Richard G. Pierson, 14405 W. Honey Lane, New Berlin, WI 53151 (414) 784-3914

Report

To: Mark Wefler
President

Firm: Racine Ski Club

Phone: 414-690-6190

Date: May 10, 2008

Author: Richard Pierson

Subject: Racine Ski Club OHM Noise

Project No.: 051008A

Title: Racine Ski Club Property Line Off-Highway Motorcycle Noise Measurements

Description:
This report presents the results of the Off-Highway Motorcycle (OHM or dirt bike) noise measurements performed at the north property line of the Racine Ski Club (RSC) grounds on Saturday May 10, 2008.

Summary:

- Since the implementation of the requirement for a conditional use permit, the Racine Ski Club has closed the MX track at the north end of the property line, along the Fredricks' residence, and is also requiring all bikes to meet a 96 dBA stationary motorcycle exhaust noise limit
- Noise measurement were obtained along the Racine Ski Club north property line, closest to the Fredricks' residence, on Saturday 5/10/08 with a typical sized group of 5 -bikes (3-Enduro & 2-Trial) and a larger group of 10 - bikes (6-Enduro & 4-Trial)
- All 10 club member bikes were measured to verify 96 dBA stationary motorcycle exhaust noise compliance prior to the riding test
- Background Noise levels on 5/10/08 at the Racine Ski Club north property line, closest to the Fredricks' residence, ranged from Leq = 48.1 - 49.1 dBA
- RSC north property line noise levels with 5 - Off Highway Motorcycles (3-Enduro and 2-Trials) operating on the RSC property, after closing the MX track and requiring 96 dBA stationary motorcycle exhaust noise compliance, were Leq = 50.5 dBA
- Property line noise levels with 10 - Off-Highway Motorcycles (6-Enduro and 4-Trials) operating on the RSC property were Leq = 50.8 dBA
- Noise levels at the Racine Ski Club north property line, along the Fredricks' residence, with 10 bikes operating are only 2 to 3 dB louder than background noise levels and are significantly below HUD daytime and even nightime noise requirements
- Based on the noise measurements 5/10/08, 24 OHMs (bikes) or more could operate on the Racine Ski Club property and still meet nightime HUD residential noise requirements (Leq < 55 dBA) while being 10 dB below daytime HUD residential noise requirements (Leq < 65 dBA)

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Objective:
The goal for this study was to measure noise levels of typical Off-Highway Motorcycle (OHM) use, after requirement for a conditional use permit and implementation of new club rules, along the property line adjacent to the closest residence neighboring the Racine Ski Club grounds. This is to compare compliance with Federal (HUD) and typical environmental noise standards, since there are no other applicable state or municipal noise standards, to quantify acceptability of the OHM noise levels at the neighboring properties.

Background:
The Racine Ski Club property is located near Burlington, Wisconsin on the west side of County Highway J. No construction was evident on or along County Highway J during the measurements. Racine Ski Club members have been riding for over 20 years on their property in the town of Burlington. Prior to the requirement for a conditional use permit, the RSC grounds included a MX track along the north property line with an Enduro trail surrounding the ski hill at the south half of the grounds.

To address noise concerns of neighbors, the Racine Ski Club has closed the MX track and added a requirement that all OHMs riding on the property meet a 96 dBA noise limit per SAE J1287 (stationary motorcycle exhaust noise measurement). In addition, only trials bike riding will be allowed north of the access road and shall not be allowed north or east of the hill crest to north of the access road.

Site Description:
The RSC property is adjacent to an old landfill, to the west, which currently is a yard waste collection site. A police shooting range is located along the south-west corner of the property. The Fredricks property is to the north, with the residence approximately 200 ft. from the property line. Another residence is located ~1000 ft. south west of the property. County Highway J runs north and south along the east side of the Racine Ski Club property. The Mt. Tom development is several hundred feet to the north-west of the property. A gravel driveway bisects the RSC property, extending west/east, along the lower ground. The topography of the RSC property is low in the middle, with a tall steep hill to the south and a moderate hill to the north-west. The site is wooded along the residential property lines.

Procedures:
Prior to measuring property line noise levels, measurement of stationary motorcycle exhaust sound levels were obtained to ensure all bikes were in compliance with the recent 96 dBA rule implemented by the club. Stationary motorcycle exhaust sound levels were obtained in accordance with the SAE J1287 procedure using a Bruel & Kjaer Type 2240 Type I Sound Level Meter:

- The measurement microphone shall be located behind, 0.5m (20 in.) from, and at the same height as the exhaust outlet and at a 45 degree angle (+/- 10 deg.) to the normal line of travel of the motorcycle.
- The test rpm is one-half the maximum rated rpm. If the test rpm is not available from the manufacturer or unknown, SAE J1287 determines "Alternate Engine Speed" from either equation A2 and A3:
  - Eq. A2) For non-racing 4-stroke engines = 250,000 / stroke (mm)
  - Eq. A3) For non-racing 2-stroke engines = 200,000 / stroke (mm)

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The club member stationary motorcycle exhaust sound levels were as follows:

Rider	Type	Make	Model	Year	Stroke	Test RPM	Sound Level
Mark Wefler	Enduro	KTM	200 EXC	2004		4000	86.5 dBA
Erik Adelsen	Enduro	KTM	300 EXC	2002		3550	91.0 dBA
Dan Salton	Trial	Sherco	290	2006	60.0mm	3333 *	90.0 dBA
Dennis Oakes	Enduro	KTM	450 XCR-W	2008		4625	91.0 dBA
Dave Gagnon	Enduro	Honda	XL500S	1981		3000	84.5 dBA
Wayne Vogt	Trial	Beta	270	2005	60.5mm	3305 *	86.5 dBA
Nick Moeller	Enduro	KTM	525 EXC	2006		4600	96.0 dBA
Alan Koop	Enduro	Yamaha	YZ400F	2000		4500	95.0 dBA
Wolfgang Neuwirth	Trial	Sherco	290	2002	60.0mm	3333 *	89.0 dBA
Hunter Neuwirth	Trial	Sherco	125	2002	50.7mm	3945 *	88.5 dBA

* - RPM calculated per Eq. A3) Test RPM - 2 strokes = 200,000/stroke (mm), otherwise test RPM supplied by Motorcycle Industry Council (MIC)

All 10 club member OHMs (6 - Enduro, 4 - Trial) used for the measurements were in compliance with the 96 dBA stationary motorcycle exhaust sound level rule. The following exhibit 1 shows the stationary motorcycle exhaust noise measurement set-up:

Exhibit 1: Stationary Motorcycle Exhaust Noise Measurement

Measurements of typical Off-Highway Motorcycle use at the Racine Ski Club (RSC) property were performed on Saturday May 10th, 2008. Measurements of background noise and OHM use at the RSC property were obtained along the north property line adjacent to the nearest residence, Fredricks, approximately 200 ft. from their residence. The temperature was approximately 57 deg. F throughout the measurements with winds less than 9 mph. Humidity was in the low 40% range.

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The following exhibit 2: shows the noise measurement location at the Racine Ski Club property:

Exhibit 2A: Racine Ski Club Property - Noise Measurement Location (X)

Exhibit 2B: Noise Measurement Location at north RSC property line

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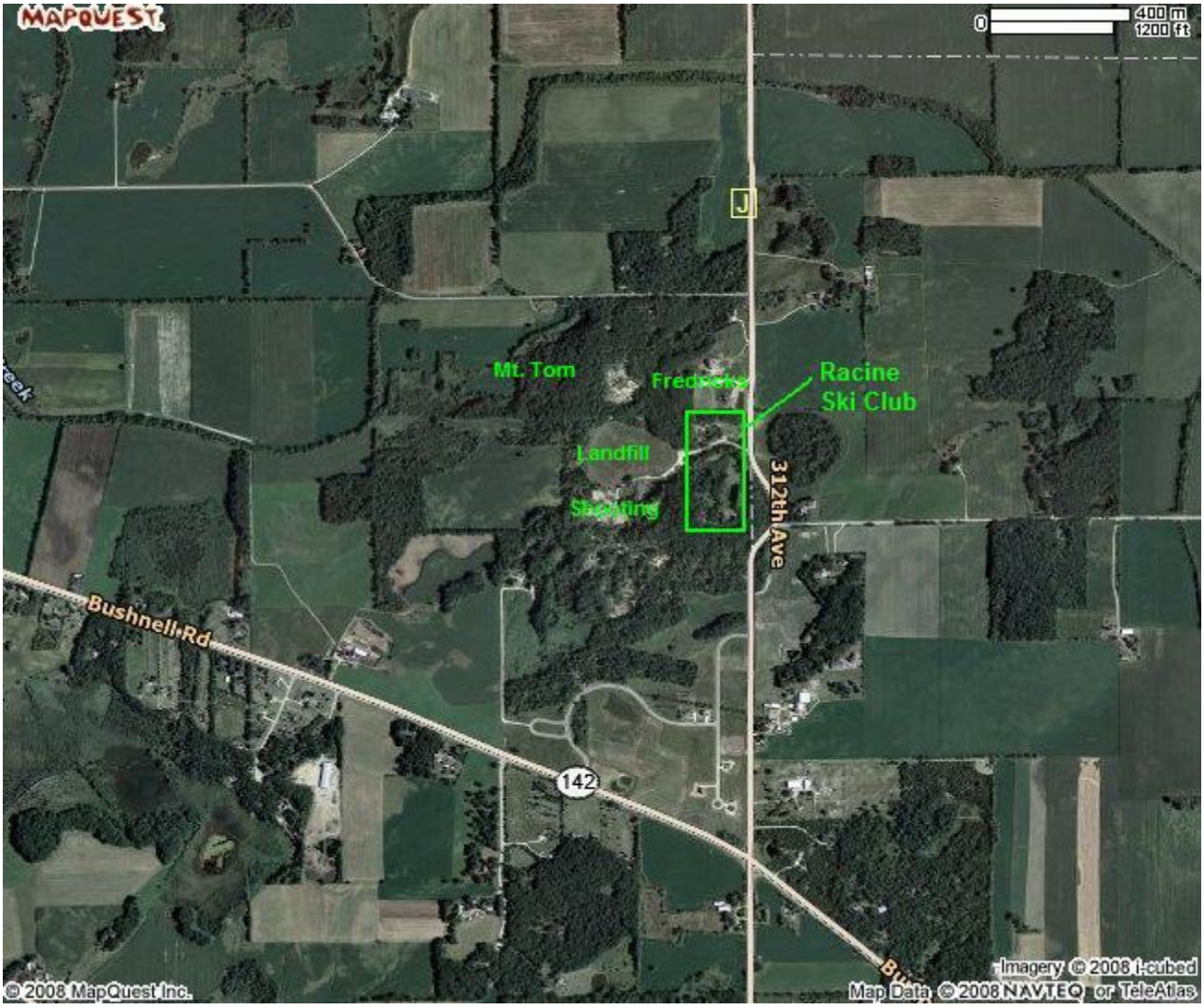

Exhibit 2C: Racine Ski Club Site Location

The Measurement Location was along the north property line of the Racine Ski Club, just east of center. This location was selected as it is central along the property line and the closest location to the nearest residence (Fredricks). The Sound level analyzer was located within a couple feet of the property line at a height of 48 in.

Measurements of A-weighted hourly average (Leq), maximum (Lmax-fast) and minimum (Lmin-fast) noise levels were obtained at the property line, both with and without OHMs in use, using a Bruel & Kjaer Type 2260 Precision Sound Analyzer. Individual event maximum noise levels (dBA - Fast) were also recorded of OHMs and other extraneous noise sources for reference.

Measurement of background noise levels was performed from 12:35pm to 12:50pm, prior to OHM operation. Then the noise levels, with a typical riding group of 3 - enduro (trail) bikes along with 2 - trials bikes were measured from 1:10pm to 1:55pm. Another background noise measurement was obtained from 2:10pm to 2:25pm. Then the noise levels, with a large riding group of 6 - enduro (trail) bikes along with 4 - trials bikes were measured from 3:03pm to 3:48pm. During the

measurement periods, County Highway J traffic was counted, along with aircraft, with maximum fast-dBA noise levels noted for select OHM, traffic and extraneous noise events as observed at the sound level analyzer.

Measurement Results:

Measurement of environmental noise levels (Leq) along with noise events was performed with a Bruel & Kjaer type 2260 Type I Precision Sound Analyzer. The Sound level analyzer was set to measure a dynamic range from 20.8 - 100.8 dBA-fast.

Background Noise: 5/10/08, 12:35pm - 12:50pm

start time: 12:35pm

Period = 15:03 min.; Leq = 49.1 dBA, Lmax = 63.1 dBA-fast, Lmin = 28.6 dBA-fast

County Highway J Trail Traffic Count: start time: 12:35pm, after period = 15:03 min.

			Cty. Hwy. J			OHMs	
	light Planes	high Jets	motorcycles	cars / pickups	trucks / semis	Enduro	Trial
qty.	0	2	0	33	2	0	0
rate / hr.	*0*	*8*	*0*	*132*	*8*	*n/a*	*n/a*

Select Maximum Noise Events (dBA-fast)

Jet high overhead	= 40.0 dBA-fast
Small car on J	= 51.5 dBA-fast
Small car w/ loud exhaust on J	= 59.5 dBA-fast
Small pick-up on J	= 53.3 dBA-fast
Large cars N on J	= 53.5 - 60.3 dBA-fast
Pick-up w/ boat S on J	= 61.5 dBA-fast
Small car w/ loud exhaust N on J	= 58.0 dBA-fast
Birds in area	= 56.2 - 62.0 dBA-fast
Dog barking in distance	= 46.0 dBA-fast
Tractor operated continuously east of J	= 40.0 - 53.8 dBA-fast

OHM Operation with Background Noise: 5/10/08, 1:10pm - 1:55pm

start time: 1:10pm

Period = 15:00 min; Leq = 51.2 dBA

Period = 30:00 min.; Leq = 50.7 dBA

Period = 45:04 min.; Leq = 50.5 dBA, Lmax = 73.6 dBA-fast, Lmin = 34.9 dBA-fast

County Highway J Trail Traffic Count: start time: 1:10pm, after period = 15:00 min.

			Cty. Hwy. J			OHMs	
	light Planes	high Jets	motorcycles	cars / pickups	trucks / semis	Enduro	Trial
qty.	1	2	1	33	1	3	2
rate / hr.	*4*	*8*	*4*	*132*	*4*	*n/a*	*n/a*

Select Maximum Noise Events (dBA-fast)

Jet high overhead	= 48.8 - 52.0 dBA-fast
light planes overhead	= 48.0 - 61.3 dBA-fast
Dump truck S on J	= 65.8 dBA-fast
Harley w/ loud pipes N on J	= 61.7 dBA-fast
2 cars N on J	= 57.0 dBA-fast
2 cars S, 1 car N on J	= 57.0 dBA-fast
1 car N, 1 car S on J	= 58.3 dBA-fast
Pickup N on J	= 54.8 dBA-fast
Loud car on J	= 61.0 dBA-fast
Birds in area	= 60.6 dBA-fast
Tractor operated continuously east of J	= 49.0 - 49.6 dBA-fast
OHMs (3-Enduro, 2-Trials) at RSC property	= 47.0 - 64.8 dBA-fast

Background Noise: 5/10/08, 2:10pm - 2:25pm

start time: 2:10pm
Period = 15:14 min.; Leq = 48.1 dBA, Lmax = 63.0 dBA-fast, Lmin = 29.1 dBA-fast

County Highway J Trail Traffic Count: start time: 2:10pm, after period = 15:00 min.

			Cty. Hwy. J			OHMs	
	light Planes	high Jets	motorcycles	cars / pickups	trucks / semis	Enduro	Trial
qty.	1	1	0	31	0	0	0
rate / hr.	*4*	*4*	*0*	*124*	*0*	*n/a*	*n/a*

Select Maximum Noise Events (dBA-fast)

Van N on J	= 57.8 dBA-fast
Minvan w/ loud exhaust N on J	= 56.9 dBA-fast
Small car N on J	= 57.4 dBA-fast
Van S on J	= 61.7 dBA-fast
Pickups N on J	= 58.0 - 60.0 dBA-fast
Tractor operated continuously east of J	= 38.0 - 58.9 dBA-fast

OHM Operation with Background Noise: 5/10/08, 3:03pm - 3:48pm

start time: 3:03pm
Period = 15:00 min; Leq = 49.9 dBA
Period = 30:00 min.; Leq = 50.6 dBA

Period = 45:01 min.; Leq = 50.8 dBA, Lmax = 71.2 dBA-fast, Lmin = 33.2 dBA-fast

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County Highway J Trail Traffic Count: start time: 3:03pm, after period = 15:00 min.

			Cty. Hwy. J			OHMs	
	light Planes	high Jets	motorcycles	cars / pickups	trucks / semis	Enduro	Trial
qty.	3	0	2	26	0	6	4
rate / hr.	*12*	*0*	*8*	*112*	*o*	*n/a*	*n/a*

Select Maximum Noise Events (dBA-fast)

Tractor operated continuously east of J
Harley Motorcycle S on J = 56.1 dBA-fast
Loud Harley N on J = 70.9 dBA-fast
light planes = 53.0 - 55.0 dBA-fast
Pickups N on J = 54.9 - 57.5 dBA-fast
UPS Truck N on J = 56.0 dBA-fast
OHMs (6-Enduro, 4-Trials) at RSC property = 51.2 - 65.6 dBA-fast

Environmental Noise Exposure at the RSC Property Line Measurement Location:

The state of Wisconsin references HUD noise requirements for environmental noise and has no other specific requirements. The Federal Department of Housing and Urban Development (HUD) Regulations, for new housing construction assisted or supported by the Department, state that average daytime exterior noise levels at Leq = 65 dBA or less are Acceptable and daytime exterior noise levels at Leq = 75 dBA or more are Normally Unacceptable. Average Nightime exterior noise levels, between 10pm and 7am, must be 10 dB lower than daytime. HUD's regulations do not contain standards for interior noise levels. Rather a goal of 45 dBA is set forth and it is assumed that with standard construction, any building will be sufficient to provide interior levels Leq = 45 dBA or less with exterior levels Leq = 65 dBA or less.

For reference, some well established noise standards in the Midwest include St. Louis County, MO and the Minnesota Pollution Control Agency. The St. Louis County, MO Noise Control Code allows daytime residential exposure from a stationary noise source not to exceed 55 dBA during Daytime Hours from 7:00am to 10:00pm, which is equivalent to the HUD Nightime noise limit. The Minnesota Pollution Control Agency Air Quality Division Chapter 7010 Noise Pollution Control Rules allow residential noise exposure not to exceed L50 = 60 dBA and L10 = 65 dBA during Daytime Hours from 7:00am to 10:00pm. This is essentially between the HUD and St. Louis County, MO daytime limits. The state of Kansas Nursing Home and Airport Buyout exposure is limited to Ldn = 65 dBA, which is the same as HUD, which allows 24 hour exposure not to exceed an approximate average of 65 dBA during Datyime Hours (7am - 10pm) and 55 dBA during Nightime Hours.

The following determines the contribution to the property line Leq levels which allows determination of the maximum number of OHMs allowed to operate while still meeting HUD noise requirements.

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OHM Operation Noise 3-Enduro & 2-Trials Bikes:	1 hr. Leq = 50.5 dBA
Minimum Background Noise:	1 hr. Leq = 48.1 dBA
Maximum OHM use noise, 5 - bikes:	1 hr. Leq = 46.8 dBA
average individual bike noise	1 hr. Leq = 39.8 dBA
OHM Operation Noise 6-Enduro & 4-Trials Bikes:	1 hr. Leq = 50.8 dBA
Minimum Background Noise:	1 hr. Leq = 48.1 dBA
Maximum OHM use noise, 10 - bikes:	1 hr. Leq = 47.5 dBA
average individual bike noise	1 hr. Leq = 37.5 dBA
HUD Daytime Property Line Noise Limit	1 hr. Leq = 65.0 dBA
Maximum Background Noise	1 hr. Leq = 49.1 dBA
Maximum allowable OHM use noise	1 hr. Leq = 64.8 dBA

- Based on 5 - bike OHM noise, daytime-HUD allows Maximum # of bikes = 315
  - nightime-HUD (Leq = 55 dBA) allows Maximum # bikes = 24
- Based on 10 - bike OHM noise, daytime-HUD allows Maximum # of bikes = 537
  - nightime-HUD (Leq = 55 dBA) allows Maximum # bikes = 41

Conclusions:

- Background Noise levels on 5/10/08 at the Racine Ski Club north property line along the Fredricks' residence fom 12:30pm - 1:00pm were Leq = 49.1 dBA
- Property line noise levels with 5 - Off Highway Motorcycles operating on the RSC property, after closing the MX track and requiring 96 dBA stationary motorycle exhaust noise compliance, from 1:00pm - 2:00pm were Leq = 50.5 dBA
- Background Noise levels from 2:00pm - 3:00pm were Leq = 48.1 dBA
- Property line noise levels with 10 - Off Highway Motorcycle operating on the RSC property from 3:00pm - 4:00pm were Leq = 50.8 dBA
- Noise levels at the Racine Ski Club property line along the Fredricks' residence, with 10 bikes operating, are only 2 to 3 dB louder than background noise levels and are also significantly below HUD daytime and even nightime residential noise requirements
- Based on the noise measurements obtained 5/10/08, 24 or more OHMs (bikes) can operate on the Racine Ski Club property and still meet nightime HUD residential noise requirements as well as being 10 dB below daytime HUD residential noise requirements

Appendix:

Trials Bike

Enduro or Trail Bike