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December 6, 2019

Barbara Case
Administrative Law Judge
Office of Administration Hearings via email and eDockets
P.O. Box 64620
St. Paul, MN 55164-0620

Daniel Wolf
Executive Secretary
Minnesota Public Utilities Commission via email and eDockets
121 – 7th Place East, Suite 350
St. Paul, MN 55101

John Wachtler
Energy Program Director via email and eDockets
Commerce – EERA
85 – 7th Place East, Suite 500
St. Paul, MN 55101

RE: Overland Comments
PPSA Annual Hearing
PUC Docket: M-999/M-19-18
OAH Docket: 82-2500-36333

Dear Judge Case, Mr. Wolf, and Mr. Wachtler:

I regret not making it to St. Paul last Tuesday in time for the hearing – a Freeborn Wind filing due that day got in the way.

For over 20 years, I've been participating in the Power Plant Siting Act Annual Hearing, beginning after I worked on nuclear waste issues, and then followed by transmission, coal gasification, natural gas, and wind. I'm heartened to see that the Commission is now integrating some of the applicable PPSA statutes into wind proceedings, and hope that balance of the applicable provisions will follow (more on that below).

An important point in addressing effectiveness of the Power Plant Siting Act is loss of institutional memory, going back to its origin in 1973[1] and the many iterations since. Some provisions have been eliminated, such as the inventory (Minn. Stat. §116C.55), some morphed, Facility Development plans (Minn. Stat. §116C.56) to Biennial Transmission Report, and the Power Plant Siting Act itself, which initially required hearings in every county where a power plant or transmission project was proposed. We've also lost the "PPSA Potluck," which may have been a drawing factor. Despite the more formal proceeding and well-captured comments in the summary report, nothing ever happens – there's no review by the Commission and no recognition of the issues raised.

One related development, however, is that the Office of Legislative Auditor is reviewing the Public Utilities Commission's public process.[2] I'd like to think it has been the persistent presence and comments made over the last two decades,[3] but it's my understanding that this review was triggered by complaints of the Commission's handling of the Sandpiper and Line 3 pipelines and the egregious conduct toward parties and the public. I've made it clear, in comments to OLA and in PPSA hearings, that it is not "just" a pipeline issue, that the problems are standard operating procedure at the Commission.

At this time, I ask that the Office of Legislative Auditor's report regarding public participation be incorporated into the PPSA record. Public participation is a primary component of the PPSA, and that a "broad spectrum of citizen participation" is to be the Commission's "principle of operation." Minn. Stat. §216E.08, Subd. 2.

I. MATERIAL PARTS OF PPSA DO APPLY TO WIND

Despite constant denial, i.e., EERA's 2019 Project Status stating "LWECS Permitted (MS 216F)" and repeated statements over the years at PPSA Annual Hearings that wind is not sited under the PPSA, aspects of the Power Plant Siting Act are indeed applicable to wind.

> **216F.02 EXEMPTIONS.**
>
> (a) The requirements of chapter 216E do not apply to the siting of LWECS, except for sections 216E.01; 216E.03, subdivision 7; 216E.08; 216E.11; 216E.12; 216E.14; 216E.15; 216E.17; and 216E.18, subdivision 3, which do apply.

Most important are the siting criteria, Minn. Stat. §216E.03, subdivision 7, and rules of Minn. R. ch. 7850, but this statutory criteria rules are not wind specific, and thus, many necessary aspects of wind siting are not addressed. Minnesota's wind rules, Minn. R. ch. 7854, has no siting criteria! That Minn. Stat. §216E.03, Subd. 7 applies to wind was first acknowledged by the Freeborn Wind applicants and the ALJ of that case in 2017, and this docket was the first ever contested case for a wind permit (2 other dockets have had contested cases on very narrow issues, such as the Goodhue Wind docket contested case regarding interpretation of Minn. Stat. §216F.081.). This procedure for wind siting dockets must become the norm.

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[1] https://www.revisor.mn.gov/laws/1973/0/Session+Law/Chapter/591/pdf/
[2] https://www.auditor.leg.state.mn.us/announce/puc.pdf
[3] PUC Public Engagement Scrutiny: https://legalectric.org/weblog/18405/

The public participation provisions of Minn. Stat. §216E.08 also apply to wind siting dockets. In each of the wind siting dockets that I have represented a client group, I have filed requests for an Advisory Task Force. See Minn. Stat. §216E.08. Commerce-EERA has consistently argued against a Task Force, claiming that because there's a large site area, that an alternative is not possible, and limiting perspective of "alternative" to the entire site, and not individual turbines. The Commission has, in each instance, denied establishing an Advisory Task Force. This is contrary to the statute, and limits public participation.

Public participation has also been limited through Administrative Law Judges' failure and unwillingness to swear public witnesses on oath when testifying at a public hearing. This has happened at least three times in my presence, two transmission dockets and one wind docket, and swearing in witnesses is a part of the job of an ALJ. This is particularly important because twice in my observation, in two different dockets, transmission and wind, a Commissioner has asked whether testimony of a member of the public was made under oath or by signed Affidavit, in deciding how much weight to give that testimony.

From Commerce-EERA's "EERA Summary," I note that EERA has put together a "work group" regarding siting of solar. I am concerned, because this was the way that Minnesota's "small wind standards" were developed[4], and subsequently improperly utilized over the following years as standards for siting large wind (LWECS), cited repeatedly in Orders, and rolled into Commerce's draft site permits for LWECS. Wind has been sited for over 20 years without siting rules, and using small wind standards since 2008 when the small wind standards were developed. Twice I have drafted and filed Petitions for Rulemaking for large wind projects, and both Petitions have been denied, most recently in 2018.[5] The Commission's denial stated:

> **III. Commission Action**
>
> The rulemaking petition complies with the applicable content requirements by including the petitioner's name and address, the group represented, and the reasons for amending the existing rules. Comments challenging the petition are primarily related to the sufficiency of the petition's claims, rather than its completeness.
>
> Having considered the petition and comments filed, the Commission is not persuaded that now is the time to consider possible amendments to its wind siting rules, Chapter 7854. The Commission currently has an open and ongoing rulemaking proceeding concerning power plant siting,[1] the outcome of which would likely inform the scope and structure of any future rulemaking proceeding on the Commission's other siting rules.
>
> Further, the varied comments received in this docket suggest that there is not informed consensus on many issues that continue to be developed in individual cases, which provide a better forum for identifying and addressing project-specific issues.
>
> For these reasons, the Commission will deny the rulemaking petition without prejudice.

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[4] *In re Establishment of General Permit Standards for the Siting of Wind Generation Projects Less than 25 Megawatts*, MPUC Docket No. E,G999/M-07-1102, MPUC Order Establishing General Wind Permit Standards at 3-4 (Jan. 11, 2008) (eDocket No. 4897855).

[5] See PUC Docket E-999/R-18-518, Commission denial online at: https://legalectric.org/f/2018/10/20189-146644-01_OrderDenyingPetition.pdf Note Staff Briefing Papers were not filed until nearly a month **AFTER** the Commission's meeting where the Petition was denied.

Reliance in 2018 on the ongoing rulemaking for ch. 7849 and 7850, and the claim that "now is not the time," is patently absurd, first, because the Minn. ch. 7849 and 7850 rulemakings have been ongoing, have zero to do with wind, and are going nowhere, stalled out since 2012. The Minn. R. 7850 rules as proposed do not address wind in any way, although reasonably, they should as Minn. Stat. §216E.03, Subd. 7 is indeed applicable to wind (I'll be sure to raise this if they ever are before the Commission and up for Comment before I croak.) As an active participant in that rulemaking advisory committee, this rulemaking was ostensibly to address the 2005 (YES, 2005!) statutory changes.[6] The proposed rules were "completed" in committee years ago, and the rules still have not come up before the Commission.

Secondly, wind siting rules are long overdue, as Minnesota has been siting wind for 25 years. I've been birddogging this rulemaking, as we were repeatedly promised that "wind is next," and we're still waiting. My client, Goodhue Wind Truth's Marie McNamara, has been an active participant in this docket over the years, to learn the rulemaking process in preparation for wind rulemaking, and to contribute lessons learned from the Goodhue Wind docket.[7] The issues to be addressed are not individual project related, but systemic, the sort of things for which rules are designed.

II. THE BIENNIAL TRANSMISSION REPORT HAS FADED INTO NON-COMPLIANCE

The Biennial Transmission Plan is an important part of the Power Plant Siting Act and plays a crucial role in general notice of transmission projects:

> **216E.18 BIENNIAL REPORT; APPLICATION FEES; APPROPRIATION; FUNDING.**
>
> **Subdivision 1. Biennial report.**
>
> Before November 15 of each even-numbered year the commission shall prepare and submit to the legislature a report of its operations, activities, findings, and recommendations concerning this chapter. The report shall also contain information on the commission's biennial expenditures, its proposed budget for the following biennium, and the amounts paid in permit application fees and in assessments pursuant to this section. The proposed budget for the following biennium shall be subject to legislative review.

This grew from the initial PPSA's Minn. Stat. §116C.55-57, where transmission was to be planned openly, with public participation, such that there were no surprises when a transmission line and route was ultimately proposed. The purpose of the Biennial Transmission Report has been lost over time, the public hearings, then meetings, have been eliminated, and the Commission even asked I Notice should be eliminated in its most recent request for comments.

Initially, I spent much time broadcasting and promoting the Biennial Transmission Plan, as with

[6] See PUC Docket E-999/R-12-1246.
[7] PUC Docket WS-08-1233

the PPSA Annual Hearing, particularly after learning of CapX 2020 in late 2004. However, I've never had a paying client for the Transmission Plan, and the time and effort, plus gas and hotel costs, to attend meetings across the state, aren't often manageable. Attendance at these meetings dropped to zero (much like the PPSA Hearing this year), and the Commission has granted permission to cease holding public meetings. This has an impact on community awareness of proposed projects, and because general notice was part of the rational for the Plan (changed to Report some years ago), to eliminate the utilities advantage of surprise and local shock at proposals, these meetings should continue.

Attached is my most recent comment, with these specific issues raised:

Compartmentalization thwarts transparency. The Commission has allowed the Integrated Distribution Plan to be filed separately in Docket No. E002/M-19-666, and the Hosting Capacity Report in Docket No. E002/M-19-685. Compartmentalizing the dockets makes it more difficult to follow, and distracts from the interconnectedness of these three reports. Transmission claimed for interconnection or market may, or may not, be needed if projects are sited with Distributed or Dispersed generation in mind; likewise if projects utilize the information supposedly contained in the "Hosting Capacity Report" for siting. Without those two reports incorporated into this docket, and report, the report is not complete.

Non-Public Designation is not acceptable. The Hosting Capacity Report, Docket E002/M-19-685, is largely "non-public."

Demand forecasts must be included in the Biennial Transmission Plan. Minnesota utilities have historically grossly over-projecting electric demand, such as the 2.49% annual increase in demand upon which the CapX 2020 transmission projects relied. Utilities have arranged a greater return on capital investment on transmission than they can make selling electricity in this decreased demand and low price state (note that wholesale prices are going down, down, down, and rates are going up, up, up). Excess transmission construction facilities not only utilities shift to a "business model" and raking in a higher ROI on (unneeded) infrastructure, but it facilitates marketing of coal rather than shutting down emissions emitting coal plants.

Known, identified, projects in planning must be disclosed. An obvious omission rendering the 2019 Report incomplete is the Wilmarth-Faribault-N. Rochester 345kV transmission project, proposed for MISO's MTEP "B List." According to the "MTEP Projects Under Evaluation," also linked below[8], this project was "studied during the MN 44 exploratory analysis, this project adds a 345 kV line between Mankato and Rochester. The line will stop at a new 345 kV yard in Faribault to support the local 100 kV system." This is specific enough to require inclusion in the plan, to provide some measure of notice to affected communities, and to provide notice to the state of utility plans.

Another 345kV project was ostensibly proposed for the Dodge Center Wind interconnection (TL-17-308), claiming it would interconnect with a regional 345kV line. This was NOT included in the Biennial Transmission Plan. Fortunately, the planned transmission line application was withdrawn, together with the MISO queue position. The line was grossly

[8] Online at: https://cdn.misoenergy.org/MTEP%20Projects%20Under%20Evaluation368757.xlsx

oversized for a 170MW wind project, and a Commissioner bizarrely suggested that running the line on existing corridor through Dodge Center, which would have wiped out over 30 homes in the process! After strong uprising by directly affected landowners, complete with photos showing the impacts, the EIS demonstrated that was not a reasonable alternative, whew, but landowners should not be surprised with such an absurd proposal and have to challenge it. This line should have been in the previous and current Biennial Transmission Plan and provided some notice to all the affected parties.

III. <u>BECAUSE NOISE MODELING WOULD DEMONSTRATE LWECS IN THE SITING PROCESS ARE LIKELY TO VIOLATE STATE NOISE STANDARDS, DEVELOPERS ARE USING WRONG GROUND FACTOR FOR MODELING, GIVING FALSE IMPRESSION OF PROBABLY COMPLIANCE.</u>

Freeborn Wind (PUC Docket 17-410) was the first wind project to be sited acknowledging application of the PPSA, and more importantly, the first contested case for siting. Two prior contested cases were held on wind projects, one a territorial dispute between developers circa 1995, and more recently, the Goodhue Wind project and applicability of county ordinance under Minn. Stat. §216F.081.

The ALJ's Recommendation in the Freeborn Wind case was that the permit be denied:

SUMMARY OF RECOMMENDATIONS

The Administrative Law Judge concludes that Freeborn Wind has failed to demonstrate that the proposed Project will meet the requirements of Minn. R. 7030.0040, the applicable Minnesota Noise Standards. Therefore, the Administrative Law Judge respectfully recommends that the Commission either deny Freeborn Wind's Application for a Site Permit, or in the alternative, provide Freeborn Wind with a period of time to submit a plan demonstrating how it will comply with Minnesota's Noise Standards at all times throughout the footprint of the Freeborn Wind Project.

The wind promotional lobby was horrified that they might have to comply with the rules, and flat out stated they could not:

Judge's ruling against Minnesota wind farm causes alarm for advocates[9]

Freeborn Wind's developer, Invenergy, has objected, saying Schlatter's interpretation of state noise rules would be "impossible" to meet. Last week, two wind-industry trade groups and three of Invenergy's competitors also filed objections to Schlatter's recommendation, as did four clean-energy and environmental groups.

The judge's "interpretation of the Minnesota Pollution Control Agency's (MPCA) noise standards would have a detrimental impact on other current and future

[9] http://www.startribune.com/judge-s-ruling-against-minnesota-wind-farm-causes-alarm-for-advocates/485312391/

wind-energy projects throughout the state," the Minnesota Center for Environmental Advocacy wrote in its objection.

[Wind industry says Minnesota pollution control stance will stifle its growth][10]

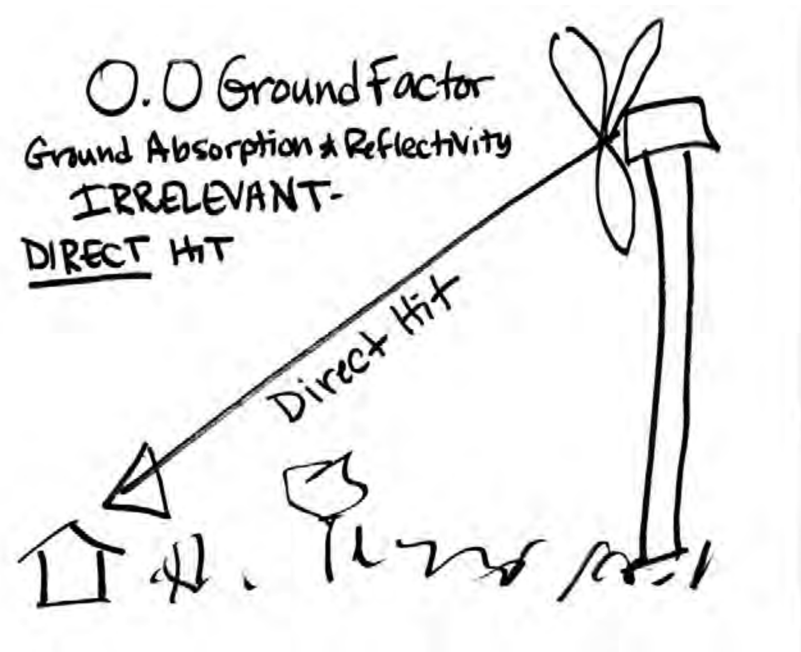
The wind-energy industry said an opinion filed by Minnesota pollution-control regulators defining wind-turbine noise will stifle its growth.

The Minnesota Pollution Control Agency (MPCA) said the state's limit for wind-farm noise applies not only to sounds from turbines but also should include background noise such as road traffic, said the filing with the Minnesota Public Utilities Commission (PUC).

The MPCA comment referred to in this article is attached.

Ground factor, a primary input assumption for noise modeling, was set at 0.0, and all evidence and testimony regarding the predictive modeling was based on this 0.0 ground factor.

In an admission that wind projects cannot comply with noise standards and cannot demonstrate compliance through modeling utilizing a 0.0 ground factor, the industry is now improperly utilizing a 0.5 or 0.7 ground factor. Why is this improper? Because wind turbines are elevated, and the sound goes directly to the "receptor" on the ground:



[10] http://www.startribune.com/wind-industry-says-minnesota-pollution-control-stance-will-stifle-its-growth/493181151/

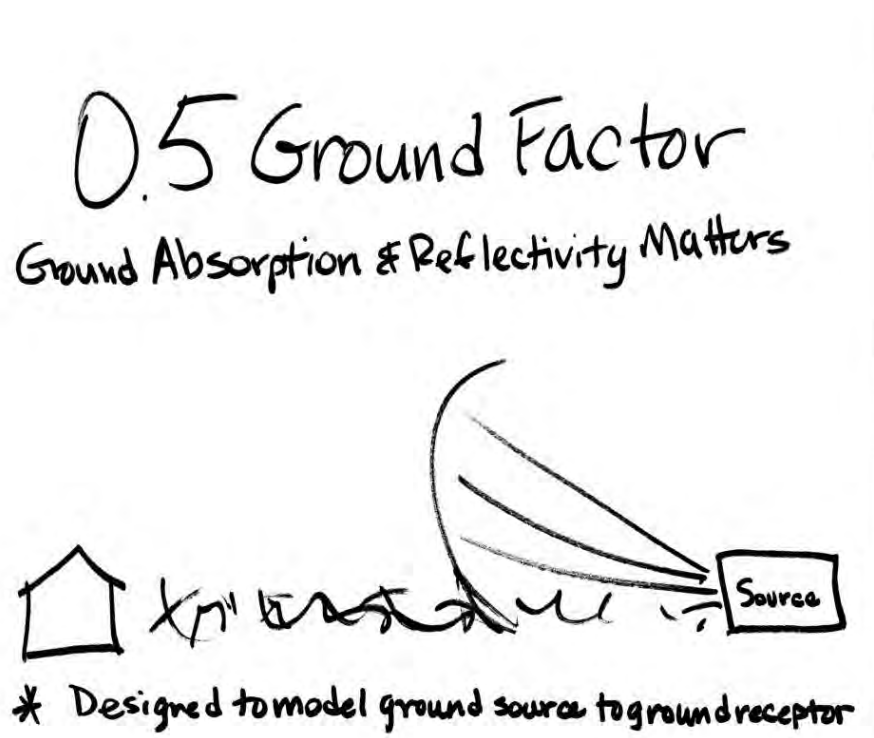
Ground factor represents conditions on the ground and things that can come between the noise source and the "receptor." See ISO 9613-2 (standards for noise modeling):

7.3 Ground effect (A_{gr})

7.3.1 General method of calculation

Ground attenuation, A_{gr}, is mainly the result of sound reflected by the ground surface interfering with the sound propagating directly from source to receiver.

Here's a depiction of how that works:



The Commerce-EERA handout listed projects in the permitting process:

LWECS IN THE PERMITTING PROCESS

- Buffalo Ridge 109.2 MW Wind Energy (WS-19-394)
- Three Waters 200 MW Wind Farm (WS-19-576)
- Plum Creek 400 MW Wind Farm (WS-18-700)
- Mower County 98.9 MW Wind (WS-05-1707); Repowering Permit Amendment
- Dodge County 170 MW Wind Project (WS-17-307); Pending
- Bitter Root 150 MW Wind Project (WS-17-749); Withdrawn

Looking at ground factors utilized in the permitting of these projects, here's the disturbing trend:

LWECS IN THE PERMITTING PROCESS

- Buffalo Ridge (WS-19-394) – 0.5 ground factor, p. 6-5 of Appendix C
- Three Waters (WS-19-576) – 0.7 ground factor, p. 8-13, Appendix D
- Plum Creek (WS-18-700) – 0.7 ground factor, p. 48, Appendix B
- Mower County (WS-05-1707) – 0.5 ground factor, p. 2, 4, Attachment 6
- Dodge County (WS-17-307) – 0.5 ground factor, p. 6-4, Appendix C

The use 0.0 of ground factor for wind is standard practice, and that a 0.5 ground factor is NOT appropriate for wind because it's elevated. This was inadvertently confirmed by Applicant's Mike Hankard in the **Badger Hollow solar docket, also in Wisconsin (PSC Docket 9697-CE-100)**:

A The model that we use has been shown to predict conservatively with 0.5. I mean, 0.5 ground factor is used in probably -- well, with the exception perhaps of wind turbine projects which are different because the source is elevated. But for projects like a typical power plant, a solar plant where the sources are relatively close to the ground, I would say 90 to 99 percent of the studies use 0.5. And when consultants like myself go out and measure these plants after they're constructed to verify our modeling assumptions, that assumption checks out as being, if anything, overpredicting the levels. So there's no need to -- there would be no justification to use something like a .2 or .3 which would predict yet higher levels because we're already demonstrating that the model is probably overpredicting. So that would not be justified for those reasons.

MR. NOWICKI: Thank you. No further questions.

The testimony of Dr. Charles Schomer in the Wisconsin Highland Wind docket[11] elaborates on the development of ISO 9613-2, that it is for measuring a ground source to a ground "receptor," and not designed for elevated noise sources with a direct path to "receptors," the purpose and use of the ISO 9613-2 standard and modeling assumptions, and the inappropriateness of use of a 0.5

[11] Online, selected pages from hearing transcript: https://legalectric.org/f/2019/11/Schomer_Pages-from-Transcript-Schomer-see-p-572.pdf

ground factor for modeling predicted noise from wind turbines. attached. I have also attached the AFCL Comment in the Freeborn Wind docket (WS-17-410) that addresses 0.5 ground factor improperly used in that docket.

The statements and justifications made in the noise modeling "studies" for the projects listed above are false and misleading. Like the Freeborn Wind project, the Highland Wind project could not meet the state noise standards using the 0.0 ground factor assumption, and so the developers moved the goal posts and produced noise modeling using a 0.5 ground factor with a claim that the project did meet state noise standards. This is deception, garbage in-garbage out modeling.

I have asked, on the record, whether PUC Commissioners understand what 0.5 ground factor means, and have received repeated, and feisty, assurances that yes, they do know what it means. If they do know, they are accepting this deception and inflicting sound exceedences on those living near the turbines.

In Bent Tree, we've seen buyouts of two landowner families due to noise exceedences, achieved after SEVEN years of complaining with no action by the Commission until pushed. In allowing use of a 0.5 ground factor, in permitting projects that are sited despite inability to demonstrate that they can meet the noise standards, the Commission is inviting further legal action. Unfortunately, the rights of landowners are funneled through an ineffective and inadequate Complaint process, reliant on landowner complaints and extreme persistence, rather than the Commission holding applicants to state standards.

Worse yet than acceptance of modeling based on a 0.5 ground factor is the utter absurdity of use of a 0.7 ground factor, as is seen for the Three Waters (WS-19-576) and Plum Creek (WS-18-700).

The Power Plant Siting Act's directive regarding public participation, applicable to siting of wind projects, is particularly important, as the Commission is failing to deal with the need for compliance with noise standards, leaving it to the public to address this failure. Landowners and residents are at a severe disadvantage, as most members of the public have no way to identify this problem, and certainly cannot afford to intervene, much less hire expert witnesses to address this deception.

That's all I have time for this year on PPSA. Thank you for considering these comments.

Very truly yours

Carol A Overland

Carol A. Overland
Attorney at Law

cc: All parties via eDockets

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November 15, 2019

Daniel Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 – 7th Place East, Suite 350
St. Paul, MN 55101

Filed via eDockets

RE: Completeness Comment on Biennial Transmission Projects Report
In the Matter of the 2019 Minnesota Biennial Transmission Project Report
PUC Docket: M999/M-19-205

Dear Mr. Wolf:

Please add my name, at the address above, to the official Service List as directed in the Notice.

The Commission has set out several topics for comment, beginning with "completeness."

I. IS THE BIENNIAL TRANSMISSION PROJECTS REPORT (REPORT) COMPLETE (THAT IS, DOES IT CONTAIN THE REQUIRED INFORMATION AS SET OUT IN MN RULE 7848.1300)? [NOTE: PER RULE, CHALLENGES TO COMPLETENESS MUST BE RECEIVED WITHIN 20 DAYS OF THE NOVEMBER 1, 2019 INITIAL FILING.]

First, although the Commission has allowed the Integrated Distribution Plan to be filed separately in Docket No. E002/M-19-666, and the Hosting Capacity Report in Docket No. E002/M-19-685. Compartmentalizing the dockets makes it more difficult to follow, and distracts from the interconnectedness of these three reports. Transmission claimed for interconnection or market may, or may not, be needed if projects are sited with Distributed/Dispersed generation in mind; likewise if projects utilize the information supposedly contained in the "Hosting Capacity Report" for siting. Without those two reports incorporated into this docket, and report, the report is not complete.

In the alternative, there should be at minimum a notice on the docket page to refer to these other dockets, and preferably everything filed in the integrated distribution plan and the hosting capacity report be filed in the biennial transmission projects report.

One purpose of the Biennial Transmission Projects Report, established in 2001, is to provide notice of projects planned or in planning, and in developing the report, "reporting parties may rely on available information and analysis developed by a regional transmission organization or any subgroup of a regional transmission organization" in identifying transmission projects. If known projects are in planning stage, they should be reported, and if not, the report is not complete.

One obvious use of the Biennial Transmission Projects Report, Integrated Distribution Plan, and the Hosting Capacity Report is to utilize available information to determine if a transmission line is needed. These reports can assist long range planning, incorporating those coal plants and other generation scheduled to shut down, shifting loads, and then can be used to holistically site generation near load, as much as possible, before jumping to claim a transmission "need." The Hosting Capacity Report is the converse of the DRG study, where this study is to identify hosting capacity throughout the system, and not just identify certain substations that can accommodate increased interconnection load system wide. Wind projects have consistently failed to identify substations where interconnection without network upgrades is possible, i.e., siting near the Sherco plant, other closed/closing coal plants. Closing those coal plants opens up capacity. It is irresponsible to attempt to site any generation without first using the substation sites where interconnection is easiest. Storage is now feasible, and should be included as a transmission alternative. The PUC's storage related dockets should also be incorporated into this transmission docket.

The Hosting Capacity Report is largely "non-public." Good grief, NOT ACCEPTABLE.

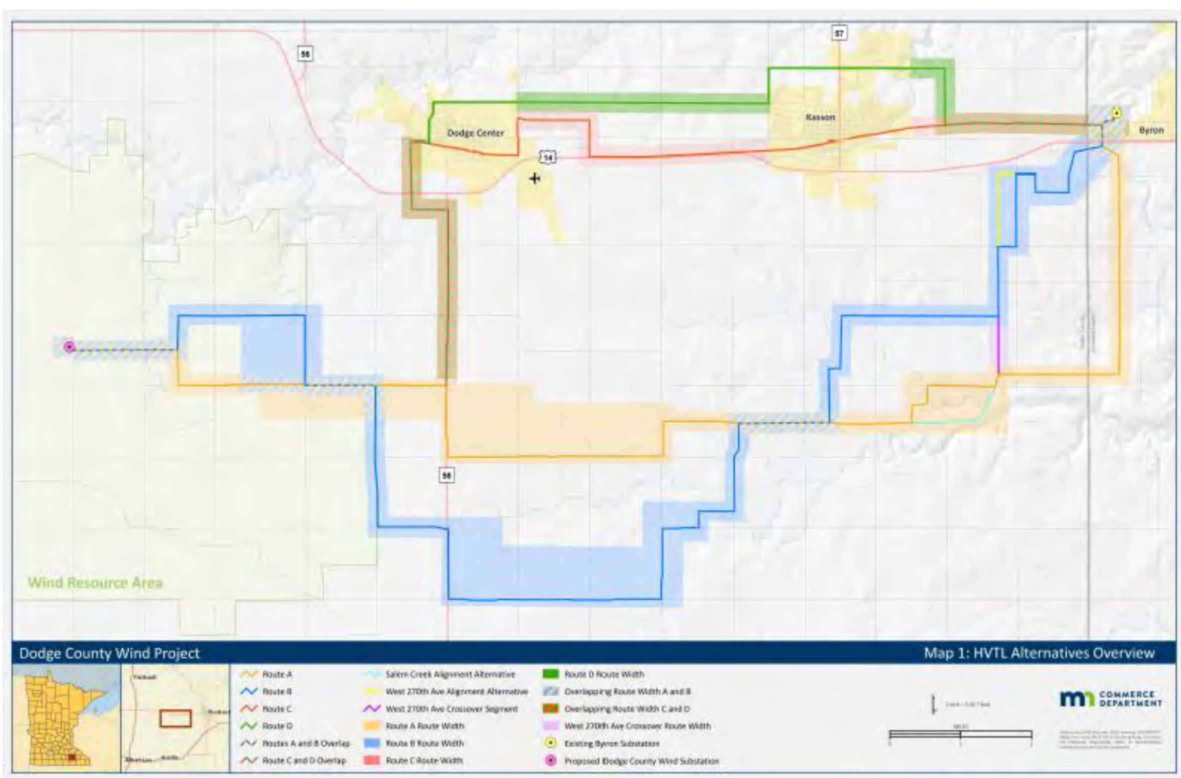
Minnesota utilities have a history of proposing transmission "solutions" for distribution problems, particularly Xcel's Hiawatha and Hollydale transmission projects. The Hiawatha Project should not have been built as Xcel couldn't demonstrate need for that transmission project (and transmission through an urban setting should have to meet a higher standard of need).

Minnesota utilities also have a history of grossly over-projecting electric demand, such as the 2.49% annual increase in demand upon which the CapX 2020 transmission projects relied. That misrepresentation of demand is now showing up in our electric bills, and the utilities have arranged a greater return on capital investment on transmission than they can make selling electricity in this decreased demand and low price state (note that wholesale prices are going down, down, down, and rates are going up, up, up – Xcel's transmission rider just filed is expected to increase a ~650mWhr customer's electric bill by $2.43/mo., and that's just the transmission rider!).

An obvious omission rendering the 2019 Report incomplete is the Wilmarth-Faribault-N. Rochester 345kV transmission project, proposed for MISO's MTEP "B List." According to the "MTEP Projects Under Evaluation," also linked below, this project was "studied during the MN 44 exploratory analysis, this project adds a 345 kV line between Mankato and Rochester. The line will stop at a new 345 kV yard in Faribault to support the local 100 kV system." This is specific enough to require inclusion in the plan, to provide some measure of notice to affected communities, and to provide notice to the state of utility plans.

Specific omissions include these documents, linked, which should be incorporated into the report:

- Generally, the report should include the most recent 20191018 MTEP Appendix A Status Report10/23/2019;
- Also generally, the report should include the MTEP Projects Under Evaluation 10/23/2019;
- Specifically, the report should include the Wilmarth-Faribault-N. Rochester 345kV transmission project, found on the MTEP Projects Under Evaluation10/23/2019;
- Another omission is the desire of the Dodge County Wind to have a 345kV radial "interconnection" line, but also claimed part of a future regional system, connecting into the Prairie Island-Byron-Adams line. This grossly oversized "interconnection" line was rejected by Dodge County Wind claiming prohibitive costs in its MISO interconnection study, and it is seeking another point of interconnection. That rejected line should be disclosed in the report, and as much information as is known about Dodge County Wind's intention. To which future regional transmission is Dodge County Wind intending to interconnect its radial 345kV interconnection tie-line?



- The MISO Transmission Expansion Plan is MISO's plan to EXPAND transmission, a primarily market-based enterprise which has very different analysis and criteria than the state of Minnesota – MISO's sieve is not the same as the state's, MISO's interests are not the same as the state's. Use of MISO and MTEPs confuses jurisdictional boundaries, and the Commission should not so readily adapt the MISO plan. The Public Utilities Commission is the state decider, not MISO. The state must carefully consider MTEP, MVP and other MISO projects very carefully using its own criteria and not those of transmission expansion and promotion.

- This writer also wholeheartedly agrees with Commerce-DER's suggestion that the most recent NERC Long-Term Reliability Assessment be included. The MRO load and capability report is an excellent stand-in for the MAPP load and capability report, and the reserve margin charts from the NERC Report are also valuable and should be considered by the Commission. The 2019 NERC Long-Term Reliability Assessment should be included as soon as it is available.[1]

II. SHOULD THE COMMISSION CONTINUE TO GRANT THE WAIVER TO THE PUBLIC MEETING REQUIREMENTS AND RELATED NOTICE REQUIREMENTS FOR THE NEXT REPORT CYCLE?

Most of the Commissioners were not participating in transmission issues in 2001 when the legislature passed the first iteration of the Biennial Transmission Plan statute. At that time, there were hotly contested transmission lines such as Arrowhead, Chisago, and the SW MN 345kV line, and the purpose of this plan was NOTICE! Most people do not know there's a transmission line coming through until land agents knock on the door about easements; most people do not participate unless and until transmission is planned for their property. It's important to get notice of projects out as soon as possible so there are no surprises, at least to give best efforts. For these reasons, the Commission should not grant waivers of public meeting requirements, and good grief, not NOTICE requirements.

The other two questions will be addressed in subsequent Initial comments.

If you have any questions, or require anything further, please let me know.

Very truly yours

Carol A Overland

Carol A. Overland
Attorney at Law

cc: All parties via eDockets

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[1] 2018 NERC Long-Term Reliability Assessment:
https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2018_12202018.pdf

A in MTEP20	B>A	West	ATC	14909	Small Capital Project and Asset Renewal 2021	Asset replacements and upgrades typically require limited infrastructure modifica
A in MTEP20	B>A	West	ATC	14911	Communication Reliability Upgrades 2021	Communications network system upgrades typically require limited infrastructure
A in MTEP20	B>A	West	ATC	14913	Line Clearance Mitigation Projects 2021	Line Clearance Mitigation projects have shorter project life cycles.Projects are dr
A in MTEP20	B>A	West	ATC	14915	Physical Security 2021	Physical Security projects typically have shorter project life cycles.The Physical S
A in MTEP19	B>A	West	ATC	14906	Load Interconnection 2020	Load Interconnection Project life cycles are customer need driven and typically h
A in MTEP19	B>A	West	ATC	14908	Small Capital Project and Asset Renewal 2020	Asset replacements and upgrades typically require limited infrastructure modifica
A in MTEP19	B>A	West	ATC	14910	Communication Reliability Upgrades 2020	Communications network system upgrades typically require limited infrastructure
A in MTEP19	B>A	West	ATC	14912	Line Clearance Mitigation Projects 2020	Line Clearance Mitigation projects have shorter project life cycles.Projects are dr
A in MTEP19	B>A	West	ATC	14914	Physical Security 2020	Physical Security projects typically have shorter project life cycles.The Physical S
A in MTEP20	B>A	South	SMPA	17004	Benndale Recip Project	Details to come
A in MTEP20	B>A	West	MP	17869	Superior Transmission Line Relocations	Relocate transmission lines around industrial site to enable development
A in MTEP20	B>A	West	CMMPA	18118	Windom_Transmission_Upgrade	Windom Municipal Utilities (WMU) has two transmission lines that source the Pov
A in MTEP20	B>A	South	SMPA	18180	Missionary 230kV Reactor Bank	Add new bay and breaker at Missionary 230 kV substation. Add new Reactor Ba
A in MTEP20	B>A	South	SMPA	18182	Cole Road 69 kV Capacitor Bank	Relocate Paulding 69kV cap bank to Cole Road 69kV substation.
A in MTEP20	B>A	South	SMPA	18226	Refuge 115 kV Equipment Upgrade	Cooperative Energy plans to upgrade the 1200 A switch at Refuge Switching Sta
B in MTEP20	B	West	ATC	16766	Small Capital Project and Asset Renewal 2023	sset replacements and upgrades typically require limited infrastructure modificati
B in MTEP20	B	West	ATC	16767	Communications Reliability Upgrades 2023	Communications network system upgrades typically require limited infrastructure
B in MTEP20	B	West	ATC	16768	Line Clearance Mitigation Projects 2023	Line Clearance Mitigation projects have shorter project life cycles.Projects are dri
B in MTEP20	B	West	ATC	16769	Physical Security 2023	Physical Security projects typically have shorter project life cycles.The Physical S
B in MTEP20	B	West	ATC	16770	Load Interconnection 2023	Distribution Interconnection Project life cycles are customer need driven and typic
B in MTEP20	B	West	MP	17868	Duluth Loop 115 kV Project	Scope TBD
B in MTEP20	B	South	SMPA	18224	Batesville 161 kV Bus Reconfigure	Reconfigure the Batesville 161kV substation so that the Batesville - Batesville TV
B in MTEP19	B	West	MISO	17764	Wilmarth - Faribault - North Rochester 345 kV	Studied during the MN 44 exploratory analysis, this project adds a 345 kV line between Mankato and Rochester. The line will stop at a new 345 kV yard in Faribault to support the local 100 kV system.

WI,MI	WI,MI	Asset Renewal or Reliability
WI,MI	WI,MI	Communications
WI,MI	WI,MI	Line Clearance
WI,MI	WI,MI	Physical Security
WI,MI	WI,MI	Load Interconnection Request
WI,MI	WI,MI	Asset Renewal or Reliability
WI,MI	WI,MI	Communications
WI,MI	WI,MI	Line Clearance
WI,MI	WI,MI	Physical Security
		Details to come
		Landowner required relocation
wer Plant Substa		The age of the existing transmission lines is nearing 50 years and could be nea
nk (Single Stage		During periods of low load and minimal system generation, high voltage is expe
		In order to provide better system voltage support to a heavily loaded area of the
ition		TPL P12 Loss of Andrus to Greenville 115 kV line causes overloads on the An
ons and additions		Other - Age and Condition
modifications an		Communications
iven by the ongoi		Line Clearance
Security Program		Physical Security
cally have shorte		Interconnection
		Voltage collapse for loss of connection to Arrowhead Substation
/A ties lines do n		TPL P23 violations (breaker failures causing the loss of both Batesville - Batesv
		Low voltages exist in the Owatonna and Faribault areas during P2 and P6 events. Load growth has brought the system to capacity. In addition to this, overloads due to future high wind scenarios occur throughout south central

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September 11, 2018

Daniel P. Wolf, Executive Secretary
Minnesota Public Utilities Commission
127 7th Place East, Suite 350
St. Paul, MN 55101-2147

Filed electronically via edockets.state.mn.us

Re: In the Matter of the Application for Freeborn Wind Energy, LLC for a Large Wind Energy Conversion System Site Permit for 84 MW in Freeborn
County Docket No. MPUC IP-6946/WS-17-410

Dear Mr. Wolf:

Freeborn Wind Energy, LLC (Freeborn) and others have filed comments in this docket regarding the interpretation of Minnesota's noise standards, as applied to Large Wind Energy Conversion System (LWECS) projects. The Minnesota Pollution Control Agency (MPCA) has the authority to adopt or amend state noise standards (Minn. Rules Ch. 7030) under Minnesota Statutes 116.07. This letter is intended to help the Commission understand the MPCA's position regarding the application of the state noise standards to LWECS projects.

First, Freeborn and other wind developers contend that LWECS projects meet the state noise standards in Minn. Rules Ch. 7030.0040 as long as the noise generated from any individual turbine, or a combination of turbines, is below the applicable noise standard, absent the consideration of other sound or noise sources. The MPCA disagrees with this position. The plain language of the adopted standards support the MPCA's position, as the scope of the standards reads "These standards describe the limiting *levels of sound* established...for the preservation of *public health and welfare*." (Minn. Rule 7030.0040, emphasis added). This position is consistent with the letter sent from the MPCA to the Department of Commerce (DOC) on October 8, 2012, where the MPCA states our interpretation of standards as health-based standards for *total, ambient* sound. Thus, the MPCA recommends that the Commission should determine compliance of LWECS projects under the state noise standards by determining if *total* sound levels at nearby residences or other receptors – that is, existing sound levels plus the additional noise from a given turbine or LWECS project – exceed the standards in Minn. Rules Ch. 7030.0040.

We understand that the Commission and the DOC may have, or appear to have, applied the state noise standards in Minn. Rules Ch. 7030 differently in the past for some LWECS site permit actions. Nevertheless, as stated above, the MPCA has historically, and consistently, interpreted and applied said noise standards for *total* sound. The total sound levels at a residential receptor, or any receptor, should meet state standards as laid out in Minn. Rules Ch. 7030.0040, regardless of the source(s) contributing to the total sound levels.

The MPCA also recommends that the Commission continue to include compliance with the state noise standards in its site permits for LWECS projects. Maintaining the compliance provision ensures that a state agency retains regulatory authority to compel compliance with the state noise standards. Since the MPCA for noise standard exceedances would be very difficult. Currently, the MPCA only engages with facilities on compliance with noise standards for facilities that have an air quality permit from the MPCA. In the case of LWECS projects, we do not have a regulatory relationship with LWECS project developers or owners, and would have a very difficult time enforcing the state noise standards on LWECS project developers or owners. The Commission's siting permits include a provision requiring compliance with the state noise standards, which provides a direct mechanism to ensure ongoing compliance.

Finally, the MPCA finds that the Department of Commerce's proposed a reasonable "cause or contribute" approach to address compliance in situations where ambient/background sound is already near or exceeding state standards at one or more nearby residential receptors. The MPCA worked with the Department of Commerce on the approach, and it represents the approach the MPCA uses for the consideration of total, ambient sound standard. Noise from individual wind turbines, LWECS projects in general, or other non-natural sources may only comprise a small fraction of the *total* sound level; completely restricting noise from these projects would, therefore, be an undue burden to developers and utilities. We believe EERA's proposed approach, which allows individual turbines or LWECS projects to contribute to a total sound of no greater than one dBA above the relevant noise standard (as described in Minn. Rules Ch. 7030.0040), is reasonable and appropriate, and that the Commission should apply the approach to siting permits, going forward.

The MPCA appreciates the opportunity to provide this feedback. If you have any questions, feel free to contact me directly at 651-757-2500 or Frank.Kohlasch@state.mn.us.

Sincerely,

Frank L. Kohlasch

Frank L. Kohlasch, Manager
Air Assessment Section
Environmental Analysis and Outcomes Division

FLK:cbg

cc: John Wachtler, DOC
Louise Miltich, DOC
David Thornton, MPCA
James Kelly, MDH
Jessie Shmool, MDH

wondering if he's looked at these.

EXAMINER NEWMARK: Follow-up on what?

MR. REYNOLDS: Follow-up on the question of recent science. He's reviewed the literature. I want to know if he's reviewed these two articles.

MR. WILSON: You already released him.

EXAMINER NEWMARK: He's answered the question. You've had your chance to cross him.

MR. REYNOLDS: Well, this is in response to the redirect. Just two articles.

EXAMINER NEWMARK: You had your chance to cross him. You're excused. Thanks.

(Witness excused.)

EXAMINER NEWMARK: Is that the balance of the applicant's witnesses?

MR. WILSON: They're all done.

EXAMINER NEWMARK: Okay. Believe it or not, hm? All right. I think we have time for Mr. Hessler.

MS. NEKOLA: Clean Wisconsin would like to call Mr. Hessler.

DAVID HESSLER, CLEAN WISCONSIN WITNESS, DULY SWORN

EXAMINER NEWMARK: Thanks for your patience.

DIRECT EXAMINATION

BY MS. NEKOLA:
Q Good morning, Mr. Hessler.
A Good morning.
Q Please state your name and business address for the record.
A My name is David Hessler. My business is located at 3862 Clifton Manor Place in Haymarket, Virginia.
Q Did you prepare 12 pages of direct testimony, nine pages of rebuttal testimony, five pages of surrebuttal testimony, and three exhibits in this proceeding?
A Yes, I did.
Q And is the information in your testimony and exhibits true and correct to the best of your knowledge?
A Yes, it is.
Q Mr. Hessler, have you had the opportunity to review Mr. Schomer's surrebuttal testimony?
A Yes, I have.
Q Mr. Schomer states that low frequency pulse will be audible to many residents of Forest. Do you agree with that?
A No, I don't think that's an inevitable or foregone conclusion. The --
MR. McKEEVER: Excuse me, Mr. Hessler. Could you speak up.

THE WITNESS: I'm as close as I can get to this thing without eating it.

MR. McKEEVER: Thank you.

A No, I don't think that conclusion is inevitable. That research that his testimony is based on is 30 years of experience evaluating health effects from low frequency noise associated with military sources like artillery and tanks. And he has just taken that result and just applied it wholesale to wind turbines without considering the dramatic difference in the magnitude of the two sources.

An artillery shot is, I think everyone realizes, much, much louder than any wind turbine could be. There are many studies that show that wind turbines -- the low frequency content of wind turbine noise is very, very low and is around the -- at or under the threshold of hearing. So tanks and artillery are not -- I wouldn't describe them as being near the threshold of (inaudible).

THE REPORTER: Near the threshold of what?

THE WITNESS: Hearing. (Laughter.) How about that?

BY MS. NEKOLA:

Q Mr. Hessler, is there a particular recent study that you can point to that assesses the magnitude of low

frequency wind turbine noise?
A Yeah. There's many, many studies that have been done, I've taken my own measurements. But there is one that I think kind of epitomizes the research on this topic, and it's a study that was undertaken specifically to try to address this issue of what is going on with low frequency noise in wind turbines. It's a study that was published in the Noise Control Engineering Journal April of last year by O'Neal. And just to very briefly summarize it, they kind of went through the literature and found all of the existing -- all the ones they could, all the existing thresholds for the perception of low frequency noise worldwide.
They did a literature review of all the papers that have -- that they could find that were ever written on the subject and they summarized the results of all of those. All of those results essentially say that it's so low in magnitude that it's pretty much inconsequential.
And then the last part of this study is that they went out and did their own field measurements on two different types of turbines; and then they compared those findings to all of the thresholds that they had found, and found that the

levels were under the threshold of hearing in every instance, every ANSI standard, every threshold they could find.

(Hessler Exhibit No. 4 was marked.)

Q I'd like to hand you this. Is this a true and correct copy of the study that you were just talking about?

A Yes, it is.

MS. NEKOLA: Your Honor, we'd like to move this study into the record as Hessler Exhibit 4.

MS. BENSKY: We object, Your Honor.

EXAMINER NEWMARK: Okay. Go ahead.

MS. BENSKY: Well, I haven't seen it. I haven't had a chance to look through it. I'm paging through his testimony now to see if he did talk extensively about low frequency noise. I don't recall that he did. I don't believe this was cited in his testimony. So our witness can't see it and I don't have the ability to read it now and ask questions. So that's why I object.

EXAMINER NEWMARK: Response?

MS. NEKOLA: Your Honor, this is in response to surrebuttal testimony that referenced low frequency noise, and Mr. Hessler contemplated addressing low frequency noise all along in this case. I think it's highly appropriate to add this to the record. It's a more recent study than anything else that we have so far in the record. And if we -- we could give parties a chance to read it and perhaps decide later. We think it's --

EXAMINER NEWMARK: And just -- I didn't catch who he was responding to.

MS. NEKOLA: Mr. Schomer.

EXAMINER NEWMARK: Schomer's surrebuttal?

MS. NEKOLA: Surrebuttal, um-hmm.

MS. BENSKY: I guess there is no reason this couldn't have been part of Mr. Hessler's direct testimony. His work for Clean Wisconsin, as I understand it, is quite extensive on this case. And if this was going to be an issue that he wanted to address all along, then -- this is a 2011 study, there is no reason this couldn't have come in earlier. It'll take me more than ten minutes to read this and understand it.

We don't have any ability to put any information in the record to rebut it. So that's where the prejudice is.

MS. NEKOLA: Your Honor, this is a 2011 study that reviewed over 100 scientific papers worldwide on this topic, and also included a field study to measure wind turbine noise outside and within nearby residences. I think it would add to the record.

EXAMINER NEWMARK: Yeah, it looks like, from what I can see on direct, Schomer does reference studies about low frequency noise. And so I don't see why this couldn't have come in earlier. I'm going to have to leave it out as prejudicial. It's just too late to go through all of this and to have another witness come in.

MS. NEKOLA: One more thing that is relevant here, I think, is that we anticipated that Mr. Hessler would be able to do his own study of low frequency noise in another wind farm in Wisconsin. And he was -- he has so far been unable to do that because we haven't been able to get access to any wind farms. And so I think this is also his attempt to put in the best recent information on low frequency noise that he has available to him.

EXAMINER NEWMARK: I understand. Does staff have any opinion on this?

MR. LORENCE: I was just paging through his testimony. I see a reference to low frequency in his surrebuttal. But can you tell me where it is in his direct?

EXAMINER NEWMARK: Yeah, Schomer page 3, that first top of the page, there's been a multitude of literature published over the last 40 to 50 years that indicates that low frequency, and it continues on from there.

MR. LORENCE: Page 2 or 3?

EXAMINER NEWMARK: 3.

MR. LORENCE: I guess the only thought I have is if this is the only reference, I don't think he was really asserting anything other than the statement saying that there is publications. I thought his testimony was more direct in the sursurrebuttal with respect to low frequency. And I guess I thought -- and that was at least on page 16 of his sur-sur where he draws his last conclusion. Maybe it's the same thing. And so that's why I noticed that the -- the most as opposed to in his direct.

EXAMINER NEWMARK: And what pages on his surrebuttal? He just has surrebuttal, right? Does he have a third round?

MR. LORENCE: I saw it on surrebuttal page 16. And there may be other places. But I was looking at his last conclusion which is lines 12 through 22.

EXAMINER NEWMARK: I don't see that much difference in those two passages. But let's back up a little bit because I am aware that there is an attempt to do a study, is that the Glacier Hills farm? Is that the case?

MS. NEKOLA: Or the Shirley site.

EXAMINER NEWMARK: Or Shirley.

MS. BENSKY: He was denied access several months ago; isn't that correct?

MS. NEKOLA: No. They have not made a decision, final decision. But it has the same effect of being denied, actually.

MS. BENSKY: But in his direct testimony, doesn't he say he was denied?

MS. NEKOLA: Well, I'm not sure, but the -- the truth is that he has not been able to get access.

MR. REYNOLDS: Has there been any reason given for that?

MS. NEKOLA: No. Right, his direct testimony just says that we have not been granted access to the site. So thus far, we haven't been able to -- he hasn't been able to do the study.

EXAMINER NEWMARK: Okay. Well, the problem with this is I don't think this is enough of a substitute for a study at the other wind farms, and I know that the access question has not been fully determined.

MS. NEKOLA: That's right.

EXAMINER NEWMARK: And I would be prepared to reopen the hearing if we could have a study developed on that specific -- on those locations, one of those locations, if access is granted. But that would mean scheduling that and having a process for it.

But at this time in the game and at this hearing, I don't think we can admit this -- this study because the parties have not had a chance to review it and their witnesses aren't available. You know, if there is a point in time when we know access cannot be given, I can consider reopening the hearing to take a look at these late exhibits as a substitute. But I would like to, you know, try to -- I don't want to do that now and I don't want to thwart any attempts to get the studies done. I think that's much better evidence. So -- or it would be evidence rather than, you know, literature review.

So are there any other exhibits that relate to this? I saw you had a number of items there.

MS. NEKOLA: Not on low frequency noise. We have one other that we want to offer on another matter.

EXAMINER NEWMARK: Okay. All right. So are we okay with that?

MS. NEKOLA: We just want to point out that the study that we're -- tried to move in was not just a literature review, but that there were also actual sound measurements at wind farms.

EXAMINER NEWMARK: Okay. Thanks for clarifying that. So for now we will hold off on that.

MR. WILSON: Your Honor, for what it's worth, I had a discussion with Cindy Smith yesterday morning where this topic came up about the inability to do the low frequency testing --

EXAMINER NEWMARK: Let's go off the record.

(Discussion off the record.)

EXAMINER NEWMARK: Let's get back on.

BY MS. NEKOLA:

Q Okay. So do you think that low frequency noise problems can be ruled out?

A No. Despite the findings in that study, no, I don't think we can just assume that there won't be any problems. And I say that with respect to the testimony we heard yesterday from those three homeowners that had to leave their house -- houses at Shirley. That was very compelling and I think irrefutable evidence that there is a problem at that site. The question is why is that? And that's what we were hoping to explore with that field survey.

So I think what's happening is that there is a low frequency noise that is associated with very specific turbine models or types of blades or blade control mechanisms that results in, according to the studies that I've seen recently, results in inaudible low frequency sounds that can produce adverse symptoms and problems in certain people in rare cases. But it needs to be investigated. And that's really the state of knowledge on that.

Q You say that these instances are rare. Can you give an example of a more typical situation?

A Yeah. Yesterday we also heard from Jeff Bump who lives at the Glacier Hills site. And I'm familiar with Glacier Hills. And I know -- I met Jeff Bump. My brother and I set up instruments at his house last winter, and we measured day and night at his house for about 18 days I think at his house, and ten other houses around that site. All the ones with the closest possible exposure to turbines. We measured off of the site to get the background conditions on a -- kind of a running time history of background throughout the survey.

And, you know, he said he was bothered by this horn sound and that's -- I heard that, that's associated with the hydraulic system in the Vestas V90 turbine that's at that site. He said he was kept awake by a swishing noise. That's mid-frequency oscillation, around 500 hertz, due to the blades. But what he didn't complain about is low frequency issues and any of these adverse health effects. He said, well, he might have got a headache once, but really it was all about the fact that he was bothered at night.

But the point is that this project, Glacier Hills, has over -- I think it's over 120 turbines that are distributed over an area that's about, very roughly, 40 square miles. There are hundreds and hundreds of people that live in close proximity to turbines at that project. Yet the only people that are complaining are Mr. Bump and another fellow that lives next -- or nearby him. Those two people are the only ones that have any problem with noise out of many, many hundreds. And that is the typical situation based on all of the post-operational surveys that I've done. The number of people that are actually complaining or bothered by it is very, very low compared to the total population.

Q Thank you. Mr. Schomer also mentioned that the data contained in your Exhibit 1 is artificially elevated by pseudo-noise or instrument error. Do you have a response to that?

A Yeah. What we did in our analysis of the applicant's sound study was to look at the data, the sound data, as a function of wind speed. And that's been criticized as, well, the sound levels are elevated because the wind was blowing over the microphone. But the fact of the matter is that the winds were very light during that survey; and the peak wind, the highest wind, at the microphone during that entire two-week period was only seven miles per hour.

We have -- some years ago, I think it was about 2008, we did study, a wind tunnel study, to evaluate that phenomenon of wind blowing over the microphone to quantify what that error is. And in that study, what we found was for a seven-mile-per-hour wind, the self-generated noise or pseudo-noise would be only around 20 dB, whereas in the field survey at Highland, the levels being measured under those conditions was in the neighborhood of about 45 dBA. So there wouldn't be any effect at all from a pseudo-noise. I believe the data is perfectly valid.

(Hessler Exhibit No. 5 was marked.)

Q You've been handed a copy of a study that you just referred to and described. Is that a true and correct copy of that study?

A Yes, it is.

MS. NEKOLA: We'd like to enter this into the record as Exhibit 5.

EXAMINER NEWMARK: Any objections?

MS. BENSKY: No objection.

EXAMINER NEWMARK: All right.

(Hessler Exhibit No. 5 received.)

BY MS. NEKOLA:

Q Turning to the surrebuttal testimony of Mr. Horonjeff, have you had an opportunity to review that testimony?

A Yes, I have.

Q Mr. Horonjeff points out that your comparison of the Highland sound data with the met mast wind speed shows considerable scatter at any given wind speed,

and he suggests that the mean value should not be used. Do you have a response to that?
A Yeah. It's not really a matter of where you draw the line, the mean trend line, in that data. What it shows is that the vast majority of the sound levels that were measured during the survey were measured under very low wind conditions that -- below the point, generally speaking, where the turbines would begin to operate. And the principal point is that during the windier conditions when the project would be operating, there are very, very few measurements of low sound levels during those wind conditions, only about six to a dozen ten-minute samples out of roughly 2,000 measurements that were taken.

Mr. Horonjeff is saying that, well, sometimes it's quiet when it's windy, but that is a rarity and that's what that figure shows.
Q You were present yesterday when Mr. Reynolds questioned Ms. Blank about the sound modeling for the project, correct?
A Yes.
Q And do you recall that Mr. Reynolds quoted your direct testimony at page 11 as saying that sound models should have an ideal target level of 40 decibels? Do you recall him saying that?

A Well, I think what he said was that the project should be designed to 40. 40 is the recommended level. My view on that is -- and what we've asserted in papers and things that we've published based on our field studies of completed projects -- is that if possible, projects should use 40 dBA as an ideal design goal if at all feasible because what we find is that below 40 there's very few, if any, complaints. But as a regulatory limit, we've put forward a level of 45 because the regulatory limit is different from an ideal design goal. A regulatory limit has to balance everybody's best interest. So the 40 we weren't saying was a suggested regulatory limit but rather an ideal design goal.

Q So just to be clear, is it your position that the Highland wind project should meet the 40 decibel noise standard?

A Should it meet the 40?

Q Right, is that your position?

A No. I think it -- I would be satisfied or I would recommend that it meet the 45 limit as currently it's obligated to do.

MS. NEKOLA: Mr. Hessler is available for cross-examination.

EXAMINER NEWMARK: All right. Do you have questions?

CROSS-EXAMINATION

BY MS. BENSKY:

Q Good afternoon, Mr. Hessler.

A Good afternoon.

Q In your papers, you have a very distinct talent in taking complicated information and making it understandable for everyone, so I commend you on that and I ask that you do your best to keep it at that level here.

A We'll see how it goes.

Q Let's start with page 2, I'm just going to go through your testimony. So direct testimony page 2. At line 2, you say, "Typical projects involve field surveys to establish baseline background sound level conditions..." Is that the same way of saying ambient sound?

A Yeah. It's essentially the same thing.

Q And why is it important to establish that baseline?

A Well, the way most projects -- not just wind projects, but any fossil plant or any project -- would be evaluated is to see how its noise is going to compare to the sound level that already exists at that location. If the facility noise is going to greatly exceed the existing level, then there's

likely to be an adverse impact. If it's below the background, you might not even hear it. So it gives you a baseline to make a judgment on what the impact's going to be.
Q And in your view, is establishing that baseline an important thing to do?
A Yeah. We typically do do that for wind projects or any power plant.
Q Turning to page 3. You have your testimony up there with you?
A Yes, I do.
Q Now, page 3, and correct me if I'm wrong, it looks like you are first reviewing the initial predictions that were listed in the application using the zero coefficient assuming a total reflective ground?
A Where is it that you're at there?
Q On page 3, question number 7 -- or line 7. Your overall impression of the studies. I just want to clarify that what you're talking about right there is the modeling results where a zero coefficient was used; is that correct?
A Yeah, yeah. That's correct.
Q And looking at those results, if the average background noise was between 29 and 34 decibels and the project level was 45 decibels, your opinion is

that the project would be quite audible; is that correct?
A Yes, that's right.
Q If those were the actual numbers. And is the reason why the project would be quite audible is because you have that 11 to 16 above ambient level?
A That's right.
Q And do you have an opinion as to whether an ambient level of between 12 and 16 decibels -- or an actual level above -- let me start over.
Do you have an opinion as to whether that relative noise level would result in adverse community reaction?
A Yeah. If those were the actual levels, then we would conclude in any assessment that the project was likely to have a pretty significant adverse impact.
Q So it's not necessarily that 45-decibel level you're concerned about, you're more concerned about the relative difference, that 11 to 16 decibel difference; is that correct?
A Yeah. That's what I'm talking about in that particular paragraph.
Q Now, on page 4, going down to line number 12, you're talking about your review of the met tower data, and you had requested a site plan that you did not

receive?
A That's right.
Q And I understand later in your testimony that you kind of reverse engineered a site plan based on the available information?
A Yeah. It was possible to import into our modeling software the -- I guess the sound contour map from the application. It wasn't absolutely necessary to get the site plan in the first place. It was just -- it would have helped things. That's all.
Q So what information would you have expected the site plan to contain that would have been helpful to you?
A Just a particular kind of computer file that is easily imported into the modeling program. Just more to save time. What we had to do was just take the PDF and work with it.
Q So you feel that you obtained all of the information that you needed?
A Yeah. We made do.
Q The information that you used in your gathering of that data, do you know if that's the exact data that would have been contained in the site plan?
A We used the actual site plan from the application.
Q But you said you didn't receive the site plan.
A We used the site plan that was published in the

environmental assessment. It was just a matter of convenience to get the computer file. It wasn't germane to anything really.
Q So the actual data would have been the same? What I'm --
A That's right.
Q What I'm getting at is do you think that you input the right numbers based on the information that you had?
A Yes.
Q Now, let's talk about the met tower. The met tower was 49.5 meters, 162 feet. And is it your understanding that the hub height of the proposed turbines is between 299 to 328 feet?
A Right. Yeah. This met tower anemometer puts it within the rotor plane, not exactly at the hub height. It's very rare to have a met tower high enough that it goes all the way up to 80 or so meters.
Q So it's at the bottom of the rotor plane, 162 feet would be at the very bottom assuming the blade lengths are between 160 and 180 feet?
A Right.
Q Is there some sort of formula that you applied to that 49 meters to estimate the wind speed at the hub

height?
A The hub height wind speed wasn't needed for anything. What we did do was take the met tower wind speed at 49 and a half meters and then normalize that to 10 meters because you have to put the wind speed data on an even footing with the turbine sound power level data which is also -- which is always expressed as a function of the wind speed of 10 meters.
Q But that's something different than estimating what the wind speed would be at the hub height?
A Yes. The hub height, whether it's near the bottom of the rotor plane or at the hub height, it doesn't make any difference here, to what we were shooting for here.
Q But wouldn't it be -- if you want to know how fast the blades are going to turn, wouldn't you want to know the wind speed at the hub height? Wouldn't that be ideal?
A No. It's really -- it's all about the wind speed at this normalized height of 10 meters that's relevant to this whole thing. Even if we had a met tower that was -- met mast that was 80 meters, we would have just taken that value and normalized it to 10 meters. It would have been the same.
Q But if you had a met tower at 100 meters, you would

not have had to apply that formula?
A No. We would have had to apply it to any elevation anemometer. We want to bring it down to 10 meters from whatever height, the highest possible height.
Q So based on the met tower data, you don't know the actual speed of the wind at the hub height; is that correct?
A We could easily infer it from this 49 and a half meter data if we wanted to know it.
Q So you didn't -- is your answer you did not have the actual wind speed at the hub height?
A Met mast wasn't high enough.
Q And you did not have the actual speed at the rotor tip of 500 feet?
A We could have inferred that if we needed to know. The ideal thing would have been to have anemometers over the whole diameter of the blade, but you never have that.
Q So you have to make some approximations?
A Oh, yeah.
Q Is there generally a difference -- or can there be a difference in wind speed at 500 feet as opposed to 162 feet?
A Yeah. It is typically higher with elevation.
Q What happens when there's a very -- there's a higher

wind at the rotor tip than at the bottom of the rotor?
EXAMINER NEWMARK: In what sense? What do you mean what happens? In terms of what?
A Yeah, in terms of what?
BY MS. BENSKY:
Q When there is a higher -- when there's a higher wind at the top than there is at the bottom of the rotor, does that have any effect on the sound produced?
A Yeah. Yeah. The wind speed is typically always higher at the top than it is at the bottom. It's very rarely perfectly flat, although that does happen. The degree to which the wind speed varies from the top to the bottom or from -- between any two heights is the wind sheer, and the higher the sheer the more slanted that -- the greater the difference between the wind speeds at different heights, the greater the noise generation generally is.
Q Is there a particular season where the wind sheer is greater?
A Yeah, at most sites it's typically in the summertime.
Q The wind sheer is greater in the summertime?
A Yeah.
Q Are there any other weather conditions where the wind sheer would be greater?

A It's typically higher at night than it is during the day.
Q Now, looking at the bottom of page 4, is it your testimony that when the near ground level wind speed is very low, that does not necessarily mean that the hub height wind speed is the same; is that correct?
A Right. You -- it's hard to tell anything from the wind speed measured at a meter above the ground. That generally remains pretty low even when it gets really windy out. That's why we wanted to use the met mast that -- at the highest possible anemometer to get a sense of what's going on up at the elevation that the turbines would see that wind.
Q Just so we're all on the same page, what's an anemometer?
A A device for measuring wind speed.
Q And that's the thing that sits on top of that met tower?
A Yeah.
Q Let's turn to page 5. Looks like I already covered that. Let's go to page 10. Starting on line 6 and just follow along. Is it correct that you state, "A common design theory for new industrial projects of all kinds is to design the project so that its sound level does not exceed the background level by more

than 5 decibels..." Did I read that correctly?
A That's right.
Q Then you state, "...the logic being that such an increase is not particularly noticeable, at least when the character of the noise is rather bland and free of any prominent tones or other identifiable characteristics. Because wind turbine noise often has a variable, churning, sometimes periodic character to it, this approach is somewhat tenuous for wind projects, but nevertheless it is commonly used..."
Is it your testimony that wind turbines create a sound of such a characteristic that the 5 decibel above ambient is too much?
A Yeah. Yeah. The 5 increase would -- makes the most sense when you have a, for example, a very constant source that has a bland character to it like a conventional power plant. That sound 5 above the background is usually -- or usually results in a negligible impact, people don't really notice it. Now, wind turbines don't have a particularly steady sound so that they are more audible than other sources relative to the background. So even a 5 increase is generally pretty noticeable.
Q Thank you. Now, at the bottom of the page, you state

that assuming a background noise of 34 to 36 decibels, your recommendation in an ideal world is that the project noise be limited to between 39 to 41 decibels; is that correct?
A Yeah. That would be a 5 increase over this background level that I'm coming up with.
Q Okay. Now, on the next page, and I'm going to hand out an article that you reference and footnote on page 11.
EXAMINER NEWMARK: That's Hessler 5, right?
MS. NEKOLA: 6.
MS. BRANT: No, Your Honor. It's the same scientific journal, I believe, or a very similar format.
MS. BENSKY: No, it's a different article.
MS. NEKOLA: It's a different article, right.
BY MS. BENSKY:
Q And the first question is looking at the publication that I just gave you, is this indeed the publication that you reference in footnote 3 on page 11 of your direct testimony?
A Yeah, yeah. I'm glad you handed it out to everybody.
Q Now, let's turn to page 96, it's just this third page

in. And you're talking about the World Health Organization target noise level to protect the public. And that is listed at 40 decibels day or night; is that correct?
A I think they specifically call that the nighttime target.
Q Okay. Oh, you're right, nighttime sound levels.
And has that changed since this paper was published?
A Not to my knowledge, no.
Q And turning to page 98, first full paragraph beginning with Considering the EPA guidelines. And there's some discussion of day and night levels; and then you state -- first of all, did you author this paper?
A Yeah. I was a co-author on it.
Q Co-author with George Hessler?
A Yeah.
Q So you state, "A 45 decibel composite noise equivalent level with a 5 decibel evening weighing would be even more ideal at 45, 40 and 35 decibels for day, evening and nighttime levels, respectively."
EXAMINER NEWMARK: Can you point to that for the record.
MS. BENSKY: It is on -- it is a

publication which is footnote 3 of Hessler Direct 11. It's called, "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States," and it's on page 98 of that publication.

EXAMINER NEWMARK: And where on page 98?

MS. BENSKY: It's in the middle of the page. There's a first -- full paragraph begins with Considering the EPA.

EXAMINER NEWMARK: Okay. Thanks.

MS. BENSKY: And I'm looking at the last sentence.

EXAMINER NEWMARK: Um-hmm. Okay.

BY MS. BENSKY:

Q So my question is, is it correct that in this paper, you recommend an ideal design target of 45, 40 and 30 decibels respectively during the day, evening and nighttime?

A No. What we're doing in that part of the paper is going through all of the regulations that pertain or could possibly pertain to wind projects and just summarizing each one. At the end of the section, then draw a conclusion on what we recommend based on all these various standards.

Q And your conclusion is that a composite noise

equivalent level would be even more ideal at 45, 40 and 35; is that your conclusion in this paper?
A It's not a conclusion. It's just a comment on this particular measure.
Q But it's correct that -- I'm reading it correctly, right, that, "A 45 dBA composite noise equivalent level with the 5 dBA evening weighing would be even more ideal at 45, 40 and 35 decibels for day, evening and nighttime levels, respectively." Am I reading that correctly?
A Yeah, yeah. The lower the level the better. But we end up concluding later that as a practical matter 40 is -- seems to make sense.
Q But taking out -- you're not a state regulator, correct?
A That's right.
Q So -- you're a noise engineer, correct?
A Right.
Q And based on your very extensive expertise as a noise engineer, your opinion is that it would be ideal to have a 45, 40 and 35 dBA level for day, evening and nighttime?
A I'll always say it's more ideal.
Q Let's move on. Tell me, did you make any differen -- what hours are we talking about? What's daytime?

What are daytime hours as you're talking about here?
A It's usually 7 in the morning to 10:00 (sic) at night.
Q And what's evening?
A Then that goes to -- I'd say it's 7 to 10 p.m. or something.
Q So daytime would be 7 to 7, evening would be 7 to 10?
A Yeah.
Q And then nighttime would be 10 to 7 in the morning?
A Right.
Q Now, please turn to the next page, page 99, first full paragraph on that page says -- starts The States of New York, Massachusetts and California. Are you there?
A Okay. Yeah.
Q The first -- or the second sentence reads, "An ambient-based method is based on the perception of the new sound in a specific residential community. A perception-based method is clearly a better approach than a single absolute limit, and, in fact, many years of experience have shown this approach is working well in all these three states."
Did I read that correctly?
A Yes, that's right.
Q And you're talking about three states that have an

ambient-based guideline; is that correct?
A Right.
Q And the words that I just read, are those your recommendations in this article? You're not quoting anyone else. I want to know if that is your work right there?
A Yeah, yeah. We're talking about how they do things in New York, Massachusetts and California. And how that is, how that works, is that you measure the background, you add some factor to it, in Massachusetts it's 10, and essentially what you come up with is an absolute limit that is derived from the background. But the final answer is an absolute number.
Q But your opinion, is it correct that your opinion here is a perception-based method, which is this ambient relative standard, is clearly a better approach than a single absolute limit; is that your opinion?
A It's what's -- that's what it's saying here. But the end result of the paper is that it's better to go with absolute numbers.
Q So you contradict yourself in this publication?
A I suppose so. I think my father wrote that part, but -- in fact, I'm sure he did.

Q I'm going to tell him you said that.
A I'm always -- I'm used to that.
Q Now, on page 11 of your testimony, you're still discussing this article and you're discussing the results of it looks like a survey that you conducted? Is that correct?
A Okay. We're back in the direct testimony again?
Q Yeah. The direct testimony on line 12 --
A Yeah, okay.
Q -- you're referring to a study, and the study that you're referring to is still in this article?
A Yeah. It's just later on in the same article, yeah.
Q And you state at least 95 percent of residents were apparently satisfied with or unfazed by the sound emissions of the new wind project, even when sound levels were around or above 45 decibels. Was that your conclusion based on this study?
A Yes, it was. And what that study is all about is we're --
Q I'm sorry. Let me ask you the questions, keep this moving along.
A Okay. Go ahead.
Q Please look at Table 4 of your paper, it's on page 101, and it looks like those are the results of this study that you're talking about in your direct

testimony?
A Yes, that's right.
Q So looking at site A, there are approximately 107 households that are within this kind of target area near wind turbines; is that correct?
A Um-hmm. Yes.
Q And you found that when noise decibel levels were below 40, there were no complaints --
A That's correct.
Q -- correct? No sound complaints or no complaints at all?
A No complaints related to noise.
Q Okay. So the survey didn't ask about did people have problems with nausea or sleeplessness, it just said are you bothered by the sound?
A Well, there was no official survey. These houses that are in the table or are counted in the table, what those are are all of the houses where the project operations ever received a call with any kind of concern about the noise from the project. Some were definite complaints, others were just kind of mild concern. But they're all included here. When we do these surveys, we'll ask, you know, who has ever called about a problem; and then we will put instrumentation at that house and include them in the

compliance study. So we know how many complain and we know what the level was there.
Q Okay. So you had 107 homes where there were noise complaints --
A No.
Q -- correct?
A No, that's incorrect. The 107 is the total number of households that are within 2,000 feet of a turbine at that project.
Q I'm sorry, I didn't hear you. My colleague was talking to me.
A Yeah, the -- all the numbers in that column, the 107 is how many houses there were within 2,000 feet of a turbine in that project. In other words, it's the total population essentially.
Q Okay. And this -- to obtain the complaint data, you went to the company to get their records, correct?
A Well, it was just a matter of talking with the operations people. No records per se.
Q So you didn't receive anything saying here's our stack of written complaints?
A We asked who has ever called with any kind of concern about noise. And they -- then they told us. There may be more. That's possible.
Q So it's -- you called up Bob who runs this project

and said who's complained and he said, well, I think this guy, this guy and this guy; that's what it was?

A Well, it's whoever called up at any time. And I think this is -- it seemed to be pretty accurate.

Q But you didn't go to every -- you didn't send out a survey to 107 residences --

A No, no, not at all. This -- the purpose of these surveys was never to -- was not primarily to evaluate the impact. It was to carry out a compliance survey to see whether the project was meeting its requirements. And we just were able to draw out of that this information.

Q And that obviously is a very important distinction.

A Yeah. Yeah. None of these surveys were undertaken with the primary purpose of counting how many people complained.

EXAMINER NEWMARK: Let me just note, on your direct, you label this study, not a survey. So I don't know if that makes a difference as to what we're really getting at. You weren't intending to do a survey here, you were doing a study?

THE WITNESS: Well, all of the examples in this table, they're all field surveys of actual projects.

EXAMINER NEWMARK: Okay. So it did make a

difference. All right.
BY MS. BENSKY:
Q So I just want to make a very important clarification. You did not go -- for site A, you did not go to 107 residences, personally ask somebody do you have a problem with the noise, yes or no, and then get a result, correct?
A Yeah, that's correct.
Q So if somebody didn't complain to the company -- even if they did complain to the company, they might not be included in this?
A Oh, yeah. There could be more. We're not claiming that it is the definitive number, but this was what we were able to find out.
Q Right. So you're not saying that 95 percent of 107 households are -- don't have any noise complaints related to this project? That's not what this is saying?
A Well, what it's saying is that we know how many definitely did complain and there may be some more, but in general it shows that the vast majority did not complain.
Q All right. Now, you were here and -- you had the great pleasure of sitting here all day yesterday, correct?

A Yes, I did.
Q And you heard some people come up and testify that they had various complaints about noise, correct?
A Um-hmm. Yes.
Q Did you hear anybody say that they didn't go off and complain to the company?
A It seemed like when asked, most of them said they did call the company and made various progress.
Q Did you -- do you remember hearing anybody say they did not complain to the company?
A I don't specifically remember any examples.
Q Okay. That's fine. Going back to the actual text of your testimony, at line 11, the text reads, "In fact, an interesting finding of the study was that at least 95 percent of residents were apparently satisfied with or unfazed by the sound emissions of the new wind project, even though sound levels around and above 45 dBA were observed..." That's what it says, correct?
A Yes, that's right.
Q But that's really not a conclusion that we can draw because you're assuming that at no -- that if a person did not complain to the company, that they are satisfied or unfazed by the noise, correct?
A That's why I used the word "apparently."

Q But that's an assumption that you're making in that statement?
A Yes. But this is -- as you can see from the table, this is repeatable over five sites in this study and several more after it.
Q I'm not concerned about the decibels right now. I'm just talking about the data, the number of complaints. So one big assumption of this study is that if a person was upset about the noise to any degree, that they complained to the company. Would you agree that that's an assumption that you're making in that statement?
A Yes.
Q Now, the second assumption that we're making is that the company gave you all of the complaints that they received?
A Yes.
Q And we don't know -- those are big assumptions. We just don't know if -- we don't know the answers, you never went back and double-checked that?
A They're assumptions, but I think they're fairly accurate.
Q But you really don't have a basis for thinking that they're accurate?
A I can't imagine that -- you know, in this first site

there was three complaints. I can't imagine there was 50 complaints there. I don't think that's the case.
Q But --
A And part of the reason for believing that is that we measure -- when we do these surveys, we measure in this example these three houses; but then at -- many, many others throughout the project area all have the houses that are closest to turbines. And not only do we measure, but I personally have talked to all these people, the ones that have complained and then the other ones elsewhere. And it's -- it's surprising to me, it was surprising to me how many people just don't -- it's not the noise, even though the levels are fairly high.
Q But that information that you just gave us is not reflected in this survey? You said you went out and you talked to people.
A Yeah.
Q But we don't know, based on this survey here, how many people you talked to, what they said, there's no written survey; is that correct?
A No. This is what I've gathered in the course of doing this work.
Q Okay. Just a couple follow-up questions, one having

to do with this. So let's turn to page 97. And there's two columns on the right-hand column, first full paragraph, that begins with, "In addition, the report clearly indicates."
A Yeah. Okay. I'm there.
Q Okay. About -- looking at the very last sentence of that paragraph beginning with Schomer. Do you see that?
A Yes, um-hmm.
Q And you state, "Schomer suggests that an adjustment of 10 decibels should be subtracted for quiet rural environments and perhaps another 5 decibels if the project is newly introduced into such a long-standing quiet setting." Is that what this says?
A Um-hmm.
Q And getting into this issue of day and night levels. Is there anywhere in this paper that you criticize Mr. Schomer's suggestion?
A No. This is just saying that we're taking onboard what he has to say about it and figured it into this overall analysis.
Q But you agree that you're not critical of that particular suggestion in this paper?
A No. That's why it's in there.
Q Now, you spent the day here yesterday and you heard

Mr. Hankard say that if you measure at very close to a wall, you're going to get a result that's three decibels higher and that's not a good thing to do to measure sound in a wall. Do you agree with that?
A Yes, yes. You don't want to put the microphone right on a vertical surface, no.
Q My question is, what's the decibel level on the other side of the wall? Does sound -- can sound waves go through the wall?
A Yes. To some extent. Depends on the wall construction and so on, frequency content of the noise.
Q I hear some laughing behind me from Mr. Schomer, so I don't know if that was a question showing a lot of naivety.
But what I'm getting at is when there's a 45-decibel level outside a home, what's going on inside the home? Does the sound travel through the wall such that the walls can create some sort of reverberation and make it even louder indoors than it is outdoors?
A No. What typically happens is the level inside is substantially lower than what you're measuring outside.
Q With any frequency of sound?

A Yeah, as a general rule.
Q Are there any frequencies that travel better through walls than other frequencies?
A Sure, sure. The lower frequencies pass through a given construction much more easily than high frequencies.
Q And when you say low frequency, what is the kind of baseline low frequency that's going to make it through the wall?
A Any frequency down to 1 hertz.
Q But up to what hertz level?
A Well, let's say from 20 hertz down.
Q Okay. I'm almost done. Can you please turn to your rebuttal testimony, and pull out Exhibit 3 from that testimony, please.
Now, Exhibit 3 looks like it's a comparison between the model predictions and the actual noise levels measured; is that correct?
A Is it this figure, you mean?
Q Yeah.
A Okay. Yeah. What that's showing is the black figures in the middle of the chart are the sound level at 1,000 feet from an isolated wind turbine in three different directions measured over 14 days.
Q So there are actually three black lines in here?

A Yeah. They all kind of are similar.
Q And the -- I guess it would be the Y axis at the bottom, that represents a total of 14 days?
A That's right.
Q So my first question is we see some peaks, correct?
A Yes.
Q What length of time is one of those peaks? Is it an hour, a minute, a second?
A This data was measured in ten-minute increments, and there's a couple of -- well, there is a very prominent spike right in the middle of the survey, that was probably 20 to 30 minutes in duration.
Q That spike?
A Yeah.
Q Is every spike -- is every little point a ten-minute average or 30-minute average?
A Well, the sound level data appears as a continuous line; but it's actually made up of many, many thousands of ten-minute samples all strung together.
Q What I'm trying to figure out is for how long was it that loud when we see a peak? Does this graph give us that information?
A Well, from having looked at graphs like this a lot, I can tell there's -- this peak in the middle is, like I said, probably 20 to 30 minutes long.

Q And where was this measurement taken? What state?
A This is at a site in Minnesota that was in an extremely rural area, not near any roads or towns or anything. And it was just in a wide open field.
Q And near what wind farm?
A Prairie Star, I believe it's called.
Q And do you know the make and model of the turbine?
A I think it was a Vestas V90.
Q And do you know what the power output was?
A The electrical power output? It was 2 megawatt, I think.
Q And do you know how tall the turbine was?
A I think it was on a typical 80 meter mast. This is just taken as an example just to compare modeling versus what you measure.
Q So with an 80 meter mast it would be probably around 400 -- 360, 370 feet?
A Right, right.
Q And this 14-day period was in August?
A That's correct.
Q Is there a certain month of the year where the winds are stronger?
A Well, it varies at every site. I don't know what the wind rose was at this particular site, I don't recall.

Q As a general matter in Minnesota, is it windier in the winter or in the summer?
A I think it's the wintertime there.
Q And you agree that in August there are generally more leaves on the trees, more grass on the ground, more birds?
A Yes.
Q Now, looking at this, we do see several points where there are exceedances over 40 decibels; is that correct?
A Yes. Remember, this is only a thousand feet away.
Q Right. But there are exceedances over 40 decibels?
A That's right.
Q Now, this bold red line looks like it is -- the first bold line at the top is using that 0.0 coefficient --
A Yes, that's right. Um-hmm.
Q -- modeling? And the second line down is using the .5 coefficient?
A Right.
Q And then there's a very, very faint red line down below and that's the 1.0 coefficient?
A Right.
Q Now, if the standard was you may not exceed 40 decibels at night, looking at this graph, would you think that there are exceedances?

A Yeah. It does go over 40 for this particular
measurement setup, these distances and so on.
Q On average it doesn't, but it does go up there, it
goes above it?
A Right. Well, that's typical.
Q So it is typ -- are you saying that it's typical that
there are -- that the actual sound does exceed the
modeling at certain times? Would that be a correct
assumption?
A Oh, most definitely, yes.

MS. BENSKY: That's all I have.

MR. REYNOLDS: Could we take a break?

EXAMINER NEWMARK: It will be short if we do it now. It will be longer if we wait 'til after he's done.

MR. REYNOLDS: I'd rather take a short break. It's going to be at least a half hour.

EXAMINER NEWMARK: All right. Let's take 20 minutes.

(Recess taken from 12:15 to 12:43 p.m.)

(Change of reporters.)

EXAMINER NEWMARK: Okay. There's a motion to move Mr. Hessler's study that he footnoted in his testimony, and that would be --

MS. BENSKY: Footnote 3, page 11 of

direct.

EXAMINER NEWMARK: Okay. And his -- Exhibit 5 it would be, we would mark it as 5.

Any objections to that?

MS. BRANT: I'm sorry, Your Honor, would it be 5 or 6? We have a pending with 4 that was denied, but potentially to be admitted later.

MS. NEKOLA: And then we have 5.

MS. BRANT: Exhibit 5, which is his pseudo notice.

MS. BENSKY: So 6. 4 was marked.

EXAMINER NEWMARK: So 5 is still pending.

Let's go off the record.

(Discussion off the record.)

EXAMINER NEWMARK: So Hessler 6, any objections? No. Okay. It's in the record.

(Hessler Exhibit No. 6 marked and received.)

EXAMINER NEWMARK: All right. I think, Mr. Hessler, remember you're under oath, and you're available for cross.

CROSS-EXAMINATION

BY MR. REYNOLDS:

Q Mr. Hessler, I have a couple of questions for you. You testified that you were struck by the testimony of the Shirley Wind people.

A Yes. That's correct.
Q Why is that?
A Because of the -- because it's completely credible, and I don't doubt it at all.
Q And do you doubt -- is it significant to you that the residents testified that they had no problems before, and when they left the site, their symptoms disappeared?
A Yeah. That's very simple. It appears to be due to the project there.
Q And what -- was that one of the reasons you wanted to do some testing of Glacier Hills? Sorry, at Shirley.
A Yes. And I think what's needed is to get to the bottom of why that is.
Q And what -- is it fair to say that the symptoms that they complained of, such as headache, nausea, ear problems, are consistent with exposure to low frequency sound?
A Yeah, I think that's true. Of course it depends on the magnitude of the sound, whether you're affected or not, but because specifically one fellow said he lived one mile away, that means that it's the only possible sound that could travel that far would be low frequency noise.
Q And so what -- what has -- what's been the result of

your effort to test up there? What would you have to do and what request did you make, and what were the results?
A Well, we came up with a preliminary test plan where we had identified one or two units that were kind of isolated so we could kind of more or less scientifically measure them, and I think we submitted that to the project up there so they would know they were abound. But at first we didn't hear anything, and I think they finally said, well, they don't want to -- we're welcome to participate, but they don't want to do it.
Q And what were you planning to actually test for?
A Well, low frequency specifically. And what we had in mind was to test using a procedure that's outlined in IEC standard 61400, which is a procedure for measuring the sound power of wind turbines. It's what all manufacturers use. But the point is that that methodology uses a reflecting board that you put on the ground and then you lay the microphone right on the board, and the reason for that is that the wind speed is theoretically zero at the surface. So you're largely eliminating self-contamination from pseudo-noise that we talked about a bit earlier because it's very, very difficult to measure low

frequency noise because it's covered up by cell noise of wind. It's a real technical challenge.
Q And let me ask you this. You've noted that there are significant differences. There's -- there's a significant difference between, say, Mr. Bump's testimony and the three individuals who abandoned their homes at Shirley?
A Right.
Q Now, there are different machines at the farms, right?
A That's right.
Q What's at Glacier Hills?
A Those are Vestas V90.
Q And what's the output?
A I think they're 2 megawatt.
Q All right. And what are the ones at Shirley?
A They're the Nordex N100, and that's two and a half -- I don't remember.
Q And the -- that's one of the machines that's proposed at this Highland project; is that right?
A One of the three that are being considered. It's prominent in these analyses I think just because it has a slightly higher sound power level, but that's the only reason it's really being looked at carefully.

Q All right. Are you aware of recent low frequency noise from large turbine literature that describes findings of higher low frequency noise from larger turbines, those in the 2.3 to 3.6 megawatt category?
A Yeah. I have heard that, but my sense is that -- well, what strikes me is how remarkably similar the sound power level is of all the turbines that are in current use all the way from one-and-a-half-megawatt units up to 3-megawatt units. They're all remarkably similar in my view.
Q Well, are you familiar with a 2010 low frequency noise from large turbines work by Henrik Moller and Christian Pedersen on the subject?
A Yeah. Yeah, I've read that, but some time ago. And I think they do some sort of analysis, and it appears that it maybe is a little bit louder in the lower frequencies for larger turbines, but that may be true slightly.
Q So you would point to the potential cause of the Shirley complaints to the machine itself?
A Yeah. I think -- I think this sort of problem is related to the specific turbine. Now, before yesterday when I heard that testimony, my view is that those kinds of problems were principally associated with the Vestas V82 in its early form that

had stall-regulated blades instead of pitch-regulated blades. But this is the first I've heard of a problem with a N100 site. I've worked with project that put in N90s and N100s and there aren't any problems at that site, so it's puzzling.
Q Let me ask you this. You have -- you heard testimony about your recommended noise level design goals, right? That's a paper that you and your dad and -- you and your dad put together?
A Yeah.
Q All right. And would you -- your findings indicate that a 40-decibel level in the A range, that's the audible range, is ideal?
A Yeah. And the reason for that is that we found that there are few, if any, complaints at houses where the outside level was 40 or less.
Q And so in an ideal world, if it would be possible to have a project where the maximum level is 40 --
A Uh-huh.
Q -- is it fair to say that we probably wouldn't see the citizens come in here and talk about the need to abandon their homes?
A I think what you would see is a lack of complaints about audible noise and amplitude modulation, things like that, but that 40 dBA level really is not

connected in any way to this infrasonic situation.
Q The dBA level would be connected with sleep disturbance?
A Yeah. It's the audible noise, the swishing sound that you can hear, you know, as Mr. Bump said yesterday.
Q Well, let me ask you this. There have been some references to the sound of these turbines being at 40 dBA being like the sound of a refrigerator. Do you agree with that?
A No. There's no -- nothing that you can compare it to. It's not a constant sound. It's not particularly loud, but it does have a time variance to it that kind of calls attention to itself, and it depends on the specific wind conditions and how much turbulence there is and time of day. All kinds of factors go into it so, yeah, it's more noticeable than other things.
Q So that that you're referring to is the swishing sound or the noise amplitude?
A Yeah. And that -- that does occur, but that is not always the principal characteristic. In fact, I spent a lot of time at wind projects, and it's more or less a steady kind of -- I use the word churning sound. It's -- but there's not -- you don't always

or often see pronounced swishing or amplitude modulation.
Q Would you -- is it fair to say then that the sound from turbines combines three separate variables or parameters: one is audible sound in the dBA range; two is low frequency or infrasound in the very low to nonaudible range; and three would be the amplitude modulation from the -- from the pulsating action of the turbine blades?
A Yeah. I think the first and the third one are kind of related, but --
Q Well, is it fair to say that there's a difference in the ability of folks to sleep, for instance, if the sound is like white noise, just steady, as opposed to pulsating noise?
MR. SCRENOCK: I'm going to object, Your Honor. I'm not sure that Mr. Hessler's been qualified as an expert on sleep disorders.
EXAMINER NEWMARK: He has testified on people's reactions to sound, I think. Isn't that what he's been saying?
MS. NEKOLA: No, I don't think that's accurate.
EXAMINER NEWMARK: No? People complain, certain distances and --

MS. NEKOLA: Well, that's correct, but not specific health or sleep reactions, just complaints.

MR. REYNOLDS: Well, he's done investigation on complaints. He's analyzed ideal -- I mean, it's a pretty simple question. I mean, I'm not calling him to ask him an opinion to a reasonable certainty, but just a correlation between this aspect of wind turbine noise and sleep disturbance.

EXAMINER NEWMARK: Yeah.

MR. SCRENOCK: I understood his question to be asking the witness whether a particular parameter as he described it, wind turbine noise, what would cause someone to have difficulty sleeping, and I don't believe that is within the realm of what Mr. Hessler's been testifying on.

EXAMINER NEWMARK: Well, I'm going to let him answer. He can say he doesn't know.

THE WITNESS: You know what I would say to that is, I think it's the highly variable nature of wind turbine noise that appears to lead to sleep disturbance because you can be standing next to a turbine and it makes -- it will be making a certain sound, and then the next minute it will suddenly get louder and then get quieter again. And I think

those changes, I think, may be associated with people waking up and having problems sleeping.
BY MR. REYNOLDS:
Q How about the whistling sound that Mr. Bump talked about?
A You know, that -- well, I think he said it was a foghorn sound. That's the way I would describe it. That's with a hydraulic pump that's in the nacelle of every one of those turbines, and it is a constant mechanical noise. He mentioned that it varied, but what he's really talking about is the yaw mechanism to move the nacelle back and forth, that's variable, that comes and goes, but the hydraulic noise is constant. That's just a feature of that particular model turbine.
Q All right. You have made a recommendation -- well, let me ask you this first. With respect to the modeling, you took a look at the Applicant's model, which predicted using the N100 predicted 45 residents would be potentially over 45 dBA, right? You saw that info?
A Yeah. That was with the -- I think the initial application where they were using a ground absorption coefficient of zero.
Q That's right. And when you used a ground absorption

coefficient of .5, you found that it would be 45 -- four houses above 45 dBA?
A Yes. That's correct.
Q And would you agree with me that if you're going to err on the side of public safety, that a more conservative model is probably a better way to plan a prospective wind farm?
A Well, when we first started analyzing wind projects 10 years ago or more, and we didn't know if the model was accurate or not, they would put on a safety factor and so on. Now since that time, we've had the opportunity to do a lot of testing and compared what's actually measured to what's predicted, and we found the best agreement, the most realistic agreement, is when you use .5 ground absorption. That gives the closest correlation to what's actually found out there.
Q All right. But you agree with me that models -- your data shows that the models are generally consistent but not perfectly on track with reality?
A Yeah. What the model gives you is the long-term average level from the project at a given point, and what we always made clear in our reports is that that is the average, and the actual level is going to vary commonly by plus or minus 5 dBA, sometimes by more.

It will get noise spikes like we were looking at a few minutes ago in that example. That's just the nature of a wind turbine.
Q So the 45 dBA which you're advocating for is not a maximum, it's an average?
A Yeah. That's a given. I'm glad you brought that up. Yeah. In this paper where we recommend that, we say what should be limited to 45 is the main long-term average level at each house. There's no practical way to maintain a level below a threshold like 45 or even 50 all of the time. That never happens. There's always spikes due to weather conditions and things. They're short-lived, but they're almost unavoidable.
Q All right. So then for a 45 dBA average, then you might have spikes up to, say, 45, but probably not over 50?
A I got mixed up in that. Can you --
Q All right. If you had the ideal target of 40 dBA, if that were -- if that were basically the target here measured by the model, and that would mean that there would be levels at the farm of up to 45 but probably not beyond 50 dBA?
A Yes. Yeah, it would go -- if you say designed to 40 at a particular point, the actual level would vary

above and below that up to 45, within the 35-45 range, and there would be probably rare spikes to 50, even more than 50.
Q So with respect to your ideal level, that's based upon your evaluation of various venues and examining available complaints from residents?
A Right, right. And those levels -- well, you know, those -- that phenomenon where the level varies happens at every site. So what we did was we measured the main long-term level at all of these houses, and that's what's tabulated there is how many people were complaining between 40 and 44. That's the main long-term level between that range. You know, so at any given house they might be exposed to, let's say, a level 43, but the actual level might have gone up to 50 at times and down to 35. That happens everywhere. So I'm trying to keep everything on a level playing field.
Q All right. Now, assuming that the project could be redesigned for a 40 dBA, making that assumption, that would be your preferred dBA limit, would it not?
A Well, it would be better for everyone if that were the actual performance of the project, but typically it's not practical or feasible to achieve that level at most projects. I would say 90 percent.

Q So are we talking about economic development versus the public interest to be free of noise complaints?
A I think it's just fundamental economics of the project. To make 40 at a given site, you may -- oftentimes you have to remove so many turbines that the project just becomes not viable.
Q All right. But assuming for the sake of this question that this project could be redesigned for 40 dBA.
A Uh-huh.
Q You would recommend that based upon your work, right?
A That would be a good thing if that were possible, yes.
Q And there are other jurisdictions such as New York that have 38 to 40 dBA; isn't that right? I think these are noticed in your paper. California, New York. Page 98.
A Yeah. Now there that's what we talked about a little while earlier. Those are relative limits that are, like, converted to an absolute number. In New York the methodology for years has been to measure the background and then you could go over that by 5. So I think the 38 is just based on a typical background level of 33, plus 5. That's where that number comes from.

Q All right. I think you testified to this earlier that there is a significant impact with respect to noise if the ambient level is very low and with wind turbines coming in with a higher noise threshold; is that right?
A Yeah. If you had a -- in the specific example there, if the project level were higher than 45 and the background level were 16 below that, that means that the project would be dominant, the only thing you could hear pretty much. That's that situation. But the absolute limits that we're putting forward of 40-45 are based on the -- the typical setting that all of these projects normally are in. In other words, rural farm country. Those levels appear to be to our mind satisfactory given that sort of an environment.
Q This is -- is it fair to say that the Town of Forest is unique because of its very quiet background levels?
A No, I wouldn't agree with that at all. That project site is very similar to dozens and dozens of other ones that I could think of.
Q Well, but we're talking about -- what areas where people live in are quieter than these at the 20 dBA level for ambient noise?

A Well, those are the kind of levels we find in every one of these sites that's in rural farm country. When the wind is calm, the level is always 20, 25 dBA, and that happens everywhere. It's really the wind. It's really the background level when the wind is blowing that has some relevance.
Q So with respect to -- back to the Shirley Wind Project. Given the fact that the applicant here is recommending the potential use of the same machines, of the same kind of configurations at the Highland Project as the Shirley Project, would you have concerns about potential impacts in the Town of Forest that have been reported in Shirley?
A Yeah. As I think I mentioned earlier, I think the issues there are related specifically to the -- to that model turbine, and I think until that's better understood, I don't see any reason why it wouldn't repeat itself if that same turbine were used somewhere else.
Q Do you -- now, with respect to the difficulty of you being able to test at Glenmore -- are you having the same problem at Glacier Hills?
A Yeah. We asked for permission, and same sort of no response thing. Went on for a long time, and then I think, oh, what was it, the other day they officially

said, no, we don't want to do that.
Q All right. And do you think that it's -- that the Applicants would be -- that it's in the nature of good science to prevent scientists like you from gathering data?
A Yeah. You know, I think what needs doing is -- is some field testing to understand this thing.
Q And we agree that it's not completely understood?
A That's correct. Yeah.
Q And do you agree with the environmental assessment here that a certain percentage of -- of Town of Forest residents will suffer a decrease in quality of their life if this project is approved?
MR. SCRENOCK: I object to that, Your Honor. I'm not sure that Mr. Hessler's been qualified as a quality of life expert.
EXAMINER NEWMARK: Yeah. I think it's too ambiguous of a question.
BY MR. REYNOLDS:
Q All right. Have you read the environmental assessment?
A Yes. Uh-huh.
Q All right. And you -- do you remember a part in there where the environmental assessment assumes that if this project goes forward, there will be a small

percentage of Town of Forest residents who will be adversely affected as designed?
A Yeah. I would say that's a very typical conclusion at least. I mean, there's hardly any site where you can sit back and comfortably say everybody's going to be fine. I don't -- there's hardly any situation that falls into that. I can only think of one project, and it was on an island and nobody lived there, but -- but for most projects, the norm is to conclude there will probably be some small impact.
Q And so especially if the same turbines are used at Shirley, you would expect the same result in the Town of Forest?
A Well, I don't have any reason to believe that it wouldn't -- that whatever is going on there would not repeat itself.
MR. REYNOLDS: That's all I have.
EXAMINER NEWMARK: Okay. Other cross?
MR. SCRENOCK: I do, Your Honor.
EXAMINER NEWMARK: Oh, go ahead.
MR. SCRENOCK: Just a few questions.

CROSS-EXAMINATION

BY MR. SCRENOCK:
Q Mr. Hessler, I note that in your testimony, I don't need to point to any specific points, but you refer

throughout, or at least at different points, about the incidence of complaints. And in response to one of Ms. Bensky's questions earlier, you used the phrase pretty significant adverse impact. By that were you referring to the same thing in terms of incidence of complaints?
A Yeah. I'm talking about complaints and that study we were talking about before.
Q Thank you. And you had a lengthy discussion about the wind speed monitor and the level from ground where those measurements were taken. You were talking about normalizing the wind speeds to 10 meters. Was the purpose of that to essentially equate a -- excuse me -- that I'm assuming, and I guess I want to know if my assumption is correct, that the way that the model works or the reason that you normalize the time of year is that there's assumed sort of graduation of wind speed throughout the elevations and that a wind speed at 50 meters normalized to 10 meters will equate to a specific wind speed up at the hub height. Is that the purpose of the normalization?
A Yes. The -- the primary reason that I normalized it to 10 meters is because that's what we always do in these assessments. So I wanted to look at it in the

way that we normally look at field data.
Q Okay.
A I wanted to keep it consistent so I can tell what it meant relative to other sites and other situations.
Q Okay. Now, you had talked with Mr. Reynolds a little bit about the 0.0 ground absorption coefficient versus the 0.5, and I think you indicated that you used that process frequently; is that right, that type of modeling with those coefficients?
A Well, what we always do is assume .5 ground because, as I mentioned, we get the best agreement between modeled and measured results in a particular point.
Q So you don't do that for the purpose of skewing the results?
A Oh, no. No. What I'm after is, I want to know what it's really going to be at a given house.
Q And you had indicated that when you ran your model with the 0.5 ground absorption coefficient for the Highland Project, that you found that there were four houses that you identified that would be within -- above the 45 decibels. Do you know whether those houses represent participating or nonparticipating landowners?
A I didn't at the time. I have heard recently that they are all participants.

Q Okay.
A Not sure about that, though.
Q And with -- Mr. Reynolds asked you about the use of the similar model turbines from the Shirley Project, I believe that's the N100 here, and you indicated that you don't have any reason to think that the problems -- the experiences of folks wouldn't reoccur. Do you have any reason to believe that they would?
A Well, I would say we don't fully understand why there's problems at Shirley, but my belief is that it's associated with a specific turbine model and possibly the blade regulation, whether it's pitch or stall regulated. I think I would be leery about using that turbine again before more is known about it.
Q If one of the other two turbine models that were discussed being used for this project were being used, what would be your perception?
A I would be more comfortable with that because I think the other ones are the Siemens. I don't know of any other model, Siemens and one other one, but I don't -- I've never noticed any problems with those.
Q So based on whatever is going on at Shirley that we're not sure what it is, you wouldn't have reason

to expect those issues to reoccur with either of the other two models?
A That's right.
MR. SCRENOCK: Thank you. I have nothing further.
EXAMINER NEWMARK: Okay. Other questions? I believe staff goes first.

CROSS-EXAMINATION

BY MR. LORENCE:
Q Mr. Hessler, are you familiar with the PSC noise measurement protocol?
A Yes.
Q Is any part of that protocol oriented towards infrasound?
A Well, I believe the intent of it was to try to quantify low frequency sounds by involving the C-weighted sound level and pre-construction measurements and post-construction measurements. That sounds good on paper, but the problem with C-weighted levels is that they're extremely sensitive to wind induced pseudo-noise that we talked about earlier. That wind blowing over the microphone affects only the lower -- the low end of the frequency spectrum, and the C-weighted level is directly dependent on what's going on in the low end

of the frequency spectrum. So any little breeze blowing over the microphone gives you a very high obstensible C-weighted sound level.

So to answer your question, the protocol has -- calls for C-weighted measurements, but -- and we've taken that data, and what we found is that the levels before the project and after the project are identical because they're purely a function of how fast the wind was blowing.

Q So the pre-construction measurements of the protocol are you saying are not capable of measuring infrasound?

A Yeah. That's right. That you get a result from taking those measurements, but it has no actual meaning. It's a false signal that's almost purely a function of the wind speed of the microphone.

MR. LORENCE: No further questions. Thank you.

EXAMINER NEWMARK: Go ahead.

MS. BENSKY: I have a follow-up.

RECROSS-EXAMINATION

BY MS. BENSKY:

Q How do you solve that problem? How should the protocol be different to account for that?

EXAMINER NEWMARK: I think he answered

that. You lay the microphone down on the ground with a board, is that --

THE WITNESS: Can I answer?

EXAMINER NEWMARK: Well, did you answer that already?

THE WITNESS: Not exactly.

EXAMINER NEWMARK: Okay.

THE WITNESS: No. You could use that technique that I referred to, but the problem with it is a practical nature. These surveys last -- or need to last for a period of weeks to get -- catch all kinds of wind speeds and times of day, and you can't leave a microphone sitting on the ground. You know, if it rains or snows, it destroys the equipment. So those kinds of measurements have to be attended. So to -- I suppose if you wanted to document the pre-existing conditions, you would take much shorter term measurements using -- perhaps using that technique and taking short band sample, but it's very -- it's a very challenging thing to measure.

BY MS. BENSKY:

Q And are you aware of any -- switching gears a little bit. Are you aware of any study that correlates wind turbine make and model with a particular number of

complaints? Is there anything that the Commission can look at that would be helpful in deciding the turbine model that would likely produce the least amount of complaints?
A No. Most turbine models have no known noise issues associated with them. The only ones -- there's only one or two that I'm aware of that have -- that are kind of special cases and have issues. I mentioned the Vestas V82, or at least in the format what used to be built five years ago. That -- I think that one's a problem. But -- but of the ones being considered here, only the Nordex appears to have possibly something going on with it.
Q So is the answer that you're not aware that that has been studied?
A No, it hasn't been specifically studied.
Q And one last question. To maintain absolute limit of 45 dBA that is never exceeded, what would -- what should the project be designed at?
A Yeah, that's a good question. It has to be substantially lower than that to allow for temporary noise spikes, up to 10 dBA below. Now, that issue has been around for a while of these temporary exceedances. What I suggested, and I wrote some siting guidelines for Minnesota Public Utilities

Commission, and what I say in there is that, well, if the measured level is in compliance 95 percent of the time or more, then I would consider it in compliance. So there has to be some allowance for these temporary excursions because they're essentially unavoidable.

Q But that -- but that 10 decibel drop is consistent with your recommendation in your paper that 35 dBA at night should be the limit ideally, correct?

A Well, that wasn't the conclusion of the paper, but --

Q Are those two consistent?

A Yeah.

MS. BENSKY: Thank you.

MR. REYNOLDS: Have one follow-up question.

EXAMINER NEWMARK: One. All right.

RECROSS-EXAMINATION

BY MR. REYNOLDS:

Q I wanted to show you, and I just want to identify this. I marked it as Hessler A. I don't have copies, but I just want to know if this is the paper that shows that -- that you referred to that shows that larger turbines above .2 -- .23 have higher low frequency levels than less than 2? Is that the paper you were referring to?

A Yes, I believe that's what this paper says. As I said, I haven't read it for years.

MR. REYNOLDS: Okay. And -- yeah, it's Hessler Exhibit No. 8. I just wrote on it.

MS. NEKOLA: Your Honor, we object. We haven't seen this.

MR. REYNOLDS: Yeah, I understand. I am just marking it so that he can identify it.

EXAMINER NEWMARK: What's his next exhibit?

MS. NEKOLA: It would be 7.

MR. REYNOLDS: Okay.

EXAMINER NEWMARK: It would be 7 anyway. Okay. Are you trying to move it in now at this point?

MR. REYNOLDS: I don't have to move it in now. I just wanted him to identify it and then I have one follow-up question.

EXAMINER NEWMARK: Well, based on this exhibit?

MR. REYNOLDS: Well, okay. Let me do a backup question.

BY MR. REYNOLDS:

Q What is the title of the exhibit that you're looking at?

A Low frequency noise from large wind turbines.

Q And is the premise of that article that large wind turbines above point -- 2.3 megawatts tend to have more low frequency sound than turbines less than 2 megawatts?

EXAMINER NEWMARK: He's already answered that. No. He's already answered.

MR. REYNOLDS: Okay.

BY MR. REYNOLDS:

Q Do you know, the other turbines that are proposed here are above 2.3 megawatts, are they not?

A There's been so much focus on the N100 that I don't even remember what the other two models were.

Q Well, if -- if I told you that they were above 2.3 megawatts, then they would -- those turbines would fall within the definition of larger turbines as outlined in that paper, right?

A Yeah, I suppose so, but I would point to a figure in that paper --

EXAMINER NEWMARK: Okay. Let's hold on, though. We're really running far afield if we're going to be digging into this exhibit since there's an objection already based on entering it in the record. Any response to that objection? You want to move it?

MR. REYNOLDS: Well, yeah. I think it's

relevant because the testimony about low frequency noise, I think this witness has talked about that it's not a big deal, and here we may have an answer with respect to why there's a difference between the wind turbines at Shirley, which are 2.5, and the lack of low frequency symptoms at Glacier Hills, which are less than 2, and the fact that this witness thinks there are low frequency problems at Shirley. So that the question is, well, we could use the other turbine, but there's still within the gamut of these larger turbines. So I think it's relevant to that, and I -- I'm certainly willing to give the -- my colleagues a chance to look at this. I only had one copy. It came up, you know.

EXAMINER NEWMARK: Timing has been an issue here. Do you guys have a response? Clean?

MS. NEKOLA: Just -- it's the same response. We haven't had a chance to look at this. Mr. Hessler hasn't seen it for a long time, and I don't see the relevance. I'm confused really what you're trying to do here.

MR. REYNOLDS: Difference between Glacier Hills and Shirley is --

EXAMINER NEWMARK: I'm going to leave it out.

MR. REYNOLDS: Okay.

EXAMINER NEWMARK: We're not going to put it in, and I think he's actually answered these questions anyway. It's already on the record, so it would be repetitive at this point. And let's move on.

MS. NEKOLA: Can we go off the record a minute?

(Discussion off the record.)

EXAMINER NEWMARK: All right. Back on the record. Do you have anything else?

MR. SCRENOCK: No.

EXAMINER NEWMARK: All right. I had some questions, but at the risk of opening up another whole round of cross, I'll forgo it.

Any redirect?

MS. BRANT: Yeah, we have some redirect.

REDIRECT EXAMINATION

BY MS. BRANT:

Q Mr. Hessler, you talked with Ms. Bensky about your Exhibit 3 in this proceeding?

A Yes. Uh-huh.

Q Can you just clarify for us the purpose of Exhibit 3?

A Yeah. It was just to give a generic example of actual measurements of wind turbine sound compared to

EXAMINER NEWMARK: Okay.

DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Could you state your name, please.

A Wes Slaymaker, S-L-A-Y-M-A-K-E-R.

Q And Mr. Slaymaker, you filed some direct testimony in this case?

A That's correct.

Q Is it true and correct to the best of your knowledge?

A It is.

MR. REYNOLDS: All right. That's it.

EXAMINER NEWMARK: Okay. You're excused.

(Witness excused.)

EXAMINER NEWMARK: All right. Who's next?

MR. REYNOLDS: Dr. SCHOMER.

PAUL SCHOMER, TOWN OF FOREST WITNESS, DULY SWORN

EXAMINER NEWMARK: Okay.

DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Can you state your name, please.

A Paul Schomer.

Q All right. And have you filed testimony in this case?

A Yes.

Q All right. In the form of direct?

A Yes.
Q And rebuttal?
A Surrebuttal.
Q Yeah, whatever.
A Yes.
Q Did you bring that testimony with you?
A I did not.
Q All right. And since giving that testimony, have you received other information such as Roberts surrebuttal or listening to the testimony of Mr. Hessler? Do you have anything to add to that testimony that you've already given in written form?
A I would have comment on what Mr. Hessler said this morning.
Q All right.
A That would be all.
Q Go ahead.
A There's two points I would make very briefly and very simply. One has to do with the pseudo-noise, and he's talked about it. We've talked about it a lot. It's a very important issue in terms of being able to measure things around a wind farm, and Mr. Hessler's introduced it. He and his father did a study which was published in NCEJ, which he referred to this morning.

And when you're dealing with wind noise -- I'm going to try to make this very simple -- there's two kinds of turbulence. Turbulence is the air moving around for one reason or another. One kind of turbulence is just like the -- if you put a stick in water, a stream, and you see the line go out behind the stick, and that's called wake turbulence because it's just like a wake from a boat.

And there's another kind of turbulence called intrinsic turbulence. This is the air moving around on its own, heating the air against the ground or being turned over by buildings nearby or stones or shrubbery or whatever makes the air mixed up and not steady. So there's these two kinds of turbulence that is pseudo-noise, and this is what we're trying to get rid of so that we can make measurements that are accurate.

Q Okay. So what's your comment on Mr. Hessler's comment?

A The comment is that Mr. Hessler and his father measured only the wake turbulence in the wind tunnel because it was very smooth flow. It didn't have intrinsic turbulence, and the intrinsic turbulence is the much more dominating factor. And so the numbers he quotes for -- for what turbulence causes are quite

low compared to what you measure in reality.
Q All right. And how is that relevant to what we're considering here?
A That's relevant in the difference between the level of the turbine noise and the level of the background, that the level of the turbine compared to the level of the background exceeds 10 dBA. It's not less than 10 dBA.
Q And why is that important?
A That is -- 10 dBA is thought of when you start to have serious problems with a new noise source compared to what was existing. And so this exceedance is significant, and the numbers presented by Mr. Hessler are identical to what has been published for just the total pseudo-noise.
Q All right. Do you have any comments on the issue of low frequency sound emanated from large turbines defined as above 2.3 megawatts versus low turbines, smaller turbines, less than 2 megawatts?
A I would expect in just about any machine, as the machine gets bigger, the dimensions get bigger. It's how it couples energy out of it. As the sound radiated will get bigger, which means the wavelength is longer. The fundamental dimension to the sound gets bigger, which means it's lower frequency. This

would -- I would expect from any machine, and I'm not surprised to see the data for this machine go that way.
Q And would that explain the wide or rather consistent complaints of health effects from the residents at Shirley that have 2.5 megawatt machines as opposed to other wind farms?
MR. WILSON: I'm going to object to that question to the extent that it goes to health impact. I don't think he's qualified as a health expert.
EXAMINER NEWMARK: Okay. I'll sustain that.
BY MR. REYNOLDS:
Q You have given testimony on the -- do you have information about the relative impacts of low frequency sound on health?
A Yes.
MR. WILSON: Objection.
MR. REYNOLDS: This has been the part of it. He's testified to this. We've had Mr. Hankard who testified about annoyance versus health.
EXAMINER NEWMARK: The first question, did you say complaints or did you say health?
MS. BENSKY: That was just a foundational

question.

MR. REYNOLDS: Yes. Exactly.

EXAMINER NEWMARK: That's fine. Let him answer.

THE WITNESS: What question am I answering now?

EXAMINER NEWMARK: None. Let him think.

BY MR. REYNOLDS:

Q All right. There has been testimony about -- from the Shirley Wind residents who have machines that are 2.5 megawatts, and then we've had testimony about -- from complaints that -- that are more of the sleep category as opposed to the nausea, headache, earache category, okay? You've given testimony that the infrasound impacts to human health focus on those kinds of symptoms like headache, nausea, vertigo, feeling of ill at ease, right?

A Yes.

Q Would the size of the turbines at Shirley and its likely higher production of low frequency noise have a potential explanation for why the folks at Shirley are having such difficulty?

A I think it's a potential explanation, but I think I could come up with -- there's other explanations maybe. But that's certainly a potential explanation.

Q All right. Well, the whole -- the point of this hearing is to try to determine whether the project as designed for the Town of Forest is -- is appropriate.
A Yes.
Q And size of turbines is one factor?
A It is a factor.
Q What else?
A I think that -- that the -- to me, one of the important factors has been the nature of the community being somewhat unique. This is -- the basic things that have been talked about here are most important. The testimony you had yesterday, although I was not here, I've heard that kind of thing before, and I think that the issue before us is whether that's going to continue. The people are being taken out of their homes by the sound. This is not new. As I've pointed out in my testimony, this has been going on for 30 years, not with wind farms but with low frequency noise, and especially pulsating noise.
The notion that wind farms is somehow different is just not -- makes sense. And that we know and we've known for years that these same symptoms have occurred over time with different kinds of sources of low frequency sound, and the result is

always the same. There's a fraction of the population, we don't think it's a large fraction, that has these symptoms to the point where some are driven out of their homes.

EXAMINER NEWMARK: Okay. Sir, I think wasn't the question what -- what was your question, what things can be done to prevent this, to reduce this?

MR. REYNOLDS: Yes.

BY MR. REYNOLDS:

Q Okay. So there are -- in your view, you've made a recommendation that if this project is -- is -- is approved, that the -- that the noise limits be reduced?

A I have made a recommendation that the noise limits be reduced and that the -- I have made a recommendation that the prediction based upon the average is not consistent with what's been put together as the procedures in Wisconsin.

Q All right. Explain that.

EXAMINER NEWMARK: Well, is this in his testimony already? He said he explained this.

MR. REYNOLDS: All right. Yeah.

EXAMINER NEWMARK: Okay.

BY MR. REYNOLDS:

Q Well, let me ask you this. We've been talking about average noise limits and maximum noise limits.
A Correct.
Q What are the limits that we should be shooting for here?
A Well, what I think about always is are things logical, is this what was meant. And as I understand it in Wisconsin and in this proceeding, people have said there's a 45 dB nighttime limit, and it has to be designed for 100 percent of the houses, the homes of nonparticipating residents meet 45 dB. It wouldn't be acceptable for 50 percent of the homes to meet 45 dB.
And then I ask the question, if 100 percent of the homes have to meet 45 dB, how can you have 100 percent of the homes meeting it half the time is somehow different than half the homes meeting it all the time. To me the two are the very same thing, just on a basis of logic that if you have a rule of 45 dB, it should be that way. You can't have it -- it's met half the time at all the houses but it -- the two are the same.
Q So is that the -- is your recommendation for a 39 dB limit designed then to make sure that the maximum doesn't exceed 45?

A No. I was saying that we should model using zero at a minimum, model using zero as the modeling rather than .5.
Q Okay.
A So that there is -- you get closer to this realization that you have a limit met all the time at all the houses and not -- well, all the time at some of the houses you wouldn't permit, but some of the time at all the houses is permitted. And the two are identical, so it's difficult to understand the distinction.
Q So when you first looked at this, the model that you looked at in the application was based upon a zero coefficient?
A The original material presented, I think it was called Appendix V as I recall, had zero for the modeling.
Q And you thought that was an appropriate number?
A I believe that is an appropriate number.
Q And why be conservative in modeling?
A Well, one of the reasons I came to this -- two reasons I come to this. One is the one I've just illuminated, that if you have a rule that all the houses meet it and then you say half the time, and then you say but you can't have -- it's met 100

percent of the time at half the houses, there's no logic there.

The other reason is that this is supposed to be done in terms of the ISO standard. People say we're applying ISO 9613, and ISO 9613 calls for -- if you follow it, it says we're making a conservative prediction and that the only permissible way and to say you're using 9613 is to make the prediction, and then if you want to have a time average according to ISO 9613, there's a specific procedure in the standard for doing that, and that's not being followed.

So I do it on the basis of logic, of what the rule is, and I've come to that conclusion on the basis of following the standards, which have not been followed.

Q So is it -- is it fair to say that a conservative model will err, if at all, on the side of public safety?

A I wouldn't call it erring, but it will certainly be on the side of public safety.

MR. REYNOLDS: Okay. That's all I have.

EXAMINER NEWMARK: Okay. Other questions?

CROSS-EXAMINATION

BY MR. WILSON:

Q Mr. Schomer, have you visited the site?
A No.
Q So that means you haven't taken any data at the site?
A No.
Q You testified in response to some questions from Mr. Reynolds that the nature of this community was very unique. If you haven't been to the site, how can you understand whether this community is unique or not?
A I find the unique factor in the activities this community has engaged in in terms of trying to maintain the quiet, rural nature of the community, and I find that to be similar to situations I've seen in other parts of the country where that kind of community existed, and I've seen very unique reactions when that exists.
Q So if I understood your testimony, what's unique about this community is that they're -- at least some people in the community are fighting the project?
A No. I said that in the testimony I've read that's been put in place in this, that this community has a land use plan of some kind. I don't profess to be a planner and get all the terms right, but that this community has gone out and said we want to maintain the quiet, rural nature of this community, we don't

want to plan for industry, we want a plan for five-acre homes and the maintenance of farms. That's where they're unique.

And the similarity I find that was I -- plans that the FAA tried to implement some probably 25 or 30 years ago, and probably the one example I can think of where the FAA was eventually stopped by Congress because of the uproar. And I find this -- the dynamics of this community to be along those lines.

Q So you've reviewed the comprehensive plan for the Town of Forest?

A I've reviewed the testimony.

Q But you haven't reviewed the plan?

A I've not reviewed the document, no.

Q Are you familiar with the fact that in Wisconsin, most local communities have to do some type of comprehensive plan by law?

A Yes.

Q Okay. So they're not unique from that perspective?

A No.

Q Okay. You don't have any medical training; is that right?

A That's correct.

Q You have an engineering degree?

A Correct.
Q So if you take a look at page 2 of your direct testimony. You have a copy of your testimony with you?
A I wasn't asked to bring them, so I am at the mercy of somebody to give me a copy.
MR. REYNOLDS: What do you want, direct?
MR. WILSON: For the time being, yes.
MR. REYNOLDS: All right.
MR. WILSON: He'll need sur, too.
MR. REYNOLDS: He is on direct.
THE WITNESS: All right. Page 2.
BY MR. WILSON:
Q Line 17 and 18, I find within a reasonable degree of engineering certainty that there will be significant health impacts. Can you explain to me the relationship between engineering and health impacts?
A I think that we've heard Mr. Hessler testify, and I think that on the same basis we have been observing and learning about these problems for many years. And, no, we're not going to give prescriptions out and -- but we understand better the acoustics and the physics, and I think that there's a shared burden to do these things properly, but we are part of the team.

Q Okay. Are you saying that -- you've already testified you're not a health expert; is that correct?
A I have testified, and I'm certainly not trained as a health expert.
Q Are you a health expert?
A I think I understand something about the health effects of noise from the literature that I follow. Does that say I'm a doctor, no.
MR. WILSON: Did you give him his sur?
MR. REYNOLDS: He's got it.
BY MR. WILSON:
Q So at page 11 of your sur, you're talking about your conclusion that the 0.00 contour is appropriate?
THE WITNESS: I have to ask for page 11 of the sur.
MR. REYNOLDS: I'm sorry?
THE WITNESS: The surrebuttal.
MR. REYNOLDS: It's right there.
THE WITNESS: It is?
MR. REYNOLDS: Yeah. It's all tabbed together.
THE WITNESS: Oh, right behind that?
MR. REYNOLDS: Yep.
THE WITNESS: Okay. That should be easy.

Page 11.

MR. WILSON: Yes.

BY MR. WILSON:

Q So at 11 there, you are testifying at line 15 about the appropriateness of the zero contour, correct?

A Correct.

Q And you would agree that that contour is the most conservative possible?

A It's the most conservative possible using 9613.

Q Okay. Now, if we could go back to your direct testimony on page 9. On page 9 in the middle of the page there you're describing your Exhibit 2, which is, you know, the results of you running a model, and in this case you used -- you used both zero and .5; is that correct --

A Yes.

Q -- to produce Exhibit 2?

A That is true.

Q Okay. And reviewing your testimony here on page 9, there's nowhere where you indicate in your direct testimony here that using the .5 is inappropriate?

A At that point in time, we had not received the operation of the source levels from proponent as perhaps you recall, and I was trying to make sense out of this with data that we had been able to

collect off the internet, which were apparently precursor data to the real data. And my whole original testimony is somewhat screwed up because we didn't have the source data that should have been a part of the application.
Q Are you done?
A I'm saying I did the best I could given the data we did and didn't have.
Q Fair enough.
A And I did analysis of .5, but the analysis I did of .5 was equal to the zero case because the source data that I found were that much higher.
Q Okay. But you used a ground factor of .5 in your initial creation of Exhibit 2, correct?
A That was one of the numbers I looked at.
Q Okay. And why did you not at that time use zero for the entire run to create Exhibit 2?
A As I just told you, I was trying to figure out what was going on because I could not understand even what was being recommended by proponent, whether it was zero or .5, what the data were that were to be used. When I made my .5 predictions, they came out zero. The zero predictions of the report, I didn't know if the report was labeled wrong, whether there was 141 houses as Mr. Hessler criticized my report for. It

was just -- would have been much better if we had the source data.
Q Okay. You have a fundamental belief that these models should be run using the zero contour, correct?
A I think that that's something that I thought about. I've not articulated it.
Q But you articulated it in your testimony?
A In this. Not up until here. I have -- I've come to that conclusion for Wisconsin for two reasons. One is because the standard that you say is being used calls for it. And the second is, when I read the rule, or as I understand the rule, and I have read the rule, there just doesn't seem to be a difference between the application two different ways. I have made predictions using the annual average for sources that call for that specifically. When you make predictions for an airport, it calls for the annual average. When you make predictions for a highway, these are called for. I didn't see that they were called for here. I saw a different kind of thing.
Q Okay. So you testified that you just recently came to the conclusion that zero is appropriate only here in Wisconsin; is that correct?
A No. I think it's probably a good idea all over, but it's something that we haven't done in this country

in transportation noise sources.
Q Okay. But this was a recent revelation that you've had; is that correct?
A This actually occurred serendipitously. I was asked to give a lecture this coming November on ISO 9613. And when I started to put the lecture together, I realized that it was calling for this conservative prediction and that indeed I had been misusing the standard, and I was on the committee that wrote it when it was written.
Q So does this revelation occur between the time that you submitted your direct testimony and the time you submitted your surrebuttal testimony?
A That part of it does, yes.
Q Yeah. So that explains why you were willing to use a .5 in your direct testimony but not in your surrebuttal testimony?
A No. The .5, as I've tried to say, is lots of reasons for it being there. Part of it is I tried to understand what was going on.
MR. WILSON: I think that's all we have.
EXAMINER NEWMARK: May or may not be. I want to let you know before you stop, I've decided to allow that Schomer page 6 on surrebuttal in. Basically we have so many standards at this point in

the record, and the studies we let in refer to WHO and all kinds of European standards, day and night standards. Let's just put it all in, and I'll give you a chance to cross him on that if you need to. None?

MR. WILSON: We're just fine with your ruling.

EXAMINER NEWMARK: All right. Any other questions?

MS. BENSKY: I have a few.

CROSS-EXAMINATION

BY MS. BENSKY:

Q We've talked a lot about this ISO 9613 standard. You said you were on the committee that wrote it?

A Correct.

Q Mr. McKeever is passing them out to everyone so I think it will be helpful to --

A I can't hear so well at my -- you have to speak up a little bit.

Q You spent too much time around wind turbines? Sorry. That was a joke. It was funny.

So you've just been handed a piece of paper. Is this the international standard 9613-2 that you helped create?

A Yes.

Q And this was designed in 1996, correct?
A This was first edition it says 1996, December 15th.
Q And has it been revised since then?
A No.
Q Was this standard designed specifically for wind turbine noise?
A No.
Q And if you turn to page -- I don't know what page it is -- the pages don't appear to be numbered. If you turn five pages in, it says acoustics.
A Okay. Maybe you have a clause number.
Q Part 2, acoustics attenuation of sound during propagation outdoors. It's the fifth page in.
A I'm not sure I know what -- there's Clause 2 is the following -- there's normative references. Are you in the --

EXAMINER NEWMARK: I think you have it right in front there.

THE WITNESS: Part 2, yes. That's all dealing with Part 2. Part 1 is air absorption, tables of air absorption.

EXAMINER NEWMARK: Can I have that back, please? I'm going to follow along.

THE WITNESS: Okay. Part 2.

BY MS. BENSKY:

Q And there are two columns on this page, and the right-hand column, the second paragraph beginning with the word, this method is applicable. Do you see where I am? That's on the right-hand column near the top.
A This method is applicable, yes.
Q Uh-huh. And it says, it is applicable directly or indirectly to most situations concerning road or rail traffic, industrial noise sources, construction activities, and many other ground-based noise sources. Is a wind turbine a ground-based noise source?
A Probably not. There's no other standard to use.
Q So this is the best standard, but it's not quite right?
A It's not going to be quite right.
Q But this standard specifically does not apply to sound from aircraft and flight or blast waves from mining, right?
A Okay. That was probably inserted by me.
Q Is one of the reasons why you are calling for using this very conservative absorption coefficient because of this limitation?
A That would be one of the reasons. We have -- we studied in my laboratory air to ground versus ground

to ground propagation by having one experiment where we had 100-foot-high tower that we did sound propagation measurements for, and then we had a source on the ground that we did the propagation measurements for, and the difference of 100-foot-high tower versus on the ground was -- oh, I've got published papers on it. I don't know that I remember the exact numbers. The levels -- the higher levels are about the same, but they're three times more often, then you're up 100 feet.
Q What happens if you're up 100 meters?
A It's going to possibly be even more frequent. Possibly be the same. I guess that didn't answer much, but that's the best I can do.
Q Well, the point is that we just don't know?
A Well, I know it won't be less, but I don't know that -- I haven't reached the saturation or that it's going to continue to grow.
Q Having this in your hand, and if you can do it very quickly, can you point to other paragraphs that encourage the model to be used in a conservative manner?
A Say that again, please.
Q Well, you talked about after looking through this, you realized that the intention was to obtain

conservative results; is that correct?
A Yes.
Q And I'm asking you where in the document we should look to get that information.
A Okay. That is one place. When it talks about the cement, and I just have to find where it talks about that. Well, in 3.2 in definitions it gives equivalent continuous downwind octave band sound pressure level, and downwind is a shorthand name for sound -- propagated sound where it travels in the louder manner. Because as everybody knows, you're downwind outdoors, it's louder than if you're upwind, and that's what the downwind means here, that you're getting a prediction that's hearing-enhanced propagation. So in 3.2, the definition of downwind indicates this. And then it talks about predicting the downwind. Let's see. I think on Equation 5 and 6 -- in 5 it talks about the downwind again.
EXAMINER NEWMARK: That's meteorological conditions, number five? Is that where you're at?
THE WITNESS: No. I'm on Equation 5 on the unknown page, but it's in the end of Clause 6.
EXAMINER NEWMARK: Oh.
THE WITNESS: And this is the basic equation for using ISO 9613, and it talks about

downwind. And as I said, if one wants to calculate the long-term -- the long-term averages, if you look at the bottom of just before you get to 7, there's -- you go up two paragraphs, it says the long-term average weighted sound pressure LAT, paren, LT for long-term, shall be calculated according to the equation there, and that's not been done.

BY MS. BENSKY:

Q In this project?

A In this project.

Q And what's the significance of that?

A Well, this is the procedure that was designed in the standard for going from downwind to long-term if long-term wanted to be used. What this does is it says that if you're up in the air, which is what I just -- we know we are, they recognized when this was written, they being -- this was really based upon a German standard initially -- that when you have an elevated source, you're going to get this high level more of the time, as I said, three times as often, which was a whole lot of the time from 100-foot high. When you look at this case, this standard says that you never have anything but the high levels from an elevated source and that the -- the average that's

used for other sources shouldn't be used for this because it is elevated, and I think that's the difference that comes in here.
MS. BENSKY: Thank you.
EXAMINER NEWMARK: Anything else?
MS. BENSKY: Briefly.
BY MS. BENSKY:
Q Is it necessary for you to visit a site to be able to analyze data that was taken at that site?
A No.
Q Is this something that you do all the time in your professional work?
A Well, I like to judge the people that have made the measurements and have some feel for things, but I would say that things that are done by Mr. Hankard or Mr. Hessler, I believe the measurements in general. Now, I've said that I thought he was wrong on the empty pseudo-noise, but that's a separate thing.
Q And even though that you -- so, is your own experimentation necessary to be able to reach the opinions that you've reached in this case? Is it necessary for you personally to conduct experiments in order for you to reach the opinions that you have reached in this case?
A No. As I've said, even if I had done studies that

would be part of the team, that I think that nothing is done by one person alone.
Q And in fact, whoever uses this model is to some extent relying on your work, right?
A They're relying on my work. They're relying on the Deutsches In -- DIN, Deutsches Institut fur Normung.
Q So even though you've not been to the site, and even though you haven't done your own experimentation, can you still state the opinions that you stated in this case to a reasonable degree of scientific certainty?
A Yes, I do.
MS.
MS. BENSKY: Thank you.
EXAMINER NEWMARK: Okay. Other questions?

RECROSS-EXAMINATION

BY MR. WILSON:
Q Just a couple questions following up on ISO 9613-2. When you testified earlier that you were implementing a method incorrectly, was it this method that you were --
A I'm sorry? I don't quite follow the question.
Q Well, you told me -- you told me before when I was asking you questions that you had this recent epiphany which is the result now of using -- you're saying you use the zero ground contour, and you told

me that up until recently something had been -- had been implemented improperly by yourself as well.
A Yes. I had forgotten. I don't -- you know, I don't use 9613 that often. It's used for this, but it's not used -- I use 9613 for this, and I use it for small arms ranges occasionally.
Q Okay.
A But when you're doing airports or highways or other things, there's models put out by the DOT for those kinds of sources. So if you do general work, which I do in all kinds of noise areas, you use different things at different times. What I was saying is until I had looked over this to prepare this lecture for Brazil when I'll be there, I remembered that this was for the downwind situation, which is also called for in ISO 1996, which I do know because I'm chairman of that committee.
Q Okay. I just have one other question for you. Have you done any studies that implement this standard with your new recollection against actual sound measurements to be able to tell whether it's a good fit?
A Well, you're not looking for a good fit. When you're --
Q That's not my -- my question is this, have you

compared your calculations using this method against actual sound measurements with your recent recollection that you've got to do in a certain way?
A Well, of course I haven't.
MR. WILSON: Thank you. That's all.
EXAMINER NEWMARK: Okay. Redirect?
MR. REYNOLDS: Just a couple questions.
MR. LORENCE: Your Honor --
EXAMINER NEWMARK: Oh.
MR. LORENCE: -- I may have a question before we get to redirect.
MR. REYNOLDS: Sorry. Go ahead.
EXAMINER NEWMARK: While you're doing that, I was going to take a minute. Did we verify his testimony?
MR. REYNOLDS: If I didn't -- I thought I did.
EXAMINER NEWMARK: Did you? You know what, just do it again just in case because I don't remember.
FURTHER DIRECT EXAMINATION
BY MR. REYNOLDS:
Q Dr. Schomer, do you verify that the rebuttal or surrebuttal that you've given, or direct and surrebuttal, is true and correct?

A Yes.

MR. REYNOLDS: Okay.

EXAMINER NEWMARK: And these Exhibits 1 through 4 as well?

MR. WILSON: Your Honor, I think given the discussion of this document, it probably ought to go in as an exhibit.

MR. McKEEVER: Yes.

MR. LORENCE: I'm going to ask a couple questions on it, so you may want to hold off on that.

EXAMINER NEWMARK: Okay. Let me just have him answer. Are Exhibits 1 through 4 -- sir? Mr. Schomer, Exhibits 1 through 4, were they filed -- are they correct to the best of your knowledge?

THE WITNESS: I'm sorry?

EXAMINER NEWMARK: Your Exhibits 1 through 4, are they correct to the best of your knowledge?

THE WITNESS: Yes.

EXAMINER NEWMARK: Okay. Thanks.

All right. Commission staff.

CROSS-EXAMINATION

BY MR. LORENCE:

Q Dr. Schomer, on page 12 of your surrebuttal

testimony, and I'm looking on lines 6 through 8.
A Uh-huh. I guess I'm not fast enough. All right. I got to page 12.
Q On lines 6 through 8 you say, ISO 1996 requires what is termed "downwind" or weather-enhanced propagation conditions so that model predictions are only infrequently exceeded. Do you see that sentence?
A Yes.
Q I have never seen ISO 9613-2 before today. Could you tell me where that's required in this -- in this ISO 9613?
A Those are the questions we just answered, but I can go through it again.
Q Well, you talked about the downwind stuff, but you say it says that it's only infrequently exceeded, and I'm wondering if it says that in here anywhere?
A That's what the downwind nomenclature means, and I believe it's in either 9613 -- I know it's in either 9613 or in 1996, which 9613 incorporates by reference.
Q I have one more question, and again this shows my complete ignorance on this standard. In Section 7.3, that's called ground effects, and again there's not a page number here, but if you could turn to that.
A Okay. 7.3. 7.3, ground effects, yes.

Q Is this section equivalent of the ground factor that we've been talking about the last two days?
A This section is -- makes use of the ground factor. It's not equivalent. This is where the ground factor comes in. What you have is on the next page there's graphs showing the -- what the sound propagation is in different octave bands. And then in the implementation there's a table on the next page, Table 3, and in Table 3 if you look in there, there's A sub S or A sub R in the middle column at the top, and that's for the source or receiver region. We've been talking about there's really three factors, the .5 or the zero whatever. You have a factor for the source region, a factor for the middle, and a factor for the receiver region. And if you look at the formulas under A sub R of the middle column, you'll see a G. That's the ground factor that goes between zero and 1.
Q And that's the ground factor we have been talking about for two days?
A There's three of them technically: one for the source, one for the receiver, and one for the middle.
Q So if we turn back one page where it begins with the letter A, then it says hard ground.
A Hard ground, yes.

Q That first paragraph ends -- it says, for hard ground G equals zero. So this is the ground factor zero that we've been talking about, correct?
A Correct.
Q And then for porous ground in B, it's G equals 1?
A Correct.
Q And then for mixed ground, it says it's someplace in between zero and 1. Do you see that?
A I see that.
Q So this is the ground factor we've been talking about here?
A Yes. But to understand that is a question that was earlier. You've got a source up in the air and not on the ground, so does this standard really apply. And my answer was, it's the best we have, but you can't apply it exactly the way you would if it was on the ground because the source is as high in the air, it changes what the propagation is. So that the definition of what is hard and what is soft, you have a source that's 100 meters in the air on average. That's not on the ground as one of the other counsel's pointed out.
Q But it has to get to the ground -- the sound has to get to the ground eventually, doesn't it?
A It has to get to the ground eventually.

Q And once it's on the ground, won't it travel along the ground?
A No. It's only -- the only thing you have is an effect of the microphone height at your receiver. The other -- it doesn't -- it doesn't come down to the ground and then travel across the ground like this. It doesn't do that. What you're interested in is the path that goes straight from this up in the air source to your receiver, which may be near the ground, but you don't have any other path. If you do, it's because you don't have good propagation. Then it's poor propagation conditions.
MR. LORENCE: Thank you. I have no further questions.
MS. BENSKY: Your Honor, can I follow up on that? This is really important, and I want to make sure I understand.

RECROSS-EXAMINATION

BY MS. BENSKY:
Q So are you saying that if we have a flat -- if we have a flat ground, if there's a source that's close to the ground emanating sound, that sound can just go and be absorbed in the ground, correct?
A Ground absorption -- what happens, and this is more related to people's experience. You know, if we went

through all the details, it would be complicated, but I think people's experience is useful here. First of all, the first rule is that if you're downwind, it's louder than if you're upwind, and there's -- the reason is the downwind, and this is going to seem strange, we think of sound almost as rays, sound rays rather than waves.

And let's put it this way. Let's say you were behind the barrier. You expect it to be quieter. It's quieter because there's no direct path from the sound to you. It has to come around the corner just like if you had a -- something to stop the sun or a reflector of light. You go behind it, it's not as light as in front of it. Sound is the same thing. If you have a barrier or something that prevents the sound from getting to you, it's quieter than if you don't have that. Well, on a sunny day and you're upwind, you don't hear things. But if you're downwind, you do.

Another thing -- example, if you're out in a boat, do you hear things far away out in a boat? You've seen that? This is the hard surface of the water, and frequently above the water there's a temperature inversion because of the cooling and heating of the water. And those two can form two layers that the sound gets trapped in, and then you have very -- you hear the people whispering on the shore, and it's like they're 10 feet away from you. I'm sure many of you have experienced this. This has to do with the propagation downwind versus upwind, has to do with the propagation.

The physics is complicated, but the effects -- same thing. Ever hear sources very early in the morning? You wake up at 5:00 a.m. and you hear a distant train or horns or the wheels? Have you experienced that? That again has -- at that time of day, you've got a direct path from the source, which is -- you don't hear the rest of the day to you. It has to do with the physics of the situation.

I'm not going to attempt to go into the physics, but I'm trying to give you different examples out of your daily life that show you this is what goes on. We don't want to really go into the details of what's going on.

Q So if there's a source up in the air that's emitting sound, the sound's going to come down and it's going to hit the receptor before it hits the ground and absorbs; is that correct?

A It's going to hit the receptor directly. There will be -- it gets confusing.

Q That's for sure.
A The ground is important only that it gives a reflection that can enhance or interfere with the direct path. But it does hit the microphone, that's the first thing it hits in time. The sound will arrive at the microphone before -- it comes directly from the source, so it will arrive first.
Q So somebody standing outside near a wind turbine or any source up in the air, that sound wave is going to travel down, and it's going to hit that person's ear before it goes down to the ground and gets absorbed?
A Well, won't be totally absorbed but, yes, it does hit you before it's absorbed. And I think your point is good, that as you're traveling along the ground, from ground to ground it will be absorbing some of the sounds, and that alone is -- that's part of the reason that the air-to-ground path is louder.
Q And so do you think it's proper to assume no absorption and use that 0.0 coefficient for this reason?
A That's part of the reason. Part of the reason is the -- in order to have a prediction that is what is called for in the standard, which is a prediction that is -- if you like the term conservative, a prediction that predicts what's going to happen 90

percent of the time or 95 percent of the time or some percentage of the time, I actually think that from the data that I know of, the prediction is probably the -- about 85 percent of the time would be included, and 15 percent of the time you would be above what's being predicted with the 0.00 prediction. It's not the most conservative prediction in the world by any means.
Q   But considering we have to use this model because we don't have anything better, the best way to use this model for a source that's 100 meters in the air is to use that 0.0 coefficient?
A   0.00 is the best you can do with this.
MS. BENSKY: Great. That's very helpful. Thank you.
MR. REYNOLDS: Couple questions on redirect.

REDIRECT EXAMINATION

BY MR. REYNOLDS:
Q   Dr. Schomer, is it the heart of it that the challenge of creating a model to reflect what the citizens of Forest will actually experience, is that the heart of why it's better to have conservative estimates than not conservative estimates of sound? Because we're trying to figure out what's going to happen to the

citizens in Forest.
A I think there's probably lots of reasons I can think of for doing this. Again, we're dealing with a low frequency sound primarily. The A-weighted sound is going to correlate with it as it does with nearly all noise sources.

I think it's important to understand how the ear hears because that's all a part of this, and the ear doesn't hear all frequencies equally. It doesn't process all frequencies equally, and it gets very different at low frequencies. The ear gets very different at low frequencies, and this is one of the reasons I would say this is important. We -- I think Mr. Hessler testified that the threshold of hearing changes, or maybe it was in that paper that was passed out, but the threshold of hearing is very different from one person to another.

But what's even more important is that at the middle frequencies, like 1,000 hertz, a change of 10 decibels is a doubling or a cutting in half of loudness. At these low frequencies, like let's say 10 hertz, at 10 hertz, about a 2 dB change is a doubling of loudness. So at low frequencies, anything that you're off gets magnified by the ear. If you're off by 5 dB at low frequencies, that's a factor of four in loudness. Whereas if you're off by 5 dB at a middle frequency in a prediction, that's not even a factor of two in loudness. So errors get magnified at the low frequencies just because of how we hear.

Q That was one of the reasons for looking at the more conservative model. Are there any others?

A Well, let's see. I've talked about the standard calling for it. I've talked about it makes sense from the -- from the way the rule is written. Certainly it makes sense from being conservative from just the standpoint of how the ear hears. I think that just what we've talked about, the health effects and the fact that there's people that may be affected just like in one other community, somehow it seems like it calls for us to be cautious.

I think that if -- if it were some other area where government was involved directly, let's say, we're going to install -- we're going to license fire detectors that only work 90 percent of the time and 10 percent of the time people aren't warned about the fire protector, but that's good enough. People wouldn't say that's good enough, so the fire protection has to work all the time. And I think when we're talking about people literally being driven out of their homes, we have to be a little bit cautious.

MR. REYNOLDS: Thank you. I don't have anything else.

EXAMINER NEWMARK: Highland?

MR. WILSON: No.

EXAMINER NEWMARK: All right. What are we doing with our ISO 9613-2?

MS. BENSKY: I'd like to move it into evidence.

EXAMINER NEWMARK: All right. Any objections?

MR. LORENCE: I guess I'd like to talk about that for a second.

EXAMINER NEWMARK: Okay.

MR. LORENCE: We've kept out all kinds of reports and exhibits today because they didn't come in at the proper time. Professor Schomer could have put it in at any time with his exhibits. I recognize that counsel here is not -- is not -- his witness is not asking this. But I guess I would ask the ALJ that under the theory that, you know, we've been keeping out late-filed things and this is awfully dense information, whether this should go in the record.

EXAMINER NEWMARK: Okay.

MR. LORENCE: And I just as a second aside for counsel, I'm not positive, but I think that these are usually under copyright, and is this something that we would be able to place on our website and make available to the world if -- I don't want to get you in any kind of copyright trouble if that's the case.

MR. McKEEVER: I'll just say I got it on the internet.

MR. LORENCE: Yeah.

MR. REYNOLDS: And this is the standard that has been used by all the measurers of sound, so this is -- this is kind of the bible of sound measurement.

MR. LORENCE: And I guess that reinforces my question then. Anybody could have put it in. Any of the experts could have put it in from direct testimony on it. So whether we get it here at this late hour or not, I'll defer to the decision, but I'm -- given what we've done today with other things, I just wanted to raise that point.

MS. BENSKY: I guess the nature of this exhibit is totally different. This exhibit doesn't give any opinions. It's just a standard that everybody -- all the sound people in this case have used and relied upon. So I think it would be helpful to have it in. And even if it wasn't in, I think it's the type of material that could be quoted and briefed anyway, so --

EXAMINER NEWMARK: Let's not get into that.

MR. WILSON: I think at the risk of making it look like Ms. Bensky and I are on the same team --

EXAMINER NEWMARK: We would like to see that.

MR. WILSON: I agree.

EXAMINER NEWMARK: Okay.

MR. WILSON: It should come in.

EXAMINER NEWMARK: I understand.

MR. WILSON: There's a lot of testimony on it.

EXAMINER NEWMARK: Let me say the overarching concern I have or rationale for letting it in is we've cited to equations and all kinds of portions of this document which I think can only be correctly or adequately explained or referenced by having the document. So for the abundance of caution for making the record even larger, I think it would enhance the Commissioner's review of the testimony we've just heard. So what's the number for this one? It's 9, Schomer 9, is that --

MR. REYNOLDS: I thought it was 5.

EXAMINER NEWMARK: Well, I don't know if we ever marked your other ones. I might have mentioned on the record because Mr. Schomer, I was not accepting his Exhibits 5 through 8, and I am pretty sure I referenced that at the beginning of the hearing. So we're just going to call this 9.

MS. BENSKY: Okay.

(Schomer Exhibit No. 9 marked and received.)

EXAMINER NEWMARK: All right. I think you're done.

THE WITNESS: Thanks.

EXAMINER NEWMARK: You're excused.

(Witness excused.)

EXAMINER NEWMARK: 3 o'clock. Let's take 15 minutes.

(Break taken from 3:05 p.m. to 3:20 p.m.)

EXAMINER NEWMARK: Well, got enough people back, I guess. You want to start off the record?

MR. McKEEVER: Yeah.

(Discussion held off the record.)

EXAMINER NEWMARK: All right. Next?

wondering if he's looked at these.

EXAMINER NEWMARK: Follow-up on what?

MR. REYNOLDS: Follow-up on the question of recent science. He's reviewed the literature. I want to know if he's reviewed these two articles.

MR. WILSON: You already released him.

EXAMINER NEWMARK: He's answered the question. You've had your chance to cross him.

MR. REYNOLDS: Well, this is in response to the redirect. Just two articles.

EXAMINER NEWMARK: You had your chance to cross him. You're excused. Thanks.

(Witness excused.)

EXAMINER NEWMARK: Is that the balance of the applicant's witnesses?

MR. WILSON: They're all done.

EXAMINER NEWMARK: Okay. Believe it or not, hm? All right. I think we have time for Mr. Hessler.

MS. NEKOLA: Clean Wisconsin would like to call Mr. Hessler.

DAVID HESSLER, CLEAN WISCONSIN WITNESS, DULY SWORN

EXAMINER NEWMARK: Thanks for your patience.

DIRECT EXAMINATION

BY MS. NEKOLA:
Q Good morning, Mr. Hessler.
A Good morning.
Q Please state your name and business address for the record.
A My name is David Hessler. My business is located at 3862 Clifton Manor Place in Haymarket, Virginia.
Q Did you prepare 12 pages of direct testimony, nine pages of rebuttal testimony, five pages of surrebuttal testimony, and three exhibits in this proceeding?
A Yes, I did.
Q And is the information in your testimony and exhibits true and correct to the best of your knowledge?
A Yes, it is.
Q Mr. Hessler, have you had the opportunity to review Mr. Schomer's surrebuttal testimony?
A Yes, I have.
Q Mr. Schomer states that low frequency pulse will be audible to many residents of Forest. Do you agree with that?
A No, I don't think that's an inevitable or foregone conclusion. The --
MR. McKEEVER: Excuse me, Mr. Hessler. Could you speak up.

THE WITNESS: I'm as close as I can get to this thing without eating it.

MR. McKEEVER: Thank you.

A No, I don't think that conclusion is inevitable. That research that his testimony is based on is 30 years of experience evaluating health effects from low frequency noise associated with military sources like artillery and tanks. And he has just taken that result and just applied it wholesale to wind turbines without considering the dramatic difference in the magnitude of the two sources.

An artillery shot is, I think everyone realizes, much, much louder than any wind turbine could be. There are many studies that show that wind turbines -- the low frequency content of wind turbine noise is very, very low and is around the -- at or under the threshold of hearing. So tanks and artillery are not -- I wouldn't describe them as being near the threshold of (inaudible).

THE REPORTER: Near the threshold of what?

THE WITNESS: Hearing. (Laughter.) How about that?

BY MS. NEKOLA:

Q Mr. Hessler, is there a particular recent study that you can point to that assesses the magnitude of low

frequency wind turbine noise?
A Yeah. There's many, many studies that have been done, I've taken my own measurements. But there is one that I think kind of epitomizes the research on this topic, and it's a study that was undertaken specifically to try to address this issue of what is going on with low frequency noise in wind turbines. It's a study that was published in the Noise Control Engineering Journal April of last year by O'Neal. And just to very briefly summarize it, they kind of went through the literature and found all of the existing -- all the ones they could, all the existing thresholds for the perception of low frequency noise worldwide.
They did a literature review of all the papers that have -- that they could find that were ever written on the subject and they summarized the results of all of those. All of those results essentially say that it's so low in magnitude that it's pretty much inconsequential.
And then the last part of this study is that they went out and did their own field measurements on two different types of turbines; and then they compared those findings to all of the thresholds that they had found, and found that the

levels were under the threshold of hearing in every instance, every ANSI standard, every threshold they could find.

(Hessler Exhibit No. 4 was marked.)

Q I'd like to hand you this. Is this a true and correct copy of the study that you were just talking about?

A Yes, it is.

MS. NEKOLA: Your Honor, we'd like to move this study into the record as Hessler Exhibit 4.

MS. BENSKY: We object, Your Honor.

EXAMINER NEWMARK: Okay. Go ahead.

MS. BENSKY: Well, I haven't seen it. I haven't had a chance to look through it. I'm paging through his testimony now to see if he did talk extensively about low frequency noise. I don't recall that he did. I don't believe this was cited in his testimony. So our witness can't see it and I don't have the ability to read it now and ask questions. So that's why I object.

EXAMINER NEWMARK: Response?

MS. NEKOLA: Your Honor, this is in response to surrebuttal testimony that referenced low frequency noise, and Mr. Hessler contemplated addressing low frequency noise all along in this case. I think it's highly appropriate to add this to the record. It's a more recent study than anything else that we have so far in the record. And if we -- we could give parties a chance to read it and perhaps decide later. We think it's --

EXAMINER NEWMARK: And just -- I didn't catch who he was responding to.

MS. NEKOLA: Mr. Schomer.

EXAMINER NEWMARK: Schomer's surrebuttal?

MS. NEKOLA: Surrebuttal, um-hmm.

MS. BENSKY: I guess there is no reason this couldn't have been part of Mr. Hessler's direct testimony. His work for Clean Wisconsin, as I understand it, is quite extensive on this case. And if this was going to be an issue that he wanted to address all along, then -- this is a 2011 study, there is no reason this couldn't have come in earlier. It'll take me more than ten minutes to read this and understand it.

We don't have any ability to put any information in the record to rebut it. So that's where the prejudice is.

MS. NEKOLA: Your Honor, this is a 2011 study that reviewed over 100 scientific papers worldwide on this topic, and also included a field study to measure wind turbine noise outside and within nearby residences. I think it would add to the record.

EXAMINER NEWMARK: Yeah, it looks like, from what I can see on direct, Schomer does reference studies about low frequency noise. And so I don't see why this couldn't have come in earlier. I'm going to have to leave it out as prejudicial. It's just too late to go through all of this and to have another witness come in.

MS. NEKOLA: One more thing that is relevant here, I think, is that we anticipated that Mr. Hessler would be able to do his own study of low frequency noise in another wind farm in Wisconsin. And he was -- he has so far been unable to do that because we haven't been able to get access to any wind farms. And so I think this is also his attempt to put in the best recent information on low frequency noise that he has available to him.

EXAMINER NEWMARK: I understand. Does staff have any opinion on this?

MR. LORENCE: I was just paging through his testimony. I see a reference to low frequency in his surrebuttal. But can you tell me where it is in his direct?

EXAMINER NEWMARK: Yeah, Schomer page 3, that first top of the page, there's been a multitude of literature published over the last 40 to 50 years that indicates that low frequency, and it continues on from there.

MR. LORENCE: Page 2 or 3?

EXAMINER NEWMARK: 3.

MR. LORENCE: I guess the only thought I have is if this is the only reference, I don't think he was really asserting anything other than the statement saying that there is publications. I thought his testimony was more direct in the sursurrebuttal with respect to low frequency. And I guess I thought -- and that was at least on page 16 of his sur-sur where he draws his last conclusion. Maybe it's the same thing. And so that's why I noticed that the -- the most as opposed to in his direct.

EXAMINER NEWMARK: And what pages on his surrebuttal? He just has surrebuttal, right? Does he have a third round?

MR. LORENCE: I saw it on surrebuttal page 16. And there may be other places. But I was looking at his last conclusion which is lines 12 through 22.

EXAMINER NEWMARK: I don't see that much difference in those two passages. But let's back up a little bit because I am aware that there is an attempt to do a study, is that the Glacier Hills farm? Is that the case?

MS. NEKOLA: Or the Shirley site.

EXAMINER NEWMARK: Or Shirley.

MS. BENSKY: He was denied access several months ago; isn't that correct?

MS. NEKOLA: No. They have not made a decision, final decision. But it has the same effect of being denied, actually.

MS. BENSKY: But in his direct testimony, doesn't he say he was denied?

MS. NEKOLA: Well, I'm not sure, but the -- the truth is that he has not been able to get access.

MR. REYNOLDS: Has there been any reason given for that?

MS. NEKOLA: No. Right, his direct testimony just says that we have not been granted access to the site. So thus far, we haven't been able to -- he hasn't been able to do the study.

EXAMINER NEWMARK: Okay. Well, the problem with this is I don't think this is enough of a substitute for a study at the other wind farms, and I know that the access question has not been fully determined.

MS. NEKOLA: That's right.

EXAMINER NEWMARK: And I would be prepared to reopen the hearing if we could have a study developed on that specific -- on those locations, one of those locations, if access is granted. But that would mean scheduling that and having a process for it.

But at this time in the game and at this hearing, I don't think we can admit this -- this study because the parties have not had a chance to review it and their witnesses aren't available. You know, if there is a point in time when we know access cannot be given, I can consider reopening the hearing to take a look at these late exhibits as a substitute. But I would like to, you know, try to -- I don't want to do that now and I don't want to thwart any attempts to get the studies done. I think that's much better evidence. So -- or it would be evidence rather than, you know, literature review.

So are there any other exhibits that relate to this? I saw you had a number of items there.

MS. NEKOLA: Not on low frequency noise. We have one other that we want to offer on another matter.

EXAMINER NEWMARK: Okay. All right. So are we okay with that?

MS. NEKOLA: We just want to point out that the study that we're -- tried to move in was not just a literature review, but that there were also actual sound measurements at wind farms.

EXAMINER NEWMARK: Okay. Thanks for clarifying that. So for now we will hold off on that.

MR. WILSON: Your Honor, for what it's worth, I had a discussion with Cindy Smith yesterday morning where this topic came up about the inability to do the low frequency testing --

EXAMINER NEWMARK: Let's go off the record.

(Discussion off the record.)

EXAMINER NEWMARK: Let's get back on.

BY MS. NEKOLA:

Q Okay. So do you think that low frequency noise problems can be ruled out?

A No. Despite the findings in that study, no, I don't think we can just assume that there won't be any problems. And I say that with respect to the testimony we heard yesterday from those three homeowners that had to leave their house -- houses at Shirley. That was very compelling and I think irrefutable evidence that there is a problem at that site. The question is why is that? And that's what we were hoping to explore with that field survey.

So I think what's happening is that there is a low frequency noise that is associated with very specific turbine models or types of blades or blade control mechanisms that results in, according to the studies that I've seen recently, results in inaudible low frequency sounds that can produce adverse symptoms and problems in certain people in rare cases. But it needs to be investigated. And that's really the state of knowledge on that.

Q You say that these instances are rare. Can you give an example of a more typical situation?

A Yeah. Yesterday we also heard from Jeff Bump who lives at the Glacier Hills site. And I'm familiar with Glacier Hills. And I know -- I met Jeff Bump. My brother and I set up instruments at his house last winter, and we measured day and night at his house for about 18 days I think at his house, and ten other houses around that site. All the ones with the closest possible exposure to turbines. We measured off of the site to get the background conditions on a -- kind of a running time history of background throughout the survey.

And, you know, he said he was bothered by this horn sound and that's -- I heard that, that's associated with the hydraulic system in the Vestas V90 turbine that's at that site. He said he was kept awake by a swishing noise. That's mid-frequency oscillation, around 500 hertz, due to the blades. But what he didn't complain about is low frequency issues and any of these adverse health effects. He said, well, he might have got a headache once, but really it was all about the fact that he was bothered at night.

But the point is that this project, Glacier Hills, has over -- I think it's over 120 turbines that are distributed over an area that's about, very roughly, 40 square miles. There are hundreds and hundreds of people that live in close proximity to turbines at that project. Yet the only people that are complaining are Mr. Bump and another fellow that lives next -- or nearby him. Those two people are the only ones that have any problem with noise out of many, many hundreds. And that is the typical situation based on all of the post-operational surveys that I've done. The number of people that are actually complaining or bothered by it is very, very low compared to the total population.

Q Thank you. Mr. Schomer also mentioned that the data contained in your Exhibit 1 is artificially elevated by pseudo-noise or instrument error. Do you have a response to that?

A Yeah. What we did in our analysis of the applicant's sound study was to look at the data, the sound data, as a function of wind speed. And that's been criticized as, well, the sound levels are elevated because the wind was blowing over the microphone. But the fact of the matter is that the winds were very light during that survey; and the peak wind, the highest wind, at the microphone during that entire two-week period was only seven miles per hour.

We have -- some years ago, I think it was about 2008, we did study, a wind tunnel study, to evaluate that phenomenon of wind blowing over the microphone to quantify what that error is. And in that study, what we found was for a seven-mile-per-hour wind, the self-generated noise or pseudo-noise would be only around 20 dB, whereas in the field survey at Highland, the levels being measured under those conditions was in the neighborhood of about 45 dBA. So there wouldn't be any effect at all from a pseudo-noise. I believe the data is perfectly valid.

(Hessler Exhibit No. 5 was marked.)

Q You've been handed a copy of a study that you just referred to and described. Is that a true and correct copy of that study?

A Yes, it is.

MS. NEKOLA: We'd like to enter this into the record as Exhibit 5.

EXAMINER NEWMARK: Any objections?

MS. BENSKY: No objection.

EXAMINER NEWMARK: All right.

(Hessler Exhibit No. 5 received.)

BY MS. NEKOLA:

Q Turning to the surrebuttal testimony of Mr. Horonjeff, have you had an opportunity to review that testimony?

A Yes, I have.

Q Mr. Horonjeff points out that your comparison of the Highland sound data with the met mast wind speed shows considerable scatter at any given wind speed,

and he suggests that the mean value should not be used. Do you have a response to that?
A Yeah. It's not really a matter of where you draw the line, the mean trend line, in that data. What it shows is that the vast majority of the sound levels that were measured during the survey were measured under very low wind conditions that -- below the point, generally speaking, where the turbines would begin to operate. And the principal point is that during the windier conditions when the project would be operating, there are very, very few measurements of low sound levels during those wind conditions, only about six to a dozen ten-minute samples out of roughly 2,000 measurements that were taken.
Mr. Horonjeff is saying that, well, sometimes it's quiet when it's windy, but that is a rarity and that's what that figure shows.
Q You were present yesterday when Mr. Reynolds questioned Ms. Blank about the sound modeling for the project, correct?
A Yes.
Q And do you recall that Mr. Reynolds quoted your direct testimony at page 11 as saying that sound models should have an ideal target level of 40 decibels? Do you recall him saying that?

A Well, I think what he said was that the project should be designed to 40. 40 is the recommended level. My view on that is -- and what we've asserted in papers and things that we've published based on our field studies of completed projects -- is that if possible, projects should use 40 dBA as an ideal design goal if at all feasible because what we find is that below 40 there's very few, if any, complaints. But as a regulatory limit, we've put forward a level of 45 because the regulatory limit is different from an ideal design goal. A regulatory limit has to balance everybody's best interest. So the 40 we weren't saying was a suggested regulatory limit but rather an ideal design goal.
Q So just to be clear, is it your position that the Highland wind project should meet the 40 decibel noise standard?
A Should it meet the 40?
Q Right, is that your position?
A No. I think it -- I would be satisfied or I would recommend that it meet the 45 limit as currently it's obligated to do.
MS. NEKOLA: Mr. Hessler is available for cross-examination.
EXAMINER NEWMARK: All right. Do you have

questions?

CROSS-EXAMINATION

BY MS. BENSKY:

Q Good afternoon, Mr. Hessler.

A Good afternoon.

Q In your papers, you have a very distinct talent in taking complicated information and making it understandable for everyone, so I commend you on that and I ask that you do your best to keep it at that level here.

A We'll see how it goes.

Q Let's start with page 2, I'm just going to go through your testimony. So direct testimony page 2. At line 2, you say, "Typical projects involve field surveys to establish baseline background sound level conditions..." Is that the same way of saying ambient sound?

A Yeah. It's essentially the same thing.

Q And why is it important to establish that baseline?

A Well, the way most projects -- not just wind projects, but any fossil plant or any project -- would be evaluated is to see how its noise is going to compare to the sound level that already exists at that location. If the facility noise is going to greatly exceed the existing level, then there's

likely to be an adverse impact. If it's below the background, you might not even hear it. So it gives you a baseline to make a judgment on what the impact's going to be.
Q And in your view, is establishing that baseline an important thing to do?
A Yeah. We typically do do that for wind projects or any power plant.
Q Turning to page 3. You have your testimony up there with you?
A Yes, I do.
Q Now, page 3, and correct me if I'm wrong, it looks like you are first reviewing the initial predictions that were listed in the application using the zero coefficient assuming a total reflective ground?
A Where is it that you're at there?
Q On page 3, question number 7 -- or line 7. Your overall impression of the studies. I just want to clarify that what you're talking about right there is the modeling results where a zero coefficient was used; is that correct?
A Yeah, yeah. That's correct.
Q And looking at those results, if the average background noise was between 29 and 34 decibels and the project level was 45 decibels, your opinion is

that the project would be quite audible; is that correct?
A Yes, that's right.
Q If those were the actual numbers. And is the reason why the project would be quite audible is because you have that 11 to 16 above ambient level?
A That's right.
Q And do you have an opinion as to whether an ambient level of between 12 and 16 decibels -- or an actual level above -- let me start over.
Do you have an opinion as to whether that relative noise level would result in adverse community reaction?
A Yeah. If those were the actual levels, then we would conclude in any assessment that the project was likely to have a pretty significant adverse impact.
Q So it's not necessarily that 45-decibel level you're concerned about, you're more concerned about the relative difference, that 11 to 16 decibel difference; is that correct?
A Yeah. That's what I'm talking about in that particular paragraph.
Q Now, on page 4, going down to line number 12, you're talking about your review of the met tower data, and you had requested a site plan that you did not

receive?
A That's right.
Q And I understand later in your testimony that you kind of reverse engineered a site plan based on the available information?
A Yeah. It was possible to import into our modeling software the -- I guess the sound contour map from the application. It wasn't absolutely necessary to get the site plan in the first place. It was just -- it would have helped things. That's all.
Q So what information would you have expected the site plan to contain that would have been helpful to you?
A Just a particular kind of computer file that is easily imported into the modeling program. Just more to save time. What we had to do was just take the PDF and work with it.
Q So you feel that you obtained all of the information that you needed?
A Yeah. We made do.
Q The information that you used in your gathering of that data, do you know if that's the exact data that would have been contained in the site plan?
A We used the actual site plan from the application.
Q But you said you didn't receive the site plan.
A We used the site plan that was published in the

environmental assessment. It was just a matter of convenience to get the computer file. It wasn't germane to anything really.
Q So the actual data would have been the same? What I'm --
A That's right.
Q What I'm getting at is do you think that you input the right numbers based on the information that you had?
A Yes.
Q Now, let's talk about the met tower. The met tower was 49.5 meters, 162 feet. And is it your understanding that the hub height of the proposed turbines is between 299 to 328 feet?
A Right. Yeah. This met tower anemometer puts it within the rotor plane, not exactly at the hub height. It's very rare to have a met tower high enough that it goes all the way up to 80 or so meters.
Q So it's at the bottom of the rotor plane, 162 feet would be at the very bottom assuming the blade lengths are between 160 and 180 feet?
A Right.
Q Is there some sort of formula that you applied to that 49 meters to estimate the wind speed at the hub

height?
A The hub height wind speed wasn't needed for anything. What we did do was take the met tower wind speed at 49 and a half meters and then normalize that to 10 meters because you have to put the wind speed data on an even footing with the turbine sound power level data which is also -- which is always expressed as a function of the wind speed of 10 meters.
Q But that's something different than estimating what the wind speed would be at the hub height?
A Yes. The hub height, whether it's near the bottom of the rotor plane or at the hub height, it doesn't make any difference here, to what we were shooting for here.
Q But wouldn't it be -- if you want to know how fast the blades are going to turn, wouldn't you want to know the wind speed at the hub height? Wouldn't that be ideal?
A No. It's really -- it's all about the wind speed at this normalized height of 10 meters that's relevant to this whole thing. Even if we had a met tower that was -- met mast that was 80 meters, we would have just taken that value and normalized it to 10 meters. It would have been the same.
Q But if you had a met tower at 100 meters, you would

not have had to apply that formula?
A No. We would have had to apply it to any elevation anemometer. We want to bring it down to 10 meters from whatever height, the highest possible height.
Q So based on the met tower data, you don't know the actual speed of the wind at the hub height; is that correct?
A We could easily infer it from this 49 and a half meter data if we wanted to know it.
Q So you didn't -- is your answer you did not have the actual wind speed at the hub height?
A Met mast wasn't high enough.
Q And you did not have the actual speed at the rotor tip of 500 feet?
A We could have inferred that if we needed to know. The ideal thing would have been to have anemometers over the whole diameter of the blade, but you never have that.
Q So you have to make some approximations?
A Oh, yeah.
Q Is there generally a difference -- or can there be a difference in wind speed at 500 feet as opposed to 162 feet?
A Yeah. It is typically higher with elevation.
Q What happens when there's a very -- there's a higher

wind at the rotor tip than at the bottom of the rotor?

EXAMINER NEWMARK: In what sense? What do you mean what happens? In terms of what?

A Yeah, in terms of what?

BY MS. BENSKY:

Q When there is a higher -- when there's a higher wind at the top than there is at the bottom of the rotor, does that have any effect on the sound produced?

A Yeah. Yeah. The wind speed is typically always higher at the top than it is at the bottom. It's very rarely perfectly flat, although that does happen. The degree to which the wind speed varies from the top to the bottom or from -- between any two heights is the wind sheer, and the higher the sheer the more slanted that -- the greater the difference between the wind speeds at different heights, the greater the noise generation generally is.

Q Is there a particular season where the wind sheer is greater?

A Yeah, at most sites it's typically in the summertime.

Q The wind sheer is greater in the summertime?

A Yeah.

Q Are there any other weather conditions where the wind sheer would be greater?

A It's typically higher at night than it is during the day.
Q Now, looking at the bottom of page 4, is it your testimony that when the near ground level wind speed is very low, that does not necessarily mean that the hub height wind speed is the same; is that correct?
A Right. You -- it's hard to tell anything from the wind speed measured at a meter above the ground. That generally remains pretty low even when it gets really windy out. That's why we wanted to use the met mast that -- at the highest possible anemometer to get a sense of what's going on up at the elevation that the turbines would see that wind.
Q Just so we're all on the same page, what's an anemometer?
A A device for measuring wind speed.
Q And that's the thing that sits on top of that met tower?
A Yeah.
Q Let's turn to page 5. Looks like I already covered that. Let's go to page 10. Starting on line 6 and just follow along. Is it correct that you state, "A common design theory for new industrial projects of all kinds is to design the project so that its sound level does not exceed the background level by more

than 5 decibels..." Did I read that correctly?
A That's right.
Q Then you state, "...the logic being that such an increase is not particularly noticeable, at least when the character of the noise is rather bland and free of any prominent tones or other identifiable characteristics. Because wind turbine noise often has a variable, churning, sometimes periodic character to it, this approach is somewhat tenuous for wind projects, but nevertheless it is commonly used..."
Is it your testimony that wind turbines create a sound of such a characteristic that the 5 decibel above ambient is too much?
A Yeah. Yeah. The 5 increase would -- makes the most sense when you have a, for example, a very constant source that has a bland character to it like a conventional power plant. That sound 5 above the background is usually -- or usually results in a negligible impact, people don't really notice it. Now, wind turbines don't have a particularly steady sound so that they are more audible than other sources relative to the background. So even a 5 increase is generally pretty noticeable.
Q Thank you. Now, at the bottom of the page, you state

that assuming a background noise of 34 to 36 decibels, your recommendation in an ideal world is that the project noise be limited to between 39 to 41 decibels; is that correct?

A Yeah. That would be a 5 increase over this background level that I'm coming up with.

Q Okay. Now, on the next page, and I'm going to hand out an article that you reference and footnote on page 11.

EXAMINER NEWMARK: That's Hessler 5, right?

MS. NEKOLA: 6.

MS. BRANT: No, Your Honor. It's the same scientific journal, I believe, or a very similar format.

MS. BENSKY: No, it's a different article.

MS. NEKOLA: It's a different article, right.

BY MS. BENSKY:

Q And the first question is looking at the publication that I just gave you, is this indeed the publication that you reference in footnote 3 on page 11 of your direct testimony?

A Yeah, yeah. I'm glad you handed it out to everybody.

Q Now, let's turn to page 96, it's just this third page

in. And you're talking about the World Health Organization target noise level to protect the public. And that is listed at 40 decibels day or night; is that correct?
A I think they specifically call that the nighttime target.
Q Okay. Oh, you're right, nighttime sound levels.
And has that changed since this paper was published?
A Not to my knowledge, no.
Q And turning to page 98, first full paragraph beginning with Considering the EPA guidelines. And there's some discussion of day and night levels; and then you state -- first of all, did you author this paper?
A Yeah. I was a co-author on it.
Q Co-author with George Hessler?
A Yeah.
Q So you state, "A 45 decibel composite noise equivalent level with a 5 decibel evening weighing would be even more ideal at 45, 40 and 35 decibels for day, evening and nighttime levels, respectively."
EXAMINER NEWMARK: Can you point to that for the record.
MS. BENSKY: It is on -- it is a

publication which is footnote 3 of Hessler Direct 11. It's called, "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States," and it's on page 98 of that publication.

EXAMINER NEWMARK: And where on page 98?

MS. BENSKY: It's in the middle of the page. There's a first -- full paragraph begins with Considering the EPA.

EXAMINER NEWMARK: Okay. Thanks.

MS. BENSKY: And I'm looking at the last sentence.

EXAMINER NEWMARK: Um-hmm. Okay.

BY MS. BENSKY:

Q So my question is, is it correct that in this paper, you recommend an ideal design target of 45, 40 and 30 decibels respectively during the day, evening and nighttime?

A No. What we're doing in that part of the paper is going through all of the regulations that pertain or could possibly pertain to wind projects and just summarizing each one. At the end of the section, then draw a conclusion on what we recommend based on all these various standards.

Q And your conclusion is that a composite noise

equivalent level would be even more ideal at 45, 40 and 35; is that your conclusion in this paper?
A It's not a conclusion. It's just a comment on this particular measure.
Q But it's correct that -- I'm reading it correctly, right, that, "A 45 dBA composite noise equivalent level with the 5 dBA evening weighing would be even more ideal at 45, 40 and 35 decibels for day, evening and nighttime levels, respectively." Am I reading that correctly?
A Yeah, yeah. The lower the level the better. But we end up concluding later that as a practical matter 40 is -- seems to make sense.
Q But taking out -- you're not a state regulator, correct?
A That's right.
Q So -- you're a noise engineer, correct?
A Right.
Q And based on your very extensive expertise as a noise engineer, your opinion is that it would be ideal to have a 45, 40 and 35 dBA level for day, evening and nighttime?
A I'll always say it's more ideal.
Q Let's move on. Tell me, did you make any differen -- what hours are we talking about? What's daytime?

What are daytime hours as you're talking about here?
A It's usually 7 in the morning to 10:00 (sic) at night.
Q And what's evening?
A Then that goes to -- I'd say it's 7 to 10 p.m. or something.
Q So daytime would be 7 to 7, evening would be 7 to 10?
A Yeah.
Q And then nighttime would be 10 to 7 in the morning?
A Right.
Q Now, please turn to the next page, page 99, first full paragraph on that page says -- starts The States of New York, Massachusetts and California. Are you there?
A Okay. Yeah.
Q The first -- or the second sentence reads, "An ambient-based method is based on the perception of the new sound in a specific residential community. A perception-based method is clearly a better approach than a single absolute limit, and, in fact, many years of experience have shown this approach is working well in all these three states."
Did I read that correctly?
A Yes, that's right.
Q And you're talking about three states that have an

ambient-based guideline; is that correct?
A Right.
Q And the words that I just read, are those your recommendations in this article? You're not quoting anyone else. I want to know if that is your work right there?
A Yeah, yeah. We're talking about how they do things in New York, Massachusetts and California. And how that is, how that works, is that you measure the background, you add some factor to it, in Massachusetts it's 10, and essentially what you come up with is an absolute limit that is derived from the background. But the final answer is an absolute number.
Q But your opinion, is it correct that your opinion here is a perception-based method, which is this ambient relative standard, is clearly a better approach than a single absolute limit; is that your opinion?
A It's what's -- that's what it's saying here. But the end result of the paper is that it's better to go with absolute numbers.
Q So you contradict yourself in this publication?
A I suppose so. I think my father wrote that part, but -- in fact, I'm sure he did.

Q I'm going to tell him you said that.
A I'm always -- I'm used to that.
Q Now, on page 11 of your testimony, you're still discussing this article and you're discussing the results of it looks like a survey that you conducted? Is that correct?
A Okay. We're back in the direct testimony again?
Q Yeah. The direct testimony on line 12 --
A Yeah, okay.
Q -- you're referring to a study, and the study that you're referring to is still in this article?
A Yeah. It's just later on in the same article, yeah.
Q And you state at least 95 percent of residents were apparently satisfied with or unfazed by the sound emissions of the new wind project, even when sound levels were around or above 45 decibels. Was that your conclusion based on this study?
A Yes, it was. And what that study is all about is we're --
Q I'm sorry. Let me ask you the questions, keep this moving along.
A Okay. Go ahead.
Q Please look at Table 4 of your paper, it's on page 101, and it looks like those are the results of this study that you're talking about in your direct

testimony?
A Yes, that's right.
Q So looking at site A, there are approximately 107 households that are within this kind of target area near wind turbines; is that correct?
A Um-hmm. Yes.
Q And you found that when noise decibel levels were below 40, there were no complaints --
A That's correct.
Q -- correct? No sound complaints or no complaints at all?
A No complaints related to noise.
Q Okay. So the survey didn't ask about did people have problems with nausea or sleeplessness, it just said are you bothered by the sound?
A Well, there was no official survey. These houses that are in the table or are counted in the table, what those are are all of the houses where the project operations ever received a call with any kind of concern about the noise from the project. Some were definite complaints, others were just kind of mild concern. But they're all included here. When we do these surveys, we'll ask, you know, who has ever called about a problem; and then we will put instrumentation at that house and include them in the

compliance study. So we know how many complain and we know what the level was there.
Q Okay. So you had 107 homes where there were noise complaints --
A No.
Q -- correct?
A No, that's incorrect. The 107 is the total number of households that are within 2,000 feet of a turbine at that project.
Q I'm sorry, I didn't hear you. My colleague was talking to me.
A Yeah, the -- all the numbers in that column, the 107 is how many houses there were within 2,000 feet of a turbine in that project. In other words, it's the total population essentially.
Q Okay. And this -- to obtain the complaint data, you went to the company to get their records, correct?
A Well, it was just a matter of talking with the operations people. No records per se.
Q So you didn't receive anything saying here's our stack of written complaints?
A We asked who has ever called with any kind of concern about noise. And they -- then they told us. There may be more. That's possible.
Q So it's -- you called up Bob who runs this project

and said who's complained and he said, well, I think this guy, this guy and this guy; that's what it was?
A Well, it's whoever called up at any time. And I think this is -- it seemed to be pretty accurate.
Q But you didn't go to every -- you didn't send out a survey to 107 residences --
A No, no, not at all. This -- the purpose of these surveys was never to -- was not primarily to evaluate the impact. It was to carry out a compliance survey to see whether the project was meeting its requirements. And we just were able to draw out of that this information.
Q And that obviously is a very important distinction.
A Yeah. Yeah. None of these surveys were undertaken with the primary purpose of counting how many people complained.
EXAMINER NEWMARK: Let me just note, on your direct, you label this study, not a survey. So I don't know if that makes a difference as to what we're really getting at. You weren't intending to do a survey here, you were doing a study?
THE WITNESS: Well, all of the examples in this table, they're all field surveys of actual projects.
EXAMINER NEWMARK: Okay. So it did make a

difference. All right.
BY MS. BENSKY:
Q So I just want to make a very important clarification. You did not go -- for site A, you did not go to 107 residences, personally ask somebody do you have a problem with the noise, yes or no, and then get a result, correct?
A Yeah, that's correct.
Q So if somebody didn't complain to the company -- even if they did complain to the company, they might not be included in this?
A Oh, yeah. There could be more. We're not claiming that it is the definitive number, but this was what we were able to find out.
Q Right. So you're not saying that 95 percent of 107 households are -- don't have any noise complaints related to this project? That's not what this is saying?
A Well, what it's saying is that we know how many definitely did complain and there may be some more, but in general it shows that the vast majority did not complain.
Q All right. Now, you were here and -- you had the great pleasure of sitting here all day yesterday, correct?

A Yes, I did.
Q And you heard some people come up and testify that they had various complaints about noise, correct?
A Um-hmm. Yes.
Q Did you hear anybody say that they didn't go off and complain to the company?
A It seemed like when asked, most of them said they did call the company and made various progress.
Q Did you -- do you remember hearing anybody say they did not complain to the company?
A I don't specifically remember any examples.
Q Okay. That's fine. Going back to the actual text of your testimony, at line 11, the text reads, "In fact, an interesting finding of the study was that at least 95 percent of residents were apparently satisfied with or unfazed by the sound emissions of the new wind project, even though sound levels around and above 45 dBA were observed..." That's what it says, correct?
A Yes, that's right.
Q But that's really not a conclusion that we can draw because you're assuming that at no -- that if a person did not complain to the company, that they are satisfied or unfazed by the noise, correct?
A That's why I used the word "apparently."

Q But that's an assumption that you're making in that statement?
A Yes. But this is -- as you can see from the table, this is repeatable over five sites in this study and several more after it.
Q I'm not concerned about the decibels right now. I'm just talking about the data, the number of complaints. So one big assumption of this study is that if a person was upset about the noise to any degree, that they complained to the company. Would you agree that that's an assumption that you're making in that statement?
A Yes.
Q Now, the second assumption that we're making is that the company gave you all of the complaints that they received?
A Yes.
Q And we don't know -- those are big assumptions. We just don't know if -- we don't know the answers, you never went back and double-checked that?
A They're assumptions, but I think they're fairly accurate.
Q But you really don't have a basis for thinking that they're accurate?
A I can't imagine that -- you know, in this first site

there was three complaints. I can't imagine there was 50 complaints there. I don't think that's the case.
Q But --
A And part of the reason for believing that is that we measure -- when we do these surveys, we measure in this example these three houses; but then at -- many, many others throughout the project area all have the houses that are closest to turbines. And not only do we measure, but I personally have talked to all these people, the ones that have complained and then the other ones elsewhere. And it's -- it's surprising to me, it was surprising to me how many people just don't -- it's not the noise, even though the levels are fairly high.
Q But that information that you just gave us is not reflected in this survey? You said you went out and you talked to people.
A Yeah.
Q But we don't know, based on this survey here, how many people you talked to, what they said, there's no written survey; is that correct?
A No. This is what I've gathered in the course of doing this work.
Q Okay. Just a couple follow-up questions, one having

to do with this. So let's turn to page 97. And there's two columns on the right-hand column, first full paragraph, that begins with, "In addition, the report clearly indicates."
A Yeah. Okay. I'm there.
Q Okay. About -- looking at the very last sentence of that paragraph beginning with Schomer. Do you see that?
A Yes, um-hmm.
Q And you state, "Schomer suggests that an adjustment of 10 decibels should be subtracted for quiet rural environments and perhaps another 5 decibels if the project is newly introduced into such a long-standing quiet setting." Is that what this says?
A Um-hmm.
Q And getting into this issue of day and night levels. Is there anywhere in this paper that you criticize Mr. Schomer's suggestion?
A No. This is just saying that we're taking onboard what he has to say about it and figured it into this overall analysis.
Q But you agree that you're not critical of that particular suggestion in this paper?
A No. That's why it's in there.
Q Now, you spent the day here yesterday and you heard

Mr. Hankard say that if you measure at very close to a wall, you're going to get a result that's three decibels higher and that's not a good thing to do to measure sound in a wall. Do you agree with that?
A Yes, yes. You don't want to put the microphone right on a vertical surface, no.
Q My question is, what's the decibel level on the other side of the wall? Does sound -- can sound waves go through the wall?
A Yes. To some extent. Depends on the wall construction and so on, frequency content of the noise.
Q I hear some laughing behind me from Mr. Schomer, so I don't know if that was a question showing a lot of naivety.
But what I'm getting at is when there's a 45-decibel level outside a home, what's going on inside the home? Does the sound travel through the wall such that the walls can create some sort of reverberation and make it even louder indoors than it is outdoors?
A No. What typically happens is the level inside is substantially lower than what you're measuring outside.
Q With any frequency of sound?

A Yeah, as a general rule.
Q Are there any frequencies that travel better through walls than other frequencies?
A Sure, sure. The lower frequencies pass through a given construction much more easily than high frequencies.
Q And when you say low frequency, what is the kind of baseline low frequency that's going to make it through the wall?
A Any frequency down to 1 hertz.
Q But up to what hertz level?
A Well, let's say from 20 hertz down.
Q Okay. I'm almost done. Can you please turn to your rebuttal testimony, and pull out Exhibit 3 from that testimony, please.
Now, Exhibit 3 looks like it's a comparison between the model predictions and the actual noise levels measured; is that correct?
A Is it this figure, you mean?
Q Yeah.
A Okay. Yeah. What that's showing is the black figures in the middle of the chart are the sound level at 1,000 feet from an isolated wind turbine in three different directions measured over 14 days.
Q So there are actually three black lines in here?

A Yeah. They all kind of are similar.
Q And the -- I guess it would be the Y axis at the bottom, that represents a total of 14 days?
A That's right.
Q So my first question is we see some peaks, correct?
A Yes.
Q What length of time is one of those peaks? Is it an hour, a minute, a second?
A This data was measured in ten-minute increments, and there's a couple of -- well, there is a very prominent spike right in the middle of the survey, that was probably 20 to 30 minutes in duration.
Q That spike?
A Yeah.
Q Is every spike -- is every little point a ten-minute average or 30-minute average?
A Well, the sound level data appears as a continuous line; but it's actually made up of many, many thousands of ten-minute samples all strung together.
Q What I'm trying to figure out is for how long was it that loud when we see a peak? Does this graph give us that information?
A Well, from having looked at graphs like this a lot, I can tell there's -- this peak in the middle is, like I said, probably 20 to 30 minutes long.

Q And where was this measurement taken? What state?
A This is at a site in Minnesota that was in an extremely rural area, not near any roads or towns or anything. And it was just in a wide open field.
Q And near what wind farm?
A Prairie Star, I believe it's called.
Q And do you know the make and model of the turbine?
A I think it was a Vestas V90.
Q And do you know what the power output was?
A The electrical power output? It was 2 megawatt, I think.
Q And do you know how tall the turbine was?
A I think it was on a typical 80 meter mast. This is just taken as an example just to compare modeling versus what you measure.
Q So with an 80 meter mast it would be probably around 400 -- 360, 370 feet?
A Right, right.
Q And this 14-day period was in August?
A That's correct.
Q Is there a certain month of the year where the winds are stronger?
A Well, it varies at every site. I don't know what the wind rose was at this particular site, I don't recall.

Q As a general matter in Minnesota, is it windier in the winter or in the summer?
A I think it's the wintertime there.
Q And you agree that in August there are generally more leaves on the trees, more grass on the ground, more birds?
A Yes.
Q Now, looking at this, we do see several points where there are exceedances over 40 decibels; is that correct?
A Yes. Remember, this is only a thousand feet away.
Q Right. But there are exceedances over 40 decibels?
A That's right.
Q Now, this bold red line looks like it is -- the first bold line at the top is using that 0.0 coefficient --
A Yes, that's right. Um-hmm.
Q -- modeling? And the second line down is using the .5 coefficient?
A Right.
Q And then there's a very, very faint red line down below and that's the 1.0 coefficient?
A Right.
Q Now, if the standard was you may not exceed 40 decibels at night, looking at this graph, would you think that there are exceedances?

A Yeah. It does go over 40 for this particular measurement setup, these distances and so on.
Q On average it doesn't, but it does go up there, it goes above it?
A Right. Well, that's typical.
Q So it is typ -- are you saying that it's typical that there are -- that the actual sound does exceed the modeling at certain times? Would that be a correct assumption?
A Oh, most definitely, yes.
MS. BENSKY: That's all I have.
MR. REYNOLDS: Could we take a break?
EXAMINER NEWMARK: It will be short if we do it now. It will be longer if we wait 'til after he's done.
MR. REYNOLDS: I'd rather take a short break. It's going to be at least a half hour.
EXAMINER NEWMARK: All right. Let's take 20 minutes.
(Recess taken from 12:15 to 12:43 p.m.)
(Change of reporters.)
EXAMINER NEWMARK: Okay. There's a motion to move Mr. Hessler's study that he footnoted in his testimony, and that would be --
MS. BENSKY: Footnote 3, page 11 of

direct.

EXAMINER NEWMARK: Okay. And his -- Exhibit 5 it would be, we would mark it as 5.

Any objections to that?

MS. BRANT: I'm sorry, Your Honor, would it be 5 or 6? We have a pending with 4 that was denied, but potentially to be admitted later.

MS. NEKOLA: And then we have 5.

MS. BRANT: Exhibit 5, which is his pseudo notice.

MS. BENSKY: So 6. 4 was marked.

EXAMINER NEWMARK: So 5 is still pending.

Let's go off the record.

(Discussion off the record.)

EXAMINER NEWMARK: So Hessler 6, any objections? No. Okay. It's in the record.

(Hessler Exhibit No. 6 marked and received.)

EXAMINER NEWMARK: All right. I think, Mr. Hessler, remember you're under oath, and you're available for cross.

CROSS-EXAMINATION

BY MR. REYNOLDS:

Q Mr. Hessler, I have a couple of questions for you. You testified that you were struck by the testimony of the Shirley Wind people.

A Yes. That's correct.
Q Why is that?
A Because of the -- because it's completely credible, and I don't doubt it at all.
Q And do you doubt -- is it significant to you that the residents testified that they had no problems before, and when they left the site, their symptoms disappeared?
A Yeah. That's very simple. It appears to be due to the project there.
Q And what -- was that one of the reasons you wanted to do some testing of Glacier Hills? Sorry, at Shirley.
A Yes. And I think what's needed is to get to the bottom of why that is.
Q And what -- is it fair to say that the symptoms that they complained of, such as headache, nausea, ear problems, are consistent with exposure to low frequency sound?
A Yeah, I think that's true. Of course it depends on the magnitude of the sound, whether you're affected or not, but because specifically one fellow said he lived one mile away, that means that it's the only possible sound that could travel that far would be low frequency noise.
Q And so what -- what has -- what's been the result of

your effort to test up there? What would you have to do and what request did you make, and what were the results?
A Well, we came up with a preliminary test plan where we had identified one or two units that were kind of isolated so we could kind of more or less scientifically measure them, and I think we submitted that to the project up there so they would know they were abound. But at first we didn't hear anything, and I think they finally said, well, they don't want to -- we're welcome to participate, but they don't want to do it.
Q And what were you planning to actually test for?
A Well, low frequency specifically. And what we had in mind was to test using a procedure that's outlined in IEC standard 61400, which is a procedure for measuring the sound power of wind turbines. It's what all manufacturers use. But the point is that that methodology uses a reflecting board that you put on the ground and then you lay the microphone right on the board, and the reason for that is that the wind speed is theoretically zero at the surface. So you're largely eliminating self-contamination from pseudo-noise that we talked about a bit earlier because it's very, very difficult to measure low

frequency noise because it's covered up by cell noise of wind. It's a real technical challenge.
Q And let me ask you this. You've noted that there are significant differences. There's -- there's a significant difference between, say, Mr. Bump's testimony and the three individuals who abandoned their homes at Shirley?
A Right.
Q Now, there are different machines at the farms, right?
A That's right.
Q What's at Glacier Hills?
A Those are Vestas V90.
Q And what's the output?
A I think they're 2 megawatt.
Q All right. And what are the ones at Shirley?
A They're the Nordex N100, and that's two and a half -- I don't remember.
Q And the -- that's one of the machines that's proposed at this Highland project; is that right?
A One of the three that are being considered. It's prominent in these analyses I think just because it has a slightly higher sound power level, but that's the only reason it's really being looked at carefully.

Q All right. Are you aware of recent low frequency noise from large turbine literature that describes findings of higher low frequency noise from larger turbines, those in the 2.3 to 3.6 megawatt category?
A Yeah. I have heard that, but my sense is that -- well, what strikes me is how remarkably similar the sound power level is of all the turbines that are in current use all the way from one-and-a-half-megawatt units up to 3-megawatt units. They're all remarkably similar in my view.
Q Well, are you familiar with a 2010 low frequency noise from large turbines work by Henrik Moller and Christian Pedersen on the subject?
A Yeah. Yeah, I've read that, but some time ago. And I think they do some sort of analysis, and it appears that it maybe is a little bit louder in the lower frequencies for larger turbines, but that may be true slightly.
Q So you would point to the potential cause of the Shirley complaints to the machine itself?
A Yeah. I think -- I think this sort of problem is related to the specific turbine. Now, before yesterday when I heard that testimony, my view is that those kinds of problems were principally associated with the Vestas V82 in its early form that

had stall-regulated blades instead of pitch-regulated blades. But this is the first I've heard of a problem with a N100 site. I've worked with project that put in N90s and N100s and there aren't any problems at that site, so it's puzzling.
Q Let me ask you this. You have -- you heard testimony about your recommended noise level design goals, right? That's a paper that you and your dad and -- you and your dad put together?
A Yeah.
Q All right. And would you -- your findings indicate that a 40-decibel level in the A range, that's the audible range, is ideal?
A Yeah. And the reason for that is that we found that there are few, if any, complaints at houses where the outside level was 40 or less.
Q And so in an ideal world, if it would be possible to have a project where the maximum level is 40 --
A Uh-huh.
Q -- is it fair to say that we probably wouldn't see the citizens come in here and talk about the need to abandon their homes?
A I think what you would see is a lack of complaints about audible noise and amplitude modulation, things like that, but that 40 dBA level really is not

connected in any way to this infrasonic situation.
Q The dBA level would be connected with sleep disturbance?
A Yeah. It's the audible noise, the swishing sound that you can hear, you know, as Mr. Bump said yesterday.
Q Well, let me ask you this. There have been some references to the sound of these turbines being at 40 dBA being like the sound of a refrigerator. Do you agree with that?
A No. There's no -- nothing that you can compare it to. It's not a constant sound. It's not particularly loud, but it does have a time variance to it that kind of calls attention to itself, and it depends on the specific wind conditions and how much turbulence there is and time of day. All kinds of factors go into it so, yeah, it's more noticeable than other things.
Q So that that you're referring to is the swishing sound or the noise amplitude?
A Yeah. And that -- that does occur, but that is not always the principal characteristic. In fact, I spent a lot of time at wind projects, and it's more or less a steady kind of -- I use the word churning sound. It's -- but there's not -- you don't always

or often see pronounced swishing or amplitude modulation.
Q Would you -- is it fair to say then that the sound from turbines combines three separate variables or parameters: one is audible sound in the dBA range; two is low frequency or infrasound in the very low to nonaudible range; and three would be the amplitude modulation from the -- from the pulsating action of the turbine blades?
A Yeah. I think the first and the third one are kind of related, but --
Q Well, is it fair to say that there's a difference in the ability of folks to sleep, for instance, if the sound is like white noise, just steady, as opposed to pulsating noise?
MR. SCRENOCK: I'm going to object, Your Honor. I'm not sure that Mr. Hessler's been qualified as an expert on sleep disorders.
EXAMINER NEWMARK: He has testified on people's reactions to sound, I think. Isn't that what he's been saying?
MS. NEKOLA: No, I don't think that's accurate.
EXAMINER NEWMARK: No? People complain, certain distances and --

MS. NEKOLA: Well, that's correct, but not specific health or sleep reactions, just complaints.

MR. REYNOLDS: Well, he's done investigation on complaints. He's analyzed ideal -- I mean, it's a pretty simple question. I mean, I'm not calling him to ask him an opinion to a reasonable certainty, but just a correlation between this aspect of wind turbine noise and sleep disturbance.

EXAMINER NEWMARK: Yeah.

MR. SCRENOCK: I understood his question to be asking the witness whether a particular parameter as he described it, wind turbine noise, what would cause someone to have difficulty sleeping, and I don't believe that is within the realm of what Mr. Hessler's been testifying on.

EXAMINER NEWMARK: Well, I'm going to let him answer. He can say he doesn't know.

THE WITNESS: You know what I would say to that is, I think it's the highly variable nature of wind turbine noise that appears to lead to sleep disturbance because you can be standing next to a turbine and it makes -- it will be making a certain sound, and then the next minute it will suddenly get louder and then get quieter again. And I think those changes, I think, may be associated with people waking up and having problems sleeping.

BY MR. REYNOLDS:

Q How about the whistling sound that Mr. Bump talked about?

A You know, that -- well, I think he said it was a foghorn sound. That's the way I would describe it. That's with a hydraulic pump that's in the nacelle of every one of those turbines, and it is a constant mechanical noise. He mentioned that it varied, but what he's really talking about is the yaw mechanism to move the nacelle back and forth, that's variable, that comes and goes, but the hydraulic noise is constant. That's just a feature of that particular model turbine.

Q All right. You have made a recommendation -- well, let me ask you this first. With respect to the modeling, you took a look at the Applicant's model, which predicted using the N100 predicted 45 residents would be potentially over 45 dBA, right? You saw that info?

A Yeah. That was with the -- I think the initial application where they were using a ground absorption coefficient of zero.

Q That's right. And when you used a ground absorption

coefficient of .5, you found that it would be 45 -- four houses above 45 dBA?
A Yes. That's correct.
Q And would you agree with me that if you're going to err on the side of public safety, that a more conservative model is probably a better way to plan a prospective wind farm?
A Well, when we first started analyzing wind projects 10 years ago or more, and we didn't know if the model was accurate or not, they would put on a safety factor and so on. Now since that time, we've had the opportunity to do a lot of testing and compared what's actually measured to what's predicted, and we found the best agreement, the most realistic agreement, is when you use .5 ground absorption. That gives the closest correlation to what's actually found out there.
Q All right. But you agree with me that models -- your data shows that the models are generally consistent but not perfectly on track with reality?
A Yeah. What the model gives you is the long-term average level from the project at a given point, and what we always made clear in our reports is that that is the average, and the actual level is going to vary commonly by plus or minus 5 dBA, sometimes by more.

It will get noise spikes like we were looking at a few minutes ago in that example. That's just the nature of a wind turbine.
Q So the 45 dBA which you're advocating for is not a maximum, it's an average?
A Yeah. That's a given. I'm glad you brought that up. Yeah. In this paper where we recommend that, we say what should be limited to 45 is the main long-term average level at each house. There's no practical way to maintain a level below a threshold like 45 or even 50 all of the time. That never happens. There's always spikes due to weather conditions and things. They're short-lived, but they're almost unavoidable.
Q All right. So then for a 45 dBA average, then you might have spikes up to, say, 45, but probably not over 50?
A I got mixed up in that. Can you --
Q All right. If you had the ideal target of 40 dBA, if that were -- if that were basically the target here measured by the model, and that would mean that there would be levels at the farm of up to 45 but probably not beyond 50 dBA?
A Yes. Yeah, it would go -- if you say designed to 40 at a particular point, the actual level would vary

above and below that up to 45, within the 35-45 range, and there would be probably rare spikes to 50, even more than 50.

Q So with respect to your ideal level, that's based upon your evaluation of various venues and examining available complaints from residents?

A Right, right. And those levels -- well, you know, those -- that phenomenon where the level varies happens at every site. So what we did was we measured the main long-term level at all of these houses, and that's what's tabulated there is how many people were complaining between 40 and 44. That's the main long-term level between that range. You know, so at any given house they might be exposed to, let's say, a level 43, but the actual level might have gone up to 50 at times and down to 35. That happens everywhere. So I'm trying to keep everything on a level playing field.

Q All right. Now, assuming that the project could be redesigned for a 40 dBA, making that assumption, that would be your preferred dBA limit, would it not?

A Well, it would be better for everyone if that were the actual performance of the project, but typically it's not practical or feasible to achieve that level at most projects. I would say 90 percent.

Q So are we talking about economic development versus the public interest to be free of noise complaints?
A I think it's just fundamental economics of the project. To make 40 at a given site, you may -- oftentimes you have to remove so many turbines that the project just becomes not viable.
Q All right. But assuming for the sake of this question that this project could be redesigned for 40 dBA.
A Uh-huh.
Q You would recommend that based upon your work, right?
A That would be a good thing if that were possible, yes.
Q And there are other jurisdictions such as New York that have 38 to 40 dBA; isn't that right? I think these are noticed in your paper. California, New York. Page 98.
A Yeah. Now there that's what we talked about a little while earlier. Those are relative limits that are, like, converted to an absolute number. In New York the methodology for years has been to measure the background and then you could go over that by 5. So I think the 38 is just based on a typical background level of 33, plus 5. That's where that number comes from.

Q All right. I think you testified to this earlier that there is a significant impact with respect to noise if the ambient level is very low and with wind turbines coming in with a higher noise threshold; is that right?
A Yeah. If you had a -- in the specific example there, if the project level were higher than 45 and the background level were 16 below that, that means that the project would be dominant, the only thing you could hear pretty much. That's that situation. But the absolute limits that we're putting forward of 40-45 are based on the -- the typical setting that all of these projects normally are in. In other words, rural farm country. Those levels appear to be to our mind satisfactory given that sort of an environment.
Q This is -- is it fair to say that the Town of Forest is unique because of its very quiet background levels?
A No, I wouldn't agree with that at all. That project site is very similar to dozens and dozens of other ones that I could think of.
Q Well, but we're talking about -- what areas where people live in are quieter than these at the 20 dBA level for ambient noise?

A Well, those are the kind of levels we find in every one of these sites that's in rural farm country. When the wind is calm, the level is always 20, 25 dBA, and that happens everywhere. It's really the wind. It's really the background level when the wind is blowing that has some relevance.
Q So with respect to -- back to the Shirley Wind Project. Given the fact that the applicant here is recommending the potential use of the same machines, of the same kind of configurations at the Highland Project as the Shirley Project, would you have concerns about potential impacts in the Town of Forest that have been reported in Shirley?
A Yeah. As I think I mentioned earlier, I think the issues there are related specifically to the -- to that model turbine, and I think until that's better understood, I don't see any reason why it wouldn't repeat itself if that same turbine were used somewhere else.
Q Do you -- now, with respect to the difficulty of you being able to test at Glenmore -- are you having the same problem at Glacier Hills?
A Yeah. We asked for permission, and same sort of no response thing. Went on for a long time, and then I think, oh, what was it, the other day they officially

said, no, we don't want to do that.
Q All right. And do you think that it's -- that the Applicants would be -- that it's in the nature of good science to prevent scientists like you from gathering data?
A Yeah. You know, I think what needs doing is -- is some field testing to understand this thing.
Q And we agree that it's not completely understood?
A That's correct. Yeah.
Q And do you agree with the environmental assessment here that a certain percentage of -- of Town of Forest residents will suffer a decrease in quality of their life if this project is approved?
MR. SCRENOCK: I object to that, Your Honor. I'm not sure that Mr. Hessler's been qualified as a quality of life expert.
EXAMINER NEWMARK: Yeah. I think it's too ambiguous of a question.
BY MR. REYNOLDS:
Q All right. Have you read the environmental assessment?
A Yes. Uh-huh.
Q All right. And you -- do you remember a part in there where the environmental assessment assumes that if this project goes forward, there will be a small

percentage of Town of Forest residents who will be adversely affected as designed?
A Yeah. I would say that's a very typical conclusion at least. I mean, there's hardly any site where you can sit back and comfortably say everybody's going to be fine. I don't -- there's hardly any situation that falls into that. I can only think of one project, and it was on an island and nobody lived there, but -- but for most projects, the norm is to conclude there will probably be some small impact.
Q And so especially if the same turbines are used at Shirley, you would expect the same result in the Town of Forest?
A Well, I don't have any reason to believe that it wouldn't -- that whatever is going on there would not repeat itself.
MR. REYNOLDS: That's all I have.
EXAMINER NEWMARK: Okay. Other cross?
MR. SCRENOCK: I do, Your Honor.
EXAMINER NEWMARK: Oh, go ahead.
MR. SCRENOCK: Just a few questions.
CROSS-EXAMINATION
BY MR. SCRENOCK:
Q Mr. Hessler, I note that in your testimony, I don't need to point to any specific points, but you refer

throughout, or at least at different points, about the incidence of complaints. And in response to one of Ms. Bensky's questions earlier, you used the phrase pretty significant adverse impact. By that were you referring to the same thing in terms of incidence of complaints?
A Yeah. I'm talking about complaints and that study we were talking about before.
Q Thank you. And you had a lengthy discussion about the wind speed monitor and the level from ground where those measurements were taken. You were talking about normalizing the wind speeds to 10 meters. Was the purpose of that to essentially equate a -- excuse me -- that I'm assuming, and I guess I want to know if my assumption is correct, that the way that the model works or the reason that you normalize the time of year is that there's assumed sort of graduation of wind speed throughout the elevations and that a wind speed at 50 meters normalized to 10 meters will equate to a specific wind speed up at the hub height. Is that the purpose of the normalization?
A Yes. The -- the primary reason that I normalized it to 10 meters is because that's what we always do in these assessments. So I wanted to look at it in the

way that we normally look at field data.
Q Okay.
A I wanted to keep it consistent so I can tell what it meant relative to other sites and other situations.
Q Okay. Now, you had talked with Mr. Reynolds a little bit about the 0.0 ground absorption coefficient versus the 0.5, and I think you indicated that you used that process frequently; is that right, that type of modeling with those coefficients?
A Well, what we always do is assume .5 ground because, as I mentioned, we get the best agreement between modeled and measured results in a particular point.
Q So you don't do that for the purpose of skewing the results?
A Oh, no. No. What I'm after is, I want to know what it's really going to be at a given house.
Q And you had indicated that when you ran your model with the 0.5 ground absorption coefficient for the Highland Project, that you found that there were four houses that you identified that would be within -- above the 45 decibels. Do you know whether those houses represent participating or nonparticipating landowners?
A I didn't at the time. I have heard recently that they are all participants.

Q Okay.
A Not sure about that, though.
Q And with -- Mr. Reynolds asked you about the use of the similar model turbines from the Shirley Project, I believe that's the N100 here, and you indicated that you don't have any reason to think that the problems -- the experiences of folks wouldn't reoccur. Do you have any reason to believe that they would?
A Well, I would say we don't fully understand why there's problems at Shirley, but my belief is that it's associated with a specific turbine model and possibly the blade regulation, whether it's pitch or stall regulated. I think I would be leery about using that turbine again before more is known about it.
Q If one of the other two turbine models that were discussed being used for this project were being used, what would be your perception?
A I would be more comfortable with that because I think the other ones are the Siemens. I don't know of any other model, Siemens and one other one, but I don't -- I've never noticed any problems with those.
Q So based on whatever is going on at Shirley that we're not sure what it is, you wouldn't have reason

to expect those issues to reoccur with either of the other two models?
A That's right.
MR. SCRENOCK: Thank you. I have nothing further.
EXAMINER NEWMARK: Okay. Other questions? I believe staff goes first.

CROSS-EXAMINATION

BY MR. LORENCE:
Q Mr. Hessler, are you familiar with the PSC noise measurement protocol?
A Yes.
Q Is any part of that protocol oriented towards infrasound?
A Well, I believe the intent of it was to try to quantify low frequency sounds by involving the C-weighted sound level and pre-construction measurements and post-construction measurements. That sounds good on paper, but the problem with C-weighted levels is that they're extremely sensitive to wind induced pseudo-noise that we talked about earlier. That wind blowing over the microphone affects only the lower -- the low end of the frequency spectrum, and the C-weighted level is directly dependent on what's going on in the low end

of the frequency spectrum. So any little breeze blowing over the microphone gives you a very high obstensible C-weighted sound level.

So to answer your question, the protocol has -- calls for C-weighted measurements, but -- and we've taken that data, and what we found is that the levels before the project and after the project are identical because they're purely a function of how fast the wind was blowing.

Q So the pre-construction measurements of the protocol are you saying are not capable of measuring infrasound?

A Yeah. That's right. That you get a result from taking those measurements, but it has no actual meaning. It's a false signal that's almost purely a function of the wind speed of the microphone.

MR. LORENCE: No further questions. Thank you.

EXAMINER NEWMARK: Go ahead.

MS. BENSKY: I have a follow-up.

RECROSS-EXAMINATION

BY MS. BENSKY:

Q How do you solve that problem? How should the protocol be different to account for that?

EXAMINER NEWMARK: I think he answered

that. You lay the microphone down on the ground with a board, is that --

THE WITNESS: Can I answer?

EXAMINER NEWMARK: Well, did you answer that already?

THE WITNESS: Not exactly.

EXAMINER NEWMARK: Okay.

THE WITNESS: No. You could use that technique that I referred to, but the problem with it is a practical nature. These surveys last -- or need to last for a period of weeks to get -- catch all kinds of wind speeds and times of day, and you can't leave a microphone sitting on the ground. You know, if it rains or snows, it destroys the equipment. So those kinds of measurements have to be attended. So to -- I suppose if you wanted to document the pre-existing conditions, you would take much shorter term measurements using -- perhaps using that technique and taking short band sample, but it's very -- it's a very challenging thing to measure.

BY MS. BENSKY:

Q And are you aware of any -- switching gears a little bit. Are you aware of any study that correlates wind turbine make and model with a particular number of

complaints? Is there anything that the Commission can look at that would be helpful in deciding the turbine model that would likely produce the least amount of complaints?
A No. Most turbine models have no known noise issues associated with them. The only ones -- there's only one or two that I'm aware of that have -- that are kind of special cases and have issues. I mentioned the Vestas V82, or at least in the format what used to be built five years ago. That -- I think that one's a problem. But -- but of the ones being considered here, only the Nordex appears to have possibly something going on with it.
Q So is the answer that you're not aware that that has been studied?
A No, it hasn't been specifically studied.
Q And one last question. To maintain absolute limit of 45 dBA that is never exceeded, what would -- what should the project be designed at?
A Yeah, that's a good question. It has to be substantially lower than that to allow for temporary noise spikes, up to 10 dBA below. Now, that issue has been around for a while of these temporary exceedances. What I suggested, and I wrote some siting guidelines for Minnesota Public Utilities

Commission, and what I say in there is that, well, if the measured level is in compliance 95 percent of the time or more, then I would consider it in compliance. So there has to be some allowance for these temporary excursions because they're essentially unavoidable.
Q But that -- but that 10 decibel drop is consistent with your recommendation in your paper that 35 dBA at night should be the limit ideally, correct?
A Well, that wasn't the conclusion of the paper, but --
Q Are those two consistent?
A Yeah.
MS. BENSKY: Thank you.
MR. REYNOLDS: Have one follow-up question.
EXAMINER NEWMARK: One. All right.

RECROSS-EXAMINATION

BY MR. REYNOLDS:
Q I wanted to show you, and I just want to identify this. I marked it as Hessler A. I don't have copies, but I just want to know if this is the paper that shows that -- that you referred to that shows that larger turbines above .2 -- .23 have higher low frequency levels than less than 2? Is that the paper you were referring to?
A Yes, I believe that's what this paper says. As I

said, I haven't read it for years.

MR. REYNOLDS: Okay. And -- yeah, it's Hessler Exhibit No. 8. I just wrote on it.

MS. NEKOLA: Your Honor, we object. We haven't seen this.

MR. REYNOLDS: Yeah, I understand. I am just marking it so that he can identify it.

EXAMINER NEWMARK: What's his next exhibit?

MS. NEKOLA: It would be 7.

MR. REYNOLDS: Okay.

EXAMINER NEWMARK: It would be 7 anyway. Okay. Are you trying to move it in now at this point?

MR. REYNOLDS: I don't have to move it in now. I just wanted him to identify it and then I have one follow-up question.

EXAMINER NEWMARK: Well, based on this exhibit?

MR. REYNOLDS: Well, okay. Let me do a backup question.

BY MR. REYNOLDS:

Q What is the title of the exhibit that you're looking at?

A Low frequency noise from large wind turbines.

Q And is the premise of that article that large wind turbines above point -- 2.3 megawatts tend to have more low frequency sound than turbines less than 2 megawatts?

EXAMINER NEWMARK: He's already answered that. No. He's already answered.

MR. REYNOLDS: Okay.

BY MR. REYNOLDS:

Q Do you know, the other turbines that are proposed here are above 2.3 megawatts, are they not?

A There's been so much focus on the N100 that I don't even remember what the other two models were.

Q Well, if -- if I told you that they were above 2.3 megawatts, then they would -- those turbines would fall within the definition of larger turbines as outlined in that paper, right?

A Yeah, I suppose so, but I would point to a figure in that paper --

EXAMINER NEWMARK: Okay. Let's hold on, though. We're really running far afield if we're going to be digging into this exhibit since there's an objection already based on entering it in the record. Any response to that objection? You want to move it?

MR. REYNOLDS: Well, yeah. I think it's

relevant because the testimony about low frequency noise, I think this witness has talked about that it's not a big deal, and here we may have an answer with respect to why there's a difference between the wind turbines at Shirley, which are 2.5, and the lack of low frequency symptoms at Glacier Hills, which are less than 2, and the fact that this witness thinks there are low frequency problems at Shirley. So that the question is, well, we could use the other turbine, but there's still within the gamut of these larger turbines. So I think it's relevant to that, and I -- I'm certainly willing to give the -- my colleagues a chance to look at this. I only had one copy. It came up, you know.

EXAMINER NEWMARK: Timing has been an issue here. Do you guys have a response? Clean?

MS. NEKOLA: Just -- it's the same response. We haven't had a chance to look at this. Mr. Hessler hasn't seen it for a long time, and I don't see the relevance. I'm confused really what you're trying to do here.

MR. REYNOLDS: Difference between Glacier Hills and Shirley is --

EXAMINER NEWMARK: I'm going to leave it out.

EXAMINER NEWMARK: We're not going to put it in, and I think he's actually answered these questions anyway. It's already on the record, so it would be repetitive at this point. And let's move on.

MR. REYNOLDS: Okay.

MS. NEKOLA: Can we go off the record a minute?

(Discussion off the record.)

EXAMINER NEWMARK: All right. Back on the record. Do you have anything else?

MR. SCRENOCK: No.

EXAMINER NEWMARK: All right. I had some questions, but at the risk of opening up another whole round of cross, I'll forgo it.

Any redirect?

MS. BRANT: Yeah, we have some redirect.

REDIRECT EXAMINATION

BY MS. BRANT:

Q Mr. Hessler, you talked with Ms. Bensky about your Exhibit 3 in this proceeding?

A Yes. Uh-huh.

Q Can you just clarify for us the purpose of Exhibit 3?

A Yeah. It was just to give a generic example of actual measurements of wind turbine sound compared to

APPENDIX C – Sound Report

SOUND LEVEL ASSESSMENT REPORT

Buffalo Ridge Wind Project
Lincoln County, Minnesota

Prepared for:

Buffalo Ridge Wind, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

Prepared by:

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July 16, 2019

6.0 MODELED SOUND LEVELS

6.1 Sound Sources

6.1.1 Project Wind Turbines

The sound level analysis for the Project conservatively includes 47 wind turbines, of which seven (7) are considered alternate locations. Of these 47 wind turbines, 37 wind turbines are GE 2.82-127 units, five (5) are GE 2.5-127, and five (5) are GE 2.3-116 units. All proposed wind turbines have LNTE blades. The GE 2.82-127 and the GE 2.5-127 wind turbines have a hub height of 89 meters and a rotor diameter of 127 meters. All GE 2.82-127 and GE 2.5-127 wind turbines have a hub height of 89 meters and a rotor diameter of 127 meters. A technical report from GE[8] was provided to Epsilon which documented the expected sound power levels associated with the GE 2.82-127 LNTE and the GE 2.5-127 LNTE wind turbines. These sound power levels are defined as "calculated apparent" by the turbine manufacturer and therefore do not include any uncertainty factor.

All GE 2.3-116 wind turbines have a hub height of 80 meters and a rotor diameter of 116 meters. A similar technical report from GE[9] was provided to Epsilon that documented the expected sound power levels associated with the GE 2.3-116 LNTE wind turbine. These sound power levels are defined as "calculated apparent" by the turbine manufacturer and therefore do not include any uncertainty factor.

6.1.2 Project Substation Transformer

In addition to the wind turbines, there will be a collector substation associated with the Project in Lincoln County. The substation is proposed to be located southeast of wind turbine #20 as shown in Figure 6-1. One 125 megavolt-ampere (MVA) transformer is proposed for the substation. Epsilon has estimated octave-band sound power levels using the MVA rating provided by Atwell and techniques in the Electric Power Plant Environmental Noise Guide (Edison Electric Institute), Table 4.5 Sound Power Levels of Transformers. Table 6-1 summarizes the sound power level data used in the modeling.

8 General Electric Company, Technical Documentation Wind Turbine Generator Systems 2.x-127 with LNTE – 60 Hz Product Acoustic Specifications, 2018.

9 General Electric Company, Technical Documentation Wind Turbine Generator Systems 2.3-116 with LNTE 50 Hz and 60 Hz Product Acoustic Specifications, 2015.

Table 6-1 Modeled Substation Transformer Sound Power Levels

Maximum Rating	Broadband dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB
		Sound Power Levels per Octave-Band Center Frequency [Hz]								
125 MVA	100	96	102	104	99	99	93	88	83	76

6.1.3 Existing Non-Project Wind Turbines

As discussed in Section 5, existing non-Project wind turbines are currently in the vicinity of the Project Area and are assumed to remain as operational. To predict the future wind turbine sound levels in the vicinity of the Project, a desktop cumulative modeling analysis was conducted which included the sound level contribution from these non-Project turbines. Coordinates and descriptions for these turbines were based upon publicly available data from the USGS Wind Turbine Database[10]. According to the database, wind turbines of Ruthton Wind Farm make up a total of 24 non-Project wind turbines within the vicinity of the Project Area that were included in the modeling. Based on information indicated in the USGS Turbine Database, the wind turbines were modeled as Vestas V47-660 units. The V47-660 wind turbine model has a hub height of 65 meters and a rotor diameter of 47 meters. Sound power level data for this wind turbine type were available to Epsilon in the WindPRO WTG Catalog. WindPRO is a software suite developed by EMD International A/S and is used for assessing potential environmental impacts from wind turbines. Only broadband total sound power levels were available for the V47-660 unit in the WindPRO Catalog. The maximum available broadband sound power level for the Vestas unit indicated in the WindPRO Catalog is 102 dBA. The modeled sound level for these non-Project wind turbines assumed a +2dB uncertainty factor, and therefore was 104 dBA.

6.1.4 Future Non-Project Wind Turbines

Southeast of the Project Area, another wind energy facility, Lake Benton Wind II, is under construction. Epsilon performed the pre-construction sound level assessment for Lake Benton Wind II, details of which are provided in a report dated May 1, 2018.[11] To predict the future wind turbine sound levels near the Project, a cumulative modeling analysis was conducted which included the sound level contribution from these approved new turbines. Coordinates and descriptions for these turbines were utilized from the pre-construction modeling. Lake Benton

[10] USGS (2019). U.S. Wind Turbine Database. U.S. Wind Turbine Database View. [Online.] Available at https://eerscmap.usgs.gov/uswtdb/viewer/#10/44.2225/-96.2195

[11] Epsilon Associates, Inc. Sound Level Assessment Report Lake Benton Wind II Project Pipestone County, Minnesota. Maynard, MA. May 1, 2018.

Wind II is comprised of a total of 44 wind turbines southeast of the Project Area.[12] These wind turbines will be referred to throughout this report as “future non-Project” wind turbines. Of the 44 wind turbines, 33 wind turbines are GE 2.3-116 units, six (6) are GE 2.3-116 LNTE units, two (2) are GE 2.1-116 units, and three (3) are GE 2.1-116 LNTE units. All GE 2.3-116 wind turbines have a hub height of 90 meters and a rotor diameter of 116 meters. All GE 2.1-116 wind turbines have a hub height of 80 meters and a rotor diameter of 116 meters. A technical report from GE[13] was provided to Epsilon which documented the expected sound power levels associated with the GE 2.3-116 wind turbine. Sound levels for the GE 2.3-116 wind turbines have been assumed for the GE 2.1-116 model in this analysis based on direction from NextEra Energy Resources, LLC. These sound power levels are defined as “calculated apparent” by the turbine manufacturer and therefore do not include any uncertainty factor.

6.1.5 All Wind Turbines within the Vicinity of the Project Area (Project + Existing Non-Project + Future Non-Project)

A sound level model was generated to predict future wind turbine related sound levels in the community produced by combining the proposed Project, the existing non-Project wind turbines, and the future non-Project wind turbines. This modeling scenario therefore included a total of 115 wind turbines (47 Project-related, 24 existing non-Project, 44 future non-Project) as described in the previous subsections.

6.2 Modeling Methodology

The sound impacts associated with the proposed wind turbines were predicted using the Cadna/A sound level calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The benefits of this software are a more refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections (if applicable), drop-off with distance, and atmospheric absorption. The Cadna/A software allows for octave band calculation of sound from multiple sources as well as computation of diffraction.

Inputs and significant parameters employed in the model are described below:

- *Project Layout:* A Project layout dated June 28, 2019 was provided by Atwell. The 40 proposed wind turbines and 7 proposed alternates were conservatively input into the model. The Project will also have one 125 MVA transformer at a collector substation. The location of the substation transformer in the model was estimated based on plans

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12 It is Epsilon’s understanding that the four (4) alternate wind turbines will not be constructed and were therefore excluded from this modeling analysis.

13 General Electric Company, Technical Documentation Wind Turbine Generator Systems 2.3-116 with LNTE 50 Hz and 60 Hz Product Acoustic Specifications, 2015.

received from Atwell on January 24, 2019. The proposed wind turbines are identified in Figure 6-1 and location coordinates are provided in Appendix C.

- *Existing Non-Project Wind Turbine Locations:* Coordinate locations of the existing non-Project wind turbines within the vicinity of the Project Area were provided by Atwell on February 21, 2019. These wind turbines are shown in Figure 6-2.

- *Future Non-Project Wind Turbine Locations:* Coordinate locations of the approved Lake Benton Wind II turbines in proximity to the Project Area were consistent with the Lake Benton Wind II pre-construction modeling identified in the May 1, 2018 report; however, four (4) wind turbines were excluded from the modeling in this assessment as it is Epsilon's understanding that the alternate wind turbines that will not be constructed. These wind turbines are shown in Figure 6-2.

- *Parcel Participation:* A dataset containing participation status information for property parcels in the proximity of the Project was provided by Atwell on May 28, 2019. Parcels identified as leased within the dataset are participating and are indicated as such on Figure 6-1. Consistent with the Minnesota Department of Commerce's Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota, dated August 2010, properties in the vicinity of the Project not participating in the Project will have turbines set back at least 3 rotor diameters (RD) from their property in non-prevailing wind directions and at least 5 RD from their property in prevailing wind directions from each wind turbine (5 by 3 setback). Therefore, any parcel located in Lincoln or Pipestone Counties that is closer than these setbacks must be a participating parcel for the Project. Accordingly, any non-leased parcel closer than these setbacks has been assigned a "participating-assumed" status.[14] A setback data layer was provided by Atwell and is shown on Figure 6-1. All other parcels are considered non-participating. Participation status used throughout this analysis is shown in Figure 6-1.

- *Modeling Receptor Locations:* A modeling receptor dataset was provided by Atwell on March 12, 2019. Receptors identified as barn, shed, garage, or silo were excluded from modeling. Therefore, the remaining 411 receptors identified as mobile home, residential, and industrial were input into the sound level model. These receptors were modeled as discrete points at a height of 1.5 meters above ground level to mimic the ears of a typical standing person. Participation status for each modeling receptor was assigned based on the data presented in Figure 6-1. All modeling receptors are identified in Figure 6-3 and are distinguished as either participating, participating-assumed, or non-participating.

  A modeling grid with 20-meter spacing was calculated for the entire Project Area and the surrounding region. The grid was modeled at a height of 1.5 meters above ground level

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[14] One parcel within the setback limitations in Pipestone County was not included in the May 28, 2019 data but has been indicated as participating-assumed in the subsequent figures in this report.

for consistency with the discrete modeling points. This modeling grid allowed for the creation of sound level isolines.

- *Terrain Elevation:* Elevation contours for the modeling domain were directly imported into Cadna/A which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.

- *Source Sound Levels:* Sound power levels used in the modeling were described in Section 6.1. Documentation from GE provided levels that represent "worst-case" operational sound level emissions for the Project's proposed wind turbines. The WindPRO software package provided sound levels for the existing non-Project wind turbines to represent "worst-case" emissions. For the future non-Project wind turbines, Epsilon used sound power level data from the pre-construction modeling described in the May 1, 2018 report.

- *Uncertainty factor:* No uncertainty factor was provided by the wind turbine manufacturers; however, based on experience with other wind turbine manufacturers and wind turbine sound modeling, an uncertainty factor of 2.0 dBA was assumed and added to the sound power level for each modeled wind turbine (Project, existing non-Project, and future non-Project).

- *Meteorological Conditions:* A temperature of 10°C (50°F) and a relative humidity of 70% was assumed in the model.

- *Ground Attenuation:* Spectral ground absorption was calculated using a G-factor of 0.5 which corresponds to "mixed ground" consisting of both hard and porous ground cover. This method yields more conservative results (i.e., higher sound levels) as the vast majority of the area is actually agricultural. An exception was made for a large body of water in the vicinity of the Project, Lake Benton, where a G-factor of 0 was used.

Octave band sound power levels corresponding to the highest available wind turbine broadband sound power level for each wind turbine type including uncertainty were input into Cadna/A[15] to model wind turbine generated L_{eq} sound pressure levels during conditions when worst-case sound power levels are expected. These calculations were performed for Project plus existing non-Project wind turbines plus future non-Project wind turbines, Project wind turbines only, existing non-Project wind turbines only, and future non-Project wind turbines only. Sound pressure levels were modeled at 411 receptors within the vicinity of the Project Area. In addition to modeling at

[15] The one exception to this approach was for the Vestas wind turbine where only a broadband sound level was available.

discrete points, sound levels were also modeled throughout a large grid of points, each spaced 20 meters apart to allow for the generation of sound level isolines in each modeling scenario.

Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by Epsilon, were implemented in the Cadna/A model to ensure conservative results (i.e., higher sound levels), and are described below:

- All modeled sources were assumed to be operating simultaneously and at the design wind speed corresponding to the greatest sound level impacts.
- As per ISO 9613-2, the model assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation.
- Meteorological conditions assumed in the model (T=10℃/RH=70%) were selected to minimize atmospheric attenuation in the 500 Hz and 1 kHz octave bands where the human ear is most sensitive.
- No additional attenuation due to tree shielding, air turbulence, or wind shadow effects was considered in the model.

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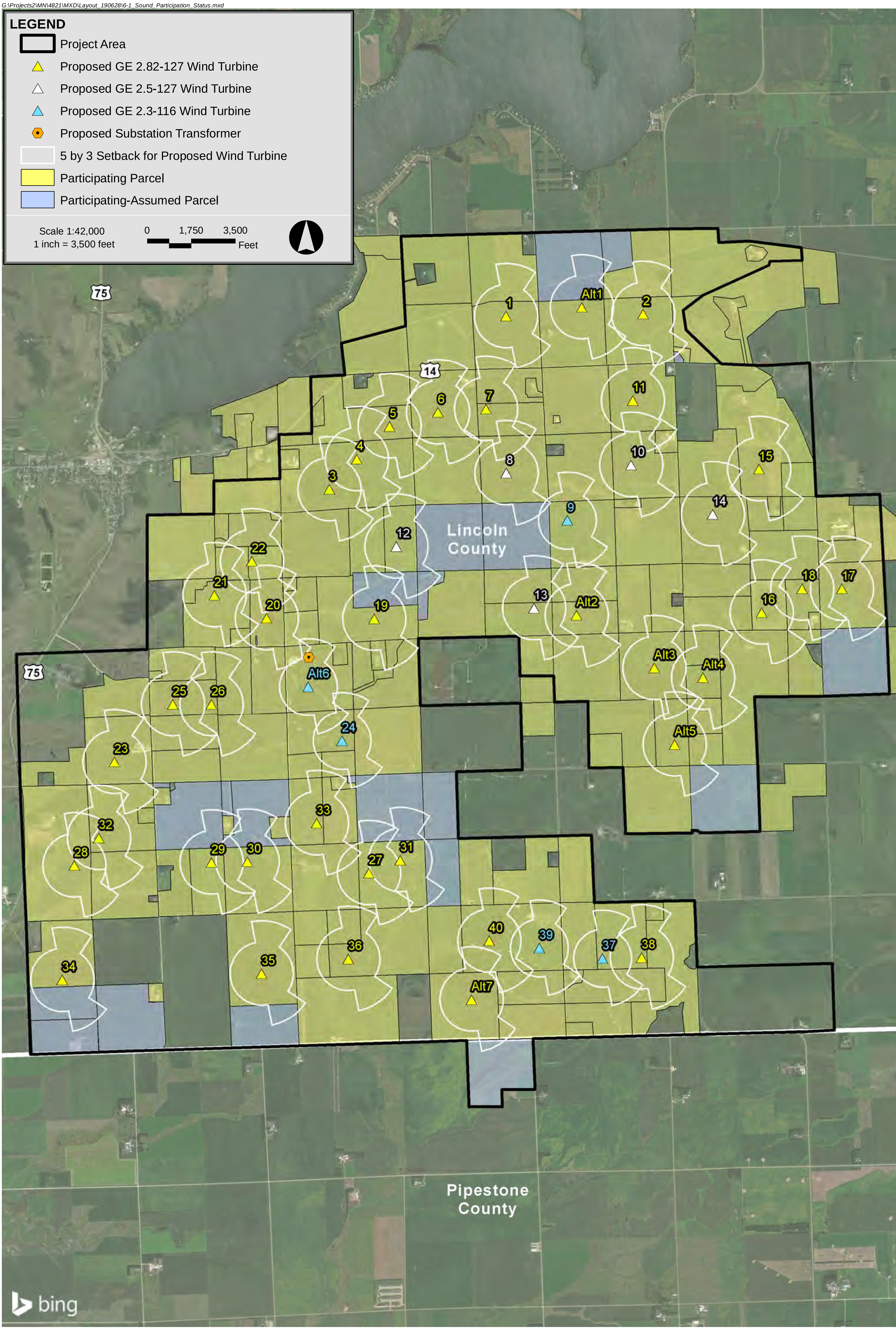
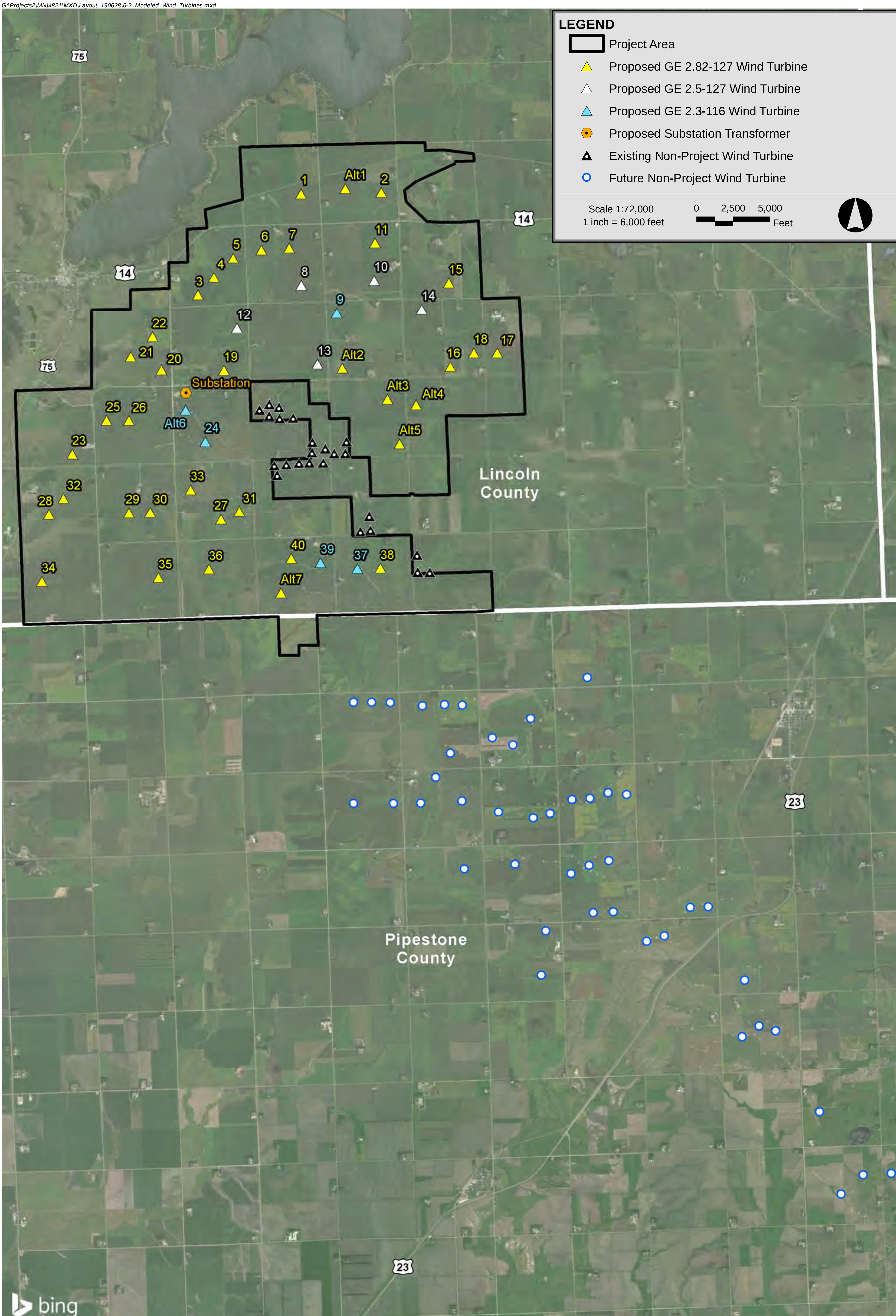


Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon

Figure 6-1
Participation Status



Buffalo Ridge Wind Project **Lincoln County, Minnesota**

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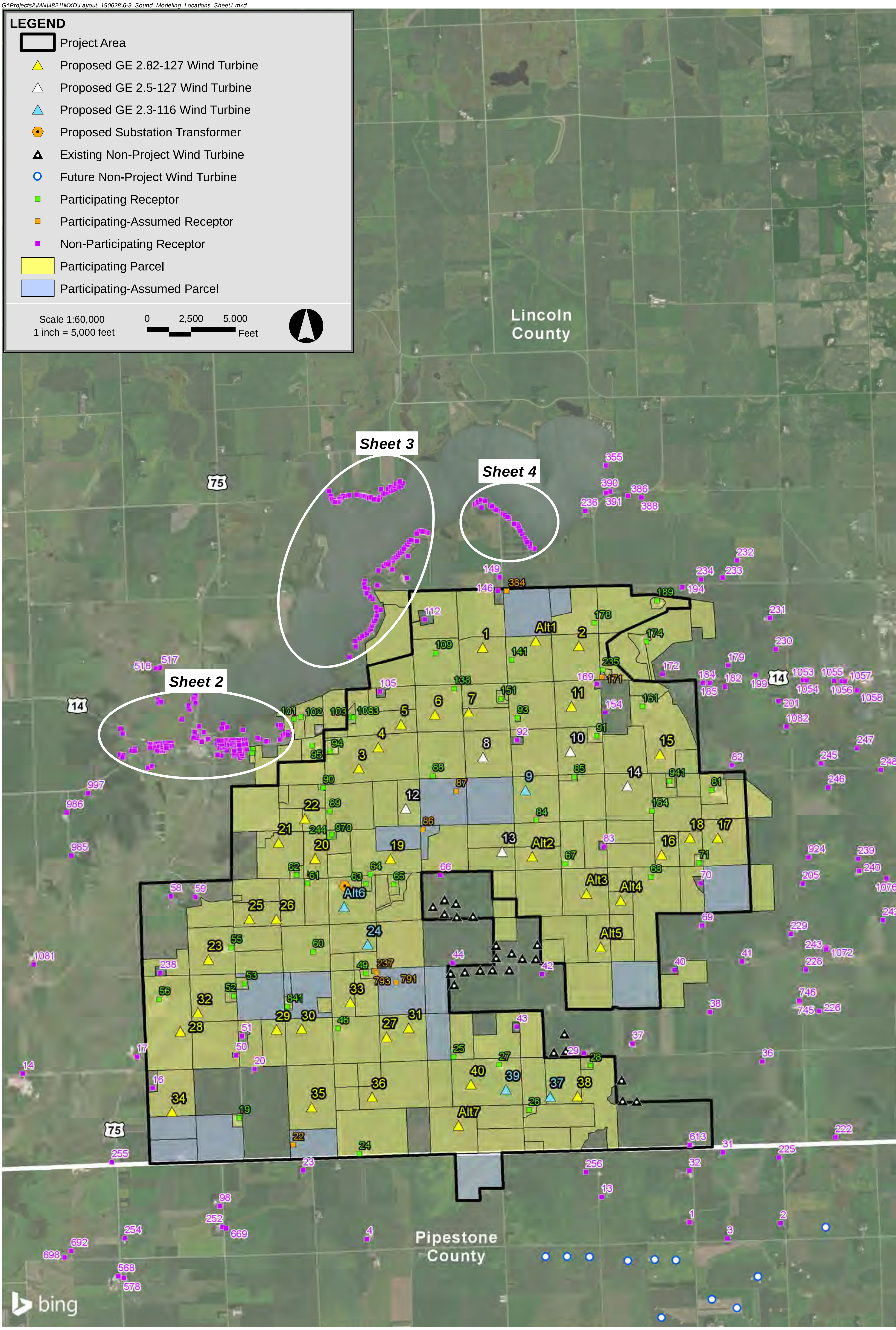
Figure 6-2

Modeled Wind Turbines and Substation



Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon

Figure 6-3, Sheet 1 of 4

Sound Level Modeling Locations

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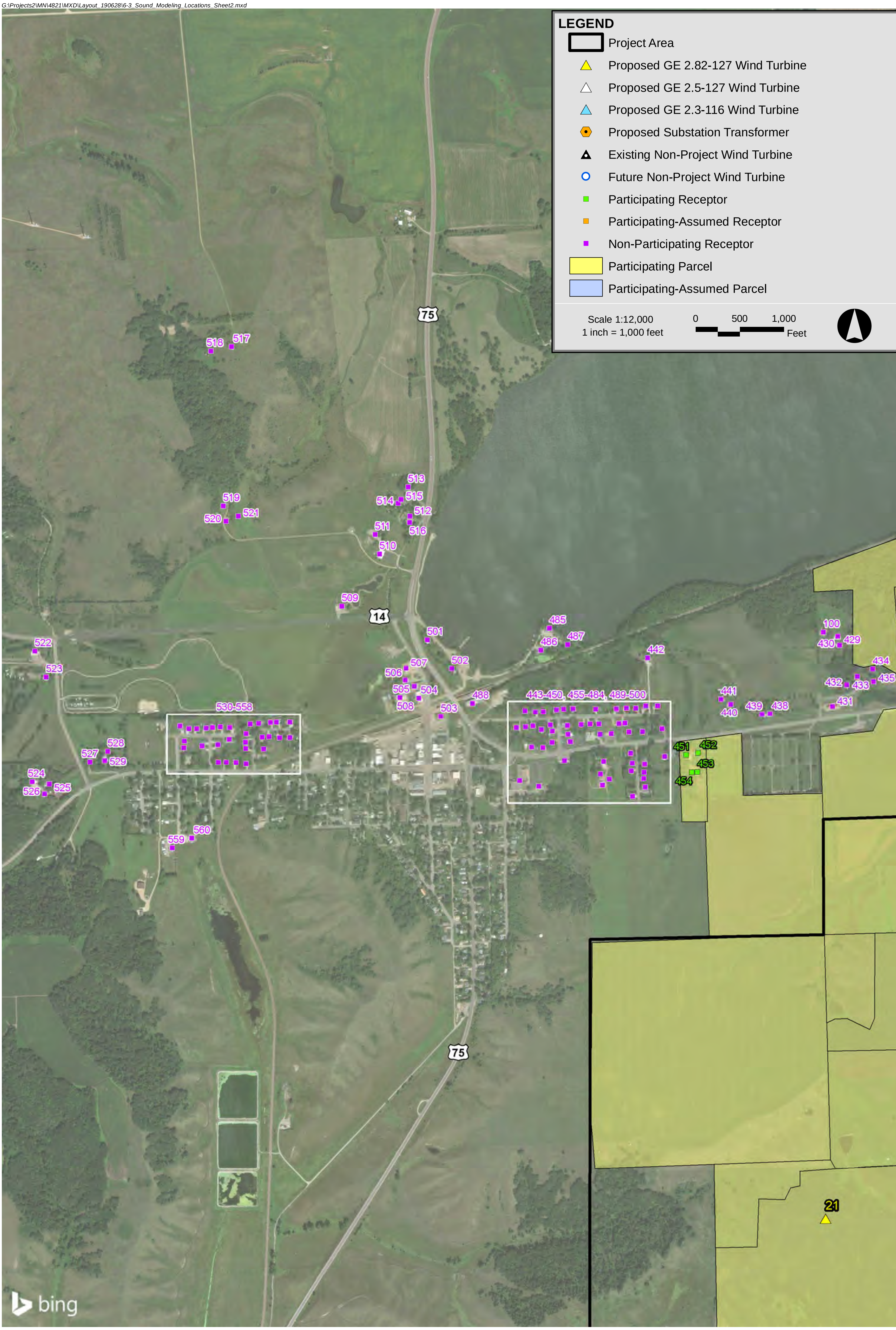

Buffalo Ridge Wind Project Lincoln County, Minnesota

Epsilon

Figure 6-3, Sheet 2 of 4

Sound Level Modeling Locations

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Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon

Figure 6-3, Sheet 3 of 4

Sound Level Modeling Locations

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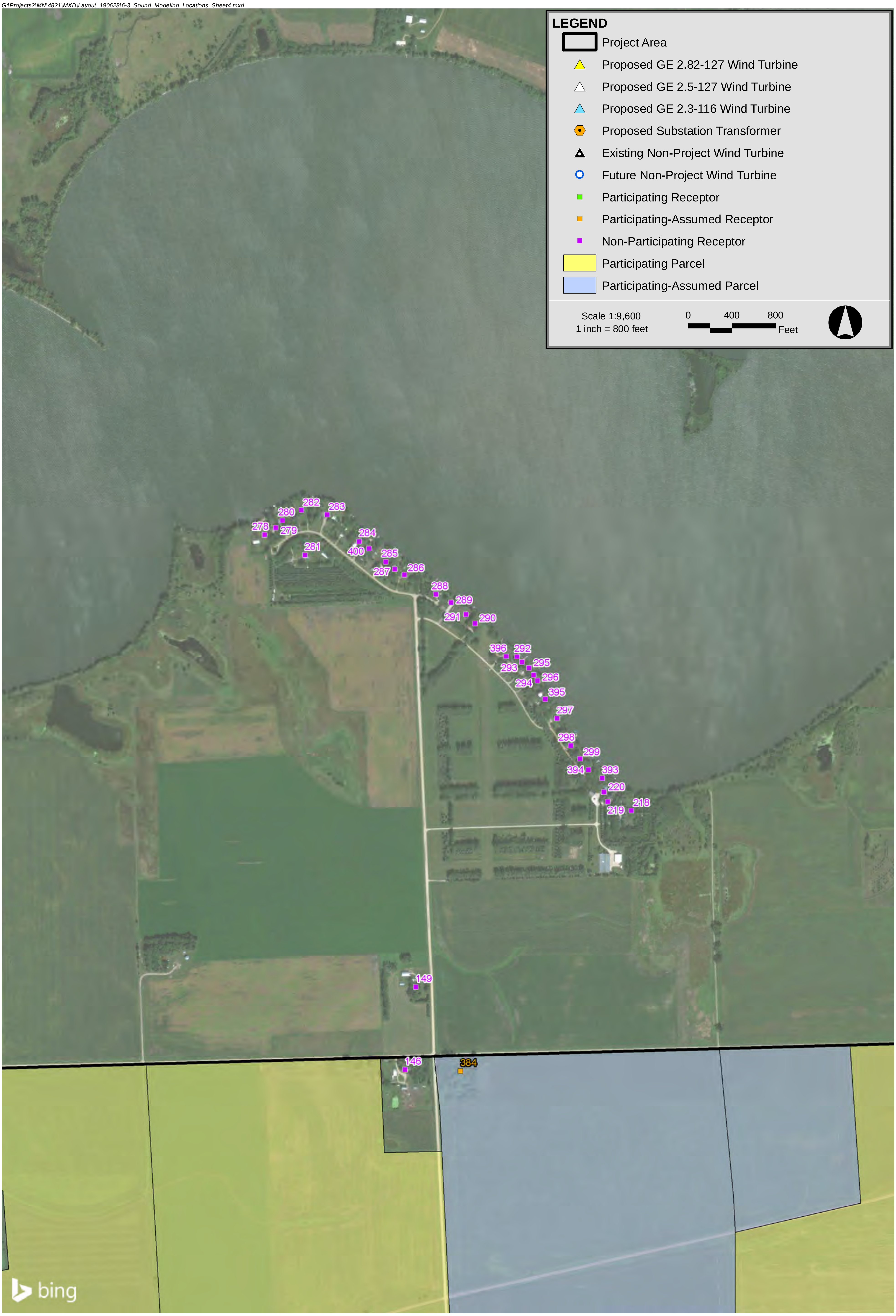

Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon

Figure 6-3, Sheet 4 of 4
Sound Level Modeling Locations

6.3 Sound Level Modeling Results

All modeled sound levels, as output from Cadna/A are A-weighted equivalent sound levels (L_{eq}, dBA). Based on Epsilon's experience in conducting post-construction sound level measurement programs for wind energy facilities, the equivalent sound level has been comparable to the median (L_{50}, dBA) sound level when the wind turbine sound was prevalent and steady under ideal wind and operational conditions.[16] Therefore, the modeled sound levels may be considered as L_{50} sound levels and directly compared to the Minnesota L_{50} limit.

6.3.1 Project + Existing Non-Project + Future Non-Project

Table D-1 in Appendix D shows the predicted "Project + Non-Project + Future Non-Project" broadband (dBA) sound levels at the 411 Noise Area Classification 1 receptors modeled within proximity to the Project. These broadband L_{50} sound levels range from 27 to 52 dBA and represent the worst-case future L_{50} sound levels produced solely by wind turbines near the Project following the Project construction. The maximum modeled sound level of 52 dBA is at non-participating receptor #44. Receptor #44 is less than 600 feet from an existing non-Project wind turbine. The second highest modeled sound level is 49 dBA, which occurs at participating receptors #841, 244, and #62. In addition to these discrete modeling points, sound level isolines generated from the modeling grid are presented in Figure 6-4. The sound levels presented in the tables and in the figure do not include any contribution from other existing sound sources in the area.

6.3.2 Project Only Results

Table D-2 in Appendix D shows the predicted "Project Only" broadband (dBA) sound levels at the 411 Noise Area Classification 1 receptors modeled within proximity to the Project. These broadband L_{50} sound levels range from 27 to 49 dBA and represent the worst-case future L_{50} sound levels produced solely by the Project wind turbines. The maximum modeled sound level of 49 dBA occurs at participating receptors #841, 244, and #62. In addition to these discrete modeling points, sound level isolines generated from the modeling grid are presented in Figure 6-5. The sound levels presented in the tables and in the figure do not include any contribution from other existing sound sources in the area.

6.3.3 Existing Non-Project Only Results

Table D-3 in Appendix D shows the modeled "Existing Non-Project Only" broadband (dBA) sound levels at the 411 Noise Area Classification 1 receptors within proximity to the Project. These broadband L_{50} sound levels range from 0 to 51 dBA. The maximum L_{50} sound level of 51 dBA is predicted at non-participating receptor #44 which results from existing non-Project wind turbines only. This sound level significantly contributes to the Project + existing non-Project + future non-Project wind turbine sound levels discussed in Section 6.3.1. In addition to discrete modeling

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[16] Within 0.4 decibels.

points, sound level isolines generated from the modeling grid are presented in Figure 6-6. The sound levels presented in the tables and in the figure do not include any contribution from other existing sound sources in the area nor from the Project.

6.3.4 Future Non-Project Only Results

Table D-4 in Appendix D shows the modeled "Future Non-Project Only" broadband (dBA) sound levels at the 411 Noise Area Classification 1 receptors within proximity to the Project. These broadband L_{50} sound levels range from 11 to 44 dBA. The maximum L_{50} sound level of 44 dBA is predicted at non-participating receptor #1 which results from future non-Project wind turbines only. Receptor #1 is less than 2,300 feet from an future non-Project wind turbine. In addition to discrete modeling points, sound level isolines generated from the modeling grid are presented in Figure 6-7. The sound levels presented in the tables and in the figure do not include any contribution from other existing sound sources in the area nor from the Project.

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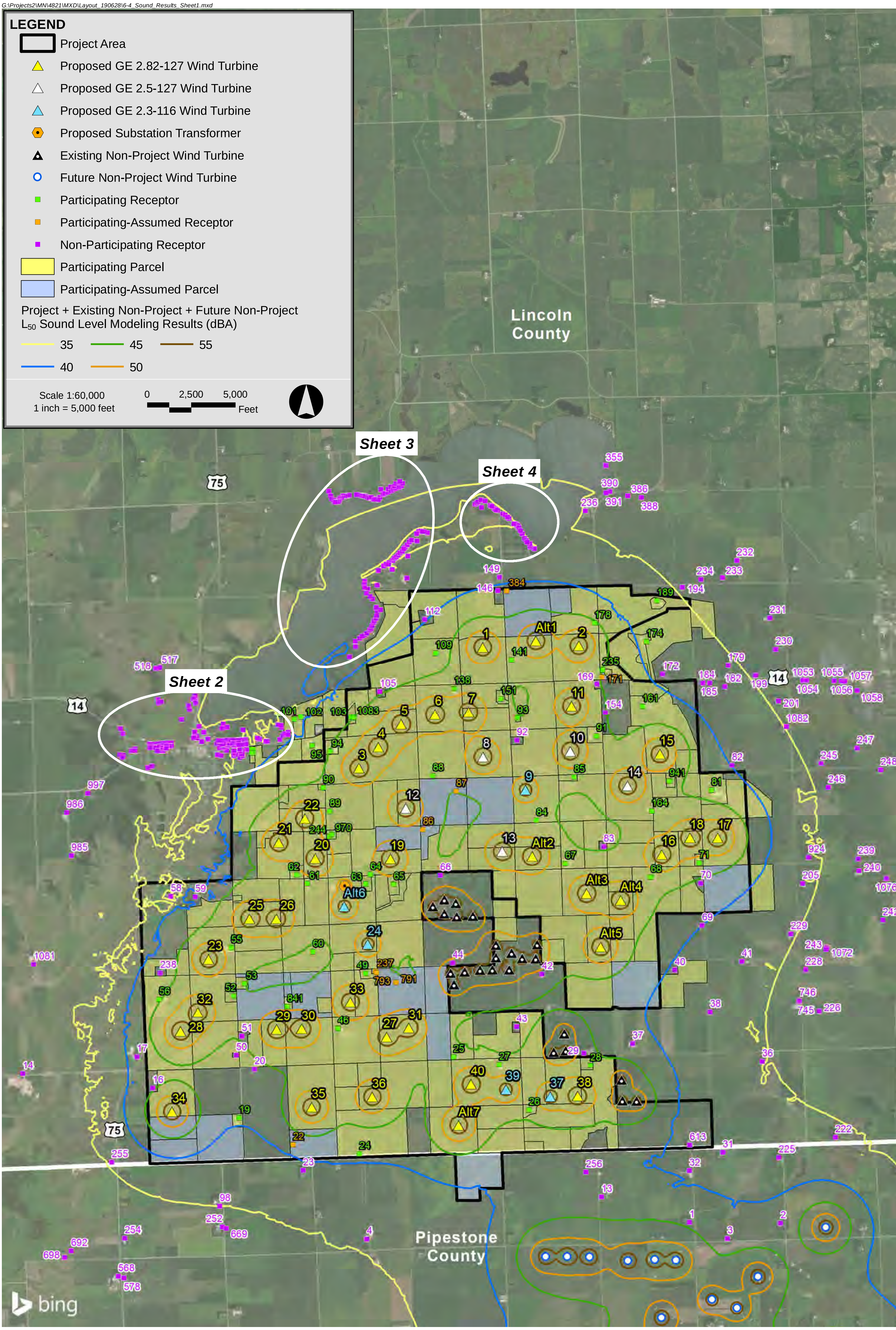

Buffalo Ridge Wind Project Lincoln County, Minnesota

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Figure 6-4, Sheet 1 of 4

Project + Existing Non-Project + Future Non-Project L_{50} Sound Level Modeling Results

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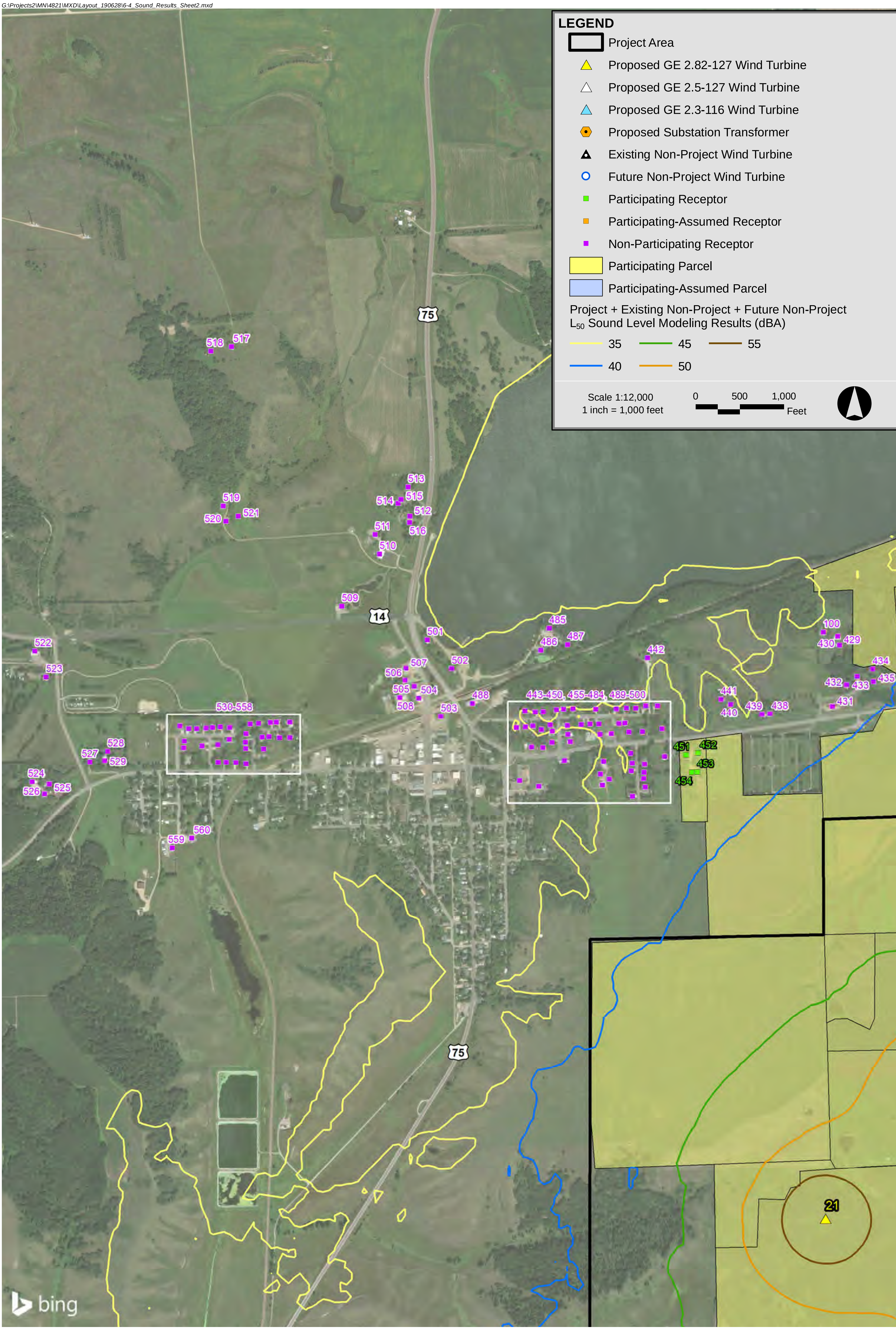

Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon ASSOCIATES INC.

Figure 6-4, Sheet 2 of 4

Project + Existing Non-Project + Future Non-Project L_{50} Sound Level Modeling Results

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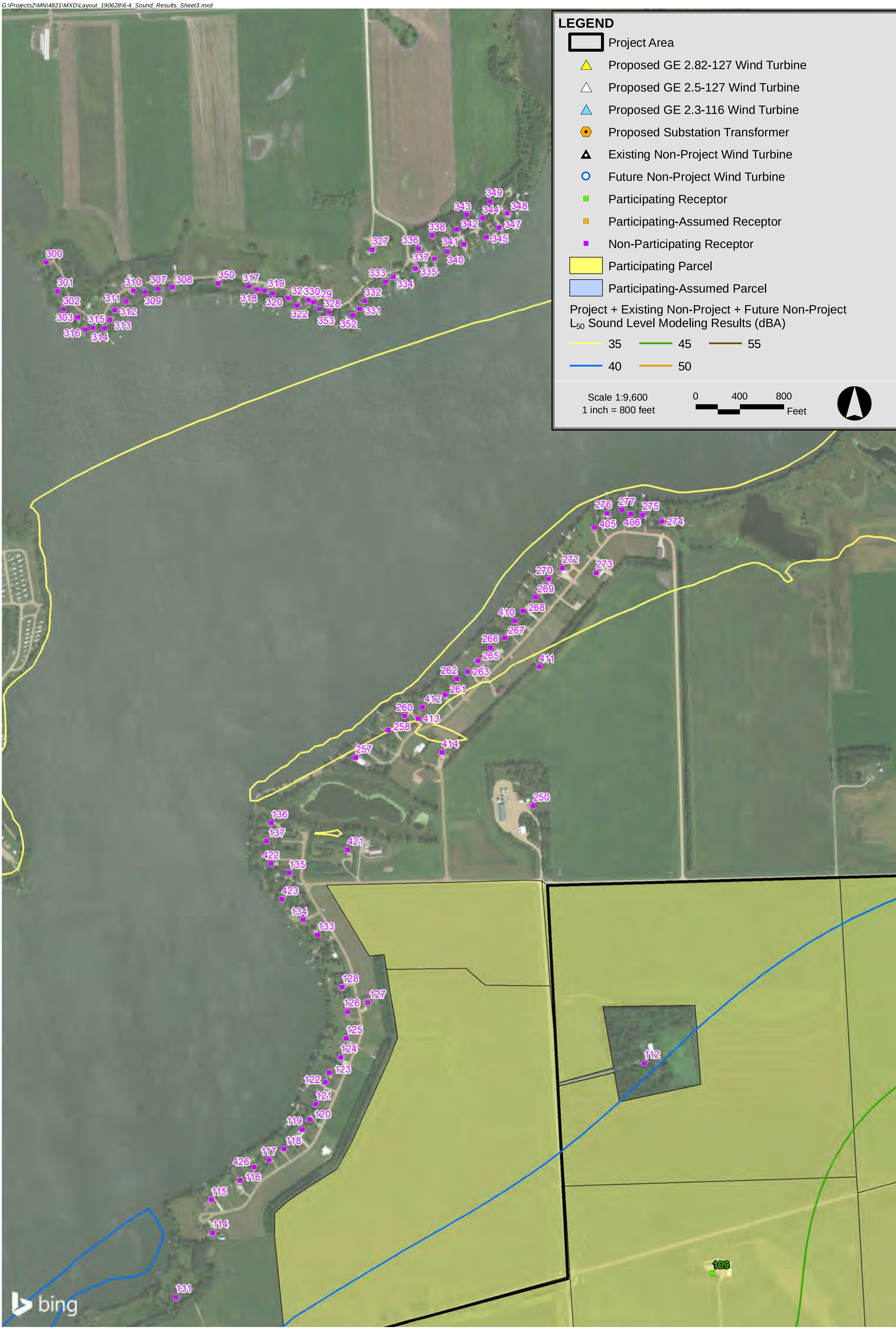
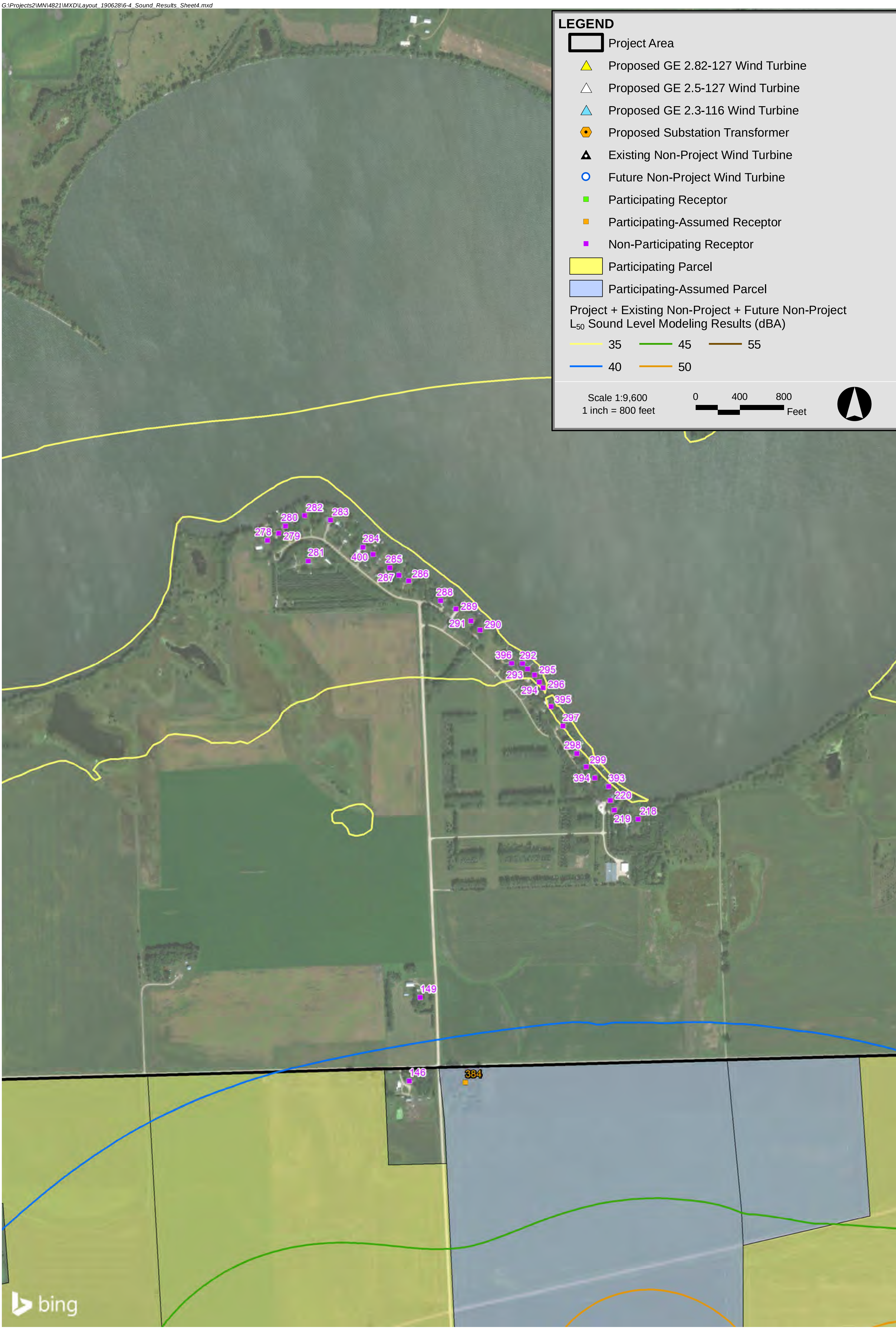


Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon ASSOCIATES INC.

Figure 6-4, Sheet 3 of 4

Project + Existing Non-Project + Future Non-Project L_{50} Sound Level Modeling Results

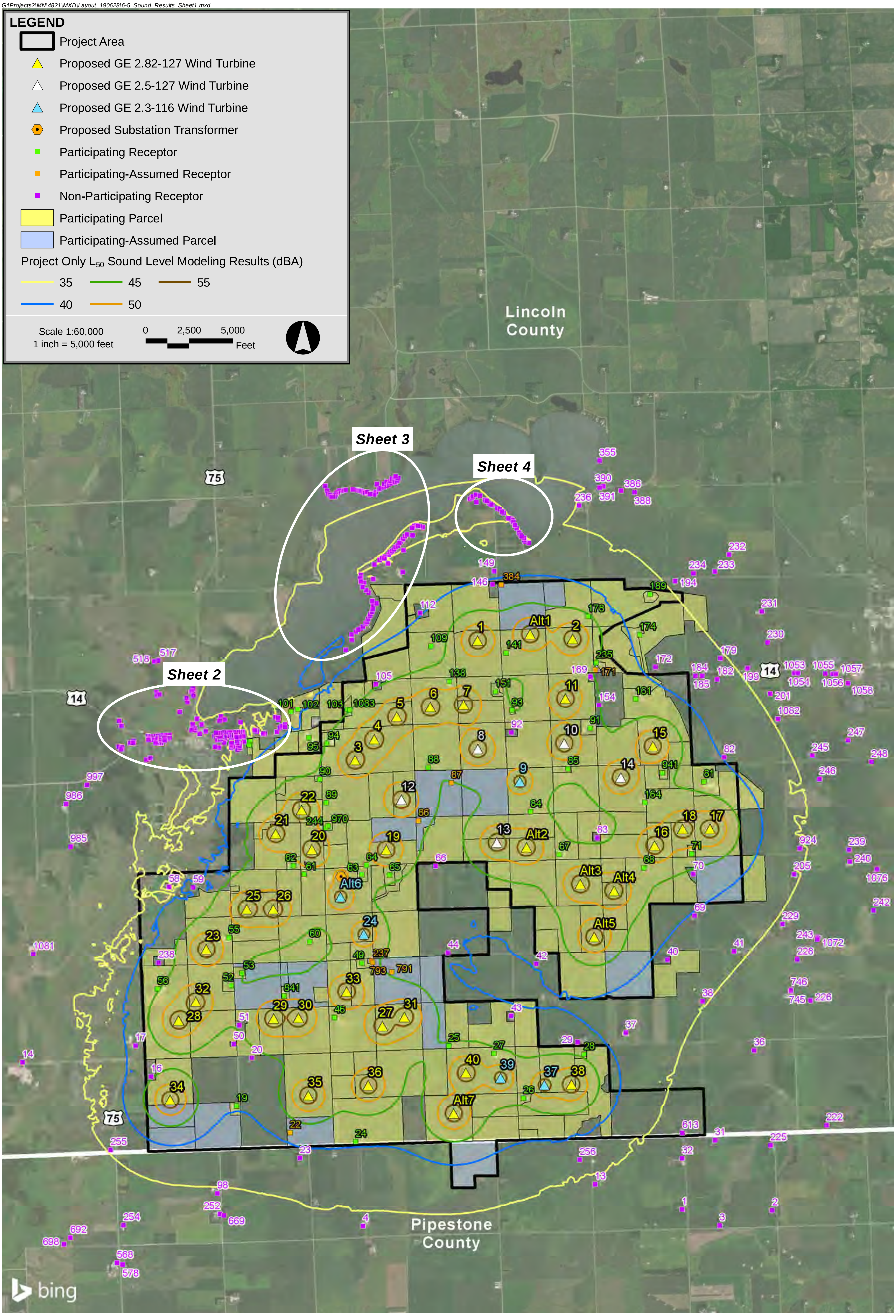


Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon ASSOCIATES INC.

Figure 6-4, Sheet 4 of 4

Project + Existing Non-Project + Future Non-Project L_{50} Sound Level Modeling Results

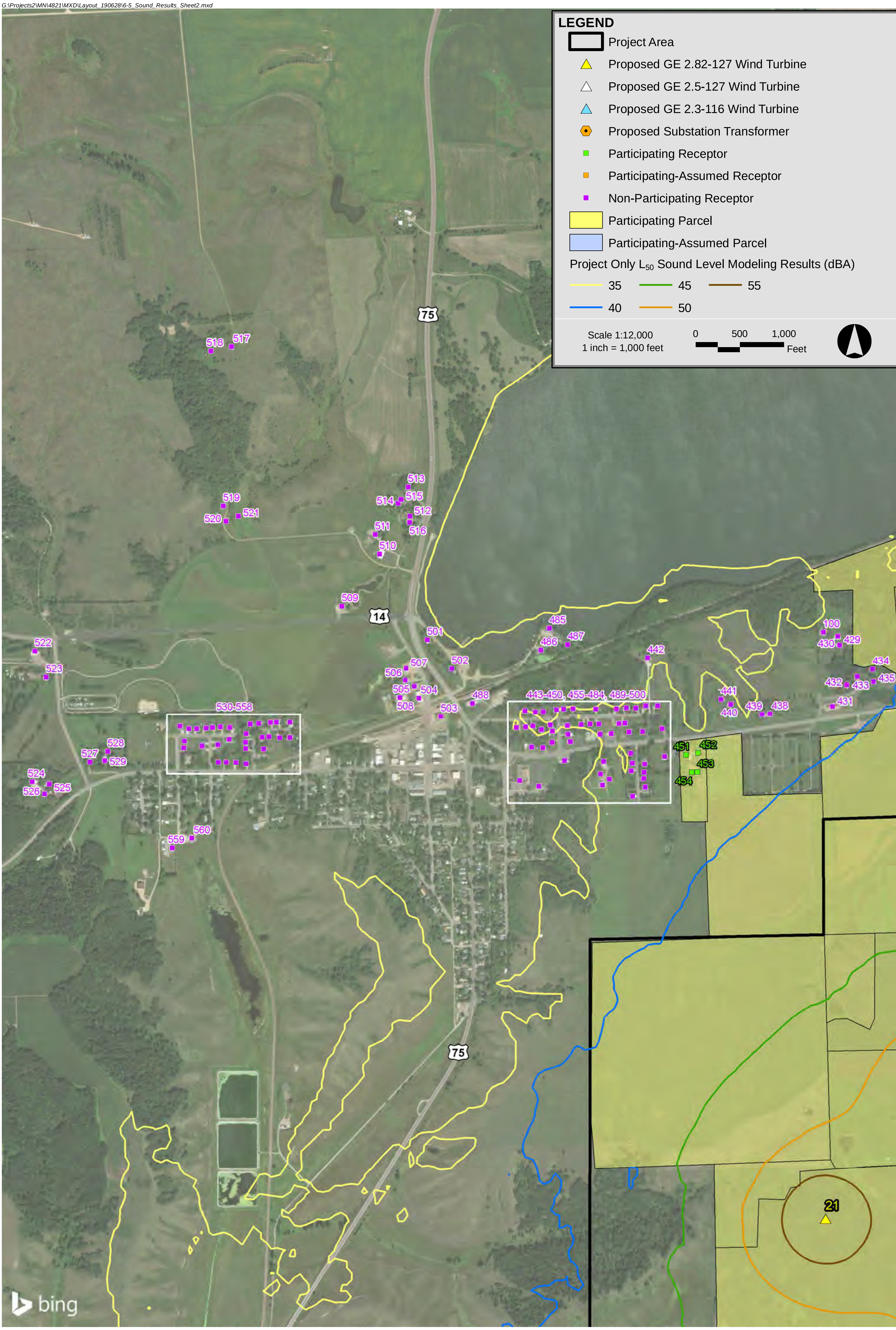


Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon

Figure 6-5, Sheet 1 of 4

Project Only L_{50} Sound Level Modeling Results


LEGEND
Project Area
Proposed GE 2.82-127 Wind Turbine
Proposed GE 2.5-127 Wind Turbine
Proposed GE 2.3-116 Wind Turbine
Proposed Substation Transformer
Participating Receptor
Participating-Assumed Receptor
Non-Participating Receptor
Participating Parcel
Participating-Assumed Parcel
Project Only L_{50} Sound Level Modeling Results (dBA)
35
45
55
40
50
Scale 1:12,000
1 inch = 1,000 feet
0
500
1,000
Feet
75
14
75
518
517
513
514
515
512
516
511
510
519
520
521
509
522
523
501
485
486
487
442
100
430
429
434
435
432
433
431
441
440
439
438
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488
443-450, 455-484, 489-500
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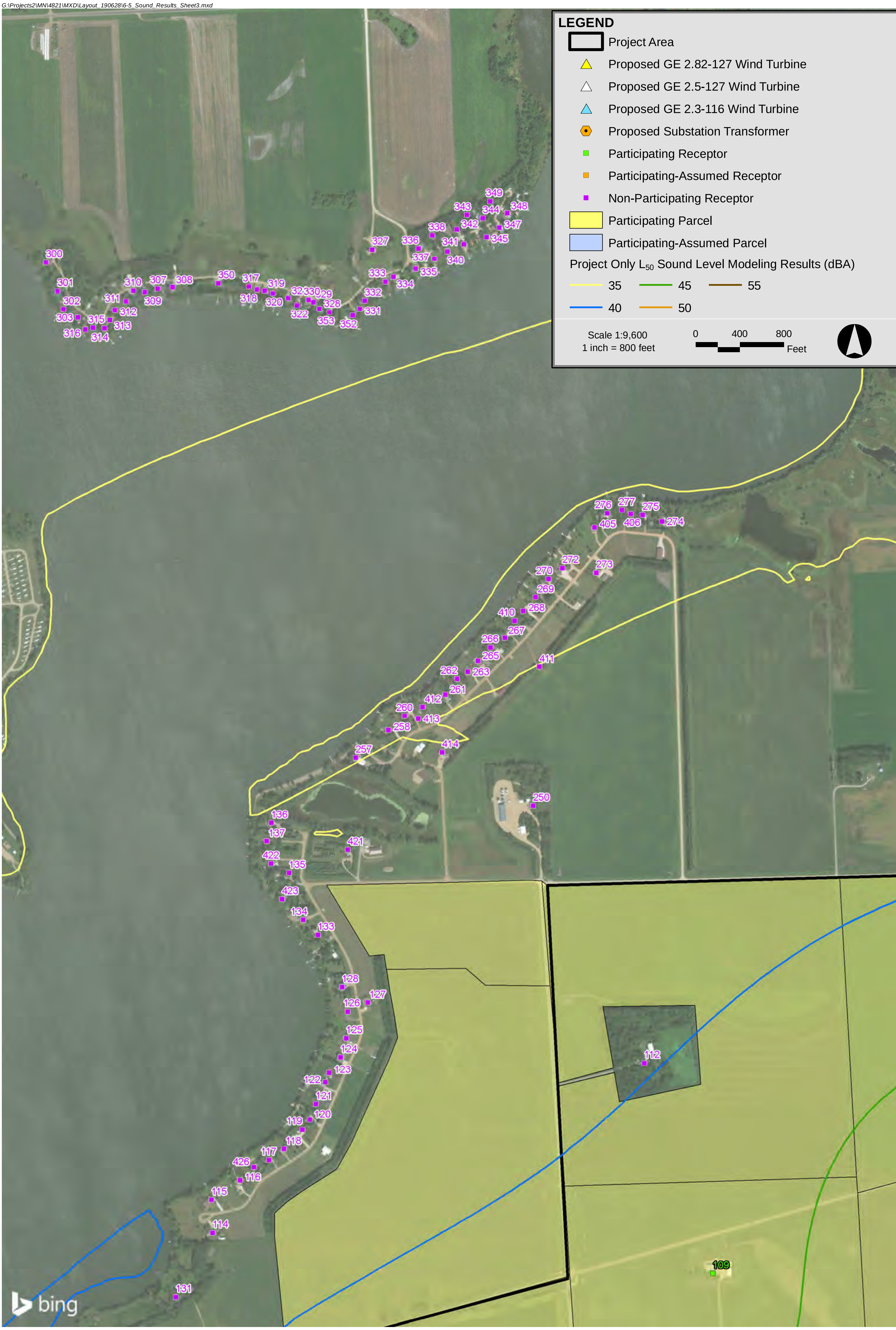

Buffalo Ridge Wind Project Lincoln County, Minnesota

Epsilon Associates Inc.

Figure 6-5, Sheet 3 of 4

Project Only L_{50} Sound Level Modeling Results

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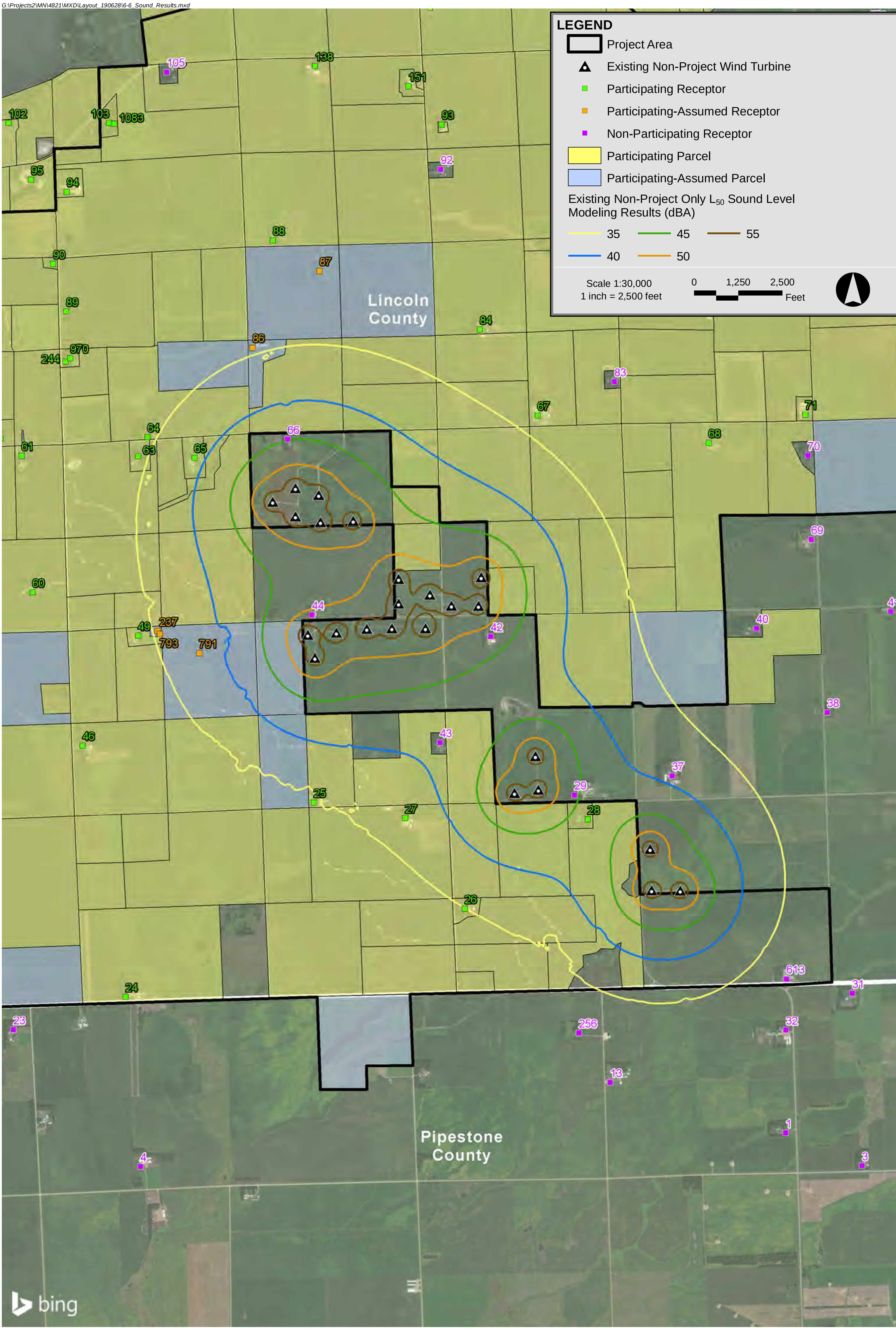
Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Epsilon ASSOCIATES INC.

Figure 6-5, Sheet 4 of 4

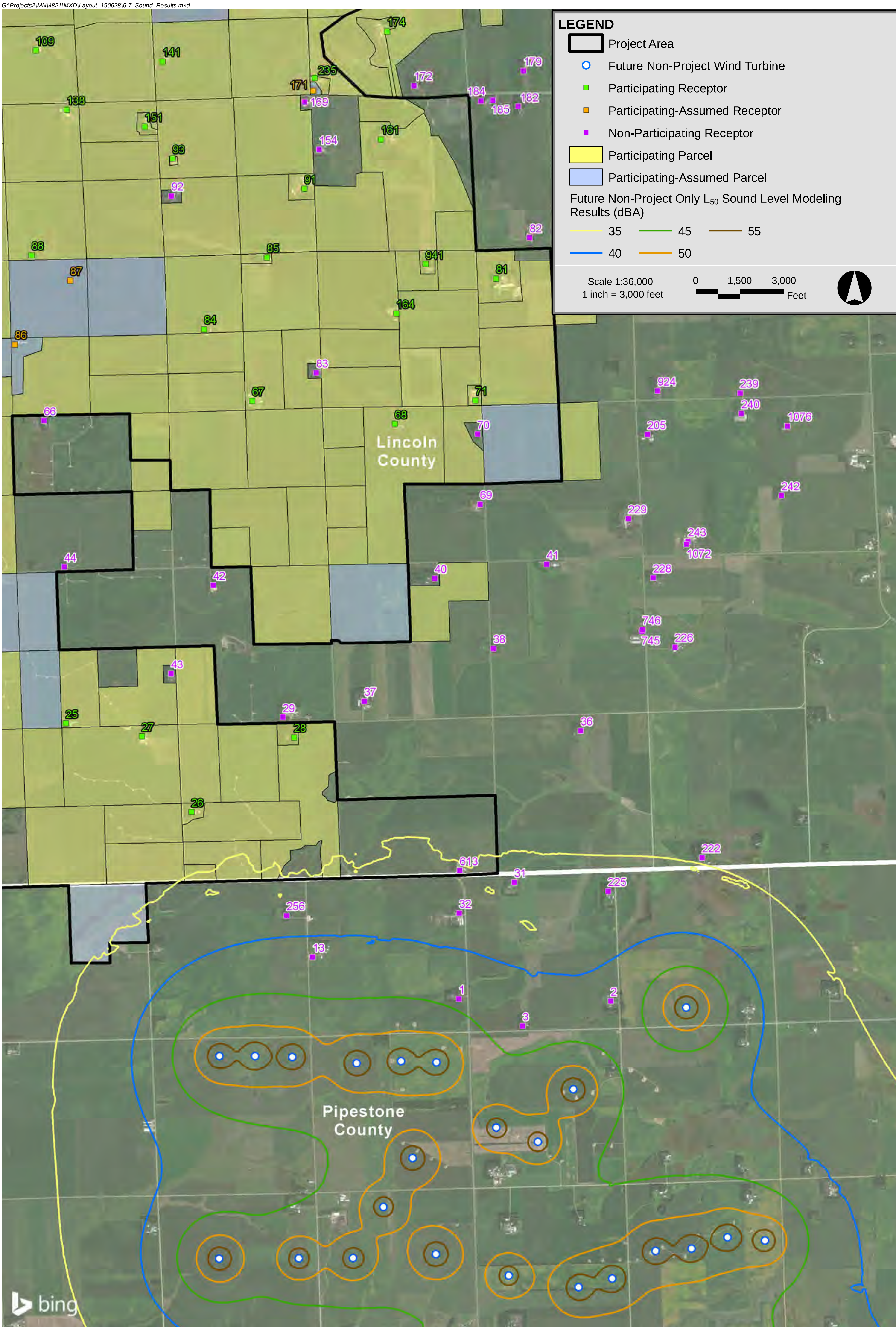
Project Only L_{50} Sound Level Modeling Results



Buffalo Ridge Wind Project **Lincoln County, Minnesota**

Figure 6-6

Existing Non-Project Only L_{50} Sound Level Modeling Results



Buffalo Ridge Wind Project Lincoln County, Minnesota

Figure 6-7

Future Non-Project Only L_{50} Sound Level Modeling Results

7.0 EVALUATION OF SOUND LEVELS

The proposed Buffalo Ridge Wind Project within Lincoln County, MN is required to comply with the sound level requirements in Minn. R. Ch. 7030 for Noise Pollution Control. NAC 1 (primarily residential) receptors are protected by the lowest sound level limits of the MPCA. Since wind turbines can operate under conditions resulting in maximum sound power, during both the day and at night, the Project would need to comply during the period with more stringent limits, nighttime. Furthermore, because wind turbine sound is generally steady, the L_{50} (median) sound level is more likely to be affected by wind turbine sound than the L_{10} which is controlled more by unsteady sound. The L_{50} limit is also more restrictive than the L_{10} limit. Therefore, NAC 1 receptors have been evaluated against the L_{50} sound level limit of 50 dBA in this analysis.

A-weighted L_{50} sound pressure levels collected during the ambient sound level measurement program at all locations ranged from 19 to 59 dBA. Nighttime measurements at locations a significant distance from the non-Project wind turbines (Locations 2 and 4) showed non-wind-turbine ambient L_{50} broadband sound levels range from 28 to 49 dBA when ground-level wind speeds were at or below 11 mph and winds at hub height corresponded to conditions in the modeling. Non-wind-turbine ambient sound levels in the Project Area fluctuate due to sound sources such as ground-level winds, vehicular traffic, and vegetation rustle, all of which can cause non-wind-turbine ambient sound levels to approach the MPCA L_{50} nighttime limit of 50 dBA based on the measured sound levels.

The predicted worst-case sound level from the combination of the Project wind turbines, the existing non-Project wind turbines, and the future non-Project wind turbines (Project + Existing Non-Project + Future Non-Project) is below the 50 dBA limit at all modeled NAC 1 receptors except for at one (1) receptor. Appendix E provides the modeling results sorted by sound level from high to low. A review of Table E-1 shows the highest L_{50} sound level to be 52 dBA at receptor #44. This is a non-participating receptor that is less than 600 feet from an existing non-Project wind turbine. As shown in Appendix Table D-3, the Existing Non-Project Only sound level at receptor #44 is 51 dBA, which exceeds the MPCA limit. The data used for the modeling of existing non-Project wind turbines was limited to third party sources and actual sound levels may be less. The Project Only sound level at this receptor is 42 dBA, shown in Appendix Table D-2. It can be concluded that the Project contributes to the Project + Existing Non-Project + Future Non-Project sound level at this receptor by no more than 1 dBA, which is an imperceptible change in the sound level.

The second highest modeled Project + Existing Non-Project + Future Non-Project sound level is 49 dBA, which occurs at participating receptors #841, 244, and #62. The Project Only L_{50} sound level at these three receptors is also 49 dBA, which is the highest Project Only sound level, and is below the most restrictive MPCA sound limit of 50 dBA. The highest modeled Project Only L_{50} sound level at a non-participant is 46 dBA (receptors #92, #169, and #51). Project Only sound levels sorted from high to low are presented in Table E-2 of Appendix E.

Therefore, the Project is in compliance with MPCA sound level regulation.

8.0 LOW FREQUENCY AND INFRASOUND

An evaluation of low frequency (LF) and infrasound levels from a wind energy center at receptors is not required by the State of Minnesota. However, a discussion of LF and infrasound, as it pertains to wind turbines, is provided below for informational purposes.

Low frequency (LF) and infrasound are present in the environment due to other sources besides wind turbines. For example, refrigerators, air conditioners, and washing machines generate infrasound and low frequency sound as do natural sources such as ocean waves. The frequency range of low frequency sound is generally from 20 Hz to 200 Hz, and the range below 20 Hz is often described as "*infrasound*". However, audibility can extend to frequencies below 20 Hz if the energy is high enough. Since there is no sharp change in hearing at 20 Hz, the division between "low-frequency sound" and "infrasound" should only be considered "practical and conventional." The threshold of hearing is standardized for frequencies down to 20 Hz.[17] Based on extensive research and data, Watanabe and Moeller have proposed normal hearing thresholds for frequencies below 20 Hz.[18] These sound levels are so high that infrasound is generally considered inaudible. For example, the sound level at 8 Hz would need to be 100 dB to be audible.

A detailed infrasound and low frequency noise measurement program of wind turbines was conducted from 2013-2015 by the Ministry for the Environment, Climate and Energy of the Federal State of Baden-Wuerttemberg, Germany.[19] The conclusions of the German study were:

> *"Infrasound and low-frequency noise are an everyday part of our technical and natural environment. Compared with other technical and natural sources, the level of infrasound caused by wind turbines is low. Already at a distance of 150 m (~500 ft), it is well below the human limits of perception. Accordingly, it is even lower at the usual distances from residential areas. Effects on health caused by infrasound below the perception thresholds have not been scientifically proven. Together with the health authorities, we in Baden-Württemberg have come to the conclusion that adverse effects relating to infrasound from wind turbines cannot be expected on the basis of the evidence at hand."*

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17 Acoustics - Normal equal-loudness-level contours, International Standard ISO 226:2003, International Organization for Standardization, Geneva, Switzerland, (2003).

18 T. Watanabe, and H. Moeller, "Low Frequency Hearing Thresholds in Pressure Field and in Free Field", J. Low Frequency Noise and Vibration, 9(3), 106-115, (1990).

19 *Low frequency noise incl. infrasound from wind turbines and other sources*, LUBW, Baden-Wuerttemberg, Germany, September 2016.

The Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Department of Public Health commissioned an expert panel who found that: "Claims infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system."[20]

Health Canada, in collaboration with Statistics Canada, conducted one of the most extensive studies to understand the impacts of wind turbine noise to-date.[21] A cross-section epidemiological study was carried out in 2013 in the provinces of Ontario and Prince Edward Island on randomly selected participants living near and far from operating wind turbines. Many peer-reviewed publications have been written based on the Health Canada research, including an analysis of low frequency and infrasound data. For example, Keith et al concluded that there was no advantage of using C-weighting to measure low frequency sound since the relationship between A-weighting and C-weighting are so highly correlated.[22] In other words, acceptable A-weighted limits also eliminate low frequency and infrasound impacts.

Low frequency and infrasound have also been studied extensively in Japan. Tachibana et al conducted extensive measurements of 34 wind farms nationwide and concluded that infrasound from wind turbines is not audible/sensible, and that wind turbine noise is not a problem in the infrasound region.[23]

As noted in the 2011 NARUC report, "the widespread belief that wind turbines produce elevated or even harmful levels of low frequency and infrasonic sound is utterly untrue as proven repeatedly and independently by numerous investigators."[24]

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20 *Wind Turbine Health Impact Study: Review of Independent Expert Panel,* Massachusetts Department of Environmental Protection and Massachusetts Department of Public Health, January 2012.

21 Health Canada website: http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php

22 *Wind turbine sound pressure level calculations at dwellings,* S. E. Keith et al, J. Acoustical Society of America, 139(3), March 2016.

23 *Nationwide field measurements of wind turbine noise in Japan,* H. Tachibana et al, Noise Control Engineering Journal, 62(2), March-April 2014.

24 Assessing Sound Emissions from Proposed Wind Farms & Measuring the Performance of Completed Projects, NARUC, prepared by Hessler Associates, Inc., October 2011.

9.0 CONCLUSIONS

A comprehensive sound level modeling assessment was conducted for the Buffalo Ridge Wind Project. In addition, ambient sound levels were measured to characterize the existing background sound levels within the area. Nighttime measurements showed non-wind-turbine ambient L_{50} broadband sound levels range from 28 to 49 dBA when ground-level wind speeds were at or below 11 mph and winds at hub height corresponded to conditions in the modeling. Non-wind-turbine ambient sound levels in the Project Area[25] fluctuate due to sound sources such as ground-level winds, vehicular traffic, and vegetation rustle, all of which can cause non-wind-turbine ambient sound levels to approach the MPCA L_{50} nighttime limit of 50 dBA based on the measured sound levels.

The predicted worst-case sound level from the combination of the Project wind turbines, the existing non-Project wind turbines, and the future non-Project (Project + Existing Non-Project + Future Non-Project) wind turbines is below the 50 dBA limit at all modeled NAC 1 receptors except for at one (1) receptor. The sound level at this location is 52 dBA and is primarily attributable to the existing non-Project wind turbines as the modeled sound from only these wind turbines exceeds the 50 dBA limit. While the modeling of the existing facility shows an exceedance, it is based on limited data available from third parties. Actual sound levels may be less. The next highest modeled L_{50} sound level is 49 dBA and occurs at three (3) participating locations. The highest predicted worst-case Project Only L_{50} sound level at a modeling receptor is 49 dBA, and therefore meets the most restrictive Minnesota sound limit of 50 dBA.

25 At measurement Locations 2 and 4

Appendix A

Draft Project Sound Level Measurement Protocol

Buffalo Ridge Wind Project
Lincoln County, MN

Sound Level Measurement Protocol

April 19, 2019

Introduction

This protocol describes the methodology involved in measuring the ambient (pre-construction) sound levels for the Buffalo Ridge Wind ("BRW") Project. BRW will be a wind power generation facility consisting of approximately 40 wind turbines located within Lincoln County, Minnesota. The locations of the proposed wind turbines are shown in Figure 1.[1,2] The proposed wind turbines will be a combination of GE 2.3-116, GE 2.52-127, and GE 2.82-127 units. The GE 2.3-116 wind turbines have a hub height of 80 meters and a rotor diameter of 116 meters. The GE 2.52-127 and GE 2.82-127 wind turbines have a hub height of 89 meters and a rotor diameter of 127 meters. Epsilon will conduct a sound level measurement program to document existing ambient sound levels in the vicinity of the BRW Project.

The purpose of this protocol is to describe the measurement methodology, identify measurement locations, identify acoustical and meteorological equipment proposed, and provide a brief description of the items to be included in the pre-construction sound level report. Procedures identified in the Guidance for Large Wind Energy Conversion System, Noise Study Protocol and Report ("LWECS Guidance") published by the Minnesota Department of Commerce ("DOC"), Energy Facility Permitting, dated October 8, 2012 were used in the development of this measurement protocol.

Sound Level Measurement Methodology

The LWECS Guidance advises measurements at a minimum of three (3) locations within the Project area where wind turbines are either not constructed or not operating to represent ambient sound level conditions. Broadband A-weighted (dBA) and one-third octave-band (dB) sound levels will be measured at five (5) locations in Lincoln County to collect pre-construction sound level data. Per the LWECS Guidance document, one (1) location has been selected to represent the receptor with the worst-case modeled sound level based on a preliminary modeling analysis. The document also advises sound level measurements at locations within the Project area when wind turbines are either not constructed or not operating to represent ambient sound level conditions. The BRW Project area (contained

1 The wind turbine layout identified in the figure is dated April 10, 2019.

2 This sound level measurement protocol has been designed and measurement locations have been selected based on the BRW wind turbine layout dated February 28, 2019. Changes between the wind turbine layout dated February 28, 2019 and the wind turbine layout dated April 10, 2019 are not anticipated to warrant any changes in the proposed measurement locations or the methodology outlined in this protocol.

within the Project Boundary shown in Figure 1) currently contains no wind turbines; however, a wind energy facility is located close to the Project boundary. This facility is not owned or operated by an affiliate of NextEra Energy Resources, LLC ("NEER") and is assumed to be currently operational. Figure 1 identifies the existing non-NEER wind turbines.[3] Sound levels produced by the existing facility will likely impact sound levels at receptors in the central and southeast region of the BRW Project. Furthermore, NEER is in the process of developing another wind energy facility to the southeast of BRW in Pipestone County. This facility, Lake Benton II Wind, is anticipated to be under construction in 2019. For reference purposes, the locations of the Lake Benton II Wind wind turbines are shown on Figure 1. Sound levels produced by the Lake Benton II Wind project could impact sound levels at receptors to the south of the BRW project.

The five (5) proposed measurement locations within the vicinity of the Project were selected based on LWECS Guidance, proximity to proposed wind turbines, other measurement locations, existing wind turbines, proposed wind turbine types, and modeled sound levels.

The five (5) proposed measurement locations and six (6) alternate locations in Lincoln County are shown in Figure 1 and are briefly described below. With the exception of one (1) alternate location (3Alt2), all monitoring locations are proposed to be at a residence (exterior) with some on participating and others on participating-assumed[4] or non-participating parcels. Participating-assumed or non-participating homeowners may be unwilling to grant permission at a particular location; if permission is not granted, measurements will be conducted at an alternate location when practical. In addition, the alternate location may be selected if site conditions realized during setup warrant relocation. At the time of this Protocol, permission has not been obtained at the measurement locations. Additional alternative locations may be selected and/or the number of measurement locations reduced if permission cannot be obtained prior to the commencement of the measurement program.

<u>Primary</u>

- **Location 1:** Participating-Assumed – Modeling Receptor #244
  - Highest modeled Project-Only sound level
  - Representative of receptor closest to any wind turbine in the layout

- **Location 2:** Participating – Modeling Receptor #85

- **Location 3:** Participating-Assumed – Modeling Receptor #28
  - Near existing wind turbines (non-NEER)

- **Location 4:** Participating – Modeling Receptor #841
  - Highest modeled Project-Only sound level

- **Location 5:** Participating – Modeling Receptor #26

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3 The locations of non-NEER wind turbines were provided by Atwell.

4 Participating-assumed parcels are parcels that are not yet leased but would be required to be leased based on required setbacks.

Alternate

- **Location 1Alt1:** Participating-Assumed – Modeling Receptor #62
- **Location 1Alt2:** Participating – Modeling Receptor #61
- **Location 2Alt:** Non-Participating – Modeling Receptor #92
- **Location 3Alt1:** Non-Participating – Modeling Receptor #29
- **Location 3Alt2:** Participating Parcel – County PIN #08-0196-010
- **Location 4Alt:** Participating – Modeling Receptor #46

Measurement Equipment

The sound level measurements will be made using Larson Davis (LD) model 831 sound level meters (or equivalent). The model meets "Type 1 Precision" requirements set forth in American National Standards Institute (ANSI) S1.4-1983 standard for sound level meters. The meters will log values of various broadband A-weighted (dBA) sound level measurement parameters including the L_{eq}, L_{max}, L_{10}, L_{50}, and L_{90}, and will be programmed to log this statistical data on an hourly basis. The LWECS Guidance also requires C-weighted data collection. The sound level meters will collect C-weighted L_{eq} data and the additional C-weighted sound level parameters will be calculated through post-processing analysis. One-minute time history data will be collected by the meters. The microphones will be tripod-mounted at a height of 1.5 meters (5 feet) above ground. A 7-inch windscreen will be placed on all microphones.

The measurement equipment will be calibrated in the field before and after the survey with the manufacturer's acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. All calibrations will be within $\pm$1.0 dB from the most recent calibration otherwise the data collected during that period will be discarded. The meters are calibrated and certified as accurate to standards set by the National Institute of Standards and Technology by an independent laboratory within the past 12 months.

Since this is a wind turbine project, the wind speed during the sound level study is significant. The ground-level wind speed has a direct influence on the ambient sound levels. Ground-level wind speed data will be continuously measured at all sound level monitoring locations for the duration of the study per the LWECS Guidance. A HOBO H21-002 micro-weather station, or comparable instrumentation, with a tripod and data logger will be used at the monitoring locations. The wind sensors will be mounted at microphone height (1.5 meters) and log data every hour. This wind instrument has a measurement range of 0 to 45 m/s (100 mph) and an accuracy of $\pm$1.1 m/s (2.4 mph). The starting threshold is ≤1 m/s (2.2 mph).

Additional meteorological parameters, e.g. temperature, precipitation, etc. will either be collected through additional instrumentation deployed by Epsilon or will be downloaded from the closest National Weather Service station.

In order to allow for the characterization of background sound levels during different wind regimes which may be useful once the wind energy facility is operational it would be necessary to know the wind speeds at higher heights (hub height, if possible) during the pre-construction sound level measurement program. If these data are available during the program, they will be incorporated into the report.

Schedule

The sound level measurement program is planned to commence during the end of April or beginning of May 2019. Following the approach outlined in the LWECS Guidance, the sound level measurement program will run for at least one week. The equipment will not be staffed continuously; however, observations will be made three times during the program (see below). The field technician will leave the site either the same day or the day after all equipment is running and return in approximately one week. Continuous A-weighted measurements (24 hours/day) will be made concurrently at all monitoring locations over an approximately 7-day period. The program could be extended due to excess precipitation. The observation periods will be as follows:

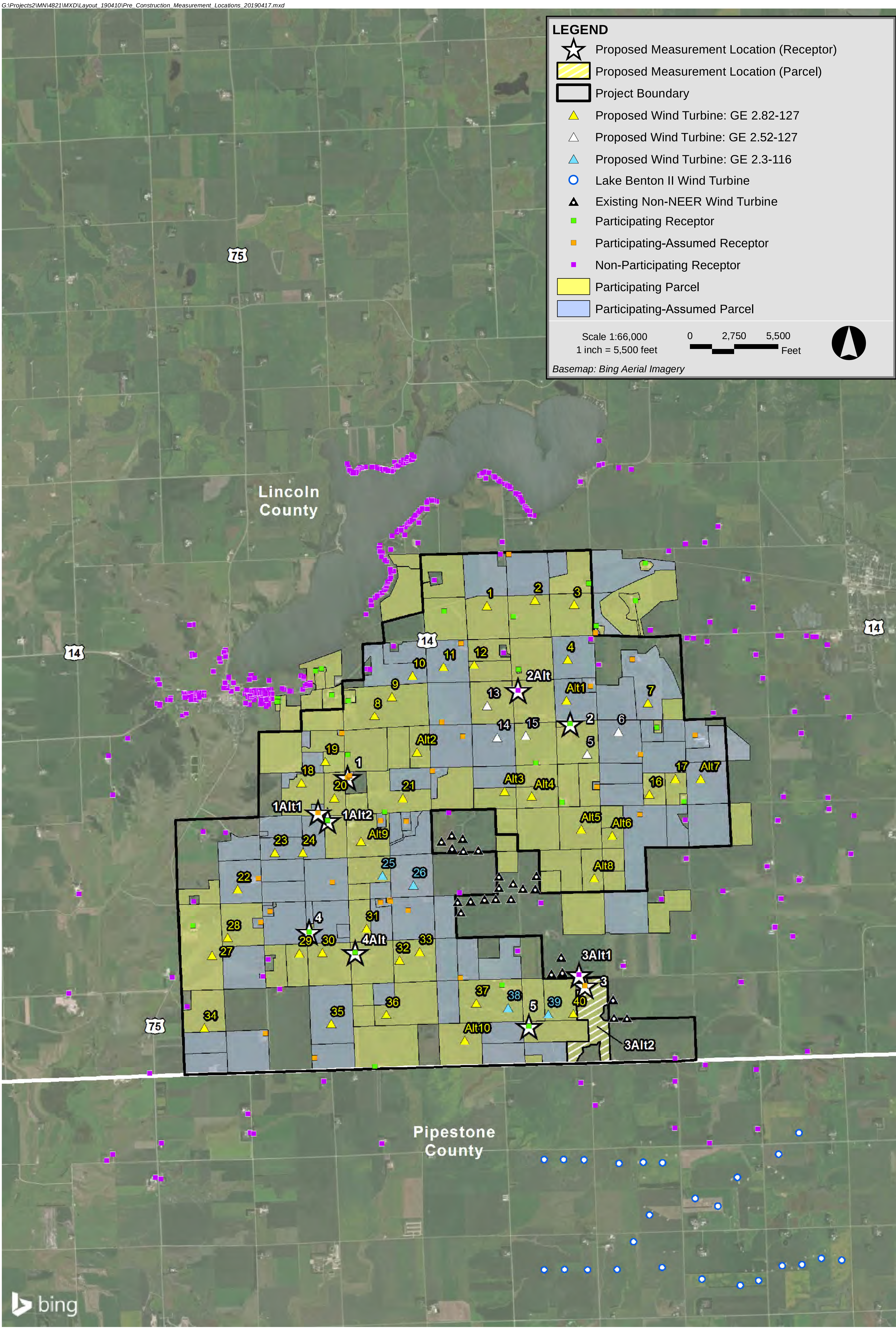
- Upon deployment (daytime),
- During the 1st night when all monitors are running (nighttime), and
- During the pick-up (daytime).

A report, which summarizes the measurement program that will include figures depicting the wind turbine and measurement locations and tabular results, will be submitted as part of the application.

Results/Report

The LWECS document will be used as a guide for sound level data processing, result summaries, and the report structure. No extraneous noise events will be excluded from the data. Hourly periods of recorded precipitation will be removed from the datasets. The percentage of the excluded data will be presented. Sound levels will be presented in graphical format as they were measured in relation to wind speed over the measurement duration. The report will include various figures and tables to effectively summarize the results of the measurement program.

G:\Projects2\MN\4821\MXD\Layout_190410\Pre_Construction_Measurement_Locations_20190417.mxd



Buffalo Ridge Wind Lincoln County, Minnesota

Epsilon ASSOCIATES INC.

Figure 1

Proposed Pre-Construction Measurement Locations

Appendix B

NCEI Meteorological Data: NWS Station – Brookings Regional Airport, Brookings, SD

DATE & TIME	REPORTTPYE	HourlyAltimeterSetting	HourlyDewPointTemperature	HourlyDryBulbTemperature	HourlyPrecipitation	HourlyPresentWeatherType	HourlyPressureChange	HourlyPressureTendency	HourlyRelativeHumidity	HourlySeaLevelPressure	HourlySkyConditions	HourlyStationPressure	HourlyVisibility	HourlyWetBulbTemperature	HourlyWindDirection	HourlyWindGustSpeed	HourlyWindSpeed
2019-04-29T00:56:00	FM-15	29.86	38	40	0.01				93	29.93			10		140		11
2019-04-29T02:56:00	FM-15	29.88	38	41					89	29.95			10		0		0
2019-04-29T03:36:00	FM-16	29.88	37	39					93				10		0		0
2019-04-29T04:56:00	FM-15	29.9	38	41					89	29.96	BKN:07 13	28.16	10	40	250		6
2019-04-29T05:30:00	FM-15	29.91	39	41					93		SCT:04 13	28.17	10	40	280		13
2019-04-29T05:56:00	FM-15	29.93	39	41			-0.04	3	93	30	SCT:04 11	28.19	10	40	270		16
2019-04-29T06:03:00	FM-15	29.93	37	39					93		BKN:07 11	28.19	10	38	270		18
2019-04-29T06:13:00	FM-15	29.93	36	39					87		SCT:04 11	28.19	10	38	280		21
2019-04-29T06:56:00	FM-15	29.95	34	40					79	30.02			10		280		16
2019-04-29T07:56:00	FM-15	29.96	33	41					73	30.03			10		280		17
2019-04-29T08:56:00	FM-15	29.96	34	43					71	30.03			10		280		17
2019-04-29T09:56:00	FM-15	29.98	34	45					66	30.05	FEW:02 24 BKN:07 32	28.24	10	40	290		15
2019-04-29T10:56:00	FM-15	29.99	35	46					66	30.05	OVC:08 32	28.25	10	41	290	25	21
2019-04-29T11:56:00	FM-15	30.02	36	47			-0.05	3	66	30.09	OVC:08 32	28.27	10	42	300	25	17
2019-04-29T12:56:00	FM-15	30.02	37	47					69	30.09	BKN:07 29 OVC:08 34	28.27	10	42	310		22
2019-04-29T13:56:00	FM-15	30.04	36	47					66	30.11	BKN:07 25 OVC:08 32	28.3	10	42	310	25	17
2019-04-29T14:08:00	FM-15	30.05	36	46					66		FEW:02 25 OVC:08 32	28.3	10	41	310		18
2019-04-29T14:56:00	FM-15	30.05	36	50			-0.03	3	59	30.11	BKN:07 39	28.3	10	44	310		10
2019-04-29T15:56:00	FM-15	30.06	37	50					61	30.13	FEW:02 34 BKN:07 55	28.31	10	44	290		11
2019-04-29T16:56:00	FM-15	30.09	38	49					66	30.15	FEW:02 43 BKN:07 50 OVC:08 60	28.34	10	44	320		13
2019-04-29T17:56:00	FM-15	30.1	37	48					66	30.17			10		330		14
2019-04-29T18:56:00	FM-15	30.13	36	45					71	30.21	OVC:08 34	28.38	10	41	350		11
2019-04-29T19:56:00	FM-15	30.15	35	43					74	30.23	OVC:08 38	28.4	10	39	360		14
2019-04-29T20:56:00	FM-15	30.19	35	41			-0.08	3	79	30.26	OVC:08 50	28.44	10	38	360		9
2019-04-29T21:56:00	FM-15	30.18	34	39					82	30.26	CLR:00	28.43	10	37	20		7
2019-04-29T22:56:00	FM-15	30.19	34	38					86	30.27	FEW:02 50	28.44	10	36	10		7
2019-04-29T23:56:00	FM-15	30.2	34	38			-0.01	3	86	30.27	CLR:00	28.45	10	36	10		7
2019-04-30T00:56:00	FM-15	30.2	35	38					89	30.28	BKN:07 50	28.45	10	37	20		6
2019-04-30T01:17:00	FM-15	30.2	36	37					93		BKN:07 12 BKN:07 50	28.45	10	37	30		7
2019-04-30T01:56:00	FM-15	30.18	35	38					89	30.26	BKN:07 12	28.43	10	37	10		9
2019-04-30T02:09:00	FM-15	30.18	34	37					87		SCT:04 12	28.43	10	36	20		9
2019-04-30T02:27:00	FM-15	30.18	36	37					93		BKN:07 12	28.43	10	37	20		8
2019-04-30T02:56:00	FM-15	30.19	35	38			0.01	8	89	30.26	OVC:08 12	28.44	10	37	30		7
2019-04-30T03:56:00	FM-15	30.18	35	38					89	30.25	OVC:08 10	28.43	10	37	30		8
2019-04-30T04:16:00	FM-15	30.17	36	37					93		OVC:08 8	28.42	10	37	30		7
2019-04-30T04:56:00	FM-15	30.17	36	38					93	30.24	OVC:08 8	28.42	10	37	30		7
2019-04-30T05:56:00	FM-15	30.17	36	38			0.02	5	93	30.24	OVC:08 8	28.42	10	37	60		8
2019-04-30T06:56:00	FM-15	30.18	37	39	0.02	-RA:02 BR:1 |RA |RA			93	30.25	OVC:08 6	28.43	5	38	70		8
2019-04-30T07:56:00	FM-15	30.17	38	39	0.05	-RA:02 BR:1 |RA |RA			96	30.24	OVC:08 6	28.42	4	39	90		6
2019-04-30T08:48:00	FM-15	30.15	37	39	0.04	-RA:02 BR:1 |RA |RA			93		OVC:08 10	28.4	5	38	90		8
2019-04-30T08:56:00	FM-15	30.14	38	40	0.04	-RA:02 BR:1 |RA |RA	0.02	8	93	30.22	OVC:08 10	28.39	6	39	70		10
2019-04-30T09:56:00	FM-15	30.14	37	40	0.01	-RA:02 |RA |RA			89	30.22	BKN:07 8 OVC:08 11	28.39	10	39	80		9
2019-04-30T10:56:00	FM-15	30.12	38	40	0.01	-RA:02 |RA |RA			93	30.2	OVC:08 8	28.37	8	39	70		10
2019-04-30T11:56:00	FM-15	30.11	37	39	T	-RA:02 |RA |RA	0.03	8	93	30.19	OVC:08 8	28.36	10	38	60		9
2019-04-30T12:56:00	FM-15	30.12	37	39	T	-RA:02 |RA |RA			93	30.2	OVC:08 6	28.37	10	38	70		11
2019-04-30T13:56:00	FM-15	30.09	38	39	T	-RA:02 BR:1 |RA |RA			96	30.17	OVC:08 6	28.34	3	39	70		14
2019-04-30T14:56:00	FM-15	30.08	38	39	T	BR:1 ||	0.04	8	96	30.16	OVC:08 6	28.33	5	39	60		11
2019-04-30T15:56:00	FM-15	30.06	38	39					96	30.14	OVC:08 4	28.31	9	39	60		13
2019-04-30T16:56:00	FM-15	30.06	38	39					96	30.14			4		70		11
2019-04-30T17:31:00	FM-16	30.06	37	39					93				2.5		80		13
2019-04-30T17:56:00	FM-15	30.05	38	39					96	30.12			2.5		70	20	15
2019-04-30T18:16:00	FM-16	30.05	37	39					93				1.5		60		10
2019-04-30T18:56:00	FM-15	30.04	38	39					96	30.12			1.75		60		9
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2019-04-30T19:40:00	FM-16	30.04	37	39		|FG |			93				0.5		60		10
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2019-04-30T21:56:00	FM-15	30.05	39	39	0.01	|RA |			100	30.12			7		30		6
2019-04-30T22:07:00	FM-16	30.04	39	39	0.01	|RA |			100				9		30		7

DATE & TIME	REPORTTPYE	HourlyAltimeterSetting	HourlyDewPointTemperature	HourlyDryBulbTemperature	HourlyPrecipitation	HourlyPresentWeatherType	HourlyPressureChange	HourlyPressureTendency	HourlyRelativeHumidity	HourlySeaLevelPressure	HourlySkyConditions	HourlyStationPressure	HourlyVisibility	HourlyWetBulbTemperature	HourlyWindDirection	HourlyWindGustSpeed	HourlyWindSpeed
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2019-04-30T23:05:00	FM-16	30.04	39	39	T	|RA |			100				10		60		7
2019-04-30T23:56:00	FM-15	30.03	39	40	T		0.03	8	97	30.1	OVC:08 4	28.29	10	40	70		8
2019-04-30T23:59:00	SOD																
2019-05-01T00:56:00	FM-15	30.01	39	40					97	30.09	SCT:04 15 BKN:07 35 OVC:08 44	28.27	10	40	70		6
2019-05-01T01:38:00	FM-15	30	37	39					93		BKN:07 11 OVC:08 39	28.26	10	38	60		7
2019-05-01T01:56:00	FM-15	29.99	38	40					93	30.07	BKN:07 11 OVC:08 40	28.25	10	39	80		8
2019-05-01T02:35:00	FM-15	29.99	37	39					93		OVC:08 9	28.25	10	38	80		8
2019-05-01T03:56:00	FM-15	30.01	37	39					93	30.09	OVC:08 9	28.27	10	38	50		6
2019-05-01T04:56:00	FM-15	30	37	39					93	30.08	OVC:08 7	28.26	10	38	40		3
2019-05-01T05:34:00	FM-15	30	37	39		BR:1 ||			93		BKN:07 6 OVC:08 9	28.26	2	38	50		6
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2019-05-01T05:56:00	FM-15	30.01	38	38		BR:1 ||	-0.02	1	100	30.09	OVC:08 4	28.27	2.5	38	60		7
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2019-05-01T06:46:00	FM-15	30.03	37	37		BR:1 ||			100		OVC:08 4	28.29	3	37	40		6
2019-05-01T06:56:00	FM-15	30.03	38	38		BR:1 ||			100	30.11	OVC:08 4	28.29	3	38	40		8
2019-05-01T07:42:00	FM-15	30.02	37	39					93		OVC:08 6	28.27	10	38	70		8
2019-05-01T07:56:00	FM-15	30.02	38	40					93	30.09	OVC:08 6	28.27	10	39	40		8
2019-05-01T08:56:00	FM-15	30.03	37	40			-0.02	3	89	30.11	BKN:07 10 OVC:08 13	28.29	10	39	40		6
2019-05-01T09:56:00	FM-15	30.04	37	41					86	30.12	OVC:08 10	28.3	10	39	50		5
2019-05-01T11:56:00	FM-15	30.05	38	42			-0.01	1	85	30.13	OVC:08 14	28.3	10	40	360		6
2019-05-01T12:56:00	FM-15	30.05	38	43	0.01	-RA:02 |RA |RA			82	30.13	OVC:08 14	28.3	10	41	20		3
2019-05-01T13:16:00	FM-15	30.06	39	43	T	-RA:02 |RA |RA			87		OVC:08 16	28.31	10	41	350		3
2019-05-01T13:48:00	FM-15	30.06	39	43	0.01	-RA:02 |RA |RA			87		OVC:08 14	28.31	10	41	10		5
2019-05-01T13:56:00	FM-15	30.06	39	43	0.01	-RA:02 |RA |RA			86	30.14	BKN:07 11 OVC:08 16	28.31	10	41	350		6
2019-05-01T14:47:00	FM-15	30.06	39	43	T	-RA:02 |RA |RA			87		SCT:04 13 OVC:08 19	28.31	10	41	40		6
2019-05-01T14:56:00	FM-15	30.06	39	43	T	-RA:02 |RA |RA	-0.01	0	86	30.13	BKN:07 13 OVC:08 19	28.31	10	41	10		7
2019-05-01T15:11:00	FM-15	30.06	39	43	T	-RA:02 |RA |RA			87		SCT:04 13 OVC:08 21	28.31	10	41	10		7
2019-05-01T15:56:00	FM-15	30.06	39	42	0.03	RA:02 |RA |RA			89	30.14	FEW:02 13 BKN:07 25 OVC:08 30	28.31	10	41	30		7
2019-05-01T16:12:00	FM-15	30.06	37	43	0.01	-RA:02 |RA |RA			81		FEW:02 18 BKN:07 33 OVC:08 41	28.31	10	40	60		5
2019-05-01T16:35:00	FM-15	30.07	37	43	0.01	-RA:02 |RA |RA			81		FEW:02 16 BKN:07 21 OVC:08 43	28.32	10	40	30		3
2019-05-01T16:56:00	FM-15	30.07	38	42	0.02	-RA:02 |RA |RA			85	30.14	BKN:07 21 BKN:07 35 OVC:08 55	28.32	10	40	40		5
2019-05-01T17:37:00	FM-15	30.08	37	43	T	-RA:02 |RA |RA			81		BKN:07 24 OVC:08 42	28.33	10	40	0		0
2019-05-01T17:56:00	FM-15	30.08	38	42	T	-RA:02 |RA |RA	-0.02	3	85	30.15	OVC:08 22	28.33	10	40	0		0
2019-05-01T18:56:00	FM-15	30.08	38	43	T	-RA:02 |RA |RA			82	30.16	OVC:08 16	28.33	10	41	240		3
2019-05-01T20:56:00	FM-15	30.1	39	42			-0.03	3	89	30.18	OVC:08 18	28.35	10	41	220		3
2019-05-01T21:56:00	FM-15	30.1	40	42					92	30.18	OVC:08 26	28.35	10	41	220		3
2019-05-01T22:56:00	FM-15	30.1	40	42					92	30.17	BKN:07 13 OVC:08 20	28.35	10	41	220		5
2019-05-01T23:10:00	FM-15	30.1	41	43	T	-RA:02 BR:1 |RA |RA			93		SCT:04 6 BKN:07 11 OVC:08 20	28.35	3	42	250		13
2019-05-01T23:13:00	FM-15	30.1	41	43	0.01	-RA:02 BR:1 |RA |RA			93		BKN:07 6 OVC:08 11	28.35	2.5	42	260		11
2019-05-01T23:27:00	FM-15	30.11	39	41	0.01	-RA:02 BR:1 |RA |RA			93		BKN:07 6 BKN:07 11 OVC:08 19	28.36	5	40	280		10
2019-05-01T23:43:00	FM-15	30.12	39	41	0.01				93		SCT:04 4 BKN:07 19 OVC:08 38	28.37	10	40	270		8
2019-05-01T23:56:00	FM-15	30.12	40	41	0.01		-0.01	3	96	30.19	FEW:02 7 BKN:07 13 OVC:08 36	28.37	10	41	270		8
2019-05-01T23:59:00	SOD																
2019-05-02T00:08:00	FM-15	30.12	39	41					93		BKN:07 9 OVC:08 15	28.37	10	40	280		7
2019-05-02T00:16:00	FM-15	30.12	39	41					93		SCT:04 9 OVC:08 15	28.37	10	40	270		7
2019-05-02T00:56:00	FM-15	30.11	39	41					93	30.19	FEW:02 10 SCT:04 20 OVC:08 60	28.36	10	40	280		8
2019-05-02T01:21:00	FM-15	30.11	39	39					100		FEW:02 9 OVC:08 55	28.36	10	39	280		10
2019-05-02T01:56:00	FM-15	30.11	38	40					93	30.19	SCT:04 9 BKN:07 16 OVC:08 60	28.36	10	39	290		9
2019-05-02T02:56:00	FM-15	30.11	37	40			0.01	6	89	30.19	OVC:08 18	28.36	10	39	290		8
2019-05-02T03:25:00	FM-15	30.11	37	39					93		BKN:07 10 OVC:08 16	28.36	10	38	300		10
2019-05-02T03:44:00	FM-15	30.11	37	39					93		SCT:04 10 OVC:08 15	28.36	10	38	310		11
2019-05-02T03:52:00	FM-15	30.11	36	39					87		OVC:08 13	28.36	10	38	300		15
2019-05-02T03:56:00	FM-15	30.11	36	39					89	30.19	OVC:08 13	28.36	10	38	300		14
2019-05-02T05:30:00	FM-15	30.13	36	37					93		OVC:08 9	28.38	10	37	300		14
2019-05-02T05:56:00	FM-15	30.14	36	38			-0.03	3	93	30.22	OVC:08 7	28.39	10	37	310		13
2019-05-02T06:49:00	FM-15	30.15	36	37					93		OVC:08 11	28.4	10	37	300		13
2019-05-02T06:56:00	FM-15	30.16	36	38					93	30.24	OVC:08 11	28.41	10	37	300		10
2019-05-02T07:56:00	FM-15	30.17	35	40					83	30.24	OVC:08 13	28.42	10	38	330		10
2019-05-02T08:56:00	FM-15	30.17	36	40			-0.03	1	86	30.25	OVC:08 13	28.42	10	38	310		10
2019-05-02T09:56:00	FM-15	30.18	35	42					76	30.25	OVC:08 15	28.43	10	39	310		9
2019-05-02T10:53:00	FM-15	30.18	36	45					71		SCT:04 19 SCT:04 24	28.43	10	41			
2019-05-02T10:56:00	FM-15	30.18	36	45					71	30.25	SCT:04 21	28.43	10	41	320		6
2019-05-02T11:26:00	FM-15	30.17	36	45					71		BKN:07 25	28.42	10	41	VRB		5

DATE & TIME	REPORTTPYE	HourlyAltimeterSetting	HourlyDewPointTemperature	HourlyDryBulbTemperature	HourlyPrecipitation	HourlyPresentWeatherType	HourlyPressureChange	HourlyPressureTendency	HourlyRelativeHumidity	HourlySeaLevelPressure	HourlySkyConditions	HourlyStationPressure	HourlyVisibility	HourlyWetBulbTemperature	HourlyWindDirection	HourlyWindGustSpeed	HourlyWindSpeed
2019-05-02T11:56:00	FM-15	30.17	36	48			0.01	8	63	30.24	BKN:07 27	28.42	10	43	320		5
2019-05-02T12:42:00	FM-15	30.16	36	48					62		SCT:04 29	28.41	10	43	250		6
2019-05-02T12:56:00	FM-15	30.15	37	49					64	30.22	FEW:02 29	28.4	10	43	320		7
2019-05-02T13:56:00	FM-15	30.13	36	51					56	30.19	CLR:00	28.38	10	44	260		6
2019-05-02T15:56:00	FM-15	30.08	33	53					47	30.14	CLR:00	28.33	10	44	VRB		5
2019-05-02T16:56:00	FM-15	30.08	32	54					43	30.14	CLR:00	28.33	10	44	260		7
2019-05-02T17:56:00	FM-15	30.07	31	53			0.03	6	43	30.14	CLR:00	28.32	10	43	0		0
2019-05-02T18:56:00	FM-15	30.06	32	52					47	30.13	CLR:00	28.31	10	43	140		6
2019-05-02T19:56:00	FM-15	30.07	34	49		HZ:7 |FU |HZ			56	30.14	CLR:00	28.32	6	42	140		7
2019-05-02T20:56:00	FM-15	30.08	35	46			-0.01	3	66	30.15	CLR:00	28.33	8	41	130		6
2019-05-02T21:56:00	FM-15	30.1	39	45					80	30.17	BKN:07 100	28.35	10	42	120		10
2019-05-02T22:56:00	FM-15	30.08	38	44					79	30.15	CLR:00	28.33	10	41	140		13
2019-05-02T23:56:00	FM-15	30.08	38	43			0	8	82	30.14	BKN:07 80	28.33	10	41	130		11
2019-05-02T23:59:00	SOD																
2019-05-03T00:56:00	FM-15	30.06	37	41					86	30.13	CLR:00	28.31	10	39	130		11
2019-05-03T01:56:00	FM-15	30.03	36	40					86	30.1	CLR:00	28.29	10	38	130		11
2019-05-03T02:56:00	FM-15	30.03	37	41			0.05	6	86	30.09	BKN:07 85	28.29	10	39	140		11
2019-05-03T03:56:00	FM-15	30.02	37	42					82	30.08	FEW:02 90 SCT:04 110	28.27	10	40	140		11
2019-05-03T04:56:00	FM-15	30.01	37	43					80	30.06	OVC:08 85	28.27	10	40	150		13
2019-05-03T05:56:00	FM-15	30.01	38	44	T	-RA:02 |RA |RA	0.02	6	79	30.06	FEW:02 55 OVC:08 75	28.27	10	41	160		15
2019-05-03T06:56:00	FM-15	30	37	44					76	30.06	BKN:07 85	28.26	10	41	150		16
2019-05-03T07:56:00	FM-15	29.99	39	45					80	30.05	BKN:07 90	28.25	10	42	150		15
2019-05-03T08:56:00	FM-15	29.96	41	51			0.04	8	69	30.02	FEW:02 65	28.22	10	46	170		18
2019-05-03T09:56:00	FM-15	29.94	43	56					62	30	FEW:02 70	28.2	10	49	180	23	20
2019-05-03T10:56:00	FM-15	29.95	44	60					56	30	FEW:02 38 BKN:07 75	28.21	10	52	210	26	21
2019-05-03T11:56:00	FM-15	29.94	46	58			0.01	6	65	30	OVC:08 38	28.2	10	52	220	28	20
2019-05-03T12:56:00	FM-15	29.94	46	58					65	30	OVC:08 42	28.2	10	52	230		15
2019-05-03T13:56:00	FM-15	29.92	47	62					58	29.98	SCT:04 41 BKN:07 110	28.18	10	54	230		13
2019-05-03T14:56:00	FM-15	29.91	44	60			0.03	8	56	29.97	FEW:02 41 OVC:08 90	28.17	10	52	310		15
2019-05-03T15:56:00	FM-15	29.9	42	60					52	29.96	CLR:00	28.16	10	51	310		7
2019-05-03T16:56:00	FM-15	29.91	41	62					46	29.96	CLR:00	28.17	10	51	270		13
2019-05-03T17:56:00	FM-15	29.92	42	59			-0.01	3	54	29.97	CLR:00	28.18	10	50	280		8
2019-05-03T18:56:00	FM-15	29.92	41	58					53	29.98	CLR:00	28.18	10	49	330		9
2019-05-03T20:56:00	FM-15	29.96	39	51			-0.04	3	64	30.01	CLR:00	28.22	10	45	0		0
2019-05-03T21:56:00	FM-15	29.97	39	49					69	30.01	CLR:00	28.23	10	44	0		0
2019-05-03T22:56:00	FM-15	29.97	38	44					79	30.02	CLR:00	28.23	10	41	240		3
2019-05-03T23:56:00	FM-15	29.96	39	43			0	0	86	30.02	CLR:00	28.22	10	41	0		0
2019-05-03T23:59:00	SOD																
2019-05-04T00:56:00	FM-15	29.96	40	44					85	30.01	CLR:00	28.22	10	42	0		0
2019-05-04T01:56:00	FM-15	29.96	37	39					93	30.01	CLR:00	28.22	10	38	0		0
2019-05-04T02:56:00	FM-15	29.95	38	40			0.01	8	93	30.01	CLR:00	28.21	10	39	130		5
2019-05-04T03:56:00	FM-15	29.95	38	39					96	30	CLR:00	28.21	10	39	140		3
2019-05-04T04:56:00	FM-15	29.95	38	39					96	30	CLR:00	28.21	10	39	0		0
2019-05-04T05:56:00	FM-15	29.95	37	38			0	3	97	30.01	CLR:00	28.21	10	38	130		7
2019-05-04T06:56:00	FM-15	29.97	41	43					93	30.02	CLR:00	28.23	10	42	120		3
2019-05-04T07:56:00	FM-15	29.97	46	53					77	30.02	CLR:00	28.23	10	49	190		5
2019-05-04T08:56:00	FM-15	29.96	46	60			0	0	60	30	CLR:00	28.22	10	53	200		9
2019-05-04T09:56:00	FM-15	29.94	36	62					38	29.99	CLR:00	28.2	10	49	210		8
2019-05-04T10:56:00	FM-15	29.92	36	64					35	29.97	CLR:00	28.18	10	50	210	17	13
2019-05-04T11:56:00	FM-15	29.91	38	66			0.05	8	36	29.95	CLR:00	28.17	10	52	230	16	11
2019-05-04T12:56:00	FM-15	29.89	35	67					31	29.93	CLR:00	28.15	10	51	VRB		8
2019-05-04T13:56:00	FM-15	29.86	34	68					28	29.91	CLR:00	28.12	10	51	200		8
2019-05-04T14:56:00	FM-15	29.83	34	68			0.07	8	28	29.88	CLR:00	28.09	10	51	VRB		6
2019-05-04T15:56:00	FM-15	29.82	35	68					30	29.86	CLR:00	28.09	10	51	240		7
2019-05-04T16:56:00	FM-15	29.81	38	67					35	29.85	BKN:07 85	28.08	10	52	240		7
2019-05-04T17:56:00	FM-15	29.8	39	67			0.04	6	36	29.84	CLR:00	28.07	10	53	230		6
2019-05-04T18:56:00	FM-15	29.79	42	65					43	29.83	CLR:00	28.06	10	53	170		5
2019-05-04T19:56:00	FM-15	29.79	39	63					41	29.83	BKN:07 90 BKN:07 100	28.06	10	51	180		3
2019-05-04T20:56:00	FM-15	29.82	46	57	T	-RA:02 |RA |RA	-0.03	3	67	29.86	OVC:08 80	28.09	10	51	350		8
2019-05-04T21:56:00	FM-15	29.82	45	56	T				67	29.85	CLR:00	28.09	10	50	110		6
2019-05-04T22:56:00	FM-15	29.82	45	54					72	29.86	CLR:00	28.09	10	49	60		10
2019-05-04T23:56:00	FM-15	29.85	41	48			-0.02	3	77	29.89	BKN:07 100	28.11	10	45	40		8
2019-05-04T23:59:00	SOD																
2019-05-05T00:56:00	FM-15	29.84	38	47					71	29.88	CLR:00	28.1	10	43	70		5
2019-05-05T01:56:00	FM-15	29.83	38	45					77	29.87	CLR:00	28.09	10	42	40		6

DATE & TIME	REPORTTPYE	HourlyAltimeterSetting	HourlyDewPointTemperature	HourlyDryBulbTemperature	HourlyPrecipitation	HourlyPresentWeatherType	HourlyPressureChange	HourlyPressureTendency	HourlyRelativeHumidity	HourlySeaLevelPressure	HourlySkyConditions	HourlyStationPressure	HourlyVisibility	HourlyWetBulbTemperature	HourlyWindDirection	HourlyWindGustSpeed	HourlyWindSpeed
2019-05-05T02:56:00	FM-15	29.84	38	43			0.01	5	82	29.88	CLR:00	28.1	10	41	360		3
2019-05-05T03:56:00	FM-15	29.85	39	43					86	29.89	OVC:08 30	28.11	10	41	340		5
2019-05-05T04:56:00	FM-15	29.85	36	42					79	29.89	FEW:02 120	28.11	10	39	20		6
2019-05-05T05:56:00	FM-15	29.87	36	40			-0.03	3	86	29.91	CLR:00	28.13	10	38	10		6
2019-05-05T06:56:00	FM-15	29.87	37	43					80	29.91	CLR:00	28.13	10	40	30		14
2019-05-05T07:56:00	FM-15	29.87	33	47					59	29.91	CLR:00	28.13	10	41	40	22	15
2019-05-05T08:56:00	FM-15		32	50					50		CLR:00		10		60		15
2019-05-05T09:56:00	FM-15	29.9	35	53					51	29.95	CLR:00	28.16	10	45	40		14
2019-05-05T10:56:00	FM-15	29.91	32	53					45	29.96	CLR:00	28.17	10	43	60		10
2019-05-05T11:56:00	FM-15	29.9	31	55					40	29.95	CLR:00	28.16	10	44	50		5
2019-05-05T12:56:00	FM-15	29.9	33	58					39	29.94	SCT:04 95	28.16	10	46	30		8
2019-05-05T13:56:00	FM-15	29.88	33	58					39	29.93	OVC:08 75	28.14	10	46	40	18	11
2019-05-05T14:56:00	FM-15	29.88	33	58			0.02	6	39	29.93	OVC:08 80	28.14	10	46	20		13
2019-05-05T15:56:00	FM-15	29.88	34	57					42	29.93	OVC:08 75	28.14	10	46	10		14
2019-05-05T16:56:00	FM-15	29.88	34	54					47	29.94	OVC:08 70	28.14	10	45	10		20
2019-05-05T17:56:00	FM-15	29.9	32	51			-0.02	3	48	29.96	OVC:08 75	28.16	10	42	30	20	13
2019-05-05T18:56:00	FM-15	29.9	30	50					46	29.96	OVC:08 70	28.16	10	41	20		13
2019-05-05T19:56:00	FM-15		34	47					61		FEW:02 70 BKN:07 90		10		10		10
2019-05-05T20:56:00	FM-15	29.98	34	47					61	30.03	OVC:08 70	28.24	10	41	10		7
2019-05-05T21:56:00	FM-15	30	34	46	T	-RA:02 |RA |RA			63	30.05	OVC:08 60	28.26	10	41	20		13
2019-05-05T22:56:00	FM-15	30.01	37	43	T	-RA:02 |RA |RA			80	30.07	OVC:08 65	28.27	10	40	10		13
2019-05-05T23:56:00	FM-15	30.01	36	43	T	-RA:02 |RA |RA	-0.03	0	76	30.07	OVC:08 70	28.27	10	40	10		11
2019-05-05T23:59:00	SOD																
2019-05-06T01:56:00	FM-15	30.02	34	43					71	30.08	OVC:08 80	28.27	10	39	40		6
2019-05-06T02:56:00	FM-15	30.05	34	43			-0.04	3	71	30.1	OVC:08 70	28.3	10	39	40		6
2019-05-06T03:56:00	FM-15	30.06	34	43	T				71	30.11	OVC:08 70	28.31	10	39	40		3
2019-05-06T04:56:00	FM-15	30.06	34	43					71	30.12	SCT:04 70 BKN:07 90 OVC:08 100	28.31	10	39	30		6
2019-05-06T05:56:00	FM-15	30.08	33	43			-0.04	3	68	30.15	BKN:07 55 OVC:08 90	28.33	10	39	30		7
2019-05-06T06:56:00	FM-15	30.1	33	43					68	30.16	OVC:08 55	28.35	10	39	40		8
2019-05-06T07:56:00	FM-15	30.12	33	44	0.04				65	30.19	OVC:08 50	28.37	10	39	30		8
2019-05-06T08:12:00	FM-15	30.12	34	43		|FU |			71				0.5		40		10
2019-05-06T08:23:00	FM-15	30.12	34	45		HZ:7 |FU |HZ			66		SCT:04 50 OVC:08 100	28.37	5	40	60		9
2019-05-06T08:56:00	FM-15	30.14	33	46		|FU |	0.06	9	61	30.21			1		40		9
2019-05-06T09:02:00	FM-15	30.14	32	45		|FU |			61				0.5		60		8
2019-05-06T09:09:00	FM-15	30.14	32	45					61						50		8
2019-05-06T09:56:00	FM-15	30.15	31	46					56	30.22	OVC:08 50	28.4	10	40	40		9
2019-05-06T10:56:00	FM-15	30.14	31	49					50	30.21	FEW:02 60 OVC:08 100	28.39	10	41	50	16	10
2019-05-06T11:56:00	FM-15	30.13	29	49			0.01	8	46	30.2	BKN:07 60 OVC:08 75	28.38	10	40	40		14
2019-05-06T12:56:00	FM-15	30.15	29	48					48	30.22	OVC:08 60	28.4	10	40	60		8
2019-05-06T13:56:00	FM-15	30.15	30	48	T	-RA:02 |RA |RA			50	30.21	OVC:08 60	28.4	10	40	40		9
2019-05-06T14:56:00	FM-15	30.15	31	48	T		-0.01	1	52	30.22	BKN:07 49 OVC:08 60	28.4	10	41	40	16	7
2019-05-06T15:56:00	FM-15	30.15	34	47	T	-RA:02 |RA |RA			61	30.22	BKN:07 45 OVC:08 60	28.4	10	41	30		10
2019-05-06T16:56:00	FM-15	30.19	35	46	T	-RA:02 |RA |RA			66	30.25	BKN:07 41 OVC:08 49	28.44	10	41	20		8
2019-05-06T17:40:00	FM-15	30.21	36	43	T	-RA:02 |RA |RA			76		BKN:07 29 BKN:07 37 OVC:08 45	28.46	10	40	20		10
2019-05-06T17:49:00	FM-15	30.22	36	43	T	-RA:02 |RA |RA			76		FEW:02 27 BKN:07 45 OVC:08 70	28.47	10	40	20		9
2019-05-06T17:56:00	FM-15	30.21	36	42	T	-RA:02 |RA |RA	-0.06	3	79	30.29	FEW:02 27 OVC:08 70	28.46	10	39	20		8
2019-05-06T18:56:00	FM-15	30.24	36	41	0.01	-RA:02 |RA |RA			82	30.31	BKN:07 43 OVC:08 50	28.48	10	39	30		9
2019-05-06T19:56:00	FM-15	30.24	37	41	T	-RA:02 |RA |RA			86	30.31	SCT:04 38 BKN:07 50 OVC:08 80	28.48	10	39	20		9
2019-05-06T22:56:00	FM-15	30.23	34	40					79	30.29	BKN:07 55 OVC:08 90	28.48	10	37	40		8
2019-05-06T23:56:00	FM-15	30.2	33	39			0.04	8	79	30.27	SCT:04 90	28.45	10	36	40		8
2019-05-06T23:59:00	SOD																
2019-05-07T00:56:00	FM-15	30.27	31	39					73	30.34	SCT:04 55 OVC:08 90	28.51	10	36	70		7
2019-05-07T01:56:00	FM-15	30.26	30	39					70	30.33	OVC:08 55	28.51	10	35	60		10
2019-05-07T02:56:00	FM-15	30.23	30	38			-0.02	0	73	30.3	SCT:04 55 OVC:08 80	28.48	10	35	40		10
2019-05-07T03:56:00	FM-15	30.25	29	38					70	30.33	BKN:07 75	28.49	10	34	50		6
2019-05-07T04:56:00	FM-15	30.26	28	38					68	30.33	OVC:08 70	28.51	10	34	40		6
2019-05-07T05:56:00	FM-15	30.27	28	38			-0.04	1	68	30.35	OVC:08 60	28.51	10	34	60		7
2019-05-07T06:56:00	FM-15	30.29	29	39					67	30.37	OVC:08 65	28.53	10	35	40		6
2019-05-07T07:56:00	FM-15	30.27	30	42					62	30.35	BKN:07 65	28.51	10	37	50		9
2019-05-07T08:56:00	FM-15	30.26	29	46			0.01	8	51	30.34	CLR:00	28.51	10	39	70		13
2019-05-07T09:56:00	FM-15	30.27	29	49					46	30.34	CLR:00	28.51	10	40	40		9
2019-05-07T10:56:00	FM-15	30.25	29	50					44	30.32	CLR:00	28.49	10	41	VRB		10
2019-05-07T11:56:00	FM-15	30.24	29	52			0.02	8	41	30.31	CLR:00	28.48	10	42	90		9
2019-05-07T12:56:00	FM-15	30.23	30	52					43	30.29	CLR:00	28.48	10	42	90		9
2019-05-07T13:56:00	FM-15	30.2	32	55					42	30.26	SCT:04 100	28.45	10	44	130	16	9

DATE & TIME	REPORTTPYE	HourlyAltimeterSetting	HourlyDewPointTemperature	HourlyDryBulbTemperature	HourlyPrecipitation	HourlyPresentWeatherType	HourlyPressureChange	HourlyPressureTendency	HourlyRelativeHumidity	HourlySeaLevelPressure	HourlySkyConditions	HourlyStationPressure	HourlyVisibility	HourlyWetBulbTemperature	HourlyWindDirection	HourlyWindGustSpeed	HourlyWindSpeed
2019-05-07T14:56:00	FM-15	30.18	33	55			0.06	8	44	30.24	BKN:07 85	28.43	10	45	90		7
2019-05-07T15:56:00	FM-15	30.15	34	55					45	30.21	OVC:08 80	28.4	10	45	90		7
2019-05-07T16:56:00	FM-15	30.13	35	55					47	30.2	OVC:08 75	28.38	10	46	90		7
2019-05-07T17:56:00	FM-15	30.13	39	53	T	-RA:02 |RA |RA	0.04	6	59	30.19	OVC:08 70	28.38	10	46	140		6
2019-05-07T18:56:00	FM-15	30.11	43	49	0.05	-RA:02 |RA |RA			80	30.18	OVC:08 65	28.36	10	46	80		8
2019-05-07T19:56:00	FM-15	30.1	42	48	0.01				80	30.16	OVC:08 70	28.35	10	45	50		10
2019-05-07T20:56:00	FM-15	30.09	42	48	T	-RA:02 |RA |RA	0.04	6	80	30.16	OVC:08 55	28.34	10	45	40		10
2019-05-07T21:56:00	FM-15	30.09	42	47	T	-RA:02 |RA |RA			83	30.15	OVC:08 55	28.34	10	45	50		10
2019-05-07T22:56:00	FM-15	30.09	42	47	0.01	-RA:02 |RA |RA			83	30.14	BKN:07 30 BKN:07 35 OVC:08 43	28.34	10	45	60		10
2019-05-07T23:06:00	FM-15	30.09	43	46	T	-RA:02 |RA |RA			87		BKN:07 28 BKN:07 34 OVC:08 41	28.34	10	45	60		10
2019-05-07T23:51:00	FM-15	30.06	43	46	0.01	-RA:02 |RA |RA			87		FEW:02 27 OVC:08 42	28.31	10	45	50		13
2019-05-07T23:56:00	FM-15	30.06	43	46	0.01	-RA:02 |RA |RA	0.04	6	89	30.11	FEW:02 27 OVC:08 40	28.31	10	45	50		11
2019-05-07T23:59:00	SOD																
2019-05-08T00:35:00	FM-15	30.06	43	46	T	-RA:02 |RA |RA			87		BKN:07 27 OVC:08 38	28.31	10	45	50		10
2019-05-08T00:56:00	FM-15	30.05	43	46	0.01	-RA:02 BR:1 |RA |RA			89	30.11	SCT:04 25 OVC:08 36	28.3	5	45	50		13
2019-05-08T01:56:00	FM-15	30.04	44	45	0.03	-RA:02 BR:1 |RA |RA			97	30.09	SCT:04 25 BKN:07 29 OVC:08 44	28.3	6	45	50		13
2019-05-08T02:21:00	FM-15	30.03	45	45	0.01	-RA:02 |RA |RA			100		FEW:02 6 BKN:07 21 OVC:08 28	28.29	7	45	50		13
2019-05-08T02:56:00	FM-15	30.02	44	45	0.02	-RA:02 |RA |RA	0.04	8	97	30.07	SCT:04 20 BKN:07 31 OVC:08 48	28.27	9	45	60		13
2019-05-08T03:39:00	FM-15	30.01	45	45	0.02	-RA:02 BR:1 |RA |RA			100		FEW:02 6 BKN:07 43 OVC:08 49	28.27	6	45	60		10
2019-05-08T03:56:00	FM-15	29.99	44	45	0.03	-RA:02 |RA |RA			97	30.05	FEW:02 8 SCT:04 28 OVC:08 47	28.25	7	45	60		11
2019-05-08T04:38:00	FM-15	29.97	45	46	0.03	-RA:02 BR:1 |RA |RA			93		BKN:07 6 BKN:07 21 OVC:08 45	28.23	6	46	60		13
2019-05-08T04:56:00	FM-15	29.97	45	46	0.04	-RA:02 |RA |RA			96	30.02	BKN:07 6 BKN:07 12 OVC:08 41	28.23	7	46	70	20	14
2019-05-08T05:34:00	FM-15	29.97	45	46	0.03	-RA:02 BR:1 |RA |RA			93		SCT:04 8 SCT:04 14 OVC:08 41	28.23	5	46	80		16
2019-05-08T05:56:00	FM-15	29.96	44	46	0.06	-RA:02 BR:1 |RA |RA	0.06	6	93	30.01	FEW:02 10 SCT:04 14 OVC:08 41	28.22	4	45	80	26	20
2019-05-08T06:56:00	FM-15	29.93	43	45	0.08	-RA:02 BR:1 |RA |RA			93	29.99	SCT:04 12 OVC:08 45	28.19	5	44	80	26	21
2019-05-08T07:29:00	FM-15	29.92	43	45	0.04	-RA:02 |RA |RA			93		BKN:07 10 BKN:07 35 OVC:08 47	28.18	7	44	70	25	17
2019-05-08T07:56:00	FM-15	29.9	42	44	0.08	RA:02 BR:1 |RA |RA			93	29.96	BKN:07 10 OVC:08 38	28.16	4	43	70	28	18
2019-05-08T08:56:00	FM-15	29.88	42	44	0.05	-RA:02 BR:1 |RA |RA	0.07	7	93	29.94	OVC:08 10	28.14	5	43	60	28	20
2019-05-08T09:56:00	FM-15	29.86	41	43	0.08	RA:02 BR:1 |RA |RA			93	29.92	BKN:07 10 OVC:08 15	28.12	4	42	70	32	24
2019-05-08T10:56:00	FM-15	29.85	41	42	0.09	RA:02 BR:1 |RA |RA			96	29.91	BKN:07 12 OVC:08 30	28.11	5	42	70	30	17
2019-05-08T11:56:00	FM-15		40	42	0.13	RA:02 BR:1 |RA |RA			92		OVC:08 11		5		70	29	17
2019-05-08T12:56:00	FM-15	29.83	39	40	0.18	RA:02 BR:1 |RA |RA			97	29.9	OVC:08 10	28.09	6	40	50	26	20
2019-05-08T13:56:00	FM-15	29.83	37	40	0.12	-RA:02 |RA |RA			89	29.9	OVC:08 12	28.09	10	39	40	30	21
2019-05-08T14:56:00	FM-15	29.81	36	38	0.04	-RA:02 |RA |RA			93	29.88	OVC:08 10	28.08	10	37	40	32	17
2019-05-08T15:56:00	FM-15	29.81	35	37	0.04	RA:02 |RA |RA			93	29.88	OVC:08 10	28.08	10	36	30	29	22
2019-05-08T16:44:00	FM-15	29.83	34	36	0.06	-RA:02 |RA |RA			93		OVC:08 8	28.09	10	35	30	33	22
2019-05-08T16:56:00	FM-15	29.84	34	36	0.07	-RA:02 |RA |RA			93	29.91	OVC:08 8	28.1	10	35	30	32	20
2019-05-08T17:56:00	FM-15	29.87	33	35	0.06	UP:09 ||	-0.06	3	93	29.94	OVC:08 8	28.13	10	34	20	26	18
2019-05-08T18:56:00	FM-15	29.9	33	35	0.02	-RA:02 |RA |RA			93	29.98	OVC:08 8	28.16	10	34	20	26	17
2019-05-08T19:56:00	FM-15	29.92	34	35	0.01	-RA:02 |RA |RA			96	30	OVC:08 8	28.18	10	35	10	26	17
2019-05-08T20:56:00	FM-15	29.93	34	35	T	-RA:02 |RA |RA	-0.06	1	96	30.01	OVC:08 8	28.19	10	35	10	24	16
2019-05-08T21:56:00	FM-15	29.93	34	36	T	UP:09 ||			93	30.01	OVC:08 8	28.19	10	35	10	26	17
2019-05-08T23:56:00	FM-15	29.94	35	37	T	UP:09 ||	-0.01	3	93	30.02	OVC:08 8	28.2	7	36	360	23	18
2019-05-08T23:59:00	SOD																
2019-05-09T00:06:00	FM-15	29.95	36	37	T	UP:09 ||			93		OVC:08 10	28.21	9	37	10	26	17
2019-05-09T00:56:00	FM-15	29.94	35	37	T	UP:09 ||			93	30.02	OVC:08 10	28.2	10	36	20	21	17
2019-05-09T01:56:00	FM-15	29.95	36	38	T	-RA:02 |RA |RA			93	30.03	SCT:04 12 BKN:07 16 OVC:08 29	28.21	10	37	360	23	16
2019-05-09T02:10:00	FM-15		36	37	T	-RA:02 |RA |RA			93		BKN:07 10 BKN:07 17 OVC:08 22		10		350	23	17
2019-05-09T02:19:00	FM-15	29.95	36	37	T				93		SCT:04 12 BKN:07 19 OVC:08 27	28.21	10	37	360		15
2019-05-09T02:30:00	FM-15	29.96	36	37	T				93		OVC:08 14	28.22	10	37	360	24	15
2019-05-09T02:56:00	FM-15	29.95	35	39	T		-0.01	3	86	30.03	OVC:08 14	28.21	10	37	360	26	20
2019-05-09T03:12:00	FM-15	29.95	36	37					93		SCT:04 14 SCT:04 22 OVC:08 34	28.21	10	37	350		15
2019-05-09T03:31:00	FM-15	29.95	36	39					87		SCT:04 16 BKN:07 26 OVC:08 32	28.21	10	38	350	23	15
2019-05-09T03:56:00	FM-15	29.95	36	39					89	30.03	BKN:07 16 OVC:08 26	28.21	10	38	350		15
2019-05-09T04:56:00	FM-15	29.96	37	39					93	30.04	OVC:08 16	28.22	10	38	340		11
2019-05-09T05:56:00	FM-15	29.97	37	41			-0.02	3	86	30.06	BKN:07 16 OVC:08 23	28.23	10	39	350	22	17
2019-05-09T06:56:00	FM-15	30	36	40					86	30.08	BKN:07 14 OVC:08 22	28.26	10	38	10	29	20
2019-05-09T07:56:00	FM-15	30.01	37	41					86	30.09	OVC:08 14	28.27	10	39	360	31	24
2019-05-09T08:46:00	FM-15	30	37	43					81		SCT:04 14 BKN:07 21	28.26	10	40	10	26	21
2019-05-09T08:56:00	FM-15	30	37	43			-0.03	0	80	30.08	BKN:07 18	28.26	10	40	360	26	17
2019-05-09T09:22:00	FM-15	30.01	37	45					76		SCT:04 18	28.27	10	41	20		18
2019-05-09T09:31:00	FM-15	30.01	37	46					71		BKN:07 20 BKN:07 25	28.27	10	42	20	26	17
2019-05-09T09:56:00	FM-15	30.01	37	45					74	30.09	BKN:07 22	28.27	10	41	360	26	21
2019-05-09T10:56:00	FM-15	30.04	36	46					68	30.11	BKN:07 28	28.3	10	41	20	26	18
2019-05-09T11:45:00	FM-15	30.06	36	46					66		FEW:02 26 OVC:08 36	28.31	10	41	10		17

DATE & TIME	REPORTTPYE	HourlyAltimeterSetting	HourlyDewPointTemperature	HourlyDryBulbTemperature	HourlyPrecipitation	HourlyPresentWeatherType	HourlyPressureChange	HourlyPressureTendency	HourlyRelativeHumidity	HourlySeaLevelPressure	HourlySkyConditions	HourlyStationPressure	HourlyVisibility	HourlyWetBulbTemperature	HourlyWindDirection	HourlyWindGustSpeed	HourlyWindSpeed
2019-05-09T11:56:00	FM-15	30.06	36	47			-0.06	3	66	30.14	OVC:08 36	28.31	10	42	20	23	16
2019-05-09T12:20:00	FM-15	30.08	37	46					71		BKN:07 29 OVC:08 36	28.33	10	42	10	21	14
2019-05-09T12:56:00	FM-15	30.08	37	48					66	30.15	BKN:07 29 OVC:08 38	28.33	10	43	350		16
2019-05-09T13:08:00	FM-15	30.08	36	46					66		FEW:02 29 OVC:08 38	28.33	10	41	360	24	17
2019-05-09T13:56:00	FM-15	30.07	37	49					64	30.14	FEW:02 38 BKN:07 49	28.32	10	43	10		15
2019-05-09T14:56:00	FM-15	30.06	34	49			0	8	56	30.13	SCT:04 39 BKN:07 49	28.31	10	42	350		17
2019-05-09T15:56:00	FM-15	30.07	36	50					59	30.14	FEW:02 41 OVC:08 55	28.32	10	44	360		11
2019-05-09T16:56:00	FM-15	30.06	33	52					49	30.12	BKN:07 55	28.31	10	43	330	21	17
2019-05-09T17:56:00	FM-15	30.05	32	52			0.01	8	47	30.11	BKN:07 55	28.3	10	43	350		16
2019-05-09T18:56:00	FM-15	30.06	29	49					46	30.13	SCT:04 55	28.31	10	40	330		15
2019-05-09T19:56:00	FM-15	30.07	32	45					61	30.14	CLR:00	28.32	10	39	330		8
2019-05-09T20:56:00	FM-15	30.1	31	43			-0.04	3	63	30.17	CLR:00	28.35	10	38	330		5
2019-05-09T21:56:00	FM-15	30.12	31	41					67	30.19	CLR:00	28.37	10	37	50		3
2019-05-09T22:56:00	FM-15	30.13	33	39					79	30.2	CLR:00	28.38	10	36	270		5
2019-05-09T23:56:00	FM-15	30.14	34	40			-0.04	1	79	30.21	CLR:00	28.39	10	37	270		3
2019-05-09T23:59:00	SOD																

Appendix C

Wind Turbine Coordinates

Table C-1: Wind Turbine Coordinates

Wind Turbine ID	Coordinates NAD83 UTM Zone 14N (meters)	
	X (Easting)	Y (Northing)
1	721406.00	4906251.99
2	723061.98	4906279.00
3	719276.01	4904165.00
4	719607.78	4904528.06
5	720001.99	4904925.00
6	720586.38	4905093.01
7	721164.93	4905134.04
8	721412.55	4904359.83
9	722146.61	4903790.85
10	722917.01	4904458.99
11	722936.21	4905236.93
12	720083.58	4903474.82
13	721745.00	4902731.98
14	723901.99	4903863.01
15	724459.03	4904409.00
16	724489.00	4902680.00
17	725456.98	4902966.00
18	724979.00	4902967.00
19	719817.00	4902606.01
20	718520.99	4902612.00
21	717891.00	4902888.99
22	718342.58	4903297.99
23	716683.88	4900875.46
24	719429.01	4901133.01
25	717390.99	4901571.99
26	717854.00	4901572.00
27	719754.01	4899535.00
28	716200.02	4899628.99
29	717855.00	4899663.99
30	718288.88	4899674.73
31	720132.01	4899692.99
32	716498.01	4899959.00
33	719125.98	4900137.01
34	716056.00	4898247.98
35	718459.00	4898325.01
36	719504.00	4898501.00
37	722571.00	4898509.00
38	723042.99	4898520.02
39	721808.01	4898632.01
40	721204.99	4898720.00
Alt1	722320.99	4906361.01
Alt2	722259.00	4902646.00
Alt3	723195.00	4902010.02
Alt4	723782.99	4901893.01
Alt5	723440.22	4901087.93
Alt6	719022.60	4901784.73
Alt7	720990.30	4898011.84

Appendix D

Sound Level Modeling Results - Tabular

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
1	724967.32	4896341.13	Non-Participating	1	44
2	726537.89	4896321.29	Non-Participating	1	42
3	725625.32	4896059.58	Non-Participating	1	43
4	719410.70	4896051.41	Non-Participating	1	36
13	723456.49	4896774.78	Non-Participating	1	42
14	713480.83	4898900.44	Non-Participating	1	32
16	715723.31	4898648.13	Non-Participating	1	45
17	715447.24	4899194.95	Non-Participating	1	41
19	717211.44	4898135.31	Participating	1	40
20	717476.52	4898978.04	Non-Participating	1	44
22	718141.05	4897676.55	Participating-Assumed	1	42
23	718315.29	4897230.65	Non-Participating	1	39
24	719282.97	4897515.15	Participating	1	41
25	720904.17	4899187.90	Participating	1	46
26	722203.20	4898274.38	Participating	1	47
27	721690.13	4899054.22	Participating	1	47
28	723264.12	4899043.61	Participating	1	47
29	723148.39	4899253.41	Non-Participating	1	47
31	725540.63	4897544.85	Non-Participating	1	38
32	724971.27	4897228.10	Non-Participating	1	39
36	726225.39	4899113.03	Non-Participating	1	35
37	723990.20	4899418.91	Non-Participating	1	42
38	725325.11	4899964.56	Non-Participating	1	37
40	724716.86	4900688.30	Non-Participating	1	40
41	725875.26	4900834.50	Non-Participating	1	37
42	722427.30	4900617.84	Non-Participating	1	48
43	721991.20	4899704.37	Non-Participating	1	44
44	720889.44	4900807.13	Non-Participating	1	52
46	718911.99	4899677.74	Participating	1	48
49	719388.68	4900626.02	Participating	1	47
50	717161.40	4899221.14	Non-Participating	1	44
51	717258.54	4899542.38	Non-Participating	1	46
52	717119.07	4900238.72	Participating	1	46
53	717301.27	4900451.69	Participating	1	45
55	717076.39	4901073.99	Participating	1	48
56	715837.07	4900177.49	Participating	1	45
58	716032.82	4901955.98	Non-Participating	1	35
59	716453.80	4901946.72	Non-Participating	1	41
60	718480.21	4901000.12	Participating	1	45
61	718385.88	4902176.53	Participating	1	48
62	718203.16	4902322.57	Participating	1	49
63	719389.44	4902171.45	Participating	1	47
64	719470.78	4902334.95	Participating	1	48
65	719873.61	4902159.54	Participating	1	47
66	720678.38	4902318.70	Non-Participating	1	47
67	722830.76	4902522.74	Participating	1	47
68	724305.46	4902285.98	Participating	1	48

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
69	725187.55	4901454.70	Non-Participating	1	40
70	725160.81	4902178.69	Non-Participating	1	44
71	725137.82	4902529.85	Participating	1	48
81	725352.22	4903786.97	Participating	1	43
82	725699.53	4904212.19	Non-Participating	1	40
83	723492.59	4902812.41	Non-Participating	1	45
84	722333.43	4903262.08	Participating	1	47
85	722982.06	4904008.09	Participating	1	47
86	720375.68	4903106.67	Participating-Assumed	1	47
87	720951.07	4903766.63	Participating-Assumed	1	45
88	720550.53	4904032.74	Participating	1	46
89	718770.32	4903420.97	Participating	1	48
90	718659.29	4903828.29	Participating	1	46
91	723368.88	4904718.11	Participating	1	47
92	721996.88	4904643.52	Non-Participating	1	46
93	722006.38	4905029.65	Participating	1	45
94	718774.53	4904450.55	Participating	1	45
95	718467.45	4904553.41	Participating	1	42
98	716874.05	4896617.04	Non-Participating	1	35
100	717883.25	4904909.85	Non-Participating	1	39
101	718162.37	4905006.41	Participating	1	39
102	718274.26	4905044.01	Participating	1	40
103	719140.84	4905043.74	Participating	1	45
105	719636.02	4905481.91	Non-Participating	1	45
109	720594.55	4906146.96	Participating	1	43
112	720406.24	4906727.10	Non-Participating	1	40
114	719215.91	4906259.09	Non-Participating	1	38
115	719213.16	4906349.80	Non-Participating	1	38
116	719291.50	4906403.40	Non-Participating	1	38
117	719371.22	4906459.76	Non-Participating	1	38
118	719412.46	4906490.00	Non-Participating	1	38
119	719463.31	4906543.60	Non-Participating	1	38
120	719483.93	4906571.09	Non-Participating	1	38
121	719500.42	4906613.70	Non-Participating	1	38
122	719526.54	4906674.17	Non-Participating	1	38
123	719537.53	4906700.29	Non-Participating	1	38
124	719569.14	4906742.89	Non-Participating	1	37
125	719584.26	4906795.12	Non-Participating	1	37
126	719588.39	4906869.34	Non-Participating	1	37
127	719643.36	4906894.08	Non-Participating	1	37
128	719573.27	4906936.69	Non-Participating	1	37
131	719114.20	4906081.78	Non-Participating	1	39
133	719506.22	4907080.47	Non-Participating	1	36
134	719465.69	4907121.78	Non-Participating	1	36
135	719426.72	4907251.15	Non-Participating	1	36
136	719377.63	4907389.09	Non-Participating	1	35
137	719365.16	4907339.21	Non-Participating	1	35

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
138	720913.33	4905533.52	Participating	1	48
141	721904.81	4906033.39	Participating	1	47
146	721666.16	4907223.36	Non-Participating	1	41
149	721695.97	4907454.30	Non-Participating	1	39
151	721719.87	4905358.34	Participating	1	46
154	723523.13	4905122.61	Non-Participating	1	45
161	724163.66	4905228.63	Participating	1	42
164	724320.81	4903427.17	Participating	1	46
169	723372.30	4905615.79	Non-Participating	1	46
171	723461.82	4905731.71	Participating-Assumed	1	45
172	724504.21	4905783.38	Non-Participating	1	39
174	724225.15	4906343.92	Participating	1	39
178	723334.67	4906665.95	Participating	1	46
179	725634.47	4905935.88	Non-Participating	1	36
182	725579.11	4905569.15	Non-Participating	1	37
184	725196.23	4905627.67	Non-Participating	1	38
185	725317.77	4905632.44	Non-Participating	1	37
189	724410.32	4907052.07	Participating	1	36
194	724847.86	4907280.34	Non-Participating	1	35
199	726107.97	4905764.29	Non-Participating	1	35
201	726503.06	4905320.15	Non-Participating	1	35
205	726919.36	4902176.15	Non-Participating	1	36
218	722296.75	4907945.00	Non-Participating	1	37
219	722230.87	4907970.76	Non-Participating	1	37
220	722220.68	4907997.11	Non-Participating	1	36
222	727482.24	4897801.59	Non-Participating	1	36
225	726508.78	4897454.26	Non-Participating	1	38
226	727202.86	4899979.73	Non-Participating	1	34
228	726976.25	4900694.01	Non-Participating	1	34
229	726718.52	4901305.38	Non-Participating	1	35
230	726456.05	4906213.42	Non-Participating	1	33
231	726354.15	4906752.29	Non-Participating	1	33
232	725787.65	4907743.68	Non-Participating	1	32
233	725536.82	4907446.28	Non-Participating	1	33
234	725169.65	4907420.70	Non-Participating	1	34
235	723475.42	4905860.10	Participating	1	45
236	723175.31	4908595.11	Non-Participating	1	34
237	719557.26	4900666.24	Participating-Assumed	1	46
238	715848.85	4900637.11	Non-Participating	1	43
239	727874.48	4902603.59	Non-Participating	1	33
240	727888.73	4902392.04	Non-Participating	1	33
242	728301.58	4901544.64	Non-Participating	1	32
243	727336.17	4901068.97	Non-Participating	1	34
244	718764.15	4902985.61	Participating	1	49
245	727235.63	4904241.24	Non-Participating	1	34
246	727363.29	4903829.96	Non-Participating	1	34
247	727860.69	4904504.97	Non-Participating	1	32

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
248	728267.58	4904129.52	Non-Participating	1	32
250	720099.79	4907436.08	Non-Participating	1	36
252	716921.70	4896257.62	Non-Participating	1	34
254	715238.72	4896061.92	Non-Participating	1	32
255	715015.61	4897377.20	Non-Participating	1	36
256	723187.80	4897202.59	Non-Participating	1	41
257	719610.00	4907569.00	Non-Participating	1	35
258	719700.93	4907644.54	Non-Participating	1	35
260	719745.33	4907684.29	Non-Participating	1	35
261	719857.46	4907742.57	Non-Participating	1	35
262	719890.34	4907786.12	Non-Participating	1	35
263	719919.46	4907805.15	Non-Participating	1	35
265	719947.43	4907836.01	Non-Participating	1	35
266	719982.04	4907873.21	Non-Participating	1	35
267	720021.83	4907900.02	Non-Participating	1	35
268	720072.19	4907973.95	Non-Participating	1	35
269	720106.25	4908011.80	Non-Participating	1	35
270	720141.70	4908061.35	Non-Participating	1	35
272	720179.89	4908091.98	Non-Participating	1	34
273	720273.48	4908078.90	Non-Participating	1	35
274	720454.78	4908220.05	Non-Participating	1	34
275	720401.45	4908238.23	Non-Participating	1	34
276	720304.09	4908243.08	Non-Participating	1	34
277	720344.49	4908251.56	Non-Participating	1	34
278	721275.07	4908713.80	Non-Participating	1	34
279	721305.81	4908733.71	Non-Participating	1	34
280	721324.42	4908753.63	Non-Participating	1	34
281	721387.20	4908657.52	Non-Participating	1	34
282	721377.24	4908782.63	Non-Participating	1	33
283	721448.68	4908770.08	Non-Participating	1	34
284	721538.73	4908695.61	Non-Participating	1	34
285	721612.76	4908638.90	Non-Participating	1	34
286	721664.28	4908602.97	Non-Participating	1	34
287	721637.87	4908618.55	Non-Participating	1	34
288	721751.99	4908548.40	Non-Participating	1	34
289	721794.46	4908525.50	Non-Participating	1	34
290	721861.07	4908467.22	Non-Participating	1	35
291	721835.68	4908492.61	Non-Participating	1	34
292	721978.07	4908374.37	Non-Participating	1	35
293	721992.22	4908358.55	Non-Participating	1	35
294	722024.70	4908323.58	Non-Participating	1	35
295	722011.37	4908342.31	Non-Participating	1	35
296	722035.11	4908307.34	Non-Participating	1	35
297	722089.60	4908201.94	Non-Participating	1	35
298	722127.86	4908126.15	Non-Participating	1	36
299	722153.60	4908089.69	Non-Participating	1	36
300	718757.08	4908934.79	Non-Participating	1	32

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
301	718789.00	4908855.07	Non-Participating	1	32
302	718804.77	4908805.37	Non-Participating	1	32
303	718844.90	4908782.13	Non-Participating	1	32
307	719064.83	4908862.39	Non-Participating	1	32
308	719105.42	4908866.46	Non-Participating	1	32
309	719028.86	4908852.24	Non-Participating	1	32
310	718997.87	4908856.18	Non-Participating	1	32
311	718976.83	4908827.32	Non-Participating	1	32
312	718946.52	4908802.66	Non-Participating	1	32
313	718932.81	4908775.31	Non-Participating	1	32
314	718917.79	4908752.12	Non-Participating	1	32
315	718886.39	4908753.91	Non-Participating	1	32
316	718864.96	4908748.89	Non-Participating	1	32
317	719315.87	4908867.66	Non-Participating	1	32
318	719338.08	4908860.01	Non-Participating	1	32
319	719358.98	4908856.51	Non-Participating	1	32
320	719382.24	4908848.92	Non-Participating	1	32
321	719423.86	4908836.08	Non-Participating	1	32
322	719448.43	4908815.84	Non-Participating	1	32
327	719655.92	4908969.59	Non-Participating	1	32
328	719510.56	4908805.86	Non-Participating	1	32
329	719494.17	4908824.72	Non-Participating	1	32
330	719480.38	4908831.06	Non-Participating	1	32
331	719621.89	4908806.30	Non-Participating	1	33
332	719635.36	4908828.68	Non-Participating	1	32
333	719692.62	4908881.15	Non-Participating	1	32
334	719714.06	4908894.66	Non-Participating	1	32
335	719775.28	4908916.96	Non-Participating	1	32
336	719783.54	4908972.62	Non-Participating	1	32
337	719827.18	4908944.00	Non-Participating	1	32
338	719821.62	4909008.89	Non-Participating	1	32
340	719863.03	4908964.75	Non-Participating	1	32
341	719908.49	4908984.50	Non-Participating	1	32
342	719889.00	4909025.73	Non-Participating	1	32
343	719916.82	4909065.08	Non-Participating	1	32
344	719960.33	4909056.08	Non-Participating	1	32
345	719970.89	4909004.75	Non-Participating	1	32
347	720006.42	4909030.79	Non-Participating	1	32
348	720028.40	4909070.31	Non-Participating	1	32
349	719981.33	4909102.97	Non-Participating	1	32
350	719231.68	4908876.50	Non-Participating	1	32
352	719602.30	4908788.46	Non-Participating	1	33
353	719538.13	4908797.13	Non-Participating	1	32
355	723529.44	4909379.33	Non-Participating	1	32
384	721820.17	4907219.46	Participating-Assumed	1	41
386	723908.08	4908855.30	Non-Participating	1	32
388	724139.90	4908828.11	Non-Participating	1	32

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
390	723596.89	4908931.73	Non-Participating	1	33
391	723532.73	4908905.53	Non-Participating	1	33
393	722215.45	4908035.25	Non-Participating	1	36
394	722177.41	4908058.91	Non-Participating	1	36
395	722056.64	4908256.22	Non-Participating	1	35
396	721948.07	4908375.27	Non-Participating	1	35
400	721565.91	4908675.92	Non-Participating	1	34
405	720268.50	4908203.65	Non-Participating	1	34
406	720369.09	4908241.09	Non-Participating	1	34
410	720048.78	4907946.28	Non-Participating	1	35
411	720116.92	4907819.45	Non-Participating	1	35
412	719794.95	4907709.10	Non-Participating	1	35
413	719782.62	4907676.53	Non-Participating	1	35
414	719848.76	4907583.53	Non-Participating	1	35
421	719588.35	4907315.19	Non-Participating	1	36
422	719376.99	4907276.82	Non-Participating	1	36
423	719406.83	4907178.95	Non-Participating	1	36
426	719330.01	4906440.32	Non-Participating	1	38
429	717938.68	4904865.30	Non-Participating	1	39
430	717932.82	4904896.09	Non-Participating	1	39
431	717915.15	4904653.73	Non-Participating	1	39
432	717963.00	4904727.58	Non-Participating	1	39
433	718000.35	4904756.38	Non-Participating	1	39
434	718053.13	4904782.14	Non-Participating	1	40
435	718055.75	4904739.22	Non-Participating	1	40
438	717699.27	4904628.61	Non-Participating	1	39
439	717671.57	4904626.25	Non-Participating	1	38
440	717564.02	4904661.44	Non-Participating	1	37
441	717530.49	4904678.61	Non-Participating	1	37
442	717277.82	4904821.59	Non-Participating	1	34
443	717311.81	4904655.97	Non-Participating	1	36
444	717272.02	4904656.19	Non-Participating	1	37
445	717237.39	4904648.11	Non-Participating	1	37
446	717204.21	4904648.73	Non-Participating	1	37
447	717169.91	4904645.97	Non-Participating	1	37
448	717099.04	4904644.95	Non-Participating	1	36
449	717327.26	4904576.71	Non-Participating	1	37
450	717260.30	4904565.99	Non-Participating	1	37
451	717411.00	4904486.37	Participating	1	37
452	717451.66	4904493.50	Participating	1	37
453	717449.05	4904427.71	Participating	1	37
454	717429.94	4904425.88	Participating	1	37
455	717336.41	4904481.15	Non-Participating	1	37
456	717225.45	4904344.45	Non-Participating	1	38
457	717269.99	4904375.01	Non-Participating	1	38
458	717222.15	4904431.08	Non-Participating	1	37
459	717267.74	4904455.08	Non-Participating	1	37

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
460	717265.56	4904425.78	Non-Participating	1	38
461	717264.21	4904404.49	Non-Participating	1	38
462	717224.49	4904457.74	Non-Participating	1	37
463	717219.75	4904491.92	Non-Participating	1	36
464	717121.71	4904382.52	Non-Participating	1	38
465	717145.67	4904402.55	Non-Participating	1	38
466	717115.41	4904420.58	Non-Participating	1	37
467	717126.03	4904463.65	Non-Participating	1	37
468	717011.84	4904531.58	Non-Participating	1	33
469	717114.32	4904557.73	Non-Participating	1	35
470	717152.66	4904559.41	Non-Participating	1	36
471	717179.04	4904594.16	Non-Participating	1	37
472	717199.47	4904596.07	Non-Participating	1	37
473	717213.29	4904565.10	Non-Participating	1	37
474	717110.15	4904593.27	Non-Participating	1	36
475	717079.66	4904593.39	Non-Participating	1	36
476	717049.32	4904590.87	Non-Participating	1	35
477	717003.01	4904556.89	Non-Participating	1	33
478	717001.77	4904587.97	Non-Participating	1	35
479	717020.75	4904646.13	Non-Participating	1	36
480	716988.35	4904644.82	Non-Participating	1	35
481	716963.30	4904642.62	Non-Participating	1	35
482	716991.24	4904467.35	Non-Participating	1	32
483	716903.21	4904378.45	Non-Participating	1	32
484	716837.08	4904397.61	Non-Participating	1	32
485	716939.50	4904923.55	Non-Participating	1	32
486	716909.64	4904848.14	Non-Participating	1	31
487	717001.95	4904867.04	Non-Participating	1	31
488	716674.31	4904664.07	Non-Participating	1	31
489	716825.86	4904581.19	Non-Participating	1	35
490	716856.90	4904583.09	Non-Participating	1	35
491	716882.54	4904586.65	Non-Participating	1	35
492	716878.39	4904513.48	Non-Participating	1	33
493	716916.94	4904511.86	Non-Participating	1	33
494	716948.95	4904530.39	Non-Participating	1	34
495	716949.29	4904568.19	Non-Participating	1	35
496	716942.67	4904589.66	Non-Participating	1	35
497	716911.86	4904573.19	Non-Participating	1	35
498	716917.97	4904635.88	Non-Participating	1	35
499	716890.24	4904634.18	Non-Participating	1	35
500	716854.83	4904638.65	Non-Participating	1	35
501	716518.40	4904883.23	Non-Participating	1	33
502	716602.70	4904783.65	Non-Participating	1	32
503	716565.00	4904619.61	Non-Participating	1	33
504	716489.56	4904682.61	Non-Participating	1	32
505	716473.85	4904722.74	Non-Participating	1	32
506	716442.68	4904744.70	Non-Participating	1	32

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
507	716445.50	4904785.31	Non-Participating	1	33
508	716424.48	4904684.60	Non-Participating	1	32
509	716223.64	4904999.11	Non-Participating	1	33
510	716354.23	4905179.04	Non-Participating	1	33
511	716338.97	4905246.51	Non-Participating	1	33
512	716459.20	4905309.54	Non-Participating	1	34
513	716453.10	4905409.39	Non-Participating	1	34
514	716418.30	4905353.97	Non-Participating	1	34
515	716427.83	4905367.28	Non-Participating	1	34
516	716458.13	4905288.00	Non-Participating	1	34
517	715843.66	4905893.14	Non-Participating	1	32
518	715773.02	4905877.69	Non-Participating	1	30
519	715815.13	4905344.94	Non-Participating	1	31
520	715824.71	4905292.24	Non-Participating	1	32
521	715867.43	4905309.16	Non-Participating	1	31
522	715166.41	4904844.74	Non-Participating	1	32
523	715205.36	4904754.06	Non-Participating	1	32
524	715157.37	4904393.98	Non-Participating	1	32
525	715215.94	4904385.63	Non-Participating	1	32
526	715199.70	4904352.03	Non-Participating	1	31
527	715356.05	4904461.80	Non-Participating	1	32
528	715417.46	4904498.17	Non-Participating	1	32
529	715407.47	4904466.54	Non-Participating	1	32
530	715666.65	4904585.78	Non-Participating	1	32
531	715696.65	4904576.48	Non-Participating	1	32
532	715724.48	4904576.59	Non-Participating	1	32
533	715756.97	4904578.58	Non-Participating	1	32
534	715778.32	4904580.68	Non-Participating	1	32
535	715805.26	4904582.32	Non-Participating	1	32
536	715837.95	4904581.14	Non-Participating	1	32
537	715835.66	4904540.43	Non-Participating	1	32
538	715797.01	4904522.16	Non-Participating	1	32
539	715742.38	4904518.03	Non-Participating	1	32
540	715681.73	4904534.21	Non-Participating	1	32
541	715679.22	4904510.19	Non-Participating	1	32
542	715894.13	4904455.71	Non-Participating	1	32
543	715859.67	4904459.97	Non-Participating	1	31
544	715826.19	4904461.11	Non-Participating	1	31
545	715798.36	4904461.00	Non-Participating	1	32
546	715893.31	4904508.16	Non-Participating	1	32
547	715892.01	4904529.56	Non-Participating	1	32
548	715893.34	4904559.87	Non-Participating	1	32
549	715908.04	4904592.58	Non-Participating	1	32
550	715937.31	4904595.17	Non-Participating	1	32
551	715977.73	4904597.64	Non-Participating	1	32
552	715998.33	4904598.89	Non-Participating	1	32
553	716045.23	4904599.37	Non-Participating	1	32

Table D-1: Project + Existing Non-Project + Future Non-Project Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
554	716045.31	4904546.09	Non-Participating	1	32
555	716009.60	4904544.70	Non-Participating	1	32
556	715972.76	4904548.81	Non-Participating	1	32
557	715949.78	4904547.41	Non-Participating	1	32
558	715954.67	4904506.34	Non-Participating	1	32
559	715639.77	4904166.54	Non-Participating	1	31
560	715706.97	4904199.28	Non-Participating	1	31
568	715127.65	4895407.57	Non-Participating	1	31
578	715224.57	4895378.18	Non-Participating	1	31
613	724975.11	4897668.13	Non-Participating	1	39
669	716989.84	4896233.57	Non-Participating	1	34
692	714314.71	4895847.22	Non-Participating	1	30
698	714205.06	4895733.41	Non-Participating	1	27
745	726858.39	4900143.28	Non-Participating	1	34
746	726865.43	4900158.30	Non-Participating	1	34
791	719916.57	4900476.21	Participating-Assumed	1	45
793	719578.52	4900642.43	Participating-Assumed	1	46
841	718039.49	4900059.75	Participating	1	49
924	727022.24	4902627.29	Non-Participating	1	36
941	724623.73	4903937.11	Participating	1	47
970	718804.83	4903017.02	Participating	1	48
985	714318.77	4902656.83	Non-Participating	1	33
986	714237.97	4903398.65	Non-Participating	1	32
997	714603.77	4903727.73	Non-Participating	1	33
1053	726925.43	4905673.26	Non-Participating	1	33
1054	726986.94	4905673.30	Non-Participating	1	33
1055	727460.91	4905672.52	Non-Participating	1	32
1056	727588.03	4905661.99	Non-Participating	1	32
1057	727648.51	4905661.71	Non-Participating	1	32
1058	727857.79	4905504.27	Non-Participating	1	32
1072	727319.90	4901042.05	Non-Participating	1	34
1076	728362.36	4902262.86	Non-Participating	1	32
1081	713673.07	4900785.04	Non-Participating	1	33
1082	726638.58	4904876.28	Non-Participating	1	35
1083	719182.87	4905036.07	Participating	1	45

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Y (m)	Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
1	724967.32	4896341.13	Non-Participating	1	30
2	726537.89	4896321.29	Non-Participating	1	29
3	725625.32	4896059.58	Non-Participating	1	29
4	719410.70	4896051.41	Non-Participating	1	34
13	723456.49	4896774.78	Non-Participating	1	34
14	713480.83	4898900.44	Non-Participating	1	32
16	715723.31	4898648.13	Non-Participating	1	45
17	715447.24	4899194.95	Non-Participating	1	41
19	717211.44	4898135.31	Participating	1	40
20	717476.52	4898978.04	Non-Participating	1	44
22	718141.05	4897676.55	Participating-Assumed	1	42
23	718315.29	4897230.65	Non-Participating	1	39
24	719282.97	4897515.15	Participating	1	41
25	720904.17	4899187.90	Participating	1	46
26	722203.20	4898274.38	Participating	1	46
27	721690.13	4899054.22	Participating	1	47
28	723264.12	4899043.61	Participating	1	44
29	723148.39	4899253.41	Non-Participating	1	42
31	725540.63	4897544.85	Non-Participating	1	32
32	724971.27	4897228.10	Non-Participating	1	32
36	726225.39	4899113.03	Non-Participating	1	32
37	723990.20	4899418.91	Non-Participating	1	38
38	725325.11	4899964.56	Non-Participating	1	35
40	724716.86	4900688.30	Non-Participating	1	39
41	725875.26	4900834.50	Non-Participating	1	36
42	722427.30	4900617.84	Non-Participating	1	40
43	721991.20	4899704.37	Non-Participating	1	41
44	720889.44	4900807.13	Non-Participating	1	41
46	718911.99	4899677.74	Participating	1	48
49	719388.68	4900626.02	Participating	1	47
50	717161.40	4899221.14	Non-Participating	1	44
51	717258.54	4899542.38	Non-Participating	1	46
52	717119.07	4900238.72	Participating	1	46
53	717301.27	4900451.69	Participating	1	45
55	717076.39	4901073.99	Participating	1	48
56	715837.07	4900177.49	Participating	1	45
58	716032.82	4901955.98	Non-Participating	1	34
59	716453.80	4901946.72	Non-Participating	1	41
60	718480.21	4901000.12	Participating	1	45
61	718385.88	4902176.53	Participating	1	48
62	718203.16	4902322.57	Participating	1	49
63	719389.44	4902171.45	Participating	1	47
64	719470.78	4902334.95	Participating	1	48
65	719873.61	4902159.54	Participating	1	47
66	720678.38	4902318.70	Non-Participating	1	43
67	722830.76	4902522.74	Participating	1	47
68	724305.46	4902285.98	Participating	1	48

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
69	725187.55	4901454.70	Non-Participating	1	40
70	725160.81	4902178.69	Non-Participating	1	44
71	725137.82	4902529.85	Participating	1	48
81	725352.22	4903786.97	Participating	1	43
82	725699.53	4904212.19	Non-Participating	1	40
83	723492.59	4902812.41	Non-Participating	1	45
84	722333.43	4903262.08	Participating	1	46
85	722982.06	4904008.09	Participating	1	47
86	720375.68	4903106.67	Participating-Assumed	1	47
87	720951.07	4903766.63	Participating-Assumed	1	45
88	720550.53	4904032.74	Participating	1	46
89	718770.32	4903420.97	Participating	1	48
90	718659.29	4903828.29	Participating	1	46
91	723368.88	4904718.11	Participating	1	47
92	721996.88	4904643.52	Non-Participating	1	46
93	722006.38	4905029.65	Participating	1	45
94	718774.53	4904450.55	Participating	1	45
95	718467.45	4904553.41	Participating	1	42
98	716874.05	4896617.04	Non-Participating	1	35
100	717883.25	4904909.85	Non-Participating	1	39
101	718162.37	4905006.41	Participating	1	39
102	718274.26	4905044.01	Participating	1	40
103	719140.84	4905043.74	Participating	1	45
105	719636.02	4905481.91	Non-Participating	1	45
109	720594.55	4906146.96	Participating	1	43
112	720406.24	4906727.10	Non-Participating	1	40
114	719215.91	4906259.09	Non-Participating	1	38
115	719213.16	4906349.80	Non-Participating	1	38
116	719291.50	4906403.40	Non-Participating	1	38
117	719371.22	4906459.76	Non-Participating	1	38
118	719412.46	4906490.00	Non-Participating	1	38
119	719463.31	4906543.60	Non-Participating	1	38
120	719483.93	4906571.09	Non-Participating	1	38
121	719500.42	4906613.70	Non-Participating	1	38
122	719526.54	4906674.17	Non-Participating	1	38
123	719537.53	4906700.29	Non-Participating	1	38
124	719569.14	4906742.89	Non-Participating	1	37
125	719584.26	4906795.12	Non-Participating	1	37
126	719588.39	4906869.34	Non-Participating	1	37
127	719643.36	4906894.08	Non-Participating	1	37
128	719573.27	4906936.69	Non-Participating	1	37
131	719114.20	4906081.78	Non-Participating	1	39
133	719506.22	4907080.47	Non-Participating	1	36
134	719465.69	4907121.78	Non-Participating	1	36
135	719426.72	4907251.15	Non-Participating	1	36
136	719377.63	4907389.09	Non-Participating	1	35
137	719365.16	4907339.21	Non-Participating	1	35

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
138	720913.33	4905533.52	Participating	1	48
141	721904.81	4906033.39	Participating	1	47
146	721666.16	4907223.36	Non-Participating	1	41
149	721695.97	4907454.30	Non-Participating	1	39
151	721719.87	4905358.34	Participating	1	46
154	723523.13	4905122.61	Non-Participating	1	45
161	724163.66	4905228.63	Participating	1	42
164	724320.81	4903427.17	Participating	1	46
169	723372.30	4905615.79	Non-Participating	1	46
171	723461.82	4905731.71	Participating-Assumed	1	45
172	724504.21	4905783.38	Non-Participating	1	39
174	724225.15	4906343.92	Participating	1	39
178	723334.67	4906665.95	Participating	1	46
179	725634.47	4905935.88	Non-Participating	1	35
182	725579.11	4905569.15	Non-Participating	1	36
184	725196.23	4905627.67	Non-Participating	1	37
185	725317.77	4905632.44	Non-Participating	1	37
189	724410.32	4907052.07	Participating	1	36
194	724847.86	4907280.34	Non-Participating	1	35
199	726107.97	4905764.29	Non-Participating	1	35
201	726503.06	4905320.15	Non-Participating	1	34
205	726919.36	4902176.15	Non-Participating	1	36
218	722296.75	4907945.00	Non-Participating	1	37
219	722230.87	4907970.76	Non-Participating	1	37
220	722220.68	4907997.11	Non-Participating	1	36
222	727482.24	4897801.59	Non-Participating	1	29
225	726508.78	4897454.26	Non-Participating	1	30
226	727202.86	4899979.73	Non-Participating	1	32
228	726976.25	4900694.01	Non-Participating	1	33
229	726718.52	4901305.38	Non-Participating	1	35
230	726456.05	4906213.42	Non-Participating	1	33
231	726354.15	4906752.29	Non-Participating	1	32
232	725787.65	4907743.68	Non-Participating	1	32
233	725536.82	4907446.28	Non-Participating	1	33
234	725169.65	4907420.70	Non-Participating	1	34
235	723475.42	4905860.10	Participating	1	45
236	723175.31	4908595.11	Non-Participating	1	34
237	719557.26	4900666.24	Participating-Assumed	1	46
238	715848.85	4900637.11	Non-Participating	1	43
239	727874.48	4902603.59	Non-Participating	1	33
240	727888.73	4902392.04	Non-Participating	1	32
242	728301.58	4901544.64	Non-Participating	1	31
243	727336.17	4901068.97	Non-Participating	1	33
244	718764.15	4902985.61	Participating	1	49
245	727235.63	4904241.24	Non-Participating	1	34
246	727363.29	4903829.96	Non-Participating	1	34
247	727860.69	4904504.97	Non-Participating	1	32

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
248	728267.58	4904129.52	Non-Participating	1	31
250	720099.79	4907436.08	Non-Participating	1	36
252	716921.70	4896257.62	Non-Participating	1	34
254	715238.72	4896061.92	Non-Participating	1	32
255	715015.61	4897377.20	Non-Participating	1	35
256	723187.80	4897202.59	Non-Participating	1	37
257	719610.00	4907569.00	Non-Participating	1	35
258	719700.93	4907644.54	Non-Participating	1	35
260	719745.33	4907684.29	Non-Participating	1	35
261	719857.46	4907742.57	Non-Participating	1	35
262	719890.34	4907786.12	Non-Participating	1	35
263	719919.46	4907805.15	Non-Participating	1	35
265	719947.43	4907836.01	Non-Participating	1	35
266	719982.04	4907873.21	Non-Participating	1	35
267	720021.83	4907900.02	Non-Participating	1	35
268	720072.19	4907973.95	Non-Participating	1	35
269	720106.25	4908011.80	Non-Participating	1	35
270	720141.70	4908061.35	Non-Participating	1	34
272	720179.89	4908091.98	Non-Participating	1	34
273	720273.48	4908078.90	Non-Participating	1	35
274	720454.78	4908220.05	Non-Participating	1	34
275	720401.45	4908238.23	Non-Participating	1	34
276	720304.09	4908243.08	Non-Participating	1	34
277	720344.49	4908251.56	Non-Participating	1	34
278	721275.07	4908713.80	Non-Participating	1	34
279	721305.81	4908733.71	Non-Participating	1	34
280	721324.42	4908753.63	Non-Participating	1	33
281	721387.20	4908657.52	Non-Participating	1	34
282	721377.24	4908782.63	Non-Participating	1	33
283	721448.68	4908770.08	Non-Participating	1	33
284	721538.73	4908695.61	Non-Participating	1	34
285	721612.76	4908638.90	Non-Participating	1	34
286	721664.28	4908602.97	Non-Participating	1	34
287	721637.87	4908618.55	Non-Participating	1	34
288	721751.99	4908548.40	Non-Participating	1	34
289	721794.46	4908525.50	Non-Participating	1	34
290	721861.07	4908467.22	Non-Participating	1	35
291	721835.68	4908492.61	Non-Participating	1	34
292	721978.07	4908374.37	Non-Participating	1	35
293	721992.22	4908358.55	Non-Participating	1	35
294	722024.70	4908323.58	Non-Participating	1	35
295	722011.37	4908342.31	Non-Participating	1	35
296	722035.11	4908307.34	Non-Participating	1	35
297	722089.60	4908201.94	Non-Participating	1	35
298	722127.86	4908126.15	Non-Participating	1	36
299	722153.60	4908089.69	Non-Participating	1	36
300	718757.08	4908934.79	Non-Participating	1	32

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
301	718789.00	4908855.07	Non-Participating	1	32
302	718804.77	4908805.37	Non-Participating	1	32
303	718844.90	4908782.13	Non-Participating	1	32
307	719064.83	4908862.39	Non-Participating	1	32
308	719105.42	4908866.46	Non-Participating	1	32
309	719028.86	4908852.24	Non-Participating	1	32
310	718997.87	4908856.18	Non-Participating	1	32
311	718976.83	4908827.32	Non-Participating	1	32
312	718946.52	4908802.66	Non-Participating	1	32
313	718932.81	4908775.31	Non-Participating	1	32
314	718917.79	4908752.12	Non-Participating	1	32
315	718886.39	4908753.91	Non-Participating	1	32
316	718864.96	4908748.89	Non-Participating	1	32
317	719315.87	4908867.66	Non-Participating	1	32
318	719338.08	4908860.01	Non-Participating	1	32
319	719358.98	4908856.51	Non-Participating	1	32
320	719382.24	4908848.92	Non-Participating	1	32
321	719423.86	4908836.08	Non-Participating	1	32
322	719448.43	4908815.84	Non-Participating	1	32
327	719655.92	4908969.59	Non-Participating	1	32
328	719510.56	4908805.86	Non-Participating	1	32
329	719494.17	4908824.72	Non-Participating	1	32
330	719480.38	4908831.06	Non-Participating	1	32
331	719621.89	4908806.30	Non-Participating	1	32
332	719635.36	4908828.68	Non-Participating	1	32
333	719692.62	4908881.15	Non-Participating	1	32
334	719714.06	4908894.66	Non-Participating	1	32
335	719775.28	4908916.96	Non-Participating	1	32
336	719783.54	4908972.62	Non-Participating	1	32
337	719827.18	4908944.00	Non-Participating	1	32
338	719821.62	4909008.89	Non-Participating	1	32
340	719863.03	4908964.75	Non-Participating	1	32
341	719908.49	4908984.50	Non-Participating	1	32
342	719889.00	4909025.73	Non-Participating	1	32
343	719916.82	4909065.08	Non-Participating	1	32
344	719960.33	4909056.08	Non-Participating	1	32
345	719970.89	4909004.75	Non-Participating	1	32
347	720006.42	4909030.79	Non-Participating	1	32
348	720028.40	4909070.31	Non-Participating	1	32
349	719981.33	4909102.97	Non-Participating	1	32
350	719231.68	4908876.50	Non-Participating	1	32
352	719602.30	4908788.46	Non-Participating	1	32
353	719538.13	4908797.13	Non-Participating	1	32
355	723529.44	4909379.33	Non-Participating	1	32
384	721820.17	4907219.46	Participating-Assumed	1	41
386	723908.08	4908855.30	Non-Participating	1	32
388	724139.90	4908828.11	Non-Participating	1	32

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Y (m)	Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
390	723596.89	4908931.73	Non-Participating	1	32
391	723532.73	4908905.53	Non-Participating	1	33
393	722215.45	4908035.25	Non-Participating	1	36
394	722177.41	4908058.91	Non-Participating	1	36
395	722056.64	4908256.22	Non-Participating	1	35
396	721948.07	4908375.27	Non-Participating	1	35
400	721565.91	4908675.92	Non-Participating	1	34
405	720268.50	4908203.65	Non-Participating	1	34
406	720369.09	4908241.09	Non-Participating	1	34
410	720048.78	4907946.28	Non-Participating	1	35
411	720116.92	4907819.45	Non-Participating	1	35
412	719794.95	4907709.10	Non-Participating	1	35
413	719782.62	4907676.53	Non-Participating	1	35
414	719848.76	4907583.53	Non-Participating	1	35
421	719588.35	4907315.19	Non-Participating	1	36
422	719376.99	4907276.82	Non-Participating	1	35
423	719406.83	4907178.95	Non-Participating	1	36
426	719330.01	4906440.32	Non-Participating	1	38
429	717938.68	4904865.30	Non-Participating	1	39
430	717932.82	4904896.09	Non-Participating	1	39
431	717915.15	4904653.73	Non-Participating	1	39
432	717963.00	4904727.58	Non-Participating	1	39
433	718000.35	4904756.38	Non-Participating	1	39
434	718053.13	4904782.14	Non-Participating	1	40
435	718055.75	4904739.22	Non-Participating	1	40
438	717699.27	4904628.61	Non-Participating	1	38
439	717671.57	4904626.25	Non-Participating	1	38
440	717564.02	4904661.44	Non-Participating	1	37
441	717530.49	4904678.61	Non-Participating	1	37
442	717277.82	4904821.59	Non-Participating	1	34
443	717311.81	4904655.97	Non-Participating	1	36
444	717272.02	4904656.19	Non-Participating	1	37
445	717237.39	4904648.11	Non-Participating	1	37
446	717204.21	4904648.73	Non-Participating	1	37
447	717169.91	4904645.97	Non-Participating	1	37
448	717099.04	4904644.95	Non-Participating	1	36
449	717327.26	4904576.71	Non-Participating	1	37
450	717260.30	4904565.99	Non-Participating	1	37
451	717411.00	4904486.37	Participating	1	37
452	717451.66	4904493.50	Participating	1	37
453	717449.05	4904427.71	Participating	1	37
454	717429.94	4904425.88	Participating	1	37
455	717336.41	4904481.15	Non-Participating	1	37
456	717225.45	4904344.45	Non-Participating	1	38
457	717269.99	4904375.01	Non-Participating	1	38
458	717222.15	4904431.08	Non-Participating	1	37
459	717267.74	4904455.08	Non-Participating	1	37

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
460	717265.56	4904425.78	Non-Participating	1	38
461	717264.21	4904404.49	Non-Participating	1	38
462	717224.49	4904457.74	Non-Participating	1	37
463	717219.75	4904491.92	Non-Participating	1	36
464	717121.71	4904382.52	Non-Participating	1	38
465	717145.67	4904402.55	Non-Participating	1	38
466	717115.41	4904420.58	Non-Participating	1	37
467	717126.03	4904463.65	Non-Participating	1	37
468	717011.84	4904531.58	Non-Participating	1	33
469	717114.32	4904557.73	Non-Participating	1	35
470	717152.66	4904559.41	Non-Participating	1	36
471	717179.04	4904594.16	Non-Participating	1	37
472	717199.47	4904596.07	Non-Participating	1	37
473	717213.29	4904565.10	Non-Participating	1	37
474	717110.15	4904593.27	Non-Participating	1	36
475	717079.66	4904593.39	Non-Participating	1	36
476	717049.32	4904590.87	Non-Participating	1	35
477	717003.01	4904556.89	Non-Participating	1	33
478	717001.77	4904587.97	Non-Participating	1	35
479	717020.75	4904646.13	Non-Participating	1	36
480	716988.35	4904644.82	Non-Participating	1	35
481	716963.30	4904642.62	Non-Participating	1	35
482	716991.24	4904467.35	Non-Participating	1	32
483	716903.21	4904378.45	Non-Participating	1	32
484	716837.08	4904397.61	Non-Participating	1	32
485	716939.50	4904923.55	Non-Participating	1	32
486	716909.64	4904848.14	Non-Participating	1	31
487	717001.95	4904867.04	Non-Participating	1	31
488	716674.31	4904664.07	Non-Participating	1	31
489	716825.86	4904581.19	Non-Participating	1	35
490	716856.90	4904583.09	Non-Participating	1	35
491	716882.54	4904586.65	Non-Participating	1	35
492	716878.39	4904513.48	Non-Participating	1	33
493	716916.94	4904511.86	Non-Participating	1	33
494	716948.95	4904530.39	Non-Participating	1	34
495	716949.29	4904568.19	Non-Participating	1	35
496	716942.67	4904589.66	Non-Participating	1	35
497	716911.86	4904573.19	Non-Participating	1	35
498	716917.97	4904635.88	Non-Participating	1	35
499	716890.24	4904634.18	Non-Participating	1	35
500	716854.83	4904638.65	Non-Participating	1	35
501	716518.40	4904883.23	Non-Participating	1	33
502	716602.70	4904783.65	Non-Participating	1	32
503	716565.00	4904619.61	Non-Participating	1	33
504	716489.56	4904682.61	Non-Participating	1	32
505	716473.85	4904722.74	Non-Participating	1	32
506	716442.68	4904744.70	Non-Participating	1	32

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Y (m)	Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
507	716445.50	4904785.31	Non-Participating	1	33
508	716424.48	4904684.60	Non-Participating	1	32
509	716223.64	4904999.11	Non-Participating	1	33
510	716354.23	4905179.04	Non-Participating	1	33
511	716338.97	4905246.51	Non-Participating	1	33
512	716459.20	4905309.54	Non-Participating	1	34
513	716453.10	4905409.39	Non-Participating	1	34
514	716418.30	4905353.97	Non-Participating	1	34
515	716427.83	4905367.28	Non-Participating	1	34
516	716458.13	4905288.00	Non-Participating	1	34
517	715843.66	4905893.14	Non-Participating	1	32
518	715773.02	4905877.69	Non-Participating	1	30
519	715815.13	4905344.94	Non-Participating	1	31
520	715824.71	4905292.24	Non-Participating	1	32
521	715867.43	4905309.16	Non-Participating	1	31
522	715166.41	4904844.74	Non-Participating	1	32
523	715205.36	4904754.06	Non-Participating	1	32
524	715157.37	4904393.98	Non-Participating	1	32
525	715215.94	4904385.63	Non-Participating	1	32
526	715199.70	4904352.03	Non-Participating	1	31
527	715356.05	4904461.80	Non-Participating	1	32
528	715417.46	4904498.17	Non-Participating	1	32
529	715407.47	4904466.54	Non-Participating	1	32
530	715666.65	4904585.78	Non-Participating	1	32
531	715696.65	4904576.48	Non-Participating	1	32
532	715724.48	4904576.59	Non-Participating	1	32
533	715756.97	4904578.58	Non-Participating	1	32
534	715778.32	4904580.68	Non-Participating	1	32
535	715805.26	4904582.32	Non-Participating	1	32
536	715837.95	4904581.14	Non-Participating	1	32
537	715835.66	4904540.43	Non-Participating	1	32
538	715797.01	4904522.16	Non-Participating	1	32
539	715742.38	4904518.03	Non-Participating	1	32
540	715681.73	4904534.21	Non-Participating	1	32
541	715679.22	4904510.19	Non-Participating	1	32
542	715894.13	4904455.71	Non-Participating	1	32
543	715859.67	4904459.97	Non-Participating	1	31
544	715826.19	4904461.11	Non-Participating	1	31
545	715798.36	4904461.00	Non-Participating	1	32
546	715893.31	4904508.16	Non-Participating	1	32
547	715892.01	4904529.56	Non-Participating	1	32
548	715893.34	4904559.87	Non-Participating	1	32
549	715908.04	4904592.58	Non-Participating	1	32
550	715937.31	4904595.17	Non-Participating	1	32
551	715977.73	4904597.64	Non-Participating	1	32
552	715998.33	4904598.89	Non-Participating	1	32
553	716045.23	4904599.37	Non-Participating	1	32

Table D-2: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
554	716045.31	4904546.09	Non-Participating	1	32
555	716009.60	4904544.70	Non-Participating	1	32
556	715972.76	4904548.81	Non-Participating	1	32
557	715949.78	4904547.41	Non-Participating	1	32
558	715954.67	4904506.34	Non-Participating	1	32
559	715639.77	4904166.54	Non-Participating	1	31
560	715706.97	4904199.28	Non-Participating	1	31
568	715127.65	4895407.57	Non-Participating	1	30
578	715224.57	4895378.18	Non-Participating	1	30
613	724975.11	4897668.13	Non-Participating	1	33
669	716989.84	4896233.57	Non-Participating	1	34
692	714314.71	4895847.22	Non-Participating	1	30
698	714205.06	4895733.41	Non-Participating	1	27
745	726858.39	4900143.28	Non-Participating	1	33
746	726865.43	4900158.30	Non-Participating	1	33
791	719916.57	4900476.21	Participating-Assumed	1	45
793	719578.52	4900642.43	Participating-Assumed	1	46
841	718039.49	4900059.75	Participating	1	49
924	727022.24	4902627.29	Non-Participating	1	36
941	724623.73	4903937.11	Participating	1	47
970	718804.83	4903017.02	Participating	1	48
985	714318.77	4902656.83	Non-Participating	1	33
986	714237.97	4903398.65	Non-Participating	1	32
997	714603.77	4903727.73	Non-Participating	1	33
1053	726925.43	4905673.26	Non-Participating	1	33
1054	726986.94	4905673.30	Non-Participating	1	33
1055	727460.91	4905672.52	Non-Participating	1	32
1056	727588.03	4905661.99	Non-Participating	1	32
1057	727648.51	4905661.71	Non-Participating	1	31
1058	727857.79	4905504.27	Non-Participating	1	31
1072	727319.90	4901042.05	Non-Participating	1	33
1076	728362.36	4902262.86	Non-Participating	1	31
1081	713673.07	4900785.04	Non-Participating	1	33
1082	726638.58	4904876.28	Non-Participating	1	35
1083	719182.87	4905036.07	Participating	1	45

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
1	724967.32	4896341.13	Non-Participating	1	24
2	726537.89	4896321.29	Non-Participating	1	17
3	725625.32	4896059.58	Non-Participating	1	20
4	719410.70	4896051.41	Non-Participating	1	16
13	723456.49	4896774.78	Non-Participating	1	23
14	713480.83	4898900.44	Non-Participating	1	0
16	715723.31	4898648.13	Non-Participating	1	9
17	715447.24	4899194.95	Non-Participating	1	7
19	717211.44	4898135.31	Participating	1	16
20	717476.52	4898978.04	Non-Participating	1	19
22	718141.05	4897676.55	Participating-Assumed	1	18
23	718315.29	4897230.65	Non-Participating	1	17
24	719282.97	4897515.15	Participating	1	21
25	720904.17	4899187.90	Participating	1	34
26	722203.20	4898274.38	Participating	1	35
27	721690.13	4899054.22	Participating	1	37
28	723264.12	4899043.61	Participating	1	43
29	723148.39	4899253.41	Non-Participating	1	46
31	725540.63	4897544.85	Non-Participating	1	27
32	724971.27	4897228.10	Non-Participating	1	29
36	726225.39	4899113.03	Non-Participating	1	24
37	723990.20	4899418.91	Non-Participating	1	39
38	725325.11	4899964.56	Non-Participating	1	28
40	724716.86	4900688.30	Non-Participating	1	29
41	725875.26	4900834.50	Non-Participating	1	23
42	722427.30	4900617.84	Non-Participating	1	48
43	721991.20	4899704.37	Non-Participating	1	41
44	720889.44	4900807.13	Non-Participating	1	51
46	718911.99	4899677.74	Participating	1	28
49	719388.68	4900626.02	Participating	1	34
50	717161.40	4899221.14	Non-Participating	1	17
51	717258.54	4899542.38	Non-Participating	1	19
52	717119.07	4900238.72	Participating	1	20
53	717301.27	4900451.69	Participating	1	21
55	717076.39	4901073.99	Participating	1	20
56	715837.07	4900177.49	Participating	1	11
58	716032.82	4901955.98	Non-Participating	1	7
59	716453.80	4901946.72	Non-Participating	1	15
60	718480.21	4901000.12	Participating	1	28
61	718385.88	4902176.53	Participating	1	27
62	718203.16	4902322.57	Participating	1	26
63	719389.44	4902171.45	Participating	1	34
64	719470.78	4902334.95	Participating	1	34
65	719873.61	4902159.54	Participating	1	39
66	720678.38	4902318.70	Non-Participating	1	45
67	722830.76	4902522.74	Participating	1	34
68	724305.46	4902285.98	Participating	1	27

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
69	725187.55	4901454.70	Non-Participating	1	25
70	725160.81	4902178.69	Non-Participating	1	23
71	725137.82	4902529.85	Participating	1	23
81	725352.22	4903786.97	Participating	1	18
82	725699.53	4904212.19	Non-Participating	1	15
83	723492.59	4902812.41	Non-Participating	1	29
84	722333.43	4903262.08	Participating	1	31
85	722982.06	4904008.09	Participating	1	25
86	720375.68	4903106.67	Participating-Assumed	1	35
87	720951.07	4903766.63	Participating-Assumed	1	30
88	720550.53	4904032.74	Participating	1	28
89	718770.32	4903420.97	Participating	1	26
90	718659.29	4903828.29	Participating	1	17
91	723368.88	4904718.11	Participating	1	21
92	721996.88	4904643.52	Non-Participating	1	24
93	722006.38	4905029.65	Participating	1	22
94	718774.53	4904450.55	Participating	1	14
95	718467.45	4904553.41	Participating	1	13
98	716874.05	4896617.04	Non-Participating	1	8
100	717883.25	4904909.85	Non-Participating	1	16
101	718162.37	4905006.41	Participating	1	16
102	718274.26	4905044.01	Participating	1	17
103	719140.84	4905043.74	Participating	1	19
105	719636.02	4905481.91	Non-Participating	1	18
109	720594.55	4906146.96	Participating	1	16
112	720406.24	4906727.10	Non-Participating	1	13
114	719215.91	4906259.09	Non-Participating	1	13
115	719213.16	4906349.80	Non-Participating	1	13
116	719291.50	4906403.40	Non-Participating	1	13
117	719371.22	4906459.76	Non-Participating	1	13
118	719412.46	4906490.00	Non-Participating	1	13
119	719463.31	4906543.60	Non-Participating	1	13
120	719483.93	4906571.09	Non-Participating	1	12
121	719500.42	4906613.70	Non-Participating	1	12
122	719526.54	4906674.17	Non-Participating	1	12
123	719537.53	4906700.29	Non-Participating	1	12
124	719569.14	4906742.89	Non-Participating	1	12
125	719584.26	4906795.12	Non-Participating	1	11
126	719588.39	4906869.34	Non-Participating	1	11
127	719643.36	4906894.08	Non-Participating	1	11
128	719573.27	4906936.69	Non-Participating	1	11
131	719114.20	4906081.78	Non-Participating	1	14
133	719506.22	4907080.47	Non-Participating	1	10
134	719465.69	4907121.78	Non-Participating	1	10
135	719426.72	4907251.15	Non-Participating	1	9
136	719377.63	4907389.09	Non-Participating	1	8
137	719365.16	4907339.21	Non-Participating	1	9

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
138	720913.33	4905533.52	Participating	1	19
141	721904.81	4906033.39	Participating	1	16
146	721666.16	4907223.36	Non-Participating	1	10
149	721695.97	4907454.30	Non-Participating	1	9
151	721719.87	4905358.34	Participating	1	20
154	723523.13	4905122.61	Non-Participating	1	18
161	724163.66	4905228.63	Participating	1	16
164	724320.81	4903427.17	Participating	1	23
169	723372.30	4905615.79	Non-Participating	1	16
171	723461.82	4905731.71	Participating-Assumed	1	15
172	724504.21	4905783.38	Non-Participating	1	13
174	724225.15	4906343.92	Participating	1	11
178	723334.67	4906665.95	Participating	1	11
179	725634.47	4905935.88	Non-Participating	1	9
182	725579.11	4905569.15	Non-Participating	1	10
184	725196.23	4905627.67	Non-Participating	1	11
185	725317.77	4905632.44	Non-Participating	1	11
189	724410.32	4907052.07	Participating	1	7
194	724847.86	4907280.34	Non-Participating	1	5
199	726107.97	4905764.29	Non-Participating	1	8
201	726503.06	4905320.15	Non-Participating	1	8
205	726919.36	4902176.15	Non-Participating	1	15
218	722296.75	4907945.00	Non-Participating	1	6
219	722230.87	4907970.76	Non-Participating	1	6
220	722220.68	4907997.11	Non-Participating	1	5
222	727482.24	4897801.59	Non-Participating	1	16
225	726508.78	4897454.26	Non-Participating	1	21
226	727202.86	4899979.73	Non-Participating	1	18
228	726976.25	4900694.01	Non-Participating	1	18
229	726718.52	4901305.38	Non-Participating	1	18
230	726456.05	4906213.42	Non-Participating	1	5
231	726354.15	4906752.29	Non-Participating	1	4
232	725787.65	4907743.68	Non-Participating	1	1
233	725536.82	4907446.28	Non-Participating	1	3
234	725169.65	4907420.70	Non-Participating	1	4
235	723475.42	4905860.10	Participating	1	8
236	723175.31	4908595.11	Non-Participating	1	3
237	719557.26	4900666.24	Participating-Assumed	1	35
238	715848.85	4900637.11	Non-Participating	1	10
239	727874.48	4902603.59	Non-Participating	1	10
240	727888.73	4902392.04	Non-Participating	1	10
242	728301.58	4901544.64	Non-Participating	1	10
243	727336.17	4901068.97	Non-Participating	1	15
244	718764.15	4902985.61	Participating	1	27
245	727235.63	4904241.24	Non-Participating	1	9
246	727363.29	4903829.96	Non-Participating	1	9
247	727860.69	4904504.97	Non-Participating	1	6

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
248	728267.58	4904129.52	Non-Participating	1	5
250	720099.79	4907436.08	Non-Participating	1	9
252	716921.70	4896257.62	Non-Participating	1	8
254	715238.72	4896061.92	Non-Participating	1	2
255	715015.61	4897377.20	Non-Participating	1	0
256	723187.80	4897202.59	Non-Participating	1	31
257	719610.00	4907569.00	Non-Participating	1	8
258	719700.93	4907644.54	Non-Participating	1	7
260	719745.33	4907684.29	Non-Participating	1	7
261	719857.46	4907742.57	Non-Participating	1	7
262	719890.34	4907786.12	Non-Participating	1	7
263	719919.46	4907805.15	Non-Participating	1	7
265	719947.43	4907836.01	Non-Participating	1	7
266	719982.04	4907873.21	Non-Participating	1	7
267	720021.83	4907900.02	Non-Participating	1	7
268	720072.19	4907973.95	Non-Participating	1	6
269	720106.25	4908011.80	Non-Participating	1	6
270	720141.70	4908061.35	Non-Participating	1	6
272	720179.89	4908091.98	Non-Participating	1	6
273	720273.48	4908078.90	Non-Participating	1	6
274	720454.78	4908220.05	Non-Participating	1	5
275	720401.45	4908238.23	Non-Participating	1	5
276	720304.09	4908243.08	Non-Participating	1	5
277	720344.49	4908251.56	Non-Participating	1	5
278	721275.07	4908713.80	Non-Participating	1	3
279	721305.81	4908733.71	Non-Participating	1	3
280	721324.42	4908753.63	Non-Participating	1	3
281	721387.20	4908657.52	Non-Participating	1	3
282	721377.24	4908782.63	Non-Participating	1	3
283	721448.68	4908770.08	Non-Participating	1	3
284	721538.73	4908695.61	Non-Participating	1	3
285	721612.76	4908638.90	Non-Participating	1	3
286	721664.28	4908602.97	Non-Participating	1	4
287	721637.87	4908618.55	Non-Participating	1	4
288	721751.99	4908548.40	Non-Participating	1	4
289	721794.46	4908525.50	Non-Participating	1	4
290	721861.07	4908467.22	Non-Participating	1	3
291	721835.68	4908492.61	Non-Participating	1	4
292	721978.07	4908374.37	Non-Participating	1	1
293	721992.22	4908358.55	Non-Participating	1	3
294	722024.70	4908323.58	Non-Participating	1	3
295	722011.37	4908342.31	Non-Participating	1	2
296	722035.11	4908307.34	Non-Participating	1	3
297	722089.60	4908201.94	Non-Participating	1	0
298	722127.86	4908126.15	Non-Participating	1	0
299	722153.60	4908089.69	Non-Participating	1	0
300	718757.08	4908934.79	Non-Participating	1	1

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
301	718789.00	4908855.07	Non-Participating	1	1
302	718804.77	4908805.37	Non-Participating	1	1
303	718844.90	4908782.13	Non-Participating	1	1
307	719064.83	4908862.39	Non-Participating	1	1
308	719105.42	4908866.46	Non-Participating	1	1
309	719028.86	4908852.24	Non-Participating	1	1
310	718997.87	4908856.18	Non-Participating	1	1
311	718976.83	4908827.32	Non-Participating	1	1
312	718946.52	4908802.66	Non-Participating	1	1
313	718932.81	4908775.31	Non-Participating	1	2
314	718917.79	4908752.12	Non-Participating	1	2
315	718886.39	4908753.91	Non-Participating	1	2
316	718864.96	4908748.89	Non-Participating	1	2
317	719315.87	4908867.66	Non-Participating	1	2
318	719338.08	4908860.01	Non-Participating	1	2
319	719358.98	4908856.51	Non-Participating	1	2
320	719382.24	4908848.92	Non-Participating	1	2
321	719423.86	4908836.08	Non-Participating	1	2
322	719448.43	4908815.84	Non-Participating	1	2
327	719655.92	4908969.59	Non-Participating	1	1
328	719510.56	4908805.86	Non-Participating	1	2
329	719494.17	4908824.72	Non-Participating	1	2
330	719480.38	4908831.06	Non-Participating	1	2
331	719621.89	4908806.30	Non-Participating	1	2
332	719635.36	4908828.68	Non-Participating	1	2
333	719692.62	4908881.15	Non-Participating	1	2
334	719714.06	4908894.66	Non-Participating	1	2
335	719775.28	4908916.96	Non-Participating	1	2
336	719783.54	4908972.62	Non-Participating	1	1
337	719827.18	4908944.00	Non-Participating	1	2
338	719821.62	4909008.89	Non-Participating	1	1
340	719863.03	4908964.75	Non-Participating	1	2
341	719908.49	4908984.50	Non-Participating	1	1
342	719889.00	4909025.73	Non-Participating	1	1
343	719916.82	4909065.08	Non-Participating	1	1
344	719960.33	4909056.08	Non-Participating	1	1
345	719970.89	4909004.75	Non-Participating	1	1
347	720006.42	4909030.79	Non-Participating	1	1
348	720028.40	4909070.31	Non-Participating	1	1
349	719981.33	4909102.97	Non-Participating	1	1
350	719231.68	4908876.50	Non-Participating	1	1
352	719602.30	4908788.46	Non-Participating	1	2
353	719538.13	4908797.13	Non-Participating	1	2
355	723529.44	4909379.33	Non-Participating	1	0
384	721820.17	4907219.46	Participating-Assumed	1	10
386	723908.08	4908855.30	Non-Participating	1	0
388	724139.90	4908828.11	Non-Participating	1	0

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
390	723596.89	4908931.73	Non-Participating	1	0
391	723532.73	4908905.53	Non-Participating	1	1
393	722215.45	4908035.25	Non-Participating	1	0
394	722177.41	4908058.91	Non-Participating	1	0
395	722056.64	4908256.22	Non-Participating	1	0
396	721948.07	4908375.27	Non-Participating	1	0
400	721565.91	4908675.92	Non-Participating	1	3
405	720268.50	4908203.65	Non-Participating	1	5
406	720369.09	4908241.09	Non-Participating	1	5
410	720048.78	4907946.28	Non-Participating	1	6
411	720116.92	4907819.45	Non-Participating	1	7
412	719794.95	4907709.10	Non-Participating	1	7
413	719782.62	4907676.53	Non-Participating	1	7
414	719848.76	4907583.53	Non-Participating	1	8
421	719588.35	4907315.19	Non-Participating	1	9
422	719376.99	4907276.82	Non-Participating	1	9
423	719406.83	4907178.95	Non-Participating	1	9
426	719330.01	4906440.32	Non-Participating	1	13
429	717938.68	4904865.30	Non-Participating	1	16
430	717932.82	4904896.09	Non-Participating	1	16
431	717915.15	4904653.73	Non-Participating	1	17
432	717963.00	4904727.58	Non-Participating	1	17
433	718000.35	4904756.38	Non-Participating	1	17
434	718053.13	4904782.14	Non-Participating	1	17
435	718055.75	4904739.22	Non-Participating	1	17
438	717699.27	4904628.61	Non-Participating	1	16
439	717671.57	4904626.25	Non-Participating	1	11
440	717564.02	4904661.44	Non-Participating	1	9
441	717530.49	4904678.61	Non-Participating	1	9
442	717277.82	4904821.59	Non-Participating	1	7
443	717311.81	4904655.97	Non-Participating	1	8
444	717272.02	4904656.19	Non-Participating	1	8
445	717237.39	4904648.11	Non-Participating	1	8
446	717204.21	4904648.73	Non-Participating	1	7
447	717169.91	4904645.97	Non-Participating	1	7
448	717099.04	4904644.95	Non-Participating	1	7
449	717327.26	4904576.71	Non-Participating	1	8
450	717260.30	4904565.99	Non-Participating	1	8
451	717411.00	4904486.37	Participating	1	9
452	717451.66	4904493.50	Participating	1	9
453	717449.05	4904427.71	Participating	1	9
454	717429.94	4904425.88	Participating	1	9
455	717336.41	4904481.15	Non-Participating	1	9
456	717225.45	4904344.45	Non-Participating	1	9
457	717269.99	4904375.01	Non-Participating	1	9
458	717222.15	4904431.08	Non-Participating	1	8
459	717267.74	4904455.08	Non-Participating	1	8

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Coordinates UTM NAD83 Zone 14N Y (m)	Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
460	717265.56	4904425.78	Non-Participating	1	8
461	717264.21	4904404.49	Non-Participating	1	9
462	717224.49	4904457.74	Non-Participating	1	8
463	717219.75	4904491.92	Non-Participating	1	8
464	717121.71	4904382.52	Non-Participating	1	14
465	717145.67	4904402.55	Non-Participating	1	14
466	717115.41	4904420.58	Non-Participating	1	14
467	717126.03	4904463.65	Non-Participating	1	8
468	717011.84	4904531.58	Non-Participating	1	7
469	717114.32	4904557.73	Non-Participating	1	7
470	717152.66	4904559.41	Non-Participating	1	8
471	717179.04	4904594.16	Non-Participating	1	8
472	717199.47	4904596.07	Non-Participating	1	8
473	717213.29	4904565.10	Non-Participating	1	8
474	717110.15	4904593.27	Non-Participating	1	7
475	717079.66	4904593.39	Non-Participating	1	7
476	717049.32	4904590.87	Non-Participating	1	7
477	717003.01	4904556.89	Non-Participating	1	7
478	717001.77	4904587.97	Non-Participating	1	7
479	717020.75	4904646.13	Non-Participating	1	7
480	716988.35	4904644.82	Non-Participating	1	7
481	716963.30	4904642.62	Non-Participating	1	6
482	716991.24	4904467.35	Non-Participating	1	7
483	716903.21	4904378.45	Non-Participating	1	7
484	716837.08	4904397.61	Non-Participating	1	7
485	716939.50	4904923.55	Non-Participating	1	5
486	716909.64	4904848.14	Non-Participating	1	6
487	717001.95	4904867.04	Non-Participating	1	6
488	716674.31	4904664.07	Non-Participating	1	5
489	716825.86	4904581.19	Non-Participating	1	6
490	716856.90	4904583.09	Non-Participating	1	6
491	716882.54	4904586.65	Non-Participating	1	6
492	716878.39	4904513.48	Non-Participating	1	6
493	716916.94	4904511.86	Non-Participating	1	7
494	716948.95	4904530.39	Non-Participating	1	7
495	716949.29	4904568.19	Non-Participating	1	7
496	716942.67	4904589.66	Non-Participating	1	7
497	716911.86	4904573.19	Non-Participating	1	6
498	716917.97	4904635.88	Non-Participating	1	6
499	716890.24	4904634.18	Non-Participating	1	6
500	716854.83	4904638.65	Non-Participating	1	6
501	716518.40	4904883.23	Non-Participating	1	4
502	716602.70	4904783.65	Non-Participating	1	4
503	716565.00	4904619.61	Non-Participating	1	5
504	716489.56	4904682.61	Non-Participating	1	4
505	716473.85	4904722.74	Non-Participating	1	4
506	716442.68	4904744.70	Non-Participating	1	4

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
507	716445.50	4904785.31	Non-Participating	1	4
508	716424.48	4904684.60	Non-Participating	1	4
509	716223.64	4904999.11	Non-Participating	1	2
510	716354.23	4905179.04	Non-Participating	1	2
511	716338.97	4905246.51	Non-Participating	1	2
512	716459.20	4905309.54	Non-Participating	1	2
513	716453.10	4905409.39	Non-Participating	1	7
514	716418.30	4905353.97	Non-Participating	1	2
515	716427.83	4905367.28	Non-Participating	1	2
516	716458.13	4905288.00	Non-Participating	1	2
517	715843.66	4905893.14	Non-Participating	1	5
518	715773.02	4905877.69	Non-Participating	1	0
519	715815.13	4905344.94	Non-Participating	1	4
520	715824.71	4905292.24	Non-Participating	1	0
521	715867.43	4905309.16	Non-Participating	1	0
522	715166.41	4904844.74	Non-Participating	1	0
523	715205.36	4904754.06	Non-Participating	1	0
524	715157.37	4904393.98	Non-Participating	1	0
525	715215.94	4904385.63	Non-Participating	1	0
526	715199.70	4904352.03	Non-Participating	1	0
527	715356.05	4904461.80	Non-Participating	1	0
528	715417.46	4904498.17	Non-Participating	1	0
529	715407.47	4904466.54	Non-Participating	1	0
530	715666.65	4904585.78	Non-Participating	1	1
531	715696.65	4904576.48	Non-Participating	1	1
532	715724.48	4904576.59	Non-Participating	1	1
533	715756.97	4904578.58	Non-Participating	1	1
534	715778.32	4904580.68	Non-Participating	1	2
535	715805.26	4904582.32	Non-Participating	1	2
536	715837.95	4904581.14	Non-Participating	1	2
537	715835.66	4904540.43	Non-Participating	1	2
538	715797.01	4904522.16	Non-Participating	1	2
539	715742.38	4904518.03	Non-Participating	1	2
540	715681.73	4904534.21	Non-Participating	1	1
541	715679.22	4904510.19	Non-Participating	1	1
542	715894.13	4904455.71	Non-Participating	1	2
543	715859.67	4904459.97	Non-Participating	1	2
544	715826.19	4904461.11	Non-Participating	1	2
545	715798.36	4904461.00	Non-Participating	1	2
546	715893.31	4904508.16	Non-Participating	1	2
547	715892.01	4904529.56	Non-Participating	1	2
548	715893.34	4904559.87	Non-Participating	1	2
549	715908.04	4904592.58	Non-Participating	1	2
550	715937.31	4904595.17	Non-Participating	1	2
551	715977.73	4904597.64	Non-Participating	1	2
552	715998.33	4904598.89	Non-Participating	1	2
553	716045.23	4904599.37	Non-Participating	1	3

Table D-3: Existing Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Existing Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
554	716045.31	4904546.09	Non-Participating	1	3
555	716009.60	4904544.70	Non-Participating	1	3
556	715972.76	4904548.81	Non-Participating	1	2
557	715949.78	4904547.41	Non-Participating	1	2
558	715954.67	4904506.34	Non-Participating	1	3
559	715639.77	4904166.54	Non-Participating	1	2
560	715706.97	4904199.28	Non-Participating	1	2
568	715127.65	4895407.57	Non-Participating	1	0
578	715224.57	4895378.18	Non-Participating	1	0
613	724975.11	4897668.13	Non-Participating	1	32
669	716989.84	4896233.57	Non-Participating	1	8
692	714314.71	4895847.22	Non-Participating	1	0
698	714205.06	4895733.41	Non-Participating	1	0
745	726858.39	4900143.28	Non-Participating	1	19
746	726865.43	4900158.30	Non-Participating	1	19
791	719916.57	4900476.21	Participating-Assumed	1	38
793	719578.52	4900642.43	Participating-Assumed	1	36
841	718039.49	4900059.75	Participating	1	24
924	727022.24	4902627.29	Non-Participating	1	14
941	724623.73	4903937.11	Participating	1	20
970	718804.83	4903017.02	Participating	1	27
985	714318.77	4902656.83	Non-Participating	1	5
986	714237.97	4903398.65	Non-Participating	1	4
997	714603.77	4903727.73	Non-Participating	1	5
1053	726925.43	4905673.26	Non-Participating	1	6
1054	726986.94	4905673.30	Non-Participating	1	5
1055	727460.91	4905672.52	Non-Participating	1	4
1056	727588.03	4905661.99	Non-Participating	1	3
1057	727648.51	4905661.71	Non-Participating	1	3
1058	727857.79	4905504.27	Non-Participating	1	3
1072	727319.90	4901042.05	Non-Participating	1	16
1076	728362.36	4902262.86	Non-Participating	1	9
1081	713673.07	4900785.04	Non-Participating	1	2
1082	726638.58	4904876.28	Non-Participating	1	9
1083	719182.87	4905036.07	Participating	1	19

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
1	724967.32	4896341.13	Non-Participating	1	44
2	726537.89	4896321.29	Non-Participating	1	42
3	725625.32	4896059.58	Non-Participating	1	43
4	719410.70	4896051.41	Non-Participating	1	30
13	723456.49	4896774.78	Non-Participating	1	42
14	713480.83	4898900.44	Non-Participating	1	20
16	715723.31	4898648.13	Non-Participating	1	16
17	715447.24	4899194.95	Non-Participating	1	15
19	717211.44	4898135.31	Participating	1	25
20	717476.52	4898978.04	Non-Participating	1	24
22	718141.05	4897676.55	Participating-Assumed	1	26
23	718315.29	4897230.65	Non-Participating	1	27
24	719282.97	4897515.15	Participating	1	29
25	720904.17	4899187.90	Participating	1	29
26	722203.20	4898274.38	Participating	1	33
27	721690.13	4899054.22	Participating	1	30
28	723264.12	4899043.61	Participating	1	31
29	723148.39	4899253.41	Non-Participating	1	29
31	725540.63	4897544.85	Non-Participating	1	36
32	724971.27	4897228.10	Non-Participating	1	38
36	726225.39	4899113.03	Non-Participating	1	31
37	723990.20	4899418.91	Non-Participating	1	31
38	725325.11	4899964.56	Non-Participating	1	30
40	724716.86	4900688.30	Non-Participating	1	28
41	725875.26	4900834.50	Non-Participating	1	28
42	722427.30	4900617.84	Non-Participating	1	27
43	721991.20	4899704.37	Non-Participating	1	28
44	720889.44	4900807.13	Non-Participating	1	26
46	718911.99	4899677.74	Participating	1	25
49	719388.68	4900626.02	Participating	1	25
50	717161.40	4899221.14	Non-Participating	1	18
51	717258.54	4899542.38	Non-Participating	1	22
52	717119.07	4900238.72	Participating	1	23
53	717301.27	4900451.69	Participating	1	23
55	717076.39	4901073.99	Participating	1	22
56	715837.07	4900177.49	Participating	1	21
58	716032.82	4901955.98	Non-Participating	1	14
59	716453.80	4901946.72	Non-Participating	1	14
60	718480.21	4901000.12	Participating	1	24
61	718385.88	4902176.53	Participating	1	22
62	718203.16	4902322.57	Participating	1	22
63	719389.44	4902171.45	Participating	1	20
64	719470.78	4902334.95	Participating	1	22
65	719873.61	4902159.54	Participating	1	23
66	720678.38	4902318.70	Non-Participating	1	23
67	722830.76	4902522.74	Participating	1	25
68	724305.46	4902285.98	Participating	1	25

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
69	725187.55	4901454.70	Non-Participating	1	27
70	725160.81	4902178.69	Non-Participating	1	26
71	725137.82	4902529.85	Participating	1	25
81	725352.22	4903786.97	Participating	1	23
82	725699.53	4904212.19	Non-Participating	1	23
83	723492.59	4902812.41	Non-Participating	1	24
84	722333.43	4903262.08	Participating	1	23
85	722982.06	4904008.09	Participating	1	23
86	720375.68	4903106.67	Participating-Assumed	1	16
87	720951.07	4903766.63	Participating-Assumed	1	22
88	720550.53	4904032.74	Participating	1	22
89	718770.32	4903420.97	Participating	1	22
90	718659.29	4903828.29	Participating	1	14
91	723368.88	4904718.11	Participating	1	22
92	721996.88	4904643.52	Non-Participating	1	22
93	722006.38	4905029.65	Participating	1	21
94	718774.53	4904450.55	Participating	1	14
95	718467.45	4904553.41	Participating	1	13
98	716874.05	4896617.04	Non-Participating	1	25
100	717883.25	4904909.85	Non-Participating	1	15
101	718162.37	4905006.41	Participating	1	13
102	718274.26	4905044.01	Participating	1	13
103	719140.84	4905043.74	Participating	1	13
105	719636.02	4905481.91	Non-Participating	1	20
109	720594.55	4906146.96	Participating	1	20
112	720406.24	4906727.10	Non-Participating	1	19
114	719215.91	4906259.09	Non-Participating	1	14
115	719213.16	4906349.80	Non-Participating	1	12
116	719291.50	4906403.40	Non-Participating	1	14
117	719371.22	4906459.76	Non-Participating	1	16
118	719412.46	4906490.00	Non-Participating	1	17
119	719463.31	4906543.60	Non-Participating	1	18
120	719483.93	4906571.09	Non-Participating	1	18
121	719500.42	4906613.70	Non-Participating	1	18
122	719526.54	4906674.17	Non-Participating	1	18
123	719537.53	4906700.29	Non-Participating	1	16
124	719569.14	4906742.89	Non-Participating	1	14
125	719584.26	4906795.12	Non-Participating	1	15
126	719588.39	4906869.34	Non-Participating	1	16
127	719643.36	4906894.08	Non-Participating	1	19
128	719573.27	4906936.69	Non-Participating	1	18
131	719114.20	4906081.78	Non-Participating	1	12
133	719506.22	4907080.47	Non-Participating	1	19
134	719465.69	4907121.78	Non-Participating	1	19
135	719426.72	4907251.15	Non-Participating	1	19
136	719377.63	4907389.09	Non-Participating	1	17
137	719365.16	4907339.21	Non-Participating	1	16

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
138	720913.33	4905533.52	Participating	1	21
141	721904.81	4906033.39	Participating	1	20
146	721666.16	4907223.36	Non-Participating	1	19
149	721695.97	4907454.30	Non-Participating	1	19
151	721719.87	4905358.34	Participating	1	21
154	723523.13	4905122.61	Non-Participating	1	22
161	724163.66	4905228.63	Participating	1	22
164	724320.81	4903427.17	Participating	1	24
169	723372.30	4905615.79	Non-Participating	1	21
171	723461.82	4905731.71	Participating-Assumed	1	21
172	724504.21	4905783.38	Non-Participating	1	21
174	724225.15	4906343.92	Participating	1	20
178	723334.67	4906665.95	Participating	1	20
179	725634.47	4905935.88	Non-Participating	1	21
182	725579.11	4905569.15	Non-Participating	1	21
184	725196.23	4905627.67	Non-Participating	1	21
185	725317.77	4905632.44	Non-Participating	1	21
189	724410.32	4907052.07	Participating	1	20
194	724847.86	4907280.34	Non-Participating	1	20
199	726107.97	4905764.29	Non-Participating	1	21
201	726503.06	4905320.15	Non-Participating	1	22
205	726919.36	4902176.15	Non-Participating	1	25
218	722296.75	4907945.00	Non-Participating	1	19
219	722230.87	4907970.76	Non-Participating	1	19
220	722220.68	4907997.11	Non-Participating	1	18
222	727482.24	4897801.59	Non-Participating	1	35
225	726508.78	4897454.26	Non-Participating	1	37
226	727202.86	4899979.73	Non-Participating	1	29
228	726976.25	4900694.01	Non-Participating	1	28
229	726718.52	4901305.38	Non-Participating	1	27
230	726456.05	4906213.42	Non-Participating	1	21
231	726354.15	4906752.29	Non-Participating	1	20
232	725787.65	4907743.68	Non-Participating	1	19
233	725536.82	4907446.28	Non-Participating	1	19
234	725169.65	4907420.70	Non-Participating	1	20
235	723475.42	4905860.10	Participating	1	19
236	723175.31	4908595.11	Non-Participating	1	18
237	719557.26	4900666.24	Participating-Assumed	1	25
238	715848.85	4900637.11	Non-Participating	1	21
239	727874.48	4902603.59	Non-Participating	1	24
240	727888.73	4902392.04	Non-Participating	1	25
242	728301.58	4901544.64	Non-Participating	1	26
243	727336.17	4901068.97	Non-Participating	1	27
244	718764.15	4902985.61	Participating	1	21
245	727235.63	4904241.24	Non-Participating	1	23
246	727363.29	4903829.96	Non-Participating	1	23
247	727860.69	4904504.97	Non-Participating	1	22

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
248	728267.58	4904129.52	Non-Participating	1	22
250	720099.79	4907436.08	Non-Participating	1	19
252	716921.70	4896257.62	Non-Participating	1	25
254	715238.72	4896061.92	Non-Participating	1	23
255	715015.61	4897377.20	Non-Participating	1	22
256	723187.80	4897202.59	Non-Participating	1	39
257	719610.00	4907569.00	Non-Participating	1	18
258	719700.93	4907644.54	Non-Participating	1	18
260	719745.33	4907684.29	Non-Participating	1	18
261	719857.46	4907742.57	Non-Participating	1	18
262	719890.34	4907786.12	Non-Participating	1	18
263	719919.46	4907805.15	Non-Participating	1	18
265	719947.43	4907836.01	Non-Participating	1	18
266	719982.04	4907873.21	Non-Participating	1	18
267	720021.83	4907900.02	Non-Participating	1	18
268	720072.19	4907973.95	Non-Participating	1	17
269	720106.25	4908011.80	Non-Participating	1	17
270	720141.70	4908061.35	Non-Participating	1	17
272	720179.89	4908091.98	Non-Participating	1	17
273	720273.48	4908078.90	Non-Participating	1	18
274	720454.78	4908220.05	Non-Participating	1	17
275	720401.45	4908238.23	Non-Participating	1	17
276	720304.09	4908243.08	Non-Participating	1	17
277	720344.49	4908251.56	Non-Participating	1	17
278	721275.07	4908713.80	Non-Participating	1	17
279	721305.81	4908733.71	Non-Participating	1	17
280	721324.42	4908753.63	Non-Participating	1	16
281	721387.20	4908657.52	Non-Participating	1	18
282	721377.24	4908782.63	Non-Participating	1	16
283	721448.68	4908770.08	Non-Participating	1	17
284	721538.73	4908695.61	Non-Participating	1	18
285	721612.76	4908638.90	Non-Participating	1	18
286	721664.28	4908602.97	Non-Participating	1	18
287	721637.87	4908618.55	Non-Participating	1	18
288	721751.99	4908548.40	Non-Participating	1	17
289	721794.46	4908525.50	Non-Participating	1	16
290	721861.07	4908467.22	Non-Participating	1	11
291	721835.68	4908492.61	Non-Participating	1	13
292	721978.07	4908374.37	Non-Participating	1	11
293	721992.22	4908358.55	Non-Participating	1	11
294	722024.70	4908323.58	Non-Participating	1	11
295	722011.37	4908342.31	Non-Participating	1	11
296	722035.11	4908307.34	Non-Participating	1	11
297	722089.60	4908201.94	Non-Participating	1	11
298	722127.86	4908126.15	Non-Participating	1	13
299	722153.60	4908089.69	Non-Participating	1	12
300	718757.08	4908934.79	Non-Participating	1	17

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
301	718789.00	4908855.07	Non-Participating	1	17
302	718804.77	4908805.37	Non-Participating	1	17
303	718844.90	4908782.13	Non-Participating	1	17
307	719064.83	4908862.39	Non-Participating	1	17
308	719105.42	4908866.46	Non-Participating	1	17
309	719028.86	4908852.24	Non-Participating	1	17
310	718997.87	4908856.18	Non-Participating	1	17
311	718976.83	4908827.32	Non-Participating	1	17
312	718946.52	4908802.66	Non-Participating	1	17
313	718932.81	4908775.31	Non-Participating	1	17
314	718917.79	4908752.12	Non-Participating	1	17
315	718886.39	4908753.91	Non-Participating	1	17
316	718864.96	4908748.89	Non-Participating	1	17
317	719315.87	4908867.66	Non-Participating	1	17
318	719338.08	4908860.01	Non-Participating	1	17
319	719358.98	4908856.51	Non-Participating	1	17
320	719382.24	4908848.92	Non-Participating	1	17
321	719423.86	4908836.08	Non-Participating	1	17
322	719448.43	4908815.84	Non-Participating	1	17
327	719655.92	4908969.59	Non-Participating	1	17
328	719510.56	4908805.86	Non-Participating	1	18
329	719494.17	4908824.72	Non-Participating	1	17
330	719480.38	4908831.06	Non-Participating	1	17
331	719621.89	4908806.30	Non-Participating	1	18
332	719635.36	4908828.68	Non-Participating	1	18
333	719692.62	4908881.15	Non-Participating	1	18
334	719714.06	4908894.66	Non-Participating	1	17
335	719775.28	4908916.96	Non-Participating	1	17
336	719783.54	4908972.62	Non-Participating	1	17
337	719827.18	4908944.00	Non-Participating	1	17
338	719821.62	4909008.89	Non-Participating	1	17
340	719863.03	4908964.75	Non-Participating	1	17
341	719908.49	4908984.50	Non-Participating	1	17
342	719889.00	4909025.73	Non-Participating	1	17
343	719916.82	4909065.08	Non-Participating	1	17
344	719960.33	4909056.08	Non-Participating	1	17
345	719970.89	4909004.75	Non-Participating	1	17
347	720006.42	4909030.79	Non-Participating	1	17
348	720028.40	4909070.31	Non-Participating	1	17
349	719981.33	4909102.97	Non-Participating	1	17
350	719231.68	4908876.50	Non-Participating	1	17
352	719602.30	4908788.46	Non-Participating	1	18
353	719538.13	4908797.13	Non-Participating	1	18
355	723529.44	4909379.33	Non-Participating	1	18
384	721820.17	4907219.46	Participating-Assumed	1	19
386	723908.08	4908855.30	Non-Participating	1	18
388	724139.90	4908828.11	Non-Participating	1	18

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
390	723596.89	4908931.73	Non-Participating	1	18
391	723532.73	4908905.53	Non-Participating	1	18
393	722215.45	4908035.25	Non-Participating	1	13
394	722177.41	4908058.91	Non-Participating	1	12
395	722056.64	4908256.22	Non-Participating	1	11
396	721948.07	4908375.27	Non-Participating	1	11
400	721565.91	4908675.92	Non-Participating	1	17
405	720268.50	4908203.65	Non-Participating	1	16
406	720369.09	4908241.09	Non-Participating	1	17
410	720048.78	4907946.28	Non-Participating	1	17
411	720116.92	4907819.45	Non-Participating	1	18
412	719794.95	4907709.10	Non-Participating	1	15
413	719782.62	4907676.53	Non-Participating	1	15
414	719848.76	4907583.53	Non-Participating	1	18
421	719588.35	4907315.19	Non-Participating	1	19
422	719376.99	4907276.82	Non-Participating	1	19
423	719406.83	4907178.95	Non-Participating	1	19
426	719330.01	4906440.32	Non-Participating	1	15
429	717938.68	4904865.30	Non-Participating	1	13
430	717932.82	4904896.09	Non-Participating	1	14
431	717915.15	4904653.73	Non-Participating	1	13
432	717963.00	4904727.58	Non-Participating	1	13
433	718000.35	4904756.38	Non-Participating	1	13
434	718053.13	4904782.14	Non-Participating	1	13
435	718055.75	4904739.22	Non-Participating	1	13
438	717699.27	4904628.61	Non-Participating	1	13
439	717671.57	4904626.25	Non-Participating	1	13
440	717564.02	4904661.44	Non-Participating	1	13
441	717530.49	4904678.61	Non-Participating	1	13
442	717277.82	4904821.59	Non-Participating	1	12
443	717311.81	4904655.97	Non-Participating	1	12
444	717272.02	4904656.19	Non-Participating	1	12
445	717237.39	4904648.11	Non-Participating	1	12
446	717204.21	4904648.73	Non-Participating	1	12
447	717169.91	4904645.97	Non-Participating	1	12
448	717099.04	4904644.95	Non-Participating	1	12
449	717327.26	4904576.71	Non-Participating	1	13
450	717260.30	4904565.99	Non-Participating	1	13
451	717411.00	4904486.37	Participating	1	13
452	717451.66	4904493.50	Participating	1	13
453	717449.05	4904427.71	Participating	1	13
454	717429.94	4904425.88	Participating	1	13
455	717336.41	4904481.15	Non-Participating	1	13
456	717225.45	4904344.45	Non-Participating	1	13
457	717269.99	4904375.01	Non-Participating	1	13
458	717222.15	4904431.08	Non-Participating	1	13
459	717267.74	4904455.08	Non-Participating	1	13

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
460	717265.56	4904425.78	Non-Participating	1	13
461	717264.21	4904404.49	Non-Participating	1	13
462	717224.49	4904457.74	Non-Participating	1	13
463	717219.75	4904491.92	Non-Participating	1	13
464	717121.71	4904382.52	Non-Participating	1	13
465	717145.67	4904402.55	Non-Participating	1	13
466	717115.41	4904420.58	Non-Participating	1	13
467	717126.03	4904463.65	Non-Participating	1	13
468	717011.84	4904531.58	Non-Participating	1	12
469	717114.32	4904557.73	Non-Participating	1	12
470	717152.66	4904559.41	Non-Participating	1	12
471	717179.04	4904594.16	Non-Participating	1	12
472	717199.47	4904596.07	Non-Participating	1	12
473	717213.29	4904565.10	Non-Participating	1	12
474	717110.15	4904593.27	Non-Participating	1	12
475	717079.66	4904593.39	Non-Participating	1	12
476	717049.32	4904590.87	Non-Participating	1	12
477	717003.01	4904556.89	Non-Participating	1	12
478	717001.77	4904587.97	Non-Participating	1	12
479	717020.75	4904646.13	Non-Participating	1	12
480	716988.35	4904644.82	Non-Participating	1	12
481	716963.30	4904642.62	Non-Participating	1	12
482	716991.24	4904467.35	Non-Participating	1	12
483	716903.21	4904378.45	Non-Participating	1	12
484	716837.08	4904397.61	Non-Participating	1	12
485	716939.50	4904923.55	Non-Participating	1	12
486	716909.64	4904848.14	Non-Participating	1	12
487	717001.95	4904867.04	Non-Participating	1	12
488	716674.31	4904664.07	Non-Participating	1	12
489	716825.86	4904581.19	Non-Participating	1	12
490	716856.90	4904583.09	Non-Participating	1	12
491	716882.54	4904586.65	Non-Participating	1	12
492	716878.39	4904513.48	Non-Participating	1	12
493	716916.94	4904511.86	Non-Participating	1	12
494	716948.95	4904530.39	Non-Participating	1	12
495	716949.29	4904568.19	Non-Participating	1	12
496	716942.67	4904589.66	Non-Participating	1	12
497	716911.86	4904573.19	Non-Participating	1	12
498	716917.97	4904635.88	Non-Participating	1	12
499	716890.24	4904634.18	Non-Participating	1	12
500	716854.83	4904638.65	Non-Participating	1	12
501	716518.40	4904883.23	Non-Participating	1	12
502	716602.70	4904783.65	Non-Participating	1	12
503	716565.00	4904619.61	Non-Participating	1	12
504	716489.56	4904682.61	Non-Participating	1	12
505	716473.85	4904722.74	Non-Participating	1	12
506	716442.68	4904744.70	Non-Participating	1	12

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
507	716445.50	4904785.31	Non-Participating	1	12
508	716424.48	4904684.60	Non-Participating	1	12
509	716223.64	4904999.11	Non-Participating	1	11
510	716354.23	4905179.04	Non-Participating	1	11
511	716338.97	4905246.51	Non-Participating	1	11
512	716459.20	4905309.54	Non-Participating	1	11
513	716453.10	4905409.39	Non-Participating	1	11
514	716418.30	4905353.97	Non-Participating	1	11
515	716427.83	4905367.28	Non-Participating	1	11
516	716458.13	4905288.00	Non-Participating	1	11
517	715843.66	4905893.14	Non-Participating	1	18
518	715773.02	4905877.69	Non-Participating	1	17
519	715815.13	4905344.94	Non-Participating	1	11
520	715824.71	4905292.24	Non-Participating	1	11
521	715867.43	4905309.16	Non-Participating	1	11
522	715166.41	4904844.74	Non-Participating	1	11
523	715205.36	4904754.06	Non-Participating	1	11
524	715157.37	4904393.98	Non-Participating	1	11
525	715215.94	4904385.63	Non-Participating	1	11
526	715199.70	4904352.03	Non-Participating	1	11
527	715356.05	4904461.80	Non-Participating	1	11
528	715417.46	4904498.17	Non-Participating	1	11
529	715407.47	4904466.54	Non-Participating	1	11
530	715666.65	4904585.78	Non-Participating	1	11
531	715696.65	4904576.48	Non-Participating	1	11
532	715724.48	4904576.59	Non-Participating	1	11
533	715756.97	4904578.58	Non-Participating	1	11
534	715778.32	4904580.68	Non-Participating	1	11
535	715805.26	4904582.32	Non-Participating	1	11
536	715837.95	4904581.14	Non-Participating	1	12
537	715835.66	4904540.43	Non-Participating	1	12
538	715797.01	4904522.16	Non-Participating	1	12
539	715742.38	4904518.03	Non-Participating	1	12
540	715681.73	4904534.21	Non-Participating	1	11
541	715679.22	4904510.19	Non-Participating	1	11
542	715894.13	4904455.71	Non-Participating	1	12
543	715859.67	4904459.97	Non-Participating	1	12
544	715826.19	4904461.11	Non-Participating	1	12
545	715798.36	4904461.00	Non-Participating	1	12
546	715893.31	4904508.16	Non-Participating	1	12
547	715892.01	4904529.56	Non-Participating	1	12
548	715893.34	4904559.87	Non-Participating	1	12
549	715908.04	4904592.58	Non-Participating	1	12
550	715937.31	4904595.17	Non-Participating	1	12
551	715977.73	4904597.64	Non-Participating	1	12
552	715998.33	4904598.89	Non-Participating	1	12
553	716045.23	4904599.37	Non-Participating	1	12

Table D-4: Future Non-Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Future Non-Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
554	716045.31	4904546.09	Non-Participating	1	12
555	716009.60	4904544.70	Non-Participating	1	12
556	715972.76	4904548.81	Non-Participating	1	12
557	715949.78	4904547.41	Non-Participating	1	12
558	715954.67	4904506.34	Non-Participating	1	12
559	715639.77	4904166.54	Non-Participating	1	12
560	715706.97	4904199.28	Non-Participating	1	12
568	715127.65	4895407.57	Non-Participating	1	23
578	715224.57	4895378.18	Non-Participating	1	23
613	724975.11	4897668.13	Non-Participating	1	36
669	716989.84	4896233.57	Non-Participating	1	25
692	714314.71	4895847.22	Non-Participating	1	21
698	714205.06	4895733.41	Non-Participating	1	15
745	726858.39	4900143.28	Non-Participating	1	29
746	726865.43	4900158.30	Non-Participating	1	29
791	719916.57	4900476.21	Participating-Assumed	1	21
793	719578.52	4900642.43	Participating-Assumed	1	25
841	718039.49	4900059.75	Participating	1	24
924	727022.24	4902627.29	Non-Participating	1	25
941	724623.73	4903937.11	Participating	1	23
970	718804.83	4903017.02	Participating	1	21
985	714318.77	4902656.83	Non-Participating	1	19
986	714237.97	4903398.65	Non-Participating	1	19
997	714603.77	4903727.73	Non-Participating	1	19
1053	726925.43	4905673.26	Non-Participating	1	21
1054	726986.94	4905673.30	Non-Participating	1	21
1055	727460.91	4905672.52	Non-Participating	1	21
1056	727588.03	4905661.99	Non-Participating	1	21
1057	727648.51	4905661.71	Non-Participating	1	21
1058	727857.79	4905504.27	Non-Participating	1	21
1072	727319.90	4901042.05	Non-Participating	1	27
1076	728362.36	4902262.86	Non-Participating	1	25
1081	713673.07	4900785.04	Non-Participating	1	19
1082	726638.58	4904876.28	Non-Participating	1	22
1083	719182.87	4905036.07	Participating	1	13

Appendix E

Sound Level Modeling Results – Tabular Sorted by Sound Level

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
44	720889.44	4900807.13	Non-Participating	1	52
841	718039.49	4900059.75	Participating	1	49
244	718764.15	4902985.61	Participating	1	49
62	718203.16	4902322.57	Participating	1	49
42	722427.30	4900617.84	Non-Participating	1	48
71	725137.82	4902529.85	Participating	1	48
970	718804.83	4903017.02	Participating	1	48
138	720913.33	4905533.52	Participating	1	48
55	717076.39	4901073.99	Participating	1	48
61	718385.88	4902176.53	Participating	1	48
68	724305.46	4902285.98	Participating	1	48
64	719470.78	4902334.95	Participating	1	48
46	718911.99	4899677.74	Participating	1	48
89	718770.32	4903420.97	Participating	1	48
65	719873.61	4902159.54	Participating	1	47
29	723148.39	4899253.41	Non-Participating	1	47
141	721904.81	4906033.39	Participating	1	47
86	720375.68	4903106.67	Participating-Assumed	1	47
85	722982.06	4904008.09	Participating	1	47
63	719389.44	4902171.45	Participating	1	47
27	721690.13	4899054.22	Participating	1	47
66	720678.38	4902318.70	Non-Participating	1	47
49	719388.68	4900626.02	Participating	1	47
26	722203.20	4898274.38	Participating	1	47
28	723264.12	4899043.61	Participating	1	47
67	722830.76	4902522.74	Participating	1	47
91	723368.88	4904718.11	Participating	1	47
941	724623.73	4903937.11	Participating	1	47
84	722333.43	4903262.08	Participating	1	47
237	719557.26	4900666.24	Participating-Assumed	1	46
164	724320.81	4903427.17	Participating	1	46
793	719578.52	4900642.43	Participating-Assumed	1	46
25	720904.17	4899187.90	Participating	1	46
151	721719.87	4905358.34	Participating	1	46
92	721996.88	4904643.52	Non-Participating	1	46
88	720550.53	4904032.74	Participating	1	46
90	718659.29	4903828.29	Participating	1	46
52	717119.07	4900238.72	Participating	1	46
169	723372.30	4905615.79	Non-Participating	1	46
178	723334.67	4906665.95	Participating	1	46
51	717258.54	4899542.38	Non-Participating	1	46
791	719916.57	4900476.21	Participating-Assumed	1	45
94	718774.53	4904450.55	Participating	1	45
154	723523.13	4905122.61	Non-Participating	1	45
53	717301.27	4900451.69	Participating	1	45
87	720951.07	4903766.63	Participating-Assumed	1	45
93	722006.38	4905029.65	Participating	1	45

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Coordinates UTM NAD83 Zone 14N Y (m)	Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
1083	719182.87	4905036.07	Participating	1	45
235	723475.42	4905860.10	Participating	1	45
83	723492.59	4902812.41	Non-Participating	1	45
171	723461.82	4905731.71	Participating-Assumed	1	45
56	715837.07	4900177.49	Participating	1	45
60	718480.21	4901000.12	Participating	1	45
103	719140.84	4905043.74	Participating	1	45
16	715723.31	4898648.13	Non-Participating	1	45
105	719636.02	4905481.91	Non-Participating	1	45
70	725160.81	4902178.69	Non-Participating	1	44
43	721991.20	4899704.37	Non-Participating	1	44
1	724967.32	4896341.13	Non-Participating	1	44
50	717161.40	4899221.14	Non-Participating	1	44
20	717476.52	4898978.04	Non-Participating	1	44
3	725625.32	4896059.58	Non-Participating	1	43
81	725352.22	4903786.97	Participating	1	43
109	720594.55	4906146.96	Participating	1	43
238	715848.85	4900637.11	Non-Participating	1	43
13	723456.49	4896774.78	Non-Participating	1	42
2	726537.89	4896321.29	Non-Participating	1	42
161	724163.66	4905228.63	Participating	1	42
37	723990.20	4899418.91	Non-Participating	1	42
95	718467.45	4904553.41	Participating	1	42
22	718141.05	4897676.55	Participating-Assumed	1	42
59	716453.80	4901946.72	Non-Participating	1	41
256	723187.80	4897202.59	Non-Participating	1	41
17	715447.24	4899194.95	Non-Participating	1	41
384	721820.17	4907219.46	Participating-Assumed	1	41
24	719282.97	4897515.15	Participating	1	41
146	721666.16	4907223.36	Non-Participating	1	41
19	717211.44	4898135.31	Participating	1	40
69	725187.55	4901454.70	Non-Participating	1	40
82	725699.53	4904212.19	Non-Participating	1	40
112	720406.24	4906727.10	Non-Participating	1	40
435	718055.75	4904739.22	Non-Participating	1	40
102	718274.26	4905044.01	Participating	1	40
40	724716.86	4900688.30	Non-Participating	1	40
434	718053.13	4904782.14	Non-Participating	1	40
32	724971.27	4897228.10	Non-Participating	1	39
431	717915.15	4904653.73	Non-Participating	1	39
433	718000.35	4904756.38	Non-Participating	1	39
432	717963.00	4904727.58	Non-Participating	1	39
149	721695.97	4907454.30	Non-Participating	1	39
172	724504.21	4905783.38	Non-Participating	1	39
23	718315.29	4897230.65	Non-Participating	1	39
174	724225.15	4906343.92	Participating	1	39
429	717938.68	4904865.30	Non-Participating	1	39

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
101	718162.37	4905006.41	Participating	1	39
430	717932.82	4904896.09	Non-Participating	1	39
131	719114.20	4906081.78	Non-Participating	1	39
613	724975.11	4897668.13	Non-Participating	1	39
100	717883.25	4904909.85	Non-Participating	1	39
438	717699.27	4904628.61	Non-Participating	1	39
114	719215.91	4906259.09	Non-Participating	1	38
439	717671.57	4904626.25	Non-Participating	1	38
115	719213.16	4906349.80	Non-Participating	1	38
116	719291.50	4906403.40	Non-Participating	1	38
117	719371.22	4906459.76	Non-Participating	1	38
118	719412.46	4906490.00	Non-Participating	1	38
426	719330.01	4906440.32	Non-Participating	1	38
457	717269.99	4904375.01	Non-Participating	1	38
31	725540.63	4897544.85	Non-Participating	1	38
119	719463.31	4906543.60	Non-Participating	1	38
120	719483.93	4906571.09	Non-Participating	1	38
456	717225.45	4904344.45	Non-Participating	1	38
121	719500.42	4906613.70	Non-Participating	1	38
461	717264.21	4904404.49	Non-Participating	1	38
122	719526.54	4906674.17	Non-Participating	1	38
464	717121.71	4904382.52	Non-Participating	1	38
123	719537.53	4906700.29	Non-Participating	1	38
184	725196.23	4905627.67	Non-Participating	1	38
225	726508.78	4897454.26	Non-Participating	1	38
460	717265.56	4904425.78	Non-Participating	1	38
465	717145.67	4904402.55	Non-Participating	1	38
124	719569.14	4906742.89	Non-Participating	1	37
125	719584.26	4906795.12	Non-Participating	1	37
466	717115.41	4904420.58	Non-Participating	1	37
453	717449.05	4904427.71	Participating	1	37
454	717429.94	4904425.88	Participating	1	37
458	717222.15	4904431.08	Non-Participating	1	37
459	717267.74	4904455.08	Non-Participating	1	37
127	719643.36	4906894.08	Non-Participating	1	37
185	725317.77	4905632.44	Non-Participating	1	37
440	717564.02	4904661.44	Non-Participating	1	37
441	717530.49	4904678.61	Non-Participating	1	37
450	717260.30	4904565.99	Non-Participating	1	37
126	719588.39	4906869.34	Non-Participating	1	37
473	717213.29	4904565.10	Non-Participating	1	37
38	725325.11	4899964.56	Non-Participating	1	37
449	717327.26	4904576.71	Non-Participating	1	37
451	717411.00	4904486.37	Participating	1	37
472	717199.47	4904596.07	Non-Participating	1	37
455	717336.41	4904481.15	Non-Participating	1	37
471	717179.04	4904594.16	Non-Participating	1	37

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
128	719573.27	4906936.69	Non-Participating	1	37
446	717204.21	4904648.73	Non-Participating	1	37
467	717126.03	4904463.65	Non-Participating	1	37
445	717237.39	4904648.11	Non-Participating	1	37
447	717169.91	4904645.97	Non-Participating	1	37
218	722296.75	4907945.00	Non-Participating	1	37
444	717272.02	4904656.19	Non-Participating	1	37
462	717224.49	4904457.74	Non-Participating	1	37
41	725875.26	4900834.50	Non-Participating	1	37
219	722230.87	4907970.76	Non-Participating	1	37
182	725579.11	4905569.15	Non-Participating	1	37
452	717451.66	4904493.50	Participating	1	37
443	717311.81	4904655.97	Non-Participating	1	36
189	724410.32	4907052.07	Participating	1	36
133	719506.22	4907080.47	Non-Participating	1	36
220	722220.68	4907997.11	Non-Participating	1	36
250	720099.79	4907436.08	Non-Participating	1	36
463	717219.75	4904491.92	Non-Participating	1	36
448	717099.04	4904644.95	Non-Participating	1	36
134	719465.69	4907121.78	Non-Participating	1	36
474	717110.15	4904593.27	Non-Participating	1	36
205	726919.36	4902176.15	Non-Participating	1	36
222	727482.24	4897801.59	Non-Participating	1	36
470	717152.66	4904559.41	Non-Participating	1	36
924	727022.24	4902627.29	Non-Participating	1	36
394	722177.41	4908058.91	Non-Participating	1	36
423	719406.83	4907178.95	Non-Participating	1	36
475	717079.66	4904593.39	Non-Participating	1	36
298	722127.86	4908126.15	Non-Participating	1	36
299	722153.60	4908089.69	Non-Participating	1	36
421	719588.35	4907315.19	Non-Participating	1	36
479	717020.75	4904646.13	Non-Participating	1	36
135	719426.72	4907251.15	Non-Participating	1	36
4	719410.70	4896051.41	Non-Participating	1	36
179	725634.47	4905935.88	Non-Participating	1	36
255	715015.61	4897377.20	Non-Participating	1	36
393	722215.45	4908035.25	Non-Participating	1	36
422	719376.99	4907276.82	Non-Participating	1	36
414	719848.76	4907583.53	Non-Participating	1	35
497	716911.86	4904573.19	Non-Participating	1	35
137	719365.16	4907339.21	Non-Participating	1	35
229	726718.52	4901305.38	Non-Participating	1	35
480	716988.35	4904644.82	Non-Participating	1	35
491	716882.54	4904586.65	Non-Participating	1	35
36	726225.39	4899113.03	Non-Participating	1	35
469	717114.32	4904557.73	Non-Participating	1	35
136	719377.63	4907389.09	Non-Participating	1	35

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Y (m)	Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
476	717049.32	4904590.87	Non-Participating	1	35
478	717001.77	4904587.97	Non-Participating	1	35
257	719610.00	4907569.00	Non-Participating	1	35
411	720116.92	4907819.45	Non-Participating	1	35
489	716825.86	4904581.19	Non-Participating	1	35
495	716949.29	4904568.19	Non-Participating	1	35
500	716854.83	4904638.65	Non-Participating	1	35
98	716874.05	4896617.04	Non-Participating	1	35
496	716942.67	4904589.66	Non-Participating	1	35
258	719700.93	4907644.54	Non-Participating	1	35
261	719857.46	4907742.57	Non-Participating	1	35
296	722035.11	4908307.34	Non-Participating	1	35
413	719782.62	4907676.53	Non-Participating	1	35
499	716890.24	4904634.18	Non-Participating	1	35
260	719745.33	4907684.29	Non-Participating	1	35
262	719890.34	4907786.12	Non-Participating	1	35
263	719919.46	4907805.15	Non-Participating	1	35
294	722024.70	4908323.58	Non-Participating	1	35
395	722056.64	4908256.22	Non-Participating	1	35
412	719794.95	4907709.10	Non-Participating	1	35
498	716917.97	4904635.88	Non-Participating	1	35
1082	726638.58	4904876.28	Non-Participating	1	35
265	719947.43	4907836.01	Non-Participating	1	35
266	719982.04	4907873.21	Non-Participating	1	35
267	720021.83	4907900.02	Non-Participating	1	35
293	721992.22	4908358.55	Non-Participating	1	35
295	722011.37	4908342.31	Non-Participating	1	35
297	722089.60	4908201.94	Non-Participating	1	35
199	726107.97	4905764.29	Non-Participating	1	35
292	721978.07	4908374.37	Non-Participating	1	35
396	721948.07	4908375.27	Non-Participating	1	35
410	720048.78	4907946.28	Non-Participating	1	35
490	716856.90	4904583.09	Non-Participating	1	35
481	716963.30	4904642.62	Non-Participating	1	35
194	724847.86	4907280.34	Non-Participating	1	35
268	720072.19	4907973.95	Non-Participating	1	35
269	720106.25	4908011.80	Non-Participating	1	35
273	720273.48	4908078.90	Non-Participating	1	35
58	716032.82	4901955.98	Non-Participating	1	35
201	726503.06	4905320.15	Non-Participating	1	35
270	720141.70	4908061.35	Non-Participating	1	35
290	721861.07	4908467.22	Non-Participating	1	35
291	721835.68	4908492.61	Non-Participating	1	34
272	720179.89	4908091.98	Non-Participating	1	34
274	720454.78	4908220.05	Non-Participating	1	34
289	721794.46	4908525.50	Non-Participating	1	34
275	720401.45	4908238.23	Non-Participating	1	34

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Y (m)	Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
288	721751.99	4908548.40	Non-Participating	1	34
228	726976.25	4900694.01	Non-Participating	1	34
246	727363.29	4903829.96	Non-Participating	1	34
276	720304.09	4908243.08	Non-Participating	1	34
277	720344.49	4908251.56	Non-Participating	1	34
405	720268.50	4908203.65	Non-Participating	1	34
406	720369.09	4908241.09	Non-Participating	1	34
745	726858.39	4900143.28	Non-Participating	1	34
746	726865.43	4900158.30	Non-Participating	1	34
245	727235.63	4904241.24	Non-Participating	1	34
286	721664.28	4908602.97	Non-Participating	1	34
252	716921.70	4896257.62	Non-Participating	1	34
287	721637.87	4908618.55	Non-Participating	1	34
669	716989.84	4896233.57	Non-Participating	1	34
285	721612.76	4908638.90	Non-Participating	1	34
442	717277.82	4904821.59	Non-Participating	1	34
494	716948.95	4904530.39	Non-Participating	1	34
281	721387.20	4908657.52	Non-Participating	1	34
400	721565.91	4908675.92	Non-Participating	1	34
236	723175.31	4908595.11	Non-Participating	1	34
284	721538.73	4908695.61	Non-Participating	1	34
513	716453.10	4905409.39	Non-Participating	1	34
1072	727319.90	4901042.05	Non-Participating	1	34
226	727202.86	4899979.73	Non-Participating	1	34
234	725169.65	4907420.70	Non-Participating	1	34
243	727336.17	4901068.97	Non-Participating	1	34
278	721275.07	4908713.80	Non-Participating	1	34
279	721305.81	4908733.71	Non-Participating	1	34
512	716459.20	4905309.54	Non-Participating	1	34
515	716427.83	4905367.28	Non-Participating	1	34
516	716458.13	4905288.00	Non-Participating	1	34
280	721324.42	4908753.63	Non-Participating	1	34
283	721448.68	4908770.08	Non-Participating	1	34
514	716418.30	4905353.97	Non-Participating	1	34
282	721377.24	4908782.63	Non-Participating	1	33
501	716518.40	4904883.23	Non-Participating	1	33
510	716354.23	4905179.04	Non-Participating	1	33
230	726456.05	4906213.42	Non-Participating	1	33
468	717011.84	4904531.58	Non-Participating	1	33
492	716878.39	4904513.48	Non-Participating	1	33
511	716338.97	4905246.51	Non-Participating	1	33
985	714318.77	4902656.83	Non-Participating	1	33
239	727874.48	4902603.59	Non-Participating	1	33
507	716445.50	4904785.31	Non-Participating	1	33
240	727888.73	4902392.04	Non-Participating	1	33
477	717003.01	4904556.89	Non-Participating	1	33
1053	726925.43	4905673.26	Non-Participating	1	33

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Coordinates UTM NAD83 Zone 14N Y (m)	Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
493	716916.94	4904511.86	Non-Participating	1	33
1054	726986.94	4905673.30	Non-Participating	1	33
233	725536.82	4907446.28	Non-Participating	1	33
509	716223.64	4904999.11	Non-Participating	1	33
997	714603.77	4903727.73	Non-Participating	1	33
1081	713673.07	4900785.04	Non-Participating	1	33
231	726354.15	4906752.29	Non-Participating	1	33
391	723532.73	4908905.53	Non-Participating	1	33
503	716565.00	4904619.61	Non-Participating	1	33
331	719621.89	4908806.30	Non-Participating	1	33
352	719602.30	4908788.46	Non-Participating	1	33
390	723596.89	4908931.73	Non-Participating	1	33
332	719635.36	4908828.68	Non-Participating	1	32
353	719538.13	4908797.13	Non-Participating	1	32
504	716489.56	4904682.61	Non-Participating	1	32
506	716442.68	4904744.70	Non-Participating	1	32
531	715696.65	4904576.48	Non-Participating	1	32
247	727860.69	4904504.97	Non-Participating	1	32
328	719510.56	4908805.86	Non-Participating	1	32
329	719494.17	4908824.72	Non-Participating	1	32
333	719692.62	4908881.15	Non-Participating	1	32
334	719714.06	4908894.66	Non-Participating	1	32
335	719775.28	4908916.96	Non-Participating	1	32
337	719827.18	4908944.00	Non-Participating	1	32
386	723908.08	4908855.30	Non-Participating	1	32
502	716602.70	4904783.65	Non-Participating	1	32
508	716424.48	4904684.60	Non-Participating	1	32
517	715843.66	4905893.14	Non-Participating	1	32
538	715797.01	4904522.16	Non-Participating	1	32
322	719448.43	4908815.84	Non-Participating	1	32
330	719480.38	4908831.06	Non-Participating	1	32
340	719863.03	4908964.75	Non-Participating	1	32
341	719908.49	4908984.50	Non-Participating	1	32
345	719970.89	4909004.75	Non-Participating	1	32
535	715805.26	4904582.32	Non-Participating	1	32
321	719423.86	4908836.08	Non-Participating	1	32
336	719783.54	4908972.62	Non-Participating	1	32
347	720006.42	4909030.79	Non-Participating	1	32
530	715666.65	4904585.78	Non-Participating	1	32
534	715778.32	4904580.68	Non-Participating	1	32
539	715742.38	4904518.03	Non-Participating	1	32
556	715972.76	4904548.81	Non-Participating	1	32
557	715949.78	4904547.41	Non-Participating	1	32
558	715954.67	4904506.34	Non-Participating	1	32
320	719382.24	4908848.92	Non-Participating	1	32
338	719821.62	4909008.89	Non-Participating	1	32
342	719889.00	4909025.73	Non-Participating	1	32

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
348	720028.40	4909070.31	Non-Participating	1	32
388	724139.90	4908828.11	Non-Participating	1	32
533	715756.97	4904578.58	Non-Participating	1	32
986	714237.97	4903398.65	Non-Participating	1	32
242	728301.58	4901544.64	Non-Participating	1	32
317	719315.87	4908867.66	Non-Participating	1	32
318	719338.08	4908860.01	Non-Participating	1	32
319	719358.98	4908856.51	Non-Participating	1	32
327	719655.92	4908969.59	Non-Participating	1	32
343	719916.82	4909065.08	Non-Participating	1	32
344	719960.33	4909056.08	Non-Participating	1	32
482	716991.24	4904467.35	Non-Participating	1	32
532	715724.48	4904576.59	Non-Participating	1	32
540	715681.73	4904534.21	Non-Participating	1	32
546	715893.31	4904508.16	Non-Participating	1	32
550	715937.31	4904595.17	Non-Participating	1	32
553	716045.23	4904599.37	Non-Participating	1	32
349	719981.33	4909102.97	Non-Participating	1	32
483	716903.21	4904378.45	Non-Participating	1	32
547	715892.01	4904529.56	Non-Participating	1	32
14	713480.83	4898900.44	Non-Participating	1	32
232	725787.65	4907743.68	Non-Participating	1	32
313	718932.81	4908775.31	Non-Participating	1	32
314	718917.79	4908752.12	Non-Participating	1	32
315	718886.39	4908753.91	Non-Participating	1	32
316	718864.96	4908748.89	Non-Participating	1	32
350	719231.68	4908876.50	Non-Participating	1	32
542	715894.13	4904455.71	Non-Participating	1	32
548	715893.34	4904559.87	Non-Participating	1	32
549	715908.04	4904592.58	Non-Participating	1	32
554	716045.31	4904546.09	Non-Participating	1	32
1055	727460.91	4905672.52	Non-Participating	1	32
1076	728362.36	4902262.86	Non-Participating	1	32
254	715238.72	4896061.92	Non-Participating	1	32
308	719105.42	4908866.46	Non-Participating	1	32
312	718946.52	4908802.66	Non-Participating	1	32
505	716473.85	4904722.74	Non-Participating	1	32
536	715837.95	4904581.14	Non-Participating	1	32
303	718844.90	4908782.13	Non-Participating	1	32
307	719064.83	4908862.39	Non-Participating	1	32
309	719028.86	4908852.24	Non-Participating	1	32
310	718997.87	4908856.18	Non-Participating	1	32
311	718976.83	4908827.32	Non-Participating	1	32
528	715417.46	4904498.17	Non-Participating	1	32
529	715407.47	4904466.54	Non-Participating	1	32
537	715835.66	4904540.43	Non-Participating	1	32
551	715977.73	4904597.64	Non-Participating	1	32

Table E-1: Project + Existing Non-Project + Future Non-Project Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project + Existing Non-Project + Future Non-Project Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
552	715998.33	4904598.89	Non-Participating	1	32
555	716009.60	4904544.70	Non-Participating	1	32
302	718804.77	4908805.37	Non-Participating	1	32
484	716837.08	4904397.61	Non-Participating	1	32
485	716939.50	4904923.55	Non-Participating	1	32
1056	727588.03	4905661.99	Non-Participating	1	32
248	728267.58	4904129.52	Non-Participating	1	32
301	718789.00	4908855.07	Non-Participating	1	32
524	715157.37	4904393.98	Non-Participating	1	32
1057	727648.51	4905661.71	Non-Participating	1	32
355	723529.44	4909379.33	Non-Participating	1	32
520	715824.71	4905292.24	Non-Participating	1	32
522	715166.41	4904844.74	Non-Participating	1	32
523	715205.36	4904754.06	Non-Participating	1	32
525	715215.94	4904385.63	Non-Participating	1	32
527	715356.05	4904461.80	Non-Participating	1	32
541	715679.22	4904510.19	Non-Participating	1	32
545	715798.36	4904461.00	Non-Participating	1	32
300	718757.08	4908934.79	Non-Participating	1	32
1058	727857.79	4905504.27	Non-Participating	1	32
526	715199.70	4904352.03	Non-Participating	1	31
487	717001.95	4904867.04	Non-Participating	1	31
519	715815.13	4905344.94	Non-Participating	1	31
486	716909.64	4904848.14	Non-Participating	1	31
543	715859.67	4904459.97	Non-Participating	1	31
544	715826.19	4904461.11	Non-Participating	1	31
488	716674.31	4904664.07	Non-Participating	1	31
521	715867.43	4905309.16	Non-Participating	1	31
559	715639.77	4904166.54	Non-Participating	1	31
560	715706.97	4904199.28	Non-Participating	1	31
568	715127.65	4895407.57	Non-Participating	1	31
578	715224.57	4895378.18	Non-Participating	1	31
518	715773.02	4905877.69	Non-Participating	1	30
692	714314.71	4895847.22	Non-Participating	1	30
698	714205.06	4895733.41	Non-Participating	1	27

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Coordinates UTM NAD83 Zone 14N Y (m)	Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
841	718039.49	4900059.75	Participating	1	49
244	718764.15	4902985.61	Participating	1	49
62	718203.16	4902322.57	Participating	1	49
71	725137.82	4902529.85	Participating	1	48
138	720913.33	4905533.52	Participating	1	48
970	718804.83	4903017.02	Participating	1	48
55	717076.39	4901073.99	Participating	1	48
61	718385.88	4902176.53	Participating	1	48
68	724305.46	4902285.98	Participating	1	48
89	718770.32	4903420.97	Participating	1	48
64	719470.78	4902334.95	Participating	1	48
46	718911.99	4899677.74	Participating	1	48
141	721904.81	4906033.39	Participating	1	47
85	722982.06	4904008.09	Participating	1	47
86	720375.68	4903106.67	Participating-Assumed	1	47
63	719389.44	4902171.45	Participating	1	47
91	723368.88	4904718.11	Participating	1	47
65	719873.61	4902159.54	Participating	1	47
49	719388.68	4900626.02	Participating	1	47
941	724623.73	4903937.11	Participating	1	47
27	721690.13	4899054.22	Participating	1	47
67	722830.76	4902522.74	Participating	1	47
84	722333.43	4903262.08	Participating	1	46
164	724320.81	4903427.17	Participating	1	46
26	722203.20	4898274.38	Participating	1	46
237	719557.26	4900666.24	Participating-Assumed	1	46
151	721719.87	4905358.34	Participating	1	46
793	719578.52	4900642.43	Participating-Assumed	1	46
90	718659.29	4903828.29	Participating	1	46
92	721996.88	4904643.52	Non-Participating	1	46
88	720550.53	4904032.74	Participating	1	46
52	717119.07	4900238.72	Participating	1	46
169	723372.30	4905615.79	Non-Participating	1	46
25	720904.17	4899187.90	Participating	1	46
51	717258.54	4899542.38	Non-Participating	1	46
178	723334.67	4906665.95	Participating	1	46
94	718774.53	4904450.55	Participating	1	45
154	723523.13	4905122.61	Non-Participating	1	45
53	717301.27	4900451.69	Participating	1	45
93	722006.38	4905029.65	Participating	1	45
1083	719182.87	4905036.07	Participating	1	45
87	720951.07	4903766.63	Participating-Assumed	1	45
235	723475.42	4905860.10	Participating	1	45
171	723461.82	4905731.71	Participating-Assumed	1	45
56	715837.07	4900177.49	Participating	1	45
83	723492.59	4902812.41	Non-Participating	1	45
103	719140.84	4905043.74	Participating	1	45

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
791	719916.57	4900476.21	Participating-Assumed	1	45
60	718480.21	4901000.12	Participating	1	45
16	715723.31	4898648.13	Non-Participating	1	45
105	719636.02	4905481.91	Non-Participating	1	45
70	725160.81	4902178.69	Non-Participating	1	44
28	723264.12	4899043.61	Participating	1	44
50	717161.40	4899221.14	Non-Participating	1	44
20	717476.52	4898978.04	Non-Participating	1	44
81	725352.22	4903786.97	Participating	1	43
109	720594.55	4906146.96	Participating	1	43
66	720678.38	4902318.70	Non-Participating	1	43
238	715848.85	4900637.11	Non-Participating	1	43
29	723148.39	4899253.41	Non-Participating	1	42
161	724163.66	4905228.63	Participating	1	42
95	718467.45	4904553.41	Participating	1	42
22	718141.05	4897676.55	Participating-Assumed	1	42
59	716453.80	4901946.72	Non-Participating	1	41
17	715447.24	4899194.95	Non-Participating	1	41
384	721820.17	4907219.46	Participating-Assumed	1	41
43	721991.20	4899704.37	Non-Participating	1	41
146	721666.16	4907223.36	Non-Participating	1	41
44	720889.44	4900807.13	Non-Participating	1	41
24	719282.97	4897515.15	Participating	1	41
42	722427.30	4900617.84	Non-Participating	1	40
19	717211.44	4898135.31	Participating	1	40
82	725699.53	4904212.19	Non-Participating	1	40
112	720406.24	4906727.10	Non-Participating	1	40
435	718055.75	4904739.22	Non-Participating	1	40
69	725187.55	4901454.70	Non-Participating	1	40
102	718274.26	4905044.01	Participating	1	40
434	718053.13	4904782.14	Non-Participating	1	40
431	717915.15	4904653.73	Non-Participating	1	39
433	718000.35	4904756.38	Non-Participating	1	39
432	717963.00	4904727.58	Non-Participating	1	39
149	721695.97	4907454.30	Non-Participating	1	39
172	724504.21	4905783.38	Non-Participating	1	39
174	724225.15	4906343.92	Participating	1	39
101	718162.37	4905006.41	Participating	1	39
429	717938.68	4904865.30	Non-Participating	1	39
430	717932.82	4904896.09	Non-Participating	1	39
40	724716.86	4900688.30	Non-Participating	1	39
131	719114.20	4906081.78	Non-Participating	1	39
23	718315.29	4897230.65	Non-Participating	1	39
100	717883.25	4904909.85	Non-Participating	1	39
438	717699.27	4904628.61	Non-Participating	1	38
114	719215.91	4906259.09	Non-Participating	1	38
439	717671.57	4904626.25	Non-Participating	1	38

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
37	723990.20	4899418.91	Non-Participating	1	38
115	719213.16	4906349.80	Non-Participating	1	38
116	719291.50	4906403.40	Non-Participating	1	38
117	719371.22	4906459.76	Non-Participating	1	38
118	719412.46	4906490.00	Non-Participating	1	38
119	719463.31	4906543.60	Non-Participating	1	38
426	719330.01	4906440.32	Non-Participating	1	38
457	717269.99	4904375.01	Non-Participating	1	38
120	719483.93	4906571.09	Non-Participating	1	38
456	717225.45	4904344.45	Non-Participating	1	38
121	719500.42	4906613.70	Non-Participating	1	38
461	717264.21	4904404.49	Non-Participating	1	38
464	717121.71	4904382.52	Non-Participating	1	38
122	719526.54	4906674.17	Non-Participating	1	38
123	719537.53	4906700.29	Non-Participating	1	38
460	717265.56	4904425.78	Non-Participating	1	38
465	717145.67	4904402.55	Non-Participating	1	38
124	719569.14	4906742.89	Non-Participating	1	37
184	725196.23	4905627.67	Non-Participating	1	37
256	723187.80	4897202.59	Non-Participating	1	37
466	717115.41	4904420.58	Non-Participating	1	37
125	719584.26	4906795.12	Non-Participating	1	37
453	717449.05	4904427.71	Participating	1	37
458	717222.15	4904431.08	Non-Participating	1	37
454	717429.94	4904425.88	Participating	1	37
459	717267.74	4904455.08	Non-Participating	1	37
440	717564.02	4904661.44	Non-Participating	1	37
441	717530.49	4904678.61	Non-Participating	1	37
450	717260.30	4904565.99	Non-Participating	1	37
126	719588.39	4906869.34	Non-Participating	1	37
127	719643.36	4906894.08	Non-Participating	1	37
185	725317.77	4905632.44	Non-Participating	1	37
473	717213.29	4904565.10	Non-Participating	1	37
449	717327.26	4904576.71	Non-Participating	1	37
451	717411.00	4904486.37	Participating	1	37
472	717199.47	4904596.07	Non-Participating	1	37
455	717336.41	4904481.15	Non-Participating	1	37
471	717179.04	4904594.16	Non-Participating	1	37
128	719573.27	4906936.69	Non-Participating	1	37
467	717126.03	4904463.65	Non-Participating	1	37
445	717237.39	4904648.11	Non-Participating	1	37
446	717204.21	4904648.73	Non-Participating	1	37
444	717272.02	4904656.19	Non-Participating	1	37
447	717169.91	4904645.97	Non-Participating	1	37
218	722296.75	4907945.00	Non-Participating	1	37
462	717224.49	4904457.74	Non-Participating	1	37
219	722230.87	4907970.76	Non-Participating	1	37

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Y (m)	Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
452	717451.66	4904493.50	Participating	1	37
182	725579.11	4905569.15	Non-Participating	1	36
443	717311.81	4904655.97	Non-Participating	1	36
189	724410.32	4907052.07	Participating	1	36
463	717219.75	4904491.92	Non-Participating	1	36
220	722220.68	4907997.11	Non-Participating	1	36
133	719506.22	4907080.47	Non-Participating	1	36
250	720099.79	4907436.08	Non-Participating	1	36
448	717099.04	4904644.95	Non-Participating	1	36
474	717110.15	4904593.27	Non-Participating	1	36
134	719465.69	4907121.78	Non-Participating	1	36
470	717152.66	4904559.41	Non-Participating	1	36
394	722177.41	4908058.91	Non-Participating	1	36
475	717079.66	4904593.39	Non-Participating	1	36
423	719406.83	4907178.95	Non-Participating	1	36
41	725875.26	4900834.50	Non-Participating	1	36
298	722127.86	4908126.15	Non-Participating	1	36
299	722153.60	4908089.69	Non-Participating	1	36
479	717020.75	4904646.13	Non-Participating	1	36
135	719426.72	4907251.15	Non-Participating	1	36
421	719588.35	4907315.19	Non-Participating	1	36
924	727022.24	4902627.29	Non-Participating	1	36
205	726919.36	4902176.15	Non-Participating	1	36
393	722215.45	4908035.25	Non-Participating	1	36
422	719376.99	4907276.82	Non-Participating	1	35
255	715015.61	4897377.20	Non-Participating	1	35
179	725634.47	4905935.88	Non-Participating	1	35
414	719848.76	4907583.53	Non-Participating	1	35
480	716988.35	4904644.82	Non-Participating	1	35
491	716882.54	4904586.65	Non-Participating	1	35
497	716911.86	4904573.19	Non-Participating	1	35
38	725325.11	4899964.56	Non-Participating	1	35
137	719365.16	4907339.21	Non-Participating	1	35
469	717114.32	4904557.73	Non-Participating	1	35
476	717049.32	4904590.87	Non-Participating	1	35
478	717001.77	4904587.97	Non-Participating	1	35
136	719377.63	4907389.09	Non-Participating	1	35
495	716949.29	4904568.19	Non-Participating	1	35
489	716825.86	4904581.19	Non-Participating	1	35
500	716854.83	4904638.65	Non-Participating	1	35
257	719610.00	4907569.00	Non-Participating	1	35
296	722035.11	4908307.34	Non-Participating	1	35
411	720116.92	4907819.45	Non-Participating	1	35
496	716942.67	4904589.66	Non-Participating	1	35
499	716890.24	4904634.18	Non-Participating	1	35
258	719700.93	4907644.54	Non-Participating	1	35
260	719745.33	4907684.29	Non-Participating	1	35

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
261	719857.46	4907742.57	Non-Participating	1	35
294	722024.70	4908323.58	Non-Participating	1	35
395	722056.64	4908256.22	Non-Participating	1	35
412	719794.95	4907709.10	Non-Participating	1	35
413	719782.62	4907676.53	Non-Participating	1	35
498	716917.97	4904635.88	Non-Participating	1	35
262	719890.34	4907786.12	Non-Participating	1	35
263	719919.46	4907805.15	Non-Participating	1	35
293	721992.22	4908358.55	Non-Participating	1	35
295	722011.37	4908342.31	Non-Participating	1	35
297	722089.60	4908201.94	Non-Participating	1	35
265	719947.43	4907836.01	Non-Participating	1	35
266	719982.04	4907873.21	Non-Participating	1	35
267	720021.83	4907900.02	Non-Participating	1	35
292	721978.07	4908374.37	Non-Participating	1	35
490	716856.90	4904583.09	Non-Participating	1	35
1082	726638.58	4904876.28	Non-Participating	1	35
396	721948.07	4908375.27	Non-Participating	1	35
98	716874.05	4896617.04	Non-Participating	1	35
410	720048.78	4907946.28	Non-Participating	1	35
481	716963.30	4904642.62	Non-Participating	1	35
194	724847.86	4907280.34	Non-Participating	1	35
199	726107.97	4905764.29	Non-Participating	1	35
229	726718.52	4901305.38	Non-Participating	1	35
268	720072.19	4907973.95	Non-Participating	1	35
269	720106.25	4908011.80	Non-Participating	1	35
273	720273.48	4908078.90	Non-Participating	1	35
290	721861.07	4908467.22	Non-Participating	1	35
58	716032.82	4901955.98	Non-Participating	1	34
270	720141.70	4908061.35	Non-Participating	1	34
291	721835.68	4908492.61	Non-Participating	1	34
272	720179.89	4908091.98	Non-Participating	1	34
201	726503.06	4905320.15	Non-Participating	1	34
274	720454.78	4908220.05	Non-Participating	1	34
289	721794.46	4908525.50	Non-Participating	1	34
275	720401.45	4908238.23	Non-Participating	1	34
288	721751.99	4908548.40	Non-Participating	1	34
405	720268.50	4908203.65	Non-Participating	1	34
406	720369.09	4908241.09	Non-Participating	1	34
4	719410.70	4896051.41	Non-Participating	1	34
276	720304.09	4908243.08	Non-Participating	1	34
277	720344.49	4908251.56	Non-Participating	1	34
286	721664.28	4908602.97	Non-Participating	1	34
13	723456.49	4896774.78	Non-Participating	1	34
287	721637.87	4908618.55	Non-Participating	1	34
285	721612.76	4908638.90	Non-Participating	1	34
442	717277.82	4904821.59	Non-Participating	1	34

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
246	727363.29	4903829.96	Non-Participating	1	34
494	716948.95	4904530.39	Non-Participating	1	34
245	727235.63	4904241.24	Non-Participating	1	34
400	721565.91	4908675.92	Non-Participating	1	34
513	716453.10	4905409.39	Non-Participating	1	34
281	721387.20	4908657.52	Non-Participating	1	34
284	721538.73	4908695.61	Non-Participating	1	34
236	723175.31	4908595.11	Non-Participating	1	34
515	716427.83	4905367.28	Non-Participating	1	34
516	716458.13	4905288.00	Non-Participating	1	34
234	725169.65	4907420.70	Non-Participating	1	34
252	716921.70	4896257.62	Non-Participating	1	34
278	721275.07	4908713.80	Non-Participating	1	34
279	721305.81	4908733.71	Non-Participating	1	34
512	716459.20	4905309.54	Non-Participating	1	34
514	716418.30	4905353.97	Non-Participating	1	34
669	716989.84	4896233.57	Non-Participating	1	34
280	721324.42	4908753.63	Non-Participating	1	33
282	721377.24	4908782.63	Non-Participating	1	33
283	721448.68	4908770.08	Non-Participating	1	33
501	716518.40	4904883.23	Non-Participating	1	33
510	716354.23	4905179.04	Non-Participating	1	33
492	716878.39	4904513.48	Non-Participating	1	33
511	716338.97	4905246.51	Non-Participating	1	33
468	717011.84	4904531.58	Non-Participating	1	33
507	716445.50	4904785.31	Non-Participating	1	33
613	724975.11	4897668.13	Non-Participating	1	33
477	717003.01	4904556.89	Non-Participating	1	33
985	714318.77	4902656.83	Non-Participating	1	33
230	726456.05	4906213.42	Non-Participating	1	33
228	726976.25	4900694.01	Non-Participating	1	33
493	716916.94	4904511.86	Non-Participating	1	33
1053	726925.43	4905673.26	Non-Participating	1	33
509	716223.64	4904999.11	Non-Participating	1	33
233	725536.82	4907446.28	Non-Participating	1	33
243	727336.17	4901068.97	Non-Participating	1	33
997	714603.77	4903727.73	Non-Participating	1	33
1054	726986.94	4905673.30	Non-Participating	1	33
1072	727319.90	4901042.05	Non-Participating	1	33
503	716565.00	4904619.61	Non-Participating	1	33
1081	713673.07	4900785.04	Non-Participating	1	33
239	727874.48	4902603.59	Non-Participating	1	33
391	723532.73	4908905.53	Non-Participating	1	33
745	726858.39	4900143.28	Non-Participating	1	33
746	726865.43	4900158.30	Non-Participating	1	33
36	726225.39	4899113.03	Non-Participating	1	32
231	726354.15	4906752.29	Non-Participating	1	32

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N X (m)	Coordinates UTM NAD83 Zone 14N Y (m)	Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
240	727888.73	4902392.04	Non-Participating	1	32
352	719602.30	4908788.46	Non-Participating	1	32
390	723596.89	4908931.73	Non-Participating	1	32
504	716489.56	4904682.61	Non-Participating	1	32
506	716442.68	4904744.70	Non-Participating	1	32
508	716424.48	4904684.60	Non-Participating	1	32
531	715696.65	4904576.48	Non-Participating	1	32
538	715797.01	4904522.16	Non-Participating	1	32
331	719621.89	4908806.30	Non-Participating	1	32
328	719510.56	4908805.86	Non-Participating	1	32
332	719635.36	4908828.68	Non-Participating	1	32
353	719538.13	4908797.13	Non-Participating	1	32
502	716602.70	4904783.65	Non-Participating	1	32
530	715666.65	4904585.78	Non-Participating	1	32
535	715805.26	4904582.32	Non-Participating	1	32
556	715972.76	4904548.81	Non-Participating	1	32
333	719692.62	4908881.15	Non-Participating	1	32
334	719714.06	4908894.66	Non-Participating	1	32
335	719775.28	4908916.96	Non-Participating	1	32
386	723908.08	4908855.30	Non-Participating	1	32
517	715843.66	4905893.14	Non-Participating	1	32
534	715778.32	4904580.68	Non-Participating	1	32
539	715742.38	4904518.03	Non-Participating	1	32
322	719448.43	4908815.84	Non-Participating	1	32
329	719494.17	4908824.72	Non-Participating	1	32
330	719480.38	4908831.06	Non-Participating	1	32
337	719827.18	4908944.00	Non-Participating	1	32
340	719863.03	4908964.75	Non-Participating	1	32
341	719908.49	4908984.50	Non-Participating	1	32
345	719970.89	4909004.75	Non-Participating	1	32
347	720006.42	4909030.79	Non-Participating	1	32
533	715756.97	4904578.58	Non-Participating	1	32
557	715949.78	4904547.41	Non-Participating	1	32
558	715954.67	4904506.34	Non-Participating	1	32
321	719423.86	4908836.08	Non-Participating	1	32
336	719783.54	4908972.62	Non-Participating	1	32
319	719358.98	4908856.51	Non-Participating	1	32
320	719382.24	4908848.92	Non-Participating	1	32
338	719821.62	4909008.89	Non-Participating	1	32
342	719889.00	4909025.73	Non-Participating	1	32
344	719960.33	4909056.08	Non-Participating	1	32
348	720028.40	4909070.31	Non-Participating	1	32
388	724139.90	4908828.11	Non-Participating	1	32
482	716991.24	4904467.35	Non-Participating	1	32
483	716903.21	4904378.45	Non-Participating	1	32
532	715724.48	4904576.59	Non-Participating	1	32
540	715681.73	4904534.21	Non-Participating	1	32

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
542	715894.13	4904455.71	Non-Participating	1	32
546	715893.31	4904508.16	Non-Participating	1	32
547	715892.01	4904529.56	Non-Participating	1	32
548	715893.34	4904559.87	Non-Participating	1	32
550	715937.31	4904595.17	Non-Participating	1	32
553	716045.23	4904599.37	Non-Participating	1	32
986	714237.97	4903398.65	Non-Participating	1	32
318	719338.08	4908860.01	Non-Participating	1	32
327	719655.92	4908969.59	Non-Participating	1	32
343	719916.82	4909065.08	Non-Participating	1	32
549	715908.04	4904592.58	Non-Participating	1	32
554	716045.31	4904546.09	Non-Participating	1	32
317	719315.87	4908867.66	Non-Participating	1	32
349	719981.33	4909102.97	Non-Participating	1	32
505	716473.85	4904722.74	Non-Participating	1	32
528	715417.46	4904498.17	Non-Participating	1	32
529	715407.47	4904466.54	Non-Participating	1	32
536	715837.95	4904581.14	Non-Participating	1	32
552	715998.33	4904598.89	Non-Participating	1	32
247	727860.69	4904504.97	Non-Participating	1	32
314	718917.79	4908752.12	Non-Participating	1	32
350	719231.68	4908876.50	Non-Participating	1	32
555	716009.60	4904544.70	Non-Participating	1	32
307	719064.83	4908862.39	Non-Participating	1	32
308	719105.42	4908866.46	Non-Participating	1	32
311	718976.83	4908827.32	Non-Participating	1	32
312	718946.52	4908802.66	Non-Participating	1	32
313	718932.81	4908775.31	Non-Participating	1	32
315	718886.39	4908753.91	Non-Participating	1	32
316	718864.96	4908748.89	Non-Participating	1	32
537	715835.66	4904540.43	Non-Participating	1	32
551	715977.73	4904597.64	Non-Participating	1	32
14	713480.83	4898900.44	Non-Participating	1	32
232	725787.65	4907743.68	Non-Participating	1	32
303	718844.90	4908782.13	Non-Participating	1	32
309	719028.86	4908852.24	Non-Participating	1	32
485	716939.50	4904923.55	Non-Participating	1	32
310	718997.87	4908856.18	Non-Participating	1	32
484	716837.08	4904397.61	Non-Participating	1	32
302	718804.77	4908805.37	Non-Participating	1	32
524	715157.37	4904393.98	Non-Participating	1	32
226	727202.86	4899979.73	Non-Participating	1	32
525	715215.94	4904385.63	Non-Participating	1	32
541	715679.22	4904510.19	Non-Participating	1	32
545	715798.36	4904461.00	Non-Participating	1	32
1055	727460.91	4905672.52	Non-Participating	1	32
32	724971.27	4897228.10	Non-Participating	1	32

Table E-2: Project Only Results by Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 14N		Participation Status	Noise Area Class.	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
301	718789.00	4908855.07	Non-Participating	1	32
520	715824.71	4905292.24	Non-Participating	1	32
522	715166.41	4904844.74	Non-Participating	1	32
523	715205.36	4904754.06	Non-Participating	1	32
527	715356.05	4904461.80	Non-Participating	1	32
355	723529.44	4909379.33	Non-Participating	1	32
31	725540.63	4897544.85	Non-Participating	1	32
254	715238.72	4896061.92	Non-Participating	1	32
300	718757.08	4908934.79	Non-Participating	1	32
1056	727588.03	4905661.99	Non-Participating	1	32
1057	727648.51	4905661.71	Non-Participating	1	31
487	717001.95	4904867.04	Non-Participating	1	31
519	715815.13	4905344.94	Non-Participating	1	31
526	715199.70	4904352.03	Non-Participating	1	31
248	728267.58	4904129.52	Non-Participating	1	31
1076	728362.36	4902262.86	Non-Participating	1	31
486	716909.64	4904848.14	Non-Participating	1	31
1058	727857.79	4905504.27	Non-Participating	1	31
543	715859.67	4904459.97	Non-Participating	1	31
242	728301.58	4901544.64	Non-Participating	1	31
544	715826.19	4904461.11	Non-Participating	1	31
521	715867.43	4905309.16	Non-Participating	1	31
488	716674.31	4904664.07	Non-Participating	1	31
559	715639.77	4904166.54	Non-Participating	1	31
560	715706.97	4904199.28	Non-Participating	1	31
1	724967.32	4896341.13	Non-Participating	1	30
518	715773.02	4905877.69	Non-Participating	1	30
225	726508.78	4897454.26	Non-Participating	1	30
568	715127.65	4895407.57	Non-Participating	1	30
578	715224.57	4895378.18	Non-Participating	1	30
692	714314.71	4895847.22	Non-Participating	1	30
3	725625.32	4896059.58	Non-Participating	1	29
222	727482.24	4897801.59	Non-Participating	1	29
2	726537.89	4896321.29	Non-Participating	1	29
698	714205.06	4895733.41	Non-Participating	1	27