Arnott's Huntingwood Processing Expansion

Noise and Vibration Assessment

FDC Building Services

22 – 24 Junction Street, Forest Lodge
NSW 2037

Prepared by:

SLR Consulting Australia

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0.1	26 November 2025	Brandon Nguyen Khuong	Mark Irish	Mark Irish
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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with FDC Building Services (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by FDC Building Services (FDC) to assess a Modification for the approved SSDA (SSD-17352813) relating to the expansion works to the existing food processing facility (bakery) at 65 Huntingwood Drive, Huntingwood (the Site). The facility is occupied by Arnott's Biscuits.

This report summarises the potential construction and operational noise and vibration impacts associated with the modified development, primarily associated with the proposed Stage 1 ancillary works. Additionally, this assessment considers the operational traffic noise during the transition period (Stage 1) and final design (Stage 2).

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

1.1 Relevant Documents

The following standards, guidelines and drawings have been used to establish the project specific acoustic design requirements for the development.

- Architectural drawings, prepared by HLA Architects (dated 20/12/2024)
- Secretary's Environmental Assessment Requirements (SEARs) for SSD – 17352813 issued 12th May 2021 (SEARs)
- NSW EPA's Noise Policy for Industry, dated October 2017 (NPfI).
- NSW EPA's Road Noise Policy, dated March 2011 (RNP).
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG).
- Transport for NSW's Construction Noise and Vibration Guideline, dated September 2023 (CNVG).
- BS 7385.2:1993 Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Ground-borne Vibration (BS 7385.2).
- NSW Department of Environment and Conservation – Assessing Vibration: A Technical Guideline, dated February 2006 (AVTG).
- Addendum Transport Impact Assessment (TIA) – Section 4.55 Modification to SSD-17352813, prepared by Urbis (Ref: P0057666 Arnott's Huntingwood Modification TIA 250619, dated 19/06/2024)

1.2 Proposal Description

The proposed development is located within the existing site at 65 Huntingwood Drive. The site is adjacent to Huntingwood Drive and Brabham Drive, which are located around 10 m to the north and west respectively.

The proposal seeks to modify the expansion works to the Arnotts' facility by introducing a Stage 1 development that includes the construction and operation of the following buildings/facilities:

- Oven annex
- Engineering shed, including minor hardstand extensions to accommodate the facility
- Chocolate manufacturing building, including ancillary high voltage building
- Enrobing annex

- Packaging material warehouse

The site location is shown in **Figure 1** and the proposed ground floor layout is shown in **Figure 2**.

Figure 1 Site Location and Surrounding Receivers

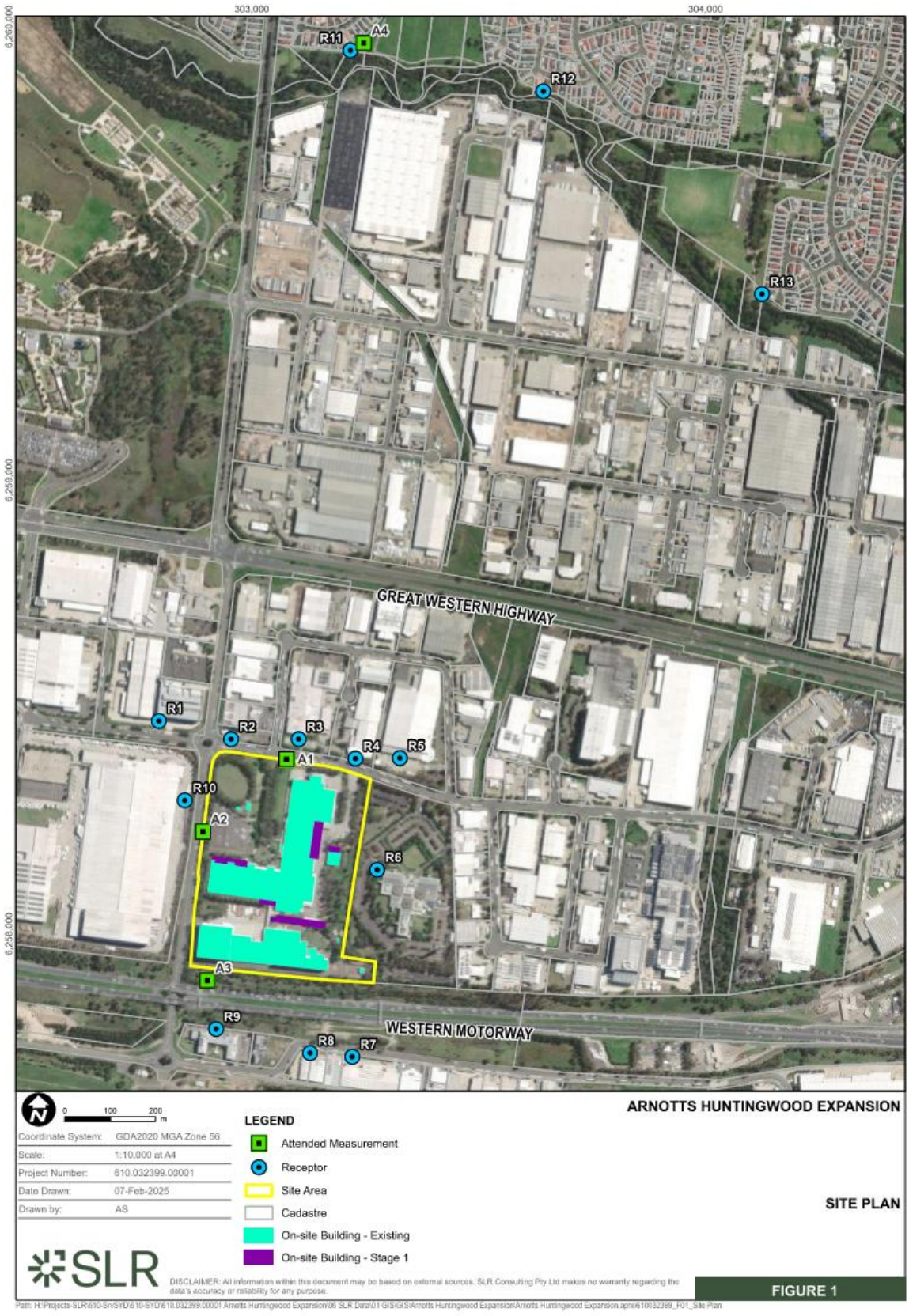
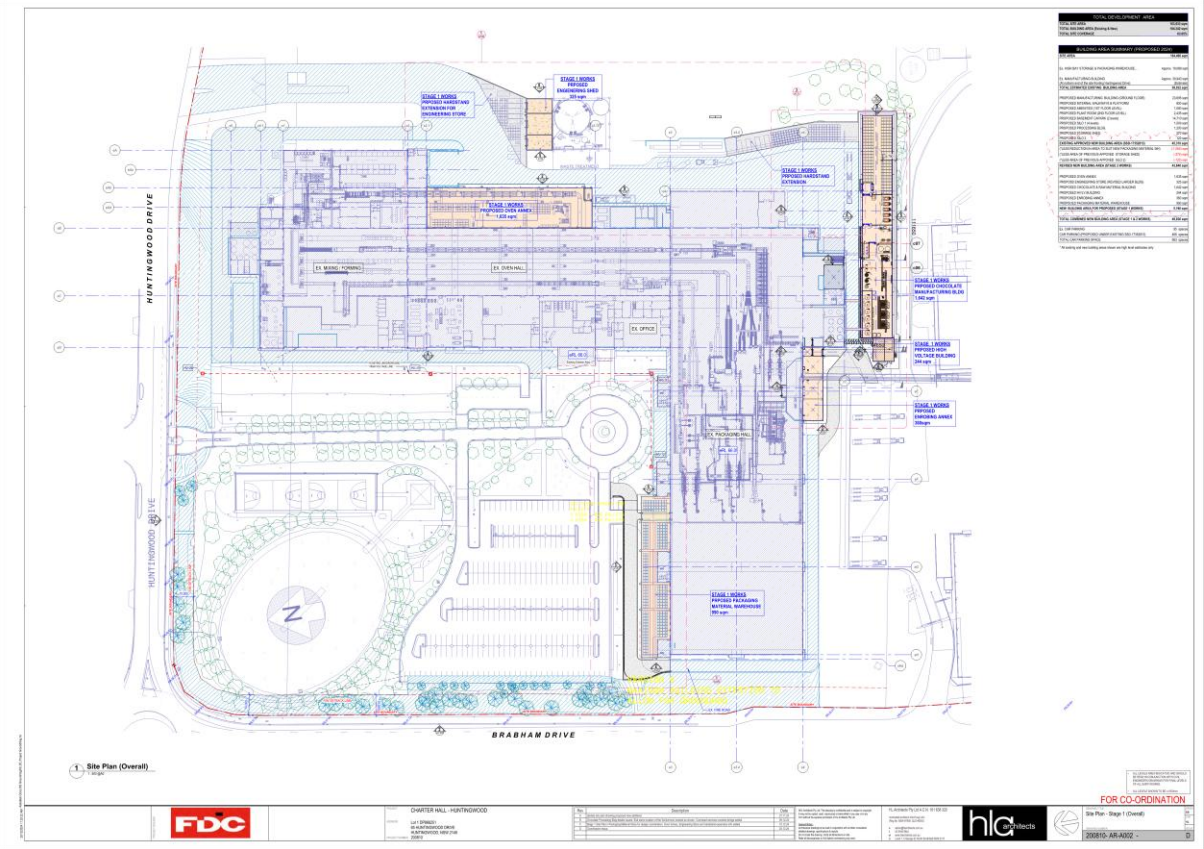


Figure 2 Proposed Stage 1 Development



The expanded facility will continue to operate 24 hours per day, seven days per week.

The Stage 1 development is expected to result in a minor increase in traffic generation when compared to the existing scenario as per the Addendum Transport Impact Assessment – Section 4.55 Modification to SSD-17352813 prepared by Urbis (Ref: P0057666 Arnott's Huntingwood Modification TIA 250218, dated 18/02/2024). Hence, any subsequent operational noise increase has been considered in this assessment and is detailed in **Section 4.2**.

The identified sources of noise from the proposed development include:

- Existing mechanical plant operation
- Stage 1 mechanical plant operation
- Stage 1 and Stage 2 heavy vehicle movements across the following sectors:
  - Raw materials
  - Waste
  - Packaging materials
  - Service and support
  - High Bay Warehouse
- Light vehicle movements during the following stages:
  - Stage 1 – staff use existing at-ground carpark
  - Stage 2 interim – during construction of the Stage 2 facility, temporary carpark will be located as per **Figure 3**.

- Stage 1 + Stage 2 – staff will park in the proposed underground carpark

Figure 3 Temporary Carpark Space during Stage 2 Construction – sourced from TIA

1.3 Nearest Receivers

The nearest sensitive receivers are commercial and industrial properties surrounding the site, ranging from 30 metres to the north to 170 metres to the south. The nearest receivers are shown in **Figure 1** and detailed in **Table 1**.

Table 1 Surrounding Sensitive Receivers

ID	Address	Type	Distance (m)	Direction
R01	Brabham Drive, Eastern Creek	Industrial	160	North West
R02	64 Huntingwood Drive, Huntingwood	Commercial	30	North
R03	62 Huntingwood Drive, Huntingwood	Commercial	50	North
R04	58 Huntingwood Drive, Huntingwood	Commercial	30	North
R05	52 Huntingwood Drive, Huntingwood	Industrial	70	North east
R06	51 Huntingwood Drive, Huntingwood	Industrial	80	East
R07	22 Peter Brock Drive, Eastern Creek	Industrial	170	South
R08	10 Peter Brock Drive, Eastern Creek	Industrial	170	South
R09	2A Peter Brock Drive, Eastern Creek	Hotel	150	South
R10	71 Huntingwood Drive, Huntingwood	Industrial	50	West
R11	9 Flemming Grove, Doonside	Residential	1500	North
R12	19 Shelley Crescent, Blacktown	Residential	1500	North
R13	1 Mariko Place, Blacktown	Residential	1400	North-East

1.4 Planning Secretary's Environmental Assessment Requirements (SEARs)

From our understanding, this SSDA modification does not invoke any new specific SEARs. Therefore, the previously issued SEARs as part of SSDA (SSD-17352813) issued on 12th May 2021 has been adopted for this assessment.

Items relevant to this assessment and where they have been addressed has been summarised in **Table 2**.

Table 2 Previously issued SEARs for SSDA (SSD-17352813)

Item In SEARS	Where Addressed
The identification of impacts associated with construction, site emission and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours and a detailed sleep disturbance assessment.	Section **5.1** Section **5.3.1** Section **5.3.2** **Appendix C**
Details of noise monitoring survey, background noise levels, noise source inventory and 'worst case' noise emission scenarios.	Section **4.2.1**
Consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area.	Section **3.3.2** Section **4.2.2** Section **4.2.3**
A cumulative impact assessment inclusive of impacts from other developments, including the existing development.	Section **3.3.2**
Details and analysis of the effectiveness of proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and vibration following application of mitigation these measures and details of any proposed compliance monitoring programs.	Section **6.2**

2.0 Existing Noise Environment

The site is located within an industrial precinct and is adjacent to the M4 Western Motorway. The receivers in immediate proximity to the site are classified as industrial and commercial receivers and the closest residential receivers are approximately 1500m north of the site.

Extensive attended measurements were previously undertaken in June 2021 for the day, evening and night-time periods. The general observations of the acoustic amenity during the survey are considered typical of the receiver's environment and are not expected to have significantly changed since the previous survey.

For additional information regarding the noise monitoring instrumentation, methodology and results, refer to the previous noise impact assessment (610.30322-R01-v0.5, dated 24/08/2021) prepared for the approved SSDA (SSD-17352813).

3.0 Assessment Criteria

3.1 Construction Noise Criteria

As per Conditions B7 of the conditions of consent (SSD-17352813), guidance from the NSW Interim Construction Noise Guideline (ICNG) is used to assess and manage impacts from construction noise at residences and 'other sensitive' land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) based on the existing background noise in the area. Representative 'worst-case' noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

3.1.1 Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in Table 3.

Table 3 Determination of NMLs for Residential Receivers

Time of Day	NML (dBA) $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL[1] + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise: • Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises 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 dBA	The Highly Noise Affected (HNA) 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 restructuring the hours that the very noisy activities can occur, taking into account: o 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 o If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Standard Construction Hours	Noise affected RBL + 5 dB	• 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

Time of Day	NML (dBA) $L_{Aeq(15minute)}$	How to Apply
		• Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW Industrial Noise Policy (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).

3.1.2 Other Sensitive Land Uses

The ICNG provides criteria for a number of non-residential 'other sensitive' land uses, such as educational institutes, hospitals, medical facilities, commercial premises and outdoor recreational areas. The ICNG references AS 2107 for criteria for other sensitive receivers which are not listed in the guideline.

The ICNG NMLs for other sensitive receivers are shown in Table 4.

Table 4 NMLs for Project Specific Other Sensitive Receivers

Land Use	NML $L_{Aeq(15minute)}$
Commercial	External noise level 70 dBA
Industrial	External noise level 75 dBA
Hotel[1]	Internal noise level 45 dBA

Note 1: Derived from ICNG criteria for educational institutions, hospitals and places of worship

3.1.3 NML Summary

The NMLs for the proposal are determined using the background noise monitoring and are shown in Table 5. The works are proposed to occur during Standard Construction Hours so only the daytime NMLs are shown.

Table 5 Construction Noise Management Levels

Receiver Type	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Criteria
	Standard Construction Hours	Out of Hours			
	Daytime	Daytime[1]	Evening	Night-time	
Residential	52	n/a	n/a	n/a	n/a
Industrial	75	n/a	n/a	n/a	n/a
Commercial	70	n/a	n/a	n/a	n/a
Hotel[2]	65	n/a	n/a	n/a	n/a

Note 1: This refers to the period on Saturday between 7am – 8am and 1pm – 6pm, on Sunday and public holidays between 8am – 6pm.

Note 2: 45 dBA internal criteria – assuming 20 dB reduction with closed windows.

3.1.4 Construction Road Traffic Noise

The potential impacts from construction traffic on public roads are assessed under the NSW *EPA Road Noise Policy* (RNP)).

An initial screening test is first used to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB as a result of project related construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria shown in Table 6.

Table 6 RNP Criteria for Assessing Construction Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am - 10 pm)	Night-time (10 pm - 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

3.2 Construction Vibration Criteria

Minimum working distances for typical vibration intensive construction equipment are provided in the Roads and Maritime *Construction Noise and Vibration Guideline* (CNVG) and are shown in Table 7.

The minimum working distances are for both cosmetic damage (from *BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2*, BSI, 1993) and human comfort (from the NSW DEC *Assessing Vibration: A Technical Guideline*, 2006). Works that occur further from receivers than the minimum distances are unlikely to result in vibration impacts.

Table 7 CNVG Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	1-2 tonne	5 m	15 m to 20 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	>18 tonne	25 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	73 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	4 m

Plant Item	Rating/Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Jackhammer	Hand held	1 m (nominal)	2 m

Note 1: More stringent conditions may apply to heritage or other sensitive structures.

The minimum working distances are indicative and will vary depending on the particular item of equipment and local geotechnical conditions. The distances apply to human response and/or cosmetic damage of typical buildings under typical geotechnical conditions.

3.3 Operational Noise Criteria

3.3.1 Project Noise Trigger Levels

The project noise trigger levels for industrial noise from the proposal are derived from Condition B8 from the previously approved conditions of consent for SSDA (SSD-17352813) and is summarised in Table 8.

Table 8 Project Noise Trigger Levels – sourced from Conditions B8 (SSD-17352813)

Applicable Receptors	Receiver Type	Period	Amenity Noise Level L_{Aeq} (dBA)	Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				Intrusiveness	Amenity[1,2]
R02-R04	Commercial	When in use	65	-	**63**
R01, R05-R08, R10	Industrial	When in use	70	-	**68**
R09	Hotel	Day	65	-	**63**
		Evening	55	-	**53**
		Night	50	-	**48**
R11-R13	Residential	Day	60	**47**	58
		Evening	50	**47**	48
		Night	45	**41**	43

Note 1: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

Note 2: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels due to other sources of industrial noise being present in the area.

3.3.2 Cumulative Noise Impacts

The NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects* requires that the potential combined effect of cumulative impacts on all nearby industrial developments to be considered when assessing potential noise impacts from state significant projects. The guideline references the NPfI when determining the approach to assessing the cumulative industrial noise impacts.

The NPfI states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The NPfI requires that the amenity noise levels which are applied to an individual project be reduced by 5 dB to allow for the potential cumulative impact from multiple sources of industrial noise in an area (including existing and new).

By doing this, the policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable. The NPfI states that *"where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required"*.

The potential cumulative impacts from the development and other sources of industrial noise in the area are therefore accounted for in the proposal-specific PNTLs (see **Section 3.3.1**).

3.3.3 Annoying Characteristics

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or dominant low-frequency content. The NPfI specifies the following modifying factors, shown in Table 9, which are to be applied where annoying characteristics are present.

Table 9 NPfI Modifying Factors

Factor	Assessment/Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible.	5 dB[3]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB[2] (excluding duration correction)

Note 1: Corrections to be added to the measured or predicted levels.

Note 2: Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

Note 3: Adjustment to be applied to night-time only.

3.3.4 Sleep Disturbance

The NPfI defines the sleep disturbance screening level as 52 dBA LAFmax or the prevailing background level plus 15 dB, whichever is greater. The 52 dBA LAFmax screening level has been used for this for this assessment.

3.4 Operational Traffic on Surrounding Roads

The potential impacts from project related traffic on the surrounding public roads are assessed using the NSW EPA *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB. Where this is considered likely, further assessment is required using the RNP criteria shown in Table 10.

Table 10 RNP/NCG Criteria for Assessing Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

4.0 Methodology

4.1 Construction Noise and Vibration

A noise model of the study area has been used to predict noise levels from the proposed construction work to all surrounding receivers. The model uses ISO 9613-2 algorithms in SoundPLAN 8.2 software.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding areas.

4.1.1 Construction Activities

Representative scenarios have been adopted from the previous noise impact assessment (610.30322-R01-v0.5, dated 24/08/2021) prepared for the approved SSDA (SSD-17352813).

The representative construction scenarios developed and the associated equipment to assess potential impacts during construction are detailed in **Table 11**.

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

The sound power levels for the construction equipment used in each scenario is presented in **Appendix B**.

Table 11 Construction Activities

Scenario	Works Activity	Equipment
W.001	Site establishment	• Generator • Hand tools • Trucks >20 tonne
W.002	Earth works	• Excavator (tracked) 20t • Generator • Vibratory roller • Trucks >20 tonne
W.003	Concrete works	• Concrete agitator truck • Generator • Concrete pump • Trucks >20 tonne • Concrete vibrator
W.004	Structure works	• Franne crane 20 tonne • Elevated work platform • Generator • Machine mounted hydraulic drill • Truck >20 tonne
W.005	Finishing works	• Franna crane 20 tonne • Elevated work platform • Generator • Hand tools

Scenario	Works Activity	Equipment
		• Trucks >20 tonne

4.1.2 Hours of Construction

The works would be undertaken during Standard Construction Hours, which are:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm on Saturdays
- No work on Public Holidays or Sundays.

It is not expected that there would be any requirement for works during evening or night-time periods.

4.2 Operational Noise

The potential operational noise levels from the proposal have been predicted to the surrounding receivers using ISO9613-2 industrial noise algorithm in SoundPLAN 8.2. The model includes ground topography, buildings and representative noise sources from the proposal.

The potential impacts have been determined by comparing the predicted noise levels to the NPfI Project Noise Trigger Levels in a 15-minute assessment period. Both current operations and expanded operations have been considered as part of this assessment.

Operational noise levels have been assessed for the Stage 1 development which includes the noise generating activities identified in **Section 4.2.1**.

4.2.1 Operational Noise Sources

A summary of the noise sources associated with the operation of the development are provided below.

On-Site Heavy and Service Traffic

The project is seeking minor increases to heavy and service vehicle trip generation to support the Stage 1 and Stage 2 development.

The latest vehicle movements are prepared by Urbis and is summarised in **Table 12**.

Table 12 Vehicle Traffic Data – Worst-case Hourly Vehicle Volumes

Location	Vehicle Type	Development Stage	
		Stage 1	Stage 1 + Stage 2
Raw Materials	Semi-trailer tankers	16	21
	Semi-trailer	5	7
	Rigid	4	5
Waste	Rigid/skip change out	5	6
	Semi-trailer	1	2
Packaging Materials	B-Double	0	0
	Semi-trailer	11	14
	Rigid	5	7

Location	Vehicle Type	Development Stage	
		Stage 1	Stage 1 + Stage 2
Service and Support Vehicles	Courier vans	11	14
	Engineering and service vans	0	0
	Deliveries	11	14
High Bay Warehouse	B-Double	21	27
	Semi-trailer	66	87
	Rigid	15	21

From the above daily traffic volumes, Arnott's have provided the vehicle movement for the worst-case 15 minute scenario. On-site vehicles have been modelled using the data shown in **Table 13**. The volumes are conservative and representative of a potential worst-case 15-minute period for the daytime, evening and night-time.

Table 13 Heavy and Support Vehicle Traffic Data – Worst-Case 15-Minute Period

Location	Type	Movement	Sound Power Level (dBA)[1]	Speed (km/h)	Number of Vehicles in Worst-case 15-minute Period					
					Stage 1			Stage 1 + Stage 2		
					Day	Evening	Night-time	Day	Evening	Night-time
Raw materials	Large Truck	Access routes	108[1]	25	5	2	2	6	2	2
		On-lot route and hardstands		10						
Waste	Large Truck	Access routes	108[1]	25	2	1	0	2	1	0
		On-lot route and hardstands		10						
Packaging Materials	Large Truck	Access routes	108[1]	25	5	0	0	6	0	0
		On-lot route and hardstands		10						
Service and Support Vehicles	Vans	Access routes	96[2]	20	6	0	0	6	0	0
High Bay Warehouse	Large Truck	Access routes	108[1]	25	10	10	10	13	13	13
		On-lot route and hardstands		10						

Note 1: Sound power level for large trucks based on 106 dBA for trucks at slow speed for 80% of the time and 111 dBA for trucks accelerating for 20% of the time and is representative of trucks with three or more axles. Sound power level for medium trucks based on 100 dBA for trucks at slow speed for 80% of the

time and 106 dBA for trucks accelerating for 20% of the time and is representative of trucks with two axles and six tires. Sound power levels taken from the Federal Highway Administration's Traffic Noise Model.

Note 2: Taken from *Road Traffic Noise Prediction Model "ASJ RTN-Model 2013" Proposed by the Acoustical Society of Japan – Part 2: Study on Sound Emission of Road Vehicles*, OKADA et al, Internoise 2014, and accounts for vehicles accelerating.

On-Site Light Vehicle Traffic

Due to the project's expansion, the expected staff number are predicted to increase. The TIA conservatively assumed each staff member will drive themselves and arrive 30 minutes before and leave 30 minutes after their shift.

Based on this, the worst-case 15-minute period during all assessment periods have been derived for staff vehicle movements and is summarised in **Table 12**.

Table 14 Light Vehicle Traffic Data – Worst-Case 15-Minute Period

Period	Development Stage		
	Stage 1	Stage 2 Interim	Stage 1 + Stage 2
Day 7am – 6pm	110	85	158
Evening 6pm – 10pm	0	0	32
Night-time 10pm – 7am	110	121	158

Mechanical Plant

The location of current and future locations for cooling towers, cooling water pumps and centrifuge fans have been provided by FDC. The assumed details for these mechanical plant items are shown in Table 15.

Table 15 Typical Mechanical Plant Details

Noise Source	Sound Power Level (dBA)	Number		Typical Duration of Operation	Source Height[1] (m)
		Current Operations	Stage 1 Operations		
Cooling towers	95	3	-	24 hours	1[1]
Cooling water pumps	80	-	-	24 hours	1[1]
Centrifuge fan	88	1	-	24 hours	2
General exhaust fan	88	-	5	24 hours	2
Evaporator cooler	87	-	4	24 hours	0.5
Packaged air conditioner/Condenser	87	-	7	24 hours	0.5

Note 1: Height above roof.

The impacts from mechanical plant should be reviewed during detailed design stage once further information is available. It is unlikely that mechanical plant will influence noise levels at receivers above on site vehicle movements and other on-site activities. In the event of predicted impacts, it is generally straightforward to control mechanical plant noise emissions

using standard mitigation measures (ie quieter equipment specification, localised shielding, etc).

On-Site Activities/Loading Docks

In addition to vehicle movements on site, locations have been assumed for noisy on site activities. The locations for these sources are the designated loading docks/delivery points. The details of these activities have been provided in the table below.

Table 16 Typical Loading Dock Noise Sources

Noise Source	Sound Power Level (dBA)	Typical Duration of Use in Worst-case 15-minute Period	Source Height (m)
Truck reversing alarm[1]	102[1]	60 seconds	1
Forklift reversing alarm[1]	97[1]	90 seconds	0.5
Truck Idling (while unloading to silo)	105	300 seconds	1
Skip Bin Change Out	110	30	1.5
Air brakes	118	1 second	1
Gas Forklift	93	900 seconds	1

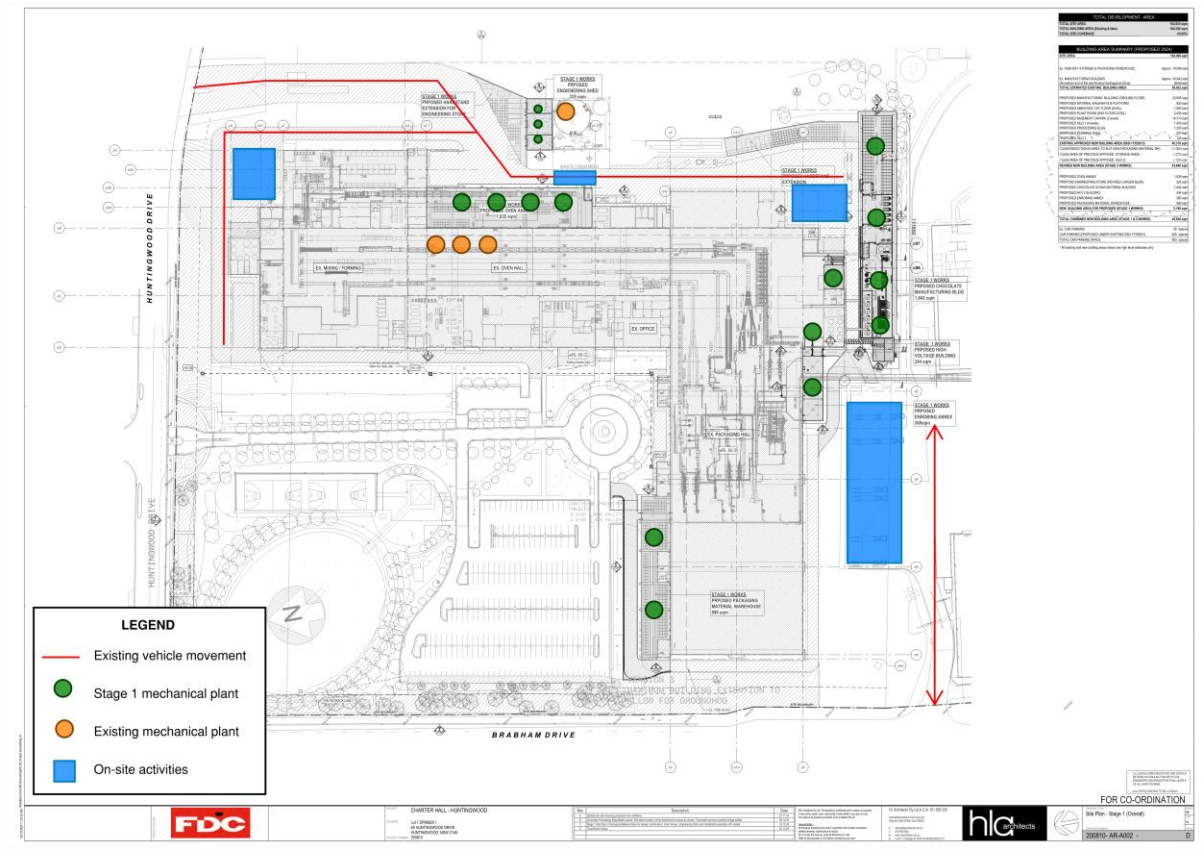
Note 1: SWL includes a -3 dB reduction for LAeq to account for alarm on-time.

Building breakout noise generated from activities from within the packaging facility are expected to be negligible in comparison to external vehicle movements and other on-site activities and have therefore not been included in the assessment.

Modelled Noise Sources

Figure 4 depicts the existing internal traffic pathways, on-site noise generating sources and existing mechanical plant locations as well as the Stage 1 mechanical plant locations.

Figure 4 Stage 1 Noise Generating Sources



4.2.2 Corrections for Annoying Noise Characteristics

The potential annoying noise characteristics and modifying factor corrections relevant to the proposal are:

- **Tonality** – the proposed development introduces additional mechanical plant to serve the ancillary buildings and does not seek to increase traffic volumes through the site. At this stage, final mechanical selections have not been confirmed but it is expected that suitable plant selection to avoid applying tonality penalties are possible and feasible.
- **Low frequency noise** – the proposed development introduces additional mechanical plant to serve the ancillary buildings and does not seek to increase traffic volumes through the site. At this stage, final mechanical selections have not been confirmed but it is expected that suitable plant selection to avoid applying low frequency noise penalties are possible and feasible.
- **Intermittent noise** – the NPfI defines intermittent noise as noise heard at the receiver where the level suddenly drops or increases several times during the assessment period, with a noticeable change of at least 5 dB, such as where equipment cycles on and off. The intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms. No sources have been identified with potential intermittent characteristics.

4.2.3 Weather Conditions

Fact Sheet D of the NPfI requires noise assessments to consider the potential effects of noise-enhancing weather conditions, such as wind from the source to the receiver and/or temperature inversions.

The nearest receivers are classified as industrial and commercial and are less than 100m from the proposed site and the effects of weather on noise levels are expected to be negligible. The closest residential receivers are approximately 1500m from the proposal site and may be subjected to the effects of noise enhancing weather. Notwithstanding, the noise prediction modelling uses ISO 9613-2 algorithms which include noise-enhancing weather conditions including downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion.

As such, the assessment has conservatively applied noise-enhancing weather conditions for all periods as per Option 1 of Fact Sheet D of the NPfI.

5.0 Assessment of Impacts

5.1 Construction Noise

The following outcome is based on the predicted impacts at the most affected receivers and is representative of the realistic worst-case noise levels (without additional mitigation) that are likely to occur during construction. Receivers which are further away from the works and/or shielded from view would have substantially lower impacts. The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios.

Noise predictions from the construction works have been predicted to the nearest receivers during the daytime and are summarised in **Table 17**. Additionally, the predicted exceedances are summarised in **Table 18**.

Table 17 Predicted Daytime Construction Noise Levels

ID	Receiver Type	NML (Daytime)	Predicted Noise Level – LAeq(15minute) (dBA)				
			W.001	W.002	W.003	W.004	W.005
R01	Industrial	75	50	55	56	56	50
R02	Industrial	75	57	62	63	63	57
R03	Commercial	70	52	57	58	58	52
R04	Commercial	70	59	64	65	65	59
R05	Industrial	75	53	58	59	59	53
R06	Industrial	75	59	64	65	65	59
R07	Industrial	75	50	55	56	56	50
R08	Industrial	75	34	39	40	40	34
R09	Hotel	65	36	41	42	42	36
R10	Industrial	75	61	66	67	67	61
R11	Residential	52	33	38	39	39	33
R12	Residential	52	29	34	35	35	29
R13	Residential	52	36	41	42	42	36

Table 18 Predicted Exceedances at Nearest Receivers

ID	Receiver Type	NML (Daytime)	Predicted Exceedance – LAeq(15minute) (dBA)				
			W.001	W.002	W.003	W.004	W.005
R01	Industrial	75	-	-	-	-	-
R02	Industrial	75	-	-	-	-	-
R03	Commercial	70	-	-	-	-	-
R04	Commercial	70	-	-	-	-	-
R05	Industrial	75	-	-	-	-	-

ID	Receiver Type	NML (Daytime)	Predicted Exceedance – LAeq(15minute) (dBA)				
			W.001	W.002	W.003	W.004	W.005
R06	Industrial	75	-	-	-	-	-
R07	Industrial	75	-	-	-	-	-
R08	Industrial	75	-	-	-	-	-
R09	Hotel	65	-	-	-	-	-
R10	Industrial	75	-	-	-	-	-
R11	Residential	52	-	-	-	-	-
R12	Residential	52	-	-	-	-	-
R13	Residential	52	-	-	-	-	-

The above shows that compliance is predicted at all surrounding receptors for works during standard hours. The highest construction noise impacts are predicted during concrete and structure works, when construction equipment is located the western portion of the site (near R10) during the construction of the packaging material warehouse.

Best practice construction noise mitigation and management measures are discussed in **Section 6.1**.

Works Outside Standard Construction Hours

No works outside of standard construction hours are currently planned for the development.

Should the need for out of hours works arise, the works will be conducted in accordance with an approved Out of Hours protocol to be prepared, submitted and approved as part of the Construction Environmental Management Plan (CEMP) prior to commencement of the works.

5.2 Construction Vibration

The major potential sources of vibration from the proposed construction activities would likely be during earthworks when rock breakers and vibratory rollers are being used.

Vibration offset distances have been determined from the CNVG minimum working distances for cosmetic damage and human response in Table 7. Buildings within the minimum working distances are summarized below.

Consideration of vibration offset distances should also be given to existing buildings on site that will be occupied during construction works.

5.2.1 Cosmetic Damage Assessment

All receivers are outside of the safe work distances for cosmetic damage.

5.2.2 Human Comfort Vibration Assessment

Buildings directly to the west of the site are approximately 70 metres from the site boundary.

Earth works may involve the use of a vibratory roller. Receiver R10 to the west is within the safe work distance for human comfort for large vibratory rollers (above 7 tonnes) during the construction of the packaging material warehouse.

Occupants of these buildings may be able to perceive vibration impacts at times when vibration intensive equipment is in use. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is in use.

Construction vibration mitigation and management measures are discussed in **Section 6.1**.

5.2.3 Construction Traffic

Construction traffic would generally access the site from Huntingwood Drive to the north and Brabham Drive to the west via the M4 motorway or Great Western Highway. The construction traffic route would travel through an industrial/commercial area with no adjacent residential sensitive receivers.

The requirements for construction traffic movements would be minimal and would not be expected to result in any additional noise impacts at the nearest receivers due to the existing volumes of traffic on the access roads, noting that a vehicle increase of roughly 60% would be required to increase the noise levels by 2 dB.

5.3 Operational Noise

5.3.1 Predicted Noise Levels

A summary of the noise assessment at the receivers surrounding the proposal is shown in **Table 19** for the proposed Stage 1, Stage 2 (interim) and Stage 1 + Stage 2 operations.

Table 19 Industrial Noise Assessment

ID	Period	Project Noise Trigger Level	Noise Level LAeq(15minute) (dBA)								
			Stage 1			Stage 2 Interim			Stage 1 + Stage 2		
			Predicted	Exceedance	Compliance	Predicted	Exceedance	Compliance	Predicted	Exceedance	Compliance
R1	Daytime	**70**	42	-	Yes	40	-	Yes	42	-	Yes
	Evening	**70**	38	-	Yes	38	-	Yes	38	-	Yes
	Night-time	**70**	40	-	Yes	37	-	Yes	40	-	Yes
R2	Daytime	**65**	47	-	Yes	44	-	Yes	47	-	Yes
	Evening	**65**	42	-	Yes	42	-	Yes	43	-	Yes
	Night-time	**65**	45	-	Yes	42	-	Yes	46	-	Yes
R3	Daytime	**65**	58	-	Yes	58	-	Yes	58	-	Yes
	Evening	**65**	56	-	Yes	56	-	Yes	56	-	Yes
	Night-time	**65**	56	-	Yes	55	-	Yes	56	-	Yes
R4	Daytime	**65**	64	-	Yes	64	-	Yes	65	-	Yes
	Evening	**65**	60	-	Yes	60	-	Yes	60	-	Yes
	Night-time	**65**	60	-	Yes	60	-	Yes	62	-	Yes
R5	Daytime	**70**	55	-	Yes	55	-	Yes	55	-	Yes
	Evening	**70**	52	-	Yes	52	-	Yes	52	-	Yes
	Night-time	**70**	52	-	Yes	51	-	Yes	53	-	Yes
R6	Daytime	**70**	58	-	Yes	58	-	Yes	59	-	Yes
	Evening	**70**	53	-	Yes	53	-	Yes	53	-	Yes
	Night-time	**70**	53	-	Yes	53	-	Yes	57	-	Yes

ID	Period	Project Noise Trigger Level	Noise Level LAeq(15minute) (dBA)								
			Stage 1			Stage 2 Interim			Stage 1 + Stage 2		
			Predicted	Exceedance	Compliance	Predicted	Exceedance	Compliance	Predicted	Exceedance	Compliance
R7	Daytime	**70**	42	-	Yes	43	-	Yes	43	-	Yes
	Evening	**70**	39	-	Yes	39	-	Yes	39	-	Yes
	Night-time	**70**	39	-	Yes	41	-	Yes	42	-	Yes
R8	Daytime	**70**	33	-	Yes	40	-	Yes	34	-	Yes
	Evening	**70**	31	-	Yes	31	-	Yes	31	-	Yes
	Night-time	**70**	31	-	Yes	41	-	Yes	33	-	Yes
R9	Daytime	**63**	32	-	Yes	41	-	Yes	33	-	Yes
	Evening	**53**	31	-	Yes	31	-	Yes	31	-	Yes
	Night-time	**48**	31	-	Yes	41	-	Yes	32	-	Yes
R10	Daytime	**70**	46	-	Yes	43	-	Yes	44	-	Yes
	Evening	**70**	43	-	Yes	43	-	Yes	44	-	Yes
	Night-time	**70**	46	-	Yes	43	-	Yes	44	-	Yes
R11	Daytime	**47**	<30	-	Yes	<30	-	Yes	<30	-	Yes
	Evening	**47**	<30	-	Yes	<30	-	Yes	<30	-	Yes
	Night-time	**41**	<30	-	Yes	<30	-	Yes	<30	-	Yes
R12	Daytime	**47**	<30	-	Yes	<30	-	Yes	<30	-	Yes
	Evening	**47**	<30	-	Yes	<30	-	Yes	<30	-	Yes
	Night-time	**41**	<30	-	Yes	<30	-	Yes	<30	-	Yes
R13	Daytime	**47**	<30	-	Yes	<30	-	Yes	30	-	Yes

ID	Period	Project Noise Trigger Level	Noise Level LAeq(15minute) (dBA)								
			Stage 1			Stage 2 Interim			Stage 1 + Stage 2		
			Predicted	Exceedance	Compliance	Predicted	Exceedance	Compliance	Predicted	Exceedance	Compliance
	Evening	**47**	<30	-	Yes	<30	-	Yes	<30	-	Yes
	Night-time	**41**	<30	-	Yes	<30	-	Yes	<30	-	Yes

The above assessment indicates that noise from the proposal is predicted to comply with the Project Noise Trigger Levels at all surrounding receivers for on-site operational traffic during Stage 1, Stage 2 interim and Stage 1 + Stage 2.

Variances in noise levels between the aforementioned stages of designs are attributed to differences in heavy and light vehicle volumes and staff parking vehicle routes. This assessment only considers mechanical plant associated with the Stage 1 development.

Operational noise contours for the predictions during all assessment periods for each stage of design have been presented in **Appendix C**.

5.3.2 Sleep Disturbance

The predicted night-time LAmax noise levels at the nearest residential receivers are shown in Table 20.

Table 20 Sleep Disturbance Assessment

Receiver Location	Source	Noise Level L_{Amax} (dBA)			Below Screening Level
		Sleep Dist. Screening Level	Predicted	Exceedance	
R11	All sources	52	Up to 39	-	Yes
R12	All sources	52	Up to 26	-	Yes
R13	All sources	52	Up to 36	-	Yes

The above assessment indicates that maximum noise events from the proposal are predicted to be below the sleep disturbance screening level at all surrounding residential receivers.

5.3.3 Off-site Road Traffic

Light and heavy vehicles would access the development directly from Huntingwood Drive which flows into Great Western Highway.

As the Great Western Highway is considered a major roadway which accommodates more than 20,000 AADT, the site generated traffic per development stages shown in **Table 13** and **Table 14** are not expected to significantly increase traffic to surrounding roadways. Therefore, no further assessment is required.

6.0 Mitigation and Management Measures

6.1 Construction Noise and Vibration Mitigation

Although no exceedances of the NMLs are expected, noise or vibration impacts may be apparent at the nearest receivers at certain times during construction of the proposal. The project should apply all feasible and reasonable mitigation measures to minimise the impacts, particularly during noise intensive works, such as demolition.

The following best-practice measures shown in **Table 21** should be implemented to minimise the potential impacts from the works.

Table 21 Standard Construction Recommended Mitigation and Management Measures

Project stage	Measure
Scheduling	Highly noisy intensive works should only be undertaken during the following Standard Construction Hours, unless otherwise assessed and justified: • 7 am to 6 pm Mondays to Fridays, inclusive; and • 8 am to 1 pm Saturdays; and • at no time on Sundays or public holidays.
	Provide appropriate respite periods as per the CNVG when noise intensive works are undertaken or during periods of high noise impacts.
	Carry out community consultation to determine the need and frequency of respite periods, if necessary.
	Avoid loading and unloading of materials / deliveries outside of daytime hours.
Site Layout	Site entry and exit points should be located as far as possible from sensitive receivers.
	Compounds and work areas should be one-way to minimise the need for vehicles to reverse.
	Work compounds, parking areas, equipment and stockpiles should be positioned away from noise-sensitive locations and/or in shielded locations.
	Trucks should not idle near to residential receivers.
	Stationary sources of noise, such as generators, should be located away from sensitive receivers.
Contractor management	Training should be provided to project personnel, including relevant sub-contractors, on noise and vibration requirements and the location of sensitive receivers during inductions and toolbox talks.
	Delivery vehicles should be fitted with straps rather than chains for unloading, wherever possible.
	Truck drivers should avoid compression braking as far as practicable.
	Where night-time works are required, trucks should use broadband reversing alarms.
Noise source mitigation	Use the minimum sized equipment necessary to complete the work and where possible, use alternative, low-impact construction techniques.
	Power tools should use mains power where possible rather than generators.
	Shut down machinery, including generators, when not in operation.

Project stage	Measure
	Avoid dropping materials from a height and dampen or line metal trays, as necessary.
	Ensure equipment is operated in the correct manner.
	All equipment should be appropriately maintained and fitted with noise control devices, where practicable, including acoustic lining of engine bays and air intake / discharge silencers, etc.
Community consultation	Provide appropriate notice to the affected sensitive receivers prior to starting works and before any noisy periods of works.
	Provide signage with a 24 hour contact number.
	Where there are complaints regarding noise, review and implement additional control measures, where feasible and reasonable.
Monitoring	Conduct noise and/or vibration monitoring in response to any valid complaints received.
	Conduct vibration monitoring whenever vibration intensive works are undertaken within the minimum working distances of sensitive receivers or structures.

6.2 Noise Mitigation

Operational noise emissions from the proposal are predicted to comply with the PNTLs at the surrounding receivers and no specific mitigation measures are required.

7.0 Conclusion

SLR has been engaged to assess the potential construction and operational noise and vibration emissions to support the modification to allow for the Stage 1 ancillary buildings works at the existing food processing facility at 65 Huntingwood Drive, Huntingwood.

As this report forms part of the planning submission for the Modification to the previously approved SSDA (SSD-17352813), it should be read in conjunction with the previously approved noise impact assessment (610.30322-R01-v0.5, dated 24/08/2021) to further understand the site's context and the existing acoustic environment.

The proposal includes the construction and operation of ancillary facilities, which would continue to be operational 24 hours a day, seven days a week. Additionally, operational on-site traffic noise during Stage 1, Stage 2 interim and Stage 1 + Stage 2 has been assessed.

Noise levels during the construction of the site expansion are not anticipated to exceed the noise management levels as per Condition B7 conditions of consent (SSD-17352813) at any time during works. A number of best-practice mitigation and management measures have been recommended to be applied, where feasible and reasonable, to minimise the impacts during construction as far as practicable.

Operational noise emissions from the proposal have been predicted to the surrounding receivers and the levels are expected to comply with Condition B8 conditions of consent (SSD-17352813). No specific mitigation measures are required to be considered.

No exceedances of the sleep disturbance screening criteria were found.

Based on the predicted levels, the proposal is considered appropriate from an acoustic standpoint.

Appendix A Acoustic Terminology

Arnott's Huntingwood Processing Expansion

Noise and Vibration Assessment

FDC Building Services

SLR Project No.: 610.032399.00003

1 December 2025

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

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

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

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

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

3. Sound Power Level

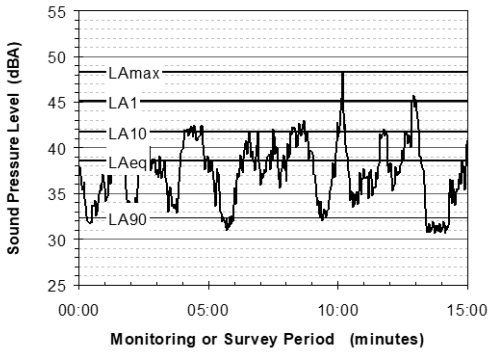
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

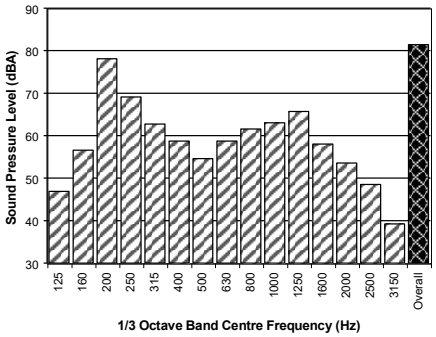
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

Tonality - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.

Impulsiveness - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

Intermittency - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.

Low Frequency Noise - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

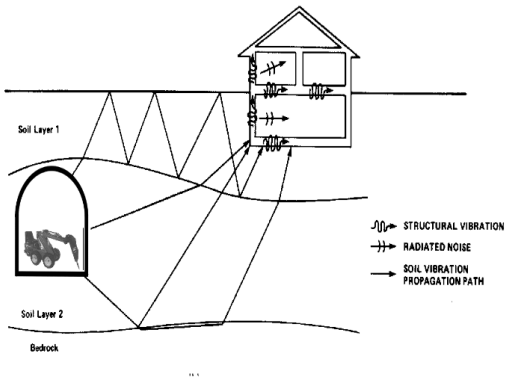
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

Appendix B Construction Noise Sources

Arnott's Huntingwood Processing Expansion

Noise and Vibration Assessment

FDC Building Services

SLR Project No.: 610.032399.00003

1 December 2025

Scenario		Total Lw (dBA)	Concrete agitator truck	Crane Franna (20 tonne)	Elevated Work Platform	Excavator - Tracked (20 tonne)	Generator - diesel/ petrol	Hand tools (electric)	Machine mounted hydraulic drill	Pump - Concrete	Roller - Vibratory	Truck (>20 tonne)	Vibrator - Concrete
Sound Power Level (Lw)			109	98	97	105	103	102	113	109	109	107	113
Estimated utilisation in assessment period (%)			100%	30%	25%	50%	100%	75%	50%	100%	100%	25%	100%
Construction Scenario													
W.001	Site establishment	**110**					1	3				4	
W.002	Earth works	**115**				1	1				1	4	
W.003	Concrete works	**116**	1				1			1		4	1
W.004	Structure works	**116**		1	1		1		1			4	
W.005	Finishing works	**110**		1	1		1	3				4	

Appendix C Operational Noise Contour Maps

Arnott's Huntingwood Processing Expansion

Noise and Vibration Assessment

FDC Building Services

SLR Project No.: 610.032399.00003

1 December 2025

Figure 5 Stage 1 Operational Noise Contour Maps – Day

Figure 6 Stage 1 Operational Noise Contour Maps – Evening

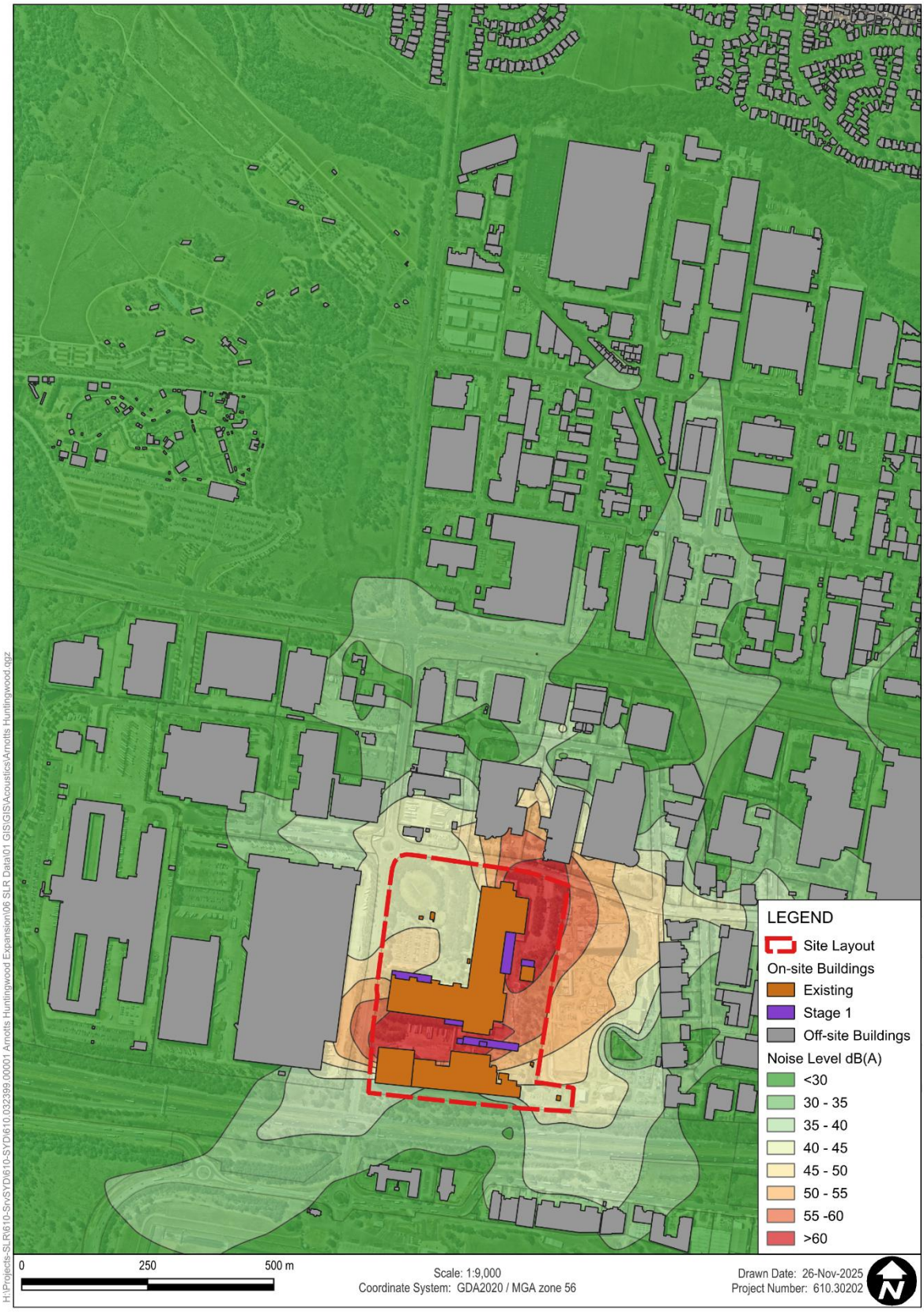


Figure 7 Stage 1 Operational Noise Contour Maps – Night-time

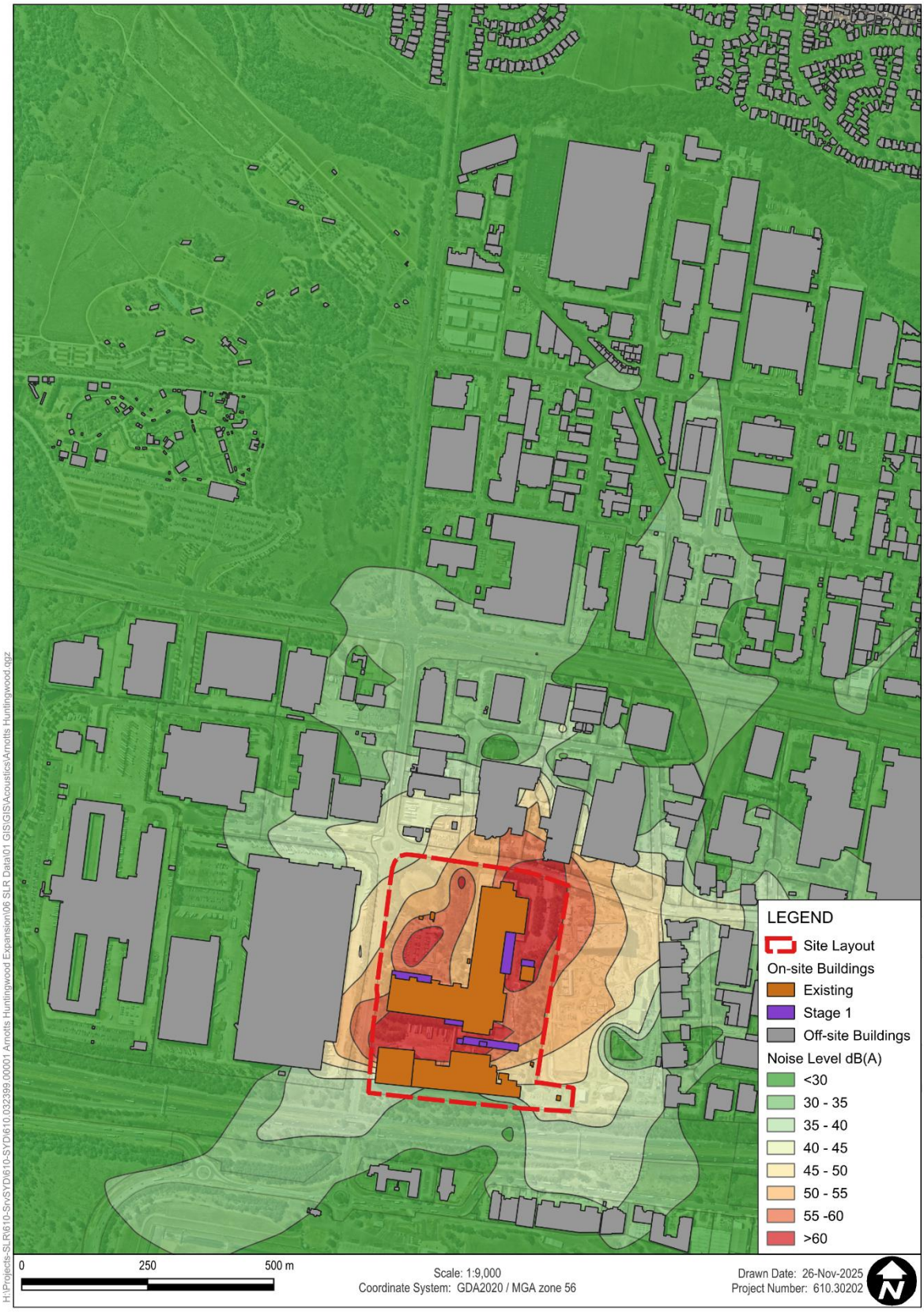


Figure 8 Stage 2 Interim Operational Noise Contour Maps – Day

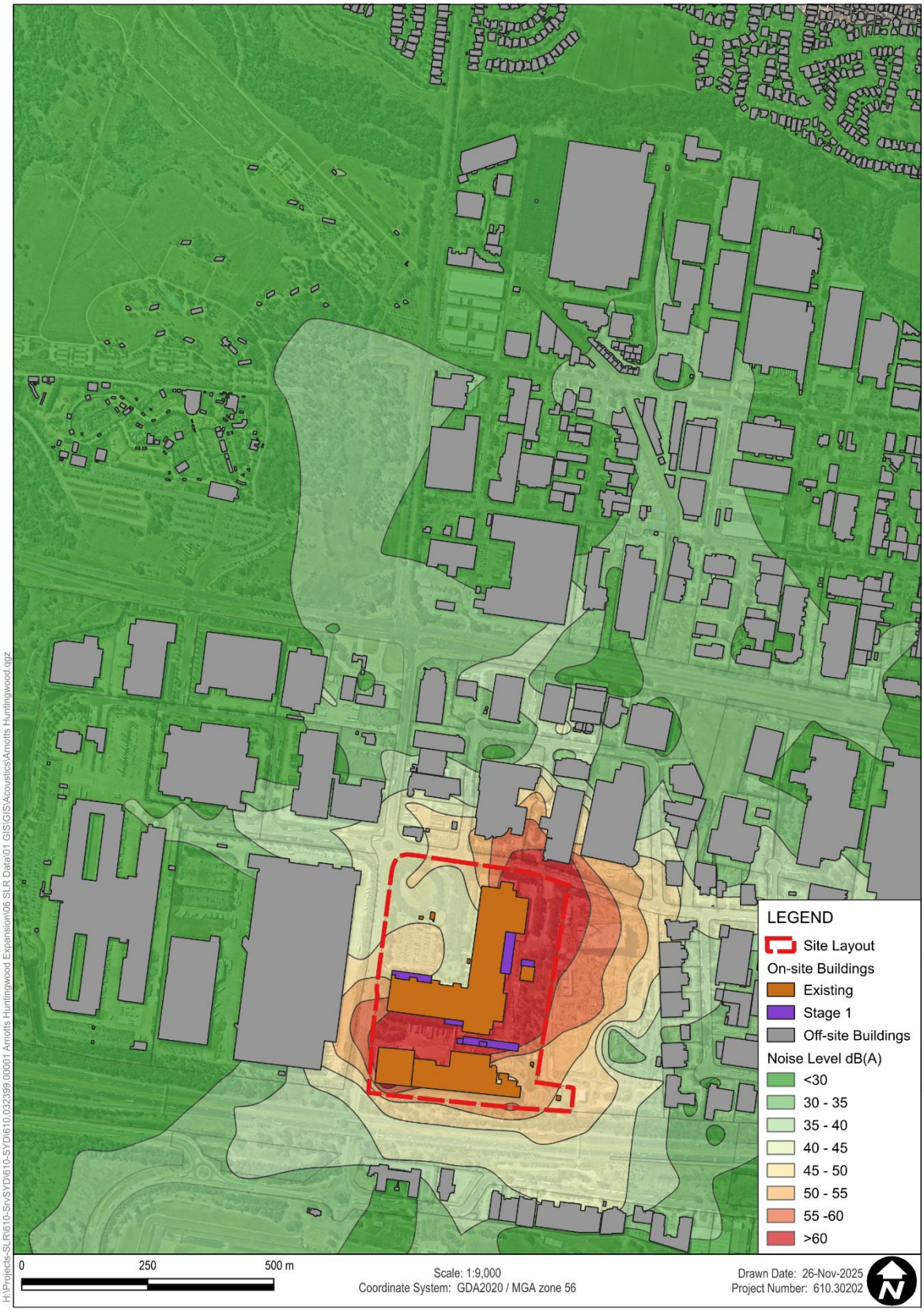


Figure 9 Stage 2 Interim Operational Noise Contour Maps – Evening

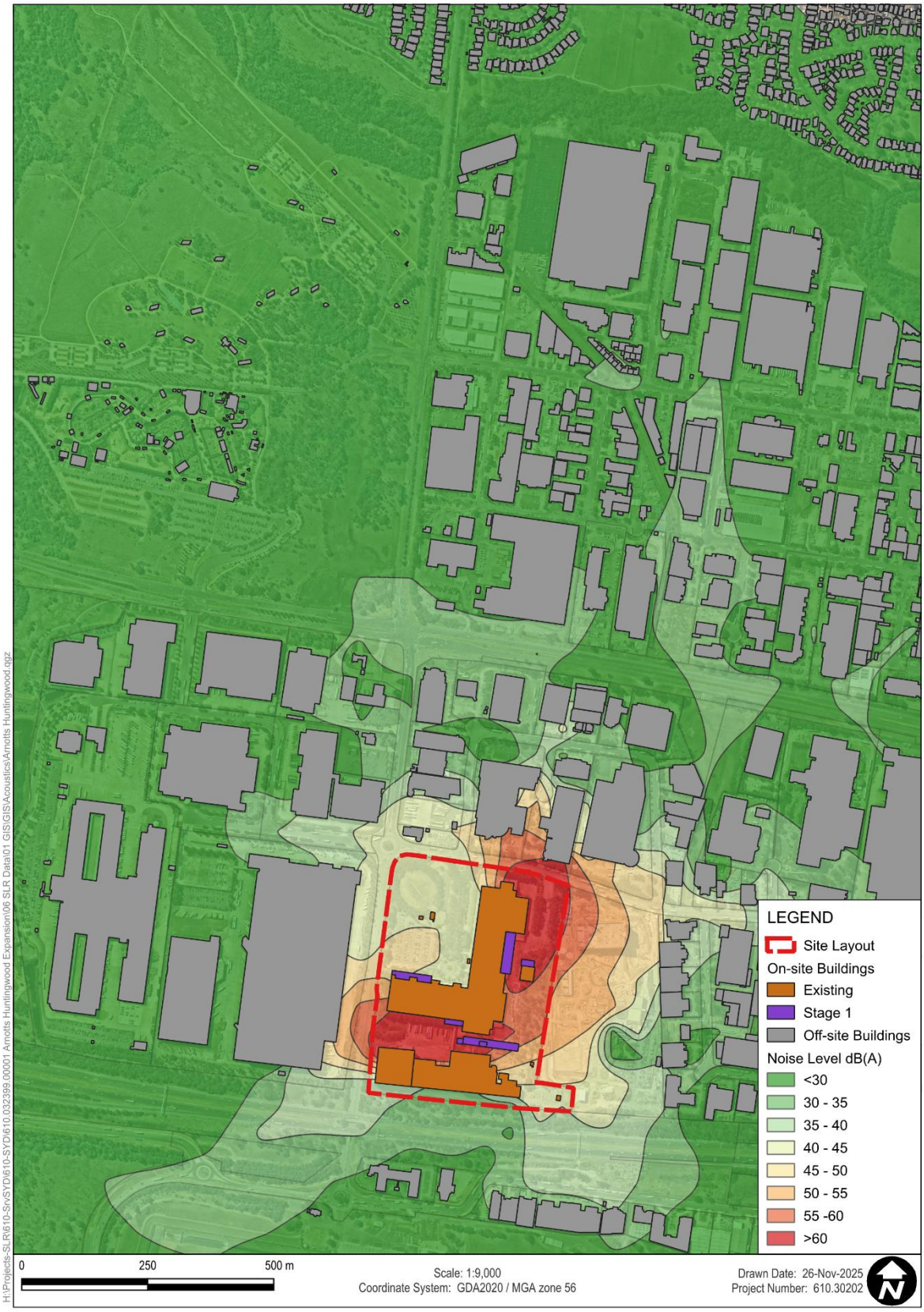


Figure 10 Stage 2 Interim Operational Noise Contour Maps – Night-time

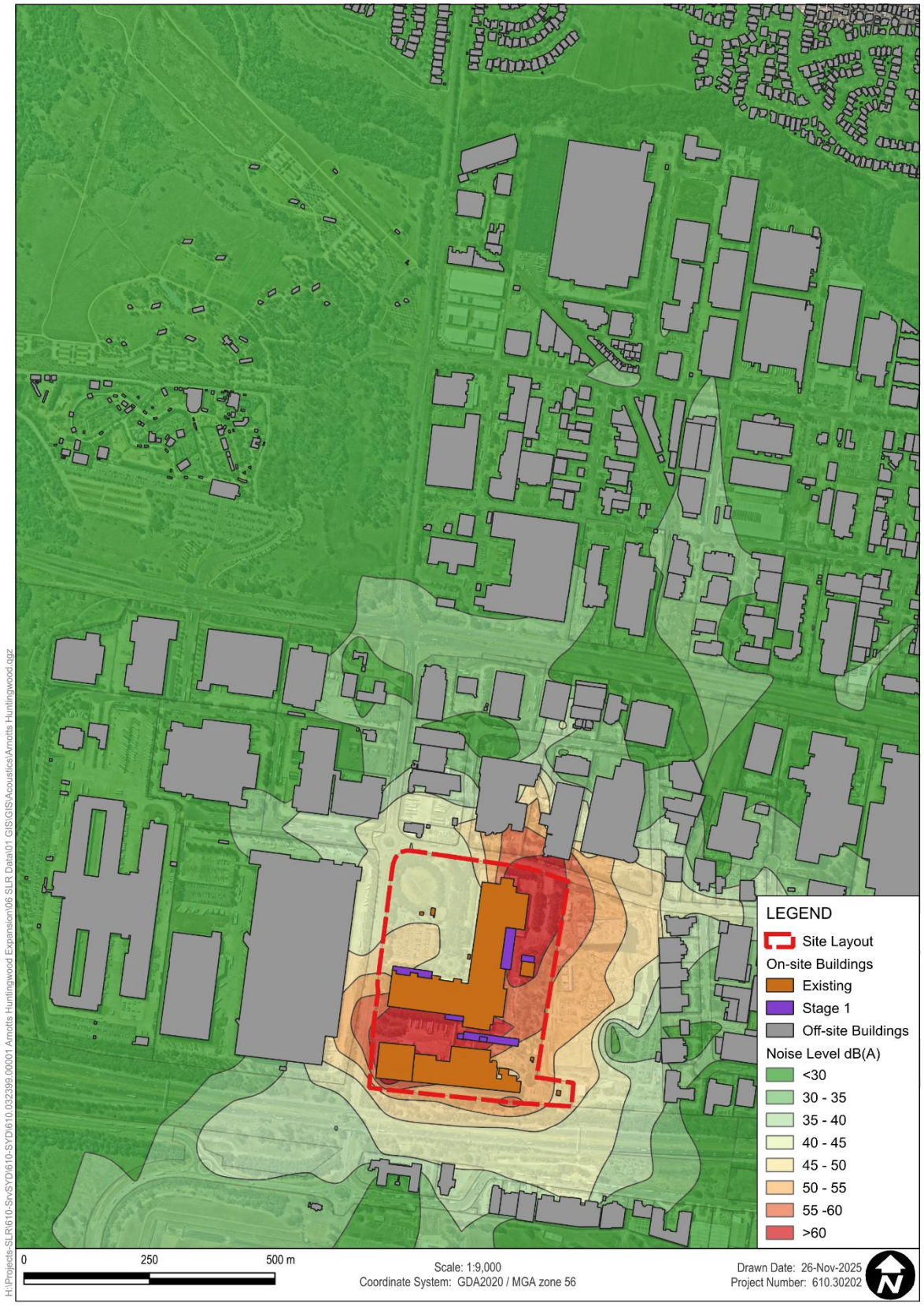


Figure 11 Stage 1 + Stage 2 Operational Noise Contour Maps – Day

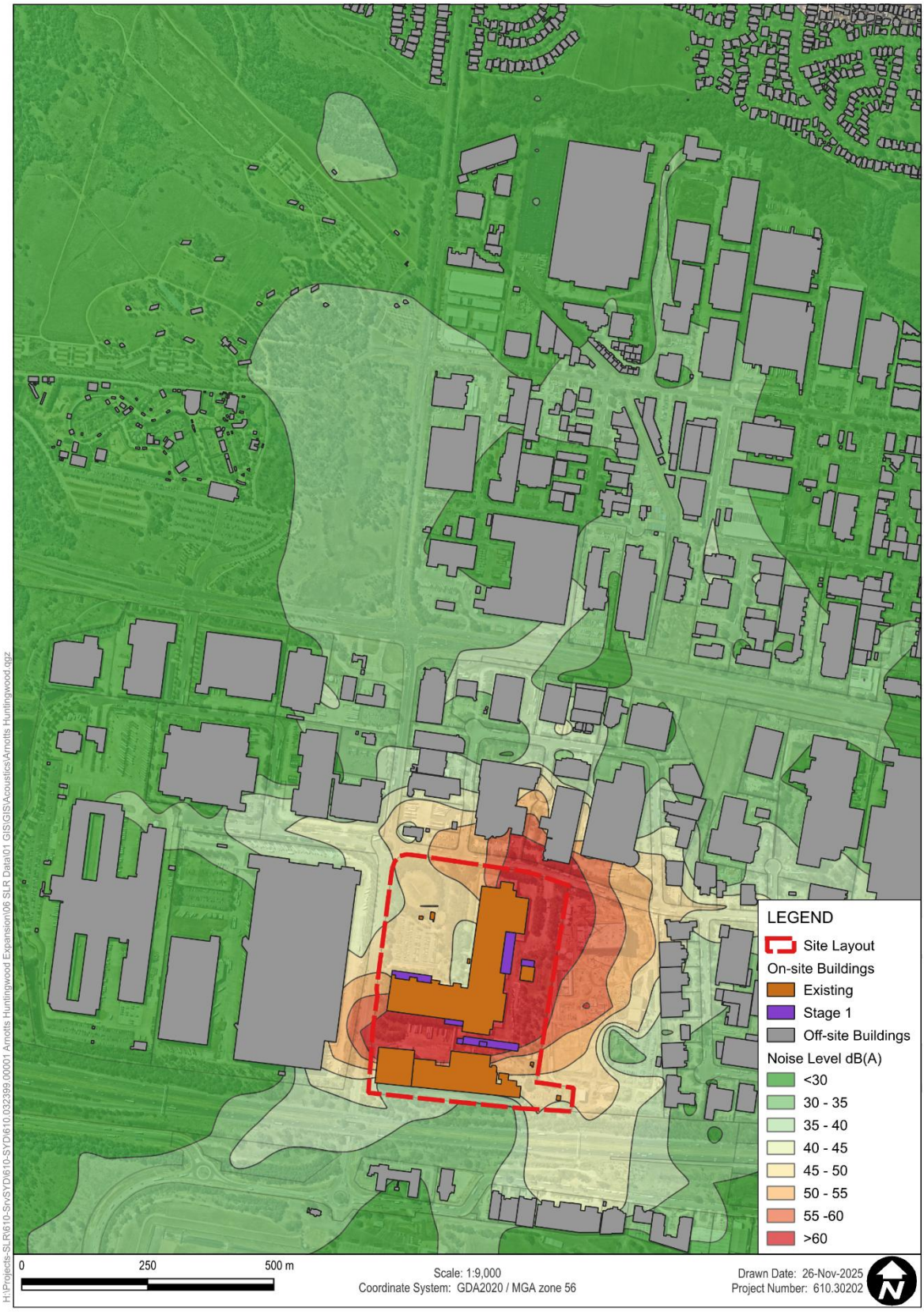


Figure 12 Stage 1 + Stage 2 Operational Noise Contour Maps – Evening

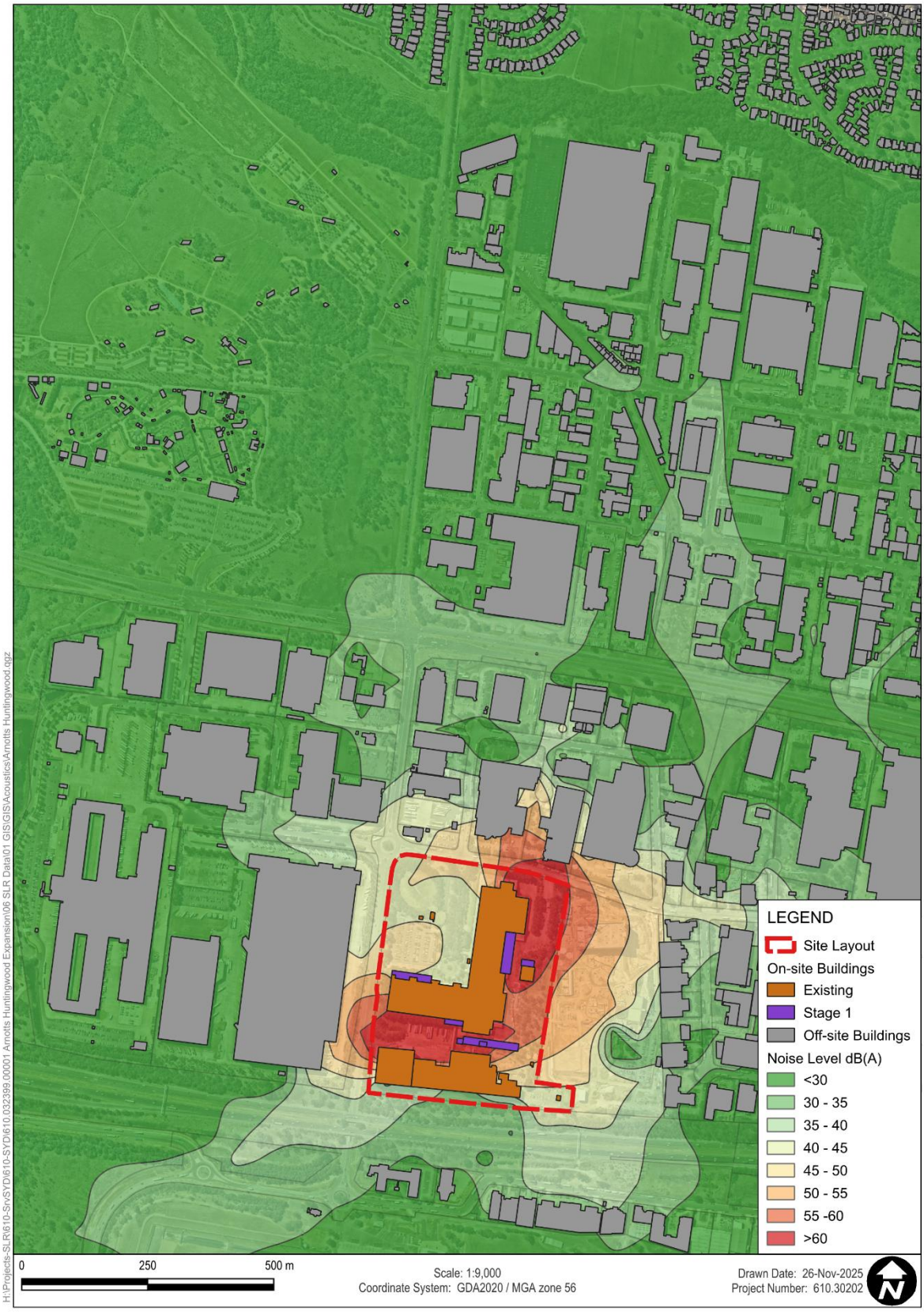


Figure 13 Stage 1 + Stage 2 Operational Noise Contour Maps – Night-time