## NOISE MONITORING AND ANALYSIS FOR HOUSTON LAWCON ENVIRONMENTAL ASSESSMENT

FOR

City of Houston 105 W. Maple, PO Box 667 Houston, MN 55943

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HOUSTON LAWCON EA NOISE MONITORING AND ANALYSIS WSB PROJECT NO. 02181-000

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## **Introduction & Purpose**

WSB was retained by the City of Houston, MN to complete the Land and Water Conservation Fund (LWCF) Environmental Screening Form and Environmental Assessment for a proposed change in recreation use at South Park in Houston, MN.

The South Park Project (Project) is located in Houston County in Section 4 of Township 103N, Range 6W (**Figure 1**). South Park was first developed in 1974 with Land and Water Conservation Fund (LWCF) assistance, and additional parcels have been acquired throughout the years. The existing parkland is 118 acres and provides a wide array of active and passive outdoor recreation opportunities. The LWCF portion of the park is 80-acres.

The City of Houston is proposing to change the land use in an approximately 80-acre parcel of South Park (**Figure 1**) from its existing land use designation, which allows for strictly non-motorized uses, to allowing an off-highway vehicles (OHV) trail system. At this phase of Project development no trail alignments have been designated, but the conversion of land uses on the LAWCON property requires an environmental review.

The purpose of this report is to document the results of existing noise monitoring on the site and estimate the anticipated noise levels at other selected locations around the site.

## **Noise Conditions**

Noise is defined as any unwanted sound. Sound travels in a wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels. Decibels represent the logarithmic measure of sound energy relative to a reference energy level. For noise associated with a site such as South Park, an adjustment, or weighting, of the high- and low-pitched sounds is made to approximate the way that an average person hears sounds. The adjusted sound levels are stated in units of "A-weighted decibels" (dBA). In Minnesota, noise levels that are exceeded 10 percent and 50 percent of the time during the hour of the day and/or night that has the heaviest traffic. These numbers are identified as the  $L_{10}$  and  $L_{50}$  levels.

Along with the volume of the noise source and other factors (i.e. topography of the area) that contribute to the loudness of noise, the distance of a receptor from a sound's source is also an important factor. Sound levels decrease as distance from a source increases. The following rule of thumb regarding sound decreases due to distance is commonly used: Beyond approximately 50 feet, each time the distance between a source and a receptor is doubled, sound levels decrease by three decibels over hard ground, such as pavement or water, and by 4.5 decibels over vegetated areas.

A human ear can usually tell the difference when sound changes. A sound increase of three (3) dBA is barely perceptible to the human ear, a five (5) dBA increase is clearly noticeable, and a ten (10) dBA increase is heard twice as loud. For example, if the sound energy is doubled (e.g. the amount of traffic doubles), there is a three dBA increase in noise, which is just barely noticeable to most people. On the other hand, if traffic increases to where there is 10 times the sound energy level over a reference level, then there is a 10 dBA increase and it is heard as twice as loud.

**Table 1** provides a rough comparison of the noise levels of some common noise sources.

Sound Pressure Level (dBA)	Noise Source		
140	Jet Engine (at 25 meters)		
130	Jet Aircraft (at 100 meters)		
120	Rock and Roll Concert		
110	Pneumatic Chipper		
100	Jointer/Planer		
90	Chain saw		
80	Heavy Truck Traffic		
70	Business Office		
60	Conversational Speech		
50	Library		
40	Bedroom		
30	Secluded Woods		
20	Whisper		

 Table 1: Decibel Levels of Common Noise Sources

Source: "A Guide to Noise Control in Minnesota" MPCA

# Assessment and Regulation

The Minnesota Pollution Control Agency is given power to adopt noise standards in Minnesota Statute 116.07 Subd. 2. The adopted standards are given in Minnesota Administrative Rules Chapter 7030. The MPCA standards require A-weighted noise measurements. Different standards are specified for daytime (7:00 AM – 10:00 PM) and nighttime (10:00 PM – 7:00 AM) hours. The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L10) and 50 percent of any hour (L50). Household units, including farm houses, are included in Land Use Classification 1. **Table 2** shows the MPCA State noise standards. All the land within the project area is considered Land Use Class 1.

Land Use	Code	Day (7:00am - 10:00pm) dBA		Night (10:00pm – 7:00am) dBA	
		L <sub>10</sub>	L <sub>50</sub>	L <sub>10</sub>	L <sub>50</sub>
Residential	NAC-1	65	60	55 <sup>(1)</sup>	50 <sup>(1)</sup>
Commercial	NAC-2	70	65	70	65
Industrial	NAC-3	80	75	80	75

#### Table 2: MPCA State Noise Standards – Hourly A-Weighted Decibels

Source: Minnesota Rules Part 7030.0040

(1) The daytime standards for noise area classification 1 shall be applied to noise area classification 1 during the nighttime if the land use activity does not include overnight lodging.

## **Background Noise Monitoring**

The existing noise levels were monitored during April 2013 at three locations within the project area. The locations were chose to represent areas of normal outdoor human activity to document the existing noise conditions and to be used to validate the noise model. Noise levels were monitored using methods that comply with State and Federal guidelines. Monitored noise levels for existing conditions are also used to compare to modeling results for existing conditions to validate the computer modeling techniques and results.

**Table 3** displays the typical sound levels observed during daytime and nighttime hours. The noise monitoring was completed using a Larson Davis Model 831Sound Level Meter. The locations of the three monitoring sites are shown on **Figure 2**. The monitoring locations are believed to be representative of the project area. Site 1 is located in the northwest corner of the site, Site 2 is located in the northeast corner of the site and, Site 3 is located approximately 750 feet south on the east side of the site.

Time Period	Location	Noise Levels		
		L <sub>10</sub>	L <sub>50</sub>	
<b>Nighttime</b> 6:00 – 7:00 AM	Site 1	54.1	49.7	
	Site 2	54.6	50.9	
	Site 3	48.1	44.9	
Mn State Nighttime Standard		55	50	
<b>Daytime</b> 5:00 – 6:00 PM	Site 1	56.6	53.0	
	Site 2	57.0	53.9	
	Site 3	50.2	46.4	
Mn State Daytime Standard		65	60	

#### **Table 3: Existing Monitored Sound Levels**

Generally, the current  $L_{10}$  and  $L_{50}$  sound levels are within State Noise Standards during both the daytime and nighttime conditions. The monitoring revealed that the only location that exceeded State Noise Standards was at Site #2 during the nighttime hours which exceed the standard by less than 1 dBA.

#### Monitoring Seasonal Variation

There is no clear indication that noise levels significantly change from season to season. As indicated previously the rule of thumb concluding that sound decreases due to distance would apply in any season.

Another rule of thumb is that; vegetation, if it is high enough, wide enough, and dense enough that it cannot be seen through, can decrease noise. A 200-foot width of dense vegetation can reduce noise by 10 decibels, which cuts in half the loudness of the noise source. Researches have also identified that in general meteorological conditions (i.e. temperature, humidity, pressure, etc.) do not have an effect on noise levels.

The monitoring for the South Park project was completed in April 2013 when leaves were still off the trees. This would indicate that the monitored background sound levels may be higher, depending on the location of the sources being heard, than the levels during the times of the year when leaves are on the trees.

## **Noise Modeling**

Anticipated noise levels were assessed by modeling at receptor sites that may be affected by changes in or adjacent to the project site. Noise modeling receptors were selected at four (4) sites in addition to the monitoring locations adjacent to the site. The modeling receptor locations are shown on **Figure 2**. Noise modeling was done using the noise prediction program "MINNOISEV3.1", a version of the FHWA "STAMINA" model adapted by MnDOT.

The afternoon (PM peak) hour used to represent the first worst-case daytime scenario was (5:00-6:00 pm). The morning (AM peak) hour used to represent the nighttime worst-case scenario was (6:00-7:00 am)

Noise monitoring and modeling results for receptors are presented in **Table 4**.

Time Period	Location	Noise Levels		
i ille r ei iou		L <sub>10</sub>	L50	
	Site 1	54.6	49.9	
	Site 2	55.0	51.0	
Nighttimo	Site 3	48.5	45.2	
Nighttime	M4	47.1	44.3	
0.00 - 7.00 AM	M5	46.2	43.5	
	M6	46.4	43.6	
	M7	48.1	44.8	
Mn State Nighttime Standard		55	50	
<b>Daytime</b> 5:00 – 6:00 PM	Site 1	56.6	53.0	
	Site 2	57.0	53.9	
	Site 3	50.2	46.4	
	M4	49.4	45.4	
	M5	48.6	44.9	
	M6	49.0	44.9	
	M7	50.1	46.2	
Mn State Daytime Standard		65	60	

#### Table 4: Modeled Sound Levels

The monitored noise levels are all within one (1) dBA of the modeled noise levels, supporting the validity of the model in predicting noise levels at other receptor sites. The results of the modeling conclude that, generally, the current  $L_{10}$  and  $L_{50}$  sound levels are within State Noise Standards during both the daytime and nighttime conditions at all locations. The modeling results validated that the only location that exceeded State Noise Standards was at Site #2 during the nighttime hours which exceed the standard by less than 1 dBA.

## **Conclusions**

In Minnesota, the MPCA State Noise Standards restrict noise levels to  $65/60 \text{ dBA} (L_{10}/L_{50})$  during the daytime and 55/50 dBA during the nighttime. The analysis indicates that the current noise levels in South Park at below the State Noise Standards with the exception of one location that exceeds the Standards by less than one (1) dBA, which is not perceptible by the human ear.



