NOISE

INTRODUCTION

A noise assessment was performed to determine whether drilling activities in a well site would result in significant impacts at vicinity sensitive receptors. The New York State Department of Environmental Conservation (NYSDEC) noise guidance was used for this assessment. Below is a discussion of the methodology and the analysis results.

NOISE ANALYSIS METHODOLOGY

Noise Background

Following is a description of the noise terminology used in this assessment.

- Decibel—Noise is measured in units called decibels. A 1-decibel change in noise is about the smallest change detectable by the human ear under ideal laboratory conditions. Outside a laboratory, only a change of about 3 decibels or more can be easily detected without the use of instruments. A change of more than 5 decibels is an appreciable change in a community's noise level. A 10-decibel increase is large and is a doubling of loudness. (For example, 50 decibels sounds twice as loud as 40 decibels.)
- A-weighted decibel—Sound measured by scientific instruments is adjusted to correspond to human hearing: it is filtered to reduce the strength of very low- and high-pitched sounds. This adjusted unit is known as the A-weighted decibel, or dBA.
- L_{eq}—The L_{eq} is an hourly measure that accounts for the fluctuations in dBA from all noise sources combined during that hour. It incorporates the total noise during the hour, converted into a type of average. For example, if a fluctuating noise with L_{eq} equal to 70 dBA is replaced by a constant noise of 70 dBA, then the same total noise energy would enter a listener's ear (see Table 1 for examples of typical fluctuating and constant noise levels). The L_{eq} is equivalent to the constant noise in this sense. In accordance with the NYSDEC policy, the basic unit of noise used in this study is the dBA L_{eq}.

Table 1
Common Noise Levels

Sound Source	dBA
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 500 meters	100
Train horn at 30 meters	90
Busy city street, loud shout	80
Highway traffic at 15 meters, train	70
Predominantly industrial area	60
Background noise in an office	50
Public library	40
Soft whisper at 5 meters	30
Threshold of hearing	0

Note: A 10 dBA increase in level appears to double the loudness, and a 10 dBA decrease halves the apparent loudness.

Sources: Cowan, James P. *Handbook of Environmental Acoustics,* Van Nostrand Reinhold, New York, 1994.

Egan, M. David, *Architectural Acoustics*. McGraw-Hill Book Company, 1988.

NYSDEC Noise Impact Guidance

NYSDEC published a guidance document entitled *Assessing and Mitigating Noise Impacts* (October 6, 2000). This document states that increases from 0-3 dBA should have no appreciable effect on receptors, increases of 3-6 dBA may have the potential for adverse impact only in cases where the most sensitive of receptors are present, and increases of more than 6 dBA may require a closer analysis of impact potential depending on existing noise levels and the character of surrounding land use and receptors. It goes on to say that in terms of threshold values, the addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dBA, and ambient noise levels in industrial or commercial areas may exceed 65 dBA with a high end of approximately 79 dBA. Projects that exceed these guidance levels should explore the feasibility of implementing mitigation.

For purposes of impact assessment, the proposed project will have a significant noise impact if one of the following criteria is exceeded:

- The project results in an increase in noise levels of 6.0 dBA or more at sensitive receptors.
- At non-industrial areas, noise levels generated by the drilling activities are greater than or equal to 65 dBA.
- At industrial or commercial areas, noise levels generated by the drilling activities are greater than or equal to 79 dBA.

Noise Prediction Method

The noise assessment was performed for a period of drilling/fracturing activities which is the worst case based on types and number of pieces of equipment and number of trucks anticipated to be operating. Table 2 shows the noise levels for typical equipment that would be used for the drilling and fracturing activities.

Table 2
Equipment Noise Emission Levels (dBA)

Typical Equipment	Quantity	Noise Level at 50 feet*
Generator (Caterpillar 3408)	6	82
Generator (Caterpillar 3512c)	15	82
National 610 drill rig	1	85
SpeedStar 185K drill rig	1	85
Ingersoll Rand 1170/350 air compressors	3	80
National 9-P-100 water pumps	2	77
Diesel trucks	40	84

*Sources: Citywide Construction Noise Mitigation, Chapter 28, Department of Environmental Protection of New York City, 2007; Transit Noise and Vibration Impact Assessment, Federal Transit Administration (FTA), May 2006.

At sensitive receptor locations noise levels due to the each of the noise sources at a well site were calculated based upon using the following formula:

$Leq = E.L. + 10\log(U.F) - 20\log(D/50) - Aair - Atree - Aenv$

where: L_{eq} = predicted noise equivalent pressure level,

E.L. = noise emission level,

D = distance between noise source and receptor (feet),

A_{air} = attenuation by absorption in the air,

A_{tree} = attenuation by shrubbery and trees, and

A_{env} = attenuation due to ground effects.

ASSESSMENT RESULT

Based upon the analysis results, the project noise levels would exceed the NYSDEC noise threshold of 65 dBA for non-industrial land uses at approximately 700 feet from a well site, and the project noise levels would exceed the NYSDEC noise threshold of 79 dBA for industrial and commercial uses at approximately 100 feet from a well site. In addition, to determine whether significant noise impacts would occur using the NYSDEC noise threshold of 6.0 dBA increase, an ambient noise monitoring program in the vicinity of the well site in order to characterize the existing noise environment will be performed. Due to fairly low ambient noise levels expected in these rural areas, the project might result in significant noise impacts at vicinity sensitive receptor locations.

Noise Level Calculations - Drilling and Fracturing phases

Noise Source	Emission Level at 50 ft			Use Factor		Distance Attenuation		Distance in meter			Air Attenuatio	Foliage Attenuatio	Aenv									Predicted Noise Level	Equivalent Noise Energy
													As = (b*G)-1.5			Ar = (b*G)-1.5			Am = -3e(1-G)				
	dBA / Unit	Qty. / 1hr	E.L. dBA	U.F.(%)	10log (UF)	Distance (feet)	20log (D/50)	Distance (D)	Source height (hs)	Receiver height (hr)	Aair	Atree	Factor (b)	Groun d (G)	As	Factor (b)	Groun d (G)	Ar	Factor (e)	Groun d (G)	Ar		
Generator (Caterpillar 3408)	82	6	90	50	-3	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	51	129314.8
Generator (Caterpillar 3512c)	82	15	94	50	-3	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	55	323286.9
National 610 drill rig	85	1	85	20	-7	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	42	17201.1
SpeedStar 185K drill rig	85	1	85	20	-7	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	42	17201.1
Ingersoli Rand 1170/350 air compressors	80	3	85	40	-4	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	45	32636.8
National 9-P-100 water pumps	77	2	80	50	-3	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	41	13631.0
diesel trucks	84	40	100	40	-4	1000	26	305	3.0	1.5	0.3	2.0	5.3	0.8	2.9	8.4	0.75	4.8	0.6	0.75	-0.4	60	1093067.1
SUM																							1626338.8
Total Noise Level Leq(1)																							62

Note:

Leq(1) = E.L. + 10log(U.F) - 20log(D/50) - Atotal (Aair+Atree+Aenv).

E.L. is the noise emission level of the particular piece of equipment

U.F.=Usage factor that accounts for the fraction of time equipment is in full power operation throughout the workday

The following values are calculated based on the methods in "The Noise Manual" edited by E.H. Berger..., 5th Edition.

Atotal (Aair+Atree+Aenv)

Air Attenuation (Aair) = a'D/1000; a' is the air attenuation coefficient (see Table 15.1), assuming 68F with a relative humidity of 70% at 250 Hz, a' = 1.1

Foliage Attenuation (Atree) = 4-8 dBA attenuation due to approximately 300 feet of dense trees (see p621), 2 is used conservatively.

Aenv = As+Ar+Am (at 250Hz)

Source zone As= (b*G)-1.5 (see Table 15.3)

b=8.4 (see Table 15.3)

G=(30*3-15)/90, for the source zone 30hs=30*3=90, assume the source located in the center of 30m x 30m site, 15m of source zone is "hard," and the remaining 75m is "soft." (see p617)

Receiver zone Ar= (b*G)-1.5 (see Table 15.3)

b=8.4 (see Table 15.3)

G=0.75 assume 75% of ground is grass

Middle zone Am= -3e(1-G) (see Table 15.3)

e=(1-(30(hs+hr)/D

G=0.75 assume 75% of ground is grass