Michichi Solar Facility & BESS Project

Noise Impact Assessment

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Michichi Solar LP

Author:
Green Cat Renewables Canada Corporation

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This document has been prepared by Green Cat Renewables Canada Corporation. The material and data in this report were prepared under the supervision and direction of the undersigned.

SEP. 12, 2024

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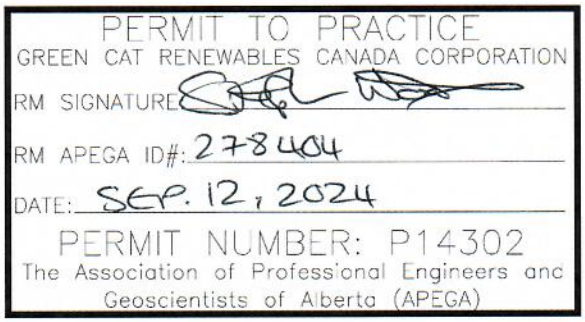

The noise impact assessment is being issued with professional engineering authentication. The information contained in this report, to which the engineering authentication is applied, is deemed complete for the intended purpose.

Disclaimer

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Executive Summary

Michichi Solar LP (Michichi Solar), a subsidiary of Capstone Infrastructure Corporation, is the owner and operator of the Michichi Solar Facility (the Solar Facility). The Michichi Solar Facility is an operational 25-megawatt (MW_{AC}) solar photovoltaic (PV) electricity generating facility located within quarter sections SE-23-29-20-W4M and NE-23-29-20-W4M in Starland County, Alberta, approximately 1km north of the Town of Drumheller.

Michichi Solar is proposing to install a Battery Energy Storage System (the BESS Project) within the fence line of the existing Solar Facility. The BESS Project would be installed adjacent to the existing switching station at the Solar Facility. The BESS Project would have a total capacity of 10 MW, with a total energy storage capacity of 20 MWh.

Michichi Solar retained Green Cat Renewables Canada Corporation (GCR) to conduct an updated noise impact assessment (NIA) to include the BESS Project, and to compare the results with the NIA previously conducted by GCR for the Solar Facility, which was submitted to the Alberta Utilities Commission (AUC) in November 2022[1] (the Previous NIA). The Solar Facility was approved by the AUC under Approval 27823-D02-2022, was constructed, and has been operational since March 2023. The BESS Project is a proposed addition to the Solar Facility (collectively, the combined Solar Facility and BESS Project). This assessment has considered all noise producing sources within the combined Solar Facility and BESS Project and has evaluated the incremental noise at receptors from the BESS Project.

The BESS Project would consist of eight (8) BESS units, eight (8) BESS inverters, and four (4) BESS transformers. The Solar Facility inverter/transformer stations, BESS units, and BESS inverters/transformers are understood to be the only significant noise producing elements of the combined Solar Facility and BESS Project. A 30kW diesel backup generator (installed on-site for the Solar Facility) was understood to not be a significant noise producing Project element due to its infrequent operation but was considered in this assessment to align with the Previous NIA. No other noise emitting elements were considered in this assessment.

To align with the Previous NIA, the same ten (10) receptors considered in the Previous NIA were assessed in this updated NIA, even though four (4) of them are located outside of the combined Solar Facility and BESS Project study area (1,500m of the combined Solar facility and BESS Project boundary). GCR also reviewed aerial imagery and identified one (1) additional receptor within the combined Solar Facility and BESS Project study area, for a total inclusion of eleven (11) receptors. These receptors are considered representative of the receptors expected to be the most impacted by any incremental noise related to the proposed BESS Project. The area was also reviewed for regulated third-party energy-related facilities that may produce noise within the vicinity of the combined Solar Facility and BESS Project.

A software model was used to predict sound levels from existing regulated facilities, approved third-party projects, and the combined Solar Facility and BESS Project to determine compliance of the BESS Project with the AUC Rule 012: *Noise Control* requirements. The cumulative sound levels of the combined Solar Facility and BESS Project were found to be below the night-time permissible sound levels (PSL) for all receptors; however, the compliance margin was found to be less than 3dB. Therefore, a detailed noise assessment was carried out as per the AUC Rule 012, Appendix 3 – Summary report, recommendations.

Where applicable, cumulative sound levels incorporated sound from: existing and approved regulated third-party energy-related facilities; the combined Solar Facility and BESS Project; and ambient sources.

[1] AUC Exhibit 27823-X0006: Michichi Solar Project – Noise Impact Assessment v2.0 Final (2021-07-14)

Cumulative sound levels at all receptors modelled in this NIA were assessed to be below PSLs by more than 1dB (i.e., compliance margin). Receptor R06 was assessed to be the most affected receptor from the combined Solar Facility and BESS Project, with night-time cumulative sound levels of 38.7 dB(A). Two of the assessed receptors showed an incremental increase in cumulative sound levels as compared to the Previous NIA, with the increase being attributable to the use of updated sound power data for the Solar Facility inverter/transformer stations, as well as the new addition of the proposed BESS Project.

A Low Frequency Noise (LFN) assessment determined that sound from the combined Solar Facility and BESS Project was not likely to produce any significant LFN effects.

Therefore, the combined Solar Facility and BESS Project is therefore assessed to meet the requirements of AUC Rule 012.

Table of Contents

1 Introduction

Michichi Solar LP (Michichi Solar) has constructed and is operating the 25-MW_{AC} Michichi Solar Facility (the Solar Facility). Green Cat Renewables Canada Corporation (GCR) prepared a Noise Impact Assessment (NIA) for the Solar Facility, which was submitted to the AUC as Exhibit 27823-X0006[2] in November 2022 (the Previous NIA). The Solar Facility is located within Starland County, Alberta, within the eastern half of section 23-29-20-W4M, approximately 1km north of the Town of Drumheller.

Michichi Solar have retained GCR to conduct a NIA for the proposed addition of Battery Energy Storage System (the BESS Project), to the operational Solar Facility, within the constructed fence line of the Solar Facility. This assessment has considered the cumulative impact of the existing Solar Facility and the BESS Project (collectively, the combined Solar Facility and BESS Project), as well as third-party energy related facilities on nearby receptors.

The combined Solar Facility and BESS Project location is shown in **Figure 1-1** below.

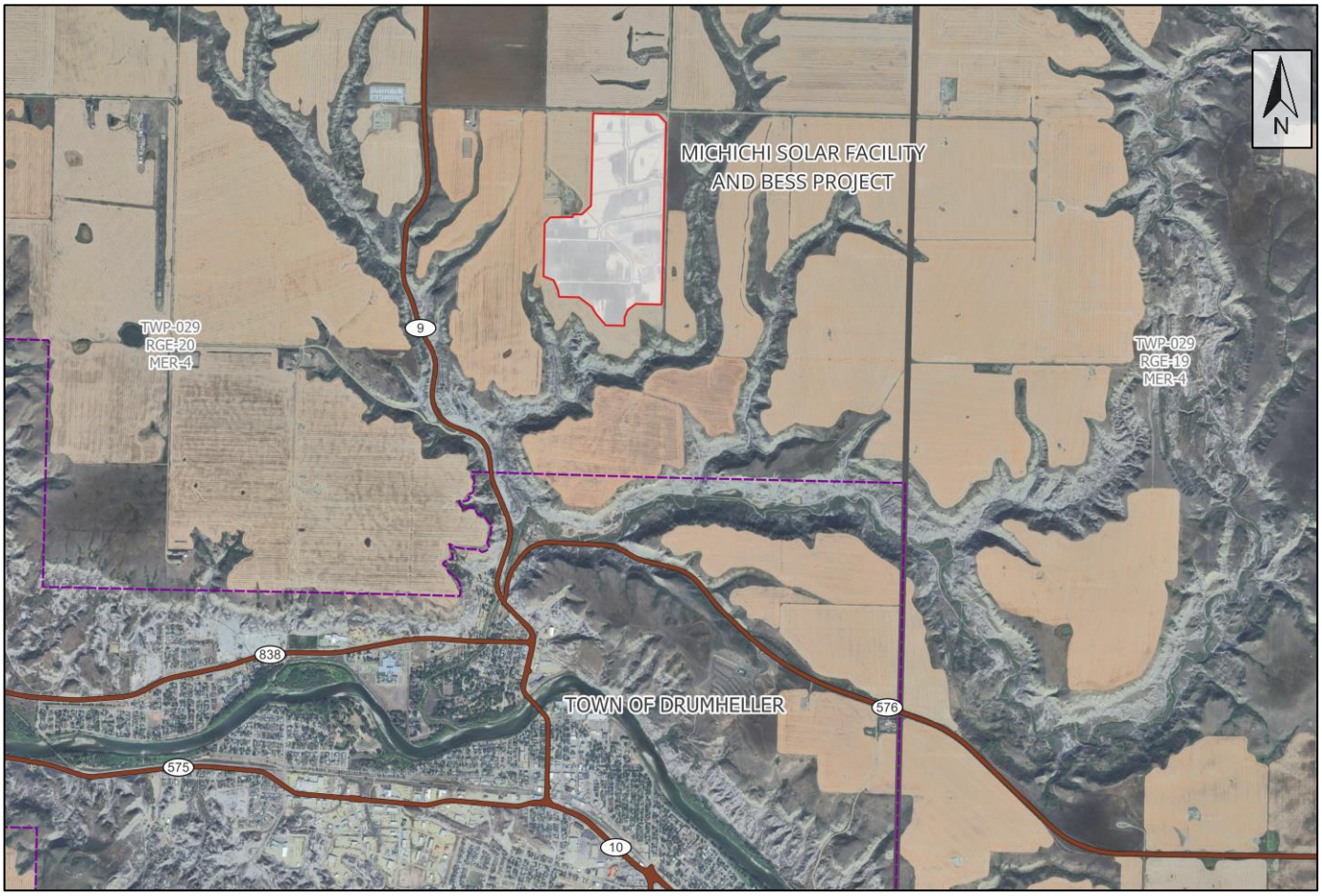


Figure 1-1 – Michichi Solar Facility and BESS Project Location

[2] AUC Exhibit 27823-X0006: Michichi Solar Project – Noise Impact Assessment v2.0 Final (2021-07-14)

2 Rule 012 Assessment Process

The assessment process follows Alberta Utilities Commission (AUC) Rule 012 guidelines. The International Standard 'ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors' was followed in the prediction of noise levels at nearby receptors. A glossary of relevant AUC Rule 012 terms is reproduced in Appendix A.

The following steps give an overview of the process followed in identifying potential noise impacts on the most affected receptors.

- Define study area (distance contour at site boundary + 3km).
- Identify active and approved third-party regulated energy-related facilities (AUC or Alberta Energy Regulator (AER)) within the study area.
- Identify noise receptor(s) within 1.5km of the site boundary, or along the 1.5km boundary criteria (where no noise receptors exist).

For each noise receptor:

- Determine Basic Sound Level (BSL) and Ambient Sound Level (ASL)
- Calculate Permissible Sound Levels (PSLs)
- Predict the sound level from existing and approved third-party regulated energy-related facilities
- Combine facility and Ambient Sound Levels to give baseline sound levels
    - If baseline sound levels exceed PSLs or if facility sound level data is not available, then the baseline sound level may be set such that it is equivalent to (and therefore compliant with) the PSLs.
- Predict sound level from the proposed Project
- Assess for Low Frequency Noise (LFN) content due to the proposed Project
- Calculate Cumulative Sound Levels
- Assess compliance with AUC Rule 012 requirements.
    - In the case where baseline sound levels have been set to PSLs, cumulative sound levels are assessed against a 'no net increase' criterion.

3 Noise Model

All noise propagation calculations were performed using iNoise from DGMR Software (version Enterprise 2024.1). This is quality assured software with full support of ISO/TR 17534-3, which provides recommendations to ensure uniformity in the interpretation of the ISO 9613 method.

DGMR provide the following information on the function of ISO/TR 17534-3[3]: '*The CNOSSOS-EU and ISO 9613 standard are among the most used noise prediction method worldwide. Many countries refer to these standards in their noise legislation. However the standards do not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534. This quality standard gives clear recommendations for interpreting the methods. iNoise fully supports these recommendations. The models and results for the test cases are included in the software...'.*

3.1 Model Parameters

Summer-time climatic conditions were assumed as required by Rule 012. Table 3-1 shows the modelling parameters that were adopted for all calculations.

Table 3-1 – Model Parameters

Modelling Parameter	Setting
Terrain of Site Area	Height contours interpolated at 3m[4]
Barrier Effects Included	None
Temperature	10°C
Relative Humidity	70%
Wind	1 – 5ms^{-1} from facility to receptor as per ISO-9613
Ground Attenuation	0.5 (default throughout the study area) 0.0 (for waterbodies)
Number of Sound Reflections	1
Receptor Heights	1.5m for one-storey / 4.5m for two-storey
Operation Condition	Full load
Source Height	2.3m for Inverter/Transformer Stations 2.3m for BESS Units 1.1m for BESS Transformers 2.0m for BESS Inverters 1.0m for Diesel Generator

[3] https://dgmrsoftware.com/products/inoise/
[4] Data obtained from AltaLIS.

4 Baseline

4.1 Study Area

The combined Solar Facility and BESS Project site has a total fenced area of approximately 194 acres. The BESS Project is located on less than 1 acre of this total site area. Therefore, the study area for the Solar Facility consists of all areas within 3km of the combined Solar Facility and BESS Project boundary. The study area for the combined Solar Facility and BESS Project includes several detached dwellings in the surrounding area, rural/agricultural land, waterbodies, and portions of Highways 9, 836, and 576.

Ten (10) receptors which were assessed in the Previous NIA, and one (1) additional receptor identified within 1.5km of the combined Solar Facility and BESS Project site boundary, were selected to assess potential noise impacts arising from the proposed BESS Project, for a total of eleven (11) receptors. These dwellings have been assessed for cumulative noise impacts from the combined Solar Facility and BESS Project, and other nearby facilities, as required by AUC Rule 012.

4.2 Project Description

The Solar Facility encompasses an area of approximately 194 acres of land consisting of approximately 62,075 PV modules, with a total generating capacity of 25.0 MW_{AC}. The solar arrays utilize ground mounted, single-axis tracker modules which feed eight (8) inverter/transformer stations. A 30kW diesel backup generator is also installed on-site, which was confirmed by Michichi Solar to only be operational during daytime periods under standard conditions.

The BESS Project will consist of eight (8) BESS units accompanied by eight (8) BESS inverters and four (4) BESS transformers, with a total BESS capacity of 10MW/20MWh. The combined Solar Facility and BESS Project also consists of several auxiliary switching station transformers, but these were not included in this assessment given their small size (<250 kVA) and their consequently negligible noise impact.

The aforementioned equipment are assessed to be the only significant sources of noise from the combined Solar Facility and BESS Project. As such, no other elements are considered in this assessment.

A list of all noise producing sources, along with their locations, for the combined Solar Facility and BESS Project provided in Appendix B.

Daytime periods are defined as occurring between 07:00-22:00, while night-time periods fall between 22:00-07:00. The combined Solar Facility and BESS Project will largely operate during the defined daytime hours; however, sunrise on the longest days of the year (during summer months) will occur at approximately 05:00, which falls within the night-time period. Therefore, the assessment considers both daytime and night-time operational impacts (i.e., operating 24/7).

4.3 Sensitive Receptors

To align with the Previous NIA, the same ten (10) receptors considered in the Previous NIA were assessed in this updated NIA, although four (4) of them are located outside of the combined Solar Facility and BESS Project study area (1,500m of the combined Solar facility and BESS Project boundary). GCR also reviewed aerial imagery and identified one (1) additional receptor within the combined Solar Facility and BESS Project study area, for a total inclusion of eleven (11) receptors. Receptors were modelled at heights of 1.5m and 4.5m to represent one-storey and two-storey dwellings, respectively, which aligns with the Previous NIA. These receptors are considered representative of the receptors expected to be the most impacted by the noise from the proposed Project and other nearby facilities. Table 4-1 shows the receptor details.

Table 4-1 – Receptor Details

Receptor ID	UTM Coordinates (NAD 83, Zone 12N)		Dwelling Type	Receptor Height (m)	Relative location from site boundary
	Easting	Northing			
R01	380684	5707064	Single-story	1.5m	790m W
R02	381792	5707501	Double-story	4.5m	360m N
R03	379487	5705530	Single-story	1.5m	1740m SW
R04	381037	5704341	Double-story	4.5m	1500m S
R05	381108	5704415	Double-story	4.5m	1400m S
R06	382149	5706887	Single-story	1.5m	200m E
R07	379623	5705539	Single-story	1.5m	1610m SW
R08	380498	5708381	Double-story	4.5m	1570m NW
R09	378483	5707064	Double-story	4.5m	2750m W
R10	382202	5708589	Double-story	4.5m	1480m N
R11[5]	381335	5704380	Double-story	4.5m	1380m S

4.4 Existing Third-Party Regulated Energy-Related Facilities

A search for active and approved regulated energy-related facilities and pumping wells within 3km of the combined Solar Facility and BESS Project boundary was conducted in July 2024. The AER's Facilities list (ST102) and Wells list (ST037) were consulted for the AER regulated facilities and wells, and AUC eFiling portal was used to identify any existing and approved AUC regulated facilities. GCR identified fifty-two (52) AER regulated facilities and pumping wells, along with one (1) AUC regulated facilities, that were considered to have the potential to influence cumulative sound levels. No other existing or approved AUC regulated facilities have been identified within the assessment area.

[5] As R11 was not assessed in the Previous NIA, it was assumed to be a double-story dwelling with a receptor height of 4.5m as a conservative assumption.

Table 4-2 lists the third-party energy-related facilities identified within 3km of the combined Solar Facility and BESS Project that have the potential to influence cumulative sound levels.

Table 4-2 – Third-Party Sound Sources

Map Label	Name	Type	Operator Name	UTM Coordinates (NAD 83, Zone 12N)	
				Easting	Northing
AER01	Norcen Drum Unit #3 4-30	Crude Oil Multiwell Proration Battery	Bearspaw Petroleum Ltd.	383766	5707381
AER02	Bearspaw East Drumheller 4-30	Gas Plant Sweet	Bearspaw Petroleum Ltd.	383890	5707379
AER03	Husky Oil Operations Limited	Compressor Station	Pine Cliff Energy Ltd.	383780	5709478
AER04	Cansup 10-12-029-20 Comp Unit# 14	Compressor Station	Prairie Provident Resources Canada Ltd.	382881	5703304
AER05	Bearspaw 13-15-29-20 W4m Gas Goup	Gas Multiwell Group Battery	Bearspaw Petroleum Ltd.	378884	5705454
AER06	Sheerness 09-29-29-20 W4	Crude Oil Single-Well Battery	North 40 Resources Ltd.	378917	5708557
AER07	Bearspaw Drum Oil Battery	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	384783	5705417
AER08	Drum 104/10-19-029-19 W4m03 Oil Batt	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	384568	5706519
AER09	Bearspaw Drum 8-26	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	381919	5707918
AER10	Drum 102/14-19-029-19 W4m02 Oil Batt	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	384376	5706924
AER11	Stellarton Energy 10-35-29-20-4	Gas Single-Well Battery	Long Run Exploration Ltd.	381279	5709946
AER12	Bearspaw East Drum 10-15-29-20 W4m	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	379551	5705070
AER13	Drum 100/10-30-029-19 W4m00 Oil Batt	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	384510	5708268
AER14	Renaissance Drum 7-15	Crude Oil Single-Well Battery	Torxen Energy Ltd.	379674	5704636
AER15	Drum 100/14-30-029-19 W4m00 Oil Batt	Crude Oil Single-Well Battery	Bearspaw Petroleum Ltd.	384247	5708529
AER16	Bearspaw Drumheller 4-30	Gas Multiwell Group Battery	Bearspaw Petroleum Ltd.	383816	5707328
AER17	Drumheller 04/10-19-29-19w4	Gas Test Battery	Bearspaw Petroleum Ltd.	384598	5706490
AER18	Drumheller 02/02-19-29-19w4	Gas Test Battery	Bearspaw Petroleum Ltd.	384578	5705687
AER19	Strike Drumheller 10-12	Gas Multiwell Group Battery	Prairie Provident Resources Canada Ltd.	382898	5703288
AER20	Bearspaw Drumheller Sweet Ggs	Gas Gathering System	Bearspaw Petroleum Ltd.	383816	5707328

Map Label	Name	Type	Operator Name	UTM Coordinates (NAD 83, Zone 12N)	
				Easting	Northing
AER21	Norcen Drumheller	Disposal	Bearspaw Petroleum Ltd.	383797	5706505
AER22	Munson	Field Meter Station	NOVA Gas Transmission Ltd.	383440	5709348
AER23	Munson #2	Field Meter Station	NOVA Gas Transmission Ltd.	383440	5709348
AER24	BEARSPAW ET AL DRUM 6-19-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384241	5706137
AER25	TXNE WAYNE 7-15-29-20	Pumping Well	Torxen Energy Ltd.(A7NW)	379674	5704636
AER26	BEARSPAW ET AL DRUM 10-30-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384510	5708268
AER27	BEARSPAW ET AL DRUM 14-24-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382731	5707072
AER28	BEARSPAW ET AL DRUM 12-18-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	383613	5704938
AER29	BEARSPAW ET AL DRUM 16-15-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	380213	5705555
AER30	BEARSPAW ET AL DRUM 10-15-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	379551	5705070
AER31	BEARSPAW ET AL DRUM 6-18-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	383963	5704680
AER32	BEARSPAW ET AL DRUM 9-26-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	381690	5708284
AER33	BEARSPAW ET AL DRUM 15-24-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382869	5707067
AER34	BEARSPAW ET AL DRUM 14-13-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382567	5705391
AER35	BEARSPAW DRUM 7-25-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382844	5707914
AER36	BEARSPAW ET AL 102 DRUM 6-25-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382447	5707877
AER37	BEARSPAW ET AL DRUM 5-25-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382401	5707909
AER38	BEARSPAW ET AL DRUM 14-19-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384376	5706924
AER39	BEARSPAW ET AL DRUM 7-30-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384662	5707660

Map Label	Name	Type	Operator Name	UTM Coordinates (NAD 83, Zone 12N)	
				Easting	Northing
AER40	BEARSPAW ET AL DRUM 9-25-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	383514	5707990
AER41	BEARSPAW ET AL 102 DRUM 2-24-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	383044	5705687
AER42	BEARSPAW 102 DRUM 2-36-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382935	5708874
AER43	BEARSPAW ETAL 02 DRUM 3-36-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382722	5708860
AER44	BEARSPAW DRUMHELLER 3-18-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384198	5704137
AER45	BEARSPAW DRUM 8-26-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	381919	5707918
AER46	BEARSPAW ET AL DRUM 10-24-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382827	5706655
AER47	BEARSPAW DRUMHELLER 3-35-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	381158	5708826
AER48	BEARSPAW 103 DRUM 10-19-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384568	5706519
AER49	BEARSPAW DRUM 13-30-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	383685	5708294
AER50	BEARSPAW 102 DRUM 2-19-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384772	5705427
AER51	BEARSPAW ET AL DRUM 11-24-29-20	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	382797	5706657
AER52	BEARSPAW DRUM 13-17-29-19	Pumping Well	Bearspaw Petroleum Ltd.(0NL1)	384783	5705417
AUC1	Michichi Creek 802S	Substation	Atco Electric	380075	5707098

All third-party noise sources as well as the 1.5km and 3km study area boundaries are noted on **Figure 4-1**.

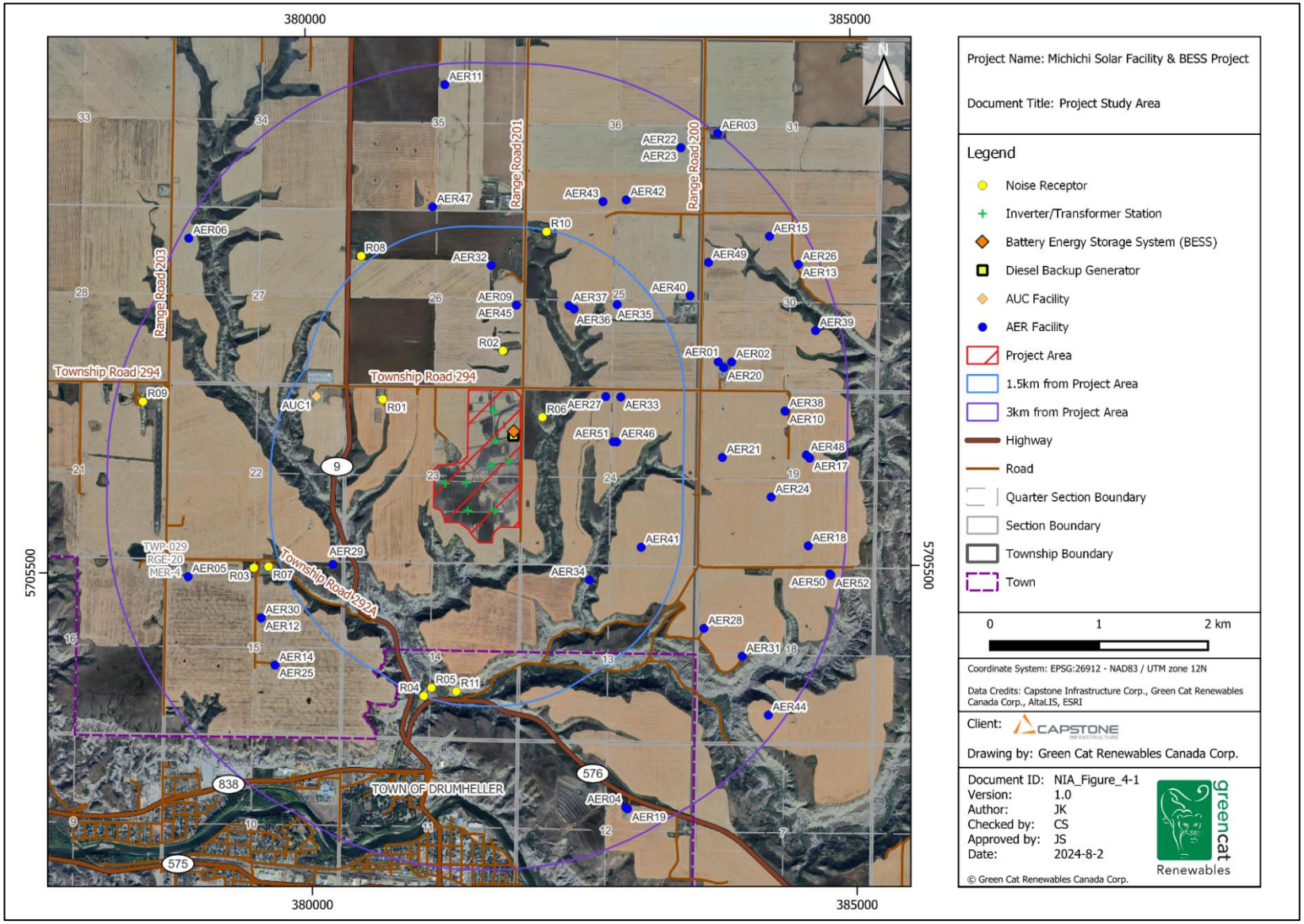


Figure 4-1 – Solar Facility and BESS Project Study Area

4.5 Baseline Sound Levels

Baseline sound levels for each receptor should incorporate a contribution from all existing and approved AER and AUC facilities with the addition of the Ambient Sound Level (ASL). ASL is determined from the Basic Sound Level (BSL).

4.5.1 Determination of Basic Sound Level (BSL)

Rule 012 criteria for the determination of BSL include: dwelling density; road and rail traffic noise; and aircraft flyovers. In this case, road and traffic noise are the determining factors. Criteria are given in Table 4-3.

Table 4-3 – Rule 012 Criteria for determination of Basic Sound Levels (BSL)

Proximity to transportation	Dwelling density per quarter section of land		
	(1) 1 to 8 dwellings; 22:00 - 07:00 (night-time) (dBA Leq)	(2) 9 to 160 dwellings; 22:00 - 07:00 (night-time) (dBA Leq)	(3) >160 dwellings; 22:00 - 07:00 (night-time) (dBA Leq)
Category 1[6]	40	43	46
Category 2[7]	45	48	51
Category 3[8]	50	53	56

The assessed receptors in the study area have been evaluated to determine their category for both dwelling density and proximity to transportation. Table 4-4 identifies the categories for the assessed receptors.

Traffic data collected for Highway 9 within the study area indicates a level of traffic flow that well exceeds the Rule 012 'Heavily Travelled Road' criteria of '90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year'. Therefore, receptors between 30m and 500m from this route have been assessed as category 2 for transportation. All receptors have been assessed as category 1 for dwelling density.

Traffic data for Highway 9 is provided in Appendix C.

4.5.2 Determination of Ambient Sound Level (ASL)

The combined Solar Facility and BESS Project is located in an area typical of rural Alberta (including agricultural and oil & gas industries). Rule 012 states that 'In the absence of measurement, the night-time ambient sound level is assumed to be five dB less than the basic sound level and the daytime ambient sound level is assumed to be five dB less than the basic sound level plus the daytime adjustment'.[9] This results in a night-time ASL between 35 dB(A) and 40 dB(A), and a daytime ASL between 45 dB(A) and 50 dB(A) for the assessed receptors. BSL and ASL for night-times and daytimes for each receptor are given in Table 4-4.

[6] Category 1—dwelling(s) distance is more than or equal to 500 metres (m) from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.
[7] Category 2—dwelling(s) distance is more than or equal to 30 m, but less than 500 m from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.
[8] Category 3—dwelling(s) distance is less than 30 m from heavily travelled roads, or rail lines or subject to frequent aircraft flyovers.
[9] The daytime ASL accounts for the addition of the standard 10db(A) daytime adjustment to the night-time ASL for the hours between 7 a.m. and 10 p.m., without any further adjustments, i.e., Class A, B, and C adjustments were not applied.

4.5.3 Determination of Permissible Sound Level (PSL)

For each receptor, the PSL is determined using Basic Sound Level (BSL) plus any allowed adjustments. In this case, as no special conditions exist, the PSL is determined as:

Night-Time (NT) Permissible Sound Level = Basic Sound Level

Daytime (DT) Permissible Sound Level = Basic Sound Level + Daytime Adjustment (10dB)

BSLs, ASL, and PSLs for night-times and daytimes and for each location are given in Table 4-4.

Table 4-4 – Daytime and Night-time BSL, ASL, and PSL

Receptor ID	Transportation Category	Dwelling Category	BSL	ASL		PSL	
			NT/DT	NT	DT	NT	DT
R01	2	1	45	40	50	45	55
R02	1	1	40	35	45	40	50
R03	1	1	40	35	45	40	50
R04	2	1	45	40	50	45	55
R05	2	1	45	40	50	45	55
R06	1	1	40	35	45	40	50
R07	1	1	40	35	45	40	50
R08	2	1	45	40	50	45	55
R09	1	1	40	35	45	40	50
R10	1	1	40	35	45	40	50
R11	2	1	45	40	50	45	55

4.5.4 AER Facility Sound Power Levels

Baseline sound levels include the noise contributions from existing adjacent sound sources and the ambient sound level assessed for the local environment. GCR identified fifty-two (52) AER regulated facilities and pumping well that were considered to have the potential to influence cumulative sound levels.

Sound power levels for all AER facilities and pumping wells were sourced from internal noise measurement databases and third-party NIAs that included measurements of similar facilities. The quoted sound power level is deemed typical and representative of the facility type.

AER22 and AER23 were identified in the AER database to be of facility type 'Field Meter Station'. In GCR's experience, the field meter station Is understood to not include any significant noise producing elements. Thus, AER22 and AER23 have been excluded from further assessment.

Table 4-5 shows the octave band sound power levels for the included AER regulated energy-related facilities and pumping wells within 3km of the combined Solar Facility and BESS Project.

Table 4-5 – Octave Band Sound Power Levels for AER Regulated Facilities

Map Label	Facility	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AER01	Norcen Drum Unit #3 4-30	52.0	60.5	72.4	71.9	67.7	65.9	64.3	62.9	60.0	94.3	76.9
AER02	Bearspaw East Drumheller 4-30	74.5	92.6	100.4	104.0	101.4	104.6	104.2	96.5	84.0	122.4	110.5
AER03	Husky Oil Operations Limited	65.8	82.4	89.7	95.9	99.2	98.5	101.9	93.7	90.1	113.2	105.9
AER04	Cansup 10-12-029-20 Comp Unit# 14	65.8	82.4	89.7	95.9	99.2	98.5	101.9	93.7	90.1	113.2	105.9
AER05	Bearspaw 13-15-29-20 W4m Gas Goup	72.9	82.2	86.7	90.2	93.5	95.4	95.2	89.6	81.8	114.4	100.7
AER06	Sheerness 09-29-29-20 W4	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER07	Bearspaw Drum Oil Battery	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER08	Drum 104/10-19-029-19 W4m03 Oil Batt	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER09	Bearspaw Drum 8-26	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER10	Drum 102/14-19-029-19 W4m02 Oil Batt	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER11	Stellarton Energy 10-35-29-20-4	65.5	72.0	79.2	85.0	92.0	87.6	87.2	86.8	79.0	106.8	95.6
AER12	Bearspaw East Drum 10-15-29-20 W4m	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER13	Drum 100/10-30-029-19 W4m00 Oil Batt	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1

Map Label	Facility	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AER14	Renaissance Drum 7-15	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER15	Drum 100/14-30-029-19 W4m00 Oil Batt	61.8	67.6	64.3	73.9	75.3	77.3	77.3	73.7	67.7	102.1	83.1
AER16	Bearspaw Drumheller 4-30	72.9	82.2	86.7	90.2	93.5	95.4	95.2	89.6	81.8	114.4	100.7
AER17	Drumheller 04/10-19-29-19w4	59.5	73.8	80.7	74.7	71.6	69.7	67.8	62.8	59.7	103.6	83.1
AER18	Drumheller 02/02-19-29-19w4	59.5	73.8	80.7	74.7	71.6	69.7	67.8	62.8	59.7	103.6	83.1
AER19	Strike Drumheller 10-12	72.9	82.2	86.7	90.2	93.5	95.4	95.2	89.6	81.8	114.4	100.7
AER20	Bearspaw Drumheller Sweet Ggs	68.8	76.9	78.0	77.5	80.6	78.9	76.1	71.8	67.6	109.5	86.3
AER21	Norcen Drumheller	50.6	58.7	62.9	71.7	79.4	80.3	76.1	68.6	56.0	92.6	84.2
AER22	Munson	--	--	--	--	--	--	--	--	--	--	--
AER23	Munson #2	--	--	--	--	--	--	--	--	--	--	--
AER24	BEARSPAW ET AL DRUM 6-19-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER25	TXNE WAYNE 7-15-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER26	BEARSPAW ET AL DRUM 10-30-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER27	BEARSPAW ET AL DRUM 14-24-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4

Map Label	Facility	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AER28	BEARSPAW ET AL DRUM 12-18-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER29	BEARSPAW ET AL DRUM 16-15-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER30	BEARSPAW ET AL DRUM 10-15-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER31	BEARSPAW ET AL DRUM 6-18-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER32	BEARSPAW ET AL DRUM 9-26-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER33	BEARSPAW ET AL DRUM 15-24-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER34	BEARSPAW ET AL DRUM 14-13-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER35	BEARSPAW DRUM 7-25-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER36	BEARSPAW ET AL 102 DRUM 6-25-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER37	BEARSPAW ET AL DRUM 5-25-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER38	BEARSPAW ET AL DRUM 14-19-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER39	BEARSPAW ET AL DRUM 7-30-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4

Map Label	Facility	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AER40	BEARSPAW ET AL DRUM 9-25-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER41	BEARSPAW ET AL 102 DRUM 2-24-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER42	BEARSPAW 102 DRUM 2-36-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER43	BEARSPAW ETAL 02 DRUM 3-36-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER44	BEARSPAW DRUMHELLER 3-18-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER45	BEARSPAW DRUM 8-26-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER46	BEARSPAW ET AL DRUM 10-24-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER47	BEARSPAW DRUMHELLER 3-35-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER48	BEARSPAW 103 DRUM 10-19-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER49	BEARSPAW DRUM 13-30-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER50	BEARSPAW 102 DRUM 2-19-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4
AER51	BEARSPAW ET AL DRUM 11-24-29-20	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4

Map Label	Facility	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AER52	BEARSPAW DRUM 13-17-29-19	68.0	74.0	77.7	79.2	82.8	86.3	86.6	85.0	82.8	108.5	92.4

4.5.5 AUC Facility Sound Power Levels

GCR identified one (1) AUC regulated energy-related facility within 3km of the combined Solar Facility and BESS Project boundary: The Michichi Creek 802S Substation, which consists of three High Voltage (HV) Transformers. The sound power levels for these transformers operating at Michichi Creek 802S Substation were sourced from a third-party NIA[10], and are shown in Table 4-6.

Table 4-6 – Octave Band Sound Power Levels for AUC Regulated Facility (MichichI Creek 802S Substation)[10]

Map Label	Facility/Equipment	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC1	Michichi Creek 802S Substation (Transformer 701T)[11]	50.9	70.1	82.2	84.7	90.1	87.3	83.5	78.3	69.2	102.3	93.7
AUC1	Michichi Creek 802S Substation (Transformer 702T)[11]	25.8	40.4	57.1	73.1	82.0	74.6	55.2	52.0	38.5	87.3	83.2
AUC1	Michichi Creek 802S Substation (Transformer 703T)[11]	26.2	43.7	67.5	75.8	86.9	80.4	54.2	49.5	38.0	92.2	88.1
AUC1	Michichi Creek 802S Substation (Transformer 701T Fans #1 and #2)[12]	44.4	56.6	65.7	70.2	70.6	70.8	65.0	60.8	52.7	88.4	76.3
AUC1	Michichi Creek 802S Substation (Transformer 701T Fans #3 - #8)[12]	-36.3	61.4	70.5	75.0	75.4	75.6	69.8	65.6	57.5	91.4	81.1
AUC1	Michichi Creek 802S Substation (Transformer 702T Fans)[12]	46.9	60.1	69.8	77.9	83.3	81.8	76.7	69.1	62.2	93.7	87.0

[10] ATCO Electric 802S Michichi Creek Bundle NIA (Motive Acoustics, May 2022)
[11] For the transformers, the loudest reported octave band data for a given side was used to model the transformer as an omni-directional point source, as a conservative assumption.
[12] For the transformer fans, provided sound power levels for a single fan were logarithmically summed to match the quantity of fans specified in the NIA.

Map Label	Facility/Equipment	Octave Band Centre Frequency, Hz								Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC1	Michichi Creek 802S Substation (Transformer 703T Fans)[12]	53.2	53.1	65.2	71.8	78.5	76.4	74.4	69.8	63.8	93.8	82.4

4.6 Modelling Results

Table 4-7 shows the predicted sound levels at each receptor from both AER and AUC regulated facilities and pumping wells included in this assessment. For the purposes of this assessment, all noise producing AER and AUC facilities were deemed to operate at full load and produce noise continuously.

Table 4-7 – Predicted Sound Levels from Existing Third-Party Regulated Facilities

Receptor ID	AUC Regulated Facilities		AER Regulated Facilities		Total Regulated Facilities	
	NT	DT	NT	DT	NT	DT
R01	26	26	23.5	23.5	27.9	27.9
R02	11.7	11.7	32	32	32.0	32.0
R03	14.2	14.2	33.6	33.6	33.6	33.6
R04	5.3	5.3	20.3	20.3	20.4	20.4
R05	5.5	5.5	21.5	21.5	21.6	21.6
R06	9.6	9.6	30.5	30.5	30.5	30.5
R07	14.6	14.6	32.4	32.4	32.5	32.5
R08	14.9	14.9	24.9	24.9	25.3	25.3
R09	16.6	16.6	18.3	18.3	20.5	20.5
R10	6.5	6.5	31.5	31.5	31.5	31.5
R11	--	--	22.2	22.2	22.2	22.2

4.7 Total Baseline Sound Levels

Baseline sound levels include the noise contributions from existing adjacent sound sources and the ambient sound level assessed for the local environment. Table 4-8 shows the cumulative baseline sound levels for night-time (NT) and daytime (DT) periods.

Table 4-8 – Cumulative Baseline Sound Levels for Night-time and Daytime Periods

Receptor ID	Total Regulated Facilities		ASL		Baseline	
	NT	DT	NT	DT	NT	DT
R01	27.9	27.9	40	50	40.3	50.0
R02	32.0	32.0	35	45	36.8	45.2
R03	33.6	33.6	35	45	37.4	45.3
R04	20.4	20.4	40	50	40.0	50.0
R05	21.6	21.6	40	50	40.1	50.0
R06	30.5	30.5	35	45	36.3	45.2
R07	32.5	32.5	35	45	36.9	45.2
R08	25.3	25.3	40	50	40.1	50.0
R09	20.5	20.5	35	45	35.2	45.0
R10	31.5	31.5	35	45	36.6	45.2
R11	22.2	22.2	40	50	40.1	50.0

Supplemental noise source information for each receptor is provided in Appendix D.

5 Solar Facility & BESS Project Sound Levels

The operational Solar Facility consists of solar PV arrays using ground mounted, single-axis trackers. The solar arrays are connected to eight (8) inverter/transformer stations, with a total generating capacity of up to 25.0 MW_{AC}. The BESS Project will consist of eight (8) BESS units accompanied by eight (8) BESS inverters and four (4) BESS transformers, with a total BESS capacity of 10MW/20MWh. A 30kW diesel backup generator is installed on-site for the Solar Facility, which was confirmed by Michichi Solar to only be operational during daytime periods under standard conditions. The combined Solar Facility and BESS Project also consists of several auxiliary switching station transformers, but these were not included in this assessment given their small size (<250 kVA) and their consequently negligible noise impact.

The diesel backup generator runs on a scheduled reliability test cycle for a minimum of 20 minutes, once per month under standard operating conditions. This test cycle was confirmed by Michichi Solar to be programmed to run during daytime hours only. Due to the infrequent operation of the diesel backup generator, it is not considered to be a significant noise producing Project element. However, to align with the Previous NIA, the diesel backup generator has been included in this noise assessment, with an assumed continuous operation during daytime hours. This represents a highly conservative assumption for the infrequent operating behaviour of the diesel backup generator.

For the purposes of the noise assessment, it has been assessed that the only significant noise producing elements of the combined Solar Facility and BESS Project are the inverters/transformer stations, BESS units, BESS inverters, and BESS transformers. The diesel backup generator (for the Solar Facility) is not considered to be a significant noise producing Project element but was included in this assessment to align with the previous NIA. All noise producing sources were modelled as omni-directional point sources.

In general, each single-axis tracker is expected to be quieter than the inverter/transformer stations. The single-axis trackers will operate asynchronously across the site for a few seconds every few minutes to adjust the tilt angle of the modules (adjustment frequency is dependent on time of year). Due to the trackers' infrequent and asynchronous operation, and their uniform distribution across solar sites, it was assessed that they would have limited potential to contribute to overall project sound levels and would not be considered significant noise producing Project elements. The sound power level data for the significant noise producing Project elements was used to model sound emissions for both daytime and night-time periods. The combined Solar Facility and BESS Project elements were assumed to operate at full load, which is an inherently conservative modelling approach for night-time periods at a solar farm.

5.1 Solar Facility

5.1.1 Inverter/Transformer Stations

The inverter/transformer stations for the approved and constructed PV electricity generating facility are the Sungrow SG3600UD units. An assessment of the sound power levels for these units was conducted using the manufacturer's noise test report. The sound data measurements for these inverters provided by the equipment manufacturer are shown in Appendix E.[13]

Table 5-1 shows the linear, 'A', and 'C' frequency weighted octave band sound power spectra derived for the Sungrow SG3600UD inverter/transformers.

[13] The manufacturer issued updated sound power levels for the Sungrow SG3600 units after the Previous NIA was conducted. The updated levels used in this assessment are notably higher than those in the Previous NIA.

Table 5-1 – Octave Band Sound Power Levels for Sungrow SG3600UD Inverter/Transformer units

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
31.5	91.0	51.2	87.6
63	91.0	65.4	90.8
125	92.0	76.5	92.4
250	93.0	83.0	91.6
500	97.0	93.4	96.6
1000	88.0	87.6	87.6
2000	87.0	87.8	86.4
4000	83.0	83.6	81.8
8000	80.0	78.5	76.6
Sum	**100.9**	**95.9**	**100.5**

A site visit was conducted by GCR staff in May 2024 to take field measurements of operational Sungrow SG3600UD units on-site at a similar operating solar PV electricity generating plant (Kneehill Solar Facility[14]). The aim of the measurements was to verify the data presented in Table 5-1. On-site measurements were conducted at a distance of 1m from opposite ends of the skid, on the side closest to the inverter and on the side closest to the transformer. The measurement locations aligned spatially with those specified in the manufacturer's noise test report. Field measurements were conducted while the inverter was operating at full load.

Table 5-2 compares the measured data to the sound pressure levels provided in the manufacturer's noise test report at the corresponding measurement locations.

Table 5-2 – Comparison of Field-Measured Sound Pressure Levels of SG3600UD Unit Operating at Full Load

Location	Source	Total dB(A)
Inverter Side	GCR Field Measurement – Inverter Side	80.3
	Sungrow Test Report – Measurement #10 (Inverter Side)	79.6
	Difference	**0.7**
Transformer Side	GCR Field Measurement – Transformer Side	59.7
	Sungrow Test Report – Measurement #7 (Transformer Side)	58.8
	Difference	**0.9**

[14] Power Plant Approval 27824-D02-2022, Kneehill Solar Generation Facility, December 20, 2022

Field measurements indicated that the operation of the installed inverter/transformer stations closely aligned with the manufacturer's noise test report; within 1dB(A) of the reported broadband A-weighted sound pressure levels at the corresponding measurement locations. Considering the difference in measurement distance (GCR measured at a distance of 1m, which is closer than the 1.25m reported in the manufacturer test report), differing ambient conditions at the time of measurement, and the difference in the devices used for the measurements, the discrepancies between the measured and reported sound pressure levels are considered marginal. Therefore, it is concluded that the sound data presented in the manufacturer's test report for the Sungrow SG3600UD inverters is representative of real-world conditions and is valid for use in this assessment.

5.1.2 Diesel Backup Generator

The approved and constructed Solar Facility also includes an on-site 30kW diesel backup generator which was confirmed by Michichi Solar to be only operational during daytime periods under standard conditions. Under standard operation, the generator completes a reliability test cycle during daytime hours once per month, lasting for a minimum of 20 minutes. During unplanned outages, the backup generator may be required to operate during night-time.

Octave band sound power data was not provided for the diesel generator. In the absence of this data, sound spectra for a 30kW propane generator were provided by Michichi Solar, which report an A-weighted sound pressure level of 62.1 dB(A) measured at 7m and an A-weighted sound power level of 89.7 dB(A). Both generator types feature a sound attenuated level 2 enclosure.

Michichi Solar confirmed that the equivalent diesel generator would have sound pressure levels of up to 13 dB(A) greater than those reported for the propane generator. Thus, a linear adjustment of 13 dB(A) was applied to the propane generator sound power octave band spectrum to derive a reasonable estimation of the sound spectra for the diesel generator. The resultant broadband sound power level for the selected diesel generator is 102.7 dB(A).

The noise data of a 30kW propane generator provided to GCR can be found in Appendix F.

Table 5-3 shows the linear, 'A', and 'C' frequency weighted octave band sound power spectra derived for the 30kW diesel backup generator.

Table 5-3 – Octave Band Sound Power Levels for the 30kW Diesel Backup Generator

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
31.5	104.4	65.0	101.4
63	114.4	88.2	113.6
125	105.7	89.6	105.5
250	107.3	98.7	107.3
500	98.8	95.6	98.8
1000	94.0	94.0	94.0
2000	90.3	91.5	90.1
4000	90.6	91.6	89.8
8000	90.3	89.2	87.3
Sum	**116.1**	**102.7**	**115.4**

5.2 BESS Project

5.2.1 Energy Storage Battery Racks

The proposed battery energy storage units are the CanadianSolar Solbank S-2967-2h units. The primary source of noise arising from the units will be from the cooling fans. For the purpose of this assessment, it has been assumed that the cooling fans will operate at full load during all night-time and daytime hours.

The sound pressure levels (SPL) for the Solbank S-2967-2h units were provided by the manufacturer[15], which included broadband values measured at points around the battery container as well as octave band spectra data measured on the front side of the battery container, all measured at a distance of 1m. A weighted sound pressure level of 63.5 dB(A) was obtained from logarithmically averaging all 15 broadband measurements, and an adjusted octave band spectra was obtained by applying the difference between the front side SPL and omni-directional SPL to the given octave band spectra. A measurement surface area correction was then applied to the adjusted octave band spectra to derive the modelled sound power level of 83.7 dB(A) for the selected BESS units.

5.2.2 BESS Inverters

The proposed inverters for the BESS are the EPCPower CAB1000 units. The noise test report provided includes the unweighted one-third octave band sound power level spectra, which was used in modelling the BESS inverters. The noise test report for these inverters is shown in Appendix G.

Table 5-4 shows the linear, 'A' and 'C' frequency weighted one third octave band sound power data for the selected BESS inverters.

Table 5-4 – One Third Octave Band Sound Power Levels for the EPCPower CAB1000 BESS Inverters

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
50	73.3	43.1	72
63	70	43.8	69.2
80	74.2	51.7	73.7
100	82.1	63	81.8
125	76.4	60.3	76.2
160	75.7	62.3	75.6
200	87.9	77	87.9
250	79	70.4	79
315	81.2	74.6	81.2
400	78.6	73.8	78.6
500	78	74.8	78
630	79.3	77.4	79.3

[15] 0.5P-0.67P_SolBank Noise Level Testing Report (Canadian Solar, 2023) (Confidential)

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
800	78	77.2	78
1000	77.5	77.5	77.5
1250	75.9	76.5	75.9
1600	73.4	74.4	73.3
2000	72.2	73.4	72
2500	75.7	77	75.4
3150	75.7	76.9	75.2
4000	67.5	68.5	66.7
5000	73.2	73.7	71.9
6300	74.5	74.4	72.5
8000	71.3	70.2	68.3
10000	69.3	66.8	64.9
Sum	**92.3**	**87.6**	**92.1**

5.2.3 BESS Transformers

The proposed medium-voltage (MV) transformers for the BESS are 3MVA each. Sound levels for the transformers accompanying the BESS units have not been specified by the manufacturer; however, sound levels produced by the 3MVA transformers are expected to be significantly lower in comparison to other noise producing project elements. Nevertheless, a typical transformer of a suitable type has been modelled. The BESS transformers have been modelled in Oil Natural Air Natural (ONAN) conditions.

The linear 'A' and 'C' frequency weighted octave band sound power spectra for the 3MVA BESS transformers is shown in Table 5-5.

Table 5-5 – Octave Band Sound Power Levels for the 3MVA BESS Transformers[16]

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
31.5	84.7	45.3	81.7
63	79.7	53.5	78.9
125	81.7	65.6	81.5
250	77.7	69.1	77.7
500	76.7	73.5	76.7
1000	65.7	65.7	65.7
2000	58.7	59.9	58.5
4000	53.7	54.7	52.9
8000	47.7	46.6	44.7
Sum	**88.1**	**75.9**	**86.7**

5.3 Modelling Results

Predicted sound levels for the combined Solar Facility and BESS Project are shown in Table 5-6. It is assumed that the on-site backup diesel generator runs during daytime hours only. Otherwise, all other equipment is assumed to be operational 24/7.

Table 5-6 – Predicted Project Case Sound Levels

Receptor ID	Project Sound Level, DT (dBA)	Project Sound Level, NT (dBA)
R01	27.6	25.7
R02	36.1	34.3
R03	22.1	21.2
R04	19.2	19.0
R05	16.7	16.5
R06	38.9	34.9
R07	22.9	21.9
R08	21.3	19.2
R09	19.2	18.3
R10	22.3	19.7
R11	6.4	5.6

[16] Based on theoretical prediction method (Crocker, 2007).

Receptor R06 is expected to be the receptor experiencing the highest Project sound levels, having a maximum sound pressure level of 38.9dB(A). The combined Solar Facility and BESS Project sound level contours for daytime and night-time are shown in Appendix H and Appendix I, respectively.

5.4 Low Frequency Assessment

Table 5-7 shows the difference between A and C weighted predicted sound levels at each of the receptors modelled. The results show that the C-weighted and A-weighted receptor levels have differences below the Rule 012 criterion of 20dB. This indicates that low frequency noise is not expected to be an issue.

Table 5-7 – Low Frequency Noise Assessment

Receptor ID	Predicted Sound Level (dBA)	Predicted Sound Level (dBC)	Difference dBC – dBA
R01	27.6	42.8	15.1
R02	36.1	51.0	14.9
R03	22.1	36.8	14.7
R04	19.2	31.4	12.2
R05	16.7	30.0	13.3
R06	38.9	54.1	15.2
R07	22.9	37.2	14.3
R08	21.3	37.7	16.3
R09	19.2	34.3	15.0
R10	22.3	38.8	16.5
R11	6.5	24.4	17.8

6 Cumulative Impact Assessment

The cumulative impact assessment incorporates sound level contributions from the baseline and combined Solar Facility and BESS Project case assessments. Compliance with AUC Rule 012 is determined through comparison of cumulative sound levels with PSLs. Table 6-1 shows the results of the cumulative impact and compliance assessment.

Table 6-1 – Cumulative Sound Level Assessment for Night-Time (NT) and Daytime (DT) Periods

Receptor ID	Baseline Sound Level (dBA)		Solar Facility & BESS Project Sound Level (dBA)		Cumulative Sound Level (dBA)		PSL (dBA)		PSL Compliance Margin (dB)	
	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT
R01	40.3	50.0	25.7	27.6	40.4	50.1	45	55	5	5
R02	36.8	45.2	34.3	36.1	38.7	45.7	40	50	1	4
R03	37.4	45.3	21.2	22.1	37.5	45.3	40	50	3	5
R04	40.0	50.0	19.0	19.2	40.1	50.0	45	55	5	5
R05	40.1	50.0	16.5	16.7	40.1	50.0	45	55	5	5
R06	36.3	45.2	34.9	38.9	38.7	46.1	40	50	1	4
R07	36.9	45.2	21.9	22.9	37.1	45.3	40	50	3	5
R08	40.1	50.0	19.2	21.3	40.2	50.0	45	55	5	5
R09	35.2	45.0	18.3	19.2	35.2	45.0	40	50	5	5
R10	36.6	45.2	19.7	22.3	36.7	45.2	40	50	3	5
R11	40.1	50.0	5.6	6.4	40.1	50.0	45	55	5	5

The cumulative sound levels at all assessed receptors are shown to be below their respective PSLs by a minimum margin of 1dB. R06 was assessed to be the most impacted receptor with the cumulative sound level of 38.7dB(A). Worst-case combined Solar Facility and BESS Project noise impacts are therefore assessed to be compliant with the requirements of AUC Rule 012.

Compared to the results presented in the Previous NIA, the maximum incremental increase in cumulative sound levels for the assessed receptors is 1.9dB(A) at R06. The increase at receptors within the predicted cumulative sound levels is attributable to the use of updated manufacturer sound power data for the inverter/transformer stations operating as part of the existing Solar Facility as well as the proposed addition of the BESS Project equipment. Updated baseline sound levels also contribute to the differences in cumulative sound levels between the Previous NIA and this assessment. Changes in baseline sound levels are primarily attributable to the updated internal noise measurement databases and third-party NIAs used to model the third-party energy related facilities in the study area. A comparison of cumulative sound levels between the Previous and current NIA is shown in Table 6-2. Note that receptor R11 was not included in the Previous NIA.

Table 6-2 – Cumulative Sound Level Comparison between Previous and Current Assessments for Night-Time (NT) and Daytime (DT) Periods

Receptor ID	Cumulative Sound Level, Previous Assessment (dBA)		Cumulative Sound Level, Current Assessment (dBA)		Difference in Cumulative Sound Level (dBA)	
	NT	DT	NT	DT	NT	DT
R01	41.0	50.1	40.4	50.1	-0.6	0.0
R02	38.4	45.5	38.7	45.7	0.3	0.2
R03	37.6	45.3	37.5	45.3	-0.1	0.0
R04	40.1	50.0	40.1	50.0	0.0	0.0
R05	40.1	50.0	40.1	50.0	0.0	0.0
R06	36.8	45.2	38.7	46.1	1.9	0.9
R07	37.3	45.3	37.1	45.3	-0.2	0.0
R08	40.4	50.0	40.2	50.0	-0.2	0.0
R09	35.6	45.1	35.2	45.0	-0.4	-0.1
R10	36.8	45.2	36.7	45.2	-0.1	0.0
R11	--	--	40.1	50.0	--	--

7 Conclusions

Ten (10) receptors which were assessed in the Previous NIA, and one (1) additional receptor identified within 1.5km of the Michichi Solar Facility and BESS Project site boundary, were selected to assess potential noise impacts arising from the proposed BESS Project. Worst-case sound power levels were used to model sound emissions from the combined Solar Facility and BESS Project during day and night periods.

While the BESS Project could operate at anytime within a 24hr period, the Solar Facility operates when the sun is out during daytime hours; however, AUC Rule 012 defines night-time hours to be from 22:00 to 07:00 all year long. Due to the sun rising prior to 07:00 during summer months, the Solar Facility operates during periods of the defined night-time period. Therefore, the assessment also considered worst-case (full load operation) noise emission levels 24 hours a day. In practice there are periods when the combined Solar Facility and BESS Project will operate in standby mode where sound emissions are much lower than the peak sound output levels assumed throughout this assessment. Based on the above, the current assessment is considered to be conservative.

Cumulative sound levels at all receptors considered in this NIA were assessed to be below PSLs by a minimum margin of 1dB. Receptor R06 was assessed to be the most affected receptor from the combined Solar Facility and BESS Project, with night-time cumulative sound levels of 38.7 dB(A), which represents a compliance margin of 1.3 dB(A) below the PSL of 40 dB(A). Compared to the results presented in the Previous NIA, the maximum increase in cumulative sound levels for the assessed receptors was 1.9 dB(A) at R06. This increase can be attributable to the updated sound power data for the inverter/transformer stations used to model the existing Solar Facility as well as the introduction of the new BESS Project equipment. A LFN assessment determined that sound from the proposed BESS Project is not expected to produce any significant LFN effects.

It is therefore concluded that the Michichi Solar Facility and BESS Project would operate in compliance with AUC Rule 012 requirements at all assessed receptors, aligning with the conclusion of the Previous NIA.

8 Acoustic Practitioners' Information

Table 8-1 summarizes the information of the author(s) and technical reviewer(s).

Table 8-1 – Summary of Practitioners' Information

Name	Joshua Kim	Justin Lee	Cameron Sutherland
Title	Renewable Energy E.I.T.	Renewable Energy E.I.T.	Technical Director
Role	• Author • Acoustic noise modelling	• Technical Reviewer • Acoustic noise modelling	• Technical Reviewer and Approver • Technical Assessment Lead
Experience	• Experience with acoustic modelling (iNoise & CadnaA) of renewable energy projects in Alberta. • Analyst on multiple noise assessments for renewable energy projects in Alberta (2023-Present).	• Experience with acoustic modelling (iNoise & CadnaA) of renewable energy projects in Alberta. • Analyst on multiple noise assessments for renewable energy projects in Alberta (2021-Present). • Current INCE associate.	• Acoustic and environmental consultancy (2005-Present). • Acoustics (IOA) diploma (2012). • Expert witness experience in wind turbine noise in the UK (2017/18). • Expert witness experience in technical solar development in Canada (2019-23).

Appendix A: Rule 012 Glossary

Ambient sound level (ASL)

The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The ambient sound level does not include noise from any energy-related facilities or from wind and must be determined without it. The average night-time ambient sound level in rural Alberta is 35 dBA. The ambient sound level can be measured when the sound level in an area is not believed to be represented by the basic sound levels in Table 1[17]. The ambient sound level must be determined under representative conditions and does not constitute absolute worst-case conditions (e.g., an unusually quiet day) but conditions that portray typical conditions for the area.

In the absence of measurement, the night-time ambient sound level is assumed to be 5 dBA less than the basic sound level and the daytime ambient sound level is assumed to be 5 dBA less than the basic sound level plus the daytime adjustment.

A-weighted sound level

The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear at levels typical of rural backgrounds in mid frequencies. Sound levels are denoted: dB(A).

Basic sound level (BSL)

The night-time A-weighted Leq sound level commonly observed to occur in the designated land-use categories with industrial presence and is assumed to be five dB(A) above the ambient sound level, as set out in Table 1 of Rule 012.

Comprehensive sound level

The comprehensive sound level includes ambient sound level, noise from existing facilities and energy-related facilities.

Cumulative sound level

The cumulative sound level includes the comprehensive sound level, noise from proposed facilities, energy-related facilities approved but not yet constructed, and the predicted noise from the applicant's proposed facility.

C-weighted sound level

The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dBA). The C-weighted sound level (e.g., measured with the C-weighting) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low-frequency content of complex sound environments.

Daytime

Defined as the hours from 7 a.m. to 10 p.m.

Daytime adjustment

An adjustment that allows a 10 dBA increase because daytime ambient sound levels are generally about 10 dBA higher than night-time values.

[17] Table 1. Basic sound levels (BSL) for night-time (AUC Rule 12, Page 5, http://www.auc.ab.ca/Shared%20Documents/Rules/Rule012.pdf)

Density per quarter section

Refers to a quarter section with the affected dwelling at the centre (a 451-metre radius). For quarter sections with various land uses or with mixed densities, the density chosen must be factored for the area under consideration.

Down wind

The wind direction from the noise source towards the receiver (± 45 degrees), measured at either dwelling height or source height. The 45 degrees requirement is consistent with the definition for downwind conditions, as included in ISO 9613-1996, Attenuation of Sound During Propagation Outdoors – Part 2: general method of calculation.

Dwelling

Any permanently or seasonally occupied structure used for habitation for the purpose of human rest; including a nursing home or hospital with the exception of an employee or worker residence, dormitory, or construction camp located within an energy-related industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling if it can be demonstrated that they are in regular and consistent use.

A permanent dwelling is a fixed residence occupied on a full-time basis.

The most impacted dwelling(s) are those subject to the highest average weighted sound level relative to the permissible sound level.

Energy equivalent sound level (Leq)

The Leq is the average weighted sound level over a specified period of time. It is a single-number representation of the cumulative acoustical energy measured over a time interval. The time interval used should be specified in brackets following the Leq—e.g., Leq (9 hours) is a nine-hour Leq.

Energy-related facility

A facility under the jurisdiction of the Commission or other regulatory agency, used for energy generation, transport (except by road or rail line) and resource extraction. These include mining, extraction, processing, and transportation (except by road or rail line) as well as federally regulated electrical transmission lines and pipelines.

Far field

The far field is that area far enough away from the noise source that the noise emissions can be treated as if they come from a single point or line source and the individual components of the noise source are not apparent as separate sources. This is typically at a distance of at least three to five times the major dimensions of the noise source, such as length, width, height, or diameter.

Heavily travelled road

Includes highways and any other road where 90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year. The following methods to validate the travel volume are acceptable:

Alberta Transportation's Average Annual Summer Daily Traffic (ASDT) value. If the ASDT is not available, the Alberta Transportation's Average Annual Daily Traffic (AADT) value can be used. In the case of using the ASDT or AADT, 10 per cent of the daily traffic volume can be assumed to be the night-time period traffic.

Linear weighting (or Z-weighting)

The sound level measured without any adjustment for the sensitivity of human hearing. It is a direct measure in decibels of the variation in air pressure and is often referred to as the "sound pressure level". This level is sometimes

called the "linear weighted level" or "the unweighted level," as it includes no frequency weighting beyond the tolerances and limits of the sound level meter being used for the measurements.

Low frequency noise

Where a clear tone is present below and including 250 Hz and the difference between the overall C-weighted sound level and the overall A-weighted sound level exceeds 20 dB.

Night-time

Defined as the hours from 10 p.m. to 7 a.m.

No net increase

The concept of no net increase in relation to noise impact assessments may arise when the sound added by an incremental project to the baseline sound level results in a negligible sound level increase.

In cases where an applicant is proposing development of a facility where it is not practical or efficient to characterize baseline sound levels, the applicant may assume baseline compliance with the permissible sound level and use no net increase to justify that the proposed facility will have a negligible impact on cumulative sound levels. However, the predicted cumulative sound level must not exceed the permissible sound level by more than 0.4 dB.

When baseline sound levels are predicted to exceed the permissible sound level by 0.4 dB or less, the applicant is required to assess compliance for its proposed facility by adding noise contribution from its proposed facility to baseline sound levels.

Noise

The unwanted portion of sound.

Permissible sound level (PSL)

The maximum daytime or nighttime sound level as determined in Table 1 at a point 15 m from the dwelling(s) in the direction of the facility. The permissible sound level is the sum of the basic sound level, daytime adjustment, Class A adjustments and Class B adjustment, or Class C adjustments.

Proposed facility

A proposed facility is a facility for which an application has been deemed complete by the Commission but is not yet approved or for which an approval has been issued, but is not yet constructed.

Sound power level

The decibel equivalent of the rate of energy (or power) emitted in the form of noise. The sound power level is an inherent property of a noise source.

Sound pressure level

The decibel equivalent of the pressure of sound waves at a specific location, which is measured with a microphone. Since human reaction and material behaviours vary with frequency, the sound pressure level may be measured using frequency bands or with an overall weighting scale such as the A-weighting system. The sound pressure level depends on the noise sources, as well as the location and environment of the measurement path.

Summertime conditions

Ground cover and temperatures that do not meet the definition for wintertime conditions. These can occur at any time of the year.

Tonal components

The test for the presence of tonal components consists of two parts. The first must demonstrate that the sound pressure level of any one of the slow-response, linear, one-third octave bands between 20 and 250 Hz is 10 dBA or more than the sound pressure level of at least one of the adjacent bands within two one-third octave bandwidths. In addition, there must be a minimum of a 5 dBA drop from the band containing the tone within two bandwidths on the opposite side.

The second part is that the tonal component must be a pronounced peak clearly obvious within the spectrum.

Wind speed

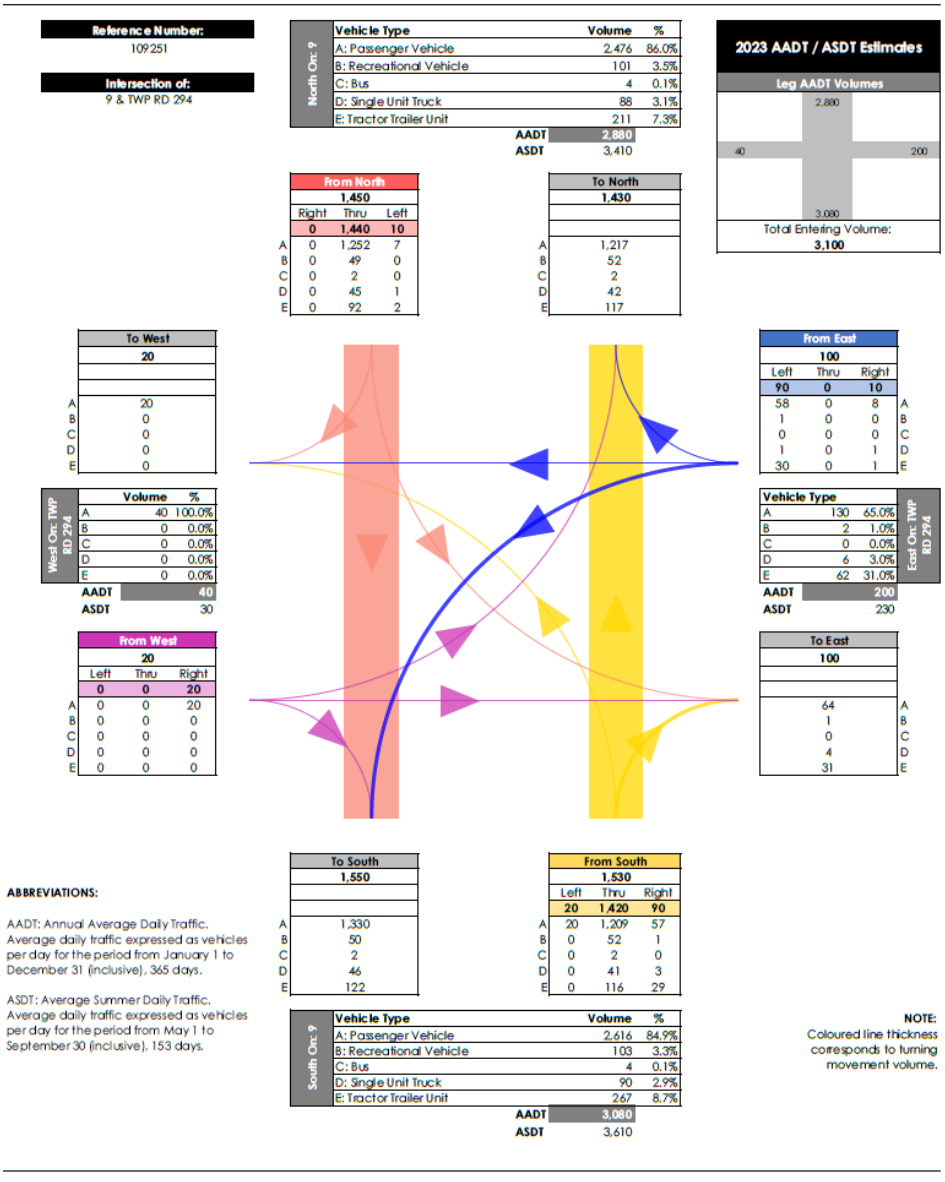
The speed of the wind, expressed in metres per second (m/s), measured in and averaged over 10-minute intervals at the same height as the microphone, but not more than 10 metres above ground level.

Appendix B: Locations of all Noise Producing Sources

Noise Source	UTM Coordinates (NAD83, Zone 12N)	
	Easting	Northing
Solar Facility – Inverter and Transformer Station #1	381702	5706955
Solar Facility – Inverter and Transformer Station #2	381714	5706680
Solar Facility – Inverter and Transformer Station #3	381833	5706481
Solar Facility – Inverter and Transformer Station #4	381670	5706453
Solar Facility – Inverter and Transformer Station #5	381251	5706288
Solar Facility – Inverter and Transformer Station #6	381446	5706290
Solar Facility – Inverter and Transformer Station #7	381455	5706040
Solar Facility – Inverter and Transformer Station #8	381703	5706034
Solar Facility – Diesel Backup Generator	381880	5706723
BESS Unit #1	381864	5706765
BESS Unit #2	381866	5706765
BESS Unit #3	381876	5706765
BESS Unit #4	381879	5706765
BESS Unit #5	381889	5706765
BESS Unit #6	381891	5706764
BESS Unit #7	381901	5706764
BESS Unit #8	381904	5706764
BESS Transformer and Inverter Skid #1	381865	5706758
BESS Transformer and Inverter Skid #2	381878	5706757
BESS Transformer and Inverter Skid #3	381890	5706757
BESS Transformer and Inverter Skid #4	381903	5706757

Appendix C: Alberta Traffic Volume History

The following chart[18] shows the relevant section of the traffic volume history for the intersection of Highway 9 and Township Road 294 in the proximity of the site. Using the '10% of ASDT' calculation to determine whether the highway is a 'Heavily Travelled Road', the available data shows that the Rule 012 criteria of '90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year' is exceeded for vehicles travelling both north and south on Highway 9.



[18] https://www.transportation.alberta.ca/mapping/2023/TM/00109251.pdf

Appendix D: Supplemental Noise Source Information

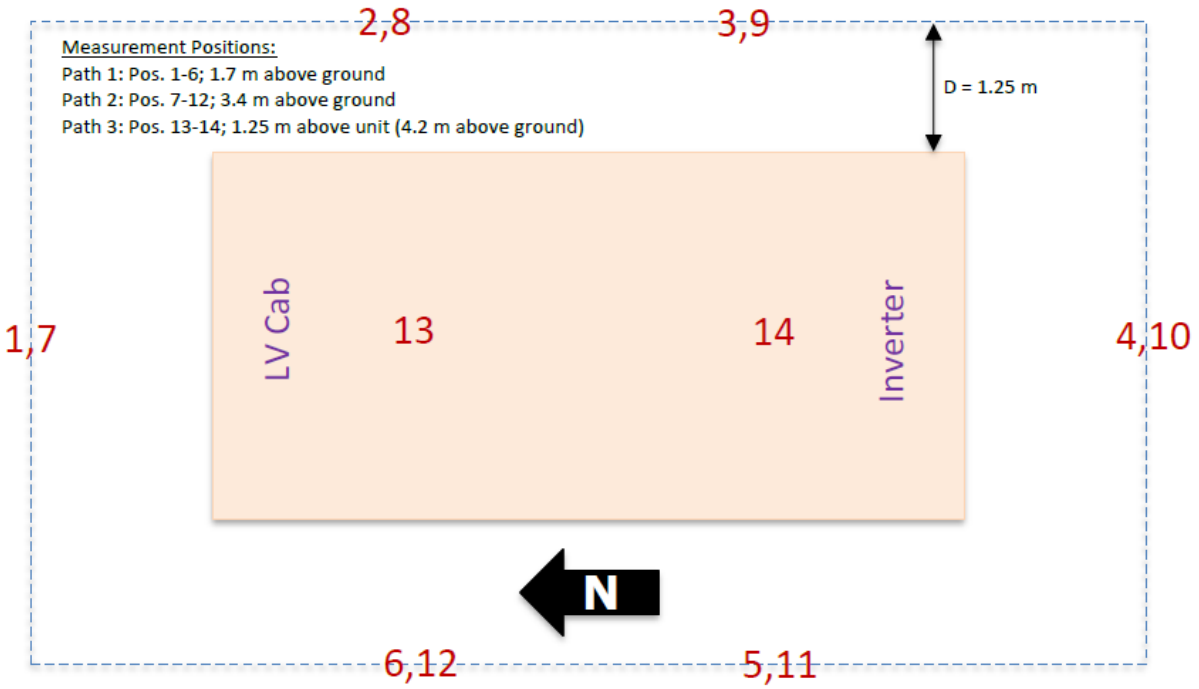
Receptor ID	Project		Third-Party	
	Nearest Significant Project Noise Source	Distance to Nearest Significant Project Noise Source	Nearest Third-Party Facility Noise Source	Distance to Nearest Third-Party Facility Noise Source
R01	Inverter/Transformer Station	1020m E	AUC1	610m W
R02	Inverter/Transformer Station	550m S	AER9/AER45	440m N
R03	Inverter/Transformer Station	1920m NE	AER12/AER30	460m S
R04	Inverter/Transformer Station	1750m NE	AER14/AER25	1390m W
R05	Inverter/Transformer Station	1660m NE	AER29	1450m NW
R06	BESS Unit	270m SW	AER27	610m NE
R07	Inverter/Transformer Station	1790m NE	AER12/AER30	480m S
R08	Inverter/Transformer Station	1870m SE	AER11	800m NE
R09	Inverter/Transformer Station	2880m SE	AUC1	1590m E
R10	Inverter/Transformer Station	1710m SW	AER43	590m NE
R11	Inverter/Transformer Station	1660m N	AER34	1590m NE

Appendix E: Sungrow SG3600UD Noise Test Report Data

Table 1. Sound Measurement Data, dB

Position	Octave Band Center Frequency, Hz									dBA	dBZ
	31.5	63	125	250	500	1000	2000	4000	8000		
1	69	68	68	67	68	63	62	57	52	69.2	75.6
2	66	67	68	67	67	63	63	57	51	68.9	74.6
3	69	68	70	71	75	66	64	62	58	74.3	79.0
4	71	71	74	71	78	71	71	66	64	78.0	81.8
5	69	68	70	71	76	66	63	60	59	74.3	79.2
6	66	67	65	66	69	62	60	56	51	68.7	74.2
7	61	64	64	58	58	54	45	40	35	58.7	69.0
8	65	68	71	65	66	64	59	56	50	68.2	75.2
9	69	69	69	72	75	65	66	61	55	74.0	79.0
10	70	73	74	71	81	71	68	67	62	78.6	83.3
11	69	69	72	72	73	67	65	60	55	73.6	79.0
12	67	68	67	66	70	63	62	58	52	69.9	75.3
13	64	68	68	65	71	60	56	51	47	68.5	74.9
14	69	71	73	71	74	64	63	57	51	72.4	79.2
Average	**68**	**69**	**71**	**69**	**74**	**66**	**64**	**61**	**57**	**73.3**	**78.4**
L_W	**91**	**92**	**93**	**92**	**97**	**88**	**87**	**83**	**80**	**95.9**	**100.9**

Figure 2. Measurement Positions, Overhead View



Appendix F: Propane Generator (30kW) Sound Data

Sound Pressure Level @ 7 meters, dB(A)

See notes 1-6 listed below

Configuration		Position (note 1)								8 Position Average
		1	2	3	4	5	6	7	8	
Standard – unhoused	Infinite Exhaust	77.3	74.7	73.5	74.3	70.8	74.3	74.0	73.4	74.4
F231-2 – sound attenuated level 1	Mounted	69.1	66.3	62.9	61.9	59.6	61.5	60.5	67.1	64.9
F217-2 – sound attenuated level 2	Mounted	61.9	63.7	61.9	62.3	60.7	61.2	59.9	63.8	62.1

Sound Power Level, dB(A)

See notes 2-4, 7, 8 listed below

Configuration		Octave band center frequency (Hz)										Overall Sound Power Level
		31.5	63	125	250	500	1000	2000	4000	8000	16000	
F231-2 – sound attenuated level 1	Mounted	50.9	75.3	75.5	85.7	83.3	82.4	80.9	85.6	77.9	67.5	91.4
F217-2 – sound attenuated level 2	Mounted	52	75.2	76.6	85.7	82.6	81	78.5	78.6	76.2	66.3	89.7

Exhaust Sound Power Level, dB(A)

See notes 2, 9 listed below

Open Exhaust (no muffler) @ rated load	Octave band center frequency (Hz)										Overall Sound Power Level
	31.5	63	125	250	500	1000	2000	4000	8000	16000	
	37.0	78.9	91.8	102.5	99.9	103.8	104.6	99.3	98.3	91.0	109.9

Note:

1. Position 1 faces the generator front per ISO 8528-10. The positions proceed around the generator set in a counter-clockwise direction in 45° increments. All position are at 7 m (23 ft) from surface of the generator set and 1.2 m (48 in.) from floor level.
2. Sound levels are subject to instrumentation, measurement, installation and manufacturing variability.
3. Data based on full rated load.
4. Sound data with generator sets with infinite exhaust do not include exhaust noise.
5. Sound pressure levels are measured per ANSI S1.13 and ANSI S12.18, as applicable.
6. Reference sound pressure is 20 µPa.
7. Sound power levels per ISO 3744 and ISO 8528-10, as applicable.
8. Reference power = 1 pw (10^{-12} W).
9. Exhaust sound power levels are per ISO 6798, as applicable.

Appendix G: EPCPower CAB1000 Noise Test Report

HMMT Partners Oy **H03-0043-02** 1(1)

M.Sc. (Tech.) Mika Hanski, M.Sc. (Tech.) Timo Markula 2022-11-24

EPC Power

INVERTER NOISE LEVELS

Applicable device: CAB1000 at 1500 kVA apparent power

Client: EPC Power Oy
Contact: Antti Eerola

Sound pressure level measurements were conducted according to IEC 60076-10:2016 in the TVO Olkiluoto BESS site on 2022-10-03.

The operating conditions of the unit during measurements, measurement details and measured A-weighted equivalent noise levels L_{Aeq} [dB] are presented in *Figure 1*.

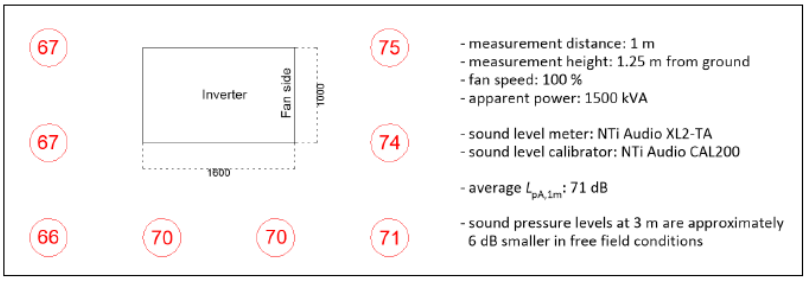


Figure 1. Measured L_{Aeq} [dB] (within red circles), operating condition during the measurements and measurement details.

The sound level meter complies with IEC 61672-1:2013 Class 1 requirements. The sound level calibrator complies with IEC 60942 Class 1 requirements.

The calculated total A-weighted sound power level L_{WA} for this load condition is **88 dB**. The unweighted spectrum of the sound power level in 1/3-octave bands is presented below. The sound power level has been determined according to the spatial average sound pressure level ($L_{pA,1m}$ 71 dB) according to the sound pressure level method defined in IEC 60076-10:2016. The relative sound pressure level differences between the sides shown in *Figure 1* can be used as directivity information in noise mapping.

f [Hz]	50	63	80	100	125	160	200	250	315	400	500	630
L_W [dB]	73.3	70.0	74.2	82.1	76.4	75.7	87.9	79.0	81.2	78.6	78.0	79.3

f [Hz]	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
L_W [dB]	78.0	77.5	75.9	73.4	72.2	75.7	75.7	67.5	73.2	74.5	71.3	69.3

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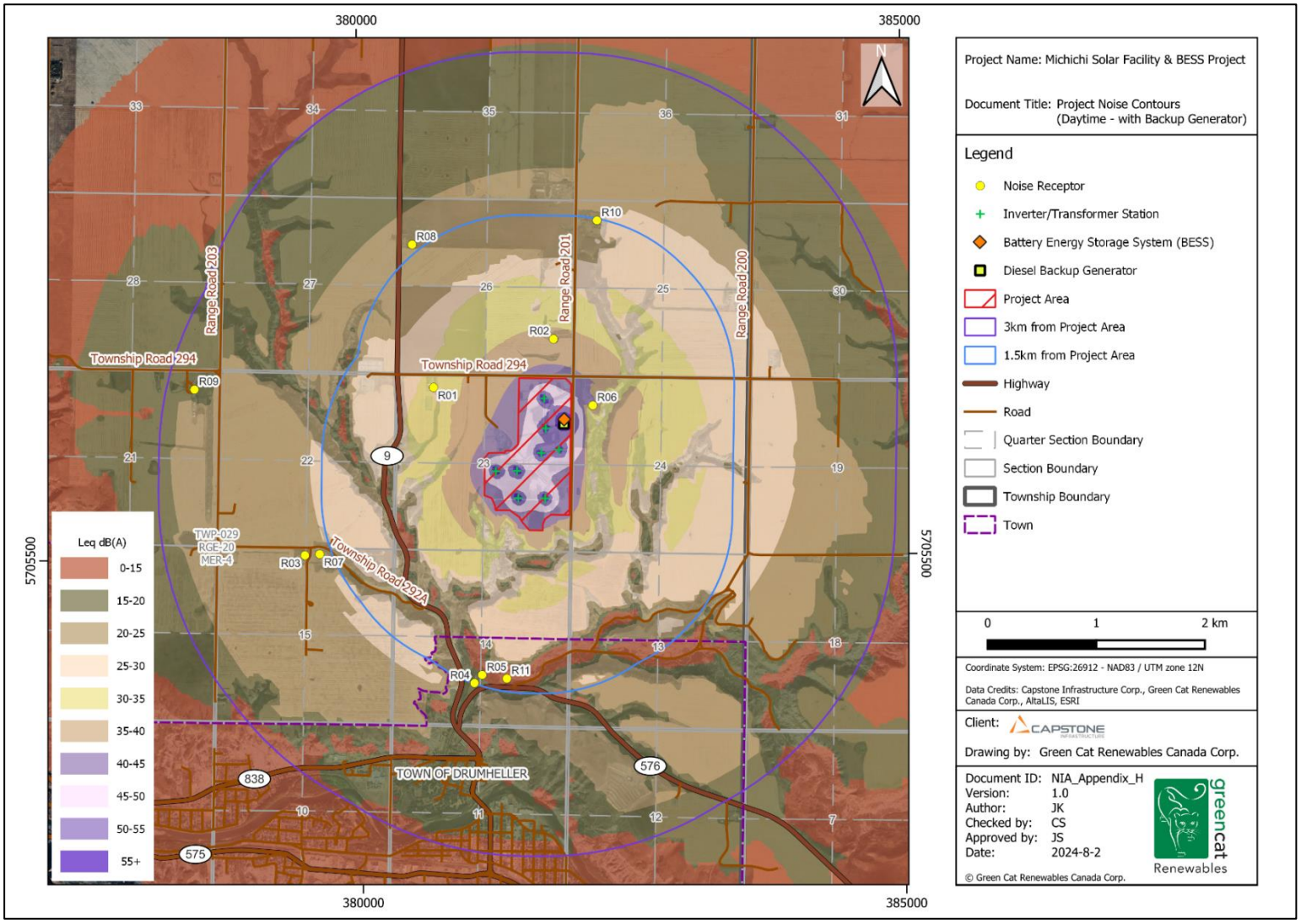
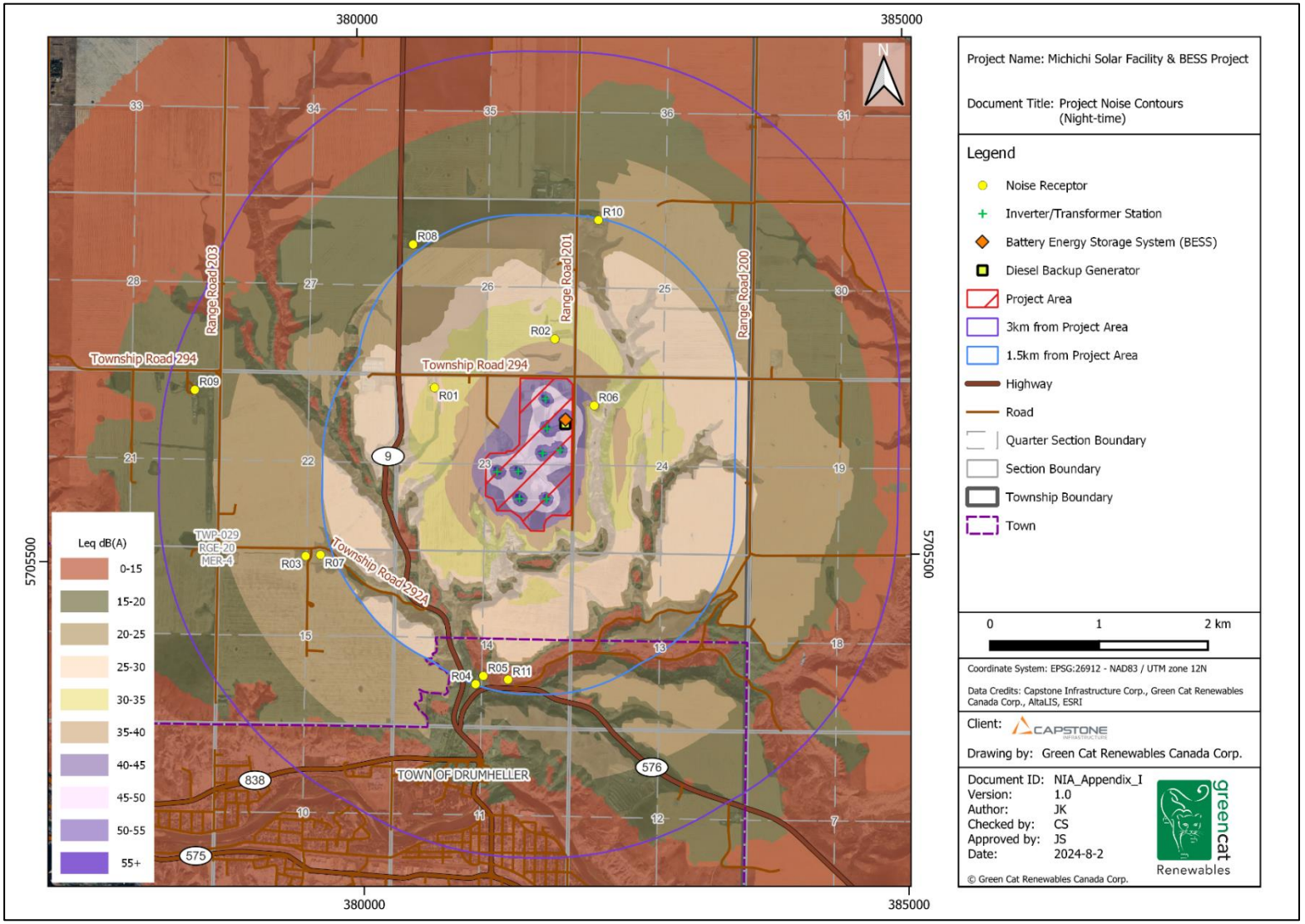
Appendix H: Project Sound Level Contours (Daytime)



Appendix I: Project Sound Level Contours (Night-time)



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