



**RESPONSE TO NSW PLANNING DEPARTMENT**

**DRAFT GUIDELINES**

**FOR WIND DEVELOPMENTS**

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## **SUMMARY OF KEY ISSUES**

**On the basis of current limited knowledge, these proposed draft guidelines will inevitably result in serious and predictable harm, to the health of current and future rural residents in New South Wales, from the harmful effects of sound and vibration energy generated by industrial wind turbines.**

The New South Wales Department of Health's refusal to acknowledge the existence of an emerging serious global public health problem with exposure to operating wind turbines, is a gross dereliction of their responsibilities to protect the health of rural citizens who will inevitably be adversely impacted by these developments.

Rural residents are already significantly disadvantaged with respect to decreased access to health care and related services, and suffer a greater illness burden as a result. The additional burden of ill health, which these turbines will directly cause rural citizens, is entirely preventable, if wind turbines are located appropriately. This is clearly a planning issue.

To proceed with the proposed setbacks outlined in the draft guidelines is deliberately ignoring the warnings of a growing number of clinicians and acousticians internationally,<sup>1</sup> based on limited but compelling empirical data and adverse event reports, from both residents and their treating doctors. Acousticians such as Professor Phillip Dickinson, from New Zealand, who is well aware of the problems experienced there, has suggested that a 5-10km setback<sup>2</sup> would prevent many of the problems, concurring with our advice.

Urgent independent collaborative multidisciplinary acoustics and clinical research is required to investigate the problems, in order to determine what a safe turbine setback distance is, given a multitude of different variables. The planning requirements need to take into account the "worst case" scenarios for noise impacts, because this is what people will be living with.

The effects of audible and inaudible sound and vibration energy are resulting in frequent sleep disturbance for residents up to 10km away<sup>3</sup> from thirty seven 3MW turbines in South Australia at TRU energy's Waterloo Wind Development. As 3MW turbines and larger are planned for multiple sites in NSW, it is inevitable that these adverse effects will be felt out to this distance and beyond. In France, at 4,000 feet above sea level, there are credible reports of people characteristically affected at distances of 12 km - 14 km away<sup>4</sup> as the crow flies, from six 2MW turbines. This is of major concern, and highlights the knowledge vacuum we are operating in, and the need for urgent clinical and acoustic data collection globally.

There is a complete lack of knowledge nationally and internationally about the actual dose of sound energy at different frequencies being experienced by people inside their homes and workplaces, and no knowledge of what constitutes a “safe” dose with cumulative exposure. Consistently, people’s health relentlessly deteriorates with ongoing exposure, if they are affected.

Siting turbines too close to institutions such as schools, jails, hospitals and nursing homes, with vulnerable and powerless groups, will result in serious harm to those living, and working in those establishments. This will be the inevitable outcome from many of the currently planned and unsafely sited wind developments in NSW, particularly those with larger turbines, placed on hills.

Rural residents in New South Wales are currently being damaged by the sound and vibration pollution emissions from existing wind developments at Capital, Woodlawn, Crookwell, and Cullerin.<sup>5</sup> NSW Department of Health deny the problem exists, because there is “insufficient credible peer reviewed published evidence” but refuse to investigate the reports of serious health problems occurring in rural residents for themselves, apart from one or two phone calls which have not resulted in follow up, according to the residents.<sup>6</sup>

Nor has there been any proper independent and comprehensive acoustic assessment of the full range of acoustic pollution to which residents are exposed, inside their homes, and in their workplaces, despite numerous complaints being made. Preliminary acoustic data of this type collected by an independent acoustician at residences impacted adversely by Infigen’s Capital and Woodlawn Wind Developments and funded by concerned rural residents suggests that there are indeed problems relating to the infrasound and low frequency sound energy measured inside resident’s homes where those residents are becoming ill.<sup>7</sup>

The current NSW audit of wind turbine noise does not include full spectrum noise assessments, nor does it include inside home measurements. This is ignoring the precise frequencies and locations (inside homes and workplaces) which we suspect are doing the most damage to health.

There may well be additional health effects from Electromagnetic field effects for some residents, in some locations, which similarly remain uninvestigated.<sup>8</sup>

These serious health problems are entirely preventable, by adopting a truly precautionary approach, based on existing relevant information including field observations, until more definitive independent multidisciplinary acoustic and medical longitudinal research is conducted. This is precisely what the Waubra

Foundation's Explicit Cautionary notice<sup>9</sup> suggested, in **June 2011**, and it was based on the best field observations and limited research literature available at that time. Subsequent information is revealing that even this distance may be inadequate to protect the health of surrounding neighbours in some locations.<sup>10</sup>

Two research proposals by suitably qualified and experienced independent acousticians, Dr Bob Thorne and Professor Colin Hansen, were first suggested to the NSW government Health Department representatives at an En Health meeting in **November 2010**. Subsequent proposals have been submitted directly to the NSW government by Acoustics researchers since that time.

Research was also recommended by the Australian Federal Senate inquiry into Rural Wind Farms in **June, 2011**.<sup>11</sup>

In the meantime, the suggestion by the NHMRC to "adopt a precautionary approach"<sup>12</sup> is being ignored by developers and bureaucrats from planning and health departments alike. The justification given is that "there is no evidence" or "there is no credible peer reviewed published scientific evidence".

Yet people's health is being seriously damaged, and has been for years in Europe, the UK, North America, New Zealand, and in Australia. The voices of the sick residents, their clinicians, and their advocates, have been universally ignored by these bureaucrats, and the politicians they advise.

This lack of relevant research, despite the longstanding reported problems, is a global public health disgrace. So are the attempts of the wind industry to deny the problems, despite being well aware of them, as the letter from the Vestas CEO to the then Minister for the Environment in Denmark shows. Clearly corporate profits are being put ahead of the health of rural residents, the world over.<sup>13</sup>

**THEREFORE: to proceed with these inadequate guidelines, and without investigation into the current problems at existing developments, is reckless and irresponsible in the extreme.**

What is urgently needed is:

1. Full sound spectrum acoustic monitoring at all the homes of impacted residents in New South Wales, by acousticians who do not rely on the wind developers for their income, including inside and outside measurements concurrently. Data required by the acousticians from the developers to properly determine their results must be handed over.

2. Thorough clinical assessment of impacted residents, paying particular attention to the commonly reported health problems experienced by residents elsewhere.
3. Concurrent sleep and acoustic studies at the homes of people reporting regularly disturbed sleep, to assist with determining the cause of their sleep disturbance.
4. Other broader epidemiological studies will be dependent on available funding, but as a minimum there should be an assessment which includes the population within 10km of existing developments, and suitable controls not exposed to low frequency noise for comparison. There must also be longitudinal data collected, as it is widely observed that symptoms deteriorate over time, with increasing exposure.

**Relevant Excerpts from the proposed DRAFT Guidelines are reproduced below:**

Page 7:

***(e) Health***

*The approach to health issues in these guidelines have been developed in consultation with the NSW Ministry of Health. The guidelines adopt a precautionary approach for the consideration of health issues. This includes requiring proponents to explicitly consider health issues as well as comply with stringent operational performance criteria including stringent noise criteria. Applications may also be referred to the Ministry of Health as part of the assessment process.*

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***Health issues***

*The potential for the proposed wind farm to impact on human health should be considered, focusing on neighbours' houses within 2 km of any proposed wind turbine. This may be undertaken with reference to the following:*

*\_ up to date evidence-based research*

*\_ statements from relevant health bodies, such as the National Health and Medical Research*

*Council's (2010) Public Statement: Wind Turbines and Health.*

*\_ the predicted level of impact from the wind farms including impacts from noise, shadow flicker, blade glint, night lighting, electric and magnetic fields*

*\_ consultation undertaken regarding health issues and concerns  
The Department of Planning and Infrastructure may refer applications to the  
NSW Department of Health (NSW Health) as part of the assessment.*

As the following discussion makes clear, these draft guidelines have clearly not adopted an adequate precautionary approach, nor are they informed by the latest evidence and information.

International knowledge in this field is rapidly increasing, and waiting for the National Health and Medical Research Council (NHMRC) to issue updated statements inevitably means the information is not the most recent and up to date, if that is all that is relied on.

At the time the proposed NSW guidelines were issued, the NHMRC had not issued their report of the June 2011 workshop, which they released in early January.<sup>14</sup> The NHMRC have reported that they are in the process of constructing a panel of suitably qualified and experienced experts, and are in the process of updating the original Rapid Review with a subsequent literature review. It is hoped that this subsequent review will include material omitted in that initial Rapid Review of July 2010, as well as relevant information and peer reviewed research, which has been subsequently published.

In the meantime, the Australian Research Council have awarded Professor Colin Hansen's team from Adelaide University a grant to investigate wind turbine noise at existing developments. Information about the true sound energy exposure levels at different frequencies, which residents are living with, and are being so adversely impacted by, will be of international relevance.

Given the current well known attitude of the NSW Health department to this issue, I see little benefit from the proposed guidelines suggesting that it would be useful to refer projects to the NSW Department of Health, unless there is a serious change in attitude by departmental employees, or a change of staff.

Finally, the noise guidelines can be the "toughest in the world", but if they do not mandate measuring the very sound energy which is thought to be making people sick, inside their homes, and if they do not mandate independent ongoing noise monitoring and ensure that the relevant work is done by independent acousticians who are approved by the affected residents and who have sufficient expertise and the right equipment, the guidelines are of absolutely no practical use or protection for the residents.

Transparent continuous full spectrum noise monitoring, available on line for the whole world to see, and properly recorded so that the data can be analysed properly, would go some way towards restoring faith in the existing wind turbine noise compliance systems and procedures, which are currently considered to be completely useless (and too open to manipulation by wind developers) by the residents who have to live with the effects of this audible and inaudible sound energy pollution.

## **WHAT IS CURRENTLY KNOWN, and WHO has KNOWN WHAT WHEN?**

### **A significant recent development in conceptual understanding**

Wind turbines emit infrasound (0-20Hz), low frequency sound (20-200Hz) and audible sound. Many sound frequencies can cause damage to health if they are at a high enough sound pressure level, for a long enough time, particularly in susceptible individuals. Protection of the health of individuals and of manmade structures is the rationale for much of the work of acousticians.

The recent pioneering acoustic survey by Rand & Ambrose<sup>15</sup> in a house in Falmouth, USA has measured exactly what acoustic energy is being experienced **inside** one home where the resident has become seriously unwell with the characteristic symptoms now reported widely around the world, which have been called “wind turbine syndrome”. Just one turbine has been enough to do the damage to this resident’s health.

The sound energy inside this home had markedly different proportions to the sound energy outside the home, and it is this change in proportion of sound energy, and the amplification of that sound energy inside the home, which acousticians and medical clinicians think may help explain the problems now being consistently reported by some turbine neighbours including hosts and their families.

Some hosts and former residents living near wind turbines in Australia have advised myself and others that they cannot speak publicly about the health problems they and their families have developed, because of binding confidentiality clauses in their sale contracts if they were bought out by the developers,<sup>16</sup> or because of broad clauses which prohibit them as turbine hosts from saying anything which might portray the wind development in a negative light. I have also been advised of these clauses by some of the lawyers these people have consulted, who have confirmed the existence of these clauses. I

have also been told by international researchers and residents this practice is global.

**This data from Falmouth is the only publicly available data anywhere in the world on the precise exposures of sound energy including infrasound and low frequency INSIDE the home of an affected resident. This sort of acoustic assessment is clearly urgently needed at the homes of impacted people, in order to determine precisely what 'dose' of sound energy and which frequencies they are being exposed to and which correlate with their symptoms.**

Unexpectedly for Rand and Ambrose, they too developed the characteristic symptoms, which correlated with wind turbine operation, and specifically correlated with the sound energy down in the lowest part of the frequency spectrum, ie the infrasound low frequency range (ILFN) of 0 – 200 Hz. This is clearly not an epidemiological study, but it is a crucial breakthrough in our understanding of what “dose” and frequencies of sound energy might be directly causing the problems, which so many people report.

### **Historical Background**

Many frequencies of sound and vibration energy can cause serious illness if the sound pressure levels are high enough, exposure occurs for long enough, or occurs in specific frequencies. Acousticians have known for some time that infrasound and low frequency noise can directly cause many of these characteristic symptoms and health problems.

Abstracts of studies relating specifically to **infrasound** and its effects on animals and humans have been listed in a very useful Literature review<sup>17</sup> compiled in 2001 by researchers at the National Institute of Environmental Health Sciences, in the USA, and there are a few other studies in the public domain since this review was published.

Professor Geoffrey Leventhall and his colleagues wrote a very useful literature review of the effects of **low frequency noise** in a report for DEFRA<sup>18</sup> in the UK, in 2003, which lists many of the symptoms now being reported to occur in residents exposed to wind turbine noise. Professor Leventhall's article clearly demonstrates that **this knowledge is out in the public domain of acousticians, and has been for some time, and that the symptoms are directly caused by exposure to certain frequencies of sound energy.**



Indeed, Professor Leventhall publicly stated during his lecture at the National Health and Medical Research Council Workshop on 7<sup>th</sup> June, 2011 **that he had known about the symptoms of “wind turbine syndrome” for years.**<sup>19</sup> Indeed he has. Professor Leventhall has conducted research, which has directly confirmed the deleterious effects of exposure to low frequency noise on work performance published in a peer reviewed journal in 1997, for example. In that particular study, he noted that the symptoms worsen with cumulative exposure, just as we are observing with exposure to operating wind turbines.<sup>20</sup>

Historically, these health problems occurring in relation to low frequency noise exposure from any source have been referred to by Acousticians as “annoyance”, and medical clinicians working in this area believe it is this terminology which has led to the current situation of widespread clinical ignorance of these issues amongst our colleagues, and a concurrent lack of collaborative multidisciplinary research involving both clinicians and acousticians, despite the problems being reported globally for many years.

Clinicians have simply not realized there is a problem with wind turbine noise, unless, like Dr Amanda Harry in Cornwall in 2003, or Dr David Iser in Toora, Victoria, Australia in 2004, they have suddenly been confronted with their longstanding patients developing an unfamiliar pattern of serious clinical illnesses, which had not previously been described in the English language medical literature which is most accessible to clinicians in Australia, for example.

The presentation of these illnesses in both those rural locations in the UK and in Australia over 8 years ago, coincided with the start up of a new wind development in the vicinity of their rural practices. Both doctors decided to investigate further, and reported their symptoms at the time to their respective health authorities, and were ignored.<sup>21,22</sup>

Every other medical practitioner since who has become aware of the problems by talking directly to affected residents, and publicized their concerns, has been consistently either ignored or vilified, often by the very Health Departments who themselves refuse to investigate the resident’s complaints, because there is “no evidence” of a problem.

However, as Professor Warwick Anderson, current CEO of the National Health and Medical Research Council made abundantly clear in his oral evidence to the Australian Federal Senate Inquiry into Rural wind farms on 31<sup>st</sup> March, 2011, **“we do not say there are no ill effects”.**<sup>23</sup> Professor Anderson and his staff are well aware that developers, bureaucrats, and ideological and financial

supporters of the wind industry have misused the summary statement of the Rapid Review to infer that wind turbines are completely safe.<sup>24</sup>

Professor Anderson went on to point out later on in his oral evidence that an absence of (peer reviewed published) evidence does not mean there is no problem, particularly where there has been so little research into this specific area of wind turbine noise and its effect on health.<sup>25</sup>

It is hardly surprising that there are endless literature reviews saying there is “no” or “little” evidence of a problem in the peer reviewed literature, given the lack of research, but what is surprising is that not even the most basic of epidemiological studies has ever been done, which have involved medical clinicians as part of the team. Nor has there been any attempt to work out the actual acoustic energy exposures of people, especially inside their own homes. Consequently this practice of using “annoyance” to describe what are in fact “serious health problems” has perpetuated the collective medical ignorance of the problems.

There are larger acoustic population surveys from Europe which certainly confirm the existence of “annoyance” with respect to wind turbine noise, and one from 2004<sup>26</sup> which makes it clear that wind turbine noise is “highly annoying” at much lower sound pressure levels of audible noise than other forms of industrial noise such as road, rail and air traffic noise. It is now thought by acousticians who do not rely on the wind industry for their income that this difference in the “annoyance” in that study relates to the low frequency component of wind turbine noise, which is acknowledged to be more annoying.

As Acousticians are generally engineers, and not medical practitioners, they have not had the specific education and training to understand the complexity of the pathophysiological processes which might underlie these symptoms, and their progression over time. Nor do sociologists have the requisite specific clinical or acoustics education and professional training, even if they do become Professors of Public Health at prestigious universities.

This is the province of trained medical clinicians and researchers with backgrounds in varied fields of general practice, paediatrics, physiology, neurology, endocrinology, cardiology, otolaryngology, psychiatry and no doubt others, as our understanding of this essentially “new illness” to medicine is further explored. Until now, medical practitioners and researchers have been generally unaware of the health problems associated with sound and vibration

energy, unless they were practicing in occupational medicine, or specializing in treatment of disorders of the inner ear and vestibular system.

In 2009, an American Paediatrician, Dr Nina Pierpont, published her study<sup>27</sup> which investigated the range of symptoms of all the members of 10 families exposed to operating wind turbines, where some of the family members had developed the characteristic health problems. What Dr Pierpont sought to do was establish if there were some characteristics about these people who became affected within those households which made them more likely to develop the symptoms she called “wind turbine syndrome”.

Dr Pierpont found that people who have a history of migraines, motion sickness and inner ear pathology seem to be more susceptible to the effects of the wind turbine noise. She also found that children and the elderly seem to be particularly vulnerable. She recommended urgent further research, including epidemiological studies, to further define the problem.

Why then, has Dr Nina Pierpont’s work which investigated the susceptibilities of certain population groups to develop “wind turbine syndrome” been so widely dismissed by acousticians, such as Professor Leventhall, who admit that the symptoms exist, and occur with exposure to low frequency noise, which wind turbines are known to emit? And why has it also been dismissed by Public Health experts, who often do not appear to have read it, and who have not then done their own due diligence, either by investigating the complaints made by residents in their own regions, or by talking to the treating medical practitioners who are trying to look after them?

Acousticians and sociologists are not qualified to speak on the clinical aspects of Dr Pierpont’s work. Her clinical findings have been replicated by work done in Ontario,<sup>28</sup> and have been confirmed by my own field observations gathered from affected residents and their treating doctors in Australia.<sup>29</sup> Similar resident reports are emerging from many countries which have installed wind turbines near homes, including many in Europe, the UK, and North America.

**One of the hallmarks of credible research is if the findings can be replicated.**

Dr Pierpont’s clinical descriptions and findings of susceptible populations have been subsequently reported by residents and sometimes their treating doctors, around the world.

There has been widespread misinformation spread by advocates of the wind industry, including some in positions of power and authority in public health circles, about Dr Pierpont’s qualifications. Dr Pierpont is a trained and

practicing **Paediatrician**, a former assistant Clinical Professor at Columbia University, and has a PhD in ornithology.

Similarly there have been comments made about Dr Pierpont's work not being "peer reviewed". This is a lie. Dr Pierpont's work has been extensively peer reviewed, and copies of those peer reviews, and the executive summary of her book are attached, together with her study and the raw data. The fact that it has not been published in a medical journal does not mean the work is not credible, despite the assertions of some who might wish this to be so. PhD's are accepted as credible pieces of original work, and they are not published in peer reviewed journals, but as standalone documents, just as Dr Pierpont's study has been.

### **The importance of Sleep**

Severely disturbed sleep is being reported by many residents, at current wind developments across Australia and internationally, out to distances of at least 10km in some circumstances, especially with larger turbines, or where the turbines are at higher altitudes.

The audible noise is certainly a problem for some people, however by far the majority report a characteristic pattern of waking suddenly in a panicked state, wide awake, hyperalert, sweaty palms, racing heart, with all the hallmarks of intense arousal of their sympathetic nervous system. They often report that they cannot hear the turbines at the time, inside their homes. Nor can they see them when they are asleep, as is commonly suggested as a reason for them waking by wind turbine proponents, who say residents are waking up because the residents "don't like the look of them". The residents report that this does not happen on nights when the wind turbines are not turning, and does not happen with certain weather and wind conditions. Nor does it happen when they are away from their homes. It can be repetitive, occurring on multiple occasions within the same night, and may occur night after night.

The Falmouth acoustics survey by Rand and Ambrose<sup>30</sup> has shown that this pattern appears to be caused directly by sound energy penetrating into the home in the lowest frequencies. What is now required is the concurrent acoustic and sleep studies, to further examine exactly what the brain waves are doing at the time of the acoustic stimulus and immediately afterwards.

The clinical history these people give is the same, all over the world. Many of these people do not have access to the internet, and nor do they report

knowing anything about the reported effects of the turbines on sleep and health. Many are initially supportive of wind energy, until they find that their health is severely damaged, and they cannot sleep. Then their attitudes change.<sup>31</sup>

There is now peer reviewed published research, which confirms that sleep disturbance is occurring in these populations, from a recent study conducted in New Zealand by Dr Daniel Shepherd.<sup>32</sup> Dr Shepherd is an experienced Psychoacoustician who has worked in this area for some years, provided expert evidence at a number of tribunals. More recently he provided independent expert evidence in the Ontario court case where the judges found on the basis of expert evidence presented in that case, that there ARE adverse health effects from wind turbines, and that further research is required.<sup>33</sup>

Severe chronic sleep deprivation is well known to have a multitude of serious adverse health sequelae,<sup>34</sup> including hypertension, atherosclerosis, immune suppression, mental health disorders, diabetes. It is therefore clear that if severe chronic sleep deprivation is occurring, as reported, and now confirmed by Dr Shepherd's work, that the clinical sequelae are clear, well known, and extremely damaging. The timely recent editorial in the British Medical Journal by two well respected Sleep Physicians<sup>35</sup> from the UK and Ireland illustrates the rationale for serious concern about this issue clearly.

Yet again, two experienced and eminent clinicians are calling for research.

### **The role of Cortisol**

A number of clinicians have been concerned more recently about the role of cortisol in the pathophysiological processes which are being observed.

Professor Gary Wittert, the paid medical expert for Acciona in the Paltridge vs Acciona & District Council of Grant court case in the South Australian ERD court in January 2011 admitted during his evidence that the people described in the court material submitted by me were sick, and that they were stressed. On those points we concur.

Professor Wittert then went on to assert that in his opinion, despite never having listened to these sick residents himself, nor to their concerned treating medical practitioners, that these people were sick because of scaremongering by trained clinicians such as myself, who are publicizing the reported health problems, and urging authorities to immediately fund and facilitate properly conducted, independent research.

Unfortunately, Professor Wittert's assertions do not withstand careful scrutiny. People at Waubra, Cape Bridgewater, Toora, Capital, Cullerin, Waterloo and Mt Bryan in South Australia all have documented formal complaints to the wind developers, to health authorities, to their GP's, and in some instances in the media,<sup>36</sup> **well before I was even aware there was a problem.** I was first convinced there was a serious problem, which had been ignored for too long, in July 2010.

There is no doubt that there is anxiety in the communities where wind turbines are planned, and proposed, however these residents get their information from a variety of sources, and many of them go and do their own "homework" by contacting and visiting residents in other areas who are already living with wind turbines, in order to make up their own minds. They soon find that unfortunately what I have been publicizing is all too true. They then become anxious because of fear about what they know is coming, and know that neither the health nor the planning authorities will help them protect their own and their family's health and well being.

In addition to the stress and anxiety created by being abandoned by their governments, there is growing concern amongst clinicians globally about the role which chronic elevation of cortisol might be playing in the development of a range of chronic conditions, which are emerging in populations chronically exposed to operating wind turbines. Professor Robert McMurtry and Dr Noel Kerin have been exploring this avenue of investigation in Ontario.

There are human pathology results, limited but compelling, from the US and from Canada, which support this concern. Results such as abnormally high levels of night time salivary cortisol when exposed to operating turbines compared to normal levels when residents have not been exposed for a few weeks and are starting to feel better, are focusing our attention back to the limited animal studies which are in the public domain, particularly those reported in the NIEHS Toxicology of Infrasound Literature review from 2001. There are a couple of studies referenced in that review or in the articles themselves, which refer to both adrenaline and cortisol secretion occurring after exposure to infrasound.<sup>37</sup> The clinical descriptions of adrenaline related conditions such as Tako Tsubo Heart attacks and acute hypertensive crises which are occurring in residents exposed to infrasound and low frequency noise from wind turbines and from open cut coal mining activities in the Upper Hunter region of NSW (Tako Tsubo events) would appear to be highly relevant, especially given that the usual causes for these unusual conditions were reported to be absent, and no other reason could be found for their occurrence.

There are other studies in mammals, which clearly show that chronic exposure to infrasound can cause focal damage to various organs including the heart, liver, kidneys and adrenals.<sup>38</sup> One study identifies oxidative stress directly caused by exposure to infrasound as the pathological process causing focal organ damage, and found that rodents who were given a trial of antioxidants did not show the degree of damage seen with controls.

The knowledge from the Rand and Ambrose data at Falmouth that infrasound and low frequency noise energy exposure may be significantly higher inside homes than first thought is adding to that clinical concern.

Additionally, the wide range of pathology which is being reported by residents who have been chronically exposed, some of which Teresa Simonetti, a medical student from Sydney University has compiled with Professor Simon Chapman,<sup>39</sup> could well be explained by abnormally high cortisol levels which will adversely affect a myriad of different body systems and organs.

In 1998 Bruce McEwen, an Australian researcher working at the Rockefeller Institute in New York, had a paper published in the New England Journal of Medicine, where he discussed the concept of allostatic load with chronic stress.<sup>40</sup>

Since that time, work in areas such as the neurobiology of depression has revealed the connections between elevated cortisol, brain derived neurotrophic factor and a shrinking hippocampus being implicated in depressive illnesses,<sup>41</sup> particularly in recurrent depression if clinical intervention is not rapid, timely, and effective.

Chronically elevated cortisol is extraordinarily damaging for long term health and well being, and this is exactly what appears to be happening to many residents who are chronically exposed to wind turbine noise.

In addition to humans, there are credible reports of domestic pets and livestock being diagnosed by veterinary or agricultural officials with mysterious wasting diseases consistent with chronic stress, or farmers are doing their own autopsies on dead livestock and finding haemorrhaging of the adrenal glands in newborn calves, for example.<sup>42</sup> These are all signals that further research into this specific area is urgently required.

## **CONCLUSIONS**

- The proposed NSW Wind Farm Planning guidelines are completely inadequate to protect health, on the basis of existing limited knowledge
- Investigation into the noise pollution and adverse health problems at existing wind developments needs to be urgently and thoroughly carried out by acoustics and clinical professionals who are objective in their approach, and who are not either driven by ideology or influenced by wind developers
- Independent multidisciplinary acoustic and clinical research needs to be urgently conducted on a national basis at a variety of wind developments, in order to remedy the knowledge vacuum, to enable the safe siting of wind developments in future
- We continue to advocate for adoption of a truly precautionary approach to the siting of any new wind developments, and our current recommendations are that no wind turbine should be constructed within 10km of a home or a workplace until the appropriate independent research is conducted.
- We further advocate that existing wind developments must be retrofitted with continuous noise monitoring systems, which are available 24/7 online, available for all to see, and that wind turbines which breach the evidence based noise guidelines are switched off if they are breaching appropriate noise guidelines, which include the measurement of internal infrasound and low frequency noise.
- In the interim, residents at impacted houses must be able to engage acousticians of their choice, at the developer's expense, in order to independently measure the full sound and vibration energy they are exposed to, over representative periods of weather and wind conditions which correlate with the worst case scenario



## **ATTACHMENTS & INCLUSIONS**

Waubra foundation DVD Link:

<http://www.youtube.com/user/WaubraFoundation>

Video citations

Recommendations from the Federal Senate Inquiry

Waubra Foundation Explicit Cautionary Notice

Waubra Foundation submission to the Federal Senate Inquiry

Dr Nina Pierpont's Executive Summary and Peer Reviews, as part of her submission to the Australian Federal Senate Inquiry

Dr Amanda Harry's Study

Professor Carl Phillips's article

Dr Daniel Shepherd's Study in Noise & Health, 2011

Dr Chris Hanning & Dr Alun Evans BMJ Editorial March 2012

Professor Phillip Dickinson's article

Barbara Frey and Peter Hadden's 2012 Review

Carmen Krogh and Brett Horner's update from Ontario

## **REFERENCES**

1. Concerned acousticians, clinicians and researchers include  
Dr Malcolm Swinbanks (Acoustician),  
Dr Chris Hanning (Sleep Physician),  
Professor Henrik Moller (Danish Acoustician),  
Dr Mauri Johansson (Occupational Physician, Denmark),  
Dr Henning Theorell, (Physician, Sweden),  
Professor Alec Salt (Physiologist, Washington State University),  
Professor John Harrison, (Physicist, Queen's University),

Professor Robert McMurtry, (former Dean of the Medical & Dental School of Western Ontario),

Professor Arline Bronzaft (Psychologist & international expert on the effects of Noise on children),

Dr Amanda Harry, (UK Rural GP),

Dr David Iser, (Rural GP Victoria),

Dr Wayne Spring, (Ballarat Sleep physician),

Dr Andja Mitric-Andjic (Daylesford Rural GP)

Dr Alan Watts, (Carcoar, NSW Rural GP)

2. Dickinson, Professor Philip “A pragmatic view of a wind turbine noise standard” updated paper originally presented at Acoustics 2009 in Adelaide, South Australia <http://www.wind-watch.org/documents/pragmatic-view-of-a-wind-turbine-noise-standard/>
3. Field observations from Waterloo Wind Development, also Moller & Pedersen “Low Frequency Noise from Large Turbines” J Acoustical Society America 2011 129: 3727 - 3744
4. Personal communication, Hubert De Bonneville, <http://www.windturbinesyndrome.com/2012/french-writer-going-nuts-from-wind-turbines-france/>
5. Field observations
6. Personal communication, Capital resident
7. Personal communication, Steven Cooper, Acoustician
8. Personal communication, Crookwell & Cape Bridgewater residents
9. Waubra Foundation Explicit Cautionary notice, downloadable from [www.waubrafoundation.com.au](http://www.waubrafoundation.com.au)
10. Hubert De Bonneville, op cit
11. Australian Federal Senate Inquiry recommendations [http://www.aph.gov.au/Parliamentary\\_Business/Committees/Senate\\_Committees?url=clac\\_ctte/impact\\_rural\\_wind\\_farms/report/index.htm](http://www.aph.gov.au/Parliamentary_Business/Committees/Senate_Committees?url=clac_ctte/impact_rural_wind_farms/report/index.htm)

12. NHMRC Public Statement is downloadable from <http://www.nhmrc.gov.au/your-health/wind-farms-and-human-health>
13. <http://www.epaw.org/media.php?lang=en&article=pr6>
14. Workshop report is downloadable from <http://www.nhmrc.gov.au/your-health/wind-farms-and-human-health>
15. Stephen Ambrose and Robert Rand "The Bruce McPherson Infrasound and Low Frequency Noise Study" Falmouth, December, 2011  
<http://www.wind-watch.org/documents/bruce-mcpherson-infrasound-and-low-frequency-noise-study/>
16. <http://www.abc.net.au/news/video/2010/02/19/2825235.htm>
17. NIEHS (National Institute of Environmental Health Sciences)  
November 2001, "Infrasound Brief Review of Toxicological Literature"  
[ntp.niehs.nih.gov/ntp/htdocs/Chem\\_Background/.../Infrasound.pdf](http://ntp.niehs.nih.gov/ntp/htdocs/Chem_Background/.../Infrasound.pdf)
18. Leventhall, Benton & Pelmeur May 2003, A report for DEFRA "A review of published Research on Low Frequency Noise and its Effects"  
<http://archive.defra.gov.uk/environment/quality/noise/research/lowfrequency/>
19. Professor Leventhall's presentation to the National Health and Medical Research Council of Australia's forum on 7<sup>th</sup> June, 2011 in Canberra  
<http://www.nhmrc.gov.au/your-health/wind-farms-and-human-health>
20. Perrson Wayne K, Leventhall, G et al "Effects on performance and work quality due to low frequency ventilation noise" Jnl Sound & Vibration 1997 205 (4) 467-474
21. Harry, Dr Amanda "Wind turbines, Noise and Health" 2007  
<http://www.wind-watch.org/documents/wind-turbines-noise-and-health/>
22. Iser, Dr David, personal communication
23. See Professor Warwick Anderson's comments as CEO of the National Health and Medical Research Council in his Oral testimony to the Federal Senate Inquiry into Rural Wind Farms p 86  
[202.14.81.34/hansard/senate/commttee/S13730.pdf](http://202.14.81.34/hansard/senate/commttee/S13730.pdf)

24. Email from Heather Bishop, NHMRC to Mr Paul Manning
25. Professor Warwick Anderson, op cit
26. Van Den Berg, G et al Project WINDFARMperception. "Visual and Acoustic impact of wind turbine farms on residents" University of Groningen, 2008 and Pederson and Waye, Perception and Annoyance due to wind turbine noise – a dose-response relationship in J Acous. Soc. Am. 116 (6) 2004 pp 3460-70
27. Pierpont, Dr Nina "Wind Turbine Syndrome, A report on a Natural Experiment" Published by K Selected Books, Santa Fe NM 2009 Available from [www.windturbinesyndrome.com](http://www.windturbinesyndrome.com)
28. Work by members of the Society for Wind Vigilance in Ontario, especially Professor Robert McMurtry & Carmen Krogh, published in the special edition of the Bulletin of Science & Technology in August 2011 available from <http://bst.sagepub.com/content/31/4/316>
29. Laurie, Dr Sarah Medical Director, Waubra Foundation, reported in Submission to the Australian Federal Senate Inquiry into Rural wind Farms, February 2011, accessible via senate submissions or [www.waubrafoundation.com](http://www.waubrafoundation.com)
30. Rand & Ambrose op cit.
31. Field observations, and personal communication, Carmen Krogh, Society for wind Vigilance
32. Shepherd, Daniel et al "Evaluating the impact of wind turbine noise on health related quality of life" Noise & Health 2011 13: 333-339
33. "This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree" p207 Environmental Review Tribunal, Case Nos 10-121/10-122 /Erickson v Director, Ministry of the Environment, dated 19<sup>th</sup> July, 2011  
<http://www.ert.gov.on.ca/english/decisions/index.htm>
34. Capuccio F et al, "Sleep Duration predicts cardiovascular outcomes: a systemic review and meta-analysis of prospective studies" European Heart Journal, (2011) 32, 1484-1492

35. Hanning, C & Evans, A BMJ 2012: 344 e 1527
36. For example <http://www.abc.net.au/news/video/2010/02/19/2825235.htm>
37. NIEHS November 2001, Op. cit., especially pp 16-30  
eg Nishimura K, 1988 "The effects of infrasound on pituitary adrenocortical response and gastric microcirculation in rats"  
J Low Frequency Noise & Vibration 7(1):20-33
38. Dadali, VA et al "Effects of infrasound and protective effect of adaptogens" in experimental animals, Gig. Sanit. (1):40-43 (Russian)  
MEDLINE record 92406047 cited as reference no 58 in NIEHS November 2001, Op. cit. (abstract)
39. Links posted on Yes2renewables website
40. McEwen, Bruce "Protective and Damaging Effects of Stress Mediators"  
NEJM 1998, 338 171-179
41. Warner-Schmidt JL, Duman RS (2006). "Hippocampal neurogenesis: opposing effects of stress and antidepressant treatment". [\*Hippocampus\*](#) **16** (3): 239-49
42. Personal communication – Cape Bridgewater, Toora, and Cullerin Ranges. Animals involved included dogs, calves and goats. Also animals including dogs, cats, cattle & horses in Ontario, personal communication with residents in the Amaranth, Shelburne area in October 2010.