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Sydney Helicopters 89-151 Old Castlereagh Rd, Castlereagh NSW 2749

Noise Impact Assessment

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Document Title	Noise Impact Assessment
Attention To	Heliport Developers Pty Ltd

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	4/03/2022	20200346.4/0403A/R0/TA	TA		TA
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2	13/04/2022	20200346.4/1304A/R2/TA	LA		TA

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) has been engaged to assess the noise impacts associated with the relocation of Sydney Helicopters to a proposed new helipad located at 89-151 Old Castlereagh Rd, Castlereagh NSW 2749.

The principal objective of this assessment is to undertake an evaluation of the proposed use of the helipad and provide an assessment of potential noise impacts to the surrounding receivers.

This document has been prepared as a result of consultations with The New South Wales Department of Planning and Environment and the Environmental Protection Authority, and as a response to previous assessments conducted on site.

2 PROPOSED LOCATION AND OPERATION

The proposed location for the helipad is 89 – 151 Old Castlereagh Road, Castlereagh. The site is immediately surrounded by recreational/sporting facilities, with existing land uses surrounding the development as follows:

R1 - 47-65 Old Castlereagh Road, located to the east of the helipad - 430m to helipad

R2 -39-45 Old Castlereagh Road located to the east of the helipad – 648m to helipad

C3 -Sydney International Regatta Centre, located to the northwest of the helipad - 1150m from helipad

R3 -Waterside Estate, further to the east, past the Old Castlereagh Road residences – 1100m to helipad

C2 -A proposed golf course the south west – Approximately 1000m to the helipad (note: the exact distance is unknown as the golf course is not approved, or before any consent authority)

See Figure 2-1 below for site location.

ALC has been advised of the following proposed operation for the helipad.

- The helipad will operate between 7am and 10pm.
- Approximately 5 night flights (night flights are classified as flights that occur after last light, based on the time of year this can vary from 6pm to 8pm)
- The following helicopters have the potential to use the helipad

    - AS350 squirrel helicopter (most common type used)
    - Bell 206
    - Bell 407
    - Bell 429 (emergency services helicopter)
    - Bell 412 (emergency services helicopter)

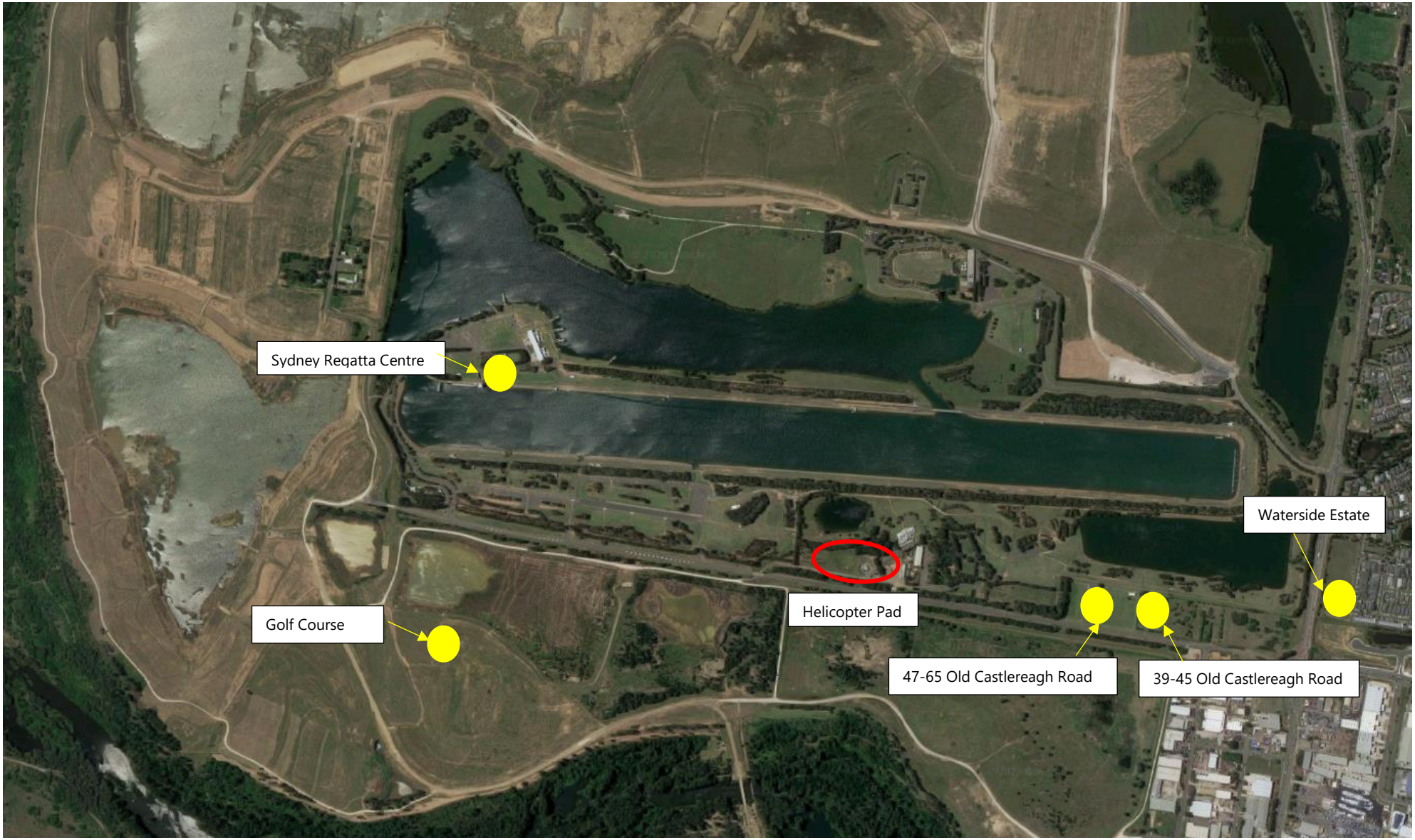


Figure 2-1: Proposed Helipad Location and Surrounding Receivers

3 NOISE EMISSION CRITERIA

In determination of noise emission criterion for helicopter flights, take-off and landing (including taxiing and other preparation for flight but excluding maintenance), the following information has been considered:

- Draft *Noise Guide for Local Government (NGLG)*

    - With respect to noise from helicopter premises, the draft guideline refers to Sections 139 & 140 of the POEOA.
    - We note that noise from aircraft in flight (including ground based movements) are regulated by the ASA, and as such are excluded from the provisions of the POEOA.

- Section 139 & 140 of the POEOA Act 1997

    - These sections of the POEOA Act refer to the maintenance of plant and equipment, and more specifically noise from improperly or inefficiently maintained plant items.
    - There is no specific criteria or assessment framework which could be reliably determined by direct application of these Sections of the Act, and as identified above the POEOA does not apply to noise from aircraft movements or flight.
    - Notwithstanding, and as identified in the draft NGLG, plant items associated with the use of the heliport should be operated in a proper and efficient manner.

- Various regulations and acts overseen by Air Services Australia – There is no current explicit criteria for the assessment of helipads within all current ASA documentation, however their previous guidelines provided the following guidance (which is more relaxed than the originally nominated EPA Noise Control Manual recommendations which were utilised as the original assessment criteria within the previous submission). Previously, the ASA provided the following recommendations: *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).*

    - Again, there is no specific *current* acoustic criteria published by Air Services Australia.
    - A general framework and typical considerations for the minimisation of aircraft noise is presented by ASA. These have been adopted in the submitted acoustic reports, including limiting of the numbers of flights and times at which flights may occur.

- Recent Land and Environment Court decisions relating to use of helipads

    - Whilst LEC decisions are able to inform future assessments of similar uses, it must be noted that each development will have specific features & constraints which need to be considered in the context of the overall assessment of environmental impact.
    - As such, adopting an approach used in a particular LEC case is not necessarily applicable to all future developments which may involve similar developments. We also note that this is a requirement not contained within the SEARs.
    - Notwithstanding, and noting that the technical reasoning which informed the adoption of the criteria detailed in the *Nessdee V Orange City Council* is not available for review, the Department and EPA have nominated the adoption of the noise criteria detailed in the judgement, namely 48 dB(A) $L_{eq\ (24\ hour)}$ at residential developments. This corresponds to ANEF13. We also note that the Tweed Shire Council appears to have recently adopted this approach to noise emissions from helipads (ie ANEF 13 / 48dB(A) $L_{eq\ (24\ hour)}$
    - In addition, commercial properties were not addressed within the *Nessdee V Orange City Council case*. As such, in conjunction with acoustic expert Rob Bullen, working on behalf of the Department of Planning, a helicopter noise criterion of 55dB(A) $L_{eq\ 24\ hour}$ has been determined for the Regatta

and Golf Course. This 55dB(A) $L_{eq\ 24\ hour}$ criterion has been used to assess the acceptability of acoustic impacts to these commercial premises.

A summary of the applicable criteria for the helipad is presented below:

Table 1 - Noise Emission Criterion During Flights, Take-Off and Landing

Receiver	dB(A) $L_{eq,\ 24\ hour}$
Residential Properties	48 dB(A)
Commercial Properties (Regatta and Golf Course)	55 dB(A)

4 NOISE IMPACT ASSESSMENT

4.1 PREDICTED NOISE IMPACTS

Noise levels associated with typical helicopter movements have been assessed using the SoundPlan™ noise modelling software. The following flight path information has been provided by Sydney Helicopters.

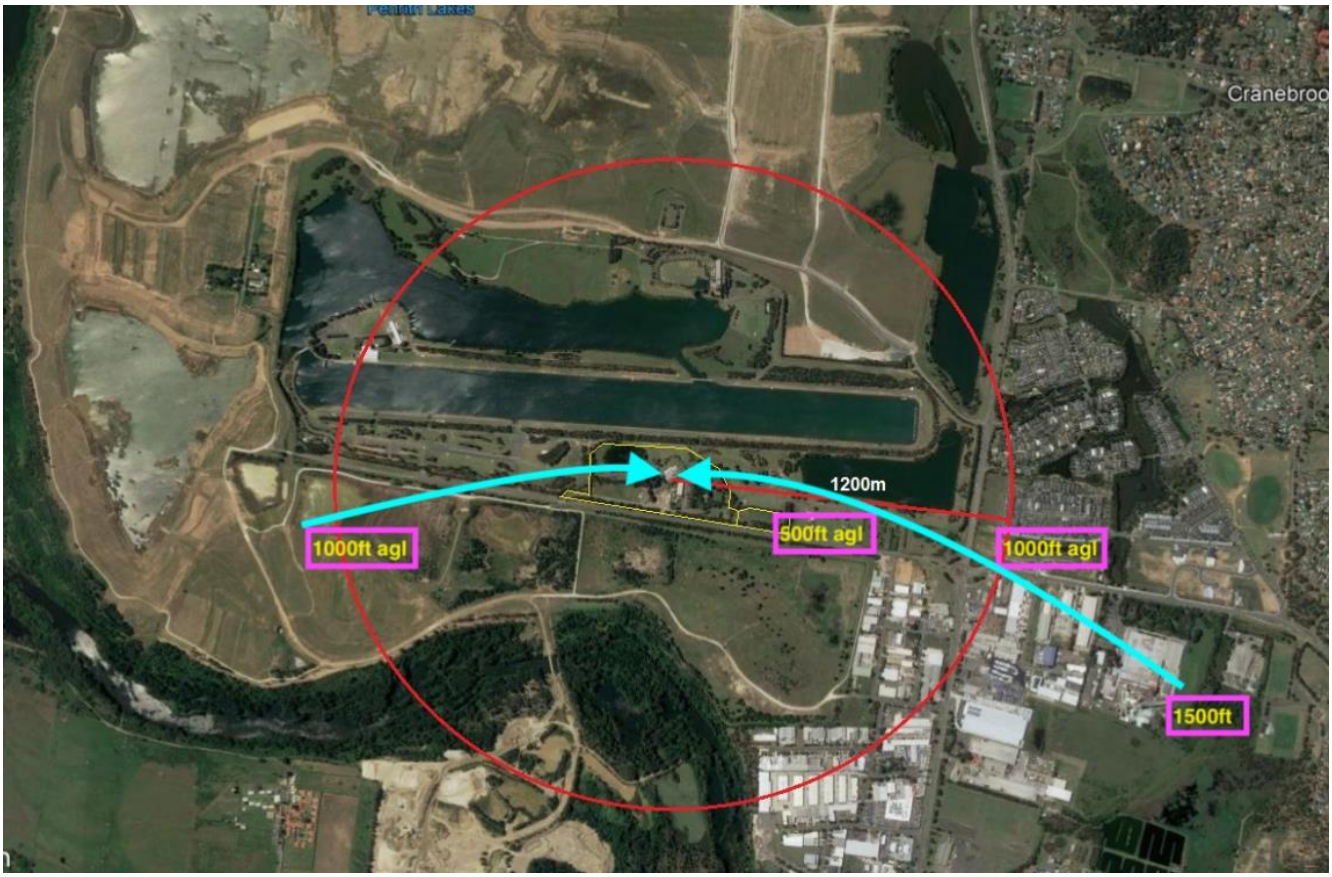


Figure 4-1: Typical Flight Paths

4.1.1 Modelling Data

The noise model has been developed based on the following information:

- The flight paths provided by Sydney Helicopters
- The most conservative sound power levels (SELs) have been used for the purposes of this assessment, those being the SELs derived from the takeoff and departures. These take-off and departure noise levels have been used within the model for both departures and arrivals, which is conservative, given the arrivals will generally be 5dB lower than these determined SELs.
- To model the worst-case scenario, a speed of 25 knots has been used as the overflight speed.

These SELs have been determined by measurements obtained by this office on previous projects, existing product data, and standards as follows:

- Bendigo Hospital helicopter measurements.
- Capitol Apartments helicopter measurements
- On site sample measurements of the AS350 adopting the typical flight path.
- European Union Safety Agency Chapter 8 & 11 Noise Levels

The sound exposure levels (SELs) used within the calculation methodology are detailed below. These SELs at a distance of 30m from the helipad and include the take off and immediate departure.

The following table details the sound exposure levels (SELs) used within the calculations, including the SEL for each helicopter at the closest point on the helicopter flight path.

Table 2 –Sound Exposure Levels

Helicopter type	SEL at 30m	SEL at R1	SEL at R2	SEL at C1	SEL at R3	SEL at C2
Bell 407	92	82	81	73	77	78
Bell 429	92	82	81	73	77	78
AS350	92	82	81	73	77	78
Bell 206	91	81	80	72	76	77
Bell 412[1]	95	85	84	76	80	81

[1] (Note: The Bell 412 is used primarily for emergency services related work it is not an aircraft that is commonly used for general commercial work. Approximately 95% of the Bell 412 utilisation is for emergency related work. When used for emergency services the aircraft is exempt from the noise criteria)

4.1.2 Attended Site Measurements for SEL Verification

Acoustic Logic attended the site location on Monday the 11th of April 2022 with Department of Planning and Environment representatives to verify the Sound Exposure Levels presented within Table 2 above. The following section presents the results of this on-site verification testing.

4.1.2.1 SEL Verification Methodology

Acoustic Logic attended site on Monday the 11th of April 2022 to record the noise level experienced at the nearest residential receiver (R1) due to a worst-case helicopter pass-by from the project site. An AS350 helicopter was flown in an eastwardly take off direction, and westwardly landing direction, in a flight path consistent with the flightpath mark-up presented within Figure 4-1. Acoustic Logic had two engineers separately measure the SEL experienced at the receiver location due to both take-off and landing events. This process was repeated four times (Four landing pass-bys and four take-off pass-bys) to assess consistency with measurements.

4.1.2.2 Measurement Position

Attended noise measurements were undertaken at 47-65 Old Castlereagh Road, Penrith.

4.1.2.3 Measurement Period

Attended noise measurements were conducted on Monday the 11th of April 2022 between 3:00pm and 4:00pm.

4.1.2.4 Measurement Equipment

The measurements were conducted using two Norsonic 140 Sound Analysers. The analysers were set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

4.1.2.5 Measured External Noise Levels

The measured external noise level for the attended measurement is presented in the table below.

Table 3 – Measured Traffic Noise Levels at Attended Measurement Location

Measurement Location	Time of day	Flight Pass-By	Norsonic 140 Sound Analyser Reference Number	Measured Sound Exposure Level dB(A)
47-65 Old Castlereagh Road, Penrith	Monday the 11h of April 2022 3:00pm – 4:00pm	Landing 1	1	79
			2	79
		Landing 2	1	78
			2	78
		Landing 3	1	79
			2	79
		Landing 4	1	78
			2	78
		Take-Off 1	1	83
			2	82
		Take-Off 2	1	82
			2	81
		Take-Off 3	1	83
			2	82
		Take-Off 4	1	82
			2	81

Based upon the attended measurements presented within the above table, it can be confirmed that the noise levels presented within Table 2 and utilised within the SoundPlan Noise Model are accurate.

4.1.3 Modelling Results

The results of the model are presented below. For the grid noise maps provided by the SoundPLAN model, See Appendix A.

In all scenarios the predicted helicopter levels are based on the maximum number of recommended flights per aircraft recommended in Section 4.1.3.

The maximum number of flights have been adjusted per aircraft to ensure the 48dB(A) $L_{eq(24hr)}$ is satisfied at all receivers, but most importantly at the most potentially affect receiver located at 47-65 Old Castlereagh Road. Ensuring compliance at this location results in a marked compliance buffer for residential properties located at greater distances, given the inherently increased height of the helicopters at the remaining locations.

Table 4 –Predicted Noise Levels – Bell 407, Bell 429, AS350, Bell 206

Receiver	Nearest point along the flight path	Predicted dB(A) $L_{eq24\ hour}$	Criteria dB(A) $L_{eq24\ hour}$	Complies
47-65 Old Castlereagh Road	125m	46dB(A)	48dB(A)	Yes
39-45 Old Castlereagh Road	168m	45dB(A)	48dB(A)	Yes
Sydney International Regatta Centre	568m	37dB(A)	55dB(A)	Yes
Waterside Estate	249m	40dB(A)	48dB(A)	Yes
Proposed Golf Course	385m	42dB(A)	55dB(A)	Yes

Table 5 –Predicted Noise Levels – Bell 412 (95% Emergency Flights)

Receiver	Nearest point along the flight path	Predicted dB(A) $L_{eq24\ hour}$	Criteria dB(A) $L_{eq24\ hour}$	Complies
47-65 Old Castlereagh Road	125m	48dB(A)	48dB(A)	Yes
39-45 Old Castlereagh Road	168m	46dB(A)	48dB(A)	Yes
Sydney International Regatta Centre	568m	40dB(A)	55dB(A)	Yes
Waterside Estate	249m	44dB(A)	48dB(A)	Yes
Proposed Golf Course	385m	45dB(A)	55dB(A)	Yes

4.1.4 Maximum Permissible Flights

In order to achieve compliance with the 48dB(A) $L_{eq(24hour)}$ noise level at the closest residents (being the most noise affected), the following maximum number of flights are to be adopted during operation.

Bell 206,407,429 AS350 (East)

A maximum of 23 flights in the eastern take-off direction (landing to the helipad from the east) within a 24 hour period with the use of the Bell 206, 407, 429 and AS350.

We note that the proposed maximum number of flights per day for the helipad is 23 and the total yearly flights is proposed to be limited to 750. Within this context, the above restrictions on approaches to/from the helipad are feasible and can be managed appropriately through scheduling of flights.

Bell 206,407,429 AS350 (West)

A maximum of 23 flights in the western take-off direction (landing to the helipad from the west) within a 24 hour period with the use of the Bell 206, 407, 429 and AS350.

Bell 412

A maximum of 16 flights within a 24 hour period with the use of the Bell 412. The likelihood of 16 Bell 412 commercial helicopter flights within a 24 hour period is extremely remote given that the Bell 412 is used primarily for emergency services related work it is not an aircraft that is commonly used for general commercial work.

The Bell 412 is used primarily for emergency services related work it is an aircraft that is rarely used in a commercial capacity. Approximately 95% of the Bell 412 utilisation is for emergency related work, which is exempt from noise criteria.

5 GROUND MAINTENANCE NOISE EMISSION ASSESSMENT

As per discussions with the Department and the EPA, all on-ground maintenance activities (excluding taxiing and other preparation for flight) are to be assessed according to the provisions of the Noise Policy for Industry (NPfI). The NPfI recommends the development of project noise trigger levels, which provide a benchmark for assessing a proposal or site. The project noise trigger levels should not be interpreted as mandatory noise criteria but, rather, as noise levels that, if exceeded, would indicate a potential noise impact on the community.

5.1 NOISE EMISSION CRITERIA

5.1.1.1 Noise Policy for Industry

The Noise Policy for Industry (NPfI) provides a methodology for assessing the need for noise mitigation:

- Determine project specific "trigger" levels.
- Predict noise emissions to surrounding properties, and assess against the trigger levels.
- Noise mitigation should be assessed when the predicted noise emissions exceed the trigger levels.

In this assessment, the trigger levels determined using the NPfI will be adopted as assessment criteria for permanent plant and equipment. Project specific noise "trigger" levels are determined based on the land use impacted, ambient noise environment and the time of day.

The EPA NPfI has three sets of criteria which are all required to be satisfied, namely "intrusiveness", "amenity" and "maximum noise levels". Intrusiveness and amenity are generally assessed at the most affected part of the property, or at the balcony or façade of an apartment or upper level of residence. Maximum noise levels generally assessed outside bedroom windows, however as the maintenance operations do not occur between 10pm and 7am, the "intrusiveness", "amenity" criteria are the focus of this assessment of maintenance noise.

The derivation of the project specific trigger levels is discussed below.

Intrusiveness Criteria

The guideline is intended to limit the audibility of noise emissions at residential receivers only. Noise emissions measured using the L_{eq} descriptor should not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality (in accordance with Fact Sheet C of the Policy).

The NPfI stipulates in Table 2.1 that project intrusiveness noise levels should not be set below 40 dB(A) during the daytime and 35 dB(A) in the evening and night time. A conservative approach has been adopted in this assessment by implementing the NPfI minimum project intrusiveness noise levels as follows:

Table 6 - NPfI Minimum Project Intrusiveness Noise Levels

Location	Period/Time	NPfI minimum project intrusiveness noise levels dB(A) $L_{eq(15min)}$
All surrounding residential receivers	Day (7am-6pm)	40
	Evening (6pm-10pm)	35
	Night (10pm-7am)	35

Amenity Criteria

The guideline is intended to limit the absolute noise level from all "industrial" noise sources so that it is consistent with the general environment.

Table 2.2 of the NPfI sets out acceptable noise levels for various land uses.

There are 3 categories for residential receivers - rural, suburban, urban. This subject site is most appropriately categorised as suburban.

Categories for non-residential uses are also indicated in the table.

Generally, the NPI requires project amenity noise levels to be calculated in the following manner:

Amenity $L_{Aeq,15min}$ *= Recommended Amenity Noise Level – 5 dB(A) + 3 dB(A)*

The applicable amenity goals are provided in the following table.

Table 7 - Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15\ minute)}$
Residential – Suburban	Day (7am-6pm)	55	53
	Evening (6pm-10pm)	45	43
	Night (10pm-7am)	40	38
Active Recreation (Regatta and Golf Course)	When in Use	55	53

Summarised NPfI Noise Emission Criteria

The applicable assessment criteria and trigger levels are summarised in the following table. It is noted that all criteria is to be satisfied.

Table 8 – Noise Emissions Criteria (NPI)

Location	Time Period	Project Amenity Criteria dB(A) $L_{eq,15min}$	Intrusiveness Criteria dB(A) $L_{eq,15min}$
Residential – Suburban	Day	53	**40**
	Evening	43	**35**
	Night	38	**35**
Active Recreation (Regatta and Golf Course)	Day	**53**	-
	Evening	**53**	-
	Night	Not applicable	-

5.2 MAINTENANCE NOISE EMISSION ASSESSMENT

Predicted noise levels for maintenance activities at sensitive receivers have been predicted based on the following information and assumptions:

- On ground helicopter maintenance activities including refuelling and use of hand tools have a Sound Power Level of 90dB(A).
- It is assumed as a conservative assumption that the maintenance activities are continuous during the 15 minute assessment period.
- No maintenance is to be conducted between the hours of 10pm and 7am.
- The distance between the maintenance and surrounding receivers is as follows:
    - 47-65 Old Castlereagh Road, 430m to helipad
    - 39-45 Old Castlereagh Road 648m to helipad
    - Sydney International Regatta Centre -1150m from helipad
    - Waterside Estate - 1100m to helipad
    - Proposed golf course– Approximately 1000m to the helipad

Noise levels have been assessed against the "evening" time period of 6pm to 10pm as this is the worst case time period for potential maintenance activities.

The predicted noise levels are as follows

Table 9 - Maintenance Activities

Receiver	Predicted dB(A) $L_{eq\ 15\ min}$	Criteria dB(A) $L_{eq\ 15\ min}$	Complies
47-65 Old Castlereagh Road	<30dB(A)	35dB(A)	Yes
39-45 Old Castlereagh Road	<30dB(A)	35dB(A)	Yes
Sydney International Regatta Centre	<25dB(A)	53dB(A)	Yes
Waterside Estate	<25dB(A)	35dB(A)	Yes
Proposed Golf Course	<25dB(A)	53dB(A)	Yes

As detailed above, all predicted noise levels are fully compliant with the requirements of the NSW Noise Policy for Industry (NPfI).

6 CONSTRUCTION NOISE ASSESSMENT

As requested by the DPIE and the EPA, a construction noise assessment is to be conducted for the minor works associated with the Helipad.

There is minor demolition and construction work associated with the development as follows:

- Demolition of 2x single storey sheds
- Demolition of 1 small single storey shed and associated pavement
- Removal of 1 inground tank
- Removal of 1 flood light
- Removal of fewer than 10 trees
- Reinstatement of grass turf in locations of removed hardstands and pavement
- New concrete hardstand in location of existing concrete hardstands
- New lighting as required for the FATO

It is anticipated that the complete scope of the minor works will be completed within 7 days.

As the construction works are fewer than three weeks in duration, the scope of works is considered to be "short term" as defined within the EPA Interim Construction Noise Guideline (ICNG). Short term works are defined as:

> *Short-term means that the works are not likely to affect an individual or sensitive land use for more than three weeks in total….*
>
> *Small construction projects in rural areas may not generate significant noise at surrounding residences due to the typically large distances involved*

As such, and in accordance with EPA ICNG the qualitative method for assessing potential noise impacts is triggered in accordance with Section 5.1 of the ICNG

Given the short-term duration of the works and the distance between the works and residential receivers on Old Castlereagh Road (over 450m) we recommend the following:

6.1.1 Hours of Construction

- Monday to Friday 7am to 6 pm
- Saturday 8 am to 1 pm
- No work on Sundays or public holidays

6.1.2 Site Recommendations and Consultation

- Turn off plant that is not being used.
- No construction traffic to arrive on site before 7am or after 6pm.
- Locate static plant as far away from residential boundaries as feasible, noting that an inherently marked distance is already provided between Sydney Helicopters and surrounding receivers.

7 CONCLUSION

This report presents the noise impact assessment of Sydney Helicopters' proposed new helipad to be located at 89-151 Old Castlereagh Rd, Castlereagh NSW 2749.

The assessment has reviewed impacts from

- Flight movements from various helicopters that are proposed to use the facility;
- On-ground maintenance activities; and
- Construction activities

Noise from the operation of the helipad (with the incorporation of appropriate management controls as proposed) has been determined to be fully compliant with the noise emission requirements of:

- Protection of the Environment Operations Act 1997
- Requirements from Air Services Australia
- Adopted criteria from LEC decisions, being 48 dB(A) $L_{eq(24\ hour)}$.

Noise from the operation of ground maintenance activities have been assessed in accordance with NSW Noise Policy for Industry (NPfI) and have been found to be fully compliant.

Noise from the minor construction has been assessed in accordance with EPA Interim Construction Noise Guideline qualitative method for assessing potential noise impacts as per Section 5.1 of the ICNG.

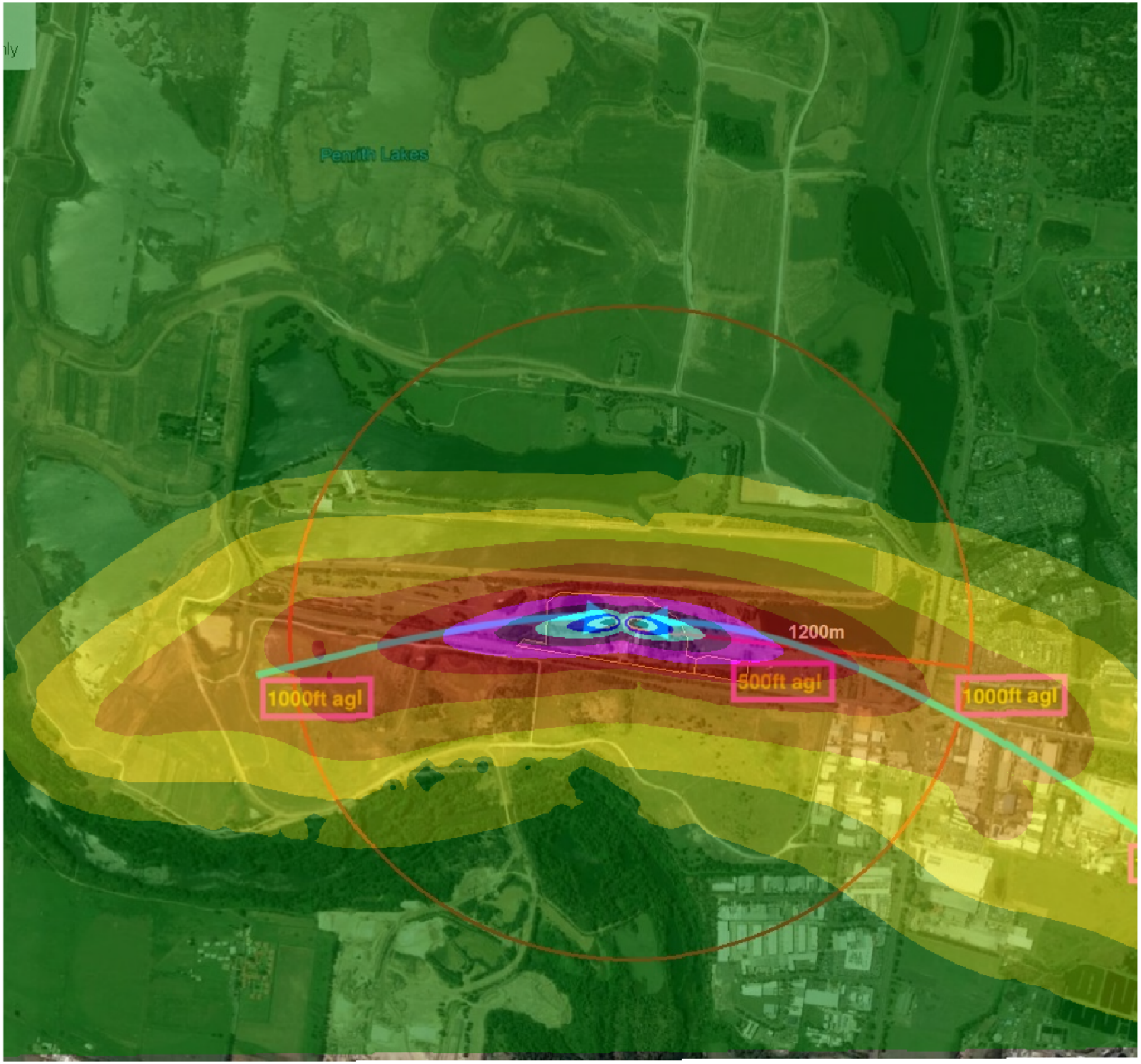
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Thomas Aubusson
MAAS

APPENDIX A – GRID NOISE MAPS

Sydney Helicopters
407, 429, AS350, 206



Grid Noise Map - Penrith

L_{eq} (24 hour)

23 Flights in Each Direction

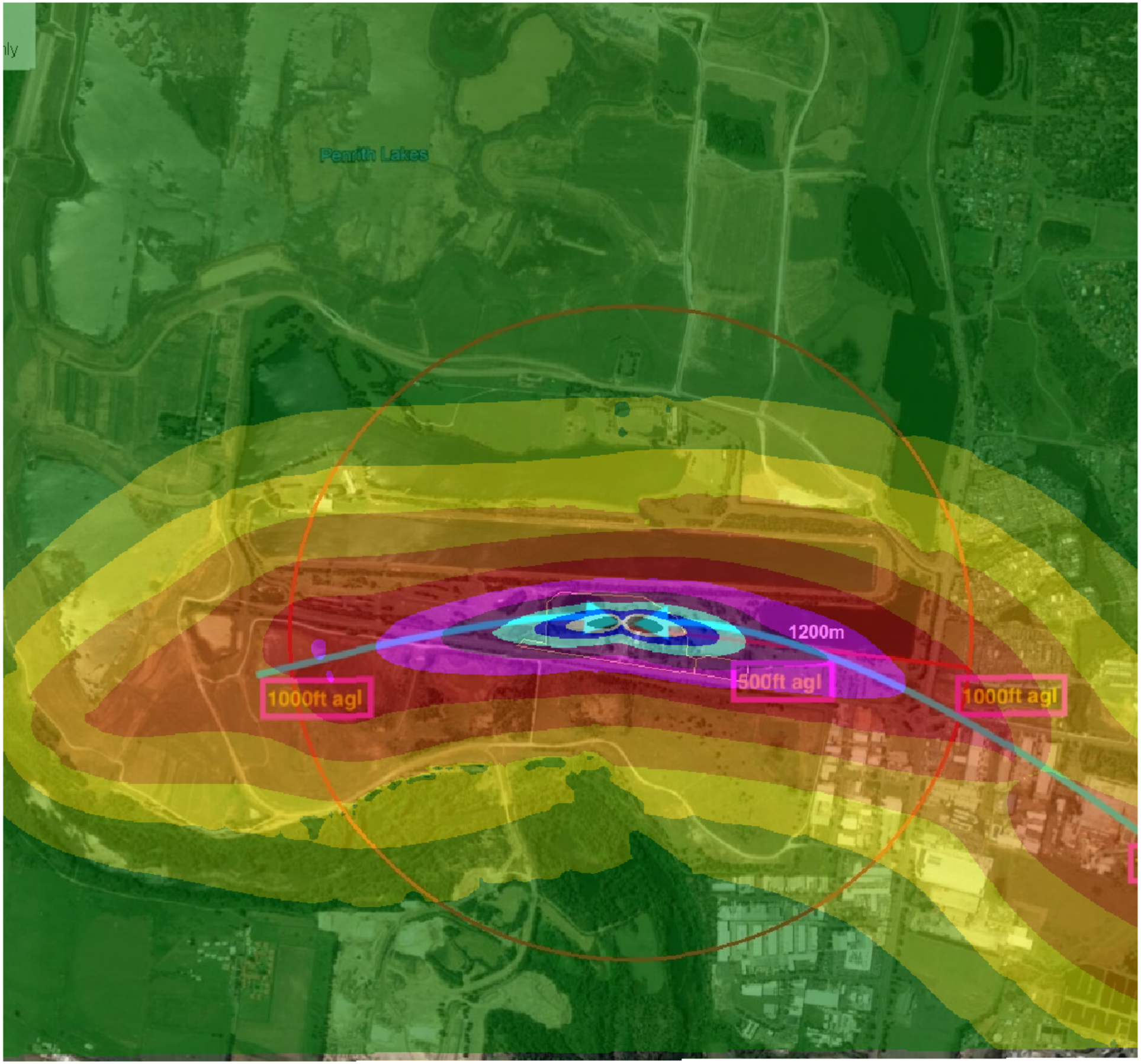
Prepared by: L. Abood
Date: 13/04/2022

Noise Level
L_{eq}
in dB(A)

< 36
36 - 38
38 - 40
40 - 42
42 - 44
44 - 46
46 - 48
48 - 50
50 - 52
52 - 54
54 - 56
>=56

ACOUSTIC LOGIC

Sydney Helicopters
Bell 412



Grid Noise Map - Penrith

L_{eq} (24 hour)

16 Flights in Each Direction

Prepared by: L. Abood
Date: 12/04/2022

Noise Level
L_{eq}
in dB(A)

	< 36
	36 - 38
	38 - 40
	40 - 42
	42 - 44
	44 - 46
	46 - 48
	48 - 50
	50 - 52
	52 - 54
	54 - 56
	>=56

ACOUSTIC LOGIC

APPENDIX B – ATTENDED MEASUREMENT SOUND ANALYSER CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 29225

Equipment Description:	Sound Level Meter		
Manufacturer:	Norsonic		
Model No:	NOR-140	**Serial No:**	1405928
Microphone Type:	1225	**Serial No:**	208208
Preamplifier Type:	1209	**Serial No:**	15792
Filter Type:	1/3 Octave	**Test No:**	FILT 6357
Comments:	All tests passed for class 1. (See over for details)		
Owner:	Acoustic Logic 9 Sarah Street Mascot, NSW 2020		
Ambient Pressure:	991 hPa ±1.5 hPa		
Temperature:	23 °C ±2° C	**Relative Humidity:**	64% ±5%
Date of Calibration:	09/04/2021	**Issue Date:**	12/04/2021

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA
WORLD RECOGNISED ACCREDITATION

Accredited Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB
ELECTRONICS

HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 96808133 Fax: (02)96808233
Mobile: 0413 809806
web site: www.acu-vib.com.au

CERTIFICATE NO.: SLM 29225

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass N/A
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

A full technical report is available if required.

Date of Calibration: 09/04/2021 **Issue Date:** 12/04/2021

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C21104

Client Details	Acoustic Logic Consultancy Pty Ltd 9 Sarah Street Mascot NSW 2020
Equipment Tested/ Model Number :	Norsonic Nor140
Instrument Serial Number :	1405929
Microphone Serial Number :	540927
Pre-amplifier Serial Number :	15791

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	22.4°C	**Ambient Temperature :**	23.1°C
Relative Humidity :	53.7%	**Relative Humidity :**	53.3%
Barometric Pressure :	100.03kPa	**Barometric Pressure :**	99.9kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 26 Feb 2021
Secondary Check: Max Moore
Report Issue Date : 1 Mar 2021

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.12dB*	*Temperature*	*±0.2°C*
1kHz	*±0.11dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.13dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.