NORTHLAND POWER

Belleville North Solar Project

Noise Assessment Report

August 15, 2011

Northland Power Inc.
on behalf of
Northland Power Solar
Belleville North L.P.
Toronto, Ontario

Noise Assessment Report

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Project Report

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Executive Summary

This report presents the results of the noise assessment study required for Solar Facilities under Regulation 359/09, as part of the Renewable Energy Approval (REA) Process.

Northland Power Solar Belleville North L.P. (hereinafter referred to as "Northland") has retained Hatch Ltd. (Hatch) to prepare a Noise Assessment Study for the Northland Power Belleville North Solar-Photovoltaic facility (hereinafter referred to as the "Project"), with an installed capacity of 10 MW. The Project will be located within the City of Prince Edward County, Ontario.

This Noise Assessment Study has been prepared based on the document entitled "Basic Comprehensive Certificates of Approval (Air) – User Guide" by the Ontario Ministry of the Environment (MOE). The sound pressure levels at the points of reception (POR) have been estimated using ISO 9613-2, implemented in the CADNA-A computer code. The performance limits used for verification of compliance correspond to the values for rural areas (45 dBA for day time, 40 dBA for night time). The results presented in this report are based on the best available information at this time. It is the intention that, in the detailed engineering phase of the project, certified noise data based on final plans and designs will confirm the conclusions of this noise study.

Based on the results obtained in this study, we believe that the sound pressure levels at POR will not exceed MOE requirements for rural areas. Any noise issues that might arise during commissioning will be manageable and can be resolved by implementing typical remediation measures as described in this report. It is our intention to verify by field measurements taken on completion of installation and during commissioning that the noise levels at the POR are within the limits set by the MOE.

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1. Introduction

This report presents the results of the noise assessment study required for Solar Facilities under Regulation 359/09, as part of the Renewable Energy Approval (RA) Process.

Northland Power Solar Belleville North L.P. (hereinafter referred to as "Northland") retained Hatch Ltd. (Hatch) to prepare a Noise Assessment Study for the Northland Power Belleville North Solar-Photovoltaic (Solar PV) facility (hereinafter referred to as the "Project"), with an installed capacity of 10 MW. The Project will be located within the City of Prince Edward County, Ontario.

The report was prepared according to publication "Basic Comprehensive Certificates of Approval (Air) – User Guide, 2004" by the Ministry of the Environment (MOE), and includes a general description of the facility, sources and points of reception (POR), assessment of compliance, as well as all the supporting information relevant to the Project.

2. Facility Description

The Project will utilize photovoltaic (PV) panels installed on fixed racking structures, mounted on the ground. The PV panels generate DC electricity, which is converted to 560-V AC electricity by clusters of inverters. The 560-V power is transformed to 13.8 kV by a transformer located at each inverter cluster. The 13.8-kV power is brought to a single central substation transformer to be stepped up to 44 kV for transmission away from the site.

Since the panels will be ground-mounted and the total nameplate capacity is over 10 kW, the Project is considered to be a Class 3 Solar Facility, according to the classification presented in Regulation 359/09.

A general description of the Project is provided in Table 2.1.

Table 2.1 General Project Description

Project Description	Ground-mounted Solar PV, Class 3
System Nameplate Capacity	10 MW AC/10 MVA
Local Distribution Company	Hydro One Networks Inc.
Approximate Coordinates	Latitude 44°3'44'' N, Longitude 77°20'10'' W

2.1 Site Location

The property consists of agricultural land totalling more than 38 hectares, located about 16 km northwest of Picton, in the Township of Sophiasburg. Figure 2.1 shows the geographical location of the Project, as well as areas to be occupied with the PV panels. The detailed scaled Zoning Designation Plan and Area Location Plan drawings are included in Appendix A. A total of 70 receptors are located within 1.5 km from the substation.

For modelling purposes, the vegetation that blocks some of the POR from the sources has not been incorporated, so the predicted sound levels at these locations may be slightly over predicted.

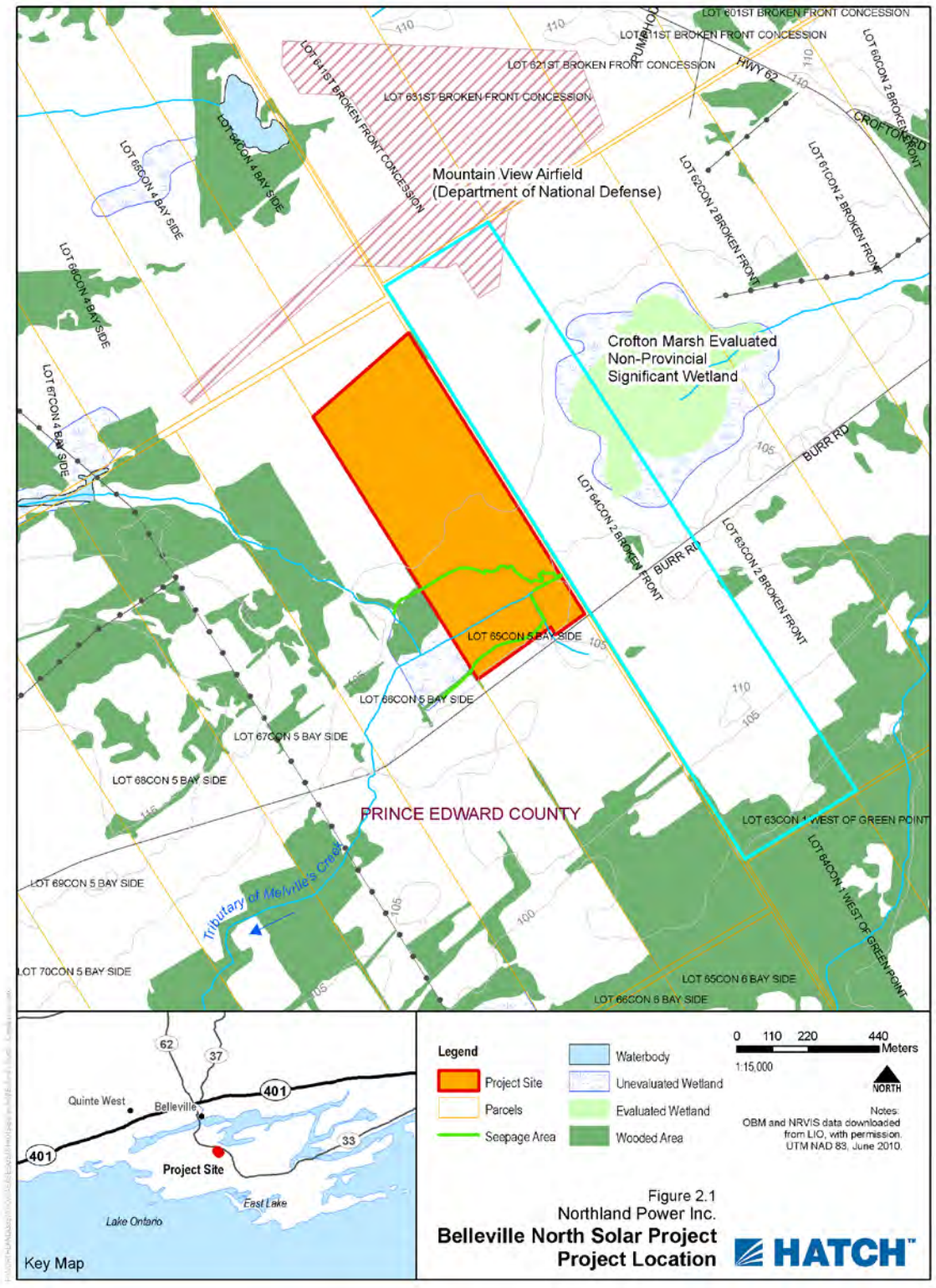


Figure 2.1 Project Location

2.2 Acoustical Environment

The Project will be surrounded by farmland, with some forested areas to the west and south. The background noise levels are expected to be typical of rural areas, classified as a Class 3 based on Publication NPC-232 by the MOE. Some traffic noise is expected from Highway 62 and Burr Road, mainly during day hours. Also, aircraft noise is expected in the area, due to the Mountain View Airfield (Department of National Defence) located 500 m north from the site.

Mineral extraction operations performed in a quarry 2 km northwest of the site may also contribute significantly to the background sound levels of the area. The traffic volumes can also be affected by material transportation from/to the quarry.

2.3 Life of Project

The expected life of the Project is 30 years. The manufacturer's warranty on the PV modules is 25 years and the expected life of solar power plants of this type is 35 to 40 years.

2.4 Operating Hours

Solar PV facilities produce electricity during the day hours, when the sun's rays are collected by the panels. After sunset, the plant will not receive solar radiation to generate any electricity. Under these conditions, the inverters will not produce noise and the transformers will be energized, but not in operation (no fans).

2.5 Approach to the Study

The sound pressure levels at the POR were predicted using procedures from ISO 9613-2, which is a widely used standard for evaluation of noise impact in environmental assessments. The sound power levels were estimated from the National Electrical Manufacturers Association (NEMA) standards for the substation transformer. The inverter manufacturer provided the noise data for the inverter clusters, which include the medium-voltage transformer. The software package CADNA-A, which implements ISO-9613-2, was used to predict the noise levels at the closest POR. This numerical modelling software is able to handle the sound sources present in the Project, as well as considering atmospheric and ground attenuation. The height contours for the site were taken from the Ontario Base Maps (OBM).

3. Noise Source Summary

The main sources of noise from the Project will be the step-up transformer, located at the substation, and eight inverter clusters which also include medium-voltage transformers. Cogeneration Associates Limited provided a layout of the solar PV facility (see Figure A3, Appendix A). The coordinates of each source are presented in Appendix B.

3.1 Substation

At this point, it is anticipated that the step-up power transformer located in the substation will have a capacity of 10 MVA. In addition, the transformer will be oil-filled with air-forced cooling (ONAF). For the purpose of evaluating the potential noise impacts of the transformer, the sound power level was estimated using data from NEMA TR1-1993 (2000). This standard provides maximum sound

level values for transformers, and manufacturers routinely meet this specification. Hence, the results based on NEMA slightly overestimate the impact on POR. The NEMA levels were then converted into frequency spectra using empirical correlations for transformer noise (Harris, 1998).

Power transformers are considered by the MOE to be tonal noise sources. A 5-dBA penalty will be added to the sound power spectrum, as recommended by Publication NPC-104, "Sound Level Adjustments," for tonality. Table B2, Appendix B, shows the frequency spectrum used to model the substation transformer.

3.2 Inverter Clusters (Pads)

At this stage of the Project, Northland is planning to use inverter clusters manufactured by SMA. Each Sunny Central SC1250MV unit comprises two 630HE inverters (630 kW), contained in an e-house or enclosure (see Appendix B). The main sources of noise are the cooling/ventilation fans for the inverters, the electrical components on the inverters and the medium-voltage transformer.

The installed capacity of each inverter cluster is 1.25 MW, as shown in Table 3.1. SMA provided third-octave noise data for the inverter cluster unit, which includes the medium-voltage transformer (see Appendix B). A 5-dBA penalty was added to the frequency spectrum, as stipulated in Publication NPC-104, "Sound Level Adjustments," to allow for tonality. The frequency spectra used for the inverter clusters and medium-voltage transformers is shown in Table B2, Appendix B.

The "barrier effect" provided by the solar panels surrounding the inverter clusters has not been modelled, which means that the sound pressure levels predicted at the POR can be higher than would be the case if the barrier was accounted for. Note also that, at night time, the facility will not operate. Under these conditions, the inverters do not produce noise. The medium-voltage transformers are energized and make some magnetostrictive noise at a reduced level, but no cooling fans are in operation. Since the noise data provided by SMA combines both inverter and transformer, the model will assume that the cluster will be operating 24 hours.

3.3 Noise Summary Table

A summary of the sound sources described above, including sound level, characteristics and potential noise control measures, is presented in **Table 3.1**.

Table 3.1 Noise Source Summary

Source ID	Source Description	Overall Sound Power Level (dBA)	Source Location	Sound Characteristics	Noise Control Measures
1	Subs. Transformer: 10 MVA	93.3	O	S-T	B
2	Inverter Cluster #1: 1.25 MW	102.2	O	S-T	U
3	Inverter Cluster #2: 1.25 MW	102.2	O	S-T	U
4	Inverter Cluster #3: 1.25 MW	102.2	O	S-T	U
5	Inverter Cluster #4: 1.25 MW	102.2	O	S-T	U
6	Inverter Cluster #5: 1.25 MW	102.2	O	S-T	B
7	Inverter Cluster #6: 1.25 MW	102.2	O	S-T	B
8	Inverter Cluster #7: 1.25 MW	102.2	O	S-T	B
9	Inverter Cluster #8: 1.25 MW	102.2	O	S-T	B

Notes:
1. A 5-dBA penalty is included in this table.
2. Location: Inside building (I), Outside building (O).
3. Sound Characteristics: Steady (S), Tonal (T), Impulsive (I), Quasi-Steady Impulsive (QSI).
4. Noise Control: Silencer (S), Acoustic lining (A), Barrier (B), Lagging (L), Enclosure (E), Other (O), Uncontrolled (U).

4. Point of Reception Summary

The POR used in this study have been taken from the OBM for the Belleville area. Some additional receptors (residential buildings) were added based on satellite imagery from Google Earth Pro (2002). The total number of POR within a 1-km radius from the substation is 44 (see Figure A2). Three of these receptors have been chosen as representative for evaluating the noise impact from the facility, and are presented in Table 4.1 (see Figure A2 in Appendix A). The complete set of results is included in Appendix C, including a noise map from CADNA-A. For this study, the elevation above ground of the POR is 4.5 m.

Table 4.1 Point of Reception Noise Impact (Day Time)

Source ID	POR 1		POR 5		POR 16	
	Distance (m)	L_{eq} Sound Level at POR 1 (dBA)	Distance (m)	L_{eq} Sound Level at POR 5 (dBA)	Distance (m)	L_{eq} Sound Level at POR 16 (dBA)
1	147	28.7	241	25.0	470	19.5
2	924	29.9	944	29.7	974	29.4
3	857	29.8	836	30.0	951	28.7
4	782	31.7	846	30.8	813	31.3
5	685	33.0	690	32.9	788	31.6
6	620	27.2	712	26.3	660	27.0
7	523	28.6	547	28.3	654	27.3
8	479	29.3	617	27.7	523	29.1
9	378	31.6	442	30.6	538	31.6

5. Impact Assessment

The purpose of the acoustic assessment report is to demonstrate that the facility is in compliance with the noise performance limits. The Project will be located in a Class 3 Area, based on the classification defined in Publication NPC-232 by the MOE. Class 3 area means a rural area with an acoustical environment that is dominated by natural sounds, having little or no traffic, such as an agricultural area.

Table 5.1 shows the performance limits set by the MOE for Class 3 Areas, according to Publication NPC-232.

Table 5.1 Performance Limits (One-Hour L_{eq}) by Time of Day for Class 3 Areas

Time of Day	One Hour L_{eq} (dBA) Class 3 Area
07:00 to 19:00	45
19:00 to 23:00	40
23:00 to 07:00	40

The Project will be operating during the day hours, that is, before 19:00 during most of the year. However, in the summer months, the sun may shine until past 21:00, although the inverters will be well below 100% loading conditions. This means that during the summer the Project will be operating at the time the applicable performance limit changes from 45 dBA to 40 dBA. At night time, the transformer is still energized, so the resultant sound pressure levels should be compared to the lower limit of 40 dBA. Note that since the frequency spectrum provided by the manufacturer includes the inverters and medium-voltage transformer at 100% loading conditions, it is assumed that both devices are operating during 24 hours. In reality, the only sound that could be perceived at night time is the magnetostrictive noise from the transformers.

The enclosures were not taken into consideration in this report.

For this study, the overall ground attenuation coefficient was assumed to be 0.7, which is commonly used by the MOE for evaluating the noise impact of other renewable energy facilities.

5.1 Compliance With Performance Limits

Table 5.2 presents the predicted sound pressure levels for the representative POR. The complete set of results is included in Appendix C.

Table 5.2 Acoustic Assessment Summary (Day and Night Time)

POR ID	POR Description	Sound Level at POR (L_{eq}) Day / Night (dBA)	Verified by Acoustic Audit (Yes/No)	Performance Limit (L_{eq}) Day / Night (dBA)	Compliance With Performance Limit (Yes/No)
1	House – South	39.9/39.9	No	45.0/40.0	Yes
5	House – Southwest	39.2/39.2	No	45.0/40.0	Yes
16	House – Southeast	38.9/38.9	No	45.0/40.0	Yes

The results show that all POR are compliant with MOE guidelines based on the performance limits.

6. Mitigation Measures

Mitigation for operation of the Project has been modelled and shown to be feasible in the form of acoustic barriers. However, if an enclosure is deployed to cover the inverters, the proposed barriers may be substituted by acoustically treated walls and/or fan silencers and acoustic louvers. In this case, these devices must be designed according to the specific dimensions and configuration of the enclosure. Earth berms could also be used to mitigate the noise impact on the POR.

The minimum construction requirements for the proposed noise barriers located next to the substation are presented in Table 6.1, as well as the approximate dimensions. Figure B1 and Table B3 in Appendix B present a diagram of the barrier design and the absorption coefficients used in the noise model.

Table 6.1 Barrier Description

Mitigation ID	Location	Construction Requirements	Approximate Height (m)	Approximate Length (m)	Distance From Source (m)
BarrierS	See Figure B1	20 kg/m^2, continuous	5.0	5.0 + 5.0 + 5.0	1.5
Barrier5	See Figure B1	20 kg/m^2, continuous	4.2	9.0 + 6.0 + 9.0	1.5
Barrier6	See Figure B1	20 kg/m^2, continuous	4.2	9.0 + 6.0 + 9.0	1.5
Barrier7	See Figure B1	20 kg/m^2, continuous	4.2	9.0 + 6.0 + 9.0	1.5
Barrier8	See Figure B1	20 kg/m^2, continuous	4.2	9.0 + 6.0 + 9.0	1.5

While analysis indicates that no additional mitigation will be required, the noise levels will be verified at the closest POR after the Project goes into service. If measurements indicate a need to further reduce sound levels to satisfy MOE criteria, additional mitigation measures will be taken at the sources.

7. Conclusions and Recommendations

For the Project, the sound pressure levels at the POR have been estimated using the CADNA-A model, based on ISO 9613-2. The performance limits used for comparison correspond to Class 3 areas, with 45 dBA during day time (7:00 a.m. to 7:00 p.m.) and 40 dBA during night time. Mitigation for operation of the Project has been modelled and shown to be feasible.

Based on the results obtained in this study, it is concluded that the sound pressure levels at the POR will be below MOE requirements for Class 3 areas at night time (40 dBA) and day time (45 dBA).

8. References

Harris, C. 1998. Acoustical Measurements and Noise Control, Third Edition. Acoustical Society of America.

IEEE. 2006. C57.12.90-2006: Standard Test Code for Liquid-Immersed, Power and Regulating Transformers. pp 64 to 76.

Ministry of the Environment (MOE). 1997. Noise Assessment Criteria in Land Use Planning. Publication LU-131. Ontario Ministry of the Environment. 12 pp + Annex.

MOE. 1995. Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban). Publication NPC-205. Ontario Ministry of the Environment. 6 pp + Annex.

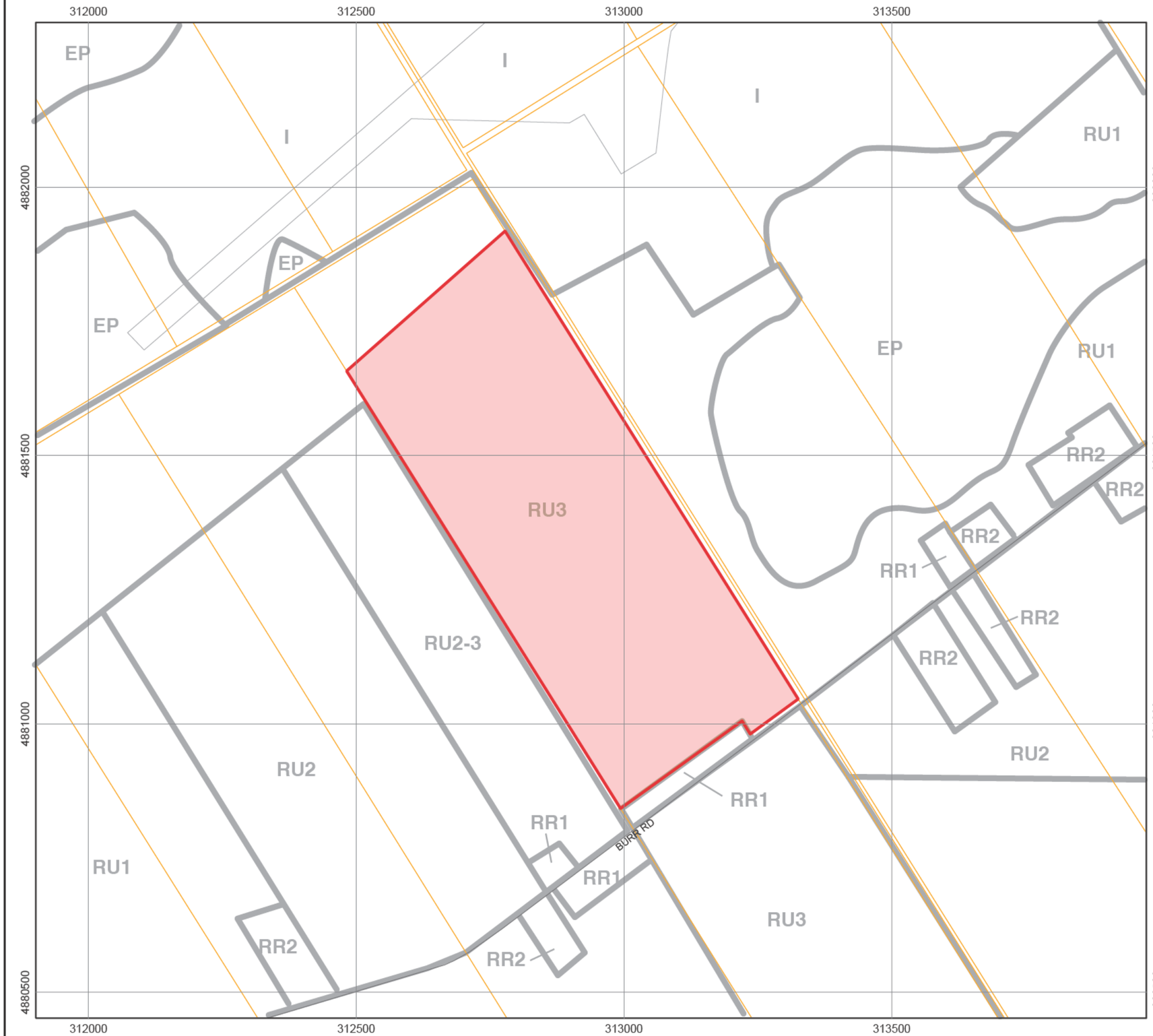
MOE. 1995. Sound Level Limits for Stationary Sources in Class 3 Areas (Rural). Publication NPC-232. Ontario Ministry of the Environment. 8 pp + Annex.

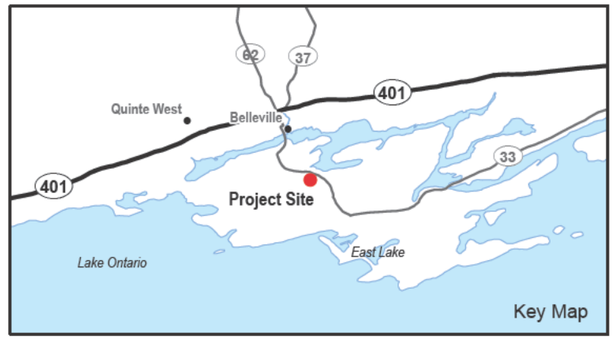
NEMA. 2000. Standards Publication No. TR 1-1993 (R2000): Transformers, Regulators and Reactors. National Electrical Manufacturers Association. 31 pp.

ISO 1996-1 Description, Measurement and Assessment of Environmental Noise – Part 1: Basic Quantities and Assessment Procedures.

Appendix A

Land-Use Zoning Designation Plan, Area Location Plan and Plant Layout





RU1	Rural 1
RU3	Rural 3
RU2	Rural 2
R1	Urban Residential Type 1
R2	Urban Residential Type 2
R3	Urban Residential Type 3
HR	Hamlet Residential
LSR	Limited Service Residential
MHR	Mobile Home Residential
RR1	Rural Residential 1
RR2	Rural Residential 2
CC	Core Commercial
CG	General Commercial
CL	Local Commercial
CH	Highway Commercial
TC	Tourist Commercial
TPC	Trailer Park Commercial
MG	General Industrial
MH	Heavy Industrial
MR	Rural Industrial
MX	Extractive Industrial
MD	Waste Disposal Industrial
I	Institutional
OS	Open Space
EP	Environmental Protection
EP-W	Ep - Provincially Significant Wetland
FD	Future Development

Project Site

N

0 75 150 300 Metres

1:7,500

Source: Zoning By Law for County of Prince Edward, 2006

Northland Power Inc.
Belleville North Solar Project

Land Use Zoning Designation Plan

Figure A.1

HATCH

312000 312500 313000 313500

4882000 4881500 4881000 4880500

Mountain View Airfield
(Department of National Defense)

Crofton Marsh
Evaluated Non-Provincially
Significant Wetland

Unnamed Watercourse

PRINCE EDWARD COUNTY

POR 1

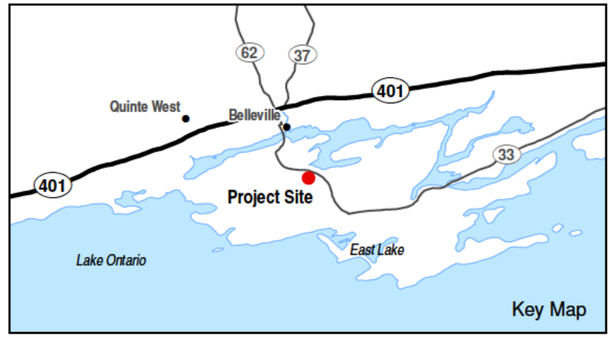
POR 5

POR 16

BURR RD

BURR RD

105 110 115



Legend

- Representative POR
- Building
- Topographic Contour (5m interval)
- Roads
- Watercourse
- Project Site
- Parcels
- Airport
- Waterbody
- Unevaluated Wetland
- Evaluated Wetland
- Wooded Area

Notes: OBM and NRVIS data downloaded from LIO, with permission.
UTM NAD 83, June 2010.

0 75 150 300 Metres

1:7,500

NORTH

Northland Power Inc.
Belleville North Solar Project
Scaled Area Location Plan

Figure A.2

HATCH

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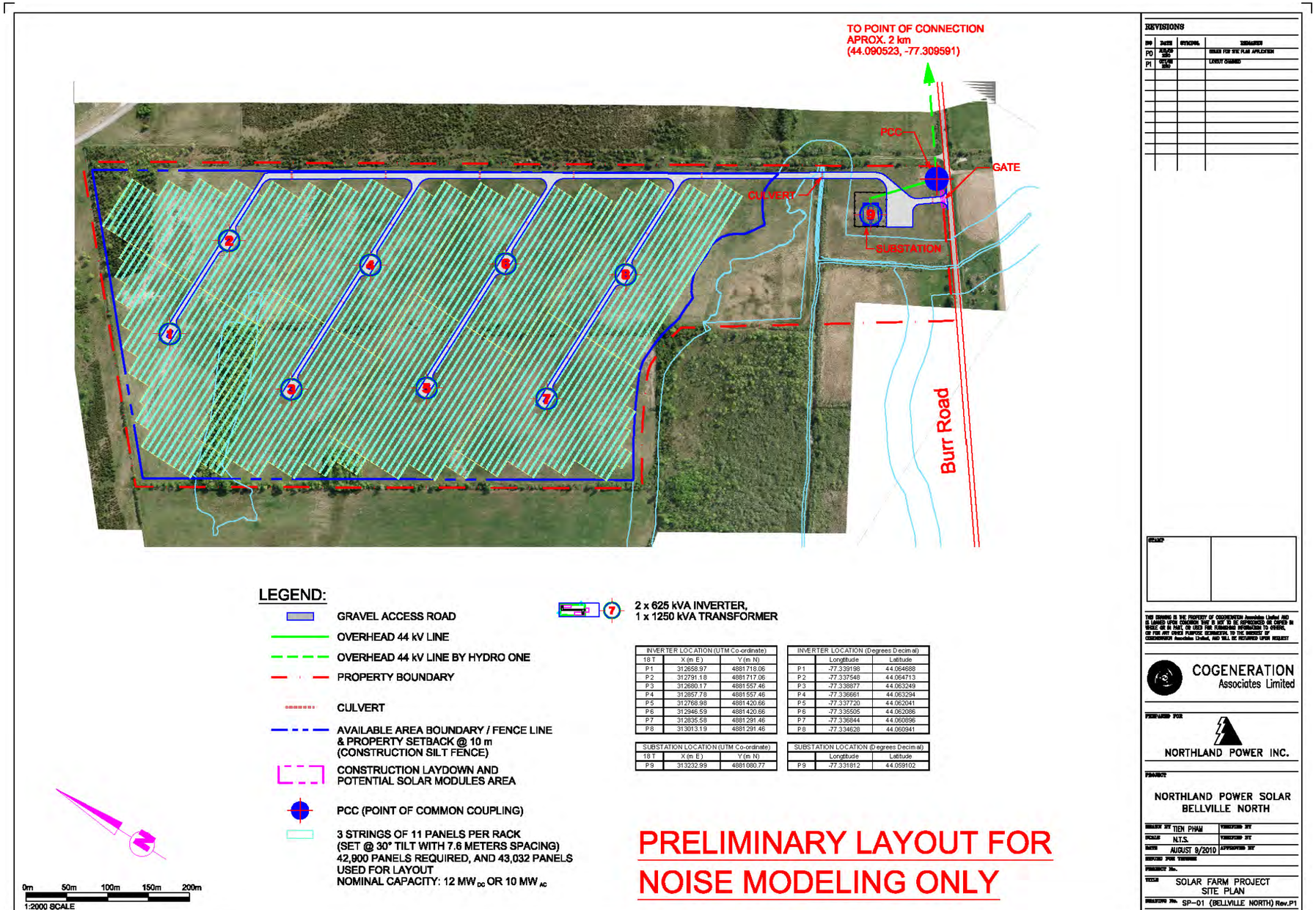

INVERTER LOCATION (UTM Co-ordinate)		
18 T	X (m E)	Y (m N)
P1	312658.97	4881718.06
P2	312791.18	4881717.06
P3	312680.17	4881557.46
P4	312857.78	4881557.46
P5	312768.88	4881420.66
P6	312946.59	4881420.66
P7	312835.58	4881291.46
P8	313013.19	4881291.46

SUBSTATION LOCATION (UTM Co-ordinate)		
18 T	X (m E)	Y (m N)
P9	313232.99	4881080.77

INVERTER LOCATION (Degrees Decimal)		
	Longitude	Latitude
P1	-77.339198	44.064688
P2	-77.337548	44.064713
P3	-77.338877	44.063249
P4	-77.336661	44.063294
P5	-77.337720	44.062041
P6	-77.335505	44.062086
P7	-77.336844	44.060896
P8	-77.334628	44.060941

SUBSTATION LOCATION (Degrees Decimal)		
	Longitude	Latitude
P9	-77.331812	44.059102

Figure A3 Northland Belleville North Layout (provided by Cogeneration Associates Limited)

Appendix B

Noise Sources

Table B1 Point Sources Used in CADNA-A, Includes Tonality Penalty of 5 dBA

Name	Result PWL		Correction		Height	Coordinates		
	Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)	(m)	X (m)	Y (m)	Z (m)
Substation – 10 MVA	93.3	93.3	5.0	5.0	3.2	313233	4881081	108.2
Inverter Cluster #1: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312659	4881718	110.9
Inverter Cluster #2: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312791	4881717	110.2
Inverter Cluster #3: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312680	4881557	110.4
Inverter Cluster #4: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312858	4881557	109.4
Inverter Cluster #5: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312769	4881421	109.5
Inverter Cluster #6: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312947	4881421	108.5
Inverter Cluster #7: 1.25 MW	102.2	102.2	5.0	5.0	3.5	312836	4881291	108.5
Inverter Cluster #8: 1.25 MW	102.2	102.2	5.0	5.0	3.5	313013	4881291	108.5

Table B2 Frequency Spectra Use for Modelling the Noise Sources, Not Including Tonality Penalty

Name	Octave Spectrum (dBA)										
	31.5	63	125	250	500	1000	2000	4000	8000	A	lin
10-MVA Subs. Transformer	45.5	64.7	76.8	79.3	84.7	81.9	78.1	72.9	63.8	88.3	96.9
Inverter 1.25 MW	4.8	64.8	78.9	93.0	91.6	90.1	87.6	79.9	65.4	97.2	103.7

Table B3 Absorption Coefficient α for the Barrier

Name	Octave Spectrum (dBA)									
	31.5	63	125	250	500	1000	2000	4000	8000	Aw
Barrier	0.00	0.00	0.01	0.05	0.05	0.04	0.04	0.04	0.00	0.05

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SUNNY CENTRAL 800MV / 1000MV / 1250MV

SC 800MV-11 / SC 1000MV-11 / SC 1250MV-11

Efficient

- Without low-voltage transformer: greater plant efficiency due to direct connection to the medium-voltage grid

Turnkey Delivery

- With medium-voltage transformer and concrete substation for outdoor installation

Optional

- Medium-voltage switchgear systems for a flexible structure of large solar parks
- AC transfer station with measurement
- Medium-voltage transformers for other grid voltages (deviating from 20 kV)

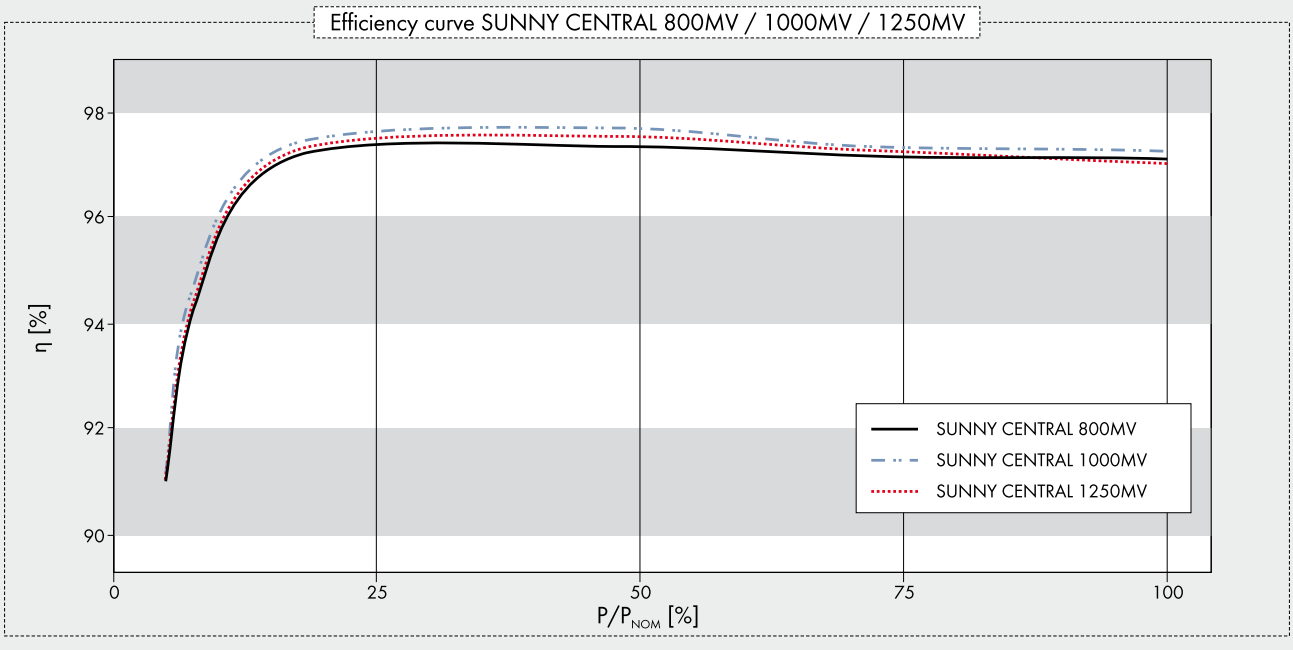
SUNNY CENTRAL for Direct medium-voltage feed-in 800MV / 1000MV / 1250MV

High-performance medium-voltage station

For even more power: Two powerful Sunny Central HE inverters are components of a medium-voltage station (MV) which feeds directly into a shared medium-voltage transformer. In this way, for example, two Sunny Central 630HE inverters are combined into a powerful Sunny Central 1250MV station. The advantage: By removing the need for the low-voltage transformer, the plant operator realizes greater yields and at the same time lower inverter costs. The Sunny Central MV is delivered as a "turnkey" concrete substation for outside installation. On top of that, the Sunny Central MV actively participates in grid management, and thereby fulfils all requirements of the Medium-Voltage Directive valid as of July 2010.

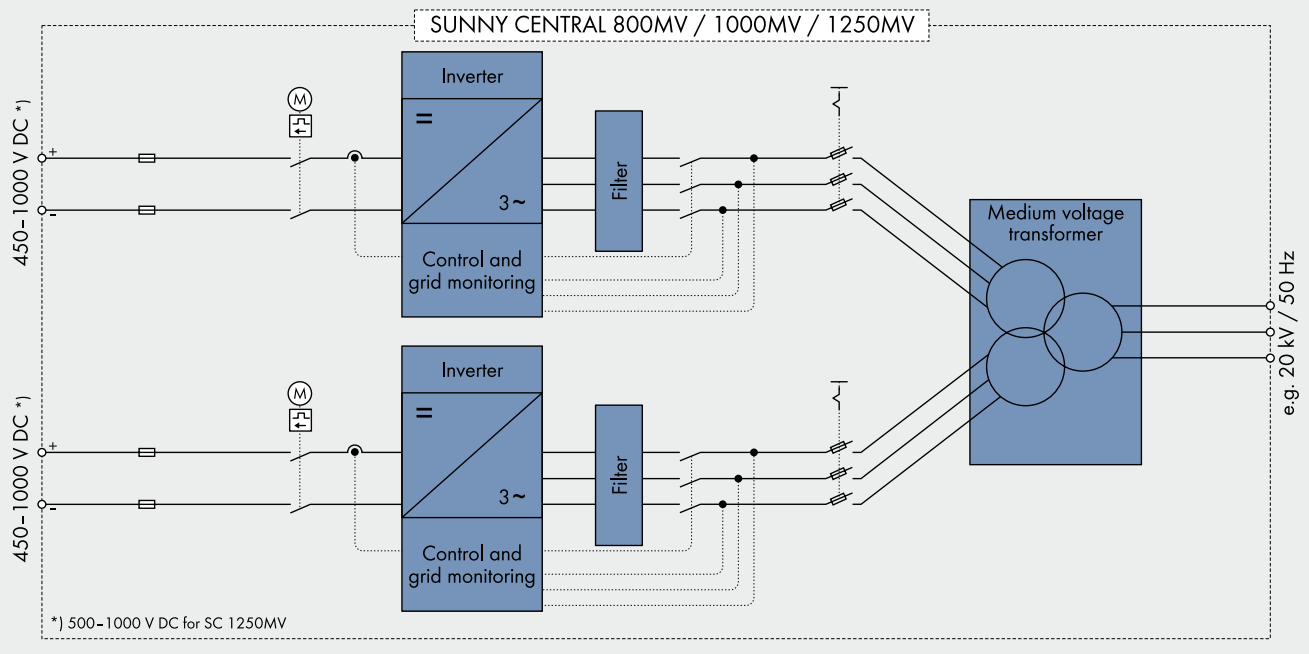
SUNNY CENTRAL 800MV / 1000MV / 1250MV

Technical data	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
Input data			
Nominal DC power	816 kW	1018 kW	1284 kW
Max. DC power	900 kWp[1)]	1120 kWp[1)]	1410 kWp[1)]
MPP voltage range	450 V – 820 V [5)]	450 V – 820 V [5)]	500 V – 820 V [5) 7)]
Max. DC voltage	1000 V	1000 V	1000 V
Max. DC current	1986 A	2484 A	2844 A
Number of DC inputs	(16 + 16) + 4 DCHV	(16 + 16) + 4 DCHV	(16 + 16) + 4 DCHV
Output data			
Nominal AC power @ 45 °C	800 kVA	1000 kVA	1250 kVA
Continuous AC power @ 25 °C	880 kVA	1100 kVA	1400 kVA
Nominal AC voltage	20000 V	20000 V	20000 V
Nominal AC current	23.2 A	28.8 A	36.1 A
AC grid frequency 50 Hz	●	●	●
AC grid frequency 60 Hz	●	●	●
Power factor (cos φ)		0.9 leading ... 0.9 lagging	
Max. THD	< 3 %	< 3 %	< 3 %
Power consumption			
Internal consumption in operation	< 3000 W [4)]	< 3000 W [4)]	< 3000 W [4)]
Standby consumption	< 180 W + 1100 W	< 180 W + 1100 W	< 180 W + 1350 W
External auxiliary supply voltage	3 x 230 V, 50/60 Hz	3 x 230 V, 50/60 Hz	3 x 230 V, 50/60 Hz
External back-up fuse for auxiliary supply	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole
Dimensions and weight			
Height	3620 mm	3620 mm	3620 mm
Width	5400 mm	5400 mm	5400 mm
Depth	3000 mm	3000 mm	3000 mm
Weight	35000 kg	35000 kg	35000 kg
Efficiency [2)]			
Max. efficiency	97.7 %	97.9 %	97.8 %
Euro-eta	97.3 %	97.5 %	97.4 %
Protection rating and ambient conditions			
Protection rating (as per EN 60529)	IP54	IP54	IP54
Operating temperature range	–20 °C ... +45 °C	–20 °C ... +45 °C	–20 °C ... +45 °C
Rel. humidity	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Fresh air consumption	12400 m³/h	12400 m³/h	12400 m³/h
Max. altitude (above sea level)	1000 m	1000 m	1000 m

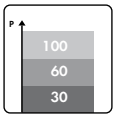


	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
Features			
Display: text line / graphic	●/–	●/–	●/–
Ground fault monitoring	●	●	●
Heating	●	●	●
Emergency stop	●	●	●
Circuit breaker AC side	SI load disconnection switch	SI load disconnection switch	SI load disconnection switch
Circuit breaker DC side	Switch-disconnector with motor	Switch-disconnector with motor	Switch-disconnector with motor
Monitored overvoltage protectors AC / DC	●/●	●/●	●/●
Monitored overvoltage protectors for auxiliary supply	●	●	●
SCC (Sunny Central Control) interfaces			
Communication (NET Piggy-Back, optional)	analog, ISDN, Ethernet	analog, ISDN, Ethernet	analog, ISDN, Ethernet
Analog inputs	10 x A_{in} [3]	10 x A_{in} [3]	10 x A_{in} [3]
Overvoltage protection for analog inputs	O	O	O
Sunny String-Monitor connection (COM1)	RS485	RS485	RS485
PC connection (COM3)	RS232	RS232	RS232
Electrically separated relay (ext. alert signal)	2	2	2
Certificates / listings			
EMC	EN 61000-6-2 EN 61000-6-4		
CE conformity	●	●	●
BDEW-MSRL / FGW / TR8 [6]	●	●	●
RD 1633 / 2000	●	●	●
Arrêté du 23/04/08	●	●	●
● standard features O optional features – not available			
Type designation	SC 800MV-11	SC 1000MV-11	SC 1250MV-11

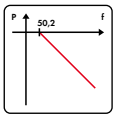
HE: High Efficiency, inverter without galvanic isolation for connection to a medium-voltage transformer (taking into account the SMA specification for the transformer)
1) Specifications apply to irradiation values below STC
2) Efficiency measured without an internal power supply at U_{DC} = 500 V
3) 2x inputs for the external nominal value specification for active power and reactive power, 1x external alarm input, 1x irradiation sensor, 1x pyranometer
4) Internal consumption at nominal power
5) At 1.05 $U_{AC, nom}$ and cos φ = 1
6) With limited dynamic grid support
7) At f_{grid} = 60 Hz: 510 V - 820 V
Please note: in certain countries the substations may differ from the substations shown in the images



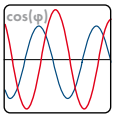
POWERFUL GRID MANAGEMENT FUNCTIONS



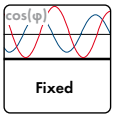
Remote controlled power reduction in case of grid overload
In order to avoid short-term grid overload, the grid operator presets a nominal active power value which the inverter will implement within 60 seconds. The nominal value is transmitted to the inverters via a ripple control receiver in combination with the SMA Power Reducer Box. Typical limit values are 100, 60, 30 or 0 per cent of the nominal power.



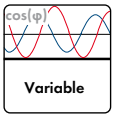
Frequency-dependent control of active power
As of a grid frequency of 50.2 Hz, the inverter automatically reduces the fed-in of active power according to a definable characteristic curve which thereby contributes to the stabilization of the grid frequency.



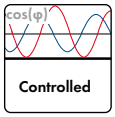
Static voltage support based on reactive power
To stabilize the grid voltage, SMA inverters feed reactive power (leading or lagging) into the grid. Three different modes are available:



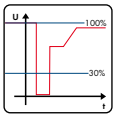
a) Fixed definition of the reactive power by the grid operator
The grid operator defines a fixed reactive power value or a fixed displacement factor between $\cos(\varphi)_{leading}$= 0.90 and $\cos(\varphi)_{lagging}$= 0.90.



b) Definition of a dynamic setpoint of the reactive power by the utility operator
The grid operator defines a dynamic displacement factor - any value between $\cos(\varphi)_{leading}$= 0.90 und $\cos(\varphi)_{lagging}$= 0.90. It is transmitted either through a communication unit the evaluation can e.g. be evaluated and processed by the SMA Power Reducer Box.

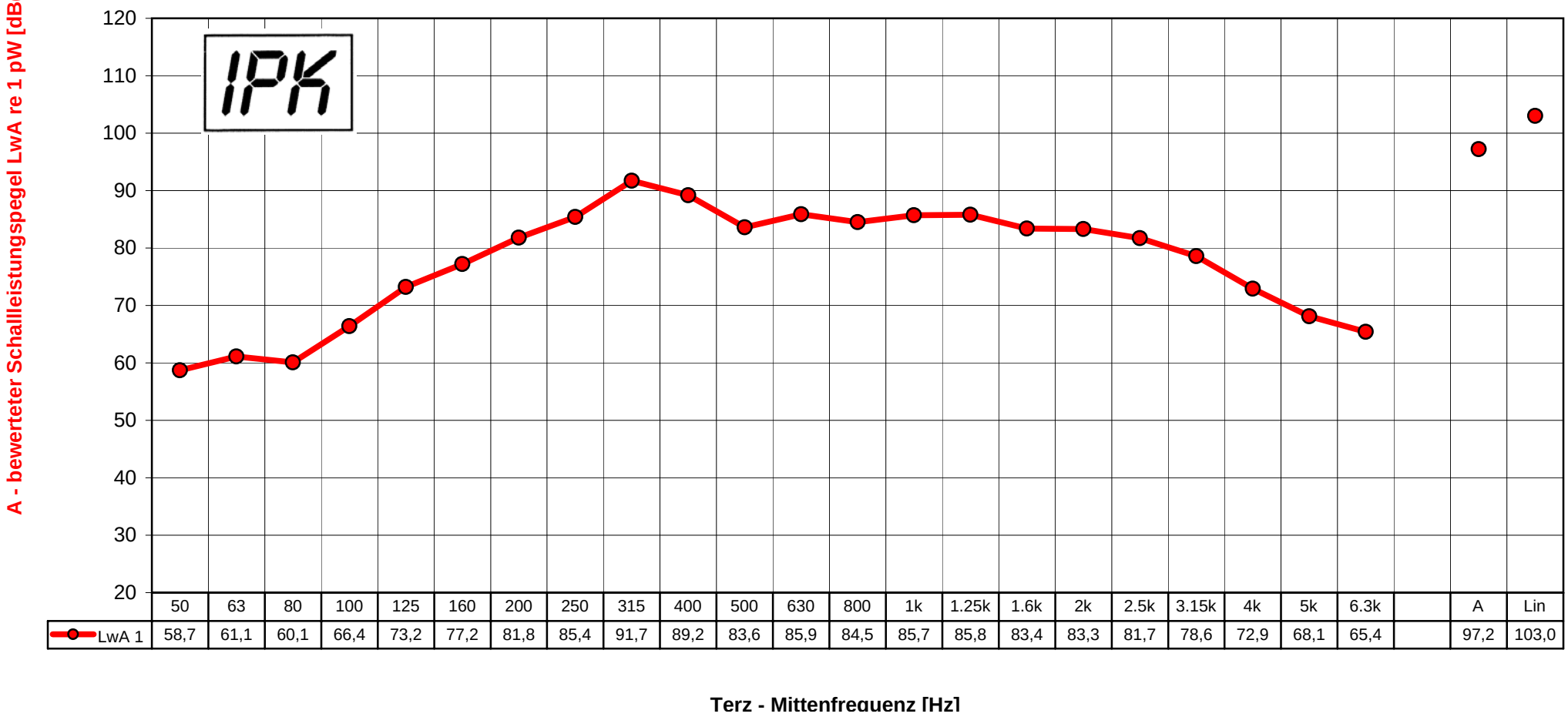


c) Control of the reactive power over a characteristic curve
The reactive power or the phase shift is controlled by a pre-defined characteristic curve – depending on the active power fed into the grid or the grid voltage.



Limited Dynamic Grid Support
The inverter continues to feed to the grid after short term voltage drops – as long as the grid voltage is within a defined voltage window.

SMA Solar Technologie Umrichteranlage Sunny Central SC 1000MV
Betrieb bei Nennleistung und 50 Hz; 1000 KW



	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k		A	Lin
LwA 1	58,7	61,1	60,1	66,4	73,2	77,2	81,8	85,4	91,7	89,2	83,6	85,9	84,5	85,7	85,8	83,4	83,3	81,7	78,6	72,9	68,1	65,4		97,2	103,0

Terz - Mittenfrequenz [Hz]

INGENIEURBÜRO PETER KAPOLNEK
Waiblinger Str. 69, 70372 Stuttgart, Tel.: (0711) 567911, Telefax: (0711) 561447

From: Janos Rajda [mailto:Janos.Rajda@sma-america.com]
Sent: Monday, October 18, 2010 9:38 AM
To: Moran, Joaquin
Cc: Mike Lord; Chris Rytel; Elie Nasr
Subject: RE: Noise Levels - U R G E N T

Hi Joaquin,

Yes it will apply as two (2) 625kW, 60Hz are complete mechanical equivalents to two (2) 500kW, 50Hz or to a 1000kW 2-units system. The slight electrical difference between the two units relate to minimum DC voltage rating and grid frequency the units are connected to with no significant impact on levels of unit parts audio noise generation.

Regards,

Janos

From: Moran, Joaquin [mailto:JMoran@Hatch.ca]
Sent: October-18-10 9:13 AM
To: Janos Rajda
Cc: Mike Lord; Chris Rytel; Elie Nasr
Subject: RE: Noise Levels - U R G E N T

Hi Janos,

Thanks for the information. Just to clarify, the sound power levels provided seem to be for a 1000 kW unit, 50 Hz. Will these apply to the units to be deployed in this case (625 kW, 60 Hz)?

Cheers,

Joaquin

Joaquin E. Moran
Tel. +1 905 374-0701 x 5236

From: Janos Rajda [mailto:Janos.Rajda@sma-america.com]
Sent: Sunday, October 17, 2010 11:22 PM
To: Moran, Joaquin
Cc: Mike Lord; Chris Rytel; Elie Nasr
Subject: RE: Noise Levels - U R G E N T

Hi Joaquin,

Over the weekend we obtained third octave sound power levels for 100% or rated loading case for two SC units as supplied at the time for FirstSolar project in Sarnia.

Thanks again for providing as with sample data, which proved to be helpful in communicating the sound power level format requirement.

Best regards,

Janos

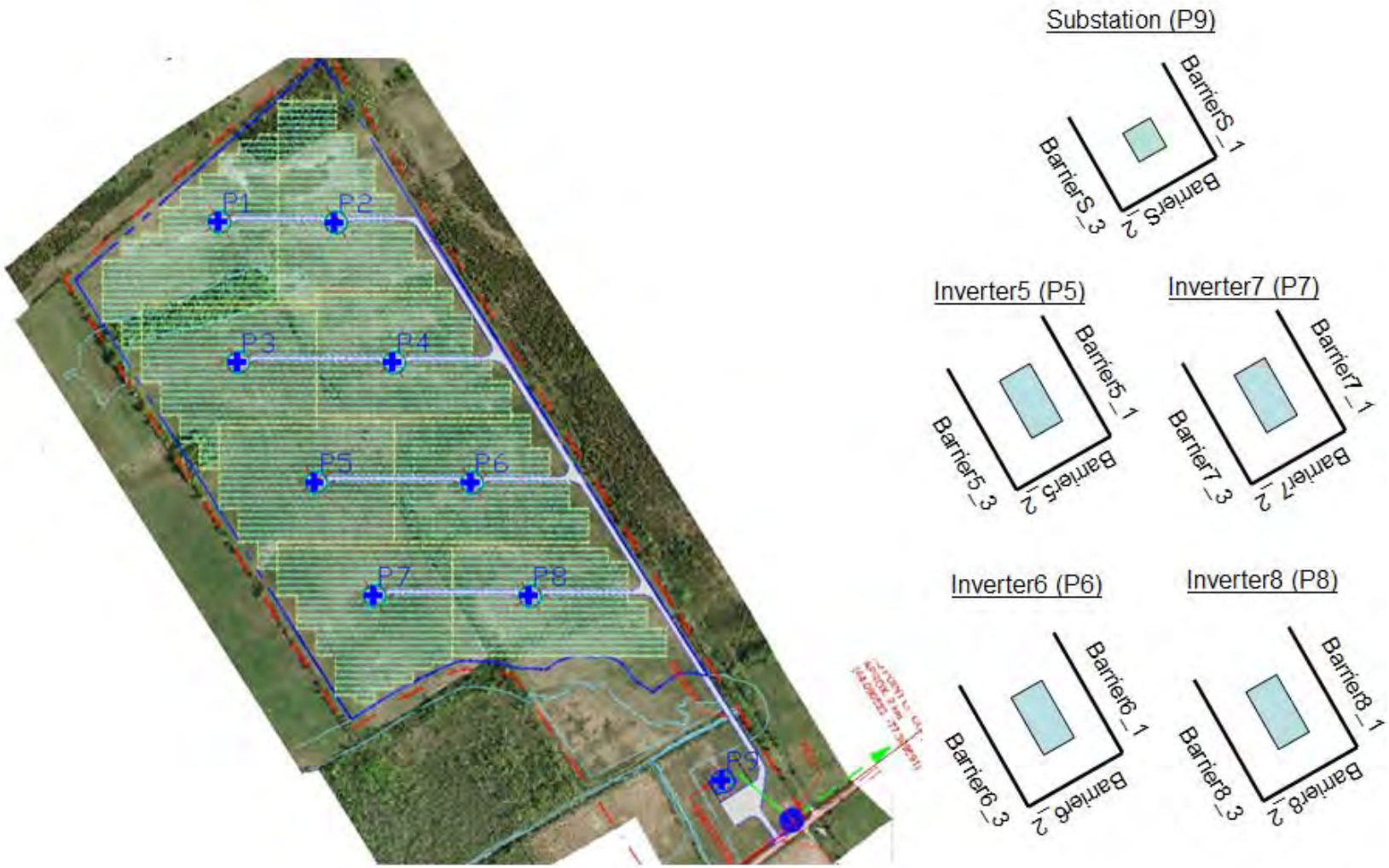


Figure B1 Location and ID of Proposed Sound Barriers

Appendix C

Sound Pressure Levels for Points of Reception, Noise Maps from CADNA-A

Table C1 Sound Pressure Levels for POR (shaded rows correspond to representative POR)

ID	Level Lr		Limit. Value		Noise Type	Height	Coordinates		
	Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)		(m)	X (m)	Y (m)	Z (m)
1	39.9	39.9	45.0	40.0	Total	4.5	313170	4880948	109.5
2	39.8	39.8	45.0	40.0	Total	4.5	313129	4880926	109.5
3	38.4	38.4	45.0	40.0	Total	4.5	313472	4881127	109.5
4	39.0	39.0	45.0	40.0	Total	4.5	313452	4881183	109.5
5	39.2	39.2	45.0	40.0	Total	4.5	313445	4881196	109.5
6	39.1	39.1	45.0	40.0	Total	4.5	313487	4881209	109.5
7	39.3	39.3	45.0	40.0	Total	4.5	313043	4880860	109.5
8	37.6	37.6	45.0	40.0	Total	4.5	313551	4881144	109.5
9	39.0	39.0	45.0	40.0	Total	4.5	313528	4881224	109.5
10	38.9	38.9	45.0	40.0	Total	4.5	313544	4881246	109.5
11	37.4	37.4	45.0	40.0	Total	4.5	313590	4881166	109.5
12	38.0	38.0	45.0	40.0	Total	4.5	313028	4880756	109.5
13	37.9	37.9	45.0	40.0	Total	4.5	313618	4881215	109.5
14	38.6	38.6	45.0	40.0	Total	4.5	312956	4880783	109.5
15	38.5	38.5	45.0	40.0	Total	4.5	313608	4881314	109.5
16	38.9	38.9	45.0	40.0	Total	4.5	312881	4880770	109.5
17	38.8	38.8	45.0	40.0	Total	4.5	312874	4880763	109.5
18	38.4	38.4	45.0	40.0	Total	4.5	312865	4880731	109.5
19	37.8	37.8	45.0	40.0	Total	4.5	313698	4881344	109.5
20	37.2	37.2	45.0	40.0	Total	4.5	313725	4881319	109.5
21	37.2	37.2	45.0	40.0	Total	4.5	313752	4881330	109.5
22	36.7	36.7	45.0	40.0	Total	4.5	312776	4880611	109.5
23	37.7	37.7	45.0	40.0	Total	4.5	312757	4880626	109.5
24	36.4	36.4	45.0	40.0	Total	4.5	312772	4880589	109.5
25	37.5	37.5	45.0	40.0	Total	4.5	312745	4880615	109.5
26	37.5	37.5	45.0	40.0	Total	4.5	312722	4880613	109.5
27	36.2	36.2	45.0	40.0	Total	4.5	313830	4881476	109.5
28	37.2	37.2	45.0	40.0	Total	4.5	312645	4880582	109.5
29	35.8	35.8	45.0	40.0	Total	4.5	313870	4881542	109.5
30	37.1	37.1	45.0	40.0	Total	4.5	312633	4880569	109.5
31	35.1	35.1	45.0	40.0	Total	4.5	313944	4881437	109.5
32	37.0	37.0	45.0	40.0	Total	4.5	312620	4880564	109.5
33	36.9	36.9	45.0	40.0	Total	4.5	312601	4880558	109.5
34	35.5	35.5	45.0	40.0	Total	4.5	313906	4881551	109.5
35	36.4	36.4	45.0	40.0	Total	4.5	312609	4880507	109.5
36	36.5	36.5	45.0	40.0	Total	4.5	312591	4880520	109.5
37	34.0	34.0	45.0	40.0	Total	4.5	313996	4881652	109.5
38	36.1	36.1	45.0	40.0	Total	4.5	312405	4880562	111.5
39	36.2	36.2	45.0	40.0	Total	4.5	312392	4880584	112.1
40	33.6	33.6	45.0	40.0	Total	4.5	314044	4881631	109.5
41	36.3	36.3	45.0	40.0	Total	4.5	312385	4880593	112.3
42	35.4	35.4	45.0	40.0	Total	4.5	312421	4880517	110.6
43	33.7	33.7	45.0	40.0	Total	4.5	314033	4881665	109.5
44	34.1	34.1	45.0	40.0	Total	4.5	312457	4880430	109.5
45	32.5	32.5	45.0	40.0	Total	4.5	312413	4880446	109.5
46	32.1	32.1	45.0	40.0	Total	4.5	312384	4880434	109.5

ID	Level Lr		Limit. Value		Noise Type	Height	Coordinates		
	Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)		(m)	X (m)	Y (m)	Z (m)
47	32.4	32.4	45.0	40.0	Total	4.5	312324	4880490	111.2
48	34.2	34.2	45.0	40.0	Total	4.5	312281	4880561	113.4
49	32.2	32.2	45.0	40.0	Total	4.5	312209	4880547	114.5
50	31.1	31.1	45.0	40.0	Total	4.5	312190	4880491	114.2
51	30.9	30.9	45.0	40.0	Total	4.5	312170	4880525	114.5
52	35.4	35.4	45.0	40.0	Total	4.5	313516	4882351	110.8
53	31.3	31.3	45.0	40.0	Total	4.5	314303	4881859	109.5
54	29.8	29.8	45.0	40.0	Total	4.5	312076	4880421	115.8
55	31.3	31.3	45.0	40.0	Total	4.5	314304	4881888	109.5
56	29.7	29.7	45.0	40.0	Total	4.5	312074	4880408	115.8
57	30.8	30.8	45.0	40.0	Total	4.5	314375	4881870	109.5
58	34.4	34.4	45.0	40.0	Total	4.5	313599	4882409	111.2
59	30.9	30.9	45.0	40.0	Total	4.5	314364	4881891	109.5
60	34.4	34.4	45.0	40.0	Total	4.5	313574	4882438	111.4
61	30.7	30.7	45.0	40.0	Total	4.5	314386	4881899	109.5
62	30.6	30.6	45.0	40.0	Total	4.5	314407	4881894	109.5
63	30.4	30.4	45.0	40.0	Total	4.5	314418	4881934	108.8
64	34.1	34.1	45.0	40.0	Total	4.5	313539	4882514	112.0
65	30.2	30.2	45.0	40.0	Total	4.5	314449	4881924	108.6
66	34.0	34.0	45.0	40.0	Total	4.5	313551	4882523	112.1
67	34.0	34.0	45.0	40.0	Total	4.5	313535	4882529	112.2
68	34.4	34.4	45.0	40.0	Total	4.5	313456	4882543	112.4
69	33.3	33.3	45.0	40.0	Total	4.5	313652	4882538	112.3
70	26.8	26.8	45.0	40.0	Total	4.5	314528	4881967	106.7
71	26.9	26.9	45.0	40.0	Total	4.5	314517	4881986	106.9
72	28.3	28.3	45.0	40.0	Total	4.5	311838	4880348	118.9
73	27.3	27.3	45.0	40.0	Total	4.5	311811	4880339	118.0
74	26.3	26.3	45.0	40.0	Total	4.5	314573	4882033	105.6
75	26.9	26.9	45.0	40.0	Total	4.5	311767	4880341	117.2
76	26.7	26.7	45.0	40.0	Total	4.5	311747	4880309	116.5
77	25.8	25.8	45.0	40.0	Total	4.5	314789	4881731	109.5
78	26.6	26.6	45.0	40.0	Total	4.5	311743	4880292	116.2
79	26.3	26.3	45.0	40.0	Total	4.5	311806	4880152	114.0
80	24.7	24.7	45.0	40.0	Total	4.5	314633	4882067	104.5
81	23.7	23.7	45.0	40.0	Total	4.5	314838	4881704	109.5
82	24.6	24.6	45.0	40.0	Total	4.5	314646	4882059	104.5
83	32.0	32.0	45.0	40.0	Total	4.5	313692	4882727	113.8
84	31.9	31.9	45.0	40.0	Total	4.5	313696	4882738	113.9
85	29.8	29.8	45.0	40.0	Total	4.5	314336	4882430	111.8
86	29.8	29.8	45.0	40.0	Total	4.5	314326	4882446	112.0
87	29.7	29.7	45.0	40.0	Total	4.5	314231	4882630	114.5
88	30.2	30.2	45.0	40.0	Total	4.5	314035	4882750	114.5
89	29.2	29.2	45.0	40.0	Total	4.5	314324	4882608	114.5
90	19.2	19.2	45.0	40.0	Total	4.5	314812	4882122	104.5
91	2.8	2.8	45.0	40.0	Total	4.5	314836	4882129	104.5
92	24.9	24.9	45.0	40.0	Total	4.5	311525	4880199	114.5
93	3.5	3.5	45.0	40.0	Total	4.5	315167	4880909	109.5

ID	Level Lr		Limit. Value		Noise Type	Height (m)	Coordinates		
	Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)			X (m)	Y (m)	Z (m)
94	3.5	3.5	45.0	40.0	Total	4.5	315183	4880871	109.5
95	2.7	2.7	45.0	40.0	Total	4.5	314882	4882126	105.1
96	2.6	2.6	45.0	40.0	Total	4.5	314798	4882267	104.1
97	-2.7	-2.7	45.0	40.0	Total	4.5	314847	4882209	100.5
98	3.5	3.5	45.0	40.0	Total	4.5	315203	4880843	110.2
99	-2.7	-2.7	45.0	40.0	Total	4.5	314842	4882221	100.2
100	2.6	2.6	45.0	40.0	Total	4.5	314897	4882154	105.0

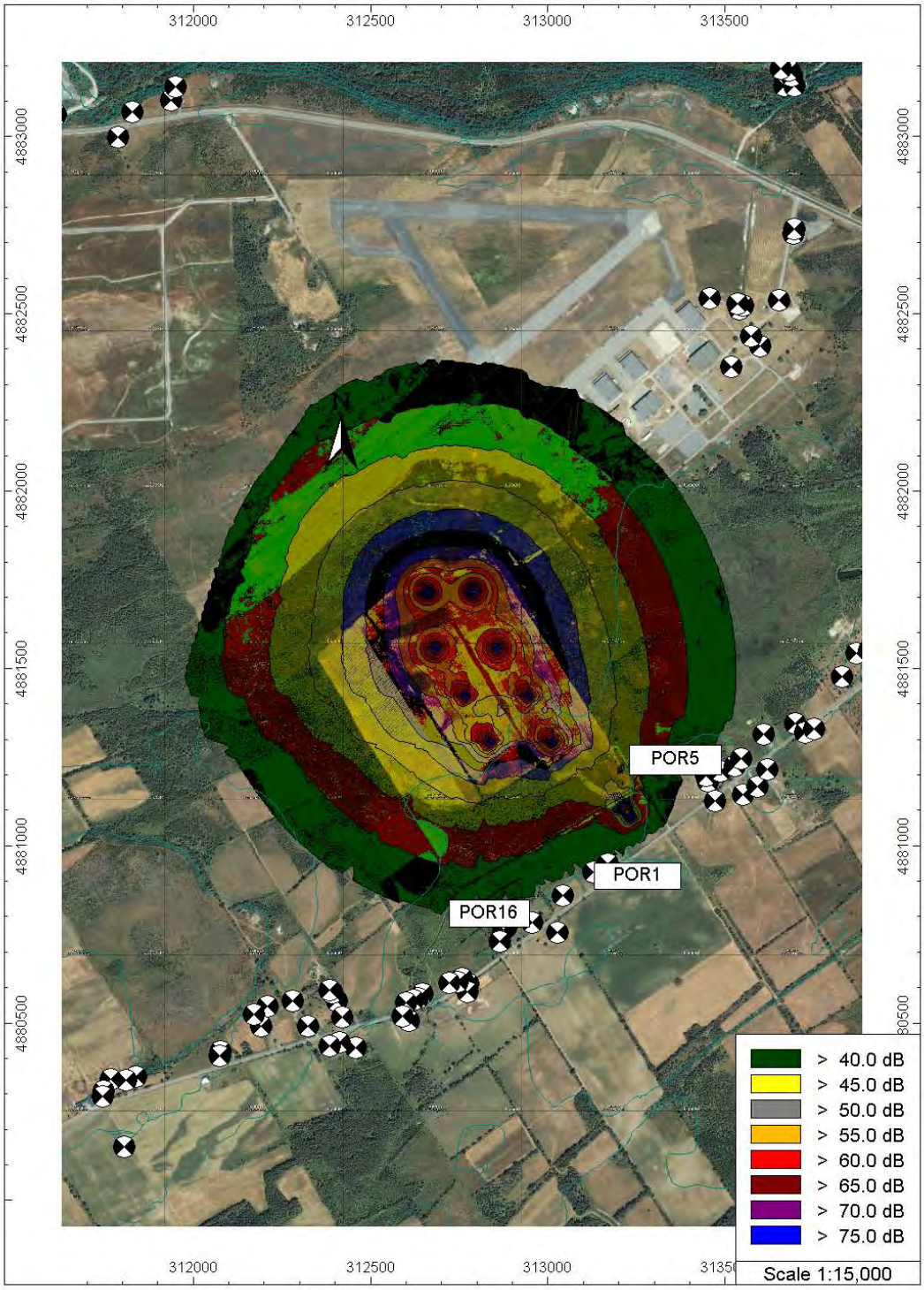


Figure C1 Noise Map