PUC Hearing, 3.20.19, Waverly, SD

Presented by Patrick Lynch

Dear Commissioners,

I would like to speak on two topics. The first is a concern for the health and safety of my family if the project proceeds as proposed. I have attached a study contained in the US National Library of Medicine and the National Institutes of Health. In this they recommend a night time noise level which should not exceed 30 dB(A). They along with the World Health Organization recommend this because it can attribute to increased cardiovascular risk, higher cortisol levels, and sleep disturbance such as awakenings and shallower sleep stages as the most severe health effects of noise on sleep studied.

My property is CR1-C27-NP in Updated Appendix H Appendices A-D- Noise Report of the edocket. My property is going to experience noise level 42.2 dB(A) at my property line and 40 dB(A) at my home. Both of these exceed these noise level recommendations. Looking at the maps most if not all properties participating or non-participating will exceed these levels.

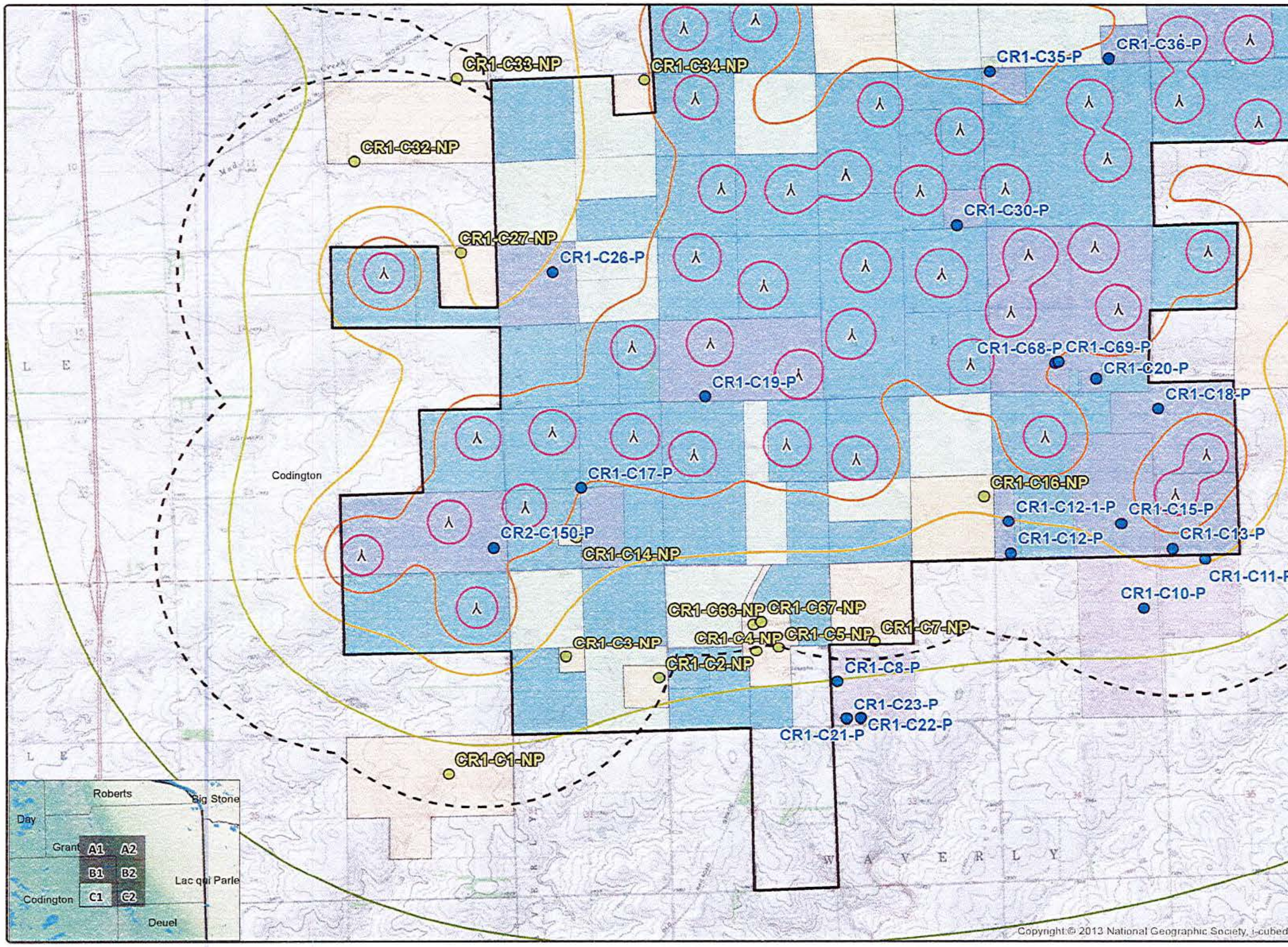
Also, according to the shadow flicker report my home will experience 6 hours and 58 minutes of shadow flicker each year. I heard testimony at the Codington County public hearing that this also can cause sleep disturbance. It is my belief that I should not have to live or raise my children in an environment where we are unable to sleep soundly and suffer any long term health impacts.

My second topic is the violation of my property rights. I ultimately desire to move my home into a different area on my property. Unfortunately this would move my family into an area where I would experience even more noise and shadow flicker. I believe have the right to enjoy my entire property to its fullest. I feel the turbine projecting noise and flicker onto my land and affecting the way I use it is an illegal taking of my property rights. I ask that you either deny this permit or curtail the placement of turbines so that all non-participating property owners experience zero shadow flicker and noise levels of less than 30 dB(A).

Patrick Lynch

[redacted]

Watertown, SD 57201



0 0.25 0.5 1 Mile

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Crowned Ridge Wind Farm Sound Pressure Iso-Lines

Client

SWCA Environmental Consultants

Project Description

Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD

Project #: 20174431

Issue Dates

#	Description	Date
1	Original	2019.02.15

Drawn By: AS *Checked By:* JH

Legend

- Crowned Ridge Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non-Participants
- Participants

Sound Pressure (dBA)

- 25
- 30
- 35
- 40
- 45
- 50

- Participating Codington Parcels
- Non-Part. Codington Parcels
- Participating Land Parcels
- Non-Participating Land Parcels

N W E S

Table C-1: Crowned Ridge Sound Level Tabular Results Sorted by Receptor ID
Realistic case sound results at land parcel boundaries and occupied structures
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C1-NP	Non-P	Boundary	657,276	4,983,921	590.3	36.5	4,258
CR1-C2-NP	Non-P	Boundary	658,435	4,984,609	601.8	37.7	5,036
CR1-C3-NP	Non-P	Boundary	657,812	4,984,785	603.1	39.4	2,936
CR1-C4-NP	Non-P	Boundary	659,890	4,985,620	605.4	40.5	3,914
CR1-C6-P	Participant	Boundary	663,383	4,994,502	591.0	38.5	3,878
CR1-C7-NP	Non-P	Boundary	661,266	4,985,387	591.0	46.6	1,253
CR1-C8-P	Participant	Boundary	661,277	4,984,852	597.6	43.1	2,139
CR1-C9-P	Participant	Boundary	665,421	4,985,265	609.0	49.5	1,079
CR1-C10-P	Participant	Boundary	662,869	4,985,477	601.4	52.2	610
CR1-C11-P	Participant	Boundary	664,444	4,985,206	608.6	52.0	738
CR1-C12-P	Participant	Boundary	662,067	4,985,677	604.9	45.3	1,670
CR1-C13-P	Participant	Boundary	664,410	4,986,207	615.0	53.3	574
CR1-C14-NP	Non-P	Boundary	657,803	4,986,003	609.0	46.1	1,191
CR1-C15-P	Participant	Boundary	663,047	4,985,700	612.8	51.1	722
CR1-C16-NP	Non-P	Boundary	661,642	4,985,677	597.0	48.8	948
CR1-C17-P	Participant	Boundary	658,017	4,986,369	606.4	45.2	1,837
CR1-C18-P	Participant	Boundary	664,126	4,986,525	610.2	52.4	591
CR1-C19-P	Participant	Boundary	660,393	4,987,529	607.7	50.1	784
CR1-C20-P	Participant	Boundary	662,024	4,987,612	604.8	51.0	640
CR1-C26-P	Participant	Boundary	658,015	4,987,993	606.0	43.5	1,867
CR1-C27-NP	Non-P	Boundary	656,658	4,988,484	587.2	42.2	1,749
CR1-C28-NP	Non-P	Boundary	665,432	4,989,009	583.9	44.9	1,483
CR1-C29-NP	Non-P	Boundary	666,496	4,989,001	573.9	42.7	1,952
CR1-C30-P	Participant	Boundary	661,978	4,989,318	613.3	51.3	633
CR1-C31-NP	Non-P	Boundary	665,639	4,989,013	584.6	44.5	1,637
CR1-C32-NP	Non-P	Boundary	657,187	4,989,566	573.0	38.2	4,970
CR1-C33-NP	Non-P	Boundary	657,126	4,990,843	567.0	38.1	5,856
CR1-C34-NP	Non-P	Boundary	658,763	4,990,247	589.7	45.9	1,293
CR1-C35-P	Participant	Boundary	661,955	4,990,153	606.0	47.2	1,112
CR1-C36-P	Participant	Boundary	663,564	4,990,731	610.7	48.3	1,033
CR1-C37-P	Participant	Boundary	663,879	4,990,574	594.0	51.1	699
CR1-C38-NP	Non-P	Boundary	660,955	4,990,468	591.2	47.3	1,027
CR1-C39-NP	Non-P	Boundary	659,741	4,991,242	583.2	48.5	856
CR1-C40-NP	Non-P	Boundary	658,706	4,991,231	579.8	44.9	1,555
CR1-C41-NP	Non-P	Boundary	664,801	4,991,929	577.1	46.1	1,585
CR1-C42-P	Participant	Boundary	659,828	4,992,807	580.5	51.1	604
CR1-C44-NP	Non-P	Boundary	665,447	4,992,972	578.2	44.4	1,824
CR1-C45-NP	Non-P	Boundary	653,821	4,993,552	572.0	37.0	4,291
CR1-C46-P	Participant	Boundary	656,678	4,992,970	611.5	51.4	561

Table C-2: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level
Realistic case sound results at land parcel boundaries and occupied structures
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County
continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C22-P	Participant	Structure	660,755	4,984,082	594.8	42.0	2,375
CR1-C21-P	Participant	Structure	660,756	4,984,086	594.8	42.0	2,388
CR1-C23-P	Participant	Structure	660,619	4,984,078	596.0	41.5	2,523
CR1-C40-NP	Non-P	Structure	657,865	4,991,818	583.8	41.5	2,690
CR1-C29-NP	Non-P	Structure	666,572	4,988,867	575.9	41.4	2,457
CR1-C7-NP	Non-P	Structure	660,893	4,984,861	593.2	41.3	3,022
CR1-C38-NP	Non-P	Structure	660,639	4,991,557	597.0	41.0	3,474
CR1-C26-P	Participant	Structure	657,767	4,988,493	597.0	40.6	3,484
CR1-C110-NP	Non-P	Structure	654,385	4,996,686	593.9	40.2	2,910
CR1-C8-P	Participant	Structure	660,532	4,984,445	599.7	40.1	3,740
CR1-C27-NP	Non-P	Structure	656,876	4,988,683	583.0	40.0	2,549
CR1-C47-P	Participant	Structure	662,825	4,993,508	613.8	39.5	3,750
CR1-C55-P	Participant	Structure	660,914	4,995,169	607.9	39.5	3,360
CR1-C67-NP	Non-P	Structure	659,789	4,985,057	606.0	39.0	5,791
CR1-C66-NP	Non-P	Structure	659,718	4,985,032	606.0	38.9	5,800
CR1-C5-NP	Non-P	Structure	659,958	4,984,794	605.2	38.9	5,659
CR1-C3-NP	Non-P	Structure	657,888	4,984,697	604.2	38.8	3,294
CR1-C4-NP	Non-P	Structure	659,744	4,984,749	605.9	38.5	5,981
CR1-C49-P	Participant	Structure	662,250	4,993,731	609.0	38.4	5,148
CR1-C111-NP	Non-P	Structure	653,857	4,995,573	591.0	38.4	3,678
CR1-C2-NP	Non-P	Structure	658,791	4,984,483	601.6	37.4	6,273
CR1-C65-NP	Non-P	Structure	665,805	4,995,305	579.0	37.4	3,884
CR1-C33-NP	Non-P	Structure	656,839	4,990,404	569.8	37.4	6,719
CR1-C109-NP	Non-P	Structure	653,780	4,996,828	588.0	37.2	4,797
CR1-C32-NP	Non-P	Structure	655,843	4,989,581	568.6	37.1	3,714
CR1-C54-NP	Non-P	Structure	663,421	4,995,376	583.4	36.5	5,351
CR1-C6-P	Participant	Structure	662,989	4,995,228	599.8	36.5	6,102
CR1-C45-NP	Non-P	Structure	653,390	4,993,503	573.0	35.4	5,673
CR1-C53-NP	Non-P	Structure	663,376	4,996,043	578.6	35.4	7,201
CR1-C1-NP	Non-P	Structure	656,743	4,983,525	595.9	34.9	5,541

GE
Energy

Ice Shedding and Ice Throw – Risk and Mitigation

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Ice Shedding and Ice Throw – Risk and Mitigation

Introduction

As with any structure, wind turbines can accumulate ice under certain atmospheric conditions, such as ambient temperatures near freezing (0°C) combined with high relative humidity, freezing rain, or sleet. Since weather conditions may then cause this ice to be shed, there are safety concerns that must be considered during project development and operation. The intent of this paper is to share knowledge and recommendations in order to mitigate risk.

The Risk

The accumulation of ice is highly dependent on local weather conditions and the turbine's operational state.[2,4] Any ice that is accumulated may be shed from the turbine due to both gravity and the mechanical forces of the rotating blades. An increase in ambient temperature, wind, or solar radiation may cause sheets or fragments of ice to loosen and fall, making the area directly under the rotor subject to the greatest risks[1]. In addition, rotating turbine blades may propel ice fragments some distance from the turbine—up to several hundred meters if conditions are right.[1,2,3] Falling ice may cause damage to structures and vehicles, and injury to site personnel and the general public, unless adequate measures are put in place for protection.

Risk Mitigation

The risk of ice throw must be taken into account during both project planning and wind farm operation. GE suggests that the following actions, which are based on recognized industry practices, be considered when siting turbines to mitigate risk for ice-prone project locations:

- **Turbine Siting:** Locating turbines a safe distance from any occupied structure, road, or public use area. Some consultant groups have the capability to provide risk assessment based on site-specific conditions that will lead to suggestions for turbine locations. In the absence of such an assessment, other guidelines may be used. Wind Energy Production in Cold Climate[6] provides the following formula for calculating a safe distance:

  1.5 * (hub height + rotor diameter)

  While this guideline is recommended by the certifying agency Germanischer Lloyd as well as the Deutsches Windenergie-Institut (DEWI), it should be noted that the actual distance is dependant upon turbine dimensions, rotational speed and many other potential factors. Please refer to the *References* for more resources.

- **Physical and Visual Warnings:** Placing fences and warning signs as appropriate for the protection of site personnel and the public.[4]

- **Turbine Deactivation:** Remotely switching off the turbine when site personnel detect ice accumulation. Additionally there are several scenarios which could lead to an automatic shutdown of the turbine:

  - Detection of ice by a nacelle-mounted ice sensor which is available for some models (with current sensor technology, ice detection is not highly reliable)
  - Detection of rotor imbalance caused by blade ice formation by a shaft vibration sensor; note, however, that it is possible for ice to build in a symmetric manner on all blades and not trigger the sensor[2]
  - Anemometer icing that leads to a measured wind speed below cut-in

- **Operator Safety:** Restricting access to turbines by site personnel while ice remains on the turbine structure. If site personnel absolutely must access the turbine while iced, safety precautions may include remotely shutting down the turbine, yawing to place the rotor on the opposite side of the tower door, parking vehicles at a distance of at least 100 m from the tower, and restarting the turbine remotely when work is complete. As always, standard protective gear should be worn.

References

The following are informative papers that address the topic of wind turbine icing and safety. These papers are created and maintained by other public and private organizations. GE does not control or guarantee the accuracy, relevance, timeliness, or completeness of this outside information. Further, the order of the references is not intended to reflect their importance, nor is it intended to endorse any views expressed or products or services offered by the authors of the references.

[1] *Wind Turbine Icing and Public Safety – a Quantifiable Risk?:* Colin Morgan and Ervin Bossanyi of Garrad Hassan, 1996.

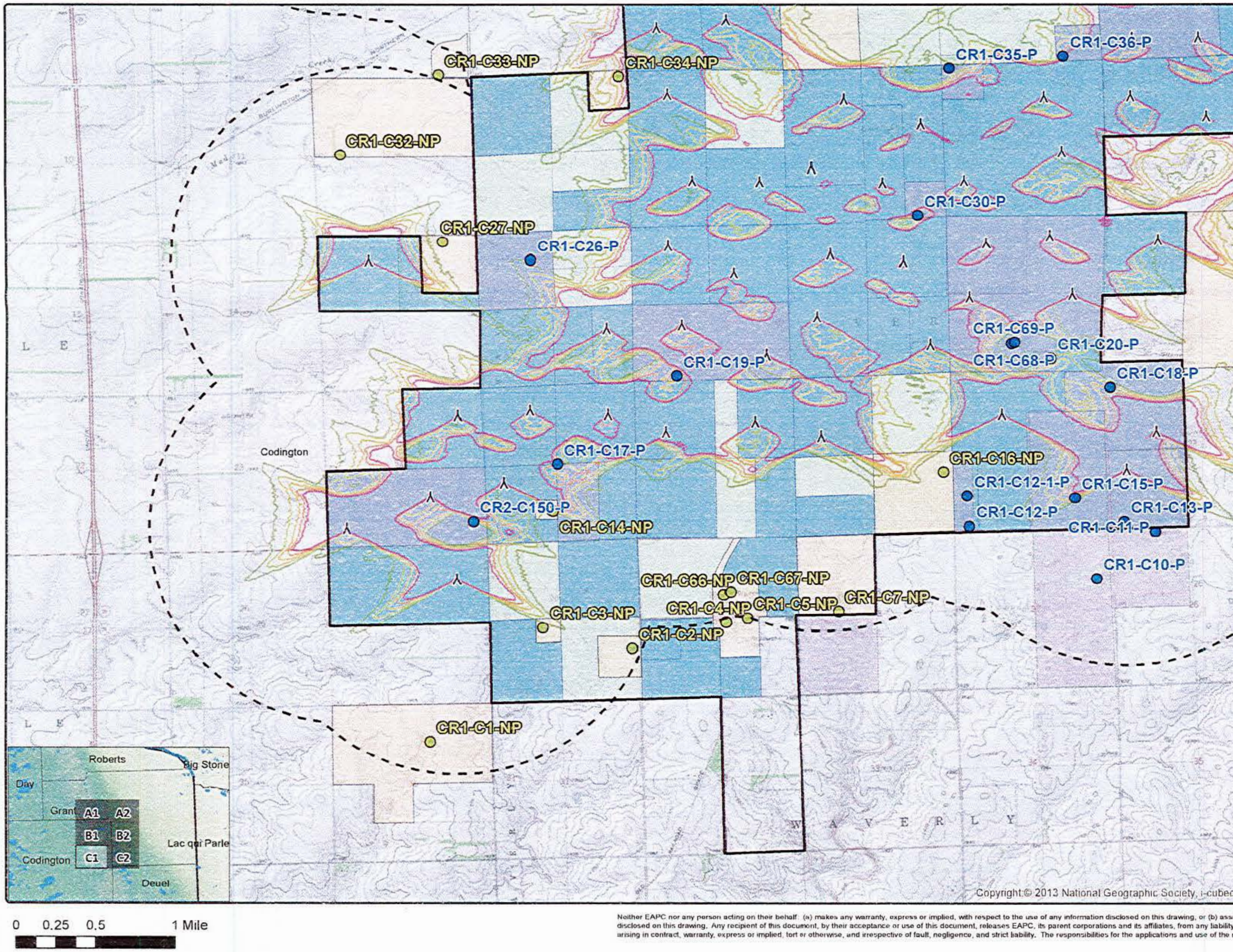
[2] *Assessment of Safety Risks Arising From Wind Turbine Icing:* Colin Morgan and Ervin Bossanyi of Garrad Hassan, and Henry Seifert of DEWI, 1998.

[3] *Risk Analysis of Ice Throw From Wind Turbines:* Henry Seifert, Annette Westerhellweg, and Jürgen Kröning of DEWI, 2003.

[4] *State-of-the-Art of Wind Energy in Cold Climates:* produced by the International Energy Agency, IEA, 2003.

[5] *On-Site Cold Climate Problems:* Michael Durstewitz, Institut fur Solare Energieversorgungstechnik e.V. (ISET), 2003.

[6] *Wind Energy Production in Cold Climate:* Tammelin, Cavaliere, Holttinen, Hannele, Morgan, Seifert, and Säntti, 1997.



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Crowned Ridge Wind Farm
Shadow Flicker Iso-Lines

Client

SWCA Environmental Consultants

Project Description

Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174431

Issue Dates

#	Description	Date
1	Original	2019.02.15

Drawn By: AS | *Checked By: JH*

Legend

- Crowned Ridge Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non-Participants
- Participants

Shadow Flicker (hr/yr)

- 10
- 15
- 20
- 25
- 30

- Participating Codington Parcels
- Non-Part. Codington Parcels
- Participating Land Parcels
- Non-Participating Land Parcels

N W E S