



E.ON Climate & Renewables Canada Ltd.

Grizzly Bear Creek Wind Power Project

May 19, 2016

The Alberta Utilities Commission

Decision 3329-D01-2016

Grizzly Bear Creek Wind Power Project

Proceeding 3329

Applications 1610717-1 and 1610717-2

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1 Decision summary

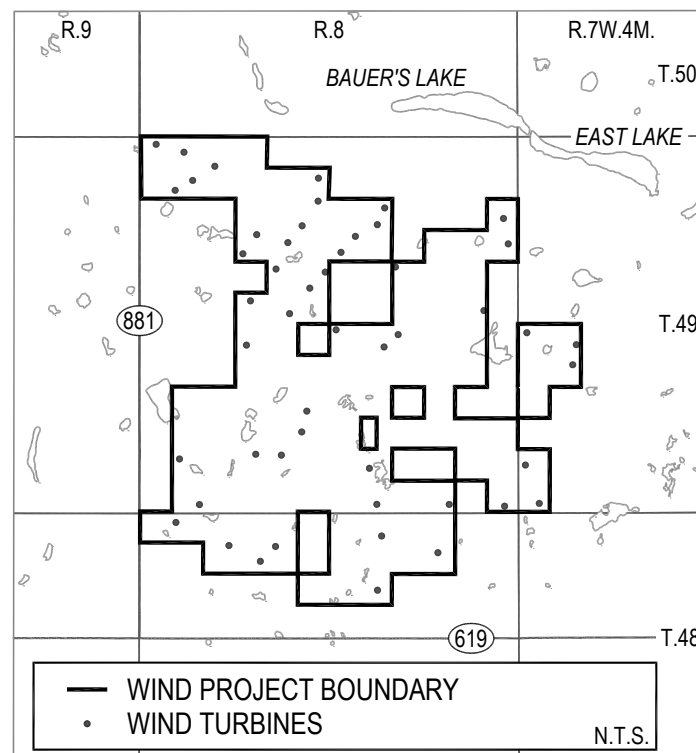
1. In this decision, the Alberta Utilities Commission must decide whether to approve the applications by E.ON Climate & Renewables Canada Ltd. (E.ON or the applicant) for the construction and operation of the Grizzly Bear Creek Wind Power Project, pursuant to sections 11, 14 and 15 of the *Hydro and Electric Energy Act*. The project would be located in an area south of the town of Mannville, in portions of both the County of Minburn and the County of Vermilion River. After consideration of the record of the proceeding, and for the reasons outlined in this decision, the Commission finds that approval of the proposed project is in the public interest having regard to the social and economic effects of the project and its effects on the environment.

2. In reaching the determinations set out in this decision, the Commission has considered all relevant materials comprising the record of this proceeding, including the evidence and submissions provided by each party. References in this decision to specific parts of the record are intended to assist the reader in understanding the Commission's reasoning relating to a particular matter and should not be taken as an indication that the Commission did not consider all relevant portions of the record as it relates to that matter.

2 Introduction

3. The location of the project is shown in the following map:

Figure 1 – Grizzly Bear Creek Wind Power Project proposed location



4. The applicant stated that it selected the project site based on a number of factors including the wind resource, its review of the terrain and topography, access to transmission lines and landowner interests. The applicant began to evaluate the feasibility of the area in 2008. Once it determined that the area was suitable for a wind power project, it commenced turbine siting and made routing determinations for the collector system and access roads taking into account the following considerations:

- preliminary wind resource assessment
- review of terrain and topography
- access to transmission lines
- landowner interest
- environmental constraints
- municipal setbacks from residences, property lines, and road allowances

5. The applicant submits that the project site was carefully selected and is optimally designed to protect the environment, human health, and existing land uses.¹

2.1 Background

6. On July 10, 2014, the applicant filed two applications with the AUC to construct and operate the project. The applications were registered as applications 1610717-1 and 1610717-2 and were designated as Proceeding 3329. The project would consist of the following components:

- Fifty 2.4-megawatt (MW) wind turbines with a total capacity of 120 MW located within Township 48, Range 8, west of the Fourth Meridian and Township 49, Ranges 7 and 8, west of the Fourth Meridian.
- Each tower would be 91 metres tall and have a rotor diameter of 116.8 metres. The maximum height at tip of blade would be 149.4 metres.
- A 34.5-kilovolt (kV) collector system consisting of underground power lines located within the project area.
- The Grizzly Bear Creek Wind Power Project Substation 708S for future connection to the Alberta Interconnected Electrical System. The substation would contain four 34.5-kV circuit breakers, a 240-kV circuit breaker and a 240x144/34.5-kV transformer located in LSD 12 of Section 10, Township 49, Range 8, west of the Fourth Meridian.

7. The AUC issued a notice of application on August 11, 2014, for the project. In response to its notice, the AUC received submissions from landowners and other interested stakeholders.

8. The AUC issued a notice of hearing on December 11, 2014. The notice provided details of the application, timing for an AUC information session and a schedule of the remaining process steps for consideration of the application.

¹ Exhibit 3329-X0112, Reply evidence submission, PDF page 4.

9. On January 16, 2015, the applicant requested that the schedule of process steps be suspended while it reviewed its turbine model selection. The Commission issued a notice advising parties of the cancellation of the oral hearing and suspended the remaining steps in the proceeding on January 23, 2015.

10. On September 1, 2015, the applicant requested to resume the proceeding as previously applied for and filed updates to its participant involvement program and interconnection documentation on November 2, 2015.

11. On November 24, 2015, the Commission issued a notice of rescheduled hearing which contained the revised process schedule.

12. The hearing commenced on Monday, April 7, 2016, in Mannville, Alberta before Commission Member Tudor Beattie, QC (panel chair), Commission Member Neil Jamieson and Acting Commission Member Kate Coolidge. The hearing adjourned in Mannville on March 11, 2016, and resumed in Calgary from March 14, 2016 to March 18, 2016.

2.2 Participants in the proceeding

13. The Commission received objections to the project from the Grizzly Bear Coulee Projection Group (GBCPG). The GBCPG consisted of the following members:

- Ward and Kim Clark
- Marilyn and Kirby Demas
- Ronald and Judy Dixon
- Boone Hess
- Douglas and Karen Hess
- Doug and Cheryl Livingstone
- Robert and Audra Livingstone
- Calvin Maron
- Walter and Margaret Maron
- Michael and Elizabeth Myhovich
- Donald Myshak
- Hazel Mytz
- Michael and Candice Obrigewitch
- Lincoln and Tammi Smart
- Laura Tapley
- Elfrieda Westover
- Warren Westover
- Fred and June Wyard-Scott (Wyand-Scott Farms Ltd.)
- Ken Wyand-Scott (Wyand-Scott Farms Ltd.)

14. The Commission received written submissions from Alice Stafinski in support of the project.

15. The Commission also received written submissions from the following:

- Brian Rogan
- Benign Energy Canada II Inc.
- County of Vermilion River
- Dave Haugan

16. A list of all proceeding participants, including those that submitted written submissions, has been attached to this decision as [Appendix A](#). All submissions were reviewed by the panel and taken into account in coming to their decision. A copy of the Commission's ruling on standing is attached as [Appendix E](#).²

3 How the decision is structured

17. The structure for this decision is as follows. The decision first lays out the legislative scheme that governs wind power plants. Next, the decision addresses the admissibility of expert evidence.

18. The decision then addresses the issues raised in the proceeding. These are: the applicant's consultation and participant involvement program; the project's noise impact assessments and the project's compliance with the AUC regulatory requirements for noise; health impacts arising from noise produced by the project; safety concerns relating to the project; potential property impacts; the project's potential impact on the environment; and project construction and decommissioning.

19. Finally, the Commission will provide its overall conclusion on the application.

4 Legislative scheme

20. The Commission regulates the construction and operation of power plants in Alberta. The wind farm proposed by the applicant is a "power plant" as that term is defined in subsection 1(k) of the *Hydro and Electric Energy Act*. Section 11 of the *Hydro and Electric Energy Act* states that no person may construct or operate a power plant without prior approval from the Commission. In addition, sections 14 and 15 of the *Hydro and Electric Energy Act* direct that approval from the Commission is necessary prior to constructing or operating a substation or a transmission line.³

21. Accordingly, the applicant has applied to construct and operate the project pursuant to sections 11, 14 and 15 of the *Hydro and Electric Energy Act*.

22. When considering an application for a power plant and associated infrastructure, the Commission is guided by sections 2 and 3 of the *Hydro and Electric Energy Act*, and Section 17 of the *Alberta Utilities Commission Act*.

² Exhibit 0055.01.AUC-3329, AUC Ruling on Standing.

³ Defined in Section 1(1)(o)(iii) of the *Hydro and Electric Energy Act*, "transmission line" includes substations.

23. Section 2 lists the purposes of the *Hydro and Electric Energy Act*. Those purposes include:

- To provide for the economic, orderly and efficient development and operation, in the public interest, of the generation of electric energy in Alberta.
- To secure the observance of safe and efficient practices in the public interest in the generation of electric energy in Alberta.
- To assist the government in controlling pollution and ensuring environment conservation in the generation of electric energy in Alberta.

24. Section 3 of the *Hydro and Electric Energy Act* requires the Commission to have regard for the purposes of the *Electric Utilities Act* when assessing whether a proposed power plant and associated infrastructure is in the public interest under Section 17 of the *Alberta Utilities Commission Act*. The purposes of the *Electric Utilities Act* include the development of an efficient electric industry structure and the development of an electric generation sector guided by competitive market forces.⁴

25. In Alberta, the legislature expressed its clear intention that electric generation is to be developed through the mechanism of a competitive, deregulated electric generation market. Section 3 of the *Hydro and Electric Energy Act* directs that the Commission shall not have regard to whether the proposed power plant "...is an economic source of electric energy in Alberta or to whether there is a need for the electric energy to be produced by such a facility in meeting the requirements for electric energy in Alberta or outside of Alberta." Accordingly, in considering an application before it, the Commission does not take into account the potential need and cost of a project.

26. The Commission's public interest mandate is located within Section 17 of the *Alberta Utilities Commission Act*, which states:

Public interest

17(1) Where the Commission conducts a hearing or other proceeding on an application to construct or operate a hydro development, power plant or transmission line under the *Hydro and Electric Energy Act* or a gas utility pipeline under the *Gas Utilities Act*, it shall, in addition to any other matters it may or must consider in conducting the hearing or other proceeding, give consideration to whether construction or operation of the proposed hydro development, power plant, transmission line or gas utility pipeline is in the public interest, having regard to the social and economic effects of the development, plant, line or pipeline and the effects of the development, plant, line or pipeline on the environment.

27. In Decision 2014-040,⁵ the Commission reiterated its approach to assessing whether the approval of a power plant is in the public interest as follows:

The determination of whether a project is in the public interest requires the Board [the Commission's predecessor] to assess and balance the negative and beneficial impacts of

⁴ *Electric Utilities Act*, Section 5.

⁵ Decision 2014-040: 1646658 Alberta Ltd. – Bull Creek Wind Project, Proceeding 1955, Application 1608556, February 20, 2014. Errata issued on March 10, 2014.

the specific project before it. Benefits to the public as well as negative impacts on the public must be acknowledged in this analysis. The existence of regulatory standards and guidelines and a proponent's adherence to these standards are important elements in deciding whether potential adverse impacts are acceptable. Where such thresholds do not exist, the Board must be satisfied that reasonable mitigative measures are in place to address the impacts. In many cases, the Board may also approve an application subject to specific conditions that are designed to enhance the effectiveness of mitigative plans. The conditions become an essential part of the approval, and breach of them may result in suspension or rescission of the approval.

In the Board's view, the public interest will be largely met if applications are shown to be in compliance with existing provincial health, environmental, and other regulatory standards in addition to the public benefits outweighing negative impacts.⁶

28. The Commission is of the view that the above approach to assessing whether a proposed project is in the public interest is consistent with the purpose and intent of the statutory scheme. Further, the Commission considers that this approach provides an effective framework for the assessment of wind energy projects.

29. Rule 007: *Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations and Hydro Developments* applies for the construction and operation of power plants, substations and transmission lines, which are governed by the *Hydro and Electric Energy Act*. The application must meet the informational and other requirements set out in Rule 007. Specifically, an applicant must provide technical and functional specifications, information on public consultation, environmental and land-use information including a noise impact assessment. The application must also meet the requirements set out in Rule 012: *Noise Control*.

30. Further, an applicant must obtain all approvals under other applicable provincial or federal legislation.

5 Admissibility of expert evidence

31. Expert evidence is opinion evidence on a scientific, technical or otherwise specialized matter provided by a person with specialized knowledge, experience or training. The Supreme Court of Canada succinctly explained the role of an expert witness in *R. v Howard*: "[e]xperts assist the trier of fact in reaching a conclusion by applying a particular scientific skill not shared by the judge or the jury to a set of facts and then by expressing an opinion as to what conclusions may be drawn as a result."⁷

32. The Supreme Court of Canada set out the test for admissibility of expert evidence in *R. v. Mohan*.⁸ To call expert evidence, a party must demonstrate that the evidence is relevant, necessary to assist the decision maker, and is not subject to an exclusionary rule. The party must also demonstrate that the proposed expert is properly qualified.

⁶ Decision 2014-040, page 16.

⁷ *R. v Howard* [1989] 1 S.C.R. 1337.

⁸ *R. v. Mohan*, [1994] 2 S.C.R. 9.

33. In *White Burgess Langille Inman v Abbott and Haliburton Co.*⁹ (White Burgess), the Supreme Court of Canada further addressed expert evidence and the relationship between independence, admissibility and weight. The Supreme Court found that expert witnesses have a special duty to the court to provide fair, objective and non-partisan assistance. The court found that there was a threshold admissibility requirement for expert evidence in relation to this duty. The court reviewed the law in Canada and other jurisdictions and determined that "...an expert's lack of independence and impartiality goes to the admissibility of the evidence in addition to being considered in relation to the weight to be given to the evidence if admitted."¹⁰

34. In White Burgess, the court described the threshold inquiry as "whether the expert is able and willing to carry out his or her primary duty to the court."¹¹ The court explained that "... it is the nature and extent of the interest or connection with the litigation or a party thereto which matters, not the mere fact of the interest or connection; the existence of some interest or a relationship does not automatically render the evidence of the proposed expert inadmissible." However, the court set out the following caution about the exclusion of expert evidence:

I emphasize that exclusion at the threshold stage of the analysis should occur only in very clear cases in which the proposed expert is unable or unwilling to provide the court with fair, objective and non-partisan evidence. Anything less than clear unwillingness or inability to do so should not lead to exclusion, but be taken into account in the overall weighing of costs and benefits of receiving the evidence.¹²

35. The court made it clear that the concept of apparent bias is not relevant to the question of whether an expert will be unable or unwilling to fulfill its duty to the court. It stated that decision makers should not ask if the reasonable observer would think that the expert is not independent. Rather, the court explained that the question is "whether the relationship or interest results in the expert being unable or unwilling to carry out his or her primary duty to the court to provide fair, non-partisan and objective assistance."¹³

36. The court applied this analysis to the expert evidence in question and concluded that the expert recognized that she was aware of the standards and requirements that experts be independent, the precise guidelines in the accounting industry concerning accountants acting as expert witnesses and that she owed an ultimate duty to the court in testifying as an expert witness.

37. The Commission considers that the above-noted cases establish the principles applicable to expert evidence and the relationship between independence, admissibility and weight in proceeding before the Commission. In assessing the expert evidence filed in this proceeding, the Commission will follow the principles outlined in White Burgess.

⁹ *White Burgess Langille Inman v Abbott and Haliburton Co.*, 2015 SCC 23.

¹⁰ White Burgess, paragraph 45.

¹¹ White Burgess, paragraph 49.

¹² White Burgess, paragraph 49.

¹³ White Burgess, paragraph 50.

38. Further, the Commission commented on the weighing of expert evidence in Decision 2011-436,¹⁴ and those comments are in keeping with the principles outlined in White Burgess.

39. In the event that the Commission finds that an expert's evidence extends beyond the limits of his or her expertise, the Commission will take the approach outlined in Decision 2012-303:¹⁵

...evidence provided by [an expert] in areas where he was clearly not qualified to opine, will be given the weight of a lay witness rather than the weight of a properly qualified expert in these areas. Where that evidence diverges from the evidence of a properly qualified expert witness, the evidence of the qualified expert witness will be preferred.¹⁶

40. The Commission has adopted the approach described above when weighing the expert evidence proffered in this proceeding.

41. In this proceeding, the Commission heard expert opinion evidence on a variety of subjects related to the project. This evidence was presented on behalf of both the applicant and the GBCPG. While neither party submitted that the other's expert evidence was inadmissible, both urged the Commission to apply the above-noted principles in determining the weight to be given to the evidence and testimony of a given expert witness. In the Commission's view, the best place for this analysis is within the sections of this decision in which the expert's evidence is discussed.

6 Consultation

42. The AUC prescribes consultation requirements for applicants in Rule 007. The purpose of a public consultation program is to inform parties whose rights may be directly and adversely affected by a proposed project.

43. Appendix A, *Participant Involvement Program Requirements*, in Rule 007 requires that an applicant include a description of its participant involvement program (PIP) in its application to the AUC. Rule 007 specifies that a PIP must be conducted before an application is filed, and should include the distribution of a project-specific information package, responses to questions and concerns raised by potentially affected persons, and a discussion of options, alternatives and mitigation measures. The applicant is expected to ensure that information is conveyed in an understandable manner to the public and that the project is discussed with the widest possible audience as early as practical.

44. The PIP should also obtain feedback and suggestions with respect to the project, with a view to modifying the project to reduce impacts on parties whose rights may be directly and adversely affected to the extent practical. The applicant is required to make all reasonable

¹⁴ Decision 2011-436: AltaLink Management Ltd. and EPCOR Distribution & Transmission Inc. – Heartland Transmission Project, Proceeding 457, Application 1606609, November 1, 2011.

¹⁵ Decision 2012-303: ATCO Electric Ltd. – Eastern Alberta Transmission Line Project, Proceeding 1069, Applications 1607153 and 1607736, November 15, 2012.

¹⁶ *Ibid*, paragraph 128.

attempts to contact potentially directly and adversely affected persons to discuss the project and address any questions or concerns.

45. The PIP includes both a public notification and a personal consultation component. Rule 007 states that for power plant developments including wind power plants, the applicant must provide public notification to all occupants, residents and landowners within 2,000 metres measured from the edge of the proposed power plant site boundary. The applicant must provide personal consultation to all occupants, residents and landowners within 800 metres from the edge of the proposed power plant site boundary. Furthermore, Rule 007 directs that for major power plant applications, if there are populated areas just outside the 2,000-metre limit, applicants should consider including those areas in the public notification.

46. The Commission and its predecessor, the Alberta Energy and Utilities Board, have previously expressed what is expected of applicants in conducting an effective notification and consultation program. In Decision 2008-006,¹⁷ the Board stated that "...the program should include responding to questions and concerns, discussing options, providing alternatives and potential mitigation measures, and seeking confirmation that potentially affected parties do not object." The Board went on to state that it "...expects applicants to be sensitive to timing constraints the public may have especially when dealing with landowners engaged in agricultural endeavours."

47. Also, in Decision 2011-329, the Commission discussed the role of interveners and applicants when it stated as follows:

The Commission considers that consultation is a two-way street. The applicant has a duty to consult with landowners and residents in the vicinity of the project in accordance with AUC Rule 007, and make reasonable efforts to ensure that all those, whose rights may be directly and adversely affected by a proposed development, are informed of the application, and have an opportunity to voice their concerns and to be heard.

Landowners and residents are entitled to consultation; however, as a practical matter, landowners and residents must make their concerns known to the applicant so that they may be discussed and addressed. ...¹⁸

6.1 Views of the applicant

48. E.ON stated the objective of its PIP was to build trust, credibility and a respectful relationship with stakeholders potentially affected by or interested in the project. The PIP identified potentially affected or interested parties, provided relevant information, identified concerns, and implemented mitigation measures where practicable.

49. E.ON's first step was to identify stakeholders, using its internal databases, and publicly available ownership maps from the counties of Vermilion River and Minburn. E.ON identified occupants, residents and landowners within 800 metres of the project boundary for personal consultation and within 2,000 metres for public notification. It also identified municipalities,

¹⁷ Decision 2008-006: Montana Alberta Tie Ltd. 230-kV International Merchant Power Line Lethbridge, Alberta to Great Falls Montana, Applications 1475724, 1458443 and 1492150, January 31, 2008, page 36.

¹⁸ Decision 2011-329, NaturEner Energy Canada Inc., 162-MW Wild Rose 2 Wind Power Plant and Associated Eagle Butte Substation, Proceeding 625, Application 1606143, August 2, 2011, paragraphs 169-170.

government ministries and agencies, industrial operators and interested community groups. In addition, E.ON contacted the Aboriginal Consultation Office, and was advised that no consultation with aboriginal groups was required for the project.

50. E.ON started formal consultation activities in April 2012 by phoning stakeholders within 2,000 metres of the project. The purpose of the phone calls was to inform stakeholders of the project, answer questions, offer information packages to be sent by mail, confirm contact information and extend invitations to its open house.

51. In April 2013, E.ON distributed a project information package consisting of an introductory letter, open house invitation and information on how to get involved. A project update information package was sent out in July 2013 with an invitation to the second open house. On November 2013, E.ON mailed out information responding to the information session that the GBCPG organized. The last information package was sent in September 2015.

52. E.ON held three open houses for the project: May 2, 2012 in Vermilion, April 25, 2013 in Mannville and July 16, 2013 in Vermilion. The open houses were advertised in the Vermilion Voice and Vermilion Standard newspapers. E.ON representatives were present at the open houses to answer questions, and visual representations of the project, maps and other information were available.

53. In addition to these open houses, E.ON attended a public information session hosted by the GBCPG on November 6, 2013 in Mannville. E.ON brought a representative from Intrinsic Environmental Sciences (Intrinsic) to do a presentation on the health effects associated with living near wind turbines¹⁹ and to answer questions. Intrinsic also prepared a fact sheet regarding the human health effects of living near wind turbines that was included in the November 2013 information package.

54. In addition, E.ON took Marilyn Demas to a wind farm in Saskatchewan. E.ON also invited Laura Tapley to visit a wind farm in Swift Current; however, she declined, as she wanted to visit one on her own to be unbiased.²⁰

55. Throughout the consultation process, E.ON heard concerns about the siting of turbines and access roads; concerns with electric and magnetic fields, shadow flicker and noise; project reclamation; weed control; effects on wildlife; visual impacts and local employment. E.ON stated it took these concerns into account and resolved concerns where possible. E.ON tracked concerns that could not be resolved and stated it would continue to work with stakeholders.

56. E.ON began consultation with the counties of Minburn and Vermilion River in October 2011. The County of Minburn provided a letter of support²¹ for the project on May 21, 2013. The County of Vermilion River provided a letter on August 26, 2013 stating²² it was not in favour of the project, siting public opposition and possible health concerns and visual

¹⁹ Transcript, Volume 3, page 505, lines 14 to 22.

²⁰ Transcript, Volume 4, page 1037, lines 16 to 19.

²¹ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 8.

²² Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 10.

impacts. E.ON held follow-up meetings with the County of Vermilion River and stated that the county was neutral on the project and neither supported nor opposed the project.²³

6.2 Views of the interveners

57. The members of the GBCPG had concerns with E.ON's consultation efforts. Some members stated that E.ON did not directly consult with them initially. Others submitted that the information provided, in the project information packages, and at the open houses, was incomplete and was misleading because the information provided focused on the positives of the project. Information on the hazards or adverse impacts of the project, particularly on human and animal health, was not given.

58. For example, Mr. and Mrs. Demas submitted that their research found studies that showed that wind turbines had adverse impacts on animals, contrary to E.ON's statement that wind turbines did not have an adverse impact on animals.²⁴

59. Some members also pointed to a lack of information on the reclamation process. At the hearing, Kim Clark stated the information provided at the open house was misleading, particularly the size of the structures.²⁵

60. Ms. Tapley stated that she was not consulted at any time. While she understood that it was an oversight, she would have expected the applicant to use more up-to-date maps to ensure no one was missed.²⁶ Ms. Tapley owns and resides on the southwest quarter of Section 20, Township 49, Range 8, west of the Fourth Meridian. Ms. Tapley also has renters who reside on the same quarter section. Ms. Tapley stated that she was not originally consulted by E.ON and had heard about the project from her neighbours. She called E.ON on September 9, 2014, shortly after receiving a letter from the County of Minburn regarding the development permit application for the project. Once Ms. Tapley made contact with the applicant, she was referred to the applicant's noise experts, but she felt they did not answer her questions and was left with the impression that her concerns were minimized since she did not have a wind turbine on her property.²⁷

61. The GBCPG submitted that E.ON, in its consultation, should have provided information that was fair, complete, and unbiased. The GBCPG contended that such a consultation would have led to greater community engagement, and a better understanding of the project. It also would have resulted in a more meaningful dialogue about the project between the applicant and affected parties.²⁸

6.2.1 The applicant's response to interveners' consultation concerns

62. E.ON acknowledged that it missed Ms. Tapley during its initial consultation. However, once it became aware of the omission, E.ON contacted Ms. Tapley, provided information, arranged a conference call with representatives from Golder Associates Ltd. (Golder) to discuss

²³ Exhibit 3329-X0036, Attachment 50(a) - January 2016 PIP Update, PDF pages 50 to 51.

²⁴ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF pages 1 to 2.

²⁵ Transcript, Volume 4, page 974, lines 9 to 20.

²⁶ Transcript, Volume 4, page 1001, lines 15 to 19.

²⁷ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 35.

²⁸ Transcript, Volume 10, page 2162, lines 14 to 18.

her concerns, and attempted to organize a wind farm tour for her. E.ON revised its noise impact assessment after consulting with Ms. Tapley and corrected the height of the house on the southwest quarter of Section 20, Township 49, Range 8, west of the Fourth Meridian and added Ms. Tapley's trailer. E.ON stated that both receptors are predicted to comply with Rule 012.²⁹ Based on these efforts, E.ON contended that Ms. Tapley was consulted.

63. E.ON also identified a cabin, designated as receptor R63, which it had previously missed. E.ON was advised that the cabin was rarely used overnight and since it lacked a foundation or other features of permanence, E.ON was of the opinion that the cabin was unlikely to be designated as a dwelling under Rule 012. Regardless, E.ON included the cabin in the noise model and confirmed that it would comply with the permissible sound levels stipulated in Rule 012.³⁰

64. E.ON disagreed with the assertions that it provided misleading information on health impacts to the interveners. E.ON stated it provided information and links to reliable, peer-reviewed studies, and government-based information. An examination of the studies discloses that the purposes of studies like the Health Canada Study and associated studies³¹ were to research the potential health effects of wind farms on nearby residents.³² It added that the information given did not make statements that just disqualify the notion of any issue related to health effects, but took a balanced approach to the issues.³³ Dr. Ollson, a health consultant with Ollson Environmental Health Management hired by the applicant, also testified that his contact information was included on the health data sheet prepared by Intrinsik, but he received no requests for information or clarification.³⁴

65. E.ON contended that the interveners seemed to expect that E.ON should have provided information affirming their pre-determined notions that adverse health effects were associated with wind farms.³⁵ E.ON was not prepared to do so because of the lack of evidence showing that adverse health effects were associated with wind farms.

66. E.ON submitted that it developed its PIP in accordance with the requirements of Rule 007, and held numerous open houses and meetings. It diligently responded to concerns raised by stakeholders. E.ON admitted that it was unable to resolve all concerns, but this was not

²⁹ Exhibit 3329-X0024, Attachment 16(c)(i) - Golder Technical Memorandum - R8_R8A, PDF page 3.

³⁰ Exhibit 3329-X0040, E.ON_Response_to_GBCPG_IR_Round_1, PDF page 27.

³¹ Exhibit 3329-X0115, PDF page 11, in 2014 Health Canada released *Wind Turbine Noise and Health Study: Summary of Results*. Ottawa, Health Canada, November, 2014. <http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php> See Appendix J of Exhibit 3329- X0116 for the full text. This was followed by a paper by D. Michaud ,*Wind Turbine Noise and Health Study: Summary of Result*, 6th International Meeting on Wind Turbine Noise, Glasgow, 2015 (Michaud 2015). See Appendix L of Exhibit 3329- X0116 for full text. These publications are collectively referred to as the Health Canada Study in this decision. D. Michaud et al., 2016, *Effects of Wind Turbine Noise on Self-Reported and Objective Measures of Sleep*, Sleep, Vol. 39., No. 1, (Michaud et al. 2016). See Appendix M of Exhibit 3329-X0116 for full text, This paper also referenced Feder et al., *Impacts on quality of life associated with exposure to wind turbines noise*, Environ Res. 2015 Oct;142:227-38 (Feder et al. 2015) which was also discussed at Transcript, Volume 4, PDF pages 160 and 221.

³² Transcript, Volume 10, page 2231, lines 6 to 12.

³³ Transcript, Volume 10, page 2231 to 2232, lines 22 to 25, 1 to 3.

³⁴ Transcript, Volume 3, pages 507 to 508, lines 24 to 25, 1 to 4.

³⁵ Transcript, Volume 10, page 2231, lines 1 to 6.

an indication of inadequate consultation. E.ON further submitted that the consultation allowed stakeholders to be notified of the project, participate in the hearing, and voice their concerns on outstanding issues, for the Commission's determination.³⁶

6.3 Commission findings

67. Rule 007 states that a PIP must be conducted before a facility application is filed with the Commission. It is therefore a fundamental component of any facility application. It is the responsibility of the applicant to meet its notification and consultation requirements, under Rule 007.

68. In Decision 2011-436, the Commission made the following comments with respect to effective consultation under Rule 007:

... In the Commission's view, effective consultation achieves three purposes. First, it allows parties to understand the nature of a proposed project. Second, it allows the applicant and the intervenor to identify areas of concern. Third, it provides a reasonable opportunity for the parties to engage in meaningful dialogue and discussion with the goal of eliminating or mitigating to an acceptable degree the affected parties concerns about the project. If done well, a consultation program will improve the application and help to resolve disputes between the applicant and affected parties outside of the context of the hearing room.³⁷

69. The Commission is mindful of these purposes in assessing the PIP conducted by E.ON. The Commission also considers the applicant's efforts to notify and consult with landowners and other stakeholders prior to the filing of the application, as well as the applicant's efforts to engage in ongoing consultation, including consultation with persons initially missed.

70. Based on the evidence in this proceeding, E.ON's PIP consisted of the following components. It prepared mailing lists of landowners and made initial telephone contact of those persons. This was followed by a mail out of project information packages to all stakeholders. At different intervals, three additional information documents were sent out to stakeholders. E.ON consulted with stakeholders located within the project area and held three open houses. It also attended an intervenor-hosted information session. E.ON included in its written information its clear contact information, so that potentially affected stakeholders could make further inquiries. The Commission finds that E.ON has demonstrated that it made reasonable ongoing efforts to address concerns as they arose, and to include stakeholders missed in the initial stages of the consultation.

71. The Commission acknowledges that an effective consultation program may not resolve all landowner concerns. There may be situations where individual stakeholders may feel that the consultation effort, as it pertained to their interests specifically, was insufficient or superficial. The above-noted views of the parties demonstrate that the perceptions of the applicant and those of some intervenors about the quality and effectiveness of the public consultation are quite different. This is not the fault of the applicant or the intervenors; it merely reflects the fact that the parties do not agree.

³⁶ Transcript, Volume 10, pages 2032 to 2033, lines 24 to 25, 1-12.

³⁷ Decision 2011-436, page 57, paragraph 283.

72. Regarding the information provided about potential adverse health effects associated with wind turbines, the Commission observes the efforts made by the applicant to provide health information to interested stakeholders in response to requests. The Commission recognizes that the applicant retained Dr. Ollson to prepare a health information sheet and provided links to information from peer-reviewed and government-based information for this purpose. The Commission finds that this approach was reasonable in the circumstances. The Commission recognizes that the health literature on this topic is complex and can be challenging to explain and convey to stakeholders. The Commission finds that E.ON demonstrated a willingness to meet with stakeholders to discuss their concerns. In addition, E.ON appears to have been receptive and responsive when dealing with new concerns raised by stakeholders after its application was submitted to the Commission, such as organizing visits to operating wind farms and making its experts available to answer questions.

73. The Commission finds that the applicant's PIP met the three objectives described above. Notwithstanding the concerns expressed by interveners, the Commission finds that the applicant made reasonable efforts to engage in a two-way dialogue with landowners. Accordingly, the Commission concludes that the applicant's consultation and PIP met the regulatory requirements of Rule 007.

7 Noise

7.1 Introduction

74. In this section, the Commission makes findings about the noise impact that the proposed turbines and associated infrastructure will likely generate at nearby residences. This section is organized into a number of subsections. First, the Commission provides a brief review of some basic concepts that are necessary to understand the science of sound measurement. Second, a description of the Commission's noise impact assessment and noise measurement requirements in Rule 012 is given. Third, the Commission briefly describes the activities undertaken by the applicant in preparation of its noise impact assessment which it filed with the application. Fourth, the Commission summarizes the parties' views on whether the applicant's noise impact assessment complies with Rule 012, including the noise emissions from third-party energy-related facilities. Fifth, the Commission summarizes the views of the parties about the low frequency noise and infrasound that may be produced by the project. In the last subsection, the Commission provides its findings with respect to the project's compliance with Rule 012 and the project's expected low frequency noise and infrasound.

7.2 Sound and noise

75. Sound is produced by vibrations that travel through the air or another medium. Noise can be defined as the unwanted portion of sound.

76. Sound propagates as a wave. A sound wave has the same physical properties associated with other waves, including amplitude and a frequency. What a person hears is dependent on the sound pressure level and the frequency of a sound wave.

77. The sound pressure level of a sound wave is a function of the wave's amplitude. The sound pressure level is the intensity of the vibrations of the wave and is measured in MicroPascals (μPa). A logarithmic conversion is used to convert μPa to decibels because sound pressure levels extend over a wide range of magnitudes.

78. Frequency is the number of vibrations that occur in one second and is measured in cycles of vibrations per second. The unit of frequency is hertz (Hz). The pitch of a sound is dependent on the frequency.

79. Lower frequency sounds can be characterized as a hum (low pitch), while higher frequency sounds can be characterized as a whine (high pitch). Typically, most people hear sounds at frequencies between 20 Hz to 20,000 Hz; however, there is variation between people in their ability to hear sound. Frequencies below 250 Hz are commonly referred to as low frequency sound. Frequencies below 20 Hz are commonly referred to as infrasound. There is some overlap between these frequency ranges and the cut-offs are not firm. As an example of typical frequencies, normal speech is between the range of 100 Hz and 4,000 Hz.

80. The subjective or perceived loudness of a sound is determined by several factors, including that the human ear is not equally sensitive to all frequencies. The human ear is less sensitive to low and high frequency sounds and more sensitive to mid-frequency sounds. Because of this range of sensitivity of the ear to various frequencies, weighting scales are applied to the measured sound level to more appropriately account for human hearing. Some commonly used scales are linear-weighted, A-weighted and C-weighted. G-weighting is a frequency weighting that is specifically designed for assessment of infrasound in the frequency band from 1 Hz to 20 Hz.

81. The linear weighted scale (dB (Lin) or dB), is the sound level, in decibels, without any adjustment.

82. The scale commonly used for noise impact assessments is the A-weighted decibel scale (dB(A) or dBA). The A-weighted decibel scale is designed to reflect human hearing by approximating the ear's frequency response. The A-weighted decibel scale gradually reduces the contributions of sound in the lower frequencies below about 800 Hz.

83. On the linear weighted scale, a low frequency sound must have a higher decibel level than a high frequency sound to be perceived as being equally loud to the ear. If a low frequency sound and a high frequency sound are perceived to be equally loud by the ear, each would have the same dBA (A-weighted) value, but the low frequency sound would have a higher dB (linear weighted) value than the high frequency sound.

84. Another common scale is the C-weighted decibel scale (dB(C) or dBC). The C-weighted decibel scale does not follow the same gradual cut-off for low frequency sounds as the A-weighted decibel scale. The C-weighted decibel scale filters the levels at frequencies below about 30 Hz and above 4,000 Hz. The C-weighted decibel scale is therefore useful for capturing noise with low frequency components.

85. The G-weighted decibel scale (dB(G) or dBG) was specifically designed for assessment of infrasound, and is applied to a sound pressure level measurement to determine the infrasonic components of that sound.³⁸ A G-weighted sound pressure level of 95 to 100 dB is close to perception level.³⁹

³⁸ Transcript, Volume 4, page 830, lines 4 to 8.

³⁹ Transcript, Volume 4, page 829, lines 1 to 6.

86. The table below shows typical noise levels of everyday sources in dBA.

Table 1. Typical noise levels⁴⁰

Noise source	dBA
pneumatic chipper at one metre	115
hand-held circular saw at one metre	115
textile room	103
newspaper press	95
power lawn mower at one metre	92
diesel truck 50 kilometres per hour at 20 metres	85
passenger car 60 kilometres per hour at 20 metres	65
conversation at one metre	55
quiet room	40

87. An important parameter for understanding sound is the sound power level. The sound power level is a physical property of a sound source that represents the rate of energy (or power) emitted in the form of sound. This is often measured in watts and converted to a decibel equivalent value. The sound power level of a source is a parameter used for rating and comparing sound sources. Sound power levels for specific equipment, including wind turbines, may be obtained by performing measurements and calculations.

88. A good way to understand the difference between sound pressure levels and sound power levels is to use the example of an electric heater radiating heat into a room. The heater provides heat, which is measured in watts, and is analogous to sound power. The resultant temperature in the room is measured in degrees and is analogous to sound pressure level measured in dBA. As the distance from the heater increases, the temperature decreases in the same way as when the distance from the sound source increases, the sound pressure level decreases. However, like the wattage of the heater, the sound power level of the source does not change.

89. When a sound is measured, the sound pressure level and the frequency distribution are recorded. The measurement can typically be expressed as a broadband sound pressure level, in octave band frequency ranges, or in one-third octave band frequency ranges. A broadband sound pressure level is the amplitude of all sound at all frequencies and is expressed as a single numerical value. The frequency distribution of a broadband sound level can be broken down into specific frequency ranges, defined as octave bands. The one-third octave band provides a finer breakdown of the octave band frequency distribution.

90. A sound measurement can be completed by taking an instantaneous measurement or by taking a series of measurements and averaging them over a set period of time. Some frequently used sound level metrics include:

- L_{eq} which is generally considered an average of a fluctuating sound (or sound pressure) level over a period of time such as a daytime or nighttime period.
- L_{max} which is the maximum sound level over the duration of the measurement period.

⁴⁰ Canadian Centre for Occupational Health and Safety, Noise - Basic Information, Table 2 Typical Noise Levels, http://www.ccohs.ca/oshanswers/phys_agents/noise_basic.html.

- $L_{\text{night, outside}}$ which is used by the European Commission and the World Health Organization and is the sound level over an eight-hour nighttime period outside at the façade of a building.

7.3 Rule 012: Noise Control

91. Rule 012 applies to noise from the construction and operation of electric and natural gas utility facilities, including wind turbines. Rule 007 requires an applicant to provide a noise impact assessment as part of a power plant application.

92. Rule 012 is designed to ensure that the noise from a proposed facility, measured cumulatively with noise from other nearby energy-related facilities, will not exceed the AUC's permissible sound levels. The permissible sound level is the maximum daytime or nighttime sound level, measured at a point 15 metres from a dwelling(s), in the direction of the facility. For this project, the permissible sound level values determined in accordance with Rule 012 are 50 dBA L_{eq} daytime and 40 dBA L_{eq} nighttime.⁴¹ The daytime period is defined as the hours from 7 a.m. to 10 p.m. and the nighttime period is defined as the hours from 10 p.m. to 7 a.m.

93. The cumulative sound level, which is compared to the permissible sound level for compliance determination, includes the assumed or measured ambient sound level, any existing and approved, but not yet constructed energy-related facilities, and the predicted sound level from the applicant's proposed facility.

94. Rule 012 sets out the requirements for preparing a noise impact assessment. Section 3.2(5) specifies that the following factors must be considered and included in the noise impact assessment:

- meteorological parameters
- noise source identification
- sound power level and/or sound pressure level spectral data
- type of noise propagation model used
- standards followed
- ground conditions and ground attenuation factor
- terrain parameters
- reflection parameters
- any adjustments made

95. There are a number of sound and noise-related standards that were discussed by the applicant and the interveners in the proceeding, including parts of the IEC 61400 series and ISO 9613-2.⁴²

⁴¹ Receptors R56, R57 and R58 have permissible sound levels of 53 dBA L_{eq} daytime and 43 dBA L_{eq} nighttime due to adjustments for dwelling density. However, all other receptors must meet the permissible sound levels of 50 dBA L_{eq} daytime and 40 dBA L_{eq} nighttime; therefore, in this decision, the permissible sound level referred to is 50 dBA L_{eq} daytime and 40 dBA L_{eq} nighttime.

⁴² ISO 9613-2, Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

96. The IEC 61400 series is produced by the International Electrotechnical Commission and is titled IEC 61400 – Wind Turbines. The IEC 61400 standard addresses most aspects of a wind turbine's life, from site conditions before construction to turbine components being tested, assembled and operated. In this proceeding, IEC 61400-11⁴³ and IEC 61400-14⁴⁴ were discussed. IEC 61400-11 specifies how the sound power levels are to be calculated for an individual wind turbine. IEC 61400-14 outlines the methodology used to determine the sound power level of a wind turbine when more than one turbine is evaluated.

97. ISO 9613-2 is a standard produced by the International Organization for Standardization, which outlines a methodology used to determine the attenuation of sound propagation outdoors using factors such as ground effects, temperature, humidity and foliage.

98. Rule 012 requires the use of computer models that meet accepted protocols and international standards for predicting a project's cumulative sound level. Rule 012 identifies the CONCAWE protocol⁴⁵ and ISO 9613 standard as accepted protocols and international standards.

99. Rule 012 defines the low frequency noise range to be from 20 Hz to 250 Hz. If a project's dBC sound pressure value is available, the Commission requires the applicant to calculate the dBC sound pressure value minus the dBA sound pressure value to identify the potential for a low frequency noise condition. In accordance with Rule 012, a low frequency noise condition may exist when the dBC minus dBA value is equal to or greater than 20 dB and a clear tonal component exists between the frequencies 20 Hz to 250 Hz. Low frequency noise conditions are confirmed through measurements.

7.4 Wind turbine sound and noise

100. An operating wind turbine produces noise mechanically and aerodynamically. Mechanical sound from a wind turbine can be generated by different components in the nacelle.⁴⁶ The major mechanical components include the gearbox, generator, yaw motors and drives, cooling fans and hydraulics; each produces its own characteristic sounds. Other mechanical systems such as fans and hydraulic motors can also contribute to the overall acoustic emissions. Mechanical noise from these sources can be emitted to the environment though airborne or structure-borne mechanisms, which would include transmission through the nacelle casing and ventilation openings in the nacelle casing.

101. The interaction of air and the rotating turbine blades produces aerodynamic noise through a variety of processes as air passes over and past the blades. Also, the direction in which the blade is pointing changes as it rotates, leading to differences in the directivity of the noise from the trailing edge. Most modern turbines use pitch control to reduce noise emitted at higher wind speeds. The aerodynamic sound from modern wind turbines is the trailing edge noise. Amplitude modulation of this noise source due to the presence of atmospheric effects and directional propagation effects result in the whooshing or beating sound often reported. Generally, wind

⁴³ IEC 61400-11, Wind Turbines – Part 11: Acoustic noise measurement techniques.

⁴⁴ IEC 61400-14, Wind Turbines – Part 14: Declaration of apparent sound power level and tonality values.

⁴⁵ CONCAWE stands for CONService of Clean Air and Water in Europe.

⁴⁶ The nacelle is the central component of the wind turbine that the blades connect to and houses all of the generating components in a wind turbine, including the generator, gearbox, drive train, and brake assembly.

turbines radiate more noise as the wind speed increases. Provided the mechanical noise is adequately treated, aerodynamic noise from the blades is generally the dominant noise source.⁴⁷

7.5 Views of the applicant

102. The applicant filed a noise impact assessment in support of the application. In its noise impact assessment, the applicant predicted that the project would comply with the permissible sound levels (50 dBA L_{eq} daytime and 40 dBA L_{eq} nighttime) in Rule 012.

103. E.ON retained two experts to provide evidence on the project's noise impact assessment and wind turbine noise. Mr. Andrew Faszler, a professional engineer with expertise in acoustics and vibrations with Golder was responsible for the noise impact assessment. He testified at the hearing regarding the noise impact assessment and related documents. Mr. Payam Ashtiani, from Aercoustics Engineering Ltd., who is a professional engineer with expertise in acoustics and vibrations, prepared an expert report responding to the expert evidence filed by the GBCPG. He also testified on behalf of the applicant.

7.5.1 Noise impact assessment results and noise control measures

104. E.ON submitted a noise impact assessment conducted by Golder, which concluded the project would be in compliance with Rule 012. E.ON stated the project noise impact assessment incorporated a number of conservative assumptions. These assumptions were that noise emissions from each of the 263 well sites in the area was equivalent to the noise emissions of the loudest measured site, notwithstanding that many of these well sites have no or minimal noise emissions, and that each wind turbine would result in downwind propagation of noise to each receptor. The use of a ground factor characteristic of a less absorptive ground condition than actually exists in the project area was another conservative measure.⁴⁸

105. The noise impact assessment project area was defined as the area in which E.ON has land agreements in place and where project components could be sited. Golder stated that for the purposes of this noise impact assessment the noise study area is a five-kilometre buffer surrounding project components.⁴⁹ The project components consist of 50 wind turbines and associated infrastructure, including an electrical substation and underground electrical collection lines.

106. The proposed wind turbines are Nordex model N117-2400, each with hub heights of 91 metres and a rotor diameter of 116.8 metres. The sound data for the proposed wind turbines were provided by Nordex and Nordex has provided a warranty regarding the maximum noise output. Mr. Ashtiani testified that "the typical warranties that manufacturers provide don't limit the wind conditions or the atmospheric conditions under which those warranties apply."⁵⁰ He added that Nordex offered a "make-good" warranty and it stands by its product and the

⁴⁷ Exhibit 3329-X0154, Massachusetts Department of Environmental Protection and Massachusetts Department of Public Health, Wind Turbine Health Impact Study: Report of Independent Expert Panel, January 2012, PDF pages 26 to 28.

⁴⁸ Transcript, Volume 1, page 49, line 5 to 18.

⁴⁹ Exhibit 0004.00.ECRC-3329, A copy of the noise impact assessment that includes the potential noise impacts of the proposed facility under normal operating conditions.

⁵⁰ Transcript, Volume 2, page 416, lines 22 to 25.

warranted noise output. In the event the turbines do not meet the warranted level, it must either make modifications to the turbines or to the operations, such that they meet that level.⁵¹

107. The Nordex wind turbines are capable of operating in a number of operating modes. In this application, Mode 0 corresponds to maximum electrical output for a given wind speed with a sound power level of 105 dBA. The wind turbines are also capable of operating in five Sound Optimized Modes (SOM), being restricted operating modes with maximum sound power levels of SOM 1 – 104.5 dBA, SOM 2 – 104 dBA, SOM 3 – 103.5 dBA, SOM 4 – 103 dBA and SOM 5 – 101 dBA.⁵²

108. Golder modelled all Nordex wind turbines as operating in Mode 0 (105 dBA) with the exception of wind turbine 22 and wind turbine 23, which will operate in the SOM 5 – 101 dBA mode during the nighttime period to achieve compliance with the nighttime permissible sound level.⁵³ In all cases (i.e., Mode 0 or SOM) wind turbines were modelled at maximum noise output for their operating mode. In both Mode 0 and SOM, the maximum noise output for the wind turbines occurs for a wind speed of 10 metres per second (m/s) measured at a height of 10 metres above ground. The manufacturer, Nordex USA Inc., has confirmed that there are no tonal components associated with the Nordex N117-2400 wind turbine.⁵⁴

109. The noise impact assessment included the project substation, which Golder assumed would consist of one transformer unit, rated at 140 megavolt-ampere.⁵⁵ The sound data for the proposed transformer unit was then calculated using standard engineering formulae to estimate total sound power level. Golder stated that it used conservative assumptions in estimating the total sound power level of the transformer in that the transformer would operate in an Oil Natural Forced Air configuration 100 per cent of the time and it added a 5 dB penalty to the transformer noise emissions in accordance with a widely accepted standard (ISO 2003) in its calculations.

110. During the preparation of the information responses, E.ON stated that it became aware of the need to relocate a proposed turbine (turbine 4), to accommodate a County of Vermilion River land parcel boundary setback requirement. From a noise impact assessment perspective, the move resulted in a decrease in the cumulative nighttime noise level of 0.1 dBA, from 36.8 dBA to 36.7 dBA at receptor 50, with a change in the nighttime permissible sound level margin of compliance from 3.2 dB to 3.3 dB.⁵⁶

111. E.ON stated that, during its ongoing consultation, it was informed that an additional receptor, R8A (mobile home) was located near receptor R8. E.ON also made revisions to the height of the previously modelled receptor R8 from 1.5 metres (single-storey building) to 4.5 metres (two-storey building) to properly model the receptor. E.ON also located and included a camp/cabin (receptor R63) in its analysis.

112. E.ON updated its noise impact assessment to include the two new receptors, to change the characteristics of a third receptor, and to include the Bauer 918S Substation as a third-party

⁵¹ Transcript, Volume 4, page 853, lines 14 to 22.

⁵² Transcript, Volume 4, page 870, lines 14 to 21.

⁵³ Exhibit 0029.01.ECRC-3329, IR Round 1 responses, PDF page 15.

⁵⁴ Exhibit 0029.01.ECRC-3329, IR Round 1 responses, PDF page 15.

⁵⁵ Exhibit 0059.01.ECRC-3329, E On information request responses Round 2, PDF page 4.

⁵⁶ Exhibit 0029.01.ECRC-3329, IR Round 1 responses, PDF page 1.

noise source.⁵⁷ E.ON concluded that receptor R8 (4.5 metres) is predicted to have a higher noise level than previously modelled but is still predicted to comply with the permissible sound levels set out in Rule 012. Receptor R8A was also predicted to comply with Rule 012.⁵⁸ It added that, while the cabin, receptor R63, is rarely occupied overnight and is unlikely a dwelling as defined in Rule 012, the cabin was modelled and predicted to be compliant with the permissible sound levels in Rule 012.

113. Ultimately, E.ON submitted the project would meet the permissible sound levels, which would be verified by post-construction sound level monitoring. It expected measured sound levels to be one to two decibels below the results predicted in the model because of the conservative assumptions in the noise impact assessment.⁵⁹ Further, in its opening statement, E.ON committed to conducting an appropriately designed and suitably representative post-construction sound level survey at select receptor locations in accordance with the methodology set out in Rule 012 to demonstrate operational compliance.⁶⁰ E.ON recommended the post-construction noise monitoring be conducted at receptor locations R1, R12, R35 and R55 which were predicted to have nighttime sound levels of 39.9, 39.8, 39.9 and 39.8 respectively.⁶¹ Mr. Faszter indicated that one of the reasons for choosing these four receptor locations is that these were within a margin of compliance of 0.5 dBA. In addition, he stated that receptor R1 is near the two wind turbines that would be operating in the SOM mode, receptor R12 is surrounded by wind turbines and near the proposed substation, receptor R35 is near two major contributing third-party noise sources (Enbridge Vermillion Pump Station and the Spur Resources Compressor Station) and receptor R55 is the closest member of the GBCPG to a wind turbine.⁶²

114. Mr. Ashtiani stated that if consideration of a margin of compliance was to increase from 0.5 to 1 dBA, receptor locations R37 and R38, predicted to have nighttime permissible sound levels of 39.3 and 39.4, may be considered for post-construction monitoring since it would be reasonable to expect these receptor locations to be in a downwind condition for the prevailing wind direction.⁶³

115. Regarding potential mitigation measures, E.ON indicated that the operating parameters of each wind turbine can be set individually to fulfill imposed curtailment plans. These parameters are set using the Nordex Control 2 software. The changes to the parameters can be made by physically visiting each turbine and changing operating parameters or they can be easily changed remotely by way of the supervisory control and data acquisition system. Once the turbine parameters are set up, the sound mode will automatically go into effect at the desired time. Each wind turbine can be set individually or collectively to use different sound modes at different times of the day, specific wind sectors, and different wind speeds.⁶⁴

⁵⁷ Exhibit 3329-X0041, Attachment 14(f)(i) - Bauer NIA Summary Form.

⁵⁸ Exhibit 3329-X0024, Attachment 16(c)(i) - Golder Technical Memorandum - R8_R8A, PDF page 3.

⁵⁹ Transcript, Volume 4, pages 866 to 867, lines 13 to 25, 1 to 5.

⁶⁰ Transcript, Volume 1, page 50, lines 3 to 7.

⁶¹ Transcript, Volume 4, page 759, lines 11 to 12.

⁶² Transcript, Volume 4, page 810, lines 8 to 20.

⁶³ Transcript, Volume 4, page 811, lines 1 to 18.

⁶⁴ Exhibit 0059.01.ECRC-3329, E ON information request responses Round 2, PDF page 2.

116. In the event that further mitigation is required to achieve compliance, Mr. Faszter testified that further investigation would first be required to determine the causes and mitigations. Potential solutions could be to fix the equipment so it is running correctly, implementing turbines in SOM, mitigation of third-party noise sources, or the shutdown of turbines.

7.5.2 Third-party energy-related facilities noise sources

117. E.ON identified 271 third-party facilities in the study area which included six larger facilities, two satellite well sites, and 263 individual wells located throughout the noise study area and just outside the study area. E.ON explained it had queried the IHS database for facilities within 3.7 kilometres of receptors in the noise impact assessment to identify oil and gas facilities (excluding wells), and reviewed satellite photographs obtained from Google Earth prior to the August 2012 field visit.⁶⁵ The noise emissions were obtained through a combination of direct field measurements and data extracted from regulatory applications filed with the Alberta Energy Regulator. These were outlined in the noise impact assessment.⁶⁶⁻⁶⁷

118. The database query identified 28 potentially relevant facilities, including a gas gathering system, compressor station, pipeline, and pump station, along with multiple batteries, meter stations, injection plants, satellites, and regulator stations. Golder conducted a field visit in August 2012 in an attempt to locate the 28 potentially relevant facilities. During the field visit, Golder measured noise emissions from seven facilities and took note of the facilities that were silent, those that were co-located with one of the seven facilities that were measured, or for which a surface expression could not be found.⁶⁸ Golder confirmed that 14 sites produced no noise because there was no noise emitting equipment at the location.⁶⁹

119. In the noise impact assessment, Golder commented that the noise emissions from six major third-party facilities, three Harvest Operations Corp. injection plants, two Harvest Operations Corp. satellite wells, and one Advantage Oil and Gas Ltd. compressor station, were based on field measurements.⁷⁰ The Enbridge Vermillion Pump Station was modelled in the project noise impact assessment using a 2010 noise impact assessment prepared by Acoustical Consultants Inc. (ACI) because the pump station was not in operation at the time of the site visit.⁷¹ As a result, Golder stated that the noise impact assessment was the most recent, as any changes to the noise sources would have resulted in a requirement for a revised noise impact assessment. Golder contended that it was reasonable to conclude that the September 2010 noise impact assessment accurately reflected noise emissions from the current Vermillion Pump Station and these were conservative predictions of noise emissions from the pump station.⁷²

⁶⁵ Exhibit 3329-X0040, E.ON IR response to GBCPG, PDF page 21.

⁶⁶ Exhibit 0029.01.ECRC-3329, IR Round 1 Responses, PDF page 9.

⁶⁷ Exhibit 0004.00.ECRC-3329, A copy of the noise impact assessment that includes the potential noise impacts of the proposed facility under normal operating conditions.

⁶⁸ Exhibit 3329-X0040, E.ON IR response to GBCPG, PDF page 21.

⁶⁹ Exhibit 3329-X0040, E.ON IR response to GBCPG, PDF page 9.

⁷⁰ Exhibit 0004.00.ECRC-3329, A copy of the noise impact assessment that includes the potential noise impacts of the proposed facility under normal operating conditions, PDF page 9.

⁷¹ Transcript, Volume 2, Page 385, Lines 7 to 10.

⁷² Exhibit 3329-X0113, ECRC Reply Evidence_Appendix D _Expert Report and Curriculum Vitae of Andrew Faszter, PDF Page 7.

120. Golder stated that measurements were taken at the Spur Resources battery/compressor station during the August 2012 visit. However, the measurements were substantially lower than the noise emissions for the Spur facility presented in the ACI 2010 noise impact assessment for the Vermilion Pump Station⁷³ because, during the field visit, Golder was only able to get within 63 metres of the Spur facility and was only able to take a measurement on one side of the facility.⁷⁴ Golder stated it used the higher predicted noise emissions from the ACI noise impact assessment.

121. The applicant stated in the noise impact assessment that “it was not feasible to estimate separate noise emissions for each of the 263 third-party wells, and took a conservative approach to representing the 263 third-party wells. Each well was assumed to consist of an electrically driven pumpjack identical to the loudest electrically driven pumpjack measured during the August 3 and 4, 2012 field program.” E.ON submitted that this was a conservative assumption because many of the 263 well sites do not emit noise.⁷⁵

122. When questioned on the assumptions used for the third-party wells, Mr. Faszter reiterated that the noise impact assessment used the loudest measured noise emission of the wells for all 263 wells, which demonstrated that the noise model used conservative assumptions.⁷⁶ Mr. Faszter stated that wells are routinely omitted from noise impact assessments, so the inclusion of them in the project noise impact assessment showed it was inherently conservative.⁷⁷

123. After the original noise impact assessment was submitted, E.ON became aware of the Bauer 918S Substation which is associated with the Enbridge Vermilion Pump Station. E.ON submitted that, with the addition of the Bauer 918S Substation, “the Application Case cumulative noise levels are predicted to remain below the applicable Permissible Sound Level (“PSL”) values for all receptors and there are no predicted Low Frequency Noise (“LFN”) issues at any of the receptors.”⁷⁸ Mr. Faszter testified that he was not aware of a newer noise impact assessment summary form.⁷⁹ He subsequently reviewed the new noise impact assessment summary form and testified that the noise emissions from that substation were less than what was already included in the model.⁸⁰

7.5.3 Noise modelling and standards

124. The applicant presented the noise model input parameters which included the standards used, the source type/directivity, ground factor, temperature and humidity, wind conditions, and terrain. In regard to ground attenuation Mr. Faszter testified that wetlands were classified as being zero, being completely reflective and representative of water and the rest of the study area used a ground factor of 0.5 which is midway between a completely reflective ground surface and

⁷³ Exhibit 3329-X0113, ECRC Reply Evidence_Appendix D _Expert Report and Curriculum Vitae of Andrew Faszter, PDF Page 8.

⁷⁴ Transcript, Volume 2, page 390, lines 2 to 9.

⁷⁵ Exhibit 0029.01.ECRC-3329, IR Round 1 Responses, PDF pages 9 and 13.

⁷⁶ Transcript, Volume 2, pages 361 to 362, lines 22 to 25, 1 to 4.

⁷⁷ Exhibit 3329-X0113, ECRC Reply Evidence_Appendix D _Expert Report and Curriculum Vitae of Andrew Faszter, PDF page 8.

⁷⁸ Exhibit 3329-X0040, E.ON IR response to GBCPG, PDF page 23.

⁷⁹ Exhibit 3329-X0037, Attachment14(f)(ii) - Bauer Updated NIA Modelling Results.

⁸⁰ Transcript, Volume 4, page 816, lines 2 to 7.

absorptive ground surface.⁸¹ Mr. Ashtiani added that “that is in line with best practices that are used around the world, basically, with the ISO 9613-2 standard, where numerous studies and post-construction measurements have shown that using a ground factor of 0.5 for the ground, notwithstanding the -- using zero over water, has been shown to be sufficiently conservative to ensure that the sound level predictions are met and that post-construction measurements agree with measuring at or below the levels used in such models.”⁸²

125. The applicant stated the noise modelling for the noise impact assessment was performed using the CadnaA model, version 4.3.143 software (DataKustik 2013), which uses the methodology of ISO 9613-2.⁸³ The applicant added that the use of the ISO 9613-2 standard for wind turbines is acceptable. This standard is a widely used noise model in Alberta and almost every jurisdiction in the world. It had also been validated for predicting noise from wind turbines by researchers around the world, and its modelling parameters for wind turbine noise have been developed and are consistent with those that are required by Rule 012.⁸⁴

126. The applicant submitted that the noise impact assessment considered potential noise impacts associated with the 31.5 Hz octave band since the definition of “spectrum” provided in Rule 012 suggests that octave band spectral data from 31.5 Hz to 8 kHz should be included. E.ON stated that the use of octave bands between 31.5 Hz and 8 kHz is standard practice when assessing environmental noise and the CadnaA software allows for the inclusion of the 31.5 Hz octave band using an extrapolation of the ISO 9613-2 standard. In addition, the CadnaA software is used widely in Alberta, across Canada, and around the world in the modelling and assessment of environmental noise.⁸⁵

127. The applicant indicated that the proposed wind turbines are modelled as point sources. Mr. Ashtiani testified that for wind turbines, the sound levels are measured downwind at a distance of 130 to 150 metres. Because the sound is coming from the middle hub of the turbine, the averaging of the sound can be imagined as a sphere centered on the nacelle, radiating sound in equal intensity in all direction, much like a point source.⁸⁶

128. The applicant pointed out that the overall accuracy of the propagation algorithms used in the computer model based on the ISO 9613-2 standard is +/- 3 dB for distances between source and receptor up to one kilometre. The accuracy for propagation distances greater than one kilometre is not stated in the standard. The computer model predicted noise levels assuming downwind propagation from each source to each receptor 100 per cent of the time. Since downwind conditions are known to enhance noise propagation, this downwind assumption is expected to overestimate general noise levels. Furthermore, noise screening from trees and other vegetation was not considered in the computer model, even though it is expected to occur to some degree.⁸⁷

⁸¹ Transcript, Volume 2, page 415, lines 5 to 11.

⁸² Transcript, Volume 2, page 415, lines 13 to 22.

⁸³ Exhibit 0004.00.ECRC-3329, A copy of the noise impact assessment that includes the potential noise impacts of the proposed facility under normal operating conditions, PDF page 20.

⁸⁴ Transcript, Volume 2, page 428, lines 17 to 24.

⁸⁵ Exhibit 3329-X0040, EON_Response_to_GBCPG_IR_Round_1, PDF page 28.

⁸⁶ Transcript, Volume 3, page 698, lines 5 to 24.

⁸⁷ Exhibit 0004.00.ECRC-3329, A copy of the noise impact assessment that includes the potential noise impacts of the proposed facility under normal operating conditions, PDF page 20.

129. With respect to low frequency noise in the ISO model, Mr. Ashtiani testified that:

...it is standard practice to include sounds in the 31 hertz band -- octave band measurements in noise models according to 9613. Although not specifically called out by the standard, its use -- its standard use is because of its agreeance with post-construction measurements. And as long as the assumptions there are sufficiently conservative, the experience in Alberta, that I'm sure has had lots of low frequency noise sources, such as cogeneration plants and the like, shows that the use of that model is appropriate in post-construction measurements in some way validate the appropriate application of that model.⁸⁸

130. Golder submitted that the CadnaA model was configured to provide noise level predictions in both dBA and dBC. As directed in Rule 012, these values were used in accordance with the presence of tonal components to determine whether the potential for low frequency noise exists. Golder stated that the majority of the receptors did not show the potential for low frequency noise, and those that did also showed this potential in the baseline case.⁸⁹ E.ON highlighted that there are no tonal components associated with the Nordex N117-2400 wind turbine.⁹⁰

131. Mr. Faszter stated that Golder modelled down to the 31.5 Hz octave band, which does include the frequencies within that band lower than 31.5 Hz, but not into the infrasonic range. The modelling covers down to 20 Hz. He was of the opinion that including sound levels below 20 Hz would not change the result because those values, when frequency weighted, get discounted such that they would not change the results of the noise model in the dBA and dBC scale.⁹¹

132. The IEC 61400-11 is a standard used in determining the sound power for wind turbines. Mr. Ashtiani indicated that IEC 61400-11 is an industry accepted approach, and was the approach taken by Golder in the preparation of the noise impact assessment with respect to some third-party sources. "Under IEC 61400-11, noise measurements are separated into appropriate wind bins in 0.5 m/s increments, and detailed calculations are performed to determine the mean sound power level of the turbine in 1/3rd octave bands with respect to both hub-height wind speed and transposed-to-ground level wind speed. Multiple tests are typically carried out on a given turbine model, and the reported sound power levels are used by the manufacturer to develop sound emission specifications, often with sound power level warranties provided to their clients. The sound emission of the project turbines is warranted by the manufacturer."⁹²

133. Mr. Ashtiani testified that measurements taken using the IEC 61400-11 standard can be carried out in high or low wind shear conditions, during either day or night and there are no weather condition restrictions on the acoustic noise testing of wind turbines outside of those for which the instrumentation is valid. He stated that high turbulent times correspond with low wind

⁸⁸ Transcript, Volume 2, pages 423 to 424, lines 15 to 25, 1 to 3.

⁸⁹ Exhibit 0004.00.ECRC-3329, A copy of the noise impact assessment that includes the potential noise impacts of the proposed facility under normal operating conditions, PDF page 32.

⁹⁰ Exhibit 3329-X0040, EON_Response_to_GBPCPG_IR_Round_1, PDF page 43.

⁹¹ Transcript, Volume 4, pages 873 to 874, lines 21 to 25, 1 to 4.

⁹² Exhibit 3329-X0114, ECRC Reply Evidence_Appendix E_Expert Report and Curriculum Vitae of Payam Ashtiani, PDF page 11.

shear situations and high wind shear situations correspond with low turbulent situations.⁹³ Further, Mr. Ashtiani testified that turbulence is more pronounced during daytime.

7.5.4 Low frequency noise and infrasound

134. Rule 012 defines low frequency noise between the frequencies of 20 Hz and 250 Hz. The applicant stated that low frequency noise would not be an issue since the noise impact assessment passed the test for potential low frequency impacts. Rule 012 states a low frequency noise condition may exist when the dBC minus dBA value is equal to or greater than 20 dB and a clear tonal component exists between the frequencies of 20 Hz and 250 Hz. Mr. Ashtiani stated that for all receptors, the dBC minus dBA test is below 20 dB and the manufacturer has stated there are no tonal components from the proposed wind turbines.⁹⁴

135. Infrasound is a term used to describe sounds that are produced at frequencies of zero to 20 Hz, too low to be heard by the human ear. It is typically measured and reported on the G-weighted scale. Mr. Ashtiani stated that typical Type 1 instrumentation, required by Rule 012, has a linear sensitivity to 10 Hz. To further extend into the infrasound range would require infrasound microphones or micro barometers instrumentation sufficiently sensitive with a low noise floor to be able to detect the low noise level and protection from wind induced noise with windscreens would be required. He stated that this equipment is usually found with researchers and is not standard instrumentation for acoustic engineers.⁹⁵ The applicant stated that the assessment of infrasound is neither required nor recommended by Rule 012 and ISO 9613-2, and was not considered in the project.⁹⁶

136. While it was not specifically addressed in the noise impact assessment, E.ON responded to concerns about infrasound from the GBCPG. E.ON stated that the fact that infrasound can be detected and measured did not indicate that it was problematic or harmful.⁹⁷ The applicant argued that hearing is the most sensitive response mechanism of the human body and that the threshold of perception is the threshold of audibility.⁹⁸ Mr. Ashtiani pointed to a figure in his report that showed human hearing thresholds⁹⁹ and stated that the fact that it is one smooth curve alludes to your ear being the organ that is able to detect all of these. Mr. Ashtiani stated that while it is possible to perceive sound with your body, the levels have to be loud enough that you would hear it first, much like going to a concert and feeling the music in your chest.¹⁰⁰ E.ON stated that monitoring in the audible range and compliance with Rule 012 was a good proxy to ensure that infrasound was not an issue.¹⁰¹

137. E.ON stated that low frequency noise can cause problems; however, this occurs when the noise levels are high enough to cross into the audible range. Mr. Ashtiani stated that the 85 dBG

⁹³ Transcript, Volume 3, page 244, lines 19 to 22.

⁹⁴ Transcript, Volume 3, page 750, lines 5 to 8.

⁹⁵ Transcript, Volume 4, pages 825 to 826, lines 1 to 25, 1 to 22.

⁹⁶ Exhibit 3329-X0040, EON_Response_to_GBCPG_IR_Round_1, PDF page 28.

⁹⁷ Transcript, Volume 10, page 2036, lines 15 to 24.

⁹⁸ Transcript, Volume 2, page 420, lines 6 to 10.

⁹⁹ Exhibit 3329-X0114, ECRC Reply Evidence Appendix E, Expert Report and Curriculum Vitae of Payam Ashtiani, PDF page 4.

¹⁰⁰ Transcript, Volume 3, page 599, lines 15 to 22.

¹⁰¹ Transcript, Volume 10, pages 2036 to 2037, lines 25, 1 to 3.

on the curve is the approximate threshold of audibility.¹⁰² Mr. Ashtiani testified that when talking about the ability to perceive, both frequency and amplitude must be considered.¹⁰³ Mr. Ashtiani pointed to a study by Dr. Nussbaum which showed that levels have to be substantially higher than the levels predicted for the project before people are able to detect them.¹⁰⁴ The Nussbaum report concluded that most individuals could tolerate 8 Hz at 130 decibels for 30 minutes without ill effects.¹⁰⁵ When comparing this to the human hearing threshold figure in Mr. Ashtiani's report, it showed this sound to be audible.¹⁰⁶ Mr. Ashtiani stated that the levels of infrasound from the wind farms are substantially below these levels.¹⁰⁷

138. E.ON argued that audible sound includes infrasound and low frequency sound so that a person exposed to audible sound would also be exposed to the lower frequencies. E.ON stated there are no health impacts at levels set out by Rule 012¹⁰⁸ and that there is no evidence before the Commission of any real-world examples of infrasound causing any annoyance at levels below the threshold of audibility which coincides with the threshold of perceptibility.¹⁰⁹ The applicant referenced Queensland, Australia and Japan as two jurisdictions that have infrasound noise limits which are set very close to the threshold of perception as being protective.¹¹⁰ He added that the threshold of perception was the same as the threshold of audibility.

139. Mr. Ashtiani agreed that the dBC minus dBA by itself was not a good indicator for low frequency noise, but clarified that it was just one step in Rule 012 to determine whether there was potential for low frequency noise conditions.¹¹¹ Rule 012 also requires the presence of a tonal component and ultimately confirmation via a post-construction sound level survey. The applicant underscored there are no tonal components associated with the Nordex N117-2400 wind turbine¹¹² and that it has committed to conducting a post-construction sound level survey.¹¹³

7.6 Views of the interveners

140. The GBCPG questioned the adequacy of the noise measurement studies, noise modelling, and noise assessments conducted by E.ON for the proposed wind farm. They are also concerned about the potential impact of low frequency noise, infrasound, and vibrations from the proposed wind turbines on area residents.

141. The GBCPG retained three experts to provide evidence with respect to the noise impact assessments and wind turbine noise in this proceeding. Mr. James Farquharson of FDI Acoustics Inc. (FDI Acoustics) was retained to review the noise impact assessment, and related noise

¹⁰² Exhibit 3329-X0114, ECRC Reply Evidence_Appendix E_Expert Report and Curriculum Vitae of Payam Ashtiani, PDF page 4.

¹⁰³ Transcript, Volume 3, page 602, lines 13 to 15.

¹⁰⁴ Transcript, Volume 3, pages 600 to 601, lines 13 to 25, 1 to 3.

¹⁰⁵ Exhibit 3329-X0053, I - Nussbaum Reinis - Some Individual Differences in Human Response to Infrasound, PDF page 36.

¹⁰⁶ Exhibit 3329-X0114, ECRC Reply Evidence_Appendix E_Expert Report and Curriculum Vitae of Payam Ashtiani, PDF page 4.

¹⁰⁷ Transcript, Volume 3, page 660, lines 1 to 3.

¹⁰⁸ Transcript, Volume 10, page 2240, lines 12 to 19.

¹⁰⁹ Transcript, Volume 10, page 2044, lines 2 to 6.

¹¹⁰ Transcript, Volume 3, page 652, lines 1 to 9.

¹¹¹ Transcript, Volume 4, page 827, lines 10 to 19.

¹¹² Exhibit 3329-X0040, EON_Response_to_GBCPG_IR_Round_1, PDF page 43.

¹¹³ Transcript, Volume 1, page 50, lines 3 to 7.

documents for the project. Mr. Farquharson, an expert in the field of noise, noise impacts and noise impact assessments, prepared the FDI Acoustics report¹¹⁴ and testified before the Commission. Mr. Rick James, of E-Coustic Solutions was also retained. Mr. James is an acoustical engineer and acoustician with expertise in studying the sounds emitted by wind turbines in North America, including low frequency noise. Mr. James prepared the E-Coustic Solutions report¹¹⁵ and testified before the Commission. In addition, Mr. Steven Cooper of Acoustic Group Pty Ltd., Consulting Acoustical and Vibration Engineers, was retained. Mr. Cooper is an acoustical consulting engineer with expertise in the field of acoustics, noise and vibration issues in relation to wind farms in Australia. Mr. Cooper prepared the Acoustic Group report¹¹⁶ and testified before the Commission.

7.6.1 Noise impact assessment results and noise control measures

142. The GBCPG ultimately did not agree with the noise impact assessment results because the model did not properly consider low frequency noise and infrasound. These issues are more thoroughly discussed in the respective sections below.

143. In his testimony, Mr. Farquharson stated that, overall, he agreed on many points with the noise impact assessment, and its approach. However, he was of the opinion that the noise impact assessment was dated and underestimated the third-party energy-related facilities noise contribution. He was of the opinion that additional fieldwork was needed to ensure that noise emissions from third-party energy-related facilities were quantified properly.¹¹⁷ The issue of noise emissions from third-party energy-related facilities is discussed in more detail below.

144. Further, Mr. Farquharson recommended that, if the proposed wind farm were approved, the applicant should commit to the completion of a post-construction sound level survey at the residences in the study area, and the study should be provided to the community and the AUC. He also made the following recommendations about the instrumentation and manner in which the sound level survey should be conducted. The instrumentation should be capable of measuring the parameters associated with the evaluation of low frequency noise (one-third octave band level and the overall C-weighted level). Continuous audio recordings of the monitored period should be completed. The use of portable meteorological stations as determined by the number of residences evaluated and their proximity to each other to measure was recommended, as was the recording of the meteorological observations at suitable intervals during the sound level survey. Also, to confirm these meteorological observations, hand held instruments at reasonable intervals throughout the sound level survey should be used. A field observation log for the sound level survey should be kept to aid in the analysis of the results. The completed survey must encompass representative conditions. He added that the report should include a comparison and discussion of the predicted results from the recompleted noise impact assessment to those measured during the post-construction noise survey.¹¹⁸

145. Mr. Cooper opined that the noise impact assessment was deficient. In his opinion, the noise impact assessment was not an impact assessment, but simply a statement as to the results

¹¹⁴ Exhibit 3329-X0082, F - Evidence of James Farquharson.

¹¹⁵ Exhibit 3329-X0084, D - Evidence of Rick James.

¹¹⁶ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV.

¹¹⁷ Transcript, Volume 7, page 1451, lines 14 to 19.

¹¹⁸ Exhibit 3329-X0082, F - Evidence of James Farquharson, PDF page 4.

of calculations from a computer model. The noise impact assessment was not a meaningful document in that it did not explain the actual noise impacts on nearby residents such as the effect on their daily activities or their nighttime sleep. He added that the noise impact assessment failed to identify the acoustic environment in the project area and has assumed a basic sound level for nighttime to be the L_{eq} levels from Table 1 of Rule 012, rather than use a measured sound level. He asserted that the Commission should address these failings in the noise impact assessment by requiring that the noise impact assessment identify that sleep disturbances and other symptoms may result from the proposed wind farm. Mr. Cooper recommended that, if the project were approved, the applicant should be required to provide guarantees that there will be no health or adverse impacts because there is no material provided in the noise impact assessment to show the potential impacts that would occur. Mr. Cooper was critical of Rule 012 because it did not require consideration of audible characteristics of modulation or impulsivity that in Australia can be part of "Potential Adverse Characteristics".¹¹⁹ In addition, in his opinion, the Health Canada Study¹²⁰ identified the limit of annoyance that is normally established from dose-response curves is exceeded by the nighttime design targets set out in the noise impact assessment.¹²¹

146. Mr. James was also critical of the noise impact assessment. His critique was mainly of the standards used for the noise modelling and that the noise impact assessment did not consider low frequency noise or infrasound. These issues are discussed in detail below.

147. The GBCPG requested the following requirements for post-construction monitoring, should the application be approved:¹²²

- Post-construction monitoring be done by a third party with results made available to the AUC and local residents, including members of the GBCPG.
- Such monitoring must involve full spectrum monitoring, both inside and outside homes, and must be done with complete transparency of the data to all parties, including residents and local health authorities.
- The monitoring should be made available to any local residents, including members of the GBCPG who request it.
- E.ON substitute dB Lin, or dB linear, for dBC in the post-construction comprehensive noise study that it has committed to do and that the post-construction comprehensive noise study include infrasound and low frequency noise measurements inside some of the local residents' homes.
- The monitoring system should be done in real time and with built-in shutdown mechanisms for when either accepted noise limits are exceeded or when noise nuisance is repeatedly occurring to the residents with a built-in facility for change so that as the residents become increasingly sensitized to the pulsing infrasound and low frequency noise, over time, and, therefore, need lower and lower limits in order to protect their sleep.

¹¹⁹ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 13.

¹²⁰ See footnote 31.

¹²¹ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 27.

¹²² Transcript, Volume 10, pages 2148 to 2158.

7.6.2 Third-party energy-related facilities noise sources

148. Mr. Farquharson reviewed the noise impact assessment of June 2014. He was of the opinion that the noise impact assessment was dated and underestimated the third-party energy-related facilities noise contribution for the following reasons.¹²³ The noise impact assessment for the Enbridge Vermillion Pump Station was dated September 28, 2010, and the noise impact assessment for the proposed wind farm assumes that the Enbridge Vermillion Pump Station noise impact assessment is relevant to the facility; there was no apparent effort to confirm the information in that assessment was accurate. Mr. Farquharson was critical of Golder because it had taken a series of measurements outside of the site as it was unable to access the Vermilion Pump Station site.¹²⁴ However, in his testimony, Mr. Farquharson acknowledged that, based on his site visit, the site has some constraints and good measurements could not be obtained.¹²⁵ He added that there appeared to be no effort to confirm the data used for the Spur Compressor Station used in the Enbridge Vermillion Pump Station noise impact assessment.¹²⁶

149. He took issue with the assumption that the 263 wells in the noise study area for the project all have the same noise emission because some of these sites may not have an operating pumpjack which may result in underestimating third-party contributions. Mr. Farquharson was of the opinion that underestimating third-party contributions could result in the proposed wind farm exceeding the nighttime permissible sound levels because many residences in the study area had a nighttime margin of compliance of less than 1.0 dB, with some of these residences having predicted third-party contributions above 30 dBA.

7.6.3 Noise modelling and standards

150. Mr. Farquharson testified that he agreed with the ground attenuation value that was used in the model for the noise impact assessment.¹²⁷ Also, he did not have any concerns with modelling the wind turbines as point sources and the elevation of the turbine hubs.¹²⁸ He added in relation to ISO 9613 that he had “objected to it in its use in the past, but it's acceptable under the – under Rule 012, and I don't have a major concern in this area at all.”¹²⁹

151. Mr. James opined that the noise impact assessment was deficient for the following reasons. First, the input data to the noise impact assessment model did not include tolerances for the Mean Apparent Sound Power Level derived during testing of the wind turbines and used as inputs to the computer sound propagation model.

152. Second, the input sound power levels were not adjusted to include Batch Error confidence levels as required by current versions of CAN/CSA-IEC 61400 (2012) Wind turbines--Part 11: Acoustic noise measurement techniques, and IEC 61400 Wind turbines, Part 14: Ed. 1, 2005, Declaration of apparent sound power level and tonality values. He was of the opinion that for similar turbines a +/- 1 dBA tolerance should have been added for measurement errors to the mean apparent sound power level or to the predictions prior to

¹²³ Transcript, Volume 7, pages 1442 to 1443, lines 10 to 25, 1 to 11.

¹²⁴ Transcript, Volume 7, page 1447, lines 14 to 22.

¹²⁵ Transcript, Volume 7, page 1450, lines 17 to 20

¹²⁶ Transcript, Volume 7, page 1497, lines 23 to 25.

¹²⁷ Transcript, Volume 7, page 1452, lines 20 to 21.

¹²⁸ Transcript, Volume 7, pages 1463 to 1464, lines 16 to 25, 1 to 9.

¹²⁹ Transcript, Volume 7, page 1474, lines 7 to 10.

drawing conclusions. He added that the noise impact assessment did not discuss the IEC 61400 Wind turbines, Part 14 or its requirements for Batch Error. Mr. James expressed the view that, based on other makes and models where the batch or production tolerances are provided, he has assumed a Batch Error of ± 2 dBA.

153. Third, the noise impact assessment model did not include the ± 3 dB tolerance for modelling errors required in: ISO 9613 (Ed. 1 1996), Acoustics-Attenuation of sound during propagation outdoors, Part 2: General method of calculation standard upon which the model is based. This tolerance of ± 3 dBA from ISO 9613-2 Table 5 applies for distances from 100 metres to one kilometre. No tolerance is provided for greater distances. He pointed out that the noise impact assessment acknowledged that this tolerance is specified but does not include it in calculations or consider it in its conclusions. In his opinion, the results of the predictive model without the use of tolerances for the methods and measurements used do not represent normal operating conditions as required by Rule 012. The deviations from current standards and practices used to develop the predictive model results in under-predicting the representative conditions at the receptor sites.

154. Mr. James concluded that, if the noise impact assessment model had included a safety factor of 5 dB, enough to account for the combined +2 and +3 dB confidence levels for measurement (CAN/CSA-IEC 61400-11), batch (IEC 61400-14), and modelling (ISO 9613-2), then all of receptors in tables 13 and 14 of the noise impact assessment would exceed 40 dBA since the largest margin of compliance is 4.1 dB for night and all daytime margins are less than 5.0 dB. With these adjustments, all receptors may exceed the nighttime permissible sound level set out in Rule 012. In response to questions, Mr. James acknowledged that Rule 012 did not require the use of the standards referred to above.¹³⁰

155. Mr. James was also of the opinion that the noise model used for the proposed wind farm did not address the types of audible noise from wind turbines that commonly occur because of the summer nighttime wind speed profile. He stated that, while the noise impact assessment assumes that sound emissions are at a maximum when using the 10 m/s data, it ignores that operation of the wind turbines would be in turbulent, high wind shear conditions which occur in areas that are not flat, especially at night.

156. Mr. James was of the opinion that the IEC 61400-11 tests of wind turbines are conducted under ideal conditions and not under “turbulent, high wind shear conditions” that would be commonly experienced at the project site. Mr. James indicated that turbulence is more pronounced during nighttime conditions. There is no manufacturer’s test data that can be used to represent wind turbine noise emissions for high wind shears and the lack of data should have been disclosed in the noise impact assessment. He was of the opinion that the noise model result tables and contour maps in the noise impact assessment do not represent the nighttime high wind shear conditions that people find most objectionable. Adjustments to the input sound power level data should have been applied to account for this additional uncertainty. This failure meant that the model did not represent the sounds of normal operation and noise impact on the receptors in the project area.

¹³⁰ Transcript, Volume 8, pages 2002 to 2003, lines 12 to 25, 1 to 17.

157. Mr. James questioned whether the noise impact assessment model and calculations of dBA and dBC include the energy from infrasound and low frequency noise in the 31.5 Hz octave band and below. Mr. James asserted that the noise impact assessment computer model did not evaluate the sounds emitted by wind turbines below the 63 Hz octave band and that acoustic energy emitted by modern upwind wind turbines increases as the frequency decreases. He added that the 2012 CAN/CSA-IEC 61400-11 standard requires that measurements of wind turbine sound emissions be provided in the documentation of mean apparent sound power level for frequencies down to 20 Hz and the noise impact assessment presents sound power levels for the 31.5 Hz octave band. As a result, all acoustic energy below the 63 Hz octave band's lower frequency limit of 44 Hz was ignored in the noise impact assessment, including audible low frequency sound 20 Hz to the 32.5 Hz octave band's upper boundary, and inaudible infrasound in the range of zero to 20 Hz.¹³¹

158. Mr. James testified that the ISO 9613, Part 2 model specifically states that it is not validated for frequencies below the 63 Hz octave band.¹³² Although the software developers of the noise models have included input slots for 31.5 Hz, Mr. James was concerned this input was not validated and there was no assurance that the 15.5 dB shown for the dBC minus dBA was true.¹³³ He added that a C-weighted sound level calculated with a model that is not validated for the low frequencies is insufficient for that purpose.

7.6.4 Low frequency noise and infrasound

159. When questioned about low frequency noise and infrasound propagation, Mr. Farquharson stated that he did not disagree with the evidence provided in the noise impact assessment.¹³⁴ He added that "ground impedance for infrasound and low frequency sound is approximately zero, especially for sounds with energy in the 31.5 Hz octave band and lower." and that ground impedance would be a different value in the lower frequency ranges.¹³⁵ Otherwise, he did not comment on low frequency noise and infrasound issues because these issues should be addressed by Mr. James.

160. Mr. James acknowledged that Rule 012 limits low frequency sound. However, its use of dBC weighting and not linear weighting and focus on outdoor test sites precludes the rule from having any effective limits on sounds below 10 Hz. Infrasound and low frequency sound annoyance and health effects are primarily an indoor problem requiring indoor tests for dBC minus dBA differentials and narrow band analysis for infrasound below 10 Hz. For the dBC minus dBA test to be effective, it would need to be changed to use dB Lin minus dBA and use instruments capable of measuring down to below 0.25 Hz.¹³⁶

161. Mr. James further reiterated that dB Lin minus dBA should be the adopted test. He testified that the dBC minus dBA test is not a valid test as the low frequency energy is not in the frequency range where dBC begins to de-emphasize the signals.¹³⁷ The unweighted dB linear

¹³¹ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 5.

¹³² Transcript, Volume 7, page 1543, lines 18 to 20.

¹³³ Transcript, Volume 7, page 1544, lines 1 to 15.

¹³⁴ Transcript, Volume 7, page 1480, lines 5 to 14,

¹³⁵ Transcript, Volume 7, page 1472, lines 6 to 13.

¹³⁶ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 11.

¹³⁷ Transcript, Volume 8, page 1746, lines 2 to 7.

would not under-represent the lower frequency range. Mr. James stated that the dBC minus dBA test became the standard partly because in many cases, instruments did not have the dB linear responses; however, this is no longer the case with modern equipment.¹³⁸

162. Mr. James referenced the Kelley study in 1987 that found that when people were exposed to pulsations of infrasound and low frequency sound at peak levels of 60 dB they reported adverse sensations. In spite of some design differences between the wind turbine test model used in the 1987 study and the modern upwind wind turbines to be used at the proposed wind farm, both older and newer designs produce infrasound pulsations from blade and tower interactions. The Kelley study showed that any source that produces sharp, short duration pulsations of infrasound can result in the same adverse sensations and health effects found in 1987. He added that more recent studies of wind turbine infrasound emissions have confirmed that modern upwind wind turbines produce infrasound pulsations related to the blade pass frequency (fundamental and harmonics).¹³⁹ Natural background infrasound do not have tones and harmonics that are pulsatile.¹⁴⁰ Mr. James stated that infrasound and low frequency sounds do not attenuate rapidly with distance in the way that mid and higher frequencies do. He added that he has measured wind turbine infrasound showing the tones and harmonics at distances of over 10 kilometres and that the Health Canada Study found tones at a site with a similar distance.¹⁴¹ He was of the view that given the current knowledge, the 50 dB threshold derived as described in his report is a good starting point for concern about adverse impacts on people. He pointed out that while the Health Canada Study did not address adverse effects on people, Dr. Michaud has recently stated:

The scientific evidence base in relation to WTN [wind turbine noise] exposure and health is limited, which includes uncertainty as to whether or not low frequency noise (LFN) and infrasound from wind turbines contributes to the observed community response and potential health impacts.¹⁴²

163. Mr. James also referenced the Shirley Wind Farm study. That study described the findings of four acoustical consulting firms related to a survey of low frequency noise conducted at residences located near the Shirley Wind Farm in Wisconsin. This study found that infrasound was present at levels of 50 dB and above at one home in the community near the wind turbines. He added that he conducted subsequent studies in the Shirley community and found that the tones identified in the Shirley Wind Farm study were common to homes at distances of over four miles (6.4 kilometres).¹⁴³ He pointed to the findings of the Brown County Board of Health on complaints about the Shirley Wind Farm. He also referenced the Cape Bridgewater Wind Farm study which is discussed below.

164. In addition, Mr. James stated that the Health Canada Study also found the same wind turbine tones and harmonics in Prince Edward Island which show the same tonal characteristics found in the studies mentioned above at the blade pass frequency of 0.6 to 0.7 Hz and harmonics at sound pressure levels of 50 dB or higher at distance of four kilometres. Levels where tones

¹³⁸ Transcript, Volume 8, page 1746, lines 14 to 24.

¹³⁹ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 11.

¹⁴⁰ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 16.

¹⁴¹ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 16.

¹⁴² Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 17.

¹⁴³ Exhibit 3329-X0084, D - Evidence of Rick James, PDF pages 11 to 12.

over 50 dB SPL¹⁴⁴ (sum of energy of all tones) are associated with complaints of adverse sensations in the Cape Bridgewater Wind Farm Noise Study and Shirley Wind Farm studies.¹⁴⁵ Mr. James opined that acoustic energy emitted by the operation of modern utility scale wind turbines is at the root of the adverse health effects.¹⁴⁶

165. Mr. James concluded that until more is known about this aspect of wind turbine sound emissions and adverse sensations that wind projects should have precautionary buffer zones of two or more miles (three to four kilometres). At a minimum there should be provisions for any affected families near a wind farm to have their property purchased by the owner of the wind farm at a fair value so that they can relocate. He acknowledged that there are no studies using appropriate instruments and protocols in the project area to use in addressing the question about similarity of impact. However, in his opinion, all of the studies show that the characteristics that are related to the adverse effects are common to all wind projects. There was no reason to conclude that the impact on people living near the project would be different.¹⁴⁷

166. Mr. Cooper stated that the focus of his report was the acoustical/vibration/sensation effects from the proposed wind farm. He added that the matter of health impacts is outside of his professional expertise. However, he was aware from his consulting practice of the relevant noise and vibration standards that identify criteria to protect the health and well-being of the community and work force. He stated that ongoing sleep disturbance is classified as a health impact and had first-hand knowledge of information from residents of sleep disturbance.¹⁴⁸

167. Mr. Cooper noted that Rule 012 fails to mention infrasound and the failure to address amplitude modulation and infrasound associated with the project, as well as low frequency noise, is not acceptable to the community.¹⁴⁹ He added that the noise impact assessment in question fails to consider the narrowband infrasound signature that has been identified at receiver locations to be associated with the operation of wind turbines. The matter of the infrasound signature and the impact that occurs on residents as a result of inaudible infrasound signals or pressure waves that modulate or pulse at an infrasound rate is an issue that is subject of further research into the effects on people both in terms of perception and health. He was of the view that this is an issue that the Commission needs to examine in detail.¹⁵⁰

168. Mr. Cooper indicated that the Health Canada Study,¹⁵¹ showed a dose-response curve for wind turbines. A large proportion of the respondents in the Health Canada Study are in semi-urban areas where the ambient background level is higher than in rural areas.¹⁵² He pointed to Figure II in this study which showed that above 35 dBA just over 10 per cent of the population were highly annoyed. In Mr. Cooper's opinion this figure indicates that the absolute levels set out in Rule 012 will give rise to disturbance at night. However, Mr. Cooper took issue with the Health Canada Study in that it was restricted to A-weighted data and narrow band infrasound

¹⁴⁴ Sound pressure level.

¹⁴⁵ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 12.

¹⁴⁶ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 15.

¹⁴⁷ Exhibit 3329-X0084, D - Evidence of Rick James, PDF page 15.

¹⁴⁸ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 4.

¹⁴⁹ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 27.

¹⁵⁰ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 10.

¹⁵¹ See footnote 31.

¹⁵² Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 11.

data was absent. In his opinion, if the A-weighted contribution of the turbines cannot be extracted from the measurements (due to wind) then there is a restriction on relating the operation of the wind farm to the impacts observed by residents. This was a finding from the Cape Bridgewater study.¹⁵³

169. Mr. Cooper indicated that, prior to the Health Canada Study,¹⁵⁴ it appeared that the only dose-response curves available for wind turbines relate to two studies in Sweden and one in the Netherlands (occurring more than 12 years ago) that had a limited data set and did not separate rural areas from urban areas. Those studies did not actually measure the wind turbines but utilized predicted levels obtained from computer modelling. In addition, Mr. Cooper stated that his Cape Bridgewater study identified that determining the actual A-weighted contribution of wind turbines at rural residences presents some difficulty and for residences removed from the turbines the A-weighted external level was more related to the wind rather than the wind turbines.¹⁵⁵

170. Mr. Cooper asserted that the acousticians in Australia referenced in his report have identified the infrasound components associated with the operation of a wind turbine. He opined that with the studies undertaken by those acousticians and the critical on-off testing from the Cape Bridgewater study shows, that there is a wind turbine acoustic signature and that there is an acoustic impact on residents. Medical research can be conducted based on this research.¹⁵⁶ However, such research should occur in the homes of the persons participating in the research because the buildings themselves interact with the infrasound and low frequency energy.¹⁵⁷

171. In his report, Mr. Cooper provided an overview of his Cape Bridgewater Wind Farm Noise Study. The study involved noise and vibration monitoring over an eight-week period utilizing three houses near the Cape Bridgewater Wind Farm. Six residents participated in the study. During the study, for about a two-week period the wind farm was shut down. Mr. Cooper indicated that this study, among other things, was not a health study and not a sound level survey of the wind farm for purposes of compliance. He explained the manner in which the study was conducted. Based on this study, Mr. Cooper was of the opinion that, if one restricts an assessment of disturbance from a wind farm to one-third octave bands, dBA or dBG, those measurement parameters cannot identify the wind turbine signature and will automatically produce an incorrect finding. Mr. Cooper opined that the Cape Bridgewater study shows a link between wind farm and disturbance.¹⁵⁸

172. The GBCPG disagreed with the applicant that the ear was the most sensitive organ with respect to low frequency noise. The threshold of perception was not the same as the threshold of audibility. Mr. James testified that when a distant storm is approaching, one can feel little vibrations in one's stomach or throat and little pressure pulsation in the ears, before a person hears thunder.¹⁵⁹ Mr. Cooper agreed, stating that he conducted testing with residents at wind farms in May 2013 where they could detect the operation of the wind farm without hearing it. He

¹⁵³ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 14.

¹⁵⁴ See footnote 31.

¹⁵⁵ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 11.

¹⁵⁶ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 16.

¹⁵⁷ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 17.

¹⁵⁸ Exhibit 3329-X0049, E - Steven Cooper Evidence and CV, PDF page 26.

¹⁵⁹ Transcript, Volume 7, page 1548, lines 20 to 24.

added that he had done testing in an anechoic room, cleanly generated a 10 Hz signal and proved that the threshold of perception is below the threshold of hearing.¹⁶⁰ Mr. Cooper stated that Dr. Kelley's 1985 report also confirmed that sound could be felt before it was heard.¹⁶¹

173. The GBCPG requested a buffer zone be applied to wind farms to account for the impacts of low frequency noise and infrasound. Mr. James recommended a minimum buffer zone of four kilometres¹⁶² while Mr. Cooper found impacts extend seven kilometres from wind turbines.¹⁶³

7.7 Commission findings

174. In this section, the Commission considers whether the operation of the project may cause adverse noise impacts on nearby residents, whether the wind power project is compliant with Rule 012, whether there are low frequency noise concerns, and what conditions, if any, should be imposed on the wind farm if it is approved. Five expert witnesses filed reports and testified on this topic in the proceeding.

175. E.ON submitted that its project complies with Rule 012 permissible sound levels. It submitted that the noise impact assessment was done correctly and met the requirements set out in Rule 012. E.ON also pointed to the recent Health Canada Study and associated studies¹⁶⁴ and World Health Organization reports in support of its position that the proposed wind farm would not result in adverse health impacts

176. The GBCPG had noise concerns about the project related to sleep disturbance, annoyance and other health impacts due to audible and inaudible sound from the wind turbines. Their experts argued that the noise impact assessment was flawed because it did not accurately model or did not adequately consider low frequency noise and infrasound.

177. Before providing its conclusions on the issues, the Commission must first address the issue of witness objectivity and the weight that should be accorded to the evidence of the noise experts that participated in the proceeding.

7.7.1 Findings on expert objectivity and weight

178. The Commission finds that Mr. Faszter and Mr. Farquharson are experts in the preparation of noise impact assessments and the Commission found these witnesses to be credible and their evidence to be useful.

179. The Commission finds that Mr. Ashtiani, Mr. Cooper, and Mr. James are experts in the field of acoustics with considerable training, knowledge and experience on the topic of low frequency noise and infrasound and its effects. The Commission observes that under cross-examination Mr. Ashtiani recognized and even praised the contributions of other scientists or acousticians whose views he did not share.¹⁶⁵ The Commission found these witnesses to be

¹⁶⁰ Transcript, Volume 7, pages 1610 to 1611, lines 16 to 25, 1.

¹⁶¹ Exhibit 3329-X0087, D - Exhibit 3a-w - Documents Wind Turbine Infrasound and Adverse Health Effects, PDF page 301.

¹⁶² Transcript, Volume 8, page 1768, lines 1 to 6.

¹⁶³ Transcript, Volume 8, page 1751, lines 5 to 18.

¹⁶⁴ See footnote 31.

¹⁶⁵ Transcript, Volume 4, page 804, lines 6 to 12.

credible. However, Mr. Cooper's views about the gaps in Rule 012 and in the noise impact assessment were not useful because the comments were based on the Australian requirements for noise impact assessments which differ from those in Rule 012. Further, the Commission did not consider useful the views expressed by Mr. James and Mr. Cooper relating to adverse health impacts from low frequency noise and infrasound because such opinions were outside the scope of their expertise and were not borne out by the evidence in this proceeding.

7.7.2 Noise impact assessment results and noise control measures

180. The purpose of a noise impact assessment is to provide reasonable predictions of the project's noise that may be experienced at nearby residences.

181. The Commission finds that the noise model used by the applicant to prepare the noise impact assessment is one that meets an international standard that is clearly identified in Rule 012. The Commission considers that the inputs used in the noise model by the applicant to predict sound levels were conservative. The predicted sound levels are in compliance with the daytime permissible sound levels set out in Rule 012 and the nighttime permissible sound levels set out in Rule 012, if turbines 22 and 23 are operated in SOM 5 – 101 dBA mode. The margin of compliance for nighttime cumulative sound level ranges from 0.1 to 4.1 dBA. Further, it is of note that Mr. Farquharson testified that he was in agreement on many points of the noise impact assessment, including the data inputs other than those for third-party energy-related facilities.

182. For the reasons set out below, the Commission is not persuaded by the submissions of the GBCPG and its experts, Mr. James and Mr. Cooper, that the noise impact assessment was deficient because it did not adequately consider the impacts of low frequency noise and infrasound on nearby residents.

183. The Commission took note that each wind turbine has a number of operating modes and operating parameters that can be set for each wind turbine. Changes to the parameters can be made by physically visiting each wind turbine or remotely by way of the supervisory control and data acquisition system. Each wind turbine can be set at different sound modes at different times of the day, specific wind sectors, and different wind speeds. For this reason, the Commission accepts that the operation of some wind turbines in SOM modes is a reasonable mitigation measure to meet the nighttime permissible sound level, and agrees with E.ON that it is a potential mitigation method available for other turbines, should it be needed. E.ON has committed to operating turbines 22 and 23 in SOM 5 – 101 dBA mode during the nighttime period. Should the Commission approve the project, to ensure compliance with the permissible sound levels, the Commission directs that turbines 22 and 23 be operated in SOM 5 – 101 dBA mode during the nighttime period.

184. Due to the importance of the noise mitigation measures to ensure the project's compliance with the permissible sound level, the Commission finds that should it approve the project, it would include the following condition in the approval:

- The applicant must ensure that all noise mitigation measures proposed in the application are implemented, to ensure compliance with the permissible sound level at all receptor locations in the study area. The noise control measures proposed in the application included: maintaining the equipment so it is running correctly, implementing wind turbines in Sound Optimized Mode, applying mitigation on third-party energy-related facility noise sources, or the shutting down of wind turbines.

7.7.3 Third-party energy-related facilities noise sources

185. The primary issue raised by the GBCPG was that the noise impact assessment was dated and underestimated the third-party energy-related facilities noise contribution. Specifically, it argued that the applicant should not have used data from a 2010 noise impact assessment for the Enbridge Vermillion Pump Station without confirming it was accurate. Also, it contended that the noise emissions from the 263 third-party facilities should have been measured.

186. The Commission considers that the use of the 2010 noise impact assessment for the Enbridge Vermillion Pump Station was reasonable because the facility had not changed since its approval, access to the site could not be obtained to conduct field measurements, and the field measurements taken outside of the facility were not reliable. The Commission notes that Mr. Farquharson agreed with Golder and confirmed that it was difficult to obtain good measurements from this facility due to constraints. Mr. Farquharson also confirmed that he has used similar methods when preparing noise impact assessments.

187. The Commission is of the view that measurements did not need to be taken at all 263 identified well sites. It was acceptable to attribute to each well the highest noise emissions of a measured well with a pumpjack because this assumed that each well was assigned a site maximum noise emission. Based on these reasons, the Commission finds the approach taken to model the noise emissions from third-party energy-related facilities was reasonable.

7.7.4 Noise modelling and standards

188. With respect to the wind turbine sound power level used in a noise impact assessment, Section 3.3(1) of Rule 012 states:

For noise impact assessments, the sound power level from a wind turbine must correspond to the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions for both the daytime and nighttime period. These operating conditions and restrictions to one or more wind turbines must be documented in the noise impact assessment.

189. The Commission observes that the sound power levels provided by Nordex for use in the noise impact assessment were calculated using IEC 61400-11. This standard was specifically developed to calculate sound power levels for wind turbines and is internationally accepted. The Commission recognizes that there was a disagreement between Mr. Ashtiani and Mr. James about whether a further adjustment to the sound power levels using IEC 61400-11 was required. The Commission notes that Nordex guaranteed the wind turbine sound power levels calculated using IEC 61400-11. The Commission is satisfied that the sound power levels used by the applicant represent the turbine's maximum noise emitted when the wind turbine operates under the planned maximum operating conditions for both the daytime and nighttime period. The Commission therefore finds that the sound power levels used by the applicant were appropriate sound power levels to use as inputs for its noise model.

190. The Commission notes that the CadnaA model was used to prepare the noise impact assessment. The CadnaA model uses the ISO 9613-2 methodology for outdoor sound attenuation. ISO 9613-2 is one of the standards specifically identified in Rule 012 as an acceptable standard for use when preparing a noise impact assessment. The Commission finds that this standard is extensively used for noise impacts assessments and is recognized

internationally. The evidence from Mr. Faszer, Mr. Ashtiani and Mr. Farquharson supports this conclusion.

191. With respect to the ground attenuation factors, ISO 9613-2 outlines the general method of calculation and the accuracy and limitations of the model. The Commission considers that the use of a ground attenuation factor of $G=0.5$ was a reasonable assumption for the applicant to make in the noise impact assessment due to the ground conditions in the project area. Also, Mr. Faszer testified that an attenuation factor of $G=0$ was used for water surfaces in the project area. Further, the Commission notes that Mr. Farquharson agreed with the use of a ground attenuation factor of $G=0.5$.

192. The Commission recognizes that noise prediction models have a level of uncertainty. The use of the ISO 9613-2 standard in the model introduces an accuracy of ± 3 dB for distances greater than 1,000 metres. However, Rule 012 does not require an applicant to take this ± 3 dB into account in its predicted cumulative sound levels and for determining whether the project meets the permissible sound levels. The applicant's compliance with the permissible sound level is of utmost importance because, even if the modelling proves to be inaccurate, once in operation, the project must comply with the permissible sound level. The Commission expects that a post-construction comprehensive sound level survey will be helpful to determine whether the project meets the permissible sound level.

193. Having regard to the foregoing, the Commission finds that the applicant incorporated reasonable modelling assumptions and protocols when preparing the noise impact assessment. The Commission finds that there is no need to make any upward or downward adjustments to the predicted sound levels in the noise impact assessment and does not accept the adjustments recommended by Mr. James. The Commission concludes the results of the noise impact assessment were reasonable and consistent with the requirements of Rule 012.

7.7.5 Low frequency noise and infrasound

194. The Commission recognizes that wind turbines may produce low frequency noise and infrasound.

195. Mr. Ashtiani, Mr. Faszer and Mr. Farquharson agreed that the Rule 012 test, using the dBC minus dBA value, is a useful step for determining whether a project produces a higher component of low frequency noise in the overall soundscape. Mr. James also agreed that this test is useful when used for common community noise sources, but he argued that this test wasn't sensitive to the extremely low frequencies generated by wind turbines. Mr. James instead recommended using an unweighted dB minus dBA test to include unweighted sound energy from the lower frequencies down to the blade pass frequencies.

196. The Commission finds that the dBC minus dBA calculation is recognized in other jurisdictions around the world for the evaluation of low frequency noise and is recognized in several of the studies filed in this proceeding as an effective test. This test was recommended by Mr. Faszer and Mr. Ashtiani. The Commission considers that the unweighted dB minus dBA test suggested by Mr. James is not an established means for evaluating infrasound and low frequency noise from wind turbines. In the Commission's view, the dBC minus dBA test is a reasonable and accepted method for identifying the potential for a low frequency noise condition.

197. Further, Rule 012 outlines the dBC minus dBA calculation as the first step to identifying the potential for a low frequency noise condition. In accordance with that rule, a low frequency noise exists if the dBC minus dBA value is equal to or greater than 20 dB and there is a clear tonal component between the frequencies of 20 Hz to 250 Hz. The dBC minus dBA test is not designed to evaluate infrasound frequencies below 20 Hz and the data below 20 Hz is not input into noise models. Although this data can now be measured by the latest commercially available instrumentation, it is not a common practice to conduct these measurements, except for the specific purpose of investigating infrasound.

198. The Commission accepts Mr. Ashtiani's testimony that in the project area, for all receptors, the dBC minus dBA test is below 20 dB, excluding the receptors that are greater than 20 dB in the baseline case, and the manufacturer has stated there are no tonal components from the proposed wind turbines.¹⁶⁶ Given this, the applicant concluded that there was no indication that operation of the project would result in a contribution to low frequency noise at the receptors. The Commission finds that the applicant followed the requirements of Rule 012 in conducting its low frequency noise analysis and is satisfied, based on the evidence, that there is no indication that operation of the project would result in a contribution to low frequency noise at the receptors. The Commission notes that the values in the noise impact assessment are predictions and that the low frequency noise and infrasound of the project can only be determined through measurements of an operating facility.

199. The Commission notes that the Health Canada Study,¹⁶⁷ the Cape Bridgewater study and the Shirley Wind Farm study measurements demonstrated that wind farms produced low frequency noise and infrasound. The Commission observes that both the Shirley Wind Farm and Cape Bridgewater studies measured the audible levels of low frequency noise, which would not be in compliance with the permissible sound levels during nighttime in Rule 012. Therefore, the Commission finds that neither the Shirley Wind Farm nor Cape Bridgewater studies provide comparable values to the expected low frequency sound and infrasound levels that could be produced by the project.

200. The Commission notes Mr. James' and Mr. Cooper's concerns in respect to the linear measurements for low frequency noise and infrasound from wind farms. By contrast, Mr. Ashtiani and Mr. Faszer were of the opinion that the dBA and dBG scales were able to identify low frequency noise and infrasound. Mr. Ashtiani testified that the threshold of audibility was at about 85 dBG. He pointed to a study by Dr. Nussbaum which showed that most individuals could tolerate frequencies of 8 Hz at 130 decibels for 30 minutes without ill effects.¹⁶⁸ Mr. Ashtiani stated that the levels of infrasound from the wind farms are substantially below these levels.¹⁶⁹ Further, the Commission notes that the Turnbull studies which measured low frequency noise and infrasound in the dBG weighting scale and close to the turbines, at 100 metres, the measurements were in the low 70 dBG levels. Even at 85 metres from the wind turbines at the Clemens Gap Wind Farm in Australia, the highest level measured was 72 dBG, at 185 metres, it dropped to 67 dBG, and at 360 metres, it dropped to 61 dBG. Similar

¹⁶⁶ Transcript, Volume 3, page 750, lines 5 to 8.

¹⁶⁷ See footnote 31.

¹⁶⁸ Exhibit 3329-X0053, I - Nussbaum Reinis - Some Individual Differences in Human Response to Infrasound, PDF page 36.

¹⁶⁹ Transcript, Volume 3, page 660, lines 1 to 3.

measurements were found at the Cape Bridgewater Wind Farm, at 200 metres at 63 dBG. The two jurisdictions which have adopted thresholds for low frequency noise have set the threshold at 85 dBG and 92 dBG. In light of this evidence and given that the nearest receptor at the proposed wind farm is 674 metres from a wind turbine, the Commission is not persuaded by the opinions of Mr. James and Mr. Cooper that, if one restricts an assessment of disturbance from a wind farm to one-third octave bands, dBA or dBG, those measurement parameters cannot identify the wind turbine signature and will automatically produce an incorrect finding.

201. Further, in Rule 012, linear measurements are not used for the demonstration of compliance with the permissible sound levels. The measure for compliance in Rule 012 is based on the dBA weighting scale, predicted or measured over the daytime and nighttime period. The Commission finds the information that these lower frequency peaks could be measured to be in the range of audibility is irrelevant in its determination of predicted sound levels and actual sound levels for compliance of the project. In Rule 012 sound levels are averaged over the daytime and nighttime periods for the purposes of compliance. Instantaneous noise peaks may be removed during isolation analysis when determining compliance of the operating facility.

202. In addition, Mr. James and Mr. Cooper acknowledge that not enough is known about low frequency noise and infrasound from wind turbines and adverse effects on nearby residents, even though a tonal component may be detected up to 10 kilometres away from a wind turbine. As Mr. Cooper stated, the Cape Bridgewater study was not a health study and further research into the potential adverse impact is needed. For these reasons, the Commission does not accept the opinions of Mr. James and Mr. Cooper regarding the potential adverse health impacts of low frequency noise and infrasound.

203. Further, if a wind farm operating in Alberta had a low frequency noise component identified, Rule 012 requires the owner of the wind farm to add 5 dBA to the comprehensive sound level measurement in the determination of compliance with the permissible sound level. If the owner of the wind farm was unable to meet that permissible sound level, the Commission would require the owner to take additional noise control measures to ensure compliance or restrict operations including the shutdown of the wind turbines.

7.7.6 Post-construction monitoring

204. As previously stated, compliance with the permissible sound level is of utmost importance to the Commission. The Commission acknowledges the applicant's commitment to perform post-construction noise monitoring surveys at some of the receptor locations within a margin of compliance of 0.5 dBA. The applicant committed to conducting post-construction noise monitoring at four receptors to verify compliance with Rule 012. These receptors were identified as receptors R1, R12, R35 and R55.

205. The applicant selected these receptors because receptor R1 is near the two wind turbines that would be operating in the SOM mode, receptor R12 is surrounded by wind turbines and near the proposed substation, receptor R35 is near two major contributing third-party energy-related facilities noise sources and receptor R55 is the residence of a member of the GBCPG nearest to a wind turbine.

206. The applicant stated that if the margin of compliance was increased to 1 dBA, it would consider post-construction sound monitoring surveys at receptors R37 and R38 as it would be

reasonable to expect these receptor locations to be in a downwind condition for the prevailing wind direction.

207. The Commission finds that if it approves the project, it would require a condition that any post-construction comprehensive sound surveys must be conducted under representative conditions and follow the requirements of Rule 012. In addition, low frequency noise would be required to be evaluated, including a dBC minus dBA calculation, the evaluation for a tonal component and a comparison of the measurement results with the permissible sound level according to the requirements of Rule 012.

208. The Commission must look at a number of criteria to determine the locations at which post-construction noise measurement studies in the project study area will be taken. In its evaluation, the Commission considers the commitments made by the applicant, the layout of the project, the distribution of the turbines and third-party energy-related facilities, the project sound level contribution at the receptor locations, the overall cumulative predicted sound levels at the receptor locations and the issues and concerns brought forward by residents in the study area.

209. Should the Commission approve the project, it would require the applicant to conduct post-construction comprehensive sound level surveys, including an evaluation of low frequency noise, at the following receptors under representative operating conditions, in accordance with Rule 012: R1, R12, R23, R35, R38 and R55.

210. Based on the foregoing, if the Commission approves the project, the approval will be subject to the following condition to verify and confirm that the project complies with the requirements of Rule 012:

The applicant shall:

- a) Conduct post-construction comprehensive noise studies, including an evaluation of low frequency noise, at receptors R1, R12, R23, R35, R38 and R55 under representative conditions, in accordance with Rule 012.
- b) File all studies and reports relating to the post-construction comprehensive noise study with the Commission within one year of connecting the power plant to the Alberta Interconnected Electric System.

211. The GBCPG requested that a number of conditions be inserted in any approval granted. The Commission is not persuaded that such conditions are necessary. More specifically, the Commission finds that a full spectrum monitoring, both inside and outside of the home is not necessary to confirm compliance with Rule 012.

212. The Commission rejects the GBCPG's request that monitoring be made available to any local resident because a selection of the receptors closest to the wind turbines is expected to ensure that the permissible sound levels are met in the project study area. It is reasonable to assume that if the closer receptor is compliant, the further receptor is as well.

213. The Commission rejects the request for a substitution of dB Lin for dBC. The Commission notes that the dB Lin minus dBC test is not an accepted practice for evaluating infrasound and low frequency noise from wind turbines and the dBC minus dBA calculation is recognized in other jurisdictions around the world for the evaluation of low frequency noise.

7.7.7 Conclusion

214. Having regard to the foregoing, the Commission concludes that the noise from the project will likely meet the nighttime and daytime permissible sound levels. Further, the Commission finds that if any low frequency sound is produced by the project, the requirements set out in Rule 012 must be met. Also, it is unlikely that infrasound from the project will be detected by residents at the receptors or if any infrasound could be detected, it would likely be at levels which would not impact the residents in the project area.

8 Health

8.1 Introduction

215. The GBCPG expressed concerns about the health effects associated with living in proximity of wind turbines. More specifically, it raised concerns about health impacts from audible noise, low frequency noise, and infrasound. The GBCPG also voiced concerns about shadow flicker and light pollution. The GBCPG retained Dr. Michael Nissenbaum, a staff radiologist at RADIMED, to provide evidence on the health effects of wind turbines. Dr. Nissenbaum opined that based on the Mars Hill/Vinalhaven study, it is clear that there is a high probability of significant adverse health effects for residents whose homes are located within 1,400 metres (0.87 miles) of the proposed wind turbines. He added that the dose-response (distance-effect) relationship seen at Mars Hill and Vinalhaven was strong evidence of a causal relationship between wind turbine noise and ill health.¹⁷⁰

216. The applicant retained Dr. Christopher Ollson to provide reply evidence on the issue of the potential health effects of wind turbines. Based on his review of peer-reviewed scientific papers on wind turbine noise and health effects, Dr. Ollson opined that the proposed wind farm would not adversely impact the health of nearby residents, if the permissible sound levels set out in Rule 012 are met.¹⁷¹ Mr. Rob Istchenko, Director of Wind Energy at WSP Canada Inc., was retained to prepare a report on shadow flicker and testified at the hearing.

217. In this section of the decision, the Commission provides an overview of the evidence provided by each of these experts. The Commission's findings follow that overview.

8.2 The GBCPG's evidence on health effects

218. The GBCPG submitted health concerns related to pre-existing medical conditions and the effects the proposed wind farm may have on those conditions. The group members also expressed concerns with shadow flicker and noise. More specifically, Marilyn Demas was concerned about the effect that the proposed wind turbines would have on her headaches and migraines and those of her son. She explained that the migraine symptoms get worse when she lacks sleep. As a result, she was concerned about the effect of the proposed wind turbines on her sleep and quality of life and that of her family.¹⁷² Laura Tapley stated that she has pre-existing medical conditions and experiences sleep disturbance and chronic pain among other symptoms.

¹⁷⁰ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF pages 5 and 6.

¹⁷¹ Exhibit 3329-X0115, ECRC Reply Evidence_Appendix F_Part 1_Expert Report and Curriculum Vitae of Christopher Ollson, PDF page 9.

¹⁷² Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 3.

Ms. Tapley was concerned that the noise from the wind turbines would result in greater sleep disturbance which could lead to increased levels of pain and fatigue.¹⁷³

219. The GBCPG contended that noise and infrasound from the proposed wind farm would cause adverse health impacts to nearby residents. In support of its position, the GBCPG referred to the Brown County Board of Health decision that the Shirley Wind Farm was a human health hazard.¹⁷⁴ It also cited the Cape Bridgewater study that concluded that sensations reported by homeowners were linked to infrasound from the Cape Bridgewater wind turbines.¹⁷⁵

220. The members of the GBCPG disagreed with the applicant's position that, compliance with Rule 012 would be sufficiently protective of nearby residents and that if the dBC minus dBA value did not indicate a problem with low frequency noise, then low frequency noise, including infrasound, was not an issue.¹⁷⁶ The GBCPG argued that Rule 012 is only applicable to audible noise and does not address infrasound because infrasound does not attenuate in the same manner as audible noise. Further, infrasound creates a sensation in the human body that is felt rather than heard.¹⁷⁷ The GBCPG contended that around the world residents in areas that comply with A-weighted, C-weighted, and G-weighted limits suffer from sleep disturbance.¹⁷⁸

221. The GBCPG retained Dr. Nissenbaum to prepare an expert report on the adverse health effects of wind turbines. The main focus of Dr. Nissenbaum's report and testimony was the Mars Hill and Vinalhaven wind farm study. He explained that he was one of the authors of the study on the Mars Hill and Vinalhaven wind farms in Maine. This study involved 38 individuals, out of a total of 65, who lived within 1,500 metres of the wind turbines in these wind farms. The study had two components. The first component consisted of the following questionnaires: the Pittsburgh Sleep Quality Index, the Epworth Sleepiness Scale, the SF-36 version 2, Mental Health summary and physical component summary. The second component was a functional inquiry into the individual's health, the symptoms they were experiencing, whether they were taking any new medications or had new prescriptions, before and after the wind farms were erected. He pointed to the graphic representations in the study that showed that the farther away one gets from wind turbines, the better are the Epworth Sleepiness Scale scores, the Pittsburgh Sleep Quality Index scores, and the SF-36 mental health scores. He added that the study did not find a relationship with the physical component scores of the SF-36. He testified that the study found that the closer a person lives to the wind turbines, the more likely the person is to have sleep problems and poorer mental health and quality of life.¹⁷⁹ The study did not take sound measurements at the residences of the individuals involved in the study, but included some

¹⁷³ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 37.

¹⁷⁴ The Brown County Board of Health declared the Shirley Wind Project a human health hazard for all people who are exposed to infrasound and low frequency noise and other emissions potentially harmful to human health after the receiving complaints for area residents and conducting a noise study. A record of the proceedings of the Board of Health meeting that declared the Shirley Wind Project a human health hazard is located in Exhibit 3329-X0087, D - Exhibit 3a-w - Documents Wind Turbine Infrasound and Adverse Health Effects, PDF page 58.

¹⁷⁵ The Cape Bridgewater Report was a study conducted by Mr. Steven Cooper, an expert retained by the GBCPG. The report is also referred to in Section 7, Noise in this decision and was registered as Exhibit 3329-X0049, and exhibits 3329-X0164 to 3329-X0168.

¹⁷⁶ Transcript, Volume 10, page 2110, lines 9 to 20.

¹⁷⁷ Transcript, Volume 10, pages 2112 to 2113, lines 12 to 25, 1.

¹⁷⁸ Transcript, Volume 10, page 2115, lines 3 to 8.

¹⁷⁹ Transcript, Volume 6, pages 1180 to 1181, lines 4 to 25, 1 to 19.

publicly available sound measurements as a point of interest because distance seemed a more reliable indicator than sound measurements and that for any given turbine size the sound profile is going to be quite similar.

222. He was of the opinion that this study was applicable to the proposed wind farm. He stated that the topography of the area was similar to the town of Vinalhaven, but the wind turbines from the Maine studies were smaller than the wind turbines in this project. The study concluded that the dose-response (distance-effect) relationship seen at Mars Hill and Vinalhaven is strong evidence of a causal relationship between wind turbine noise and ill health when other factors that may also vary with distance are controlled for.¹⁸⁰ Dr. Nissenbaum stated that there was a high probability of significant adverse health effects for residents within 1,400 metres of the proposed wind turbines including:

- Sleep disturbances/sleep deprivation and the multiple illnesses that cascade from chronic sleep disturbance. These include cardiovascular diseases mediated by chronically increased levels of stress hormones, weight changes, and metabolic disturbances, including the continuum of impaired glucose tolerance up to diabetes.
- Psychological stresses, which can result in additional effects including cardiovascular disease, chronic depression, anger, and other psychiatric symptomatology.
- Increased headaches.
- Auditory and vestibular system disturbances.
- Increased requirement for and use of prescription medication.¹⁸¹

223. The Mars Hill and Vinalhaven study recommended a safety margin be built in and that the setback distances of the proposed wind farms based on pre-construction sound modelling were too close for the protection of the human population.¹⁸²

224. Dr. Nissenbaum was of the opinion that wind turbines sited too close to dwellings would result in chronic sleep disturbance which in turn would result in a host of adverse symptoms and over time, illness. Symptoms would include headaches, changes in weight, psychiatric symptoms, cognitive dysfunction, and possible increases in blood pressure.¹⁸³ Dr. Nissenbaum testified that sleep disturbance results in adverse health effects such as atrophy to areas of the brain, measurable effects upon gene expression affecting the immune system, and impaired learning and development in children.¹⁸⁴ Dr. Nissenbaum cited a number of studies in support of these adverse health effects. He testified that one study cited in his report showed that the brain was able to process sound coming in at an 8-Hz frequency. However, he confirmed that these studies did not relate to persons living near wind farms.¹⁸⁵ He further acknowledged in his

¹⁸⁰ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 5.

¹⁸¹ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 6.

¹⁸² Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 6 .

¹⁸³ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 12.

¹⁸⁴ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 7.

¹⁸⁵ Transcript, Volume 6, page 1423, lines 10 to 20.

testimony that the studies cited showed a correlation between sleep disturbance and brain atrophy but that it was not proof of causality.

225. In addition to the Mars Hill and Vinalhaven study, Dr. Nissenbaum cited a 2009 report by Dr. Eja Pedersen that stated residents living near wind projects creating sufficient noise will deprive these residents of health-related quality of life. Dr. Pedersen's report also stated noise from wind farms was more annoying than the same level of sound from other sources, which may be due to the amplitude modulation of audible sounds that is pulsating in nature, and a dominance of dynamically modulated infrasonic and lower frequency acoustic energy.¹⁸⁶

226. Dr. Nissenbaum testified that the word "annoyance" in relation to effects of wind farms has been interpreted in two ways. One is the colloquial North American significance of annoyance as meaning something that is minor and inconsequential, unless it falls in the realm of the so-called highly annoyed. The other is the meaning ascribed to annoyance chiefly in the Pedersen studies and in the World Health Organization documents, where annoyance is considered a basket of adverse effects which include stress and sleep disturbances, as well as more purely psychological or psychiatric responses.¹⁸⁷ In his report, Dr. Nissenbaum opined that in the latter case, the word "annoyance" is used for convenience to refer to the basket of adverse health effects.¹⁸⁸

227. Dr. Nissenbaum concluded that:

[s]leep disruption, when it occurs either as a response to IWT [wind farm] noise, or as a manifestation of annoyance (the distinction is unclear, and medically irrelevant) carries the same downstream adverse physiological consequences. The nature of IWT [wind farm] noise makes it particularly toxic at lower sound pressure levels compared to other sources of community noise – it is constant, it is more pronounced at night, it has many low frequency components that make it pervasive and penetrative into dwellings, and which have limbic effects on the primitive brain. It has periodic amplitude modulation that may engage the speech center of the brain. There are a significant minority of people who hear it within 1500m, or experience it, do not appear to habituate to it, and are adversely affected.¹⁸⁹

228. Dr. Nissenbaum further concluded in relation to infrasound and Rule 012 that:

The best intentions of the AUC and of the developer cannot guarantee that adverse effects will not occur. Preconstruction sound modelling has failed to predict noise levels accurately in many projects, and furthermore was designed to ensure compliance with regulations (in this case Rule 012) insufficient to the task of protecting people from noise that is highly modulated in an impulsive fashion, inclusive of lower frequencies, persistent over very lengthy periods of time, and to which people do not appear to habituate."¹⁹⁰

¹⁸⁶ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 16.

¹⁸⁷ Transcript, Volume 6, Pages 1177 to 1178, Lines 14 to 25, 1 to 9.

¹⁸⁸ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 30.

¹⁸⁹ Exhibit 3329-X0051, H – Dr. Michael Nissenbaum Report, PDF page 31.

¹⁹⁰ Exhibit 3329-X0051, H – Dr. Michael Nissenbaum Report, PDF page 32.

229. Dr. Nissenbaum criticized the Health Canada Study¹⁹¹ because it excluded children which form about 20 per cent in average rural communities, as well as the elderly, which comprise about 15 per cent of rural populations. He was also critical of the study because it made no effort to track down the individuals who had lived in the 434 homes that were abandoned, vacant or demolished. Also, the study did not indicate the distance of the wind turbines from these homes, other than stating that the distribution of these homes was uniform. He was of the view that this study should have qualified its conclusions by indicating these exclusions. Dr. Nissenbaum also noted that the wind turbines studied were of differing sizes as were the distances.¹⁹² He pointed to the statement of the authors of the Health Canada Study that the current study findings should not be generalized to other areas because the locations of the study were not randomly selected.

230. Although he had criticisms of the study, Dr. Nissenbaum pointed to the fact that wind turbine annoyance was also found to be statistically related to measured hair cortisol, systolic and diastolic blood pressure. Also, annoyance was correlated with the distance of the wind turbines. He stated that this information was not included in the published study which was a deficiency in the published study because he considered this a highly significant finding.¹⁹³

231. Dr. Nissenbaum was also critical of Dr. Ollson's interpretation that annoyance is not in and of itself a health effect and of the studies cited in support of this interpretation. Further, he responded to criticisms of the Mars Hill and Vinalhaven study.¹⁹⁴

232. In argument, the GBCPG reiterated the limitations and criticisms raised by Dr. Nissenbaum regarding the Health Canada Study and Michaud et al. 2016,¹⁹⁵ which concluded that there are no health effects from wind turbine noise at levels of up to 46 dBA.¹⁹⁶ Although it took issue with the study, the GBCPG noted that the Health Canada Study did find a statistically significant increase in annoyance with wind turbine noise, when noise levels exceeded 35 dBA. Also, wind turbine noise annoyance was statistically related to several self-reported health effects, including blood pressure, migraines, tinnitus, dizziness, scores on the Pittsburgh Sleep Quality Index, and perceived stress, and statistically related to measured hair cortisol, systolic and diastolic blood pressure.¹⁹⁷ It submitted that the Health Canada Study supports the GBCPG's position that a precautionary approach should be taken when considering the application.

233. Various members of the GBCPG mentioned shadow flicker as a concern, stating that they had read it made people feel ill.¹⁹⁸ Laura Tapley submitted that, while the shadow flicker would not be present daily or all year, it would force her to abandon her east deck in the mornings of the spring months and would force her to install blinds on her east kitchen window.¹⁹⁹ Should the project be approved, the GBCPG requested that E.ON be required to work with local residents

¹⁹¹ See footnote 31.

¹⁹² Transcript, Volume 6, pages 1192 to 1200.

¹⁹³ Transcript, Volume 6, pages 1198 to 1199.

¹⁹⁴ Transcript, Volume 6, pages 1203 to 1225.

¹⁹⁵ See footnote 31.

¹⁹⁶ Transcript, Volume 10, page 2119, lines 22 to 25 and pages 2123 to 2124.

¹⁹⁷ Exhibit 3329-X0116, ECRC Reply Evidence_Appendix F_Part 2_Appendices B-N to the Expert Report of Dr.Christopher Ollson, Appendix L, PDF pages 151 to 155; Transcript, Volume 10, pages 2125 to 2126.

¹⁹⁸ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 25.

¹⁹⁹ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 37.

on shadow flicker post-construction monitoring and mitigation.²⁰⁰ No expert evidence was provided by the interveners on this issue.

8.3 E.ON's evidence on health effects

234. E.ON retained Dr. Christopher Ollson to prepare health information for stakeholders and to provide expert evidence regarding the potential effects of the project on human health. Dr. Ollson was of the opinion that the project would not adversely affect the health of the members of the GBCPG or other residents living in proximity to the project. He explained that, notwithstanding the views of the experts retained by the GBCPG, the weight of the scientific and medical evidence confirms that the 40 dBA L_{eq} nighttime cumulative noise limit prescribed by Rule 012 is protective of health.²⁰¹ This conclusion was based on his review of peer-reviewed scientific literature, non-peer-reviewed literature, and government agency reports, most recently the Health Canada Study. The Health Canada Study and associated publications²⁰² conclude that there is no evidence of an association between exposure to wind turbine noise and the prevalence of self-reported or measured health effects, beyond annoyance, at wind turbine noise levels of up to 46 dBA.

235. Dr. Ollson stated that this Health Canada Study is the most comprehensive of its kind. It is the first study to introduce objective measurements of sleep disturbance in addition to the typical self-reported questionnaires. Dr. Ollson submitted that given the breadth of the study, the number of participants and that it is consistent with past credible peer-reviewed studies on whether living in proximity to wind turbines impacts sleep, this study is a critical one. It refutes the findings of the GBCPG's expert and supports the use of Rule 012 in properly siting wind turbines from homes to ensure that sleep is not affected.²⁰³

236. E.ON disagreed with the GBCPG's criticism of the Health Canada Study that it excluded vacant homes from the study. E.ON testified that the vacancy rates reflect the norm throughout Canada, including this project area.²⁰⁴

237. Dr. Ollson disputed the GBCPG's claim that annoyance was a health effect because it is not recognized by the World Health Organization or other health organizations as a medical disease.²⁰⁵

238. Dr. Ollson agreed that infrasound could lead to health impacts; however, it would only pose a potential threat to health if persons are exposed to a high enough dose, such as 130 dBG.²⁰⁶ He pointed to the Turnbull studies which had measurements in the low 70 dBG at 100 metres from the turbines. He added that even at 85 metres from the wind turbines at the Clemens Gap Wind Farm in Australia, the highest level measured was 72 dBG, at 185 metres it dropped to 67 dBG, and at 360 metres, it dropped to 61 dBG. Similar measurements were found

²⁰⁰ Transcript, Volume 10, pages 2178 to 2179, lines 22 to 25, 1.

²⁰¹ Exhibit 3329-X0112, ECRC Reply Evidence Submission_with Appendices A, B, C, PDF page 8.

²⁰² See footnote 31.

²⁰³ Exhibit 3329-X0115, ECRC Reply Evidence_Appendix F_Part 1_Expert Report and Curriculum Vitae of Christopher Ollson, PDF page 14.

²⁰⁴ Transcript, Volume 10, page 2081, lines 4 to 15.

²⁰⁵ Exhibit 3329-X0115, ECRC Reply Evidence_Appendix F_Part 1_Expert Report and Curriculum Vitae of Christopher Ollson, PDF page 24.

²⁰⁶ Transcript, Volume 4, pages 862 to 863, lines 23 to 25, 1-3.

at the Cape Bridgewater Wind Farm: at 200 metres it was 63 dBG. Dr. Ollson added that given the measurements collected over the years and the distance of 674 metres of the nearest residence to a wind turbine in the proposed wind farm, that proper siting of wind turbines in accordance with noise guidelines such as Rule 012, would not expose people to levels of infrasound sufficient to induce adverse health effects.²⁰⁷

239. In argument, E.ON contended that the Dr. Nissenbaum's study in Maine is not applicable to this project since the noise levels in that study exceeded the permissible sound level requirements outlined in Rule 012.²⁰⁸ The measured noise levels in those locations averaged above 50 dBA and peaked at 61 dBA, well above the 40 dBA nighttime limit in Rule 012.²⁰⁹ E.ON noted that those measurements were taken when the turbines were operating at reduced power; therefore, the actual noise levels that the residents were subjected to might have been even higher. E.ON also argued the Epworth Sleepiness Scale scores for the residences exposed to average noise levels below 41 dBA (comparable to the Rule 012 permissible sound level), were lower than the average of the far group.²¹⁰ E.ON argued that Dr. Nissenbaum's report and conclusions should not be accepted because of the flaws in his study. E.ON also submitted that Dr. Nissenbaum is a radiologist and should not be qualified to give opinion on health effects associated with wind turbines and noise. In support of this argument, E.ON pointed to the rulings in the following decisions: *Fohr v Ontario (Ministry of Environment and Climate Change)*, *McKinnon v Martin* and *Dingeldein v Ontario*.²¹¹ Similarly, the Shirley Wind Farm study would not have been in compliance with Rule 012 and that complaints about wind farms around the world are not helpful or instructive in this proceeding because there is no way of knowing whether the circumstances that might have been at play are analogous to Alberta-based wind farm projects. Noise limits in other jurisdictions are not the same as in Alberta.²¹²

240. Further, E.ON contended that the Cape Bridgewater study is not applicable to this project because it is not a health study.²¹³ The ambient noise levels at certain receptors also exceeded 50 dBA because the permitted sound level for the wind turbines was set at 40 dBA or background, plus 5 dBA, whichever is greater. This is higher than the permissible sound level of Rule 012.²¹⁴ E.ON argued that Cape Bridgewater study also contains methodological errors and flaws such as a lack of a control group and lack of standardized reporting.²¹⁵ Regardless, the majority of the reports of sensations at level two or higher, which indicate some type of impact to the individual, were associated with sound that was audible.²¹⁶

241. E.ON conducted a shadow flicker study to address the concerns of the GBCPG. The report indicated that Alberta did not have provincial standards stipulating an acceptable limit of shadow flicker at a receptor and that the exposure to shadow flicker is minimal whether on an

²⁰⁷ Exhibit 3329-X0112, ECRC Reply Evidence Submission_with Appendices A, B, C, PDF page 9; Transcript, Volume 4, pages 862 to 865.

²⁰⁸ Transcript, Volume 10, page 2058, lines 9 to 18.

²⁰⁹ Exhibit 3329-X0052, I - Nissenbaum et al - Effects of industrial wind turbine noise on sleep and health, PDF page 3.

²¹⁰ Transcript, Volume 10, page 2060, lines 10 to 20.

²¹¹ Transcript, Volume 10, pages 2063 to 2064, lines 23 to 25, 1 to 20.

²¹² Transcript, Volume 10, pages 2223 to 2224, lines 16 to 25, 1 to 8.

²¹³ Transcript, Volume 10, page 2071, lines 3 to 6.

²¹⁴ Transcript, Volume 10, page 2065, lines 20 to 25.

²¹⁵ Transcript, Volume 10, page 2066, lines 13 to 21.

²¹⁶ Transcript, Volume 10, pages 2072 to 2073, lines 20 to 25, 1 to 3.

annual or maximum daily basis at any of the receptors. E.ON stated that if concerns with shadow flicker were raised, it would work with the affected landowners to see how the issue could be resolved.²¹⁷ E.ON provided information to the stakeholders that the main health concern associated with shadow flicker is the risk of seizures in people with photosensitive epilepsy; however, the rotation rate of the proposed wind turbine was much too slow to trigger such seizures.²¹⁸

8.4 Commission findings

242. In this section, the Commission considers whether operation of the project may cause adverse health effects for nearby residents, including those with pre-existing medical conditions, children and the elderly. Two expert witnesses filed reports and testified on this topic in the proceeding.

243. The GBCPG's health concerns about the project related to various symptoms that have been reported by some people living near wind turbines, including chronic sleep disturbance which in turn would result in a host of adverse symptoms and over time, illness. Symptoms would include headaches, changes in weight, psychiatric symptoms, cognitive dysfunction, and possible increases in blood pressure. Those symptoms have been attributed to the audible and inaudible noise (low frequency noise and infrasound) produced by wind turbines and to the stress or annoyance arising from living in the proximity to wind turbines.

244. E.ON submitted that if the project adheres to the nighttime permissible sound levels set out in Rule 012, the proposed wind farm would not affect the health of nearby residents. E.ON acknowledged that the proposed wind farm may cause annoyance, but that annoyance is not a health impact. E.ON referenced the Health Canada Study as support for its position that noise below a threshold level of 46 dBA would not lead to adverse health effects.

245. Before providing its conclusions on the substantive issues, the Commission must first address the issue of witness objectivity and the weight that should be accorded to the evidence of the two health experts that participated in the proceeding.

8.4.1 Findings on expert objectivity and weight

246. The Commission finds that Dr. Ollson provided evidence that was consistent with his expertise and in a relatively objective manner. Dr. Ollson demonstrated considerable knowledge of the wind turbine, health-related issues raised in the hearing and demonstrated some flexibility in the views and positions that he presented to the Commission. The Commission found this witness to be credible and his evidence to be useful.

247. The Commission accepts Dr. Nissenbaum as an expert in radiology. The Commission acknowledges that Dr. Nissenbaum was one of the authors of the Mars Hill and Vinalhaven study which considered potential health effects of wind farms and that he has some specialized knowledge about studies on potential adverse health effects from noise. The Commission is of the view that Dr. Nissenbaum provided evidence that was not always within his expertise. He attempted to apply the Mars Hill and Vinalhaven study to the proposed project without giving

²¹⁷ Transcript. Volume 10, page 2233, lines 14 to 18.

²¹⁸ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 313.

due consideration to the specifics of the proposed wind farm project and the requirements of Rule 012. Further, Dr. Nissenbaum presented potential health risks of noise from other studies that were not related to noise from wind farms. Moreover, the causal connection between the noise levels predicted at the proposed wind farm and the adverse health impacts claimed by Dr. Nissenbaum were not supported by the preponderance of other health studies referred to in this proceeding. For these reasons, the Commission finds it can give little weight to Dr. Nissenbaum's specific conclusions regarding the project's health effects on nearby residents.

8.4.2 Health effects from audible wind turbine noise

248. The evidence before the Commission was that audible noise from wind turbines at a certain sound level and distance from a residence can be associated with sleep disturbance and annoyance, both of which can lead to other health effects including those symptoms described above.

249. The experts agreed that audible wind turbine noise can result in sleep disturbance, but disagreed about the sound level and distance at which such disturbance may occur. If the project is approved, E.ON must comply with Rule 012, which dictates that the cumulative noise at nearby receptors cannot exceed the nighttime permissible sound level of 40 dBA L_{eq} . The parties disagreed about whether compliance with this sound level would protect the health of nearby residents.

250. The applicant's witness submitted that, if cumulative noise, including wind turbine contributions at nearby receptors was less than 40 dBA L_{eq} , the sleep and health of nearby residents would not be affected. The applicant submitted that the project's 40 dBA L_{eq} was consistent with the Health Canada Study results, and the World Health Organization 2009 guidelines, and would be protective of human health for nearby residents.

251. The GBCPG submitted that sleep disturbance and health effects caused by audible wind turbine noise can occur at levels below 40 dBA due to amplitude modulation and referenced Dr. Nissenbaum's evidence in support of this position. Dr. Nissenbaum submitted that he did not believe that Rule 012 was protective of health because pre-construction sound modelling has failed to predict noise levels accurately in many projects. He added that pre-construction sound modelling was insufficient to the task of protecting people from noise that is highly modulated in an impulsive fashion, inclusive of lower frequencies, persistent over very lengthy periods of time, and to which people do not appear to habituate.²¹⁹

252. The Commission notes that, in the Mars Hill and Vinalhaven study, the noise levels exceeded the permissible sound levels allowed in Rule 012 and are not comparable to the proposed project. The Commission also observes that the higher rates of reported sleep disturbance are associated with noise levels above the 40 dBA level. The Commission does not find the GBCPG's evidence to be compelling that wind turbine noise below 40 dBA will cause sleep disturbance or health effects. Dr. Nissenbaum opined that residents near the proposed wind farm can be expected to experience, at the least, similar adverse effects at similar proportions at similar distances to those that occurred in Maine within 1,400 metres of smaller 1.5-MW wind turbines. In his view, there was a high probability of adverse health effects, including annoyance,

²¹⁹ Exhibit 3329-X0051, H - Dr Michael Nissenbaum Report, PDF page 32.

chronic sleep disturbance, and all their potentially serious downstream health consequences in a significant minority of the families living in close proximity to the wind turbines of the proposed wind farm.²²⁰

253. Based on the following reasons, the Commission finds that Dr. Nissenbaum's evidence that wind turbine noise below 40 dBA will cause sleep disturbance or health effects is not compelling because it is solely based on the Mars Hill and Vinalhaven study. It does not reflect a reasonable interpretation of the available scientific evidence.

254. The Mars Hill and Vinalhaven study showed empirically an association of distance from the turbines with self-reported sleep disturbances, and with a diminished score in the mental health section of a quality of life index, and a few other incidental findings. It did not demonstrate any illnesses in relationship to distance from turbines or estimated noise levels. It did not demonstrate increased headaches or auditory or vestibular system disturbances. It did show a small increased use of prescription medication for sleep ($P=0.5$) and for psychotropic medications ($P=0.06$), but those effects were not statistically significant.

255. The Commission considers that the study's use of noise data from publically available records and from a single day of measurements is not a sufficient basis for drawing conclusions about a dose-response relationship for wind turbine noise. The Commission notes that there were very few sites identified in the study with levels in the 30 to 40 dBA range. Most of the predicted and measured noise levels for the individuals that lived between 375 metres and 1,400 metres appear to have been in excess of 40 dBA, especially when the range of predicted or measured wind turbine noise is considered rather than the average.

256. In addition, the Commission considers that an expert opinion on the likelihood of adverse health effects in regard to the proposed wind farm in Alberta should be based on all available evidence, including the Mars Hill and Vinalhaven study, but not based only on this study. In presenting his conclusions Dr. Nissenbaum should have considered European studies and the Health Canada Study which are all much larger and have considerable methodological strengths in comparison to the Mars Hill and Vinalhaven study.

257. Although presented in great detail, the sleep studies referred to by Dr. Nissenbaum are not helpful to the Commission because he did not assess the validity of the study results, and even more importantly, whether the study is applicable to a general population, and the type of exposure relevant to this proceeding. In addition, Dr. Nissenbaum did not provide an analysis of the studies cited in relation to other studies on the same topic to determine whether they give supporting or perhaps contradictory evidence.

258. Further, the Commission had before it and heard testimony on the Health Canada Study. Preliminary research findings were released on the Health Canada website in 2014, presented at a conference in 2015 (Michaud 2015), and appeared in a peer-reviewed publication on quality of life in 2015 (Feder et al. 2015), and on sleep in January 2016 (Michaud et al. 2016). The Commission notes that the Health Canada Study involved a survey conducted in areas of south-western Ontario and in Prince Edward Island relating to 315 and 84 wind turbines respectively, with sizes up to three MW. The survey sample was drawn from all identified dwellings within

²²⁰ *Ibid.*

approximately 600 metres from the turbine, and a random sample of dwellings between 600 metres and 11.22 kilometres. A list of all adults aged 18 to 79 living in these dwellings was compiled, and one adult per household randomly selected, with no substitutions. Selected individuals were approached for an in-person interview between May and September 2013 and the study involved 16 interviewers.

259. The overall response rate was 79 per cent, which is high for a study of this nature, giving a sample of 1,238 individuals, 606 males and 632 females. Self-reported sleep quality over the past 30 days was assessed using the Pittsburgh Sleep Quality Index. Additional questions assessed the prevalence of diagnosed sleep disorders and the magnitude of sleep disturbance over the previous year. A unique feature of this study, compared to all other community studies of sleep in regard to wind farms, was that subjects were asked to wear an Actiwatch2 wrist watch during all hours of the day and night from the seven days following the interviews. This provided objective measures for sleep latency, sleep efficiency, total sleep time, rate of awakening bouts, and wake duration after sleep onset. Of the 1,238 subjects, 1,208 (98 per cent) completed the Pittsburgh Sleep Quality Index assessment, and 781 (63 per cent) completed the sleep actigraphy part of the study.

260. Outdoor noise levels from turbines were calculated following international standards for conditions that typically approximate the highest long-term average levels at each dwelling, by both ISO 9613-133 and ISO 9613-234 as incorporated in commercial software. The resulting calculations represent long-term (one year) A-weighted equivalent continuous outdoor sound pressure levels (LA_{eq}). Outdoor noise levels reached 46 dBA with an arithmetic mean of 35.6 dBA. Thus, in comparison with other published studies, this study was very large, with a high response rate, and in addition to self-reported measures of sleep similar to those used in earlier studies, added objective measurements of sleep.

261. The Health Canada Study and associated publications concluded that self-reported and objectively measured sleep outcomes consistently revealed no apparent pattern or statistically significant relationship to noise levels. The results shown relate to five categories of wind turbine noise, from less than 25 dB up to a maximum category of 40 to 46 dB, with 234 subjects in this maximum category. The frequency of self-reported sleep disturbance did not vary between the noise categories. The use of sleep medication at least once a week was in fact higher in the two lowest noise categories than in others. The overall average Pittsburgh Sleep Quality Index score was 5.94, and showed no variation with noise category, being 6.09 in the maximum noise category and 6.22 in the minimum. Nor was any association seen when the scores were divided into poor and good sleep categories. Further analyses by multivariate methods, and analyses of the sleep actigraphy data, also showed no associations between measures of sleep disturbance and noise exposures.

262. Amongst those with a sleep disturbance, questions were asked as to its source, and the wind turbine was reported as the source in the 15 per cent and 22 per cent of subjects in the 35 to 40 and 40 to 46 dB noise categories, compared to less than two per cent in the lower noise categories. Sleep was significantly influenced by other factors, including, but not limited to, the use of sleep medication, other health conditions (including sleep disorders), and caffeine consumption. Sleep was also significantly associated with reported annoyance. Three issues were raised relating to wind turbines: having a complaint about wind turbines, having personal benefits from wind turbines, and having annoyance with the blinking lights placed on the

turbines. Of these, only the annoyance with blinking lights case was statistically significant in relation to changes in total sleep time and numbers of awakening bouts as recorded by actigraphy. Other questions asked about annoyance more generally showed no associations and were not included in the multivariate analysis.

263. In summary, the Health Canada Study and associated publications concluded that self-reported diagnosed sleep disorders, and reporting high sleep disturbance for any reason, were unrelated to wind turbine noise; sleep assessed by the Pittsburgh Sleep Quality Index score was unrelated to wind turbine noise; and as measured by wristwatch actigraphy, sleep latency, sleep efficiency, the rate of awakening bouts, and total sleep time were all unrelated to noise exposures. The study results do not support an association between exposure to outdoor wind turbine noise up to 46 dBA and an increase in the prevalence of disturbed sleep.

264. In addition, the Health Canada Study assessed the quality of life in relationship to the noise exposures in the same participants. The World Health Organization instrument QOL-BREF was used. This is a 26-item questionnaire which has been extensively tested. It consists of four domains, physical health, psychological, social relationships, and environment, in addition to two questions to assess self-rated quality of life and satisfaction with health. Assessment of these four domains and two overall questions showed that none of them were associated with wind turbine noise levels. Some other questions about wind turbines did show some associations. Participants who reported high visual annoyance towards wind turbines showed lower scores on both the physical and environment domains; while those reporting personal benefit from turbines had higher scores on the physical domain. An irregular association was found with hearing wind turbines over time, with those reporting hearing them for less than one year, compared with not at all or greater than one year, having higher scores on the psychological dimension. The Health Canada Study concluded that, collectively, results do not support an association between exposures to wind turbine noise up to 46 dBA and quality of life assessed using the World Health Organization QOL-BREF questionnaire.

265. The Commission notes that the Health Canada Study states that results may not be generalized to areas beyond the sample as the wind turbine locations in this study were not randomly selected from all possible sites operating in Canada, that the results do not permit any conclusions about causality and should be considered in the context of all published peer-reviewed literature. Dr. Ollson commented that this caution is given so that the study should not be used to advance the position that the same results will occur in all conditions and in all areas.²²¹

266. The Commission considers that such limitations may be overly cautious because such limitations would apply to all existing studies on wind turbines and health. The essential issue in these studies is whether the associations between wind farm exposures and health can be generalized. The Health Canada Study is a large and well-designed study and results of the study along with appropriate considerations and comparison to other evidence, can lead to conclusions about causality.

267. The Commission finds credible Dr. Ollson's expert opinion that the proposed wind farm, as long as it is in compliance with Rule 012, will not adversely impact the health of residents and

²²¹ Transcript, Volume 4, page 880, lines 14 to 24.

communities living in proximity to the project. This opinion is based on an extensive review of studies, which examine the relationship between wind turbines and possible human health effects, including the Health Canada Study and several European studies. He also cited the World Health Organization Night Noise Guidelines for Europe (World Health Organization (WHO) 2009) as an authoritative source.

268. In addition, the Commission observes that the 40 dBA L_{eq} nighttime permissible sound level in Rule 012 is in keeping with World Health Organization Night Noise Guidelines for Europe (World Health Organization (WHO) 2009). In addition, the Commission took note of the findings of the Australian National Health and Medical Research Council 2015 study which concluded that noise exposure at the levels of up to 40 dBA, would not likely lead to increases in serious disease.

269. In addition, it is noteworthy that the Alberta noise limits are based on cumulative noise rather than project-only contribution.

270. Based on the above, the Commission finds that there is no persuasive evidence that the proposed wind farm which is required to meet the nighttime permissible sound level of 40 dBA L_{eq} set out in Rule 012 is likely to result in adverse health effects for nearby residents.

8.4.3 Health effects from low frequency noise and infrasound from wind turbines

271. In this section, the Commission must decide if low frequency and infrasound produced by the project, if approved, are likely to result in health effects for nearby residents. The Commission finds, for the reasons that follow, that the evidence filed in this proceeding does not support such a finding.

272. There was much discussion during the hearing about whether the A-weighted scale should be used to measure low frequency noise or infrasound. The Commission is not convinced that the A-weighted scale cannot be used to measure low frequency noise or infrasound for the purposes of Rule 012. Of note is the finding in the Health Canada Study that dBA and dBC levels were very highly correlated.

273. The Commission accepts Dr. Ollson's opinion that the mere presence of measured low frequency noise and infrasound does not indicate a potential threat to health or an inability for people to sleep. This opinion is based on the studies referenced in his report which have measured low frequency sound and infrasound in relation to wind turbines. Dr. Ollson also noted that there are two guidelines for infrasound measured in dBG. These are in Queensland, Australia, where the guideline value is 85 dBG, or 80 dBG for impulsive noise, and in Japan it is 92 dBG at 10 Hz. The measurements given in Table 1 of Dr. Ollson's report shows that all these measurements were below 80 dBG. Dr. Ollson's assertion is that the infrasound in homes near the proposed wind farm would be lower than those set out in the Australian and Japanese guidelines, if the permissible sound level of 40 dBA nighttime is implemented.

274. In the Commission's view, the evidence on the record of this proceeding does not support the GBCPG's and Dr. Nissenbaum's assertion that infrasound or low frequency noise from the project would result in adverse health effects for nearby residents. The Commission finds that the evidence before it supports the conclusion that infrasound from the project is not associated with annoyance or health effects at the expected levels. Further, in accordance with the condition

described above, the applicant will be required to do post-construction monitoring. Should a low frequency noise condition exist, the applicant will be required to mitigate that noise condition.

8.4.4 Stress and annoyance

275. Numerous studies and reports were filed in the proceeding that described the annoyance reported by some people who live near wind turbines. The various studies filed in the proceeding support the position that wind turbine noise is considered by many to be more annoying than other sources at comparable sound levels. However, most studies also recognized that the perceived annoyance can also be related to attitudes about turbines, visual impacts, the setting of the turbines (urban versus rural, hilly versus flat), and the presence or absence of economic benefit.

276. Dr. Ollson cited studies in Canada and the United Kingdom suggesting that annoyance from noise in general will impact a substantial proportion of the population, given as eight per cent and 11 per cent. He also pointed to the Health Canada Study which showed increasing levels of annoyance related to increasing levels of wind turbine noise, with about 10 per cent being highly annoyed at noise levels of 35 to 40 dBA. This is consistent with the European studies cited.

277. The Commission does not accept Dr. Nissenbaum's view that annoyance results in adverse health effects. Although annoyance is an important effect, Dr. Pedersen, in the report cited by Dr. Nissenbaum, stated that "annoyance is a response, rather than an effect". It is not a disease, or a health outcome.

278. Based on the above, the Commission is not persuaded that noise annoyance is in and of itself a health effect.

8.4.5 Shadow flicker

279. One of the issues raised by the GBCPG was the impact of shadow flicker. No reports or additional information was provided by the interveners. The applicant prepared a shadow flicker report²²² and supplemental report²²³ on the newly identified receptors.

280. The Commission finds that the minimal shadow flicker produced by the project and the slow rotation rate of the turbine blades will not result in an increased health risk.

8.4.6 Conclusion

281. The Commission has carefully reviewed the evidence filed in this proceeding regarding the health effects of wind turbines. In the Commission's view, the evidence filed in the proceeding does not support the proposition that the audible, and low frequency noise and infrasound that would be produced by the project would result in health effects for area residents. The Commission recognizes that operation of the project may result in annoyance for some area residents and that the more subjective elements of this annoyance may not be mitigated for all residents. Notwithstanding the potential for annoyance, the Commission is satisfied that adherence to Rule 012 and the project's 40 dBA L_{eq} nighttime permissible sound level will protect nearby residents from sleep disturbance and other health effects related to turbine noise.

²²² Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 317.

²²³ Exhibit 3329-X0120, ECRC Reply Evidence_Appendix H_Shadow Flicker Report Technical Addendum.

9 Safety

9.1 Ice throw, fires and emergency response

282. The GBCPG members expressed safety concerns relating to wind turbines. These are: wind turbines collapsing, throwing off ice, or catching on fire. They were also concerned about the lack of a detailed emergency response plan and response time of emergency responders.

9.1.1 Views of the interveners

283. Some members of the GBCPG voiced concerns with ice throw from the turbine blades and the safety of nearby residents. For example, Kirby and Marilyn Demas stated they spend a lot of time outdoors in the winter sledding, skating, walking and snowshoeing and were concerned for their safety if ice was thrown off the turbines while they were outside.²²⁴

284. In the event of a fire at the proposed wind farm, the GBCPG was concerned about emergency responses because the fire departments in Mannville and Vermillion are small and staffed by volunteers, not readily available, but on call 24/7.²²⁵ The group also had concerns about the ability of the local fire fighters to put out wind turbine fires and prairie fires.²²⁶ The GBCPG also voiced concern that the local responders had not been contacted by E.ON and the response times were unknown.²²⁷

285. Another concern of the GBCPG stemmed from the location of E.ON's control centre, which is in Austin, Texas, because the control centre is the primary point of contact in the event of an emergency. The group added that communication between Alberta and Texas might not be reliable 100 per cent of the time.²²⁸

286. The GBPG had concerns that the emergency response plan was not yet developed. The members of the group have not been able to review a plan, provide feedback, or engage in the development process. The GBCPG stated it should be given the opportunity to review the applicant's emergency response plan once these have been finalized.²²⁹

9.1.2 Views of the applicant

287. E.ON explained that wind turbines are equipped with an automated system for de-icing the blades. It stated that the Nordex wind turbines will detect the change in the vibration as a result of ice forming on the blade, which will trigger an alarm. The alarm signal will be sent to the E.ON control centre, the turbine will shut down and an automated de-icing cycle will be initialized.²³⁰ Typically, the de-icing process will take approximately an hour and consists of the turbine blade being heated and rotated to point towards the ground to allow the ice to fall off. This process is repeated for all the blades. The turbine will not be restarted until the sensors or the site supervisor determines that the blades are free of ice.²³¹

²²⁴ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 3.

²²⁵ Transcript, Volume 10, page 2179, lines 10 to 14.

²²⁶ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 57.

²²⁷ Transcript, Volume 3, pages 521 to 522, lines 17 to 25, 1 to 2.

²²⁸ Transcript, Volume 10, page 2181, lines 12 to 21.

²²⁹ Transcript, Volume 10, page 2181, lines 2 to 7.

²³⁰ Transcript, Volume 3, page 510, lines 17 to 22.

²³¹ Exhibit 3329-X0112, ECRC Reply Evidence Submission with Appendices A, B, C, PDF page 11.

288. E.ON testified that it has experience with ice throw from wind turbines, in that it operates wind farms in climates wherein icing occurs and that ice throw from wind turbines is rare. Also, the setbacks of the wind turbines from residences and roads are more than sufficient to protect the public from the risks of ice throw. E.ON added that it will post signs around the project to warn of the possibility of ice fall from the wind turbines.

289. E.ON testified that fires in wind turbines are very rare and are typically caused by lightning strikes. The wind turbines are equipped with a number of grounding, lightning and surge protection mechanisms to prevent fire.²³² In the event of a fire, E.ON explained the sensors on the turbine would send an alarm to its control centre and the site supervisor would be contacted. The local fire fighters and other emergency responders would be notified and asked to travel to the wind farm to secure the area. The fire fighters would ensure that no person approaches the turbine, prevent the spread of fire on the ground, and allow the wind turbine to burn itself out.²³³ For this reason, local fire fighters would not require any specialized training because they would only deal with the fires on the ground. The site supervisor would travel to the site with a technician crew, who are on-site during business hours and on call after hours seven days a week, to assist the emergency responders.

290. E.ON testified that its control centre in Austin, Texas, monitors the activity of all of its wind farms in North America²³⁴ and would receive an alarm if a wind turbine shuts down in the event of ice buildup or fire. The site supervisor or site representative would also be notified. The control centre is manned 24 hours a day by at least two or three technicians²³⁵ and the on-site operations and maintenance centre will be staffed during regular business hours Monday to Friday.²³⁶ The staff at the Austin control centre are certified by the North Electric Reliability Company and the site supervisors and technicians go through a training program run by the Danish Wind Power Academy.²³⁷

291. E.ON acknowledged that a site-specific emergency response plan had not been completed. However, it committed to developing the plan in concert with the local responder organizations. E.ON contended that the local responders, rather than the general public, are the most appropriate persons to contribute to the plan because they have the knowledge and expertise. Also, they will be implementing the plan.²³⁸ The public notification of evacuation and safety procedures would be left up to the local responders because there may be security and privacy concerns.²³⁹ E.ON further testified that the emergency response plan would be completed, prior to the energization of the site.²⁴⁰ E.ON added that the local responders would participate in annual exercises on the proposed wind farm site as part of their training.²⁴¹ These annual exercises would simulate situations such as fires, medical emergencies, and

²³² Exhibit 3329-X0112, ECRC Reply Evidence Submission with Appendices A, B, C, PDF page 11.

²³³ Transcript, Volume 3, page 515, lines 8 to 17.

²³⁴ Transcript, Volume 3, pages 516 to 517, lines 22 to 25, 1 to 3.

²³⁵ Transcript, Volume 3, page 515, lines 22 to 25.

²³⁶ Transcript, Volume 3, page 514, lines 16 to 24.

²³⁷ Transcript, Volume 3, page 563, lines 11 to 15.

²³⁸ Transcript, Volume 10, page 2234, lines 15 to 20.

²³⁹ Transcript, Volume 10, page 2234, lines 21 to 25.

²⁴⁰ Transcript, Volume 3, page 523, lines 7 to 10.

²⁴¹ Transcript, Volume 3, page 522, lines 15 to 17.

environmental emergencies. E.ON submitted that, while it has committed to complete a site-specific emergency response plan, it is not a regulatory requirement in this instance.²⁴²

9.1.3 Commission findings

292. The Commission notes that the proposed wind turbines have automated systems to monitor and shut down the wind turbine in the event of icing of the turbine blades to prevent ice throw from the blades. Of particular note is that a blade that has ice buildup will be pointed to the ground so that the ice, which has not melted, will fall around the wind turbine. Also, an alarm will be triggered at E.ON's control centre and its site supervisor will be contacted. The turbine will not restart until it has been confirmed by the automatic sensors on a wind turbine or the site supervisor that the turbine is ice-free. In addition, the setbacks of the wind turbines from residences and roads and the posting of signs around the proposed wind farm site are protective of the public from the risks of ice throw. The Commission is satisfied that the implementation of the described monitoring and safety measures, mitigate the possible risks of ice throw events from wind turbines.

293. In the event of fire, the Commission accepts the applicant's commitment that it will have an emergency response plan in place, prior to the energization of the proposed wind farm. Although E.ON's control centre is situated in Austin, Texas, the automated system will monitor the wind farm, but more importantly there will be trained personnel on-site during business hours and on call after hours. The Commission observes that the applicant will have a system in place to notify the local emergency responders and site supervisor in the event of a fire. Also, emergency responders will be asked to control the spread of fire as opposed to combating the fire in the turbine. The Commission finds that the applicant's approach to a potential turbine fire is reasonable.

294. The Commission recognizes the applicant will work with local emergency responders in developing its emergency response plan for the proposed wind farm. The Commission agrees with this approach. However, the GBCPG and other interested nearby residents should be given the opportunity to review the emergency response plan once finalized so that they are aware of the procedures in place in the event of an emergency.

295. For the reasons, the Commission is satisfied that the safety measures proposed by the applicant are protective of public safety.

10 Property impacts

296. The GBCPG raised concerns regarding the potential property impacts that the project may cause. This included impacts to property values, visual impacts, agricultural impacts, land and development.

10.1 Views of the interveners

297. Members of the GBCPG submitted that the project would result in visual impacts due to the size and number of wind turbines. They expressed the concern that the proposed wind farm would ruin the natural setting of the area. They noted the rural and undeveloped nature of the

²⁴² Transcript, Volume 10, pages 2233 to 2234, lines 23 to 25, 1 to 2.

area in which they reside.²⁴³ Some members pointed to their lengthy history in the area and their ties to the land. Fred and June Wyard-Scott stated that the Mannville area and farm site was chosen by Fred's grandfather (Ken's great-grandfather) for its serenity, beauty, and natural setting of the coulee.²⁴⁴

298. The GBCPG also had concerns with the blinking warning lights that would be present on 30 of the 50 turbines. Group members stated the night sky is serene and dark, which would be spoiled by these lights.²⁴⁵

299. While none of the GBCPG members reside on lands containing project facilities, they voiced agricultural concerns such as the spread of noxious weeds such as club root, soil compaction and impacts to aerial spraying. Fred and June Wyard-Scott stated that while they usually ground-spray pesticides and herbicides, they use aerial spraying on occasion. They were concerned that they would no longer be able to use aerial spraying.²⁴⁶ Mr. Wyard-Scott testified that he understood that aerial sprayers could not fly within one mile of a turbine when applying pesticides or herbicides.²⁴⁷

300. The GBCPG expressed concerns that the project would restrict their ability to develop their lands because county restrictions may impact their ability to get a development permit to subdivide a parcel due to the proximity to the wind turbines.²⁴⁸ Robert and Audra Livingstone stated landowners in the area cannot put structures in proximity to the wind turbines because there are restrictions on land and land use. They were concerned that they or their children would not be able to subdivide their lands in the future.²⁴⁹

301. The GBCPG also has concerns about the property values. The interveners stated their land value would go down because no one will want to live around the wind turbines.²⁵⁰ Candice and Michael Obrigewitch submitted that nobody buys acreages so that they can overlook wind towers. People buy an acreage for its natural beauty, its peace and quiet, to enjoy nature's wildlife which helps to relieve daily stress and worries.²⁵¹ Laura Tapley stated that her research showed that property values decline for properties close to wind turbines. However, properties that host a wind turbine usually increase in value because of the financial compensation received from the wind turbine owners. She believes this is the reason that some studies conclude that wind turbines do not affect property sales or prices.²⁵²

302. Candice and Michael Obrigewitch are concerned that the use of their property may be impacted by the wind project. They believe that they would not be able to continue with the 4H livestock program because the program requires that all of their livestock be all natural and free from all additives.²⁵³ Doug and Cheryl Livingstone also expressed concerns about impacts of

²⁴³ Exhibit 3329-X0045, Submissions of the Grizzly Bear Coulee Protection Group, PDF pages 8 to 9.

²⁴⁴ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 57.

²⁴⁵ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 3.

²⁴⁶ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 57.

²⁴⁷ Transcript, Volume 4, page 1018, lines 13 to 17.

²⁴⁸ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 28.

²⁴⁹ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 25.

²⁵⁰ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 31.

²⁵¹ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 33.

²⁵² Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 39.

²⁵³ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF pages 33 to 34.

the project on the business operations of their lodge and retreat centre adjacent to the project, called Red Feather Ridge. They explained that the lodge offers beautiful natural scenery and tranquility, which is the key reason that people visit and use this facility. They testified that the facility is used for wedding receptions, dances and conferences. Mr. Livingstone testified that many of the towers would be visible from Red Feather Ridge.²⁵⁴

303. Ken Wyard-Scott testified that the project has divided the community. Neighbours don't talk to neighbours to avoid conflict because there are people that are in favour of the project and others that are against it.²⁵⁵

10.2 Views of the applicant

304. E.ON acknowledged that a number of landowners, most notably the Red Feather Ridge owners, will have views of the wind turbines, but that visual impact is subjective and the degree to which that constitutes an adverse impact is in the eye of the beholder.²⁵⁶ E.ON pointed out that the area contains a number of pump stations, wells compressor stations, and other oil and gas facilities, which it contended suggests an acceptance of development in the natural area. E.ON added that, although the owners of the Red Feather Ridge expressed concerns about visual impact, they refused an offer from E.ON to take photos from the vantage point of the lodge to prepare photo montages that would have afforded a good simulation of the view.²⁵⁷

305. E.ON testified that the turbine lighting is a requirement of Transport Canada and that E.ON has committed to installing the minimum required number of lights, flash frequency and duration.²⁵⁸ The minimum number of towers requiring lighting is 30 towers, the minimum flash frequency is 20 flashes per minute and the minimum flash cycle duration is 1.5 milliseconds.²⁵⁹

306. With respect to impacts of the project on property values and land use, E.ON contended that these concerns were not supported by evidence in the proceeding. E.ON added that most major studies in the United States did not find evidence that wind turbines decrease property values. E.ON also submitted that in the Bull Creek decision,²⁶⁰ the Commission found that property value was not expected to be an issue and if there are impacts, it would diminish quickly with distance.²⁶¹

307. In relation to agricultural impacts, E.ON argued that no wind turbines or associated infrastructure would be located on any lands owned by GBCPG members; therefore, the project would have no direct agricultural impacts.²⁶² E.ON stated that the requirement to wash equipment to prevent the spread of noxious weeds was more of a concern for the participating landowners, and would be addressed in the environmental protection plan that E.ON has committed to developing.²⁶³ With respect to the concerns over aerial spraying, E.ON submitted that no

²⁵⁴ Transcript, Volume 4, pages 998 to 1000.

²⁵⁵ Transcript, Volume 4, page 1014, lines 4 to 9.

²⁵⁶ Transcript, Volume 10, page 2048, lines 19 to 22.

²⁵⁷ Transcript, Volume 10, page 2049, lines 12 to 18.

²⁵⁸ Transcript, Volume 10, page 2233, lines 7 to 13.

²⁵⁹ Transcript, Volume 2, page 374, lines 1 to 12.

²⁶⁰ Decision 2014-040: 1646658 Alberta Ltd. – Bull Creek Wind Project, Proceeding 1955, Application 1608556, February 20, 2014. Errata issued on March 10, 2014.

²⁶¹ Transcript, Volume 10, pages 2232 to 2233, lines 18 to 25, 1 to 2.

²⁶² Transcript, Volume 10, page 2047, lines 1 to 4.

²⁶³ Transcript, Volume 10, page 2047, lines 5 to 12.

evidence was presented showing that the project would result in limiting aerial spraying in the area. E.ON argued that Mr. Wyard-Scott, who brought up the concern, rarely used an aerial spraying service. Mr. Wyard-Scott used a high-clearance sprayer, which would remain an option. Regardless, E.ON has committed to working with the landowners in the area to try to accommodate the usage of aerial spraying if the need arises.²⁶⁴

10.3 Commission findings

308. The assessment of visual impacts is subjective in nature; however, the Commission recognizes that the proposed wind turbines are large and would change the landscape of the project area. However, the Commission notes that the project area is already disturbed by extensive oil and gas activity. The Commission took these considerations into account when assessing the incremental visual impact of the project.

309. With regard to visual impacts stemming from the lights associated with the project, the Commission notes that the applicant committed to use the minimum number of lights required by Transport Canada on the turbines, along with the minimum number of synchronized flashes per minute and flash duration.²⁶⁵

310. The Commission finds that there was insufficient evidence presented to show that land use would be impacted by the project and noted that no components of the project will be sited on the GBCPG's lands. With respect to property value, the Commission was not presented with sufficient evidence in this proceeding to suggest that the project will result in an adverse impact on property values of parcels adjacent to the project. Similarly, the Commission does not find any direct agricultural impacts as the project is not on lands belonging to the interveners. The Commission is satisfied with E.ON's willingness to work with the landowners should the need for aerial spraying occur.

11 Environmental issues

311. The applicant retained Golder to prepare an environmental evaluation for the project (the environmental evaluation report).²⁶⁶ The applicant asserted that the project complied with provincial requirements and guidelines, including wildlife setbacks and that these setbacks are adequate to protect wildlife.²⁶⁷ E.ON also retained Mr. Stephen Glendinning, of Shrike Environmental Consulting Ltd., to prepare a report²⁶⁸ in response to the GBCPG evidence. Mr. Glendinning is a professional biologist and wildlife ecologist who was previously with Golder and prepared the environmental evaluation in 2014. He was one of the witnesses on the E.ON witness panel.

²⁶⁴ Transcript, Volume 10, pages 2047 to 2048, lines 13 to 25, 1 to 3.

²⁶⁵ Transcript, Volume 2, page 374, lines 1 to 12.

²⁶⁶ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 37.

²⁶⁷ Transcript, Volume 9, pages 1902-1903.

²⁶⁸ Exhibit 3329-X0119, ECRC Reply Evidence_Appendix G_Expert Report and Curriculum Vitae of Stephen Glendinning.

312. The GBCPG retained Mr. Cliff Wallis, a professional biologist of Cottonwood Consultants Ltd., to prepare written evidence and testify at the hearing on behalf of the GBCPG on environmental matters.²⁶⁹

313. The Commission found Mr. Glendinning and Mr. Wallis to be credible and their evidence to be useful.

11.1 Views of the applicant

314. E.ON retained Golder to conduct an environmental evaluation. The evaluation described baseline environmental conditions, identified potential project effects and developed mitigation for identified sensitivities. The project area consists of privately owned land in an agricultural area that is primarily cultivated.²⁷⁰ The project area is comprised of cultivated cropland (67 per-cent), modified pasture (9.1 per cent), wetlands (9.2 per cent), hay land (6.4 per cent) and trees/shrubs (six per cent) as well as smaller portions of farmyards (1.9 per cent), native pasture (0.2 per cent), and dugouts (less than one per cent).²⁷¹

315. Golder stated that the project area did not contain any provincially or federally designated protected areas, Environmentally Significant Areas (ESA), Important Bird Areas, or National Wildlife Areas and that the project area contains relatively limited amounts of native pasture and is highly fragmented 'natural habitat'. No project components were proposed within areas of native pasture. Golder stated that ESA 117 is located to the east of the project. ESA 117 is considered nationally significant based on the criteria that it "contains habitat for focal species" and "contains large natural areas". The focal species attributed to ESA 117 are the burrowing owl and ferruginous hawk; however, Golder stated that the project area was beyond the northern extent of the species' ranges and neither species was observed in field surveys.²⁷² Golder also stated that ESAs identified in provincial databases have no policy context and do not limit development.

316. A wetland ecologist from Golder conducted field surveys within the project area in 2011 and 2012. When a wetland was identified, its location was mapped and information such as dominant plant species, weeds and degree of human effect were recorded. Wetland classification followed the Stewart and Kantrud (1971) wetland classification system. Golder identified 1,718 wetlands in the project area classified from classes I to V. The majority of the wetlands were classes III and IV, seasonal (dry early/mid-summer) and semi-permanent (dry late summer).²⁷³ Golder stated that the project has limited potential to alter the hydrology and topography of wetlands or watercourses within the project area since no wetlands are directly disturbed by the proposed turbines and substation. Golder noted that 0.4 hectares of wetlands would be disturbed by access roads and the underground collector system.

317. Golder submitted that wetland avoidance would be the primary mitigation employed during construction and operation. If construction activities were required in the vicinity of wetlands or watercourses, Golder recommended that measures be taken to limit silt or spills

²⁶⁹ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol.

²⁷⁰ Transcript, Volume 10, page 42, lines 22 to 23.

²⁷¹ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 57.

²⁷² Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 61.

²⁷³ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 64.

in these areas. Other mitigation measures suggested to protect wetlands included construction during dry ground conditions to the extent possible, and the employment of rig matting, geotextiles, vegetated buffer zones, and earthen berms or silt fencing, as appropriate. Golder also suggested safety fencing be installed to prevent vehicle traffic from entering wetlands, as needed. Following construction, construction access roads and workspaces in the vicinity of wetlands would be re-vegetated as quickly as feasible to reduce the potential for siltation, as appropriate.²⁷⁴

318. Soil studies found within the project area is rated as having low to high wind-erosion risk and generally a low risk for water erosion on slopes less than five percent, low to moderate water-erosion risk on slopes from five to nine per cent and moderate to high water-erosion risk on slopes greater than nine per cent.²⁷⁵ Soil compaction was a risk that could restrict root penetration and elongation. Golder suggested limiting the area of disturbance and the time between salvage, storage and reclamation to mitigate the potential for wind erosion. Earthwork related construction activities such as the travel of equipment should be either shut down during wet weather or be conducted after appropriate mitigation measures are applied. In the absence of effective mitigation procedures, E.ON should suspend construction. To mitigate soil compaction, Golder recommended that heavy equipment activities and soil handling during construction and reclamation be restricted to moderate, moderately fine-textured and fine soils during wet conditions. Golder recommended that if the soil is being adversely affected, where possible, that construction should take place during dry or frozen ground conditions, and only on previously disturbed areas. To alleviate compaction, soils that are believed to have been compacted may be “deep-ripped”.²⁷⁶

319. Golder stated that due to the heavy agricultural development in the project area, much of the native vegetation had been modified or removed. No listed plant species were recorded during the surveys. To mitigate the introduction or spread of weed species, Golder recommended that all construction equipment entering the project area be in a clean condition and that weed-free seed mixes be used during reclamation.²⁷⁷

320. Golder explained that wildlife surveys were designed through consultation with Mr. Dave Moore of Alberta Environment and Sustainable Resource Development and followed the recommended protocols for wind developments (ASRD 2011b). Alberta Environment and Sustainable Resource Development is now Alberta Environment and Parks (AEP). Mr. Moore accompanied E.ON representatives and Golder personnel during a site visit on September 27, 2012, in which many of the proposed turbine locations were toured. Consultation with Mr. Moore has continued as subsequent turbine layout iterations were considered. As the project area is dominated by cultivated cropland and no project components are to be located within native pasture, Golder submitted that the impact on wildlife habitat is minimal. AEP sign-off for the project was received on June 30, 2014.²⁷⁸ E.ON received an updated sign-off after revising the location of turbine 4.²⁷⁹

²⁷⁴ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 65.

²⁷⁵ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 70.

²⁷⁶ Exhibit 0021.00.ECRC-3329, Application attachments, PDF pages 73 to 74.

²⁷⁷ Exhibit 0021.00.ECRC-3329, Application attachments, PDF pages 77 to 78.

²⁷⁸ Exhibit 0021.00.ECRC-3329, Application attachments, PDF pages 79 to 80.

²⁷⁹ Exhibit 0059.01.ECRC-3329, E On information request responses Round 2, PDF pages 11 to 19.

321. Golder's bat monitoring protocol was based on the Alberta Bat Action Team, *Bats and Wind Turbines - Pre-Siting and Pre-Construction Survey Protocols*. This protocol calls for a minimum five-week monitoring period during the fall and in areas north of the Alberta prairies, and additional monitoring for four weeks during the spring and six weeks in the summer. Golder conducted monitoring during the 2012 spring migration period and the 2011 and 2012 fall migration periods. The spring monitoring classified bat activity as "potentially acceptable risk" for bat mortality, while the fall monitoring periods classified bat activity as "potentially moderate risk" for bat mortality.²⁸⁰ E.ON has committed to post-construction monitoring of the project. If bat mortality findings meet the AEP (2013e) *Bat Mitigation Framework* criteria for implementation of operational mitigation strategies, E.ON has committed to undertaking the operational mitigation strategies and confirmatory monitoring. Mitigation strategies include identification of areas of concentrated bat mortality, adjustment of turbine cut-in speeds to 5.5 m/s, applying mitigation seasonal and daily (i.e., nighttime hours) to coincide with bat migration periods, confirmatory monitoring of mitigation effectiveness, and escalated mitigation if high bat mortality persists.²⁸¹

322. Golder utilized nine Avian Use Studies (AUS), with an 800-metre radius, to assess the level of bird migration through the project area. Eight AUS were positioned in the project area and the ninth was adjacent to Bauer's Lake and East Lake, northwest of the project boundary. Mr. Glendinning testified that 235 wetlands were contained within the AUS area.²⁸² The principal goals of the AUS were to quantitatively describe the temporal and spatial use of the project area by birds during spring and fall migration using diurnal point count surveys, and to provide an evaluation of the potential effects of wind power development on birds within the project area. All birds observed within or flying over the AUS plot were recorded during a 20-minute sample event conducted in the morning and afternoon. Waterfowl were the most commonly observed species group and the species group at greatest risk of turbine collision.²⁸³ Waterfowl mortality due to wind turbines is considered to be relatively low.²⁸⁴

323. Overall, the potential adverse effects of the project on wildlife include mortality, avoidance and habitat alteration and loss. Golder recommended siting turbines in cultivated crop land, minimum distances between turbines, avoidance of siting turbines along ridgelines, setback from wetlands, and avoidance of native pasture. Prior to, or during construction (depending on actual construction start-up), E.ON would conduct additional wildlife surveys in accordance with the AEP sign-off. In the event that new wildlife sensitivities were identified, E.ON would consult with AEP – Fish and Wildlife personnel to determine supplemental mitigation measures, as appropriate. E.ON has also committed to a post-construction monitoring program to determine the effect of the operation of the project on birds and bats. E.ON stated it intends to conduct the post-construction monitoring program for two years, and at minimum include carcass searches during the peak activity seasons, at one-third of the turbines, coupled with searcher efficiency and scavenger impact trials. Results of the post-construction monitoring program would be shared with AEP – Fish and Wildlife personnel on an annual basis.²⁸⁵

²⁸⁰ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 83.

²⁸¹ Exhibit 0021.00.ECRC-3329, Application attachments, PDF page 84.

²⁸² Transcript, Volume 2, page 465, lines 1 to 15.

²⁸³ Exhibit 0021.00.ECRC-3329, Application attachments, PDF pages 84 to 85.

²⁸⁴ Transcript, Volume 5, page 1137, lines 15 to 20.

²⁸⁵ Exhibit 0021.00.ECRC-3329, Application attachments, PDF pages 88 to 89.

324. Mr. Glendinning prepared an expert report in response to Mr. Wallis' report that raised concerns with ESAs in the area, the AEP's acceptance and sign-off which included a number of setback relaxations from wetlands, and inadequate waterfowl surveys. With respect to ESAs, Mr. Glendinning stated that no ESAs are in the project area and that ESAs identified in provincial databases, while valuable from a planning perspective, do not restrict development.²⁸⁶ Mr. Glendinning submitted that only five turbines are within the 100-metre setback from wetlands, 11 are located within 159 metres of wetlands (100-metre distance plus the vertical extension of rotor arc) and that justifications for all setback relaxations were provided to Mr. Moore prior to AEP approval.²⁸⁷ Mr. Glendinning added that all wildlife surveys followed established protocols and the use of the AUS was appropriate and adequate. E.ON stated it is committed to minimizing the impact of the project on the environment and is committed to consulting with AEP on additional mitigation measures if required.²⁸⁸

11.2 Views of the interveners

325. The GBCPG were concerned that the proposed wind project would adversely impact wildlife in the area and questioned the sufficiency of the mitigation measures. The group members stated that deer, waterfowl, bats, geese, pelicans, blue herons, owls and migratory birds frequent the area.²⁸⁹ The interveners had concerns that the project is in the flight path of geese, which could lead to collisions, that owl nesting grounds could be destroyed during construction, and wildlife could be driven away due to noise and activity.²⁹⁰

326. The GBCPG retained Mr. Cliff Wallis of Cottonwood Consultants Ltd. to provide expert evidence with respect to the environmental impacts of the project. In his report, Mr. Wallis raised concerns with the presence of an ESA immediately adjacent to the project area, the relaxations of setbacks from wetlands and the lack of specific use data for the wetlands. Mr. Wallis opined that additional field data on waterfowl use within the project area should be conducted to understand the potential interactions with the project.²⁹¹

327. In addition, Mr. Wallis submitted that ESAs may contain rare or unique biodiversity or are areas that may require special management consideration due to biodiversity conservation needs. The early recognition of ESAs is essential to help identify and prioritize areas that may be important to conserve, or that require special management consideration, thus supporting land-use planning processes.²⁹² Mr. Wallis is concerned there may be residual impacts on species utilizing adjoining ESAs and recommended more research be conducted within the ESA adjacent to the project area.

328. Mr. Wallis explained his concerns about the relaxation of turbine setbacks from wetlands. The AEP 2011 guidelines stated that wind turbines should not be constructed within 100 metres of any permanent or ephemeral wetland.²⁹³ It should be noted that there are numerous proposed

²⁸⁶ Exhibit 3329-X0112, ECRC Reply Evidence Submission_with Appendices A, B, C, PDF pages 10 to 11.

²⁸⁷ Exhibit 3329-X0119, ECRC Reply Evidence_Appendix G_Expert Report and Curriculum Vitae of Stephen Glendinning, PDF page 11.

²⁸⁸ Exhibit 3329-X0112, ECRC Reply Evidence Submission_with Appendices A, B, C, PDF page 11.

²⁸⁹ Exhibit 3329-X0045, Submissions of the Grizzly Bear Coulee Protection Group, PDF page 11.

²⁹⁰ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 2.

²⁹¹ Exhibit 3329-X0045, Submissions of the Grizzly Bear Coulee Protection Group, PDF page 12.

²⁹² Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF page 8.

²⁹³ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF page 32.

relaxations of wetland setbacks, at turbines 1, 12, 18, 21, 32, 34, 44, 46, 49 and 50 affecting at least 22 wetlands.²⁹⁴

329. Mr. Wallis was concerned because bat monitoring had not occurred since 2012. He expressed the view that there may be potential for higher risk of bat mortality than is currently reported, given the mix of woodlands and the high density of wetlands, which are potential feeding areas. Mr. Wallis submitted that there remained questions about the effectiveness of the bat mitigation strategies, but confirmed that the recommended mitigations are consistent with other wind facilities in North America and compliant with the *Bat Mitigation Framework*.²⁹⁵

330. Mr. Wallis stated the lack of attention to wetlands and their biodiversity was the most significant deficiency in the environmental evaluation conducted by Golder. Mr. Wallis indicated that the project area contains over 1,700 wetlands, but only 46 Breeding Bird Survey Plots and nine Avian Use Study Plots centered on these wetlands were conducted. Mr. Wallis was of the opinion that the survey effort outlined in the Wildlife Baseline Report was inadequate for a proper assessment of the significance of the project area to migrating, staging and breeding waterfowl, and therefore inadequate to guide turbine placement. He added that six days of surveys in nine locations for over 1,700 wetlands over two seasons does not provide sufficient information to evaluate impacts on migrating water birds and that 46 Breeding Bird Survey Plots is insufficient to identify the importance of those 1,700 wetlands as breeding habitat for water birds, including sensitive species.²⁹⁶ Mr. Wallis stated that he visited the site on multiple days in October 2014 and again in 2015, and observed significant flocks of migrating waterfowl including over 10,000 waterfowl on Bauer's Lake, just north of the project area. In his opinion, the project area appears to be along an unidentified waterfowl migration route and that the lack of long-term monitoring data in the specific area represents a data gap and government approval has been given in the absence of comprehensive long-term monitoring data.²⁹⁷

331. Mr. Wallis testified that the Wildlife Baseline Report was inadequate even though it was designed in concert with AEP. In his opinion, Mr. Wallis stated that operational constraints, similar to those in place for bats, should be included as conditions in the approval, which would not be burdensome on the applicant.²⁹⁸ Mr. Wallis stated that he had seen populations continue to decline and that either the guidelines or the implementation of the guidelines was inadequate to protect wildlife populations and proponents should strive to exceed these guidelines.²⁹⁹

332. Mr. Wallis stated that the mitigation measures and post-construction monitoring program apply largely to bats and no mitigation appears to be proposed for waterfowl. Approval of the project should be conditional upon a mitigation framework that also is effective for waterfowl.³⁰⁰ For ungulates, Mr. Wallis suggested that construction occur outside the January 15 to April 30th key wildlife and biodiversity zone restricted activity period in the vicinity of turbines 35, 4 and 37.³⁰¹

²⁹⁴ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF page 30.

²⁹⁵ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF page 30.

²⁹⁶ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF page 32.

²⁹⁷ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF pages 32 to 33.

²⁹⁸ Transcript, Volume 5, page 1106, lines 1 to 17.

²⁹⁹ Transcript, Volume 5, page 1108, lines 2 to 24.

³⁰⁰ Exhibit 3329-X0075, K - Evidence of Cliff Wallis, P.Biol., PDF page 43.

³⁰¹ Transcript, Volume 5, page 1079, lines 14 to 17.

11.3 Commission findings

333. The Commission observes that the siting of all turbines, the substation, collector system and roads is on cultivated lands and not on native pasture. Such siting reduces the potential for adverse impacts on the environment because the lands have been previously disturbed, primarily by cultivation. The siting on cultivated field as opposed to native pasture reduces impacts to wildlife and their habitat.

334. In the Commission's view, sign-off by AEP indicates that the impact to environment, and specifically wetlands was acceptable to AEP. The Commission also notes that AEP considered the justifications for the setback relaxations when issuing the sign-off. With regard to the foregoing, the Commission concludes that the applicant's approach to siting turbines was reasonable in the circumstances.

335. The applicant recognized that the project would have an effect on birds and bats and has taken some mitigation measures such as not siting wind turbines near ridgelines or other terrain that concentrate migratory bird (and bat) species.

336. The Commission recognizes that bird and bat surveys have been performed by the applicant and that AEP set out specific recommendations to protect birds within the project area. However, the bird and bat migration studies were conducted nearly two years before the application was filed. E.ON has committed to completing additional wildlife studies prior to construction of the project and one more fall bat monitoring survey before construction begins and the data from these additional surveys will be reviewed to determine if further action is required. E.ON has also committed to conducting post-construction monitoring for a minimum of two years to determine changes to bird and bat use. Carcass searches will be completed within the rotor swept area plus 10 metres of the turbines at a representative sample of one-third of the turbine sites.

337. In addition, should the impact on birds and bats be determined to be too high during post-construction monitoring, the applicant made several commitments related to minimizing the impact of the project on birds and bats. These include altering cut-in speeds of turbines, applying seasonal and daily mitigation measures (i.e., nighttime hours) to coincide with bat migration periods, and any mitigation based upon the site specific circumstances following consultation with AEP.

338. As stated in the AEP sign-off, E.ON has agreed, in principle, to construction of turbines and associated infrastructure outside of the April 1st through July 31st critical breeding season for grassland birds. If that is not possible, nest sweeps would be conducted prior to construction, in order to avoid contravention of the *Alberta Wildlife Act* and the federal *Migratory Birds Convention Act*. If nests are located during sweeps, consultation with AEP-WM to discuss mitigation will occur.

339. Based on the sign-off letter received from AEP, the Commission is satisfied that the wildlife surveys conducted by the applicant were reasonable in the circumstances.

340. The Commission considers that sign-off from AEP is strong evidence that the project's environmental effects would be acceptable. The Commission finds that conditions, as outlined below are necessary to adequately protect the environment. The Commission is of the view that

these conditions and the AEP sign-off demonstrate that the project's environmental effects can be mitigated to an acceptable degree.

341. The Commission notes that the location of the ESA in relation to the project was not at issue because the parties agreed that the ESAs were correctly identified and used in the planning of the project.

342. Given E.ON's above-noted commitments and to ensure protection of the birds, bats and wildlife as well as the environment in the project area, the Commission includes the following conditions in the approval of the project:

- E.ON shall conduct a pre-construction spring wildlife survey, which will include birds and amphibians, within two years from the start of construction.
- E.ON shall conduct a pre-construction fall bat migration study, within two years from the start of construction.
- E.ON shall develop a post-construction monitoring plan in consultation with Alberta Environment and Parks Wildlife Management (AEP-WM), to include:
 - Post-construction follow-up surveys will be completed over a minimum of two years to determine changes to bird and bat use of the areas associated with turbines and related infrastructure.
 - Monitoring will occur during the bird and bat migration periods (March 1 and October 31).
 - Carcass searches will be completed within the rotor swept area plus 10 metres of the turbines at a representative sample of one-third of the turbine sites. A portion of these turbine sites should be chosen based on proximity to bat detectors and Avian Use Survey Points.
 - Surveys will be conducted using the methods described in "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds" (Canadian Wildlife Service 2007).
 - Each searcher will be tested for search efficiency.
 - Additionally, a scavenger removal study will be carried out. Individual carcasses will be collected, labelled and submitted to AEP-WM. A detailed report of the post-construction monitoring will be provided to AEP-WM annually.

343. Based on the evidence, the Commission concludes that with diligent application of the proposed mitigation strategies outlined, the environmental effects from construction and operation of the project can be adequately mitigated.

12 Project construction and decommissioning

344. The GBCPG raised concerns with construction impacts such as dust and damage to roads. It also questioned the applicant's ability to decommission the project and whether the project might be abandoned without adequate reclamation.

12.1 Views of the applicant

345. E.ON has committed to minimizing and mitigating dust during construction, and all phases of the project. Dust control via water trucks or other application and erosion control measures are E.ON's contractor construction requirements.³⁰²

346. With respect to increased traffic, E.ON stated that the increase in traffic would primarily be associated with the construction phase of the project. E.ON explained that construction traffic would consist of approximately six concrete trucks a day and light-duty trucks travelling to and from various construction sites. Also, a crane would be assembled and dissembled on the construction sites where needed and would not traverse from one area of the project to another on the roads. E.ON added that, when constructing other projects, it had always been able to accommodate local traffic needs and address concerns of the local community.³⁰³ E.ON stated that it intended to enter into a road use agreement with county authorities as required, and that issues relating to traffic control are expected to be addressed in such agreements.³⁰⁴ A traffic plan would be drawn up in agreement with the counties. E.ON committed to inserting in the road use agreements that it would maintain the roads around the project, and improve or leave the roads in the condition that they were before the start of the project.³⁰⁵

347. Regarding decommissioning and reclamation, E.ON explained that it would dismantle the wind turbines and other project infrastructure, and excavate to a depth of one metre to cut off the base anchoring the wind turbine.³⁰⁶ E.ON contended that the fact that only part of the turbine foundation would be removed should not be of concern to the GBCPG because no turbines would be sited on the lands of its members.

348. E.ON stated that it had individually consulted with and concluded agreements with the landowners hosting turbines or other project infrastructure on their lands.³⁰⁷ It also confirmed this in its testimony.³⁰⁸ Further, E.ON's decommissioning and reclamation plan was accepted by AEP.³⁰⁹ E.ON testified that it will comply with the regulatory requirements at the time of reclamation.³¹⁰

349. E.ON acknowledged that it does not have direct experience with decommissioning wind farms because relatively very few wind farms have been in operation long enough to require decommissioning.³¹¹ However, E.ON argued that funding decommissioning costs during the life

³⁰² Exhibit 0029.01.ECRC-3329, IR Round 1 Responses, PDF page 25.

³⁰³ Transcript, Volume 3, pages 537 to 537, lines 19 to 25, 1 to 18.

³⁰⁴ Exhibit 3329-X0112, ECRC Reply Evidence Submission_with Appendices A, B, C, PDF page 13.

³⁰⁵ Transcript, Volume 3, page 537, lines 13 to 18.

³⁰⁶ Transcript, Volume 3, page 499, lines 12 to 20.

³⁰⁷ Exhibit 3329-X0112, ECRC Reply Evidence Submission with Appendices A, B, C, PDF page 13.

³⁰⁸ Transcript, Volume 3, page 501, lines 11 to 13.

³⁰⁹ Exhibit 0021.00.ECRC-3329, Attachment 5, PDF page 27.

³¹⁰ Transcript, Volume 10, page 2247, lines 1 to 3.

³¹¹ Transcript, Volume 3, page 500, lines 21 to 25.

of the project was not necessary because the decommissioning costs would be offset by the sale of all valuable recyclable or reusable parts of the turbine and tower, and potentially some cabling.³¹² In support of its position, it submitted that it had conducted a number of studies that showed the salvage value of the wind turbines and other project components exceeds the decommissioning costs.³¹³ E.ON added that a fund for wind farm decommissioning and reclamation, similar to the one for oil and gas wells, was not needed because wind farm components do not have potential pollution and contamination issues that may be present with wells.³¹⁴

12.2 Views of the interveners

350. The members of the GBCPG raised various issues in relation to increased dust and traffic, as well as, road deterioration. More specifically, Kirby and Marilyn Demas were concerned about the safety risks that the increase in traffic at the construction stage of the project would pose to their children, who are new drivers. They added that increased traffic will be a challenge for all the residents who are not used to busy traffic in the country.³¹⁵ Ms. Tapley also expressed safety concerns from the increase in traffic because her grandson and dogs walk to the bus stop along the road.³¹⁶

351. Some of the GBCPG members, such as Doug Livingstone, testified that some of the roads in the area were in poor repair. Mr. Livingstone stated that Range Road 80 has been impacted tremendously by traffic from the oil and gas development. He was concerned about the impact on the roads from the increased traffic during the construction of the project. He stated that roads in the counties were not built to withstand the wear and tear of traffic from a project of this magnitude.³¹⁷ Mr. Livingstone acknowledged there would be agreements in place to maintain and restore the roads, but noted that there are similar agreements in place with the energy companies in the county and the roads are dismal.³¹⁸ Ms. Tapley voiced her concerns about the poor state of Range Road 85. She stated that this road is not well travelled; the county has not done work on it, and it is soft. Boone Hess also had concerns about the increased levels of dust and increased truck traffic and heavy equipment being carried over the roads in the area.³¹⁹

352. The GBCPG had concerns relating to the eventual decommissioning and reclamation of the project. It acknowledged that E.ON has committed to removing infrastructure up to three feet deep, but the foundations for the proposed wind turbines are nine feet deep and should be fully removed.³²⁰ Ken Wyard-Scott added that the portion of land that is reclaimed would be virtually useless because the roots of plants will hit the remaining cement, and run out of nutrients. These plants would not produce like the rest of the land.³²¹

³¹² Transcript, Volume 3, page 501, lines 16 to 19.

³¹³ Transcript, Volume 3, page 500, lines 6 to 10 and page 502, lines 6 to 10.

³¹⁴ Transcript, Volume 10, page 2247, lines 11 to 18.

³¹⁵ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 3.

³¹⁶ Transcript, Volume 4, pages 1002 to 1003, lines 13 to 25, 1 to 2.

³¹⁷ Transcript, Volume 4, pages 994 to 995, lines 15 to 25, 1 to 18.

³¹⁸ Transcript, Volume 4, page 1025, lines 3 to 15.

³¹⁹ Exhibit 3329-X0048, C - GBCPG Landowner Submissions, PDF page 7.

³²⁰ Transcript, Volume 4, page 1002, lines 2 to 8.

³²¹ Transcript, Volume 4, page 1010, lines 1 to 7.

353. Ken Wyard-Scott also questioned who would be liable, if the project is approved and built, if the project is sold, or if the company goes bankrupt. He did not want to see the wind turbines turned into salvage before their time or turn into liabilities for the community.³²² The GBCPG argued that in case of bankruptcy, the contracts with landowners which included terms regarding decommissioning and reclamation would not be useful.³²³ The GBCPG was also concerned that E.ON's statement that the salvage value was greater than the cost of decommissioning because it meant that only that the valuable components would be removed from the project area.³²⁴

354. In addition, the group was concerned about E.ON's lack of decommissioning experience, lack of a decommissioning plan and lack of a decommissioning reserve fund.³²⁵ It was also concerned that the Commission's approval of a decommissioning plan was not required and E.ON would not be required to obtain a reclamation certificate under the *Environmental Protection and Enhancement Act* and *Conservation and Reclamation Regulation*.³²⁶ The GBCPG requested that, should the project be approved, the Commission require E.ON to adhere to the reclamation standards in place at the time of decommissioning.

12.3 Commission findings

355. The Commission finds E.ON's proposed mitigations to minimize dust and commitments to restoring the local roads after construction are reasonable.

356. The Commission accepts E.ON's evidence that the increase in traffic will occur during the construction phase of the proposed wind farm. During construction, the volume of the increase is approximately six cement trucks per day and some light-duty trucks. The Commission took note that the roads in the area will not be used to move the construction crane from one part of the project to another as the crane would be disassembled and reassembled where needed. Further, E.ON has committed to entering into road use agreements with the counties of Vermilion and Minburn to mitigate traffic impacts. E.ON also committed to maintaining or improving the roads in the vicinity of the project. E.ON has expressed its willingness to work with residents to address traffic concerns. For these reasons, the Commission is satisfied that E.ON has provided adequate mitigation measures to reduce the impacts that would result from the construction and increased traffic in the project area.

357. Sections 21 and 22 of the *Hydro and Electric Energy Act* address the decommissioning of power plants. Pursuant to Section 22, the owner of a power plant must notify the Commission and the Independent System Operator prior to decommissioning. Section 22 states:

Notice of discontinuance of operations required

(2) A person who holds an approval for a power plant under this Part, and a person who operated a power plant on June 1, 1971, shall provide written notice to the Commission and the Independent System Operator established under the *Electric Utilities Act* before permanently discontinuing the operation of, or permanently dismantling or removing any works or installations forming part of, the power plant.

³²² Transcript, Volume 4, page 1015, lines 14 to 18.

³²³ Transcript, Volume 10, page 2190, lines 18 to 25.

³²⁴ Transcript, Volume 10, page 2191, lines 5 to 10.

³²⁵ Transcript, Volume 10, page 2190, lines 3 to 17.

³²⁶ Transcript, Volume 10, pages 2191 to 2192, lines 18 to 25, 1 to 6.

358. Under the current legislative framework, the applicant would not be required to seek the Commission's approval to decommission the project and, thus, the Commission would not assess the adequacy of any proposed decommissioning plan.

359. Section 137 of the *Environmental Protection and Enhancement Act* requires that the owner or operator of facilities, which result in certain activities defined in that act, obtain a reclamation certificate. At present, wind power generators are not specifically listed as an activity governed by the *Environmental Protection and Enhancement Act*.

360. The Commission notes that the applicant has committed to comply with the requirements of the AEP sign-off, which imposes a duty upon the applicant to reclaim the project site to an equivalent land capability and to consult with AEP as to the adequacy of the reclamation. Reclaiming the project site to an equivalent land capability, as outlined by AEP, would allow the land to support various land uses after conservation and reclamation, similar to the ability that existed prior to the project being constructed.

361. Regarding a fund for decommissioning costs, the *Alberta Utilities Commission Act*, *Hydro and Electric Energy Act*, and the *Environmental Protection and Enhancement Act* do not contain any requirements for the establishment of a fund for decommissioning costs for wind farms. No evidence was presented that E.ON is not likely to have the funds to decommission the proposed wind farm in the future. The evidence before the Commission is that the decommissioning costs will be paid out of moneys recovered from the sale of the salvage from the proposed wind turbines and possibly cables.

362. Considering that the wind industry has developed largely in the last 20 years and that these facilities have long lifespans, at least 25 years, E.ON's lack of experience in decommissioning wind farms is not of concern. Further, at the time of decommissioning, E.ON will have to comply with the requirements in place that govern decommissioning of wind farms and reclamation of wind farm sites. The Commission considers that a condition on the permit and licence to this effect is not necessary.

13 Summary of findings and conclusion

363. In Section 4 of this decision, the Commission explained the legislative scheme in place for the consideration and approval of power plants in Alberta. In this section, the Commission applies that legislative scheme in light of the findings it has made above.

364. In accordance with Section 17 of the *Alberta Utilities Commission Act*, the Commission must decide whether approval of the project is in the public interest having regard to its social and economic effects and its effects on the environment.

365. Regarding the social effects of the project, the Commission finds that the construction and operation of the project will not affect the health and safety of nearby residents. With regard to potential land use impacts, agricultural impacts and road maintenance, the Commission was not convinced that the proposed project will result in the adverse impacts advanced by the GBCPG.

366. The Commission is satisfied that the applicant's estimated daytime and nighttime predicted cumulative sound levels for the project meet the requirements of Rule 012. The Commission concludes that compliance with daytime and nighttime permissible sound levels for the project, which is mandatory, will protect nearby residents from noise related health effects, including those residents with pre-existing medical conditions. The Commission has imposed conditions on its approval of the project to ensure the project strictly complies with Rule 012 and its permissible sound levels.

367. While the Commission recognizes that a segment of the community may be annoyed by the operation of the project, it finds that this annoyance may be mitigated to an acceptable degree by adherence to the 40 dBA nighttime and 50 dBA daytime permissible sound levels.

368. Regarding the economic effects of the project, Section 3 of the *Hydro and Electric Energy Act* states that when performing its analysis under Section 17, the Commission cannot consider whether the project is an economic source of electric energy or if there is a need for the electric energy that would be produced by the project. Section 3 further requires the Commission to have regard for the purposes of the *Hydro and Electric Energy Act* and the *Electric Utilities Act*.

369. Based on the evidence, the Commission finds that approval of the project would provide some economic benefit for the community. If the project is approved, the applicant stated that it would hire local employees and use local services for construction and operation of the project. The Commission also finds that approval of the project will result in increased tax contributions to the County of Minburn and the County of Vermilion River. Regarding visual impacts and potential impacts on property values, the Commission acknowledges that the proposed project will result in visual impacts. However, the Commission was not persuaded that the proposed project will result in a decrease in property values.

370. Regarding the environmental effects of the project, an important consideration for the Commission was the applicant's compliance with various AEP guidelines applicable to the project. As stated previously, the Commission regards compliance with the existing regulatory requirements administered by other public or government departments or agencies to be an important element when deciding if potential adverse impacts are acceptable. Accordingly, AEP's decision to provide its "sign-off" on the project including the measures proposed by the applicant to mitigate its environmental effects is compelling evidence that the project's environmental impacts fall within the range of acceptability.

371. Having regard to the foregoing, the Commission finds that the negative effects of the project, which include visual impacts, noise, annoyance and impacts to the environment, can be mitigated to an acceptable degree. The Commission further finds that, with this mitigation, the positive benefits of the project outweigh its negative impacts. The Commission is satisfied that approval of the project is consistent with the purposes of both the *Hydro and Electric Energy Act* and the *Electric Utilities Act* in that it will result in the safe, economic, orderly and efficient development of a new generation facility that will contribute to an efficient electricity market based on fair and open competition.

14 Decision

372. For the reasons provided above, the Commission finds that the approval of the project is in the public interest having regard to the social and economic effects of the project, and its effects on the environment. The Commission's approval of the project is subject to the following power plant approval conditions:

- i. E.ON shall operate turbines 22 and 23 in SOM 5 – 101 dBA mode during the nighttime period to ensure compliance with the nighttime permissible sound level.
- ii. The applicant must ensure that all noise mitigation measures proposed in the application are implemented, to ensure compliance with the permissible sound level at all receptor locations in the study area. The noise control measures proposed in the application included: maintaining the equipment so it is running correctly, implementing wind turbines in Sound Optimized Mode, applying mitigation on third-party energy-related facility noise sources, or the shutting down of wind turbines.
- iii. The applicant shall:
 - a) Conduct a post-construction comprehensive noise study, including an evaluation of low frequency noise, at receptors R1, R12, R23, R35, R38 and R55 under representative conditions, in accordance with Rule 012.
 - b) File all studies and reports relating to the post-construction comprehensive noise study with the Commission within one year of connecting the power plant to the Alberta Interconnected Electric System.
- iv. If the project encroaches upon newly identified wetlands, the applicant must re-site the offending project component(s) or receive AEP's approval to site the project within the wetland setback.
- v. E.ON shall conduct a pre-construction spring wildlife survey, which will include birds and amphibians, within two years from the start of construction.
- vi. E.ON shall conduct a pre-construction fall bat migration study, within two years from the start of construction.
- vii. E.ON shall develop a post-construction monitoring plan in consultation with AEP-WM. Post-construction follow-up surveys will be completed over a minimum of two years to determine changes to bird and bat use of the areas associated with turbines and related infrastructure. Specifically, monitoring will occur during the bird and bat migration periods (March 1 and October 31). Carcass searches will be completed within the rotor swept area plus 10 metres of the turbines at a representative sample of one-third of the turbine sites. A portion of these turbine sites should be chosen based on proximity to bat detectors and Avian Use Survey Points. Surveys will be conducted using the methods described in "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds" (Canadian Wildlife Service 2007). Each searcher will be tested for search efficiency. Additionally, a scavenger removal study will be carried out. Individual carcasses will be collected, labelled and submitted to AEP-WM. A detailed report of the post-construction monitoring will be provided to AEP-WM annually.

viii. The applicant shall develop and implement an environmental protection plan in consultation with AEP. The applicant shall advise the Commission when this condition has been satisfied.

ix. The applicant shall use the minimum number of lights required by Transport Canada on the turbines, and set these lights to the minimum number of synchronized flashes per minute and the minimum flash duration.

373. These conditions are designed to enhance the effectiveness of mitigation plans. These conditions become an essential part of the approval, and breach of them may result in suspension or rescission of the approval.

374. Pursuant to sections 11, 14, 15 and 18 of the *Hydro and Electric Energy Act*, the Commission approves the applications and grants Power Plant Approval 3329-D03-2016 and Substation Permit and Licence 3329-D02-2016 to the applicant. The approval documents will be distributed separately.

Dated on May 19, 2016.

Alberta Utilities Commission

(original signed by)

Tudor Beattie, QC
Panel Chair

(original signed by)

Neil Jamieson
Commission Member

(original signed by)

Kate Coolidge
Acting Commission Member

Appendix A – Proceeding participants

[\(return to text\)](#)

Name of organization (abbreviation) counsel or representative
E.ON Climate & Renewables Canada Ltd. L. H. Olthafer D. Harper N. Bakker
1576834 Alberta Ltd. (Benign Energy Canada II Inc.) A. Kettles
Alice Stafinski
Brian Rogan
County of Vermilion River
Dave Haugan
Grizzly Bear Coulee Protection Group R. Secord Y. Cheng
<p>Alberta Utilities Commission</p> <p>Commission Panel Tudor Beattie, QC Panel Chair Neil Jamieson, Commission Member Kate Coolidge, Acting Commission Member</p> <p>Commission Staff G. Bentivegna (Commission Counsel) S. Sinclair (Commission Counsel) V. Choy T. Richards J. Davis H. Richie A. Drolet</p>

Appendix B – Oral hearing – registered appearances

Name of organization (abbreviation) counsel or representative	Witnesses
E.ON Climate & Renewables Canada Ltd. L. H. Olthafer D. Harper N. Bakker	P. Ashtiani P. Bowman Q. Eastlick A. Faszer J. Franklin S. Glendinning R. Istchenko G. Martens C. Ollson
Grizzly Bear Coulee Protection Group R. Secord Y. Cheng	K. Clark W. Clark K. Hess C. Livingstone D. Livingstone L. Tapley F. Wyard-Scott K. Wyard-Scott S. Cooper J. Farquharson R. James M. Nissenbaum C. Wallis

Appendix C – Abbreviations

Abbreviation	Name in full
µPa	microPascal
ACI	Acoustical Consultants Inc.
AEP	Alberta Environment and Parks
AEP-WM	Alberta Environment and Parks Wildlife Management
AUC	Alberta Utilities Commission
Rule 007	<i>AUC Rule 007: Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations and Hydro Developments</i>
Rule 012	<i>AUC Rule 012: Noise Control</i>
AUS	Avian Use Studies
Commission	Alberta Utilities Commission
dB(A) or dBA	the A-weighted decibel scale
dB(C) or dBC	the C-weighted decibel scale
dB(G) or dBG	the G-weighted decibel scale
dB (Lin) or dB	the linear weighted scale
E.ON	E.ON Climate & Renewables Canada Ltd.
ESA	environmentally significant areas
FDI Acoustics	FDI Acoustics Inc.
G	ground attenuation factor
GBCPG	Grizzly Bear Coulee Protection Group
Golder	Golder Associates Ltd.
Intrinsik	Intrinsik Environmental Sciences
Hz	Hertz
ISO	International Organization for Standardization
m	metre
m/s	metres per second
kV	kilovolt
LFN	low frequency noise
MW	megawatt
NIA	noise impact assessment
PSL	permissible sound level
SOM	Sound Optimized Modes
White Burgess	<i>White Burgess Langille Inman v Abbott and Haliburton</i>
WHO	World Health Organization

Appendix D – AEP (previously AESRD) sign-offs



Appendix D - AEP
sign-offs.pdf

(consists of 12 pages)



Appendix D - AEP
sign-offs.pdf

(consists of 9 pages)

Appendix E – Commission ruling on standing

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Appendix E -
Commission ruling on

(consists of 5 pages)

ATTACHMENT 5

**ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT
(ESRD) CONSULTATION**



Environment and Sustainable
Resource Development

Fish and Wildlife Division
#8, 4701-52 Street
Vermilion, Alberta
Y9X 1J9
Canada
Telephone: 780-853-8137

June 30, 2014

Stephen Glendinning
Associate; Wildlife Ecologist
Manager, Prairies Region Power Sector
Golder Associates Ltd.
102, 2535 – 3rd Avenue S.E.
Calgary, Alberta
T2A 7W5
Stephen_Glendinning@golder.com

Re: ESRD-WM Sign-off for the Grizzly Bear Creek Wind Power Project

Dear: Stephen

I have reviewed the documentation provided for the Grizzly Bear Creek Wind Power Project as submitted to E.ON Climate and Renewables Canada Ltd. These documents in addition to previous materials and the onsite inspection have satisfied Wildlife Guidelines for Alberta Wind Energy Projects in the preconstruction phase.

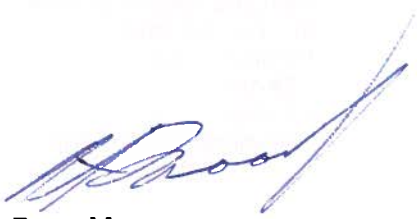
Please consider this letter as Environment and Sustainable Resource Development – Wildlife Management sign off on this proposed project with no further requirements for mitigation on these sites other than those identified in the attached Wind Energy Referral Report.

ESRD-WM recommends that further pre and the agreed post construction monitoring be carried out to identify possible wildlife impacts. This monitoring should be conducted by a qualified wildlife biologist through a program designed in consultation with the proponent and ESRD. Monitoring should include carcass collection from the area of all sampled turbines and identification of all specimens collected. Monitoring protocols should be established that include wildlife abundance to compare with preconstruction findings. All results are to be submitted to the ESRD-WM Operations Division, Resource Management in the format prescribed for entry into the FWMIS data base. Monitoring activities should be conducted for a minimum of two years post construction.

Any deviations to the planned siting of turbines identified in your report or wildlife mitigation measures identified will require further review to ensure elements of wildlife and habitat are protected.

ESRD looks forward to being involved in the next step of the project and receiving information on the post development surveys for this project.

Sincerely



Dave Moore
Senior Wildlife Biologist, Vermilion
Operations Division, Resource Management
Red Deer/North Saskatchewan Region

Government of Alberta

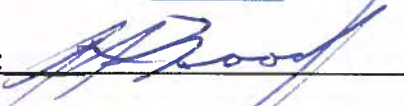
Wind Energy Referral Report – Environment and Sustainable Resource Development

1. *ESRD Operations Division, Wildlife Management Branch Review:*

The Grizzly Bear Creek Wind Power Project was reviewed by the Regional Wildlife Contact. Environment and Sustainable Resource Development – Wildlife Management (ESRD – WM) has reviewed the proposal (including turbine locations and associated infrastructure) and is satisfied with the monitoring and mitigation of impacts to wildlife and their associated habitats, including Species at risk. ESRD – WM has reviewed the proposed location, proposed mitigation strategies, including associated infrastructure and construction plans, and post construction monitoring program, as detailed below.

The E.ON Climate and Renewables Canada Wind energy wildlife mitigation plan for the Grizzly Bear Creek Wind Power Project meets with the recommended mitigation strategy developed by ESRD – WM.

ESRD- WM Office: [Vermilion](#)

Signature: 

Date: [June 30, 2014](#)

Printed Name: [Dave Moore, Senior Wildlife Biologist, Vermilion](#)

B. Project Details

Project Name: [Grizzly Bear Creek Wind Power Project](#)

Company name: [E.ON Climate & Renewables Canada Ltd.](#) **AUC Application #:** _____

Location of Project: Section: [Various](#) TWP: [48, 49](#) RGE: [7, 8](#) Meridian: [W4](#)

Project Details: Area: [76 km²](#) Turbines #: [50](#) Height: [91 m](#) Blade Length: [57.5 m \(total rotor diameter 117 m\)](#) Rotor Swept Area: [10.751 m²](#)

Grizzly Bear Creek – Turbine Coordinates (UTM NAD 83; Zone 12) May 30, 2014

Turbine	Geographic		UTM NAD 83, Zone 12	
	Latitude (°)	Longitude (°)	Easting	Northing
1	53.23712590	-111.04240300	497170	5898650
2	53.24596930	-111.10390000	493067	5899638
3	53.22894050	-111.13435800	491031	5897747
4	53.22916890	-111.00654700	499563	5897764
5	53.19205060	-111.08369800	494408	5893638
6	53.25061790	-111.09767600	493483	5900155
7	53.24230560	-111.10976500	492675	5899231
8	53.19158140	-111.03423000	497713	5893583

Turbine	Geographic		UTM NAD 83, Zone 12	
	Latitude (°)	Longitude (°)	Easting	Northing
9	53.18080160	-111.06007900	495985	5892385
10	53.21370690	-111.11091900	492593	5896050
11	53.22862920	-111.08105800	494589	5897707
12	53.17205560	-111.08340200	494425	5891414
13	53.26098100	-111.08080400	494610	5901306
14	53.26788240	-111.10647200	492899	5902076
15	53.25436580	-111.09216900	493851	5900571
16	53.19190160	-111.15239800	489818	5893629
17	53.20251910	-111.16008800	489307	5894811
18	53.19199600	-111.05568200	496280	5893630
19	53.19226830	-111.02092100	498602	5893659
20	53.26255170	-111.10660800	492889	5901483
21	53.23630230	-111.11766000	492147	5898564
22	53.25471670	-111.13034700	491304	5900614
23	53.25678410	-111.11278500	492476	5900842
24	53.20346210	-111.12069900	491938	5894911
25	53.20883650	-111.11287800	492461	5895508
26	53.25282350	-111.11833500	492105	5900402
27	53.20037250	-111.08666300	494211	5894564
28	53.26493450	-111.16190800	489201	5901755
29	53.26728940	-111.15527400	489644	5902016
30	53.23259730	-111.09962700	493350	5898150
31	No turbine 31	n/a	n/a	n/a
32	53.24722150	-111.07662700	494887	5899775
33	53.18220950	-111.12285400	491790	5892547
34	53.20121020	-111.02618400	498251	5894654
35	53.25026500	-111.13571900	490945	5900120
36	53.25706880	-111.08363000	494421	5900871
37	53.22450350	-111.00795400	499469	5897245
38	53.23927070	-111.13283200	491135	5898896
39	53.27391000	-111.15865700	489420	5902753
40	53.27567490	-111.16943100	488702	5902951
41	53.17864360	-111.12871000	491398	5892151
42	53.27065330	-111.14665000	490220	5902389
43	53.18775480	-111.16137700	489217	5893169
44	53.18466290	-111.08184300	494531	5892816
45	53.18234890	-111.14097000	490579	5892565
46	53.23197990	-111.02573800	498282	5898077
47	53.25854920	-111.03474900	497682	5901033
48	53.25264400	-111.03293000	497803	5900376

Turbine	Geographic		UTM NAD 83, Zone 12	
	Latitude (°)	Longitude (°)	Easting	Northing
49	53.23148230	-111.07561000	494953	5898024
50	53.20357740	-111.13068600	491271	5894925
51	53.24676150	-111.12292000	491798	5899728

C. Wildlife Issues to be addressed:

Site Selection:

Pre-development Planning and Surveys:

Please refer to the relevant reports, Baseline Wildlife Report for the Grizzly Bear Creek Wind Power Project February 2014 and Addendum, Baseline Wildlife Report for the Grizzly Bear Creek Wind Power Project. Submitted to E.ON Climate and Renewables Canada (E.ON) Box 772 Swift Current, Sk. S9H 3W7. Golder Associates, Report Number: 11-1334-0046 and Received by ESRD – WM February and June 2014, for details.

Impacts to Native Grasslands:

ESRD – WM identified the potential negative impacts of siting wind turbines in areas of native grasslands on wildlife, in particular on species at risk. Negative impacts may include, but are not limited to; habitat fragmentation, site abandonment, and loss of foraging/breeding/rearing habitat. ESRD – WM recommends siting all wind turbines and associated infrastructure on cultivated lands to significantly reduce the majority of negative impacts on wildlife.

Wildlife Impacts:

ESRD – WM identified concerns over the potential of negative impacts on wildlife caused by wind turbines or related infrastructure including access roads, and collection lines. ESRD – WM recommends that areas immediately adjacent to key wildlife habitats be avoided by appropriate setbacks as outlined in the *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta* <http://esrd.alberta.ca/fish-wildlife/wildlife-land-use-guidelines/documents/WildlifeLandUse-SpeciesHabitatGrasslandParkland-Apr28-2011.pdf>

Specific to the Grizzly Bear Creek Wind Power Project the following issues were identified by ESRD – WM:

1. *Bald Eagle nest:* A bald eagle nest was found in close proximity to proposed turbine 31. ESRD – WM recommends a 1000 meter buffer from an active bald eagle nest.
2. *Red-tailed hawk nest:* seven red-tailed hawk nests were found within the project area. ESRD – WM recommends a 100 meter buffer from an active red-tailed hawk nest.
3. *Swainson's Hawk nest:* One Swainson's hawk nest was found within the project Area. ESRD – WM recommends a 100 meter buffer from an active Swainson's hawk nest.

4. *Sharp-tailed grouse lek*: The project area is within the historical range of sharp-tailed grouse. Sharp-tailed grouse leks should be protected by a minimum 500 m buffer.
5. *Proximity to wintering range*: ESRD – WM identified concerns over the proximity of the development to critical winter range for both mule deer and moose. While ESRD – WM generally recommends that timing conditions (Jan 15th to April 30th) identified under the Recommended Land-use Guidelines: Key Wildlife and Biodiversity Zones <http://esrd.alberta.ca/fish-wildlife/wildlife-land-use-guidelines/documents/WildlifeLandUse-KeyWildlifeBiodiversityZones-Dec03-2010.pdf> it is recognized that winter conditions are preferred time of construction to lessen the impacts on breeding birds and native vegetation.
6. *Wetlands, Amphibian setbacks*: ESRD – WM recommends that all ephemeral or permanent wetlands, as defined by Stewart and Kantrud 1971, are buffered by 100 meters. Of particular concern are breeding ponds for plains spadefoot, great plains toad and northern leopard frogs. These setbacks will ensure the wetlands are conserved for the use by the species and protect overwintering individuals buried in areas surrounding the pond. Refer to Section E for detailed mitigation plans.
7. *Construction Timing and breeding birds*: The primary concern for grassland birds is related to construction during critical breeding, nesting and rearing stages, April 1st-July 15th. ESRD – WM recommends that all activities on native grassland occur outside the critical breeding period. This will ensure that grassland bird nests, including species at risk, are not destroyed or damaged as per the *Alberta Wildlife Act* and the *Migratory Bird Conventions Act*. Refer to Section E for detailed mitigation plans.

Avoidance of Migration Routes for Birds and Bats

A large number of bird species and bat species in Alberta migrate between overwintering habitat south of the Canadian Border and their breeding grounds here in Alberta. During these migrations species may form large groups and may migrate along the same route year after year. Wind energy projects that are built within these migration routes present a large hazard and an increased mortality risk. ESRD – WM recommends that wind farms not be sited along migration routes. Refer to Section E for detailed mitigation plans.

D. Industry Submission of Wildlife Monitoring Program (submission to *Fisheries and Wildlife Management Information system-FWMIS*)

Research Permit #: 49138 and 51684

Collection Licence #: 49137 and 51683

Pre-construction survey data submitted within 2 years of project construction: No

Note: If no construction has occurred with 2 years, new data will be requested.

Wildlife Survey Dates:

- Raptor Nesting: June 9 - 11, 26 - 28, 2011.
- Fall Bat Migration: Aug. 1 - Sept 8, 2011 and July 31 - Sept. 10, 2012.
- Fall Bird Migration: Aug. 19, Sept. 15 and Oct. 17, 2011.
- Winter Wildlife Survey, early winter: Dec. 15 and 16, 2011.

- Winter Wildlife Survey, late winter: Feb. 16, 17, 2012.
- Spring Bird Migration: Apr. 9, May 1 and May 15, 2012.
- Spring Bat Migration: Apr. 29 - May 25, 2012.
- Sharp-tailed grouse Survey: Apr. 21 – 22, 2012.
- Richardson's ground squirrel Survey: Apr. 21 – 22, 2012.
- Amphibian Survey: May 17 – 18, 2012.
- Wetland Assessment: Oct. 2011 – Oct. 2012, multiple visits.

All required surveys were completed as part of the pre-construction assessment however most of the surveys including all the bird and bat migration surveys were completed more than 2 years before the proposed start of construction. Please refer to above named report, Baseline Wildlife Report for the Grizzly Bear Creek Wind Power Project. Submitted to E.ON Climate and Renewables Canada (E.ON) Box 772 Swift Current, Sk. S9H 3W7. Golder Associates, report number: 11-1334-0046 February 2014, for details.

The results of the bat monitoring portion of the wildlife surveys resulted in in ESRD-WM recommending that this project be considered moderate to high risk for bats. E.ON Climate and Renewables Canada will commit to complete additional wildlife surveys prior to construction of the project. As per standard protocol, a pre-construction wildlife survey of the turbine sites and associated infrastructure will occur in the spring preceding construction to ensure that no new wildlife conflicts have appeared, and results reported to the ESRD – WM representative. E.ON will also be required to commit to one more fall of bat monitoring before construction begins and the data from these additional surveys will be provided to the Alberta Fish and Wildlife Management System-FWMIS. The results of these surveys may require additional mitigative measures, developed through consultation with ESRD – WM.

Post-construction Survey dates:

To be determined in conjunction with Post Construction Monitoring Plan which E.ON Climate and Renewables Canada has committed to develop with ESRD – WM. Please refer to the Wildlife Monitoring section of this letter.

Annual Due date for Post construction Survey data submittal (dd/mm): 31/12

E. ESRD – WM requirements:

Requirements Relating to Site:

Impacts to Native Grasslands

E.ON has situated all 50 turbines, the substation, collection system and roads onto cultivated lands to avoid unnecessary impacts to wildlife and wildlife habitat on native grasslands as recommended by ESRD – WM. No areas of native grasslands are affected by turbine, collections systems or associated roadways.

All turbines locations and the associated infrastructure have been approved by ESRD-WM. Any changes to physical locations greater than 10 meters as a result of factors unidentified at this time must be made in consultation with ESRD-WM and upon the written agreement of ESRD-WM.

Above ground power lines to avoid strikes and electrocution of birds

Information provided to ESRD – WM indicates that the collection system power lines for the wind turbines will be completely underground with the exception of the portion of the power line from the substation to the main transmission line.

Wildlife Impacts:

ESRD – WM Wildlife Guidelines for Alberta Wind Energy Projects (Sept 19, 2011) have been considered and applied to site by E.ON. E.ON Climate and Renewables Canada has submitted preliminary mitigation measures. Further input and consultation with ESRD – WM will occur in order to finalize an Environmental Protection and Reclamation Plan (EPRP). Special mitigation was developed between ESRD – WM and E.ON at specific wildlife sites, this includes:

Raptor nests: All turbines, access roads, collector lines, work areas and the substation have been located over 100 meters from any raptor nest. This is consistent with ESRD – WM recommendations. Turbine 31 was removed from the project because of the proximity to the bald eagle nest. All project infrastructure is located outside the 1000 meter setback for the bald eagle nest. E.ON committed to monitoring all known nests sites and to complete raptor nest search annually until the project is constructed. If additional sites are found E.ON will consult with ESRD – WM to determine appropriate mitigation for these sites.

Wetlands: Amphibian Setbacks: 1,680 Class 1 through V wetlands were observed within the project area during the preconstruction surveys of which 710 were class 1V or V. ESRD-WM recommends that for this project a minimum of 100 meter setback from all class 111 or higher wetlands be maintained for all new permanent above ground structures. One turbine (T12) is within a minimum of 100 meters from a class 111 wetland. There is one wetland at 99 meters and two at 94 meters. The turbine is situated to maximize the distance from each and the siting is acceptable to ESRD-WM. Infrastructure, collection lines and roads often fall within 100 meters of a wetland but these are primarily class 1 through 111 wetlands and mitigation will primarily involve timing of construction.

The preconstruction amphibian surveys did not locate any amphibian species of concern and only boreal chorus and wood frogs were recorded.

The collection line is to be installed outside the critical breeding period for breeding birds of April 1st-July 15th.

Additional mitigation for wetlands proposed by E.ON. and accepted by ESRD – WM include:

1. All equipment will be routed around wetlands
2. All project activities will follow BMP for sedimentation and spill prevention.
3. All disturbed areas not used for subsequent operation will be reclaimed following construction to minimize erosion and siltation.
4. Any permanent loss of wetlands due to widening of currently used roads or trails will be compensated at the standard 3:1 wetland loss ratio with an approved compensation agency.

Avoidance of Bird and Bat Migration Routes

- Migration surveys were completed in 2011 and 2012. The E.ON Wind Power Project was not sited near ridgelines, or other terrains that concentrate migratory bird and bat species. However, as the bat activity rate during the fall migration experienced some highs, and some equipment problems during potential bat migrational timing, ESRD – WM considers the project to be a medium to high risk to bats.

Construction Timing and Breeding Birds

The entire Grizzly Bear Creek Wind Power Project has been preferentially sited on cultivated land or tame pasture as recommended by ESRD-WM. However, migratory and game bird species may also nest in modified or shrubby pasture. E.ON will agree, in principle, to construction of turbines and associated infrastructure outside of the April 1st through July 31st critical breeding season for grassland birds. If that is not possible, nest sweeps will be conducted prior to construction, in order to avoid contravention of the Alberta Wildlife Act and Migratory Birds Convention Act. If nests are located during sweeps, consultation with ESRD-WM to discuss mitigation will occur.

Wildlife Monitoring Requirements:

Wildlife monitoring will be determined through consultation with ESRD – WM and E.ON Climate and Renewables Inc.

E.ON will commit to one spring wildlife survey to include birds and amphibians and one fall bat migration study before the start of construction because of the greater than two year delay between the completion of the existing wildlife surveys and construction.

E.ON have committed to develop a Post Construction Monitoring Plan (PCMP) in consultation with ESRD – WM. Post-construction follow-up surveys will be completed over a minimum of 2 years to determine changes to bird and bat use of the areas associated with turbines and related infrastructure. Specifically monitoring will occur during the bird and bat migration periods (March 1st - October 31st).

Carcass searches will be completed within the rotor swept area plus ten meters of the turbines at a representative sample of 1/3 of the turbine sites. A portion of these turbine sites should be chosen based on proximity to bats detectors and Avian Use Survey Points. Surveys will be conducted using the methods described in *“Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds”* (Canadian Wildlife Service 2007). Each searcher will be tested for search efficiency. Additionally a scavenger removal study will be carried out. Individual carcasses will be collected, labeled and submitted to ESRD – WM. A detailed report of the post-construction monitoring will be provided to ESRD – WM annually.

The post-construction monitoring program for the Grizzly Bear Creek site will gather additional data on activity levels, which can be used to further examine the relationship between activity and fatality rates. Mitigation will be required if post-construction fatality assessment reveals a higher than acceptable bird or bat fatality rate. A firm commitment for implementing mitigation and

adaptive management has been made by E.ON and they will conduct post construction monitoring to assess bird and bat mortality and implement mitigation measures if deemed necessary by ESRD – WM due to excessive mortality. E.ON has confirmed that operational modifications can be incorporated into the operating parameters of the selected turbines if deemed necessary. If a site (turbine or other infrastructure) is found to have a higher than accepted rate of mortality (as determined by ESRD – WM), mitigation measures will be employed. ESRD – WM recommends that mitigation measures for excessive mortality may include but are not limited to:

- Alter cut in speeds at turbines with high mortality rates.
- Turbine shut down at night during bat migration periods.
- Ensuring check and balances are in place to prevent unnecessary lighting at night.
- Any mitigation that is deemed appropriate based upon the site specific circumstances or incidents following consultation with ESRD – WM and the agreement of ESRD-WM.

Results of the post-construction monitoring will be provided annually to ESRD – WM.

Mitigation for Decommissioning of Wind farm

E.ON has identified the following mitigation strategies for use during decommissioning of the Grizzly Bear Creek Wind Power project:

1. All areas will be reclaimed to equivalent land use capabilities.
2. In areas of wetlands:
 - a. Underground cabling will be left in situ
 - b. All project activities will follow BMP for sedimentation and spill prevention
3. All decommissioning activities will be restricted to the access ROWs, leases and temporary work areas.
4. All connection points for collector lines will be excavated and buried powerlines removed to 1 m below surface.
5. Buried connection lines will be left in place below the cultivation layer to prevent soil disturbance.
6. Above ground lines and poles will be removed, holes will be filled and covered with topsoil.
7. Soil will be ploughed as necessary to repair any compaction.
8. Disturbed areas on tame pastures will be seeded with the appropriate seed mixtures.
9. All spills will be remediated and reclaimed.
10. All waste will be removed.
11. Turbine foundations will be removed to 1 meter below grade and turbine footprint will be returned to original land use.
12. All decommissioning activities will be scheduled to avoid sensitive breeding periods and areas.

ESRD – WM recommends that E.ON or the project owners at time of decommissioning contact ESRD – WM for consultations.

Prior to commencement of the PCMP, E.ON must ensure that proper regulations are followed and appropriate research and collection licenses are obtained. Information collected under the authority of the licenses will be submitted annually to ESRD – WM to be entered into the FWMIS database.

As discussions on PCMP development have not occurred yet, survey time lines will be determined in consultation with ESRD – WM at a later date.

From: [Dave Moore](#)
To: [Glendinning, Stephen](#)
Cc: [Gary Martens \(Gary.Martens@eon.com\)](#)
Subject: RE: Grizzly Bear Creek - Turbine 4 relocation
Date: Wednesday, October 15, 2014 9:13:02 AM

Good morning:

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Thank you for the information supplied. If you require further documentation please let me know.

Dave Moore
Senior Wildlife Biologist, Vermilion
Red Deer- North Saskatchewan Region
Alberta Environment and Sustainable Resource Development
#8 4701 52 Street
Vermilion, Alberta
Off: 780-853-8137
Cell: 780-787-0151
Fax: 780-853-8264

From: Glendinning, Stephen [mailto:Stephen_Glendinning@golder.com]
Sent: Tuesday, October 14, 2014 4:31 PM
To: Dave Moore
Cc: Gary Martens (Gary.Martens@eon.com)
Subject: Grizzly Bear Creek - Turbine 4 relocation

Dave,

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Can you please consider the proposed change to Turbine 4 and let us know if you have any questions or concerns, or if you require any additional information, assessment, avoidance, mitigation, or reporting as a result of the proposed Turbine 4 move? If so, we'd be happy to address them. If not, could you please consider providing some form of update to your previous sign-off, on behalf of ESRD?

We appreciate your attention to this matter.

Cheers,
Stephen

Stephen Glendinning (B.Sc., P.Biol.) | Associate; Wildlife Ecologist; Manager, Prairies Region Power Sector | **Golder Associates Ltd.**

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T: +1 (403) 299 5600 | **D:** +1 (403) 260 2239 | **F:** +1 (403) 299 5606 | **C:** +1 (403) 819 5286 | **E:** Stephen_Glendinning@golder.com | www.golder.com

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From: [Glendinning, Stephen](#)
To: [Dave Moore](#)
Cc: [Gary Martens \(Gary.Martens@eon.com\)](#)
Subject: RE: Grizzly Bear Creek - Turbine 4 relocation
Date: Thursday, October 16, 2014 5:25:03 PM
Attachments: [FigA4_NordexN117_Turbines_20141016_FINAL.PDF](#)

Thank you Dave, we appreciate your consideration of this. I suspect your email will be sufficient evidence that the change is acceptable to ESRD; however, if the AUC feels otherwise I might request something further.

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Cheers,
Stephen

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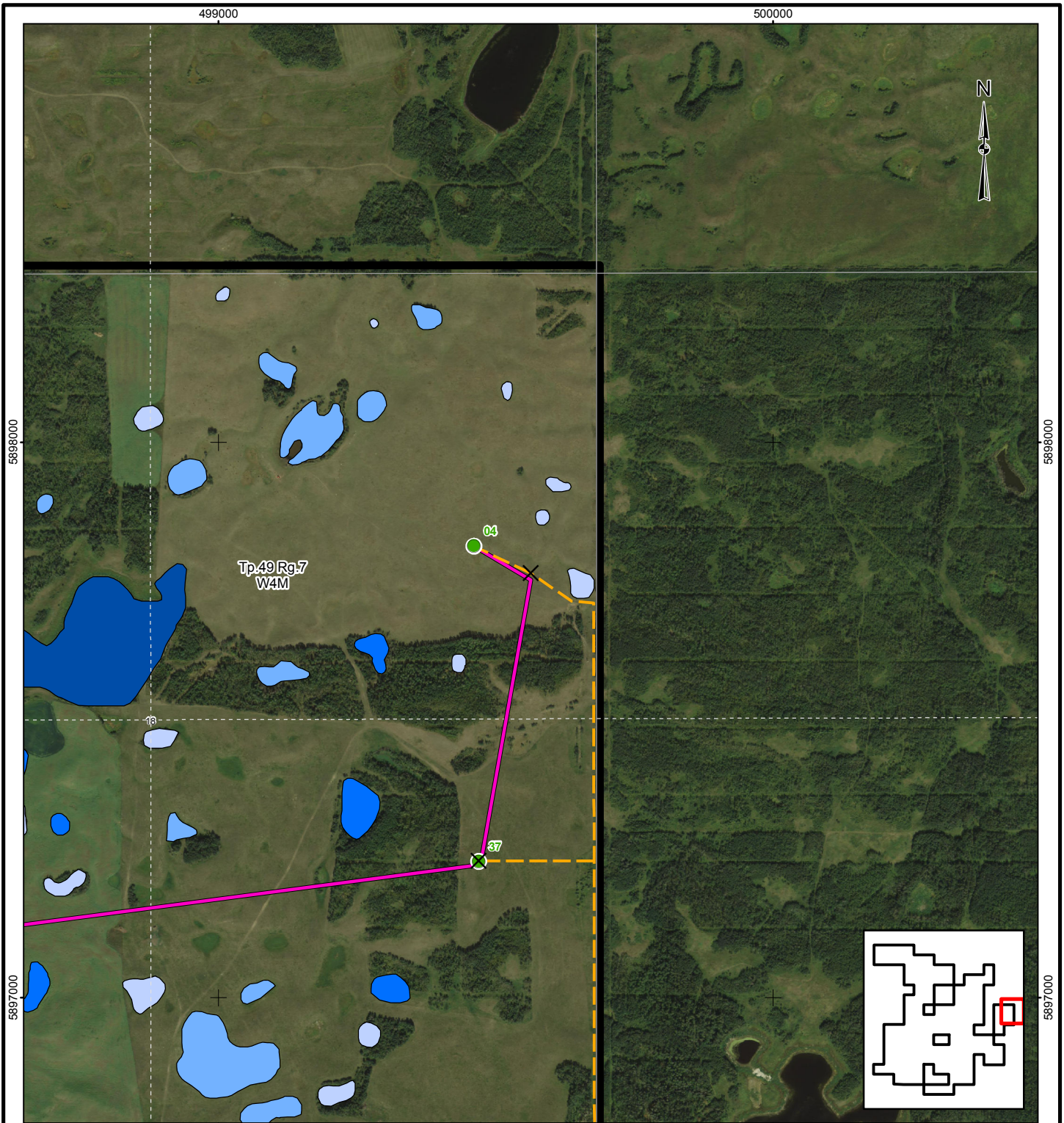
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LEGEND

	PROJECT AREA		ROADS		HABITAT FEATURES
	PROPOSED PROJECT INFRASTRUCTURE		PUBLIC INTERSECTION IMPROVEMENT		BALD EAGLE NEST
	SUBSTATION		DELIVERY ROAD		RED-TAILED HAWK NEST
	TURBINE		ROAD TO BE IMPROVED		SWAINSON'S HAWK NEST
	PREVIOUSLY PROPOSED NORDEX LAYOUT (JULY 2014 APPLICATION)		LOCAL ROAD		WETLANDS
	ACCESS ROAD				CLASS I AND II*
	COLLECTION SYSTEM				CLASS III*
					CLASS IV*
					CLASS V*
					DESKTOP WETLAND

NOTE

* STEWART AND KANTRUD (1971) WETLAND CLASSIFICATION SYSTEM. LEGEND IS CONSISTENT THROUGHOUT SERIES AND NOT ALL FEATURES APPEAR ON EVERY MAP.

REFERENCE

TRANSPORTATION DATA OBTAINED FROM CANVEC. IMAGERY OBTAINED FROM VALTUS IMAGERY SERVICES AND FROM BING MAS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION. DATUM: NAD83 PROJECTION: UTM ZONE 12



PROJECT
E. ON CLIMATE & RENEWABLES CANADA
GRIZZLY BEAR CREEK WIND POWER PROJECT

TITLE	TURBINE 04			
	PROJECT	11-1334-0046	FILE No.	
	DESIGN	SG	02 Sep. 2014	SCALE AS SHOWN
	GIS	MM	16 Oct. 2014	REV. 0
	CHECK	SG	16 Oct. 2014	FIGURE: A-04
	REVIEW	SG	16 Oct. 2014	

From: [Dave Moore](#)
To: [Glendinning, Stephen](#)
Subject: RE: Grizzly Bear Creek - Turbine 4 relocation
Date: Friday, October 17, 2014 8:49:42 AM

Thanks Stephen.

I will reiterate that the extension of the collector system is still acceptable to us and does not change our previous acceptance of it.

Dave

From: Glendinning, Stephen [mailto:Stephen_Glendinning@golder.com]
Sent: Thursday, October 16, 2014 5:23 PM
To: Dave Moore
Cc: Gary Martens (Gary.Martens@eon.com)
Subject: RE: Grizzly Bear Creek - Turbine 4 relocation

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Sent: Tuesday, October 14, 2014 4:31 PM

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October 16, 2014

To: Interested Parties

E.ON Climate & Renewables Canada Ltd.
Grizzly Bear Creek Wind Power Project
Application No. 1610717
Proceeding No. 3329

1 Overview and nature of the issue to be decided

1. E.ON Climate & Renewables Canada Ltd. (E.ON) filed an application with the Alberta Utilities Commission (AUC or the Commission) for the Grizzly Bear Creek Wind Power Project (the project). The Grizzly Bear Creek Wind Power Project is a 120-megawatt wind power plant which consists of 50 2.4-megawatt wind turbines, a 34.5-kilovolt (kV) collector system and the Grizzly Bear 708S substation. The project site is located within Township 48, Range 8, west of the Fourth Meridian and Township 49, Ranges 7 and 8, west of the Fourth Meridian, southwest of the community of Vermilion and is on private lands.

2. On August 11, 2014, the Commission issued a notice of application for Proceeding No. 3329. The original deadline for submissions was September 19, 2014, however this deadline was extended until October 20, 2014, for parties who did not receive the original notice. To date, the Commission has received 20 submissions from interested persons in response to the notice issued for the project. Of the submissions received, 18 were objections, one was a letter of support and one was a letter indicating an intent to monitor the proceeding.

3. In this ruling, the Commission must decide if the persons who filed a submission on the Grizzly Bear Creek Wind Power Project have demonstrated that they have rights that may be directly and adversely affected by the Commission's decision on the project application. A person who demonstrates the potential for direct and adverse effect is said to have "standing".

4. The Commission asked me to write to you to provide its ruling and reasons for its ruling on the standing of those persons who filed submissions on the record of Proceeding No. 3329.

2 Objections and statements of intent to participate

5. The Commission received objections to the Grizzly Bear Creek Wind Power Project from:

- Kirby and Marilyn Demas
- Ronald Russell Dixon
- Karen and Douglas Hess
- Boone Hess
- Robert and Audra Livingstone

- Doug and Cheryl Livingstone
- Walter and Margaret Maron
- Calvin Maron
- Michael and Elizabeth Myhovich
- Don Myshak
- Hazel Mytz
- Candice and Dustin Obridgewitch
- Fred and June Wyard-Scott (Wyard-Scott Farms Ltd.)
- Ken Wyard-Scott (Wyard-Scott Farms Ltd.)
- Laura Tapley
- Elfrieda Westover
- Warren Westover

6. These persons expressed a number of concerns about the project. The concerns raised include: impacts to health and safety, visual impacts, environmental impacts, agricultural impacts, land value impacts, as well as traffic and noise. Many of these persons also raised concerns about the consultation program for the Grizzly Bear Creek Wind Power Project.

7. In their respective statements of intent to participate, these persons indicated that they own and occupy land located within two kilometres of the project. Further, these persons also indicated that they are represented by Mr. Richard Secord of Ackroyd LLP and have formed the Grizzly Bear Coulee Protection Group.

8. The Commission also received a statement of intent to participate from Brian Rogan indicating that he did not want transmission lines crossing his property.

9. On August 15, 2014, the Commission received a letter from Benign Energy Canada II Inc. which indicated that it intended to monitor the proceeding.

10. On October 10, 2014, the Commission received a letter of support from Alice Stafinski.

3 Commission findings

3.1 How the Commission determines standing

11. Standing before the Commission is determined by subsection 9(2) of the Alberta Utilities Commission Act which states:

(2) If it appears to the Commission that its decision or order on an application may directly and adversely affect the rights of a person, the Commission shall

(a) give notice of the application in accordance with the Commission rules,

(b) give the person a reasonable opportunity of learning the facts bearing on the application as presented to the Commission by the applicant and other parties to the application, and

(c) hold a hearing.

12. In *Cheyne v. Alberta (Utilities Commission)*, the Alberta Court of Appeal characterized Section 9(2) as the equivalent of Section 26(2) of the *Energy Resources Conservation Act* and confirmed that there is a two-part test for standing. First, a person must demonstrate that the right he or she is asserting is recognized by law. Second, a person must provide some information that shows that the Commission's decision on the application may directly and adversely affect his or her rights. The first part of the test is legal; the second part of the test is factual. For the factual part of the test, the Alberta Court of Appeal has stated that "some degree of location and connection between the work proposed and the right asserted is reasonable."¹

13. In *Sawyer v. Alberta (Energy and Utilities Board)* the Alberta Court of Appeal commented further on the factual component of the standing test and stated that "...in considering the location or connection, the Board is entitled to look at factors such as residence, the presence or absence of other wells in the area, and the frequency and duration of the applicant's use of the area near the proposed site."²

14. The Commission assesses the potential for direct and adverse effect on a case-by-case basis, having regard for the specific circumstances of each project application and each application for standing. The Commission considers that the expression of general or broad concerns about a project, without some link or connection to the demonstrated or anticipated characteristics of a project will generally be an insufficient basis for establishing the potential for a direct and adverse effect. In the Commission's view, this is the very mischief that the Alberta Court of Appeal identified when it opined that "some degree of location or connection between the work proposed and the right asserted" is a necessary ingredient for standing.³

15. If the Commission finds that a person has standing pursuant to Section 9(2) of the *Alberta Utilities Commission Act* it must hold a hearing to consider the person's concerns about the subject application. Further, persons with standing have the right to fully participate in the hearing. The Commission considers this to include the right to file evidence in support of their position, the right to question or cross-examine the applicant(s) on its evidence and the right to make argument.

16. In the past, the Commission has allowed persons without standing the opportunity to provide a brief statement to the Commission that describe their views on the application. In exceptional circumstances the Commission may also allow parties without standing to fully participate in a hearing by filing evidence, cross-examining the applicant and giving argument.

¹ *Dene Tha' First Nation v. Alberta* (Energy and Utilities Board), 2005 ABCA 68 at para 14.

² 2007 ABCA 297 at para 16.

³ *Dene Tha' First Nation v. Alberta* (Energy and Utilities Board), 2005 ABCA 68 at para 14.

However, where all persons with standing withdraw their objections the Commission may cancel the hearing even if parties without standing have expressed a desire to participate in that hearing.

3.2 Standing ruling

17. The Commission is satisfied that the following persons have standing to participate in a hearing to consider the Grizzly Bear Creek Wind Power Project application:

- Kirby and Marilyn Demas
- Ronald Russell Dixon
- Karen and Douglas Hess
- Boone Hess
- Robert and Audra Livingstone
- Doug and Cheryl Livingstone
- Walter and Margaret Maron
- Calvin Maron
- Michael and Elizabeth Myhovich
- Don Myshak
- Hazel Mytz
- Candice and Dustin Obridgewitch
- Brian Rogan
- Fred and June Wyard-Scott (Wyard-Scott Farms Ltd.)
- Ken Wyard-Scott (Wyard-Scott Farms Ltd.)
- Alice Stafinski
- Laura Tapley
- Elfrieda Westover
- Warren Westover

18. In making its determination, the Commission considers that these persons own and occupy lands within two kilometres of the project. Given the scope of the project and the size of the proposed turbines, the Commission finds that there is a sufficient degree of connection between the ownership and occupation rights asserted by these parties and project-associated concerns that they raised in their objections.

19. As noted earlier, these persons raised similar concerns about the Grizzly Bear Creek Wind Power Project in their objections. The Commission notes that parties with standing (with the exception of Brian Rogan and Alice Stafinski) have formed the Grizzly Bear Coulee Protection Group. The Commission encourages persons objecting to the application to continue to work together as a group and, if possible, bring forward a single intervention that addresses the group's collective concerns. The participation of a group with shared interests allows group members to share the work of preparing for and participating in a hearing. This approach makes hearings more efficient and reduces the risk of having intervener costs disallowed for duplication of effort.

3.3 Conclusion

20. Because the Commission has determined that members of the Grizzly Bear Coulee Protection Group, Brian Rogan, and Alice Stafinski have rights that may be directly and adversely affected by its decision on the application, the Commission will hold a public hearing in accordance with Section 9 of the *Alberta Utilities Commission Act*. A notice of hearing will be issued in due course.

21. If you have any questions, please feel free to contact the undersigned at 403-592-4499 or shanelle.sinclair@auc.ab.ca.

Yours truly,

Shanelle Sinclair
Commission Counsel