

# COMMUNITY NOISE ASSESSMENT OF WESTERN DATA CENTER FOR GREENIDGE GENERATION DRESDEN, NEW YORK

## 1.0 Introduction

Greenidge Generation LLC plans to install a layout of data miner systems on the western side of its power generation facility on Plant Road in Dresden, NY. The data systems will comprise computer-based processors with cooling fans mounted in racks within four buildings. The rack systems will be cooled with indoor building fans installed inside each building, which will draw and exhaust air flow through ventilation openings in the sides of the buildings. The electrical power to each building will be provided by four external electrical transformers.

Aurora Acoustical Consultants Inc. was engaged to evaluate the noise received in the community from the combination of indoor miner systems and cooling fans and the outdoor transformers. Assessments were performed using environmental noise assessment software programs. The analyses incorporated sound level information obtained from the manufacturers of the data miner components, the planned building fans, and the transformer components. The analyses further incorporated the manufacturer-rated sound attenuation of planned building ventilation silencers, and the calculated sound attenuation for acoustic insulation on interior building surfaces.

The acceptability of the predicted received sound levels was evaluated in comparison to sound level limits specified in the Zoning Law of the Town of Torrey (2011, R2014). The Zoning Law in Section 98.25 limits sound generated by the operation of a source on a property to levels of 72 dB in hours from 7:00 a.m. to 9:00 p.m. and 50 dB in hours from 9:00 p.m. to 7:00 a.m. when measured at the adjoining property line. The assessments employed *unweighted* sound levels.

The acceptability of the predicted received sound levels was also evaluated in comparison to previously measured ambient sound levels at several locations in the surrounding community. Noise acceptability was evaluated referencing noise level thresholds stated in noise assessment guidelines of New York State Department of Environmental Conservation Program Policy DEP-00-1 *Assessing and Mitigating Noise Impacts* (2001). The policy states "In non-industrial settings the SPL (sound pressure level) should probably not exceed ambient noise by more than 6 dB(A) at the receptor."

The plant property holdings plan is shown in Figure 1. The layouts of the planned data center buildings are described in Figure 2, consisting of four buildings installed to the west of the plant along the former rail yard adjacent to Kings Hill Road. The layout of the assessment model is represented in Figure 3.



## 1.1 Predicted Noise Levels Summary

The sound levels generated in the area around the data center installation produced by the combined sources of the western data center are described in Figure 4. The figure shows the predicted sound level contours produced by full operations of data miners and cooling fans with the attenuation of the data center buildings, ventilation silencers, and interior sound insulation. The levels represent the overall unweighted sound levels, which are calculated from the octave-band source levels of each source component.

The highest community sound levels from the western data center sources are expected to occur along the southern boundary of the Greenidge facility. The highest predicted unweighted sound level from the western data center installation is ~~predicted to be~~ 50.0 dB★ along the railroad tracks directly south of the installation. In comparison, the measured existing ambient sound levels at Location 10 along the southern boundary ranged from 66.7 to 78.5 dB★ in the daytime.

At the nearest village boundary (Location 2), the data center unweighted sound levels ~~are~~ level is predicted ~~to reach~~ will be 37.34 dB. In comparison, the measured existing ambient sound levels at the location ~~measured~~ ranged from 62.8 to 65.3 dB★ in the daytime, 55.6 to 66.9 dB★ in evening hours, and 63.9 dB★ in early-morning nighttime hours.

## 2.0 Noise Criteria

### 2.1 Zoning Law Town of Torrey

The relevant section of the Zoning Law of the Town of Torrey Section 98.25 Performance Standards is reproduced below.

C. Noise. No person shall cause, suffer, allow or permit the operation of any source of sound on a particular category of property or any public space or right-of-way in such a manner as to create a sound level that exceeds the following sound limits when measured at the adjoining property line:

- Between 7:00 a.m. and 9:00 p.m., seventy-two (72) dB.
- Between 9:00 p.m. and 7:00 a.m., fifty (50) dB.

These levels shall not apply to farm operations. These levels also shall not apply to mechanisms or devices used in the home and in the connection with real property maintenance, repair or improvement. Such devices include: lawn mowers, hedge clippers, power saws, leaf blowers, and rototillers so long as such mechanisms or devices are used between the hours of 7:00 a.m. and 9:00 p.m.



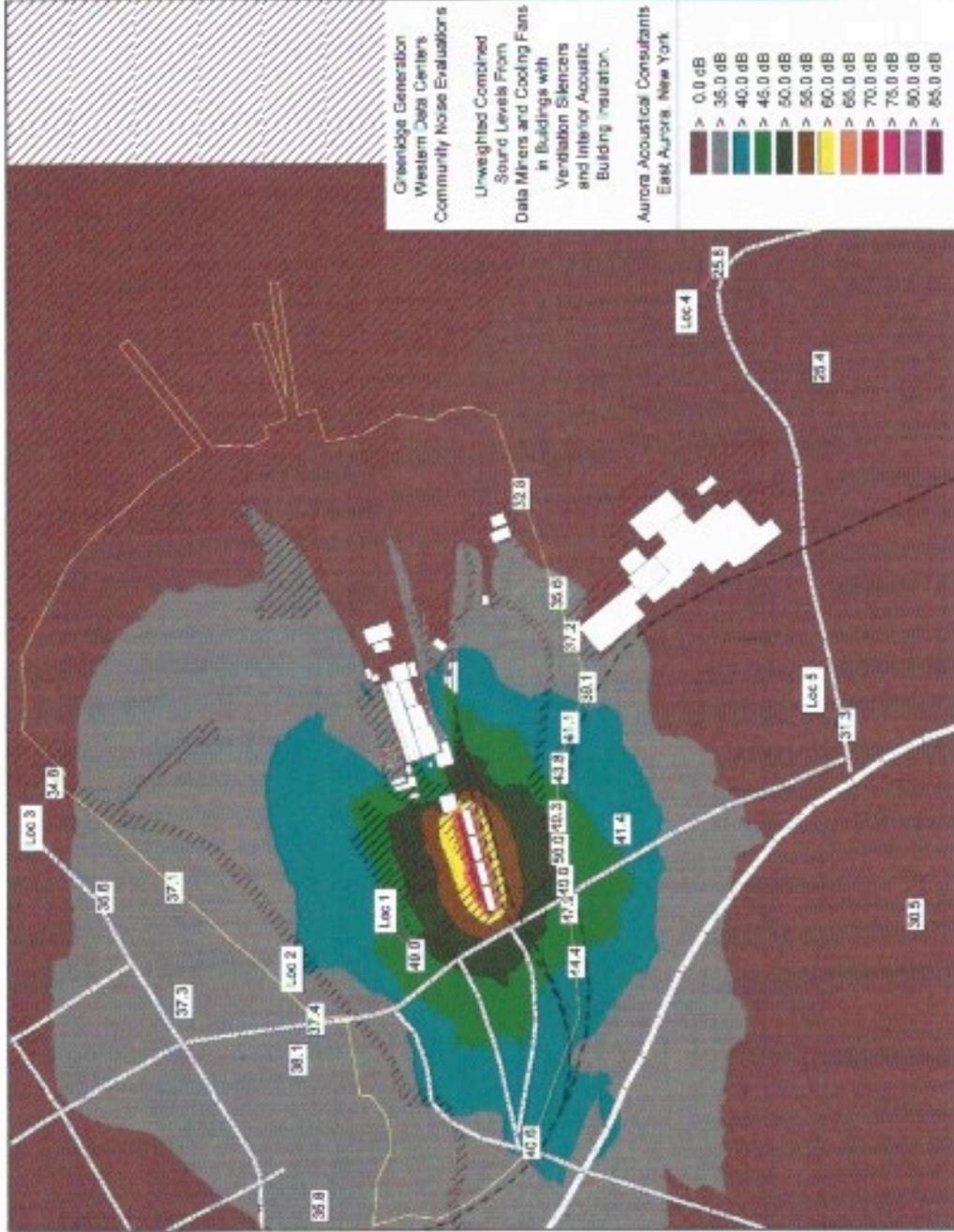


Figure 4 Predicted Un-Weighted Daytime Data Systems Sound Levels (dB)



## 2.2 NYSDEC DEP-00-1 Noise Assessment Guidelines

Relevant sections of the NYSDEC Program Policy DEP-00-1 noise assessment guidelines are reproduced below.

The goal for any permitted operation should be to minimize increases in sound pressure level above ambient levels at the chosen point of sound reception. Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dB may require a closer analysis of impact potential depending on existing SPLs (sound pressure levels) and the character of surrounding land use and receptors. SPL increases approaching 10 dB result in a perceived doubling of SPL. The perceived doubling of the SPL results from the fact that SPLs are measured on a logarithmic scale. An increase of 10 dB(A) deserves consideration of avoidance and mitigation measures in most cases. The above thresholds as indicators of impact potential should be viewed as guidelines subject to adjustment as appropriate for the specific circumstances one encounters.

Establishing a maximum SPL at the point of reception can be an appropriate approach to addressing potential adverse noise impacts. Noise thresholds are established for solid waste management facilities in the Department's Solid Waste regulations, 6 NYCRR Part 360. Most humans find a sound level of 60 - 70 dB(A) as beginning to create a condition of significant noise effect (EPA 550/9-79-100, November 1978). In general, the EPA's "Protective Noise Levels" guidance found that ambient noise levels of 55 dBA L (dn) was sufficient to protect public health and welfare and, in most cases, did not create an annoyance (EPA 550/9-79-100, November 1978). In non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dB(A) at the receptor. An increase of 6 dB(A) may cause complaints. There may be occasions where an increase in SPLs of greater than 6 dB(A) might be acceptable. The addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dB(A). This would be considered the "upper end" limit since 65 dB(A) allows for undisturbed speech at a distance of approximately three feet. Some outdoor activities can be conducted at a SPL of 65 dB(A). Still lower ambient noise levels may be necessary if there are sensitive receptors nearby.



## 4.0 Noise Assessments

### 4.1 Assessment Methodology and Source Levels

Noise emissions from the data center systems were predicted using the CADNA/A environmental noise assessment program (v2020MR1) by DataKustik GmbH. The modeling program is based on international standard ISO 9613-2:1996 *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*. Modeling scenarios were developed using aerial photographs, facility property plans, architectural building plans, data center plans, topographic elevation maps, and manufacturer submissions.

The data center buildings were modeled with dimensions of 42 feet width, 120 feet length, 14 feet in height at the eaves, and 16 feet height at the peak. Each building was developed with eight spaces for miner racks, with eight ventilation openings on each longer side, with having dimensions 12 feet in width and 12 feet in height.

Each of the eight interior building spaces in each data center building was modeled having computer racks totally 308 data miners, Bitmain model Antminer S19 Pro (110TH/s), each cooled by four computer grade fans. The miner unit is rated with a sound level of 75 dB at a distance of three feet. The miner source level inputs to the noise model comprised octave-band sound levels that were extrapolated from the published overall miner sound level, with applied octave-band level adjustments based on measurements of octave-band sound levels of existing miner systems installed at the Greenidge facility. The source sound level for one miner was adjusted by a factor of 24.9 dB in each octave band to characterize the combined source level of 308 miner units, which is determined from the adjustment formula  $L_2 = L_1 + 10 \times \log(308)$ . The unweighted octave-band sound levels for the combined miner sources in each building space are as follows:

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
63.3	78.5	90.1	96.7	94.3	95.7	92.2	90.8	87.3

The miner racks were modeled to be cooled by six vertical cooling fans, Greenheck model AER-36. The model employed sound levels for the fans that were obtained from manufacturer fan noise prediction software for a fan diameter of 36-inches and an airflow rate of 29,070 CFM. The source sound levels for one fan were adjusted by a factor of 7.8 dB (i.e.,  $10 \times \log(6)$ ) in each octave band to represent the combined source sound level of six cooling fan units. The unweighted octave-band sound power levels for the combined cooling fan sources in each building space are as follows:

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
-	95.8	108.8	112.8	111.8	108.8	104.8	99.8	95.8



Each building ventilation opening was modeled to emit the combined sound from the miner sources and the cooling fan sources. The emitted sounds are modeled to be attenuated by parallel baffle acoustic silencers. The sound attenuation values for the baffle silencers were referenced from manufacturer data from Aeroacoustic, which are summarized below.

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
-	10	18	27	33	34	27	18	15

The miner buildings were modeled to include exposed acoustic building insulation on the underside of the ceiling deck and on available wall surfaces. The sound levels emitted from each building opening included the attenuation due to distance from the average source position inside each building space to a reference point three feet outside each opening and the effects of interior sound absorption. The factor was modeled using the building module of the software program Engineering Noise Control Design v4.5. The program was used to predict an attenuation factor of 16.2 dB at higher frequencies and 15.6 dB at frequencies of 125 Hz and below. Conservatively, a noise reduction value of 15 dB, which was applied to each octave-band to account for the indoor-to-outdoor sound attenuation of the combined miner and fan source levels.

Sound emissions through each building roof and end wall were represented as face sources defined by the sound levels of the combined internal building sources that are attenuated by the following building component sound transmission loss values.

STI of construction	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Roof	23	30	46	55	63	68	70	67	71
Wall	14	17	39	54	62	67	63	64	68

The sound level rating associated with the proposed data center transformers Cooper Power 3000 kVA, is an overall NEMA level of 63 dB. Sound power levels by octave bands were calculated from the overall NEMA noise rating using the standard UFC 3-450-01 transformer octave-band noise contour as follow:

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
76	79	80	80	80	78	76	73	68

The noise assessment model calculation parameters included standard sound propagation parameters associated with a temperature of 10°C, 70% RH, downwind conditions, one order of surface sound reflections, average ground absorption coefficient of 0.50 except for water, roads, and parking lots that were defined with absorption coefficients of 0.00, without additional sound attenuation from vegetation or trees to provide conservative leaf-off predictions.



## 4.2 Western Data Center Noise Assessment Findings

The noise assessment model generated sound level contours representing noise emissions from the combined data miner and cooling fan sources of each building of the western data center installation. The contours were determined from intensive calculations using a 30m 5m grid spacing of calculation points. The predicted sound level contours with levels identified at specified boundaries and receiver locations are shown in Figure 5, which identify the overall unweighted sound levels.

## 5.0 Predicted Noise Levels Compliance

Noise levels projected to be received at the boundaries of the Greenidge Generation facility for the described data center configurations and operations are not expected to exceed the 72 dBA daytime permissible sound level limit nor the 50 dBA nighttime sound level limit of the Zoning Law of the Town of Torrey. Accordingly, the sound levels are predicted to be in compliance with local law.

Noise levels from the data centers with the described configurations and operations projected to be received at residential receptors around the Greenidge Generation facility are predicted to be lower than the lowest unweighted ambient sound levels measured at the sampling locations on multiple locations. The predicted noise levels therefore conform to noise assessment policy guidelines of the New York State Department of Environmental Conservation that limit noise level increases from operations to 6 dBA or less. Accordingly, the data center sound levels should have no appreciable affect on receptors.

## 6.0 Conclusions

Assessments of noise emissions from the planned western data center at the Greenidge Generation facility were performed referencing facility layout plans, data obtained from the manufacturers of the data miners, cooling fans, and ventilation silencers, and other specific information. The additional information include layouts of existing plant facilities, proposed data center building designs, the local ground elevation contours, the average ground absorption parameters, and other factors that were incorporated into a computerized noise assessment model, CADNA/A v2020MR1.

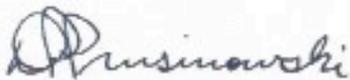
The noise assessment model was used to calculate the overall noise levels emitted from data center systems in four buildings to be located west of the power plant main building. The assessments evaluated the combined sound levels produced by data miners and cooling fans located in eight spaces in each of four buildings, emitted from ventilation openings on each longer side of each building. Mitigations include silencer baffles across each ventilation opening, and acoustic insulation on the underside of the building ceiling decks and on available interior wall surfaces. The assessments include the contributions of associated outdoor power transformers on the north side of the data center buildings. The assessments assume continuous data center operations throughout daytime and nighttime hours.



The noise assessments determined that the plane layouts, operations, and mitigations will minimize noise levels received at each of the boundaries to less than 72 dB in daytime hours and to 50 dB or less in nighttime hours.

In comparison to measured background sound levels, the noise assessments predict the data centers will generate noise levels that are lower than the lowest measured existing ambient community noise levels. The noise generated by the data centers is therefore not expected to be significantly perceptible with respect to the ambient noise. The sounds produced by the facilities are expected to be extensively masked by noise from adjacent industrial facilities, surrounding traffic, and environmental sources. In summer periods, ambient noise from insect activity will provide additional masking effects.

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