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White Rock Solar Farm

Draft Construction Noise Management Plan

Prepared For

Goldwind

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INTRODUCTION

The construction of a solar farm comprises activities such as road construction, civil works, excavation and foundation construction and electrical infrastructure works requiring processes such as heavy vehicle movements, loaders, excavators, piling, generators and cranes.

An environmental noise assessment was prepared for the White Rock Solar Farm and was summarised in Sonus report "S4834C1". The report addresses the Secretary's Environmental Assessment Requirements (SEARs), dated 3 February 2016, and references this Draft Noise Management Plan in addressing construction noise.

The most significant impacts from construction occur from activity at night. It is understood that the proposed hours of construction activity are as follows;

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sunday and Public Holidays: No work
- Note: Non-noisy works may be performed outside of these hours (e.g. electrical wiring works)

Therefore, with only day time activity occurring at significant separation distances, the construction of the White Rock solar farm is not expected to generate any significant impacts, subject to implementation of the feasible and reasonable noise mitigation measures recommended in this Draft Construction Noise Management Plan (NMP).

In developing the NMP, the relevant provisions of the following guidelines and legislation have been considered:

- *Interim Construction Noise Guideline* (the ICNG) – for construction noise;
- "NSW Road Noise Policy" published by the NSW Department of Environment, Climate Change and Water – for noise from road traffic associated with the construction of the project.

The NMP will provide a framework document to develop and implement specific action plans for each individual activity or stage of works once the construction contractor is known and the extent of processes confirmed.



AMBIENT AND BACKGROUND NOISE MONITORING

Noise monitoring has previously been carried out at dwelling “R1” in close proximity to the solar farm site as a part of a White Rock Wind Farm assessment. The logging has been used to determine the ambient and background noise environment in the vicinity of construction activity.

The noise monitoring was carried out for a period of three weeks (24 September to 13 October 2010) as part of the background noise monitoring regime required under the relevant wind farm guidelines.

The most relevant descriptors of the ambient and background noise environment to provide comparison with the ICNG are the ambient equivalent (L_{Aeq}) noise level and the Rating Background Level (RBL), respectively.

The ambient equivalent (L_{Aeq}) noise level is the average noise environment at the monitoring locations, while the RBL is the indicative background noise level at the monitoring locations, determined in accordance with the *NSW Industrial Noise Policy* (the INP). The RBL is calculated as the median of the daily tenth percentiles of the measured background noise levels (L_{A90}) during the day, evening and night periods, and represents the “lulls” in the acoustic environment at the monitoring locations.

The RBL and the ambient equivalent (L_{Aeq}) noise level for R1 have been derived from the monitoring data and are provided in Table 2.

Table 2: The RBL and ambient equivalent noise level at R1.

Monitoring Location	Rating Background Level, RBL (dB(A))		Ambient Equivalent Noise Level, L_{Aeq} (dB(A))
R1	Day	33	59
	Evening	31	55
	Night	25	52



CONSTRUCTION ACTIVITY CRITERIA

Construction Noise

The appropriate assessment methodology for noise from on-site construction activities is provided by the Interim Construction Noise Guideline (the ICNG)), released by the NSW Department of Environment and Climate Change in July 2009.

The ICNG provides an emphasis on implementing feasible and reasonable noise reduction measures and does not set mandatory standards or objective criteria. This approach is consistent with other interstate approaches to construction noise.

The ICNG does establish a quantitative approach, whereby a goal level is based on the existing rating background level (RBL) at noise-sensitive locations. The RBL is determined based on the monitored background noise level (L_{A90}) in the environment. The goal level is used by the ICNG as a “trigger” for the construction site to implement all feasible and reasonable work practices and measures.

For construction activity occurring within the proposed hours, Table 2 in Section 4.1 of the ICNG provides a goal noise level for construction activity of 10 dB(A) above the RBL. Construction activity generating a noise level greater than 10 dB(A) above the RBL results in the need to implement all reasonable and feasible measures to reduce the noise. The table also recommends an upper limit, or maximum criterion, of 75 dB(A), which should only be exceeded “in exceptional circumstances and for short periods of time (for example up to two days)”, acknowledging that construction activity is intermittent and for some processes, the application of noise reduction measures may not be reasonable or feasible.

Based on the RBL results, the goal noise level has been determined and is provided in Table 3.

Table 3: Construction noise goal noise levels.

Monitoring Location	Rating Background Level, RBL (dB(A))	Ambient Equivalent Noise Level, L_{Aeq} (dB(A))	Goal Noise Level, L_{Aeq} (dB(A))
R1	33	59	43

It is noted that the goal noise levels are extremely conservative (low) for construction noise activity in that they are significantly less than the average noise level already in the environment and



significantly less than the *NSW Road Noise Policy* requirements for (constant) activity with a similar character.

Where the goal noise levels are achieved, no specific noise mitigation measures are required. Where the goal noise levels are exceeded, then the noise mitigation measures in this NMP should be implemented.

Traffic Noise on Public Roads

The appropriate assessment methodology for traffic noise on public roads associated with the construction activity is provided by the “NSW Road Noise Policy” March 2011 published by the NSW Department of Environment, Climate Change and water.

The recommended criterion to be achieved by the additional construction traffic movements is an equivalent ($L_{Aeq,1hour}$) noise level of no greater than 55 dB(A) during the daytime (7am to 10pm). This noise level is to be achieved outside, at a distance of 1.5m from the facade of a dwelling.



CONSTRUCTION ACTIVITIES

Construction Noise

The equipment and activities that are present at the site will vary throughout the project, depending on the construction phase. Construction activity will be variable in nature. However, the predicted noise levels at the closest noise receivers for each phase of the project (provided in Table 5 below) are based on all of the listed equipment operating for one third of the assessment period in weather conditions which are most conducive for noise propagation. In practice, for any other operational conditions, weather conditions, or receiver location, the noise levels will be lower than the noise level shown in Table 5, and in many cases, significantly so. Also provided is a prediction of all possible equipment operating simultaneously, for a full assessment period.

The distance to achieve the 43 dB(A) “trigger” is in the order of 2500m and therefore the solar farm should implement the measures in this plan to reduce the noise. The receiver locations in relation to the solar farm are shown in the aerial photo provided in Appendix B.

Table 5: Predicted noise level from construction activity.

Construction Phase	Main Plant and Equipment	Predicted Noise Level at Dwelling				
		R1*	R4	R5	R49	R57
Separation distance from dwelling to construction activity:		550m	2000m	1800m	770m	2000m
Construction goal noise level		43 dB(A)	43 dB(A)	43 dB(A)	43 dB(A)	43 dB(A)
Upper noise limit		75 dB(A)	75 dB(A)	75 dB(A)	75 dB(A)	75 dB(A)
Site Preparation, Clearing & Demolition	Excavator Bulldozer Chainsaw Tree Mulcher Light Vehicle Dump Truck	53 dB(A) at 550m	42 dB(A) at 2000m	43 dB(A) at 1800m	50 dB(A) at 770m	42 dB(A) at 2000m
Establishment Site Compound, Access Roads & Delivery of Materials	Hand Tools Excavator Light Vehicles Delivery Truck Bulldozer Plate Compactor Grader Roller Asphalt Paver Bobcat Bored Piling Rig Mobile Crane	54 dB(A) at 550m	43 dB(A) at 2000m	44 dB(A) at 1800m	51 dB(A) at 770m	43 dB(A) at 2000m
Installation of Foundations	Piling Rig Mobile Crane Bobcat Excavator Concrete Vibrating Needle Concrete Truck	57 dB(A) at 550m	45 dB(A) at 2000m	46 dB(A) at 1800m	54 dB(A) at 770m	45 dB(A) at 2000m
Installation of Underground Cabling	Bobcat / Trencher Tractor & Cable Trailer Loader	44 dB(A) at 550m	33 dB(A) at 2000m	34 dB(A) at 1800m	41 dB(A) at 770m	33 dB(A) at 2000m
Assembly of Panel Frames, Mounts & Transformer Units	Truck Compressor Hand Tools Generator Ratchet Gun Mobile Crane	51 dB(A) at 550m	39 dB(A) at 2000m	40 dB(A) at 1800m	48 dB(A) at 770m	39 dB(A) at 2000m
Site Rehabilitation / Removal of Temporary Construction Facilities	Light Vehicles Excavator Bulldozer Loader Dump Truck Truck	51 dB(A) at 550m	40 dB(A) at 2000m	40 dB(A) at 1800m	48 dB(A) at 770m	40 dB(A) at 2000m
All phases, plant and equipment combined		63 dB(A)	52 dB(A)	53 dB(A)	60 dB(A)	52 dB(A)

* Closest dwelling to construction site.



The predicted noise levels indicate the “goal noise levels” (refer to Table 3) of the ICNG will be exceeded on occasion during the construction process; however, the “upper limit” requirement of 75 dB(A) of the ICNG is predicted to be achieved at all locations.

In the circumstance where the predicted noise levels exceed the “goal noise levels” but achieve the “upper limit”, the ICNG requires noise and vibration management actions to be developed to minimise the construction noise.

Traffic Noise on Public Roads

In addition to the on-site works, the construction activities will also incorporate passenger vehicle and heavy vehicle movements to and from the site along the Gwydir Highway south-west of the Matheson township, for the duration of the construction period. These vehicles will include semi-trailers, low loaders, haulage trucks, mobile cranes, water tankers, four-wheel-drive vehicles and passenger vehicles. Direct access to the site from a state highway mitigates the potential impacts compared to access via local roads.

For comparison with the traffic noise criterion, predictions of the noise from traffic at various distances from the roadside have been made based on a maximum number of heavy and passenger vehicle movements in an hour. It has been assumed that during the peak traffic period, a total of 40 light vehicles and 7 heavy vehicles may enter the site in a single hour.

Based on the above vehicle movements in a one hour period, the predicted noise levels at various setback distances from the roadside are provided in Table 6. The predictions indicate that the traffic noise criterion of 55 dB(A) will be achieved at a distance of less than 9m from the roadside.

Table 6: Predicted noise level from traffic.

Setback Distance from Roadside	Predicted Noise Level
9m	55 dB(A)
10m	54 dB(A)
15m	52 dB(A)
20m	51 dB(A)
25m	49 dB(A)
30m	48 dB(A)
40m	47 dB(A)
50m	46 dB(A)



Based on the above, and the proposed access route, there will be no dwellings within 9m of traffic and therefore the traffic noise criterion will be achieved without inclusion of any acoustic measures.



PROJECT MITIGATION MEASURES

Pro-active noise control strategies to minimise noise during construction may include engineering measures such as the construction of temporary acoustic barriers, the use of proprietary enclosures around machines, the use of silencers, the substitution of alternative construction processes and the fitting of broadband reversing signals. It may also include administrative measures such as inspections, scheduling and providing training to establish a noise minimisation culture for the works.

The following mitigation measures provide a suite developed in accordance with the ICNG from which the construction contractor can develop action plans for each individual activity. Example actions which may be required during construction have been included as Appendix A of this report. These types of actions, once approved, will be the “tool on the ground” for the ongoing operation of the site.

Scheduling

Construction works, including heavy vehicle movements into and out of the site, will be restricted to between 7am and 6pm Monday to Friday, and between 8am and 1pm on Saturdays. Works carried out outside of the hours will only entail:

- works that do not cause noise emissions to be audible at any nearby residences not located on the site;
- the delivery of materials as requested by Police or other authorities for safety reasons; and
- emergency work to avoid the loss of lives, property, and/or to prevent environmental harm.

If any other works are required outside of the specified hours, they will only be carried out with the prior consent of the authorities.

Location of Fixed Noise Sources

Locate fixed noise sources such as generators and compressors at the maximum practicable distance to the nearest dwellings.

Enclose Generators and Compressors

Provide proprietary acoustic enclosures for site compressors and generators.



Alternative Processes

Investigate and implement alternative processes where feasible and practicable, such as hydraulic or chemical splitters as an alternative to impact rock breaking, or the use of broadband reversing alarms in lieu of the high pitched devices. A broadband reversing alarm emits a unique sound which addresses the annoyance from the high pitched devices. The fitting of a broadband alarm should be subject to an appropriate risk assessment, with the construction team being responsible for ensuring the alarms are installed and operated in accordance with all relevant occupational, health and safety legislative requirements.

Site Management

- Select and locate centralised site activities and material stores as far from noise-sensitive receiver as possible;
- Care should be taken not to drop materials such as rock, to cause peak noise events, including materials from a height into a truck. Site personnel should be directed as part of an off-site training regime to place material rather than drop it;
- Plant known to emit noise strongly in one direction, such as the exhaust outlet of an attenuated generator set, shall be orientated so that the noise is directed away from noise sensitive areas if practicable;
- Machines that are used intermittently shall be shut down in the intervening periods between works or throttled down to a minimum;
- Implement worksite induction training, educating workers on the requirements of the NMP.

Equipment and Vehicle Management

- Ensure equipment has Original Equipment Manufacturer (OEM) mufflers installed;
- Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the OEM design specifications. This inspection should be part of the monitoring regime;
- Ensure silencers and enclosures are intact, rotating parts are balanced, loose bolts are tightened, frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp. These items should be part of the monitoring regime;
- Use only necessary power to complete the task;
- Inspect, as part of the monitoring regime, plant and equipment to determine if it is noisier than other similar machines, and replace or rectify as required.



Community Consultation

Establish and implement a Community Engagement Plan in accordance with Section 4.2 of the Environmental Impact Statement (EIS).

Monitoring

Establish and implement a monitoring process in accordance with the requirements in this NMP. Refer to the "Monitoring" section for the detailed requirements of a monitoring process.

Complaints Resolution

Establish and implement a complaints resolution process in accordance with the requirements in this NMP.

Project Mitigation Measures in Context

It is unlikely that the above measures will result in meeting the construction noise goals at all times due to the stringency of these goals, and the variable nature of construction activity. However, they will serve to reduce the impacts and are considered to represent the extent of feasible and reasonable noise reduction measures applied to construction activity. These measures will result in levels that are lower than the existing ambient noise levels.



MONITORING

The aim of a monitoring procedure is to ensure works are being carried out in accordance with the NMP. On site monitoring should include the following elements;

Plant and Equipment

- Regular on site inspections by the “Environmental Representative” to identify:
 - Equipment has quality OEM mufflers installed;
 - Equipment is well maintained and fitted with adequately maintained silencers which meet the OEM design specifications;
 - Silencers and enclosures are intact and closed, rotating parts are balanced, loose bolts are tightened, frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp;
 - Site personnel are using only necessary power to complete the task;
 - Plant and equipment that is noisier than other similar machines;
 - Care is being taken to place material in trucks rather than being dropped;
 - Plant emitting noise strongly in one direction is orientated so that the noise is directed away from noise sensitive areas if practicable;
 - Machines that are used intermittently are being shut down in the intervening periods between works or throttled down to a minimum.

Compliance

Given that construction noise levels are expected to be in the order of the existing ambient noise environment and therefore difficult to identify and measure at an unattended monitoring site, long term monitoring of construction activity will not be effective for this site. Noise measurements should be carried out in accordance with the Complaints Resolution Process.

If the measured noise level at the closest residence (or at a location representative of the closest residence) exceeds the goal noise level provided by the ICGN (refer Table 3) but is less than the maximum limit of 75 dB(A), then all feasible and reasonable mitigation measures will be implemented to reduce the noise at the dwellings. These mitigation measures are provided in the “Project Mitigation Measures” section.

In the event that the measured noise level exceeds the maximum limit of 75 dB(A), then all feasible and reasonable mitigation measures will be implemented and the testing repeated to confirm compliance with the 75 dB(A) criterion. Based on the predicted noise levels summarised previously, this outcome is very unlikely.



COMPLAINTS RESOLUTION

The aim of the complaints resolution process is to identify any feasible and reasonable measures that may further reduce impacts following a complaint, and to provide feedback to the community on the above process within a reasonable timeframe. The complaints resolution process should implement the following noise elements;

- Establishment of a complaints mechanism for the community via either telephone or email;
- Notification of the relevant contact details through the community consultation process;
- Provision of an Environmental Representative dealing with any complaints who is appropriately trained in the NMP requirements and in community consultation, and has the ability to action the complaint;
- Establishment of a complaints handling procedure that:
 - Assesses whether the issue can be resolved easily and take immediate action if possible;
 - If not, ensures that the appropriate consultation has been undertaken for the activity;
 - Ensures the on-site inspections of the NMP have been carried out regularly for the activity;
 - Assesses the construction site and activities to determine whether there is any reason to believe the noise exposure of receivers is higher than anticipated;
 - Undertakes monitoring of noise levels where this cannot be confirmed, with the aim of establishing if the exposure of receivers is higher than anticipated by the NMP;
 - Takes remedial action if any of the above cannot be confirmed;
 - Advises complainant of action taken;
 - Maintains a record of the above to enable review by an independent authority such as EPA.



CONCLUSION

The construction of the White Rock solar farm will occur at significant separation distances to the dwellings in the vicinity, resulting in appreciable attenuation of the noise generated by the activity. In addition, the activity will be restricted to standard daytime construction hours, addressing the most significant impacts from general construction which occur from activity at night.

Therefore, with day time activity occurring at significant separation distances, the construction of the White Rock solar farm is not expected to generate any significant impacts, subject to implementation of the feasible and reasonable noise mitigation measures recommended in this Noise Management Plan (NMP).

The NMP incorporates the following core elements:

- Identification and details of the construction activities including timing, duration and predicted noise levels;
- Identification of the best management practices and the reasonable and feasible measures to minimise the construction noise activities;
- Recommendations for specific community consultation and notification methods;
- Recommendations for specific compliance monitoring plans;
- Recommendations for specific complaints handling procedures including corrective actions to be taken and feedback methods; and
- Comparison of the NMP against the relevant provisions of the NSW Department of Environment & Climate Change *Interim Construction Noise Guideline*.

The NMP provides a framework document that the construction contractor can use to develop and implement action plans for each individual construction activity.



REFERENCES

The following documents have been referred to in the development of this Noise Management Plan (NMP):

DECCW. 2011. NSW Road Noise Policy. Department of Environment, Climate Change and Water, Sydney, New South Wales.

DECCW. 2009. Interim Construction Noise Guideline. Department of Environment, Climate Change and Water, Sydney, New South Wales.



APPENDIX A: Example Actions

Project Mitigation Measures

The following mitigation measures are pro-active noise control strategies that represent the extent of feasible and reasonable noise reduction measures. Given the variable nature of construction activity it is expected that the goal noise levels will be exceeded at times, however the maximum noise levels are predicted to be achieved under worst case conditions for the proposed activity.

Mitigation Action	Responsibility	Timing/Comments
Construction Noise		
Restrict Construction works, including heavy vehicle movements to the hours detail in the NMP. Works carried out outside of the hours should only entail: - works that do not cause noise emissions to be audible at any nearby residences not located on the site; - the delivery of materials as requested by Police or other authorities for safety reasons; and - emergency work to avoid the loss of lives, property, and/or to prevent environmental harm.	Project Manager	During Construction
Locate fixed noise sources such as drilling rigs, generators, compressors and crushing and screening plant at the maximum practicable distance to the nearest dwellings	Project Manager	During Construction
Provide proprietary acoustic enclosures for site compressors and generators.	Project Manager	During Construction
Investigate and implement hydraulic or chemical splitters as an alternative to impact rock breaking where feasible.	Project Manager	Prior to Construction
Implement use of broadband reversing alarms in lieu of the high pitched devices where feasible.	Project Manager Plant Operators	Prior to Construction
Care should be taken not to drop materials such as rock, to cause peak noise events, including materials from a height into a truck. Site personnel should be directed as part of an off-site training regime to place material rather than drop it.	Project Manager Plant Operators	During Construction
Plant known to emit noise strongly in one direction, such as the exhaust outlet of an attenuated generator set, should be orientated so that the noise is directed away from noise sensitive areas if practicable.	Project Manager	During Construction
Machines that are used intermittently should be shut down in the intervening periods between works or throttled down to a minimum.	Project Manager Plant Operators	During Construction
Implement worksite induction training, educating staff on the requirements of the NMP.	Project Manager	During Construction
Ensure equipment has Original Equipment Manufacturer (OEM) mufflers installed	Project Manager	During Construction

APPENDIX A: Example Actions

Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the OEM design specifications. This inspection should be part of the monitoring regime	Project Manager	Weekly
Ensure silencers and enclosures are intact, rotating parts are balanced, loose bolts are tightened, frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp. These items should be part of the monitoring regime	Project Manager	Weekly
Select the appropriate machinery and equipment for each task and only use the necessary power to complete the task.	Project Manager	During Construction
Inspect, as part of a monitoring regime, plant and equipment to determine if it is noisier than other similar machines, and replace or rectify as required	Project Manager	Weekly
Traffic Noise on Public Roads		
Confirm the traffic noise achieves the relevant criterion of 55 dB(A) once traffic volumes are known.	Project Manager	Traffic volumes to be confirmed so noise predictions can be made
Limit the traffic volume or implement feasible and reasonable noise mitigation measures in these areas where the traffic noise is predicted to exceed the relevant criterion.	Project Manager	During Construction
Provide information regarding the route to all drivers prior to accessing the site	Project Manager	During Construction
Schedule construction traffic deliveries such that it is as evenly dispersed as practicable.	Project Manager	During Construction



APPENDIX A: Example Actions

Community Consultation

The following community consultation measures are pro-active strategies to minimise adverse impacts during construction.

Mitigation Action	Responsibility	Timing/Comments
General Construction		
Establish an "Environmental Officer" that is appropriately trained in the NVMSR requirements and community consultation that can be a point of contact for the residents.	Project Manager	Prior to Construction
Provide regular community information newsletters that details the construction plan and duration of the construction phases that is distributed.	Project Manager	As required during Construction
Establish a site notice board in a community location providing copies of the newsletters, updated construction program details, and contact details of relevant project team members and an ability to register for email updates of the newsletter.	Project Manager	Prior to Construction
Regular updates on the construction activities to Local Council and the local Police to assist in complaint management.	Project Manager	As required during Construction
Establish a mechanism for the community to submit questions to the construction team, and for the construction team to respond.	Project Manager "Environmental Representative"	Prior to Construction
Establish a complaints resolution mechanism in accordance with the NVMSR for the community to submit issues to the construction team, and for the construction team to take action.	Project Manager "Environmental Representative"	Prior to Construction
Construction in close proximity to dwellings		
Contact the local community potentially affected by the proposed works and inform them of the proposed work, the location of the work, the day(s) and date(s) of the work and the hours involved.	Project Manager "Environmental Officer"	As required during Construction
Contact to inform the local community shall be made a reasonable time before the proposed commencement of the work;	Project Manager "Environmental Officer"	As required during Construction
The letter should provide the contact details of the project manager and / or site "Environmental Representative".	Project Manager "Environmental Officer"	As required during Construction

Noise Monitoring

Noise monitoring may be conducted to ensure the works are being carried out in accordance with the NMP. Noise monitoring may be required include if noise complaints are received.

APPENDIX B: Residence Locations

