Hunter Power Project

Construction Noise and Vibration Management Plan

| Amended Final v3

15 February 2022

Hunter Power Project

Project No:	IS354500
Document Title:	Construction Noise and Vibration Management Plan
Revision:	Amended Final
Date:	15 February 2022
Client Name:	Snowy Hydro Limited
Project Manager:	Karl Ivanusic
Author:	Sean Brennan
File Name:	Hunter Power Project_Construction Noise and Vibration Management Plan_Final

Jacobs Group (Australia) Pty Limited
ABN 37 001 024 095
ABN 37 001 024 095
Level 4, 12 Stewart Avenue
Newcastle West NSW 2302 Australia
PO Box 2147 Dangar NSW 2309 Australia
+61 2 4979 2600
+61 2 4979 2666
www.jacobs.com

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
Final	20 December 2021	Final	S Brennan	P Horn	M Luger	K Ivanusic
Amended Final	28 December 2021	Final	S Brennan	I Smith	M Luger	K Ivanusic
Amended Final v2	24 January 2022	Final	S Brennan	I Smith	M Luger	K Ivanusic
Amended Final v3	15 February 2022	Final	S Brennan	I Smith	M Luger	K Ivanusic

Contents

List of figures

List of tables

Glossary of terms

Term	Definition
Decibel (dB)	A measure of sound level. The decibel is a logarithmic way of describing a ratio. The ratio may be power, sound pressure, voltage, intensity or other parameters. In the case of sound pressure, it is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure squared to a reference sound pressure squared
EPA Regulation	Environmental Planning and Assessment Regulation 2000
Feasible and reasonable	Consideration of best practice considering the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, considering mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements
Mitigation	Action to reduce the severity of an impact
The Project	The Hunter Power Project; formerly referred to as the Kurri Kurri Power Station Project
Project Site	The area of land that is directly impacted on by a development, including access roads, and areas used to store construction material
Proponent	Snowy Hydro Limited
Rating Background Level (RBL)	The overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level)
Receiver	The noise-sensitive land use at which noise from a development can be heard
Secretary	Planning Secretary under the EP&A Act, or nominee
Secretary's Approval	A written approval from the Planning Secretary and/or delegate
Sensitive receptor	A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area (EPA 2016)
Significant	Greater than 20% concentration value difference between impact site and reference site

Abbreviations

Abbreviation	Definition
CEMS	Construction Environmental Management Strategy
CNVIS	Construction Noise and Vibration Impact Statement
dB(A)	Decibels using the A-weighted scale measured according to the frequency of the human ear
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Assessment
EPA	NSW Environment Protection Authority
EPL	Environmental Protection Licence
ICNG	NSW Interim Construction Noise Guideline
L_{A90}	The sound pressure level that is exceeded for 90% of the given measurement period
$L_{Aeq\ (15min)}$	The A-weighted equivalent continuous (energy average) sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community
$L_{Aeq\ (9hour)}$	The A-weighted equivalent continuous (energy average) sound pressure level of the construction works under consideration over a 9-hour period and excludes other noise sources such as from industry, road, rail and the community
L_{Amax}	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter
LEP	Local Environmental Plan
NML	Noise Management Level
NVMP	(Construction) Noise and Vibration Management Plan (this Plan)
NPI	Noise Policy for Industry
OOHW	Out of Hours Work
SWL	Sound Power Level

1. Introduction

1.1 Context

This Construction Noise and Vibration Management Plan (NVMP) has been developed to address Infrastructure Approval Condition C1(e)(ii) issued for the Hunter Power Project ('Project') by the Planning Secretary (Secretary) of the NSW Department of Planning, Industry and Environment (DPIE). All relevant conditions are outlined below.

Table 1-1: Infrastructure Approval conditions

Condition	Requirement	NVMP Reference
C1	Prior to commencing construction, the Proponent must prepare an Environmental Management Strategy for the development to the satisfaction of the Secretary. This Strategy must: (e) include: (i) the following sub-plans: ▪ Construction noise management plan prepared in consultation with the EPA.	Sections 4.3, 6.2 and 7.2
B30	**Hours of Construction** All construction work at the premises must be conducted between 7 am and 6 pm Monday to Friday and between 8 am and 1 pm Saturdays and at no time on Sundays and public holidays.	Section 1.2.3 and 4.2
B31	**Exceptions to Construction Hours** The following activities may be carried out outside the recommended construction hours: (a) construction that causes LAeq(15minute) noise levels that are: (i) no more than 5 dB above Rating Background Level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and (ii) no more than the Noise Management Levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses; or (b) for the delivery of materials required by the police or other authorities for safety reasons; or (c) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; or (d) as approved through the process outlined in condition B32 of this approval.	Section 1.2.3 and 4.2
B32	**Variation of Construction Hours** The hours of construction activities specified under condition B30 of this approval may be varied with the prior written approval of the Secretary. Any request to alter the hours of construction shall be: (a) considered on a case-by-case or activity-specific basis; (b) accompanied by details of the nature and justification for activities to be conducted during the varied construction hours; (c) accompanied by written evidence that appropriate consultation with potentially affected sensitive receivers and notification of	Section 1.2.3, 4.2 and 6.6

	relevant Council(s) (and other relevant agencies) has been and will be undertaken; (d) all feasible and reasonable noise mitigation measures have been put in place; and (e) accompanied by a noise impact assessment consistent with the requirements of the Interim Construction Noise Guideline (DECCW, 2009), or latest version.	

1.1.1 Purpose

The purpose of this NVMP is to provide details on the framework of mitigation and management measures proposed to address potential noise and vibration impact resulting from the construction of the Project.

1.1.2 Scope

This NVMP has been developed to address the construction works specifically occurring in relation to the Project under the Infrastructure Approval conditions provided by the NSW DPIE to fulfil the requirements of the approval.

1.1.3 Objectives

The NVMP has been prepared to ensure that all conditions, management and mitigation measures detailed in the Environmental Impact Statement and Response to Submissions reports and all other licence and permit requirements have been adequately described, assigned and scheduled. The documents with requirements that have been addressed include:

- The Environmental Impact Statement (EIS) prepared for the Hunter Power Project (Jacobs, 2021a)
- The Response to Submissions Report prepared for the Hunter Power Project (Jacobs, 2021b)
- Infrastructure Approval conditions
- Environment Protection Licence (EPL) 21627.

1.1.4 Goals and targets

The following goals and targets have been established to guide the management of noise and vibration impacts from the construction of the project:

- Compliance with all conditions, EPL requirements (refer Appendix 2) and all other regulatory requirements
- Consideration of all mitigation measures detailed in the EIS and Response to Submissions reports
- Ensure training and inductions pertaining to noise and vibration management are provided to all staff working on site prior to starting work
- Assure all noise and vibration impacts are adopted in an efficient manner
- Produce no exceedances of relevant noise limits

1.1.5 Project location

The Project Site address is 73 Dickson Road, Loxford. Access to the property is via Hart Road and the property is approximately 1.0 kilometre (km) from the M15 Hunter Expressway as shown in Figure 1-1 and Figure 1-2. The Project Site is shown in Figure 1-3.

The Project Site will be part of an Industrial Estate development. The planning proposal, currently under consideration by Cessnock City Council and the NSW DPIE, would rezone the Project Site as Heavy Industrial. The

Project Site and its surrounds are currently zoned RU2 Rural Landscape under the Cessnock Local Environmental Plan 2011 (Cessnock LEP), with small pockets of surrounding land zoned E2 Environmental Conservation.

1.1.6 Access

The Project Site is accessed off Hart Road, which is adequate for construction and operation activities. During construction and operation, all vehicular access to the Project Site, including heavy vehicles would be via the Hunter Expressway and Hart Road. Parking for staff will be provided on-site.

Refer to Appendix 1 (which includes figures and information provided in the Traffic Management Plan)for further detail on construction access and workforce parking, reiterated from the Traffic Management Plan.

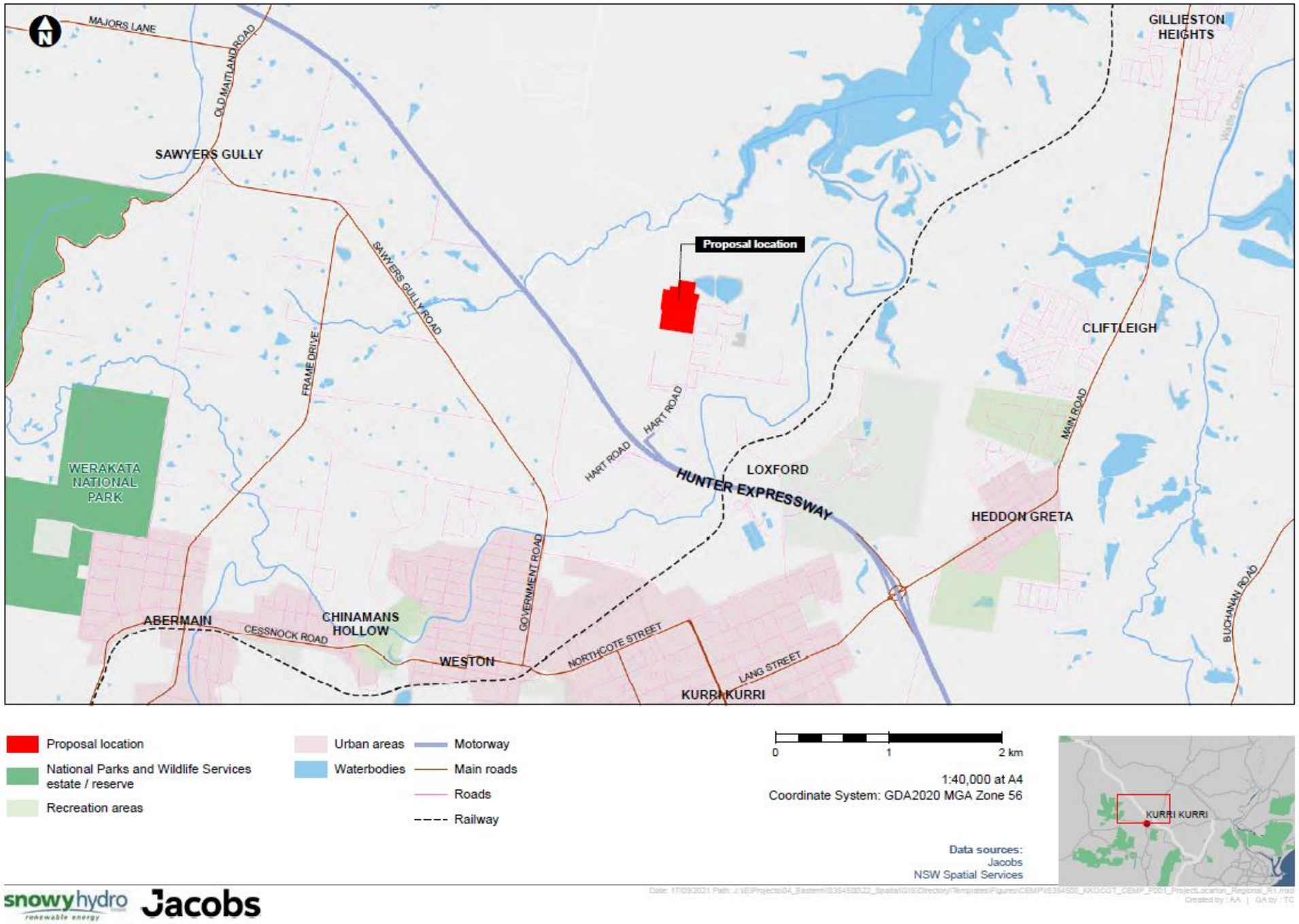


Figure 1-1: Project Location (regional)

Figure 1-2: Project Location (local)

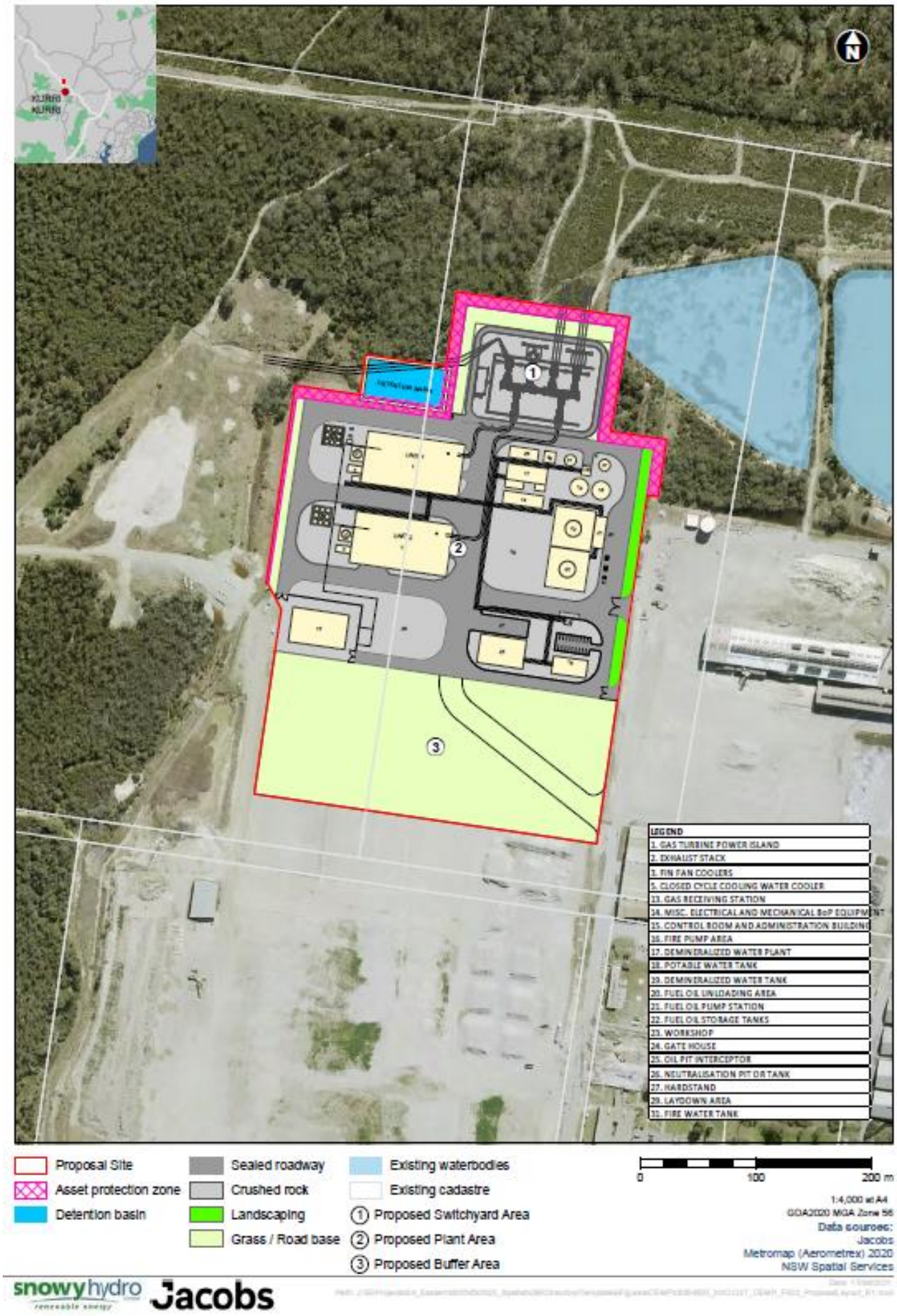


Figure 1-3: Site layout

1.2 Project construction

1.2.1 Works within construction scope

The key construction activities for the Project are summarised in Table 1-2 and are covered under the Construction Environmental Management Strategy (CEMS) unless noted otherwise. Preliminary work and pre-construction activities that are not considered construction include road dilapidation surveys, installation of fencing, and geotechnical drilling and/or surveying.

Table 1-2: Construction activity summary

Construction stage	Construction activity per program	Activity details
Pre-construction/ site establishment	Site access, civil works, and road construction to establish site	▪ Installation of environmental controls, which may include: temporary sheds, amenities, fencing, erosion and sediment controls, laydown/stockpiling areas, site surveys and, initial internal road building

Construction stage	Construction activity per program	Activity details
		▪ Construction of reinforced concrete pavement to support heavy vehicles (up to B-double size) ▪ Internal road layout design to account for turning paths of large vehicles, cranes, and articulated vehicles, so that movements in and out can be made in a forward direction ▪ Roadworks and hardstand areas to be constructed for car parking, delivery/laydown areas ▪ Where required, bunded areas for delivery, handling, and storage of fuel and other hazardous material would be constructed
Construction	Switchyard site preparation	▪ Clearing of vegetation
Site establishment and construction	Earthworks to prepare the Project Site and construction areas	▪ Initial site clearing and grading works. Earthworks may involve small amounts of cut and fill to achieve the necessary design levels across the site ▪ Trenching for underground utilities and services would be installed such as stormwater, water and sewer reticulation, electrical cables, and (internal) gas pipes between the gas receiving station and the gas turbine locations ▪ Preparation and construction of foundations. Deep piling is expected to support the heaviest infrastructure such as the gas turbines, generator and the main step-up transformers while shallower piling or pad type foundations would underpin the foundations where the proposed surface loads are less (e.g. site office/administration buildings, car park). Final numbers and depth of foundation piles will be subject to detailed design, as is the piling method (i.e. bored; driven; vibration piling) ▪ Reinforced concrete slabs would be constructed in certain pavement areas, with other areas being surfaced with crushed rock or other suitable materials
Construction	Balance of plant, switchyard construction, & turbine installation	▪ Installation of major plant items associated with the gas turbines including all above ground civil, mechanical, electrical plant equipment ▪ Installation of electrical switchyard
Commissioning	Commissioning and testing (excluded from construction scope)	▪ Program of testing and certification of all Project components, systems, and processes to demonstrate the Project can operate to the required standards before commencing operation
Post-construction/demobilisation	Demobilisation	▪ Removal of construction equipment, site fencing and construction compounds ▪ Installation and establishment of landscaping.

1.2.2 Construction program

The initial phase of construction to prepare the site and install environmental controls is expected to commence in early 2022 pending the acquisition of all approvals. An indicative program for construction is shown in Figure 1-4.

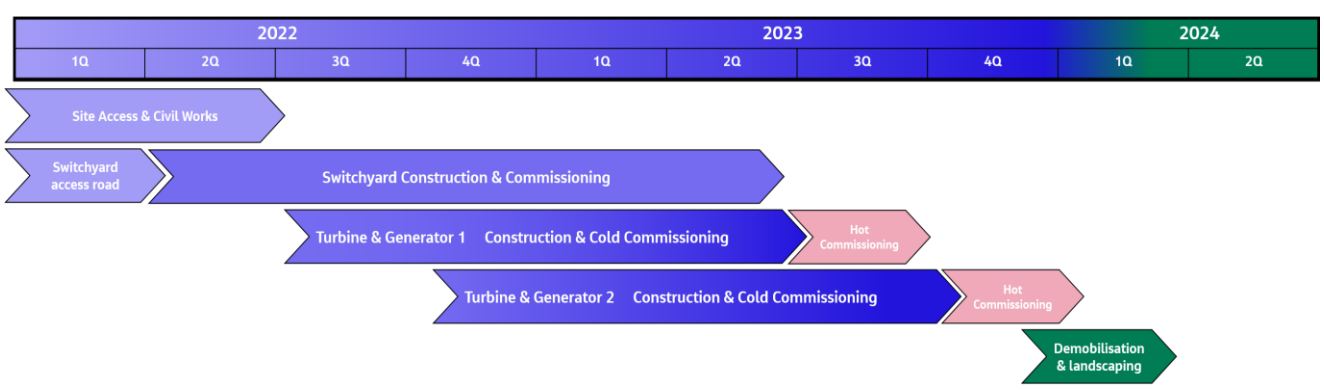


Figure 1-4: Construction program

1.2.3 Construction hours and workforce

All construction work will be undertaken during standard construction hours, which are defined as:

- 7:00am to 6:00 pm Monday to Friday, inclusive
- 8:00 am to 1:00 pm on Saturday
- At no time on Sunday or Public Holidays.

Exceptions to conducting construction activities outside of these hours may occur for the following activities in accordance with the Infrastructure Approval Condition B31:

- Activities that cause noise levels LAeg(15min) no more than 5 decibels (dB) above Rating Background Level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and no more than the Noise Management Levels (NMLs) specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses
- For the delivery of material required by the police or other authorities for safety reasons
- Where it is required in an emergency to avoid the loss of lives, property, and/or to prevent environmental harm
- As approved with prior written approval of the Secretary, outlined Condition B32.

2. Existing environment

The Project Site is located entirely within a former industrial area, on land formerly occupied by the Kurri Kurri aluminium smelter, which closed permanently in 2014 and is still undergoing demolition and remediation works.

Land use surrounding the Project Site is described as follows:

- To the west is Sawyers Gully, a suburb predominately comprised of farmland and sparsely distributed receivers. The suburb is adjacent to the Hunter Expressway, with a number of receivers in close proximity to the carriageway.
- To the southeast of the Project Site is Loxford
  - The western extent of Loxford, directly south of the Project Site comprises of sparsely distributed residential receivers with some industry, notably a pipe and manifold manufacturing facility. The Noise Catchment Area (NCA) is adjacent to both the Hunter Expressway and the Kurri Kurri Wastewater Treatment Works. Under the proposed rezoning, the northern and eastern sections of the NCA will be rezoned to General Industry while the southern section would be rezoned to Low Density Residential.
  - The eastern side of Loxford (to the southeast of the Project Site), comprises of sparsely distributed residential receivers with the nearby Kurri Kurri TAFE. Under the proposed zoning, the residential areas of this section of Loxford would be rezoned as Low Density Residential.
- Further east of Loxford is the township of Cliftleigh, which predominately features residential and commercial properties. The township also features a number of new and proposed residential developments.
- Northeast of the Project Site, the area of Gillieston North comprises isolated farmhouses and pasture
- Approximately 2 km south of the Project Site is an existing industrial area, and slightly further south is the township of Kurri Kurri which is predominately residential and commercial.

The surrounding land uses and noise sensitive receivers are detailed in Figure 2-1.

A summary of background noise levels is shown below in Table 1-1 which refers to the Noise Catchment Areas shown in Figure 2-2. Revised background noise monitoring was performed during a period of 14 days between the 29 June and 13 July 2021. This monitoring was performed in response to commentary from the Environmental Protection Authority and in addition to the background noise monitoring performed in December 2020 and January 2021. A monitoring location was selected to represent each of the NCAs. Monitoring was undertaken during the winter period in order to limit insect and other environmental noise to the greatest extent possible. It was noted that the evening period was louder than the day period at most noise monitoring locations, as a result of the noise controlling nature of traffic along the Hunter Expressway at NCA 1 and to a lesser extent NCA 2, as well as a result of frogs and other wildlife becoming more active (pertaining especially to NCAs 3, 4 and 5). In those cases, the criterion derived from these noise levels were adjusted to prevent the more sensitive time period from having a less noise sensitive criterion.

Monitor ID	NCA	Monitoring Location	Monitoring Duration	Measurement	Measured Noise Level – dB(A)		
					Day (7:00 am to 6:00 pm)	Evening (6:00 pm to 10:00 pm)	Night (10:00 pm to 7:00 am)
NM1	NCA 1	103 Bishops Bridge Rd, Sawyers Gully	29 June 2021 – 13 July 2021	L_{Aeq} (equivalent noise level)	55	57	53
				RBL (Background L_{A90})	45	45	36
NM2	NCA 2	10 Dawes Ave, Loxford	29 June 2021 – 13 July 2021	L_{Aeq} (equivalent noise level)	48	47	46
				RBL (Background L_{A90})	40	43	38
NM3	NCA 3	20 Bowditch Ave, Loxford	29 June 2021 – 13 July 2021	L_{Aeq} (equivalent noise level)	47	44	44
				RBL (Background L_{A90})	38	39	37
NM4	NCA 4	464 Cessnock Rd, Gillieston Heights	29 June 2021 – 13 July 2021	L_{Aeq} (equivalent noise level)	43*	38*	38*
				RBL (Background L_{A90})	29*	33*	30*
NM5	NCA 5	60 Metcalfe Lane, Sawyers Gully	29 June 2021 – 13 July 2021	L_{Aeq} (equivalent noise level)	45	46	42
				RBL (Background L_{A90})	37	41	35

Table 2-1: Background noise levels

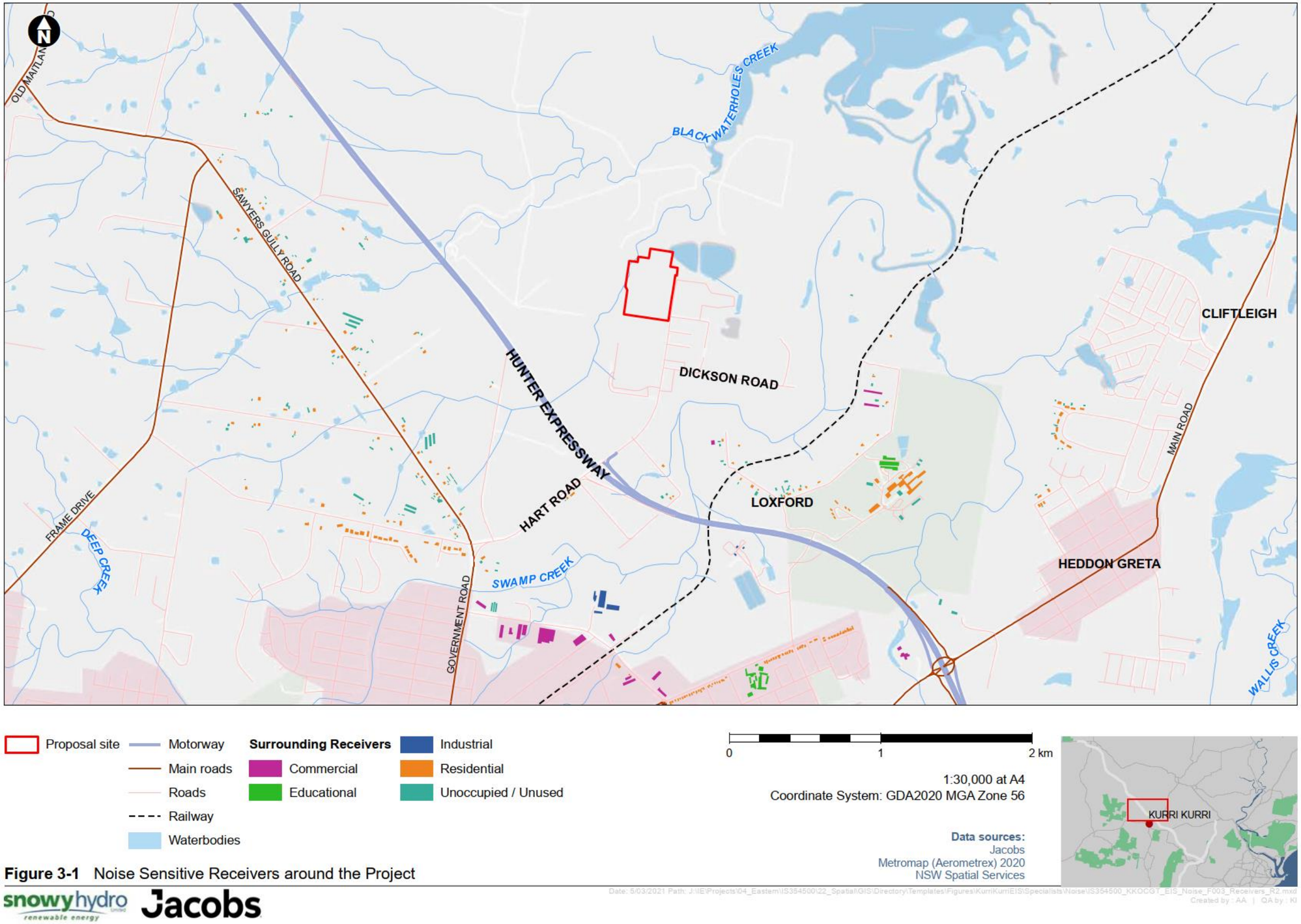


Figure 3-1 Noise Sensitive Receivers around the Project

Figure 2-1: Noise sensitive receivers around the Project Site

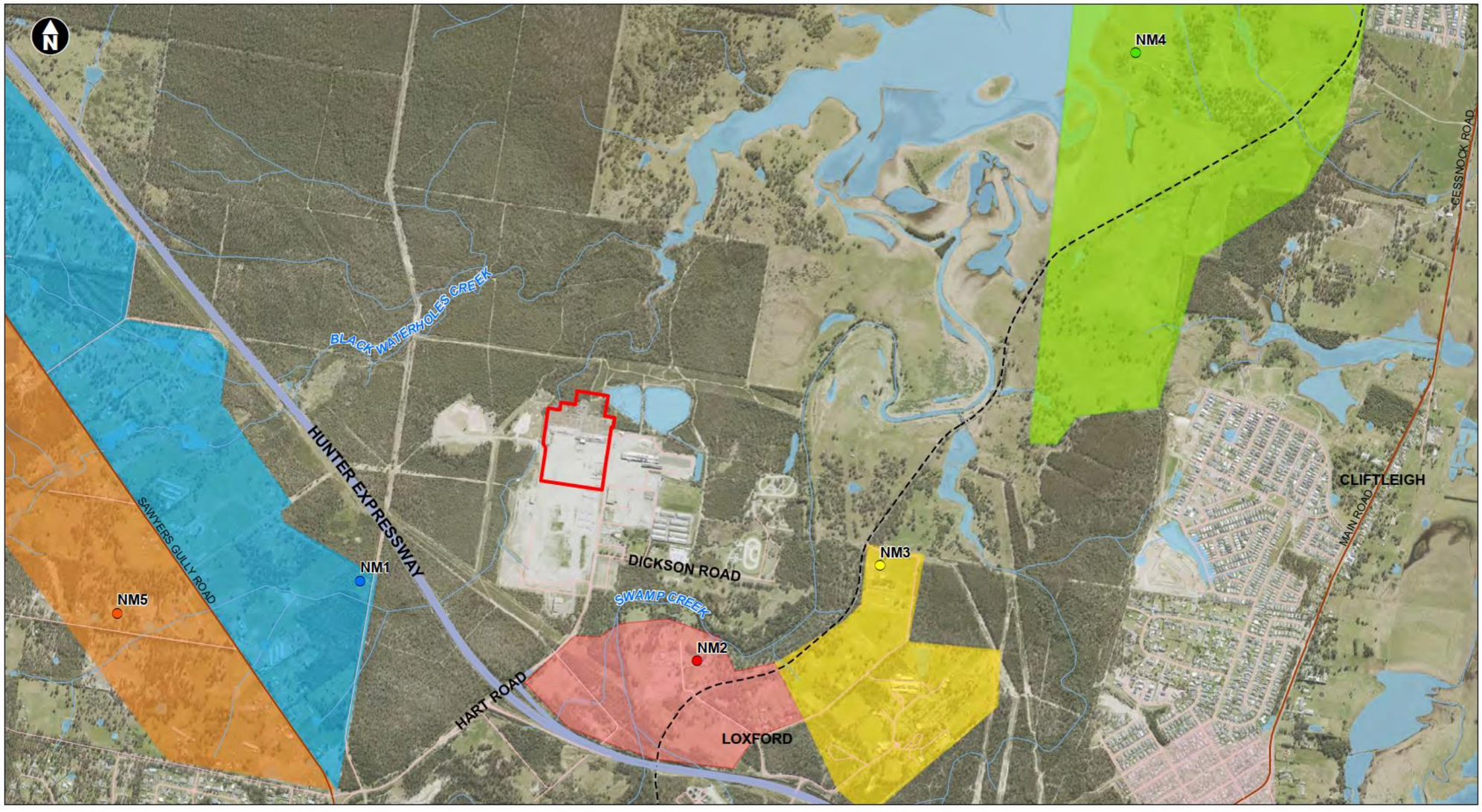


Figure 3-2 Noise Catchment Areas

Figure 2-2: Noise Catchment Areas

3. Legislative context

3.1 Relevant legislation

All legislation relevant to the NVMP is included in the CEMS.

3.2 Relevant guidelines

The main guidelines, standards and policies relevant to this NVMP include:

- NSW Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change, 2009)
- NSW Road Noise Policy (Department of Environment and Climate Change, 2011)
- NSW EPA Noise Policy for Industry 2017
- Assessing Vibration: a technical guideline (Department of Environment and Conservation, 2006)
- British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration
- British Standard BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting
- German Standard DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures

3.3 Infrastructure Approval conditions

The applicable Infrastructure Approval conditions relevant to the NVMP are listed in Table 1-1.

3.4 Environment Protection Licence (EPL)

3.5 EPL 21627 is included as an Appendix and contains the conditions administered by the NSW EPA for the Scheduled Development Work for the project and operational conditions.EIS commitment

Other environmental requirements established for construction noise in the EIS (Jacobs 2021a) have been detailed in Table 3-1.

Table 3-1: EIS commitment

EIS Mitigation Measure	Mitigation measure	Document Reference
NV1	A Construction Noise and Vibration Management Plan (NVMP) will be developed to manage noise during construction. This will include consideration of plant selection, construction hours, plant maintenance, construction traffic and transport, staff awareness, construction staging and monitoring.	This Document

3.6 Consultation

Infrastructure Approval Condition C1(e)(i) requires this management plan to be prepared in consultation with the EPA. The EPA was invited to comment on the draft air quality and water management plans on 12 November 2021, however has declined this opportunity. A summary of this consultation outcome is provided in

Table 3-2. The EPA was further consulted on the 15th February regarding this Construction Noise Management Plan and similarly declined to comment. Evidence of the consultation has been provided to the Department.

Table 3-2: Consultation feedback and response

Agency	Feedback	Response & section reference
NSW EPA	EPA responded they "encourage the development of [management plans] to ensure that proponents and licensees have determined how they will meet their statutory obligations and designed environmental objectives. Being a regulatory authority, the EPA's role is to administer and regulate the statues for environmental management and protection. As such the EPA does not directly get involved in the development of strategies to achieve those objectives and does not review or comment on such plans."	Noted

4. Noise and vibration objectives

4.1 Summary of objectives

The relevant policies and standards used to determine construction noise and vibration mitigation and management objectives have been detailed in Table 4-1.

Table 4-1: Summary of noise and vibration objectives

Impact/ issue	Relevant policy, standard and/or guideline used to establish noise and vibration management levels
Work hours	Infrastructure Approval conditions EPL
Airborne noise	Infrastructure Approval conditions Interim Construction Noise Guideline NSW EPA Noise Policy for Industry
Human comfort vibration impact	Assessing Vibration: A technical guideline
Cosmetic building damage vibration impact	BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration AS2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives
Heritage structure damage vibration impact	DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures
Buried services damage vibration impact	DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures

4.2 Construction hours

Construction working will be undertaken in accordance with conditions B30 and B31, as well as those specified in EPL 21627 (refer Appendix 2). The working hours approved under these conditions is detailed in Table 4-2 below. As per the table, wherever possible, works should be undertaken during the standard construction hours of 7am – 6pm Monday to Friday and 8am – 1pm Saturday, however certain works can be undertaken outside of those times.

For all other work or activities outside standard hours (those that don't meet the exceptions provided in Condition B31), work/activities will not be undertaken, or an assessment of OOHW will be undertaken in accordance with the protocol detailed in section 6.5 and the EPL conditions.

Table 4-2: Summary of Working Hours for the Project

Condition	Requirement	Working Hours		
		Monday - Friday	Saturday	Sunday & Public Holidays
B30	All construction work at the premises must be conducted between 7am and 6pm Monday to Friday and between 8am and 1pm Saturdays and at no time on Sundays and public holidays.	7am to 6pm	8am to 1pm	No Work

Condition	Requirement	Working Hours		
		Monday - Friday	Saturday	Sunday & Public Holidays
B31	The following activities may be carried out outside the recommended construction hours: a) construction that causes $L_{Aeq(15min)}$ noise levels that are: i. no more than 5 dB above Rating Background Level at any residence in accordance with the *Interim Construction Noise Guideline* (DECC, 2009); and ii. no more than the Noise Management Levels specified in Table 3 of the *Interim Construction Noise Guideline* (DECC, 2009) at other sensitive land uses; or b) for the delivery of materials required by the police or other authorities for safety reasons; or c) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; or d) as approved through the process outlined in condition B32 of this approval.	6pm to 7am	1pm to 8am	Any Time
B32	The hours of construction activities specified under condition B30 of this approval may be varied with the prior written approval of the Secretary. Any request to alter the hours of construction will be: a) considered on a case-by-case or activity-specific basis; b) accompanied by details of the nature and justification for activities to be conducted during the varied construction hours; c) accompanied by written evidence that appropriate consultation with potentially affected sensitive receivers and notification of relevant Council(s) (and other relevant agencies) has been and will be undertaken; d) all feasible and reasonable noise mitigation measures have been put in place; and e) accompanied by a noise impact assessment consistent with the requirements of the Interim Construction Noise Guideline (DECCW, 2009), or latest version.	6pm to 7am	1pm to 8am	Any Time

4.3 Construction noise objectives

4.3.1 Noise management levels

The ICNG provides guidance for assessing noise from construction activities in NSW. It establishes NMLs for recommended standard construction hours and for outside of the recommended standard hours. Construction is

considered to have the potential to cause a noise impact if the predicted noise exceeds the applicable noise management level. Table 4-3 lists ICNG guidance for establishing construction NMLs at residential receivers.

Table 4-3: ICNG guidance for establishing construction NMLs at residential receivers

Time of day	Management level $L_{Aeq(15min)}$	How to apply
Recommended standard hours (SH): Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected: Rating Background Level (RBL) + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, Snowy Hydro (Proponent) should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours (OOH) - All other times including public holidays	Noise affected: RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Considering the adopted Rating Background Levels (RBLs) presented in the revised noise report (Appendix G, Response to Submissions) and reproduced in Section 2, the Noise Management Levels (NMLs) for the identified surrounding residential receivers grouped into NCAs are presented in Table 4-4.

Table 4-4: Construction noise management levels (residential receivers)

NCA	NML $L_{eq\ 15\ min}$ dB(A)			
	Day (during standard hours) **7:00 am – 6:00 pm Weekdays, 8:00 am – 1:00 pm Saturdays**	**Day (outside standard hours)** **7:00 am – 6:00 pm Outside of Standard Hours**	**Evening** **6:00pm-10:00pm**	**Night** **10:00pm-7:00am**
NCA 1	55	50	50	41
NCA 2	50	45	45*	43

NCA	NML $L_{eq\ 15\ min}$ dB(A)			
	Day (during standard hours) 7:00 am – 6:00 pm Weekdays, 8:00 am – 1:00 pm Saturdays	Day (outside standard hours) 7:00 am – 6:00 pm Outside of Standard Hours	Evening 6:00pm-10:00pm	Night 10:00pm-7:00am
NCA 3	48	43	43*	42
NCA 4	45**	40**	35**	35**
NCA 5	47	42	42*	40

Criteria reduced so Evening criteria is not higher than Day OoH criteria.
*** Criteria derived from the NPI's minimum assumed RBLs (Table 2.1 of NPI).*

The ICNG also provides construction NMLs for non-residential land uses. These are presented in Table 4-5.

Table 4-5: ICNG NMLs for non-residential receivers

Non-residential receiver type	Noise management level, $L_{Aeq(15min)}$ (applies when properties are being used)
Commercial	External Noise Level – 70 dB(A)
Industrial	External Noise Level – 75 dB(A)
Educational facilities	Internal Noise Level – 45 dB(A)
Hospital / Medical	Internal Noise Level – 45 dB(A)
Place of Worship	Internal Noise Level – 45 dB(A)
Passive Recreation	External Noise Level – 60 dB(A)
Active Recreation	External Noise Level – 65 dB(A)

It should be noted that the NSW Environmental Protection Authority (NSW EPA) is developing a new construction noise guideline, the *Construction Noise Guideline*, which is currently in-draft. When released, the *Construction Noise Guideline* will replace the ICNG.

4.3.2 Sleep disturbance

For projects where night construction (and operations) occur, the potential for noise levels to lead to sleep disturbance should be considered. Section 4.3 of the ICNG discusses the method for assessing and managing sleep disturbance. This guidance references further information in the Road Noise Policy that discusses criteria for the assessment of sleep disturbance.

Refer to section 6.5 which outlines the Out of Hours Work Protocol for assessing noise impacts, and may be required if night works are required.

Where noise levels from a construction (or industrial) source at a residential receptor at night exceeds the following, a maximum noise level event assessment should be undertaken:

- LAeq,15min 40 dB(A) or the RBL + 5 dB(A), whichever is greater, and/or
- LAFMax 52 dB(A) or the RBL +15 dB(A), whichever is greater.

Based on this guidance, Table 4-6 and Table 4-7 present the sleep disturbance screening criterion for the noise catchment areas surrounding the Project.

Table 4-6: $L_{Aeq,15min}$ Sleep disturbance criterion

Noise Catchment Area	Night RBL (L_{A90} dB(A))	RBL + 5 dB(A)	Indicative $L_{Aeq,15min}$ Sleep disturbance criterion	Selected $L_{Aeq,15min}$ Sleep disturbance criterion
NCA 1	36	41	40	41
NCA 2	38	43		43
NCA 3	37	42		42
NCA 4	30	35		40
NCA 5	35	40		40

Table 4-7: L_{AFMax} Sleep disturbance criterion

Noise Catchment Area	Night RBL (L_{A90} dB(A))	RBL + 15 dB(A)	Indicative L_{AFMax} Sleep disturbance criterion	Selected L_{AFMax} Sleep disturbance criterion
NCA 1	36	51	52	52
NCA 2	38	53		53
NCA 3	37	52		52
NCA 4	30	45		52
NCA 5	35	50		52

4.3.3 Annoying noise characteristics

Equipment that has the potential to produce a tonal noise, an impulsive noise or any other type of noise defined by the ICNG as 'particularly annoying', the noise level for that particular equipment will receive a + 5 dB(A) penalty.

As per guidance from the Noise Policy for Industry (NPI), the penalty for intermittent noise (e.g. the hammers, packers and compactors) would only be applied during night periods. The penalty for tonal noise (e.g. concrete saws and grinders) will apply for all periods.

4.3.4 Construction traffic noise

Road traffic noise impacts due to the construction (and operation) of the Project were assessed against the following guidance from the application notes of the Road Noise Policy:

> *'…for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.'*

In reference to the day or night assessment criterion above, the assessment refers to the following criterion provided in the Road Noise Policy (Table 4-8).

Table 4-8: Relevant Road Noise Policy assessment criteria

Road Category	Type of project/land use	Assessment Criteria – dB(A)	
		Day (7am – 10pm)	Night (10pm – 7am)
Freeway/ arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq, (15\ hour)}$ 60 dB(A)	$L_{Aeq, (9\ hour)}$ 55 dB(A)

4.4 Construction vibration criteria

4.4.1 Human comfort

With respect to human comfort, vibration arising from construction activities must comply with criteria presented in Assessing Vibration: a technical guideline and British Standard 6472-1. DECC, 2006 identifies three different forms of vibration associated with construction activities:

- Continuous: uninterrupted vibration occurring over a defined period
- Impulsive: short-term (typically less than two seconds) bursts of vibration which occurs up to three times over an assessment period
- Intermittent: interrupted periods of continuous or repeated impulsive vibration, or continuous vibration that varies significantly in magnitude.

Continuous vibration may result from steady road traffic or steady use of construction equipment (e.g. generator). Impulsive vibration may arise during the loading or unloading of heavy equipment or materials or infrequent use of hammering equipment. Intermittent vibration may arise from the varied use of construction equipment (i.e. a dump truck moving around a site, idling while being loaded with materials, and then dumping the materials) or repeated high-noise activities such as hammering, piling or cutting.

Preferred and maximum values of human exposure for continuous and impulsive vibrations are listed in Table 4-9 (DECC, 2006), for relevant receivers to this Project. As per DECC, daytime is between 7 am and 10 pm, and night is between 10 pm and 7 am.

Table 4-9: Preferred and maximum weighted Root Mean Square (RMS) values for continuous and impulsive vibration acceleration (m/s^2) 1-80 Hertz (Hz)

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis[2]	x and y axis[2]	z-axis	x and y axis
Continuous vibration					
Residences	Day	0.010	0.0071	0.020	0.014
	Night	0.007	0.005	0.014	0.010
Impulsive vibration					
Residences	Day	0.30	0.21	0.60	0.42
	Night	0.10	0.071	0.20	0.14

[1] Daytime is 7am to 10pm. Night-time is 10 pm to 7 am

[2] z-axis refers to vertical vibration, while the x and y axes refer to horizontal vibration.

Intermittent vibration is assessed differently using vibration dose values (VDV). Preferred and maximum VDVs for different types of receivers have been reproduced in Table 4-10 for relative receivers in this assessment.

Table 4-10: Preferred and maximum VDVs for intermittent vibration ($m/s^{-1.75}$), (DECC, 2006)

Location	Day time (7 am to 10 pm)		Night-time (10 pm to 7 am)	
	Preferred VDV	Maximum VDV	Preferred VDV	Maximum VDV
Residences	0.20	0.40	0.13	0.26

4.4.2 Cosmetic building damage

Section J4.4.3 of *Australian Standard AS2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives* provides frequency-dependent guide levels for cosmetic damage to structures arising from vibration. These levels are adopted from *British Standard BS7385: 1990 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration* [BS7385-2:1993] and are presented in Table 4-11.

Table 4-11: Transient vibration guideline values for cosmetic damage

Type of building	Peak particle velocity (ppv) mm/s		
	4 to 15 Hz	15 to 40 Hz	40 Hz and above
Reinforced or framed structures industrial and heavy commercial buildings	50		
Un-reinforced or light-framed structures residential or light commercial type buildings	15 to 20	20 to 50	50

4.4.3 Heritage item impact

Guidance for more sensitive structures is presented in the German standard, *DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures* (DIN 4150-3: 2016). Vibration velocities not exceeding 3 mm/s at 1 to 10 Hz are recommended in this standard.

4.4.4 Buried services

DIN 4150-3:2016 also provides guidance for evaluating the effects of short-term vibration on buried services. This guidance has been reproduced below (Table 4-12).

Table 4-12: DIN 4150-3: 2016 guidance for evaluating effects of short-term vibration on buried services

Pipe material	Guideline value for velocity measured on the pipe (mm/s)
Steel (including welded pipes)	100
Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
Masonry, plastic	50

5. Construction noise and vibration impacts

5.1 Summary of construction noise and vibration impacts

5.1.1 Construction activities

Multiple noise and vibration producing activities will be undertaken during the construction of the project. These activities can be found in Section 1.2.1.

5.1.2 Influencing factors

Factors that may influence the potential noise and vibration impacts from the above activities have been detailed above include:

- The equipment in use, including the numbers of equipment in use and equipment in use simultaneously
- Other works occurring concurrently with the construction of the project
- Topography and screening
- Distances to sensitive receivers
- Background noise
- Hours of construction

5.2 Impact assessment

5.2.1 Context

As further described in Section 6 of the Revised Noise Impact Assessment in Appendix F of the *Hunter Power Project Response to Submissions Report* (Jacobs, 2021b), noise impacts resulting from the construction of the project have been assessed using noise modelling, while vibration impacts have been assessed through the use of vibration setback distances consistent with guidance from the CNVG.

The following subsections detail the assessment of impacts through these methods. It should be noted that the construction scheduling and equipment usage was based on what was accurate during the EIS stage and may be superseded by the time construction activities have been finalised.

5.2.2 Construction staging and plant

5.2.2.1 Noise

Sound power levels were estimated for certain main phases of construction for the Project as outlined in the EIS. Sound power levels for each construction phase were determined by developing an inventory of noise producing equipment and the estimated numbers of equipment based on the works taking place and estimating the sound power levels of each piece of equipment using sound power levels presented in national and international standards and guidelines, as well as from a Jacobs measurement database.

The indicative construction phases from the EIS for the Project works are linked to the construction stages within the CEMS, and presented in Table 5-1.

Table 5-1: Construction phase Sound Power Levels

EIS Phase Reference	Construction Stage	Construction Activity	Location	Equipment	Number of Equipment	Individual Equipment SWL	Phase SWL
1	Pre-construction and site establishment Construction	Site earthworks	Whole Site	Excavator 5-20t	1	99	117
				Dozer	1	116	
				Grader	1	108	
				Delivery Truck	1	100	
				Generator	1	101	
				Roller	1	104	
				Water Cart	1	95	
				Cars	1	95	
2	Site establishment Construction	Pile foundations	Power islands	Franna	1	99	117
				Piling Rig (Driven)*	1	116	
				Hand Tools	1	94	
				Concrete Truck	1	109	
				Delivery Truck	1	100	
				Generator	1	101	
				Cars	1	95	
3	Site establishment Construction	Under-ground services	From power islands to gas receiving station, demineralised water plant, fuel oil storage tanks, stormwater basin and control building	Excavator 5-20t	1	99	119
				Concrete Saw**	1	118	
				Roller	1	104	
				Vacuum Truck	1	109	
				Hand Tools	1	94	
				Delivery Truck	1	100	
				Generator	1	101	
				Cars	1	95	

EIS Phase Reference	Construction Stage	Construction Activity	Location	Equipment	Number of Equipment	Individual Equipment SWL	Phase SWL
4	Construction	Balance of plant (BoP)	Closed Cycle heat exchangers, Demineralised Water Tanks, Potable Water Tanks, Fuel Oil Storage Tanks, Buildings	Franna	1	99	111
				Excavator 5-20t	1	99	
				Hand Tools	1	94	
				Concrete Truck	1	109	
				Delivery Truck	1	100	
				Generator	1	101	
				Cars	1	95	
5	Construction	Switchyard – Electrical	Switchyard	Power Hand Tools	1	96	106
				Welder	1	97	
				Generator	1	101	
				Franna	1	99	
				Delivery Truck	1	100	
				Cars	1	95	
6	Construction	Primary installation of gas turbine and generator	Power Islands	Power Hand Tools	1	96	106
				Welder	1	97	
				Generator	1	101	
				Franna	1	99	
				Delivery Truck	1	100	
				Cars	1	95	

EIS Phase Reference	Construction Stage	Construction Activity	Location	Equipment	Number of Equipment	Individual Equipment SWL	Phase SWL
7	Construction	HV electrical installation	GT Transformers	Power Hand Tools	1	96	108
				Excavator 5-20t	1	99	
				Generator	1	101	
				Roller	1	104	
				Delivery Truck	1	100	
				Cars	1	95	
8	Construction Post construction/de mobilisation	Site Surfacing	Whole Site	Paving Machine	1	104	119
				Concrete Truck	1	109	
				Roller	1	104	
				Excavator 5-20t	1	99	
				Generator	1	101	
				Grader	1	108	
				Concrete Saw**	1	118	
				Delivery Truck	1	100	
				Cars	1	95	

* - Receives a 5 dB(A) penalty for intermittent noise when works take place during night periods. As the works will not take place at night, no penalty was applied.

** - Receives a 5 dB(A) penalty for tonal noise. The time correction applied to the saw and grinder (typically 5 minutes out of a 15-minute period) and the penalty have both been considered when calculating the equipment noise level..

SWL is the Sound Power Level, the total sound energy emitted by the noise source, measured in dB(A)

5.2.2.2 Vibration

Vibration producing equipment have been identified from the construction staging. The vibration producing equipment along with the associated setback distances have been detailed in Table 5-2. Other equipment that may also be used are also displayed.

Table 5-2: Construction phase vibration setbacks

EIS Reference Phase	Equipment	Cosmetic damage (Ref: BS7385-2: 1993)	Human response (Ref: DECC, 2006)	Heritage Structure Impact (Ref: DIN 4150-3, 2016)
1, 7, 8	Roller	25m	100m	45m
2	Piling Rig (Driven)	15m	50m	27m
Potential Usage	Hydraulic Hammer	22m	73m	40m
Potential Usage	Piling Rig (Bored)	2m	4m	3.75m
Potential Usage	Jackhammer	1m	2m	1.75m

5.2.3 Predicted construction noise impact

Estimated noise levels at the nearest receivers were predicted from the anticipated noise levels generated during each construction phase of the Project. Table 5-3 presents the predicted noise impact at each representative residential receiver during each construction phase, while Table 5-4 presents the predicted noise impact at each non-residential receiver during each construction phase.

There is the potential for out of hours work (OOHW) to be required, however, it is not known at this time (being prior to commencement of construction) if OOHW is required or not. The protocol for varying hours is set out in section 6.5, condition of approval B32, and the Environment Protection Licence (refer Appendix 2) for the project.

While it is not yet known if OOHW is required or not for OSOM deliveries, when unloading of OSOM deliveries occur outside of hours, the protocol in section 6.5 will be followed. If scheduling and site constraints permit, the deliveries might occur on one night with unloading the following day and return OSOM movement on a following night. In this instance the need to follow the OOHW protocol is not required. Determining this is dependent upon the logistics of the main equipment suppliers and the Principal Contractor responsible for managing the site. It is noted that the movement of OSOM vehicles on public roads will be directed by the NHVR, however, once the deliveries reach the construction site, they are no longer considered under Condition B31 of the Infrastructure Approval.

The assessment assumed all plant and equipment for each activity was operated concurrently while positioned at the location closest to each individual receiver. This was a conservative approach and while this may provide for the determination of conservative noise levels, actual construction noise levels should be lower than predicted in this assessment.

As Table 5-3 shows, during phase 1, noise levels were predicted to be above the standard hours NML of the NCA 2's nearest receiver by 1 dB(A), as well as the out of hours day NMLs at NCA 2's and NCA 3's nearest receivers by up to 6 dB(A) and 2 dB(A), respectively. Construction noise levels were also predicted to be above the NMLs at NCA 2's nearest receiver during phases 3 and 8.

The construction phases which were predicted to result in the highest noise levels at the nearest sensitive receiver are the initial site earthworks and surfacing works (i.e. Phases 1 and 8). These works would result in noise levels of 51 dB(A) and 49 dB(A) at the nearest residential receiver, respectively.

As listed in Table 5-4, noise levels were not predicted to be above NMLs at any non-residential receivers in each of the NCAs.

Table 5-3: Predicted noise impacts from construction works at residential receivers

EIS Ref Phase	NCA 1			NCA 2			NCA 3			NCA 4			NCA 5		
	Highest Predicted Noise Level at NCA 1 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 2 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 3 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 4 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 5 Representative Residential Receiver (dB(A))	Noise Level Below NML?	
		Standard Hours – 55 dB(A)	Out of Hours, Day – 50 dB(A)		Standard Hours – 50 dB(A)	Out of Hours, Day – 45 dB(A)		Standard Hours – 48 dB(A)	Out of Hours, Day – 43 dB(A)		Standard Hours – 45 dB(A)	Out of Hours, Day – 40 dB(A)		Standard Hours – 47 dB(A)	Out of Hours, Day – 42 dB(A)
1	47	Yes	Yes	51	No, by 1 dB(A)	No, by 6 dB(A)	45	Yes	No, by 2 dB(A)	32	Yes	Yes	41	Yes	Yes
2	42	Yes	Yes	45	Yes	Yes	40	Yes	Yes	<30	Yes	Yes	36	Yes	Yes
3	45	Yes	Yes	48	Yes	No, by 3 dB(A)	43	Yes	Yes	31	Yes	Yes	39	Yes	Yes
4	36	Yes	Yes	40	Yes	Yes	35	Yes	Yes	<30	Yes	Yes	30	Yes	Yes
5	30	Yes	Yes	34	Yes	Yes	30	Yes	Yes	<30	Yes	Yes	<30	Yes	Yes
6	31	Yes	Yes	35	Yes	Yes	<30	Yes	Yes	<30	Yes	Yes	<30	Yes	Yes
7	33	Yes	Yes	36	Yes	Yes	31	Yes	Yes	<30	Yes	Yes	<30	Yes	Yes
8	45	Yes	Yes	49	Yes	No, by 4 dB(A)	43	Yes	Yes	30	Yes	Yes	39	Yes	Yes

Table 5-4: Noise impacts from construction works at non-residential receivers

EIS Reference Phase	NCA 2*		NCA 3*			
	Highest Predicted Noise Level at NCA 2 Industrial Receiver (dB(A))	Noise Level Below NML? Industrial – 75 dB(A)	Highest Predicted Noise Level at NCA 3 Commercial Receiver (dB(A))	Noise Level Below NML? Commercial – 70 dB(A)	Highest Predicted Noise Level at NCA 3 Educational Receiver (dB(A))	Noise Level Below NML? Educational – 55 dB(A)
1	51	Yes	45	Yes	42	Yes
2	45	Yes	40	Yes	38	Yes
3	48	Yes	43	Yes	40	Yes
4	40	Yes	35	Yes	32	Yes
5	34	Yes	30	Yes	27	Yes
6	34	Yes	29	Yes	26	Yes
7	36	Yes	31	Yes	29	Yes
8	49	Yes	43	Yes	40	Yes

* There were no non-residential receivers identified in NCA 1, NCA 4 and NCA 5

The current schedule for the construction of the Project means that the Project will be constructed prior to the occupation of any of the adjacent industrial lots. Hence, impacts at these lots have not been considered during the assessment. However, if the construction of the Project is delayed, these lots may be occupied, and hence impacts may occur. As such, the potential noise impacts at the boundary of the Project Site have been assessed in the following subsections.

During construction, the highest predicted noise along the Project Site boundary is equal to but not above the Noise Management Level for industrial receivers. Additionally, several construction phases nearly reach the NML. Phases one and three reach the NML, while phases four and eight are within 1-2 dB(A) of the NML. The noise levels in comparison to the criteria during each construction phase are detailed in Table 5-5.

Table 5-5: Construction predicted noise impacts at the Project Site boundary

EIS Reference Phase	Industrial Lot	
	Highest Predicted Noise Level at the Boundary (dB(A))	Compliant with Noise Criteria?
		Industrial – 75 dB(A)
1	75	Yes
2	66	Yes
3	75	Yes
4	74	Yes
5	70	Yes
6	54	Yes
7	57	Yes
8	73	Yes

5.2.4 Construction traffic noise impact

During construction of the Project, the estimated peak vehicle movements per day at the peak of construction is expected to be 400 light vehicle movements, along with 120 heavy vehicle movements during standard hours daily, along with two oversize over mass movements during the night (one inbound trip and one outbound trip).

Considering the estimate of construction vehicle movements per day using the Construction Noise Estimator (RMS, 2016) it was determined that noise from the existing road traffic plus the additional construction noise traffic would be 63 dB(A) during the day and 61.2 dB(A) during the night. While these levels are above the day and night traffic noise criteria, the additional construction noise traffic associated with the Project would only contribute 0.2 dB(A) to the overall traffic noise level during the day and would contribute less than 0.1 dB(A) to the traffic noise level during the night. Therefore, the 2 dB(A) traffic noise increase criterion would not be exceeded, and it was concluded that the noise generated from the additional traffic during construction of the Project would not present a noise impact issue.

With regards to OSOM deliveries at night, the condition of approval B31(b) provides for the, “delivery of materials required by the police or other authorities for safety reasons.” It is very likely the National Heavy Vehicle Regulator (NHVR) will require OSOM deliveries to be conducted at night in order to manage the safety of the public road network and road users. As a matter of good practice, a Construction and Noise Vibration Impact Statement (CNVIS) will be prepared for OSOM transport. Refer to section 5.2.3 above regarding OSOM deliveries, unloading, and how the Out of Hours Work protocol will be addressed.

5.2.5 Sleep disturbance impact

Construction is not predicted to take place during the night, and as such construction activities associated with the Project would not result in sleep disturbance impacts.

5.2.6 Predicted cumulative noise impact

Remediation of the former Kurri Kurri aluminium smelter land adjacent the Project Site is estimated to be ongoing to late 2023 and therefore concurrent with the construction of the Project. Details of the adjacent works is described in more detail in Section 6.8.3 of the Revised Noise Impact Assessment in Appendix F of the *Hunter Power Project Response to Submissions Report* (Jacobs, 2021b).

The predicted cumulative impacts associated with the works undertaken during Phase 1 along with the concurrent Hydro Aluminium Demolition and Remediation activities has been detailed in Table 5-6 for residential receivers, and Table 5-7 for non-residential receivers. As shown in the table, cumulative impacts may result in an increase in construction noise levels at the nearest receivers. Construction noise levels at the nearest receivers at NCA 3 and NCA 4 (the receivers nearest to the demolition works) increase by approximately 6 dB(A), resulting in noise levels above the standard hours NML at NCA 3. The cumulative works also increase construction noise levels at NCA 2's nearest receiver by 3 dB(A), and at NCA 1 and NCA 5 by 1 dB(A) each. Cumulative noise has not been predicted to be above the NMLs of any non-residential receivers.

Table 5-6: Cumulative predicted construction noise impact on residential receivers

EIS Reference Phase	NCA 1			NCA 2			NCA 3			NCA 4			NCA 5		
	Highest Predicted Noise Level at NCA 1 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 2 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 3 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 4 Representative Residential Receiver (dB(A))	Noise Level Below NML?		Highest Predicted Noise Level at NCA 5 Representative Residential Receiver (dB(A))	Noise Level Below NML?	
		Standard Hours – 55 dB(A)	Out of Hours, Day – 50 dB(A)		Standard Hours – 50 dB(A)	Out of Hours, Day – 45 dB(A)		Standard Hours – 48 dB(A)	Out of Hours, Day – 43 dB(A)		Standard Hours – 45 dB(A)	Out of Hours, Day – 40 dB(A)		Standard Hours – 47 dB(A)	Out of Hours, Day – 42 dB(A)
Phase 1	47	Yes	Yes	51	No, by 1 dB(A)	No, by 6 dB(A)	45	Yes	No, by 2 dB(A)	32	Yes	Yes	41	Yes	Yes
Phase 1 with Hydro Aluminium Works	48	Yes	Yes	54	No, by 4 dB(A)	No, by 9 dB(A)	51	No, by 3 dB(A)	No, by 8 dB(A)	37	Yes	Yes	42	Yes	Yes

Table 5-7: Cumulative construction noise impact on non-residential receivers

EIS Reference Phase	NCA 2[1]		NCA 3*			
	Highest Predicted Noise Level at NCA 2 Industrial Receiver (dB(A))	Noise Level Below NML? Industrial – 75 dB(A)	Highest Predicted Noise Level at NCA 3 Commercial Receiver (dB(A))	Noise Level Below NML? Commercial – 70 dB(A)	Highest Predicted Noise Level at NCA 3 Educational Receiver (dB(A))	Noise Level Below NML? Educational – 55 dB(A)
Phase 1	51	Yes	45	Yes	42	Yes
Phase 1 with Hydro Aluminium Works	54	Yes	51	Yes	47	Yes

5.2.7 Predicted construction vibration impact

As identified in Section 5.2.2, vibratory rollers and piling rigs, which are a vibration-generating plant, would be used during construction. The equipment, setback distances and nearest impacted receivers are displayed in Table 5-8.

Table 5-8: Predicted vibration impact

Equipment	Setback Distance (m)			Nearest Affected Receiver (m)			Vibration Impact?
	Human Comfort	Cosmetic Building Damage	Heritage Structure Impact	Residency	Occupancy	Heritage Item	
Vibratory Roller	100m	25m	45m	1.15km	1.15km	1.3km	No
Air Track Drill	50m	15m	27m				No

As displayed in the table, no vibration impacts at nearest receivers have been predicted as a result of the construction of the Project. Additionally, as the nearest medical facility is 3.3 km away from the Project Site, no impacts to medical facilities due to construction vibration have been predicted.

6. Mitigation and management measures

Mitigation measures to address predicted noise and vibration impacts will be implemented to address the impacts predicted in Section 5. The specific mitigation measures to address the Infrastructure Approval conditions and EIS Environmental Mitigation Measures are detailed in Sections 6.1 to 6.3.

6.1 Standard noise mitigation measures

To reduce construction noise levels to below the respective NMLs, standard mitigation measures from Section 7 of the Revised Noise Impact Assessment in Appendix G of the *Hunter Power Project Response to Submissions Report* (Jacobs, 2021b) will be implemented. These have been derived from the standard mitigation measures contained within the ICNG (DECC, 2009) and *Construction Noise and Vibration Guidelines* (RMS, 2016). These are displayed in Table 6-1.

Table 6-1: Standard measures, noise during construction.

Mitigation measure	Details	Timing	Responsibility
NVIA1	Wherever possible and safe, limit works to standard hours of construction.	During construction	Principal Contractor
NVIA2	Select low-noise plant and equipment. Ensure equipment mufflers operate in a proper and efficient manner. All plant and equipment used on site, or in connection with the development, is operated in a proper and efficient manner	Prior to and during construction	Principal Contractor
NVIA3	Where possible, use quieter and less vibration emitting construction methods.	During construction	Principal Contractor
NVIA4	Only have necessary equipment on-site and turn off when not in use.	During construction	Principal Contractor
NVIA5	Where possible, concentrate noisy activities at one location and move to another as quickly as possible.	During construction	Principal Contractor
NVIA6	Vehicle movements, including deliveries outside standard hours, should be minimised and avoided where possible.	During construction	Principal Contractor
NVIA7	All plant and equipment is to be well maintained and where possible, fitted with silencing devices.	Prior to and during construction	Principal Contractor
NVIA8	Use only the necessary size and powered equipment for tasks.	During construction	Principal Contractor
NVIA9	Implement training to induct staff on noise sensitivities	Prior to and during construction	Principal Contractor
NVIA10	Where possible, consider the application of less intrusive alternatives to reverse beepers such as 'squawker' or 'broadband' alarms.	During construction	Principal Contractor
NVIA11	Consider the installation of temporary construction noise barriers or earth mounds for concentrated, noise-intensive activities.	During construction	Principal Contractor

Mitigation measure	Details	Timing	Responsibility
NVIA12	Where practicable, install enclosures around noisy mobile and stationary equipment as necessary.	During construction	Principal Contractor
NVIA13	Where possible, avoid simultaneous operation of two or more noisy plant close to receivers. The offset distance between noisy plant and sensitive receivers should be maximised.	During construction	Principal Contractor
NVIA14	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements.	Prior to and during construction	Principal Contractor
NVIA15	Complete routine monitoring to evaluate construction noise levels and evaluate whether the mitigation measures in place are adequate or require revision.	During construction	Principal Contractor
NVIA 16	Prior to the commencement of the installation of the gas turbines, unless otherwise agreed by the Secretary, the Proponent must ensure there is a suitable meteorological weather station operating located on the premises or at a location approved by the EPA The weather station will be capable of monitoring in accordance with the Environment Protection Licence requirements. The monitoring capability is in accordance with the EPL, which accounts for the Noise Policy for Industry, and is summarised in the Construction Monitoring Program required by condition C1 and appended to the CEMS	Prior to the commencement of the installation of the gas turbines and throughout construction	Principal Contractor
NVIA 17	The siting of the weather station will be such that the measurements are representative of the conditions at the power station and surrounding area, and that nearby infrastructure does not affect those measurements.	Prior to the commencement of the installation of the gas turbines and throughout construction	Snowy Hydro

6.2 Standard vibration mitigation measures

Assessing Vibration: a technical guideline, (DECC, 2006) provides general guidance for limiting vibration impacts during construction. These have again been reviewed and the relevant recommendations have been summarised in Table 6-2 below. If vibration is a concern during the construction of the project, these measures should be implemented.

Table 6-2: Vibration management measures from DECC, 2006

Control measure	Details	Timing	Responsibility
Controlling vibration	Choosing alternative, lower-impact equipment or methods wherever possible	During construction	Principal Contractor

Control measure	Details	Timing	Responsibility
levels from the source	Scheduling the use of vibration-causing equipment at the least sensitive times of the day (wherever possible)	Prior to and during construction	Principal Contractor
	Locating high vibration sources as far away from sensitive receiver areas as possible	During construction	Principal Contractor
	Sequencing operations so that vibration-causing activities do not occur simultaneously.	During construction	Principal Contractor
	Keeping equipment well maintained	During construction	Principal Contractor
	Do not conduct vibration intensive works within the recommended safe setback distances.	During construction	Principal Contractor
Consultation	Informing nearby receivers about the nature of construction phases and the vibration-generating activities.	During construction	Principal Contractor, Snowy Hydro Environmental Advisor

6.3 Cumulative impacts

Noise from construction works may occur concurrently with the remediation of the Kurri Kurri Aluminium Smelter, which may result in a cumulative noise impact. Measures in Table 6-3 have been provided to address the potential for cumulative noise impacts.

Table 6-3: Cumulative noise management measures

Control measure	Details	Timing	Responsibility
Scheduling Works	Where possible, scheduling works to occur at different times of the day to prevent multiple noisy activities from taking place at the same time	During construction	Principal Contractor
	Where possible, scheduling works to take place at different locations on site to prevent noisy activities from taking place near one another which will limit the amplification of the noise.	Prior to and during construction	Principal Contractor
Consultation	Discuss works schedules and timings with the proponents of other works in the industrial estate to gain an understanding of when noisy work surrounding the Project will take place. Should respectively project schedules and work priorities change, proponents should commit to regular meetings to ensure all proponents are aware of the changes.	During construction	Principal Contractor Snowy Hydro

6.4 Construction Noise and Vibration Impact Statements

As detailed in Section 5.2.1, there is a possibility that the works program to be undertaken deviates from the works detailed in the EIS, Response to Submissions and NVMP. Where works are expected to result in a greater noise impact than those in the predicted in the NVMP, a Construction Noise and Vibration Impact Statement (CNVIS) should be undertaken.

The Principal Contractor will be responsible for advising of the works program that do not align with the EIS, and developing CNVIS as identified here for each stage of the work. Each CNVIS will be reviewed by the Environment Representative for the project.

CNVISs will be employed to inform and direct noise and vibration management for the works undertaken as part of the project. The CNVIS will be progressively produced to inform all noise and vibration risks associated with each work stage and provide applicable management measures to be undertaken. Any works which a CNVIS identifies as producing noise and/or vibration impacts above the limits in Section 4 must be managed in accordance with the NVMP.

Each CNVIS should:

- Detail the scope of works covered by the CNVIS
- Detail the nearest noise and vibration sensitive receivers
- Provide justification for any Out of Hours Work (OOHW), if required
- Provide the noise and vibration objectives and criteria
- Detail the predicted noise and vibration impacts
- Provide appropriate noise and vibration management measures and monitoring requirements.

6.5 Out of Hours Work (OOHW) protocol

For all works to be undertaken outside the standard construction hours or those listed in condition B31, an OOHW Protocol will apply. The details of the protocol are detailed below.

Any request to alter the hours of construction will be considered on a case-by-case or activity-specific basis.

6.5.1 Justification for OOHW

All proposed OOHW, outside of those listed in condition 31, require a full justification as why the works are required to be undertaken outside standard construction hours. There are several reasons why works can only be undertaken out of hours and these include, but are not limited to:

- Ensuring the safety of construction personnel
- Ensuring public safety
- Minimising disruption to road network users/ pedestrian during deliveries.

6.5.2 Construction Noise and Vibration Impact Statements

Prior to the undertaking of any works during OOHW periods, outside of those covered in condition B31, a CNVIS will be developed for to determine the potential noise and vibration impacts posed by those works. As part of the noise and vibration assessment process, the following outcomes must be developed:

- The identification of any noise and vibration impacts on nearby sensitive receivers as a result of those out of hours works
- The predicted noise and vibration levels at the impacted receivers, including the amount by which the noise and vibration levels are above the appropriate noise management level or vibration limit
- The identification of feasible and reasonable mitigation and management measures to address the predicted noise and vibration impacts
- The identification of appropriate noise and vibration monitoring locations to aid in managing the noise and vibration impacts while the works are being undertaken.

6.5.3 OOHW documentation

Prior to undertaking OOHW activities, an OOHW Application Form will be developed for submission to the NSW EPA, requesting the required hours for works to be undertaken. Alongside the OOHW Application Form, the above CNVIS will also be provided to detail the activities undertaken and impacts predicted. Variations to construction hours will also require the prior written approval of the Secretary.

6.5.4 OOHW community notifications

Notification to relevant impacted receivers will be provided between 5 and 14 days prior to OOHW taking place.

Additional community notification will be undertaken where directed by the NSW EPA including:

- Letterbox drop and/ or email
- Phone calls
- Individual briefings.

Written evidence will be provided in an OOHW application showing consultation with potentially affected sensitive receivers. In the management and preparation of an application it is important to consider the timeframe for notification of potentially impacted receivers.

It is also a requirement to consult with the appropriate Council and other relevant agencies.

6.5.5 NSW EPA and the Department's review of OOHW

The OOHW Application will be reviewed and approved by the NSW EPA as required by EPL 21627 and by the Department as required by Infrastructure Approval conditions B31 and B32. Where the OOHW Application has been reviewed and approved, any specific conditions that relate to the OOHW are to be:

- Actioned for implementation (such as any additional notification to the community)
- Tool-boxed to relevant workforce and site personnel before each shift to introduce / reinforce works restrictions, management measures and expected workforce behaviour

- Implemented during works with accountability for the implementation of any conditions to be taken by the Principal Contractor.

6.5.6 Variations to construction hours will also require the prior written approval of the Secretary.OOHW monitoring

Attended noise and vibration monitoring is to be undertaken, at representative stages of the activity or work, to verify that noise levels resulting from OOHW are in accordance with the outcomes of the OOHW CNVIS. Noise and vibration monitoring should follow the procedures outlined in this NVMP.

7. Compliance management

7.1 Training

All staff and contractors working on the construction of the Project will undergo education and training regarding noise and vibration impacts and management. Training would include:

- Toolbox talks
- Work inductions
- Meetings between contractors and environmental staff
- Posters and Educational Items.

Training should detail:

- The contents of this NVMP
- Legislation pertaining to noise and vibration impact and management
- Construction hours
- Nearby noise sensitive locations
- Complaint and Enquiry reporting
- Management measures listed in this NVMP
- Specific responsibilities regarding the mitigation measures.

7.2 Monitoring

Noise and vibration monitoring will be undertaken. The results of monitoring will be compared against the predicted noise impacts. Where monitoring has found noise and vibration impacts to be above the relevant criteria, the following actions would be undertaken:

- Stoppage of work that has been identified as the cause of the criteria exceedance
- Determine if any non-project noise sources may be causing the criteria exceedance
- Determine if a particular piece of equipment is the cause of the criteria exceedance, and if any options exist to mitigate or replace the equipment
- Adopt any other mitigation or management measures where feasible and reasonable to reduce noise
- Review the work practices undertaken against the NVMP
- Adopt any lessons learnt into future modelling, mitigation actions and training.

7.2.1 Noise monitoring

Both attended and unattended noise monitoring may be undertaken during the construction of the Project. Whether attended or unattended monitoring is required will be determined on a case-by-case basis. This will depend on the nature of the activity and level of verification required by the monitoring. For example, unattended monitoring might be considered appropriate to verify a noise level from a change in construction activity occurring over multiple days, whereas attended noise monitoring might be considered appropriate to verify a complaint or noise level in a particular circumstance where the time of the noise occurring is known.

Noise monitoring will be undertaken in the following situations:

- At the commencement of activities where it has been identified that verification monitoring is required, such as confirming that noise levels are consistent with those predicted and to confirm the effectiveness of mitigation

- In response to a complaint received regarding construction noise (where determined appropriate)
- Where there is a change in methodology that may result in an increase in noise levels
- As directed by the NSW EPA
- In accordance with the Environment Protection Licence (refer Appendix 2)
- As required by a CNVIS
- As required by an OOHW Protocol
- Ongoing, case-by-case spot checks for noise intensive plant and equipment will be undertaken throughout construction to ensure compliance with the noise levels.

Locations for noise monitoring will be determined on a case-by-case basis, in response to complaints and/or the locations of predicted noise impacts. Likewise, the duration and amount of noise monitoring will ultimately be dependent on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the construction activity, wherein the plant and equipment operating is consistent with the full range of plant and equipment modelled in the noise assessment (i.e. the monitoring will not be undertaken when key noise producing equipment is not in operation). Where possible, monitoring will be undertaken at the most affected noise sensitive receiver. Noise monitoring locations factors include:

- Proximity of the receiver to the works
- Noise sensitivity of the receiver
- Location of previous monitoring
- Expected duration of the impact
- Background noise levels
- Safety of personnel undertaking the measurements.

Noise monitoring results will be made publicly available on the Snowy Hydro Internet site.

- For attended noise monitoring results will be published 10 business days after the noise monitoring has been conducted and the results verified as valid with respect to background noise interference to construction noise contributions at the monitoring location.
- For monitoring that is conducted using data logging, results will be published 10 business days after the logging results have been downloaded and the results verified as valid with respect to background noise interference to construction noise contributions at the monitoring location.

7.2.1.1 Out of Hours Protocol Noise Monitoring

As per the OOHW Protocol detailed in Section 6.5 and the CNVIS requirement in Section 6.4, noise monitoring must be performed where required by the OOHW CNVIS and/or OOHW permit provided by the NSW EPA in order to validate the predicted OOHW noise levels. As per the OOHW protocol, noise monitoring will be required where noise at a receiver is predicted to receive noise levels greater than 5 dB(A) over the NMLs during the night.

Refer to section 2.4 of the Construction Monitoring Program for further detail on noise monitoring.

The OOHW Application will be reviewed and approved by the NSW EPA as required by EPL 21627 and by the Department as required by Infrastructure Approval conditions B31 and B32.

7.2.1.2 Noise monitoring parameters

All noise measurements will be undertaken to the following parameters:

- Sample Period: 15 minutes
- Frequency Weighting: A-Weighting

- Time Constant: Fast (125 milliseconds).

Attended noise monitoring will be undertaken in 15-minute sampling intervals, and continued if logging or repeated if attended, until representative noise data showing the noise contribution being targeted is obtained in accordance with the NSW Noise Policy for Industry. Or until it is demonstrated that the noise contribution being targeted cannot be shown from prevailing background noise.

Unattended noise monitoring will be performed to record at 15-minute sampling intervals.

As a minimum, L_{Aeq}, L_{AMax}, and L_{A90} A-weighted noise levels should be recorded.

7.2.1.3 Quality assurance

All monitoring will be undertaken by suitably trained and competent personnel, who are experienced in undertaking noise measurements.

Noise monitoring equipment used will be at least Type 2 instruments and calibrated in accordance with manufacturer specifications and/or relevant Australian Standards. Records of equipment laboratory calibration will be maintained by Snowy Hydro Limited (Snowy Hydro) and the Principal Contractor throughout the delivery of the Project. The calibration of the monitoring equipment will be checked in the field before and after the noise measurement period.

Noise measures while winds are greater than 5 m/s or while rainfall is present should be discarded, in line with the monitoring requirements of the *Noise Policy for Industry* (EPA, 2017).

Noise monitoring will be undertaken and recorded in accordance with the relevant noise measurement requirements in the reference standards and documents in Section 3.1. All monitoring records will be retained throughout the delivery of the Project by Snowy Hydro. Noise monitoring records will be completed to record:

- Name of person undertaking the measurement,
- Date and time of measurement, length of measurement and any measurement time intervals,
- Type and model number of monitoring instrumentation,
- Results of field calibration checks,
- Measurement location details and number of measurements at each location,
- Weather conditions during measurements,
- Operation and activities of the noise sources under investigation,
- Estimated contribution of the Project's activities, and
- Noise due to other extraneous and environmental sources (e.g. traffic, aircraft, trains, dogs barking, insects).

7.3 Incidents and complaints

Complaints and enquiries will be managed in accordance with the process outlined in Section 6.3 of the CEMS. Incidents will be reported in accordance with the process outlined in Section 7.4 of the CEMS.

Audits will be undertaken to assess the effectiveness of environmental management measures and compliance with the NVMP and all regulatory requirements. The auditing procedure are be detailed in the CEMS.

7.4 Incident notification

The Principal Contractor will notify Snowy Hydro upon becoming aware of an incident, and Snowy Hydro will then notify the Secretary in writing via the Major Projects website immediately.

The key aspects the notification will address are:

(a) the development and application number (12590060);

(b) details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);

(c) how the incident was detected;

(d) when the Proponent became aware of the incident;

(e) any actual or potential non-compliance with conditions of approval;

(f) what immediate steps were taken in relation to the incident;

(g) further action(s) that will be taken in relation to the incident; and

(h) a development contact for further communication regarding the incident. Unless otherwise stated in the incident notification, this is the Snowy Hydro Approvals Manager on 0409 840 165.

7.5 Non-compliance notification

In the instance of a non-compliance, the Secretary will be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. Snowy Hydro will lodge the notification.

The Principal Contractor must notify Snowy Hydro whenever it is aware of a non-compliance.

The key aspects a non-compliance notification will address are:

(a) the development and application number (12590060);

(b) the condition of approval that the development is non-compliant with;

(c) the way in which the development does not comply;

(d) the reasons for the non-compliance (if known); and

(e) the corrective and preventative actions undertaken to address the non-compliance.

For clarity, a non-compliance which has already been notified as an incident does not need to also be notified as a noncompliance to the Major Projects website.

7.6 Complaints and enquiry management

An enquiry is defined as a question or request for information.

A complaint is defined as a statement that describes Project related activities as unsatisfactory or unacceptable. Complaints may also be accompanied by threats to contact the media, local MP, or some other authority.

Complaints and enquiries may be received by any method. The CRM will acknowledge and respond to enquiries and complaints about the Project, as per the process and timeframes shown in the table below. Where the complaint rises to the level of a dispute it shall be manged in accordance with the steps outlined in section 6.3 in the Construction Environmental Management Strategy.

Table 5-1: Complaints and enquiries management

Complaints and enquiries management	
Responding to complaints received during standard work hours	▪ Investigate and determine source of complaint immediately ▪ Provide an oral response acknowledging receipt of complaint to complainant as soon as possible. Every effort will be made to respond within 24 hours for emails, or one week for letters ▪ Investigate the potential environmental impacts and consequences of the complaint ▪ Record details of complaint received, how it was managed and the actions required to close out the complaint ▪ Provide an update of the complaints register to the ER for any complaints received on the day they are received.
Responding to enquiries received during standard work hours	▪ Record details of enquiry received ▪ Provide a response to enquirer on the next business day.
Responding to enquiries and complaints out of hours	▪ Stakeholders will be provided with the Project phone number for specific complaints and enquiries related to works out of hours. This number will be monitored by the CRM on a 24-hour basis ▪ The CRM will triage complaints and enquiries and liaise directly with the Principal Contractor to respond. Non-urgent enquiries and complaints will be dealt with on the next business day ▪ All details of the enquiry or complaint will be recorded in the Project consultation complaint register by the CRM. ▪ Provide an update of the complaints register to the ER for any complaints received on the day they are received.

8. Review and improvement

8.1 Continuous improvement

Continuous improvement of the NVMP will be carried out through the continued evaluation of mitigation and management measures against environmental policies, objectives and targets and identifying where opportunities exist for improvement.

The continuous improvement process will include:

- Identifying opportunities to improve environmental management measures and performance
- Identify the causes of any non-compliances with the relevant criteria
- Develop an effective plan to address any identified non-compliances
- Determine the effectiveness of applied mitigation measures
- Document any changes to work procedures undertaken to control non-compliances and/or improve efficiencies
- Compare work process results with the relevant objectives and targets.

8.2 Staging and Review of Management Plans

The Department's approval for the staging of management plans into construction and operation phases was provided on the 22nd of December 2021.

Regular reviews of management documentation will also occur and after certain events. The triggers for further review of this Management Plan include:

(a) the submission of an incident report under condition C6;

(b) the submission of an audit report under conditions C15 to C19;

(c) the approval of any modification to the conditions of this approval;

(d) a direction of the Secretary (Department of Planning Industry and Environment) under condition A2 of Schedule 2;

(e) as initiated by the Principal Contractor or Snowy Hydro; or

(f) upon the advice of the Environmental Representative.

Where revisions are made, then within 4 weeks of the review the revised document will be submitted to the Secretary for approval, unless otherwise agreed with the Secretary, or within the scope of the Environmental Representative role as set out in condition A23.

8.3 Update and amendment

Where necessary, the NVMP will be required to be updated. Document and records management for the Project is described in Section 7.7 of the CEMS.

9. References

DECC 2006, *Assessing Vibration: a technical guideline,* NSW Department of Environment and Climate Change, Sydney, NSW.

DECC 2009, *Interim Construction Noise Guideline,* NSW Department of Environment and Climate Change, Sydney South, NSW.

DECC 2011, *NSW Road Noise Policy*, NSW Department of Environment and Climate Change, Sydney, NSW.

NSW EPA 2017, *Noise Policy for Industry*, October 2017

Jacobs 2021a, *Hunter Power Project Environmental Impact Statement (Rev 0 – Final),* Jacobs Group (Australia), 22 April 2021.

Jacobs 2021b, *Hunter Power Project Response to Submissions – Submissions Report (Rev 1)*, Jacobs Group (Australia), 30 July 2021.

RMS 2016, *Construction Noise and Vibration Guidelines*, Roads and Maritime Services, North Sydney, NSW.

Appendix 1

This appendix contains the information regarding traffic generating activities as presented in the Traffic Management Plan.

Traffic generating activities

The main traffic generating activities associated with the construction of the Project are summarised in Section **Error! Reference source not found.** of the Traffic Management Plan.

During construction, all vehicular access to the Project Site will be via the Hunter Expressway and Hart Road. Site access off Hart Road is deemed satisfactory given the following:

- The site access is already established at this location, thus there will be no need for additional civil works and disruption due to the construction of a new or additional driveway elsewhere.
- The roads used to access the site are sealed and currently cater for heavy vehicle movements associated with the adjacent industrial land uses.

Construction traffic

Light vehicles

Light vehicles will be used to transport staff to the construction site and for minor construction activities such as inspections and movement of light equipment. The expected distribution of light vehicles during the morning and afternoon peak hours is shown in Appendix 1 Figure 0-1 and Appendix 1 Figure 0-2, respectively.

Group transport for workstreams as well as partial ride sharing will be implemented by the Principal Contractor.

Heavy vehicles

The following heavy vehicle movements are expected to be generated during the construction of the Project. Where efficiencies and more effective transport options and/or machinery are available these will also be utilised with timing of their use adjusted in accordance with the Project schedule:

- Heavy rigid: transport of bulk materials including gravel, concrete (or components including sand, gravel and cement)
- Semi-trailer (2 and 3-axle): delivery of structural, mechanical and electrical equipment (other than those requiring oversize transport), temporary offices and lunchrooms
- B double: fuel supply for first fill and commissioning
- Cranage: assumed two mobile all terrain cranes, one large crawler for peak construction (between September 2022 and May 2023) and two mobile Franna cranes. Two mobile Franna cranes otherwise during other parts of construction
- Heavy machinery: sourced locally and transported via low-loader. Assumed to remain onsite for the duration of individual assignments (e.g. earthmoving equipment).

Bulk materials, equipment and heavy machinery required to construct the Project are expected to originate from the east, including from the Port of Newcastle. All heavy vehicles will be required to travel via heavy vehicle-approved roads and will enter and exit the site via the Hunter Expressway and Hart Road, as shown in Appendix 1 Figure 0-3. As outlined in Section 3.1 of the Traffic Management Plan, the Hunter Expressway and Hart Road both permit 25/26 m B-double and 4.6 m high vehicles.

Oversized overmass vehicles (OSOM)

Approximately 10 two-way oversized vehicle movements are expected to be required during the construction phase to transport certain oversized equipment from the Port of Newcastle to the Project Site. A OSOM Transport Management Plan was prepared as part of the EIS to address OSOM vehicles.

In addition to the OSOM Transport Management Plan, OSOM vehicle movements that require adjustments to the State Road network and infrastructure will require separate TfNSW consultation and approval.

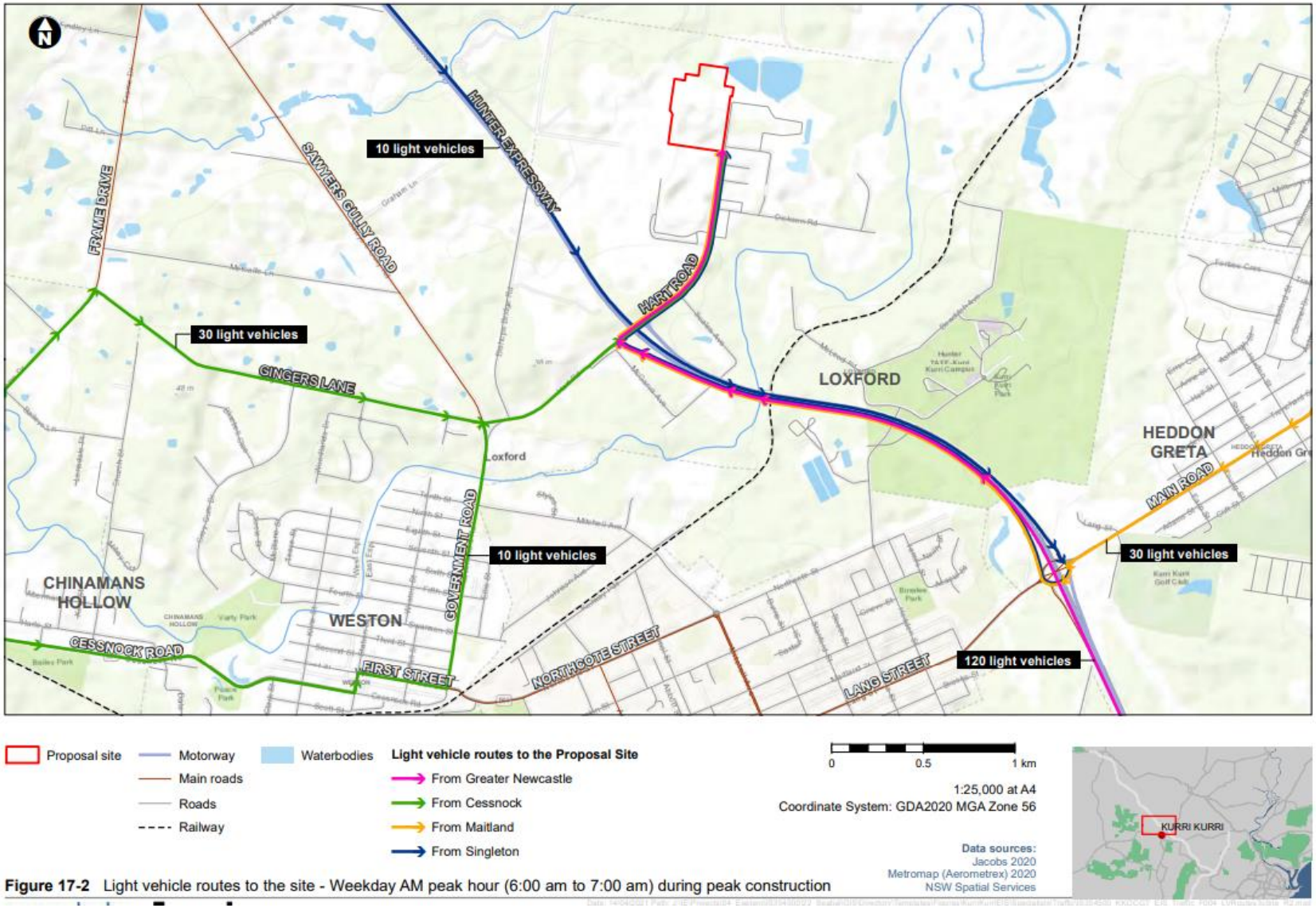


Figure 17-2 Light vehicle routes to the site - Weekday AM peak hour (6:00 am to 7:00 am) during peak construction

Figure 0-1: Light vehicle routes to the site – Weekday AM peak hour

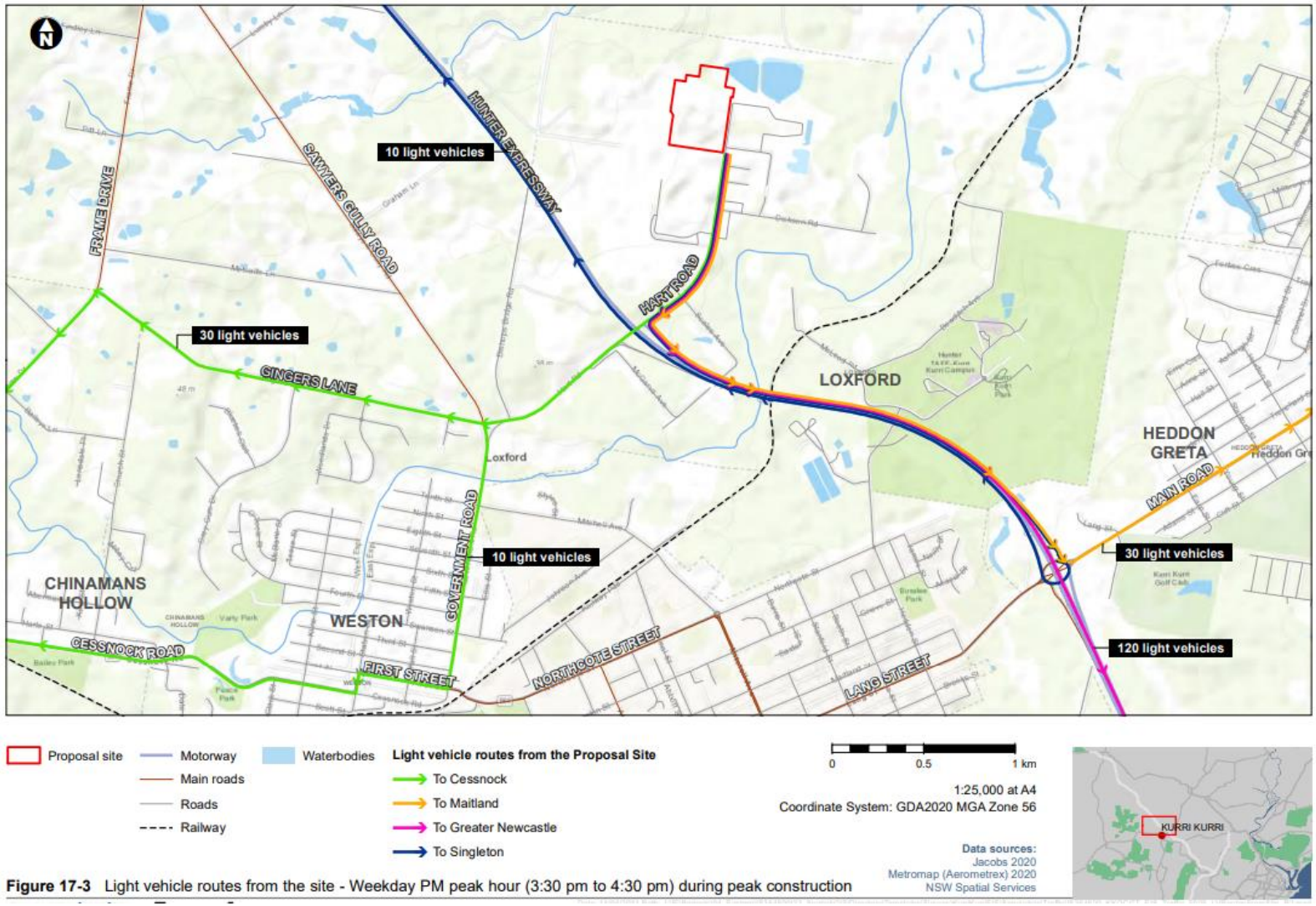


Figure 17-3 Light vehicle routes from the site - Weekday PM peak hour (3:30 pm to 4:30 pm) during peak construction

Figure 0-2: Light vehicle routes to the site – Weekday PM peak hour

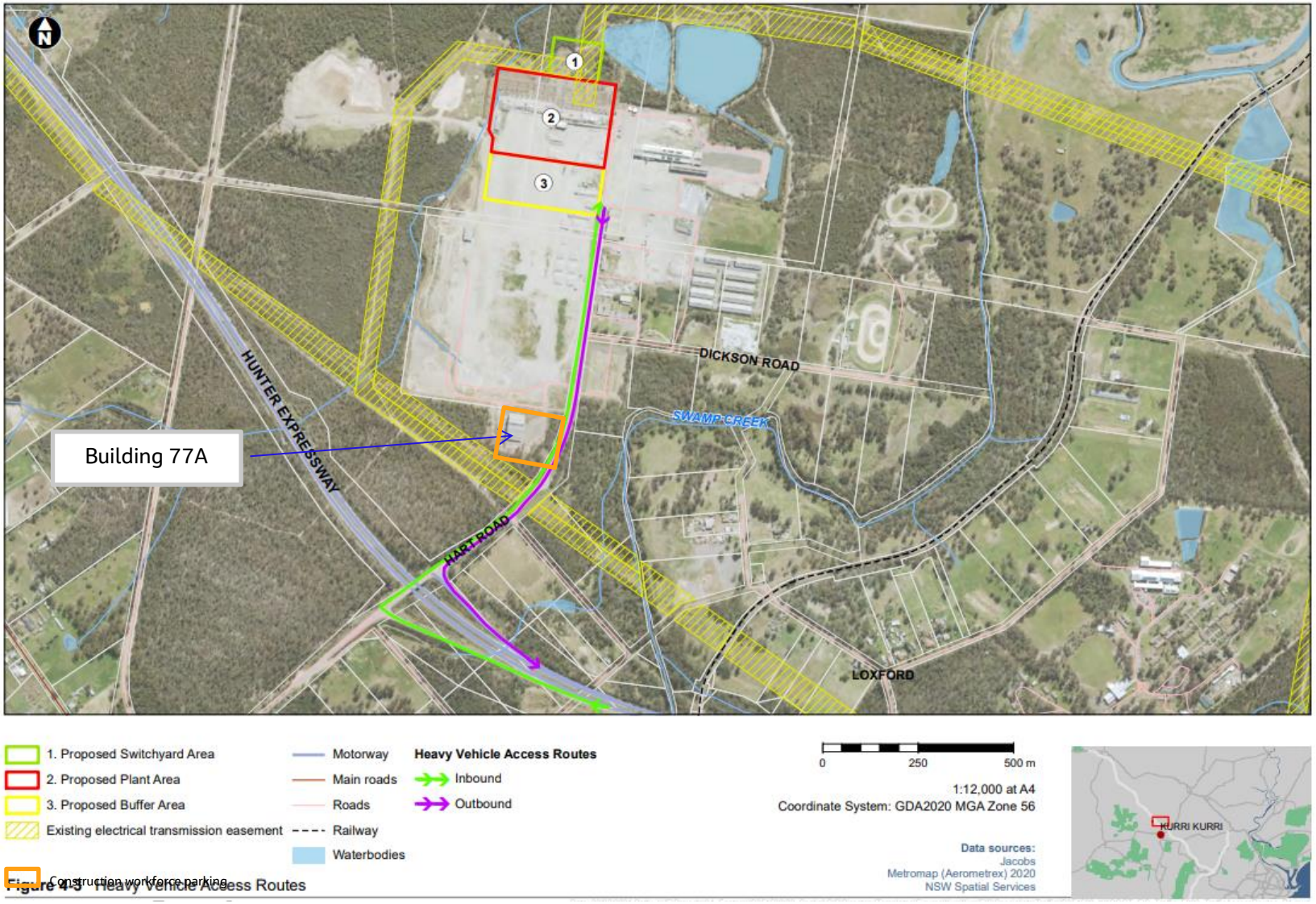


Figure 0-3: Heavy vehicle access routes

Construction traffic volumes and timing

A summary of the anticipated traffic volume associated the construction of the Project provided in Appendix 1 Table 0-1. During peak construction periods, a peak of 100 one-way light vehicle movements is expected during the hours prior to shift commencement (5:30 am to 6:30 am) and after shift end (3:30 pm to 4:30 pm). A peak of 120 one-way heavy vehicle movements per day (i.e. 60 inbound trips and 60 outbound trips), spread across standard construction hours, is expected to occur between July 2022 and May 2023.

Table 0-1: Construction traffic volumes and timing

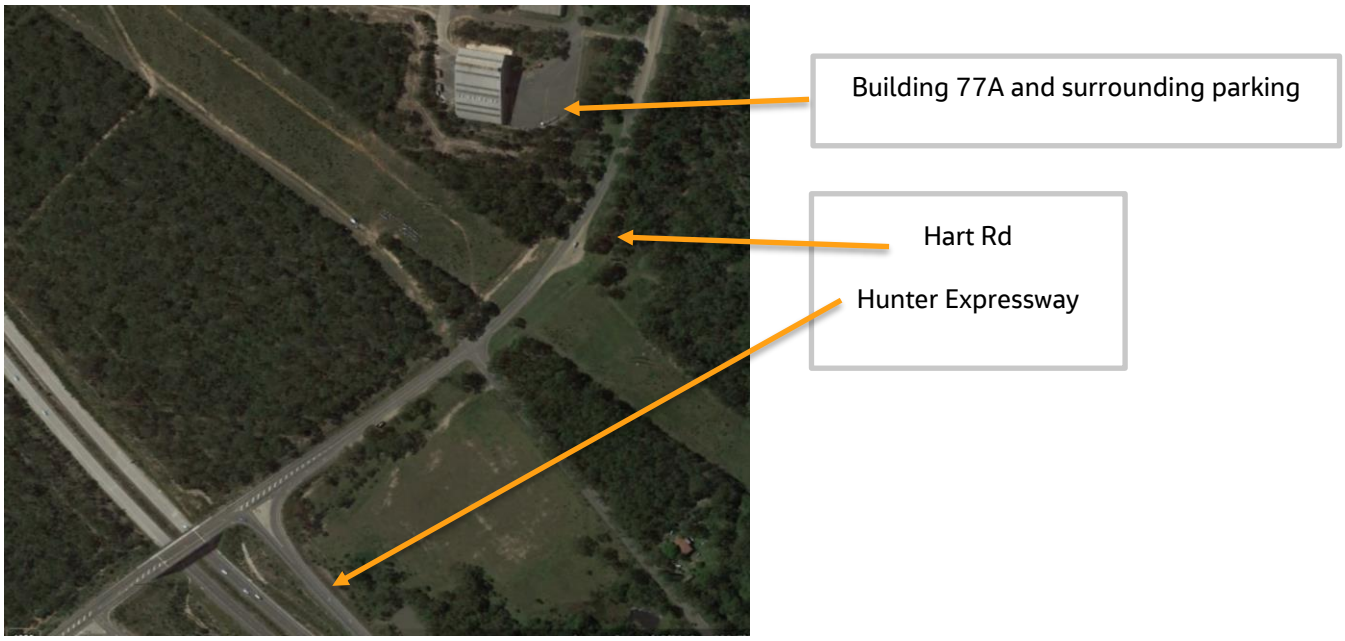
Vehicle class	Total one-way vehicle movements over duration of construction period	Maximum one-way vehicle movements (per day)	Timing		Project dates (approx.)[1]
Passenger	72,000	200	5:30 am to 6:30 am	3:30 pm to 4:30 pm	February 2022 – December 2023
Heavy rigid	9,900	100	7:00 am to 3:00 pm		February 2022 – May 2023
Semi-trailer	400	20	7:00 am to 3:00 pm		July 2022 – May 2023
B-double	240	12	8:00 am to 4:00 pm		May 2023 – December 2023
Oversize overmass	20	2	Off-peak (most likely travelling overnight)		September 2022 – November 2022
Cranage	10	4	Off-peak period		July 2022 – May 2023
Heavy machinery (via low loader)	40	4	Off-peak period		February 2022 – May 2023
Total	82,610				

Note: Project dates assume commencement of construction in February 2022.

Construction worker parking

All parking will be accommodated on-site or on adjacent properties by agreement with the land holder (Hydro Aluminium Kurri Kurri Pty Ltd) / Industrial Estate Developer). Snowy Hydro has a 'Licence to Occupy' agreement for 'Building 77A' and surrounds in place with the Partnership of McCloy Loxford Land and Dowmere commencing on 15th January 2021 and expiring on 9th January 2024 for the land folio identifiers 16/1082775 and 3/456769, which includes the uses of offices and worker parking described in this section. This area forms part of Hydro Aluminium's existing Environmental Protection Licence 1548 premises and the permitted use includes access and parking. The intention is not to have parking in the Buffer Land portion of the Project Site as not doing so will improve management of construction workforce safety, however, there is the potential for temporary parking in the Buffer Land area. Please see Figure 4-3 which identifies the Buffer Land as Area '3', and also the location of Building 77A. It's noted that the parking around building 77A is currently an established asphalt parking area, shown in the picture below this paragraph, and in relation to the Hunter Expressway and Hart Rd for context.

The purple (outbound) and green lines (inbound) in Figure 4-4 identify the alignment of the existing asphalted Hart Rd which will be used by the construction workforce to move from building 77A to the project site. Building 77A is also identified in Figure 4-4. The parking surrounding building 77A is shown in the figure below to show the asphalted area and connecting driveway between it and Hart Rd.



Appendix 2 - Environment Protection Licence