

**Douglas County Motorsports Noise  
Review and Analysis of Proposed Motorsports Regulations  
(Douglas County Project File #DR2015-016)**

DLAA #15-211

Prepared for:  
Douglas County Department of Community Development  
Planning Services Division  
Ms. Jeanette L. Bare, AICP - Planning Manager  
100 Third Street  
Castle Rock, Colorado, 80104

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## Executive Summary

D.L. Adams Associates has been asked by Douglas County to assist with understanding the noise impacts of motorsports and motocross style activities and facilities. The County has undertaken the task of developing draft regulations which may allow private property owners to develop motocross style tracks and circuits for personal use on rural residential properties, under the assumption that noise levels from the activities can meet certain targets, most notably 55 dBA at the property line.

Our findings indicate that noise emitted by motocross motorcycles and other off-highway vehicles such as snowmobiles or ATVs can be very loud, on the order of 115-130 dBA. Hence, large setbacks (and/or other forms of mitigation) are required to meet noise regulations.

The analysis and calculations provided within show that it is challenging for these kinds of activities to meet a 55 dBA noise limit on lots of less than 160 acres in size, and mitigation of noise levels may be necessary. Even with effective mitigation strategies, it may be difficult to meet 55 dBA noise levels from these activities on lots less than 100 acres in size.



## ***1 INTRODUCTION***

Increased interest in construction of personal motorsports tracks, specifically motocross style tracks, on rural residential properties in Douglas County has led to noise concerns from residents and County Officials. The County Board of Commissioners has instructed the Planning Services Division to investigate and develop draft regulations for such motorsports activities and facilities. The goal of the regulations is to balance the property rights of landowners with the potential negative impacts from these uses, such as noise, on neighboring properties.

D. L. Adams Associates has been asked by the Planning Services Division to review the proposed amendments and information presented in public workshops, and provide analysis and feedback to the County on the technical issues of noise from these types of activities.

Appendix A consists of Acoustical Terminology and Definitions used in this document, such as sound pressure level, sound power level, octave band, A-weighted sound level, among others.

## ***2 SOUND LEVEL CRITERIA***

Douglas County Zoning Resolution Section 17A - Noise Overlay District, contains the existing noise regulations of Douglas County. For rural and residential zone districts, the maximum permissible noise levels that may emitted from lots are as follows:

<b><i>Zone District</i></b>	<b><i>Seven a.m. to next Seven p.m.</i></b>	<b><i>Seven p.m. to next Seven a.m.</i></b>
<b><i>A-1/LRR/RR/ER/ SR/MF/MH</i></b>	<b><i>55 dBA</i></b>	<b><i>50 dBA</i></b>

The noise levels are to be measured at a distance of 25 feet past the property line the noise is emanating from. There are allowances for a 10 dB increase in noise levels for maximum 15 minute periods in any given hour during daytime hours. There are also specific exclusions for sound made by off-highway vehicles and snowmobiles, as well as the use of property for speed or endurance events involving motor vehicles. It is our understanding that the proposed Amendments to the Zoning Resolution will focus on addressing these exemptions specifically in regards to motorsports activities and motorsports facilities.

The County regulations are very similar to State of Colorado regulations, and adopt some of the State regulations on measurement methodology. For reference, Colorado Revised Statutes 25-12-103 stipulates the following permissible noise levels:



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<i>Zone</i>	<i>Seven a.m. to next seven Seven p.m.</i>	<i>Seven p.m. to next seven Seven a.m.</i>
<i>Residential</i>	<i>55 dBA</i>	<i>50 dBA</i>
<i>Commercial</i>	<i>60 dBA</i>	<i>55 dBA</i>
<i>Light industrial</i>	<i>70 dBA</i>	<i>65 dBA</i>
<i>Industrial</i>	<i>80 dBA</i>	<i>75 dBA</i>

The statutes require sound levels radiating from a property to meet the permissible noise levels at a distance of 25 feet, or greater, from the property line.

Additionally, CRS 25-12-110 specifically addresses noise from off-highway vehicles. It states that they shall not emit sound levels more than the following, when measured using SAE J1287 standard:

*If manufactured before January 1, 1998: 99 dBA*

*If manufactured after January 1, 1998: 96 dBA*

Further, snowmobiles shall not emit sound levels more than the following, when measured using SAE J2567:

*If manufactured before July 2, 1975: 90 dBA*

*If manufactured after July 2, 1975: 88 dBA*

The SAE test standards are discussed below for further information.

A copy of 2015 C.R.S. 25-12 is attached in Appendix B.

### **3 OFF-ROAD VEHICLE NOISE**

Understanding the noise emitted from the vehicles is the first step in determining what mitigation is required to meet any set noise code or standard. What we are interested in is determining what the sound power level (PWL,  $L_w$ ) of the source vehicle is. The sound power level is the rate of emission of acoustical energy of the source, expressed as a logarithm of a ratio to a standard reference power of 1 picowatt. This is different from the sound pressure level (SPL,  $L_p$ ), which is the sound pressure measured at a given point of observation at a specified distance from a source, expressed as a logarithm of the ratio to a standard reference pressure of 20 micropascals.

The total noise emitted from motor vehicles is a combination of air inlet noise, noise radiated directly from the engine casing and drive train, noise from the combustion exhaust system, and noise from the contact of tire/tracks and the ground. For off-highway vehicles such as motorcycles, all-terrain vehicles (ATVs), and snowmobiles, the exhaust noise is generally the dominant noise source. Off-highway motorcycles and ATV's typically have exposed engines which may contribute to the total noise level more than snowmobiles with enclosed engines.



The following sections discuss the SAE test methods, literature review, measurements conducted by DLAA, and more recent noise standards in the racing community in order to determine the sound power levels emitted by vehicles in question.

### 3.1 SAE TEST METHODS

The Colorado Revised Statutes refer to SAE test methods J1287 and J2567 for the testing of off-highway vehicles and snowmobiles, for compliance with state noise regulations.

SAE J1287 is a test for motorcycles and ATVs. The test method involves measuring the noise level of the vehicle at a distance of 0.5 meters (20 inches, 1.67 feet) and at an angle of 45° from the exhaust outlet, while the vehicle is stationary and the engine is operating at a standard test RPM. The test RPM is determined based on the year, make, and model of the vehicle but is generally in the range of 3000-5000 RPM.

With a code maximum sound pressure level measurement of 96 or 99 dBA at a distance of 20 inches per this test method, this equates to a sound power level of 101 or 104 dBA respectively, for the vehicle.

SAE J2567 is a test method for snowmobiles specifically, similar to the test for motorcycles and ATVs. The test method involves measurement the noise level of the snowmobile at a distance of 4.0 meters (157.5 inches, 13.1 feet) to the side of the vehicle in line with the exhaust outlet, at a height of 1.22 meters (48 inches), while the engine is operating at 4000 RPM (+/- 250 RPM).

With a code maximum sound level of 88 dBA or 90 dBA at 157.5 inches per this test method, this equates to a sound power level of 111 or 113 dBA, respectively, for the vehicle.

Per the code, it appears that snowmobiles are allowed to have higher sound power levels than off-road motorcycles and ATVs. However, the issue with relying on these test methods for noise prediction, is that they are stationary test protocols for compliance with arbitrary code limits, and only test one operating condition. They do not necessarily portray representative noise levels of the vehicles during operation under various engine loads and speeds. They do not portray the maximum noise levels produced by the vehicles, as the test RPM is much lower than the maximum torque engine speeds, maximum horsepower engine speeds, and engine redline speeds of the vehicles.

### 3.2 LITERATURE REVIEW

Recognizing the limitations of relying on the SAE test methods for noise prediction of off-highway vehicles, other engineers and consultants have conducted measurements and analysis of motocross and snowmobile vehicles. While many historical papers are available for review, we focused on a few papers presented within the last 10 years only, to be more representative of current conditions.



A paper from 2005 (*Sound power levels of motocross courses*, Granneman, Schermer, et al, Inter-noise 2005) presented a thorough study of noise levels from motocross racing tracks. The paper evaluated a large variety of motocross vehicles, ranging in size from 50 cc to 650 cc, both 2 stroke and 4 stroke engines. The paper compared close in stationary measures (SAE test method) as well as close-in pass-by measurements and distant overall track noise level measurements, at three different tracks. The comparison of different measurement methods showed a poor correlation between the SAE test method and actual noise produced by vehicles during race and practice on tracks. The method comparison also noted that close-in pass-by measurements yield results higher than the distant measurements, as the pass-by measurements are taken at track locations where vehicles are under high acceleration, when in reality those locations are actually only a small percentage of the overall track length.

The important general takeaway for our purposes is that the average sound power level can be taken as 120 dBA per motorcycle during race events, and 118 dBA per motorcycle during practice sessions, for general noise modeling prediction purposes. More detailed information is available based on specific bike size and configuration, if needed.

A 2013 paper by the same authors (*Reduction, tonal assessment and monitoring of motocross noise*, Schermer, Inter-noise 2013), is essentially an update to the 2005 paper. The updated paper investigated new methodologies for close-in pass-by measurements for conformance to regulations, as well as results from specific initiatives to reduce overall noise levels from motocross vehicles with improved mufflers. The paper concludes it is possible to reduce environmental noise levels from vehicles 3-5 dBA with improved mufflers.

Regarding snowmobiles, a 2013 paper (*Measuring noise emission of snowmobiles*, Zhang, Inter-noise 2013) helps to quantify actual noise levels produced by snowmobiles. Similar to the 2005 motocross paper discussed above, this paper compares measurement methodologies of stationary and pass-by tests, but the paper only reviews two models of snowmobile. During stationary measurements, the low frequency content is more significant, and during pass-by tests, the high frequency content is much higher. Overall noise levels are higher during pass-by tests. Overall sound power levels from snowmobiles was found to be between 106-111 dBA.

A second 2013 paper (*Acoustic comparison of a hybrid-electric and an internal combustion snowmobile*, Giesbrecht et al, Noise-con 2013) indicates sound power levels between 102-116 dBA for snowmobiles, with electric-hybrid machines producing lower levels, and large engine size internal combustion engines with the higher levels.

### 3.3 DLAA MEASUREMENTS

D.L. Adams Associates also has first-hand experience with motocross noise, as we conducted noise measurements of a motocross club track in Kona, Hawaii, in August 2014. The club track was quite large, with outer dimensions of approximately 460 feet by 520 feet. The measurements were recorded with a Type 1 sound level meter located a distance of approximately 750 feet from the center of the track circuit, and 480 feet to the nearest edge of



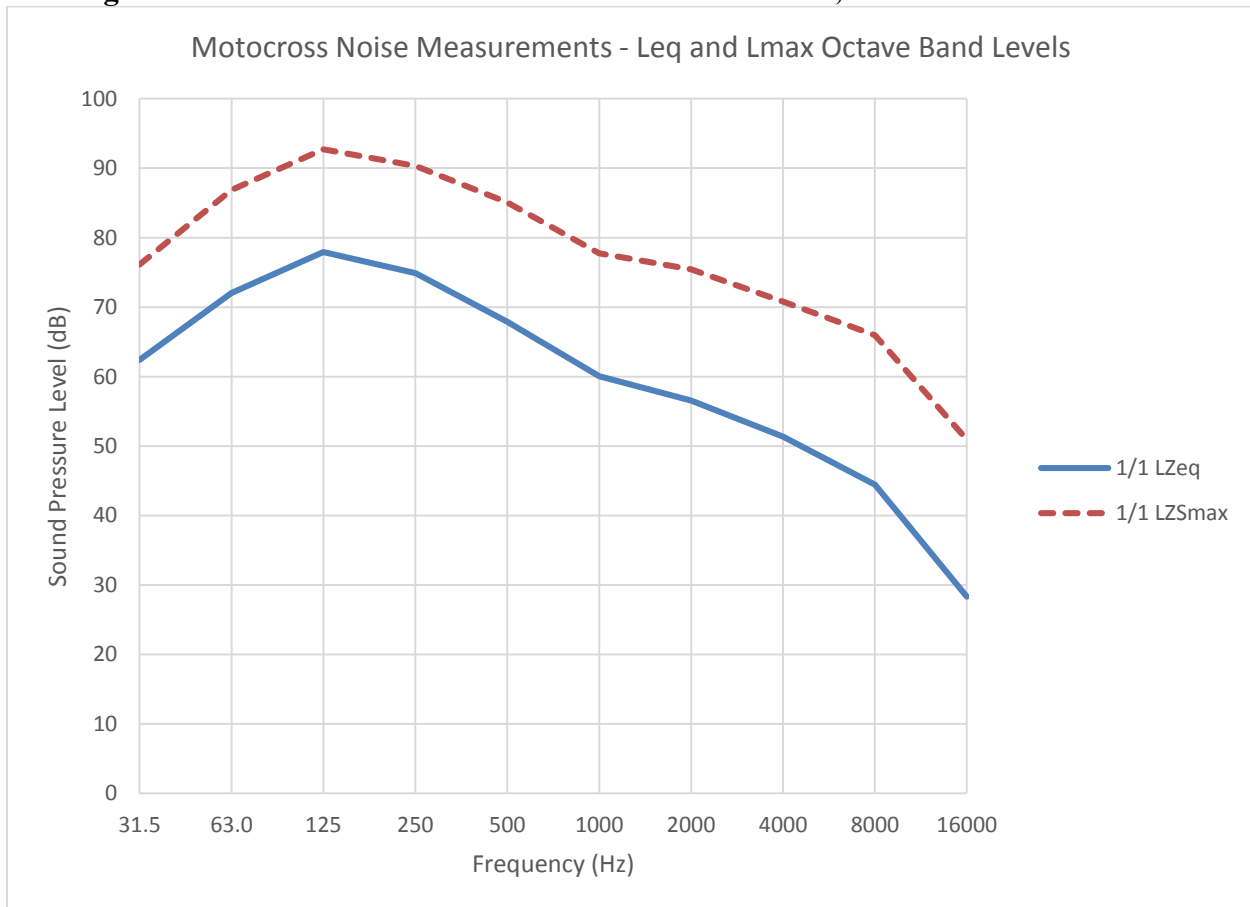
track. Measurements during a 6 hour long Saturday club practice event showed hourly average LAeq noise levels between 67-72 dBA, with maximum levels between 83-96 dBA.

Octave band frequency content of the measurements is provided in Table 1 and the graph of Figure 1. This is the data from the distant measurement position, so it is an average of all bikes running on the circuit at varying distances from the microphone, and at varying operating conditions, over a 5-hour timeframe.

**Table 1: Octave Band Motocross Noise Measurements, 750' to Center of Circuit (dB)**

Frequency (Hz)	31.5	63	125	250	500	1000	2000	4000	8000	16000
Leq	62	72	78	75	68	60	57	51	44	28
Lmax	76	87	93	90	85	78	75	71	66	51

**Figure 1: Octave Band Motocross Noise Measurements, 750' to Center of Circuit**



This is provided to illustrate the frequency content of our set of measurements only, and is not necessarily true of all tracks and vehicles. At the 750 foot distance we recorded the measurements, there would be some amount of attenuation from air absorption, and so the sound power level spectrum of the bikes and track would be flatter at higher frequencies than what is shown here, where there is a fairly significant drop in level above 1000 Hz.

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These measurements equate to average sound power level of 125-130 dBA for the circuit, and maximum sound power level of 141-154 dBA for the circuit.

During the measurements, there were an average of 10 bikes on the circuit at any given time, or 115-120 dBA per motorcycle on the circuit average, and 131-144 maximum per motorcycle.

This club and track imposed no noise limit on activities, and it is possible that bikes had been modified to use minimal mufflers or no mufflers at all. Both motorcycles and ATVs are used at the track.

### 3.4 CURRENT AMA NOISE MEASUREMENT PROCEDURES

Sound test regulations currently used by the American Motorcycle Association for amateur and professional racing tracks have changed from the SAE J1287 method to a new method referred to as the “2 Meter Max” method. The new method, while still conducted on a stationary bike, measures the maximum noise level produced by the bike as the engine speed is raised from idle to maximum redline RPM very quickly. The measurement distance is 2 meters (6.6 feet) at a 45° from the exhaust outlet.

AMA regulations call for noise levels not to exceed 112 dBA, with a 2 dB margin, for a potential maximum of 114 dBA level from the vehicle. This equates to a sound power level of 131 dBA. This method shows better correlation between the stationary test and maximum noise levels actually produced under full acceleration.

### 3.5 SOUND POWER LEVEL CONCLUSIONS

Based on all of the information summarized above, we find that the SAE J1287 test method specified in the CRS underestimates the sound power produced by off-road motorcycles, and especially motocross style racing and events.

It appears that sound power levels of motocross style motorcycles can vary, but it should be expected that average levels from a circuit track will be in the range of 115-120 dBA per bike, and maximum levels can be upwards of 130 dBA per bike.

It also appears that noise levels from snowmobiles are somewhat quieter than motocross motorcycles, with maximum sound power levels on the order 116 dBA during acceleration.

When considering that a given circuit or track may contain more than 1 rider or vehicle, the noise sources must be added together for a total sound power level. Adding decibels is a logarithmic addition, not arithmetic addition. For each doubling of the number of identical sources, the power level increases by 3 dB. The following table contains a summary of decibel addition:



**Table 2: Decibel Addition Summary**

<b>Number of Identical Sources</b>	<b>Decibels to be Added to a Single Level</b>
2	3
3	5
4	6
5	7
6	8
7	8
8	9
10	10
20	13

If you have 1 motorcycle at an average sound power level of 118 dBA, 2 identical motorcycles are 121 dBA, and 10 identical motorcycles are 128 dBA. When sources are not identical, they must be summed based on individual levels.

To help understand changes in noise level with subjective perceptions, consider the following:

A 3 dB increase in noise level is considered just perceptible.

A 5 dB increase in noise level is considered clearly noticeable.

A 10 dB increase in noise levels is considered to be twice as loud as the original sound, and a substantial change.

#### **4 ENVIRONMENTAL NOISE CALCULATIONS & CONSIDERATIONS**

Since we have considered sound power levels of the vehicles in question, we next consider how the sound propagates through the environment. Sound propagating outdoors generally decreases in level as distance increases between the source and receiver. However, environmental factors can make the calculation process very detailed and complicated.

The sound pressure level at a given distance from a point noise source in a free field can be calculated based on geometrical spreading of sound energy, absorption of sound energy in the air, and absorption of sound energy near the ground. There are additional attenuation factors such as from foliage and reflecting surfaces that can be considered on special cases.

Attenuation by geometrical divergence is not dependant on frequency. All frequencies attenuate the same amount over a given distance. Attenuation by air and ground absorption, however, are dependent on frequency.

The sound pressure level is calculated by the following equation:

$$L_p = L_w - 20 \cdot \log(r) - 0.6 + C + A_{\text{air}} + A_{\text{ground}}$$

Where  $L_p$  is the sound pressure level



$L_w$  is the sound power level of the source  
 $r$  is the distance from the source in feet  
 $C$  is a correction factor for ambient temperature and pressure  
 $A_{air}$  is the attenuation from the atmosphere  
 $A_{ground}$  is the attenuation from the ground

The “C” correction factor is very small, on the order of +/- 0.2 depending on the specific conditions, and must be looked up in acoustical reference books.

$A_{air}$  is both frequency dependent and dependant on ambient temperature and humidity. Below 500 Hz there is very little attenuation from air, but above 500 Hz and especially above 2000 Hz the attenuation can be significant. Attenuation factors for air absorption must be looked up in acoustical reference books.

$A_{ground}$  is both frequency dependent and dependant on the specific ground surfaces of the site. Hard ground will provide little to no attenuation, and usually increases noise levels by acting as a reflecting surface. Soft ground such as grass or vegetation provides mixed results depending on frequency, distance, and height of the source and receiver. Very soft and porous ground such as snow generally provides a significant amount of attenuation, but again is dependent on many factors. Attenuation factors for ground absorption are much more complicated than the others noted above, and must be looked up in acoustical reference books.

Weather and meteorological conditions can also influence the transmission of sound outdoors and have a significant effect at distances greater than about 300 feet. Wind speed and direction, and/or the presence of a temperature lapse or inversion, can have the most influence on sound transmission between distant points. Wind can also have a significant effect on ambient noise levels due to noise from rustling leaves, grass, etc.

For purposes of the following discussion, we will assume the vehicles radiate noise uniformly in all directions, act as a point source (are far away from the source compared to the size of the source), and are in a free field (far from reflective or absorptive surfaces). Most noise sources and vehicles radiate noise non-uniformly in different directions, with a given directivity, but since the vehicles in question here will be traveling around a circuit track and the distances are large, we will ignore directivity for the time being.

We will also focus solely on geometrical spreading. We will omit the “C” correction factor, as well as the air and ground attenuation factors. While these factors are important to consider for site specific studies, they require much more information than is available for a generic discussion of outdoor noise propagation. We could make assumptions about some standard conditions, but that might lead to misinterpretation of the results and how to apply them to any specific project. Geometrical spreading will not change from site to site.

The resultant equation is:

$$L_p = L_w - 20 \cdot \log(r) - 0.6$$



## 5 ZONING AND PROPERTY SIZE CONSIDERATIONS

Applying the technical knowledge gathered above to the Douglas County Zoning Resolution is now fairly straightforward (although simplified). We can review the typical lot sizes in the different zoning districts under consideration, and perform calculations to determine if it is possible to operate a motorcycle or other off-road vehicle on a motocross track or circuit, and still meet a noise level of 55 dBA at the property line.

The zone districts and lot sizes are summarized in the following table, which shows the lot size in both acreage and square feet. For simplicity, assuming the lot is perfectly square, we can see the length of each side of the lot in feet, as well as the minimum distance from the center of the lot to the property line (half of the length of a side).

**Table 3: Douglas County Zoning Districts and Lot Sizes**

<b>Zoning District</b>	<b>Parcel Size (acreage)</b>	<b>Parcel Size (square feet)</b>	<b>Length per side (feet, assume square lot)</b>	<b>Distance from Property Line to Center (feet)</b>
LRR District	9 acres	392,040	626	313
LRR District	20 acres	871,200	933	467
A-1	35 acres	1,524,600	1235	617
A-1	100 acres	4,356,000	2087	1044
A-1	160 acres	6,969,600	2640	1320

### 5.1 CALCULATIONS

As discussed in Section 3 above the expected sound power level from off-highway vehicles does vary, with a low threshold from the SAE test method of 101 dBA, to a maximum expected level of 130 dBA during motocross activities, with an average expected level of 118 dBA during motocross activities. Using these three sound power levels (PWL), we have created a series of tables which detail the distance required to meet a 55 dBA noise level, assuming a varying number of identical sources.

**Table 4: Sound Power Level and Distance to meet Code limits - 1 Vehicle**

	<b>Low PWL</b>	<b>Average PWL</b>	<b>Maximum PWL</b>
<b>PWL (dBA)</b>	101	118	130
<b>Distance Required (feet)</b>	186	1,318	5,248

**Table 5: Sound Power Level and Distance to meet Code limits - 2 Vehicles**

	<b>Low PWL</b>	<b>Average PWL</b>	<b>Maximum PWL</b>
<b>PWL (dBA)</b>	104	121	133
<b>Distance Required (feet)</b>	263	1,862	7,413



**Table 6: Sound Power Level and Distance to meet Code limits - 4 Vehicles**

	Low PWL	Average PWL	Maximum PWL
<b>PWL (dBA)</b>	107	124	136
<b>Distance Required (feet)</b>	372	2630	10,471

**Table 7: Sound Power Level and Distance to meet Code limits - 10 Vehicles**

	Low PWL	Average PWL	Maximum PWL
<b>PWL (dBA)</b>	111	128	140
<b>Distance Required (feet)</b>	589	4,169	16,596

Our calculations show that with 10 riders at average sound power levels, about 4000' of distance is needed to get to 55 dBA. That would require approximately 1,500 acres of land.

Tables 4-7 demonstrate two major points:

1. If we assume that the SAE J1287 test called for by CRS is representative of motorcycle noise levels, the setback required to meet 55 dBA levels is small, and 35 acre plots would be capable of hosting up to 10 vehicles operating at the same time.
2. If we assume that the sound power level produced by motorcycles is more in line with what consultant measurements and more modern AMA noise test standards have shown them to be, it becomes challenging for vehicles on personal motocross circuits and tracks to meet 55 dBA noise limits. It appears that for lots less than 160 acres in size mitigation would be necessary to meet noise limits, and the mitigation efforts would become more difficult as you move to smaller and smaller lot sizes.

Another way to review this information is to start with the sound power level of the motorcycles, and see what effect distance has on noise level. The following tables present similar information to Tables 4-7 above, but from a different perspective.



**Table 8: Sound Pressure Level at Various Distances, 1 Vehicle**

Distance (ft)	PWL (dBA) - 1 Vehicle		
	101	118	130
250	52	69	81
500	46	63	75
750	43	60	72
1000	40	57	69
1250	38	55	67
1500	37	54	66
1750	36	53	65
2000	34	51	63
2250	33	50	62
2500	32	49	61
2750	32	49	61
3000	31	48	60
3250	30	47	59
3500	30	47	59
3750	29	46	58
4000	28	45	57
4250	28	45	57
4500	27	44	56
4750	27	44	56
5000	26	43	55

**Table 9: Sound Pressure Level at Various Distances, 2 Vehicles**

Distance (ft)	PWL (dBA) - 2 Vehicles		
	104	121	133
250	55	72	84
500	49	66	78
750	46	63	75
1000	43	60	72
1250	41	58	70
1500	40	57	69
1750	39	56	68
2000	37	54	66
2250	36	53	65
2500	35	52	64
2750	35	52	64
3000	34	51	63
3250	33	50	62
3500	33	50	62
3750	32	49	61
4000	31	48	60
4250	31	48	60
4500	30	47	59
4750	30	47	59
5000	29	46	58



**Table 10: Sound Pressure Level at Various Distances, 4 Vehicles**

Distance (ft)	PWL (dBA) - 4 Vehicles		
	107	124	136
250	58	75	87
500	52	69	81
750	49	66	78
1000	46	63	75
1250	44	61	73
1500	43	60	72
1750	42	59	71
2000	40	57	69
2250	39	56	68
2500	38	55	67
2750	38	55	67
3000	37	54	66
3250	36	53	65
3500	36	53	65
3750	35	52	64
4000	34	51	63
4250	34	51	63
4500	33	50	62
4750	33	50	62
5000	32	49	61

**Table 11: Sound Pressure Level at Various Distances, 10 Vehicles**

Distance (ft)	PWL (dBA) - 10 Vehicles		
	111	128	140
250	62	79	91
500	56	73	85
750	53	70	82
1000	50	67	79
1250	48	65	77
1500	47	64	76
1750	46	63	75
2000	44	61	73
2250	43	60	72
2500	42	59	71
2750	42	59	71
3000	41	58	70
3250	40	57	69
3500	40	57	69
3750	39	56	68
4000	38	55	67
4250	38	55	67
4500	37	54	66
4750	37	54	66
5000	36	53	65

To reiterate, this calculation method is simplified and ignores potential additional attenuations of air in the atmosphere and the ground surface. But it illustrates how the sound power level of the source vehicle(s) has a big effect on the required setback needed to meet code limits.

## 5.2 MITIGATION POTENTIAL

Based on these calculation results, we should consider what kind of mitigation could be implemented to reduce the very large setbacks, and make it more feasible for residents on less than 160 acres to develop a track for personal use.

The first option to consider is reducing the sound level of the source. Vehicle owners may install aftermarket muffling equipment in order to minimize the amount of noise they create. Mufflers also have a tendency to degrade in performance over time, so maintenance of the vehicle is also very important to minimizing sound levels produced.

The next consideration is that the land owner could build a barrier wall or earth berm around the



track, to help mitigate noise levels to adjacent properties. A barrier with a surface mass of at least 2 lbs/ft<sup>2</sup> which blocks the line of sight between the source and receiver can provide meaningful reduction of sound levels. The higher the barrier is, the greater the insertion loss it will provide. The construction of the barrier must ensure it is a closed surface without cracks or gaps. The barrier must also be very long compared to its height, to ensure sound does not refract around the edges of the barrier and reduce the overall insertion loss.

To consider a simple example, let us assume that there are 2 motorcycles operating at average sound power levels of 118 dBA each, for a total of 121 dBA. We will assume the land is flat and they get no attenuation from the atmosphere or the ground. We know the sound source is approximately 3 feet off of the ground, and we will assume the receiver is a 6 foot tall person. Based on the calculations above (see Table 5), we know that without a barrier they would need 1,862 feet to reduce the sound level to meet 55 dBA.

If they were to construct a CMU barrier wall with a height of 6 feet, 50 feet from the track, they would reduce the sound level at the receiver 1,862 feet away by 3 dB. Effectively, this means that they can reduce the setback required. In this case, with a 6 foot barrier, they would only need 1,350 total feet of setback to meet 55 dBA at the receiver.

If they were to construct a barrier with a height of 10 feet, they would achieve a 5 dB reduction in noise level, and thus reduce the necessary setback to 1,000 feet to meet 55 dBA. Moving the barrier closer to the noise source is also an effective way to increase the overall insertion loss it provides, but solid wall barriers are potential safety hazards for course riders.

There are limitations to barriers as far as height and cost, as well as visual impacts to consider, but they are a possible method to reduce noise impact to adjacent properties. Of course, the natural layout of the land may enhance or completely prevent the effective use of barrier walls for noise mitigation of a track.

## **6 NOISE STUDY REQUIREMENTS**

The County has also requested our recommendations on methodologies an applicant could follow to perform a noise study for a proposed track. Our general recommendations for environmental noise studies such as these are as follows:

1. Obtain the services of a qualified engineer or acoustical consultant with experience in environmental noise measurements and noise mitigation.
2. Conduct sound measurements/tests of the vehicles to be used on the track. This may include SAE tests, 2 meter max tests, and/or close and distant pass-by tests of typical operating conditions.
3. Conduct sound measurements/tests of ambient conditions. We recommend a minimum length of 24 hours at points of specific interest on the site boundary, but perhaps longer





- depending on the environmental factors of the specific sites. Measurements may need to be conducted at multiple site locations to capture a range of existing conditions.
4. Based on measurements of sources and ambient conditions, prediction of noise levels to property lines based on specific site and track layout. Computer noise models are easiest to interpret on complex and large scale projects, but calculations can be completed in spreadsheets or by hand, as long as results can be presented clearly.
  5. Ensure that the noise models and calculations accurately represent the proposed track conditions and uses.
  6. If noise predictions show exceedance of code levels, present mitigation options to bring noise levels within compliance of code levels.

Understand that this process will likely be an iterative process, especially if noise mitigation is required. Initial proposals for noise mitigation are often found to be unacceptable for reasons other than noise, so multiple analyses, submittals, and reviews may be needed.

This is not meant to be prescriptive, but this is very similar to the methodology DLAA and other consultants have used in the past. Other consultants may have similar or different methodologies they employ, which may be completely acceptable.

## **7 CONCLUSIONS**

Sound power levels created by motocross facilities and activities can be very high, and have been shown to be much louder than what Colorado noise testing standards for off-highway vehicles may imply. While the existing method cited by Colorado Revised Statutes suggests sound power levels on the order of 101 dBA for off-highway vehicles, the reality is that sound power levels average between 115-120 dBA during motocross activities, with maximum levels produced upwards of 130 dBA or more.

The noise impact from off-highway vehicles and motocross style tracks is a serious one, and can be substantial in rural residential areas.

But our calculations show that it is possible to meet daytime noise code regulations of 55 dBA for these types of zoning districts, through the use of large setbacks, source or barrier mitigation techniques, and operational limits. Our analysis does show that it would be very challenging for motocross activities to meet the 55 dBA noise limit on parcels less than 100 acres in size.

We understand that the County prefers to place the burden of proof on an applicant as far as meeting established noise regulations from motocross facility activities. In that regard, hopefully this document will serve as a basis for understanding the basic technical noise concepts surrounding the issue.

Please feel free to call if you have any questions or would like to discuss this further.

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Prepared by: .

David Manley, P.E.  
Senior Consultant



## **APPENDIX A**

### Acoustical Terminology and Definitions

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D. L. Adams Associates, Inc. // January 15, 2016



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## Acoustical Terminology and Definitions

Ambient noise: The composite of airborne sound from many sources near and far associated with a given environment. No particular sound is singled out for interest.

A-weighted sound level: The A-weighted sound level is a single number rating which reflects most closely the human perception of sound levels, which is generally less sensitive to sounds at low frequencies than at mid and high frequencies. The A-weighted level is calculated by combining decibels from each octave band, while applying an ANSI specified weighting factor to each band. This system expresses sound levels in units of A-weighted decibels (dBA).

Background noise: noise from all sources unrelated to a particular sound that is the object of interest. Background noise can be short term or long term. A passing vehicle would be considered short term, while the “din” of a distant highway would be considered long term background noise.

Day-Night Equivalent Sound Level: The Day-Night Equivalent Sound Level ( $L_{DN}$  or DNL) is the Equivalent Sound Level,  $L_{EQ}$ , measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 p.m. and 7 a.m. to account for people’s higher sensitivity to noise at night when the background noise level is typically lower. The  $L_{DN}$  is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations.

Decibel (dB): A common unit used for sound level; equal to ten times the common logarithm of the ratio of two like quantities proportional to power or energy.

Equivalent sound level ( $L_{EQ}$ ): A measure of sound energy over a period of time, or a sound level which, in a stated period of time, would contain the same acoustical energy as the time-varying sound during the same period. Often referred to as the average sound level. The actual instantaneous noise levels typically fluctuate above and below the measured  $L_{EQ}$  during the measurement period. The A-weighted  $L_{EQ}$  is a common descriptor for measuring environmental noise.

Insertion Loss (IL): Of a sound attenuator or sound barrier, is the decrease in sound level measured at the receiver location when the element is inserted into the transmission path between the source and receiver, expressed in dB.

Maximum sound level ( $L_{MAX}$ ): The greatest sound level measured on a sound level meter, during a designated time interval or event. Typically is provided as an A-weighted level, or  $L_{AMAX}$ .

Minimum sound level ( $L_{MIN}$ ): The minimum sound pressure level that occurred during the measurement duration.

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Narrow band: Sometimes called *constant bandwidth* frequency bands. The bandwidth of each band is constant and independent of frequency. Narrow bands are used to evaluate the frequency spectrum of sound with higher “resolution” than can be done with octave bands or one-third octave bands. Sound pressure levels of narrow bands can only be directly compared to sound pressure levels from narrow band measurements using the same bandwidth. Narrow-band sound levels are usually measured using fast Fourier transform (FFT) analysis.

Octave band: An internationally accepted frequency band, or range, commonly used to divide the audible frequency range into ten bands. An octave band is a frequency band with an upper frequency limit twice that of its lower frequency limit. Octave bands are identified by their respective center frequencies (e.g., 31.5, 63, 125, 250, 500, 1,000, 2,000, 4,000, 8,000, and 16,000 Hertz). Octave bands are *proportional* bandwidth bands since their bandwidth gets larger with increasing frequency.

One-third octave band: An internationally accepted frequency band, or range, commonly used to divide the audible frequency range into 31 bands. Three 1/3 octave bands make up an octave band. One-third octave bands are identified by their respective center frequencies (e.g., 31.5, 40, 50, 63, 80, 100, 125, 160 Hertz, etc.). One-third octave bands are *proportional* bandwidth bands since their bandwidth gets larger with increasing frequency.

Sound power level (PWL,  $L_W$ ): A measure of the acoustic power radiated by a source, it is the rate per unit time at which sound energy is radiated off of a source, expressed on a logarithmic scale. Technically, it is ten times the common logarithm of the ratio of the sound power under consideration to the standard reference power of 1 picowatt ( $10^{-12}$  watt). The quantity so obtained is expressed in decibels.

Sound pressure level (SPL,  $L_P$ ): Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. Typically sound pressure level is the root-mean-square of the instantaneous sound pressures during a specified time interval. Time and frequency weightings should be specified. Technically, it is twenty times the common logarithm of the ratio of the sound pressure under consideration to the standard reference pressure of 20 micropascals ( $\mu\text{Pa}$ ). The quantity so obtained is expressed in decibels.

Statistical Sound Levels: The sound levels of long-term noise producing activities such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels has been developed. It is known as the Exceedance Level,  $L_N$ . The  $L_N$  represents the sound level that is exceeded for N% of the measurement time period. For example,  $L_{10} = 60$  dBA indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time.

90-percentile-exceeded sound level ( $L_{90}$ ): The sound pressure level that was exceeded 90% of the time during the measurement duration.

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D. L. Adams Associates, Inc. // January 15, 2016



## **APPENDIX B**

2015 C.R.S. 25-12

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D. L. Adams Associates, Inc. // January 15, 2016

*C.R.S. 25-12-101*

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\*\*\* This document reflects changes current through all laws passed at the First Regular Session of the Seventieth General Assembly of the State of Colorado (2015) \*\*\*

TITLE 25. HEALTH  
ENVIRONMENTAL CONTROL  
ARTICLE 12. NOISE ABATEMENT

C.R.S. 25-12-101 (2015)

25-12-101. Legislative declaration

The general assembly finds and declares that noise is a major source of environmental pollution which represents a threat to the serenity and quality of life in the state of Colorado. Excess noise often has an adverse physiological and psychological effect on human beings, thus contributing to an economic loss to the community. Accordingly, it is the policy of the general assembly to establish statewide standards for noise level limits for various time periods and areas. Noise in excess of the limits provided in this article constitutes a public nuisance.

**HISTORY:** Source: L. 71: p. 647, § 1. C.R.S. 1963: § 66-35-1.

ANNOTATION

Applied in *City of Lakewood v. DeRoos*, 631 P.2d 1140 (Colo. App. 1981).

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TITLE 25. HEALTH  
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C.R.S. 25-12-102 (2015)

25-12-102. Definitions

As used in this article, unless the context otherwise requires:

(1) "Commercial zone" means:

- (a) An area where offices, clinics, and the facilities needed to serve them are located;
- (b) An area with local shopping and service establishments located within walking distances of the residents served;
- (c) A tourist-oriented area where hotels, motels, and gasoline stations are located;
- (d) A large integrated regional shopping center;
- (e) A business strip along a main street containing offices, retail businesses, and commercial enterprises;
- (f) A central business district; or
- (g) A commercially dominated area with multiple-unit dwellings.

(2) "db(A)" means sound levels in decibels measured on the "A" scale of a standard sound level meter having characteristics defined by the American national standards institute, publication S1. 4 - 1971.

(3) "Decibel" is a unit used to express the magnitude of a change in sound level. The difference in decibels between two sound pressure levels is twenty times the common logarithm of their ratio. In sound pressure measurements sound levels are defined as twenty times the common logarithm of the ratio of that sound pressure level to a reference level of  $2 \times 10^{-5}$  N/m<sup>2</sup> (Newton's/meter squared). As an example of the effect of the formula, a three-decibel change is a one hundred percent increase or decrease in the sound



level, and a ten-decibel change is a one thousand percent increase or decrease in the sound level.

(4) (a) "Industrial zone" means an area in which noise restrictions on industry are necessary to protect the value of adjacent properties for other economic activity but shall not include agricultural, horticultural, or floricultural operations.

(b) Nothing in paragraph (a) of this subsection (4), as amended by House Bill 05-1180, as enacted at the first regular session of the sixty-fifth general assembly, shall be construed as changing the property tax classification of property owned by a horticultural or floricultural operation.

(5) "Light industrial and commercial zone" means:

(a) An area containing clean and quiet research laboratories;

(b) An area containing light industrial activities which are clean and quiet;

(c) An area containing warehousing; or

(d) An area in which other activities are conducted where the general environment is free from concentrated industrial activity.

(5.2) "Motorcycle" means a self-propelled vehicle with not more than three wheels in contact with the ground that is designed primarily for use on the public highways.

(5.4) "Motor vehicle" means a self-propelled vehicle with at least four wheels in contact with the ground that is designed primarily for use on the public highways.

(5.6) "Off-highway vehicle" means a self-propelled vehicle with wheels or tracks in contact with the ground that is designed primarily for use off the public highways. "Off-highway vehicle" shall not include the following:

(a) Military vehicles;

(b) Golf carts;

(c) Snowmobiles;

(d) Vehicles designed and used to carry persons with disabilities; and

(e) Vehicles designed and used specifically for agricultural, logging, firefighting, or mining purposes.

(6) "Residential zone" means an area of single-family or multifamily dwellings where businesses may or may not be conducted in such dwellings. The zone includes areas where multiple-unit dwellings, high-rise apartment districts, and redevelopment districts are located. A residential zone may include areas containing accommodations for transients such as motels and hotels and residential areas with limited office development, but it may

not include retail shopping facilities. "Residential zone" includes hospitals, nursing homes, and similar institutional facilities.

(7) "SAE J1287" means the J1287 stationary sound test or any successor test published by SAE international or any successor organization.

(8) "SAE J2567" means the J2567 stationary sound test or any successor test published by SAE international or any successor organization.

(9) "Snowmobile" means a self-propelled vehicle primarily designed or altered for travel on snow or ice when supported in part by skis, belts, or cleats and designed primarily for use off the public highways. "Snowmobile" shall not include machinery used strictly for the grooming of snowmobile trails or ski slopes.

**HISTORY:** Source: L. 71: p. 647, § 1. C.R.S. 1963: § 66-35-2.L. 73: p. 1406, § 47.L. 86: (2) amended, p. 501, § 121, effective July 1.L. 2005: (4) amended, p. 350, § 8, effective August 8.L. 2008: (5.2), (5.4), (5.6), (7), (8), and (9) added, p. 2101, § 1, effective July 1, 2010.

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C.R.S. 25-12-103 (2015)

25-12-103. Maximum permissible noise levels

(1) Every activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more therefrom in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

<b>Zone</b>	<b>7:00 a.m. to next 7:00 p.m.</b>	<b>7:00 p.m. to next 7:00 a.m.</b>
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

(2) In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in subsection (1) of this section may be increased by ten db(A) for a period of not to exceed fifteen minutes in any one-hour period.

(3) Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five db(A) less than those listed in subsection (1) of this section.

(4) This article is not intended to apply to the operation of aircraft or to other activities which are subject to federal law with respect to noise control.

(5) Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of project.

(6) All railroad rights-of-way shall be considered as industrial zones for the purposes of this article, and the operation of trains shall be subject to the maximum permissible noise levels specified for such zone.

(7) This article is not applicable to the use of property for purposes of conducting speed or endurance events involving motor or other vehicles, but such exception is effective only during the specific period of time within which such use of the property is authorized by the political subdivision or governmental agency having lawful jurisdiction to authorize such use.

(8) For the purposes of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

(9) In all sound level measurements, consideration shall be given to the effect of the ambient noise level created by the encompassing noise of the environment from all sources at the time and place of such sound level measurement.

(10) This article is not applicable to the use of property for the purpose of manufacturing, maintaining, or grooming machine-made snow. This subsection (10) shall not be construed to preempt or limit the authority of any political subdivision having jurisdiction to regulate noise abatement.

(11) This article is not applicable to the use of property by this state, any political subdivision of this state, or any other entity not organized for profit, including, but not limited to, nonprofit corporations, or any of their lessees, licensees, or permittees, for the purpose of promoting, producing, or holding cultural, entertainment, athletic, or patriotic events, including, but not limited to, concerts, music festivals, and fireworks displays. This subsection (11) shall not be construed to preempt or limit the authority of any political subdivision having jurisdiction to regulate noise abatement.

(12) (a) Notwithstanding subsection (1) of this section, the public utilities commission may determine, while reviewing utility applications for certificates of public convenience and necessity for electric transmission facilities, whether projected noise levels for electric transmission facilities are reasonable. Such determination shall take into account concerns raised by participants in the commission proceeding and the alternatives available to a utility to meet the need for electric transmission facilities. When applying, the utility shall provide notice of its application to all municipalities and counties where the proposed electric transmission facilities will be located. The public utilities commission shall afford the public an opportunity to participate in all proceedings in which permissible noise levels are established according to the "Public Utilities Law", articles 1 to 7 of title 40, C.R.S.

(b) Because of the statewide need for reliable electric service and the public benefit provided by electric transmission facilities, notwithstanding any other provision of law, no municipality or county may adopt an ordinance or resolution setting noise standards for electric transmission facilities that are more restrictive than this subsection (12). The owner or operator of an electric transmission facility shall not be liable in a civil action based upon noise emitted by electric transmission facilities that comply with this subsection (12).

(c) For the purposes of this section:

(I) "Electric transmission facility" means a power line or other facility that transmits electrical current and operates at a voltage level greater than or equal to 44 kilovolts.

(II) "Rights-of-way for electric transmission facilities" means all property rights and interests obtained by the owner or operator of an electric transmission facility for the purpose of constructing, maintaining, or operating the electric transmission facility.

**HISTORY:** Source: L. 71: p. 648, § 1. C.R.S. 1963: § 66-35-3.L. 82: (10) added, p. 424, § 1, effective March 11.L. 87: (11) added, p. 1154, § 1, effective May 20.L. 2004: (12) added, p. 736, § 2, effective July 1.

Cross references: For the legislative declaration contained in the 2004 act enacting subsection (12), see section 1 of chapter 219, Session Laws of Colorado 2004.

#### ANNOTATION

Residential development of property is not precluded when noise emanating onto property exceeds limits set forth in this section. *Einarsen v. City of Wheat Ridge*, 43 Colo. App. 232, 604 P.2d 691 (1979).

Trier of fact to determine mode to use in measuring noise. *Davis v. Izaak Walton League of Am.*, 717 P.2d 984 (Colo. App. 1985).

Applied in *City of Lakewood v. DeRoos*, 631 P.2d 1140 (Colo. App. 1981).

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C.R.S. 25-12-104 (2015)

25-12-104. Action to abate

Whenever there is reason to believe that a nuisance exists, as defined in [section 25-12-103](#), any county or resident of the state may maintain an action in equity in the district court of the judicial district in which the alleged nuisance exists to abate and prevent such nuisance and to perpetually enjoin the person conducting or maintaining the same and the owner, lessee, or agent of the building or place in or upon which such nuisance exists from directly or indirectly maintaining or permitting such nuisance. Notwithstanding any other provision of this section, a county shall not maintain an action pursuant to this section if the alleged nuisance involves a mining operation or the development, extraction, or transportation of construction materials, as those terms are defined in [section 34-32.5-103, C.R.S.](#), a commercial activity, the commercial use of property, avalanche control activities, a farming or ranching activity, an activity of a utility, or a mining or oil and gas operation. When proceedings by injunction are instituted, such proceedings shall be conducted under the Colorado rules of civil procedure. The court may stay the effect of any order issued under this section for such time as is reasonably necessary for the defendant to come into compliance with the provisions of this article.

**HISTORY:** Source: L. 71: p. 649, § 1. C.R.S. 1963: § 66-35-4.L. 2008: Entire section amended, p. 57, § 1, effective August 5.

Cross references: For injunctions, see C.R.C.P. 65.

ANNOTATION

Construction and operation of a public highway are not activities which can be abated as a public nuisance. *City of Lakewood v. DeRoos*, 631 P.2d 1140 (Colo. App. 1981).

Applied in *Einarsen v. City of Wheat Ridge*, 43 Colo. App. 232, 604 P.2d 691 (1979).

*C.R.S. 25-12-105*

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C.R.S. 25-12-105 (2015)

25-12-105. Violation of injunction - penalty

Any violation or disobedience of any injunction or order expressly provided for by [section 25-12-104](#) shall be punished as a contempt of court by a fine of not less than one hundred dollars nor more than two thousand dollars. Each day in which an individual is in violation of the injunction established by the court shall constitute a separate offense. The court shall give consideration in any such case to the practical difficulties involved with respect to effecting compliance with the requirements of any order issued by the court.

**HISTORY:** Source: L. 71: p. 650, § 1. C.R.S. 1963: § 66-35-5.

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TITLE 25. HEALTH  
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C.R.S. 25-12-106 (2015)

25-12-106. Noise restrictions - sale of new vehicles

(1) Except for such vehicles as are designed exclusively for racing purposes, no person shall sell or offer for sale a new motor vehicle that produces a maximum noise exceeding the following noise limits, at a distance of fifty feet from the center of the lane of travel, under test procedures established by the department of revenue:

(a) Any motorcycle manufactured on or after July 1, 1971, and before January 1, 1973.....88 db(A);

(b) Any motorcycle manufactured on or after January 1, 1973.....86 db(A);

(c) Any motor vehicle with a gross vehicle weight rating of six thousand pounds or more manufactured on or after July 1, 1971, and before January 1, 1973.....88 db(A);

(d) Any motor vehicle with a gross vehicle weight rating of six thousand pounds or more manufactured on or after January 1, 1973.....86 db(A);

(e) Any other motor vehicle manufactured on or after January 1, 1968, and before January 1, 1973.....86 db(A);

(f) Any other motor vehicle manufactured after January 1, 1973.....84 db(A).

(g) (Deleted by amendment, L. 2008, p. 2102, § 2, effective July 1, 2010.)

(2) Test procedures for compliance with this section shall be established by the department, taking into consideration the test procedures of the society of automotive engineers.

(3) Any person selling or offering for sale a motor vehicle or other vehicle in violation of this section is guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of not less than fifty dollars nor more than three hundred dollars.



**HISTORY:** Source: L. 71: p. 650, § 1. C.R.S. 1963: § 66-35-6.L. 2008: IP(1) and (1)(g) amended, p. 2102, § 2, effective July 1, 2010.L. 2009: (1)(a) and (1)(b) amended, (HB 09-1026), ch. 281, p. 1259, § 20, effective October 1.

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TITLE 25. HEALTH  
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C.R.S. 25-12-107 (2015)

25-12-107. Powers of local authorities

(1) Counties or municipalities may adopt resolutions or ordinances prohibiting the operation of motor vehicles within their respective jurisdictions that produce noise in excess of the sound levels in decibels, measured on the "A" scale on a standard sound level meter having characteristics established by the American national standards institute, publication S1.4 - 1971, and measured at a distance of fifty feet from the center of the lane of travel and within the speed limits specified in this section:

Speed limit

of more

Speed limit than 35 mph

of 35 mph but less

or less than 55 mph

(a) Any motor vehicle with a manufacturer's gross vehicle weight rating of six thousand pounds or more, any combination of vehicles towed by such motor vehicle, and any motorcycle other than a low-power scooter:

(I) Before January 1, 1973

88 db(A)

90 db(A)

(II) On and after January 1, 1973

86 db(A)

90db(A)

(b) (Deleted by amendment, L. 2008, p. 2102, § 3, effective July 1, 2010.)

(2) The governing board shall adopt resolutions establishing any test procedures deemed necessary.

(3) This section applies to the total noise from a vehicle or combination of vehicles.

(4) For the purpose of this section, a truck, truck tractor, or bus that is not equipped with an identification plate or marking bearing the manufacturer's name and manufacturer's gross vehicle weight rating shall be considered as having a manufacturer's gross vehicle weight rating of six thousand pounds or more if the unladen weight is more than five thousand pounds.

**HISTORY:** Source: L. 71: p. 651, § 1. C.R.S. 1963: § 66-35-7.L. 73: p. 1406, § 48.L. 2008: IP(1) and (1)(b) amended, p. 2102, § 3, effective July 1, 2010.L. 2009: IP(1)(a) amended, (HB 09-1026), ch. 281, p. 1259, § 21, effective October 1.

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C.R.S. 25-12-108 (2015)

25-12-108. Preemption

Except as provided in [sections 25-12-103 \(12\)](#) and [25-12-110](#), this article shall not be construed to preempt or limit the authority of any municipality or county to adopt standards that are no less restrictive than the provisions of this article.

**HISTORY:** Source: L. 71: p. 651, § 1. C.R.S. 1963: § 66-35-8.L. 88: Entire section amended, p. 1116, § 2, effective May 19.L. 2008: Entire section amended, p. 2103, § 4, effective July 1, 2010.

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TITLE 25. HEALTH  
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C.R.S. 25-12-109 (2015)

25-12-109. Exception - sport shooting ranges - legislative declaration - definitions

(1) The general assembly hereby finds, determines, and declares that the imposition of inconsistent, outdated, and unnecessary noise restrictions on qualifying sport shooting ranges that meet specific, designated qualifications work to the detriment of the public health, welfare, and morale as well as to the detriment of the economic well-being of the state. The general assembly further finds, determines, and declares that a need exists for statewide uniformity with respect to exempting qualifying shooting ranges from the enforcement of laws, ordinances, rules, and orders regulating noise. As the gain associated with having a uniform statewide exemption for qualifying sport shooting ranges outweighs any gains associated with enforcing noise regulations against such ranges, the general assembly further declares that the provisions of this section, as enacted, are a matter of statewide concern and preempt any provisions of any law, ordinance, rule, or order to the contrary.

(2) As used in this section, unless the context otherwise requires:

(a) "Local government" means any county, city, city and county, town, or any governmental entity, board, council, or committee operating under the authority of any county, city, city and county, or town.

(b) "Local government official" means any elected, appointed, or employed individual or group of individuals acting on behalf of or exercising the authority of any local government.

(c) "Person" means an individual, proprietorship, partnership, corporation, club, or other legal entity.

(d) "Qualifying sport shooting range" or "qualifying range" means any public or private establishment, whether operating for profit or not for profit, that operates an area for the discharge or other use of firearms or other equipment for silhouette, skeet, trap, black powder, target, self-defense, recreational or competitive shooting, or professional training.

(3) Notwithstanding any other law or municipal or county ordinance, rule, or order regulating noise to the contrary:

(a) A local governmental official may not commence a civil action nor seek a criminal penalty against a qualifying sport shooting range or its owners or operators on the grounds of noise emanating from such range that results from the normal operation or use of the qualifying shooting range except upon a written complaint from a resident of the jurisdiction in which the range is located. The complaint shall state the name and address of the complainant, how long the complainant has resided at the address indicated, the times and dates on which the alleged excessive noise occurred, and such other information as the local government may require. The local government shall not proceed to seek a criminal penalty or pursue a civil action against a qualifying sport shooting range on the basis of such a noise complaint if the complainant established residence within the jurisdiction after January 1, 1985.

(b) No person may bring any suit in law or equity or any other claim for relief against a qualifying sport shooting range located in the vicinity of the person's property or against the owners or operators of such range on the grounds of noise emanating from the range if:

(I) The qualifying range was established before the person acquired the property;

(II) The qualifying range complies with all laws, ordinances, rules, or orders regulating noise that applied to the range and its operation at the time of its construction or initial operation;

(III) No law, ordinance, rule, or order regulating noise applied to the qualifying range at the time of its construction or initial operation.

**HISTORY:** Source: L. 98: Entire section added, p. 240, § 1, effective April 13.

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TITLE 25. HEALTH  
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C.R.S. 25-12-110 (2015)

25-12-110. Off-highway vehicles

(1) An off-highway vehicle operated within the state shall not emit more than the following level of sound when measured using SAE J1287:

(a) If manufactured before January 1, 1998.....99 db(A);

(b) If manufactured on or after January 1, 1998.....96 db(A).

(2) A snowmobile shall not emit more than the following level of sound when measured using SAE J2567:

(a) If manufactured on or after July 1, 1972, and before July 2, 1975.....90 db(A);

(b) If manufactured on or after July 2, 1975.....88 db(A).

(3) (a) A person shall not sell or offer to sell a new off-highway vehicle that emits a level of sound in excess of that prohibited by subsection (1) of this section unless the off-highway vehicle complies with federal noise emission standards. A person shall not sell or offer to sell a new snowmobile that emits a level of sound in excess of that prohibited by subsection (2) of this section unless the snowmobile complies with federal noise emission standards.

(b) For the purposes of this section, a "new" snowmobile or off-highway vehicle means a snowmobile or off-highway vehicle that has not been transferred on a manufacturer's statement of origin and for which an ownership registration card has not been submitted by the original owner to the manufacturer.

(4) This section shall not apply to the following:

(a) A vehicle designed or modified for and used in closed-circuit, off-highway vehicle competition facilities;

(b) An off-highway vehicle used in an emergency to search for or rescue a person; and

(c) An off-highway vehicle while in use for agricultural purposes.

(5) A person who violates this section commits a class 2 petty offense and, upon conviction thereof, shall be punished by a fine of not more than one hundred dollars.

(6) No municipality or county may adopt an ordinance or resolution setting noise standards for off-highway vehicles or snowmobiles that are more restrictive than this section.

(7) (a) Nothing in this section shall be construed to modify the authority granted in [section 25-12-103](#).

(b) Nothing in this section shall be construed to authorize the test to produce a less restrictive standard than the J1287 stationary sound test or the J2567 stationary sound test published by SAE international or any successor organization.

(8) The following shall be an affirmative defense to a violation under this section if the off-highway vehicle or snowmobile:

(a) Was manufactured before January 1, 2005;

(b) Complied with federal and state law when purchased;

(c) Has not been modified from the manufacturer's original equipment specifications or to exceed the sound limits imposed by subsection (1) or (2) of this section; and

(d) Does not have a malfunctioning exhaust system.

**HISTORY:** Source: L. 2008: Entire section added, p. 2103, § 5, effective July 1, 2010.