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ASSESSMENT REPORT - **Project: 15182.03**

Yellow Lake Solar Project
Noise Impact Assessment

Alberta, Canada

Prepared for:

Yellow Lake & Burdett Solar GP Corp
Suite 400, 214 – 11 Ave SW,
Calgary, Alberta T2R 0K1

Prepared by:

Kohl Clark, B. Eng.,

Payam Ashtiani, P. Eng., B.A.Sc.

June 16th, 2020

Applicant Information

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Revision History

Revision Number	Description	Date
1	*Initial NIA Report Submission*	January 10th, 2017
2	*NIA Report Amendment (RP2);* Site layout changed – total inverter counts reduced, new 2.5 MVA Inverter unit selected and combined to form 5.0 MVA Inverter Clusters.	May 17th, 2018
3	*NIA Report Amendment (RP3);* Site layout changed – individual inverter counts reduced, new 3.15 MVA Inverter unit selected	May 11th, 2020
4	*NIA Report Amendment (RP4);* Site layout changed	June 16th, 2020

1 Introduction

BluEarth Renewables has retained Aercoustics Engineering Limited on behalf of Yellow Lake & Burdett Solar GP Corp (the Applicant) to prepare an amendment to an existing Noise Impact Assessment, dated May 11th, 2020. This Noise Impact Assessment ("NIA") pertains to the Yellow Lake Solar Project. The proposed facility (the "Project") comprises a 19-megawatt alternating current (MWAC) solar facility located roughly 2 km north-west of Foremost, Alberta, on a plot of land measuring roughly 64 hectares.

The purpose of this pre-construction noise impact assessment is to ensure that the predicted sound levels at critical receptors surrounding the Project are in compliance with Alberta Utilities Commission ("AUC") Rule 012 [1], dated March 2, 2020. This report serves as an amendment to the existing noise report, dated May 11th, 2020 (the "Previous NIA") and addresses a change to the site layout. The type and quantity of acoustically significant equipment remains unchanged from that which was detailed in the Previous NIA.

2 Facility Description

The Project spans 64 hectares (154 Acres) of land situated roughly 20 kilometres north-west of Foremost, Alberta in the county of Forty Mile No.8. The specific UTM coordinates corresponding to the approximate centre of the Project are 463060 mE, 5499981 mN, Zone 12U. The plot of land on which the Project is to be developed is designated NW13-8-12-W4.

The solar facility will include an array of solar panels with seven (7) associated Sungrow SG3150U 3.15 megavolt-ampere (MVA) inverters, each with an associated 3.15 MVA pad-mounted transformer. A project layout is provided in Appendix A.

Although power production will only occur during daylight hours, both daytime and nighttime operation of the facility have been considered in this assessment. This conservative assumption accounts for days of the year where the sun rises before 07:00 AM.

AUC Rule 012 stipulates that any third-party energy-related facilities within 1.5 km of the Project receptors must be considered in the noise impact assessment and that the cumulative noise impact for all such facilities, together with the ambient contribution, must meet the applicable noise level limits. Two facilities in the study area meet this description: an AltaLink transformer substation about two (2) km northeast of the Project as well as a pumpjack facility about two (2) km southeast. The locations of these relevant third-party sources are detailed in Figure 1.

3 Noise Sources

The dominant noise sources related to the sustained operation of the Project are the seven (7) 3.15 MVA solar inverters and the seven (7) associated 3.15 MVA pad-mounted transformers. Each of the seven sets of equipment was modelled as a single point source to represent a Solar Inverter Station with a sound power level equal to the sum of that of the two parts (one inverter, one transformer). The solar panels are supported by a fixed-rack system and are therefore not considered to be a significant noise source. The location of the Solar Inverter Stations within the Project is detailed in Figure 2. These noise sources, in addition to the two (2) energy-related facilities – each also modelled as point sources – represent the dominant noise sources considered in this noise impact assessment.

Spectral sound data for the Solar Inverters (Sungrow SG3150U 3.15 MVA) is available in Appendix B and was provided in a manufacturer test report [2]. The spectral sound pressure values provided for the inverter units were converted to an overall sound power level using ISO 3744 [3]. A summary of this calculation is provided in Appendix B. Specifications for the pad-mounted transformers had not been made at the time of this report and therefor associated noise data was unavailable. The assumed sound power levels for the 3.15 MVA pad-mounted transformers were based on manufacturer data for similarly sized transformer units and adjusted based on NEMA TR 1-2013 [4] and Beranek's *Noise and Vibration Control Engineering* [5]. A summary of this derivation is given in Appendix B.

While the noise from the transformer itself is expected to have tonal components below 250 Hertz, the tonal character of the transformer is not anticipated to be audible at the receptor locations due to both the low predicted transformer-only noise impact as well as masking noise associated with ambient and third-party noise.

To assess the potential for a Low Frequency Noise condition, a comparison between the A- and C-weighted predicted sound levels from the Project was performed at critical receptors for both the daytime and nighttime operating scenarios. This analysis is detailed further in Section 6.2 of this report and indicates that a tonal penalty is not applicable. The sound power spectra for the two noise source components, as well as for the overall Solar Inverter Station, are stated in Table 1 below. Noise sources used in the model are summarized in Table 2.

Table 1 – Noise Source Spectra

Noise Source	Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	**Total (dBA)**
NEMA Estimate 3.15 MVA Transformer	83	89	91	86	86	80	75	70	63	86
SG3150U 3.15 MW Solar Inverter	86	90	100	98	94	90	88	91	82	98
Combined Source (Solar Inverter Station)	87	93	100	98	94	91	88	91	82	98

[1] – Test Data Provided in *SUNGROW Noise Test Report for SG3150U* [2]

There are two existing third-party energy-related facilities within 1.5 km of the receptors impacted by the Project. These include an AltaLink transformer substation and a pumpjack facility. Sound power data for the transformer substation was provided by AltaLink. The sound power level for the pumpjack was based on Aercoustics' measurements of a similar unit. Octave data for both third-party sources is also included in Appendix B.

Table 2 – Noise Source Summary

Source ID	Source Name	Sound Power Level (dBA)	Source Location
IS1	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
IS2	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
IS3	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
IS4	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
IS5	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
IS6	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
IS7	3.15 MVA Solar Inverter Station	98[1,2]	YLSP
A02_pump	Pumpjack RD120	98[3]	Third-Party
A02_trans	AltaLink Transformer	100[4]	AltaLink

Note: Further documentation in Appendix B.

1. Sound data for SG3150U Inverter is from *SUNGROW Noise Test Report for SG3150U* [2]
2. Assumed sound power data for the 3.15 MVA transformer based on NEMA Standard and measurement data from a comparable unit
3. Assumed pumpjack sound power based on Aercoustics' measurements of a similar unit.
4. Sound power data provided by AltaLink. Final sound power includes 5dB tonal penalty.

4 Points of Reception

The area immediately surrounding the proposed Project is considered to be a rural environment dominated by agricultural land. Residential dwellings located within 1.5 km of the Project boundary are considered critical receptors in this assessment and are identified as receptors R01-R04 in Figure 1. All receptors were conservatively assumed to be two-storey and were modelled at a height of 4.5 m.

Satisfying AUC Rule 012 Noise Control guidelines ("the Guidelines") at the nearest-situated critical receptors is expected to ensure that compliance at all other receptors will also be met. Table 3 summarizes the location of the critical receptors as well as their position relative to the Project.

Table 3 – Receptor Summary

Receptor ID	Receptor Description	POR Height	Location[1]
R01	Two-storey dwelling	4.5 m	~1300 m southeast
R02	Two-storey dwelling	4.5 m	~1400 m southeast
R03	Two-storey dwelling	4.5 m	~900 m southwest
R04	Two-storey dwelling	4.5 m	~1100 m north

[1] – Location with reference to the nearest Project noise source, direction from source to receptor.

5 Assessment Criteria

This noise impact assessment has been carried out according to the AUC Rule 012 which stipulates that the applicable Basic Sound Level ("BSL") must be derived for all critical receptors based on the density of surrounding residences as well as the proximity from well-travelled roads.

All critical receptors listed above in Table 3 are more than 500 m from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers. This is consistent with the Category 1 acoustic environment categorization as defined by the Guidelines.

Based on this categorization, a nighttime BSL of 40 dBA was applied for the receptors. An adjustment of 10dB above the nighttime BSL was made to define the daytime Permissible Sound Level ("PSL"). The PSL's for this assessment are summarized in Table 4.

Table 4 – Receptor PSL Summary

Receptor ID	Daytime (07:00 – 22:00) PSL (dBA)	Nighttime (22:00- 07:00) PSL (dBA)
R01	50	40
R02	50	40
R03	50	40
R04	50	40

The above permissible sound levels are limits placed on the cumulative noise level at the critical receptors. The cumulative sound level includes the contribution from the Project, eligible third-party sources, and an assumed ambient noise level. This cumulative sound level will serve as the basis for an assessment of compliance. Based on the Guidelines, the ambient sound level is assumed to be 35 dBA at nighttime and 45 dBA during the daytime.

6 Noise Impact Assessment

The noise impact calculations were performed using DataKustik's CadnaA environmental noise prediction software (2019 Version). The calculations are based on established environmental sound prediction methods outlined in *ISO 9613-2: A Standard for Outdoor Noise Propagation* [6]. The noise prediction methodology assumes downwind propagation at 70% relative humidity and 10 degrees Celsius. Flat ground topography and a global ground factor of G=0.5 have been conservatively assumed for this assessment as the area surrounding the Project is flat farmland or grassland.

6.1 Predictable Worst Case

A worst-case operating scenario has been assumed for the assessment. During the daytime, this scenario includes all seven (7) Solar Inverter Stations as well as the pumpjack and AltaLink substation operating at 100% capacity. The worst-case nighttime scenario accounts for both third party sources operating, in addition to all seven (7) 3.15 MVA transformers operating, with all seven (7) 3.15 MVA solar inverters turned off.

The predicted sound levels corresponding to this worst-case scenario are detailed in Table 5 and are compared with the applicable sound level limits at each receptor. Sample calculations including calculation parameters are included in Appendix C. A noise contour figure for the cumulative daytime and nighttime noise impact including ambient and third-party sources is available in Figure 3.

Table 5 – Noise Impact Assessment Summary

Receptor ID	Sound Level at Receptor (daytime / nighttime) [dBA]	PSL (daytime / nighttime) [dBA]	Compliance with PSL? [Yes/No]
R01	45/35	50/40	Yes
R02	45/35	50/40	Yes
R03	45/35	50/40	Yes
R04	45/35	50/40	Yes

6.2 Low Frequency Analysis

Low frequency analysis was performed according to section 4.5 of AUC Rule 012. Both the A- and C-weighted noise impact from the isolated Project were assessed at each receptor and the difference between these levels was calculated. These results are outlined in Table 6 below.

Table 6 – Low Frequency Analysis Summary

Receptor ID	Daytime			Nighttime		
	LAeq [dBA]	LCeq [dBC]	LCeq - LAeq	LAeq [dBA]	LCeq [dBC]	LCeq - LAeq
R01	28	36	8	10	21	11
R02	27	36	8	9	21	12
R03	31	39	8	13	23	11
R04	30	38	8	12	23	11

Given that the difference between the predicted A- and C-weighted sound pressure levels never exceeds the 20 dB, the presence of a Low Frequency noise condition according to the Guidelines is unlikely.

6.3 Comparison for No-Net-Increase

In order to ensure that project stakeholders are not adversely affected by any acoustically-significant change in project layout and infrastructure, a comparison is made to confirm that any proposed changes will result in no environmental impacts beyond those reflected in the approved application. Specifically, the cumulative noise impact associated with the current proposed layout and equipment is compared to the cumulative noise impact associated with the second revision of the NIA (NIA RP2, dated May 17, 2018) . This comparison is included in Appendix D and shows that the proposed layout changes[1] will result in an increase in the cumulative sound level of 0.1 dBA or less at all receptors for both the daytime and nighttime operating scenarios. This satisfies the criterion of 0.4 dBA or less for a No-Net-Increase scenario.

[1] With the incorporation of the noise control measures outlined in Section 7.1.

7 Noise Control Measures

7.1 Limited Nighttime Operation

The inverters associated with Inverter Stations IS1 through IS7 may not run outside of the daytime hours of 07:00 – 22:00. It is understood that the inverters will be set with an automatic control which will place the inverters in standby between 22:00 – 07:00. In this standby operational mode, the inverters will not produce electrical power; the cooling fans, inductor, or transistor will not be operating and therefore will produce no noise.

It is understood that the associated transformer will generate noise even when the inverters are not active – nighttime operation of the transformers has been accounted for in the modelling and is predicted to ensure a no-net increase scenario for all critical receptors per Appendix D.

7.2 Construction Noise Controls

To minimize the impact of the development of the Project on nearby dwellings, the following mitigation measures should be used as described in AUC Rule 012:

a) Conduct construction activity between the hours of 7 a.m. and 10 p.m. to reduce the duration impact from construction noise,

b) Advise nearby residents of significant noise-causing activities and schedule these events to reduce disruption to them,

c) Ensure that all internal combustion engines are well maintained with muffler systems,

d) Should a noise complaint be filed during construction, the licensee must respond expeditiously and take prompt action to address the complaint.

8 Conclusion

Aercoustics Engineering Limited has completed a Noise Impact Assessment for the Yellow Lake Solar Project in Alberta.

It was determined that the predicted cumulative noise impact from the contributing ambient, relevant third-party sources, and the proposed Yellow Lake Solar Project is in compliance with AUC Rule 012.

9 References

[1] Alberta Utilities Commission, "Rule 012 - Noise Control," 2020.

[2] SUNGROW, "Noise Test Report for SG3150U," 2019.

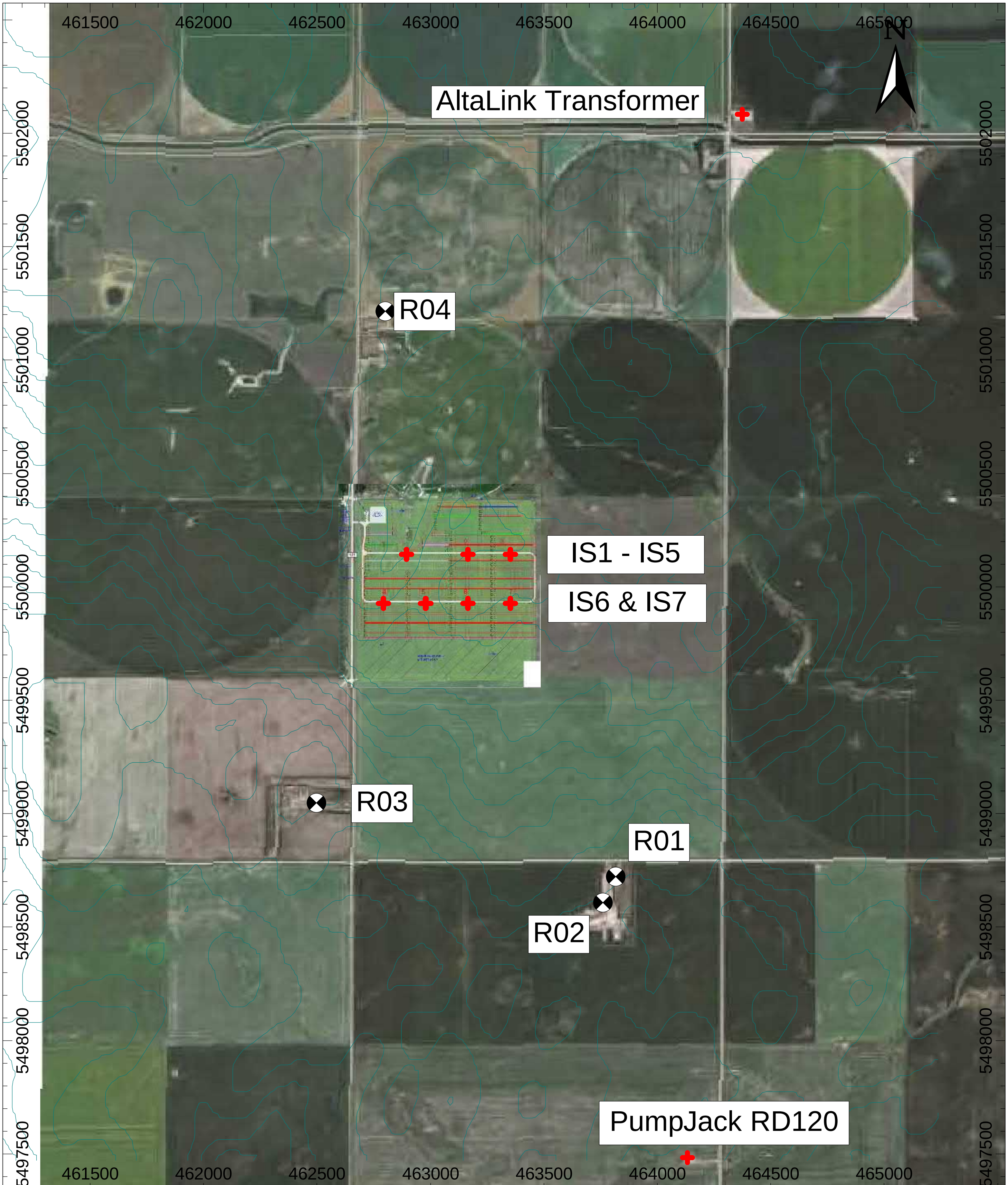
[3] ISO, "International Standard ISO 3744 - “Acoustics – Determination of soudn power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane"," Geneva, 1994.

[4] National Electrical Manufacturers Association, "NEMA TR 1-2013 - Transformers, Step Voltage Regulators and Reactors," National Electrical Manufacturers Association, Rosslyn, VA, 2014.

[5] L. Beranek, "Noise and Vibration Control Engineering," Institute of Noise Control Engineering, 1992.

[6] ISO, "International Standard ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation”," Geneva, 1996.

FIGURES



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Project ID: 15182.03

Scale: NTS
Drawn by: KC
Reviewed by: PA
Date: June 15, 2020
Revision: 1

Project Name

Yellow Lake Solar Project - Noise Impact Assessment

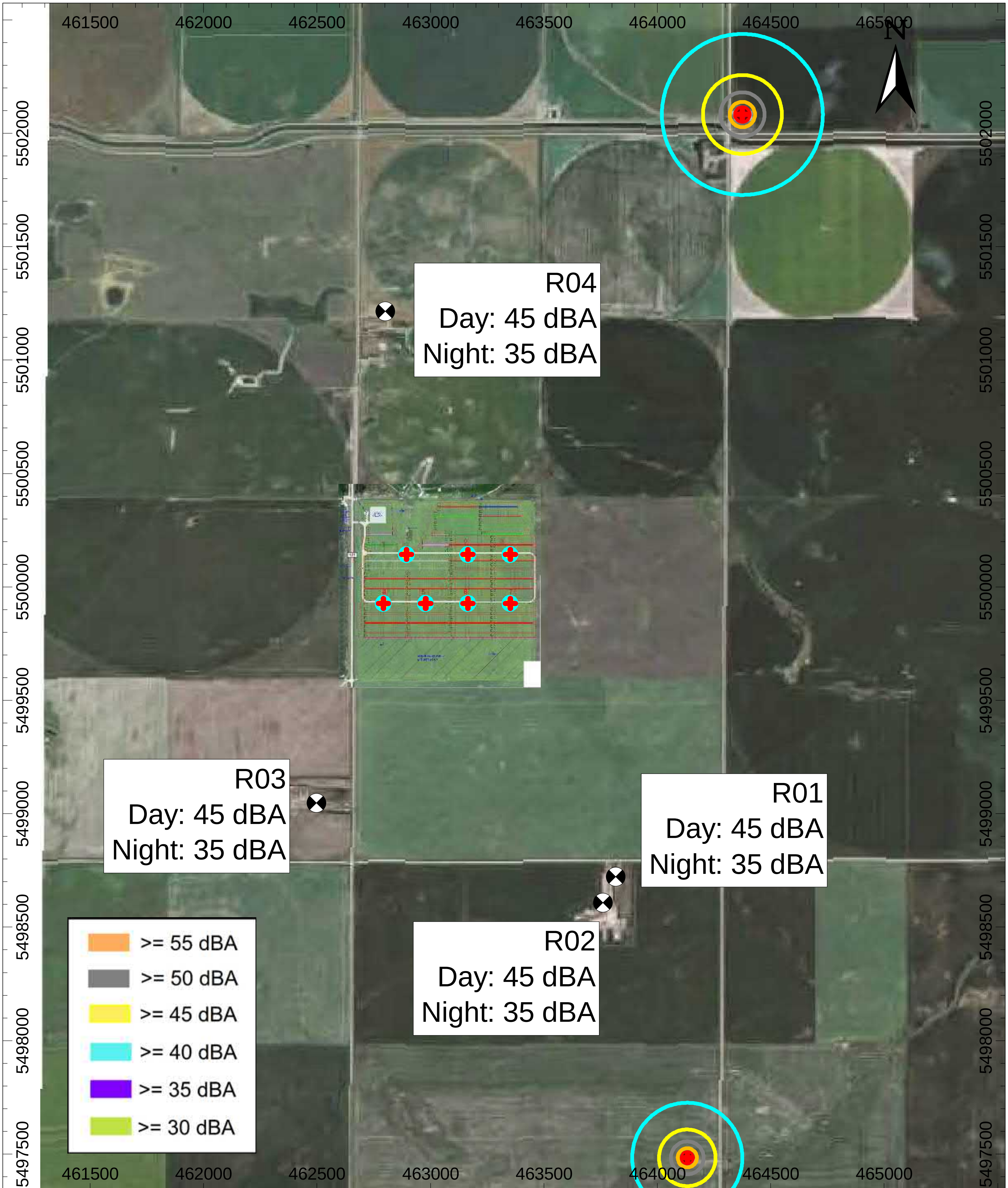
Figure Title

Site Plan

Figure 1

aercoustics

Project ID: 15182.03	**Project Name**	
Scale: NTS Drawn by: KC Reviewed by: PA Date: June 15, 2020 Revision: 1	Yellow Lake Solar Project - Noise Impact Assessment	
	Figure Title Noise Source Locations	**Figure 2**



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Project ID: 15182.03

Scale: NTS
Drawn by: KC
Reviewed by: PA
Date: June 15, 2020
Revision: 1

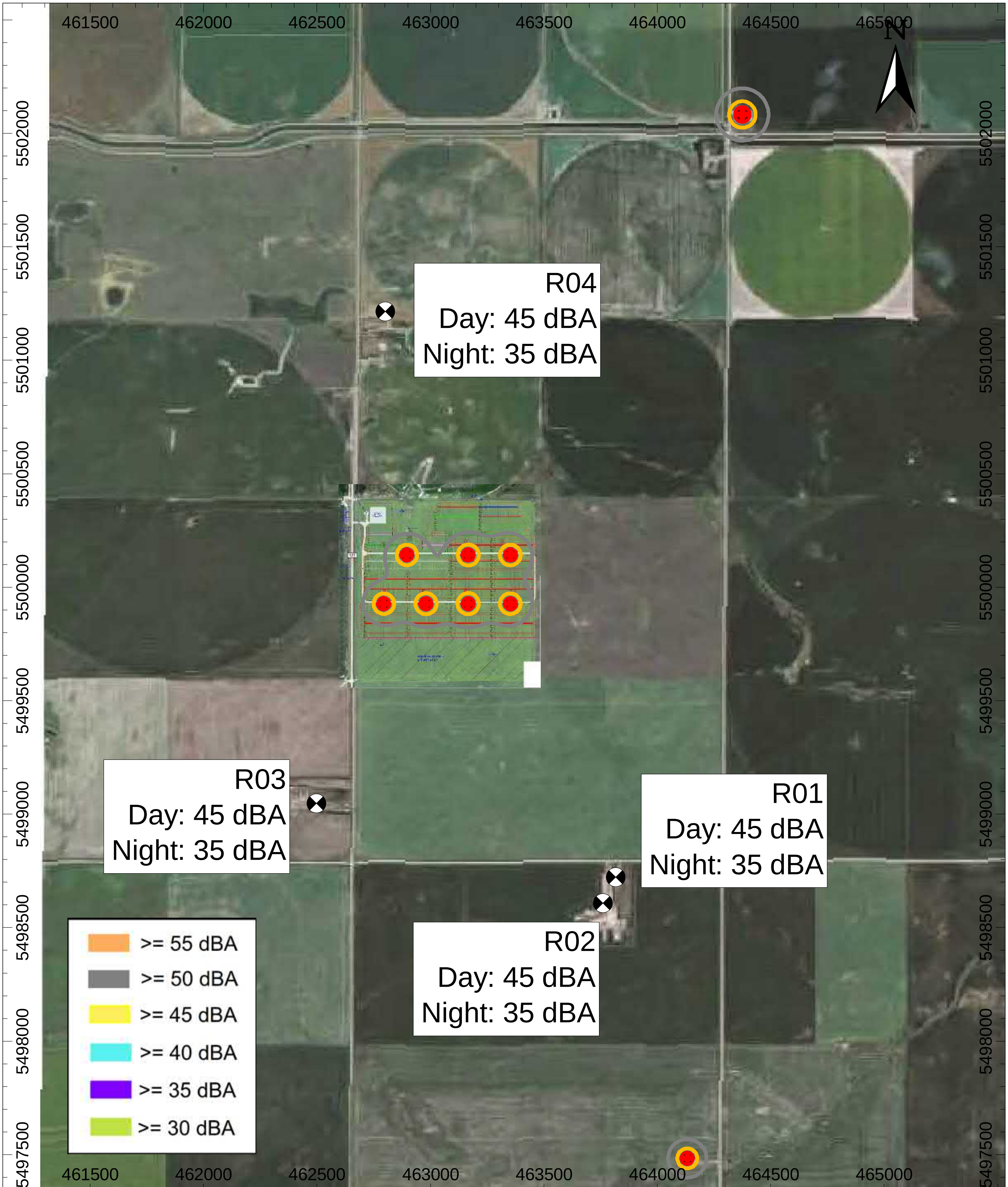
Project Name

Yellow Lake Solar Project - Noise Impact Assessment

Figure Title

Cumulative Noise Impact Contours - Nighttime

Figure 3



aercoustics

Project ID: 15182.03

Scale: NTS
Drawn by: KC
Reviewed by: PA
Date: June 15, 2020
Revision: 1

Project Name

Yellow Lake Solar Project - Noise Impact Assessment

Figure Title

Cumulative Noise Impact Contours - Daytime

Figure 4

APPENDIX A – Site Plan of Yellow Lake Solar Project

3PH GANG SWITCH
PME
25kV OH EXPORT LINE
FACILITY SWITCHYARD GENERAL AREA
RECLOSER
RISER POLE
GROUNDING Tx (DETAILS TBD)
SITE ACCESS ROAD/ GATE
25kV PAD MOUNT SWITCH
TEMPORARY PARKING & CONSTRUCTION LAYDOWN AREA
PROPOSED FENCE
PROPOSED FENCE
4.0m
WETLAND 30M SETBACK
121
6.0m WIDE ACCESS ROAD
COMPENSATED WETLAND
1
2
3
4
5
6
7
IS1/ 397
IS2/ 404
IS3/ 399
IS4/ 387
IS5/ 388
IS6/ 388
IS7/ 387
9.5m (Typ.)
PROPOSED FENCE
4.0m
WETLAND 30M SETBACK
AREA AVAILABLE:
140,087.46 M²

APPENDIX B – Sound Data Sheets

Sungrow Power Supply Co., Ltd.
Add: No. 1699 Xiyou Road, Hefei, China
Tel: +86 551 6532 7834
Email: info@sungrow.cn
Website: www.sungrowpower.com

Noise Test Report

TYPE TEST SHEET

This Type Test sheet shall be used to record the results of the type testing of Generating Unit			
Type Tested reference number		SG3150U	
Generating Unit technology		Grid-connected PV Inverter	
System supplier name		Sungrow Power Supply Co., Ltd.	
Address		No.1699 Xiyou Rd., New & High Technology Industrial Development Zone, Hefei, P.R. China	
Tel	+86 551 65327834	Fax	+86 551 6532 7800
E:mail	info@sungrow.cn	Web site	www.sungrowpower.com
Maximum export capacity, use separate sheet if more than one connection option.	N/A	kW single phase, single, split or three phase system	
		kW three phase	
	N/A	kW two phases in three phase system	
	N/A	kW two phases split phase system	
Compiled by		On behalf of	Sungrow Power Supply Co., Ltd.
		Test Date	2019-5-13
Note that testing can be done by the manufacturer of an individual component, by an external test house, or by the supplier of the complete system, or any combination of them as appropriate. Where parts of the testing are carried out by persons or organisations other than the supplier then the supplier shall keep copies of all test records and results supplied to them to verify that the testing has been carried out by people with sufficient technical competency to carry out the tests.			

Sungrow Power Supply Co., Ltd.
Add: No. 1699 Xiyou Road, Hefei, China
Tel: +86 551 6532 7834
Email: info@sungrow.cn
Website: www.sungrowpower.com

SUNGROW

The aim of this test is to determine the noise level when the PV Grid inverter in rated working condition

Used settings of the measurement device for Noise measurement

Measurement device	Date of measurement
AWA6228	2019-5-13

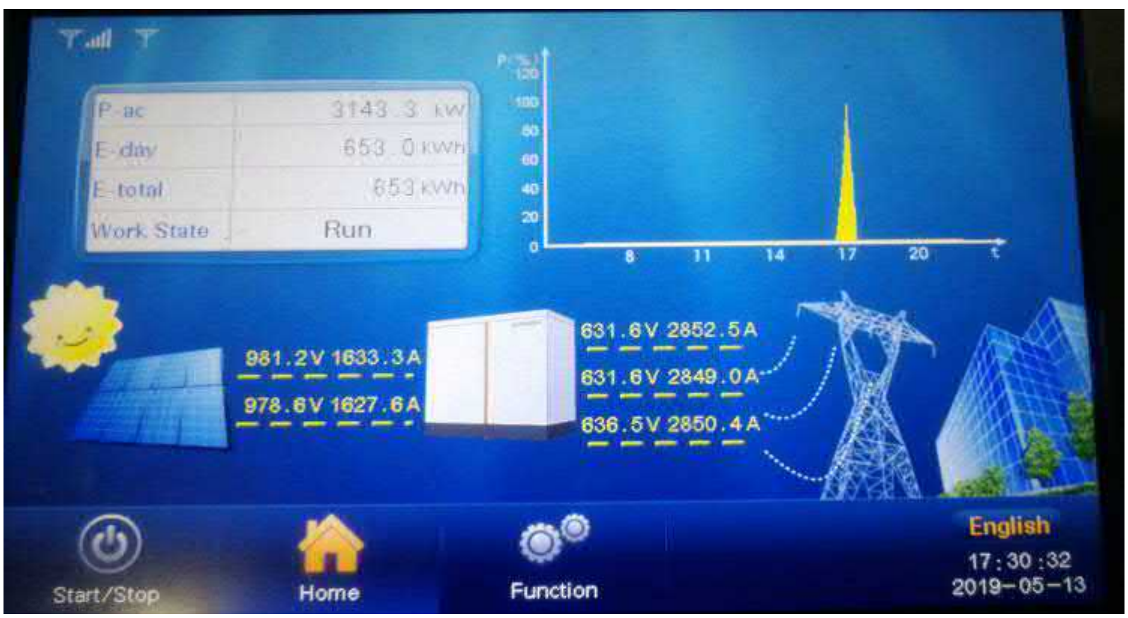
The condition s during testing are specified below:

PGU operation mode	Rated Working Condition
Voltage range	800-1300V
Grid frequency range	50Hz/ 45-55Hz
Distance	1m
Date	2019-5-13

The system noise level please check the table below.

Orientation	Noise (dB)
Front	77.2
Behind	77.5
Left	78.1
Right	79

Photo:
Operation Condition:



Sungrow Power Supply Co., Ltd.
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Tel: +86 551 6532 7834
Email: info@sungrow.cn
Website: www.sungrowpower.com

SUNGROW

Front Test :

Test Record			
Frequency(Hz)	Noise(dB)	Frequency(Hz)	Noise(dB)
16	53.9	1k	68.7
31.5	56.3	2k	66.6
63	69.3	4k	71.8
125	80.7	8k	59.6
250	76.8	16k	42.4
500	71.8	**W_A**	**77.2**

Behind:

Test Record			
Frequency(Hz)	Noise(dB)	Frequency(Hz)	Noise(dB)
16	55.9	1k	70.6
31.5	64.8	2k	68.3
63	69.5	4k	69.7
125	77.6	8k	59.6
250	77.4	16k	43.1
500	74.4	**W_A**	**77.5**

Left:

Test Record			
Frequency(Hz)	Noise(dB)	Frequency(Hz)	Noise(dB)
16	56.3	1k	70.7
31.5	67.7	2k	68.4
63	69.7	4k	71.3
125	78.6	8k	62.5
250	78.8	16k	52.9
500	73.1	**W_A**	**78.1**

Sungrow Power Supply Co., Ltd.
Add: No. 1699 Xiyou Road, Hefei, China
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Email: info@sungrow.cn
Website: www.sungrowpower.com

Right:

Test Record			
Frequency(Hz)	Noise(dB)	Frequency(Hz)	Noise(dB)
16	57.1	1k	71.7
31.5	67.9	2k	69.6
63	72.7	4k	71.4
125	81.4	8k	63.9
250	78.4	16k	53.2
500	75.4	**W_A**	**79.0**

Sungrow Power Supply Co., Ltd.
Add: No. 1699 Xiyou Road, Hefei, China
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Email: info@sungrow.cn
Website: www.sungrowpower.com

Additional comments

Sound Power Used for Analysis - SPL to PWL Conversion for Inverter

Project: Yellow Lake Solar Project - Noise Impact Assessment RP4

Report ID: 15183.03

Created on: 2020-06-15

3.15 MVA - SG3150U Inverter Sound Power Calculation

Measurement Distance from Unit [m]	1
Unit Dimensions (LxWxH) [m]	2.9 x 3 x 2.4
Area at Measurement Distance from Unit [m^2]	95
SPL to PWL Area Adjustment[1] [dB]	20

SG3150U 3.15 MVA Inverter Spectral Sound Data

	31.5	63	125	250	500	1000	2000	4000	8000	Total (dBA)
Average Sound Pressure Spectrum [2]	66	71	80	78	74	71	68	71	62	-
Sound Power Level [dB]	86	90	100	98	94	90	88	91	82	**98**

[1] Based on *ISO 3744 - Determination of PWL using SPL (engineering method over reflecting plane)*

[2] Average sound power spectrum from *SUNGROW Noise Test Report for SG3150U*

3.15 MVA - Medium Voltage Transformer Sound Power Estimate

Rated Capacity	3.15 MVA
NEMA Sound Pressure Estimate [1]	63 dBA
Assumed Surface Area	24 m^2

	31.5	63	125	250	500	1000	2000	4000	8000	Total (dBA)
Frequency Spectrum Adjustment [2]	-3	3	5	0	0	-6	-11	-16	-23	**-**
Sound Power Level (dB)	74	80	82	77	77	71	66	61	54	**77**

[1] Based on NEMA TRI-1993 (R2000), Table 0-2, Immersed Power Transformers
[2] from Beranek, Noise and Vibration Control Engineering, 1992. Table 18.1, Line 28

3.15 MVA Transformer and SG3150U 3.15 MVA Inverter **[3.15 MVA Inverter Station]**

Noise Source	31.5	63	125	250	500	1000	2000	4000	8000	**Total (dBA)**
NEMA Estimate 3.15 MVA Transformer	74	80	82	77	77	71	66	61	54	**77**
SG3150U 3.15MVA Solar Inverter	86	90	100	98	94	90	88	91	82	**98**
Combined Source	86	91	100	98	94	90	88	91	82	98

2015-08-31

AltaLink Apparatus S und P wer Levels and Site/Building Dimensi ns

Table 1 – Westfield 107S S und P wer Level Data

			Octave Band S und P wer Level (dB)									*Overall S und P wer Level*		
Apparatus	*Height*	*N minal Rating*	*31.5*	*63*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*	*dBA*	*dBC*	*S urce*
Transformer #1	2.9 m	138/25 kV, 25 MVA	89.7	93.7	96.7	94.7	94.7	88.7	83.7	78.7	70.7	94.9	101.4	CAN/CSA-C88-M90

Appr ximate Site Dimensi ns

Fence line: L x W = 75 x 40 m

Appr ximate Building Dimensi ns

Building #1: L x W x H = 9.8 x 4.3 x 3.0 m

Table 2 – Burdett 368S S und P wer Level Data

			Octave Band S und P wer Level (dB)									*Overall S und P wer Level*		
Apparatus	*Height*	*N minal Rating*	*31.5*	*63*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*	*dBA*	*dBC*	*S urce*
Transformer #1	3.1 m	138/25 kV, 42 MVA	85.7	89.7	92.7	90.7	90.7	84.7	79.7	74.7	66.7	90.9	97.4	Manufacturer
Transformer #2	3.8 m	138/25 kV, 42 MVA	91.7	95.7	98.7	96.7	96.7	90.7	85.7	80.7	72.7	96.9	103.4	CAN/CSA-C88-M90
Capacitor Bank #1	9.6 m	138 kV, 27 Mvar	N/A	N/A	94.1	74.5	80.5	74.3	64.5	62.0	63.5	81.9	94.2	Field measurement*
Capacitor Bank #2	9.6 m	138 kV, 27 Mvar	N/A	N/A	94.1	74.5	80.5	74.3	64.5	62.0	63.5	81.9	94.2	Field measurement*

** Measurement f capacit r bank at an ther substati n with the same rating*

Appr ximate Site Dimensi ns

Fence line: L x W = 80 x 58 m

Appr ximate Building Dimensi ns

Building #1: L x W x H = 9.5 x 6.5 x 5.3 m

Building #2: L x W x H = 14.0 x 6.4 x 5.3 m

Building #3: L x W x H = 12.6 x 5.0 x 3.0 m

	S und P wer Level	Octave S und P wer (dB) 31.5	63	125	250	500	1000	2000	4000	8000
Pump Jack	**98 dBA**	104	101	101	91	93	93	92	87	80

Pump Jack L cati n:

UTM C rdinates
464134 m E
5497429 m N
Z ne 12

APPENDIX C – ISO Calculation

Configuration	
Parameter	Value
General	
Country	(user defined)
Max. Error (dB)	0.00
Max. Search Radius (m)	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (m)	1000.00
Min. Length of Section (m)	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	60.00
Reference Time Night (min)	60.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	830.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rvcr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (°C)	10
rel. Humidity (%)	70
Ground Absorption G	0.50
Wind Speed for Dir. (m/s)	3.0
Roads (RLS-90)	
Strictly acc. to RLS-90	
Railways (Schall 03 (1990))	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Project: Yellow Lake Solar Project
Project Number: 15182.03

ISO 9613-2 Equation	*Lr = Lw + K0 - Dc - Adiv - Agr - Afol - Ahous - Abar - Cmet - RL [dB(A)]*

Acronym	Definition
Refl.	Order of reflections;
Lw	Sound power level
L/A	Length (m) or area (m^2) of source; for point sources = 1
Freq	Band center frequency; entries for the proceeding terms can be split up on a frequency basis or reported together (“A”).
K0	Directivity Index (dB)
Adiv	Attenuation due to geometrical divergence
Agr	The ground attenuation term in absence of a barrier
Abar	Attenuation by screening from a barrier
Aatm	Attenuation from atmospheric absorption
Afo	Attenuation of sound during propagation through foliage
Ahous	Attenuation during propagation through a built-up region of houses
Cmet	A meteorological correction term used to account for the difference in propagational effects over varying meteorological conditions in a study period.
Dc	Directivity correction
RL	Reflection loss
Lr	(partial) receiver level Day/Night (dB[A])

Receiver: R01
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Day	45

Receiver Name	Receiver ID	X	Y	Z
R01	R01	463817 m	5498723 m	841 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
A02_pump	PumpJack RD120	464131.9	5497483.3	838.0	0	98	0.0	A	73.1	0.0	-0.5	0.0	5.5	0.0	0.0	0.0	0.0	0.0	20
IS7	Sungrow Inverter Station	463352.8	5499927.0	832.8	0	98	0.0	A	73.2	0.0	-1.5	0.0	4.9	0.0	0.0	0.0	0.0	0.0	21
IS6	Sungrow Inverter Station	463166.6	5499927.0	832.6	0	98	0.0	A	73.7	0.0	-1.5	0.0	5.1	0.0	0.0	0.0	0.0	0.0	20
IS5	Sungrow Inverter Station	462980.3	5499927.0	833.1	0	98	0.0	A	74.3	0.0	-1.5	0.0	5.3	0.0	0.0	0.0	0.0	0.0	20
IS3	Sungrow Inverter Station	463352.9	5500142.4	832.6	0	98	0.0	A	74.5	0.0	-1.5	0.0	5.3	0.0	0.0	0.0	0.0	0.0	19
IS2	Sungrow Inverter Station	463166.6	5500142.3	832.6	0	98	0.0	A	74.9	0.0	-1.4	0.0	5.5	0.0	0.0	0.0	0.0	0.0	19
IS4	Sungrow Inverter Station	462794.0	5499927.0	832.6	0	98	0.0	A	75.0	0.0	-1.4	0.0	5.5	0.0	0.0	0.0	0.0	0.0	19
IS1	Sungrow Inverter Station	462896.1	5500142.4	831.7	0	98	0.0	A	75.6	0.0	-1.4	0.0	5.7	0.0	0.0	0.0	0.0	0.0	18

Project Contribution (dBA)		28
3rd Party Contribution (dBA)		20
Ambient Contribution (dBA)		45

Receiver: R02
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Day	45

Receiver Name	Receiver ID	X	Y	Z
R02	R02	463760 m	5498608 m	842 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
A02_pump	PumpJack RD120	464131.9	5497483.3	838.0	0	98	0.0	A	72.5	0.0	-0.6	0.0	5.2	0.0	0.0	0.0	0.0	0.0	21
IS7	Sungrow Inverter Station	463352.8	5499927.0	832.8	0	98	0.0	A	73.8	0.0	-1.5	0.0	5.1	0.0	0.0	0.0	0.0	0.0	20
IS6	Sungrow Inverter Station	463166.6	5499927.0	832.6	0	98	0.0	A	74.2	0.0	-1.5	0.0	5.2	0.0	0.0	0.0	0.0	0.0	20
IS5	Sungrow Inverter Station	462980.3	5499927.0	833.1	0	98	0.0	A	74.7	0.0	-1.5	0.0	5.4	0.0	0.0	0.0	0.0	0.0	19
IS3	Sungrow Inverter Station	463352.9	5500142.4	832.6	0	98	0.0	A	75.0	0.0	-1.4	0.0	5.5	0.0	0.0	0.0	0.0	0.0	19
IS4	Sungrow Inverter Station	462794.0	5499927.0	832.6	0	98	0.0	A	75.3	0.0	-1.4	0.0	5.6	0.0	0.0	0.0	0.0	0.0	18
IS2	Sungrow Inverter Station	463166.6	5500142.3	832.6	0	98	0.0	A	75.3	0.0	-1.4	0.0	5.6	0.0	0.0	0.0	0.0	0.0	18
IS1	Sungrow Inverter Station	462896.1	5500142.4	831.7	0	98	0.0	A	75.9	0.0	-1.4	0.0	5.8	0.0	0.0	0.0	0.0	0.0	17

Project Contribution (dBA)		27
3rd Party Contribution (dBA)		21
Ambient Contribution (dBA)		45

Receiver: R03
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Day	45

Receiver Name	Receiver ID	X	Y	Z
R03	R03	462498 m	5499047 m	842 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
IS4	Sungrow Inverter Station	462794.0	5499927.0	832.6	0	98	0.0	A	70.3	0.0	-1.5	0.0	4.2	0.0	0.0	0.0	0.0	0.0	25
IS5	Sungrow Inverter Station	462980.3	5499927.0	833.1	0	98	0.0	A	71.0	0.0	-1.5	0.0	4.3	0.0	0.0	0.0	0.0	0.0	24
IS6	Sungrow Inverter Station	463166.6	5499927.0	832.6	0	98	0.0	A	71.9	0.0	-1.5	0.0	4.5	0.0	0.0	0.0	0.0	0.0	23
IS1	Sungrow Inverter Station	462896.1	5500142.4	831.7	0	98	0.0	A	72.3	0.0	-1.5	0.0	4.7	0.0	0.0	0.0	0.0	0.0	22
IS7	Sungrow Inverter Station	463352.8	5499927.0	832.8	0	98	0.0	A	72.8	0.0	-1.5	0.0	4.8	0.0	0.0	0.0	0.0	0.0	22
IS2	Sungrow Inverter Station	463166.6	5500142.3	832.6	0	98	0.0	A	73.2	0.0	-1.5	0.0	4.9	0.0	0.0	0.0	0.0	0.0	21
IS3	Sungrow Inverter Station	463352.9	5500142.4	832.6	0	98	0.0	A	73.9	0.0	-1.5	0.0	5.1	0.0	0.0	0.0	0.0	0.0	20

Project Contribution (dBA)		31
3rd Party Contribution (dBA)		-73
Ambient Contribution (dBA)		45

Receiver: R04
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Day	45

Receiver Name	Receiver ID	X	Y	Z
R04	R04	462800 m	5501214 m	832 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
A02_trans	AltaLink Transformer	464374.8	5502082.6	830.3	0	100	0.0	A	76.1	0.0	-2.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	22
IS1	Sungrow Inverter Station	462896.1	5500142.4	831.7	0	98	0.0	A	71.6	0.0	-1.5	0.0	4.5	0.0	0.0	0.0	0.0	0.0	23
IS2	Sungrow Inverter Station	463166.6	5500142.3	832.6	0	98	0.0	A	72.1	0.0	-1.5	0.0	4.6	0.0	0.0	0.0	0.0	0.0	23
IS3	Sungrow Inverter Station	463352.9	5500142.4	832.6	0	98	0.0	A	72.6	0.0	-1.5	0.0	4.8	0.0	0.0	0.0	0.0	0.0	22
IS4	Sungrow Inverter Station	462794.0	5499927.0	832.6	0	98	0.0	A	73.2	0.0	-1.5	0.0	4.9	0.0	0.0	0.0	0.0	0.0	21
IS5	Sungrow Inverter Station	462980.3	5499927.0	833.1	0	98	0.0	A	73.3	0.0	-1.5	0.0	5.0	0.0	0.0	0.0	0.0	0.0	21
IS6	Sungrow Inverter Station	463166.6	5499927.0	832.6	0	98	0.0	A	73.5	0.0	-1.5	0.0	5.0	0.0	0.0	0.0	0.0	0.0	21
IS7	Sungrow Inverter Station	463352.8	5499927.0	832.8	0	98	0.0	A	73.9	0.0	-1.5	0.0	5.2	0.0	0.0	0.0	0.0	0.0	20

Project Contribution (dBA)		30
3rd Party Contribution (dBA)		22
Ambient Contribution (dBA)		45

Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Source ID	Source Name	Point of Reception R01		Point of Reception R02		Point of Reception R03		Point of Reception R04	
		Distance to POR (m)	Sound Level at POR (dBA) Day	Distance to POR (m)	Sound Level at POR (dBA) Day	Distance to POR (m)	Sound Level at POR (dBA) Day	Distance to POR (m)	Sound Level at POR (dBA) Day
A02_pump	PumpJack RD120	1279	20	1185	21		0		0
Trans_IS7	Stand-Alone Transformer	1292	0	1381	0	1225	0	1400	0
Trans_IS6	Stand-Alone Transformer	1370	0	1447	0	1103	0	1338	0
Trans_IS5	Stand-Alone Transformer	1468	0	1533	0	1002	0	1299	0
Trans_IS3	Stand-Alone Transformer	1495	0	1588	0	1387	0	1205	0
Trans_IS2	Stand-Alone Transformer	1563	0	1646	0	1281	0	1132	0
Trans_IS4	Stand-Alone Transformer	1582	0	1636	0	927	0	1287	0
Trans_IS1	Stand-Alone Transformer	1694	0	1762	0	1164	0	1076	0
IS7	Sungrow Inverter Station	1291	21	1380	20	1226	22	1401	20
IS6	Sungrow Inverter Station	1369	20	1446	20	1104	23	1338	21
IS5	Sungrow Inverter Station	1466	20	1532	19	1003	24	1300	21
IS3	Sungrow Inverter Station	1494	19	1587	19	1389	20	1206	22
IS2	Sungrow Inverter Station	1562	19	1645	18	1282	21	1133	23
IS4	Sungrow Inverter Station	1580	19	1635	18	928	25	1287	21
IS1	Sungrow Inverter Station	1692	18	1761	17	1165	22	1076	23

Project Contribution (dBA)		**28**		**27**		**31**		**30**
3rd Party Contribution (dBA)		**20**		**21**		**-73**		**22**
Ambient Contribution (dBA)		**45**		**45**		**45**		**45**
Cumulative Contribution (dBA)		**45**		**45**		**45**		**45**

Receiver: R01
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Night	35

Receiver Name	Receiver ID	X	Y	Z
R01	R01	463817 m	5498723 m	841 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
A02_pump	PumpJack RD120	464131.9	5497483.3	838.0	0	98	0.0	A	73.1	0.0	-0.5	0.0	5.5	0.0	0.0	0.0	0.0	0.0	20
Trans_IS7	Stand-Alone Transformer	463350.6	5499927.2	832.8	0	77	0.0	A	73.2	0.0	-1.8	0.0	3.1	0.0	0.0	0.0	0.0	0.0	3
Trans_IS6	Stand-Alone Transformer	463164.3	5499927.2	832.6	0	77	0.0	A	73.7	0.0	-1.8	0.0	3.2	0.0	0.0	0.0	0.0	0.0	2
Trans_IS5	Stand-Alone Transformer	462978.0	5499927.2	833.2	0	77	0.0	A	74.3	0.0	-1.8	0.0	3.4	0.0	0.0	0.0	0.0	0.0	1
Trans_IS3	Stand-Alone Transformer	463350.6	5500142.5	832.6	0	77	0.0	A	74.5	0.0	-1.8	0.0	3.5	0.0	0.0	0.0	0.0	0.0	1
Trans_IS2	Stand-Alone Transformer	463164.3	5500142.6	832.6	0	77	0.0	A	74.9	0.0	-1.8	0.0	3.6	0.0	0.0	0.0	0.0	0.0	1
Trans_IS4	Stand-Alone Transformer	462791.8	5499927.2	832.6	0	77	0.0	A	75.0	0.0	-1.7	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0

Project Contribution (dBA)		10
3rd Party Contribution (dBA)		20
Ambient Contribution (dBA)		35

Receiver: R02
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Night	35

Receiver Name	Receiver ID	X	Y	Z
R02	R02	463760 m	5498608 m	842 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
A02_pump	PumpJack RD120	464131.9	5497483.3	838.0	0	98	0.0	A	72.5	0.0	-0.6	0.0	5.2	0.0	0.0	0.0	0.0	0.0	21
Trans_IS7	Stand-Alone Transformer	463350.6	5499927.2	832.8	0	77	0.0	A	73.8	0.0	-1.8	0.0	3.3	0.0	0.0	0.0	0.0	0.0	2
Trans_IS6	Stand-Alone Transformer	463164.3	5499927.2	832.6	0	77	0.0	A	74.2	0.0	-1.8	0.0	3.4	0.0	0.0	0.0	0.0	0.0	1
Trans_IS5	Stand-Alone Transformer	462978.0	5499927.2	833.2	0	77	0.0	A	74.7	0.0	-1.8	0.0	3.5	0.0	0.0	0.0	0.0	0.0	1
Trans_IS3	Stand-Alone Transformer	463350.6	5500142.5	832.6	0	77	0.0	A	75.0	0.0	-1.7	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0

Project Contribution (dBA)		9
3rd Party Contribution (dBA)		21
Ambient Contribution (dBA)		35

Receiver: R03
Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Night	13

Receiver Name	Receiver ID	X	Y	Z
R03	R03	462498 m	5499047 m	842 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
Trans_IS4	Stand-Alone Transformer	462791.8	5499927.2	832.6	0	77	0.0	A	70.3	0.0	-1.8	0.0	2.4	0.0	0.0	0.0	0.0	0.0	6
Trans_IS5	Stand-Alone Transformer	462978.0	5499927.2	833.2	0	77	0.0	A	71.0	0.0	-1.8	0.0	2.5	0.0	0.0	0.0	0.0	0.0	5
Trans_IS6	Stand-Alone Transformer	463164.3	5499927.2	832.6	0	77	0.0	A	71.9	0.0	-1.8	0.0	2.7	0.0	0.0	0.0	0.0	0.0	4
Trans_IS1	Stand-Alone Transformer	462893.8	5500142.6	831.7	0	77	0.0	A	72.3	0.0	-1.8	0.0	2.8	0.0	0.0	0.0	0.0	0.0	4
Trans_IS7	Stand-Alone Transformer	463350.6	5499927.2	832.8	0	77	0.0	A	72.8	0.0	-1.8	0.0	3.0	0.0	0.0	0.0	0.0	0.0	3
Trans_IS2	Stand-Alone Transformer	463164.3	5500142.6	832.6	0	77	0.0	A	73.2	0.0	-1.8	0.0	3.1	0.0	0.0	0.0	0.0	0.0	3
Trans_IS3	Stand-Alone Transformer	463350.6	5500142.5	832.6	0	77	0.0	A	73.8	0.0	-1.8	0.0	3.3	0.0	0.0	0.0	0.0	0.0	2

Project Contribution (dBA)		13
3rd Party Contribution (dBA)		-73
Ambient Contribution (dBA)		35

Receiver: R04

Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Time Period	Total (dBA)
Night	22

Receiver Name	Receiver ID	X	Y	Z
R04	R04	462800 m	5501214 m	832 m

Source ID	Source Name	X	Y	Z	Refl.	Lw	L/A	Freq	Adiv	K0	Agr	Abar	Aatm	Afol	Ahous	Cmet	Dc	RL	Lr
A02_trans	AltaLink Transformer	464374.8	5502082.6	830.3	0	100	0.0	A	76.1	0.0	-2.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	22
Trans_IS1	Stand-Alone Transformer	462893.8	5500142.6	831.7	0	77	0.0	A	71.6	0.0	-1.8	0.0	2.7	0.0	0.0	0.0	0.0	0.0	5
Trans_IS2	Stand-Alone Transformer	463164.3	5500142.6	832.6	0	77	0.0	A	72.1	0.0	-1.8	0.0	2.8	0.0	0.0	0.0	0.0	0.0	4
Trans_IS3	Stand-Alone Transformer	463350.6	5500142.5	832.6	0	77	0.0	A	72.6	0.0	-1.8	0.0	2.9	0.0	0.0	0.0	0.0	0.0	3
Trans_IS4	Stand-Alone Transformer	462791.8	5499927.2	832.6	0	77	0.0	A	73.2	0.0	-1.8	0.0	3.1	0.0	0.0	0.0	0.0	0.0	3
Trans_IS5	Stand-Alone Transformer	462978.0	5499927.2	833.2	0	77	0.0	A	73.3	0.0	-1.8	0.0	3.1	0.0	0.0	0.0	0.0	0.0	3
Trans_IS6	Stand-Alone Transformer	463164.3	5499927.2	832.6	0	77	0.0	A	73.5	0.0	-1.8	0.0	3.2	0.0	0.0	0.0	0.0	0.0	2
Trans_IS7	Stand-Alone Transformer	463350.6	5499927.2	832.8	0	77	0.0	A	73.9	0.0	-1.8	0.0	3.3	0.0	0.0	0.0	0.0	0.0	2

Project Contribution (dBA)		12
3rd Party Contribution (dBA)		22
Ambient Contribution (dBA)		35

Project: Yellow Lake Solar Project - NIA RP4
Project Number: 15182.03

Source ID	Source Name	Point of Reception R01 Distance to POR (m)	Point of Reception R01 Sound Level at POR (dBA) Night	Point of Reception R02 Distance to POR (m)	Point of Reception R02 Sound Level at POR (dBA) Night	Point of Reception R03 Distance to POR (m)	Point of Reception R03 Sound Level at POR (dBA) Night	Point of Reception R04 Distance to POR (m)	Point of Reception R04 Sound Level at POR (dBA) Night
A02_pump	PumpJack RD120	1279	20	1185	21		0		0
Trans_IS7	Stand-Alone Transformer	1292	5	1381	4	1225	5	1400	4
Trans_IS6	Stand-Alone Transformer	1370	4	1447	4	1103	6	1338	4
Trans_IS5	Stand-Alone Transformer	1468	4	1533	3	1002	7	1299	5
Trans_IS3	Stand-Alone Transformer	1495	4	1588	3	1387	4	1205	5
Trans_IS2	Stand-Alone Transformer	1563	3	1646	3	1281	5	1132	6
Trans_IS4	Stand-Alone Transformer	1582	3	1636	3	927	7	1287	5
Trans_IS1	Stand-Alone Transformer	1694	3	1762	3	1164	5	1076	6
IS7	Sungrow Inverter Station	1291	0	1380	0	1226	0	1401	0
IS6	Sungrow Inverter Station	1369	0	1446	0	1104	0	1338	0
IS5	Sungrow Inverter Station	1466	0	1532	0	1003	0	1300	0
IS3	Sungrow Inverter Station	1494	0	1587	0	1389	0	1206	0
IS2	Sungrow Inverter Station	1562	0	1645	0	1282	0	1133	0
IS4	Sungrow Inverter Station	1580	0	1635	0	928	0	1287	0
IS1	Sungrow Inverter Station	1692	0	1761	0	1165	0	1076	0

Project Contribution (dBA)		**10**		**9**		**13**		**12**
3rd Party Contribution (dBA)		**20**		**21**		**-73**		**22**
Ambient Contribution (dBA)		**35**		**35**		**35**		**35**
Cumulative Contribution (dBA)		**35**		**35**		**35**		**35**

APPENDIX D – Comparison for No-Net-Increase

Cumulative Noise Impact Comparison

Project: Yellow Lake Solar Project - Noise Impact Assessment RP4
Report ID: 15183.03

Created on: 2020-06-15

Comparison of Cumulative Noise Impact Levels - Current Layout and Layout from NIA RP2 Dated May 17, 2018								
Noise Receptor ID	Time Period	New Cumulative Sound Level [dBA]	New Project-Only Sound Level [dBA]	Permissible Sound Level (PSL) [dBA]	Previous Cumulative Sound Level [dBA]	Previous Project-Only Sound Level [dBA]	Increase above PSL [dBA]	Increase above Previous Cumulative Sound Level [dBA]
R01	Day	45.1	27.9	50.0	45.0	21.0	-4.9	0.1
	Night	35.1	9.6	40.0	35.3	21.0	-4.9	-0.2
R02	Day	45.1	27.3	50.0	45.0	20.3	-4.9	0.1
	Night	35.2	9.0	40.0	35.3	20.3	-4.8	-0.1
R03	Day	45.2	31.0	50.0	45.0	24.4	-4.8	0.1
	Night	35.0	12.6	40.0	35.4	24.4	-5.0	-0.3
R04	Day	45.2	30.0	50.0	45.0	22.3	-4.8	0.1
	Night	35.2	11.6	40.0	35.4	22.3	-4.8	-0.2

APPENDIX E – Acoustical Practitioner Information

aercoustics

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Fax 416-249-3613
aercoustics.com

kohl clark
BEng

profile

Kohl Clark is an Engineer in Training (EIT) in the Province of Ontario and holds a Bachelor's degree in Mechanical Engineering from McMaster University. He has 3.5 years of experience in the field of Acoustics and has been involved in different aspects of environmental noise and vibration.

education + career milestones

B.Eng., Mechanical Engineering, McMaster University, June 2016
joined Aercoustics full time in 2016 as a noise and vibration consultant.
Member of Professional Engineers of Ontario.

selected projects

Noise modelling and assessment

Loyalist Solar Farm	Stone Mills, Lenox, & Addington County, ON
Oshawa Asphalt Plant	Oshawa, ON
Coleraine Drive Asphalt Plant	Bolton, ON
Derry Heights Commercial Development	Milton, ON
Rogers 333 Bloor Generator Upgrade	Toronto, ON
Loblaws Supermarkets	Various locations within Canada

Wind Farm noise measurements and compliance verification

Headwaters Wind Farm	Randolph County, IN
Snowy Ridge Wind Farm	Kawartha Lakes, ON
Port Ryerse Wind Farm	Port Dover, ON
K2 Wind Project Wind Project	Kincardine, ON
Belle River Wind Farm	Lakeshore, ON
Grey Highlands Wind Projects	Grey County, ON

aercoustics

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payam ashtiani

BASc PEng ASA

profile

Payam Ashtiani is a Professional engineer in good standing, with a Bachelor's degree in Mechanical Engineering from the University of Toronto. He has 8 years of experience in the field of Acoustics with a specific focus on noise from wind turbines. Apart from completing numerous noise assessments for wind projects, and extensive wind turbine noise measurement campaigns, he has authored multiple research papers on the topic and presented at international technical conferences. His experience has included providing expert advice to regulatory bodies such as the Ontario Ministry of Environment, and the Vermont Public Service Department on the topic of wind turbine noise, and has appeared as expert witness in cases such as the Kent Breeze Environmental Review Tribunal, and the Alberta Utilities Commission Hearing for the Bull Creek Wind Farm. Payam also oversees the technical group responsible for carrying out IEC 61400-11 measurements – the only such group accredited to ISO 17025 in Canada.

education + career milestones

B.A.Sc., Mechanical Engineering, University of Toronto, 2005
joined aercoustics in 2006 as a noise and vibration consultant.
Member of

Canadian Acoustical Association,
Professional Engineers of Ontario,
Acoustical Society of America

publications

Detection of Amplitude Modulation in Southern Ontario Wind Farms, Halstead, D., Suban-Loewen, S, **Ashtiani P**, 6th International Conference of Wind Turbine Noise, Glasgow, Scotland, 20-23 April 2015

Spectral discrete probability density function of measured wind turbine noise in the far field. **Ashtiani P** and Denison A (2015). Front. Public Health 3:52. doi: 10.3389/fpubh.2015.00052

Health-based audible noise guidelines account for infrasound and low-frequency noise produced by wind turbines. Berger RG, **Ashtiani P**, Ollson CA, Whitfield Aslund M, McCallum LC, Leventhall G and Knopper LD (2015) Front. Public Health 3:31. doi: 10.3389/fpubh.2015.00031

Generating a better picture of noise immissions in post construction monitoring using statistical analysis, **Ashtiani, P.**, 5th International Conference of Wind Turbine Noise, Denver, Colorado, 28 - 30 August 2013

A new software tool to facilitate NURB based geometries in acoustic design, O'Keefe J., **Ashtiani, P.**, Grant D., International Symposium on Room Acoustics, Toronto, Canada, 9 June 2013

Analysis of noise immission levels measured from wind turbines, **Ashtiani, P.**, Titus, S, Wind Turbine Noise 2011, Rome, Italy, 11-14 April 2011

Improved noise audit technique for wind farms, Titus S., **Ashtiani P.**, INTER-NOISE 2010, Lisbon, Portugal, 13-16 June 2010

Concerns with using simplified wind profiles in determining noise impacts of wind turbines, Gambino, V., **Ashtiani, P.**, Preager, T., Ramakrishnan, R., INTER-NOISE 2009, Ottawa, Canada, August 23-26, 2009

Acoustic Performance Considerations For A "Once Through Steam Generator", Gambino, V., **Ashtiani, P.**, 2006.

selected projects

Noise modelling and assessment

Wolfe Island EcoPower Centre	Wolfe Island, ON
McLeans Mountain Wind Farm	Manitoulin Island, ON
Grand Bend Wind Farm	Grand Bend, ON
Bull Creek Wind Farm	Provost, AB
Ingredion (formerly CASCO) facility NIA	Cardinal, ON
Kraft Foods NIA and noise abatement plans	Various locations within Ontario
Q9 Networks data centres	Various locations within ON, AB, BC
Oldcastle building products (Permacon Group)	Various locations within Ontario

Wind Turbine noise measurements and compliance verification

Kingsbridge wind plant (K1)	Goderich, ON
Melancthon EcoPower Centre	Melancthon, ON
Wolfe Island EcoPower Centre	Wolfe Island, ON
Gosfield Wind Project	Essex County, ON
Comber Wind Project	Essex County, ON
South Kent Wind Project	Chatham-Kent, ON
Port Dover Nanticoke Wind Project	Nanticoke, ON
South Dundas Wind Project	South Dundas, ON
HAF Wind Energy Project	West Lincoln, ON
Wainfleet Wind Energy Project	Wainfleet, ON
Vestas R&D Acoustics Testing	Undisclosed locations
GE R&D Acoustic Testing	Undisclosed locations
Hybridyne wind Systems	Various locations with Ontario

Peer Review, expert witness, and expert advice

Various Wind Turbine Noise submissions to Public Service Board	Montpellier, VT
Ontario Ministry of Environment wind turbine noise measurement protocol	Ontario
Dufferin Wind Power project noise study peer review	Dufferin County, ON
Kent Breeze ERT (Erickson vs. Director)	Chatham-Kent, ON