Comments on "WIND FARMS TECHNICAL PAPER - Environmental Noise", prepared for the Clean Energy Council by Sonus Pty Ltd., November, 2010.

Sonus page number	Sonus passage or words	My Comments
4	The standards and guidelines used for the assessment of environmental noise from wind farms in Australia and New Zealand are amongst the most stringent and contemporary in the World.	This is correct
4	The rate of complaints relating to environmental noise emissions from residents living in the vicinity of operating wind farms is very low;	This does not seem to reflect what is happening at Hallett and Waterloo - also "very low" needs to be quantified - what percentage of people can we allow to be adversely affected.
5	extensive research and evidence that indicates that the noise from wind farms developed and operated in accordance with the current Standards and Guidelines will not have **any direct adverse health effects**	Clearly use of the word "any" indicates considerable bias given all the personal reports that there are about.
7	On modern designs, mechanical noise has been significantly reduced (Moorhouse et al., 2007), such that aerodynamic noise from the blades is generally the dominant noise emission from a wind turbine.	Don't agree - mechanical noise can be radiated by the blades themselves as they are directly connected to the gearbox and can be excited into vibration by the gearbox. The tower can also be a significant noise radiator if the drive train is not well isolated from it.
8	It was previously thought that “swish” occurred as the blade passed the tower, travelling through disturbed airflow, however, a recent detailed study indicates it is related to the difference in wind speed over the swept area of a blade	Not quite right - its because airfoils radiate sound in a particular direction relative to the relative air flow over them. When the blades are going up the noise is directed upwards and is not heard on the ground unless there is a downwind condition and the observer is a considerable distance away. When the blades are going down the noise is directed more towards the ground which is why acoustic cameras (which are located only 100 to 300 m away show this as the dominant source

8	Other explanations for the rise in noise level that occurs on the downward stroke relate to the slight tilt of the rotor-plane on most modern wind turbines to ensure that the blades do not hit the tower. An effect of the tilt is that when the blades are moving downwards they are moving against the wind. Conversely, when moving upwards they are moving in the same direction as the wind. Therefore, with the effective wind speed being higher on the downward stroke, it is suggested that a higher noise level is produced	This is not true - if it were true the turbine noise would increase markedly as the wind speed increased and as noted later in the report it doesn't increase at all once a certain speed is reached.
9	Noise reduces over distance due to a range of factors including atmospheric absorption. The mid and high frequencies are subject to a greater rate of atmospheric absorption compared to the low frequencies and therefore over large distances, whilst the absolute level of noise in all frequencies reduces, the relative level of low frequency noise compared to the mid and high frequency content increases.	This is correct but it ends up making the noise much more annoying (such as the doof doof sound from a band in a club that you hear from some distance away).
9	typical separation distance between wind farms and dwellings is of the order of 1000m.	I would hope that this isn't "typical"
10	Hubbard and Shepherd 2009)	wrong date on reference
10	however, sound below 20 Hz remains audible provided that the sound level is sufficiently high	Don't think it's the same mechanism as that which is responsible for us hearing sound above 20 Hz
10	A common audibility threshold from the range of studies is an infrasound noise level of 85 dB(G) or greater. This is used by the Queensland Department of Environment and Resource Management‟s (DERM‟s) draft Guideline for the assessment of low frequency noise as the acceptable level of infrasound in the environment from a noise source to protect against the potential onset of annoyance and	Not sure how "common" this 85 dB(G) level is and under what conditions it was measured and what % of people it is supposed to protect
12	**Table 1 – Summary of Australian State Standards**	This is a good summary.

14	Where the wind farm is able to achieve the base line noise limit at higher wind speeds, the masking effect of the background noise environment does not need to be taken into account. This is because the base line noise limit is generally established to ensure there are no adverse noise impacts, even in a low background noise environment	The highlighted words show considerable bias - clearly "no adverse effects" is an exaggeration and the baseline certainly does not ensure this
15	**Table 2 - Objective Standards**	Good summary
19	It is significantly more stringent than the World Health Organisation"s recommended guideline value of 45 dB(A) for sleep disturbance effects and than the recommended noise levels for road or rail infrastructure development that	Train noise does not occur for hours at a time - its mostly just an occasional train, especially at night. Also, the WHO requirement assumes that the noise has a uniform spectral shape or the average spectrum of an average industry - not a spectrum dominated by low frequency noise such as that from wind turbines at distances experienced by most residences. It also assumes a 15 dB(A) reduction through the walls of a house - again this will not be the case for low frequency noise which goes through house walls with little attenuation - it also does not reflect the case that in rural Australia many people sleep with their windows open and these may be near their head.
19	A wind farm is also inherently located in areas where wind is present and therefore background noise levels from wind in the trees and around structures such as houses and sheds can be elevated.	"Can" is the operative word here - there are many instances when the background noise does not mask the turbine noise - for long periods of time in some cases
20	There is a significant amount of mis-information and negative publicity about the impacts of wind farms available in the broader community	This is a direct quote from the Colby report and not based on fact.
20	the rates of complaints are very low in Australia	Really!!!
20	if a noise source can be heard, then annoyance can result for some people, regardless of the noise level or the standard or guideline that applies.	Are we talking about simple annoyance or serious health implications??

21	**Figure 3 – Subjective Comparison of Noise Levels** ALMOST SILENT	The "almost silent" tag for the wind farm baseline limit shows considerable bias as even if the wind turbines complied with this, they could hardly be labelled "almost silent" in cases where background noise levels are 10 to 30 dB less than this.
24	This is because the base noise level limit is generally established to ensure there are no adverse impacts even in a low background noise environment where the masking effect is limited or negligible.	rather a biassed statement given all the problems that have been reported
28	Therefore, there will be times when the environment provides more masking than indicated by the line of best fit, and other times when the environment provides less masking.	This does not sufficiently emphasise the reality of the huge differences between background noise and wind turbine noise for very extended periods of time.
30	A requirement to conduct a “compliance checking” procedure is included in the Standards and Guidelines used in Australia.	It should be stated here the problems associated with doing this and why it can only really be done by attending the site during downwind conditions and turning the turbines on and off every 10 minutes - clearly not practical in terms of someone's time involvement.
31	the Joule study found that the calculated sound pressure levels are validated to agree to within 2dB(A) of noise levels measured under practical "worst case" conditions at distances of up to 1000m from a noise source, and that due to the *observed scatter of measured sound pressure levels under these same conditions*, ….. *an 85% level of confidence can be placed on the noise levels measured in practice not exceeding the calculated level by more than 1dB(A).*	Not sure how comprehensive this study was.
35	A common request from the surrounding community is to provide a set separation distance between the wind farm and the nearest dwelling. Where an objective assessment method is used as outlined above, there is no set distance that could be applied with equity to every wind farm.	This is a valid point but perhaps there could be a table that had minimum distances at least for 1, 2, 3 etc turbines

35	The separation distances are related to the stringency of the assessment criteria within the relevant Standards and Guidelines.	This is true according to existing guidelines - what about changing the guidelines to reflect the reality of the noise impact?
36	An additional 5 dB(A) penalty for excessive amplitude modulation is not necessary when using the SA 2003 Guidelines. However, the application of acoustic treatment to the facades of dwellings in the vicinity might be a precautionary approach for the established presence of such excessive modulation;	Facade treatment is not likely to work as it may attenuate the modulation noise less than other noise so making it worse - we should be able to find this out using the inside/outside microphones
38	In general terms, compliance checking can effectively be a repeat of the background noise monitoring regime. The variations that are applied to the compliance checking procedure might include collecting a minimum number of noise level data points under downwind conditions. A comparison is then made of the noise environment before the wind farm and after the establishment and operation of the wind farm. As wind farm assessments account for the masking effect of the ambient environment, there will be inherent difficulties in identifying the wind farm noise amongst other noise, in particular and most commonly, the background noise generated by wind in the trees. Therefore, compliance checking procedures generally provide a level of flexibility in the methodology, which might include turning the turbines on and off to determine their influence amongst other noise in the environment, or measuring at a location much closer to the wind farm, where the noise from the wind farm is more dominant in comparison to other noise in the environment.	Difficulties in compliance checking have been pointed out here but the reality that no-one actually successfully checks compliance by managing to isolate the turbine noise itself was not made clear.
39	the research overwhelmingly concludes that wind farm noise does not adversely impact on a person‟s health.	Not just a bit "head in the sand"?

39	In 2009 the American and Canadian Wind Energy Associations established a scientific advisory panel comprising medical doctors, audiologists and acoustic professionals from the United States, Canada, Denmark and the United Kingdom to produce “an authoritative reference document for legislators, regulators	This is the infamous Colby report paid for by the wind industry and a very biassed document in my opinion - dismissing any work that disagreed with the wind industry interests.
40	*There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines*	This quote form an NHMRC sponsored study is a bit of a worry - how on earth did they arrive at that?
41	There is a large amount of publicly available material that deals with alleged adverse health effects of wind turbines regardless of the overwhelming research to the contrary	More biassed and unsubstantiated statements.
41	The NHMRC review provides consistent conclusions to the panel with respect to health: *It has been suggested that if people are worried about their health they may become anxious, causing stress related illnesses. These are genuine health effects arising from their worry, which arises from the wind turbine, even though the turbine may not objectively be a risk to health (Chapman, 2009)*	Sounds plausible to me for some people but its still caused by the wind farm.
43	The hypotheses regarding a link between infrasound from wind farms and the presence of adverse health effects including dizziness, headaches and nausea made by Pierpont (Pierpont, 2009) are not based on measured levels of infrasound from operational wind farms.	Probably true so infrasound from wind farms needs to be measured but studies are also needed of the effect of infrasound on people.
43	The levels of infrasound are **significantly below recognised perception thresholds** and are therefore not detectable to humans (Hayes McKenzie Partnership Ltd, 2006); and The levels of infrasound are of the same order as those measured in residential areas due to general urban activity	Does not seem to be supported by experiences of people but we really do need good infrasound data for modern operating wind farms. This needs to be checked properly

43	Infrasound is a specific component of low frequency noise that requires a specific measurement methodology to identify it as it is readily affected by wind on the microphone. **Wind is a source of natural infrasound**.	Highlighted text not quite right as the pressure fluctuations on a microphone at infrasound frequencies due to wind are turbulent air pressure fluctuations that travel with the speed of the wind, whereas infrasound travels at the speed of sound. Nevertheless the turbulent pressure fluctuations that are due to wind blowing over the microphone need to be removed from the measured data - very difficult to do without two microphones sampling simultaneously or alternatively, measurements can be done in little or no wind at the microphone location or the microphone could be placed in a small enclosure with a mylar top, such that the top of the enclosure is flush with the ground..
45	The swish is at its greatest under the above conditions as the change in wind speed at increased heights above the ground is also at its greatest, and this results in an increased difference in wind speed	I don't agree with this explanation for swish or amplitude modulation - see page 8 comments
45	The increase in swish under these specific conditions is termed the Van Den Berg Effect, and it is **suggested** higher levels of swish **might result** in higher levels of annoyance and potentially sleep disturbance.	highlighted words seem to be trying to minimise the importance of this problem
46	it has been determined by the relevant experts that the required meteorological conditions to trigger the effect were not a feature of the environment.	this conclusion may be different if what I believe is the correct explanation for swish was used as the basis
46	noise standards applied to wind farms are significantly more stringent than limits established for the potential onset of sleep disturbance	I don't agree - the assumptions in arriving at this are not valid for wind farm noise (ie uniform spectrum and 15 dB(A) reduction in noise from outside to inside).
46	*The extent of reliable published material does not, at this stage, warrant inclusion of SACs other than tonality into the noise impact assessment planning stage.*	Maybe true about the extent of published material but modulation is an issue and needs to be taken into account
46	*the causes of most SACs in wind turbine noise emission not yet being clearly understood.*	Not really a valid reason for exclusion from regulations

47	The conditions to consistently generate high levels of audible swish have not been established to be a typical feature of Australian wind farms;	Have they been established NOT to be a feature or a problem?
48	(WHO) establish a recommendation of 30 dB(A) inside a bedroom to prevent the potential onset of sleep disturbance effects (WHO, 1995). The WHO guidelines indicate a noise level of 30 dB(A) inside a typical bedroom correlates to an external noise level with the windows open of the order of 45 dB(A).	I don't agree with applying this to wind farm noise - the assumptions in arriving at this are not valid for wind farm noise (ie uniform spectrum and 15 dB(A) reduction in noise from outside to inside).
48	The UK Department of Trade and Industry (ETSU, 1997) recognise the above effect and recommend increasing the allowable noise level for wind farms during the night period, based on sleep disturbance effects. The baseline limit for wind farms during the night time in the UK is therefore 45 dB(A).	seems like they are only happy if the noise actually wakes most people up - just a few is not enough.
overall		The report is a thorough treatment of the topic of wind farm noise but seems to be a bit biassed against people who have been adversely affected - some of them severely so.