

WATERLOO CASE SERIES PRELIMINARY REPORT

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Background:

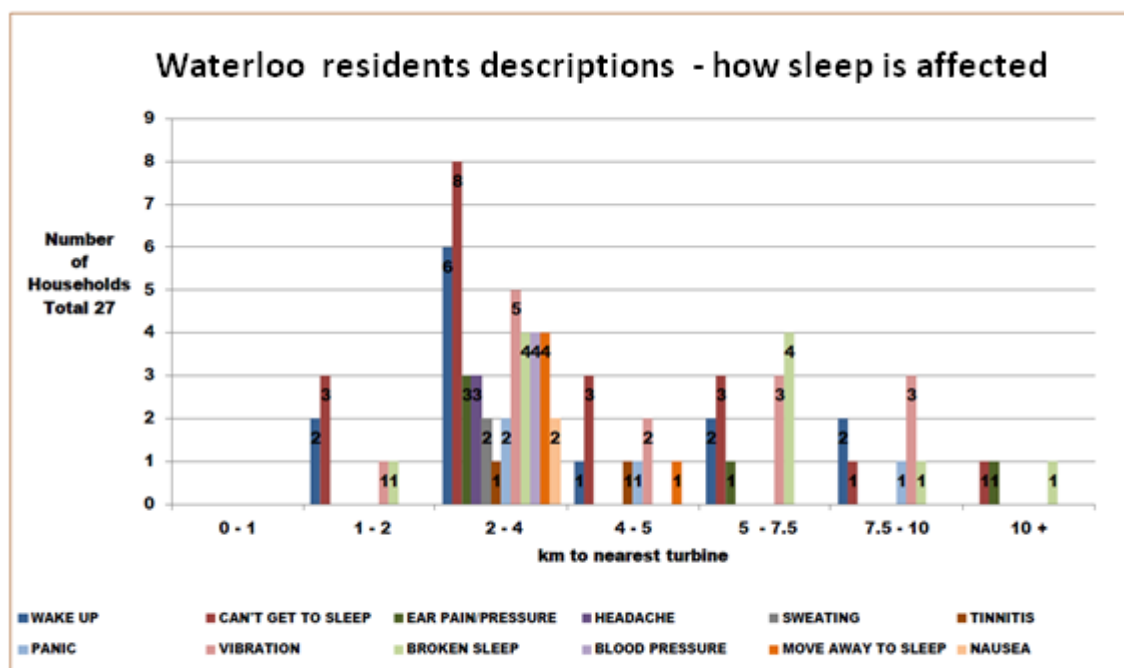
The Waterloo wind development commenced operating in October 2010 and comprises 37 VESTAS V90 wind turbines in a 17 km line along a North South ridge line.

The Waterloo area is a mixed farming community in the Mid North of South Australia where a significant proportion of the population are long term farming families involved with Primary Production and related support industries. Retirees, pensioners, working families, tree changers, lifestyle block owners and weekenders also make up the local community. There are approximately 75 houses within 5 km of the turbines and approximately 230 houses within 10 km.

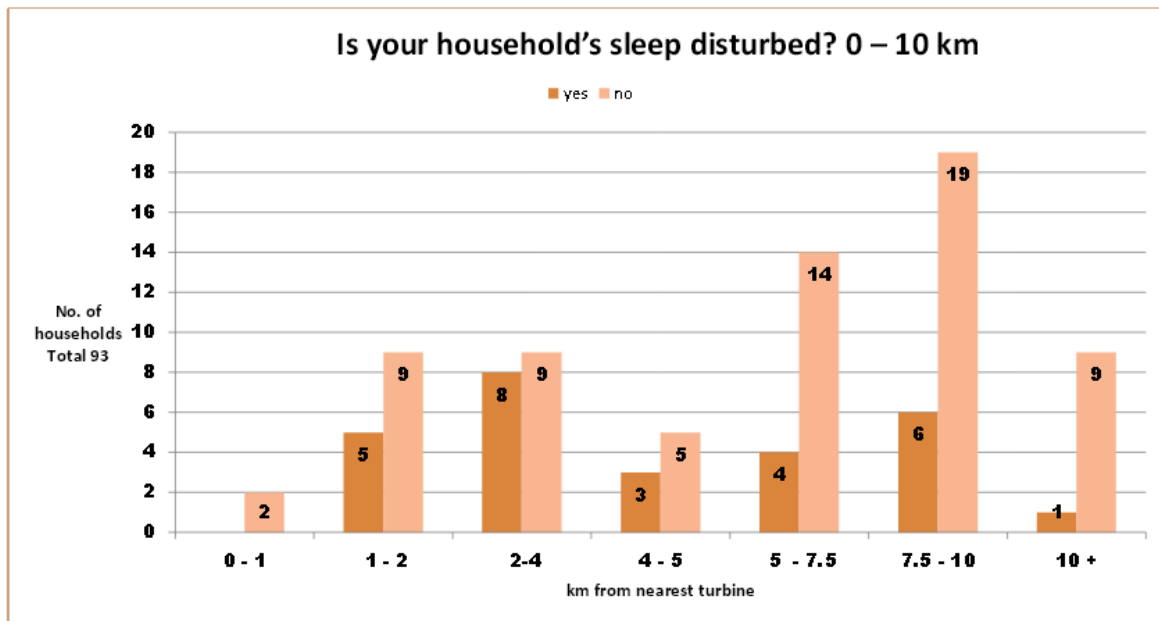
The Waterloo wind development has been the subject of a large number of complaints from residents up to 10 km from the turbines. The majority of complaints relate to NOISE, VIBRATION, SLEEP DEPRIVATION and HEALTH EFFECTS. 4 Homes have been abandoned and many residents have to regularly “get away” in order to get adequate sleep and recover.

The April 2012 Waterloo Survey graphs below show the distribution of sleep affected households relative to their distance to the nearest turbine. (93 respondents from 230 delivered surveys 40 % response rate)

<http://www.wind-watch.org/news/wp-content/uploads/2012/07/Waterloo-Wind-Farm-Survey-graphs.pdf>



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Total 93 Yes 27 (29%) No 66 (71%)

Case Series:

A case series of reports from residents living near the Waterloo wind development in South Australia is being prepared. These residents have noted a definite negative change in their quality of life, sleep, health, wellbeing or symptoms since the wind turbines began operating in comparison with periods when the wind turbines are not operating or when the residents are away from the area.

The following preliminary results about households and residents have been compiled from 2 written surveys and personal interviews of affected residents and from Noise Diaries completed by the residents for the South Australian EPA.

The data collection process is ongoing.

EPA study and diaries - In late January 2013, the SA EPA committed to investigating the complaints and announced it would be conducting 2 months of continuous noise monitoring of infrasound, Low Frequency Noise and audible noise in the area surrounding the Waterloo wind development.

More than 40 households indicated their willingness to participate in this study and from these the EPA selected 6 homes located around the wind farm to investigate the community concerns.

Information on the location and equipment sited at each of the monitoring sites is available at: http://www.epa.sa.gov.au/environmental_info/noise/wind_farms/waterloo_wind_farm_noise_study

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During the period 8 April 2013 to 9 June 2013 the SA EPA set up a range of noise monitors at 6 homes at various distances from the Waterloo turbines ranging from 1.3 km to 8 km away.

An additional component of the EPA study involved residents filling out weekly Noise Diaries which were created by the EPA.

In these diaries, residents recorded wind and weather conditions as well as documenting audible and inaudible noise, vibration, sleep patterns, health symptoms and any other observations which they felt related to the operation of the turbines.

Summaries of audible noise recorded in the diaries are displayed on the EPA website, but no summaries are provided of health effects, sleep effects, symptoms or sensations recorded by the participants.

http://www.epa.sa.gov.au/environmental_info/noise/wind_farms/waterloo_wind_farm_noise_study/summaries_of_noise_diaries

Monitoring was also conducted by acoustician Steven Cooper at 4 sites and at more than a dozen sites by the University of Adelaide, School of Mechanical Engineering led by Professors Colin Hansen and Con Doolan. Analysis of noise data by the EPA and sharing of noise diary information with the independent acousticians in order to correlate noise measurements with residents descriptions of effects noticed is still yet to happen.

Week long turbine shutdown period - Since the EPA Noise Monitoring in July 2013, there was a “cabling fault” and all 37 of the Waterloo wind turbines stopped operating for a full week. (Early evening from Friday 19th July until around midnight on Friday July 26th).

This was by far the longest period of time with no turbines operating since October 2010.

As the following reports from the residents make clear, many of the problems are impacting during the night, out to distances well beyond 2km.

The problems cease when the turbines stop operating and resume when the turbines begin again.

Visual Cues vs Other senses - Many residents living more than 5 km to the East of the Waterloo turbines cannot see whether the wind turbines are operating as the higher Tohill Range lies between their home and the wind development.

These Eastern residents are however, regularly aware that the turbines are operating because of what they can hear and feel in terms of noise, pulsing, vibration, sleep disturbance effects, head, ear, eye or chest symptoms or sensations.

The attached (ongoing and incomplete) tables list some of the effects noticed by Waterloo and districts households who attribute negative impacts on their sleep, health and quality of life to the operation of the local turbines. Distance to nearest turbine is also indicated.

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Person 1A Residence 1	1.3 km from turbines	2/2 occupants affected	Can see if turbines are turning
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
No major health problems	Sleep disturbed by noise, vibration, pulsing	normal	Back to wind turbine problems
Operate trucks and farm machinery long hours no problem	Sleep deprivation exhaustion		
Good sleeper	Headaches Thick head		
	Ear pressure		
	Ringing in ears – wake up with it		
	Wake up tired		
	Sometimes Continuous headaches		
	Wake up with vertigo		
	Can't work in workshop some days vibration /noise fills shed and can't stay/work in there.		
	Too tired to drive trucks and machinery safely		
	Have to go away for a few days to get a break and recharge		
Person 1B Residence 1	1.3 km from turbines	2/2 occupants affected	Can see if turbines are turning
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Normal	Poor sleep – broken sleep	normal	Back to turbine problems
Work long hours no problem	Dizziness vertigo		
	Balance problems, exhausted		
	headaches		
	Have to stay away for a few days at a time to catch up on sleep		

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Person 2A Residence 2	2.6 km from turbines	3/5 occupants affected	Can see if turbines are turning
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Normal Good sleeper - 8 – 10 hours/night - Rarely woke up in the night	Wake up 6 times per night, exhausted from broken sleep	Sleep well while away Don't wake up and have to get up in the night	
	Feel humming, rumbling in body and house		
	Feel the noise		
	Go away regularly for a break		
	Farming property for sale – can't stand it		
Person 2B Residence 2	2.6 km from turbines	3/5 occupants affected	Can see if turbines are turning
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Normal Some migraines	Many more headaches Worse headaches	normal	Back to turbine problems
	Sleep disturbed		
	Go away regularly for a break		
	Farming property is now for sale – can't stand it – no one wants to buy it		
Person 2C Residence 2	2.6 km from turbines	3/5 occupants affected	Can see if turbines are turning
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Normal (child)	headaches	normal	Turbine effects
Person 3a Residence 3	2.6 km from turbines	1 occupant affected	Can see if turbines are turning
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
normal	Annoyed by noise during the day and at night	Felt happy – no noise	Turbine noise

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Person 4a Residence 4	2.6 km from turbines	3/5 occupants affected	Can see the turbines
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
normal	Sleep disturbed – percussion coming through windows	Peaceful, quiet	Back to turbine effects, noise vibration, sleep disturbed
Good health	Bothered by vibration at night	Better sleep	
	Sound bouncing vibrating in house at night	No noise other than nature	
Person 4b Residence 4	2.6 km from turbines	3/5 occupants affected	Can see the turbines
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Normal	Sleep disturbed by noise and vibration	Slept well	Turbine effects
		quiet	
Person 4c Residence 4	2.6 km from turbines	3/5 occupants affected	Can see the turbines
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Normal	Disturbed by vibration and noise at night	Normal	Disturbed by turbine effects
Person 5a Residence 5	2.6 km from turbines	2/3 occupants affected	Can see the turbines
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Fit, good health, normal life	Tinnitus developed after 18 months-	Still had tinnitus – Quiet. peaceful	Back to turbine effects
	sleep disturbed by noise, can't get to sleep, wake up a lot	No annoying noise keeping awake or waking up	
Person 5b Residence 5	2.6 km from turbines	2/3 occupants affected	Can see the turbines
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
normal	disturbed by partner being awake, change bedrooms to get away from noise	Felt normal quiet	Effects returned
	felt pressure feelings in body		

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Person 6a Residence 6	2.4 km from turbines	2/2 occupants affected	Can see the turbines
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Good health Normal life Slept well Positive person	Sleep deprivation, 5 -7 night per week Feel depressed Can't have a deep sleep, weird dreams, very disturbed on waking, feel tired on waking	Felt really happy Able to do work without exhaustion. When I go away all symptoms stop.	Almost instantly effects returned – dark couldn't see them turning but could feel it
	Pounding heart, can hear blood pounding in head, pressure in head	Had much better sleep	Felt depressed
	Ear pressure, pain and popping, blocked ears, headaches swollen throat, high pulse rate, but normal blood pressure	Felt good, felt like doing things	Ears popping, ear pressure, headache Swollen glands Return to usual effects
Person 6b Residence 6	2.4 km from turbines	2/2 occupants affected	Can see the turbines
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Good health	Sleep disturbed by partner being awake	Slept well	Back to broken nights sleep with exhausted partner
Happy in life	Developed high blood pressure –		
Person 7a Residence 7	2.4 km from turbines	3/3 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
No problems	Sleep disturbed - woken up often by noise and by toddler	Good sleep	Back to constant noise and thumping
Person 7b Residence 7	2.4 km from turbines	3/3 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
No problems	Woken up often by turbines and by disturbed toddler	No problem	Back to sleepless nights

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	Headaches		
Person 7c Residence 7	2.4 km from turbines	3/3 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Not born yet	Toddler – Terrible sleeper but fine further away from turbines at other houses		
Person 8A Residence 8	2.5 km from turbines	4/4 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
normal	Poor sleep when turbines are turning	Had very good night's sleep Not grumpy	Back to normal turbine noise and bad sleep when turning
		Felt brighter and easier to get through the day	
Person 8B Residence 8	2.5 km from turbines	4/4 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
normal	Poor sleep when turbines are turning	Better sleep Not grumpy	Back to normal
Person 8C Residence 8	2.5 km from turbines	4/4 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
normal	Poor sleep when turbines are turning	Better sleep Not grumpy	Back to normal
Person 8D Residence 8	2.5 km from turbines	4/4 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
normal	Poor sleep when turbines are turning	Better sleep Not grumpy	Back to normal
Person 9A Residence 9	3.2 km from turbines	2/2 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Fine apart from bad	Terrible sleep,	Slept great, had	Effects came back

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back. Always Slept well	Pressure headache, Wake up several times in the night, lie in bed and feel the bed pulsing when turbines are turning. Sound bounces around the walls, can feel it in your head, Headaches, pressure in ears, ear ache, pressure in head, pressure in eyes, wake up feeling ill and tired,	energy, felt like doing things, slept in late. Could think clearly No headache No earache Got heaps of work done	when in Waterloo and turbines are turning again Headaches, ear ache ear pressure etc
	wake up with nausea, wake up with chest pain, unable to concentrate, dizziness, balance problems swollen glands in neck	Go away often to get away and feel normal again. Drive away – feel good, come back feel terrible.	
	Heart palpitations Get woken up early Balance problems No energy to do anything. Forget things Reduced vocabulary	Sleep fine in other places further away. Don't wake up and have to get up in the night	
Person 9A Residence 9	3.2 km from turbines	2/2 occupants affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Good except for bad back . Could do jobs around the place, renovating house. Slept well	Can't sleep at night Lie awake for hours feeling on edge; alert can't relax even though very tired Get in car and drive far enough away so can sleep – sometimes sleep in car 15 km away. Have to go away camping several days at a time every month to recover. Can't afford to go for longer or move anywhere else.	Was away for a month when turbines were off. Felt relaxed, had energy, less depressed, slept 10 hours at night,	On returning to Waterloo, effects return when turbines are turning.
	Pulsing feeling in house when turbines are turning. Feel nauseous,		

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	Depressed, no energy can't concentrate, feel angry all the time, Vocabulary - can't think of the right word Takes hours to do a simple task that should be done in half an hour.		
Person 10A Residence 10	3.3 km from turbines	Formerly 2 occupants Now abandoned	
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Normal active retired life renovating house No particular problems	Can't sleep , get woken up in the middle of the night in cold sweat feeling scared, Headaches, ringing in the ears. Nausea, chest pains, heart racing	Not there at this time Cannot return Had to move away Feel fine when not near operating turbines	No longer there as effects are too distressing
	High blood pressure, unsteadiness, tinnitus, trouble speaking or concentrating,		
Person 10b Residence 10	3.3 km from turbines	Formerly 2 occupants Now abandoned	<i>Post 26/7/13</i>
fine	Felt unwell, headaches, ear problems,	Have moved away- can't tolerate it	No longer there - feel too terrible when there and turbines are turning
Person 11A Residence 11	3.3 km from turbines	Formerly 1 occupant Now abandoned	<i>Post 26/7/13</i>
Slightly elevated blood pressure . Active retiree renovating house. Good quality of life	Headaches, ear pain, eye pressure, swollen glands in neck. Chest pain, increase in blood pressure, and BP medication, heart stents inserted. Increased sensitivity to noise and vibration	No longer able to live in the home or return to Waterloo, Cannot tolerate symptoms	Not there any more
Person 12A	3.3 km from turbines	Formerly 4 occupants	<i>Post 26/7/13</i>

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Residence 12		Now only occasionally occupied if turbine conditions permit	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Can sleep	Feel pulsations	Ears normal	Effects are back
Sleep through the night	Sleep deprivation	Feel normal Can sleep well away	
Fairly normal life	Ears popping	Neck feels normal	
	Feel pulsations in body	No noise	
	So tired all the time	No buzzing	
	Feel pressure in house	No pulsing	
	Inner ears vibrating	Less headaches	
	headaches	No vibration through pillow keeping me awake	
	Feel dizzy		
	Feel vibrations in body		
	Tight muscles - tense	Not tense	
	Grumpy	Not grumpy	
	Many Bad dreams, Weird dreams		
	Hear/feel vibrations through pillow		
	Ears buzzing		
	Exhausted all the time		
	Falling asleep at work		
	Pressure in head	No pressure feeling	
	Tightness in head		
	Light headed		
	Wake up in night		
	Wake up in shock – fly up awake, heart pounding,		
	Take a long time to get to sleep,		
	Neck feels swollen		
	Feeling I have to get away		
	Dry mouth		
	Body tingling		
	Chest pain		
	Wide awake a lot		
Person 12B Residence 12	3.3 km from turbines	Formerly 4 occupants Now only occasionally occupied if turbine conditions permit	Post 26/7/13

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<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
toddler	Wakes in the night Sound/vibration coming through pillow/bed. Gets into parents bed and wakes them if not already awake. Bed too crowded - Parent goes into child's bed – feels /hears turbine effects through child's pillow. Couldn't hear it with head off pillow.	Sleeps fine when sleeping at other house further away and when travelling away and when turbines aren't turning	
Person 12B Residence 12	3.3 km from turbines	Formerly 4 occupants 3 affected Now only occasionally occupied if turbine conditions permit	<i>Post 26/7/13</i>
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Normal life	Sleep disturbed when husband and child affected by turbine effects. Family uprooted by many changes to living arrangements	Fine when away, turbines off or wind in different direction	Disturbance returns when turbines are operating

Person 13A Residence 13	3.5 km from turbines	1/5 occupants affected	
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Normal life	Sleep disturbance, sleep deprived, go to sleep, but wake up often during the night	Slept well Felt refreshed More energy Felt like doing things Much less tired	Back to tiredness broken sleep
	Exhausted, tired all day No energy	Got more work done	
Person 14A Residence 14	4 km from turbines	5/5 occupants affected	
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>

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Normal busy family and farm life	Headaches Ears popping, ringing in ears	Quieter, No booming, thumping, humming Still on edge – lots of wind noise – expect turbines to start turning as windy conditions No floor vibration No wind turbine noise	Continued broken sleep and other turbine effects
Slept fine	Broken sleep, tired		
Young fit adult	Wake suddenly – in fright, strange wake up – can't get back to sleep		
	Whole family disturbed at times by bad sleep.		
Person 14B Residence 14	4 km from turbines	5/5 occupants affected	
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Busy farm family life	Chest tension and chest pains – no audible noise – feeling comes from turbine pressure		Effects return
Young , fit adult	Feel floor vibration	No floor vibration	
Person 14C Residence 14	4 km from turbines	5/5 occupants affected	
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Young healthy child	Slee.p disturbance	Fine when away or turbines not turning	Back to normal turbine effects
	Wakes up in night Tired during the day after broken sleep		
Person 14D Residence 14	4 km from turbines	5/5 occupants affected	
<i>Pre Oct 2010</i>	<i>Oct 2010 – 19/7/13</i>	<i>19/7/13 – 26/7/13 Or while away</i>	<i>Post 26/7/13</i>
Young healthy child	Sleep disturbance	Fine when away or turbines not turning	Back to normal turbine effects
	Wakes up in night Tired during day after broken sleep		
Person 14E	4 km from turbines	5/5 occupants	

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Residence 14		affected	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Not born yet	Sleep disturbance	Fine when away or turbines not turning	Back to normal turbine effects
	Wakes up in night - on nights when others in family are woken by turbine effects unexplained distress		
Person 15A Residence 14	4.5 km from turbines	1/1 occupants affected - now rarely stays at farm to sleep	
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Peaceful, pleasant quiet place to live and work and function	Pulsating pressure on ears, ears ringing Can't concentrate at times forgetful	Area was Peaceful and quiet. Felt much more relaxed, no pressure on ears. Able to work and function better	
	Broken sleep, Woken up at night – resulting in tiredness next day. Sleep deprivation accumulates		
	Hard to get back to sleep, feeling anxious Bad dreams		
Person 16A Residence 16	8 km from turbines	2/2 occupants affected	Cannot see turbines – hills in the way – sense/ feel or hear when they are operating
Pre Oct 2010	Oct 2010 – 19/7/13	19/7/13 – 26/7/13 Or while away	Post 26/7/13
Active, retired Physical work renovating and gardening, sleep okay No tinnitus	Difficulty getting to sleep, woken during the night , but not from audible noise - sense/fee; turbine emissions. Poor sleep Pulsing in head,	Slept better. Quiet, relief at not being able to hear or feel turbines Still have tinnitus, but not as noticeable. No pulsing in head	Sensations and symptoms return

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	headaches Tingling vibration in hands, vibration in upper lip. Ear discomfort, ear pressure, ear pain, Tight head		
	Tinnitus developed after about 12 months of turbines started operating		