BLOCK 45 SECTION 3 HUME

Hume TRG Bushfire Response and Training Centre
Noise Assessment

Prepared for:
Forestrack
76 Sheppard Street,
HUME ACT 2620

TRG Bushfire Response & Training

TRG Bushfire Response and Training (TRG) is a local family-owned business providing specialist bushfire response services across Canberra and regional NSW, particularly during times of extreme emergency.

TRG services include:
- Aerial fire suppression
- Firebreaks and construction of fires access roads
- Search and rescue operations
- Disaster relief and incident control
- Digital multispectral mapping services.

These services are provided in response to requests from Government organisations such as the ACT Emergency Services, ACT Parks. NSW RFS, Forestry Corporation NSW and the Australian Maritime Safety Authority. TRG has also provided fire emergency management such as preventative firebreaks to private landholders.

Emergency fire response services are usually required only in the summer months, for the rest of the year and when not responding to emergency requests TRG provides the following services:
- Pilot training
- Fire response planning and training, including simulation
- Design and manufacture of specialist earth moving and vegetation clearing equipment to support fire-fighting efforts
- Silviculture site preparation services

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SLR

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
GPO Box 410
Canberra ACT 2600 Australia

T: +61 2 6287 0800
E: canberra@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Forestrack (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.

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

DOCUMENT CONTROL

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670.30047-R01-v2.0	11 December 2021	John Sleeman / Matt Bryce	John Sleeman	Matt Bryce
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APPENDICES

Appendix A Acoustic Terminology

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has considered noise emissions from the construction and the operation of the proposed Hume TRG Bushfire Response and Training Centre to be located at Block 45 Section 3 in Sheppard Street, Hume in the ACT.

An aerial view of the site and surrounds is presented in **Figure 1**.

Specific acoustic terminology is used in this assessment. An explanation of common terms used is included in **Appendix A.**

1.1 Project Description

The site is located at the southwestern corner of Sheppard Street and Lanyon Drive. A concept layout of the site is shown in **Figure 2**.

1.1.1 Workshop and Maintenance Facility

The site will include a workshop facility (Building A), together with an administration building (Building B), an aircraft hangar (Building C) and hardstand apron areas for the manoeuvring of vehicles to the south of the workshop building and to the east of the hangar.

The most significant noise generating activities are:

- Trucks arriving or departing the site
- Loading/unloading of trucks
- External compressor
- Activities within the workshop building including:
  - Use of hand tools (eg rattle gun)
  - Spray cleaning.

1.1.2 Helicopter Activity

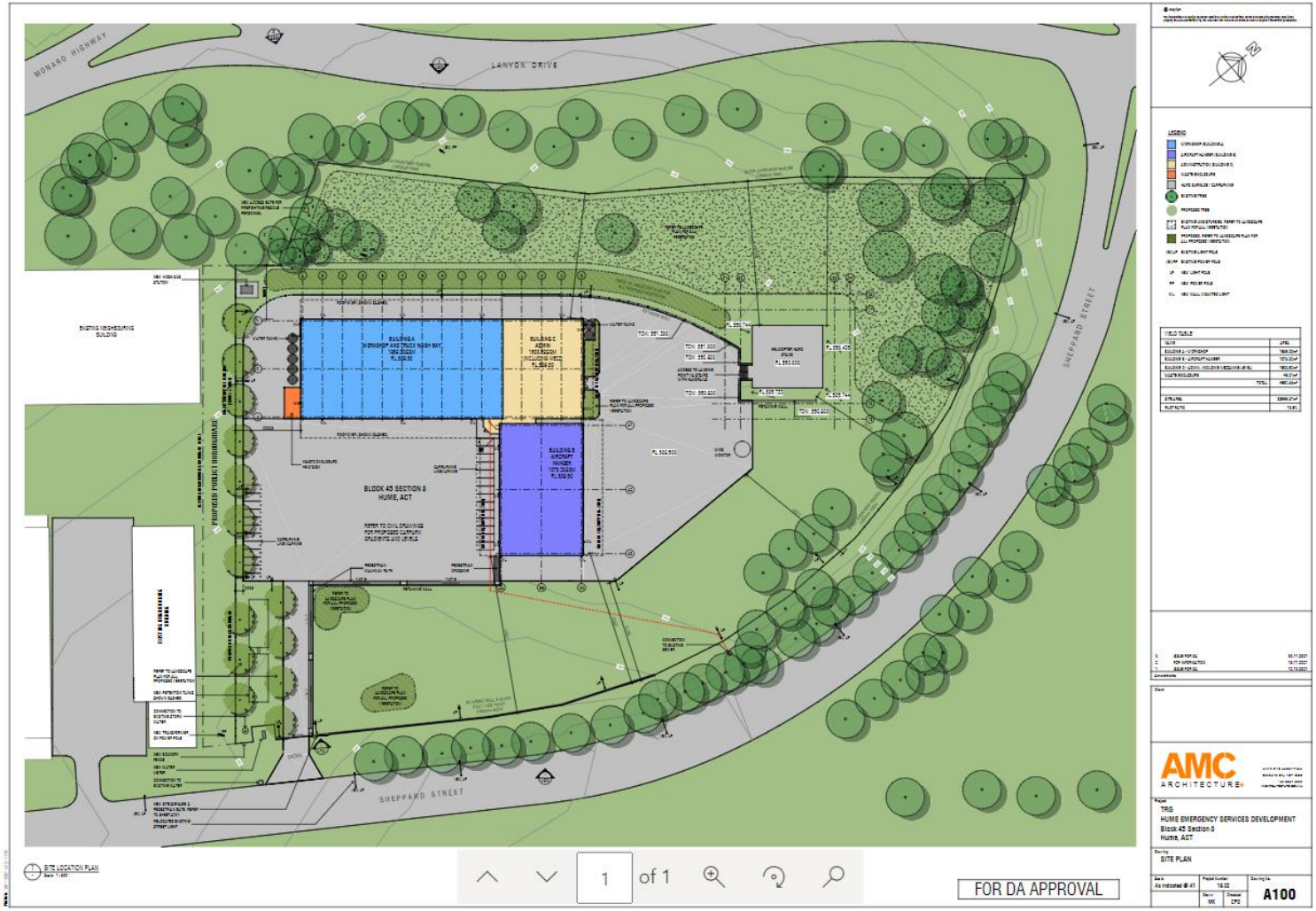
The flying of helicopters in and out of the site for the foreseeable future will primarily be for the support of bush fire response/surveillance. This is expected to be at a maximum of 30-35 flights per month or an average 2 in-and-out flights per day on average. The design helicopter is a BELL 206 L 4 Long ranger and two potential flightpaths are proposed, one to the north east and one to the east-north-east.

Normal operating hours of the facility would be 7:00 am – 5:30 pm Monday – Friday.

Similar existing helipads, being the Southcare Rescue Helicopter Base and the ACT Rural Fire Service are located approximately 600 m to the north of the proposed helicopter departure and landing site.

Figure 1 Aerial of the Proposed Site and Surrounds

Figure 2 Proposed Development Layout Plan



1.2 Planning Requirements

The Scoping Document provided by the ACT Government, Application Number 202000027 dated 24 March 2021 provides the following requirements in Section 8.1.9 in relation to the assessment of Noise and Vibration impacts associated with the operations of the facility:

Scoping Document Requirements

Assessment	SLR Report Section
Describe other interstate examples of where such a facility is located immediately adjacent to a developed urban area.	**Section 1.1**
A noise impact assessment must be completed by a suitably qualified person addressing noise on site, in accordance with EPA requirements, and noise from aircraft in accordance with Commonwealth requirements.	**Section 3.1.2**
The noise impact assessment must consider the surrounding development and sensitive receivers such as Tralee/West Queanbeyan and residential development (NSW).	**Section 3.1.2**
The noise impact assessment must also include a consideration of the operational noise contours to demonstrate that the site and layout is suitable including helicopters starting, warming up and stopping on the ground.	**Section 3.1.2**
The assessment should include assessment against any available Commonwealth aviation guidance for siting, in particular but not limited to the CASA Guidelines for the establishment and operation of onshore Helicopter Landing Sites.	General non noise siting requirements
An Operational Management Plan must be prepared to minimise impacts on surrounds residential areas in NSW so that flight operations can be managed appropriately.	**Section 3.2**
Discuss the types, magnitude, duration and frequency of any noise during the operation of the facility and vehicle movements (including aircraft).	**Section 3.1.1**
Describe compliance with requirements relating noise for the operation of aircraft, such as Commonwealth legislation and Australian Standard AS 2363 1999 Acoustics – Measurements of noise from helicopter operations.	**Section 2.1**
Describe procedures relating to the management of noise complaints	**Section 3.2**

2 Assessment Criteria

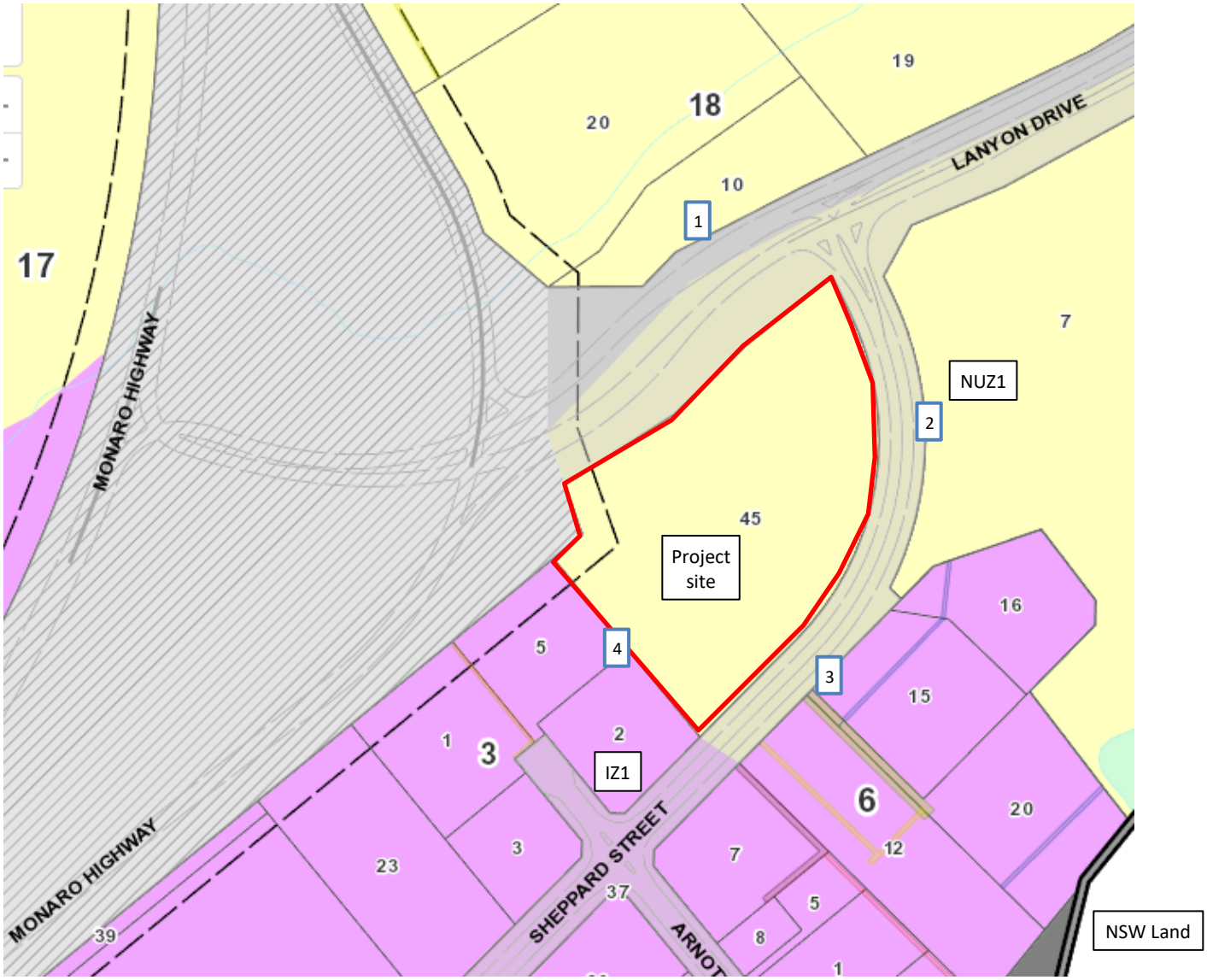
2.1 Workshop Noise

In relation to operational noise, there are no requirements relating to noise contained within the ACT *Hume Precinct Map and Code*, the *Non-Urban Zones Development Code*, or the objectives of the *NUZ1 – Broadacre Zone*.

To demonstrate that noise from the general operations at the development would not impact on neighbouring land uses, noise emanating from the facility should comply with the ACT *Environmental Protection Regulation 2005* (the "EP Regulations") which provides criteria based on ACT land zonings.

The land zonings of the project site and surrounds as per the ACT Territory Plan have been shown in **Figure 3**.

Figure 3 ACT Territory Plan Zoning Map – Block 45 Section 3, Hume



Based on the land zones, the EP Regulations zone noise standards for the site and surrounds are provided in **Table 1**.

Table 1 Zone Noise Standards

Noise Zone	ACT Land	Zone Noise Standard, dBA $L_{A10,T}$			
		Monday – Saturday 7 am – 10 pm	Sunday and public holiday 8 am – 10 pm	Monday – Saturday 10 pm – 7 am	Sunday and public holiday 10 pm – 8 am
A	land in an industrial zone (IZ1)	65	55	65	55
E	land in a broadacre zone (NUZ1)	50	40	50	40

The main assessment locations will be at the property boundaries described in **Table 2** and shown in **Figure 3**.

Table 2 Assessment Locations

Assessment Location	Land Zone	Description
Location 1	Block 10 Section 18, NUZ1	Vacant land
Location 2	Block 7 Section 19, NUZ1	Vacant land
Location 3	Block 12/15 Section 6, IZ1	Industrial site
Location 4	Block 2/5 Section 3, IZ1	Industrial site

Based on the land zoning and the applicable zone noise standards, the zone noise standards that will be specific to this assessment are shown in **Table 3**.

Table 3 Assessment-Specific Zone Noise Standards

Assessment Location	Daytime Noise Standards, dBA L_{A10} Monday – Saturday (7:00 am – 10:00 pm)
Location 1	50
Location 2	50
Location 3	58
Location 4	58

1. The noise standard on the boundary between 2 or more noise zones is the average of the noise standards for the noise zones for the time when the noise is emitted, rounded up to the nearest dBA.

2.2 Helicopter Noise

Noise assessment criteria has been developed based on the following documents:

- Australian Standard (AS) 2021:2015 *Acoustics – Aircraft noise intrusion – Building siting and construction* (AS 2021)
- AS 2363:1999 *Acoustics - Measurement of noise from helicopter operations* (AS 2363:1990, withdrawn)
- AS 2363:1990 *Acoustics - Assessment of noise from helicopter landing sites* (AS 2363:1999, superseded)
- *"Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise"* issued by Airservices Australia.

In considering noise criteria for aircraft, including helicopters it is necessary to distinguish between ground-based and air-based noise.

Ground based noise consists of engine testing and maintenance or similar related noise. Noise from airborne operations is the responsibility of Airservices Australia. Similarly, as the pilot commences pre-flight checks, conducts the flight and then completes post-flight checks, those operations are also the responsibility of Airservices Australia.

Noise from airborne operations is assessed in terms of the Australian Noise Exposure Forecast (ANEF) criteria in Australia. Whilst no longer current, Airservices Australia's *"Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise"* document has also been referenced for this assessment, as it provides numeric criteria (L_{Aeq}) that references AS 2021.

These criteria and guidelines have been adopted in the absence of current specific criteria for noise from helicopter departure and landing sites and operations in the ACT. This approach represents the current 'best practice' for the setting of noise goals for helicopter noise.

2.2.1 AS 2021

AS 2021 is concerned with land use planning and building treatments in the vicinity of an air transport infrastructure. The objective is to provide guidance to regional and local authorities, organisations, communities and others associated with urban and regional planning and building development, on the siting and construction of new buildings against aircraft noise intrusion and on the acoustical adequacy of existing buildings in areas potentially impacted by aircraft noise.

The standard uses the ANEF system, which is a single number index for predicting the cumulative exposure to aircraft noise in communities near airfields during a specified time period (normally one year). Computation of the ANEF index includes:

- measurements of aircraft noise (expressed in Effective Perceived Noise Decibels, EPNdB), which take account of the spectral, temporal and spatial aspects of the noise;
- estimates and generalisations of aircraft type groups and mix, number of operations, runway utilisation, flight paths and operational procedures; and
- time of day, ie daytime (0700 hours to 1900 hours) or evening/night-time (1900 hours to 0700 hours).

Table 2.1 of AS 2021 presents building and site acceptability based on ANEF Zones as reproduced below:

Building type	***ANEF zone of site***		
	Acceptable	***Conditionally acceptable***	***Unacceptable***
House, home unit, flat, caravan park	*Less than 20 ANEF*	*20 to 25 ANEF*	*Greater than 25 ANEF*
Hotel, motel, hostel	*Less than 25 ANEF*	*25 to 30 ANEF*	*Greater than 30 ANEF*
School, university	*Less than 20 ANEF*	*20 to 25 ANEF*	*Greater than 25 ANEF*
Hospital, nursing home	*Less than 20 ANEF*	*20 to 25 ANEF*	*Greater than 25 ANEF*
Public building	*Less than 20 ANEF*	*20 to 30 ANEF*	*Greater than 30 ANEF*
Commercial building	*Less than 25 ANEF*	*25 to 35 ANEF*	*Greater than 35 ANEF*
Light industrial	*Less than 30 ANEF*	*30 to 40 ANEF*	*Greater than 40 ANEF*
Other Industrial	*Acceptable in all ANEF zones*		

2.2.2 Airservices Australia Principles

Fundamental principles are provided in the Airservices Australia document to be used in environmental assessments of proposals for new air routes and for changes to existing arrangements, and as the basis for selecting preferred noise abatement procedures.

Principle 6 provides numeric criteria that references AS 2021, and Principle 7 provides a maximum noise level:

Principle 6: *No residential area should receive more than 60 Leq 24, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021.*

Principle 7: *There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A).*

Principle 6 provides a direct link between the ANEF system under AS 2021 and a noise level in terms of the $L_{Aeq(24hr)}$ value.

Based on the Report from the Commission of Inquiry (1993) into the Sydney CBD Heliport, which applied an assessment criterion for residential receptors based on a helicopter contribution of 20 ANEF, it is common and appropriate to adopt the general conversion of ANEF + 35 dB, which is consistent with the conversion from ANEF to L_{Aeq} of Airservices Australia Principle 6.

Subsequently, the following numerical criteria can be established:

- The "unacceptable limit" for residential receptors in AS 2021 is above 25 ANEF.
  Therefore 25 ANEF + 35 = $L_{Aeq(24hr)}$ noise level of 60 dBA.
- The "acceptable limit" for residential receptors in AS 2021 is less than 20 ANEF.
  Therefore 20 ANEF + 35 = $L_{Aeq(24hr)}$ noise level of 55 dBA.

2.2.3 AS 2363

This Standard is specified in the Scoping Document (refer to **Section 1.2**), and although now withdrawn, provides guidance on the measurement of helicopter noise. The 1999 version does not provide an evaluation of the noise compatibility of sites considered for helicopter operation as criteria for the assessment of helicopter sites are governed by the environmental authority in each State.

Whilst the 1999 version of the standard did not contain maximum noise level targets, and recommended limits be set by the planning authority, the noise targets of the superseded 1990 version have been be considered by this acoustic assessment.

The superseded 1990 version of the standard identified maximum noise level targets (L_{Amax} (Hel)) and time-averaged sound level targets ($L_{Aeq,T}$ (Hel)) for different receptors during day and night periods. The information remains useful as a guideline and is reproduced below:

RECOMMENDED ACCEPTABLILITY CRITERIA FOR 12-HOUR PERIODS

Usage of premises and zoning	*$L_{Aeq,T}$ (Hel)*		*L_{Amax} (Hel) (see Note 3)*	
	Daytime	*Nightime*	*Daytime*	*Nightime*
Residential and hospital areas	*60*	*50*	*85*	*80*
Commercial areas	*65*	*65*	*95*	*90*
Other areas (churches, schools, theatres, etc.)	*60*	*60*	*90*	*90*

1. *This Standard makes no recommendation on limits in industrial areas*
2. *For these area classifications, $L_{Aeq,T}$ (Amb) + 10 dB(A) can be used instead of $L_{Aeq,T}$ (Hel) if the former is lower).*
3. *Special consideration may be given to the operation of aerial ambulances. For this reason, $L_{Aeq,T}$ (Hel) either night or day, must be satisfied, but L_{Amax} (Hel) is not specified for aerial ambulances.*
4. *In the absence of further information, daytime is understood to be between 0700 hours and 1900 hours and night-time between 1900 hours and 0700 hours.*
5. *If the existing ambient level exceeds the L_{Aeq} level specified in the table, the introduction of helicopter operations should not raise the level by more than 2 dB(A).*

2.2.4 Project Noise Criteria

Based on AS 2021, and the accepted conversion of adding 35 dB to the ANEF value, the following acceptable $L_{Aeq(24hr)}$ noise levels have been adopted for the project. In addition L_{Amax} noise levels from the superseded AS 2363:1990 have been adopted to provide a more conservative assessment.

Table 4 Project Noise Levels

Building type	Helicopter Noise Level, dBA	
	$L_{Aeq(24hr)}$	L_{Amax}
House, home unit, flat, caravan park	55	85
Hotel, motel, hostel	60	95[1]
School, university	55	90
Hospital, nursing home	55	85
Public building	55	90[1]
Commercial building	60	95
Light industrial	65	-

1. AS 2363:1990 does not provide L_{Amax} noise levels for Hotels, motel, hostel with the limits based on those for commercial areas. Similarly public building limits are based on those for schools, university.

Note for daytime operations, the $L_{Aeq(24hr)}$ noise level derived from AS 2021 is more stringent than the daytime $L_{Aeq,T\ (Hel)}$ noise level from AS 2363:1990, as the same operations performed over a 12-hour period will produce a noise level 3 dB higher than over a 24 hour period.

However, the criteria of AS 2363:1990 are 5 dB higher than the AS 2021 derived limits (for example a residence is 60 dBA compared to 55 dBA, and commercial 65 dBA compared to 60 dBA). Therefore, for daytime only operations as proposed, compliance with the AS 2021 derived noise limit will also ensure compliance with the AS 2363:1990 $L_{Aeq,T\ (Hel)}$ daytime noise limit.

2.3 Construction Noise

Guidance for the assessment of construction noise in the ACT can be found in the *Environment Protection Guidelines for Construction and Land Development in the ACT*, issued by the EPA in 2011. That document refers to the requirements of the EPR which in Section 29 states:

> *Noise—other exceptions*
>
> *Under section 25 (1), noise is not taken to cause environmental harm in an affected place if it is noise mentioned in schedule 2, table 2.3, column 2 and the conditions (if any) mentioned in column 3 for the noise are met.*

In relation to construction noise, Schedule 2, Part 2.3 states:

Column 1 item	*Column 2 item*	*Column 3 conditions*
21	*noise emitted in the course of –* *(a) building work for which a building approval under the Building Act 2004, division 3.3.*	*(a) all of the following:* *(i) the noise is emitted from a place in noise zone A or B;* *(ii) all relevant noise reduction measures mentioned in AS 2436, as in force from time to time, are implemented;* *(iii) the noise is emitted between 6 am and 8 pm;*

This would mean that the noise zone standards may be exceeded between the hours of 6:00 am and 8:00 pm, provided all relevant noise reduction measures mentioned in Australian Standard (AS) 2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* (AS 2436), as in force from time to time, are implemented. The noise zone standards, as shown in **Table 3**, must be met at all other times.

2.4 Construction and Operational Vibration

There are no standards or guidance for vibration associated with the construction or operation of an activity or development that apply specifically in the ACT.

The nearest residences are located approximately 900 m from the project site, and the nearest commercial structure is an industrial building approximately 15 m from the location of the works.

No blasting or work in bedrock will be required during the construction program. Other construction activities including earthworks and site preparations, and the proposed operational activities would not be expected to generate significant levels of vibration at nearby receptors.

Accordingly no vibration impacts are anticipated and has not been considered further in this report.

3 Operational Noise Assessment

A three-dimensional noise model was implemented using the SoundPLAN software package to predict the operational noise to the residences and nearby commercial receptors.

The DIN 45684[1] algorithm was utilised for the prediction of helicopter noise, as this is recognised as a current best practice model and suitable for the assessment of helicopter operations.

Noise from the workshop and associated activities was predicted using the ISO 9613[2] algorithms within SoundPLAN.

The noise model includes details of the topography and receptors including those in Tralee and West Queanbeyan. Nearby commercial developments have been included in the modelling.

3.1 Helicopter Noise

3.1.1 Helicopter Types and Modelling Scenario

The design helicopter is a BELL 206 L4 Long Ranger and two potential flight paths are proposed, one to the northeast and one to the east-northeast. The design helicopter and operational information is based on the information provided for the TRG Bushfire Response and Training Centre.

Helicopter operations are proposed for between 7:00 am to 5:30 pm only, which is within the daytime period described in the EP Regulations, and comprise the following movements:

- A maximum of 2 take-off and 2 landing movements to and from the northeast; and
- A maximum of 2 take-off and 2 landing movements to and from the east-northeast.

Each of the movements includes a hover take-off and landing operation at the helicopter departure and landing site, which would be considered 'worst case' arrival and departure conditions.

To simulate the maximum potential noise from helicopter ground operations such as starting, warming up and stopping, a scenario with the helicopter operating at full power at the helicopter departure and landing site was included. Buildings proposed for the development were not included in the model.

3.1.2 Predicted Helicopter Noise Levels and Discussion

Helicopter noise levels have been predicted for all sensitive receptors in the assessment area for the project. To assess compliance with the design criteria, noise levels at the potentially most impacted receptors are discussed in this section.

Predicted noise levels at the nearest receptors are presented in Table 5 and Table 6. The predicted noise levels in terms of the of $L_{Aeq(24hr)}$ noise levels, have been presented as noise contours in **Figure 4** and **Figure 5** for the northeast and east-northeast flight paths respectively. Maximum noise levels for the high-power ground operations at the helicopter departure and landing site is shown in **Figure 6**.

[1] German Institute for Standardisation (Deutsches Institut für Normung) (DIN) "*Acoustics – Determination of Aircraft Noise Exposure at Airfields – Part 1: Calculation Method*", issued in July (07) 2013.
[2] International Organisation for Standardisation (ISO) 9613-2:1996 "*Acoustics –Attenuation of sound during propagation outdoors – Part 2: General method*".

Table 5 Predicted Operational Noise Levels – Residences

Flight Path	Receptor and Direction	Predicted Helicopter Noise Level, dBA		
		$L_{Aeq(24hr)}$[1]	Daytime $L_{Aeq(12hr)}$	L_{Amax}
		Criterion 55 dBA[2]	Criterion 60 dBA[3]	Criterion 85 dBA[3]
Northeast	R1 – northwest	32	35	56
	R2 – northeast	45	48	76
	R3 – east-northeast	28	31	52
East-northeast	R1 – northwest	28	31	53
	R2 – northeast	27	30	50
	R3 – east-northeast	45	48	74

1. Consistent with proposed daytime only operations.
2. Based on ANEF value applicable to the receptor type + 35 dB.
3. Only the relevant AS 2363:1990 daytime criteria are shown. The standard is superseded and withdrawn.

Table 6 Predicted Operational Noise Levels –Light Industrial Receptors

Receptor and Direction	Predicted Helicopter Noise Level, dBA[1]		
	$L_{Aeq(24hr)}$	Daytime $L_{Aeq(12hr)}$	L_{Amax}
	Criterion 65 dBA[2]	Criterion 65 dBA[3]	Criterion 95 dBA[3]
Block 2&5 Section 3, Hume	47	50	77
Block 16 Section 6, Hume	57	60	83
Block 12/15 Section 6, Hume	52	55	78
Block 20 Section 18, Hume (South Care Helicopter Base)	43	46	67

1. The higher Noise levels from either the northeast or east-northeast flight paths are shown.
2. Based on ANEF value applicable to the receptor type + 35 dB.
3. The AS 2363:1990 criteria presented is for daytime for 'commercial' areas, as the standard does not have criteria for light industrial areas. As such these criteria represent a conservative assessment for a light industrial receiver

It can be seen that the predicted noise levels at residential and light industrial receptors show compliance with the applicable AS 2021 criterion, in addition to the criteria from the (superseded) AS 2363:1990, for residential and commercial receivers.

In addition the contours in **Figure 4** and **Figure 5** indicate predicted noise levels would be comfortably below 50 dBA (15 ANEF + 35 dB) at surrounding residential areas. **Figure 6** illustrates the "worst-case" noise level during warming up would be below 75 dBA L_{Amax} at the nearest light industrial receptor.

Figure 4 Predicted $L_{Aeq(24hr)}$ Noise Levels – North-East Flight Path

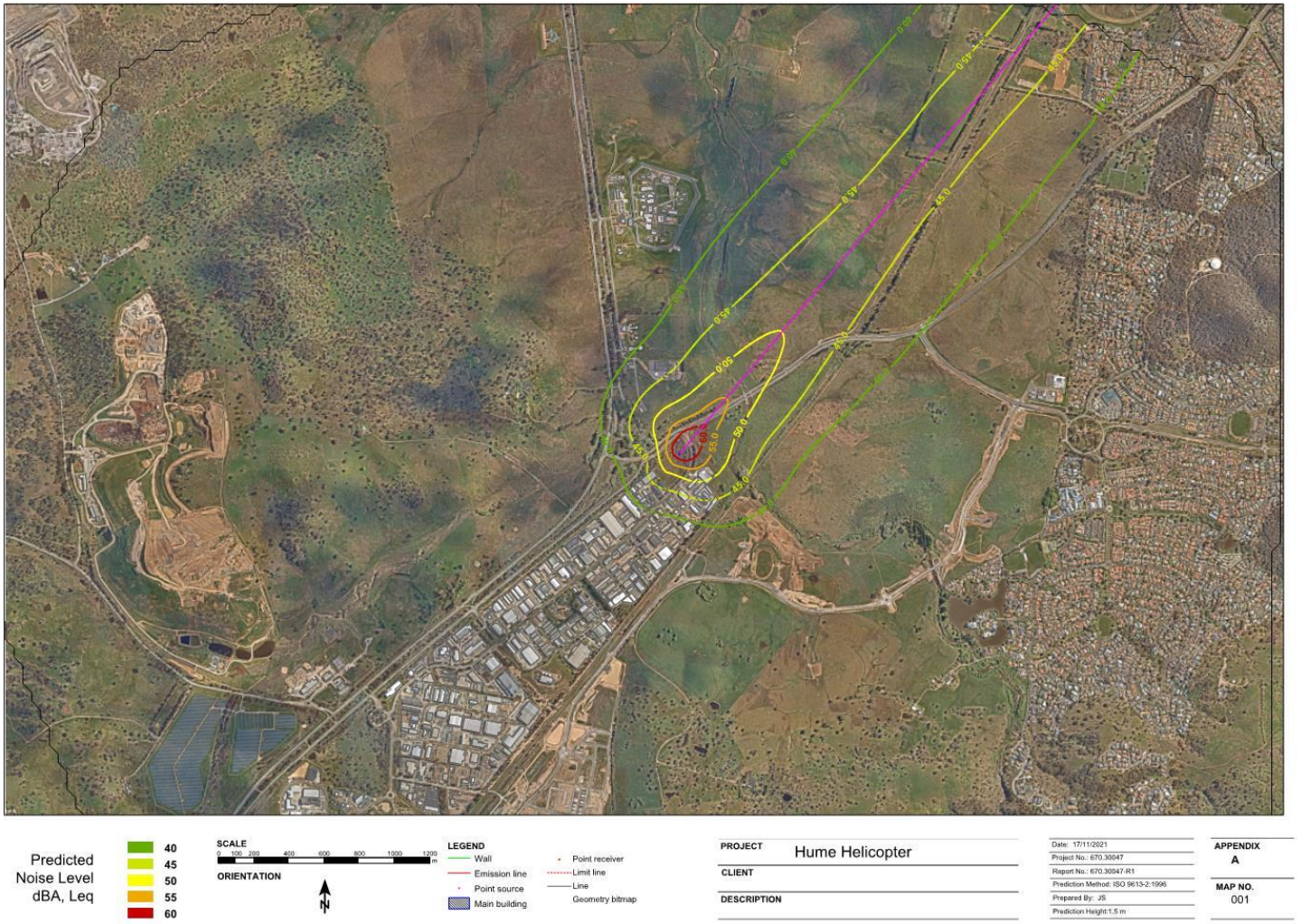


Figure 5 Predicted $L_{Aeq(24hr)}$ Noise Levels – East-North-East Flight Path

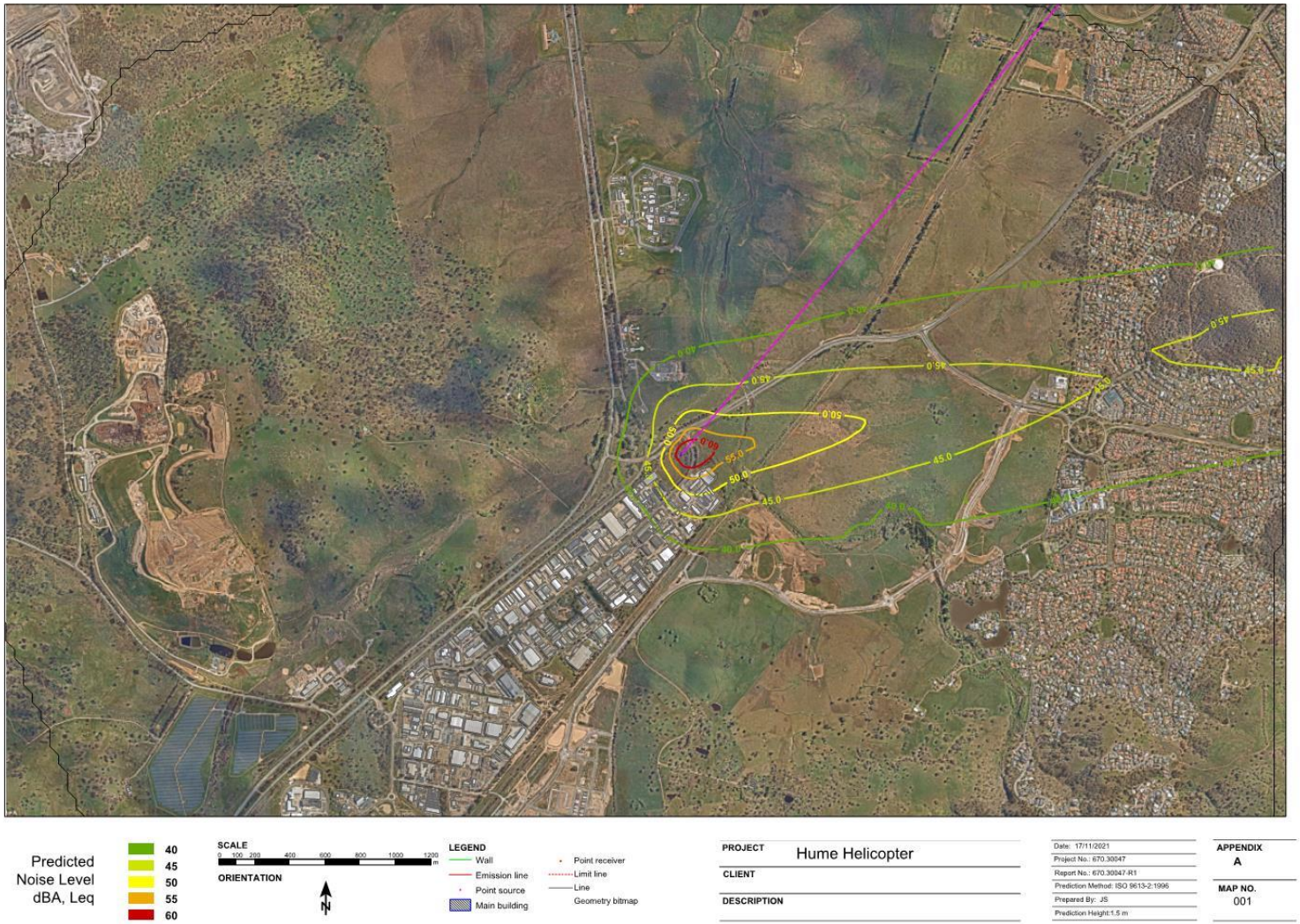
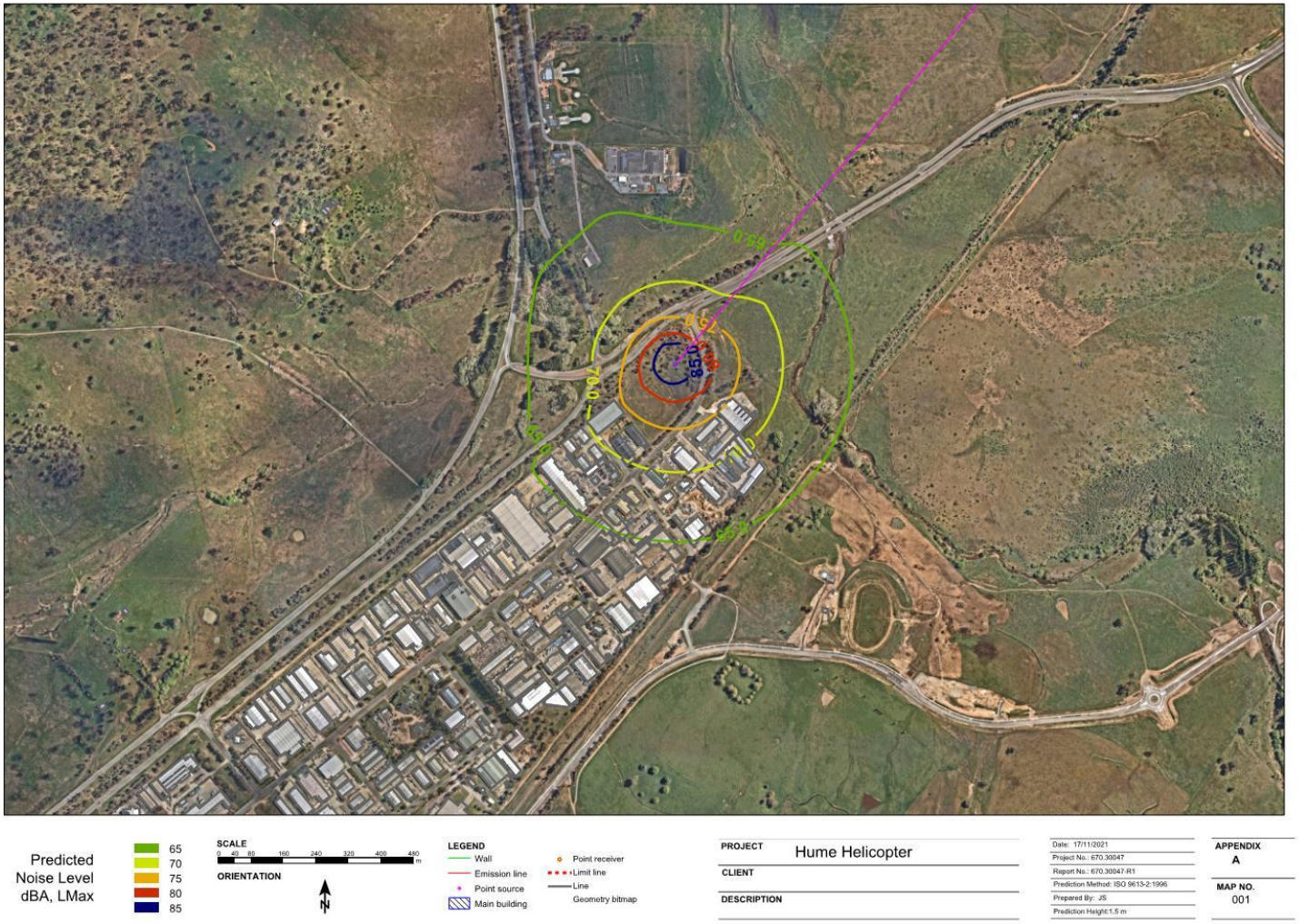


Figure 6 Predicted Maximum Noise Levels – Ground Operations



3.2 Workshop Noise

3.2.1 Noise Sources

For the purposes of this assessment, it has been assumed that all sources of noise at the workshop facility may occur at the same time (thus representing a "worst-case" scenario) for the day period, including:

- A truck arriving or departing the site
- Forklift manoeuvring
- External compressor
- Activities within the workshop building including:
  - Use of hand tools (eg rattle gun)
  - Heater
  - Spray cleaning.

The acoustically-significant sources of noise and their associated sound power level (SWL) at the site have been described in **Table 7**. The SWL values were obtained from measurements undertaken by SLR at the existing Forestrack workshop in Sheppard Street, Hume, unless noted.

The heater, rattle gun and spray cleaning will occur sporadically within the workshop building, which will be clad with metal sheeting and have large access openings to the apron area, usually left open. It is assumed the roof will have an insulation blanket layer or similar between the purlins and metal roof decking.

Trucks will arrive at and depart the site from Sheppard Street. Some will access the workshop on the apron area and others will travel around the rear, northside of the buildings to the hangar apron. The compressor enclosure (a modified shipping container) has been located near the rainwater tank adjacent to the workshop building near to the western boundary for this assessment, with the ventilation opening facing to the northwest.

All noise sources associated are assumed to operate continuously for the 10 minute assessment period. One truck would be expected to either arrive or depart the site in that time.

Table 7 Noise Sources

Noise Source	Number	Height, m	SWL, dBA, per item
Heater	1	1	86
Rattle gun	1	1	108
Spray cleaning	1	1	99
Compressor enclosure	1	1.6 – 2.0	82
Forklift	1	1.5	105
Truck (mobile)[2, 3]	1	1.5	105
Truck (accelerating)[3, 4]	1	1.5	111

1. It is assumed that the FEL manoeuvres between the hopper and the material dump for all of the assessment period.
2. Modelled at 15 km/h
3. SLR measurement database
4. Modelled at 5 km/h

3.2.2 Modelling Procedures and Information

All ground on the site and public roads was modelled as acoustically "hard ground" with minimal noise absorption. Other areas were modelled a relatively "soft ground" with partial noise absorption.

The assessment locations are very near to the site and associated noise sources, which means that meteorological conditions would have little influence on noise propagation. Therefore, the effect of neutral meteorological conditions only has been considered.

3.2.3 Noise Modelling Results

The results of the noise predictions are shown in **Table 8**, together with the compliance outcome.

Table 8 Predicted Facility Noise Levels and Assessment

Assessment Location	Daytime Zone Noise Standard, dBA $L_{A10(10minute)}$	Predicted Noise Level, dBA $L_{A10(10minute)}$	Compliance (Yes/No)
Location 1	50	43	Yes
Location 2	50	42	Yes
Location 3	58	48	Yes
Location 4	58	Up to 57	Yes

It can be seen that noise from the workshop and associated activities was predicted to comply with the daytime zone noise standard at all assessment locations.

4 Noise Management Plan – Helicopter Operations

The noise management initiatives undertaken by and proposed by Forestrack in relation to planning and operation at the airport as required by the Planning Requirements of the ACT Government Scoping Document (refer to **Section 1.2**) are summarised in this section.

4.1 Operations

Forestrack will implement the "Fly Neighbourly"[3] procedures for helicopters which would include:

- Minimise engine warm up and shutdown durations;
- Climb as soon as possible as instructed;
- Use rates of climb and descent that minimise noise over residential areas;
- Minimise or avoid blade slap where practicable. Blade slap usually occurs during shallow high speed descents, especially during turns. It can be avoided using slower, steeper descents. With the right door removed, the pilot can easily determine those flight conditions which produce slap, and develop techniques which will reduce or eliminate this source of noise;
- Maintain correct tracks after take-off, in line with CASA regulations;

[3] "Fly Neighbourly" is a voluntary code of practice designed to minimise noise-related issues.

- When departing from or approaching a landing site, try to avoid flying over residential areas hospitals and schools. Always fly above 500', and endeavour to be above 1,000' when flying over noise sensitive areas;
- When flying over populated areas, look ahead and select the least noise sensitive route; and
- Repetitive noise is far more irritating than a single occurrence. If it is necessary to fly over the same area more than once (to access visual landmarks), vary your flight path so you don't overfly the same buildings each time.

4.2 Complaints Procedure

Airservices Australia is the Commonwealth Government body responsible for addressing aircraft "in flight" noise complaints at Australian Airports and Helipads.

Forestrack will be responsible for handling noise complaints associated with ground-based activities, such as ground running of helicopters and servicing and other on-site noise. Where a complaint relating to noise is received, Forestrack will:

- Record all verbal and telephone complaints in writing, together with details of the circumstance leading to the complaint and all subsequent actions.
- As an initial step, investigate the complaint in order to determine whether a criterion exceedance has occurred or whether noise has occurred unnecessarily.
- Plan and implement corrective action, as necessary.
- Inform Complainants that their complaints are being addressed, and (if appropriate) that corrective action is being taken.
- Where the activity will occur again, carry out noise monitoring and/or other investigations to confirm the effectiveness of the corrective action and the compliance status of the activity with the project criteria.
- Inform Complainants of the implementation of the corrective action that has been taken to mitigate any adverse effects and monitoring outcome.

5 Conclusion

SLR has undertaken an assessment of operational noise associated with a proposed workshop and helicopter departure and landing site to be located at Block 45 Section 3 in Hume, ACT.

The assessment included the following components:

- Establish applicable noise assessment locations, ACT zone noise standards and helicopter noise criteria.
- Prediction of operational noise from the site and helicopter operations.
- Assessment of the predicted noise levels.

With regard to noise relating to the workshop and associated activities, compliance with the daytime zone noise standards is expected at all times at assessment locations.

An assessment of noise from the helicopter departure and landing site and helicopter operations has been undertaken, with the findings summarised in the following points:

- Design criteria for operational noise has been based on AS 2021.

  In addition maximum (L_{Amax}) noise criteria from AS 2363 (since superseded and subsequently withdrawn) have also been adopted as is common and appropriate.
- Noise modelling was carried out to assess the acoustical impact of the helicopter operations for the proposed helicopter type and movements, which consist daily of up to two arrivals and departures to the northeast, and up to two arrivals and departures to the east-northeast of the helicopter departure and landing site.
- The predicted operational noise levels from the helicopter would comply with the project noise criteria at the nearest and/or most-impacted residential and industrial receptors, and at nearby planned NSW residential developments.
- A Noise Management Plan, including procedures for helicopter operations and handling noise-related complaints, has been proposed in accordance with the Planning Requirements described in the ACT Government Scoping Document (Application Number 202000027) for the development.

APPENDIX A

Acoustic Terminology

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 roughly to that of human hearing.

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

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

3. Sound Power Level

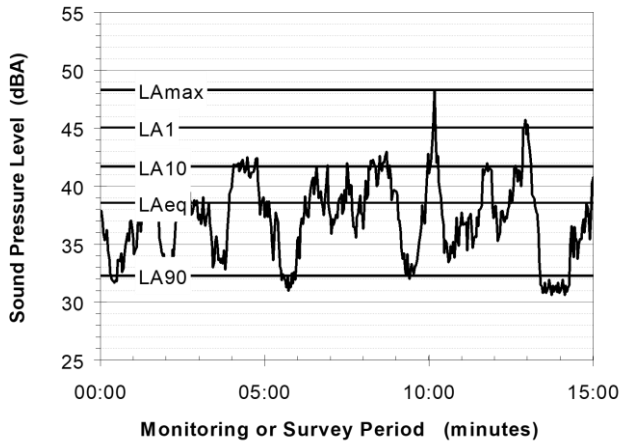
The Sound Power (SWL or LW) of a source is its acoustic energy. Sound Power Levels are expressed in decibel units (dB or dBA), or by the reference unit 10^{-12} W.

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. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receptors 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.

APPENDIX B

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

TOWNSVILLE SOUTH
12 Cannan Street
Townsville South QLD 4810
Australia
T: +61 7 4772 6500

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628