENCE** - None

5. CONCLUSION

3770 Concession Rd 3 is directly west of the Club property so it is not surprising that this property recorded the highest overall numbers.

It should be remembered that the MOE standard for rural area noise limits for gun clubs like the Union Rod and Gun Club which were in existence prior to January 1, 1980 is 70 dBAI. Given this limit, none of the test firings exceeded the permitted limits.

CONFORMITY WITH STRATEGIC PLAN – Not Applicable

Staff Contact: Len Creamer, Manager, Municipal Law Enforcement

List of interested parties to be advised of Council's decision:

- Jack Bergs
- Andy Thang
- Andrew Banstra
- George & Diane Vetzal
- Mike Box
- Lorne Rosamond
- Ben & Jane Vanderhyden
- Ed & Diane Swynar
- Mike McGrath
- Paul Young, Union Rod & Gun Club
- Brady Hooker, Union Rod & Gun Club

ATTACHMENTS

Attachment 1: Report from Swallow Consultants Ltd. dated June 29, 2012
Attachment 2: Report from Swallow Consultants Ltd. dated August 17, 2012



June 29, 2012

The Municipality of Clarington
40 Temperance Street
Bowmanville, ON
L1C 3A6

Attention: Len Creamer

Email to lcreamer@clarington.net

Re.: Report (B2-072) – Measurements of Impulsive Noise – Union Rod and Gun Club – 3796
Concession Road 3, Newcastle

Dear Len:

We understand that there have been noise complaints from the residents in the vicinity of the Union Rod and Gun Club at 3796 Concession Road 3, Newcastle. At your request, Swallow Acoustic Consultants Ltd. (SACL) conducted sound level measurements at selected residential properties near the Union Rod and Gun Club on May 17, 2012. The noise impact is assessed based on the Ministry of Environment (MOE) guidelines. This letter reports our findings.

1. Noise Sources

The noise sources are the impulsive noise due to firearm shooting at the Union Rod and Gun Club. Rifles and pistols were fired in turn during the sound level measurements.

Sound level measurements were carried out when shooting practice took place in a shooting range in the Union Rod and Gun Club. The location of the shooting practice is shown in [Figure 1](#). The firing line is not enclosed.

2. Receptors

Impulse sound levels were measured at the following locations where the residents filed noise complaints against the Union Rod and Gun Club:

- Backyard of 3770 Concession Road 3, near east property line
- Backyard of 3770 Concession Road 3, approximately 30 m from house
- Backyard of 3025 Moffat Road, approximately 18 m from house
- Front yard of 3755 Concession Road 3, approximately 30 m from house
- Front yard of 3795 Concession Road 3, approximately 20 m from house

The measurement locations and the location of shooting in Union Rod and Gun Club are shown in [Figure 1](#).

3. Sound Level Limits

MOE Publication NPC-232 “Sound Level Limits for Stationary Sources in Class 3 Areas (Rural) states that:

“For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the logarithmic Mean Impulsive Sound Level (L_{LM}) is:

- 70 dBAI if the gun club were operating before January 1, 1980; or
- 50 dBAI if the gun club began to operate after January 1, 1980; or
- The L_{LM} prior to expansion, alteration or conversion.

We understand that the Union Rod and Gun Club started its operation in 1962. Therefore the impulsive sound level limit for the gun club is 70 dBAI at the receptors.

4. Instrumentation

Sound levels were measured using a Brüel & Kjær Hand-held Analyzer Type 2250 (serial number 2630269) with a Brüel & Kjær ½” Prepolarized Condenser Microphone Type 4189 (serial number 2631315). The sound level meter was calibrated with a Brüel & Kjær Sound Level Calibrator Type 4231 (serial number 2623794). A wind shield was used for all outdoor sound level measurements.

5. Meteorological Conditions

Sound level measurements were carried out in the morning of May 17, 2012. The weather conditions during the measurements are: sunny, temperature 14°C, relative humidity 41%, wind northwest 9.3 km/h, pressure 102.32 kPa. The weather conditions are suitable for outdoor sound level measurement.

6. Measurement Results

Impulsive sound level measurements were taken at 4 receptors. The results are shown in Table 1.

Table 1
Sound Level Measurement Results

Measurement Location	Type of Firearm	Measured Sound Level (dBAI)
Backyard of 3770 Concession Road 3, near east property line	Rifle	59.4
Backyard of 3770 Concession Road 3, approximately 30 m from house	Rifle	61.2

Measurement Location	Type of Firearm	Measured Sound Level (dBAI)
Backyard of 3770 Concession Road 3	Pistol	55.2
Backyard of 3025 Moffat Road	Rifle	52.2
Backyard of 3025 Moffat Road	Pistol	54.7
Front yard of 3755 Concession Road 3	Rifle	49.5
Front yard of 3755 Concession Road 3	Pistol	48.0
Front yard of 3795 Concession Road 3	Rifle	53.3
Front yard of 3795 Concession Road 3	Pistol	47.4

7. Assessment

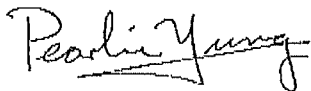
The measured sound levels due to shooting noise from the Union Rod and Gun Club are below the sound level limit of 70 dBAI at all measurement locations. Therefore the shooting noise from pistol and rifle in the gun club meets the MOE sound level limits.

8. Conclusion

The shooting noise from pistol and rifle in the Union Rod and Gun Club meet the MOE sound level limits for a gun club.

If you have any questions regarding this report, please do not hesitate to contact us.

Yours truly,
Swallow Acoustic Consultants Ltd.



Pearlie Yung, M.Sc.
B2-072

Reviewed by



John C. Swallow, M.A.Sc., P.Eng. LEED AP



Figure 1
Measurement Locations



August 17, 2012

The Municipality of Clarington
40 Temperance Street
Bowmanville, ON
L1C 3A6

Attention: Len Creamer

Email to lcreamer@clarington.net

Re.: Report (B2-072) – Measurements of Impulsive Noise – Hunting Rifle and Shotgun –
Union Rod and Gun Club – 3796 Concession Road 3, Newcastle

Dear Len:

We understand that there have been noise complaints from the residents in the vicinity of the Union Rod and Gun Club at 3796 Concession Road 3, Newcastle. At your request, Swallow Acoustic Consultants Ltd. (SACL) conducted sound level measurements for hunting rifle and shotgun shooting noise at selected residential properties near the Union Rod and Gun Club on July 31, 2012. The noise impact is assessed based on the Ministry of Environment (MOE) guidelines. This letter reports our findings.

1. Noise Sources

The noise sources are the impulsive noise due to firearm shooting at the Union Rod and Gun Club. Hunting rifle and shotgun were fired in turn in two shooting ranges respectively during the sound level measurements. The locations of the shooting ranges are shown in Figure 1. The firing lines are not enclosed.

2. Receptors

Impulse sound levels were measured at the following locations where the residents filed noise complaints against the Union Rod and Gun Club:

- Backyard of 3770 Concession Road 3, approximately 30 m from house
- Backyard of 3770 Concession Road 3, open area
- Backyard of 3025 Moffat Road, approximately 18 m from house
- Front yard of 3755 Concession Road 3, approximately 30 m from house
- Front yard of 3795 Concession Road 3, approximately 20 m from house

The measurement locations are shown in Figure 1.

3. Sound Level Limits

MOE Publication NPC-232 “Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)” states that:

“For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is the discharge of firearms on the premises of a licensed gun club, the sound level limit at a point of reception within 30 m of a dwelling or a camping area, expressed in terms of the logarithmic Mean Impulsive Sound Level (L_{LM}) is:

- 70 dBAI if the gun club were operating before January 1, 1980; or
- 50 dBAI if the gun club began to operate after January 1, 1980; or
- The L_{LM} prior to expansion, alteration or conversion.

We understand that the Union Rod and Gun Club started its operation in 1962. Therefore the impulsive sound level limit for the gun club is 70 dBAI at the receptors.

4. Instrumentation

Sound levels were measured using a Brüel & Kjær Hand-held Analyzer Type 2250 (serial number 2630269) with a Brüel & Kjær ½” Prepolarized Condenser Microphone Type 4189 (serial number 2631315). The sound level meter was calibrated with a Brüel & Kjær Sound Level Calibrator Type 4231 (serial number 2623794). A wind shield was used for all outdoor sound level measurements.

5. Meteorological Conditions

Sound level measurements were carried out in the morning of July 31, 2012. The weather conditions during the measurements are: cloudy, temperature 26°C, relative humidity 65%, wind northeast 11 km/h, atmospheric pressure 98.8 kPa. The weather conditions are suitable for outdoor sound level measurement.

6. Measurement Results

Impulsive sound level measurements were taken at 4 receptors. The results are shown in Table 1.

Table 1
Sound Level Measurement Results

Measurement Location	Type of Firearm	Measured Sound Level (dBAI)
Backyard of 3770 Concession Road 3, approximately 30 m from house	Hunting Rifle	60.1
Backyard of 3770 Concession Road 3, approximately 30 m from house	Shotgun	56.4

Measurement Location	Type of Firearm	Measured Sound Level (dBAI)
Backyard of 3770 Concession Road 3, open area	Shotgun	58.7
Backyard of 3025 Moffat Road	Hunting Rifle	50.6
Backyard of 3025 Moffat Road	Shotgun	48.1
Front yard of 3755 Concession Road 3	Hunting Rifle	50.8
Front yard of 3755 Concession Road 3	Shotgun	51.0
Front yard of 3795 Concession Road 3	Hunting Rifle	54.8
Front yard of 3795 Concession Road 3	Shotgun	57.1*

*Measured sound level partially contributed by crow cawing.

7. Assessment

The measured sound levels due to hunting rifle and shotgun shooting from the Union Rod and Gun Club are below the sound level limit of 70 dBAI at all measurement locations. Therefore the shooting noise from hunting rifle and shotgun in the gun club meets the MOE sound level limits.

8. Conclusion

The shooting noise from hunting rifle and shotgun in the Union Rod and Gun Club meet the MOE sound level limits for a gun club.

If you have any questions regarding this report, please do not hesitate to contact us.

Yours truly,
Swallow Acoustic Consultants Ltd.



Pearlie Yung, M.Sc.
B2-072

Reviewed by



John C. Swallow, M.A.Sc., P.Eng. LEED AP



Figure 1
Measurement Locations

Ministry of Community Safety
and Correctional Services

Ministère de la Sécurité communautaire
et des Services correctionnels



Chief Firearms Office

Bureau du Contrôleur des
armes à feu

777 Memorial Avenue
Orillia ON L3V 7V3
Tel: 705-329-5522
Fax: 705-329-5623

777 avenue Mémorial
Orillia ON L3V 7V3
Tél. : 705-329-5522
Télééc. : 705-329-5623

File Reference: 677 50 25

August 21, 2015

Mr. Ron Aldred
71 Temperance Street
Bowmanville, Ontario L1C 3B1

Dear Mr. Aldred:

Re: Orono Fish and Hunt Club

On July 30, 2015, Range Inspectors Ken C. Smith and David Goode and Supervisor of Shooting Clubs and Ranges Sgt. Peter Niedermaier from the Chief Firearms Office attended your shooting range location. The purpose of the inspection was to confirm your range has maintained compliance in accordance with the *Canadian Firearms Centre Range Design and Construction Guidelines (September 1999)*.

Enclosed you have been provided with an inspection report dated July 30, 2015, which confirms your range is in full compliance with the range *Guidelines*.

An amended range approval certificate is enclosed outlining the shooting disciplines currently approved at your range location. Please review the conditions on your shooting range approval. Thank you for your dedication to range safety. Please take a few moments to complete and return the enclosed "Range Inspection Evaluation Form". If you have any questions, please call.

Yours truly,

William V. Price, Superintendent
Chief Firearms Officer

c. Mr. Ken C. Smith – Provincial Range Inspector

WVP/cb
Encl.

Ministry of Community Safety
and Correctional Services

Ministère de la Sécurité communautaire
et des Services correctionnels



Chief Firearms Office

Bureau du Contrôleur des
armes à feu

777 Memorial Avenue
Orillia ON L3V 7V3
Tel: 705-329-5522
Fax: 705-329-5623

777 avenue Mémorial
Orillia ON L3V 7V3
Tél. : 705-329-5522
Télééc. : 705-329-5623

Date: 30 July 2015

MEMORANDUM TO Superintendent William V. Price
Chief Firearms Officer

Prepared by: K.C. Smith #073
Provincial Range Inspector
Chief Firearms Office

Re: **Orono Fish and Hunt Club.**
Mailing Address: P.O. Box 374,
Orono, ON.
L0B 1M0

RECEIVED JUL 30 2015

Range Location: 3292 Concession Road #7,
Orono, ON.

GPS Location: 17T PJ 88769 / 75138 (new Front Gate entrance north side from 7th
Concession Road.)

Hours of Operation: 10am - dusk Wednesday
10am - 4pm Sundays
plus - Special events as arranged with Town Council

Range Operator/Contact: Ron ALDRED
71 Temperance St.
Bowmanville. ON.
905 623-1566

Range Inspected - Approval Number 0082

Range #1 25/50/100 Yard (25/49/102 Metre) Outdoor Handgun/Centre Fire Rifle/.22
Calibre Rifle/Shotgun (slugs only).

Executive Summary

On Thursday 30 July 2015 I attended the Orono Fish and Hunt Club to inspect their ranges for compliance with the *Canadian Firearms Centre Range Design and Construction Guidelines (September 1999)*. This was the regular scheduled Bi-Annual regulatory Inspection and I was accompanied by Range Inspector D. Goode 050 and Supervisor of Ranges and Shooting Clubs Sergeant P. Niedermaier.

Present on behalf of the Orono Fish and Hunt Club were Mr. Ron Aldred, President, Mr. Ard Neimann, Director of Finance and Mr. Peter Admanski, Past Director.

On this date the construction of the 200yard and 300 yard rifle ranges is continuing with additional movement of earth and materials received from the 407 Highway Expansion which will be located adjacent to this Range. Materials have been placed to add height and significant depth to the 25 yard, 50 yard and 100 yard ranges depicted as Range 1 on the Approval.

The Range operators do not allow any form of action shooting on the Range nor do they rent out the facility to Law Enforcement agencies for training purposes.

The Club Executive present has undertaken to replace the Main Facility sign, and erect Range Safety signs along the south border along Concession Road 7, once all heavy equipment has completed deliveries of soil and materials to this location.

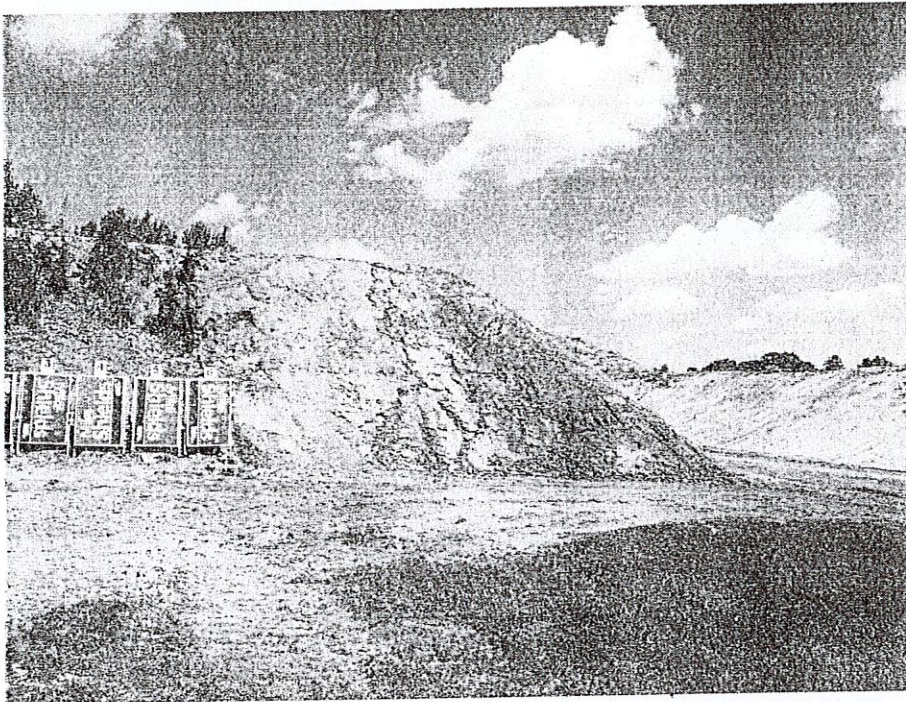
Inspection

First Aid Kits are available on site equipped with pressure bandages to be utilized in the event of gunshot injury. The First Aid Kit will be housed within the Range Safety Enclosed Structure at the Centre of the Range as noted in the attached photo.



Range /1 is equipped with a red green light warning system and is outfitted with an audible horn which activates when the Red Status light is activated to warn any person who may be inadvertently downrange on the 100 yard Range area. There are currently 12 shooting positions available for the 25 yard range, and six positions for the 50 yard and 100 yard respectively. Consideration is being given to increase the number of shooting positions on the 50 yard range.

There is ample room on the backstop at this location to facilitate further shooting lanes while maintaining sufficient flanking. (See attached photo)



25 Yard Handgun Range Backstop Height 5.1 m (minimum required 4 m.)
Slope 46 degrees
Crest 75 Yards (New materials)

50 yard Rifle Range Backstop Height 5.7 m (minimum required 4 m.)
Crest 100 yards deep (new materials)
Slope 45 degrees

100 Yard Rifle Range Backstop Height in excess of 7.5 m. (Minimum required 6 m.)
Crest 200 yards deep of new material.
Slope 46 degrees

Side berm on east side of 100 yard Range Height 5.6 m. (Minimum required 2.5 m)
(Recently constructed)
Crest 3.6 m (Minimum required 1.5 m.)

EAST BERM → 8-9M



Shooting Ranges and Sound

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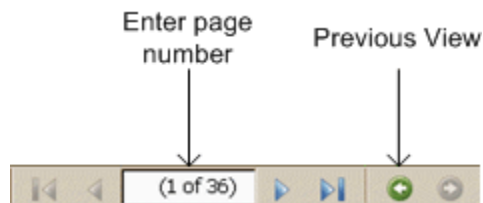
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EXECUTIVE SUMMARY

“Shooting Ranges and Sound” is a document intended for those people not trained in acoustics, who would like to gain an understanding of the propagation and control of sound and firearm noise. Such persons might be involved in the planning, construction or regulation of a shooting range in development or re-development.

The introductory section of this document provides the background information needed to understand the mechanisms involved in the generation, propagation and control of shooting noise. It describes the physics of sound, mechanisms of noise generation, sound characteristics of firearms, characteristics of sound wave propagation and sound measurement techniques.

Subsequent sections in the document describe existing noise guidelines or noise regulations and limits that are found in literature and/or law. With respect to these limits and measurements of shooting noise, an assessment can be made.

The concluding sections identify basic noise control principles and noise reduction techniques, and consider the construction of a new shooting range. Typical principles, such as shooting noise levels, noise reduction with distance and sound barriers, provide real-life examples and realistic expectations for noise control.

1 INTRODUCTION

This document is a precursor to “Range Design and Construction Guidelines” and was prepared for the Government of Canada. It is intended for use by a lay person who might be involved in the planning, construction or regulation of a shooting range in development or re-development.

“Shooting Ranges and Sound” solely reviews various guidelines, regulations and limits for shooting noise; it does not set nor recommend limits. The examples included in the document are intended to provide realistic interpretations of [sound level](#). This document should not be used for design purposes, as the sound levels of shooting noise are dependent on many factors, all of which must be considered in a particular application.

1.1 PHYSICS OF SOUND

This section presents background information that is essential to the understanding of shooting range noise generation, propagation and control. [Sound](#), as we hear it, consists of a pressure wave with [frequency](#) (or pitch), travelling in a direction. Subsections 1.1.1 through 1.1.5 describe the components of sound in more detail.

1.1.1 Sound Waves

Sound is a disturbance that propagates through an elastic material, at the speed characteristic of that material. In general, such a disturbance reaches the human ear by travelling through air.

In more technical terms, let us consider a body vibrating in air. As it moves in an outward direction, it pushes a “layer” of air along with it. Since the pressure in this layer is higher than that in the undisturbed surrounding atmosphere, the air particles in the body tend to move in an outward direction and transmit their motion to the next layer. This layer then transmits its motion to the next, and so on.

As the vibrating body moves inward, the layer of air adjacent to it is rarefied to the point where its pressure is lower than that of the undisturbed atmosphere. This layer of rarefaction follows the layer of compression in the outward direction, at the same speed. The pressure at the layer of compression is higher than that of the undisturbed atmosphere. The succession of outwardly travelling layers of compression and rarefaction is called *wave motion*.

The individual vibrating particles that transmit a sound wave do not change their average positions if the transmitting medium itself is not in motion. They merely vibrate about their equilibrium positions.

1.1.2 Frequency

The subjective pitch of a simple sound is determined by the number of times per second at which the [sound pressure](#) disturbance oscillates between positive and negative values. The physical measure of this oscillation rate is called frequency. The unit of frequency is the cycle per second (cps), which by international standards is called *hertz* (Hz). The range of normal adult hearing extends approximately from 20 to 16,000 Hz. The human ear is most sensitive – that is, the threshold of audibility is lowest – for sounds around 3,000 Hz. For reference purposes, the frequency of the middle “C” key on a piano is 256 Hz, most vowels in speech are in the 250 to 500 Hz range, and consonants like the letter “S” are in the 2000 to 3000 Hz range.

1.1.3 Sound Pressure

Sound can be sensed by the measurement of some physical quantity in the medium that is disturbed from its equilibrium value. The physical quantity that is generally of interest is the incremental variation in **sound pressure** above and below atmospheric pressure, which is normally about 100,000 Pa (1 Pa = 1 pascal = 1 newton/metre², N/m²). Sound pressures are extremely small. For normal speech, they average about 0.1 Pa above and below atmospheric pressure, at a distance of one metre from the talker.

1.1.4 Sound Pressure Levels, Decibels

The human ear is remarkably sensitive and responds to sound pressures ranging from 0.00002 Pa to 60 Pa, which is a one-million-to-one ratio. The tripling of the **sound pressure** is sensed as a doubling of the loudness; therefore, the threshold of audibility to pain is about twelve doublings of the loudness. This implies that a compressed scale will correlate better to loudness.

Taking the ratio of a given sound pressure to the threshold of hearing (technically, it is the ratio of the squares of the pressures), and then the logarithm of that ratio, results in a scale of 0 to about 12 representing the range from threshold of hearing to painful. These scale numbers are called *bels*, which is a measurement unit named after Alexander Graham Bell.

Multiplying the scale by 10 results in a range of 0 to 120 dB (**decibels** – tenths of bels), which is a much easier range to use. Each set of 10 dB represents a doubling of the subjective impression of the loudness of the sound.

1.1.5 Directivity

Directivity is a measure of the difference in sound intensity, with respect to direction, and is usually stated as a function of angular position around the acoustical centre of the source and of **frequency**. Some sources of **sound** radiate nearly uniformly in all directions. These are called *nondirective sources*. In general, such sources are small in size as compared to the wavelength of the sound that they are radiating. Most practical sources are somewhat directive; in other words, they radiate more sound in some directions than in others. However, it is natural for sources of noise to be nondirective or nearly so at low frequencies. As the frequency increases, directivity generally also increases.

1.2 MECHANISMS OF NOISE GENERATION AND SHOOTING NOISE GENERATION

In this section, two mechanisms of noise generation and shooting noise generation are discussed.

1.2.1 SHOCK WAVE

Impulse noise is a transient noise that arises as a result of a sudden release of energy into the atmosphere. The physical characteristics of these impulses are largely dependent upon the geometry and scale of the source. The resulting waveform is further dependent upon the environment in which it propagates.

More specifically, impulses fall within the domain of shock wave physics. Given a sound source and receiver, gradually increase the [sound pressure level](#) of the source and measure the signal transmitted to the receiver. At the lower range of the sound pressure level, there is a linear relation between the source and the received sound pressure level. As the sound pressure level increases, the source-receiver function deviates from linearity and the wave distorts. This wave distortion is due to the wave speed that changes from one point to another. The original high-level sinusoid gradually distorts into a “saw tooth”-like wave, referred to as a *shock sound wave*, or a repeated series of shock waves. Across a shock front, the properties of the system change discontinuously. There are very high gradients of property change and viscous stresses become large. The thickness of the shock front is related to the rise time of the ideally-measured pressure “jump” across the shock.

1.2.2 VIBRATING SURFACES

[Sound](#) can also be generated by a vibrating surface. A layer of air adjacent to the surface is moved and sound is subsequently radiated, as previously explained in [Section 1.1.1](#). A loudspeaker mounted to a wall is an example. In a more complicated case, knocking on a door causes the surface of the door to vibrate and generate sound both inside and out. Larger surfaces generate more sound energy than smaller ones, which is the reason the tympani in an orchestra is large. Furthermore, sound can strike a surface causing it to vibrate and radiate sound from the other side. This is how sound gets through a glass window.

1.3 SOUND CHARACTERISTICS OF FIREARMS

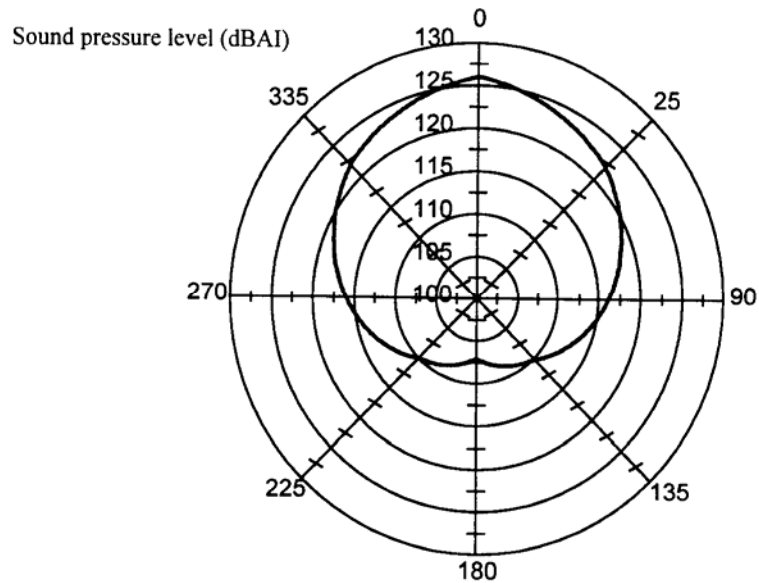
The muzzle report can be regarded as a point source with a directional characteristic. The ballistic wave can be treated as a coherent line source, radiating a conical shock wave. The propagation of the ballistic wave is extremely directional and is limited to a well-defined geometrical area. It is radiated mainly at an angle of 60° from the bullet path. The sound of a firearm usually concentrates on high [frequency](#) (i.e. above 1000 Hz).

Some examples of [sound pressure levels](#) of firearms, measured at 10 m from the muzzle (downrange), using the [A-weighted](#) impulse setting, are listed in [Table 1](#) below [8]. This type of measurement is discussed further in [Section 1.6](#). It should be noted that the sound pressure levels are mostly between 100 dBA(I) and 130 dBA(I). These are given in dBA(I) since it is the correlation between the maximum [sound level](#) and the subjective impression of loudness that is important. Directivity diagrams of a typical rifle and a typical shotgun are shown in [Figure 1](#) and [Figure 2](#) respectively¹.

¹ Falch, Edvard, “Noise from Shooting Ranges, a Nordic Prediction Method for Noise Emitted by Small-Bore Weapons,” Nordic Council of Ministers’ Noise Group, NBG, May 1984.

Table 1: Sound Pressure Levels of Firearms Being Measured at 10 m from the Muzzle (Downrange)

Name, Calibre and Ammunition of Weapon	Sound Pressure Level in dBA(I)
Rifle M/96, 6.5 mm, SK PTR M/94 PRJ M/41	126
Rifle M/96, 6.5 mm, KPTR M/14	120
Hunting rifle, 7.62 mm, 30-60 Norma Jaktmatch	127
Hunting rifle II, 5.7 mm, 222 Remington N. Jaktmatch	124
AK 4, 7.62 mm, KPTR 10	120
AK 4, 7.62 mm, SK PTR 10 PRJ	128
AK 5	125
CC 63 Junior, Cal. 22, NORMA 22 LR (pistol)	103
Pistol m/40, 9 mm, SK PTR M/39 B	126
Shotgun, Cal. 12, NIKE Skeet, 70 mm, 32 g, 2 mm	127

**Figure 1: Directivity of a Typical Rifle at 10 m**

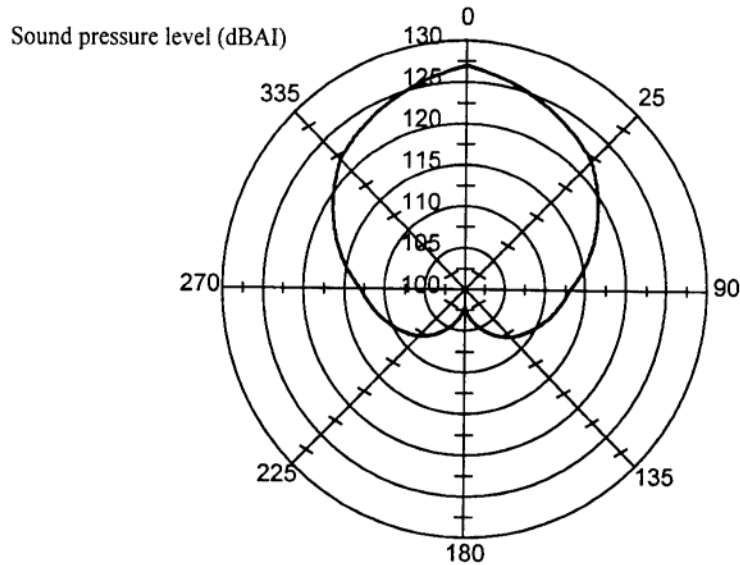


Figure 2: Directivity of a Typical Shotgun at 10 m

1.4 SOUND PROPAGATION

This section describes the environmental factors affecting the propagation of sound.

1.4.1 Distance

Sound spreads spherically at propagating distances that are large, as compared to the size of the source (point source approximation). Therefore, the **sound level** at the receiver decreases at a rate of 6 dB per doubling of distance from the source. From a line source, the propagation is more nearly cylindrical and the sound level decreases at 3 dB per doubling of distance. Although other factors can come into play, actual sound measurements often show this characteristic decay of 6 dB per doubling of distance.

1.4.2 Ground Effect

The “ground effect” occurs over soft surfaces, such as a ploughed field or grass-covered field. A reflection from the soft surface becomes out of phase and then interferes with sound going in a straight line from source to receiver. The interference almost cancels the straight line sound resulting in as much as a 25 dB reduction in sound level.

1.4.3 Air Absorption

Sound absorption occurs due to the vibration relaxation of oxygen molecules. Collisions with water vapour molecules is an important part of the energy transfer process and the **frequency** of maximum absorption is strongly dependent on the concentration of water vapour. At normal temperature and humidity, the oxygen relaxation results in strong absorption of sound at frequencies above approximately 2 kHz, which is significant for shooting range noise.

1.4.4 Weather, Wind and Temperature Inversion

Weather is an important factor in outdoor sound propagation. Under most weather conditions, both wind and temperature vary with height above the ground. These vertical gradients cause the speed of sound to vary with height, which in turn cause the sound waves to travel along curved paths from source to receiver. For downwind propagation, the speed of sound relative to the ground increases with height, and sound paths are concave downwards due to the drag on the moving air at the ground. Conversely, for upwind propagation, speed decreases with height and sound paths tend to curve upwards, thus producing a shadow zone near the ground beyond a certain distance from the source. Hence, sound levels are increased downwind and decreased upwind.

In a temperature inversion, most common at night and in the early morning due to radiation cooling of the ground, the sound speed increases with height up to a few tens or hundreds of metres, and sound paths are concave downwards. Under conditions of temperature lapse, which are most common during the day when the air near the ground is warmer, the ray paths curve upwards and produce a refractive shadow zone near the ground beyond a certain distance that depends on height of source above the ground. Sound levels are increased during a temperature inversion, and reduced in “normal lapse” conditions.

The scattering effects of atmospheric turbulence increase with increasing distances of propagation. They increase approximately as the square root of increasing sound frequency and are greater in regions of the spectrum where the sound level is determined by interference or diffraction mechanisms.

1.5 HUMAN SENSITIVITY

The greatest hearing acuity ranges from [sound pressure level](#) 40 dB to 80 dB and [frequency](#) 300 Hz to 5 kHz. Hearing acuity is poor at the extremes of the sound pressure level and frequency ranges.

The human ear requires a finite amount of time to register a [sound](#). Very short sounds (those that last less than about 0.2 seconds) do not register the same loudness as they would if they were to continue for a larger period of time.

Sudden or unexpected noise can evoke a startle reflex, where the body is prepared for “fight or flight.” The body normally returns to the pre-exposure condition over a period of a few minutes. However, it is suggested that sustained or repeated exposure could lead to persistent changes in the neurophysiological, endocrine, sensory, digestive and cardiovascular systems, which in turn could cause deterioration in health.

1.6 SOUND MEASUREMENT

This section presents various sound measurement cases.

1.6.1 Constant Sounds

As described in [Section 1.1](#), sound is a pressure wave travelling through the air from a source to a receiver. The simplest sound measurement case is that of a constant sound, such as that originating from a hydro transformer or idling truck.

Linear, A and C Frequency Weighting

The human ear does not hear all **frequencies** equally well. The human ear is significantly insensitive to low frequency sounds (from 20 Hz to 250 Hz), sensitive to mid-frequency sounds (from 500 Hz to 2 kHz) and somewhat insensitive to high frequency sounds (from 4 kHz to 16 kHz).

The frequency response of the human ear is taken into account by “weighting” the sound according to the frequency. If a sound is measured “un-weighted” – that is, with a “linear” or “Lin” frequency weighting – then the incoming **sound pressure** is not changed. The result is described as a **sound pressure level** and is expressed in dB, dB(Lin) or dBLin.

At present, the most common and widely used frequency weighting is the **A-weighting**. The frequency characteristic of the A-weighting is shown in **Figure 3**.

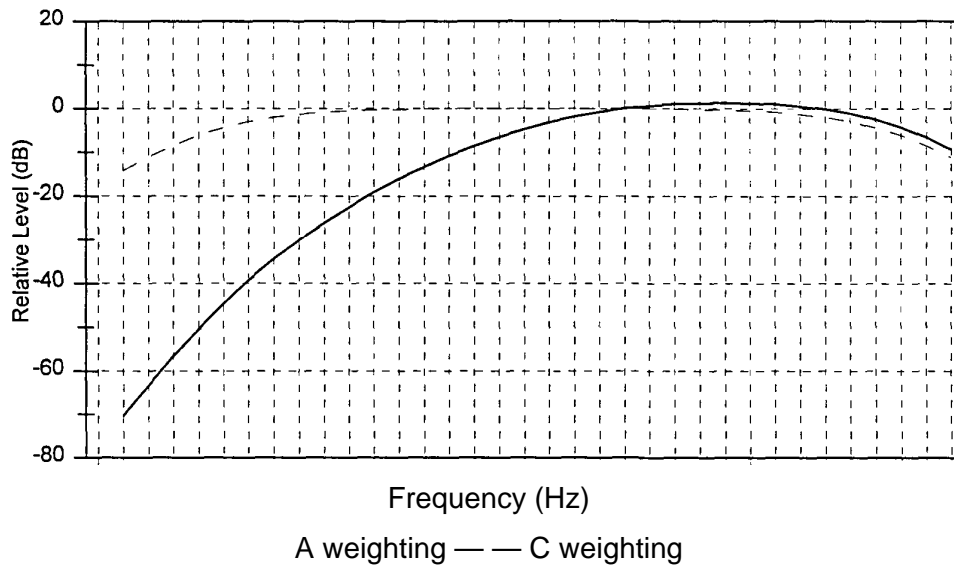


Figure 3: Frequency Characteristics of A-Weighting and C-Weighting

If a **sound** is measured with the A-weighting, then the result is described as a “sound level” and is expressed in dBA or dB(A).

“C-weighting” is sometimes used for **impulse noise** measurement, although it is not often used for general **sound level** measurement. The C-weighting is similar to linear weighting, as only the low and high frequencies are reduced. C-weighting is also shown in **Figure 3** above.

Sound pressure levels, expressed in dBA, for a wide range of typical sounds are shown in Table 2. The sound levels are given in dBA because they are relatively steady and the dBA value corresponds to the subjective impression of loudness.

Table 2: Typical Sound Pressure Level Encountered in Daily Life

Sound Pressure Level dB(A)	Description of Sound Source	Subjective Evaluation
140	Jet engine	Deafening
130	Jet aircraft during takeoff (300 ft. away)	Painful
120	“Hard rock” band (with electronic amplification)	Onset of pain
107	Air hammer	Temporary hearing loss
100	Crowd noise at football game	Very loud
92	Heavy city traffic	Very loud
80	Ringing alarm clock (at 2 ft.)	Very loud
70	B-757 aircraft cabin during flight	Loud
65	Busy restaurant or canteen	Loud
60	Conversational Speech	Moderate
5	Window air conditioner	Moderate
34	Soft whisper (at 5 ft.)	Faint
20	Rustling leaves	Very faint
10	Human breathing	Very faint

Slow Sound Level Meter Response

Sound level meters are originally analog measuring devices indicating the **sound level** by means of a moving needle. The maximum speed at which the needle moves is set by the “response time” of the needle. If the response time is long, then the needle moves more slowly. If the response time is short, then the needle moves more quickly. For the measurement of constant (or nearly constant) sound, a **slow response** time of 1 second is defined.

1.6.2 Time-Varying Sounds

If a time-varying [sound level](#) is measured, such as that from a passing truck, then the [sound level](#) expressed in dBA will rise and fall. This presents a more difficult problem for measurement than with a constant sound level.

Fast Sound Level Meter Response

In order to measure time-varying sounds, such as those from a passing truck, the “fast” meter response time of 0.125 seconds is defined. This allows the meter needle to move faster than it does for the [slow meter response](#) time. Using the [fast response](#) will result in the [sound level meter](#) needle rising as the truck approaches, reaching a maximum value that can be recorded, and then dropping as the truck recedes. The “fast” response corresponds well with the subjective impression of loudness because a response time of 0.125 seconds is close to that of the human ear.

Modern digital sound level meters have a “Maximum” or “Max” Hold capability that automatically holds the maximum sound level achieved.

The Energy Equivalent Sound Level, Leq

Instead of measuring the [sound level](#) from a single passing truck, let us say that we need to measure the sound from traffic on a typical street. In this case, there will be many vehicles passing by, with each one having its own maximum level. Therefore, we must consider how to assess this time-varying [sound](#). A method of describing time-varying sounds using a single number, which has gained widespread use, is the Energy [Equivalent Sound Level](#), or “Leq.” The Leq of a sound is that single level which represents the same energy as the time-varying sound over the measurement period. [Integrating Sound Level Meters](#) measure Leq values directly by summing the incoming sound energy over the time of the measurement, averaging the energy, and then indicating a single Leq value for the measurement. Studies have shown a reasonable correlation between Leq sound levels in dBA and the overall community response to noise. The numerical definition of Leq is contained in [Section 6](#).

Since a Leq measurement must be taken over a certain time period, the length of time for the measurement is important. Some common time scales associated with Leq measurements are 1 hour, 24 hours, a 16-hour daytime measurement (e.g. 07:00 am to 11:00 pm) and an 8-hour night-time measurement (e.g. 11:00 pm to 07:00 am).

The results of Leq measurements performed over these time periods are described as Leq (1 hour), Leq (24 hour), Leq (day) and Leq (night) respectively, and they are expressed in terms of dBA.

Single Event Level (SEL)

The Single Event Level (SEL) is a variation of the Leq, in which the level is adjusted to a standard time of 1 second. Calculation of the SEL from the [Leq](#) and measurement time is described in [Section 6](#). The SEL has also been used for the measurement of [impulsive sound](#) from firearms. Levels measured in this way using [A-weighting](#), are described as dBA(SEL).

1.6.3 Impulsive Sounds

The noise from firearms is described as being “impulsive,” which signifies that the sound lasts for only a very short period of time, typically less than 1 second. [Impulsive sounds](#) are so short that even the [fast meter response](#) is not fast enough to give a true maximum level.

The overall energy of a series of impulsive noises from firearms is correctly described by means of a [Leq](#) measurement. However, there is doubt that the Leq measurement adequately describes the community response to impulsive sound because of the startling effect such noise can have. This problem can be overcome by adding a penalty to the measured Leq value. In the 1971 version of ISO 1996 [14], a 5 dB penalty is recommended for impulsive noise. Other research has indicated penalties of 7 dB [25], 10 dB [10] or 12 dB [29].

Impulse Sound Level, dBAI

A different solution to the impulse noise measurement problem is to develop a specific measurement technique for [impulsive sounds](#). As previously stated, impulsive sounds have a very short duration; consequently, the 0.125 second [fast meter response](#) is not quick enough to keep up with them. The [“impulse” meter response](#) time of 0.035 seconds was originally developed to measure the hearing loss potential of impulsive noise in industry. Therefore, the [Impulse Sound Level Meters](#) have a meter response that is considerably faster than “fast.” In order to facilitate the act of taking the maximum reading, the meter needle is arranged to fall slowly (with a 3 second meter response time).

Modern digital sound level meters contain a “Maximum” or “Max” Hold function that holds the maximum level for recording purposes. Measurements using the impulse sound level meter response are commonly taken with the [A-weighting](#) and expressed in terms of dBAI or dBA(I).

Since the impulse sound level meter response represents a different measurement technique than that of the [Leq](#), use of the impulse time response is not generally used for a Leq measurement. Leq measurements are usually performed with either fast or [slow meter response](#) times.

Peak Sound Level

Impulsive noise from blasting operations and firearms has been measured using the “Peak” meter response. Peak is the fastest meter response of all, as the digital meter holds the maximum instantaneous [sound pressure](#) difference (or [overpressure](#)) from the steady state ambient air pressure. Peak sound level measurements can be made with linear weighting expressed as dB Peak, or with [A-weighting](#) expressed as dBA Peak.

1.6.4 Measuring Sound Levels From Firearms

Continuing from the previous section, there are two main methods of measuring [impulsive sound](#), and hence firearm [sound levels](#).

The first method is to measure the [Leq](#) of the sound from a range over a 1 hour period, and then apply a penalty between 5 dB [14] and 12 dB [29]. The second method is to measure typical shots with the [impulse \(or peak\) meter response](#) and [A-weighting](#) to obtain a level expressed in terms of dBAI (or dBA Peak).

If the individual [impulse \(or peak\) sound levels](#) vary, then they can be averaged to obtain a single result. Simple arithmetic averaging is one possibility; however, it is recommended to calculate the [Logarithmic Mean Impulse Sound Level](#) (LLM) which weights the higher levels [20]. The numerical definition of LLM is contained in [Section 6](#).

There is no strict correlation between sound levels measured in dBAI and Leq (measured in dBA). But, as indicated in [Section 1.6.3](#), if about 8 is added to the dBAI level (5 to 12 depending on the reference), it can be considered equivalent to the Leq. That is, a series of 62 dBAI impulses is roughly equivalent to 70 dBA Leq in community response.

Assessment of the annoyance of the sound from firearms using these techniques is discussed further in [Section 2](#).

2 SOUND LEVEL ASSESSMENT

There are four stages in [sound level](#) assessment:

1. Determine a sound measurement technique, or parameter, which adequately describes the annoyance of a noise;
2. Develop a criterion sound level for the parameter;
3. Select the critical point of reception; and
4. Measure the sound at the critical point of reception using the parameter.

In [Section 1.6](#), the methods of measuring the [impulsive sound](#) from firearms were discussed, and it included the description of two [impulsive sound level](#) measurement parameters. The first parameter is a [Leq](#) measurement over a time period of 1 hour, expressed in dBA, to which is added a penalty of between 5 dB and 12 dB to compensate for the startle characteristic of impulsive noise. The second parameter is the measurement of individual shots using the [impulse meter response](#) and [A-weighting](#), suitably averaging the resulting readings to provide a single level expressed in dBAI.

In this section, the development of criterion sound levels (expressed in terms of dBAI or dBA Leq) and selection of the critical point of reception are reviewed. Procedures for the actual measurement of sound levels are discussed in [Section 3](#).

2.1 PHILOSOPHY OF CRITERION SOUND LEVEL DEVELOPMENT

Criterion [sound levels](#) can be set by following two philosophies: by establishing a fixed sound level as the criterion and by setting the existing background sound level as the criterion level.

2.1.1 Fixed Criterion Sound Levels

Fixed criterion sound levels are based on two factors. They are based, firstly, on the level at which significant annoyance is expected to occur and, secondly, on the feasibility of achieving a particular level in actual practice.

It should be noted that criterion sound levels do not necessarily set the level at which sound will become audible. Many jurisdictions accept that criterion sound levels are set at values for which a “slight community response” or “sporadic complaints” might result.

One example of a fixed criterion level is the one contained in the Ontario Model Municipal Noise Control By-law, as follows:

“For impulsive sound... from... the discharge of firearms on the premises of a licensed gun club... the applicable sound level limit – if it was in operation before January 1st, 1980 is 70 dBAI, and otherwise is 50 dBAI.”²

² Ministry of the Environment, “Model Municipal Noise Control By-Law: Final Report,” August 1978, section 7.

The Ministry of the Environment, "Model Municipal Noise Control By-Law: Final Report," August 1978, recognizes that existing gun clubs may have difficulty reaching the 50 dBAI level, and thus include a "grandfather" clause allowing the higher sound level of 70 dBAI. The 50 dBAI level is also included in the Ministry of Environment and Energy, "Guide to Applying for Approval (Air): Noise and Vibration," November 1995 and in the Federal-Provincial Advisory Committee on Environmental and Occupational Health, Health and Welfare Canada, "National Guidelines for Environmental Noise Control."

Arntzen, Eystein, Sorensen, Stefan and Lindblom, Eva, "Annoyance Caused by Noise from Shooting Ranges," FASE, 84, pp. 443-448 indicates that community reaction to [impulsive sound](#) is "very low" when levels are less than 60 dBAI.

*Smoorenburg, Guido F., "Evaluation of impulse noise, in particular shooting noise, with regard to annoyance," *Internoise*, 81, pp.779-782. 44 indicates that the "threshold for annoyance" due to impulsive noise is from 60 to 65 dBA (fast), which corresponds to approximately 65 to 70 dBAI.*

These references specify that the range of sound levels for limited community reaction to the [sound](#) of firearms is between 50 dBAI and 70 dBAI.

One disadvantage of a fixed criterion is that it does not account for where the noise source is located. It might be expected that a firing range placed in rural surroundings will have a greater noise impact than one located close to a busy highway. A fixed criterion does not differentiate between these two surroundings.

2.1.2 Background Sound Levels as Criteria

One technique for avoiding the problem of a fixed criterion and for differentiating between quiet rural situations and noisy urban situations is to set the existing background [sound level](#) as the criterion level. The philosophy is that the existing background sound levels should not be significantly increased by the noise from the noise source.

In urban situations, the background sound level is primarily set by local and distant traffic or "urban hum." In rural situations, the background sound is primarily set by natural sounds.

One disadvantage of using background sound levels as criteria is that the background sound levels have to be measured before the noise source can be assessed. This makes the process more complicated. As a result, the rigidity of a fixed sound level criterion has been replaced by the complexity of having to measure the background sound levels.

An added difficulty may exist in very quiet rural surroundings where it is often impossible to achieve sound levels as low as the existing background. In order to overcome these difficulties, "hybrid" criteria have been developed. These are discussed in [Section 2.1.3](#).

2.1.3 Hybrid Sound Level Criteria

Hybrid sound level criteria are actually a set of sound level criteria for different surroundings, such as rural, urban, downtown, etc. The sound level criteria actually represent typical background sound levels, which can be expected in surroundings of each type. The existing background sound levels no longer have to be measured; however, the different types of surroundings have to be carefully (or even legally) described so that the correct criterion for a particular surrounding area can be selected.

In summation, a set of fixed sound level criteria for different surroundings overcomes the problems associated with the rigidity of a single fixed criterion and the complexity of having to measure existing background sound levels. The existing background sound environment will generally be either traffic noise in urban environments (urban hum) or natural sounds (wind, leaves rustling, etc.) in a rural environment. These sounds are not impulsive in nature, but are normally assessed using **Leq**. Therefore, the very use of hybrid sound level criteria leads to the use of Leq, with an appropriate penalty for the impulsive nature of the sound of firearms.

Hybrid sound level criteria can be developed using ISO R1996 – 1971³, which gives a Base Criterion range of 35 to 45 dBA with an average of 40 dBA. Corrections to the basic criterion for time of day and type of district are provided. These corrections can be applied to give the following set of sound level criteria values (in terms of 1 hour, Leq) for general sounds, depending on time of day and type of district.

Time of Day	Rural	Urban	Busy Urban
Day	40 dBA	50 dBA	55 dBA
Evening	35 dBA	45 dBA	50 dBA
Night	30 dBA	40 dBA	45 dBA

The *Ministry of Environment and Energy, “Guide to Applying for Approval (Air): Noise and Vibration,” November 1995* contains levels below which no further requirements apply. These levels can be compared with the above ISO levels.

Time of Day	Rural	Quiet Urban	Noisy Urban
Day	45 dBA	50 dBA	50 dBA
Evening	40 dBA	47 dBA	45 dBA
Night	40 dBA	45 dBA	45 dBA

It can be seen that the two sets of levels are generally similar. The only difference is that the ISO levels are somewhat stricter than the Ontario levels.

³ ISO R1996, “Assessment of Noise with Respect to Community Response,” May 1971.

2.2 POINT OF RECEPTION SELECTION

Definition of the point of reception for noise from shooting ranges is an important step. Clearly, residences are the first choice; however, other buildings are also sensitive to noise.

A point of reception for urban surroundings:

“... any point on the premises of a person where sound or vibration originating from other than those premises is received.”

“... the point of reception may be located on any of the following... premises: permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, camp grounds and noise sensitive buildings such as schools and places of worship.”

A point of reception located in rural surroundings:

“... within 30m of a dwelling or a camping area.”⁴

The closest point of reception within the above definitions will generally be the critical point of reception. However, it may be that the closest point of reception is shielded from firearm noise by intervening buildings, walls or favourable topography. In this situation, [sound levels](#) may have to be measured (or predicted) at several points of reception to determine which location is the one with the highest sound levels and thus be designated as the critical point of reception.

The typical reduction of noise from shooting ranges with distance is presented in [Section 4](#).

This information indicates that points of reception up to at least 1 kilometre away from a shooting range may have to be considered.

⁴ Ministry of Environment and Energy, “Guide to Applying for Approval (Air): Noise and Vibration,” November 1995, section 7.

3 SOUND LEVEL MEASUREMENTS

In order to ensure the accurate and repeatable measurement of [impulsive sound levels](#) from firearms, the [sound level meter](#), the sound level measurement procedure and the qualifications of the person performing the measurement need to be established.

3.1 SOUND LEVEL METER REQUIREMENTS

This section details the requirements for the effective use of sound level meters.

3.1.1 Sound Level Meter Types

In [Section 1.6](#), two parameters were established as being suitable for the measurement of firearm-related sounds – that is, either a [Leq](#) measurement over a 1-hour period or a reading with the [impulse meter response](#). Sound level meters with the capability of measuring Leq values over a period of time are generally called [Integrating Sound Level Meters](#). Meters equipped with the impulse meter response are generally called [Impulse Sound Level Meters](#). A meter equipped with both capabilities would be an “Integrating Impulse Sound Level Meter.” In order to measure the noise from shooting ranges, one of these three types of sound level meters is required.

A major standard defining sound level meter characteristics is IEC 651.

Four degrees of precision for sound level meters are established as follows:

Type 0	Laboratory (highest) Grade
Type 1	Precision Grade
Type 2	Survey Grade
Type 3	Lowest Grade ⁵

IEC 651 defines tolerances for Lin, A and C-weighting networks, as well as for [slow](#), [fast](#) and impulse meter response times. The components of a sound level meter are described in [Section 1.6](#).

It is generally accepted that Type 2, Survey Grade or higher grade sound level meters are suitable for the assessment of community noise. The use of Type 3 instruments is not recommended.

3.1.2 Sound Level Meter Calibration

Sound level meters require a calibration adjustment prior to every use. To do this, a [sound level calibrator](#), which fits over the microphone, is often used. It produces a [sound](#) of a fixed level and [frequency](#). A sound level calibrator must therefore be available for the measurement of shooting range noise.

3.1.3 Accessories Required for Sound Level Meters

Microphones are susceptible to the sound of wind blowing across them. To reduce the effect of wind noise, a windshield or wind screen should be available and used for all outdoor measurements. Weather conditions for meaningful [sound level](#) measurements are discussed in [Section 3.2.2](#).

⁵ IEC Standard 651, 1979, section 7.

When [Leq](#) measurements or other sound level measurements are being performed over a lengthy time period, the sound level meter should be mounted on a tripod.

3.2 SOUND LEVEL MEASUREMENT PROCEDURES

Detailed sound level measurement procedures are included in the Ontario Model Municipal By-law *Ministry of the Environment, "Model Municipal Noise Control By-Law: Final Report," August 1978* and in the *Ministry of Environment and Energy, "Guide to Applying for Approval (Air): Noise and Vibration," November 1995*. These, or similar references, should be followed in order to ensure meaningful sound level measurement results. Adequate sound level measurement procedures are discussed in Sections 3.2.1 through 3.2.3.

3.2.1 Calibration

The [Integrating](#) and/or [Impulse Sound Level Meters](#) used for the measurement of shooting range noise must be calibrated with a [sound level calibrator](#) before and after the measurements.

3.2.2 Weather Conditions

The [sound level meter](#) and the sound level calibrator should never be used in weather conditions outside the temperature and humidity ranges, etc. specified by the manufacturer.

A windshield or windscreen should be used for all outdoor measurements.

Weather conditions for meaningful noise measurements are generally considered to be winds below 15 to 20 km/hr (even with a windscreen) with no precipitation, in addition to the temperature and humidity limitations stated by the manufacturer.

3.2.3 Recording

The following information should be recorded for all outdoor sound level measurements:

1. Measurer's name;
2. Date;
3. Time of day for the measurements;
4. Weather conditions:
 - (a) Temperature;
 - (b) Wind speed and direction;
 - (c) Relative humidity; and
 - (d) Cloud cover;
5. Measurement location(s) with drawing or map;
6. Major noises included in the measurement (e.g. firearms, traffic, etc.);
7. Noise excluded from the measurement (e.g. trains, aircraft, dogs barking, etc.);
8. Sound level with description (e.g. dBAI or dBA, Leq – 1 hour); and
9. Any other relevant information or comments.

3.3 SOUND LEVEL MEASUREMENT PERSONNEL

Levels of **impulsive sound** due to firearms should only be measured by personnel trained in outdoor **sound level** measurement procedures. Personnel can be either at the technical level or at the engineering level.

Provincial Ministries of the Environment often list recognized consultants working in the field of acoustics and noise control. Staff of such recognized organizations can be utilized for sound level measurements of firearms.

In Ontario, noise issues have been redirected to the municipal level and courses in sound level measurement procedures are provided to train municipal staff, such as by-law officers. Personnel who have successfully completed such courses become qualified to perform sound level measurements of firearms.

Relatively few community colleges or universities offer formal training in acoustics and noise control. However, graduates of these institutions having earned credits in relevant courses, and having been under supervision or possessing relevant sound level measurement experience for at least 1 year, are deemed qualified.

Industrial hygienists are often trained in sound level measurements in factory surroundings. Any staff members who undergo additional training in outdoor sound level measurement, and/or supervision by personnel who are themselves trained as described above, are also qualified.

4 RANGE CONSTRUCTION PLANNING ADVICE

This section provides advice on the design, planning and construction of both outdoor and indoor shooting ranges.

4.1 DESIGN CONSIDERATIONS FOR OUTDOOR AND INDOOR RANGES

The design considerations for the construction of outdoor and indoor shooting ranges are detailed in Sections 4.1.1 through 4.1.2.

4.1.1 Design Considerations – Outdoor Ranges

In this section, we consider only the most general principles of sound propagation in the environment. **Sound pressure level**, or loudness, decreases as distance from the sound source increases. Yet, the sound pressure level at any distant location is greatly influenced by the terrain between source and receiver.

The examples described below show typical relationships between the **sound level** of a firearm and the distance from the firearm at which it is measured for different kinds of terrain.

It is known that noise carries best over water, but this is also true over flat frozen ground. Figure 4 shows the reduction in sound level with distance from a typical rifle firearm, up to a distance of 1000 m.

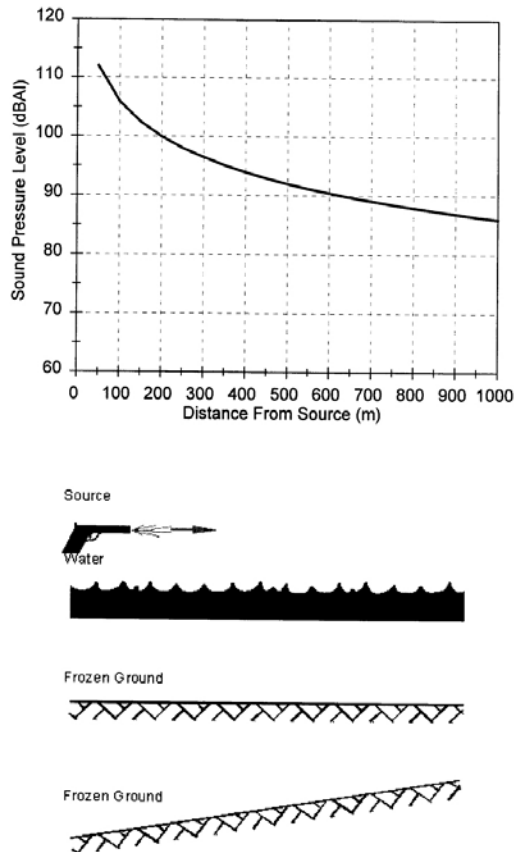


Figure 4: Attenuation Over Distance – No Ground Effect

The sound level is given in units of dBAI. This same figure takes into consideration whether the surface between source and receiver is water, frozen ground or a sloped frozen ground surface – the key characteristic is that the surface is flat.

Noise does not carry as well over flat open ground due to the “ground effect.” The ground must be essentially flat, level or sloped. Figure 5 shows sound levels as functions of distance for this condition, and it can be seen that they are significantly less than those over water.

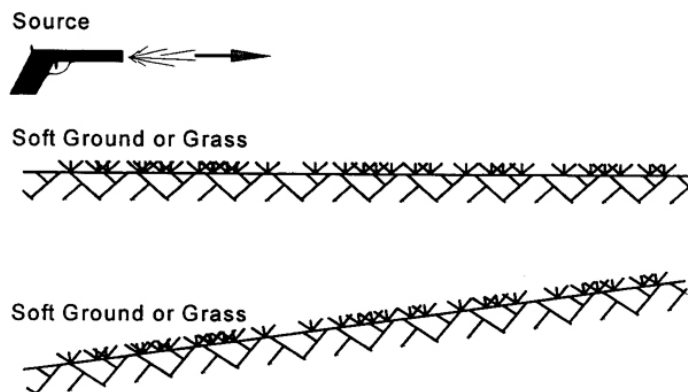
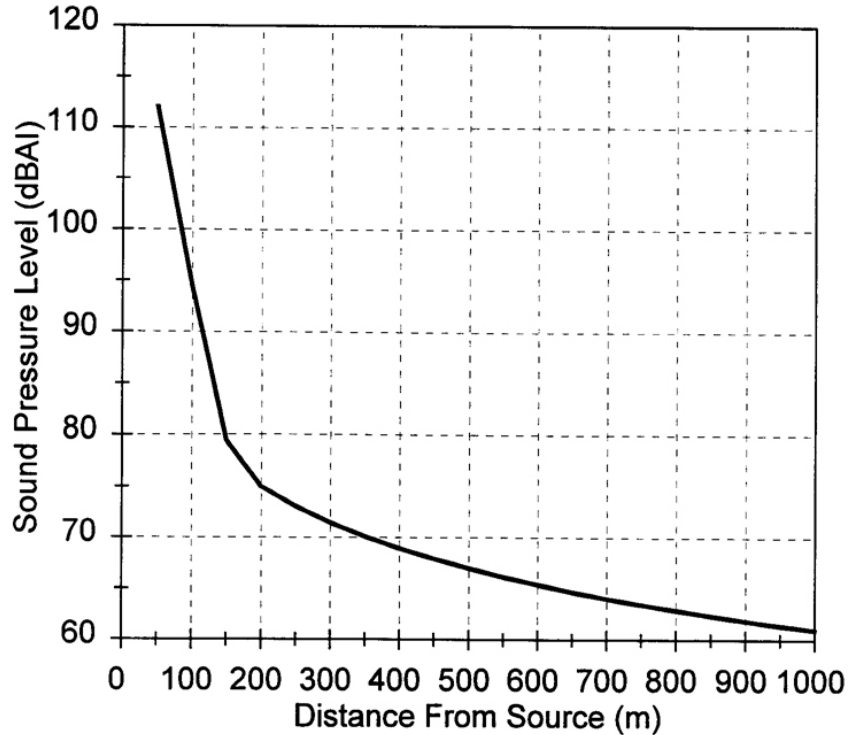


Figure 5: Attenuation over Distance with Ground Effect

Although, even at large distances from a firearm source, such as 1000 m, the sound levels can still be on the order of 60 to 70 dBAI.

A hill, berm or barrier between the source and receiver, particularly one which breaks the line of sight between source and receiver, provides further reduction in sound level. The higher the hill, the greater the reduction despite the law of diminishing returns associated with this “barrier effect.” Figure 6 shows an example of a 10 m high hill located 100 m away from a noise source. These data have been calculated in the same way as the previous figures.

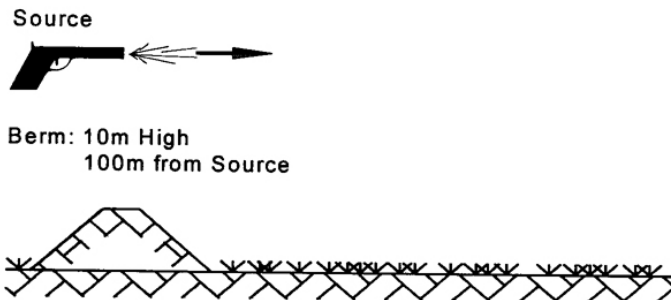
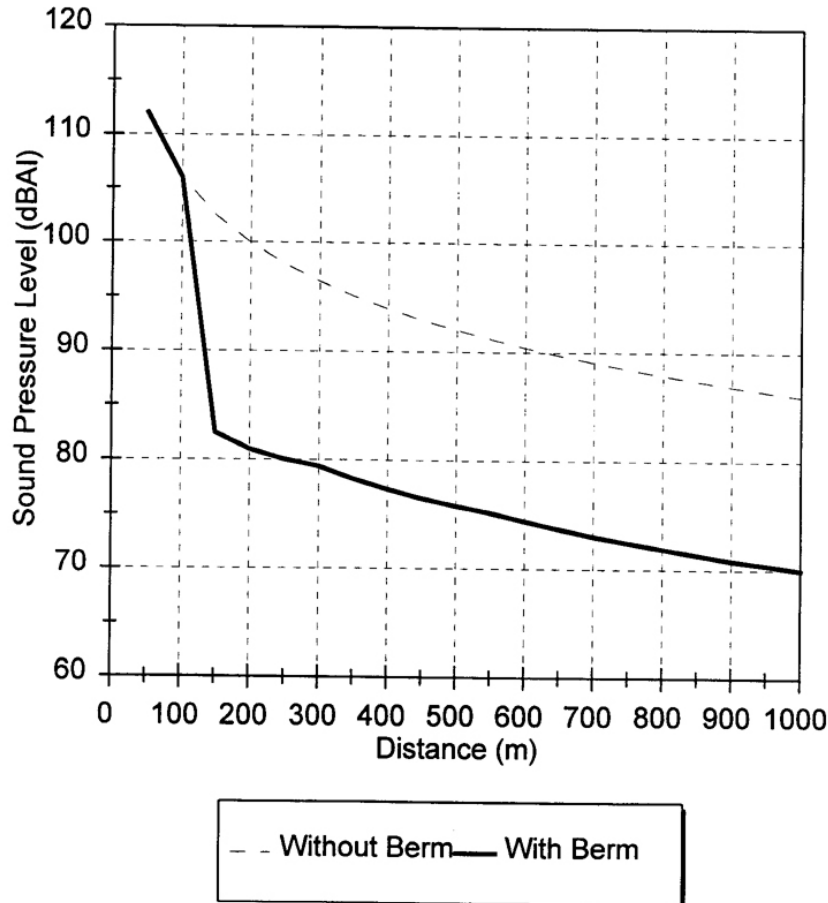


Figure 6: Attenuation Over Distance With and Without Berm

In conclusion, sound is reduced by a combination of effects: distance, terrain and barriers.

4.1.2 Design Considerations – Indoor Ranges

This section considers only the most general principles of noise propagation from the interior of a building to the exterior; it is not concerned with the internal noise levels of the range.

Noise is reduced in pressure or loudness as it crosses a wall. This noise reduction, when measured in a laboratory, is called *transmission loss*. The first rule of transmission loss is called “Mass Law” and indicates that partitions of higher mass (i.e. greater weight per square metre) reduce sound more. Figure 7 shows the noise reduction or transmission loss for three different wall types.

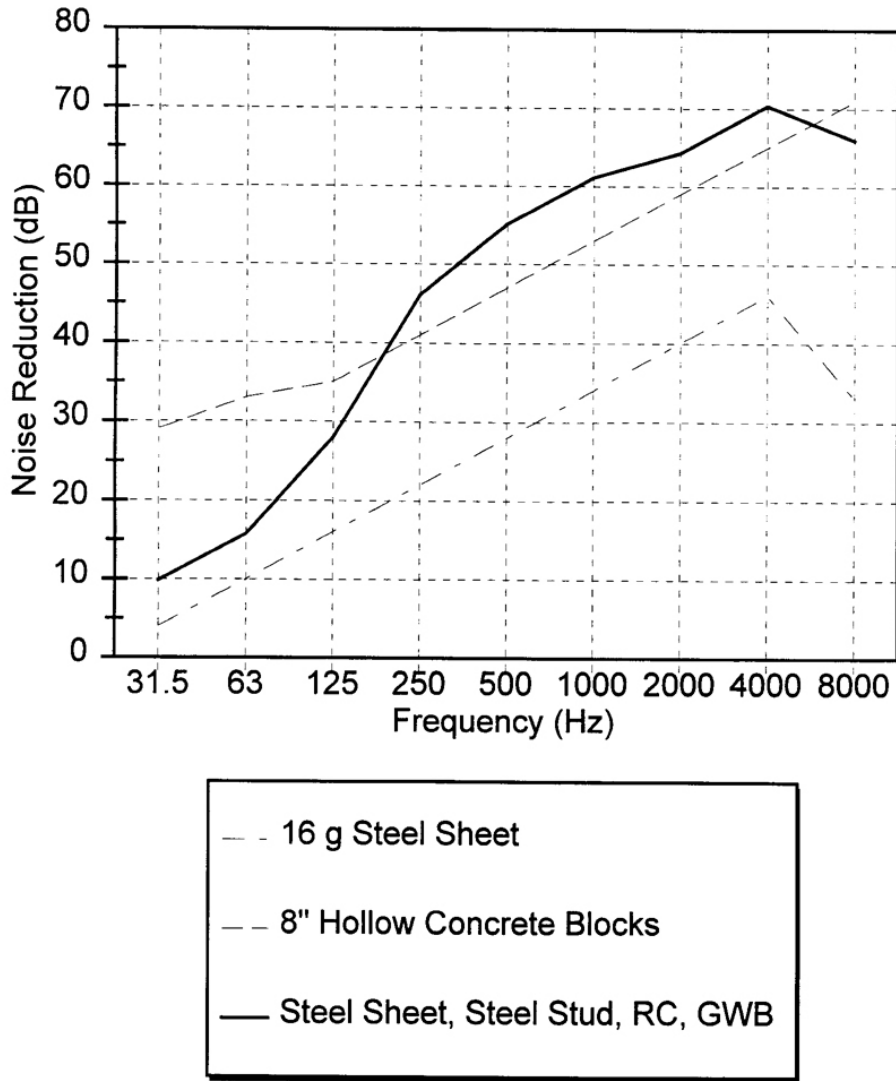


Figure 7: Noise Reduction Across the Wall

If the wall consists of 16 gauge steel sheets, such as the exterior wall of an ordinary storage shed, noise is reduced about 10 dB at 63 Hz and about 30 dB at 500 Hz. A heavier wall, such as an 8-inch hollow concrete block, provides about 35 dB of reduction at 63 Hz and about 50 dB at 500 Hz. This is the effect of Mass Law.

However, a wall made of two leaves, such as a 16 gauge steel sheet and a layer of Gypsum Wall Board (GWB), separated by a distance of approximately 150 mm and which uses a resilient element, such as commercially-available Resilient Channel, provides an entirely different characteristic. At low **frequencies**, this construction provides about the same transmission loss as any other wall of equal weight/square metres; however, in higher frequencies this wall will outperform a solid partition of much greater weight.

Sound-absorbing materials placed interior to the building will reduce the **sound level** in the building; those on the exterior help to reduce other types of noise, but they have only a small effect on the exterior noise caused by shooting noise. Sound-absorbing materials placed interior to the building reduce the build-up of reverberant noise within the space, but since they are on the surface of the building, they do not affect the initial impulse of noise from a firearm discharge.

Holes in a wall are the natural enemy of noise control. Walls, such as those described above, that can reduce sound by 60 dB are, in fact, allowing only one part in one million of the sound energy through the wall. An opening in the wall, such as a window representing just 1% of the total area of the wall, will allow so much **sound** through that the overall noise reduction of the wall will only be about 20 dB. Consequently, if a window is to be introduced it needs to be closed and sealed, as well as have a transmission loss characteristic that is essentially the same as the wall in which it is located.

Finally, almost any enclosure will actually increase the sound levels that the shooter is exposed to by virtue of the reverberation within the space. In real spaces with plenty of sound-absorbing materials, the actual reverberant sound levels are about 5 dB higher than they would be in the open.

4.2 PLANNING FOR SHOOTING RANGES

In this section, various factors affecting sound propagation and which influence the selection of a shooting range site are discussed.

4.2.1 Outdoor Ranges

Consider Receivers Up to 3 km Distant

Considering the nature of the noise source, directivity, topography and climatic conditions, receivers (particularly residences) as far as 1 to 3 km away may be affected, especially downrange.

Natural Barriers

Ideally, a range should take advantage of a natural hill, berm or escarpment in the downrange direction. Man-made barriers greater than 5 m in height become very expensive while natural hills are often very much higher, thus being more effective in reducing noise levels downrange.

Potential for Berm or Barrier

Required berms or barriers may be created in the process of levelling and preparing the shooting range site. Material removed can be used to create the berm. Additionally, excavation at the shooter location increases the height difference between shooter and berm, making the berms more effective.

Barriers

Barriers can be constructed from many materials (e.g. wood, metal and concrete), but they must have a minimum surface density of 20 kg/m², such as that of 37 mm thick wood. Barriers must be continuous, with no gaps or holes and must touch the ground (i.e. leaving no gap between the barrier and ground). There should be no trees near the barrier or on the top of any berm.

Climatic Conditions

In many locations, the wind tends to have a preferred direction. For example, the wind might come from a northwest direction 20% of the time and from a southeast direction only 10% of the time. These tendencies also change according to the time of year. Wind rosettes are available from Environment Canada, usually for airport locations.

Sound levels are increased at distances during temperature inversions, which commonly occur on summer nights when the wind speed is low, as indicated in **Section 1.4.4.**

All else being equal, the climatic conditions alone can cause sound levels to vary significantly. It is important to advise the surrounding community that shooting noise may be audible during an inversion or when the wind originates from a particular direction, and perhaps not audible at other times.

Shooter Enclosure

Certain types of ranges lend themselves to the construction of a shooter enclosure, which may be nothing more than a barrier behind the shooter and a roof overhead. However, each shooting station can be separated from each adjacent station by baffles in which the shooter aims through a port, or window, to the target external to the enclosure. Significant sound attenuation can be achieved in all directions, including downrange, provided the enclosure is heavy and well-sealed, and that sound-absorbing material is used extensively in the interior of the enclosure.

Existing Noise Sources, Particularly Transportation

Transportation noise is generally considered part of the background noise against which the shooting noise may be compared. Average sound levels near highways and superhighways are often in the 60 to 70 dBA range for 16 to 24 hours per day. In such areas, the shooting noise may be buried in the background noise. Therefore, it may be advantageous to locate a shooting range near a major highway.

Locations to Avoid

Several types of topography should be avoided, as they either help the propagation of **sound** or make it inherently difficult to provide noise controls. Noise control is particularly difficult when a shooting range is located near water (i.e. water between the source and receiver), bare rocks or large paved surfaces. As previously mentioned, sound propagates very well over a large valley, particularly if the shooter is aimed over the valley.

4.2.2 Indoor Ranges

In this section, several factors affecting sound propagation and which influence an indoor range site selection and building construction are discussed.

Consider All Potential Receivers Up to 1 km Away

Considering the relatively light wall and roof construction, the terrain and the climactic conditions of an existing building serving as an indoor range, receivers as far as 1 km away may be affected.

Wall and Roof Construction

The walls and roof of the indoor range building generally require a heavier and/or double-leaf construction in order to provide adequate transmission loss.

Sound-Absorbing Materials

Sound-absorbing materials on the inside of the indoor range provide some reduction of noise to the exterior and will reduce interior [sound levels](#), thus making the interior much more comfortable. However, the initial impulse of [sound](#) is generally affected very little by sound-absorbing materials. Hearing protection for shooters and staff is advised.

Openings to the Exterior

All openings to the exterior of the building require about the same degree of transmission loss as the walls and roof. Windows, skylights, doors (especially overhead ones) and loading doors require special treatment. Similarly, openings for air intake and exhaust, ventilation fans, and washroom and kitchen exhaust fans may require special treatment.

5 ABATEMENT TECHNIQUES

This section discusses the techniques for reducing the noise produced by outdoor and indoor shooting ranges.

5.1 NOISE ABATEMENT TECHNIQUES FOR OUTDOOR SHOOTING RANGES

In this section, we consider an outdoor shooting range on flat ground (either level or sloping). The effects of a natural hill located directly downrange, a combination berm/barrier added to the side, and a barrier behind the shooters are examined.

5.1.1 Natural Hill

Figure 8 shows the [sound levels](#) downrange for typical rifle noise, without any other noise controls in place.

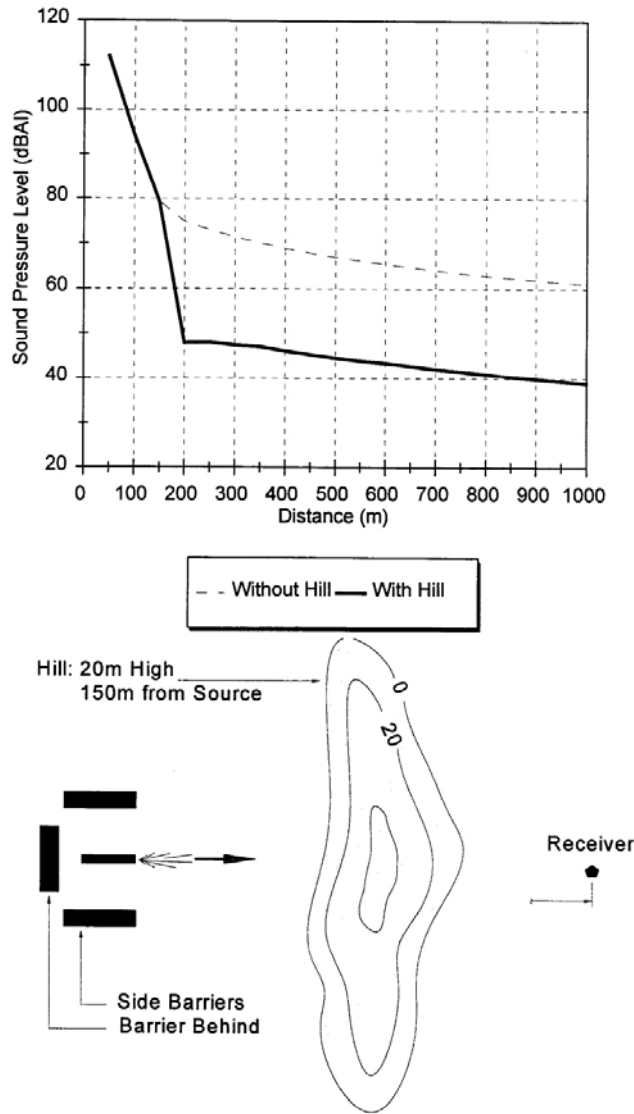


Figure 8: Attenuation Over Distance With and Without Hill

The sound levels over flat ground are shown, along with the sound levels that occur at a 20 m high natural hill located 150 m from the shooter's position. The hill provides more than 20 dB attenuation, reducing sound levels from the range of 60 to 70 dBAI to levels in the range of 40 to 50 dBAI.

5.1.2 Barriers at Sides

Figure 9 shows the effect of a 5 m barrier located 25 m from the shooter at the side of the range, assuming there is flat ground.

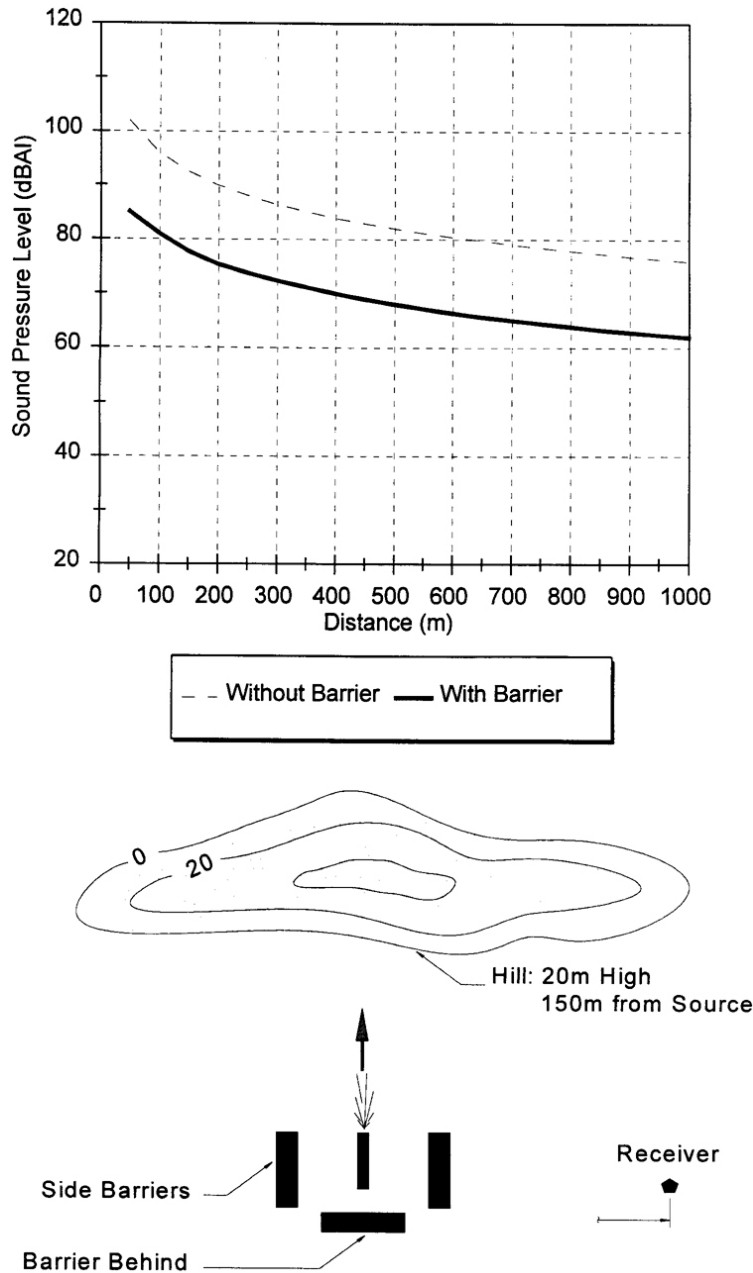


Figure 9: Attenuation Over Distance With and Without Side Barriers

Once again, the barrier provides significant reduction in noise, but since it is only 25% of the height of the hill and half the distance away, it provides less attenuation.

5.1.3 Barrier Behind Shooter

Figure 10 (see Appendix G) shows the effect of a barrier behind a shooter. Since the direction is behind the shooter, sound levels are lower due to directivity.

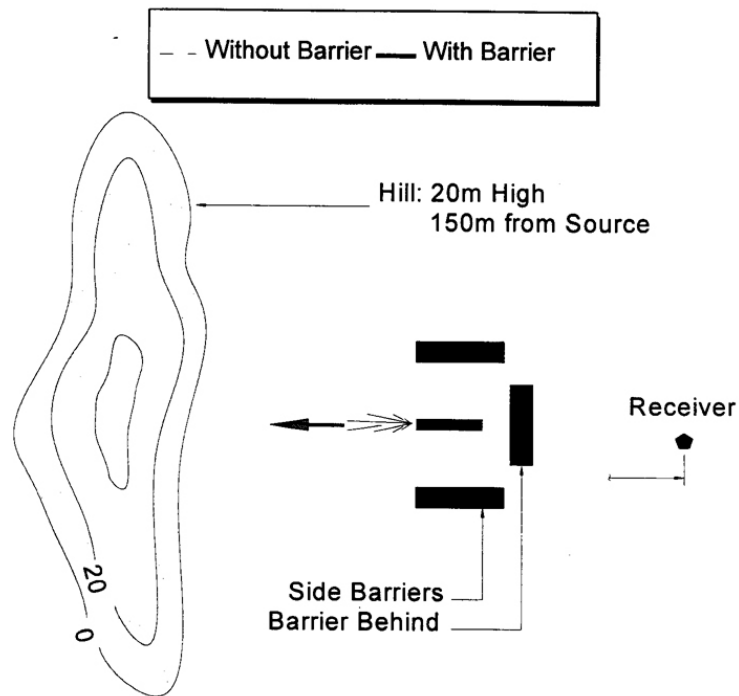
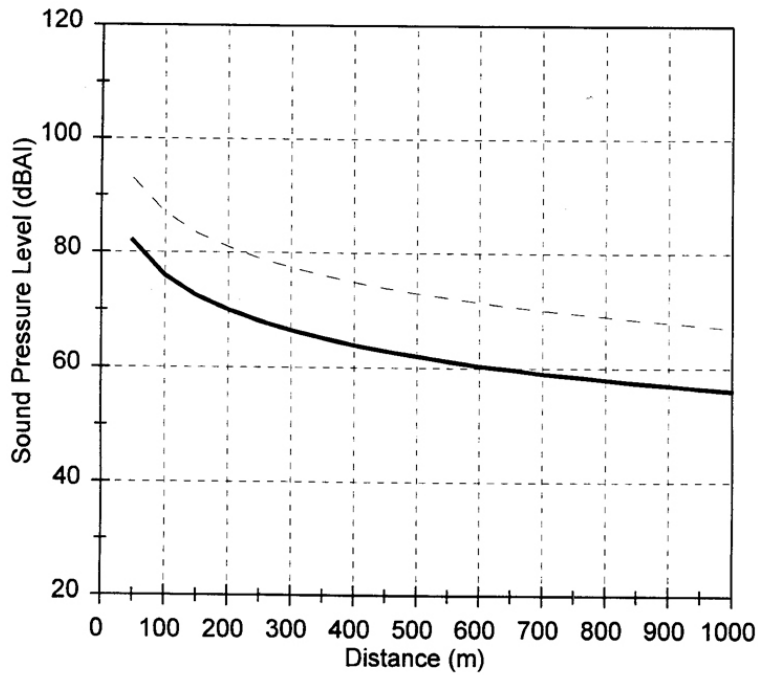


Figure 10: Attenuation Over Distance With and Without Barrier Behind Shooter

The barrier, 3 m high and 10 m behind the shooter, provides a reduction of about 10 dB.

Reviewing the calculated data downrange, to the side of the range and behind the shooter, highlights the requirement for a higher and closer barrier at the sides, in order to achieve the sound levels accomplished with the hill and behind-the-shooter barriers.

5.2 NOISE ABATEMENT TECHNIQUES FOR INDOOR SHOOTING RANGES

In this section, we consider an indoor range with and without walls, and various walls constructions.

5.2.1 Walls

Table 3 shows the calculated sound levels for various wall constructions. It shows sound levels 100 m from the shooter, assuming the handgun has a [sound level](#) of 160 dBA (peak) and that the [sound](#) is measured 2 m from the handgun at 90° to the line of fire. Both the double-leaf construction and the concrete-block construction provide sound levels of 42 dBAI at 100 m downrange from the shooter.

Again, these calculations are for demonstration purposes only and the actual sound level will vary based on the actual firearm used, the planned construction, construction quality and the exterior terrain.

Table 3: Sound Levels, dBAI, 100m from Indoor Range (Sound Pressure of the Handgun Being Measured is 160 dBAI at 600 mm)

Construction of Wall	SPL (dBAI) at 100 m from Shooter, Downrange
No Walls	109
16 gauge sheet steel	73
16 gauge sheet steel, steel studs, resilient channel, 16 mm GWB	42
8-inch hollow concrete blocks	42

5.3 PRACTICAL MEASURES OF NOISE CONTROL

This section summarizes in point-form the practical measures to take for noise control in outdoor and indoor shooting ranges.

5.3.1 Outdoor Shooting Ranges

- Range should be located facing a natural high hill.
- Berms and barriers should be as close and high as possible.
- Barriers should be covered with sound-absorbing, weatherproof material.
- Berms and barriers must be designed for drainage considerations, wind and snow accumulation.
- Shooting range should be oriented so that “downrange” is away from critical receivers.
- There should be a shooter enclosure, with interior surfaces covered with sound-absorbing material where possible.

- Locations near lakes, rivers and open ground should be avoided.
- Trees on the tops of berms or near barriers should be avoided.

5.3.2 INDOOR SHOOTING RANGES

- Consider noise both through the roof and walls.
- Heavy and/or two-leaf wall and roof construction should be employed.
- Sound-absorbing materials should be applied to the interior of the indoor range.
- All doors and windows require the same transmission loss characteristics as the roof and walls.
- All openings should be acoustically treated, especially air intakes and exhausts (e.g. locate HVAC equipment in the ceiling of any office area's supply and return it ducted to the shooting area).

6 GLOSSARY

The majority of these technical definitions are derived from the *Ministry of the Environment, "Model Municipal Noise Control By-Law: Final Report," August 1978.*

A-Weighted Sound Pressure Level

The sound pressure level that is modified by the application of A-weighting. It is measured in A-weighted decibels and denoted dBA.

A-Weighting

The frequency weighting characteristic as specified in IEC 123 or IEC 179 and intended to approximate the relative sensitivity of the normal human ear to different frequencies (pitches) of sound.

Acoustic Calibrator

An electro-mechanical or mechanical device intended for the calibration of sound level meters and meeting the specifications of Publication NPC-102 – Instrumentation, for Acoustic Calibrators.

Decibel

A dimensionless measure of sound level or sound pressure level; see "Sound Pressure Level."

Effective Sound Pressure

The "effective sound pressure" at a point is the root-mean square value of the instantaneous sound pressure, over a time interval, at the point under consideration as detected with a sound level meter.

Equivalent Sound Level

Sometimes denoted as Leq. It is the value of the constant sound level that results from exposure to the same total A-weighted energy as does the specified time-varying sound, if the constant sound level persists over an equal time interval. It is measured in dBA.

The mathematical definition of Equivalent Sound Level (Leq) for an interval defined as occupying the period between two points in time t_1 and t_2 is:

$$Leq = 10 \log_{10} \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p^2(t)}{p_r^2} dt \right]$$

where $p(t)$ is the time-varying A-weighted sound pressure and p_r is the reference pressure of 20 μ Pa.

Fast Response

A dynamic characteristic setting of a sound level meter.

Frequency

The "frequency" of a periodic quantity is the number of times that the quantity repeats itself in a unit interval of time. The unit of measurement is hertz (Hz), which represents the number of cycles per second.

General Purpose Sound Level Meter

A sound level meter that meets the specifications of Publication NPC-102 – Instrumentation, for General Purpose Sound Level Meters.

Impulse Response

A dynamic characteristic setting of a sound level meter meeting the specifications of Publication NPC-102 - Instrumentation, for Impulse Sound Level Meters.

Impulse Sound Level

The sound level of an impulsive sound as measured with an Impulse Sound Level Meter set to impulse response. It is measured in A-weighted decibels and denoted dBAI.

Impulse Sound Level Meter

A sound level meter that meets the specifications of any publication for Impulse Sound Level Meters.

Impulsive Sound

A single pressure pulse or a single burst of pressure pulses.

Integrating Sound Level Meter

A sound level meter that is capable of being used to derive the Equivalent Sound Level (Leq).

Logarithmic Mean Impulse Sound Level

Sometimes denoted LLM. For N impulsive sounds, LLM is ten times the logarithm to the base 10 of the arithmetic mean often to the power of one tenth the Impulse Sound Level of each impulsive sound. Algebraically, it can be written as follows:

$$LLM = 10 \log_{10} \left[\frac{1}{N} \left(10^{dBAI_1/10} + 10^{dBAI_2/10} + \dots + 10^{dBAI_N/10} \right) \right]$$

where dBAI₁, dBAI₂, ..., dBAI_N are the N impulse sound levels.

Overpressure

The "overpressure" at a point, due to an acoustic disturbance, is the instantaneous difference at that point between the peak pressure during the disturbance and the ambient atmospheric pressure. The unit of measurement is the pascal. One pascal, abbreviated Pa, is the same as one newton per square metre, abbreviated N/m².

Overpressure Level

It is twenty times the logarithm to the base 10 of the ratio of the peak pressure to the reference pressure of 20 μ Pa.

Peak Pressure Level Detector

A device capable of measuring peak pressure or pressure level perturbations in air which meets the specifications of Publication NPC-102 – Instrumentation, for Peak Pressure Level Detectors.

SEL

The energy mean value of the single event noise exposure level, which may be calculated from the equation: SEL = NL_{max}+10 log₁₀t_{ea} (dB).

Slow Response

A dynamic characteristic setting of a sound level meter meeting the applicable specifications of Publication NPC-102 – Instrumentation.

Sound

An oscillation in pressure, stress, particle displacement or particle velocity, in a medium with internal forces (e.g. elastic, viscous) or the superposition of such propagated oscillations, which may cause an auditory sensation.

Sound Level

The A-weighted sound pressure level.

Sound Level Meter

An instrument that is sensitive to and calibrated for the measurement of sound.

Sound Pressure

The instantaneous difference between the actual pressure and the average or barometric pressure at a given location. The unit of measurement is the micropascal (μPa), which is the same as a micronewton per square meter ($\mu\text{N}/\text{m}^2$).

Sound Pressure Level

It is twenty times the logarithm to the base 10 of the ratio of the effective pressure (p) of a sound to the reference pressure (p_r) of $20 \mu\text{Pa}$. Therefore, the sound pressure level in $\text{dB} = 20 \log_{10}(p/p_r)$.

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May 12, 2017

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Re: Sound Level Measurement Results – Orono Fish and Hunt Club

1. Introduction

At the request of the Municipality of Clarington, Swallow Acoustic Consultants Ltd. (SACL) conducted sound level measurements for shooting noise at 4 residences on Leskard Road during an event in the Orono Fish and Hunt Club on October 22, 2016. This report outlines the measurement results and assessment.

2. Noise Criteria

Sections related to shooting ranges in the Municipality of Clarington noise bylaws 2007-071 are outlined as follow:

Section 3.1

A noise curfew shall apply to the Orono Fish and Hunt Club. The curfew shall be from 9:00 p.m. until 8:00 a.m. the following day (Monday through Saturday), 9:00 p.m. Saturday until 10:00 a.m. Sunday, and 4:00 p.m. Sunday until 8:00 a.m. Monday.

Section 3.1.1

During non-curfew times, any noise emanating from the use of a shooting range shall not exceed:

- (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980; or
- (b) 50 dBAI at the point of reception for any shooting range which began operation after January 1st 1980.

It is our understanding that Orono Fish and Hunt Club began operation prior to January 1st 1980; therefore the 70 dBAI sound level limit is applicable.



3. Measurement Methodology

Sound level measurements were conducted in the afternoon on October 22, 2016. The following sections describe the methodology of the measurements.

3.1. Measurement Locations

Sound levels were measured at the residential properties on Leskard Road near the shooting range, as listed in Table 1. These locations are shown in Figure 1.

Table 1: Measurement Locations

Address	Measurement Location
7560 Leskard Road	Backyard, approximately 50 m from the house.
7685 Leskard Road	Front yard by the driveway, approximately 30 m from the house.
7150 Leskard Road	Side yard, approximately 24 m north of the house.
7506 Leskard Road	Deck at the rear of the house, elevated from backyard.

3.2. Types of Firearms

Since the Orono Fish and Hunt Club was not informed about the sound level measurements, the types of firearm discharged during the measurements are not known.

3.3. Measurement Parameters

The impulse sound levels of the shooting noise were measured in A-weighted decibels and are denoted dBAI. The impulse sound level is the sound level of an impulsive sound as measured with a sound level meter set to impulse response.

The ambient sound levels, expressed in Equivalent Sound Level (Leq) were measured at selected measurement locations over a 30 second period when no shooting noise was generated.

3.4. Instrumentation

Sound levels were measured using a Brüel and Kjær Hand-held Analyzer Type 2250 (serial number 3007997) with a Brüel and Kjær ½" Prepolarized Condenser Microphone Type 4189 (serial number 2983426). The sound level meter was field-calibrated with a Brüel and Kjær Sound Level Calibrator Type 4230 (serial number 1274906). A wind shield over the microphone was used for all outdoor sound level measurements. Calibration documents for the instrumentation are available upon request.



4. Measurement Results

The measurement results are summarised in Table 2.

Table 2: Measurement Results

Measurement Location	Impulse Sound Level (dBA)	Notes
7560 Leskard Road	55	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	52	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	57	Shooting noise faintly audible. Includes noise from leaves rustling.
7685 Leskard Road	51	Ambient
	53	Shooting noise barely audible.
	54	Shooting noise barely audible.
	55	Shooting noise barely audible.
	53	Shooting noise barely audible.
	59	Shooting noise barely audible.
	54	Shooting noise barely audible.
7150 Leskard Road	50	Ambient
	54	Shooting noise barely audible.
	51	Shooting noise barely audible.
	53	Shooting noise barely audible.
7506 Leskard Road	60	Shooting noise faintly audible.
	57	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	53	Shooting noise faintly audible.
	53	Shooting noise faintly audible.



5. Noise Assessments

The measured impulsive sound levels are between 51 dBAI and 60 dBAI. Therefore they are below the sound level limit of 70 dBAI in the Municipality of Clarington noise bylaws 2007-071.

6. Concluding Remarks

Sound level measurements were conducted at 4 residences on Leskard Road during an event in the Orono Fish and Hunt Club on October 22, 2016. The measured impulsive sound levels are below the sound level limit in the Municipality of Clarington noise bylaws.

Please do not hesitate to contact us if there are any questions.

Yours Truly,

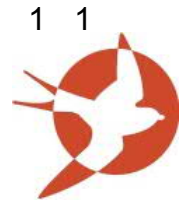
Swallow Acoustic Consultants Ltd.

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Figure 1 Measurement Locations



Orono Fish and Hunt Club

3292 Concession Road 7, Orono, Ontario

Noise Assessment

SACL #B6-611

April 28, 2017

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APPENDIX A – Weather Conditions

APPENDIX B – Measurement Results



1. Introduction

At the request of the Municipality of Clarington, Swallow Acoustic Consultants Ltd. (SACL) conducted sound level measurements for shooting noise from the Orono Fish and Hunt Club on March 23, 2017. The report outlines the measurement results and assessment.

The Orono Fish and Hunt Club is located at 3292 Concession Road 7 in Orono. Sound level measurements took place at the nearby residential properties when firearms were discharged from the 25-metre range that is located approximately 660 m north of Concession Road 7, between Leskard Road and Brown Road. At the time of the measurements, the following noise control measures were being implemented:

- Berms around the shooting range to the north, east and west. Height of the berms are unknown.
- Acoustic panels covered by burlap, which provide sound absorption, have been installed to separate each of the firing positions.
- Sound attenuation insulation has been added on the structure at the firing line, including a portion of the wall facing the firing points and an area on the underside of the roof.

It is our understanding that implementation of noise control measures is ongoing.

The objective of the measurements is to assess the shooting noise with the Municipality of Clarington noise bylaws. In addition, the measurement results are compared with the measurement results in a report prepared by SACL and dated February 14, 2012. The above noise control measures were not implemented at the time of the measurements in 2012.

2. Noise Criteria

The municipality noise bylaws and the Ontario Ministry of Environment and Climate Change (MOECC) noise guidelines are compared in the following sections.

2.1. Noise Bylaws

Sections related to shooting ranges in the Municipality of Clarington noise bylaws 2007-071 are outlined as follow:

Section 3.1

A noise curfew shall apply to the Orono Fish and Hunt Club. The curfew shall be from 9:00 p.m. until 8:00 a.m. the following day (Monday through Saturday), 9:00 p.m. Saturday until 10:00 a.m. Sunday, and 4:00 p.m. Sunday until 8:00 a.m. Monday.

Section 3.1.1

During non-curfew times, any noise emanating from the use of a shooting range shall not exceed:



- (a) 70 dBAI at the point of reception for any shooting range which began operation prior to January 1st 1980; or
- (b) 50 dBAI at the point of reception for any shooting range which began operation after January 1st 1980.

It is our understanding that Orono Fish and Hunt Club began operation prior to January 1st 1980; therefore the 70 dBAI sound level limit is applicable.

2.2. NPC-205 and NPC-232

Both MOECC publication NPC-205 “Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)” and NPC-232 “Sound Level Limits for Stationary Sources in Class 3 areas (Rural)” have the same sound level limits for impulsive noise, including the sound level limits for impulsive sounds from the discharge of firearms on the premises of a licensed gun club.

The sound level limit at a point of reception expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}) is:

- 70 dBAI if the gun club were operating before January 1, 1980; or
- 50 dBAI if the gun club began to operate after January 1, 1980; or
- The L_{LM} prior to expansion, alteration or conversion.

The sound level limits in NPC-205 and NPC-232 are similar to those in the Municipality of Clarington noise bylaws except that the sound level limits are expressed in L_{LM} . NPC-205 and NPC-232 were consolidated and replaced by NPC-300 in 2013.

2.3. NPC-300

The MOECC publication NPC-300 dated August 2013 replaced NPC-205 and NPC-232. Sound level limit for impulsive sound from a stationary source at a point of reception, expressed in terms of L_{LM} , is the higher of the applicable exclusion limit value given in Table B-3 or Table B-4, or the background sound level for that point of reception.

Table B-3
Exclusion Limit Values for Impulsive Sound Level (L_{LM} , dBAI)
Outdoor Points of Reception

Time of Day	Actual Number of Impulses in Period of One-Hour	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 23:00	9 or more	50	50	45	55
	7 to 8	55	55	50	60
	5 to 6	60	60	55	65
	4	65	65	60	70
	3	70	70	65	75
	2	75	75	70	80
	1	80	80	75	85

Table B-4
Exclusion Limit Values for Impulsive Sound Level (L_{LM} , dBAI)
Plane of Window – Noise Sensitive Spaces (Day/Night)

Actual Number of Impulses in Period of One-Hour	Class 1 Area (07:00–23:00)/ (23:00–07:00)	Class 2 Area (07:00–23:00)/ (23:00–07:00)	Class 3 Area (07:00–19:00)/ (19:00–07:00)	Class 4 Area (07:00–23:00)/ (23:00–07:00)
9 or more	50/45	50/45	45/40	60/55
7 to 8	55/50	55/50	50/45	65/60
5 to 6	60/55	60/55	55/50	70/65
4	65/60	65/60	60/55	75/70
3	70/65	70/65	65/60	80/75
2	75/70	75/70	70/65	85/80
1	80/75	80/75	75/70	90/85

The sound level limits for impulsive noise depend on the frequency of the impulses, time of the impulsive noise occurs and the area in which the noise receptors are located.

2.4. Discussion

Currently the applicable sound level limit for the Orono Fish and Hunt Club is 70 dBAI according to the noise bylaws presented above. Under the curfew in the noise bylaws, the Orono Fish and Hunt Club can operate until 9:00 p.m on Mondays through Saturdays and until 4:00 p.m. on Sundays.

The frequency of discharging firearms in the gun club likely exceeds 9 times in an hour during normal operations. Therefore, the sound level limit according to NPC-300 can range from 50 dBAI during daytime in Class 2 area to 40 dBAI on the plane of windows in Class 3 area during evening. The sound level limits in NPC-300 are significantly more stringent than the current sound level limit in the noise bylaws.



In addition, the sound level limits for impulsive sound in NPC-300 are expressed in terms of the L_{LM} , which is considered the average of multiple impulsive sounds that occur on site. The noise bylaws do not specifically require the assessment on the L_{LM} of multiple impulsive sounds.

3. Measurement Methodology

Sound level measurements were conducted during the daytime period on March 23, 2017. The following sections describe the methodology of the measurements.

3.1. Measurement Locations

Sound levels were measured at the residential properties near the shooting range, as listed in Table 1. These locations are shown in Figure 1.

Table 1: Measurement Locations

Address	Measurement Location
3282 Concession Road 7	Backyard, approximately 30 m from the house.
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.
7606 Leskard Road	Backyard, approximately 30 m from the house.
7615 Leskard Road	Front yard, approximately 25 m from the house.
7685 Leskard Road	Front yard, approximately 30 m from the house.
7560 Leskard Road	Backyard, approximately 30 m from the house.
7506 Leskard Road	Backyard, approximately 13 m from the house.
7580 Leskard Road	Backyard, approximately 30 m from the house.

3.2. Types of Firearms

The discharge of the following firearms was measured:

- Sako 6.5x55
- Lee Enfield 303 British
- 375 H&H Magnum
- Winchester 20 GA
- Winchester 12 GA
- 9 mm
- 0.38 Special



Some of the firearms were not available during measurement at some of the measurement locations. For each type of firearm fired, two to four shots from the same firearm were measured. Each shot was fired at intervals so that each shot impulse could be measured individually.

3.3. Measurement Parameters

The impulse sound levels of the shooting noise were measured in A-weighted decibels and are denoted dBAI. The impulse sound level is the sound level of an impulsive sound as measured with a sound level meter set to impulse response.

The ambient sound levels, expressed in Equivalent Sound Level (Leq) were measured at each measurement location over a 5 minute period when no shooting noise was generated.

3.4. Weather Conditions

Weather conditions during the sound level measurements are provided in Appendix A. The weather conditions are suitable for outdoor sound level measurements.

3.5. Instrumentation

Sound levels were measured using a Brüel and Kjær Hand-held Analyzer Type 2250 (serial number 3007997) with a Brüel and Kjær ½” Prepolarized Condenser Microphone Type 4189 (serial number 2983426). The sound level meter was field-calibrated with a Brüel and Kjær Sound Level Calibrator Type 4230 (serial number 1274906). A wind shield over the microphone was used for all outdoor sound level measurements. Calibration documents for the instrumentation are available upon request.

4. Measurement Results

The measurement results are summarised in Table 2. Detailed measurement results are listed in Appendix B.

Table 2: Measurement Results

<i>Location</i>	<i>Firearm</i>	<i>Impulse Sound Level (dBAI)</i>	<i>Leq (5 min) (dBA)</i>
3282 Concession Rd 7	Sako 6.5x55	52	-
3282 Concession Rd 7	Sako 6.5x55	51	-
3282 Concession Rd 7	Sako 6.5x55	48	-
3282 Concession Rd 7	Lee Enfield 303 British	49	-
3282 Concession Rd 7	Lee Enfield 303 British	50	-
3282 Concession Rd 7	Lee Enfield 303 British	52	-
3282 Concession Rd 7	375 H&H Magnum	50	-



<i>Location</i>	<i>Firearm</i>	<i>Impulse Sound Level (dBAI)</i>	<i>Leq (5 min) (dBA)</i>
3282 Concession Rd 7	375 H&H Magnum	45	-
3282 Concession Rd 7	375 H&H Magnum	49	-
3282 Concession Rd 7	Winchester 20 GA	54	-
3282 Concession Rd 7	Winchester 20 GA	49	-
3282 Concession Rd 7	Winchester 20 GA	51	-
3282 Concession Rd 7	Winchester 12 GA	50	-
3282 Concession Rd 7	Winchester 12 GA	53	-
3282 Concession Rd 7	Winchester 12 GA	50	-
3282 Concession Rd 7	9 mm	51	-
3282 Concession Rd 7	9 mm	50	-
3282 Concession Rd 7	0.38 Special	54	-
3282 Concession Rd 7	0.38 Special	43	-
3282 Concession Rd 7	0.38 Special	45	-
3282 Concession Rd 7	Ambient	-	37
7374 Leskard Rd	Sako 6.5x55	52	-
7374 Leskard Rd	Sako 6.5x55	52	-
7374 Leskard Rd	Sako 6.5x55	54	-
7374 Leskard Rd	Lee Enfield 303 British	54	-
7374 Leskard Rd	Lee Enfield 303 British	54	-
7374 Leskard Rd	Lee Enfield 303 British	54	-
7374 Leskard Rd	375 H&H Magnum	58	-
7374 Leskard Rd	375 H&H Magnum	62	-
7374 Leskard Rd	375 H&H Magnum	59	-
7374 Leskard Rd	Winchester 20 GA	46	-
7374 Leskard Rd	Winchester 20 GA	54	-
7374 Leskard Rd	Winchester 20 GA	45	-
7374 Leskard Rd	Winchester 12 GA	50	-



<i>Location</i>	<i>Firearm</i>	<i>Impulse Sound Level (dBAI)</i>	<i>Leq (5 min) (dBA)</i>
7374 Leskard Rd	Winchester 12 GA	50	-
7374 Leskard Rd	Winchester 12 GA	49	-
7374 Leskard Rd	9 mm	51	-
7374 Leskard Rd	9 mm	53	-
7374 Leskard Rd	0.38 Special	48	-
7374 Leskard Rd	0.38 Special	45	-
7374 Leskard Rd	Ambient	-	44
7606 Leskard Rd	Sako 6.5x55	55	-
7606 Leskard Rd	Sako 6.5x55	58	-
7606 Leskard Rd	Sako 6.5x55	54	-
7606 Leskard Rd	Lee Enfield 303 British	53	-
7606 Leskard Rd	Lee Enfield 303 British	55	-
7606 Leskard Rd	Lee Enfield 303 British	57	-
7606 Leskard Rd	Winchester 20 GA	51	-
7606 Leskard Rd	Winchester 20 GA	52	-
7606 Leskard Rd	Winchester 20 GA	51	-
7606 Leskard Rd	Winchester 12 GA	66	-
7606 Leskard Rd	Winchester 12 GA	66	-
7606 Leskard Rd	Winchester 12 GA	69	-
7606 Leskard Rd	9 mm	63	-
7606 Leskard Rd	9 mm	57	-
7606 Leskard Rd	9 mm	58	-
7606 Leskard Rd	0.38 Special	51	-
7606 Leskard Rd	0.38 Special	51	-
7606 Leskard Rd	Ambient	-	47
7615 Leskard Rd	Sako 6.5x55	69	-
7615 Leskard Rd	Sako 6.5x55	68	-



<i>Location</i>	<i>Firearm</i>	<i>Impulse Sound Level (dBAI)</i>	<i>Leq (5 min) (dBA)</i>
7615 Leskard Rd	Sako 6.5x55	59	-
7615 Leskard Rd	Lee Enfield 303 British	62	-
7615 Leskard Rd	Lee Enfield 303 British	69	-
7615 Leskard Rd	Lee Enfield 303 British	67	-
7615 Leskard Rd	9 mm	62	-
7615 Leskard Rd	9 mm	72	-
7615 Leskard Rd	9 mm	58	-
7615 Leskard Rd	0.38 Special	62	-
7615 Leskard Rd	0.38 Special	52	-
7615 Leskard Rd	0.38 Special	62	-
7615 Leskard Rd	Ambient	-	42
7685 Leskard Rd	Sako 6.5x55	60	-
7685 Leskard Rd	Sako 6.5x55	57	-
7685 Leskard Rd	Sako 6.5x55	61	-
7685 Leskard Rd	Lee Enfield 303 British	68	-
7685 Leskard Rd	Lee Enfield 303 British	57	-
7685 Leskard Rd	Lee Enfield 303 British	59	-
7685 Leskard Rd	Winchester 20 GA	57	-
7685 Leskard Rd	Winchester 20 GA	65	-
7685 Leskard Rd	Winchester 20 GA	58	-
7685 Leskard Rd	Winchester 12 GA	54	-
7685 Leskard Rd	Winchester 12 GA	61	-
7685 Leskard Rd	Winchester 12 GA	50	-
7685 Leskard Rd	Ambient	-	39
7560 Leskard Rd	Sako 6.5x55	59	-
7560 Leskard Rd	Sako 6.5x55	61	-
7560 Leskard Rd	Sako 6.5x55	62	-



<i>Location</i>	<i>Firearm</i>	<i>Impulse Sound Level (dBAI)</i>	<i>Leq (5 min) (dBA)</i>
7560 Leskard Rd	Lee Enfield 303 British	62	-
7560 Leskard Rd	Lee Enfield 303 British	55	-
7560 Leskard Rd	Lee Enfield 303 British	60	-
7560 Leskard Rd	Winchester 20 GA	53	-
7560 Leskard Rd	Winchester 20 GA	52	-
7560 Leskard Rd	Winchester 20 GA	50	-
7560 Leskard Rd	Winchester 12 GA	52	-
7560 Leskard Rd	Winchester 12 GA	52	-
7560 Leskard Rd	Winchester 12 GA	53	-
7560 Leskard Rd	Ambient	-	41
7506 Leskard Rd	Sako 6.5x55	58	-
7506 Leskard Rd	Sako 6.5x55	60	-
7506 Leskard Rd	Sako 6.5x55	63	-
7506 Leskard Rd	Lee Enfield 303 British	57	-
7506 Leskard Rd	Lee Enfield 303 British	61	-
7506 Leskard Rd	Lee Enfield 303 British	66	-
7506 Leskard Rd	Winchester 20 GA	53	-
7506 Leskard Rd	Winchester 20 GA	53	-
7506 Leskard Rd	Winchester 20 GA	56	-
7506 Leskard Rd	Winchester 12 GA	56	-
7506 Leskard Rd	Winchester 12 GA	55	-
7506 Leskard Rd	Winchester 12 GA	53	-
7506 Leskard Rd	Ambient	-	51
7580 Leskard Rd	Sako 6.5x55	74	-
7580 Leskard Rd	Sako 6.5x55	69	-
7580 Leskard Rd	Sako 6.5x55	61	-
7580 Leskard Rd	Sako 6.5x55	64	-



<i>Location</i>	<i>Firearm</i>	<i>Impulse Sound Level (dBAI)</i>	<i>Leq (5 min) (dBA)</i>
7580 Leskard Rd	Lee Enfield 303 British	60	-
7580 Leskard Rd	Lee Enfield 303 British	60	-
7580 Leskard Rd	Lee Enfield 303 British	61	-
7580 Leskard Rd	Winchester 20 GA	61	-
7580 Leskard Rd	Winchester 20 GA	53	-
7580 Leskard Rd	Winchester 20 GA	54	-
7580 Leskard Rd	Winchester 12 GA	61	-
7580 Leskard Rd	Winchester 12 GA	70	-
7580 Leskard Rd	Winchester 12 GA	64	-
7580 Leskard Rd	Ambient	-	43

5. Noise Assessment

Most of the measured impulsive sound levels are at or below the noise bylaw sound level limit of 70 dBAI except 1 gun shot measured at 72 dBAI at 7615 Leskard Road and one gun shot measured at 74 dBAI at 7580 Leskard Road. 7615 Leskard Road was not a measurement location in 2012. The firing of a Sako 6.5x55 was not measured at 7580 Leskard Road in 2012, However, the discharge of both firearms, Sako 0.458 Magnum rifle and Lee-Endfield 303 British rifle, measured at the same location in 2012 were below 70 dBAI.

During the 2012 measurements with the similar types of firearms, the measured sound levels at 7374 Leskard Road and 7606 Leskard Road exceeded 70 dBAI. The measured sound level was as high as 79 dBAI at 7374 Leskard Road and as high as 82 dBAI at 7606 Leskard Road. However, with the implementation of the noise control measures described in Section 1, the measured sound levels are currently below 70 dBAI at these two locations.

The measurements were conducted with one firearm fired at a time so that the measurement results in 2012 could be compared directly. The measurements do not reflect the condition of a typical event at the Orono Fish and Hunt Club, when a mixture of several firearms are discharged in an hour, and therefore the L_{LM} of the measured impulsive sounds were not calculated. During an event, the L_{LM} depends on the number of shots with high sound levels and the number of shots with lower sound levels. For example, if only one or two shots that exceed 70 dBAI are fired and many shots that are well below 70 dBAI are fired in an hour, the LLM may meet the 70 dBAI sound level limit.



It is our understanding that complaints have been received from residents that multiple discharge of firearms at the same time resulted in significantly higher sound levels. Such a condition was not measured due to the limited number of firearms available at the time of measurement.

6. Concluding Comments

Sound level measurements for the Orono Fish Hunt Club were conducted at 8 residential properties on March 23, 2017. The majority of the measured sound levels meet the noise bylaws sound level limit. Only two gun shots at two locations exceed the sound level limit. In addition, the measurement results indicate that the implemented noise control measures attenuate the shooting noise at the two locations to meet the sound level limit that previously exceeded the limit in 2012.

Please do not hesitate to contact us if there are any questions.

Yours Truly,

Swallow Acoustic Consultants Ltd.

Pearlie Yung, M.Sc., P.Eng.
Senior Project Engineer

Reviewed by

Galen Wong, M.A.Sc.
Senior Project Director



Figures

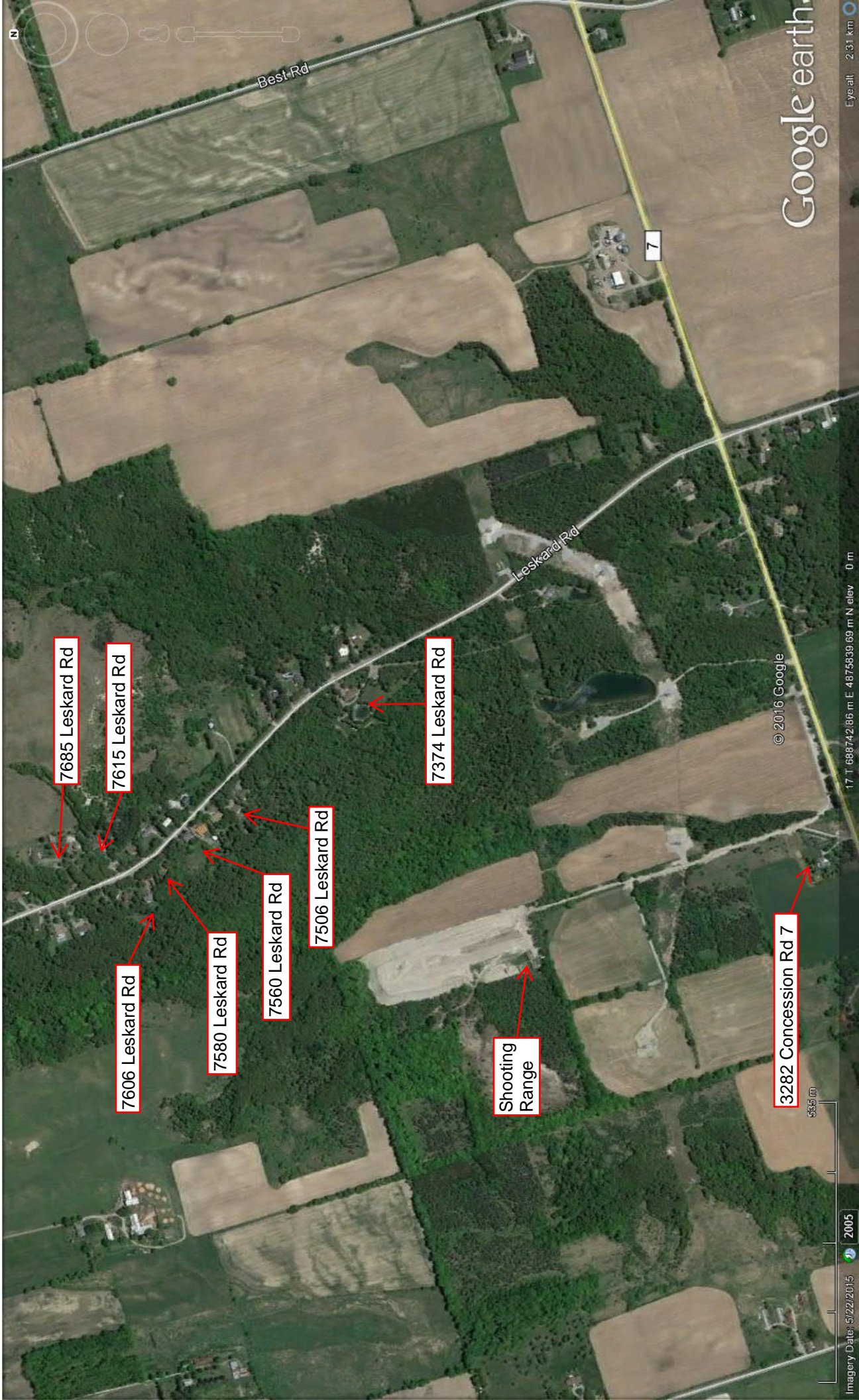


Figure 1 Measurement Locations



Appendices



APPENDIX A – Weather Conditions

Government
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du Canada[Home](#) → [Environment and natural resources](#) → [Weather, Climate and Hazard](#) → [Past weather and climate](#) → [Historical Data](#)

Hourly Data Report for March 23, 2017

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

OSHAWA ONTARIO

Latitude: 43°55'22.000" N

Longitude: 78°53'00.041" W

Elevation: 139.90 m

Climate ID: 6155875

WMO ID: 71697

TC ID: YOO

	<u>Temp</u> °C 	<u>Dew Point</u> <u>Temp</u> °C 	<u>Rel</u> <u>Hum</u> % 	<u>Wind</u> <u>Dir</u> 10's deg	<u>Wind</u> <u>Spd</u> km/h 	<u>Visibility</u> km 	<u>Stn</u> <u>Press</u> kPa 	<u>Hmdx</u>	<u>Wind</u> <u>Chill</u>	<u>Weather</u>
TIME										
00:00 ±	-7.6	-12.9	66	34	17	16.1	101.68		-14	<u>NA</u>
01:00 ±	-7.9	-12.8	68	<u>M</u>	4	16.1	101.70		-10	<u>NA</u>
02:00 ±	-8.6	-13.2	70		0	16.1	101.70			<u>NA</u>
03:00 ±	-8.7	-12.6	73	25	5	16.1	101.74		-11	<u>NA</u>
04:00 ±	-10.2	-12.9	81		0	16.1	101.76			<u>NA</u>
05:00 ±	-11.5	-13.4	86		0	16.1	101.80			<u>NA</u>
06:00 ±	-12.2	-14.0	87		0	16.1	101.85			<u>NA</u>
07:00 ±	-9.9	-11.5	88		0	16.1	101.90			<u>NA</u>

	<u>Temp</u> °C 	<u>Dew Point Temp</u> °C 	<u>Rel Hum</u> %	<u>Wind Dir</u> 10's deg	<u>Wind Spd</u> km/h 	<u>Visibility</u> km 	<u>Stn Press</u> kPa 	<u>Hmdx</u>	<u>Wind Chill</u>	<u>Weather</u>
08:00 ‡	-5.9	-10.1	73	20	5	16.1	101.92		-8	NA
09:00 ‡	-3.3	-9.3	64	22	9	16.1	101.93		-7	NA
10:00 ‡	-1.5	-11.2	48	20	11	16.1	101.91		-5	NA
11:00 ‡	-1.3	-13.0	41	21	13	16.1	101.88		-6	NA
12:00 ‡	-0.5	-10.8	46	20	15	16.1	101.83		-5	NA
13:00 ‡	-0.4	-12.0	42	16	17	16.1	101.75		-5	NA
14:00 ‡	0.2	-14.2	33	18	17	16.1	101.66			NA
15:00 ‡	0.5	-16.6	27	17	13	16.1	101.58			NA
16:00 ‡	1.0	-14.7	30	20	13	16.1	101.46			NA
17:00 ‡	1.1	-10.8	41	20	15	16.1	101.41			NA
18:00 ‡	0.3	-10.1	46	19	9	16.1	101.42			NA
19:00 ‡	-0.9	-9.4	53	11	11	16.1	101.34		-5	NA
20:00 ‡	-0.7	-8.9	54	11	9	16.1	101.33		-4	NA
21:00 ‡	-0.5	-7.3	60	11	15	16.1	101.22		-5	NA
22:00 ‡	0.0	-6.0	64	11	18	16.1	101.03		-5	NA
23:00 ‡	0.9	-5.0	65	11	18	16.1	100.94			NA

Legend

- E = Estimated
- M = Missing
- NA = Not Available
- ‡ = Partner data that is not subject to review by the National Climate Archives

Date modified:

2016-08-09



APPENDIX B – Measurement Results

Location	Firearm	Project Name	Start Time	Elapsed Time	LAI _{max}	Leq (dBA)	Notes
3282 Concession Rd 7	Sako 6.5x55	170323 001	2017/03/23 9:51	00:00:05	52.2		
3282 Concession Rd 7	Sako 6.5x55	170323 002	2017/03/23 9:55	00:00:03	50.7		
3282 Concession Rd 7	Sako 6.5x55	170323 003	2017/03/23 9:56	00:00:04	48.3		
3282 Concession Rd 7	Lee Enfield 303 British	170323 004	2017/03/23 9:59	00:00:03	48.7		
3282 Concession Rd 7	Lee Enfield 303 British	170323 005	2017/03/23 10:00	00:00:08	50.1		
3282 Concession Rd 7	Lee Enfield 303 British	170323 006	2017/03/23 10:01	00:00:07	51.8		
3282 Concession Rd 7	375 H&H Magnum	170323 007	2017/03/23 10:04	00:00:12	50.1		
3282 Concession Rd 7	375 H&H Magnum	170323 008	2017/03/23 10:04	00:00:10	45.1		
3282 Concession Rd 7	375 H&H Magnum	170323 009	2017/03/23 10:05	00:00:11	49.0		
3282 Concession Rd 7	Winchester 20 GA	170323 010	2017/03/23 10:07	00:00:12	53.5		Result could be affected by birds
3282 Concession Rd 7	Winchester 20 GA	170323 011	2017/03/23 10:08	00:00:10	49.2		
3282 Concession Rd 7	Winchester 20 GA	170323 012	2017/03/23 10:09	00:00:07	51.2		
3282 Concession Rd 7	Winchester 12 GA	170323 013	2017/03/23 10:11	00:00:11	49.9		Similar level as bird chirping nearby
3282 Concession Rd 7	Winchester 12 GA	170323 014	2017/03/23 10:13	00:00:11	52.8		
3282 Concession Rd 7	Winchester 12 GA	170323 015	2017/03/23 10:13	00:00:10	50.0		Slightly higher than truck at a distance
3282 Concession Rd 7	9 mm	170323 016	2017/03/23 10:15	00:00:14	51.3		
3282 Concession Rd 7	9 mm	170323 017	2017/03/23 10:16	00:00:11	50.5		
3282 Concession Rd 7	0.38 Special	170323 018	2017/03/23 10:19	00:00:09	54.3		
3282 Concession Rd 7	0.38 Special	170323 019	2017/03/23 10:20	00:00:05	43.4		
3282 Concession Rd 7	0.38 Special	170323 021	2017/03/23 10:24	00:00:10	45.0		
3282 Concession Rd 7	aircraft	170323 020	2017/03/23 10:22	00:00:27	72.6		Aircraft fly by, no shooting noise
3282 Concession Rd 7	Ambient	170323 022	2017/03/23 10:25	00:05:01		37.3	birds, cars
7374 Leskard Rd	Sako 6.5x55	170323 023	2017/03/23 10:49	00:00:08	51.8		clearly audible, low frequency
7374 Leskard Rd	Sako 6.5x55	170323 024	2017/03/23 10:50	00:00:12	52.0		
7374 Leskard Rd	Sako 6.5x55	170323 025	2017/03/23 10:51	00:00:12	54.3		
7374 Leskard Rd	Lee Enfield 303 British	170323 026	2017/03/23 10:52	00:00:13	53.6		
7374 Leskard Rd	Lee Enfield 303 British	170323 027	2017/03/23 10:52	00:00:13	54.0		
7374 Leskard Rd	Lee Enfield 303 British	170323 028	2017/03/23 10:53	00:00:12	53.7		
7374 Leskard Rd	375 H&H Magnum	170323 029	2017/03/23 10:54	00:00:23	58.0		
7374 Leskard Rd	375 H&H Magnum	170323 030	2017/03/23 10:55	00:00:13	61.9		
7374 Leskard Rd	375 H&H Magnum	170323 031	2017/03/23 10:55	00:00:12	59.0		
7374 Leskard Rd	Winchester 20 GA	170323 032	2017/03/23 10:57	00:00:13	46.2		
7374 Leskard Rd	Winchester 20 GA	170323 033	2017/03/23 10:58	00:00:11	54.0		mostly ambient sound
7374 Leskard Rd	Winchester 20 GA	170323 034	2017/03/23 11:00	00:00:12	45.5		
7374 Leskard Rd	Winchester 12 GA	170323 035	2017/03/23 11:01	00:00:12	49.7		influenced by bird
7374 Leskard Rd	Winchester 12 GA	170323 036	2017/03/23 11:01	00:00:12	49.8		
7374 Leskard Rd	Winchester 12 GA	170323 037	2017/03/23 11:02	00:00:12	49.3		
7374 Leskard Rd	9 mm	170323 038	2017/03/23 11:06	00:00:12	50.6		high frequency content
7374 Leskard Rd	9 mm	170323 039	2017/03/23 11:06	00:00:14	53.2		high frequency content
7374 Leskard Rd	0.38 Special	170323 040	2017/03/23 11:07	00:00:11	47.8		
7374 Leskard Rd	0.38 Special	170323 041	2017/03/23 11:08	00:00:13	44.9		

Location	Firearm	Project Name	Start Time	Elapsed Time	LAI _{max}	Leq (dBA)	Notes
7374 Leskard Rd	Ambient	170323 042	2017/03/23 11:10	00:05:01		43.8	cars, birds, distant aircraft, loud bird
7606 Leskard Rd	Sako 6.5x55	170323 043	2017/03/23 11:32	00:00:12	55.2		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Sako 6.5x55	170323 044	2017/03/23 11:33	00:00:13	57.8		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Sako 6.5x55	170323 045	2017/03/23 11:33	00:00:08	53.7		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Lee Enfield 303 British	170323 046	2017/03/23 11:35	00:00:13	53.3		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Lee Enfield 303 British	170323 047	2017/03/23 11:35	00:00:12	55.4		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Lee Enfield 303 British	170323 048	2017/03/23 11:36	00:00:12	56.6		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Winchester 20 GA	170323 049	2017/03/23 11:37	00:00:12	51.3		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Winchester 20 GA	170323 050	2017/03/23 11:38	00:00:12	51.8		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Winchester 20 GA	170323 051	2017/03/23 11:39	00:00:13	51.0		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Winchester 12 GA	170323 052	2017/03/23 11:40	00:00:13	66.4		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Winchester 12 GA	170323 053	2017/03/23 11:41	00:00:12	65.9		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Winchester 12 GA	170323 054	2017/03/23 11:41	00:00:12	69.1		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	9 mm	170323 055	2017/03/23 11:43	00:00:16	63.2		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	9 mm	170323 056	2017/03/23 11:44	00:00:11	57.1		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	9 mm	170323 057	2017/03/23 11:45	00:00:09	57.8		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	0.38 Special	170323 058	2017/03/23 11:46	00:00:10	51.1		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	0.38 Special	170323 059	2017/03/23 11:46	00:00:11	51.4		Constant water noise from the creek adjacent to property.
7606 Leskard Rd	Ambient	170323 060	2017/03/23 11:47	00:05:17		46.8	Ambient sound level dominated by water noise.
7615 Leskard Rd	Sako 6.5x55	170323 061	2017/03/23 12:06	00:00:13	69.2		
7615 Leskard Rd	Sako 6.5x55	170323 062	2017/03/23 12:06	00:00:13	68.5		
7615 Leskard Rd	Sako 6.5x55	170323 063	2017/03/23 12:07	00:00:13	59.4		
7615 Leskard Rd	Lee Enfield 303 British	170323 064	2017/03/23 12:07	00:00:13	62.4		
7615 Leskard Rd	Lee Enfield 303 British	170323 065	2017/03/23 12:08	00:00:12	69.5		
7615 Leskard Rd	Lee Enfield 303 British	170323 066	2017/03/23 12:09	00:00:12	66.9		
7615 Leskard Rd	9 mm	170323 067	2017/03/23 12:11	00:00:14	62.1		
7615 Leskard Rd	9 mm	170323 068	2017/03/23 12:12	00:00:13	72.3		
7615 Leskard Rd	9 mm	170323 069	2017/03/23 12:13	00:00:13	57.6		
7615 Leskard Rd	0.38 Special	170323 070	2017/03/23 12:16	00:00:13	61.6		
7615 Leskard Rd	0.38 Special	170323 071	2017/03/23 12:17	00:00:10	52.4		
7615 Leskard Rd	0.38 Special	170323 072	2017/03/23 12:18	00:00:12	61.9		
7615 Leskard Rd	Ambient	170323 073	2017/03/23 12:19	00:05:07		42.5	birds, rooster, cars
7685 Leskard Rd	Sako 6.5x55	170323 074	2017/03/23 13:51	00:00:06	60.4		
7685 Leskard Rd	Sako 6.5x55	170323 075	2017/03/23 13:52	00:00:11	56.6		
7685 Leskard Rd	Sako 6.5x55	170323 076	2017/03/23 13:53	00:00:13	61.1		
7685 Leskard Rd	Lee Enfield 303 British	170323 077	2017/03/23 13:58	00:00:10	67.5		
7685 Leskard Rd	Lee Enfield 303 British	170323 078	2017/03/23 13:59	00:00:12	57.4		
7685 Leskard Rd	Lee Enfield 303 British	170323 079	2017/03/23 14:00	00:00:11	58.5		
7685 Leskard Rd	Winchester 20 GA	170323 080	2017/03/23 14:01	00:00:13	57.3		

Location	Firearm	Project Name	Start Time	Elapsed Time	LAI _{max}	Leq (dBA)	Notes
7685 Leskard Rd	Winchester 20 GA	170323 081	2017/03/23 14:01	00:00:11	65.0		
7685 Leskard Rd	Winchester 20 GA	170323 082	2017/03/23 14:02	00:00:11	58.5		
7685 Leskard Rd	Winchester 12 GA	170323 083	2017/03/23 14:03	00:00:13	54.4		
7685 Leskard Rd	Winchester 12 GA	170323 084	2017/03/23 14:04	00:00:12	61.5		
7685 Leskard Rd	Winchester 12 GA	170323 085	2017/03/23 14:04	00:00:09	50.1		
7685 Leskard Rd	Ambient	170323 086	2017/03/23 14:07	00:05:02		38.8	wildlife, cars
7560 Leskard Rd	Sako 6.5x55	170323 087	2017/03/23 14:24	00:00:10	59.3		Some water noise from nearby creek
7560 Leskard Rd	Sako 6.5x55	170323 088	2017/03/23 14:25	00:00:11	61.5		Some water noise from nearby creek
7560 Leskard Rd	Sako 6.5x55	170323 089	2017/03/23 14:26	00:00:12	61.8		Some water noise from nearby creek
7560 Leskard Rd	Lee Enfield 303 British	170323 090	2017/03/23 14:27	00:00:13	61.6		Some water noise from nearby creek
7560 Leskard Rd	Lee Enfield 303 British	170323 091	2017/03/23 14:28	00:00:10	55.1		Some water noise from nearby creek
7560 Leskard Rd	Lee Enfield 303 British	170323 092	2017/03/23 14:29	00:00:19	60.4		Some water noise from nearby creek
7560 Leskard Rd	Winchester 20 GA	170323 093	2017/03/23 14:31	00:00:13	53.1		same as ambient in dBAI, some water noise from nearby creek
7560 Leskard Rd	Winchester 20 GA	170323 094	2017/03/23 14:32	00:00:10	52.4		Some water noise from nearby creek
7560 Leskard Rd	Winchester 20 GA	170323 095	2017/03/23 14:32	00:00:15	50.2		Some water noise from nearby creek
7560 Leskard Rd	Winchester 12 GA	170323 096	2017/03/23 14:34	00:00:11	51.9		Some water noise from nearby creek
7560 Leskard Rd	Winchester 12 GA	170323 097	2017/03/23 14:34	00:00:13	52.0		Some water noise from nearby creek
7560 Leskard Rd	Winchester 12 GA	170323 098	2017/03/23 14:35	00:00:10	53.3		Some water noise from nearby creek
7560 Leskard Rd	Ambient	170323 099	2017/03/23 14:35	00:05:01		41.3	water noise, car
7506 Leskard Rd	Sako 6.5x55	170323 100	2017/03/23 14:53	00:00:10	58.1		Constant water noise from creek in property
7506 Leskard Rd	Sako 6.5x55	170323 101	2017/03/23 14:53	00:00:09	60.2		Constant water noise from creek in property
7506 Leskard Rd	Sako 6.5x55	170323 102	2017/03/23 14:54	00:00:10	63.0		Constant water noise from creek in property
7506 Leskard Rd	Lee Enfield 303 British	170323 103	2017/03/23 14:54	00:00:10	57.3		Constant water noise from creek in property
7506 Leskard Rd	Lee Enfield 303 British	170323 104	2017/03/23 14:56	00:00:10	61.2		Constant water noise from creek in property
7506 Leskard Rd	Lee Enfield 303 British	170323 105	2017/03/23 14:57	00:00:10	65.8		Constant water noise from creek in property
7506 Leskard Rd	Winchester 20 GA	170323 106	2017/03/23 14:58	00:00:10	52.6		Constant water noise from creek in property
7506 Leskard Rd	Winchester 20 GA	170323 107	2017/03/23 14:59	00:00:11	53.3		Slightly over ambient; constant water noise from creek in property
7506 Leskard Rd	Winchester 20 GA	170323 108	2017/03/23 14:59	00:00:11	55.9		Slightly over ambient; constant water noise from creek in property
7506 Leskard Rd	Winchester 12 GA	170323 109	2017/03/23 15:00	00:00:11	55.5		Constant water noise from creek in property
7506 Leskard Rd	Winchester 12 GA	170323 110	2017/03/23 15:01	00:00:11	54.6		Constant water noise from creek in property
7506 Leskard Rd	Winchester 12 GA	170323 111	2017/03/23 15:01	00:00:09	52.8		Slightly over ambient; constant water noise from creek in property
7506 Leskard Rd	Ambient	170323 112	2017/03/23 15:03	00:05:02		50.7	Water noise, dog barking, car
7580 Leskard Rd	Sako 6.5x55	170323 113	2017/03/23 15:20	00:00:11	74.4		
7580 Leskard Rd	Sako 6.5x55	170323 114	2017/03/23 15:21	00:00:10	69.1		
7580 Leskard Rd	Sako 6.5x55	170323 115	2017/03/23 15:22	00:00:11	60.8		
7580 Leskard Rd	Sako 6.5x55	170323 116	2017/03/23 15:22	00:00:27	63.7		
7580 Leskard Rd	Lee Enfield 303 British	170323 117	2017/03/23 15:24	00:00:12	60.3		
7580 Leskard Rd	Lee Enfield 303 British	170323 118	2017/03/23 15:24	00:00:10	59.6		
7580 Leskard Rd	Lee Enfield 303 British	170323 119	2017/03/23 15:25	00:00:12	60.5		

Location	Firearm	Project Name	Start Time	Elapsed Time	LAI _{max}	Leq (dBA)	Notes
7580 Leskard Rd	Winchester 20 GA	170323 120	2017/03/23 15:26	00:00:11	61.4		
7580 Leskard Rd	Winchester 20 GA	170323 121	2017/03/23 15:27	00:00:11	53.2		
7580 Leskard Rd	Winchester 20 GA	170323 122	2017/03/23 15:27	00:00:11	54.3		
7580 Leskard Rd	Winchester 12 GA	170323 123	2017/03/23 15:28	00:00:12	61.0		
7580 Leskard Rd	Winchester 12 GA	170323 124	2017/03/23 15:29	00:00:12	69.7		
7580 Leskard Rd	Winchester 12 GA	170323 125	2017/03/23 15:29	00:00:11	64.2		
7580 Leskard Rd	Ambient	170323 126	2017/03/23 15:31	00:05:02		42.8	cars

Measurement Locations

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Sako 6.5x55	52	Sako 6.5x55	57.2
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Sako 6.5x55	51	Sako 6.5x55	62.7
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Sako 6.5x55	48	Sako 6.5x55	63.0
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	49	Lee-Enfield 303 British Rifle	48.7
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	50	Lee-Enfield 303 British Rifle	50.1
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	52	Lee-Enfield 303 British Rifle	55.4
3282 Concession Road 7	Backyard, approximately 30 m from the house.	375 H&H Magnum	50	Sako .458 Magnum Rifle	59.0
3282 Concession Road 7	Backyard, approximately 30 m from the house.	375 H&H Magnum	45	Sako .458 Magnum Rifle	56.8
3282 Concession Road 7	Backyard, approximately 30 m from the house.	375 H&H Magnum	49	Sako .458 Magnum Rifle	52.0
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Not tested in 2017		Sako .458 Magnum Rifle	51.4
3282 Concession Road 7	Backyard, approximately 30 m from the house.			Sako .458 Magnum Rifle	51.4
3282 Concession Road 7	Backyard, approximately 30 m from the house.			Sako .458 Magnum Rifle	51.1

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Winchester 20 GA	54	Winchester 20 GA	42.6
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Winchester 20 GA	49	Winchester 20 GA	51.1
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Winchester 20 GA	51	Winchester 20 GA	43.0
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Winchester 12 GA	50	Winchester 12 GA	52.9
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Winchester 12 GA	53	Winchester 12 GA	42.6
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Winchester 12 GA	50	Winchester 12 GA	60.3
3282 Concession Road 7	Backyard, approximately 30 m from the house.	9 mm	51	Not tested in 2012	
3282 Concession Road 7	Backyard, approximately 30 m from the house.	9 mm	50		
3282 Concession Road 7	Backyard, approximately 30 m from the house.	0.38 Special	54		
3282 Concession Road 7	Backyard, approximately 30 m from the house.	0.38 Special	43		
3282 Concession Road 7	Backyard, approximately 30 m from the house.	0.38 Special	45		
3282 Concession Road 7	Backyard, approximately 30 m from the house.	Ambient	-		

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Sako 6.5x55	52	Guns Fired out of Order	79.3
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Sako 6.5x55	52	Guns Fired out of Order	77
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Sako 6.5x55	54		74.8
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Lee Enfield 303 British	54		74.6
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Lee Enfield 303 British	54		71.9
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Lee Enfield 303 British	54		71.2
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	375 H&H Magnum	58		71.1
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	375 H&H Magnum	62		71.1

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	375 H&H Magnum	59		70.2
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Winchester 20 GA	46		69.9
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Winchester 20 GA	54	Guns Fired out of Order	66.8
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Winchester 20 GA	45		63.8
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Winchester 12 GA	50		63.5
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Winchester 12 GA	50		61.4
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Winchester 12 GA	49		59.5
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.				59.2

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	9 mm	51	Not tested in 2012	
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	9 mm	53		
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	0.38 Special	48		
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	0.38 Special	45	Not tested in 2012	
7374 Leskard Road	Backyard, approximately 30 m from the house, beside the pond.	Ambient	-		
7606 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	55	Sako 6.5x55 Rifle	74.6
7606 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	58	Sako 6.5x55 Rifle	74.6
7606 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	54	Sako 6.5x55 Rifle	75.4
7606 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	53	Lee Enfield 303 British Rifle	76.9
7606 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	55	Lee Enfield 303 British Rifle	73.8

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7606 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	57	Lee Enfield 303 British Rifle	76.1
7606 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	51	Winchester 20 GA	69.9
7606 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	52	Winchester 20 GA	63.5
7606 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	51	Winchester 20 GA	70.0
7606 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	66	Winchester 12 GA	67.8
7606 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	66	Winchester 12 GA	66.5
7606 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	69	Winchester 12 GA	67.7
7606 Leskard Road	Backyard, approximately 30 m from the house.	Not tested in 2017		SAKO .458 Magnum Rifle	79.9
7606 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	81.7
7606 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	80.5
7606 Leskard Road	Backyard, approximately 30 m from the house.	9 mm	63	Not tested in 2012	
7606 Leskard Road	Backyard, approximately 30 m from the house.	9 mm	57		
7606 Leskard Road	Backyard, approximately 30 m from the house.	9 mm	58		

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7606 Leskard Road	Backyard, approximately 30 m from the house.	0.38 Special	51		
7606 Leskard Road	Backyard, approximately 30 m from the house.	0.38 Special	51		
7606 Leskard Road	Backyard, approximately 30 m from the house.	Ambient	-		
7615 Leskard Road	Front yard, approximately 25 m from the house.	Sako 6.5x55	69	Not Tested in 2012	
7615 Leskard Road	Front yard, approximately 25 m from the house.	Sako 6.5x55	68		
7615 Leskard Road	Front yard, approximately 25 m from the house.	Sako 6.5x55	59	Not tested in 2012	
7615 Leskard Road	Front yard, approximately 25 m from the house.	Lee Enfield 303 British	62		
7615 Leskard Road	Front yard, approximately 25 m from the house.	Lee Enfield 303 British	69		
7615 Leskard Road	Front yard, approximately 25 m from the house.	Lee Enfield 303 British	67		
7615 Leskard Road	Front yard, approximately 25 m from the house.	9 mm	62		
7615 Leskard Road	Front yard, approximately 25 m from the house.	9 mm	72		
7615 Leskard Road	Front yard, approximately 25 m from the house.	9 mm	58		

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7615 Leskard Road	Front yard, approximately 25 m from the house.	0.38 Special	62		
7615 Leskard Road	Front yard, approximately 25 m from the house.	0.38 Special	52		
7615 Leskard Road	Front yard, approximately 25 m from the house.	0.38 Special	62		
7615 Leskard Road	Front yard, approximately 25 m from the house.	Ambient	-		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Sako 6.5x55	60	Not tested in 2012	
7685 Leskard Road	Front yard, approximately 30 m from the house.	Sako 6.5x55	57		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Sako 6.5x55	61	Not tested in 2012	
7685 Leskard Road	Front yard, approximately 30 m from the house.	Lee Enfield 303 British	68	Lee Enfield 303 British Rifle	62.2 (traffic noise audible)
7685 Leskard Road	Front yard, approximately 30 m from the house.	Lee Enfield 303 British	57	Lee Enfield 303 British Rifle	56.0
7685 Leskard Road	Front yard, approximately 30 m from the house.	Lee Enfield 303 British	59	Lee Enfield 303 British Rifle	52.6
7685 Leskard Road	Front yard, approximately 30 m from the house.	Not tested in 2017		SAKO .458 Magnum Rifle	57.8

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7685 Leskard Road	Front yard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	57.5
7685 Leskard Road	Front yard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	57.6
7685 Leskard Road	Front yard, approximately 30 m from the house.	Winchester 20 GA	57	Not tested in 2012	
7685 Leskard Road	Front yard, approximately 30 m from the house.	Winchester 20 GA	65		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Winchester 20 GA	58		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Winchester 12 GA	54		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Winchester 12 GA	61		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Winchester 12 GA	50		
7685 Leskard Road	Front yard, approximately 30 m from the house.	Ambient	-	Not tested in 2012	
7560 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	59	Not tested in 2012	
7560 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	61		
7560 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	62	Not Tested in 2012	

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7560 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	62	Lee Enfield 303 British Rifle	59.5
7560 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	55	Lee Enfield 303 British Rifle	64.0
7560 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	60	Lee Enfield 303 British Rifle	62.8
7560 Leskard Road	Backyard, approximately 30 m from the house.	Not tested in 2017		Lee Enfield 303 British Rifle	64.2 * top of slope
7560 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	66.6
7560 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	62.3
7560 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	66.6
7560 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	67.9 * top of slope
7560 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	53	Not tested in 2012	
7560 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	52	Not tested in 2012	
7560 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	50		
7560 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	52		
7560 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	52		

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7560 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	53		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Sako 6.5x55	58	SAKO .458 Magnum Rifle	60.0
7506 Leskard Road	Backyard, approximately 13 m from the house.	Sako 6.5x55	60	SAKO .458 Magnum Rifle	59.7
7506 Leskard Road	Backyard, approximately 13 m from the house.	Sako 6.5x55	63	SAKO .458 Magnum Rifle	59.5
7506 Leskard Road	Backyard, approximately 13 m from the house.	Not tested in 2017		SAKO .458 Magnum Rifle	67.7* top of slope
7506 Leskard Road	Backyard, approximately 13 m from the house.			SAKO .458 Magnum Rifle	68.3* top of slope
7506 Leskard Road	Backyard, approximately 13 m from the house.			SAKO .458 Magnum Rifle	66.3* top of slope
7506 Leskard Road	Backyard, approximately 13 m from the house.	Lee Enfield 303 British	57	Not tested in 2012	
7506 Leskard Road	Backyard, approximately 13 m from the house.	Lee Enfield 303 British	61	Not tested in 2012	
7506 Leskard Road	Backyard, approximately 13 m from the house.	Lee Enfield 303 British	66		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Winchester 20 GA	53		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Winchester 20 GA	53		

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7506 Leskard Road	Backyard, approximately 13 m from the house.	Winchester 20 GA	56		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Winchester 12 GA	56		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Winchester 12 GA	55		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Winchester 12 GA	53		
7506 Leskard Road	Backyard, approximately 13 m from the house.	Ambient	-		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	74	Not tested in 2012	
7580 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	63.2
7580 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	66.4
7580 Leskard Road	Backyard, approximately 30 m from the house.			SAKO .458 Magnum Rifle	64.0
7580 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	69		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	61		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Sako 6.5x55	64		

Address	Measurement Location	2017 Firearm Tested	2017 Impulse Sound Level (dBAI)	2012 Firearm Tested	2012 Impulse Sound Level (dBAI)
7580 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	60	Lee Enfield 303 British Rifle	55.4
7580 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	60	Lee Enfield 303 British Rifle	56.0
7580 Leskard Road	Backyard, approximately 30 m from the house.	Lee Enfield 303 British	61	Lee Enfield 303 British Rifle	55.3
7580 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	61	Not tested in 2012	
7580 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	53		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 20 GA	54		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	61		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	70		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Winchester 12 GA	64		
7580 Leskard Road	Backyard, approximately 30 m from the house.	Ambient	-		
7580 Leskard Road	Backyard, approximately 30 m from the house.				

October 22, 2016 Test Results Summarized in Logarithmic Mean

Summary		
Measurement Location	LLM	
3282 Concession Rd 7	51	dBAI
7374 Leskard Rd	51	dBAI
7606 Leskard Rd	54	dBAI
7615 Leskard Rd	66	dBAI
7685 Leskard Rd	61	dBAI
7560 Leskard Rd	58	dBAI
7506 Leskard Rd	60	dBAI
7580 Leskard Rd	66	dBAI