

IN THE MATTER of the Resource Management Act
1991

AND

IN THE MATTER of a Board of Inquiry appointed
under S146 of the Resource
Management Act 1991 to
consider an application by
Mighty River Power Limited for
resource consents to construct,
operate, and maintain a wind
farm at Turitea

STATEMENT OF EVIDENCE OF DOUGLAS ROGER SCOTT PRINGLE

CONTENTS

| | |
|---|----|
| APPENDICIES | 2 |
| 1. INTRODUCTION | 3 |
| Qualifications and experience | 3 |
| Involvement in Turitea Wind Farm | 4 |
| Purpose and scope of evidence | 4 |
| 2. NOISE IMPLICATIONS OF TURITEA WIND FARM PROPOSAL..... | 4 |
| Property at 21 Pineland described..... | 4 |
| Existing adjacent residences | 5 |
| Noise impact – back ground noise..... | 5 |
| Effect of noise at site 2..... | 5 |
| Effect of noise at night at site 2 | 6 |
| Experience of a 15 dbA sound pressure | 6 |
| Predicted sound pressure levels at 21 Pineland Drive..... | 7 |
| Location evidence summarised | 7 |
| 3. EFFECTS OF NIGHT TIME NOISE OF RESIDENTS HEALTH | 8 |
| Noise and sleep..... | 8 |
| Health effects summarised | 9 |
| 4. NZS 2608:1998 IS THE STANDARD ADEQUATE? | 10 |
| The date of the Standard | 10 |
| Changes proposed to NZS2608..... | 11 |
| Secondary noise limit..... | 11 |
| Use of octave band analysis in attenuation..... | 12 |
| Draft standard fails to give predictive noise equation..... | 12 |
| Uncertainty in predictive noise assessment | 13 |
| The adequacy of the standard summarised | 14 |
| 5. DEALING WITH UNCERTAINTY | 14 |
| 6. CONCLUSIONS AND RECOMMENDATIONS..... | 14 |
| 7. REFERENCES | 15 |

APPENDICIES

1. Figures for submission by DRS Pringle.
2. WHO 2005 technical report on night noise.
3. WHO 2004 technical report on night noise.
4. Webb, C. Hawkes Bay today press article.
5. Pierpont, N. Health effects of wind turbine noise.

1. INTRODUCTION

Qualifications and experience

1.1. My name is Douglas Roger Scott Pringle. I am employed as the Manager of Health and Safety at Massey University. This position covers the compliance requirements of Health and Safety in Employment legislation, Hazardous Substances and New Organisms Act, Radiation Protection Act, and Injury Prevention Compensation and Rehabilitation legislation.

1.2. I have the following qualifications:

- Bachelor of Agricultural Science, Massey University, 1974. Major in farm management and plant production.
- Post graduate Diploma of Agricultural Science, Massey University, 1975. Major in poultry production.
- Bachelor of Science, Massey University, 1995. Majors; information sciences, health and safety.
- Certificate qualification in Adult Education (Bay of Plenty Polytechnic) and Christian Studies (Laidlaw College).

I am a member of; New Zealand Institute of Safety Management, New Zealand Ergonomics Society, and New Zealand Institute of Primary Industry Management. I have been an accredited safety auditor with International Safety Rating System.

1.3. I have worked in Health and Safety since 1985. Initially I was a consultant with ACC and Department of Labour from 1985 to 1991. In 1991 I joined Massey University as Safety Coordinator covering only health and safety matters. The role has expanded to include other safety related matters as the University has expanded in size and scope.

1.4. I have been active in the development of legislation, regulations and standards when they impact the University. I have authored various papers covering health and safety both nationally and internationally.

1.5. I do occasional lecturing for block courses, including occupational noise measurement. My job includes the assessment of nuisance noise which may affect concentration and reliable communication which are essential to learning. Nuisance noise is in contrast to occupational noise which causes loss to hearing.

1.6. I have read the directions: preliminary and hearing procedures relating to the Board of Inquiry. This is my first experience in providing a submission and evidence to a Board of Inquiry appointed under the Resource Management Act.

Involvement in Turitea Wind Farm

- 1.7. I am a landowner of a property 21 Pineland Drive in the Ngarere Park sub-division and hope one day to construct a residential dwelling on that land. The property is owed by the Doug Pringle Family Trust, of which I am the settler.
- 1.8. There are existing residences adjacent to the building platform on 21 Pineland Drive property, that are affected by the evidence provided in this submission.
- 1.9. I am aware of Section 92 response by Hegley Acoustic Consultants to Mighty River Power dated 17 December 2008. This response was provided as part of the Assessment of Environmental Effects to affected land owners. The response is particularly relevant as it provides evidence of night-time noise analysis, which is referred to in this submission as evidence.
- 1.10. I was also a submitter to Palmerston North City Council proposed changes to the Turitea Reserve Management Plan in 2006.

Purpose and scope of evidence

- 1.11. The purpose of this evidence is to cover the three aspects raised in my submission made to the Turitea Callin. The three aspects are:
 - To detail the implications of predicted noise of wind turbine generators on 21 Pineland Drive property.
 - To address the health impacts of night-time noise from wind turbine generators
 - To detail the inadequacies of the standards used in environmental assessment impact reports.

2. NOISE IMPLICATIONS OF TURITEA WIND FARM PROPOSAL

- 2.1. The noise implications of the Turitea wind farm proposal are based on the evidence which has been presented to the Board of Inquiry, and the Section 92 request provided by Hegley consultants to Mighty River Power on 17th September 2008. The Section 92 request was provided to the submitter as part of the Assessment of Environmental effects. The evidence is interpreted as it affects 21 Pineland Drive.

Property at 21 Pineland described

- 2.2. 21 Pineland Drive and its proximity to proposed wind turbine generators is shown in Figure 1. The property is a triangle shape of approximately 1 ha, directly at the end of Pineland Drive. It is a hill top property at altitude of 242m without any protection of terrain between the building site and proposed wind turbine generator zones.

- 2.3. The property is 1 km from several of the proposed wind turbine generator zones to the East and South.
- 2.4. Nine of the proposed turbines zones on Bryant Hill directly to the east of Pineland Drive have been deleted by Mighty River Power.

Existing adjacent residences

- 2.5. Adjacent existing hill top dwellings will also be affected by the proposed wind turbine generators. The existing properties are shown in Figure 2. Figure two also shows that 21 Pineland Drive is just over one kilometre from proposed wind turbine zones.
- 2.6. The altitude of adjacent proposed wind turbine zones is approximately 300m asl. 21 Pineland Drive building platform and adjacent residences are at 240m asl, within some 100m vertically of the proposed wind turbine bases.
- 2.7. There is no intervening topography or vegetation to screen noise transmission. However noise from the proposed wind turbine zones is a function of distance, and ambient back ground noise. I first wish to consider back ground noise.

Noise impact – back ground noise

- 2.8. Information on back ground noise is provided in Hegley’s various reports. It is useful to consider the location of nearest background noise survey’s to 21 Pineland Drive. The evidence provided to the Board of Inquiry by Hegley in his brief of evidence dated 1 May 2009 is shown in Figure 3.
- 2.9. Hegley provides his data to C.W. Day for a peer review. In Day’s evidence survey point two is shown in a different location as illustrated in Figure 4.
- 2.10. Hegley, in the information provided in the Section 92 request, gives the coordinates of survey point two as grid reference 2733913 Easting and 6081879 Northing. This site is some 1.5 km to the south west in Greens Road from the position indicated in Hegley’s and Day’s evidence.
- 2.11. There are three different locations given to the Board of Inquiry for survey point two. Given the inconsistent information in the location of survey point two, the presented evidence must be regarded with some uncertainty.

Effect of noise at site 2

- 2.12. Despite the demonstrated uncertainty of the sound evidence, in the absence of more reliable evidence, I am forced to use the information provided by Helgey.
- 2.13. Figure 5 shows the measured and predicted noise exposure for site 2.

2.14. The figure is significant for several reasons:

- The observed ‘typical’ back ground noise is around 30 dBA rising to 31 dBA at wind speeds above 15 m/s.
- The permitted noise level for the Standard NZS6808 and also the PNCC planning level is some 10 dBA higher at Leq of 40dBA. Sound pressure levels are logarithmic and an increase of 9 dbA represents an increase of 3 times the sound pressure level.
- The predicted noise level for wind turbine generation at survey site 2 rises to 43 dBA at 8 m/s wind speed. This is now an increase of 4 times the sound pressure level above the back ground noise level. The predicted noise pressure level for the wind turbine generators exceeds levels permitted NZS6808 at wind speed higher than 7 m/s.
- There is no offer to rerate wind turbine generators in Hegley’s evidence, so it appears the design is intended to be non compliant.

Effect of noise at night at site 2

2.15. In the Section 92 request Hegley’s details show the effect of night noise at site 2. Noise at night is more significant for several reasons:

- During the day the back ground noise is higher due to industrial, farming, and other occupational day time activity.
- As the back ground noise is quieter at night a sound which may go undetected during the night may become intrusive at night.
- For most of the population night is a time of sleep and rest.
- Noise transmission is greater at night. Due to more stable air.

2.16. The observed night sound levels are shown in Figure 6. The pattern of noise is similar to Figure 5, but the sound pressure levels are different as detailed below;

- As expected the back ground noise levels are quieter, peaking at 30 dbA for a wind speed of 12 m/s.
- As a result of quieter back ground noise the increase in predicted noise levels from wind turbine generation is some 15 dBA above background at a wind speed of 8 m/s. This is now a 5 times increase in sound pressure above the back ground noise level.
- The predicted noise pressure level for the wind turbine generators also exceeds level permitted NZS6808 after wind speed of 7 m/s.
- In the Section 92 information, there is an offer to de-rate the nearest turbines at night which not repeated in the Board of Inquiry evidence. This is an acknowledgement the design is non compliant.

Experience of a 15 dbA sound pressure

2.17. I would seek the Board of Inquiry permission to bring as evidence a random sound generator to the presentation and to allow the Board to experience a 15dbA increase in sound pressure level

during the presentation. The apparatus can also generate octave band frequencies if that is of interest to the Board.

Predicted sound pressure levels at 21 Pineland Drive

- 2.18. In Hegley's evidence the nearest noise prediction point is MP15 (Figure 42a). The predicted sound pressure level at MP15 is Leq of 41.2 dBA (table 2, para 8.21). The predictions are based on Concawe algorithms, wind speed 9 m/s with account is taken of screening effects of topography (para 8.22).
- 2.19. The location of MP15 is significant. It estimated grid reference is 27355 Easting 60835 Northing and altitude 215m asl. It is estimated at 250m distance from 21 Pineland Drive. The proximity of MP15 means the location is relevant to 21 Pineland Drive. However, the altitude of 21 Pineland Drive is at 242 m asl and does not have the advantage of topography screening at the lower altitude noise prediction point.
- 2.20. When an envelope approach is used to calculate noise prediction points the predicted sound pressure level at MP15 increases to 42.8 dBA. (Section 92 request – page 9).
- 2.21. The predicted sound pressure levels are in excess of those permitted by NZS 6808.
- 2.22. Hegley's calculation are subject to peer review by Day. Day used different algorithms based on ISO9613 methodology to manipulate Hegley's data and considers Helgley's prediction at MP15 is too high, suggesting 40dBA would be predicted sound pressure level. Based on Day's peer review the sound pressure levels near 21 Pineland Drive, but at a lower altitude are just compliant with NZS6808.

Location evidence summarised

- 2.23. In summary, the evidence outlined above shows at best, the predicted noise level at MP15 is either just compliant, or non compliant in being above the acceptable level specified in NZS6808. MP15 is at a lower altitude and has topographical screening. As such, MP15's location understates the predicted noise sound pressure that will be experienced by 21 Pineland Drive and the adjacent hill top residences. Therefore the hill top residences will be most likely be subject to non compliant noise pressure levels from the proposed wind turbine generation farm.
- 2.24. As previously described there is uncertainty in the reference background monitoring point location, and differences in expert opinion on predicted wind turbine generator noise pressure level depending on calculation methodologies.
- 2.25. I wish now to consider the health effect of night time noise.

3. EFFECTS OF NIGHT TIME NOISE OF RESIDENTS HEALTH

- 3.1. The expert witness evidence is provided by Dr D.R.Black. Dr Black is a practicing specialist medical practitioner, and recognised as an expert in occupational and environmental medicine. As a health and safety practitioner I have interface with occupational medical specialists. The choice of occupational and environmental medicine expert to give evidence on a public health matter of night time noise effects is curious, given the expert witness does not purport to have any expertise in public health, other than his environmental responsibility.
- 3.2. Dr Black's evidence does not include the more recent 2004 and 2005 World Health Organisation (WHO) information, his latest WHO reference is dated 1999.
- 3.3. For acoustical effects Dr Black depends heavily on Mr Hegley's evidence. In para 5.19 he considers Hegley's findings as "insignificant from a public health point of view and will not be more than noise limits prescribed by NZS6808". The information provided by Hegley previously detailed in this evidence shows predicated noise levels above NZS6808 and Hegley also recommends de-rating turbines causing noise effects. Dr Black's statement is inconsistent with information presented in Hegley's evidence.
- 3.4. Given Dr Black's lack of expertise in noise research and misunderstanding as to the predicted noise levels not exceeding NZS6808, it would be more appropriate to turn to a more robust expert such as Dr David McBride. According to Massey University Public Health Research Centre, the best national authority on the health effects of noise is, Dr David McBride, a senior lecturer at Dunedin School of Medicine at Otago University, and occupational physician with a background in ENT surgery; the coalmining and electricity supply industries. His research interests include a particular interest in physical hazards, particularly noise and vibration.
- 3.5. In this evidence I have used the WHO which is internationally recognised as the authority on health and effects of low level noise. The WHO information is considered in detail next.

Noise and sleep

- 3.6. According to the WHO "Sleep disturbance is one of the most serious effects of environmental noise. The WHO guidelines say that for good sleep, sound level should not exceed 30 dB(A) for continuous background noise, and individual noises events exceeding 45 dB(A) should be avoided¹". The WHO also detail that relationships between noise exposure and sleep disturbance are established only for immediate effects. Next-day or long-term effects are still not clear. Existing studies have tended to focus on young adults, which is of concern as the effects on children may be more marked. "WHO is therefore planning to expand its work on sleep disturbance (focusing on noise disturbance but also on the health consequences of poor

¹ WHO *Noise and Health, Noise and sleep*, Cited 20 May 2009. Online http://www.euro.who.int/Noise/activities/20040304_1, 18 December 2008

sleep) to define a position on the secondary and long-term effects of noise on sleep for both adults and children”.

- 3.7. WHO/Europe is developing Guidelines for night time noise (NNGL) through a project in partnership with the European Commission, Directorate General Health and Consumers (DG Sanco), and with several Member States. The project reviewed the evidence of the effects of night time noise on health, and estimated the magnitude of the associated health risks. A WHO publication is planned to be released in 2009².
- 3.8. The WHO technical reports detailing the effects of noise on sleep are attached as Appendix 2 and 3. The appendices contain technical report summarising studies dealing with sleep disturbances caused by noise exposure. These reports concluded unanimously that disturbed sleep had serious health effects, with solid evidence existing in sleep medicine. The technical reports use an “insomnia model” to describe health effects.

Health effects summarised

- 3.9. To summarise, the proposed Tutirea wind farm will produce noise effects at or above the NZS6808 standard of Leq 40dBA. The sound pressure level used in NZS6808 is much higher than the recommended WHO standard of 30dBA for continuous noise.
- 3.10. The evidence provided in the Turitea wind farm proposal has serious weaknesses relative to public health and uses the older 1999 WHO guidelines.
- 3.11. The more recent WHO technical expert reports are included in this submission to detail serious health consequences of night noise on sleep disturbance.
- 3.12. On the basis of the evidence in this submission, to propose a wind farm on the scale of the Turitea project, which is less than one kilometer from an established country residential area is risky. The risk is the Turitea wind farm as proposed may become a social health experiment on a scale unprecedented in New Zealand. The 1987-88 Cartwright inquiry, dubbed by the media as an “unfortunate experiment”, is perhaps the nearest rival. The Board of Inquiry is in effect undertaking a similar social health experiment if it allows the Turitea wind farm proposal to proceed in its current form.
- 3.13. As a potential Ngahere Park resident I am not willing to be a participant or clinical subject in a large scale health experiment such as the proposed Turitea wind turbine generation farm. I have the opportunity of a voice in the approval process. The young and subsequent generations do not. It is their health that is more likely to be affected.

² WHO. *Noise and Health, Night noise guidelines*. Cited 20 May 2009. Online http://www.euro.who.int/Noise/Activities/20040721_1 4 May 2009.

- 3.14. The expert evidence presented on noise on Turitea wind farm proposal and also Territorial Authority planning instruments such as Palmerston North City Council place dependence on the 1998 NZS6808 . Given the significant health effects on night time noise, it is important to consider the adequacy NZS 2608:1998.

4. NZS 2608:1998 IS THE STANDARD ADEQUATE?

The date of the Standard

- 4.1. NZS6808 was published in 1998. Curiously, some 16 hours after the Turitea Callin submission closed on 23 February 2009, the New Zealand Standards organisation released a draft revision of NZS6808.
- 4.2. A quirk of New Zealand law is that legal references to a standard such as in territorial authority plans, must state the year of the Standard. This is to prevent the local bylaws being inadvertently changed when a Standard is reviewed. As such NZS6808:1998 will remain the criteria until a newer version is adopted by territorial authorities. In terms of compliance with planning bylaws the revised standard is of no consequence, as it not referenced in any territorial authority by laws.
- 4.3. However, to ignore recent development in technology practice would be criminally negligent, especially where health and safety of citizens are concerned. The Health and Safety in Employment Act 1992 binds the Crown and also includes individuals who are responsible for decision processes³. The Act is invoked in that the proposed Turitea wind turbine generators are a place of work for Mighty River Power Employees, and also the place of work (see S:16 of the Act) is in part controlled by the approval process. The responsibility is to “take all practicable steps to ensure that no hazard that is or arises in the place harms...”other people in the vicinity. The key phrase is ‘all practicable steps’. Specifically it means:
- “In this Act, **all practicable steps**, in relation to achieving any result in any circumstances, means all steps to achieve the result that it is reasonably practicable to take in the circumstances, having regard to—
 - (a) the nature and severity of the harm that may be suffered if the result is not achieved; and
 - (b) the current state of knowledge about the likelihood that harm of that nature and severity will be suffered if the result is not achieved; and
 - (c) the current state of knowledge about harm of that nature; and
 - (d) the current state of knowledge about the means available to achieve the result, and about the likely efficacy of each of those means; and

³ S:56(2) If a Crown organisation fails to comply with a provision of this Act, any of its officers, directors, agents, or employees concerned in the management of the organisation who directed, authorised, assented to, acquiesced in, or participated in the failure is a party to, and guilty of, the failure and is liable on conviction to the punishment provided for the offence, whether or not the Crown organisation has been prosecuted or convicted.

- (e) the availability and cost of each of those means.”
- 4.4. As well as the Health and safety in Employment Act requirements, S:16 of the Resource Management Act requires “Every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.
- 4.5. While territorial authority plans refer to older standard, I am of the view the Board of Inquiry and Mighty River Power are required to consider “the current state of knowledge” as specified by the Health and Safety in Employment Act or “best practice” as required by Resource Management Act. As such it is essential to consider what changes are being considered by the standards technical committee on the assessment and measurement of sound from wind turbine generators.

Changes proposed to NZS2608

- 4.6. The changes are well described in the forward to the draft standard. “The 1998 version of this standard was written prior to significant wind farm development in New Zealand. The basic methodology proved robust, but experience and research over the following decade brought to light numerous refinements and enhancements which are now addressed in this revised version of the Standard. The terminology and format of the Standard have been updated in line with the 2008 editions of NZS 6801 and NZS 6802. This includes adopting L90 in place of L95 as a measure of sound levels. The original recommended noise limits are retained, but are added to by provision for a more stringent secondary noise limit where justified by particular local circumstances. The simple prediction method in the 1998 version has been removed, and replaced by methods using octave band calculations and which account for a wider range of factors influencing sound propagation. Measurement procedures have been clarified and wind speeds are now referenced to the wind turbine hub-height”⁴. Two aspects are of interest, firstly the more stringent secondary noise limit, and then the use octave band in attenuation calculations. Each of these is considered in turn.

Secondary noise limit

- 4.7. The secondary noise limit recommended in the draft standard is 35dB and would be invoked if a greater degree of protection is required at evening and night time to protect health and some degree of amenity⁵. Secondary noise limits should be considered if;
- Back ground levels are quiet (less than 25 dB when the predicted noise level for wind farm exceeds back ground by 10dB.), or

⁴ The draft standard DZ6808 v 2.5

⁵ Section 5.3.1 of draft standard

- Objectives or rules in a district plan require higher protection in a particular location.

4.8. The back ground sound measurement at Hegley's site 2, is commonly less than 30 dBA, although it is not clear if Hegley's instrumentation measured octave band analysis with subsequent analysis or if this was done by the instrument. The predicted exceedance of background noise by Hegley at site 2 is clearly greater than 10 dB. It is unclear from the wording in the draft standard if conditions for secondary noise limit would be invoked for a quiet background noise.

4.9. There is justification in terms of a developed country residential subdivision to invoke the higher protection of the secondary noise limit on the basis of the number of residences affected. That however is subject to District plan processes.

4.10. The recommendation is the draft standard to an L_{A90} of 40 dB would mean the proposed wind turbine generators nearest to 21 Pineland Drive would be non compliant in that the predicted sound pressure level exceeds 40 L_{eq} .

Use of octave band analysis in attenuation

4.11. NZS2608:1998 uses a prediction equation based on hemispherical spreading of sound from source and assumed broad attenuation in air⁶. The predictive equation oversimplifies the way that sound is attenuated in air.

4.12. Most people are aware that low frequency sound travels much better than higher frequency sound. An everyday experience occurs in the sub woofer or bass sounds (the low frequency ones) heard from cars fitted with large sound systems. Low frequency sound has a longer wave length (in the order of metres) and is much more penetrating (or less attenuated) in air.

4.13. The draft standard recognises atmospheric attenuation is dependent frequency, and provides for attenuation based on octave band centre frequency, temperature and relative humidity⁷. The example given is based on ISO9613-2. However it is only an example, as the draft standard fails to give a definite predictive equation.

Draft standard fails to give predictive noise equation

4.14. The draft standard falls short of specifying a standard sound propagation calculation method directly applicable to wind turbines, preferring rather to specify the factors that shall be taken into account in prediction calculations.

⁶ NZS6808:1998. 4.3 *Wind turbine sound prediction levels.*

⁷ Draft standard DZ6808: *Appendix D, Prediction method example.*

4.15. The failure to provide a standardised prediction method is unfortunate as it has the following outcomes:

- There is no certainty to receivers as the noise levels they will experience prior to wind farm construction.
- Technical debate will occur with different expert opinion as to predicted noise levels on surrounding residents (ie the receivers of the noise). The peer review by Day of Hedleys work testifies to that.
- Access to residents to undertake prediction assessments using alternative methods is limited as this is a specialist area.

Uncertainty in predictive noise assessment

4.16. The failure of standard to specify a prediction equation is not surprising as the science of understanding the behaviour of noise from wind farms is still evolving. There have been two world conferences on wind turbine noise⁸ and a third to be held 17-19 June 2009 in Aalborg Denmark.

4.17. The predictive factors to draft standard factors to be considered in sound prediction does not take account of atmospheric stability. G.P.van den Berg⁹ in his dissertation describes how atmospheric stability may affect noise propagation. The theory is that during day time the sun's rays heat the atmosphere and cause air mixing creating unstable air, a factor well known to aircraft. Noise attenuation is also better due to air mixing. At night with low wind speeds air is stable and much more uniform which is better for aircraft and also wind turbine generators. The better air stability at night allows sound to be carried further. Low frequency sound where the wave length is also long will travel even further, and may exceed the predicative example in the draft standard. This may explain the reported popular press noise observations^{10, 11} of residents who are several kilometres distant from wind farms.

4.18. A further extension of stable air low wind velocity propagation of low frequency noise, is that under such conditions the wind turbine generators will act in unison, to produce more uniform sound pressure waves. In physics propagation of such sound under these conditions will give rise to Doppler effect. In essence this means a single residence may be subject to no increased noise

⁸ Earlier conferences were Berlin 2005, and Lyon 2007

⁹ Van den Berg G.P. *The sound of high winds: the effect of atmospheric stability on wind turbine and microphone noise*. Dissertation, University of Groeningen. 2006.

¹⁰ Webb, C. 18.02.2006. *And the beat goes on and on*. Hawkes Bay Today. Cited 2006. Online <http://www.hbtoday.co.nz/storyprint.cfm?storyid=3673106>.

¹¹ Pierpont, N. 2006. *Health effects of wind turbine noise*. Web <http://www.aweo.org/Pierpont-noise-060204.pdf>

due to nearest wind turbine generators being synchronised in a way that the sound waves cancel. As the phasing of the mills change, which may take some time, the residence will be subject to twice the sound pressure level due to sound wave combination. This is consistent with the pattern of observed noise reported in popular press (^{Footnotes 10, 11 in preceding section}).

The adequacy of the standard summarised

- 4.19. In summary, the 1998 standard used for Turitea Wind Farm proposal is not adequate, and fails to predict noise prediction correctly. As such, the standard is being revised. However, the new standard falls short of providing a defined predictive equation. That is due to the evolving science of wind turbine noise. There is a legal requirement to use best and current practice to protect residences against noise.
- 4.20. The evidence provided by Mighty River Power is well out of date and does not meet current state of knowledge.
- 4.21. There is uncertainty in noise prediction from wind farms as the science evolves.

5. DEALING WITH UNCERTAINTY

- 5.1. Uncertainty in evidence is entertained by the instruments available within the Ministry of Environment. The Hazardous Substance and New Organisms Act require ERMA as the judicial authority to exercise precautionary approach. The methods involved in a precautionary approach are explained well in 'Annotated Methodology for consideration of application for hazardous substances'¹² which is based on a Government Order¹³. Industrial noise limits are included in Health and Safety in Employment workplace exposure standards. It is not out of order to expect the same precautionary approach to be taken in accessing the impact of nuisance noise on resident's health for the proposed Turitea Wind Farm.

6. CONCLUSIONS AND RECOMMENDATIONS

- 6.1. A precautionary approach has not been taken in the application by Mighty River Power. They have pushed the design to the maximum predicted noise levels allowed at 21 Pineland Drive. Their own evidence indicates the predicted noise levels may in fact be just complaint with, or just above acceptable standards for compliance with NZS6808:1998. As the techniques they have used are dated there is real risk the health of residents in Pineland Drive will be adversely affected. This is more likely to be so, as the estimates provided to the Board of Inquiry are taken

¹² ERMENZ, *Annotated Methodology for the consideration of applications for hazardous substances and new organisms under The HSNO Act 1996*. Cited 21 May 2009. Available online <http://www.ermanz.govt.nz/resources/publications/pdfs/me089801.pdf>

¹³ *Hazardous Substances and New Organisms (Methodology) Order 1998*

at sites protected by terrain and understate the predicted noise levels for hill top properties such as 21 Pineland Drive. Further there is uncertainty in the evidence and expert opinion.

- 6.2. The evidence presented by Mighty River Power on health effects is dated and fails to recognise recent WHO concerns with night time noise. There are significant health effects of night time noise on people. On the basis of the health evidence in this submission, to propose a wind farm on the scale of the Turitea project, which less than one kilometer from an established country residential area, poses a danger of becoming an unacceptable social health experiment on a scale unprecedented in New Zealand.
- 6.3. The 1998 standard used for noise assessment for the Turitea Wind Farm proposal is not adequate, and fails to predict noise at a receiver position correctly. The evidence provided by Mighty River Power is well out of date and does not meet current state of knowledge. There is a legal requirement to use best and current practice to protect residences against noise. There is uncertainty in noise prediction from wind farms as the science of noise prediction from wind farms evolves.
- 6.4. Due to the uncertainty, and serious health consequences to nearby residents it is recommended the Board of Inquiry take a precautionary approach in determining the proximity of wind turbine generators to existing residences.
- 6.5. Given the above, it is requested a wider separation occurs between any proposed wind turbine generator and residential properties. Night noise and sleep deprivation is reported by residents as far as 3km from existing Te Apati wind farms on the flanks of the Ruahine Range. Health effects are reported by Pierpont at similar distances in overseas wind turbine farms. The outcome Turitea Reserve plan change was in effect to remove proposed wind turbine sites in the reserve back 3.5 km from 21 Pineland Drive.
- 6.6. As such, a suggested set back of 3 km is recommended.

7. REFERENCES

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