BROOKSIDE SOLAR, LLC

Matter No. 21-00917

900-2.8 Exhibit 7

Noise and Vibration

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Acronym List

AES	The AES Corporation, Inc.
ANSI	American National Standards Institute
ASA	Acoustical Society of America
ATV	all-terrain vehicle
BMP	best management practice
Cmet	meteorological correction
dBA	A-weighted decibel
Epsilon	Epsilon Associates, Inc.
FHWA	Federal Highway Administration
G	ground absorption factor
GIS	Geographic Information System
HDD	horizontal directional drilling
Hz	Hertz
INCE	Institute of Noise Control Engineering
ISO	International Organization for Standardization
Leq	equivalent continuous sound level
M	meters
MVA	megavolt-ampere
NED	National Elevation Dataset
NYCRR	New York Codes, Rules and Regulations
ORES	Office of Renewable Energy Siting
POI	point of interconnection
RCNM	Roadway Construction Noise Model
ROW	right-of-way
SAE	Standard Automotive Engineering
USCs	Uniform Standards and Conditions
WHO	World Health Organization
NEMA	National Electrical Manufacturers Association

Glossary Terms

Applicant	Brookside Solar, LLC, a subsidiary of The AES Corporation, Inc. (AES), the entity seeking a siting permit for the Facility from the Office of Renewable Energy Siting (ORES) under Section 94-c of the New York State Executive Law.
Facility	The proposed components to be constructed for the collection and distribution of energy for the Brookside Solar Project, which includes solar arrays, inverters, electric collection lines, and the collection substation.
Facility Site	The parcels encompassing Facility components which totals 1,471 acres in the Towns of Burke and Chateaugay, Franklin County, New York (Figure 2-1).
Towns	The Towns of Burke and Chateaugay, Franklin County, New York.

EXHIBIT 7: NOISE AND VIBRATION

This Exhibit provides information required in accordance with the requirements of Section 900-2.8 of the Section 94-c Regulations.

7(a) Name of Preparer

This Exhibit includes a detailed analysis of the potential sound impacts associated with the construction and operation of the Facility. Exhibit 7 was prepared by Mr. Ryan Callahan of Epsilon Associates, Inc. (Epsilon). Mr. Callahan has over 15 years of experience in the areas of community noise impacts, sound level data collection, and analyses. He is a full member of the Institute of Noise Control Engineering (INCE). The modeling performed by Epsilon for the Facility is sufficiently conservative in predicting sound impacts and includes all proposed inverters, as well as the substation operating at their maximum capacities.

7(b) Noise Design Goals for the Facility

The design goals for this Facility are described below.

(1) A maximum noise limit of 45 A-weighted decibel (dBA) equivalent continuous sound level (Leq) (8-hour), at the outside of any existing non-participating residence, and 55 dBA Leq (8-hour) at the outside of any existing participating residence. The Facility meets these limits as discussed in Section 7(l).

(2) A maximum noise limit of 40 dBA Leq (1-hour) at the outside of any existing non-participating residence from the collector substation equipment. The Facility meets these limits as discussed in Section 7(l).

(3) A prohibition on producing any audible prominent tones, as defined by using the constant level differences listed under the American National Standards Institute (ANSI) S12.9-2005/Part 4 Annex C (sounds with tonal content), at the outside of any existing non-participating residence. Should a prominent tone occur, the broadband overall dBA noise level at the evaluated non-participating position shall be increased by 5 dBA for evaluation of compliance with subparagraph (i) and (ii) of this paragraph. The inverter currently under consideration for this Facility has a tone at 5,000 Hz. Therefore, the effective limit for non-participating residents is 40 dBA Leq (8-hour) for evaluation of compliance with subparagraph (i) of this paragraph. The Facility meets these limits as discussed in Section 7(e).

(4) A maximum noise limit of 55 dBA Leq (8-hour), short-term equivalent continuous average sound level from the Facility across any portion of a non-participating property except for portions delineated as New York State-regulated wetlands pursuant to section 900-1.3(e) of this Part and utility right-of-way (ROW) to be demonstrated with modeled sound contours drawings and discrete sound levels at worst-case locations. No penalties for prominent tones will be added in this assessment. The Facility meets these limits as discussed in Sections 7(k) and 7(l).

There are no applicable quantitative sound level requirements in the Town of Chateaugay or the Town of Burke.

7(c) Radius of Evaluation

All sensitive receptors within at least a 1,500-foot radius from any noise source (e.g., substation transformer(s), medium to low voltage transformers, inverters) proposed for the Facility or within the 30-dBA noise contour, whichever is greater, were included in the analysis. Each of these sensitive receptors are visible in Figure 7-1.

A cumulative analysis requires noise modeling to include any solar facility and substation existing and proposed by the time of filing the Application, and any existing sensitive receptors within a 3,000-foot radius from any noise source proposed for this Facility, or within the 30 dBA noise contour, whichever is greater. There are no existing solar projects within 3,000 feet of a proposed noise source; therefore, a cumulative analysis was not necessary.

7(d) Modeling Standards, Input Parameters, and Assumptions

An estimate of the noise level to be produced by the Facility was made using the following assumptions.

(1) Future sound levels associated with the Facility were predicted using the CadnaA noise calculation software developed by DataKustik GmbH. This software implements the International Organization for Standardization (ISO) 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation) for full octave bands from 31.5 Hertz (Hz) to 8,000 Hz. As per ISO 9613-2, all calculations assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation. In addition, the

ISO 9613-2 standard assumes all receptors are downwind of every sound source simultaneously. No meteorological correction (Cmet) was added to the results, pursuant to 19 New York Codes, Rules and Regulations (NYCRR) § 900-2.8(d).

(2) Elevation contours for the modeling domain were directly imported into CadnaA which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.

(3) In addition to modeling at discrete points, sound levels were also modeled throughout a large grid of receptor points, each spaced 10 meters (m) apart to allow for the generation of sound level isolines. Tabular results and sound level isolines were calculated and generated for the entire Study Area. All sound sources were assumed to be operating simultaneously at maximum sound power levels. The collector substation was also modeled by itself operating at maximum sound power level.

The sound power levels for each source used in the modeling are discussed below.

Inverters

The sound level analysis includes 30 inverters as provided to Epsilon by the Applicant. The source location coordinates, ground elevations, and heights above ground are summarized in Appendix 7-1. There is one inverter manufacturer (Sungrow) evaluated for this analysis. All 30 of the proposed inverters will be Sungrow inverters with identical specifications. The inverter manufacturer, power ratings, and dimensions examined for this assessment are presented below in Table 7-1.

As shown on pages three and four of Appendix 7-A.7, the low-voltage transformers (LVTs) associated with each inverter have a sound power level 26 dBA quieter than the inverter (92 dBA versus 66 dBA). Therefore, the LVTs are negligible sound sources, and have not been included in the site-wide sound model.

Similar to the LVTs, the small electric tracking motors planned for the Facility are also negligible sources of sound. Manufacturers sound level data for the tracking motors are not available; however, based on Epsilon’s experience, the sound power levels of tracking motors for solar arrays are typically in the range of 65 to 70 dBA. Additionally, according to the solar array design team, the tracking motors for the Brookside Facility will only operate for approximately eighteen (18) minutes per day. The sound level limits presented in 94-c applicable to operational sound from the Facility are based on an 8-hour Leq. Eighteen (18) minutes represents 3.75% of an 8-hour time period. For these reasons, tracking motors have been excluded from the site-wide sound model.

Table 7-1. Power Inverter Analyzed for Sound Level Assessment

Manufacturer	Inverter Model	Maximum Electrical Output (kilovolt-ampere [kVA])	Dimensions (meters [M]) (WxHxD)
Sungrow	SG3600UD-MV	3,600	6.1 x 2.9 x 2.4

Broadband and one-third octave band sound power levels for the Sungrow inverter operating under typical (daylight) conditions were provided by the Applicant[1]. The octave band sound power levels are presented in Table 7-2.

Table 7-2. Inverter Octave Band Sound Power Levels

Inverter Type	Broadband Sound Power Level (A-weighted decibel [dBA])	Sound Power Levels per Octave-Band Center Frequency (Hertz [Hz])								
		31.5	63	125	250	500	1,000	2,000	4,000	8,000
		dB	dB	dB	dB	dB	dB	dB	dB	dB
SG3600 UD-MV	92	86	85	87	86	90	81	80	88	81

Collector Substation

In addition to the inverters, there will be a collector substation located within the Facility Site. The modeling inputs of the transformer coordinates, ground elevation, and height above ground are summarized in Appendix 7-1. One step-up transformer rated at up to 125 megavolt-ampere (MVA) is proposed for the collector substation. Epsilon estimated octave band sound level emissions using the techniques in the Electric Power Plant Environmental Noise Guide Table 4.5 Sound Power Levels of Transformers, assuming the transformer will have a National

[1] Acoustic Test Center, Quindao Branch, Institute of Acoustics, Chinese Academy of Sciences Test Report. ATC210014 Test report for SG3600UD-MV

Electrical Manufacturers Association (NEMA) noise rating of 76. Table 7-3 summarizes the sound power level data used in the modeling.

Table 7-3. Collector Substation Transformer Sound Power Levels—per unit

Maximum Rating (Megavolt-Ampere [MVA])	Broadband Sound Power Level (dBA)	Sound Power Levels per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1,000	2,000	4,000	8,000
		dB	dB	dB	dB	dB	dB	dB	dB	dB
125	96	92	98	100	95	95	89	84	79	72

- For all modeling scenarios, the ground absorption factor (G) was set to 0.5 for the ground and 0 for waterbodies.
- A temperature of 10 degrees Celsius and 70 percent relative humidity was used to calculate atmospheric absorption for the ISO 9613-2 model. These parameters were selected to minimize atmospheric attenuation in the 500 Hz and 1,000 Hz octave bands where the human ear is most sensitive, and thus provide conservative results.
- The maximum A-weighted dBA Leq (1-hour or 8-hour) sound pressure levels, and the maximum linear/unweighted/Z dB (Leq 1-hour) sound pressure levels from the 31.5 Hz up to the 8,000 Hz full-octave band, at all sensitive sound receptors within the radius of evaluation are discussed and presented in Section 7(l).
- The maximum A-weighted dBA Leq sound pressure levels (Leq (8-hour)) at the most critically impacted external property boundary lines of the Facility Site (e.g., non-participating boundary lines) are shown in Figure 7-4.1.
- A summary of the number of receptors exposed to sound levels greater than 35 dBA are shown in Table 7-4 grouped in 1-dBA bins.

Table 7-4. Receptors Modeled at 35 dBA or Greater – Unmitigated Total Sound Leq (8-hour)

Modeled Leq Sound Level (dBA)	Number of Receptors			
	Residential		Public	
	Participating	Non-Participating	Participating[1]	Non-Participating
37	3	1	0	0
36	2	2	0	0
35	0	1	0	0

Notes: 1) There are zero public receptors that are participating.

- Sound level contours as specified in 19 NYCRR § 900-2.8(k) are shown in Figure 7-4.1.
    - This subsection is applicable to wind projects and the Facility is a solar facility.
    - The CadnaA model used a 1.5-meter assessment point above the ground. No uncertainty factor was added to the modeled results.

7(e) Prominent Tones

ANSI/ Acoustical Society of America (ASA) S12.9-2013 Part 3, Annex B, section B.1 (informative) presents a procedure for testing for the presence of a prominent discrete tone. According to the standard, a prominent discrete tone is identified as present if the time-average sound pressure level in the one-third octave band of interest exceeds the arithmetic average of the time-average sound pressure level for the two adjacent one-third octave bands by any of the following constant level differences:

- 15 dB in low-frequency one-third-octave bands (from 25 up to 125 Hz);
- 8 dB in middle-frequency one-third-octave bands (from 160 up to 400 Hz); or,
- 5 dB in high-frequency one-third-octave bands (from 500 up to 10,000 Hz).
    - Sound pressure level calculations using the CadnaA modeling software which incorporates the ISO 9613-2:1996 propagation standard is limited to octave band sound levels; therefore, a quantitative evaluation of one-third octave band sound levels using the modeling software was not possible. Instead, one-third octave band sound pressure levels due to the closest inverters were calculated at the nearest five potentially impacted and representative receptor locations (both non-participants and participants) using equations accounting for hemispherical radiation and atmospheric absorption. The results presented in Table 7-5 shows that received sound pressure levels due to the closest inverters at each of these locations are predicted to result in a prominent discrete tone at the 5,000 Hz one-third octave band. Due to this prominent tone, a 5 dBA penalty is being applied on a short-term broadband basis to non-participating residential receptors (40 dBA). Despite the observed prominent tone and subsequent broadband penalty, short term broadband sound pressure levels do not exceed 40 dBA at any non-participating residences without any mitigation measures.

One-third octave band sound power levels for the collector substation transformer were not supplied by the vendor for the substation equipment; therefore, a quantitative evaluation of one-third octave band sound using the spreadsheet modeling approach was not possible. For this reason, the substation transformer was assumed to be tonal and prominent by default.

Table 7-5. Tonal Analysis & Compliance Evaluation: Unmitigated Modeled Sound Pressure Levels from Inverters

Rec. ID	One-Third Octave Band Center Frequency (Hz)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
	Tonal Limit	-	15	15	15	15	15	15	15	8	8	8	8	8	5	5	5	5	5	5	5	5	5	5	5	5	5	-
22	Received Sound Pressure Level (dB)	25	30	31	31	29	28	29	33	28	26	30	32	36	34	29	27	24	22	22	22	22	19	13	27	15	2	0
	Average Sound Pressure Level of Contiguous Bands	-	28	30	30	29	29	31	29	30	29	29	33	33	32	30	27	24	23	22	22	21	18	23	14	14	7	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	2	2	-10	13	1	-6	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
89	Received Sound Pressure Level (dB)	26	31	32	31	30	29	30	33	29	27	30	33	36	35	30	27	25	23	23	22	23	20	14	29	19	12	11
	Average Sound Pressure Level of Contiguous Bands	-	29	31	31	30	30	31	29	30	30	30	33	34	33	31	27	25	24	23	23	21	18	24	17	20	15	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	2	2	-10	12	-1	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
90	Received Sound Pressure Level (dB)	25	30	32	31	30	28	29	33	29	27	30	33	36	35	30	27	25	23	24	24	26	24	20	37	29	23	22
	Average Sound Pressure Level of Contiguous Bands	-	28	31	31	30	29	31	29	30	29	30	33	34	33	31	27	25	24	24	25	24	23	30	25	30	26	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	1	1	-11	12	-1	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
91	Received Sound Pressure Level (dB)	25	30	31	30	29	28	29	33	28	26	30	32	36	34	29	27	25	23	23	24	25	24	20	36	29	23	22
	Average Sound Pressure Level of Contiguous Bands	-	28	30	30	29	29	30	29	30	29	29	33	33	33	31	27	25	24	23	24	24	22	30	24	30	25	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	1	1	-11	12	-1	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-

Rec. ID	One-Third Octave Band Center Frequency (Hz)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500
	Tonal Limit	-	15	15	15	15	15	15	15	8	8	8	8	8	5
107	Received Sound Pressure Level (dB)	25	30	31	30	29	28	29	33	28	26	30	32	36	34
107	Average Sound Pressure Level of Contiguous Bands	-	28	30	30	29	29	30	29	30	29	29	33	33	33
107	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2
107	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Rec. ID	One-Third Octave Band Center Frequency (Hz)	630	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
	Tonal Limit	5	5	5	5	5	5	5	5	5	5	5	5	-
107	Received Sound Pressure Level (dB)	29	27	25	23	23	24	25	24	20	36	29	23	22
107	Average Sound Pressure Level of Contiguous Bands	31	27	25	24	23	24	24	22	30	24	30	26	-
107	Difference between Sound Pressure Level and Contiguous Average	-1	0	0	-1	0	0	1	1	-11	12	-1	-3	-
107	Below Tonal Limit?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-

7(f) Low Frequency Noise for Wind Facilities

This subsection is not applicable to this Facility.

7(g) Infrasound for Wind Facilities

This subsection is not applicable to this Facility.

7(h) Sound Study Area

Figure 7-1 is a map of the sound study area showing the location of sensitive sound receptors in relation to the Facility (including the collector substation and the point of interconnection [POI]).

(1) In total, 151 discrete receptors were analyzed for the Facility. These include 143 residential receptors and 8 public receptors. Of the 151 receptors, 16 were participating and 135 were non-participating, as defined in Section 7(h)(3) below. Of the 8 public receptors, 0 were participating and 8 were non-participating. A detailed listing of all receptors including receptor ID, latitude/longitude, elevation, and participation status, and receptor category is included as Appendix 7-2.

(2) All residences were included as sensitive sound receptors regardless of participation in the Facility (e.g., participating, potentially participating, and non-participating residences) or occupancy (e.g., year-round, seasonal use).

(3) Only properties that have a signed contract with the Applicant prior to the date of filing the Application were identified as “participating.” Other properties were designated as “non-participating.”

7(i) Evaluation of Ambient Pre-Construction Baseline Noise Conditions

An evaluation of ambient pre-construction baseline noise conditions was conducted for 11 days[2] by using the L_{90} statistical and the L_{eq} energy-based noise descriptors, and by following the recommendations included in ANSI/ASA S3/SC 1.100 -2014-ANSI/ASA S12.100-2014 American National Standard entitled Methods to Define and Measure the Residual Sound in

[2] Location 3 collected sound data for only approximately 8 days.

Protected Natural and Quiet Residential Areas. The full details of the ambient pre-construction sound level measurement program are found in Appendix 7-3.

7(j) Evaluation of Future Noise Levels during Construction

Future construction noise modeling was performed for the main phases of construction using the ISO 9613-2:1996 sound propagation standard as implemented in the CadnaA software package. Reference sound source information was obtained from either Epsilon's consulting files or the Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM).

The majority of the construction activity will occur around each of the inverter locations, at the location of the collector substation, at each of the solar arrays, and at the locations where horizontal directional drilling (HDD) will occur. By its very nature, construction activity moves around the Facility Site. Full construction activity will generally occur at one location at a time, although there will be some overlap at adjacent construction locations for maximum efficiency. For modeling conservatism, it was assumed that full activity was occurring at the closest locations to their surrounding receptors. There are generally five phases of construction for a solar energy project – site preparation and grading, trenching and road construction, HDD, equipment installation, and commissioning. Table 7-6 presents the equipment sound levels for the louder pieces of construction equipment expected to be used at the site along with their phase of construction.

Table 7-6. Sound Levels for Noise Sources Included in Construction Modeling

Phase	Equipment	Sound Level at 50 feet (dBA)
Site Preparation & Grading	Grader (174 hp)	85
Site Preparation & Grading	Rubber Tired Loader (164 hp)	85
Site Preparation & Grading	Scraper (313 hp)	89
Site Preparation & Grading	Water Truck (189 hp)	80
Site Preparation & Grading	Generator Set	81
Trenching & Road Construction	(2) Excavator (168 hp)	85
Trenching & Road Construction	Bar Trencher (600 hp)	89
Trenching & Road Construction	Grader (174 hp)	85
Trenching & Road Construction	Water Truck (189 hp)	80
Trenching & Road Construction	Trencher (63 hp)	83
Trenching & Road Construction	Rubber Tired Loader (164 hp)	85
Trenching & Road Construction	Generator Set	81

Phase	Equipment	Sound Level at 50 feet (dBA)
Equipment Installation	Crane (399 hp)	83
Equipment Installation	Crane (165 hp)	83
Equipment Installation	(2) Forklift (145 hp)	85
Equipment Installation	(2) Vermeer PD10 Pile Driver	84
Equipment Installation	(6) Pickup Truck/all-terrain vehicle (ATV)	55
Equipment Installation	(2) Water Truck (189 hp)	80
Equipment Installation	(2) Generator Set	81
horizontal directional drilling (HDD) Entry	Excavator (168 hp)	85
HDD Entry	Auger Drill Rig	85
HDD Entry	Pickup Truck/ATV	55
Commissioning	(2) Pickup Truck/ATV	55

The operational modeling requirements included Sections 7(d)(1)(i) through 7(d)(1)(iii), and 7(d)(3) of this Exhibit were also used for modeling of construction noise. Worst-case sound levels from construction activity are shown using sound level contours in Figure 7-j.1 and sound levels at the most critically impacted receptors are shown in Tables 7-7 and 7-8.

Two areas within the Facility Site were chosen to calculate worst case construction sound levels. The areas and assumed locations of simultaneous construction are:

- Area 1 – This area includes the closest receptors to a solar array panel. Modeling assumed simultaneous construction activity at this solar array panel. Site preparation and grading work, trenching and road construction work, equipment installation work, and commissioning work was modeled at this location.
- Area 2 – This area includes all receptors in the vicinity of the closest HDD entry point to a receptor. Modeling assumed simultaneous construction activity at this HDD entry point. HDD work and commissioning work was modeled at this HDD entry point.

For each of the areas, construction sound levels at the 10 closest receptors have been calculated. These receptors included both non-participants and participants. The results are shown as maximum 1-second Leq sound levels with all pieces of equipment for each phase operating at the locations. These results overstate expected real-world results, because under actual construction conditions, not all pieces of equipment will be operating at the same exact time, and the highest sound levels from every piece of equipment will not tend to occur at the same time as was assumed in the modeling. At other areas of construction (i.e. substation, laydown yards, inverter pads), sound levels due to construction would be lower, as those locations are further from receptors than the two areas that were analyzed.

Area 1 Modeling Results

The worst-case impacts from site preparation and grading work, trenching and road construction work, equipment installation work, and commissioning work was calculated with the CadnaA model for the 10 closest receptors to construction activity within Area 1. The loudest phase of construction within this area will be trenching and road construction work. A sound contour figure of trenching and road construction work occurring at the solar array is presented in Figure 7-j.1.

The highest unmitigated sound level at a non-participating receptor within this area is 59 dBA during site preparation and grading (Receptor #76), 61 dBA during trenching and road construction (Receptor #76), 61 dBA during equipment installation (Receptor #76), and 26 dBA during commissioning (Receptor #76). Under the worst-case scenario if all phases were to occur simultaneously, the highest unmitigated sound level at a non-participating receptor in this area is 65 dBA (Receptor #76); however, this is highly unlikely to occur. Modeling results of construction sound levels within this area are summarized in Table 7-7.

Table 7-7. Unmitigated Construction Noise Modeling Results – Area 1 Construction [dBA]

Receptor ID	Distance (M)	Participation Status	Site Preparation & Grading	Trenching & Road Construction	Equipment Installation	Commiss-ioning	Worst-Case Total (All Phases)
89	76	Participating	69	70	70	35	75
90	140	Participating	64	65	65	30	69
91	184	Participating	62	63	63	28	68
76	259	Non-Participating	59	61	61	26	65
107	266	Non-Participating	58	59	59	24	64
5	302	Non-Participating	58	60	59	24	64
115	365	Non-Participating	57	58	58	23	62
111	445	Non-Participating	50	52	51	16	56
114	450	Non-Participating	55	56	56	21	60

Receptor ID	Distance (M)	Participation Status	Site Preparation & Grading	Trenching & Road Construction	Equipment Installation	Commiss-ioning	Worst-Case Total (All Phases)
95	483	Non-Participating	54	55	55	20	60

Area 2 Modeling Results

The worst-case impacts from HDD work and commissioning work were calculated with the Cadna model for the 10 closest receptors to construction activity within Area 2. The loudest phase of construction within this area will be HDD work. A sound contour figure of HDD work occurring at the HDD entry point is presented in Figure 7-j.1.

The highest unmitigated sound level at a non-participating receptor within this area is 66 dBA during HDD (Receptor #112) and 36 dBA during commissioning (Receptor #112). Under the worst-case scenario if all phases were to occur simultaneously, the highest unmitigated sound level at a non-participating receptor in this area is 66 dBA (Receptor #112); however, this is highly unlikely to occur. Modeling results of construction sound levels within this area are summarized in Table 7-8, and the sound contour results are shown in Figure 7-j.1.

Table 7-8. Unmitigated Construction Noise Modeling Results – Area 2 Construction [dBA]

Receptor ID	Distance (M)	Participation Status	HDD	Commissioning	Worst-Case Total (All Phases)
125	73	Participating	67	38	67
112	91	Non-Participating	66	36	66
124	147	Participating	61	31	61
123	177	Participating	59	29	59
127	210	Non-Participating	58	28	58
108	225	Non-Participating	58	28	58
50	297	Non-Participating	55	25	55
58	423	Non-Participating	52	22	52
32	429	Participating	52	22	52
16	434	Non-Participating	52	22	52

Cumulative Construction Modeling Results

Additionally, to account for the possible cumulative effect of all construction activities, modeling scenarios were performed for all phases assuming simultaneous construction at 10 sites throughout the Facility Site. A sound contour figure showing the sound levels resulting from the loudest phase (trenching and road construction) occurring simultaneously at these 10 sites is presented in Figure 7-j.2. Appendix 7-11 provides tabular results at receptors for each phase of cumulative construction activity. These results overstate the expected real-world results, because under actual construction conditions, not all pieces of equipment will be operating at the same exact time, and the highest sound levels from every piece of equipment will not tend to occur at the same time as was assumed in the modeling.

Construction Noise Conclusions

Noise due to construction is an unavoidable outcome of construction. The five major construction phases are: site preparation and grading, trenching and road construction, HDD, equipment installation, and commissioning. Most of the construction will occur at significant distances to sensitive receptors, and therefore noise from most phases of construction is not expected to result in impacts to sensitive receptors. There are a few instances where construction will be fairly close to receptors (#125, #89, #112, #90 & #124) and coordination with these neighbors may be warranted. Construction noise will be minimized through the use of best management practices (BMPs).

7(k) Sound Levels in Graphical Format

(1) Figure 7-4.1 presents future Leq (8-hour) sound contour lines showing expected unmitigated sound levels during worst-case operation of the Facility's inverters plus the collector substation using the methodology described above. Figure 7-5.1 presents future Leq (1-hour) sound contour drawings showing expected unmitigated sound levels during worst-case operation of the Facility's collector substation-only using the methodology described above.

(2) The sound contour maps include all sensitive sound receptors, boundary lines (differentiating participating and non-participating), and all Facility noise sources.

(3) Sound contours are rendered until the 30 dBA noise contour is reached, in 1-dBA steps, with sound contour multiples of 5 dBA differentiated.

(4) Full-size hard copy maps (22" x 34") of these figures in 1:12,000 scale will be submitted toORES.

7(l) Sound Levels in Tabular Format

A tabular comparison between the maximum sound impacts and any design goals, noise limits, and local requirements for the Facility, and the degree of compliance at all sensitive sound receptors and at the most impacted non-participating boundary lines within the Study Area is presented below.

All sources running--inverters plus the collector substation

Unmitigated future Leq (8-hour) sound levels during worst-case operation of the Facility's inverters plus the collector substation have been calculated using the methodology described above. Appendix 7-4 provides the predicted dBA and full octave band frequency (31.5 Hz to 8,000 Hz) sound pressure levels at all sensitive receptors. The results are sorted by receptor ID and A-weighted sound level high to low, and then are broken down by receptor type (Residential and Public) and participation (non-participating and participating). In total, there are six tables from Table 7-4.1a to Table 7-4.1f found in Appendix 7-4.

The highest unmitigated sound levels at receptors, under this scenario are:

- Non-participating receptor = 37 dBA
- Participating receptor = 37 dBA

These sound levels are below the design goals of 45 dBA for a non-participating residence and 55 dBA for a participating residence, and also meet the adjusted design goal at the non-participating residences due to the observed prominent tone and subsequent 5-dBA penalty. Thus, the Facility complies with these design goals.

Sound level contours generated from the modeling grid are presented in an overview figure, (Figure 7-4.1), accompanied by a series of inset maps that provide a higher level of detail at all modeled receptors. As these figures show, sound levels will be below the design goal of 55 dBA at all non-participating property lines. The highest unmitigated sound level due to the Facility at a non-participating property line occurs on Parcel ID: 74.-2-7.300, near Inverter 8. This property line boundary is predicted to be 48 dBA which is below the maximum noise limit of fifty-five (55) dBA Leq (8-hour) across any portion of a non-participating property. .

Collector substation only

Unmitigated future Leq (1-hour) sound levels during worst-case operation of the Facility's collector substation only have been calculated using the methodology described above. Appendix 7-5 provides the predicted A-weighted (dBA) and full octave band frequency (31.5 Hz to 8,000 Hz) sound pressure levels at all residences. The results are sorted by receptor ID and sorted by A-weighted sound level from high to low for all non-participating residences. In total, there are two tables, Table 7-5.1a and 7-5.1.b, found in Appendix 7-5. Sound level contours from the collector substation generated from the modeling grid are presented in Figure 7-5.1.

The highest sound level under this scenario is 32 dBA at a non-participating receptor. This sound level meets the design goal of 35 dBA, assuming the 5 dBA tonal penalty, which is likely for a substation transformer.

Local Requirements

There are no applicable quantitative sound level requirements in the Town of Chateaugay or the Town of Burke.

7(m) Community Noise Impacts

(1) ***Hearing Loss for the Public***

The Facility's potential to result in hearing loss to the public was evaluated against the 1999 "Guidelines for Community Noise" published by the World Health Organization (WHO). According to the WHO Guidelines, the threshold for hearing impairment is 70 dBA Leq (24-hour), 110 dBA (Lmax, fast) or 120/140 dBA (peak at the ear) for children/adults. Operational noise will always be less than 55 dBA Leq (8-hour) at any residence. This is well below the 70-dBA limit. The only construction noise source for this Facility capable of exceeding the WHO hearing impairment threshold is blasting, but no blasting is anticipated for this Facility. All other construction activities will produce noise below the WHO hearing impairment threshold. Therefore, no Facility activities have the potential to cause hearing loss to the public.

(2) ***Potential for Structural Damage***

At this time, blasting is not planned as part of construction for the Facility. If blasting becomes necessary, a detailed discussion of the potential to produce structural damage on any existing proximal buildings is found in Exhibit 10- Geology, Seismology and Soils.

7(n) Noise Abatement Measures for Construction Activities

(1) Noise Abatement Measures

Noise due to construction is an unavoidable outcome of construction. The Applicant will communicate with the public to notify them of the beginning of construction of the Facility. Most of the construction will occur at significant distances to sensitive receptors, and therefore noise from most phases of construction is not expected to result in impacts to sensitive receptors. Nonetheless, construction noise will be minimized through the use of BMPs such as those listed below.

- Blasting is not anticipated at this Facility. However, if necessary, blasting will be limited to daytime hours and conducted in accordance with an approved Blasting Plan.
- Post installation and HDD will be limited to daytime hours.
- Pursuant to 19 NYCRR § 6.2(k)(1), construction equipment fitted with exhaust systems and mufflers will be used that have the lowest associated noise whenever those features are available. Functioning mufflers will be maintained on all transportation and construction machinery.
- Equipment and surface irregularities will be maintained at the construction site to prevent unnecessary noise.
- The construction will be configured, to the extent feasible, in a manner that keeps loud equipment and activities as far as possible from noise-sensitive locations.
- Back-up alarms will be used with a minimum increment above the background noise level to satisfy the performance requirements of the current revisions of Standard Automotive Engineering (SAE) J994 and OSHA requirements.
- A staging plan will be developed that establishes equipment and material staging areas away from sensitive receptors when feasible.
- Contractors will use approved haul routes to minimize noise at residential and other sensitive noise receptors.

(2) Complaint Management Plan

Complaints due to construction or operation of the Facility have the potential to occur. If complaints do arise, the Complaint Management Plan provides information on how and when the public may file a complaint, as well as an identification of any procedures or protocols that may be unique to each phase of the Facility or complaint type. In accordance with 19 NYCRR § 6.2(a), (c) and (d), the Applicant will provide notice of commencement of construction and completion of construction. The notice will include the procedure and contact information for registering a complaint. To minimize noise impacts during construction, the Applicant will comply with 19 NYCRR § 6.2(k)(2), which includes responding to noise and vibration complaints according to the complaint resolution protocol approved by ORES.

(3) Compliance with Local Laws

There are no applicable quantitative sound level requirements in the Town of Chateaugay or the Town of Burke.

7(o) Noise Abatement Measures for Facility Design and Operation

(1) Wind Facilities

This subsection is not applicable to the Facility.

(2) Solar Facilities

Adverse noise impacts will be avoided or minimized through careful siting of Facility components. The noise emitted by a solar project is limited to daytime periods for the majority of the components. No mitigation is required at any of the central inverters across the Facility or the substation under the current design. If any mitigation measures become necessary, they shall be implemented no later than the start date of operations.

7(p) Software Input Parameters, Assumptions, and Associated Data for Computer Noise Modeling

(1) Geographic Information System (GIS) files used for the computer noise modeling, including noise source and receptor locations and heights, topography, final grading, boundary lines, and participating status have been submitted to ORES by digital means.

(2) The CadnaA computer noise modeling files have been submitted to ORES by digital/electronic means.

(3) Site plan and elevation details of substations, as related to the location of all relevant noise sources, are presented in Appendix 7-6.

(4) The locations of all noise sources identified with GIS coordinates are presented in Appendix 7-1. The digital GIS files with that information have been submitted to ORES. Sound information from the manufacturers for all noise sources included in this analysis are presented in Appendix 7-7.

7(q) Miscellaneous

(1) A glossary of terminology, definitions, and abbreviations used throughout this Exhibit is included as Appendix 7-8. The references mentioned in the Application are found at the end of this document.

(2) All information has been reported in tabular, spreadsheet-compatible, or graphical format as follows:

i) All data reported in tabular format has been clearly identified to include headers and summary footer rows. Headers include identification of the information contained in each column, such as noise descriptors; weighting; duration of evaluation; time of the day; whether the value is a maximum or average value and the corresponding time frame of evaluation.

ii) Table titles identify whether the tabular or graphical information correspond to the "unmitigated" or "mitigated" results, if any mitigation measures are evaluated, and “cumulative” or “non-cumulative” for cumulative noise assessments.

iii) Columns or rows with results related to a specific design goal, noise limit, or local requirement, identify the requirement to which the information relates.

iv) Tables include rows at the bottom summarizing the results to report maximum and minimum values of the information contained in the columns. Sound receptors are separated in different tables according to their participation status.

v) This Exhibit reports estimates that there are no sensitive sound receptors that will be exposed to noise levels that exceed any design goal or noise limit, and presents total levels as well as number of receptors grouped in 1-dBA bins).

Conclusions

A study was conducted to confirm that any noise and vibrational impacts resulting from the construction and operation of the Facility will not exceed the design goals listed within the regulations of Section 94-c of the New York State Executive Law. Adverse noise impacts were avoided or minimized through careful siting of Facility components. The noise emitted by a solar project is limited to daytime periods only for the majority of the components. No mitigation is required at any of the central inverters across the Facility or the substation under the current design. The Facility has been designed to comply with 19 NYCRR § 900-2.8 and the Uniform

Standards and Conditions (USCs) and impacts related to noise and vibration have been avoided and minimized to the maximum extent practicable.

References

American National Standards Institute (ANSI)/ Acoustical Society of America (ASA) S1.4-1983 (R2006). 1983. *Specification for Sound Level Meters.*

ANSI/ASA S1.11-2004 (R2009). 2004. *Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.*

ANSI/ASA S1.40-2006 (R2020). 2006. *Specifications and Verification Procedures for Sound Calibrators.*

ANSI/ASA S1.43-1997 (R2007). 1997. *Specification for Integrating-Averaging Sound Level Meters.*

ANSI S12.9-1992/Part 2 (R2018). 1992. *Quantities and Procedures for Description and Measurement of Environmental Sound. Part 2: Measurement of long-term, wide-area sound.*

ANSI S12.9-2013/Part 3 (R2018). 2013. *Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-term Measurement with an Observer Present.*

ANSI S12.9-2005/Part 4 (R2020). 2005. *Quantities and Procedures for Description and Measurement of Environmental Sound. Part 4: Noise Assessment and Prediction of Long-term Community Response.*

ANSI S12.18-1994 (R2019). 1994. *Procedures for Outdoor Measurement of Sound Pressure Level.*

ANSI/ASA S3/SC1.100-2014 & ANSI/ASA S12.100-2014. 2014. *Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas.*

Edison Electric Institute. 1984. *Electric Power Plant Environmental Noise Guide, 2nd Edition.*

International Organization for Standardization (ISO) 9613-2. 1996. *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

U.S. Department of Transportation, Federal Highway Administration (FHWA). 2006. *FHWA Roadway Construction Noise Model User's Guide.*

World Health Organization (WHO). 1999. *Guidelines for Community Noise.*