

31 JAN 2011

The Oil Mallee Association of Australia (Inc)  
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**COPY**

ICR2878

Shire of Kojonup  
PO Box 163  
KOJONUP WA 6395

SHIRE OF KOJONUP					
FILE:	DB. BDA.8				
CEO	MCS	MRCS	WM	COPO	PB
HR	SFO	NRSM	SHM	PLAN ✓	

For the Attention : Shire President

**RE: FLAT ROCKS WIND FARM SUBMISSION**

Please find attached supporting documentation relating to the Oil Mallee Association of Australia (Inc) submission regarding Flat Rocks Wind Farm.

Our submission will be sent via email prior to COB Tuesday 1<sup>st</sup> February 2011.

Any additional attachments will accompany our email submission.

Yours sincerely

Simon Dawkins  
**GENERAL MANAGER**

28<sup>th</sup> January 2011

Attachments; *\* Not copied as part of submissions, but available on request*

- \* Oil Mallee Brochure "A Natural Solution"  
"Why Wind" Article written by D. McFall, published Kojonup News December 2010  
'Our farms buffeted by an ill wind' Herald Sun 20<sup>th</sup> June 2010  
The Dean Report : A noise impact Assessment of the Waubra Wind Farm (Extracts)
- \* Future Farm Industries CRC (FFICRC) Energy Tree Crops Report
- \* Oil Mallee Association of Australia Inc. (OMA) Industry Development Plan for Western Australia.

3A

## Why wind?

The prospect of a 'Wind Farm' within Kojonup Shire and adjacent municipality borders does not come as a surprise. There is a great deal of opportunistic 'wind prospecting' activity being conducted in WA and other interior mainland areas of Australia to secure prospective sites for potential development. The site prospecting is been driven by a national renewable energy target of 20% by year 2020 and the lure of further development.

In the case of Wind it appears a 'wild west' style stampede as the technology is established and on the face of it a 'green' solution to our renewable energy endeavours. Policy makers love it [though none will choose to live near one] thus the concerns of local residents placed in this position need to be respected and thoroughly considered.

Looking deeper wind farms are arguably a shadier pale of green than commonly perceived. Therefore the community will be well advised to engage themselves in all aspects of the technologies potential benefits and shortcomings as it considers this proposal. It is certain wind prospecting will continue and there will be more to follow so getting the planning and policy right is paramount to avoid adhoc and divisive development.

One of the fundamental and inherent shortcomings of inland wind is its intermittent supply. Wind is fickle and inland wind often blows at night in low peak energy demand times. Wind operations also 'book up' many megawatt hours though the towers often only operates at 50% capacity. When the wind does not blow the public utility [Verve Energy] is chartered to pick up the slack. Currently the cost of this exercise is borne by Verve and by extension out of the general public's purse rather than sit with the undersupplying wind farm owners.

Until corrective action is taken the wind farm proponents will continue to hog line capacity and avoid scrutiny over the true cost, savings and greenhouse benefits the technology actually brings. This discriminates against other renewable energy technologies such as biomass which provides energy on demand.

I mention biomass with good reason. If a community is to look at its future prosperity and capacity to attract people to stay and live within its borders then diversified industries bodes well with those aspirations.

Arguably wind farms provide a level of diversity but do they fully capture and resolve the interrelated layers of social, economic and environmental challenges and needs affecting a community like Kojonup? The 'externality' benefits of bioenergy over wind need to be fully appreciated in the community decision making process.

Let's look at our agricultural systems and the impact they are having at an environmental, economic and social level. Agriculture is a proud industry to which Kojonup is strongly bonded, but if we step back and take an honest look at the sustainability of this industry? Future challenges such as climatic variability, market competition, environmental/ carbon compliance and ethical production demands are real. Throw in global energy competition, rising input and financial costs, labour market competition- it's enough to test the hardest farmer. No doubt there is a pathway towards survival...but at what cost and who will be left standing?

For over 15 years a group of local landholders have been planting integrated tree crops to resolve environmental issues on farm and hopefully one day stimulate new industry development in regional areas like Kojonup. What must they be thinking of Kojonup Shire's drive towards Wind?

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The establishment of commercially sound biomass growing, harvesting and processing industries such as renewable energy will not only deliver farmers the capacity to diversify their production base but provide alternate land use systems that manage those futuristic demands I highlighted earlier with annual seasonal risk such as frost and scant rain events that have recently plagued local production returns. Can wind do this?

Verve Energy is well aware of those 'externality' benefits bioenergy can bring. A recently commissioned independent study conducted by Worley Parsons indicates nearly a 100% gain in net present value outcomes of a 7MW bioenergy over 100MW Wind Project taking in account the socio-economic aspects of project operation such as regional employment, environmental benefits and carbon capture.

Wind towers at >100 metres high are visually contentious and for those living near by often seen as a blight on the landscape but also carry concerns over noise pollution, contentious outstanding health issues and can have a negative impact on adjacent land and lifestyle values.

A community that is mature will need to appropriately consider any planning application with due diligence, seek impartial professional advice, take it's time, consider the bigger picture and above all respect the opinions and concerns of those directly effected.

In respect of the Wind Farm proposal I would hope that the Kojonup Community would step back from rushing in to support a wind proposal and fully consider the true needs of the community and the potential bio-energy can bring. The current time frame for submissions and the apparent lack of public awareness over the matter does not endure that the community is fully briefed and engaged in the decision making process.

## **David McFall**

This is the text of a letter submitted to the Kojonup News to be published 16<sup>th</sup> December, 2010.

### *Notes:*

- i 'externalities' means external benefits drawing in a range of social, economic and environmental parameters such as employment and NRM outcomes.*
- ii The Worley Parsons Study reference was taken from an article published in the Countryman dated 22/04/2010 page 14 - Author Kate Mathews.*

## Our farms buffeted by an ill wind

*Weekly Times editor Ed Gannon today begins a regular column looking at the issues important to people outside Melbourne*

Amid the hoo-ha of Julia Gillard's elevation as our first female PM, a piece of legislation finally slipped through Parliament that has left many country people despairing.

The legislation was the Renewable Energy Target, which mandated that 20 per cent of Australia's energy supply must be from renewable resources by 2020.

The Clean Energy Council reckons this will save 380 million tonnes of greenhouse gas emissions.

Immediately, the shackles were released on an estimated \$20 billion in projects. And despairingly for many rural people a fair chunk of these projects are wind farms.

There are eight wind farms currently in Victoria, operating 266 turbines. Plans on the table could take that up to 2500 turbines.

For those who have seen wind farms along the southwest coast near Portland and Port Fairy, or in South Gippsland at Toora and Wonthaggi, or the state's biggest wind farm at Waubra, west of Ballarat, they can be quite breathtaking.

The giant white 30m blades of the turbines loop in unison to conjure up a majestic scene, but for those who live or own land near them, they are an unbearable sight.

To many they are a health hazard and community wrecker.

Deep divisions have arisen across Victoria, with neighbour pitted against neighbour, as some land owners erect wind turbines on their properties - often 60m tall with 30m blades. It's pretty good money, sometimes \$10,000 a turbine a year. In the midst of a drought, that can feed a family and send kids to school.

But what of the neighbours? The appeals tribunals are awash with angry residents either trying to stop wind farms or complaining about existing turbines.

The main complaints are that wind farms knock land values for six and the vibration and noise of the slow-turning blades cause illness. Nausea, anxiety and headaches are common complaints. Many wind farm neighbours say they cannot sleep because the monotonous thump of the blades sends a jolt through their body every few seconds.

But there is another complaint against wind farms - that they are of little benefit, that they are inefficient white elephants that one day will have to be ripped out of the ground because they have failed to adequately service our power needs.

Their main drawback, opponents say, is that they are of no use when the wind doesn't blow.

Instead, Australia, as the world's sunniest continent, should be looking at harnessing solar energy.

But you will receive a similar argument from the wind sector - the sun is equally unreliable.

Perhaps, then, that's the solution - stick the wind farms where the sun don't shine. It's a sentiment opponents would wholeheartedly agree with.

**-The Dean Report: A Noise impact assessment of the Waubra Wind Farm**

June, 2010 by Robert Thorne, PhD, MS, FRSH, MIOA, MAAS (from Windaction: the website of the Industrial Wind Action Group: [www.windaction.org](http://www.windaction.org))

**Summary:**

Mr and Mrs Noel Dean requested a Report providing an assessment of the potential for adverse effects due to activity from the Waubra wind farm while living in their residences and while working on their farms. Dr. Robert Thorne undertook the study. His full report can be accessed via the link at the bottom of the 3<sup>rd</sup> paragraph. Below is a summary of Dr. Thorne's findings and conclusions.

My research to date for this investigation indicates "ordinary" wind has a laminar or smooth infrasound and low-frequency flow pattern when analysed over short periods of time. Wind farm activity appears to create a "pulsing" infrasound and low-frequency pattern. These patterns are illustrated in sonograms in this Report. My hypothesis at this stage is that wind farm sound has an adverse effect on individuals due to this pulsing nature, as well as audible noise due to the wind turbines. These effects may be cumulative. Research into this hypothesis is described further in this Report.

It is concluded, from the information presented, that Mr Dean has been and is currently adversely affected by the presence and activity of the Waubra wind farm. The effects stated by Mr Dean as affecting his health and statutory declarations from his family and residents in the vicinity of the wind farm attest to adverse health effects. Adverse health effects such as sleep disturbance, anxiety, stress and headaches are, in my view, a health nuisance and are objectionable and unreasonable. <http://www.windaction.org/documents/28511>

**Windaction Editor's Notes:**

[1] The Waubra wind energy facility is located near Ballarat, in western Victoria, Australia. It is the largest operating wind facility in the southern hemisphere consisting of 128-1.5 megawatt turbines for a total installed capacity of 192 megawatts. The turbines were first turned on in February 2009; the facility was fully operational by July 2009.

[2] Noel Dean and his family moved away from their farm in the spring of 2009 when the headaches and other symptoms worsened.

.....  
**Attached are extracts (pages 52,64,65,69, 110,111,113 & 115) from the above report. Please note illustration on page 69: One version of the proposed Flat Rocks Wind Farm provides for a turbine (tower plus blade) that is 21M higher than the largest turbine as shown in the illustration. For comparison the Albany Wind Farm turbines have a 65m tower and three 35m long blades making a total height of 100M.**

**The turbines (tower plus blade) proposed for the Flat Rocks Wind Farm are 146M in height, which is equivalent to a 48 story building. There are 74 turbines proposed.** For more reading go to <http://www.mlg.org.au/> - the website for the Molonglo Landscape Guardians

3A



**Noise Impact Assessment Report  
Waubra Wind Farm**

Mr & Mrs N Dean

*Report No 1537 - Rev 1 - July 2010*



**NMS NOISE MEASUREMENT SERVICES**

## 5 SOUND AND HEALTH

### Introduction

This Introduction is by B. Rapley as recorded in 'Sound, Noise, Flicker and the Human Perception of Wind Farm Activity' introducing the monograph by Dr D. Shepherd.

To understand the nature of the potential hazard, it is necessary to understand the nature of sound and the way it interacts with the human body. Dr. Daniel Shepherd takes on this task, providing a tutorial on the nature of the phenomenon and the method of interaction with human physiology. He makes the important point that, contrary to popular belief, we do not become used to noise (unwanted sound). To assume that someone can simply learn to accommodate a noise and ignore it is largely untrue. Dr Shepherd concludes that there is now convincing evidence in the literature that community noise causes annoyance, disrupts sleep, impairs children's school performance and negatively affects cardiovascular health. It also impedes rest, relaxation and recreational activity.

The latest research indicates that nuisance noise from wind farms is associated with psychological distress, stress, difficulties with falling asleep and sleep interruption. Furthermore, it is very hard to predict how annoyance from noise will compromise the health of susceptible individuals by considering the physical properties of the noise. This surely raises red flags for both those setting noise standards and those involved with policing consents. On these issues alone it is clear that there must be far more care in the siting of any future wind farms and a better understanding of how to mitigate the noise and compensate the affected individuals. The age-old question still exists: when do the needs of the many outweigh the needs of the few?

Brief excerpts from Dr Shepherd's monograph follow. For the complete monograph and references see 'Sound, Noise, Flicker and the Human Perception of Wind Farm Activity' the evidential text for the proposed Turitea wind farm (New Zealand) hearing.

### What is noise

Sufficient evidence now exists to link community noise to health problems, with one literature review concluding the following:

"It can be seen that these international groups of experts considered that there was sufficient evidence for the effects of noise on health regarding annoyance, school performance, ischaemic heart disease, hypertension and various aspects of sleep disturbance."

## 7 WIND FARM NOISE AND HUMAN PERCEPTION

Investigations in New Zealand have proven that the sound(s) of wind turbines are audible at low amplitudes inside homes. Such sound has readily identifiable perceptual dissonance and has a direct relationship to annoyance and sleep disturbance. This Report presents the effects of wind farm noise on residents near the Waubra wind farm and two wind farms in New Zealand and identifies concerns with potential adverse health effects, including audible, low frequency and infrasound effects.

My observations and measurements indicate that a wind farm is a source of noise (sound and vibration). It is a highly complex source of noise and is, in my opinion, unique due to its complexity and human perception. The receivers of the noise (that is, people) are highly complex in response. People do not respond to "single number" sound levels or noise levels for that matter. In the event, the installation of turbines at Waubra and Te Rere Hau and Makara (New Zealand) has resulted in widespread complaint concerning sleep disturbance due to unreasonable noise. My observations within a Makara residence show that outdoor levels of modulated sound below Leq 30 dB(A) are clearly audible within the home at night under calm weather conditions outside.

Based on my observations in the Manawatu, at Makara and in Waubra, it is my opinion that a background sound level of 40 dB(A) (or 38 dB(A) LAeq) due to wind farm noise is too high at residences. At the West Wind (Makara New Zealand) Hearing Dr van den Berg and I received agreement from the Experts' Caucus to present a separate statement to the agreed matters-

*"We believe that the conditions here agreed upon will protect residents from severe annoyance and sleep disturbance, but not from annoyance and loss of amenity. We believe annoyance and loss of amenity will be protected when the wind turbine noise limit would be 30 dBA L<sub>95</sub> in conditions of low wind speed at the dwellings and modulation restricted to 3 dB."*

The LA95 background sound level of 30 dB(A) is broadly equivalent to 32 dB(A) LAeq.

I am of the opinion, based on my own research, that wind farm noise can and does create unreasonable noise within residences and consequential adverse effects in the sense of sleep disturbance, annoyance and potential adverse health effects to residents living within 2000 metres of large wind turbines set in a wind farm. These risks are quantifiable and the effect is significantly more than minor.

Based on my observations within the Manawatu and Makara I am of the opinion that wind farm sound can be heard and recorded within residences situated within 3500 metres of large turbines



set in a wind farm. The risk of adverse effect due to sleep disturbance and annoyance is quantifiable and the effect is significantly more than minor.

Based on anecdotal evidence I have heard from affected people visual amenity also affects the perception of sound from sources of noise. This effect should be considered as part of a risk assessment. Perception of noise is enhanced when the turbines have visual dominance. By day, blade glint and flicker increase perception. At night, the red warning lights cause blade glint and strobing effects. Light bounce from low cloud creates visual dominance.

As previously stated the most significant issue for the practical management of wind farm noise is that the New Zealand standard lacks a methodology to separate single-value LA95 sound levels created by the wind turbines from ambient LA95 sound levels existing at a specific time and place due to wind movement, vegetation movements, bird song and so on. The "different" background levels cannot be separated using the standard's approach unless the turbines are switched off.

Unreasonable or disturbing noise will occur when the sound from a wind farm disturbs sleep and thereby causes anxiety, annoyance and stress. That unreasonable or disturbing noise can occur is well documented in peer-reviewed and impartial research. My research over 5 years and in Victoria and New Zealand indicates the existence of noise induced sleep disturbance and adverse health effects due to wind farm noise.

The expression sub-audible character is given in this Report to differentiate between low frequency sound (which has a solid foundation in hearing response) and infrasound, which has a less solid foundation in hearing response. Infrasound, however, has characteristics that may lead to adverse health effects. There is an extensive world-wide debate between acousticians, health professionals and the community (primarily affected persons) concerning potential adverse health effects due to the influence of wind farms. This is still the subject of debate, as outlined in this Report. However, there is sufficient peer-reviewed research and solid acoustical foundation for analysis to be made.

The above issues are debated in more detail in the evidential text "*Sound, Noise, Flicker and the Human Perception of Wind Farm Activity*" that was prepared for the Board of Inquiry Turitea Wind Farm Proposal Hearing, New Zealand, March 2010. The authors are a team of researchers that provide independent unbiased advice to the community and wind farm developers concerning the potential for adverse effects and mitigation of wind farm activity on people.

## Chapter 1: Audible Sound and Noise

Wind farms and wind turbines are a unique source of sound and noise. The noise generation from a wind farm is like no other noise source or set of noise sources. The sounds are often of low amplitude (volume or loudness) and are constantly shifting in character ("waves on beach", "rumble-thump", "plane never landing", etc). People who are not exposed to the sounds of a wind farm find it very difficult to understand the problems of people who do live near to wind farms. Some people who live near wind farms are disturbed by the sounds of the farms, others are not. In some cases adverse health effects are reported, in other cases such effects do not appear evident. Thus wind farm noise is not like, for example, traffic noise or the continuous hum from plant and machinery. Wind turbines such as those proposed are large noise sources relative to dwellings, Figure 1:

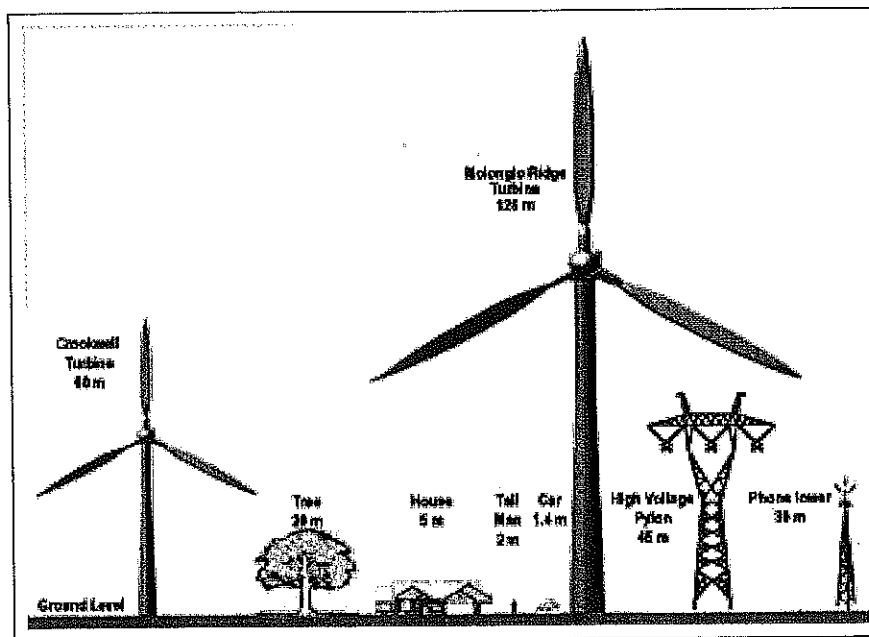


Figure 1: Relative heights of turbines to dwellings  
(Source: Molonglo Landscape Guardians, by permission)

Audible noise from modern wind turbines is primarily due to infrasound, turbulent flow and trailing edge sound. Sound character relates to blade characteristics and blade/tower interaction and can be grouped into 4 main bands. The sound can be characterised as being impulsive and broadband, audible and inaudible (infrasound):

- Infrasound below 20 Hz
- Low frequencies 20 Hz to 250 Hz
- Mid Frequency 250 to 2000 Hz (broadly, although the higher level could be 4000 Hz)
- High frequency 2000 Hz to 20,000 Hz

### The Effects on People near the Waubra Wind Farm, Victoria

The Waubra wind farm commenced operation in March 2009 in the Ballarat section and May 2009 in the northern Waubra section. Within a short time nearby residents were becoming concerned about noise. By August 2009 adverse health effects were being reported. In September-October I interviewed 5 different families near the northern section of the wind farm, all of whom report some adverse reaction since the commissioning of a nearby wind farm earlier in the year. The families are all within approximately 1000 – 2000 metres of turbines and had at least two sets of turbines near to them. Under these circumstances the residences are affected by wind farm activity over a range of wind directions. The interviews were preliminary in nature and standard psych and noise sensitivity tests were not conducted, nor were detailed health notes recorded.

Family A reports headaches (scalp and around the head pressure), memory problems and nausea when the turbines are operating. Symptoms include an inability to get to sleep and sleep disturbance, anxiety and stress, pressure at top and around head, memory problems, sore eyes and blurred vision, chest pressure. When the turbines are stopped the symptoms do not occur. A difference in severity is recorded with different wind directions. A personal comment made states:

*"I am having problems living and working indoors and outdoors on our property ... problems include headaches, nausea, pain in and around the eyes, sleep disturbance, pain in back of head; we feel this is coming from generation of wind from wind farm as it is OK when turbines are stopped."*

Family B reports tinnitus, dizziness and headaches since the turbines have started operating. Sleep disturbance at night with the sound of the turbines interrupting sleep pattern. Vibration in chest at times. Tiredness and trouble concentrating during the day. Does not have problems sleeping when not at Waubra overnight.

Family C reports the noise coming from the turbines at night disturbs sleep. During the day there is noise which causes bad headaches, sore eyes causing impaired vision earache and irritability.

Family D reports suffering from sleep disturbance, headaches, nausea and tachycardia (rapid heart rate) since the turbines started operating.

Family E reports that when the turbines are operating symptoms include feeling unwell, dull pains in the head (acute to almost migraine), nausea and feeling of motion sickness. At night when the turbines are in motion sleep disturbance from noise and vibration (unable to get any meaningful deep sleep), sleep deprivation leading to coping problems. The problems are reported as:

*"Some days when the wind is in the north-east my eyes feel swollen and are being pushed out of the sockets. I have a buzzing in my ears. On these days I feel it very difficult to summon memory and difficult to concentrate."*

and

*"The sound of the turbines when functioning is on most days so intrusive that it affects my concentration and thought processes when performing complex tasks. I suffer from sleep interruption as a direct result of the noise which then affects my ability to function at 100% the following day. One is aware of a throbbing in the head and palpitations that are in synchrony with the beat of the turbines and to a degree the flashing of the red lights. Because of this impact on my everyday life it causes me great stress and in turn great irritability."*

Two families identified blade glint / flicker and the red warning lights on the top of each tower as an additional source of annoyance.

Statutory declarations (June 2010) concerning noise issues have been declared by residents affected by the Waubra wind farm. Noise from the turbines is being experienced by residents within approximately 1000 metres of the nearest turbines and at distances of approximately 3000 to 4000 metres distant from the nearest turbines. The locales where the residents experience noise are shown in Plate W1. The noise and health effects experienced by residents are presented in Table W1.

The Waubra north and Ballarat locales are rural in nature with relatively low hills and rolling countryside. The northern section of the wind farm is illustrated in Plate W2 following. The locale is affected by south-west winds at turbine level but can be relatively calm at residences. The prevailing winds at Ballarat airport are shown in Figure W1, following. The measured wind directions are given to illustrate the importance of accurate wind data in predicting or assessing complaints.

**Table W1: Waubra wind farm affects, perception and complaint analysis**

Locale	Distance	Noise affect
1	1500-2500	Sleep disturbance, headaches, affects eyes and back of head, tinnitus. Worst affect is while working the farm. Heart pressure changes
2	1000	Sleep disturbance, headaches, high blood pressure
3	1000-1300	Sore eyes and headaches when the turbines are operating
4	1250-3000	Sleep disturbance. Affects people working on the farm. Headaches, earaches, blood pressure changes and poor eye sight.
5	1300-2200	Insomnia, headaches, sore eyes, dizziness, tinnitus and heart palpitations. Deteriorating health due to lack of sleep and stress levels. Unable to sleep through the night. Affects while working outside on the farm.
6	2000-2300	Headaches and pressure in ears when working on the farm.
7	550-1400	Sleep disturbance, windows vibrate. Affects while working on the farm. Headaches, lack of sleep, major problem with flicker. Excessive noise under a strong southwest wind
8	1000-3500	Headaches when working farm within 1500 metres of turbines. Dizziness when 2 turbines inline and in sync, effect went when approx 300m out of alignment. Sleep awakenings and disturbed by pulsating swish. Heart palpitations, vibrating sensation in chest and body. Headaches while at home. Stress and depression.
9	3500-4300	Frequently suffer from headaches, tinnitus, irritability, sleepless nights, lack of concentration, heart palpitations. Turbines exhibit a loud droning noise and pulsating whoosh.
10	3400-3800	Headaches, ringing in ears when turbines are operating. Pressure in ears, heart palpitations and anxiety attacks. Awaken at night, sleep disturbance.
11	3000-4600	Elevated blood pressure, heart palpitations, ear pressure and earache, disrupted sleep, increasing frequent headaches, head pressure, vibration in body, mood swings, problems with concentration and memory. Awaken at night, sleep disturbance.
12	1000-1200	Headaches, sickness, frequent sleep disturbance, very stressed. Affects personal life. Lights on turbines cause extreme distress. Ear pressure and loss of balance while working on the farm. Enormous pressure and stress on home and work.

**Notes:** 'Distance' is the distance in metres between the locale and the nearest turbines. The distances vary where turbines are in different directions surrounding the locale. Each locale contains one or more affected families. A common observation is that the adverse health effects noted did not exist before the wind farm commenced operation or diminish / disappear when not in the district affected by turbines.

**The Effects on People near the "West Wind" wind farm, New Zealand**

The Westwind wind farm commenced operation in May 2009. From my observations at Makara New Zealand at a residence situated approximately 1200 - 1300 metres from 5 turbines and within 3500 metres of 14 turbines there is known probability that the wind farm will exhibit adverse "special audible characteristics" on a regular basis resulting in sleep disturbance, annoyance and stress.

The observations and measurements being recorded at Makara involve the residents taking notes of the noise heard when they are awakened. At the same time a fully automated monitoring system records exterior audio as well as exterior and interior sound level data in summary levels and third-octave band levels. This allows the generation of tracking data and sonograms for compliance and unreasonable noise assessment. The complaint data is retained by the City Council. Statistical data is retained by the wind farm operator and summarized for the Council. Audio data for real-time analysis of special audible characteristics is not recorded by either Council or the wind farm operator. Audio data is recorded, however, by at one affected resident.

In the period April 2009 to 31 March 2010 a total of 906 complaints have been made to the Wellington City Council New Zealand concerning noise from the wind farm at Makara. These complaints have been made by residents living near to and affected by the wind farm. The turbines are Siemens 2.3MW machines situated approximately 1200 metres to 2200 metres from residences.

In personal interviews at Makara some residents have identified nausea as a problem. In the most severely affected case known the residents have bought another property and moved away from their farm.

Low frequency sound and infrasound are normal characteristics of a wind farm as they are the normal characteristics of wind, as such. The difference is that "normal" wind is laminar or smooth in effect whereas wind farm sound is non-laminar and presents a pulsing nature. This effect is evident even inside a dwelling and the characteristics are modified due to the construction of the building and room dimensions.

An analysis of the complaint history has been made. The character of 650 complaints has been sorted by type, figure WW1. Rumble, with 252 mentions, is the most common characteristic. Hum and thump are the next most common annoying sounds. In comparing complaints of noise outside to inside, of 650 complaints, only 23 specifically mention the noise as being outside. This, from my measurements, would be outdoor background levels of much less than 40 dB(A), around 28 to 30 dB(A) L95. Of the indoor complaints, 4.5% specifically mention sleep disturbance.

31 JAN 2011

**COPY**

Mr Steven Gash,

The Oil Mallee Association of Australia (OMA) is making a submission on the proposed Flat Rocks Wind Farm. For your convenience we have posted two documents, the first was produced by Future Farm Industries and deals with energy tree crops and their capacity to produce renewable energy. The second document is the Dean Report: a noise impact assessment of the Waubra Wind Farm, we have extracted important parts of this extensive and detailed report however the full report is online if you would like to read further into this issue. The bulk of our submission will be emailed.

Yours faithfully



Simon Dawkins (General Manager)

*ICR2879*

SHIRE OF KOJONUP					
FILE:	<i>DB BDA.8</i>				
CEO	MCS	MRCS	WM	COPO	PB
HR	SFO	NRSM	SHM	PLAN	✓

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**Summary:**

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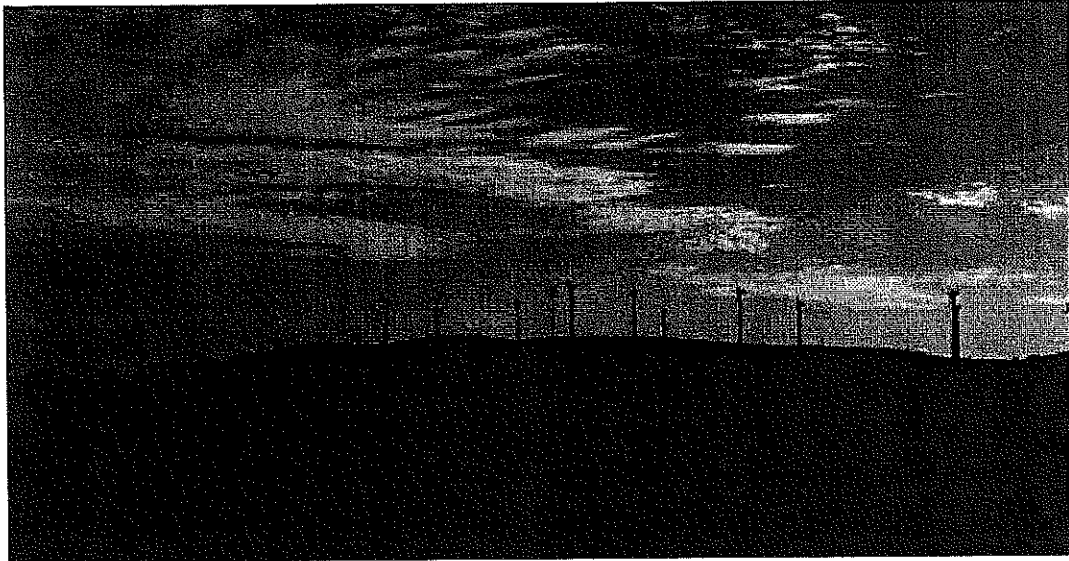
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**Noise Impact Assessment Report**  
**Waubra Wind Farm**

Mr & Mrs N Dean

*Report No 1537 - Rev 1 - July 2010*



**NOISE MEASUREMENT SERVICES**

## 5 SOUND AND HEALTH

### Introduction

This Introduction is by B. Rapley as recorded in 'Sound, Noise, Flicker and the Human Perception of Wind Farm Activity' introducing the monograph by Dr D. Shepherd.

To understand the nature of the potential hazard, it is necessary to understand the nature of sound and the way it interacts with the human body. Dr. Daniel Shepherd takes on this task, providing a tutorial on the nature of the phenomenon and the method of interaction with human physiology. He makes the important point that, contrary to popular belief, we do not become used to noise (unwanted sound). To assume that someone can simply learn to accommodate a noise and ignore it is largely untrue. Dr Shepherd concludes that there is now convincing evidence in the literature that community noise causes annoyance, disrupts sleep, impairs children's school performance and negatively affects cardiovascular health. It also impedes rest, relaxation and recreational activity.

The latest research indicates that nuisance noise from wind farms is associated with psychological distress, stress, difficulties with falling asleep and sleep interruption. Furthermore, it is very hard to predict how annoyance from noise will compromise the health of susceptible individuals by considering the physical properties of the noise. This surely raises red flags for both those setting noise standards and those involved with policing consents. On these issues alone it is clear that there must be far more care in the siting of any future wind farms and a better understanding of how to mitigate the noise and compensate the affected individuals. The age-old question still exists: when do the needs of the many outweigh the needs of the few?

Brief excerpts from Dr Shepherd's monograph follow. For the complete monograph and references see 'Sound, Noise, Flicker and the Human Perception of Wind Farm Activity' the evidential text for the proposed Turitea wind farm (New Zealand) hearing.

### What is noise

Sufficient evidence now exists to link community noise to health problems, with one literature review concluding the following:

"It can be seen that these international groups of experts considered that there was sufficient evidence for the effects of noise on health regarding annoyance, school performance, ischaemic heart disease, hypertension and various aspects of sleep disturbance."

## 7 WIND FARM NOISE AND HUMAN PERCEPTION

Investigations in New Zealand have proven that the sound(s) of wind turbines are audible at low amplitudes inside homes. Such sound has readily identifiable perceptual dissonance and has a direct relationship to annoyance and sleep disturbance. This Report presents the effects of wind farm noise on residents near the Waubra wind farm and two wind farms in New Zealand and identifies concerns with potential adverse health effects, including audible, low frequency and infrasound effects.

My observations and measurements indicate that a wind farm is a source of noise (sound and vibration). It is a highly complex source of noise and is, in my opinion, unique due to its complexity and human perception. The receivers of the noise (that is, people) are highly complex in response. People do not respond to "single number" sound levels or noise levels for that matter. In the event, the installation of turbines at Waubra and Te Rere Hau and Makara (New Zealand) has resulted in widespread complaint concerning sleep disturbance due to unreasonable noise. My observations within a Makara residence show that outdoor levels of modulated sound below Leq 30 dB(A) are clearly audible within the home at night under calm weather conditions outside.

Based on my observations in the Manawatu, at Makara and in Waubra, it is my opinion that a background sound level of 40 dB(A) (or 38 dB(A) LAeq) due to wind farm noise is too high at residences. At the West Wind (Makara New Zealand) Hearing Dr van den Berg and I received agreement from the Experts' Caucus to present a separate statement to the agreed matters-

*"We believe that the conditions here agreed upon will protect residents from severe annoyance and sleep disturbance, but not from annoyance and loss of amenity. We believe annoyance and loss of amenity will be protected when the wind turbine noise limit would be 30 dBA L<sub>95</sub> in conditions of low wind speed at the dwellings and modulation restricted to 3 dB."*

The LA95 background sound level of 30 dB(A) is broadly equivalent to 32 dB(A) LAeq.

I am of the opinion, based on my own research, that wind farm noise can and does create unreasonable noise within residences and consequential adverse effects in the sense of sleep disturbance, annoyance and potential adverse health effects to residents living within 2000 metres of large wind turbines set in a wind farm. These risks are quantifiable and the effect is significantly more than minor.

Based on my observations within the Manawatu and Makara I am of the opinion that wind farm sound can be heard and recorded within residences situated within 3500 metres of large turbines

set in a wind farm. The risk of adverse effect due to sleep disturbance and annoyance is quantifiable and the effect is significantly more than minor.

Based on anecdotal evidence I have heard from affected people visual amenity also affects the perception of sound from sources of noise. This effect should be considered as part of a risk assessment. Perception of noise is enhanced when the turbines have visual dominance. By day, blade glint and flicker increase perception. At night, the red warning lights cause blade glint and strobing effects. Light bounce from low cloud creates visual dominance.

As previously stated the most significant issue for the practical management of wind farm noise is that the New Zealand standard lacks a methodology to separate single-value LA95 sound levels created by the wind turbines from ambient LA95 sound levels existing at a specific time and place due to wind movement, vegetation movements, bird song and so on. The "different" background levels cannot be separated using the standard's approach unless the turbines are switched off.

Unreasonable or disturbing noise will occur when the sound from a wind farm disturbs sleep and thereby causes anxiety, annoyance and stress. That unreasonable or disturbing noise can occur is well documented in peer-reviewed and impartial research. My research over 5 years and in Victoria and New Zealand indicates the existence of noise induced sleep disturbance and adverse health effects due to wind farm noise.

The expression sub-audible character is given in this Report to differentiate between low frequency sound (which has a solid foundation in hearing response) and infrasound, which has a less solid foundation in hearing response. Infrasound, however, has characteristics that may lead to adverse health effects. There is an extensive world-wide debate between acousticians, health professionals and the community (primarily affected persons) concerning potential adverse health effects due to the influence of wind farms. This is still the subject of debate, as outlined in this Report. However, there is sufficient peer-reviewed research and solid acoustical foundation for analysis to be made.

The above issues are debated in more detail in the evidential text "*Sound, Noise, Flicker and the Human Perception of Wind Farm Activity*" that was prepared for the Board of Inquiry Turitea Wind Farm Proposal Hearing, New Zealand, March 2010. The authors are a team of researchers that provide independent unbiased advice to the community and wind farm developers concerning the potential for adverse effects and mitigation of wind farm activity on people.

## Chapter 1: Audible Sound and Noise

Wind farms and wind turbines are a unique source of sound and noise. The noise generation from a wind farm is like no other noise source or set of noise sources. The sounds are often of low amplitude (volume or loudness) and are constantly shifting in character (“waves on beach”, “rumble-thump”, “plane never landing”, etc). People who are not exposed to the sounds of a wind farm find it very difficult to understand the problems of people who do live near to wind farms. Some people who live near wind farms are disturbed by the sounds of the farms, others are not. In some cases adverse health effects are reported, in other cases such effects do not appear evident. Thus wind farm noise is not like, for example, traffic noise or the continuous hum from plant and machinery. Wind turbines such as those proposed are large noise sources relative to dwellings, Figure 1:

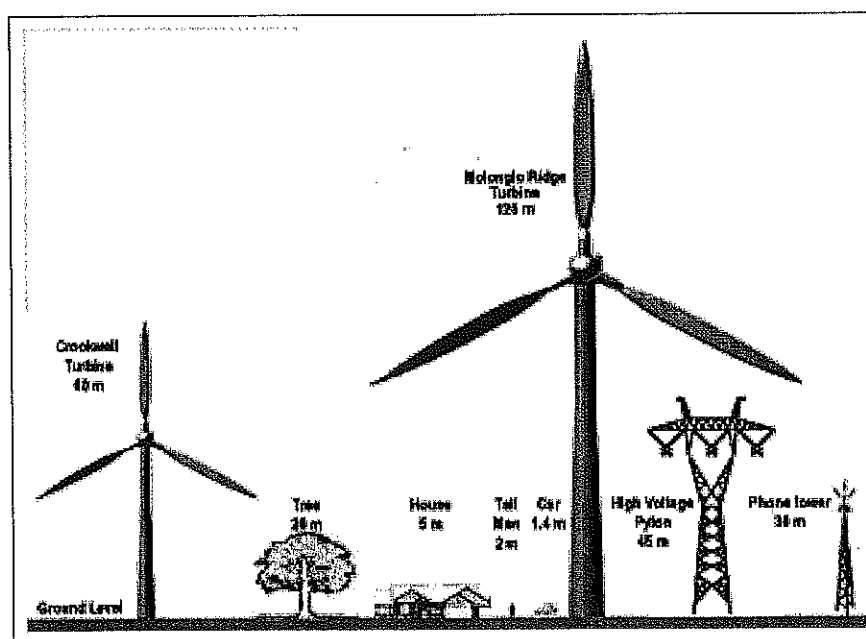


Figure 1: Relative heights of turbines to dwellings

(Source: Molonglo Landscape Guardians, by permission)

Audible noise from modern wind turbines is primarily due to infrasound, turbulent flow and trailing edge sound. Sound character relates to blade characteristics and blade/tower interaction and can be grouped into 4 main bands. The sound can be characterised as being impulsive and broadband, audible and inaudible (infrasonic):

- Infrasound below 20 Hz
- Low frequencies 20 Hz to 250 Hz
- Mid Frequency 250 to 2000 Hz (broadly, although the higher level could be 4000 Hz)
- High frequency 2000 Hz to 20,000 Hz

**The Effects on People near the Waubra Wind Farm, Victoria**

The Waubra wind farm commenced operation in March 2009 in the Ballarat section and May 2009 in the northern Waubra section. Within a short time nearby residents were becoming concerned about noise. By August 2009 adverse health effects were being reported. In September-October I interviewed 5 different families near the northern section of the wind farm, all of whom report some adverse reaction since the commissioning of a nearby wind farm earlier in the year. The families are all within approximately 1000 – 2000 metres of turbines and had at least two sets of turbines near to them. Under these circumstances the residences are affected by wind farm activity over a range of wind directions. The interviews were preliminary in nature and standard psych and noise sensitivity tests were not conducted, nor were detailed health notes recorded.

Family A reports headaches (scalp and around the head pressure), memory problems and nausea when the turbines are operating. Symptoms include an inability to get to sleep and sleep disturbance, anxiety and stress, pressure at top and around head, memory problems, sore eyes and blurred vision, chest pressure. When the turbines are stopped the symptoms do not occur. A difference in severity is recorded with different wind directions. A personal comment made states:

*"I am having problems living and working indoors and outdoors on our property ... problems include headaches, nausea, pain in and around the eyes, sleep disturbance, pain in back of head; we feel this is coming from generation of wind from wind farm as it is OK when turbines are stopped."*

Family B reports tinnitus, dizziness and headaches since the turbines have started operating. Sleep disturbance at night with the sound of the turbines interrupting sleep pattern. Vibration in chest at times. Tiredness and trouble concentrating during the day. Does not have problems sleeping when not at Waubra overnight.

Family C reports the noise coming from the turbines at night disturbs sleep. During the day there is noise which causes bad headaches, sore eyes causing impaired vision earache and irritability.

Family D reports suffering from sleep disturbance, headaches, nausea and tachycardia (rapid heart rate) since the turbines started operating.

Family E reports that when the turbines are operating symptoms include feeling unwell, dull pains in the head (acute to almost migraine), nausea and feeling of motion sickness. At night when the turbines are in motion sleep disturbance from noise and vibration (unable to get any meaningful deep sleep), sleep deprivation leading to coping problems. The problems are reported as:

**The Effects on People near the "West Wind" wind farm, New Zealand**

The Westwind wind farm commenced operation in May 2009. From my observations at Makara New Zealand at a residence situated approximately 1200 - 1300 metres from 5 turbines and within 3500 metres of 14 turbines there is known probability that the wind farm will exhibit adverse "special audible characteristics" on a regular basis resulting in sleep disturbance, annoyance and stress.

The observations and measurements being recorded at Makara involve the residents taking notes of the noise heard when they are awakened. At the same time a fully automated monitoring system records exterior audio as well as exterior and interior sound level data in summary levels and third-octave band levels. This allows the generation of tracking data and sonograms for compliance and unreasonable noise assessment. The complaint data is retained by the City Council. Statistical data is retained by the wind farm operator and summarized for the Council. Audio data for real-time analysis of special audible characteristics is not recorded by either Council or the wind farm operator. Audio data is recorded, however, by at one affected resident.

In the period April 2009 to 31 March 2010 a total of 906 complaints have been made to the Wellington City Council New Zealand concerning noise from the wind farm at Makara. These complaints have been made by residents living near to and affected by the wind farm. The turbines are Siemens 2.3MW machines situated approximately 1200 metres to 2200 metres from residences.

In personal interviews at Makara some residents have identified nausea as a problem. In the most severely affected case known the residents have bought another property and moved away from their farm.

Low frequency sound and infrasound are normal characteristics of a wind farm as they are the normal characteristics of wind, as such. The difference is that "normal" wind is laminar or smooth in effect whereas wind farm sound is non-laminar and presents a pulsing nature. This effect is evident even inside a dwelling and the characteristics are modified due to the construction of the building and room dimensions.

An analysis of the complaint history has been made. The character of 650 complaints has been sorted by type, figure WW1. Rumble, with 252 mentions, is the most common characteristic. Hum and thump are the next most common annoying sounds. In comparing complaints of noise outside to inside, of 650 complaints, only 23 specifically mention the noise as being outside. This, from my measurements, would be outdoor background levels of much less than 40 dB(A), around 28 to 30 dB(A) L95. Of the indoor complaints, 4.5% specifically mention sleep disturbance.

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**REF: SHIRE OF KOJONUP TOWN PLANNING SCHEME NO 3.**

***Submission to Kojonup Shire Council regarding the proposed Flat Rocks Wind Farm***

The Oil Mallee Association of Australia (OMA) welcomes the opportunity to provide comments on the proposed Flat Rocks Wind Farm (FRWF). The proponent, Moonies Hill Energy Pty Ltd has sought Planning Consent from the Shire of Kojonup. Planning approval has also been sought from Broomehill - Tambellup Shire.

The OMA was formed in 1995 to assist with the promotion of mallees as a successful tool for dealing with salinity, erosion and other land care issues. Over many years farmers have adopted the growing of mallees for these purposes and also with the possibility that they can be harvested for extraction of eucalyptus oil and other products including bioenergy and biochar. Significant breeding and improvement programs have been undertaken and the name "oil mallee" refers to the improved growth and oil content that has been achieved in several species.

Over 1000 farmers have grown oil mallees and a total of 15,000 hectares have been established across the WA Wheatbelt. Considerable activity by companies specialising in carbon sequestration has resulted in thousands of hectares being grown as permanent forests. As a whole the WA oil mallee program has become well known across Australia and the world and has achieved the status of an important national initiative. Two proposed Commonwealth programs, the Carbon Farming Initiative, due in mid 2011 and the Carbon Pricing legislation, due in 2012, combined with the Renewable Energy Target of 20% renewable energy by 2020, will greatly assist the development of the industry.

The OMA has considerable experience in climate change and energy policy gained over many years and has influenced policy direction through its engagement in the Climate Change Committee of the Chamber of Commerce and Industry and through the many submissions and presentations over 15 years.

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This submission is being lodged by the OMA with two main themes.

1. The ambition of the OMA and others to develop a significant bioenergy industry in the region could be frustrated by the unplanned and unexpected expansion of wind farms in the inland regions of WA. The South West Interconnected System grid will attain full capacity with the addition of large wind farms. A review of the ways in which wind farms are approved and deployed throughout the State, should be undertaken before there is a major commitment to this one form of renewable energy to the exclusion of better options.
2. The proposed large scale industrial wind farm will have significant detrimental impacts on the rural area in which it is located. These impacts extend to health and well being, a fall in the value of land and economic loss through reduced agricultural production. The evidence of health impact is consistent across Australia and in many parts of the world and on these grounds alone the FRWF should be refused planning approval.

## **1. Agricultural based bioenergy projects**

The prospects for a bioenergy industry based on growing of mallee biomass is well explained in two recent reports, "The Oil Mallee Industry Development Plan,<sup>1</sup>" and the CRCFFI publication, "Energy Tree Crops". The potential scale of the industry is considerable, with positive impacts on the regions in which the feedstock is grown and processed. (These documents will be posted to the shire.)

The socio-economic benefits of the industry to the community would be considerable with many jobs and new industries emerging from the harvesting and processing of the biomass. There are many additional benefits to land owners from integration of a new tree crop into their cropping programs. Oil mallees are productive in a drying climate, they provide significant environmental services related to salinity and wind erosion and protect quality agricultural land values. As a result this new industry builds more resilient local communities with the benefits spread across many farmers and regional communities as a whole.

The continued development of the mallee bioenergy industry will be cut short by the imposition of substantial industrial scale wind farms on the South West Interconnected System (SWIS) grid due to existing grid capacity constraints and therefore its inability to host additional electricity generation.

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<sup>1</sup> *The Oil Mallee Industry Development Plan, 2008, URS Forest Services, commissioned by the Oil Mallee Association of Australia with funding from the State and Commonwealth Governments. Energy Tree Crops: a publication of the Cooperative Research Centre for Future Farm Industries 2009.*

At a briefing by Verve in Narrogin, the OMA was informed that the wind farm at Merredin could prevent a 10 MW bioenergy plants being added at some point in the future.

The method by which these projects achieve connection to the grid is via a queuing system based on the date of application. Once a project is identified, the proponent needs to show they are ready to proceed. Wind projects achieve this readiness status through prior prospecting for wind, feasibility studies, the securing of agreements with landowners and the knowledge that the machinery can be purchased. It appears that very little other information is required prior to the application for planning approval. Once approved a power purchase agreement with Verve is secured.

In the opinion of the OMA, projects of this scale and impact should be scrutinised in more detail at an early stage. Regional Energy Plans should be prepared to secure the best overall outcome for the region and alignment with the State Government's strategic energy objectives.

There are significant impacts and costs associated with balancing the grid due to load variations caused by intermittent renewable energy. This challenge of load balancing is best exemplified by the very hot still days when the wind turbines produce very little if any electricity. The OMA is aware that the Independent Market Operator (IMO) is currently looking into the capacity factors of wind farms and the allocation of costs associated with load balancing.

There are several interested parties developing new methods of bioenergy from oil mallees, generally through a process of pyrolysis. This efficient system of transforming mallee biomass into fuels, electricity generation and biochar can enable both baseload generation and load responsive applications. There are many willing growers of mallee and many more will follow once a bioenergy project is established. The benefits of a regional bioenergy project will flow to all participating farmers and the regional benefits will continue to grow well into the future. The benefits from this new industry could be prevented if available grid capacity is allocated to wind.

## **2. The impact of wind farms on regional communities**

The OMA has become aware of major problems with wind farms based on the emerging evidence in Eastern Australia, Europe and North America. The commonality of these concerns and the strength of complaint has surprised the OMA and caused the organisation to use its knowledge of rural matters and its extensive network of members and associates to investigate these concerns on behalf of landowners and country people generally. The OMA is concerned that the problems need to be addressed before the introduction of wind farms into Kojonup and adjoining regions.

The OMA approach to regional bioenergy projects has been to focus on regional development, the building of local communities through new businesses and increasing the resilience of farming. We believe that wind farm developments do not adopt this approach and indeed the evidence indicates that these projects have a history of creating division, unequal treatment and removal of land ownership from local farmers.

In this submission two impacts of rural wind farms will be addressed;

- (i) the impact on the health and well being of people, and
- (ii) the impact on agriculture and land values.

**(i) Health and well being**

The FRWF proposes that very large scale industrial machinery will be placed on prominent locations, as near as possible to a grid connection. The large turbines planned for this project are almost 150 metres from the ground to the tip of the blade. There are a limited number of wind farms where this size of turbine has been deployed and there is therefore limited experience of their local impact over any period of time. Apart from the visual intrusion on the landscape, a major feature of wind farms is the noise and related physical impacts generated by the turbines. It is expected that larger turbines will generate more noise and disturbance.<sup>2</sup>

From a reading of the available literature outlining the particular characteristics of noise generated from wind turbines as reported by local residents, the disturbance can vary from annoyance to deeply distressing and effects so severe that people have to move away to get relief. There seems to be no doubt that these impacts are real and have not been adequately investigated.

The Dean Report<sup>3</sup> outlines the process for assessment of intrusive noise and low amplitude sound. The report outlines the necessity of combining three types of measurement;

- sound data (environmental and noise sensitivity tests),
- data processing (including subjective and personal perceptions), and
- the establishment of an intrusive noise rating system.

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<sup>2</sup> *The impact of scale and noise is addressed in the Dean Report (Waubra Wind Farm Noise Impact Report assessment for Mr and Mrs Dean: Report 1537 noise Measurement Services Pty Ltd July 2010 Rev 1) p 69 and in The weekend Australian 22-23 January 2011 p3 where there is a diagram of the turbines illustrating that turbines of the height planned for Kojonup are taller than the Sydney Harbour Bridge.*

<sup>3</sup> *The Dean Report*

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This advocacy of a detailed methodology addresses the issue of simple measurement of noise above a background level or comparison with "normal" noise levels tolerated by people in the city. The measure they propose to use was developed in South Australia and centres on measurement of likely noise above a background (baseline) level.

The Dean Report suggests that this type of simple measure is inadequate on its own and does not take into account what the prevailing low level of background noise occurs in rural areas.

More importantly, this noise assessment on the FRWF project will not take place until after Development Approval has been granted, but before the turbines are built.

The proponent indicates that the wind farm will be subsequently designed to meet these guidelines, and in doing so acknowledges that the problem of noise intrusion does exist. This situation of dealing later with this major problem could cause considerable uncertainty.

Another very real concern is the fact that the noise guidelines will apply only for the dwellings that do not have an agreement with the developers of the wind farm.<sup>4</sup> The OMA is concerned about those people located within a few kilometres of the project as it is likely they will be impacted by noise from the wind farm. The OMA is also concerned about the impact of the wind farm on properties within the boundaries of the project where confidential agreements are reached between the operator and the land owner.

It is assumed that the leasing agreement between the land owner deals with this issue of noise and there is evidence that many owners are forced to leave their homes and properties. It appears the land owner hosting the wind farm has no other recourse. The following story in the media highlights this issue and highlights the tendency for the wind farm operator to purchase the properties.

The Ballarat Courier reported that the Waubra Wind farm "buys more properties". This purchase of two additional properties adds to the five already acquired by the operator. In the latest purchase, two houses were faced with the prospect of noise levels exceeding the planning permit. "The turbines would need to have been run in reduced-noise mode" and it "was a commercial decision to purchase the properties".<sup>5</sup> This approach indicates the method of meeting previously agreed noise requirements, at least for the landowners who host the turbines, is solved by enabling the complainants to leave the area.

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<sup>4</sup> Flat rocks Wind Farm Development Application, Planning and Environment Report November 2010  
p7

<sup>5</sup> Mr Brett Wickam quoted in the Ballarat Courier 18 November 2010

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In one on-line comment made following the article, reference is made by "Anne" to this practice of wind farm operators purchasing properties in Canada. From this and other references, the OMA believes this practice is widespread. It is assumed that by purchasing the property and cancelling the lease agreement, the operator is relieved of the necessity of paying substantial lease payments over a very long period. Simply based on the evidence of this and other wind farms in Australia, Kojonup should expect a number of properties to be purchased as a direct result of the noise the turbines will create.

The pattern of ownership and occupancy by local farmers will change, not for reasons of the agricultural economy but because of the intrusion of large mechanical wind generators.

What is wind farm noise?

Further explanation of wind farm noise is necessary to understand this issue. Dr Robert Thorne, author of The Dean Report, goes further in describing the source of problem noise by referring to the low amplitude sound or "infrasound". The report indicates that most definitions of noise<sup>6</sup> are inadequate and refer to it as "unwanted sound" and suggests that more precise working definitions are required. These definitions need to incorporate the impact of noise at low frequency which cannot be measured by normal monitoring equipment. Special instrumentation "is required to measure the "rumble / thump" sounds from wind farms or the character of the ambient sound in low background at rural locations".<sup>7</sup>

Dr Thorne refers to the particular characteristics of sound and wind farms;

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<sup>6</sup> **Noise:** 1. Any undesired sound. It is measured on a "decibel scale ranging from the threshold of hearing (0 dB) to the threshold of pain (130dB). Between these limits a whisper registers about 20dB, heavy urban traffic about 90 dB and a heavy hammer on steel plate about 110 dB. A high noise level (industrial or from over amplified music, for example) can cause permanent hearing impairment. 2. Any unwanted disturbance within a useful frequency band in a communication channel.

**Sound:** A vibration in an elastic medium at a frequency and intensity that is capable of being heard by the human ear. The frequency of sounds lie in the range 20-20,000 Hz, but the ability to hear sounds in the upper part of the frequency range declines with age (see also **pitch**). Vibrations that have a lower frequency than sound are called infrasounds and those with a higher frequency are called ultrasounds.

Sound is propagated through an elastic fluid as a longitudinal sound wave, in which a region of high pressure travels through the fluid at the speed of sound in that medium. At a frequency of about 10 kilohertz the maximum excess pressure of a sound wave in air lies between  $10^{-4}$  Pa and  $10^3$  Pa. Sound travels through solids as either longitudinal or transverse waves. Source: Oxford Concise Science Dictionary, Third Edition, Oxford, New York, Oxford University Press, 1996

<sup>7</sup> The Dean Report p. 101

"Wind farm activity appears to create a 'pulsing' infrasound and low frequency pattern. ... My hypothesis at this stage is that wind farm sound has an adverse effect on individuals due to this pulsing nature, as well as audible noise due to the wind turbines. These effects can be cumulative".

"It is concluded, from the information presented, that Mr Dean has been and is currently adversely affected by the presence and activity of the Waubra wind farm. The effects as stated by Mr Dean as affecting his health and statutory declarations from his family and residents in the vicinity of the wind farm attest to adverse health effects. Adverse health effects such as sleep disturbance, anxiety, stress and headaches are, in my view, a health nuisance and are objectionable and unreasonable".<sup>8</sup>

Dr Thorne refers to fact that his opinion is based on his analysis of the information available to him. Despite the presence of wind farms for some time in Australia and the number and strength of the complaints, serious research is limited. Dr Sarah Laurie, the

Medical Director of the Waubra Foundation, makes this point while suggesting that more research is required. She writes;

"Our task is to act as a catalyst to ensure that independent peer reviewed research into the emerging issues of adverse health effects associated with wind turbine developments is urgently carried out. We have the current situation where our peak health body, the National Health and Medical Research Council, rightly says there is no peer reviewed evidence of adverse health effects from these wind turbine developments, but this does not mean there is no problem.

In the light of the extensive and growing anecdotal reports of health problems being experienced by those who live and work close to these turbine developments across the world, and the planned deployment of turbines close to homes and workplaces, it is imperative that such research is urgently carried out, independent of all those with vested interests in the outcome of such research."<sup>9</sup>

Dr Laurie states that she has found many accounts of people adversely affected since the turbines in their area have started operating. She states that she was "shocked at the extent and severity of symptoms which have been experienced by some individuals which appear to be related to the turbines when they are operating. Some patients experience symptoms when they are five kilometres away from the nearest turbines."

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<sup>8</sup> *The Dean Report: Executive Summary*

<sup>9</sup> *Dr Sarah Laurie: Open letter to the (then) Premier of Victoria, Mr John Brumby*



In the Dean Report Dr Thorne also refers to the particular relationship between noise and its ability to disrupt the enjoyment of the amenity enjoyed by people in rural areas. Noise influences the appreciation and hence economic value of the environment. The OMA believes all these issues need to be investigated before any responsible shire can approve the development.

It is no coincidence that the considerable health problems are being experienced on the farms adjacent to the largest wind farm in the southern hemisphere, Waubra. Clearly, as stated in the Dean Report (ref: page 69) there is a direct correlation between the size of the blades (length and breadth) and the amount of sound created as these blades pass the tower. Further to this, the number of towers and their placement is having a cumulative effect on the amplification of the sound. Furthermore the proposed FRWF in WA and the wind farm project in Collector in NSW have turbines which are 26 metres higher than Waubra.

#### **(ii) Agriculture and land values**

The availability of emerging evidence on the impact of wind farms from the earlier experience in eastern Australia needs to be accommodated in any evaluation of the FRWF. This project contains many of the same characteristics of other projects in Victoria and New South Wales. In these locations there is evidence that the wind farms reduce the value of the land on which they are located and all of the surrounding area for some kilometres. The "negative externalities" (noise, visual appearance, interruption to agricultural practices) caused by the wind farm are not accommodated or shared equitably by the arrangements reached with a limited number of farmers who host the turbines.

This loss of value is explained by experienced real estate sales manager, Shane McIntyre. Mr McIntyre states:

"Experts assess the loss of value to be in excess of 30 per cent, and sometimes up to half.

My personal experience is that when an enquiry (potential buyer) becomes aware of the presence of wind towers, or the possibility of wind towers in the immediate district of a property advertised for sale, the "fall out" of buyers is major. Very few go on to inspect the property, and even fewer consider a purchase. On the remote chance they wish to purchase, they seek a significant reduction in the price.

There is absolutely no doubt that the value of lands adjacent to wind towers falls significantly in value. The ambience of a rural property is important and, oftentimes, the sole reason why a purchaser selects a particular area or district."<sup>10</sup>

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<sup>10</sup> *Shane McIntyre, National Sales Manager Elders Rural Services Australia Limited, Expert confirms wind turbines hammer property values (Australia), quoted on the website of the Wind Turbine Syndrome News, [www.windturbinesyndrome.com](http://www.windturbinesyndrome.com)*

When land values fall dramatically banks and lending institutions will demand from farmers, further security on any borrowed money. In the letter Mr McIntyre refers to a number of issues that concern prospective purchasers of rural land including noise, visual amenity and the expectation of "stillness" and "serenity" which are normally associated with the land without the turbines.

This opinion is reinforced by Mr Tony Hodgson, founder of the firm Ferrier Hodgson, who said of his land in Collector, that: "My position would be that if I knew there was going to be a wind farm here I would not have bought it five years ago. I would have gone somewhere else." He also states that "there should be a register of easement that shows up on all the adjoining land."<sup>11</sup> In this latter statement he is referring to the impact of a wind farm on surrounding land.

Taking this approach further, there is at least one instance where a neighbour to a wind farm project has started legal proceedings to recover loss of value from those landowners participating in the wind farm project. Prior to this information coming to light, a Kojonup farmer has indicated that he was unwilling to enter into an agreement with a wind farm operator because he could not countenance receiving gain at the expense of his neighbours.<sup>12</sup>

The payment of substantial payments to landowners prepared to have the turbines on their property may in fact do little more than compensate the landowner for the loss in value of the whole property. Little is known about the structure and content of the lease agreements and important issues need to be understood by land owners before they enter into binding agreements. One important issue is the responsibility for decommissioning at the end of the useful life of the project. Mr Hodgson mentions the importance of this issue in the Australian interview and it is unclear from the FRWF development application whether the operator or the land owner takes responsibility for this costly exercise.

Another aspect of this assumed reduction in land value is the reduction in farming opportunity itself. There are claims by the Aerial Agricultural Association of Australia that,

"The placement of wind farms in areas of highly productive agricultural land is leading to reductions in treatment areas of aerial application companies,

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<sup>11</sup> *The Weekend Australian* 22-23 January 2011 p 3

<sup>12</sup> *Mr Roger Bilney in submission to Kojonup Sire regarding the FRWF: ie "The loss of value of farm land near wind farms was one of the major reasons that we rejected the Moonies Hill Energy proposal to site turbines on our properties- we were not prepared to inflict such loss of property values onto our neighbours. This is an area where conflict of interests will surface very quickly leading to a fraying of the fabric that holds rural communities together, that being 'do unto others as you would have done to yourself'."*



with no compensation for this externalization of costs by the wind farm developers"<sup>13</sup>

When considering the impact on agricultural production it is also necessary to consider the role of audible and inaudible noise on livestock. The President of the OMA, Mr Lex Hardie, a farmer for over forty years has drawn attention to the possible extension of the observed impact on humans to animals on farms. His comments on this topic are at Attachment 1.

### **Summary and conclusion**

The objective of this submission is to raise issues of real concern and place before the Shire our conviction that a decision in favour of the FRWF project could introduce a range of economic, social (health) impacts and an unprecedented level of division and discontent to the region. Regional community development and growth is at the heart of the OMA's endeavours to develop an agricultural industry based on "energy tree cropping" and we can foresee significant advantages of this sort of development over the imposition of inappropriate industrial scale wind farms which have no relationship to local utilisation and development.

The OMA would recommend that:

1. The approval for the proposed Flat Rocks Wind Farm be refused.
2. That the Shire seek advice from Verve and the IMO about the nature of issues being considered by the IMO regarding the capacity ratings for wind farms and the allocation of costs for "load balancing". They should also seek an assessment on the likely impact of decisions based on these issues will impact on the short and long term prospects for the viability of wind farms.
3. That the shires of Kojonup and Broomehill-Tambelup inform the State Government of the concerns of ratepayers relating to the process for approving any further wind farms.
4. That the Shire commission a regional energy plan which weighs up the advantages and disadvantages of various possible technologies on the basis of their social, economic and (local) environmental impacts.
5. That the shire request more information on the FRWF on the nature of the leases and the allocation of responsibility for decommissioning.

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<sup>13</sup> *Aerial Agricultural Association of Australia in a submission to the Senate Senate Standing Committee on Community Affairs and its inquiry of "The Social and Economic Impact of Rural Wind Farms".*

## Attachment 1

### WIND TURBINE'S POSSIBLE EFFECT ON THE FOOD CHAIN

Most farmers can relate to the fact that their sheep dog has acute hearing and can respond to sound even before the human has heard the sound. Dogs sense the movement of animals e.g. kangaroos, foxes and rabbits that come close to the homestead, whilst the farmer is quite often unaware of their presence. Furthermore a visitor approaching a farm by car yet out of sight from the farmer and the dog, the dog will invariably respond to the sound of the approaching car before the farmer.

Of all the complaints that are made around the world by humans related to The Wind Turbine Syndrome - the most common complaint is "a disturbed sleep pattern". On page 64 of the "Dean Report", Dr Robert Thorne describes his own research - as residents living within 2000metres of large wind turbines are effected. He goes on to say his observations within the Manawatu and Makara (New Zealand wind farms) that wind farm sound can be heard and recorded within residences situated within 3500metres of large turbines set in a wind farm. The risk of adverse effect due to sleep disturbance and annoyance is quantifiable and the effect is significantly more than minor. Ref. pages 64 & 65 "Dean Report".

On page 113: Table W1. Waubra wind farm affects, perception and complaint analysis - shows that at least 12 families were affected by sleep disturbance together with numerous health complaints and their residences were varying in distance from 550 - 4600 metres from the turbines.

Clearly there is a distinct possibility that all farm animals within at least a distance of 4600metres of wind turbines could have their sleep pattern disturbed. That may then lead to more serious animal health issues.

Farmers know that to achieve maximum weight gain, maximum milk supply and maximum laying hen performance, the farm animal needs to live in an environment where there are no outside factors (causing stress) which inhibit the general health of the animal. Therefore cattle and sheep grazing, beef and sheep feedlots, chicken farms (meat and eggs), piggeries and dairies adjoining wind farms are equally vulnerable to the effects of wind turbines.

This is an animal welfare issue which the RSPCA should investigate.