

In the matter of appeals by The Corporation of the County of Lambton ("County") filed September 4, 2014 and Kimberley and Richard Lance Bryce ("Bryces") filed September 5, 2014 for a Hearing before the Environmental Review Tribunal ("Tribunal") pursuant to section 142.1 of the *Environmental Protection Act*, R.S.O. 1990, c. E.19, as amended ("EPA"), with respect to Renewable Energy Approval No. 6914-9L5JBB issued by the Director, Ministry of the Environment, on August 22, 2014 to Suncor Energy Products Inc. ("Suncor"), under section 47.5 of the *Environmental Protection Act*, regarding a Class 4 wind facility consisting of the construction, installation, operation, use and retiring of a wind facility with a total nameplate capacity of 100 megawatts (MW) ("Cedar Point"), with the substation located at the Southwest corner of Cedar Point Line and Fuller Road, in the Municipality of Lambton Shores and other project infrastructure at various locations within the Town of Plympton-Wyoming, Municipality of Lambton Shores, Warwick Township, and Lambton County, Ontario.

WITNESS STATEMENT

OF

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INTRODUCTION

1. I have no personal interest in the outcome of this appeal. I intend to appear before the Environmental Review Tribunal (ERT) and be subject to direct examination and cross-examination. My evidence will be factual and opinion evidence. I have read the ERT's Practice Direction for Technical and Opinion Evidence and I provide this statement in accordance with that Practice Direction. Attached as **Exhibit "1"** to this witness statement is a Form 5 that I signed in accordance with the ERT's Rules of Practice.



AREA OF EXPERTISE

2. My area of expertise is in the field of environmental health science. I am trained, schooled and practiced in the evaluation of potential risks and health effects to people and ecosystems associated with environmental issues.
3. I have been qualified to provide opinion evidence on wind turbines and potential health effects at three previous ERTs (Erickson v. MOE 2011; Monture v. MOE [GREP] 2012; and Moseley v. MOE 2014). In addition, I provided expert evidence with regard to wind turbines and health for the Queen's Bench of Saskatchewan in McKinnon v. Martin (2010 – also referred to as the Red Lily case) and at the Alberta Utilities Commission (AUC) Proceeding No. 1955, Bull Creek Wind Project (October 2013). I am also under contract to provide expert advice on wind turbines, health and proper siting requirements for the Vermont Public Services Department.

POSITION AND QUALIFICATIONS

4. I am the Vice President, Strategic Development and Senior Environmental Health Scientist at Intrinsic Environmental Sciences Inc. ("Intrinsic"). A copy of my current *curriculum vitae* is attached as **Exhibit 2** to this witness statement. I am recognized across Canada by the federal and provincial/territorial governments, including the province of Ontario, as a senior environmental health scientist, risk assessor and environmental toxicologist.
5. My formal education includes:
 - a. Doctorate of Philosophy, Environmental Science, Royal Military College of Canada, Kingston, Ontario, 2003.
 - b. Master of Science, Environmental Science, Royal Military College of Canada, Kingston, Ontario, 2000.
 - c. Bachelor of Science (Honours), Biology, Queen's University, Kingston, Ontario, 1995.
6. I hold an appointment of Adjunct Assistant Professor at the Royal Military College of Canada in the Department of Chemistry and Chemical Engineering and Adjunct Professor in the School of the Environment at the University of Toronto. My duties include teaching of graduate level courses in Environmental Risk Assessment and co-supervision of graduate students. I have also supervised a number of Natural Sciences and Engineering Research Council (NSERC) Industrial Post-Doctoral Fellows over the past decade, including two that have published in the area of wind turbines and health. In 2013, I was appointed to the Governing Council and am Vice-Chair of the Academic Affairs Committee of the University of Toronto Scarborough Campus.

7. Over the past five years, I have been engaged by a number of private companies to review the potential health effects that may be associated with living in proximity to wind turbines as part of their preparation of environmental assessment documentation. This has led to the development of an Intrinsic research team comprised of three Doctoral level and one Master level (now Doctoral Candidate) staff members. Approximately one third of our practice on an annual basis has been devoted to better understanding the relationship between people and wind energy.

These research efforts were first published in a peer-reviewed scientific article entitled:

Knopper, L.D. and **Ollson, C.A.** 2011. Health Effects and Wind Turbines: A Review of the Literature. *Environmental Health*. 10:78. Open Access. Highly Accessed.

Environmental Health is an open access journal (meaning anyone can obtain a copy for free) and has an impact factor of 2.71, meaning that articles published in this journal are often cited in other papers. After its publication in September 2011 the journal quickly identified the article as “highly accessed”, it has been viewed over 30,000 times and cited in more than 30 other scientific articles.

8. Subsequently, our research team has published the following articles.
Four articles in peer-reviewed scientific journals:

Ollson, C.A., Knopper L.D. McCallum, L.C., Aslund-Whitfield, M.L. 2013. Are the findings of ‘Effects of industrial wind turbine noise on sleep and health’ supported? *Noise & Health* 15:63, 148-150.

Whitfield Aslund, M.L., **Ollson, C.A.**, Knopper, L.D. 2013. Projected contributions of future wind farm development to community noise and annoyance levels in Ontario, Canada. *Energy Policy*. 62, 44-50

McCallum, L., Whitfield Aslund, M., Knopper, L.D., Ferguson, G.M. and **Ollson, C.A.** 2014. An investigation of wind energy and health: quantifying electromagnetic fields around wind turbines in Canada. *Environmental Health* 2014, **13**:9

Knopper, L.D., Ollson, C.A., McCallum, L.C., Aslund, M.L., Berger, R.G, Souweine, K., and McDaniel, M. 2014. Wind turbines and Human Health. *Front. Public Health*, 19 June 2014 (attached as **Exhibit 3**)

Two additional conference proceeding publications for the 5th International Conference on Wind Turbine Noise, Denver, August 2013:

Whitfield Aslund, M.L., **Ollson, C.A.**, Knopper, L.D. 2013. 'Projected contributions of future wind farm development to community noise and annoyance levels in Ontario, Canada', submitted for publication in *Proceedings of the 5th International Conference on Wind Turbine Noise, Denver Colorado 28-30 August 2013*

Knopper, L.D., Whitfield Aslund, M.L., McCallum, L.C., **Ollson, C.A.** 2013. 'Wind turbine noise: What has the Science Told Us?', , submitted for publication in *Proceedings of the 5th International Conference on Wind Turbine Noise, Denver Colorado 28-30 August 2013*

CHRONOLOGY OF INVOLVEMENT AND DOCUMENTS REVIEWED

9. I was contacted by Counsel for Suncor in September, 2014 and asked to provide an opinion in this matter.
10. Intrinsic was retained by Suncor in 2012 to provide expertise and information on the current scientific and government literature related to wind turbines and health matters. I appeared at a number of open houses and community engagement events related to the project.
11. I have reviewed the following Appellant's documents:
 - a. Notice of Appeal, dated September 5, 2014
 - b. Disclosure Statement of the Appellants Richard Lance and Kimberley Bryce
 - c. Witness Statement of Barbara Ashbee, undated for ERT Case Nos. 13-084 to 13-089
 - d. Witness Statement of Sandy MacLoed, undated for ERT Case Nos. 13-084 to 13-089
 - e. Transcripts of Barbara Ashbee and Sandy MacLoed, September 24, 2013 for ERT Case Nos. 13-084 to 13-089
12. I also reviewed the Final Renewable Energy Approval and Reports provided on the Suncor Cedar Point Wind Power Project website at <http://www.suncor.com/en/about/4797.aspx>
 - a. The most pertinent of the reports to my evidence was the noise report:
Noise Assessment Report Cedar Point Wind Power Project. May 14, 2014.
Prepared by HGC Engineering for Suncor Energy Projects
13. I have also attached "Knopper, L.D., Ollson, C.A., McCallum, L.C., Aslund, M.L., Berger, R.G, Souweine, K., and McDaniel, M. 2014. Wind turbines and Human Health. *Front. Public Health*, 19

June 2014” as **Exhibit 3** and have relied on this paper and the references it contains, in part, to form my opinion.

DISCUSSION

14. In my witness statement prepared for *Erickson v. Ontario Ministry of the Environment, January 17, 2011*, I provided the following statement:

“Through my review of the peer-reviewed, published scientific literature and government agency reviews, it is my professional opinion that the O. Reg. 359/09 requirements of <40 dB(A) and a minimum separation distance of 550 m between wind turbines and receptors is reasonable and sufficient to protect against adverse health effects.”

Although there have been a number of government documents and scientific, social science and white papers published since *Erickson*, my review of this information has not changed my professional opinion from January 2011.

15. In the years following the publication of Knopper and Ollson (2011), the debate surrounding the relationship between wind turbines and human health has continued. As of June 2014, there were roughly 60 scientific peer-reviewed articles on the issue of causation between wind turbines and alleged health effects. While some argue that reported health effects are related to wind turbine operation (electromagnetic fields (EMF), shadow flicker, audible noise, low frequency noise, infrasound) others suggest that when turbines are sited correctly, effects are more likely attributable to a number of subjective variables (i.e., attitudes, expectation, visual aesthetics, economics) that result in an annoyed/stressed state. There is also a growing body of research that suggests that nocebo effects (that is where the etiology of the self-reported effect is in beliefs and expectations rather than a physiologically harmful entity) play a role in a number of self-reported health impacts related to the presence of wind turbines. Indeed negative attitudes and worries of individuals about perceived environmental risks have been shown to be associated with adverse health-related symptoms such as headache, nausea, dizziness, agitation and depression, even in the absence of an identifiable cause.
16. In 2014, colleagues and I published another peer-reviewed article where we critically evaluated these studies (see, Knopper, LD, et al., Wind Turbines and Human Health, 2014, *Frontiers in Public Health*, vol. 2, art. 63, copy attached as **Exhibit 3**). Based on the findings and scientific merit of the research conducted to date, it is my opinion that the weight of evidence suggests that when sited properly, wind turbines are not related to adverse health effects. This claim is supported (and has also been made) by findings from a number of government health and medical agencies (e.g., National Health and Medical Research Council in Australia, 2010; Chief

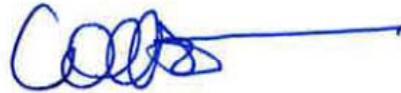
Medical Officer of Health (Ontario), May 2010; Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Public Health (MDPH), 2012; Oregon Health Authority, 2013; National Health and Medical Research Council in Australia (Merlin et al., 2014)).

17. Based on the available evidence, and taken directly from Knopper et al. 2014, our research team has suggested the following best practices for wind turbine development in the context of human health. However, it should be noted that subjective variables (e.g., attitudes and expectations) are strongly linked to annoyance and have the potential to facilitate other health complaints via the nocebo effect. Therefore, it is possible that a segment of the population may remain annoyed (or report other health impacts) even when noise limits are enforced.
 - a. Setbacks should be sound-based rather than distance-based alone
 - b. Preference should be given to sound emissions of ≤ 40 dB(A) for non-participating receptors, measured outside, at a dwelling, and not including ambient noise. This value is the same as the WHO (Europe) night noise guideline (WHO, 2009) and has been demonstrated to result in levels of wind turbine community annoyance similar to, or lower than, known background levels of noise-related annoyance from other common noise sources.
 - c. Post construction monitoring should be common place to ensure modelled sound levels are within required noise limits.
 - d. If sound emissions from wind projects is in the 40-45 dB(A) range for non-participating receptors, we suggest community consultation and community support.
 - e. Setbacks that permit sound levels >45 dB(A) (wind turbine noise only; not including ambient noise) for non-participating receptors directly outside a dwelling are not supported due to possible direct effects from audibility and possible levels of annoyance above background.
 - f. When ambient noise is taken into account, wind turbine noise can be >45 dB(A), but a combined wind turbine-ambient noise should not exceed >55 dB(A) for non-participating and participating receptors. Our suggested upper limit is based on WHO (2009) conclusions that noise above 55 dB(A) is "*considered increasingly dangerous for public health*", is when "*adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed*" and "*cardiovascular effects become the major public health concern, which are likely to be less dependent on the nature of the noise*".

18. In addition, there has been recent speculation that low frequency noise or infrasound emitted from wind turbines could be the cause of health concerns reported by some living in proximity to wind projects. To that end, our research team along with Mr. Payam Ashtiani of Aercoustics Engineering Ltd. and Dr. Geoff Leventhall recently submitted a paper for review entitled “Health-based Audible Noise Guidelines Account for Infrasound and Low Frequency Noise Produced by Wind Turbines” to the *International Journal of Environmental Research in Public Health*.
- a. The purpose of this paper was to investigate whether current audible noise-based guidelines for wind turbines account for the protection of human health given the levels of infrasound (IS) and low frequency noise (LFN) typically produced by wind turbines. New field measurements of indoor IS and outdoor LFN at locations between 400 m and 900 m from the nearest turbine, which were previously underrepresented in the scientific literature, are reported and put into context with existing published works. Our analysis showed that indoor IS levels were below auditory threshold levels while LFN levels at distances >500 m were similar to background LFN levels. Collectively, these data in conjunction with previous reports indicate that levels of IS and LFN are not sufficient to induce adverse health effects; therefore health-based audible noise guidelines, as provided by the MOE, are suitable for the protection of human health.
19. A recent article that was not addressed in Knopper et al. (2014) is that of Dr. Ian Arra of Laurentian University and reported on the Cureus website in 2014. *Arra I, Lynn H, Barker K, et al. (2014-05-23 11:51:41 UTC) Systematic Review 2013: Association Between Wind Turbines and Human Distress. Cureus 6(5): e183. doi:10.7759/cureus.183*. Dr. Arra worked with Dr. Lynn in an attempt to provide a literature review of the issues surrounding wind turbines and health. This work in large part formed the basis for a Grey Bruce Board of Health Presentation given by Dr. Arra and Dr. Lynn on February 22, 2013. It is my opinion that Arra et al., 2014, should not be given any weight in this scientific debate and is not an authoritative review of the potential health effects associated with living in proximity to wind turbines. The paper contains numerous methodological and interpretation issues, and Cureus is not a reputable or indexed scientific or medical journal.

CONCLUSION(S)

- 20. During my review of the Suncor Cedar Point Wind Power Project documentation there was nothing that I noted that was unique or site-specific about this project that changes my professional opinion from January 2011.
- 21. I have reviewed the witness statements of Barbara Ashbee and Sandy MacLeod prepared for ERT Case Nos. 13-084 to 13-089. There is nothing contained within their statements or the accompanying transcripts, dated September 24, 2013, that would cause me to alter my opinion that the Cedar Point Wind Project will not cause serious harm to health.
- 22. Therefore, I will provide my professional opinion that the operation of the Suncor Cedar Point Wind Power Project, in accordance with the Renewable Energy Approval as issued, will not cause serious harm to human health.
- 23. I will also address any evidence raised by the Appellants or their witnesses regarding wind turbines and health effects.



23 October 2014

DATE

Christopher Ollson, Ph.D.