REPORT

Nova Solar Power Project

Noise Impact Assessment

Submitted to:

Andrea Cosman

508 - 5605 Gaspé Avenue
Montreal, QC
H2T 2A4

Submitted by:

Golder Associates Ltd.

2800, 700 - 2nd Street SW, Calgary, Alberta, T2P 2W2, Canada

+1 403 299 5600

21458999-3000-3007

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Distribution List

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1.0 INTRODUCTION

Renewable Energy Systems (RES) Canada Inc. (the Proponent) is proposing the develop the Nova Solar Power Project (the Project) in Wheatland County, Alberta. The Project will be located approximately 1.2 kilometres (km) southwest of the Hamlet of Carseland, in portions of Section 2 and 3, Township 22, Range 26, West of the Fourth Meridian. The maximum generating capacity of the Project will be 150 megawatts alternating current (MWac).

Power generating facilities in Alberta are regulated by the Alberta Utilities Commission (AUC). In particular, the AUC regulates power generating facilities through *Rule 007: Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations, Hydro Developments and Gas Utility Pipelines* (AUC 2021a), which will hereafter be referred to as Rule 007, and through *Rule 012: Noise Control* (AUC 2021b), which will hereafter be referred to as Rule 012. Rule 007 sets out general requirements for regulatory applications and Rule 012 provides specific methods and criteria for assessing potential environment noise impacts.

The Proponent retained Golder Associates Ltd. (Golder) to complete a noise impact assessment (NIA) for the Project. Golder conducted the Project NIA in accordance with guidance and methodology specified in Rule 012. The results of the Project NIA are summarized in this report.

The Project NIA is structured as follows:

- Section 1 provides an introduction to the Project NIA.
- Section 2 presents a brief description of the Project equipment and planned operations.
- Section 3 outlines the assessment approach used in the Project NIA, including a description of:
  - assessment cases considered in the Project NIA
  - noise study area and relevant receptor locations
  - applicable broadband and low frequency noise (LFN) compliance criteria
  - methodology used to predict Project noise levels
- Section 4 presents noise emissions values for equipment considered in the Project NIA.
- Section 5 presents results for each assessment case, including a comparison of noise level predictions to Rule 012 compliance criteria.
- Section 6 summarizes the results of the Project NIA.
- Section 7 provides information about the acoustical practitioners that completed the Project NIA.

2.0 PROJECT DESCRIPTION

For the purposes of this NIA, it has been assumed that noise sources associated with the Project will consist of 52 Sungrow® 4400-kilowatt (kW) integrated inverter-transformer units, which will be distributed across the Project footprint, and one 34.5/138 kilovolt (kV) 176 megavolt-ampere (MVA) power transformer, which will be located at the Project substation. Golder understands the Proponent is currently exploring Project designs consisting of either 52 3600-kW inverter-transformer units or 44 4400-kW inverter-transformer units. Because noise emissions tend to increase with electrical power rating, modelling noise from 52 4400-kW units in the Project NIA represents a conservative treatment of potential noise impacts (i.e., this modelling approach will tend to overestimate noise levels from 52 3600-kW units or from 44 4400-kW units).

Maximum noise emissions from the inverter-units will occur when these units operate at full power. Maximum noise emissions from the power transformer will occur when it operates in oil natural air forced 2nd stage cooler (ONAF2) mode. A map showing the location of Project noise sources is presented in Section 3.2 of this report (see Figure 1).

The Project will only operate during daylight hours. During most parts of the year, Project operations will be confined to the Rule 012 daytime period (7 am to 10 pm). During long summer days, Project operations may extend into parts of the Rule 012 nighttime period (10 pm to 7 am). As discussed in more detail in Section 3.4 and Section 4.2 of this report, the Project NIA conservatively modelled Project noise sources with maximum emissions 24 hours per day.

3.0 ASSESSMENT APPROACH

The purpose of the Project NIA is to assess potential environmental noise impacts from the Project within the context of regulatory requirements specified in Rule 012. Specific regulatory requirements are described in detail in Section 3.3 of this report. In general, to demonstrate regulatory compliance, Rule 012 requires that cumulative noise levels at relevant receptors be compared to a mandated permissible sound level (PSL) limit. Rule 012 considers relevant receptors to be *"…the most affected dwelling(s) located within 1.5 km of the proposed facility boundary…"* (AUC 2021b). Rule 012 indicates that cumulative noise levels should be calculated as the sum of:

- an ambient sound level (ASL) meant to represent the contribution from natural noise sources, non-industrial noise sources, and industrial facilities that are not regulated by the AUC or Alberta Energy Regulator (AER)
- the noise contribution from existing facilities that are regulated by the AUC or AER
- the noise contribution from approved but not yet constructed facilities that are regulated by the AUC or AER
- the noise contribution from proposed facilities that have been deemed complete by the AUC in accordance with Rule 007
- the noise contribution from the Project

3.1 Assessment Cases

The Project NIA considered two assessment cases:

- Baseline Case, which considers cumulative noise levels associated with natural sources, non-industrial sources, industrial facilities that are not regulated by the AUC or AER, existing AUC/AER-regulated facilities, approved but not constructed AUC/AER-facilities, and proposed facilities that have been deemed complete by the AUC.
- Application Case, which consists of cumulative noise levels associated with the Baseline Case in combination with the predicted noise contribution from the Project.

For both assessment cases, the cumulative noise level at each relevant receptor was compared to the application Rule 012 PSL. Noise contributions from Baseline Case industrial facilities and noise contributions from the Project were predicted using a computer model developed in accordance with a widely accepted calculation standard for the propagation of environmental noise (ISO 1996).

Section 4.1 of this report provides additional detail on Baseline Case industrial facilities considered in the Project NIA. Section 2.0 and Section 4.2 of this report provide additional detail on Project noise sources included in the Application Case. Section 3.4 of this report provides additional detail on the computer modelling conducted for the Baseline Case and the Application Case.

3.2 Noise Study Area and Receptors

Rule 012 regulates noise from a receptor perspective and considers relevant receptors to be *"…the most affected dwelling(s) located within 1.5 km of the proposed facility boundary…"* (AUC 2021b). The Project NIA established a 2.0 km buffer surrounding the Project boundary and assessed potential Project noise impacts at the most affected dwellings located within this buffer. Note that a 2.0 km buffer was used (instead of the 1.5 km buffer recommend in Rule 012) to fully account for potential effects from cumulative noise.

Potential dwellings within the 2.0 km buffer were initially identified using satellite imagery. Golder subsequently verified dwelling locations, heights (e.g., one-storey, two-storey), and occupancy status during a site visit in August 2021.

The most affected dwellings within the 2.0 km buffer were identified and selected for inclusion in the Project NIA based on two criteria:

- proximity to Project noise sources
- proximity to Baseline Case facilities

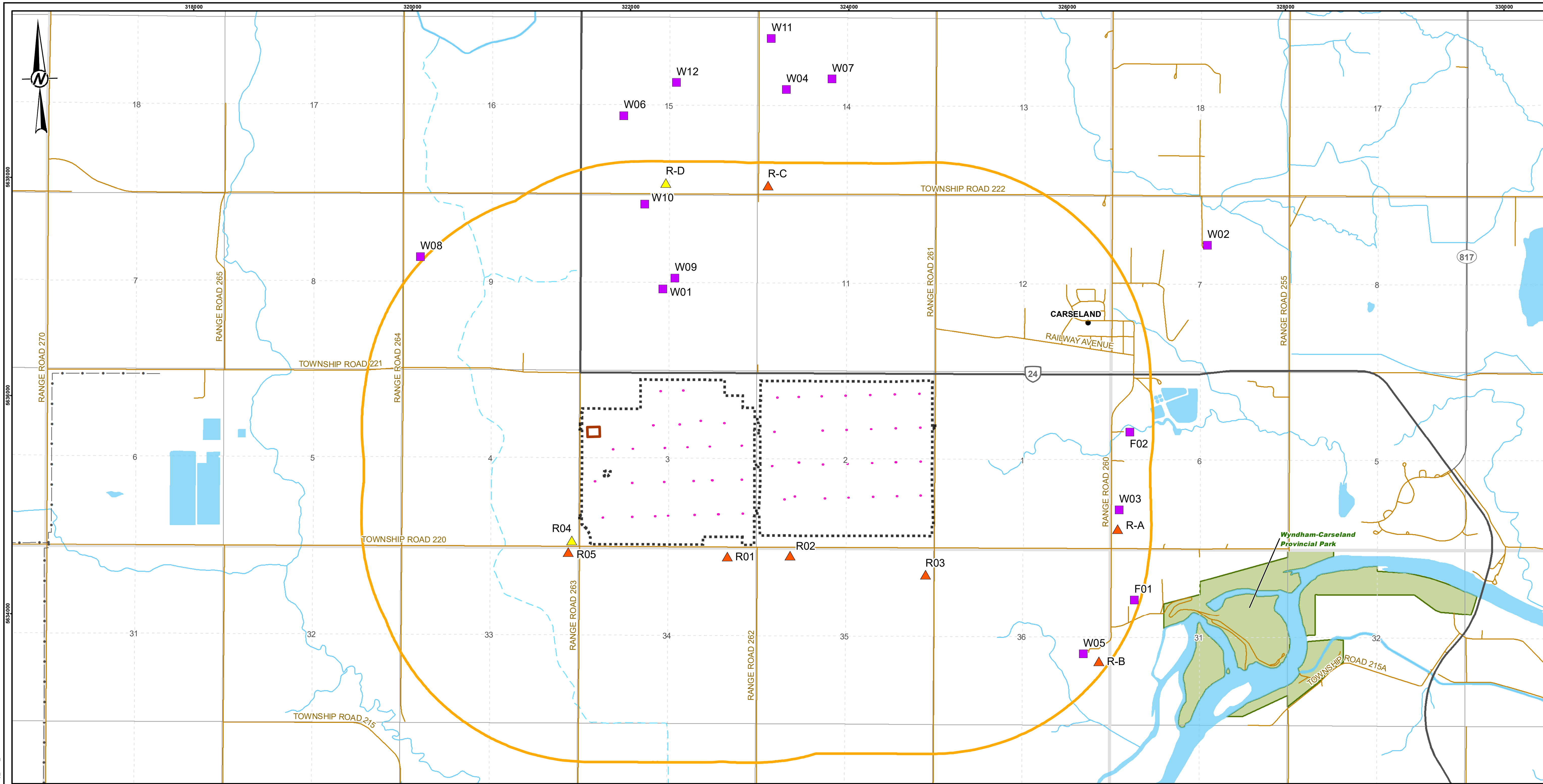
Dwellings located close to Project noise sources have the greatest potential to be affected by noise from the Project. Dwellings located close to Baseline Case facilities have the greatest potential to be affected by cumulative noise from the Project and Baseline Case sources.

Table 2 presents locations and heights for the dwelling receptors considered in the Project NIA. For each receptor, Table 2 also provides the approximate distance and direction from the Project boundary. Rule 012 does not specify appropriate receptor heights to use in noise assessments but does indicate that the height of receptors should *"…reflect the bedroom height of the dwellings"* (AUC 2021b). In accordance with this guidance, the Project NIA modelled receptors corresponding to one-storey dwellings at 1.5 m above ground and modelled receptors corresponding to two-storey dwellings at 4.5 m above ground to match the height at which bedroom noise exposure is expected to occur.

Figure 1 presents a map showing the noise study area (i.e., a 2.0 km buffer surrounding the Project footprint). The map in Figure 1 includes receptors, Project noise sources, and Baseline Case industrial facilities considered in the Project NIA. Section 4.1 of this report provides additional detail on the Baseline Case industrial facilities shown in Figure 1.

Table 1: Noise Receptors

Receptor Identification Code	Receptor Description	Rationale for Inclusion	Universal Transverse Mercator Coordinates [Zone 12]		Receptor Height [m]	Approximate Distance from Project Boundary [m]	Approximate Direction from Project Boundary
			Easting [m]	Northing [m]			
R01	occupied one-storey dwelling	proximity to Project noise sources	322738	5634334	1.5	190	south
R02	occupied one-storey dwelling	proximity to Project noise sources	323314	5634324	1.5	320	south
R03	occupied one-storey dwelling	proximity to Project noise sources	324551	5634112	1.5	530	south
R04	occupied two-storey dwelling	proximity to Project noise sources	321319	5634523	4.5	180	southwest
R05	occupied one-storey dwelling	proximity to Project noise sources	321282	5634418	1.5	250	southwest
R-A	occupied one-storey dwelling	proximity to Baseline Case facilities	326322	5634480	1.5	1,720	east
R-B	occupied one-storey dwelling	proximity to Baseline Case facilities	326114	5633274	1.5	2,000	southeast
R-C	occupied one-storey dwelling	proximity to Baseline Case facilities	323213	5637722	1.5	1,790	north
R-D	occupied two-storey dwelling	proximity to Baseline Case facilities	322278	5637774	4.5	1,800	north



LEGEND

- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- LOCAL ROAD
- TRANSMISSION LINE
- IRRIGATION DITCH
- WATERCOURSE
- WATERBODY
- PARK / PROTECTED AREA
- LIMIT OF DISTURBANCE
- NOISE STUDY AREA

NOISE RECEPTORS

- OCCUPIED ONE-STOREY DWELLING
- OCCUPIED TWO-STOREY DWELLING

NOISE SOURCES

- BASELINE CASE FACILITY
- INVERTER
- SUBSTATION

0 500 1,000

1:35,000 METRES

REFERENCE(S)

1. PROJECT COMPONENTS OBTAINED FROM RES, JANUARY, 2022.
3. ALBERTA DIGITAL BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED, ALTALIS LTD.© GOVERNMENT OF ALBERTA 2022. ALL RIGHTS RESERVED. OR IHS ENERGY INC.

PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
RENEWABLE ENERGY SYSTEMS CANADA INC.

PROJECT
NOVA SOLAR

CONSULTANT
GOLDER MEMBER OF WSP

YYYY-MM-DD	2022-02-11
DESIGNED	BS
PREPARED	LMS/LB
REVIEWED	BS
APPROVED	TC

TITLE
NOISE STUDY AREA

PROJECT NO.	PHASE	REV.	FIGURE
21458999	3000	0	1

3.3 Compliance Criteria

3.3.1 Broadband Noise

Rule 012 requires that broadband noise compliance be assessed by comparing cumulative noise levels to a mandated PSL limit. Appropriate PSL limits for individual receptors are calculated using a desktop technique outlined in Rule 012. The Rule 012 calculation technique accounts for time of day, population density, and proximity to transportation infrastructure such as heavily travelled roads and railways. For receptors located in areas with population density less than nine dwellings per quarter section and more than 500 m from heavily travelled roads and railways, Rule 012 sets:

- the daytime PSL at 50 A-weighted decibels (dBA)
- the nighttime PSL at 40 dBA

These PSL limits are consistent with a quiet rural environment.

Cumulative noise levels include the contribution from:

- natural sources
- non-industrial sources
- industrial facilities that are not regulated by the AUC or AER
- existing AUC/AER-regulated facilities
- approved but not yet constructed AUC/AER-regulated facilities
- proposed facilities that have been deemed complete the AUC
- the Project

The combined noise contribution from natural sources, non-industrial sources, and unregulated industrial facilities is characterized via an ASL. Although Rule 012 *"…does not require the use of a specific [ASL]…"*, Rule 012 does indicate that *"…[t]he assumed [ASL] is five dBA less than the applicable [PSL]…"* (AUC 2021b).

There are a number of unregulated facilities located in the Project area, including:

- Richardson Pioneer Carseland – agricultural facility
- Stella-Jones Canada – sawmill / lumber facility
- Cargill Ltd. – agricultural facility
- Co-op Cardlock – fuel station
- Nutrien Carseland Nitrogen – fertilizer facility

Rule 012 considers any noise contribution from unregulated facilities to be part of the ASL. In cases where the presence of unregulated facilities results in increases to the assumed ASL, Rule 012 allows an A2-adjusment to the quiet rural environment PSL (AUC 2021b). In other words, accounting for the presence of unregulated industrial facilities increases the applicable PSL, which results in less restrictive noise limits for the Project.

In the interest of conservatism, and given the technical challenges associated with characterizing representative noise emissions from a large number of unregulated facilities with operations that vary considerably in time, the Project NIA did not consider the noise contribution from unregulated industrial facilities. Instead, for all receptors, the Project NIA made use of the quiet rural environment PSL limits and assumed ASL values from Rule 012 (AUC 2021b). As described above, this approach is conservative since including the noise contribution from unregulated industrial facilities would result in less restrictive noise limits for the Project. Table 2 presents Rule 012 PSL limits and assumed ASL values applicable at each receptor considered in the Project NIA.

Table 2: Permissible Sound Levels and Ambient Sound Levels at Nova Solar Project Receptors

Receptor Identification Code	Rule 012 Permissible Sound Level [dBA]		Assumed Ambient Sound Level [dBA]	
	Daytime	Nighttime	Daytime	Nighttime
R01	50	40	45	35
R02	50	40	45	35
R03	50	40	45	35
R04	50	40	45	35
R05	50	40	45	35
R-A	50	40	45	35
R-B	50	40	45	35
R-C	50	40	45	35
R-D	50	40	45	35

3.3.2 Low Frequency Noise

LFN can be an issue even when broadband noise levels are otherwise acceptable. Consequently, Rule 012 requires a separate assessment of potential LFN issues. Rule 012 indicates that an LFN issue exists if both of the following conditions are met:

- the value of the cumulative noise levels, expressed in C-weighted decibels (dBC), minus the value of the cumulative noise level, expressed in dBA, is greater than or equal to 20
- a clear tone exists in a one-third octave band at or below 250 Hertz (Hz)

Rule 012 require that both of the above conditions (i.e., a dBC minus dBA difference greater than or equal to 20 and a clear tone at or below 250 Hz) be present for an LFN issue to exist. Satisfaction of one condition does not result in an LFN issue.

The first LFN condition was assessed in the Project NIA using results from predictive computer models. Assessment of the second LFN condition requires access to noise data at one-third octave band resolution. This high-resolution spectral data is typically only available via field measurements once a facility begins operations. Therefore, it was not possible for the second LFN condition to be assessed in the Project NIA.

3.4 Noise Prediction Methodology

Computer noise models for the Baseline Case and Application Case were developed using the CadnaA® software package. In accordance with Rule 012, CadnaA® implements the noise propagation algorithm described in the International Organization for Standardization (ISO) 9613-2 technical standard (ISO 1996).

The computer models were used to calculate Baseline Case and Application Case cumulative noise levels at the receptors listed in Table 1. Inputs to the computer models consisted of source emissions in the form of octave band sound power levels and environmental conditions that are known to influence noise propagation outdoors (e.g., ground cover, temperature, humidity, and wind conditions).

Noise source emissions for the Baseline Case and the Application Case are discussed in detail in Section 4.1 and Section 4.2 of this report, respectively. A summary of environmental inputs to the computer models is provided in Table 3.

Table 3: Noise Model Inputs

Parameter	Model Setting	Description / Notes
Standard	ISO 9613-2 (ISO 1996)	Models treated noise sources and noise propagation in accordance with this standard.
Ground Factor	0.5 – throughout the noise study area	This value represents the acoustic properties of the ground in accordance with ISO 9613-2.
Temperature / Humidity	10^0C / 70% relative humidity	These are typical default conditions for ISO 9613-2 intended to represent nighttime summer conditions.
Wind Conditions	1 m/s to 5 m/s from source to receptor	These represent default ISO 9613-2 wind conditions – moderate temperature inversion, wind from source to receptor 100% of the time.
Terrain	terrain modelled using CanVec® database	Ground elevation contours at 10 m intervals were included in the models.

When calculating noise levels at receptors, the ISO 9613-2 algorithm used the environmental inputs listed in Table 3 to account for four noise attenuation mechanisms:

- geometric divergence
- atmospheric absorption
- ground absorption
- screening by barriers

Geometric divergence accounts for the fact that a given noise source radiates a finite amount of acoustic energy and as this finite amount of energy propagates into the environment it is spread out over a larger and larger area (i.e., the surface of an ever-expanding sphere). This geometric spreading means that the farther away a receptor is located from a source, the less energy will be received (i.e., the lower the observed noise level).

Atmospheric absorption accounts for the fact that the acoustic energy associated with a given noise source is absorbed via interaction with molecules in the air through which it propagates. Attenuation effects associated with atmospheric absorption are most substantial at high frequencies but can be important at lower frequencies for large propagation distances.

Ground absorption accounts for the fact that each time the acoustic energy emitted by a noise source interacts with the ground some of it is absorbed. The amount of energy absorbed depends on the type of ground surface. During interactions with the hard ground very little energy is absorbed but during interactions with porous ground a substantial amount of energy is absorbed. As a result, if all other factors are held constant, observed noise levels associated with sources operating in an area of hard ground will be higher than observed noise levels associated with sources operating in an area of porous ground.

Screening by barriers accounts for the fact that a physical object (either terrain-based or anthropogenic) placed between a noise source and receptor can block acoustic energy and reduce observed noise levels at the receptor.

3.4.1.1 Assessment Conservatism

According to the ISO 9613-2 standard, the overall accuracy of the propagation algorithm used in the Project NIA is ±3 dBA for distances between source and receptor up to 1 km. The accuracy for propagation distances greater than 1 km is not stated in the standard. Model accuracy also depends on the accuracy of the noise emissions inputs, which is often ±2 dBA. Accounting for both these sources of uncertainty, the overall accuracy of the noise level predictions presented in this Project NIA is expected to be ±3.6 dBA. A number of conservative assumptions regarding propagation conditions, Project operations, and Project noise emissions were made to account for the level of uncertainty inherent in the noise level predictions.

Each receptor was assumed to be downwind from each source 100% of the time. Because downwind conditions tend to enhance noise propagation, this assumption is conservative and likely overestimates the noise impact of the Project.

Ground conditions in most of the noise study area meet the definition of porous ground provided in ISO 9613-2: *"…ground covered by grass, trees or other vegetation, and all other ground surfaces suitable for the growth of vegetation, such as farming land"* (ISO 1996). Visual review of satellite imagery and the August 2021 site visit found that roads, waterbodies, and other reflective surfaces make up a very small fraction of the study area. As such, for consistency with ISO 9613-2, a ground factor of 1.0 (or very close to 1.0) should be used in the computer models. Instead, the computer models used a substantially more reflective ground factor of 0.5 to represent conditions in the noise study area. Because reflective ground tends to enhance noise propagation, this approach is conservative and likely overestimates the noise impact of the Project.

The noise contribution from unregulated industrial facilities was not considered in the Project NIA. As discussed in Section 3.3.1 of this report, accounting for the presence of unregulated industrial facilities would have increased the applicable PSL and resulted in less restrictive noise limits for the Project. Consequently, omitting the noise contribution from unregulated industrial facilities is a conservative approach that likely overestimates the noise impact of the Project.

As discussed in detail in Section 4.1 of this report, each AUC/AER-regulated facility included in the Baseline Case was modelled with the maximum noise emissions that would be permitted under applicable AUC and AER noise regulations. In other words, each Baseline Case facility was assumed to be barely compliant with the applicable PSL at the most affected receptor(s). This approach is conservative since some or all of the Baseline Case facilities may have noise emissions less than the maximum allowable limit, in which case the Project NIA has overestimated Baseline Case cumulative noise levels and also overestimated potential Project noise impacts.

Project noise sources were modelled with maximum noise emissions during both the daytime and nighttime periods. Because Project noise sources will often be effectively silent during the nighttime period, this modelling approach is conservative and likely overestimates the noise impact of the Project.

As discussed in Section 2.0 of this report, the final Project design will likely consist of either 52 3600-kW inverter-transformer units or 44 4400-kW inverter-transformer units. However, the NIA modelled a version of the Project consisting of 52 4400-kW units. Because noise emissions tend to increase with electrical power rating, modelling noise from 52 4400-kW units is conservative and likely overestimates the noise impact of the Project.

Terrain features were the only acoustical screening elements considered in the noise model. Acoustical screening from anthropogenic features (e.g., buildings) and acoustical screening from vegetation were not considered in the computer model. This is a conservative approach to modelling potential Project noise impacts.

4.0 NOISE EMISSIONS

4.1 Baseline Case

Golder used the AUC eFiling system, Alberta Electric System Operator (AESO) database, AER ST102 database (AER 2022a), and AER ST37 database (AER 2022b) to identify AUC/AER-regulated facilities with the potential to influence cumulative noise levels at the nine receptors considered in the Project NIA (i.e., AUC/AER-regulated facilities located within approximately 3 km of a receptor). A total of 14 potentially relevant Baseline Case facilities were identified via this process. Baseline Case facilities included in the Project NIA are described in Table 4; the locations of these facilities are also shown in Figure 1.

Table 4: Baseline Case Facilities for the Nova Solar Project NIA

Facility Identification Code	Operator / Licensee	Facility Type	Legal Location	Universal Transverse Mercator Coordinates [Zone 12]	
				Easting [m]	Northing [m]
F01	Anterra Energy Inc.	Satellite	12-31-021-25W4	326456	5633824
F02	Anterra Energy Inc.	Satellite	12-06-022-25W4	326461	5635365
W01	Persist Oil & Gas Inc.	Well	06-10-022-26W4	322221	5636802
W02	Persist Oil & Gas Inc.	Well	10-07-022-25W4	327222	5637057
W03	Persist Oil & Gas Inc.	Well	04-06-022-25W4	326342	5634654
W04	Persist Oil & Gas Inc.	Well	12-14-022-26W4	323407	5638599
W05	Persist Oil & Gas Inc.	Well	08-36-021-26W4	325974	5633345
W06	Persist Oil & Gas Inc.	Well	05-15-022-26W4	321910	5638403
W07	Persist Oil & Gas Inc.	Well	11-14-022-26W4	323828	5638683

Facility Identification Code	Operator / Licensee	Facility Type	Legal Location	Universal Transverse Mercator Coordinates [Zone 12]	
				Easting [m]	Northing [m]
W08	Persist Oil & Gas Inc.	Well	12-09-022-26W4	320009	5637166
W09	Persist Oil & Gas Inc.	Well	10-10-022-26W4	322333	5636899
W10	Persist Oil & Gas Inc.	Well	14-10-022-26W4	322078	5637586
W11	Persist Oil & Gas Inc.	Well	13-14-022-26W4	323283	5639071
W12	Persist Oil & Gas Inc.	Well	10-15-022-26W4	322401	5638693

Noise emissions for Baseline Case facilities were established using the "no net increase" approach from Rule 012. In this approach, *"…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…"* (AUC 2021b).

In this case, Golder developed a computer noise model of Baseline Case facilities then, through an iterative process, used this model to adjust assumed noise emissions from each facility until the predicted Baseline Case cumulative noise level was exactly equal to the nighttime PSL limit at the most affected receptors (i.e., R-A, R-B, R-C, and R-D). As discussed in Section 3.4.1.1 of this report, the "no net increase" approach to modelling Baseline Case facilities is conservative since it assumes each facility has maximum allowable noise emissions, which is likely not the case (i.e., many or all of the Baseline Case facilities may have less than maximum allowable noise emissions).

Table 5 presents noise emissions used to model each of the Baseline Case facilities. Noise emissions are presented in the form of total sound power levels, expressed in dBA.

Table 5: Baseline Case Noise Emissions for the Nova Solar Project NIA

Facility Identification Code	Total Sound Power Level [dBA]
F01	93.5
F02	93.7
W01	95.7
W02	106.7
W03	94.1
W04	107.0
W05	93.3
W06	94.1
W07	107.0

Table 5: Baseline Case Noise Emissions for the Nova Solar Project NIA

Facility Identification Code	Total Sound Power Level [dBA]
W08	93.7
W09	95.7
W10	94.1
W11	107.0
W12	94.1

4.2 Application Case

For the purposes of the Project NIA and in the interest of conservatism, it has been assumed that noise sources associated with the Project will consist of 52 integrated inverter-transformer units (4400 kW) and one power transformer (176 MVA). Noise emissions for Project sources are presented in Table 6. Noise emissions are presented in the form of octave band sound power levels, expressed in unweighted decibels (dBZ), and total sound power levels, expressed in dBA. Noise emissions for the inverter-transformer units represent full power operation of these sources. Noise emissions for the power transformer represent ONAF2 operations. Noise emissions for the inverter-transformer units were calculated based on electrical power rating and professional experience. Noise emissions for the power transformer were calculated based on a technical standard (NEMA 2000).

Table 6: Nova Solar Project Noise Emissions

Noise Source	Quantity	Octave Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Power Transformer (176 MVA)	1	102.6	108.6	110.6	105.6	105.6	99.6	94.6	89.6	82.6	106.0
Integrated Inverter-Transformer Unit (4400 kW)	52	87.2	87.6	88.7	87.9	87.8	83.0	80.3	86.5	83.7	91.7

5.0 ASSESSMENT RESULTS

5.1 Baseline Case

5.1.1 Broadband Noise

Baseline Case cumulative noise levels are presented in Table 7 for all receptors considered in the Project NIA. Baseline Case compliance with Rule 012 is assessed in Table 8 by comparing cumulative noise levels to applicable PSL limits. Table 8 shows that Baseline Case cumulative noise levels at all nine receptors are predicted to comply with Rule 012 during the daytime period and the nighttime period. In accordance with the "no net increase" approach used to establish noise emissions for Baseline Case facilities, the nighttime margin of compliance is predicted to be 0 dBA for the four receptors that are most affected by noise from Baseline Case facilities (i.e., R-A, R-B, R-C, and R-D). In other words, at these four receptors, Baseline Case cumulative noise levels are exactly equal to the nighttime PSL limit.

Table 7: Baseline Case Cumulative Noise Levels for Nova Solar Project Receptors

Receptor Identification Code	Ambient Sound Level [dBA]		Noise Contribution from Baseline Case Facilities [dBA]	Baseline Case Cumulative Noise Level [dBA]	
	Daytime	Nighttime		Daytime	Nighttime
R01	45	35	23.1	45.0	35.3
R02	45	35	23.9	45.0	35.3
R03	45	35	23.5	45.0	35.3
R04	45	35	23.3	45.0	35.3
R05	45	35	21.2	45.0	35.2
R-A	45	35	38.4	45.9	40.0
R-B	45	35	38.4	45.9	40.0
R-C	45	35	38.4	45.9	40.0
R-D	45	35	38.4	45.9	40.0

Table 8: Baseline Case Broadband Noise Assessment for Nova Solar Project Receptors

Receptor Identification Code	Baseline Case Cumulative Noise Level(a) [dBA]		Permissible Sound Level [dBA]		Margin of Compliance(b) [dBA]		Compliance Assessment
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	
R01	45	35	50	40	5	5	compliant
R02	45	35	50	40	5	5	compliant
R03	45	35	50	40	5	5	compliant
R04	45	35	50	40	5	5	compliant
R05	45	35	50	40	5	5	compliant
R-A	46	40	50	40	4	0	compliant
R-B	46	40	50	40	4	0	compliant
R-C	46	40	50	40	4	0	compliant
R-D	46	40	50	40	4	0	compliant

(a) In accordance with Rule 012, Baseline Case cumulative noise levels from Table 7 have been rounded to the nearest whole number before comparison to applicable PSL limits.
(b) Margin of compliance calculated as PSL minus Baseline Case cumulative noise level.

5.1.2 Low Frequency Noise

As discussed in Section 3.3.2 of this report, Rule 012 sets out a two-part test for LFN issues. The first part of the LFN test compares noise levels expressed in dBA to noise levels expressed in dBC. Rule 012 provides assumed ASL values to represent the noise contribution from natural and non-industrial sources, but these ASL values are only specified in dBA. There is no accepted method of representing ASL values in dBC. Similarly, when using the "no net increase" approach to characterize Baseline Case facilities, Rule 012 indicates that the noise contribution from these facilities should be assumed exactly equal to the PSL limit, which is expressed in dBA. Rule 012 does not provide a method for estimating the contribution of Baseline Case facilities in terms of dBC noise levels. As discussed in Section 3.3.2 of this report, application of the second part of the LFN test requires access to noise data at one-third octave band resolution. This high-resolution spectral data is not available for the Baseline Case. Therefore, it was not feasible to apply either the first part or the second part of the Rule 012 LFN test to the Baseline Case.

5.2 Application Case

5.2.1 Broadband Noise

Application Case cumulative noise levels are presented in Table 9 for all receptors considered in the Project NIA. Application Case compliance with Rule 012 is assessed in Table 10 by comparing cumulative noise levels to applicable PSL limits. Table 10 shows that Application Case cumulative noise levels at all nine receptors are predicted to comply with Rule 012 during the daytime period and the nighttime period.

Table 9: Application Case Cumulative Noise Levels for Nova Solar Project Receptors

Receptor Identification Code	Ambient Sound Level [dBA]		Noise Contribution from Baseline Case Facilities [dBA]	Noise Contribution from Project [dBA]	Application Case Cumulative Noise Level [dBA]	
	Daytime	Nighttime			Daytime	Nighttime
R01	45	35	23.1	34.1	45.4	37.7
R02	45	35	23.9	32.6	45.3	37.2
R03	45	35	23.5	28.1	45.1	36.1
R04	45	35	23.3	36.3	45.6	38.8
R05	45	35	21.2	33.6	45.3	37.5
R-A	45	35	38.4	19.8	45.9	40.1
R-B	45	35	38.4	12.1	45.9	40.0
R-C	45	35	38.4	23.6	45.9	40.1
R-D	45	35	38.4	26.2	45.9	40.2

Table 10: Application Case Broadband Noise Assessment for Nova Solar Project Receptors

Receptor Identification Code	Application Case Cumulative Noise Level[(a)] [dBA]		Permissible Sound Level [dBA]		Margin of Compliance[(b)] [dBA]		Compliance Assessment
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	
R01	45	38	50	40	5	2	compliant
R02	45	37	50	40	5	3	compliant
R03	45	36	50	40	5	4	compliant
R04	46	39	50	40	4	1	compliant
R05	45	38	50	40	5	2	compliant
R-A	46	40	50	40	4	0	compliant
R-B	46	40	50	40	4	0	compliant
R-C	46	40	50	40	4	0	compliant
R-D	46	40	50	40	4	0	compliant

(a) In accordance with Rule 012, Application Case cumulative noise levels from Table 10 have been rounded to the nearest whole number before comparison to applicable PSL limits.
(b) Margin of compliance calculated as PSL minus Application Case cumulative noise level.

5.2.2 Low Frequency Noise

Table 11 presents an LFN analysis for the Project based on the first part of the two-part LFN test and omitting the noise contribution from natural and non-industrial sources and from Baseline Case facilities. Results from Table 11 suggest the difference between Project noise levels expressed in dBA and dBC is less than 20 for all nine receptors considered in the Project NIA. As such, based on the first LFN criterion set out in Rule 012, there is no potential LFN issue associated with the Project.

Table 11: Nova Solar Project Low Frequency Noise Analysis

Receptor Identification Code	Project Noise Level [dBA]		Project Noise Level [dBC]		Difference: dBC minus dBA		Rule 012 LFN Threshold	Potential for LFN Issue
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime		
R01	34.1	34.1	44.2	44.2	10.1	10.1	20	no
R02	32.6	32.6	43.0	43.0	10.4	10.4	20	no
R03	28.1	28.1	39.4	39.4	11.3	11.3	20	no
R04	36.3	36.3	46.1	46.1	9.8	9.8	20	no
R05	33.6	33.6	44.8	44.8	11.2	11.2	20	no
R-A	19.8	19.8	34.1	34.1	14.3	14.3	20	no
R-B	12.1	12.1	22.9	22.9	10.8	10.8	20	no
R-C	23.6	23.6	37.5	37.5	13.9	13.9	20	no
R-D	26.2	26.2	38.5	38.5	12.3	12.3	20	no

6.0 SUMMARY

A NIA was prepared for the Project to meet the requirements of Rule 007. The Project NIA was conducted in accordance with assessment methods presented in Rule 012. The NIA characterized potential noise impacts from the Project in the context of broadband and LFN compliance criteria specified by Rule 012.

For both the daytime period and the nighttime period, the Project NIA predicts that Application Case cumulative noise levels will comply with applicable Rule 012 PSL limits and there will be no potential LFN issues associated with the Project.

7.0 ACOUSTICAL PRACTITIONER INFORMATION

Andrew Faszer, INCE, PEng, was responsible for senior technical review of emissions calculations, modelling, and reporting related to the Project NIA. Andrew is a senior engineer with a broad environmental and industrial background, and over 20 years of consulting experience. Andrew's experience includes noise studies for oil and gas developments, conventional and wind power projects, industrial, and mining projects.

Victor Young, MSc, performed noise emissions calculations, developed computer noise models, and authored the Project NIA report. Victor has worked as an acoustic scientist in the Golder Calgary office for more than ten years. During this time, Victor has been involved in a variety of energy, utilities, and mining projects throughout Western Canada. Victor's experience includes field measurements and data analysis, computer noise modelling, and preparation of noise assessment reports.

Signature Page

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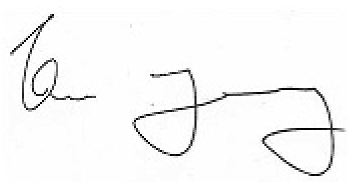

Victor Young, MSc
Acoustic Scientist

Andrew Faszer, INCE, PEng
Senior Engineer

VY/AF/rd

https://golderassociates.sharepoint.com/sites/143101/project files/6 deliverables/10. noise impact assessment/21458999 res nova nia_rev0_20220211.docx

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