



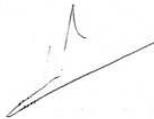
NEOEN Solar Farm Project

Noise and Vibration Management Plan

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Prepared By:
David Glossop
Senior Environment and
Sustainability Coordinator



Reviewed by:
Philippe NGUYEN
Senior project Manager



Approved By:
Marie Chuet
Project Director

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1 INTRODUCTION

1.1 Purpose

The purpose of this Noise and Vibration Management Plan (NVMP) is to comply with the legislative requirements, and to make sure noise and vibration impacts are assessed prior to work commencement, mitigated, and controlled during the works.

This Noise and Vibration Management Plan shall be read in conjunction with the *PL-EV-01 Environmental Management Plan*.

1.2 Document Responsibilities

Responsibility	Role
Development	Environmental Manager
Review	Project Manager
Approval	Project Director

Any person may request updating of this Plan.

1.3 Document Amendment and Distribution

This document shall be reviewed as follows:

- As requested by Management Review
- When there is a change of method and/or technology that may affect the accuracy of this document; or
- When there has been a significant event to which this document was relevant; or
- As a result of a non-conformance resulting from an audit

Document amendments and distribution will be conducted as per detailed in the *PL-CO-01 Project Management Plan and the PL-QA-02 Records Management Plan*.

New and amended documentation issued after the initial approval and distribution of this plan to controlled copy holders shall be identified in the *FS-QA-RG-06 Document Control Register*. Revision details shall be recorded in the *Revision Status Section* of this plan.

All changes to documents shall be reviewed and approved by the same function that performed the original review and approval and as per the cover of this plan, unless specifically designated otherwise.

1.3.1 Revision Status

Revision	Revision Date	Issued Date	Nature of modification
0	2017/01/11	YYYY/MM/DD	Issued to Tender
1	YYYY/MM/DD	YYYY/MM/DD	Contract Award revision
2			
3			
4			
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2 DEFINITIONS

BYCA	Bouygues Construction Australia Pty Ltd
EMP	Environmental Management Plan (PL-EV-01)
NVMP	Noise and Vibration Management Plan (PL-EV-006)

3 ORGANISATION

3.1 Responsibilities and Authorities

The Project Organisational chart and overall roles and responsibilities are outlined in the EMP. The key responsibilities for Noise and Vibration Management are as follows:

3.1.1 Project Manager

- Ensuring appropriate resources are available for the implementation of the NVMP

3.1.2 HSE Coordinator

- Responsible for providing assistance and advice to the Project Engineers and Environmental Coordinators to fulfil the requirements of this Plan, assessing data from inspections, monitoring and reporting, and providing project-wide advice to ensure consistent approach and outcomes are achieved
- Responsible for providing necessary training for project personnel to minimise noise and vibration
- The HSE Coordinator is also responsible for the review and update of this Plan

3.1.3 General Superintendent

- Responsible for reviewing the NVMP to ensure it is consistent with requirements to reduce risk by establishing and maintaining adequate control measures
- Identifying, analysing and treating the risks before commencing works each day and ensuring that the appropriate controls are implemented and effective; thus controls may be increased or decreased as required
- Ensuring all flora and fauna controls are implemented and effective in controlling impacts

3.1.4 All Workers on Site

In relation to Noise and Vibration management, all workers on site are required to:

- Implement and maintain all applicable control measures
- Report any potential and/or actual incidence of noise/vibration

3.2 Legal Requirements

The following Acts, Regulations and Standards are applicable to this Project:

- Protection of the Environment Operations Act 1997 (POEO Act)
- POEO (Noise Control) Regulation 2008
- NSW Industrial Noise Policy (INP) (EPA, 2000)

- NSW *Interim Construction Noise Guideline* (ICNG; DECC, 2009)
- *Assessing Vibration: A Technical Guideline* (DECC, 2006)
- NSW 'Road Noise Policy' (RNP)

3.3 Contractual Requirements

BYCA have identified the most critical Environmental Contractual requirements for the project, these are:

Parkes & Griffith

The Applicant shall minimise the noise generated by any construction, upgrading or decommissioning activities on site in accordance with the best practice requirements outlined in the *Interim Construction Noise Guideline* (DECC, 2009), or its latest version.

Narromine

Operating noise emission levels from the site are to comply with the EPA's NSW Industrial Noise Policy.

South Keswick

Noise from the development (LAeq) shall not exceed the background (LA90) by more than 5dB(A) at any time including any allowance for impulsiveness and tonal characteristics, when measured at the most affected residence.

Offensive noise as defined under the Protection of the Environment Operations Act 1997 shall not be emitted from the proposed development.

4 COMPETENCE, TRAINING AND AWARENESS

As stated in the EMP all project personnel, subcontractors and consultants will receive training in the group and personal environmental obligations during the *Site Inductions* and *Toolbox Talks*. From time-to-time staff may also attend specific training sessions, when necessary, by the Environmental Manager.

Examples of topics that will be covered during project induction and toolboxes include:

- Working Hours
- Noise and vibration sensitive areas
- Importance of minimizing noise and appropriate behavioural practices i.e. no swearing or unnecessary shouting or loud stereos/radios on site

5 NOISE AND VIBRATION MANAGEMENT

5.1 Objectives

5.1.1 Noise and Vibration

The environmental objectives with regards to noise and vibration management during the construction phase are:

- Minimisation and management of noise generation from the Project area
- Minimisation of the impact of noise emissions on environmental values or the health, welfare and amenity of the population

- Compliance of noise emissions, both individually and cumulatively, with relevant statutory requirements
- Incorporation of measures for minimising noise emissions during construction and operation in design and procurement activities
- Undertake all reasonable and practicable measures during construction and operations to minimise noise emissions

5.2 **Potential Environmental Impacts**

5.2.1 **Noise and Vibration**

The potential noise and vibration impact of the Project during the construction phase is:

- Vehicle and machinery operation, including excavators, drilling equipment, pile drivers and other equipment which may cause an increase in localised noise and vibration concerns to neighbouring properties (residential, commercial and recreational), terrestrial and aquatic fauna, flora and heritage artefacts.

5.3 **Management and Contingency Mitigation Measures**

The following Noise and Vibration Management measures will be implemented:

- This NVMP will be implemented, revised and updated as required
- Report immediately to relevant authorities any noise or vibration incident, as per the *PR-CO-04 Incident Management Procedure*
- Regular inspection of the works to ensure procedures and precautions are in place to minimise risk to human health and the environment
- The development of a contingency response if monitoring indicates a risk to sensitive receptors or human health
- All construction work will be carried out in accordance with the control of environmental noise practices set out in *Interim Construction Noise Guideline* (DECC, 2009) and EPA's NSW Industrial Noise Policy.
- All construction work will be carried out:
 - **Monday to Friday – 7am to 6pm**
 - **Saturday: 8am to 1pm**
 - **Sunday and public holidays: No construction work permitted**
- The following construction, upgrading or decommissioning activities may be undertaken outside these hours without the approval of the Secretary (Parkes and Griffith only):
 - the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons; or
 - emergency work to avoid the loss of life, property and/or material harm to the environment.
- All nearby occupants must be advised at least 24 hours before construction work commences
- The necessity of work to be done out of hours must be justified by BYCA and is subject to approval by the Department of Planning and Environment and the relevant Council.
- All 'warm-up' of equipment by employees and contractors arriving early to site will not be carried out outside of approved construction hours
- White noise reversing beeper tones will be used in vehicles operating outside of normal hours of work, where practicable

- All equipment, machines and vehicles onsite during construction will be the quietest reasonable available consistent with operational requirements, and will be routinely maintained to ensure effectiveness of noise suppression systems and equipment
- Undertaking noise monitoring to determine the compliance status during construction as a basis for adaption of construction practices as/if appropriate
- All personnel will be educated on the importance of noise management and their responsibilities during construction as part of the induction program
- Establish good relations with people living in the vicinity of the site at the beginning of project and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously.
- Any noise related complaints received during construction will be registered and trigger review of the relevant operational/management procedures by HSE Coordinator as a basis for development and implementation of appropriate modified practices

The success of management strategies will be reviewed on a regular basis to confirm its continued suitability for the site. Should the risk to the environment or to human health change during the construction period, management options will be reviewed.

6 IDENTIFY AND ASSESS

6.1 Noise

6.1.1 “A” Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an “A-weighting” filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. See the table below:

Table 1 - Examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	

40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Unoccupied recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A weighting. Sound Levels measured without any weighting are referred to as “linear”, and the units are expressed as dB(lin) or dB.

6.1.2 Maximum levels for plant and equipment

All plant and equipment used for construction must have operating Sound Power or Sound Pressure Levels less than or equal to those in Table below. For construction equipment not listed in Table below, reference should be made to the typical noise levels in Australian Standard AS 2436-1981, British Standard BS 5228-1 or DEFRA noise database (2006).

The maximum noise levels in Table below can also be used as a guide in the prediction of LAeq(15minute) construction noise. In doing so, the predicted LAeq(15minute) noise levels will be dependent on several factors including, but not limited to the duration of the construction activities, the number of plant items and their location on site in relation to the nearest receivers.

Table 2 - Maximum allowable noise levels for construction equipment

Equipment	Maximum Allowable Noise Level (dBA) – L _{Amax} 1,2,3	
	Sound Power Level	Sound Pressure Level at 7 m
Excavator Hammer	122	97
Excavator (approx. 3 tonne)	90	65
Excavator (approx. 6 tonne)	95	70
Excavator (approx. 10 tonne)	100	75
Excavator (approx. 20 tonne)	105	80
Excavator (approx. 30 tonne)	110	85
Excavator (approx. 40 tonne)	115	90
Skidsteer Loaders (approx. 1/2 tonne)	107	82
Skidsteer Loaders (approx. 1 tonne)	110	85
Dozer (equiv. CAT D8)	118	93
Dozer (equiv. CAT D9)	120	95
Dozer (equiv. CAT D10)	121	96
Backhoe/FE Loader	111	86
Dump Truck (approx. 15 tonne)	108	83
Concrete Truck	112	87
Concrete Pump	109	84
Concrete Vibrator	105	80
Bored Piling Rig	110	85
Scraper	110	85
Grader	110	85
Vibratory Roller (approx. 10 tonne)	114	89
Vibratory Pile Driver	121	96
Impact Piling Rig	134	109
Compressor (approx. 600 CFM)	100	75
Compressor (approx. 1500 CFM)	105	80
Concrete Saw	118	93
Jackhammer	113	88
Generator	104	79
Lighting Tower	80	55

Flood Lights	90	65
Cherry Picker	102	77
Mobile Crane	110	85

- Notes:
1. The Sound Power Level (SWL) represents the total noise output of the plant of equipment. The SWL is normally used in computer noise models to predict the Sound Pressure Levels (SPLs) at nearby receivers. When undertaking site compliance measurements, it is normally the SPL that is measured at a specified distance (typically 7m) from the plant or equipment.
 2. The SWLs presented in the above table have been compiled from a selection of field measurements conducted by SLR Consulting (formerly Heggies Pty Ltd) between 2004 and 2006 of plant and equipment operating on construction projects throughout NSW and are therefore considered to be representative of plant and equipment SWLs which are readily achieved by current plant and equipment normally used in the construction industry.
 3. Plant and equipment with SWLs higher than those presented in the table would be deemed to be emitting an excessive level of noise and should not be permitted to operate on construction sites..

6.2 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of “peak” velocity or “rms” velocity. The common units for velocity are millimetres per second (mm/s).

People are able to “feel” vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as “normal” in a car, bus or train is considerably higher than what is perceived as “normal” in a shop, office or dwelling.

6.3 Noise and Vibration Sensitive Areas

The following sensitive areas have been found around the Project site:

- No sensitive receptors have been identified across the four sites, however it is recommended that for construction works at Griffith within approximately 400 m of Receivers R1 and R2 (R1 – 751 Hamilton Road, Yoogali & R2 – Lot 1 Poletta Road, Yoogali) manage potential noise impacts via discussions/ agreements with residents. Consider time restrictions and providing periods of repose for residents, where feasible.

7 IMPLEMENT CONTROLS

7.1 Noise and Vibration Management Control Measures

Project mitigation and management measures for noise and vibration impacts during construction are outlined in the table below:

Table 3 – Noise and Vibration Mitigation Measures

Mitigation Measure	Responsibility	Timing	Records
Plant and equipment to be properly maintained	General Superintendent	During Construction	FS-EV-AT-01 Environmental Inspection
Avoid unnecessary noise when carrying out manual operations and when operating plant	General Superintendent	During Construction	FS-EV-AT-01 Environmental Inspection

Switch of any equipment not in use for extended periods	General Superintendent	During Construction	FS-EV-AT-01 Environmental Inspection
Works will be undertaken in accordance with the working hours outlined in section 5.3	General Superintendent	During Construction	FS-EV-AT-01 Environmental Inspection
Where practical, all vehicular movements to and from the construction and renovation site must be made only during normal working hours	General Superintendent	During Construction	FS-EV-AT-01 Environmental Inspection
Where practical, machines would be operated at low speed or power and would be switched off when not being used rather than left idling for prolonged periods	General Superintendent	During Construction	FS-EV-AT-01 Environmental Inspection
Prior to construction work being undertaken all personnel involved in undertaking that work receive environmental induction training.	HSE coordinator/ General Superintendent	Prior to/During Construction	FS-HS-RG-14 Project Site Induction Register

8 INSPECT AND TEST

8.1 *Monitoring, Inspection and Reporting*

Daily visual inspections of the construction site will be undertaken by the HSE coordinator and construction personnel to identify any potential noise and vibration management issues. Any actions to be undertaken as a result of site inspections will be recorded in the *FS-QA-RG-02 Corrective & Preventative Actions Register*.

All inspections will be conducted as per the *PL-EV-01 Environmental Management Plan*.

The noise impact assessments carried out at each of the four sites indicated there would be no exceedances of the applicable noise management levels; therefore construction noise monitoring will only be undertaken in response to complaints where this is considered appropriate.

9 RECORDS

A record shall be maintained as per *PR-QA-01 Document Control and Record Management Procedure*.