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Construction Noise Management Plan

JINDERA SOLAR FARM

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ACRONYMS AND ABBREVIATIONS

dB(A)	Decibels
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
ICNG	Interim Construction Noise Guidelines (EPA 2009)
km	kilometres
L_{Aeq}	Equivalent continuous noise level
m	Metres
NML	Noise Management Level
NMP	Noise Management Plan
NPfI	NSW Policy for Industry
NSW	New South Wales
RBL	Rating Background Level (background noise level)
RNP	NSW *Road Noise Policy*

1 INTRODUCTION

The Jindera Solar Farm involves the construction, operation and decommissioning of a ground-mounted photovoltaic solar array which will generate approximately 150 MW (DC) to be supplied directly to the national electricity grid. It is anticipated that the proposed Jindera Solar Farm would include the following infrastructure elements:

- Single axis tracker photovoltaic (PV) solar panels, mounted on steel frames over most of the site (around 400,000 PV solar panels) at about 3 m above ground level at maximum tilt.
- Battery Energy Storage System (BESS) with maximum capacity of 30MW/60MWh.
- Electrical cables and conduits.
- Inverter station
- Weather station.
- On-site high voltage substation.
- Control room and storage facility.
- Site office, staff amenities, parking area, perimeter fencing, and CCTV.
- Overhead transmission line infrastructure on poles connecting the project's on-site high voltage substation to the existing TransGrid Jindera 330/132kV substation (if requested by TransGrid, otherwise the line will be underground).
- Internal access tracks.
- Access road entrances from public roads.
- Upgrade to existing roads.
- On-site vegetative screening.

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

A Construction and Operational Noise and Vibration Assessment for the proposed Jindera Solar farm was undertaken by NGH Environmental (2019). Noise emissions from the construction phase of the project were predicted to exceed the construction noise management levels at seven receivers.

The proposed hours of construction activity are as follows:

- Monday to Friday: 7am to 6pm.
- Saturday: 8 am to 1pm.
- Sunday and Public Holidays: no work.

With daytime only activity occurring, the construction of Jindera Solar Farm is not expected to generate significant impacts, subject to implementation of the feasible and reasonable noise mitigation measures, as set out in the Environmental Impact Statement (EIS) (NGH Environmental 2019) and carried over to this construction Noise Management Plan (NMP).

This draft NMP has been prepared in advance of the final detailed design for the project, to clarify the framework for noise management during construction. This plan will be updated prior to implementation, based on the final detailed project design.

2 EXISTING ENVIRONMENT

2.1 SENSITIVE RECEIVERS

The Jindera Solar Farm proposal is located in the north-east Riverina of NSW, approximately 3 km north of the township Jindera. The proposal is located in a regional setting. Surrounding land uses are generally agriculture, including cropping and grazing.

The main existing noise sources in the locality include road traffic noise along Urana Road, Nation Road, Ortlipp Road, Walla Walla Jindera Road, Sparkes Road, Glenellen Road and Klinbergs Lane. Other noise generating activities include a poultry farm and agricultural activities such as the operation of large harvesters, tractors, haulage trucks, irrigation pumps, quad bikes and 4WD vehicles

Figure 2-1 illustrates the locations of the nearest receivers to the proposal site, with the nearest non-involved residential dwelling being approximately 105m north of the proposal infrastructure (R20).

2.2 BACKGROUND NOISE LEVEL

The rating background noise level (RBL) represents background noise levels for noise assessment purposes. The noise descriptor L_{AF90} is the noise level that is exceeded for 90% of the time and is used to measure the RBL. Background noise monitoring has not been conducted for the proposal. Based on the NPI guideline, the minimum assumed RBL's was adopted for all receiver locations (Table 2-1).

Table 2-1 Rating background noise levels (dB(A)

Location	Time of day	RBL dB(A) L_{A90}
All Residences	Day	35
	Evening	30
	Night	30

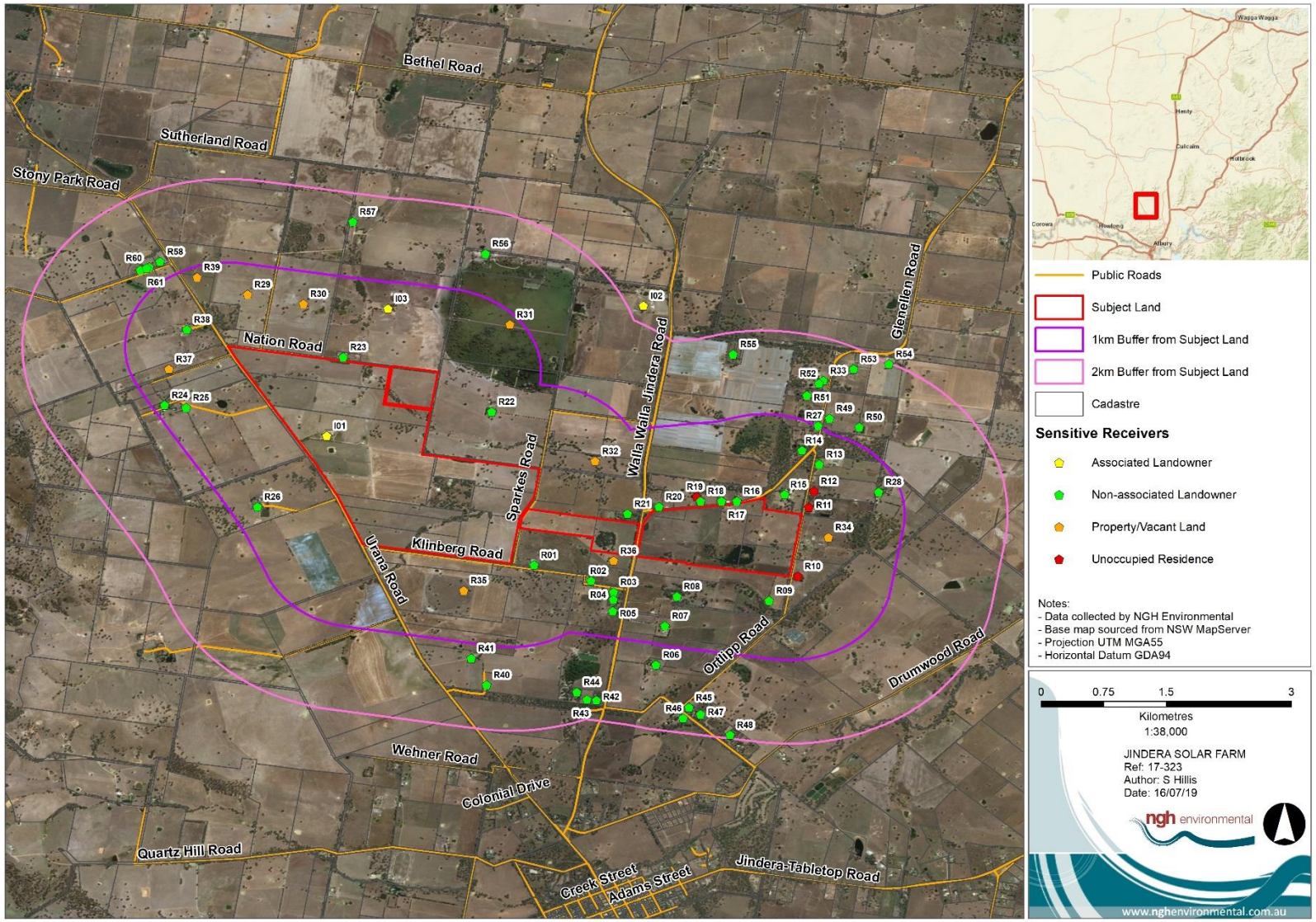

Figure 2-1 Sensitive receivers located within 2km of the development footprint.

3 NOISE CRITERIA

3.1 CRITERA

The NSW Interim Construction Noise Guideline (ICNG; DECC 2009) deals with managing construction noise impacts. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total.

3.1.1 Sensitive receivers

The guideline specifies noise targets, or 'noise management levels' (NMLs), for residences and other noise sensitive receivers (Table 3-1). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified below.

Table 3-1 Noise management levels at sensitive receivers.

Time of day	Management Level
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected Rating Background Level + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected Rating Background Level + 5dB(A)

Table 3-2 identifies the construction NMLs used to manage impacts associated with noise sensitive receivers adjacent to the proposal (refer to Figure 2-1). The NMLs for the receiver locations are derived from the RBLs (Table 3-1). During standard construction hours, a highly affected noise criteria of 75 dB(A) applies for all receivers.

Table 3-2 Construction noise management levels at sensitive recievers.

Location	Time of day	RBL dB(A) L_{A90}	NML dB(A) $L_{A90\ (15min)}$
All Residences	Day	35	45 (RBL + 10dBA)
	Evening	30	35 (RBL + 5dBA)
	Night	30	35 (RBL + 5dBA)

Notes: 1. As no night works or works outside the recommended standard hours are proposed, only the day period is assessed.

3.2 ROAD TRAFFIC NOISE CRITERIA

Noise impact from the potential increase in traffic on the surrounding road network due to construction is assessed against the NSW 'Road Noise Policy' (RNP). The RNP sets out criteria to be applied to particular types of road and land uses. The Urana Road and Walla Walla Jindera Road are categorised as a sub-arterial road. Criteria for this road are outlined in Table 3-3.

Table 3-3 RNP road traffic noise criteria, dB(A).

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	L_{Aeq},(1 hour) 55 (external)	L_{Aeq},(1 hour) 50 (external)

4 ENVIRONMENTAL IMPACTS AND ASSESSMENT

4.1 CONSTRUCTION NOISE SOURCES

Noise impact predictions take into account the typical noise levels of construction equipment likely to be used for the construction phase. The equipment and their sound power levels to be used within the development footprint are in Table 4-1.

Table 4-1 Construction equipment sound power levels within development footprint.

Equipment used	LAeq Sound power levels (dB(A) at 7m) per single item
Small Pile Driving Rig	87
Mobile Crane	88
Front end loader	66
Light Vehicle	78
Vibratory Roller	84
Delivery Truck	83
Backhoe	85
Grader	85
Power generator	75
Water truck	83
Telehandler	81
Concrete truck	84

4.2 CONSTRUCTION NOISE ASSESSMENT

Noise emissions were determined by modelling the noise sources, receiver locations, and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models take into account:

- Location of noise sources and receiver locations.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.

Error! Reference source not found. presents the noise levels likely to be experienced at the nearby affected r eceiver locations during the construction works within the development footprint. The present levels are considered a worst-case scenario with the nosiest plants operating concurrently.

Table 4-2 Predicted LAeq 15 min construction noise levels at receiver locations for works within the development footprint.

Receiver location (refer to Figure 2-1)	Noise management level [1]	Predicted construction noise Level, LAeq (15 min) [2]	Compliance with criteria? (Yes/No)
Residential receivers			
20 (uninvolved)	45	52-66	**No**
21 (uninvolved)		51-65	**No**
17 (uninvolved)		49-62	**No**
18 (uninvolved)		49-62	**No**
19 (Unoccupied)		44-58	**No**
16 (uninvolved)		43-57	**No**
10 (Unoccupied)		42-56	**No**
9 (uninvolved)		40-54	**No**
15 (uninvolved)		39-53	**No**
11 (Unoccupied)		39-53	**No**
23 (uninvolved)		37-51	**No**
1 (uninvolved)		37-50	**No**
1 (involved)		37-47	**No**
8 (uninvolved)		33-47	**No**
12 (unoccupied)		32-46	**No**
13 (uninvolved)		32-45	Yes
2 (uninvolved)		31-44	Yes
3 (uninvolved)		30-44	Yes
4 (uninvolved)		<28-41	Yes
22 (uninvolved)		<28-41	Yes
3 (involved)		<26-39	Yes
5 (uninvolved)		<25-38	Yes
7 (uninvolved)		<24-37	Yes
26 (uninvolved)		<24-37	Yes
14 (uninvolved)		<24-37	Yes
28 (uninvolved)		<22-35	Yes
27 (uninvolved)		<20-33	Yes
41 (uninvolved)		<19-32	Yes
6 (uninvolved)		<18-31	Yes
49 (uninvolved)		<18-31	Yes
50 (uninvolved)		<16-29	Yes
51 (uninvolved)		<16-29	Yes

Receiver location (refer to Figure 2-1)	Noise management level [1]	Predicted construction noise Level, LAeq (15 min) [2]	Compliance with criteria? (Yes/No)
40 (uninvolved)		<15-28	Yes
56 (uninvolved)		<14-27	Yes
52 (uninvolved)		<14-27	Yes
33 (uninvolved)		<14-27	Yes
25 (uninvolved)		<13-26	Yes
57 (uninvolved)		<13-26	Yes
42 (uninvolved)		<13-26	Yes
44 (uninvolved)		<13-26	Yes
43 (uninvolved)		<13-26	Yes
45 (uninvolved)		<12-25	Yes
47 (uninvolved)		<12-25	Yes
38 (uninvolved)		<12-25	Yes
55 (uninvolved)		<12-25	Yes
46 (uninvolved)		<12-25	Yes
53 (uninvolved)		<12-26	Yes
24 (uninvolved)		<25	Yes
48 (uninvolved)		<25	Yes
54 (uninvolved)		<25	Yes
58 (uninvolved)		<25	Yes
59 (uninvolved)		<25	Yes
60 (uninvolved)		<25	Yes
2 (involved)		<25	Yes

Notes: 1. Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 7am to 1pm).

Based on the construction noise levels presented in Table 4-2 above, the construction management levels at receivers R20, R21, R17, R18, R19, R16, R10, R9, R15, R11, R23, R1 (uninvolved), R1 (involved), R8, and R may be exceeded when the construction works are conducted within the development footprint. It is noted that construction noise levels at all receivers are predicted to be less than the highly noise affected (unoccupied) level of 75dB(A) for works in all locations. Section 5 outlines noise mitigation options to address these exceedances.

4.3 ROAD TRAFFIC NOISE ASSESSMENT

The main vehicle access to the subject site will be via Urana Road and Walla Walla Jindera Road in 3 locations. Emergency access to the site will be available from 2 locations on Klinberg Road and Ortlipp Road, however will not be used as general construction access. The proponent has advised that peak vehicle movements during the construction stage are presented in the following table.

Table 4-3 Summary of estimated construction traffic volumes during peak.

Vehicle type	Vehicles per day
Cars/light vehicles	100
Trucks/heavy vehicles	20

Table 4-4 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver[1]	Road	Criteria (dB(A))	Traffic movements	Speed (km/h)	Distance to road (m)	Predicted noise level (dB(A))	Comply? (Yes/No)
Urana Road							
58 (uninvolved)	Local	55	refer to Table 4-3	100	**90**	**60.6**	**No**
59 (uninvolved)					210	55.9	Yes[2]
38 (uninvolved)					230	55.4	Yes[2]
60 (uninvolved)					240	55.2	Yes[2]
1 (involved)					270	54.6	Yes
40 (uninvolved)					380	52.7	Yes
41 (uninvolved)					430	52.0	Yes
25 (uninvolved)					700	49.4	Yes
Walla Walla-Jindera Road							
42 (uninvolved)	Local	55	refer to Table 4-3	100	**72**	**56**	**No**
5 (uninvolved)					75	55.8	Yes[2]
4 (uninvolved)					125	53.0	Yes
3 (uninvolved)					130	52.7	Yes
20 (uninvolved)					140	52.3	Yes
21 (uninvolved)					140	52.3	Yes
43 (uninvolved)					175	51.1	Yes
44 (uninvolved)					272	48.7	Yes

Notes: 1. Receivers located closest to Urana Road and Walla Walla-Jindera Road were selected for the assessment.

2. The human ear is unable to perceive a 2 dB(A) difference in sound, therefore any exceedance less than 2 dB(A) would not result in an exceedance of the noise criteria.

From Table 4-4 it can be seen that road traffic noise level contributions from the additional movements associated with the construction works comply with the applicable noise criteria at all receivers except for receiver 58 and 42. With the implementation of additional mitigation measures, receiver 58 and 42 are considered not to be 'highly noise affected'.

5 NOISE MITIGATION MEASURES

This section summarises noise mitigation measures that can provide feasible and reasonable controls to reduce noise impacts at sensitive receivers. Specifically, these measures should be applied for works that are closest to the receivers that are predicted to experience noise exceedances, including:

- 20 (uninvolved)
- 21 (uninvolved)
- 17 (uninvolved)
- 18 (uninvolved)
- 19 (unoccupied)
- 16 (uninvolved)
- 10 (unoccupied)
- 9 (uninvolved)
- 15 (uninvolved)
- 11 (unoccupied)
- 23 (uninvolved)
- 1 (uninvolved)
- 1 (involved)
- 8 (uninvolved)
- 12 (unoccupied)

5.1 PHYSICAL NOISE CONTROLS

For specific activities, the physical noise controls set out in
Table 5-1 would be investigated where exceedances are predicted.

Table 5-1 Relative effectiveness of various forms of noise control, dB(A).

Noise control method	Practical examples	Typical noise reduction possible in practice	Maximum noise reduction possible in practice
		AS2436	AS2436
Distance	Doubling of distance between source and receiver	6	6
Screening	Acoustics barriers such as earth mounds, temporary or permanent noise barriers	5 to 10	15
Acoustic enclosures	Engine casing lagged with insulation and plywood	15 to 25	50
Engine silencing	Residential class mufflers	5 to 10	20

5.2 GENERAL MINIMISATION MEASURES

In addition to physical noise controls, the following mitigation measures as outlined in the EIS should be followed:

- Works should be undertaken during standard working hours only. (Except for the connection to substation)
    - Monday – Friday 7am to 6pm.
    - Saturday 8am to 1pm.
    - No work on Sundays or public holidays.
- A Construction Noise and Vibration Management Plan (NVMP) would generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009). The CNVMP would include the following:
    - Acoustics-Description and Measurement of Environmental Noise-General Procedures.
    - Noise measurements would be consistent with the procedures documented in AS1055.1-1997 Acoustics-Description and Measurement of Environmental Noise-General Procedures.
    - Vibration measurements would be undertaken in accordance with the procedures documented in the OEH's Assessing Vibration-a technical guideline (2006) and BS7385 Part 2-1993 Evaluation and measurement for vibration in buildings.
    - valuation and measurement for vibration in buildings.
- Operate plant in a conservative manner, which includes:
    - Selection of the quietest suitable machinery.
    - Avoidance of noisy plant working simultaneously where practical.
    - Turning off plant and equipment that is not being used.
    - Utilise broadband reverse alarm in lieu of high frequency type.
- All staff on-site should be informed of procedures to operate plant and equipment in a quiet and efficient manner. Provide toolbox meetings, training and education.
- A letter box drop would be prepared and provided to residences in close proximity to the works (within 1 km). The letter would contain details of the proposed works including timing, duration, expected impacts and a contact person for any enquiries or complaints.
- For Sensitive Receiver 20, 21, 17, 18, 19, 16 and 10:
    - Specific consultation at least 2 weeks prior to the commencement of highly noise affecting works would be undertaken. This aim of this consultation is to identify any management measures required to minimise impact at this receiver.
    - Verification of noise and vibration levels following reasonable complaints should be undertaken within a period of 14 days from the commencement of construction activities.
    - The residences would be provided a contact person for any enquiries or complaints.
- For other residences and other noise sensitive receptors likely to be noise affected (within 550 m) of the proposed work:
    - The residence would be provided a contact person for any enquiries or complaints.
    - Receive a written notification letter which may consist of the details of the proposed works, anticipated noise impacts, and the time periods over which these will occur at least two weeks prior to the commencement of construction works.

  - Verification of noise and vibration levels following reasonable complaints should be undertaken within a period of 14 days from the commencement of construction activities.
- Regular inspection and maintenance of equipment to ensure that plant is in good condition.
- Complete a one-off noise validation monitoring assessment to quantify emissions and confirm emissions meet relevant criteria.
- Scheduling of activities to minimise the number of work fronts and simultaneous activities occurring within 200m of the project boundary to minimise noise levels.
- Where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver (within 200m) including areas in constant or regular use (e.g. unloading and laydown areas).
- Where noise level exceedances cannot be avoided, then time restrictions and/or providing periods of repose for residents must be considered where feasible and reasonable. That is, daily periods of respite from noisy activities may also be scheduled for building occupants during construction hours.
- Some items of plant may exceed noise limits even after noise treatment is applied. To reduce the overall noise impact, the use of noisy plant may be restricted to within certain time periods, where feasible and reasonable. Allowing the construction activities to proceed, despite the noise exceedance may be the preferred method in order to complete the works expeditiously.

5.3 ADDITIONAL MINIMISATION MEASURES

For uninvolved receivers 58 and 42, the following measures should be followed to minimise impacts associated with road traffic noise:

- Scheduling of vehicle movements and deliveries of major components outside peak traffic hours.
- Driver awareness; ensure drivers avoid the use of engine compression brakes in vicinity of sensitive receivers.
- Consultation with affected receivers should occur prior to the commencement of haulage. The aim of this consultation is to discuss the details of the proposed works, anticipated noise impacts, and the time periods over which these will occur and to identify any management measures required to minimise impact at this receiver.

5.4 TIMING RESTRICTIONS

Where noise level exceedances cannot be avoided, then consideration may be given to implementing time restrictions and/or providing periods of respite for residents, where feasible and reasonable. That is, daily periods of respite from noisy activities may also be scheduled for building occupants during construction hours.

Some items of plant may exceed noise limits even after noise treatment is applied. To reduce the overall noise impact, the use of noisy plant may be restricted to within certain time periods, where feasible and reasonable and to be negotiated with Council and the residents. Allowing the construction activities to proceed, despite the noise exceedance may be the preferred method in order to complete the works expeditiously.

6 COMPLIANCE MANAGEMENT

6.1 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.

Regular onsite inspections to identify:

- Equipment has quality 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.

6.2 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 proponent would:

- Take direct actions to develop good relations with people living and working in the vicinity of a construction site at the beginning of a project and this would be maintained throughout the project, as this is of paramount importance.
- Keep people living and working in the vicinity of the construction site informed of progress.
- Appoint a person to liaise with the community who is adequately trained and experienced in such matters.

The complaints resolution process should be implemented as follows:

- Establish a complaints mechanism for the community, via either telephone or email.
- Take all complaints seriously and deal with them expeditiously.
- Assess whether the issue can be resolved easily and take immediate action if possible.
- If not, ensure that the appropriate consultation has been undertaken for the activity.
- Ensure the on-site inspections required have been carried out regularly for the activity.
- Assess the construction site and activities to determine whether there is any reason to believe the noise exposure of receivers is higher than anticipated.
- Undertake monitoring of noise levels with the aim of establishing if the exposure of receivers is higher than anticipated by the NMP.

- Take remedial action if exceedances have been found.
- Advise complainant of action taken.
- Maintain a record of the above to enable review by an independent authority such as EPA.

7 CONCLUSION

NGH Environmental (2019) completed an environmental noise and vibration assessment of the proposed Jindera Solar Farm. Noise emissions from the construction phase of the proposal were predicted to exceed the construction noise management levels at fourteen receivers.

Feasible and reasonable noise control solutions to reduce noise impacts to sensitive receivers are included in this NMP.

The NMP provides a framework document that the construction contractor can use to develop and implement action plans for each individual construction activities to minimise the impact of noise emissions. It has been prepared in advance of the detailed design, to demonstrate the framework for noise management during construction and would be updated prior to implementation.

8 REFERENCES

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