

Joanna Arendarczyk

From: Amy Goodwin <ak.goodwin@yahoo.com>
Sent: Wednesday, March 10, 2021 4:03 PM
To: Joanna Arendarczyk
Subject: No Northeast Watercross

Follow Up Flag: Follow up
Flag Status: Flagged

Hello,

My name is Amy Goodwin. I live at 99 Nottingham Road in Raymond. I'm writing in regards to the Northeast Watercross events that are held throughout the summer. I do not support these events. The noise they create is a nuisance to surrounding neighbors. It is hard to enjoy the sanctuary of our backyard when we have to listen to the almost constant roar from the snowmobiles all weekend long. I would like to be able to enjoy the outdoors with peace and quiet, not disruption from incredibly loud motors. I hope this will be taken into consideration.

Sincerely,
Amy Goodwin

Joanna Arendarczyk

From: George Plante <g_plante@comcast.net>
Sent: Monday, March 8, 2021 6:27 PM
To: Joanna Arendarczyk
Subject: Northeast water cross

Hi my name is George Plante I am a resident of Raymond I am a selectman for our town and I sit on our planning board also I am in favor of this event I live approximately one mile as the crow flies from this event it has been in front of our planning board and we have no issues with this actually we think it would boost our local economy a little I hope you would feel the same way thank you for your time Sincerely George Plante Raymond board of selectmen

Sent from my iPhone

From: Joshua hunter <jbhangel14@gmail.com>
Sent: Monday, March 8, 2021 6:12 PM
To: Joanna Arendarczyk
Subject: Northeast water cross

I am Josh Hunter I live at 218 Raymond Rd, Nottingham NH 03290 right in front of the event and I enjoy the events! I am 100% in for the 2021 events!

Joanna Arendarczyk

From: Marc Couture <marccouture123@yahoo.com>
Sent: Tuesday, March 9, 2021 9:50 PM
To: Joanna Arendarczyk
Subject: Northeast water cross 2021 my 2 cents

Hello

I am in support of the northeast water cross activities for 2021 .

It is activities like this that has my kids growing up doing productive activity's in NH And staying off the streets and out of trouble.

I grew up in Lawrence MA and they had nothing like this which for me I turned to being a troubled teen hanging in the streets.

I'm glad I moved up here in 2001 after having my first child at the age of 20 and am amazed at how different both my kids grew up compared to how I did .

I attribute it to the many outdoor motor sports and other activities NH allows that MA dose not.

Thank you

Marc couture

42 Sherman dr

Raymond NH 03077

From: 4maguires <4maguires@comcast.net>
Sent: Monday, March 8, 2021 4:12 PM
To: Joanna Arendarczyk
Subject: Watercross

Hi my name is Sean Maguire I live on 1 Francesca way in Nottingham. I do not own a snowmobile but wanted to check out the races in town, so I took my family we had a great time. The watercross I felt was run in a professional manner and very safe. I am a 21 year firefighter and emt and usually keep my head on a swivel looking for all the things that could go wrong. I didn't see anything that was unsafe. I hope they can get thier permits and continue with the racing its only a couple of weekends.

Sent from my Verizon, Samsung Galaxy smartphone

Joanna Arendarczyk

From: Contact form at Town of Nottingham NH <cmsmailer@civicplus.com>
Sent: Friday, March 19, 2021 2:56 PM
To: Joanna Arendarczyk
Subject: [Town of Nottingham NH] Upcoming Hearing Case #21-003-SIT (Sent by Andrea Jackson, andreaojackson@comcast.net)

Hello jarendarczyk,

Andrea Jackson (andreaojackson@comcast.net) has sent you a message via your contact form (<https://www.nottingham-nh.gov/user/91/contact>) at Town of Nottingham NH.

If you don't want to receive such e-mails, you can change your settings at <https://www.nottingham-nh.gov/user/91/edit>.

Message:

Hello JoAnna - I hope this finds you well. Could you please pass this message on to the Planning Board members regarding the above-referenced 3/24 hearing? Thank you.

Members of the Nottingham Planning Board:

We'd like to voice our support of Ms. DeFrancesco's Application for approval of three watercross events to be held in 2021. We attended two such events at 214 Raymond Road last year, and found them to be well-run, family-friendly, and quite enjoyable. There were no traffic issues observed. Many local volunteers assisted in running the events and cleaning up afterwards.

As you're well aware, there is no noise ordinance in Nottingham. While we understand concerns around noise, a pre-announced event occurring 3 times over the course of a season is far less troublesome than fireworks being randomly set off at 2 a.m. during the same season, something we've tolerated as Pawtuckaway Lake residents for several decades. We hope that you approve Ms. DeFrancesco's Application.

Warm regards,

Andrea and Frederick Jackson
129 Highland Ave., Nottingham

From: Brian & Jean Hunter
218 Raymond Rd
Nottingham NH 03290

RE: Watercross #21-003-SIT

To:Town of Nottingham Planning Board
139 Stage Rd
Nottingham NH 03290

Chairman & Member's of the Planning Board,

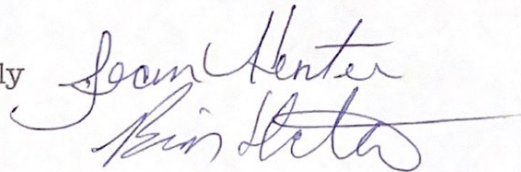
We are a direct abutter of Tax Map 69 Lot 8 & 10. Our family attended all the events of the Watercross in 2020. This was a great change in Nottingham to add. We hope you will allow this to event to continue. There was not traffic impact or disturbance at all.

We understand not everyone will like this event or the noise that comes with it. However, it's only a few times a year. When the approval is granted they are planing to spread it out and will give notice of the dates, this will allow people not in favor to make other plans.

It was a great family time & lots of land to spread out.

Please accept this as my VOTE YES!

Sincerely



2/17/2021

Letter of Support

February 17, 2021

**Town of Nottingham Planning Board
139 Stage Rd
Nottingham NH 03290**

**Re:Town of Nottingham Planning Board
139 Stage Rd
Nottingham NH 03290**

Re:Case #21-003-SIT- Application from Tami Defrancesco, Trustee of Kubota Trust & James George- 214 Raymond Rd - Application from Tami Defrancesco, Trustee of Kubota Trust & James George- 214 Raymond Rd

Planning Board & Members,

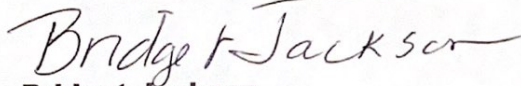
My name is Bridget Jackson, I live at 211 Stage Rd Nottingham NH. I'm writing this letter of support in the above referenced case #21-003-SIT WATERCROSS EVENT 3 x per year.

I was a participant in the Watercross event last year as an amateur rider, this was an amazing experience for my self and my friends and family to be able to come support & cheer me on. All 3 of the events were well organized, between all the staff & volunteers.

I think it is a great event to bring into our town.

I'm hoping you consider my letter and give approval to the event. Im am really looking forward to continue my new found sport in a town that I reside in.

Thank you for reading, looking forward to your consideration.



Bridget Jackson
211 Stage Rd

Carl Mun P.E.
111 Nottingham Road
Raymond, NH 03077

February 1, 2021

Town of Nottingham Planning Board
Attn: JoAnna Arendarczyk – plan.zone@nottingham-NH.gov
139 Stage Road
Nottingham, NH 03290

Cc: Raymond Planning Board – sgardner@raymondnh.gov

Re: Case #21-003-SIT

Dear Board Members,

I would like to formally object to Case #21-003-SIT – Application for approval of a Watercross event to be held three (3) times a year starting in 2021.

These events result in excessive and dangerous noise levels which exceed OSHA and NIOSH standards. Last year during one of these events, we were having a family gathering outside and were forced to retreat indoors from the noise level being so extreme. As shown in the charts below, noise levels above 90 dBA are harmful. These events far exceed that level and are compounded by the fact it is not just one noise source, but multiple noise sources during a race which both carry the noise level further and intensify the noise level exponentially as noise is measured by sound pressure levels expressed in decibels, which is a logarithmic scale. Our house is located approximately only 800 feet from the lake. These events absolutely affect our family life and are detrimental to our health and safety and we are asking this application not be approved.

A graduate paper by Kiera Lynn Moore – University of Northern Colorado stated the problem of noise exposures of recreational snowmobiles very well. Please note racing snowmobile produce exponentially higher noise levels.

STATEMENT OF THE PROBLEM

Noise induced hearing loss (NIHL) is a preventable health risk that affects many individuals on a daily basis. Of the 28 million Americans who have some degree of hearing loss, as many as 10 million individuals in America suffer from hearing loss caused from hazardous noise exposure in the workplace or recreational activities (Rabinowitz, 2000). Hazardous sound levels damage fragile structures of the inner ear and can cause permanent hearing loss over time. Temporary auditory damage can occur but repeated exposure to dangerous levels of sound can cause cell death which leads to irreversible permanent hearing threshold shifts, also known as noise induced permanent threshold shifts.

Below is the Abstract from an article on racing snowmobiles and hearing loss by Authors Fred H. Bess of Vanderbilt University and Robert E. Poynor. They measured racing snowmobiles as high as 137 dBA which far exceeds the standards set by OSHA and NIOSH. This level is even higher than a race car track noise level. At these levels OSHA's standard is less than one minute of exposure, NIOSH is less than one second exposure. Any longer exposure may result in hearing loss.

Snowmobile Engine Noise Level and hearing

Temporary threshold shifts (TTSs) were measured in 17 subjects (12 drivers and five riders) following 120 minutes of snowmobile noise exposure. All subjects were found to exhibit marked TTS at frequencies above 1,000 hertz. Predictably, the greatest amount of TTS occurred at 4,000 Hz. An acoustic analysis of the snowmobiles represented in this study revealed that the noise levels exceeded damage risk criteria for two hours exposure. One snowmobile was found to produce as much as 136 dBA at full throttle.

On November 13th of 2020, Governor Andy Cuomo signed a bill limiting snowmobile noise levels, joining Michigan, Wisconsin and Colorado to 78 decibels at full throttle measured from 50 feet away.

Any type of racing activity, car, motorcycle or snowmobile should not be allowed in a residential area and provide adequate distance to any home. This location does not have adequate distance from residential homes and again, the application should not be approved.

Sincerely,

Carl Mun P.E.

From an article by Sengpiel Audio providing comparable government standards:

Exchange Rates of NIOSH and OSHA Standards - National Institute for Occupational Safety and Health 1998; Occupational Safety and Health Administration 2009. According to each governing body, a person can safely be exposed to each decibel level for its corresponding time without risk of NIHL. For example, according to the OSHA standard, a person can withstand an environment with sound levels at 95 dBA for four hours. After four hours they are at risk for NIHL. NIOSH maintains that a person is safe in a 95 dBA environment for less than one hour.

NIOSH Standard	
Sound level (dBA)	Duration (Hours: Minutes: Seconds)
82	16:00:00
85	8:00:00
88	4:00:00
91	2:00:00
94	1:00:00
97	0:30:00
100	0:15:00
103	0:07:30
106	0:03:45
109	0:01:53
112	0:00:56
115	0:00:28
118	0:00:14
121	0:00:07
124	0:00:03
127	0:00:01

OSHA Standard	
Sound level (dBA)	Duration (Hours: Minutes: Seconds)
85	16:00:00
90	8:00:00
95	4:00:00
100	2:00:00
105	1:00:00
110	0:30:00
115	0:15:00
120	0:07:30
125	0:03:45
130	0:01:53
135	0:00:56
140	0:00:28
145	0:00:14
150	0:00:07
155	0:00:03
160	0:00:01

Abbreviations

dB – Decibel

dBA – Decibel A – Weighted

OSHA – Occupational Safety and Health Administration

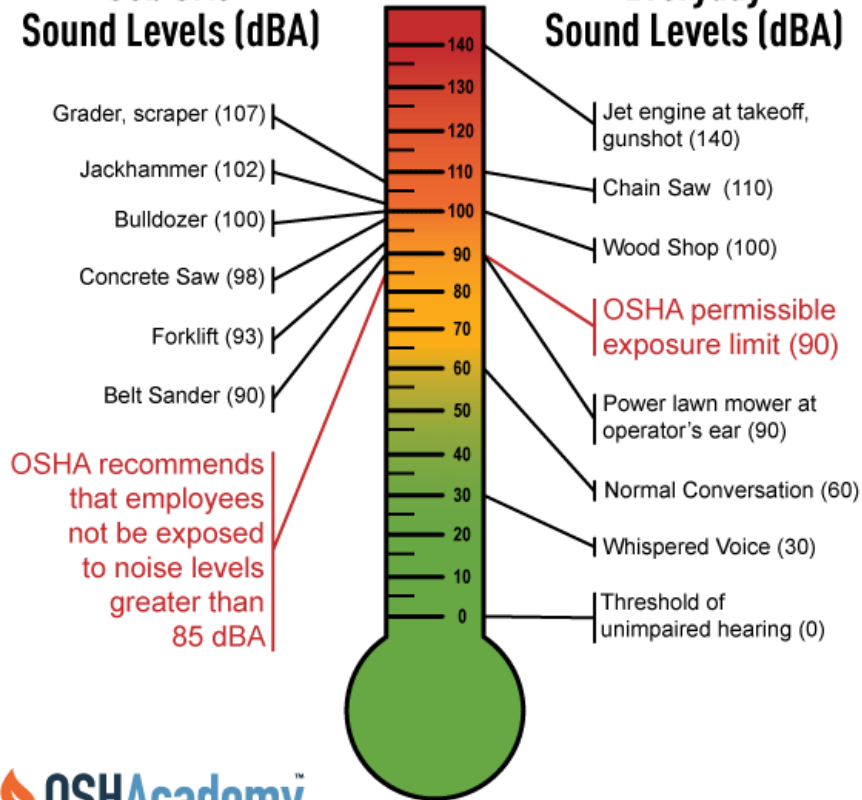
NIOSH – National Institute for Occupational Safety and Health

NIHL – Noise Induced Hearing Loss

TTS – Temporary Threshold Shift

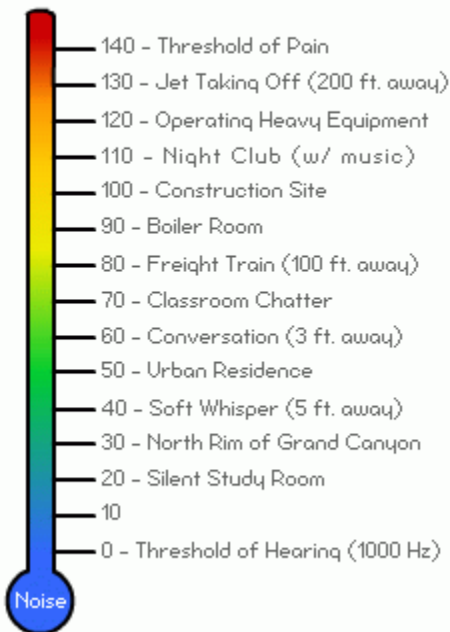
Job Site Sound Levels (dBA)

Everyday Sound Levels (dBA)



www.oshatraining.org © 2018. OSHAcademy

Typical Sound Levels (dBA)



From Nex Flow

My name is Eric Haskins,
I live at 226 Raymond road,
my home is about 200 yards
from the pond that is used
for skidoo racing.

The property owners
are well within their
rights to conduct business on their
property, the events only happen
a few times a year,
schedule in advance around
those dates if you want
to have a yard wedding
at your apartment,

To put a restriction on
a personal business on private
property would be unconstitutional
at the least, I, as a neighbor
will take legal action on
their behalf if any absurd
restrictions are put in place.
by the town of Nottingham.

Eric Haskins

From: Kimberly Ducharme <kimberlyann119@hotmail.com>
Sent: Monday, March 8, 2021 10:34 AM
To: Joanna Arendarczyk
Cc: joe ducharme
Subject: Watercross Series 2021

Good Morning,

I am writing this email on behalf of myself and my husband, both residents of Raymond New Hampshire for 7 years now.

It was brought to my attention that you would be discussing the Watercross Series in an upcoming meeting and I would like to offer our support in keeping these events, as scheduled. My family (which also includes our boys, 6 years and 2 years) look forward to these events and are in support of having these a part of our community. The events are family friendly, fun and safe and offer a unique experience for all of us to enjoy.

If there are any specific questions or concerns that I would need to further speak on, please do not hesitate to reach out to me further.

Thank you for your time, consideration and support.

Kimberly & Joseph Ducharme
3 Christina Road
Raymond, New Hampshire 03077
508-963-2195

Sent from [Mail](#) for Windows 10

Joanna Arendarczyk

From: Nathan White <nwhite@bhenv.com>
Sent: Saturday, March 20, 2021 7:40 PM
To: Joanna Arendarczyk
Subject: Snowmobile Water Cross

Hello,

I wanted to express my support for the snowmobile water cross located on Raymond Rd. We live less than a half mile from the location that it is held and have never had any issue with the noise level or the hours that the races are completed. We hope that this fun event will continue to be allowed in town.

Thank you,
Nathan White
15 Dolloff dam Rd.

Nathan White
Director of Remediation
[201 West Main Street](#)
[Ayer, MA 01432](#)
Cell: [508-989-0419](#) *
Office: [978-970-0500](#)

Sent from my iPhone

Joanna Arendarczyk

From: Sandra Koski <rubywater@yahoo.com>
Sent: Thursday, March 18, 2021 5:37 PM
To: Joanna Arendarczyk
Subject: Watercrossing events in Nottingham

Dear Board Members,

My family was camping at Pawtuckaway State Park the last weekend of September 2020 when the area became inundated with a buzzing noise that went on for hours, ruining our ability to enjoy the outdoors. There was no place to go to get away from it. Trying to paddle out to another part of the lake to see if that would help only made the problem worse, as we could then hear someone making announcements over a loudspeaker before the loud buzzing would begin again.

We did some research when we got back home and discovered there had been a snowmobile watercrossing event in Nottingham - over 5 miles away - and tried to schedule our next camping trip when that would not be happening. We checked online and didn't see anything scheduled for the last weekend in September this year, so we booked another trip.

Unfortunately, I just saw they are planning another event for the end of September, if they get approval. We really don't even feel like going as it was such a deeply disturbing experience to have to listen to the continual buzzing for hours on end.

I don't understand how it can be okay for such a loud activity to infringe on the thousands of people in the surrounding area so drastically. We were five miles away!

We have been going to Pawtuckaway for over 30 years, and know how lovely it can be, so feel particularly bad for campers from other states, who come for the beauty and quiet, and are then subjected to the sonic abuse from the constant revving of snowmobile engines.

I hope the health of the community at large, which is at least a 5 mile radius from the location in Nottingham, will take precedence over approving an activity that creates such a noise disturbance.

Sincerely,
Sandra Koski
40 Old Chester Road
Derry, NH 03038

To The planning Board of Nottingham

Please read this in at public comment time. Our names are William "Lee" Weldy and Sharon Weldy. We have lived at 110 Nottingham road for 23 years which is 800 feet from the proposed and past event. Lee originally moved to Raymond in 1977. We are writing this letter in support of the events looking to be held/scheduled at 214 Raymond road Nottingham. We have attended and been home when the events were ran last year and find them no more of an issue then the neighbor running there boat in there driveway or mowing there lawn at 7:00 in the morning or the person who starts cutting firewood at first light and cuts all day. Or the Neighbor who decides to snow blow there driveway at 4:00 in the morning. With this event we have a known start and finish time and can plan accordingly. We have seen no impact on our quality of life or issues when events are held. We have seen and had more issues with Pawtuckaway State park with the traffic, cars turning around in our driveway fireworks all hours of the day and night and can hear the boats on the lake, the Deerfield fair traffic or even bike runs as 156 is a nice road to travel. Even with no noise ordinance the sound at our house is less then some traffic going by our house its less disruptive to our dogs then the fireworks lit off on the 4th of July at the park.

Thank you for your time

William Weldy, Sharon Weldy

TOWN OF RAYMOND RESIDENTS

NOTICE OF Case #21-003-SIT- Application from Tami DeFrancesco, Trustee of Kubota Trust, requesting approval of a Watercross event to be held three (3) times a year starting in 2021. The property is located at 214 Raymond Road in Nottingham, NH and is identified as Map 69 Lot(s) 8 & 10.

We as Raymond NH Residents are in favor of this Event and have no objection:

Name :

Address:

Mark Wysocki
Mark

6 BAYOU DR Raymond

Kim Lagman
Kim Lagman

12 Manor View Dr. Raymond

Matthew Bodendorf
Matthew Bodendorf

16 BAYHILL RD RAYMOND

Chris Ungar
Chris Ungar

15 MARGARET AVE

Shauna Atwell
Shauna Atwell

15 Debra ave Raymond

Rhonda Ungar
Rhonda Ungar

15 Margaret Ave Raymond

Billie Jo Littlefield
Billie Jo Littlefield

12 Kristy Ct. Raymond

Barbie Ellis

P.O. Box 503 Raymond

Barbara Eddy

Edward A. Knowlton

~~Frank [unclear]~~ 310 Rte 27 Apt 10, Raymond

~~Julie Collette~~

Julie Collette 26 Lisa Ave Raymond

~~Sue Knapp~~

Sue Knapp

8 Fordway Road Raymond NH.

Mike Lee

7 Glen Ridge Rd. Raymond

Jessica Hemenway

36 Essex Dr Raymond

TREVER SOULIE 73 HARRIMAN HILL RD

~~77 Main Street~~

Paula Boles 73 Harriman Hill Rd
Raymond, NH 03077

Angela Wysocki

6 Bayou Dr. Raymond NH 03077

MICHE PEGAMO 24 RAIDERS LN

~~Mount Pleasant~~

Anne Walsh 13 Pierce RD

Mary Jane Horne 9 Hummingbird Lane

~~3500 Schlangen~~ 22 Hillside Dr.

~~Mar 2 W J~~

6 Walnut Hill Drive

David Esancy 3 Glen Ridge Rd. Raymond ~~Raymond~~

~~Carl Jones~~ 61 Patricia Way Raymond

Effects of Watercross Noise in Residential Area

Carl Mun

March 1, 2021

Abstract

The Nottingham Planning Board in the state of New Hampshire is reviewing an application for approval of a Watercross event to be held three (3) times a year starting in 2021, (Case #21-003-SIT). Noise levels from the event are estimated at 140 dB which far exceeds safe levels recommended by both OSHA and NIOSH. Any noise level above 90 dB are considered unsafe and may result in hearing loss. For safety, events should be located at least 1,000 feet from any residence. This distance would bring the attenuated noise level to 80 dB. The proposed location has a number of homes located less than 1,000 feet from the event, as such this application if approved would endanger those residents.

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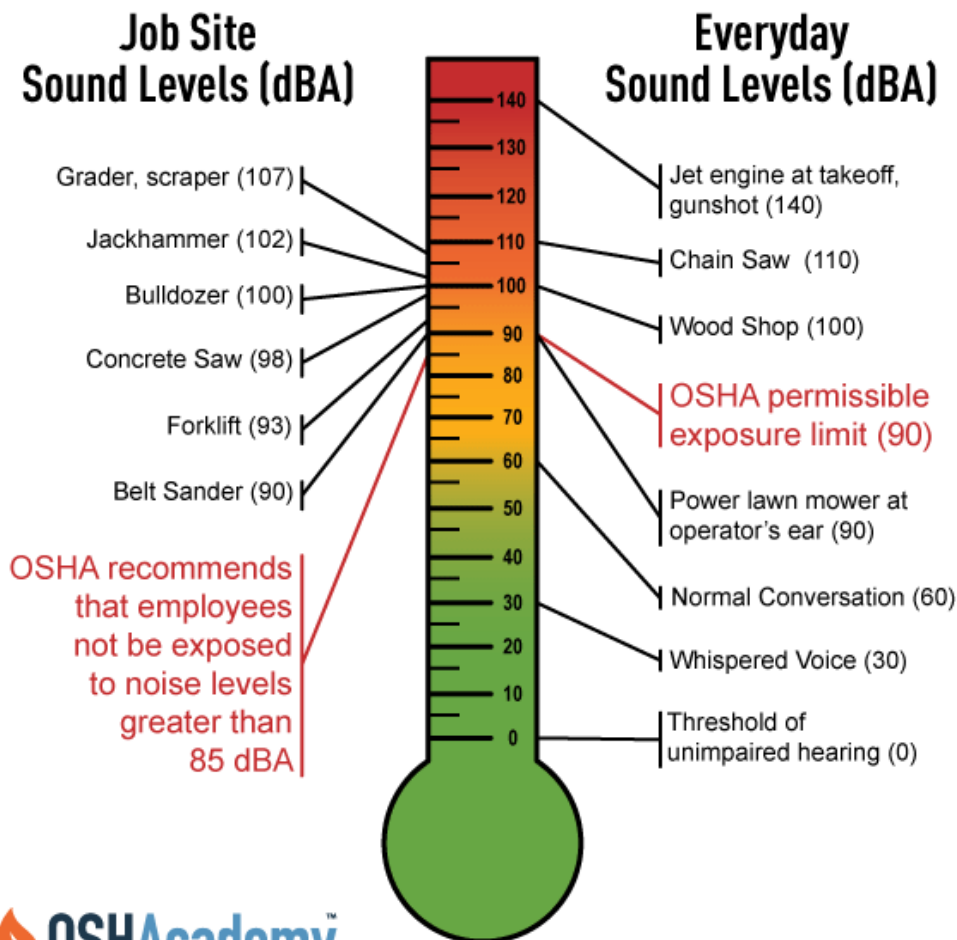
Introduction

Watercross events utilize modified snowmobiles to race across water. These snowmobiles are high performance machines built for speed and do not conform to any type of emission standards or required noise level suppression. This report reviews noise level standards, snowmobile noise levels, effects and attenuation to establish effects of residence located next to the proposed event pulling data and information from references listed at the end of this report.

Methods

I.) Safe Noise levels

As shown in the charts below, noise levels above 90 dBA are harmful. Noise levels have an additive effect when there is more than one noise source of similar intensity. This compounds the intensity of the sound pressure which both carries the noise level further and intensifies the noise level exponentially as noise is measured by sound pressure expressed in decibels on a logarithmic scale. A decibel (dB) is defined as 0.1-Del. The increase in sound pressure from 80 dB (8-Del) to 140 dB (14-Del) is 10^6 or 1,000,000 times the sound pressure. The maximum sound pressure on earth is estimated at 194 dB based at sea level 0 degrees C. This level would result in death.



From an article by Sengpiel Audio providing comparable government standards illustrating the safe time duration a person should be limited to at a given sound level.

Exchange Rates of NIOSH and OSHA Standards - National Institute for Occupational Safety and Health 1998; Occupational Safety and Health Administration 2009. According to each governing body, a person can safely be exposed to each decibel level for its corresponding time without risk of NIHL. For example, according to the OSHA standard, a person can withstand an environment with sound levels at 95 dBA for four hours. After four hours they are at risk for NIHL. NIOSH maintains that a person is safe in a 95 dBA environment for less than one hour.

NIOSH Standard	
Sound level (dBA)	Duration (Hours: Minutes: Seconds)
82	16:00:00
85	8:00:00
88	4:00:00
91	2:00:00
94	1:00:00
97	0:30:00
100	0:15:00
103	0:07:30
106	0:03:45
109	0:01:53
112	0:00:56
115	0:00:28
118	0:00:14
121	0:00:07
124	0:00:03
127	0:00:01

OSHA Standard	
Sound level (dBA)	Duration (Hours: Minutes: Seconds)
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105	1:00:00
110	0:30:00
115	0:15:00
120	0:07:30
125	0:03:45
130	0:01:53
135	0:00:56
140	0:00:28
145	0:00:14
150	0:00:07
155	0:00:03
160	0:00:01

A graduate paper by Kiera Lynn Moore – University of Northern Colorado stated the problem of noise exposures of recreational snowmobiles very well. Please note racing snowmobile produce exponentially higher noise levels.

Statement of the problem

Noise induced hearing loss (NIHL) is a preventable health risk that affects many individuals on a daily basis. Of the 28 million Americans who have some degree of hearing loss, as many as 10 million individuals in America suffer from hearing loss caused from hazardous noise exposure in the workplace or recreational activities (Rabinowitz, 2000). Hazardous sound levels damage fragile structures of the inner ear and can cause permanent hearing loss over time. Temporary auditory damage can occur but repeated exposure to dangerous levels of sound can cause cell death which leads to irreversible permanent hearing threshold shifts, also known as noise induced permanent threshold shifts.

There are numerous articles outlining the dangers of excessive noise levels and how increased levels dramatically reduce safe exposure limits.

General Health & Wellness 5-22-18

“The Science of Sound

The roar of the racetrack comes with a price.

"The damage comes to the ear from the volume of the sound," explains Matt Provenzano, MD, an otolaryngologist with Franciscan Physician Network in Michigan City. "The louder the volume, the higher energy of the sound. The more energy the ears deal with, the more potential for damage.

"Studies show the peak level in the pit exceeds 140 decibels," Dr. Provenzano said.

"Even out in the stands and infield, you're still exposed to significantly high levels of noise."

For every 5 decibel increase in noise, the recommended time of exposure is cut in half.

You can have eight hours of exposure at 90 decibels (think, the sound of a passing motorcycle), but only four hours at 95 decibels (think, the sound of a kitchen blender).

Headed to Carb Day? That concert will likely rate over 112 decibels. Continued exposure is considered dangerous to hearing.

II.) Snowmobile Noise Levels

Below is the Abstract from an article on racing snowmobiles and hearing loss by Authors Fred H. Bess of Vanderbilt University and Robert E. Poynor. They measured racing snowmobiles as high as 137 dBA which far exceeds the standards set by OSHA and NIOSH. This level is even higher than a race car track noise level. At these levels OSHA's standard is less than one minute of exposure, NIOSH is less than one second exposure. Any longer exposure may result in hearing loss.

Snowmobile Engine Noise Level and hearing

Temporary threshold shifts (TTSs) were measured in 17 subjects (12 drivers and five riders) following 120 minutes of snowmobile noise exposure. All subjects were found to exhibit marked TTS at frequencies above 1,000 hertz. Predictably, the greatest amount of TTS occurred at 4,000 Hz. An acoustic analysis of the snowmobiles represented in this study revealed that the noise levels exceeded damage risk criteria for two hours exposure. One snowmobile was found to produce as much as 136 dBA at full throttle.

Do not let the size of the vehicle force you to assumptions on noise, Hypersports and other manufactures are producing 2- and 4-cylinder performance engines exceeding 600 hp at 9,400 rpm closing in on the much larger V8 NASCAR engines. Note: snowmobiles have much shorter exhaust systems which add to the noise levels as well as many are two-cycle engines instead of the four-cycle NASCAR, which due to the exhaust at the end of the ignition cycle, produce a much louder "pop". People who operate chain saws or two-cycle gas trimmers understand how loud small two-cycle engines can be. Also, NASCAR and INDY machines race on much longer tracks, proposed Watercorss will compete on a very small lake or pond concentrating the noise.

Noise Exposures of Recreation Snowmobilers – Kiera Lynn Moore 5-1-2015

“Engine types.

Snowmobile engines come in two types, two-stroke and fourstroke. A stroke is the movement of a piston in an engine. A two-stroke engine has a single piston stroke in each direction. A four-stroke engine has one exhaust stroke and one compression stroke followed by returning strokes. Two-stroke engines give the snowmobile significant power, less weight, and cost less, however four-stroke engines produce less air and noise pollution. Krause (2003) reported that four-stroke engines had shown lower sound levels at a distance than two-stroke engines. Since four-stroke engines have to exert less energy for the same revolutions per minute (RPM), which is how many times the piston goes up and down in one minute, the noise exposures from four-stroke engines is often less.”

III.) Attenuation of Noise – Danger Zone

Noise levels of racing snowmobiles have been measured at 135+ dB. With the additive effect of multiple machines racing sound pressure levels can easily reach 140 dB. Given the distance attenuation, at 1,000 feet the noise level would be 80 dB.

Geluid Lawaai - www.hoevelakenbereifbarr.nl 1-29-2012

“How do you add noise levels?

Sound pressure levels are expressed in decibels, which is a logarithmic scale. Therefore, we cannot simply arithmetically add noise levels. For example, 35 dB plus 35 dB does not equal 70 dB.

To add two or more noise levels, if the difference between the highest and next highest noise level is: 0–1 dB then add 3 dB to the higher level to give the total noise level
2–3 dB then add 2 dB to the higher level to give the total noise level
4–9 dB then add 1 dB to the higher level to give the total noise level
10 dB and over, then the noise level is unchanged (i.e. the higher level is the total level)
So, 35 dB plus 35 dB equals 38 dB.”

Distance Attenuation Calculator – Bogna Szyk – 2-22-19

“The sound attenuation formula is as follows:

$$SPL_2 = SPL_1 - 20 * \log (R_2 / R_1)$$

where:

- **SPL₁** is the Sound Pressure Level at point 1,
- **SPL₂** is the Sound Pressure Level at point 2,
- **R₁** is the distance from the sound source to point 1
- **R₂** is the distance from the sound source to point 2.”

IV.) Conclusion

Any type of racing activity, car, motorcycle or snowmobile should not be allowed in a residential area and provide adequate distance to any home due the excessive and dangerous noise levels emitted from these events. Minimum safe distance should be at least 1,000 feet with recommendations of one quarter of a mile to assure noise levels are far below dangerous limits.

Abbreviations

dB – Decibel

dBA – Decibel A – Weighted

OSHA – Occupational Safety and Health Administration

NIOSH – National Institute for Occupational Safety and Health

NIHL – Noise Induced Hearing Loss

TTS – Temporary Threshold Shift

References

Tontechnik–Rechner, Sengpiel Audio - Exchange Rates of NIOSH and OSHA Standards,
<http://www.sengpielaudio.com/PermissibleExposureTime.htm>

Kiera Lynn Moore – University of Northern Colorado (5-1-2015) – Noise Exposures Of
Recreational Snowmobilers

General Health & Wellness (5-22-18) - The Science of Sound,
<https://www.franciscanhealth.org/community/blog/hearing-indy-500>

Fred H. Bess of Vanderbilt University and Robert E. Poynor (3-1972) - Snowmobile Engine
Noise Level and hearing

Geluid Lawaai – (2012) How do you add noise levels?
https://www.hoevelakenbereikbaar.nl/www2/MilieuZaken/Geluid_lawaai/Noise%20level%20calculations.pdf

Bogna Szyk (2-22-2019) – Distance Attenuation Calculator,
<https://www.omnicalculator.com/physics/distance-attenuation>

Snowmobile technical committee. (2009). Measurement of exhaust sound levels of stationary
snowmobiles (J2567_200901). Retrieved November 2, 2001, From:
http://standards.sae.org/j2567_200401/

Occupational Safety and Health Administration (1983)- Occupational noise exposure; Hearing
conservation amendment: Final rule. 29 CFR 1910.95 Fed. Reg., 48(46), 9738-9785.

National Institute for Occupational Safety and Health (1998) - Criteria for a recommended
standard: Occupational noise exposure. U.S. Department of Health and Human Services,
Centers for Disease Control and Prevention.

Krause, B. (2003) - Field analysis of snowmobile sounds pressure levels measured in
Yellowstone National levels. Wild Sanctuary. 1-2

About the Author

Carl Mun – Bachelors of Science in Mechanical Engineering, Purdue University 1984

Started career in the Consulting Engineering field, obtaining Professional Engineering License (PE) in 1998. Later switching to the automotive industry OEM design, prototype, testing and manufacture of exterior vehicle lighting then continuing into the engine and transmissions systems. Responsibilities included working with manufacturing machines and equipment to assure OSHA noise levels were meet. Currently working on power modular cooling of next generation electric vehicles.

Additional Information

Additional informative articles of Watercross events and effect on wildlife and nature:

<https://www.turtleguardians.com/2020/02/effects-of-watercross-on-wildlife-and-turtles/>

International Snowmobile Racing (ISR) Watercross rules require mandatory hearing protection.

<http://www.isrracing.org/tempPDF/Watercross%20Competition.pdf>

“5. Hearing protection is mandatory in all non-stock classes in all types of competition. Recommended for all stock class competition”