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10. Noise Audit Report

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INFORMATION REGARDING ENVIRONMENTAL AUDIT REPORTS

August 2007

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(Incorporated in Victoria as Cumming Infotech Research Pty Ltd - ABN 29 006 362 429)

Attention: Tiago Brandao
Project Coordinator
BayWa r.e.
Wimmera Plains Energy Facility
c/o- 79-81 Coppin Street
Richmond Victoria 3121

Date: June 15, 2020

Dear Mr. Brandao,

Audit of the preconstruction environmental noise assessment – Wimmera Plains Energy Facility (EPA CARMS no.78649-2)

Please refer to the attached audit report for the proposed wind farm. This audit is based on compliance requirements provided in the *Policy Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (pub. October 2018) and the Victorian Planning Scheme, along with the EPA Guidelines – Noise from Industry in Regional Victoria, to provide the compliance criteria. The Victorian guidelines and the planning policy refer to the New Zealand Standard - *Acoustics – Wind Farm Noise* (NZS 6808: 2010) for details of noise compliance assessment.

The scope of this audit relates only to the requirements for noise controls for the proposed Wind Farm and no other requirements provided in the Guidelines.

I have found the **Wimmera Plains Energy Facility Operational Noise Assessment** (Rp002 R01 20190083) provided by Marshall Day Acoustics, dated June 11, 2020, complies with the relevant noise requirements stated above, in particular the Standard NZS 6808:2010 Acoustics Wind Farm Noise. This report indicates a low risk to the amenity of the sensitive receptors in this area due to wind farm noise.

I confirm that I have no conflicts of interest and no involvement in the Wimmera Plains Energy Facility development. I am happy to further detail my findings at your request.

Yours sincerely

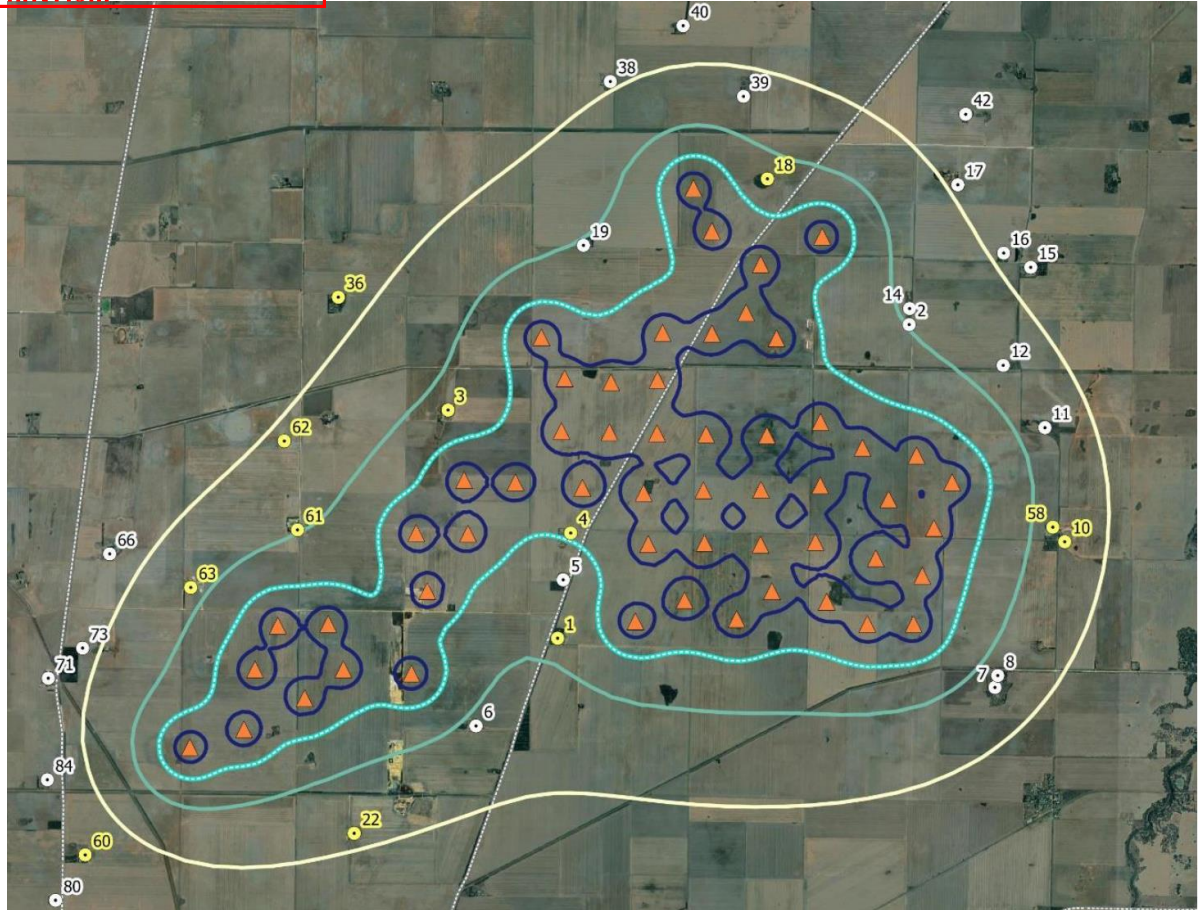


Dr. John Cumming
Director
Infotech Research
Auditor pursuant to the Environment Protection Act (1970)

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Pre-construction Noise Assessment Audit

CARMs no. 78649-2



Wimmera Plains Energy Facility

Henty Highway, Jung, Victoria 3401

Dr. John Cumming
Infotech Research

17 Clowes Street, South Yarra, Victoria 3141

Summary

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The proposed Wimmera Plains Energy Facility has 54 turbines located on the Henty Highway, about 12 km north of Horsham. Marshall Day Acoustics conducted a noise assessment of this facility and determined the predicted noise emissions would comply with the New Zealand standard: NZS 6806:2010 Acoustics – Wind Farm Noise.

This audit found that the pre-construction noise assessment report complies with the requirements of the New Zealand standard.

This confirms a low noise risk to the amenity of the identified noise sensitive locations (residents) for this facility:

- No noise sensitive locations are within one km of the wind turbines.
- No noise sensitive locations are within the maximum 40 dB contour predicted to surround the wind farm (other than involved parties).
- All noise sensitive locations received a predicted maximum L_{A90} (10 minute) sound level less than 40 dB (or 5 dB plus background, which ever is the greater).

The risk to the environment, as defined by the amenity of residents affected by noise in noise sensitive locations, is considered to be low. Nevertheless, this does not indicate that the wind turbines will not be audible at times.

The Wimmera Plains Energy Facility has had background noise monitoring undertaken at two independent noise sensitive locations prepared by Marshall Day Acoustic. This has set out the requirement for further compliance monitoring of the wind farm after it commences operations. This monitoring will be the subject of a post-construction noise assessment report that will be undertaken to confirm compliance with the Standard.

There are two nearby wind energy facilities, one in operation and the other has been approved. These are the Murra Warra Wind Farm to the north, consisting of 61 turbines in stage 1 with a further 55 turbines planned in stage 2, and the Jung Wind Farm, which is practically enveloped by the Wimmera Plains Energy Facility, consisting of two turbines. Neither is predicted to add to the noise load of the noise sensitive receptors.

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Audit report summary

Item	Description
Auditor	John Cumming
Auditor account number	75697
Auditor appointment end date	31/07/2022
Audit type	53v (Wind farm pre-construction – noise)
Date EPA notified of audit	30 th April 2020
Audit service order number	8006700 CARMs no. 78649-2
Name of person requesting audit	Tiago Brandao
Relationship to premise/location	Project Manager (Wimmera Plains Energy Facility)
Date of request	30 th April 2020
Completion date of audit	15 th June 2020
Reason for audit	Planning requirement for pre-construction noise assessments for wind farms (planning permit and Wind Farm Planning Guidelines)
Audit categorisation	53v risk of harm to beneficial uses (community values) relating to the air environment - noise
Environmental segments	Air (noise) of the noise sensitive locations surrounding the proposed Wimmera Plains Energy Facility, being residences with human habitation
If the audit was required by an EPA notice or other please provide EPA reference number	As a requirement of the Planning Permit application
Current land use zoning	FZ - Farming
EPA region	North West
Dominant – lot on plan	Volume 04303 Folio 540
Additional - lot on plan	(others)
Site/premise name	Wimmera Plains Energy Facility
Building/complex sub-unit No.	
Street/lot – Lower no.	1797
Street/lot – Upper no.	
Street name	Henty
Street type (road,court etc.)	Highway
Street Suffix (north, south etc.)	
Suburb	Jung
Postcode	3401
GIS coordinates of centroid	
Latitude	-36.6280650
Longitude	142.26213455
Site area (in square meters)	38,000,000 m ²
Members and categories of support team members used	Nil
Nature and extent of continuing risk	<ol style="list-style-type: none"> 1. The Marshall Day Acoustics noise predictions were conducted in accordance with the appropriate standards and guidelines. 2. Noise level predictions for noise sensitive locations comply with limits set in the <i>New Zealand standard NZS 6808:2010</i>. 3. It can be concluded that the proposed Wimmera Plains Energy Facility preconstruction noise assessment report complies with the noise requirements set out in the Standard. 4. The risk to amenity at the sensitive sites nearby to the wind farm from noise is predicted to be low for the uninvolved receptors R5 and R19. The risk is lower still for the other uninvolved receptors.
Outcome of audit	The following recommendations were made: <ol style="list-style-type: none"> 1. The assumptions used in the noise predictions provided by Marshall Day Acoustics can be tested with post construction noise monitoring at Receptors 5 and 19. There should, however, be a contingency

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- monitoring plan if either of these receptors withdraws from the post construction noise assessment.
- 2. A sound emission guarantee should be sought from the wind turbine supplier assuring that no special audible characteristics will apply to the turbines purchased.
- 3. Predicted noise levels in the case of significant movement of the turbines must be undertaken to re-examine compliance with the standard.

Historic land use	Farming
Current land use	Farming
Proposed future land use	Farming
Surrounding land use - north	Farming
Surrounding land use - south	Farming
Surrounding land use - east	Farming
Surrounding land use - west	Farming
Proposed land use zoning	FZ1 - Farming
Nearest surface water receptor - name	Dooen Main Channel
Nearest surface water receptor - direction	North-east
Likely point of groundwater discharge	N/A
Groundwater segment	N/A

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A wind energy facility has been proposed to be built at the Henty Highway, 12km north of Horsham, Victoria in the Shire of Horsham.

This audit is a regulatory requirement for the application for the permit of wind energy facilities, which requires a pre-construction assessment of noise by a qualified acoustics consultant. The audit is to verify that the pre-construction noise assessment complies with the standard: NZS6808:2010 – Acoustics Wind Farm Noise. Thereby providing an assurance that the proposed wind energy facility will not adversely affect the amenity of sensitive receptors, nearby residents, to an unacceptable level.

Audit objectives:

To assess compliance of the Wind Farm Pre-construction Noise Assessment Report with the requirements set out in:

1. Section 5.1.2 (a) Noise of the Policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria – October 2018 (VPPG)
2. New Zealand Standard: Acoustics – Wind Farm Noise NZS 69808:2010 (The Standard),
3. Victorian Planning Provisions (VPP) - Amendment VC149 (Sec. 52.32-4 application requirements – Mandatory Noise Assessment)

And from this compliance assessment to conclude on the risk of amenity impact to the residents near the wind energy facility, specifically any adverse impacts on the amenity from noise generated by the facility.

Scope:

Activity	Wind energy facility (WEF)
Element	Noise from turbine blades, the generators, gearboxes and hydraulics
Segment	Site environs surrounding the WEF as positioned near Jung, Victoria Centroid Latitude: -36.6280650 Longitude: 142.26213455 Area of site: 3800 Ha In particular, the noise sensitive locations as defined in the standard: <i>NZS 6808:2010 Acoustics- Wind Farm Noise.</i>
Elements	Air (noise)
Beneficial uses	Of relevance to noise: Human habitation and wellbeing
Risk assessment	Effect on amenity of receptor sites applicable to noise
Time period	To the commencement of the facility
Exclusions	The audit has not considered construction noise, nor noise generated from equipment on site other than that listed. Compliance with other than noise requirements of the VPPG and the planning permit were not considered

Table 1. Scope

Audit criteria:

The VPPG states:

- Section 5.1.2(b) Noise: that *the facility should comply with the noise limits recommended for dwellings and other noise sensitive locations set out in the New Zealand Standard – NZS 6808:2010 Acoustics- Wind Farm Noise (referred to in this audit report as the standard).*
- *Similarly, the local government Planning Scheme in Clause 52.32-5 refers to the New Zealand standard and the VPPG as criteria for planning approvals.*
- *the local government Planning Scheme in Clause 52.32-3*

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that written consent of the owner of a dwelling positioned within one kilometer of the nearest wind turbine is required for planning approval. Evidence of written consent is required.

NZS 6808:2010

Noise limits for noise sensitive locations¹

Section 4.4.2 – Acceptable limit (40 dB $L_{A90}(10min)$, or background + 5 dB if higher)

Section 4.4.3 – Special Audible Characteristics (tonal, impulsiveness, or amplitude modulation) receive a +6 dB penalty added to the noise level.

- Section 5.3 - High Amenity Areas (35 dB $L_{A90}(10min)$, or background + 5 dB if higher) to be applied for evening and night times.

These noise limits produced in the Standard apply to all times of the day and night, other than for high amenity areas.

The EPA released a guidance note for noise in regional areas, *Noise from Industry in Regional Victoria (NIRV)*. This provides recommended maximum noise levels for various receptors of industrial noise outside major urban areas. Using the variations to noise limits for utilities provided in the box on page 10 of the NIRV the limits follow:

- Day 45 dB(A)
- Evening 39 dB(A) and
- Night 34 dB(A).

The limits do not apply to the wind turbines but may apply to the transformers used in the site substation. This is not applied in this case as the transformer substation has not been positioned at this stage and the MDA noise predictions do not cover it.

Audit method:

The noise assessment was examined with reference to the compliance criteria. Explanations were sought from the author of the pre-construction Noise Assessment report. The proponents of the WEF were interviewed and provided further documentation to support the proposal.

Plans were checked against maps to confirm dwelling locations.

Task	Comment (ref. to documents / site visit)
1. Confirm noise outputs of the wind turbines	Refer to Vestas V162-5.6 MW turbine data provided to BayWa r.e.
2. Confirm the criteria relevant to the NZS 6808: 2010 standard and the EPA noise in regional Victoria guidelines	Refer to Standard NZS 6808:2010 and EPA NIRV Guidelines
3. Site inspection of the wind turbine and receptor locations and site specific issues relating to noise generation and reception	A site visit was conducted on May 22 nd . 2020 (See appended inspection report)
4. Check the models used and outputs provided in the Marshall Day report	Refer to: Operational Noise Assessment June 11, 2020 Marshall Day Acoustics
5. Review of the background noise assessment	Wimmera Plains Energy Facility Background Noise Report (Rp003 R01 20190083 June 11, 2020)
6. Risk evaluation and audit report preparation. Submission as a draft to BayWa r.e. and final report registered with the EPA for publication	Refer to: Wind energy facility noise auditor guidelines (EPA pub. 1692 October 2018) Preparation of Environmental audit reports on risk to the environment (EPA pub. 952.5 December 2015)

Table 2. Task list

¹ Noise sensitive locations are defined in the standard as being associated with habitable areas such as residences, education spaces or accommodation. They are referred to in this report also as receptors with given identification as R(number).

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Documents examined:

1. Policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria (the Guidelines) October 2018
2. Victorian Planning Policy Clause 52-32-3
3. NZS 6808:2010 Acoustics - Wind Farm Noise
4. WEF – Pre-construction Noise Assessment Report number 002 R01 20190083 (Operational Noise Assessment June 11, 2020 Marshall Day Acoustics)
5. Wimmera Plains Energy Facility Background Noise Report (Rp003 R01 20190083 June 11, 2020)
6. Preparation of Environmental audit reports on risk to the environment (EPA pub. 952.5 December 2015)
7. Wind energy facility noise auditor guidelines (EPA pub. 1692 October 2018)

Audit findings:

Cumulative effects

The possibility of competing noise from other wind farm projects was considered in the Marshall Day predictive assessment. The closest operating wind farm is Murra Warra, centered approximately 10 km north of the proposed Wimmera Plains site. The Murra Warra wind farm has completed stage 1 construction of 61 turbines, with another 54 turbines in stage 2 to the north east of stage 1. The predicted noise assessment for the Murra Warra wind farm has a 30 dB maximum noise contour that does not overlap with the predicted 30dB contour of the Wimmera Plains facility. No noise interference between these two wind farms is expected. In stage 2 of Murra Warra the extra turbines are further distant from the Wimmera Plains facility and no significant increase in noise is expected.

Another approved wind farm north of Horsham comprises two turbines at Jung adjacent to the Henty Highway. The Jung wind farm is planned to be located in the proximity of the Wimmera Plains Energy Facility. According to an author of the MDA report the predicted noise impact at the eastern receptors was 25 dB, which produces no measurable negative impact on the receptors.

No other wind farms in this vicinity were approved or under construction according to the Victorian wind energy database² last updated March 11, 2020.

² Victorian Planning site: <https://www.planning.vic.gov.au/permits-and-applications/specific-permit-topics/wind-energy-facilities/wind-energy-projects-planning>

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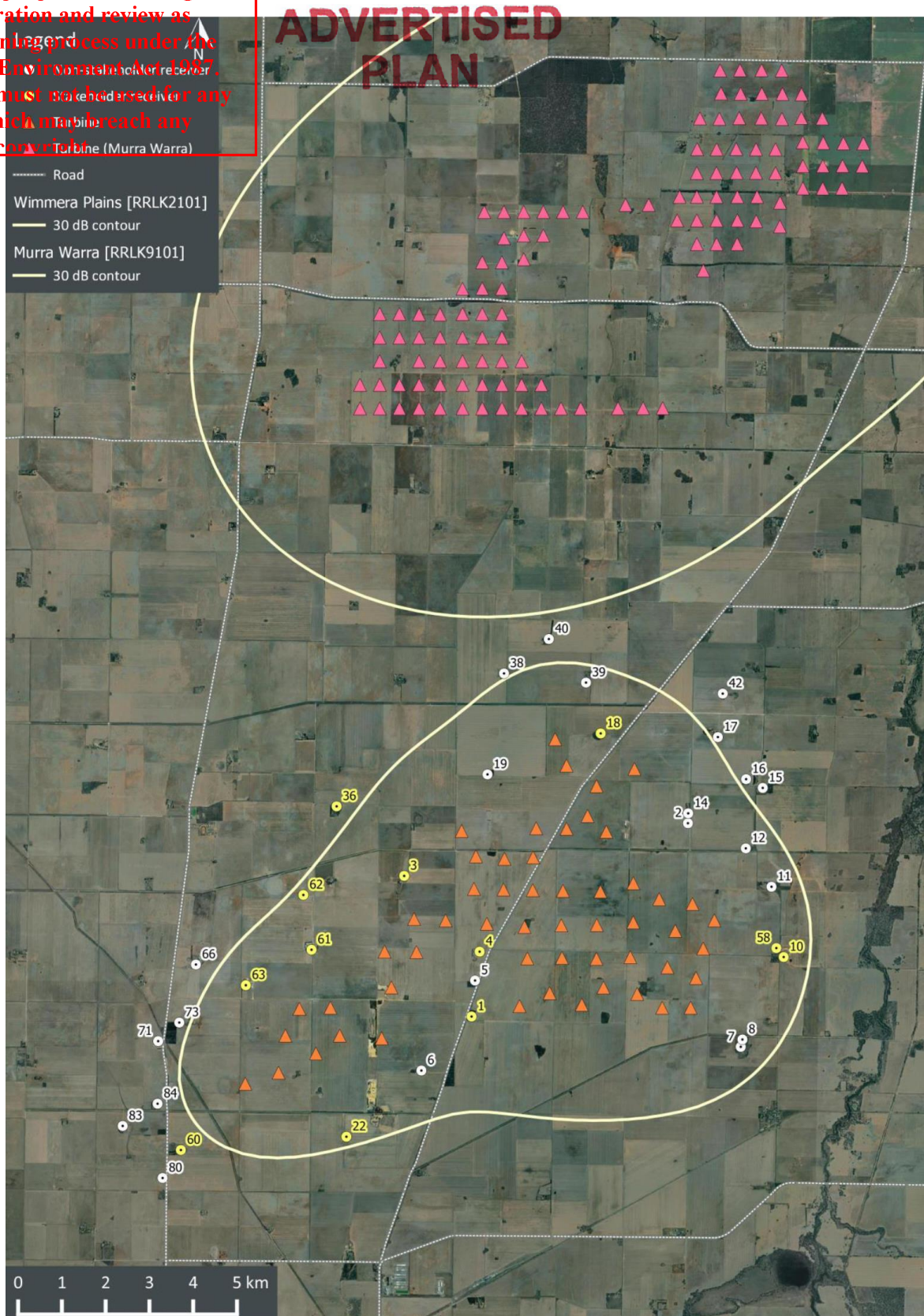


Figure 1. Cumulative assessment of noise interference examination (MDA report Appendix I2)

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Pre-construction noise assessment

Noise predictions were modelled by Marshall Day Acoustics, MDA, using the software package SOUNDPLAN version 8.1. This package models using the standard for environmental noise propagation ISO 9613-2 (*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation*). This is the most widely used international method for the prediction of wind farm noise. It has been reported that this method suits the application to Australian conditions with relatively flat topography.

Vestas V162-5.6MW turbines operated in Mode 0 were used in modelling, with sound power output data from Vestas, which provided a maximum sound output of 104 dB at hub height wind speeds from 9 m/s up. A further 1 dB was added to this for the modelling.

The key input parameters in this case used by MDA are typically used in Victorian wind farm studies:

Ground absorption factor G=0.5

Temperature = 10°C

Humidity = 70%.

These noise predictions are conservative and predict maximum noise levels for down-wind conditions for all turbines at the receptors for A-weighted audible frequencies. The prediction does not allow for shielding effects of the up-wind turbines leading to reduced wind speed for down wind turbines. Both of these modelling decisions lead to a higher noise prediction at noise sensitive locations.

The modelling output derived in the MDA predicted noise report is maximum wind farm noise levels as $L_{A90(10min)}$ for integer hub height wind speeds and the equivalent turbine sound output. This audit report has simply picked the maximum A-weighted noise level for each of the receptors in determining predicted compliance at the worst case.

Noise sensitive locations

Noise sensitive locations have been identified by BayWa r.e. using information from Landata and the council, cross referenced with aerial photography and visual inspections to confirm the presence of buildings used as residences, schools, healthcare facilities, aged and disability facilities as described in section 2.4 of the standard.

These were residences in each case and were confirmed during the auditor inspection on May 22nd 2020³. One additional residence was observed which was confirmed as being owned by an involved party and also as not being occupied.

The predicted noise report mapped 34 noise receptors, of which 12 were involved receptors, or stakeholders in the Wimmera Plains Energy facility. Only two of these (Receptors 5 and 19) were classified as noise sensitive locations being inside the 35 dB contour and not involved in the facility. There is one involved site R4 that is within the 35 and the 40dB contour.

Noise maxima for the five most affected receptors are given in Table 3.

Receptor Site	Highest predicted noise level (dB L_{A90})	Compliance margin (dB L_{A90})	Comment
4 (involved receptor)	40.6	4.4	As an involved receptor R4 is generally considered to have a limit of 45 dB
5	38.0	2.0	Receptor 5 is situated within the envelope of turbines to the centre south on the Henty Highway
19	35.3	4.7	Receptor 19 is situated to the west of centre of northern reaches of the turbine cluster

³ See Appendix 2 – Site inspection
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2	34.8	5.2	Receptor 2 is situated to the north east of the turbine cluster
14	34.4	5.6	Receptor 14 is close to Receptor 2 to the north east of the turbine cluster

Table 3. Predicted noise compliance at key receptor sites

This modelling predicts compliance for the nearest receptors, 5 and 19, while the next two nearest receptors are marginally outside the 35 dB contour, with maximum noise levels of 34.8 dB (Receptor 2) and 34.4 dB (Receptor 14). The Standard states that receptors outside the 35 dB contour are not required to be further considered (sec. 6.1.1).

High Amenity Areas

If a site is classified as a high amenity area under the New Zealand standard a 35 dB limit (or background + 5 dB) applies to evening and night-time noise. The land is zoned for farming (FZ1) to the north, east, south, and west and the noise sensitive locations are unlikely to meet the high amenity criteria. This will be confirmed in planning considerations and, if such an area is declared, the conditions as set out in the Standard section C5.3.1 will be considered.

The two noise sensitive locations involved within the 35 dB contour are Receptor 5 and Receptor 19, both are within the farming zone. Receptor 5 is on the Henty Highway and Receptor 19 is approximately 2 km from the Henty Highway on Shearwoods Road.

Compliance with the Standard will be at issue if either receptor is declared to be in a high amenity area.

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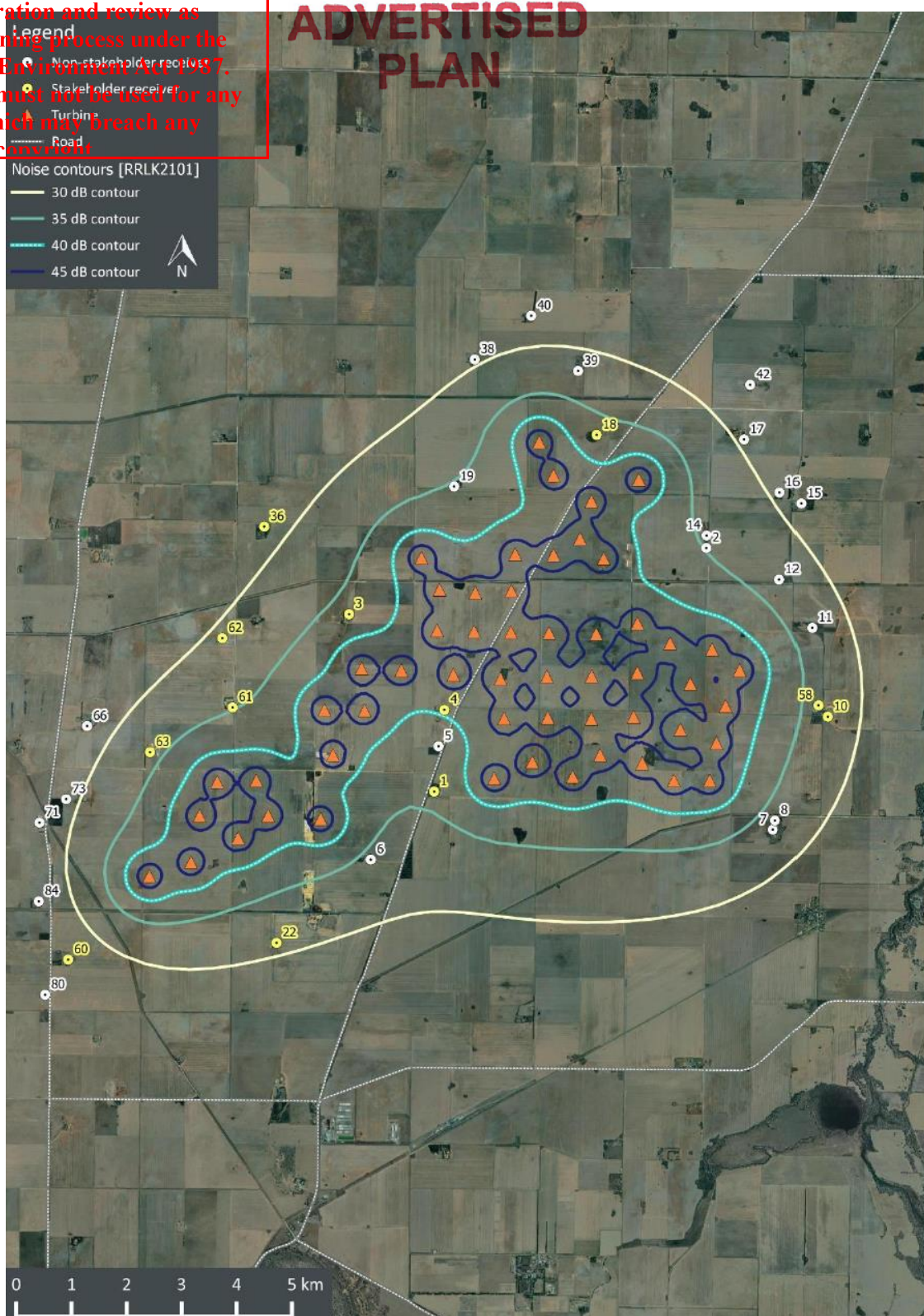


Figure 2. Predicted noise level contours from the Marshall Day report

Special Audible Characteristics (SACs)

The New Zealand standard requires a noise penalty for noise containing tonality likely to be audible. Amplitude modulation and impulsiveness also need to be considered, which are not assessed at this stage of development. However, this is still an issue that must be addressed by checking for SACs in noise monitoring post operation.

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Compliance predictions

The MDA report concludes that the wind farm will comply with the noise level requirements of the Standard. This assessment includes the potential cumulative effects of the Murra Warra and Jung wind farms.

Background noise assessment

Marshall Day issued a report – Wimmera Plains Energy Facility Background Noise Assessment (Rp 003 R01 20190083) June 11, 2020. Background noise was monitored at two receptors, no 5 and 19, both of which were within the 35dB contour. Beyond the 35 dB contour noise compliance is most likely.

The background noise assessment report details the positioning and calibration of class 1 microphones on the windfarm side of the houses with a clear view to the proposed turbines. These were set at a height of 1.5 metres above ground level.

The background noise data produced was based on a monitoring period of seven weeks, during which 6,450 useful all-time data points were recorded for Receptor 5 and 2,213 night-time data points. 6,281 useful all-time data points were recorded for Receptor 19 and 2,207 data points for night-time. This data is in excess of the 1,440 points required by the standard for both receptors. The recorded noise levels were correlated with the wind speed calculated for the hub height from nearby SoDAR equipment. This data had to be extrapolated to the hub height of 166m from the SoDAR system limit of 150m. This extrapolation and wind shear estimates may have been over-estimated under certain circumstances leading to a shift of the noise level versus wind speed plots to a higher wind speed leading to a more conservative noise limit calculation for a set hub height wind speed.

The plots show some points, particularly at night and for Receptor 19, of low background noise at higher wind speeds. It is likely in these cases that the hub height wind speed is being overstated rather than the presence of an anomaly between the wind speeds at hub height and ground level.

An analysis of different wind directions showed no significant variation in background noise levels with wind direction as expected from the flat terrain.

All time and night time noise measurements were segregated and regression analysis was used to determine the noise limits for all time and night time for Receptors 5 and 19. The limits were set according to the standard at $40 \text{ dB(A)}L_{90(10\text{min})}$ or $35_{90(10\text{min})}$ plus background, whichever is greater. These limits are then applied to the post construction noise assessment to check compliance with the standard.

The auditor concluded that the background noise assessment was conducted in accordance with the Standard and the noise limits generated are satisfactory for the sites monitored, Receptor 5 and Receptor 19.

Noise from substations

Two substations are proposed in the Wimmera Palins Wind Energy Facility to step up the voltage from the turbines to 220kV for the grid. No compliance of the proposed operations with the noise requirements in the EPA (Victoria) Guidelines – Noise from Industry in Regional Victoria (Publication 1411 – October 2011) was given in the Marshall Day Acoustics report.

The noise limits required by the NIRV Guidelines for farming zones to public conservation and resource at the receptors are:

Day < 45 dB(A) L_{90} Evening < 39 dB(A) L_{90} and Night 34 dB(A) L_{90}

These limits do not apply the wind energy facilities but apply to industrial noise.

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Assuming the total potential output of the Wimmera Plains facility is 302 MW (54 turbines X 5.6 MW); and this is split between the substations at 151 MW each; and their sound power output is 55dB⁴, the attenuated sound at the nearest receptor some 2.7 km distant can be predicted and will be less than 25 dB at the nearest receptor (no. 5). Therefore the substations addition to noise at the noise sensitive locations, Receptors 5 and 19, should not be significant.

Error analysis

ISO 9613-2:1996 prediction methodology used by the software SoundPLAN 8.1 has an inherent uncertainty. This has a typical accuracy of overall A-weighted noise levels of ± 3 dB at a distance of up to 1 km from the source. The error will be affected by the parameters used in the model and the variations that can occur in atmospheric conditions. As this uncertainty sits within the smallest compliance margin of 2dB, there is a small probability of non-compliance. This is based on the assumption that there is no systematic error in the predicted noise levels.

It is clear from the modelling method that a series of conservative decisions have been made to the application of the model that increase the predicted maximum noise levels. These modelling decisions include:

- Addition of +1 dB to stated turbine sound power outputs,
- Guaranteed turbine sound power outputs are the maximum expected output,
- The use of a conservative ground absorbance factor $G = 0.5$,
- The use of all turbine noise contributions being downwind of the receptor,
- No addition of upwind turbine wake effects (all turbines modelled to experience the measured hub height wind speed).

These factors lead to a conservative noise level prediction at the receptors which may contribute 1 to 2 dB to the receptor noise predictions. If this is taken into consideration, there is a reduced probability of non-compliance with the Standard.

The Standard states that compliance is at a predicted 40 dB at the receptors, consequentially compliance with the Standard is maintained in these predictions.

Risk to the environment

The assessment of risk to the environment relies on criteria given in the Standard NZS6808:2010 Acoustics – Wind Farm Noise. As such, the risk of noncompliance with the standard is taken as equivalent to a risk to the environment. The risk level determined for compliance is equivalent to that determined for the environment. A risk that is not acceptable i.e. Is medium or high.

A limit of 40 dB is considered by the adopted New Zealand Standard (NZS 6808:2010 Acoustics – Wind Farm Noise) to not adversely affect amenity.

The nearest residence (Receptor 5) may anticipate a wind farm noise to be a maximum of 38 dB(A) at the worst case, allowing for systematic and random errors in the assessment the risk of non-compliance and impact on the amenity of the occupants of R5 and R19 is low. This compliance will be checked by post construction noise monitoring.

The resultant noise risk is considered to be low in this case.

Conclusions

1. The Marshall Day Acoustics noise predictions were conducted in accordance with the appropriate standards, planning permit conditions and guidelines.
2. Noise level predictions for noise sensitive locations comply with limits set in the *New Zealand standard NZS 6808:2010*.

⁴ Schneider Electric outputs at <https://www.se.com/us/en/faqs/FA120629/>

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3. Background noise checks were undertaken in accordance with the Standard using an excess of the required minimum of 1,440 data points for Receptors 5 and 19.
4. The compliance margins for the closest receptors are satisfactory to ensure compliance when systematic as well as random errors are considered.
5. The receptor sites have been inspected and no circumstances were found that could potentially adversely affect compliance at either of the receptor sites.
6. It can be concluded that the proposed Wimmera Plains Energy Facility preconstruction noise assessment report complies with the noise requirements set out in the Standard.
7. The risk to amenity at the noise sensitive locations nearby to the wind farm from noise is low for Receptors 5 and 19. The risk is lower still for all other receptors.
8. The sound power characteristics of the turbines can be managed by operational controls to produce lower noise outputs if required.

Recommendations:

1. The assumptions used in the noise predictions provided by Marshall Day Acoustics can be tested with post construction noise monitoring at Receptors 5 and 19. There should, however, be a contingency monitoring plan if either of these receptors withdraws from the post construction noise assessment.
2. A sound emission guarantee should be sought from the wind turbine supplier assuring that no special audible characteristics will apply to the turbines purchased.
3. Predicted noise levels in the case of significant movement of the turbines must be undertaken to re-examine compliance with the standard.

Details of the compliance elements of the Marshall Day Acoustics report are given in Appendix 1.

This audit report has been prepared for BayWa r.e. for the proposed Wimmera Plains Energy Facility development and assumes that the data provided is correct and the development will proceed as planned.



John Cumming
Auditor pursuant to the Environment Protection Act (1970)
June 15th 2020

End

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Appendix 1 - Reconstruction Noise Assessment
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Wimmera Plains Energy Facility

Wind farm noise vright assessment	Review of assessment document	Reference document	Noise assessment report	Comment	Rectification required
Planning Scheme (Victoria)	Condition				
	Planning condition VC124 Planning amendment (noise sensitive locations within 1 km of wind turbines have written agreement)		Fig 3.	There are no sensitive receptors within 1 km of the nearest turbine	
Planning Scheme	Conformance to the Victorian Guidelines and NZS 6808:2010		7.0 Summary	Conclusion of proposal compliance	
Policy and Planning Guidelines for Developments of Wind Energy Facilities in Victoria (Oct 2018)	Written consent of owners of dwellings within 1 km of any turbine	VPP Sec. 2.1.6	Fig 2.	An involved receptor, no. 4 is within 1km of a turbine but has a contract with the project. The auditor sighted an agreement with this owner dated 30-4-2020.	
	Not in an urban growth zone or within 5 km of major regional cities	VPP Sec. 2.1.5	Appendix F - Planning zone map	The area surrounding the turbines is Farming zone FZ1. The nearest township is Jung > 5km from the nearest turbine. There is an RDZ approximately 2.7 km from the nearest turbine.	
	An Environmental Effects Statement is either completed or not required	VPP Sec.3.3.1		No EES has been requested	
	Approval under the EPBC Act has been given has been given or is not required	VPP Sec.3.3.2		No suggestion of endangered species presence was determined	

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Audit of - Wimmera Plains WEF preconstruction noise assessment - John Cumming

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Condition	Reference document	Noise assessment report	Comment	Rectification required
15a. Acoustic compliance report for the proposed wind energy facility is prepared by a suitably qualified and experienced acoustics engineer	VPP Sec.4.3.3		The pre-construction noise assessment report was prepared by Marshall Day using suitably qualified acoustics engineers	
15b. Noise assessment positions located according to the standard and shown on a map		Fig 2. and Appendix D	A compliant map (Appendix D) and GPS positions for the receptors were given in Appendices C	
15e. Compliance reports are to be publicly available			This is a function of BayWa as a site management responsibility	
Sec. 5.1.2a requires compliance with noise limits for dwellings and other noise sensitive locations stated in NZS 6808:2010	VPP Sec.5.1.2a	Sec. 6.0 Assessment	Noise predictions were given for the top 3 receptor locations all complied with the 40 dB limit with margins of at least 7 dB.	
Local Government	Horsham			
Planning Approval conditions	Compliance with NZS 6808:2010 noise levels	Clause 14	Sec. 6.2 Summary	Compliance was concluded in the pre-construction noise assessment
	Preparation of a pre-construction noise assessment	Clause 16		Marshall Day Acoustics – Wimmera Plains Energy Facility – Operational Noise Assessment (4 March 2020)
	Preparation of a compliant Noise Management Plan	Clause 20		Not yet undertaken as this is at the permit application stage

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Audit of - Wimmera Plains WEF preconstruction noise assessment - John Cumming

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Condition	Reference document	Noise assessment report	Comment	Rectification required
NZS 6808:2010 Acoustics - Wind Farm Noise Compliance assessment				
Assessment to include all noise sources coming from the wind farm - blades, generator, gearbox, hydraulics and from transformers on site	C1.5	Sec. 2.3 Noise Emissions	This assessment did not include proposed fixed sub stations	
A 40 dB limit is applied for noise sensitive locations with allowance for background noise on top	5.1	Sec. 3.2.3 Operational Noise Criteria	Noise limits were defined	
High amenity receptors are considered	5.3.1	Sec. 3.2.4 Operational Noise Criteria	No high amenity receptors were reported. This area is zoned for farming and high amenity is unlikely	
Special audible characteristics are considered	5.4	Sec. 2.3 Noise Emissions	Tonality of the sound output from the Vestas V162- 5.6 MW turbines was examined. No special audible characteristics were noted	This needs to be tested at the post construction stage in the second noise assessment
Application of noise level compliance to cumulative sound levels of all wind farms in the area.	5.6	Sec. 6.3	Impacts of the Jung and Murra Warra wind farms were included in the assessment	
Uncertainty of measurements / calculations is considered	5.7		This is considered not necessary due to the conservative wind farm noise prediction method and the compliance margin predicted	

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Condition	Reference document	Noise assessment report	Comment	Rectification required
Prediction of the 35 dB wind farm sound contour mapped	7.6.1	Sec. 6.2 Assessment Fig. 3	30, 35, 40 and 45 dB contours were mapped	
Prediction of sound levels for all noise sensitive locations inside the 35 dB contour	7.6.1	Sec. 6.2 Assessment Table 5.	Receptors within 3 km of the turbines were modelled totalling 34, 12 of which were involved receptors	
Report requirements				
Map showing topography (contours)	8.1 (a)	Appendix E	This provides an overlay of the receptors on a topographical map	
Map showing position of turbines	8.1 (a)	Appendix D and Fig. 3	Adequate maps	
Map showing positions of receptors (noise sensitive locations)	8.1 (a)	Fig.3 Appendices D and F	Adequate maps showing stakeholders and uninvolved receptors	
Sound levels calculated for sensitive receptors	8.1 (b)	Table 5	Highest predicted noise levels as dB LA(A90) were given	
Wind turbine sound power levels provided	8.1 (c)	Figure 1	Sound power levels at operating wind speeds were provided	
Make and model of wind turbines provided	8.1 (d)	Table 1	Vestas V162-5.6MW wind turbines were specified in the report	
Hub height of the wind turbines provided	8.1 (e)	Table 1.	166 m. hub height	
Distance to noise sensitive locations described	8.1 (f)	Appendix C	GPS position and distance to nearest turbine were provided for each receptor	

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Condition	Reference document	Noise assessment report	Comment	Rectification required
Calculation procedures provided	8.1 (g)	Sec 4.0	The use of ISO 9613-2:1996 was described with the SoundPLAN v8.1 software and parameters used	
Meteorological conditions provided	8.1 (h)	Sec. 4.0	Downwind conditions from each turbine was assumed for all receptors	
Air absorption parameters used in calculations	8.1 (i)	Sec. 4.0 Table 2.	Atmospheric conditions used were discussed = T 10°C, Humidity 70%	
Ground attenuation parameters provided	8.1 (j)	Sec. 4.0 Table 2.	A ground attenuation factor of G=0.5 was used and justified	
Topography / screening stated	8.1 (k)	Sec. 4.0 Table 2.	Turbine and receptor elevations are given in Appendices B and C. Terrain effects were less than 2dB	
Predicted far field wind farm sound levels	8.1 (l)	Sec. 5.0 Table 5.	Far field calculations used ISO 9613-2:1996 standard	

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Electrical Sub station	Condition	EPA (Vic) NIRV Guideline	Noise report	Comment	Rectification required
Victoria EPA Guidelines Noise from Industry in Regional Victoria	Substation location			Two substations are planned east and west of the Henty Highway	
	Substation sound power levels and dB(A)			Not provided	
	Maximum Noise levels (Day , Evening, Night)	Table 1		Farm zone/Public conservation & resource zone noise dB requirements under the NIRV are 45 Day, 39 Evening and 34 Night	
	Compliance with limits provided			This compliance is assumed	

Legend

Fully compliant	Partially compliant	Not compliant
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Appendix 2 Site inspection

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Date: May 22nd, 2020 (John Cumming)

John Cumming visited the Wimmera Plains Energy Facility (WIM) proposed site on Friday May 22nd, 2020. This is situated about 15 km north east of Horsham in the southern reaches of the Wimmera.

The area is a flat plain extending south to the Grampians and south west to Mount Arapiles. The soil consists of a fine red sandy clay with the major farming activity of grain growing supported by sheep grazing.

The WIM site is centred around the Henty Highway extending to the west and east of the highway. At the time of the inspection many of the roads were not navigable due to recent rain.

There are two community tree plantings in the vicinity of less than 2 Ha each. Houses forming the main noise sensitive receptors, were dotted along the main roadways. There were no schools, hospitals nor other institutions that may have passed as noise sensitive receptors. The nearest non-farming activity was at the Dooen Landfill and transfer station on Ladlows Road about 1 km south of the nearest turbine proposed for the WIM site.

The following table details the receptors (noise sensitive locations) that were checked during this inspection and their approximate position relative to the predicted noise contours from WIM operation. The R no. refers to the receiver number from the Marshall Day Acoustics report.

No.	Address	Status	Noise dB contour	Comment
R5 tested	1729 Henty Highway	Not involved	<40	Unkempt weatherboard house may not be occupied. Shielding to west from sheds and some trees. Murra Warra turbines are visible to the north
R4	1797 Henty Highway	Involved	<45	Substantial weatherboard house obviously occupied and well kept. Trees surrounding the house and sheds to the south
R19 tested	232 Shearwoods Road	Not involved	<40	Small weatherboard house with trees in the house paddock. Sheds are present to the east. This house is occupied.
R2	400 Jung Wheat Rd	Not involved	~ 35	A small well kept weatherboard house that looks to be occupied. The house paddock is well vegetated and it has one shed to the west.
R14	382 Jung Wheat Rd	Not involved	~ 35	Dilapidated rendered home not likely to be occupied. Sheds present to the west and north and some unkempt vegetation in the house paddock.
R1	1652 and 1648-1652 Henty Highway	Involved	<40	Weatherboard single storey and a double storey home immediately to the south. Sheds are positioned between the homes and the house paddocks are treed.
?	Walgotts Road	?	<35	Observed from the Henty Highway, this home is not listed because it is not occupied and is owned by an involved party (advice from BayWa r.e.)
R6	1507 Henty Highway	Involved	<35	Weatherboard house with trees to its south and sheds to its north. A caravan was positioned to the west of the sheds.
R22	Ladlows Road	Involved	<35	This house was obscured by trees and sheds to its west and south. This is about 1 km north east of the Dooen landfill.
R71	Blue Ribbon Road	Not involved	<30	Substantial brick home with extensive shedding to the north and south.
R73	Blue Ribbon Road	Not involved	<30	A weatherboard home with substantial tree planting to the south east and west.
R61	Kelly Road	Involved	~35	Large weatherboard with a complex of silos and sheds to the east and some protection from shrubs and trees.
R63	1324 Blue Ribbon Road	Involved	<35	Home obscured by sheds and silos with trees surrounding.

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Conclusions:

1. The inspection did not reveal any homes that were within the 40 dB contour that were not involved in the WIM proposal.
2. There were two homes, R5 and R19 that are positioned within the 35 dB contour that are not involved in WIM. These two have been tested for background noise by Marshall Day Acoustics.
3. No other possible noise sensitive locations were observed within the 35 dB contour.
4. The topography is flat with 1m difference in land elevation being noted between all receptor locations and the proposed turbine sites. No valley effects are expected in noise predictions.
5. Wind direction effects will be due to the arrangement of the turbines and not expected to be due to the terrain.
6. The land surrounding the WIM site is all cropping farmland as such a ground transmission factor of $G = 0.5$ should lead to a conservative noise prediction at receptor locations.
7. The receptors R5 and R19 both had considerable vegetation around the homes that will add to background noise at higher wind speeds as well as from birdlife. R5 was on the Henty Highway that was fairly busy with traffic.

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Receptor 5 is a farmhouse with shedding to the west and a bush block to the south. The MDA background noise check recorded over seven weeks in Summer produced more than enough data points to satisfy the Standard. Regression analysis of background noise gave a noise level greater than 35 dB at a hub height wind speed of ~ 12m/s all time and ~ 15 m/s at night.



From this analysis MDA calculated noise compliance limits for Receptor 5 of 40 dB up to 12m/s rising to 40.5 dB at 12 m/s for all time and 40 dB at all wind speeds up to 12 m/s at night-time.

There are no outstanding features of this receptor that could be found to make it a high amenity area, however the all time and night time background noise levels were lower for Receptor 5 than for Receptor 19, even though it is positioned on the Henty Highway.

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Receptor 19

This is a farmhouse with shedding to the west of it and trees around the greater house paddock and some silos to the north. Again, the MDA background noise check recorded over seven weeks in Summer produced more than enough data points to satisfy the Standard. A regression analysis of the data points gave a background noise below 35dB up to 8 m/s rising to 40.9 dB for all-time at 12 m/s. Night time measurements were under 35 dB up to a wind speed of 10 m/s which then rose to 37.1 dB by 12 m/s.



From this analysis MDA calculated noise compliance limits for Receptor 19 of 40 dB up to 8 m/s rising to 45.9 dB at 12 m/s for all time and 40 dB up to wind speeds of 10 m/s rising to 42.1 dB at 12m/s at night time.

There are no outstanding features of this receptor that could be found to make it a high amenity area, however the all-time and night time background noise levels were higher for Receptor 19 than for Receptor 5, even though it is positioned on a lower trafficked road than Receptor 5. This may be due to the proximity and extent of vegetation surrounding the house.

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September 14, 2020

Attention: Mr. Tiago Brandao
Project Manager
BayWa re

Re: Clarification sought on noise audit report of the proposed Wimmera Plains Wind Farm

Dear Mr. Brandao,

This note is provided in response to your request for a reply to the query copied below from the Department of Environment Land, Water and Planning. This query related to conclusion no. 8 of the audit report:

The sound power characteristics of the turbines can be managed by operational controls to produce lower noise outputs if required.

The query was reported as:

“Can you confirm that this is just a design feature that will not need to be relied upon to achieve noise levels at nearby dwellings compliant with the New Zealand Standard?”

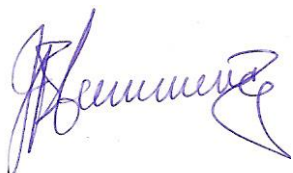
In response to this question I can reply that the predictive noise assessment for the proposed Wimmera Plains Wind Farm undertaken by Marshall Day Acoustics does predict compliance with the noise limits given in the New Zealand Standard NZS 6808:2010 of 40 dB $L_{A90(10 \text{ min})}$ or background plus 5 dB whichever is greater.

I can say that this option of using operational controls to meet noise levels is unlikely to be required if the plans are true and the sound power output of the turbines chosen is a maximum 104 dB(L_{WA}). I understand that the prediction of noise levels used in the Marshall Day Acoustics report was conservative in its assumptions that included adding 1 dB to the sound power output of the turbines.

The conclusion in the audit report simply provides reassurance to the reader that further wind farm noise controls are possible.

I hope this statement suits your purpose and answers the query.

Sincerely



John Cumming
Auditor pursuant to the Environment Protection Act (1970)

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