Australian International Aviation College

Kempsey Airport - Aircraft Noise Assessment

February 2017

Table of contents

Table index

Figure index

Glossary

Term	Description
AIAC	Australian International Aviation College
AS	Australian Standard
DA	Development Application
dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels as perceived by the human ear.
ERSA	En Route Supplement Australia
GA	General Aviation; civil aviation operations other than scheduled air services and non-scheduled air transport operations.
GHD	GHD Pty Ltd
INM	Integrated Noise Model
L_{Aeq24}	The predicted equivalent noise level over a 24 hour period.
$L_{Aeq\ (T)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
L_{Amax}	Maximum noise level over a sample period
SEE	Statement of Environmental Effects
WHO	World Health Organisation

1. Introduction

GHD Pty Ltd (GHD) has been engaged by the Australian International Aviation College (AIAC) to undertake a noise assessment of circuit operations at the AIAC located at Kempsey Airport, NSW.

1.1 Background

The Port Macquarie Airport Master Plan 2010 explains the recent increase in demand for general aviation (GA) facilities in the region. In order to make better use of the available airspace in the region, Port Macquarie – Hastings Council has developed a formal Memorandum of Understanding with Kempsey Shire Council which should see Kempsey Airport developed as a base for general aviation as part of an overall strategy to promote the establishment of a *Mid North Coast Regional Aviation Centre of Excellence* across the region. The *Mid North Coast Regional Aviation Centre of Excellence* initiative, funded by the Federal Government, promotes better utilisation of Kempsey Airport where significant potential and capacity exists for the development of new GA infrastructure and facilities to meet both existing and future demand.

1.2 Purpose of this report

The purpose of this noise assessment was to substantiate the noise impact from proposed future operations at Kempsey Airport to support the Development Application (DA) submitted to Kempsey Shire Council for the establishment of a permanent flight training facility.

1.3 Scope of work

The noise assessment undertaken for AIAC included the following scenarios:

- Average daily noise impact ($L_{Aeq\,24hr}$) for:
  - Circuit operations with current levels of traffic
  - Circuit operations with worst-case forecast traffic of the 2017 calendar year
  - Circuit operations with worst-case forecast traffic of the 2018 calendar year
- Single event maximum noise contours (L_{Amax}) for:
  - Runway 04 circuit
  - Runway 22 circuit
  - Runway 16 circuit
  - Runway 34 circuit

1.4 Limitations

This report: has been prepared by GHD for Australian International Aviation College and may only be used and relied on by Australian International Aviation College for the purpose agreed between GHD and the Australian International Aviation College as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Australian International Aviation College arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Aircraft noise descriptors

There are a large number of descriptors which have been developed to describe aircraft noise impact. Some commonly used noise descriptors of aircraft noise are the "equivalent" A-weighted noise level (L_{Aeq}) and the "maximum" A-weighted noise level (L_{Amax}). Equal energy noise descriptors include the "equivalent" A-weighted noise level averaged over a specified time ($L_{Aeq,T}$). Whist not required by Australian Standard (AS) 2021-2015 *Acoustics – Aircraft noise intrusion – Building siting and construction* for measuring noise exposure, the $L_{Aeq,T}$ noise descriptor can be used for the measurement of aircraft noise exposure in Australia. The $L_{Aeq,T}$ descriptor is the summation of all L_{Aeq} values for each aircraft operation, logarithmically averaged over a period of time, in this case, 24 hours. This is known as $L_{Aeq24hr}$.

The World Health Organisation (WHO) recommends that, for transportation activities, the noise exposure should be measured in terms of the average 24 hour L_{Aeq} and recommends an external 55 dB(A) as the value where people start to become annoyed with aircraft noise during daytime. However, the results presented in this report utilise a 40 dB(A) threshold, which represents a level above which adverse health effects have been observed.[1]

Additional supplementary parameters have also been used to further describe aircraft noise in Australia. The L_{Amax} metric is the most common supplementary aircraft noise parameter used around the world. The WHO recommends that for aviation operations, in addition to the L_{Aeq}, additional descriptors such as the L_{Amax} should also be reported. The results presented in this report utilise a 70 dB(A) L_{Amax} threshold, which represents an equivalent level of 60 dB(A) as specified in AS 2021 as the indoor design sound level for normal domestic areas in dwellings (an external single even noise event will be attenuated by approximately 10 dB(A) by the fabric of a house with open windows). An internal noise level of 60 dB(A) is the sound pressure level of a noise event that is likely to interfere with conversation or with listening to the radio or television.[2]

Both the $L_{Aeq24hr}$ and L_{Amax} noise descriptors have been utilised in this assessment.

[1] *Night Noise Guidelines for Europe* – World Health Organization (2009)
[2] *Discussion Paper – Expanding Ways to Describe and Assess Aircraft Noise* – Department of Transport and Regional Services

3. Modelling inputs and assumptions

This section describes the inputs and assumptions utilised for the noise modelling, consisting of airport data, traffic scenarios, and flight tracks. The noise modelling has been carried out using FAA's Integrated Noise Model (INM) version 7.0d which is endorsed by Airservices Australia and the Department of Defence.

INM is designed to estimate the impacts of aircraft noise using average annual input conditions. An average annual day is a user-defined best representation of the typical operations for the airport. These conditions include the number and type of operations, routing structure, runway configuration, aircraft weight, temperature and wind.

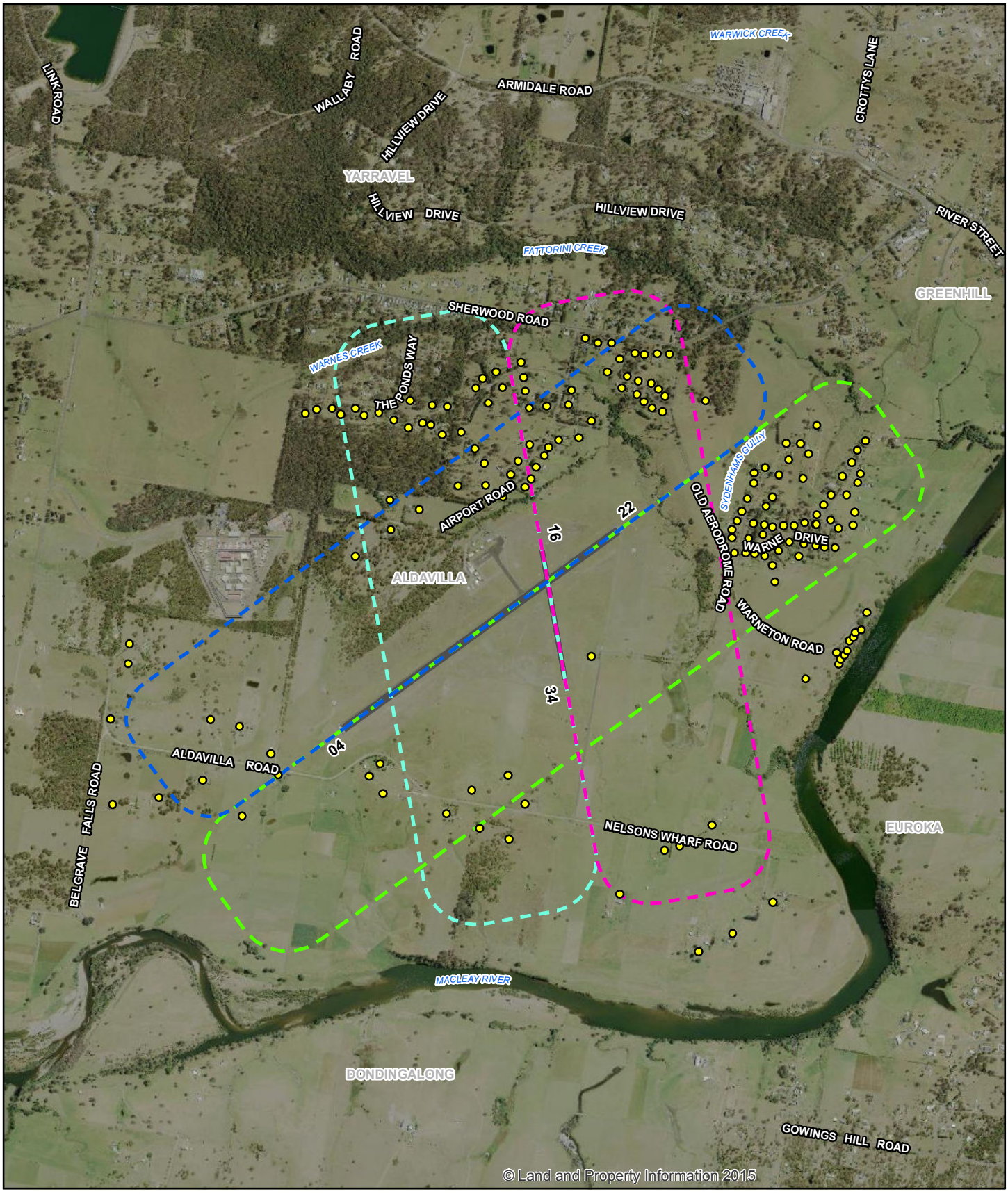
The INM required detailed data of aircraft flight tracks, aircraft profiles (thrust settings, altitude, air speed), noise signature for all aircraft, movement numbers for each flight track and time of day of the movements. Using the above data, the program compiles output for various noise metrics.

3.1 Airport data and flight tracks

The airport parameters used in the modelling include the use of terrain and average annual temperature for the site. Terrain for the region was obtained from NASA's Shuttle Radar Topography Mission database, and average annual weather conditions (temperature and wind direction) were sourced from three years of meteorological data from the Kempsey Airport weather station.

Kempsey Airport has one main runway situated in the 04/22 direction that is used the majority of the time. There is also one unsealed cross runway situated in the 16/34 direction which is primarily used for crosswind and short field take-off and landing training. Airport and runway information was obtained from the En Route Supplement Australia (ERSA).

The circuit operations for each runway were modelled based on information provided by AIAC; which consists of a standard left hand circuit on each runway. The closest sensitive receivers were identified using aerial imagery. The airport layout, circuits modelled, and nearest receiver points are depicted in Figure 1 below.



LEGEND

- Receiver
- Runway
- Circuit track 04
- Circuit track 16
- Circuit track 22
- Circuit track 34

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

Job Number 22-18739
Revision 1
Date 31 Jan 2017

Kempsey Airport and modelled circuit tracks

Figure 1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA001_AirportCircuitTracks_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay

3.2 Traffic data

3.2.1 Movements

The traffic scenarios modelled are based on information provided by AIAC, which is outlined in the Statement of Environmental Effects (SEE) for the DA. The SEE provides the following information regarding current and future traffic movements:

1. *The current traffic movements by AIAC at Kempsey Airport are in the vicinity of 191.25 movements per student over 12 months. A movement is one landing. There are currently 15 cadets training at Kempsey, which equates to around 2,868 movements per year. Of these movements, there are day movements and there are night movements. The total day movements are 150 per student. Total night movements are 41.25 per student over 12 months.*
2. *It is anticipated that the annual movements at Kempsey will increase as follows:*
    a. *Calendar year 2017 – 60 to 90 students on site (between 11,475 movements (9,000 day & 2,475 night) to 17,212 movements (13,500 day & 3,712 night))*
    b. *Calendar year 2018 – 120 to 150 students (between 22,950 movements (18,000 day & 4,950 night) to 28,687 movements (22,500 day & 6,187 night)).*

3.2.2 Aircraft types

AIAC are planning on operating only one aircraft type; the Diamond Aircraft DA40 NG which is a small single engine, four seat aircraft powered by diesel fuel and fitted with an exhaust silencer and three-blade propeller. These design features make this aircraft significantly quieter than its similar sized counterparts.

Approved noise data provided by the client indicates the aircraft is certified at a noise level of 71.4 dB(A), which has been incorporated into the INM noise model.

3.2.3 Meteorology

Meteorological conditions influence the propagation of noise in the atmosphere. Meteorological data referenced in this report was sourced from the Bureau of Meteorology (BOM) Kempsey Airport Automatic Weather Station (AWS).

The mean temperature as calculated from the meteorological data and used for the noise model is 17.8 degrees Celsius.

The general wind climate at the site is most readily displayed by means of wind rose plots, giving the incidence of winds from different directions for various wind speed ranges. The average predicted annual wind rose for the site is shown in the chart below, which indicates that predominant average wind directions are from the south west to the north west, favouring runway 22 operations.

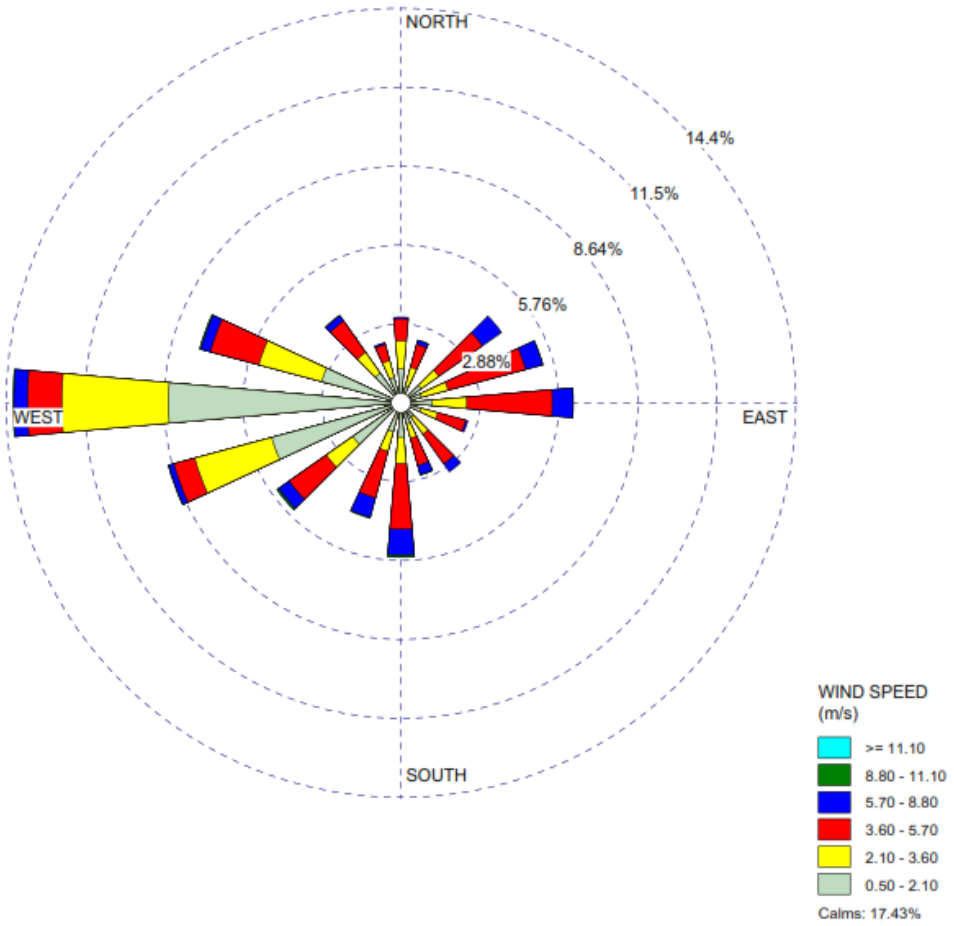


Figure 2 Wind rose – Kempsey Airport AWS

3.2.4 Runway usage

To determine runway usage, two years of wind data from Kempsey Airport meteorological station was analysed. The data indicated an approximate 30% preference towards runway 04, 52% preference towards runway 22, and 18% calm. In calm conditions, the client indicated that runway 22 was utilised more often due to the shorter taxiway distance to the runway threshold. As a result, the calm observations were split 30/70 in favour of runway 22.

The cross runway is minimally used due to its poor design and uneven surface. The cross runway would only be used when absolutely necessary, largely to ensure students are competent on using it in an emergency situation such as closure of the main runway or in the event of extreme crosswind conditions on the main runway. A conservative estimate of movements indicated a maximum of one movement per student per month on the cross runway during daytime only, however in reality it is expected to be approximately half this amount. Based on historical information, runway 16 is preferred 80% to 20% over runway 34, mainly due to lack of obstacles upwind of runway 16 and prevailing wind conditions favouring this runway.

The table below summarises the runway distributions and resultant number of movements per runway (daily average) as modelled in INM.

In order to keep the results of the noise modelling conservative/worst case, the maximum anticipated number of movements per calendar year was used, i.e. 17,212 and 28,687 movements for 2017 and 2018 scenarios respectively.

Table 3-1 Runway distribution and average daily movements

Runway	Resultant runway distribution[1]	Period	Avg daily movements Current	Avg daily movements 2017	Avg daily movements 2018
Runway 04	33.4%	Day	2	12	20
		Night	1	4	6
Runway 22	60.3%	Day	4	22	36
		Night	1	7	11
Runway 16	5%	Day	0	2	4
Runway 34	1.3%	Day	0	1	1
Total	**100%**	**-**	**8**	**47**	**79**

Note 1 – Runway distribution after redistributing calm conditions

4. Noise assessment

The following section presents the results of the noise modelling.

4.1 Current operations, $L_{Aeq24hr}$

Figure 3 depicts the 30 and 40 dB(A) $L_{Aeq24hr}$ contour for a current average day of circuit operations.

4.2 2017 operations, worst case $L_{Aeq24hr}$

Figure 4 depicts the 30 and 40 dB(A) $L_{Aeq24hr}$ contour for a worst case average day of circuit operations for the 2017 calendar year.

4.3 2018 operations, worst case $L_{Aeq24hr}$

Figure 5 depicts the 30 and 40 dB(A) $L_{Aeq24hr}$ contour for a worst case average day of circuit operations for the 2018 calendar year.

4.4 Runway 04, L_{Amax}

Figure 6 depicts the 60 and 70 dB(A) single event L_{Amax} contour for a runway 04 circuit.

4.5 Runway 22, L_{Amax}

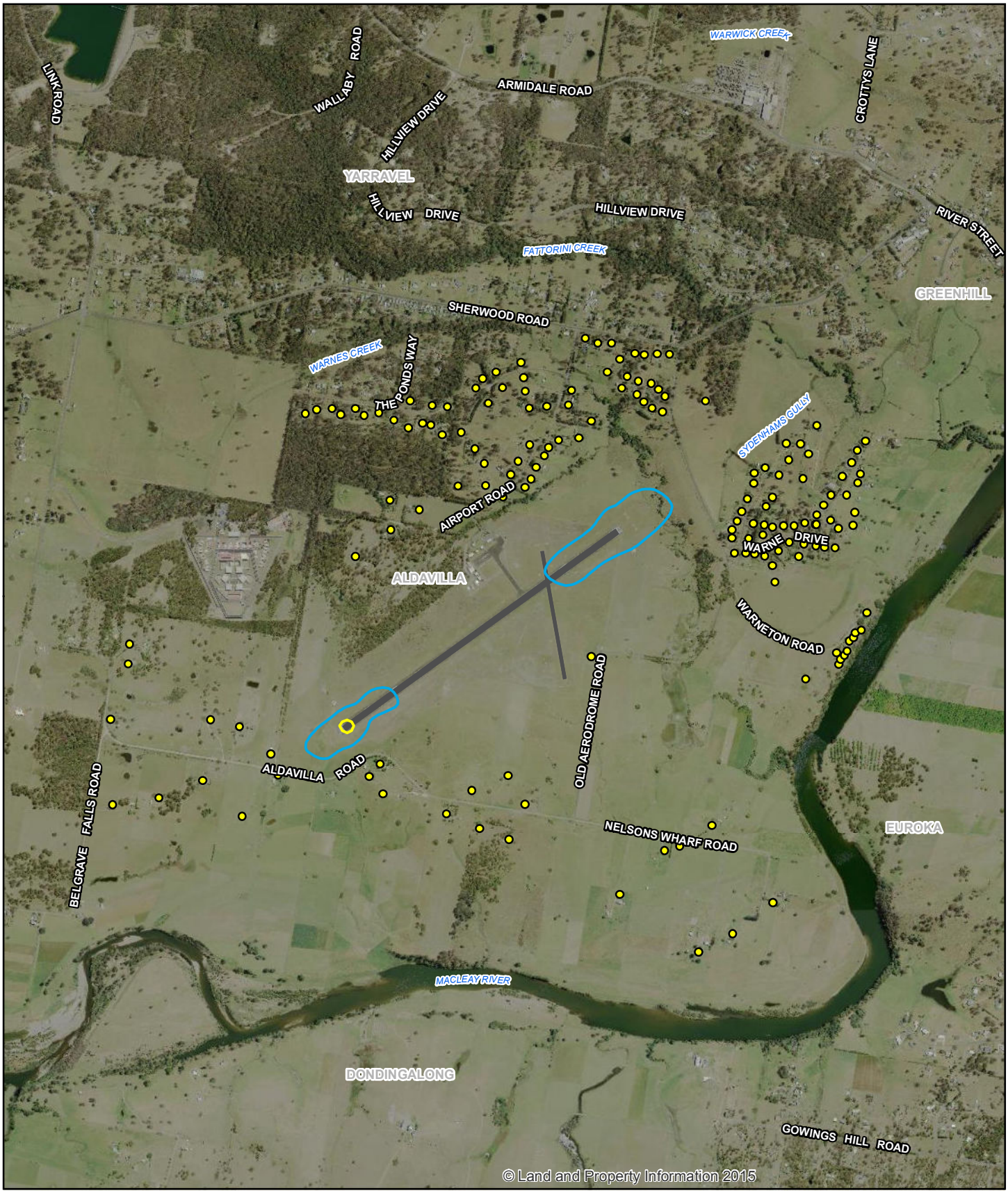
Figure 7 depicts the 60 and 70 dB(A) sing event L_{Amax} contour for a runway 22 circuit.

4.6 Runway 16, L_{Amax}

Figure 8 depicts the 60 and 70 dB(A) single event L_{Amax} contour for a runway 16 circuit.

4.7 Runway 34, L_{Amax}

Figure 9 depicts the 60 and 70 dB(A) single event L_{Amax} contour for a runway 34 circuit.



LEGEND

- Receiver
- Runway
- Noise level
  - 30 dBA, LAeq 24hr
  - 40 dBA, LAeq 24hr

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

Job Number 22-18739
Revision 1
Date 31 Jan 2017

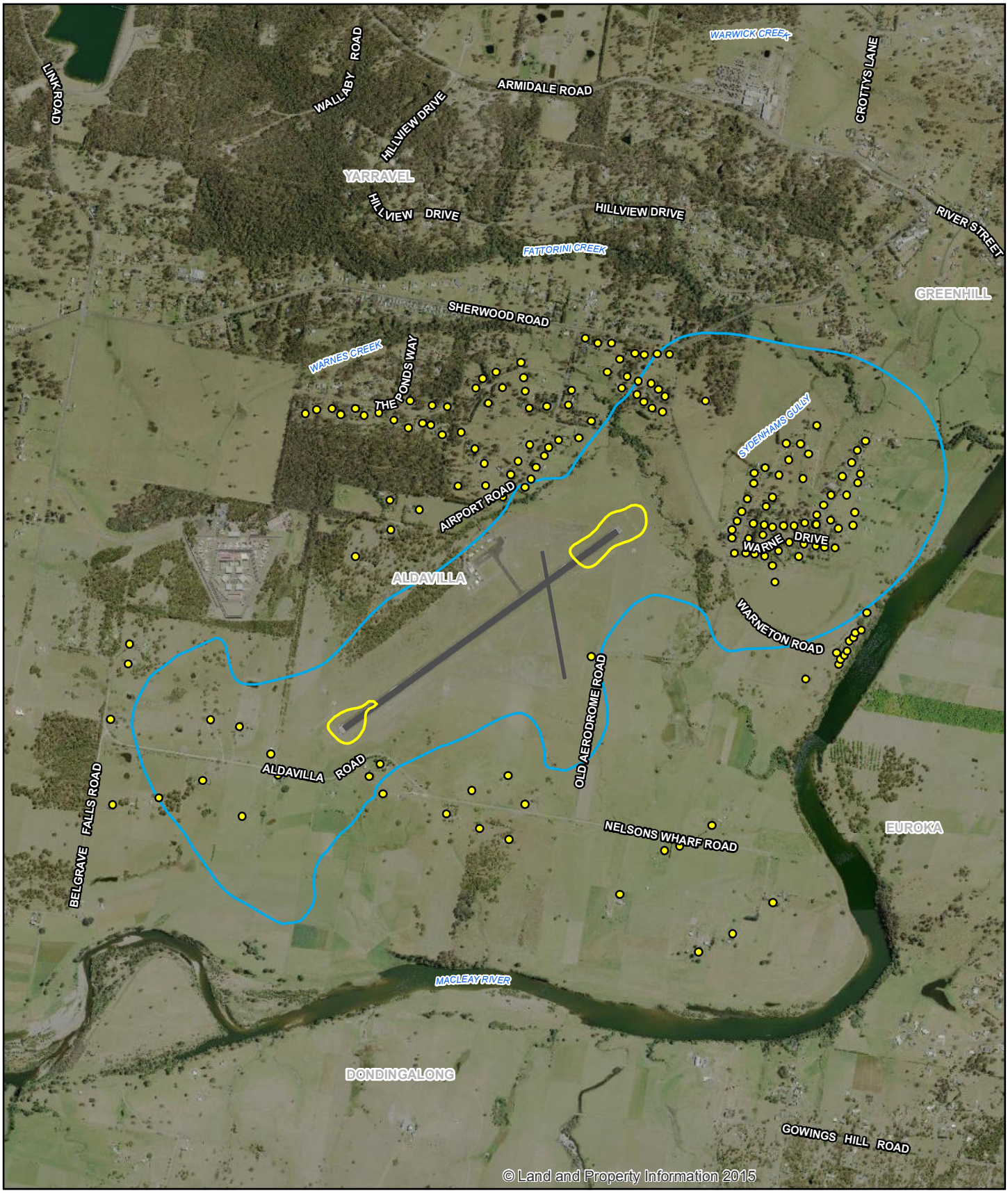
Current circuit operations L_{Aeq24}

Figure 3

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA002_NoiseLevels_Current_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay



LEGEND

- Receiver
- Runway
- Noise level
  - 30 dBA, LAeq 24hr
  - 40 dBA, LAeq 24hr

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

2017 circuit operations,
worst case L_{Aeq24}

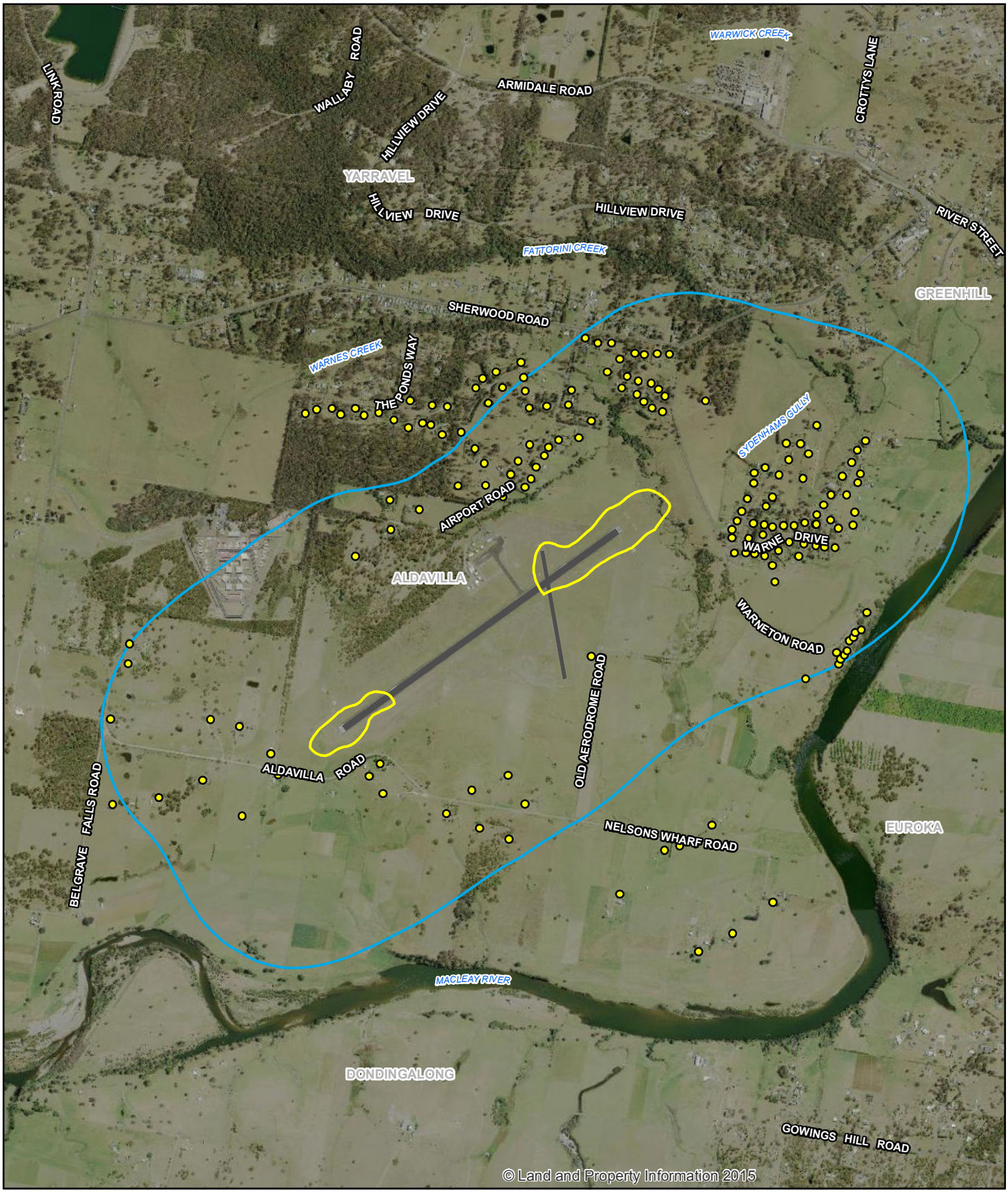
Job Number	22-18739
Revision	1
Date	31 Jan 2017

Figure 4

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA003_NoiseLevels_2017High_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay



LEGEND

- Receiver
- Runway
- Noise level
  - 30 dBA, LAeq 24hr
  - 40 dBA, LAeq 24hr

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

2018 circuit operations, worst case L_{Aeq24}

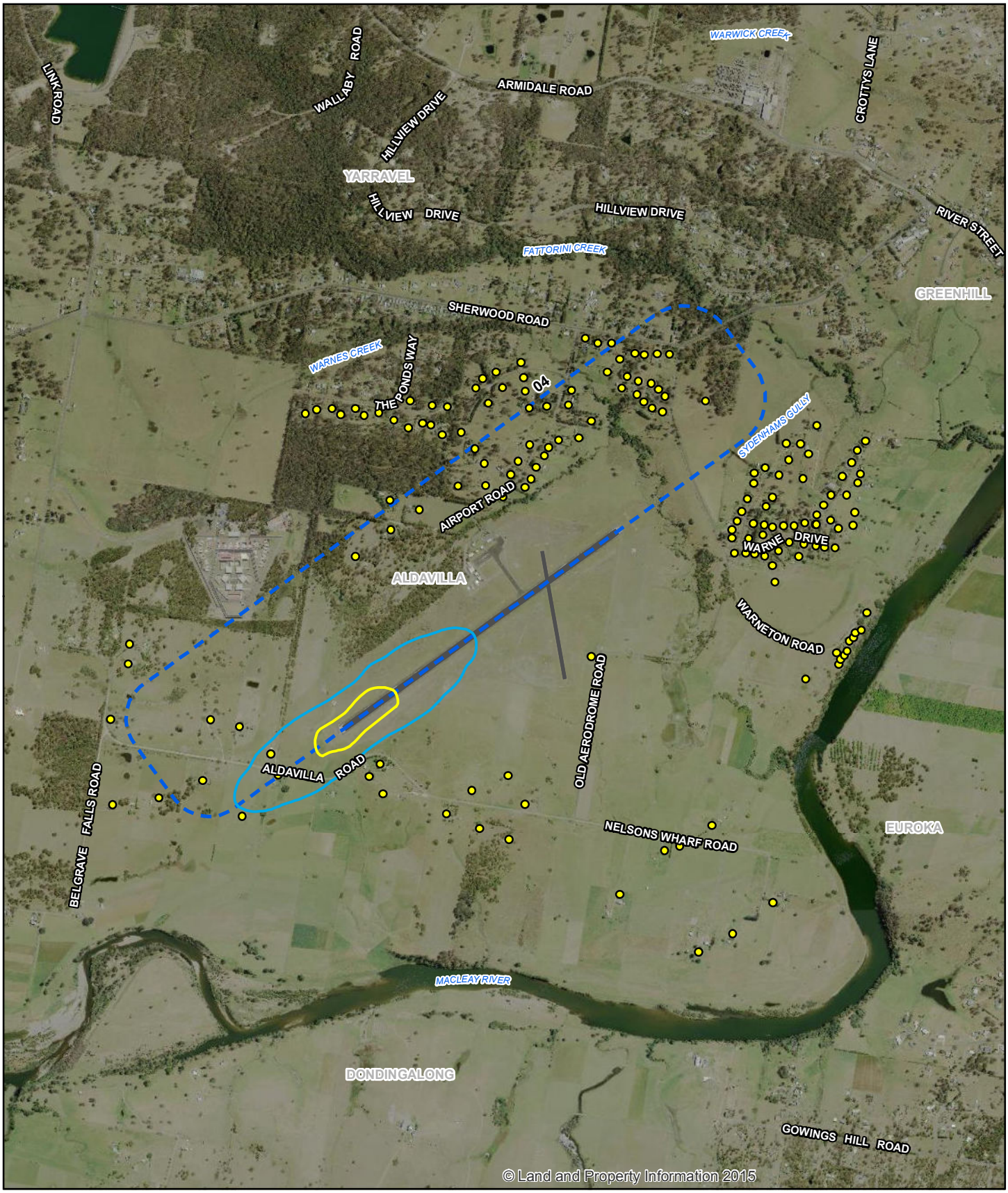
Job Number	22-18739
Revision	1
Date	31 Jan 2017

Figure 5

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA004_NoiseLevels_2018High_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay



LEGEND

Receiver	Noise level
Runway	60 dBA , LAmax
Circuit track 04	70 dBA, LAmax

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

Job Number 22-18739
Revision 1
Date 31 Jan 2017

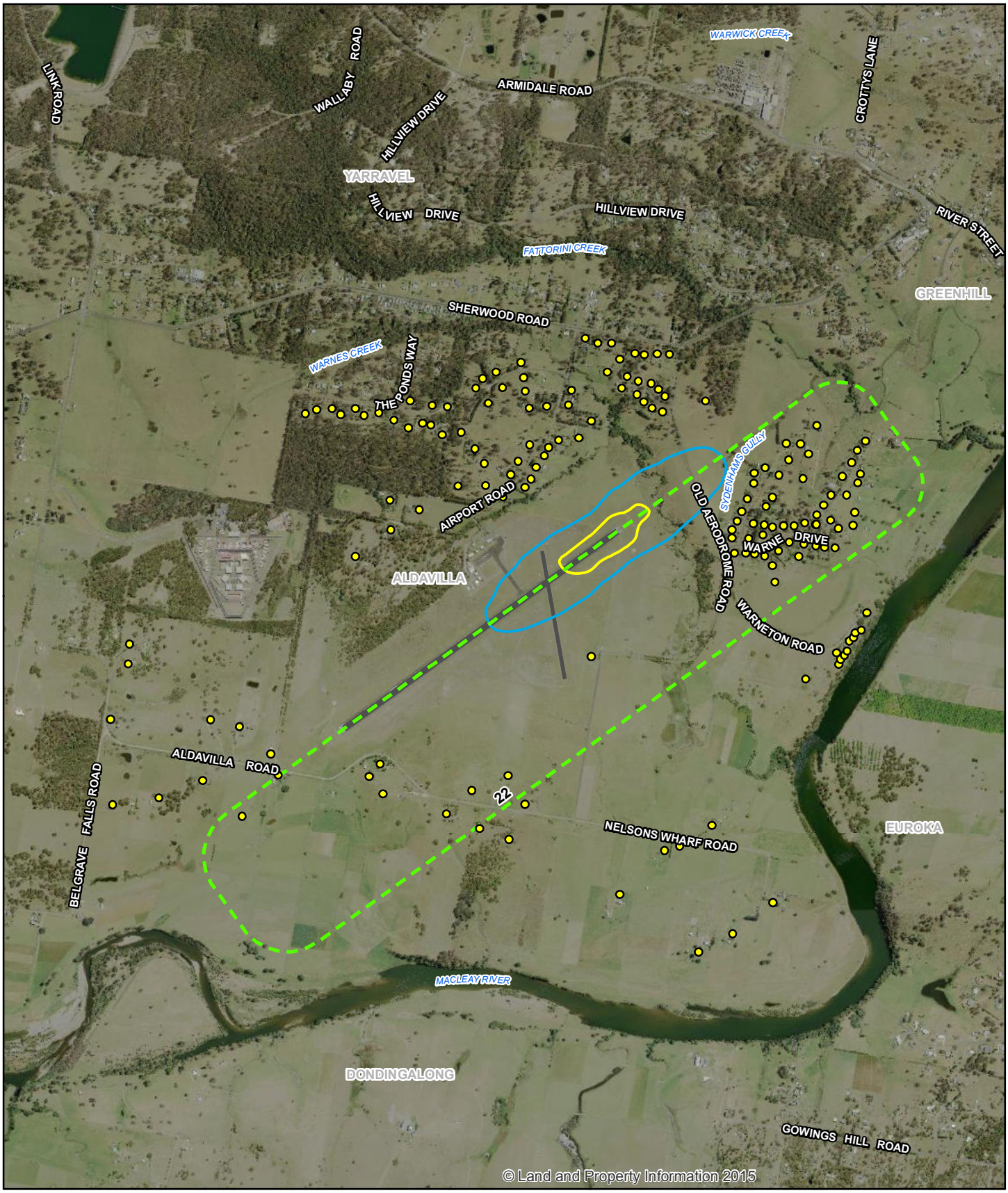
Runway 04 Circuit L_{Amax}

Figure 6

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA005_NoiseLevels_Runway04Circuit_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay



LEGEND

Receiver	Noise level
Runway	60 dBA , LAmax
Circuit track 22	70 dBA, LAmax

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

Job Number 22-18739
Revision 1
Date 31 Jan 2017

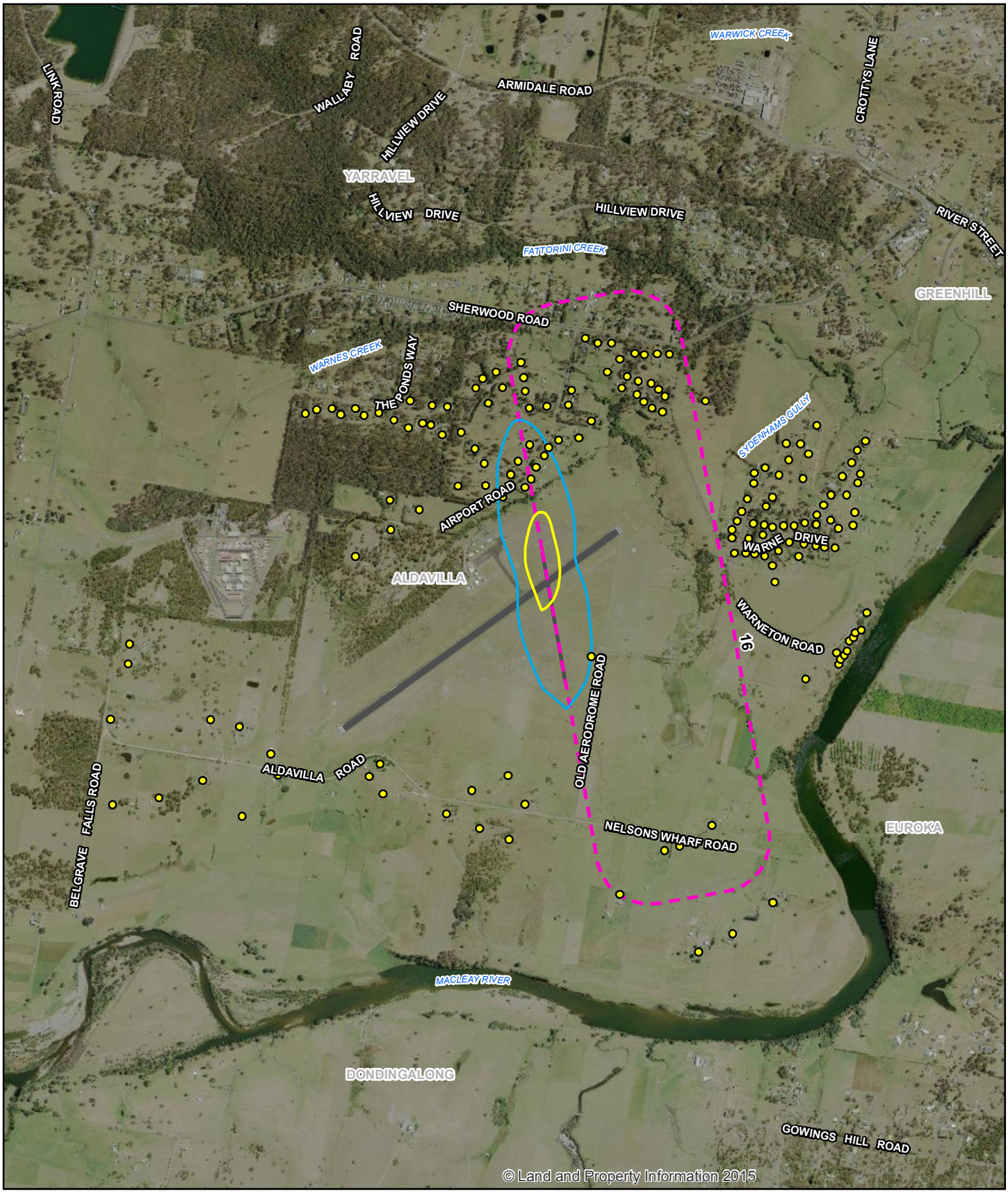
Runway 22 Circuit L_{Amax}

Figure 7

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA006_NoiseLevels_Runway22Circuit_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay



LEGEND

Receiver	Noise level
Runway	60 dBA , LAmax
Circuit track 16	70 dBA, LAmax

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

Job Number 22-18739
Revision 1
Date 31 Jan 2017

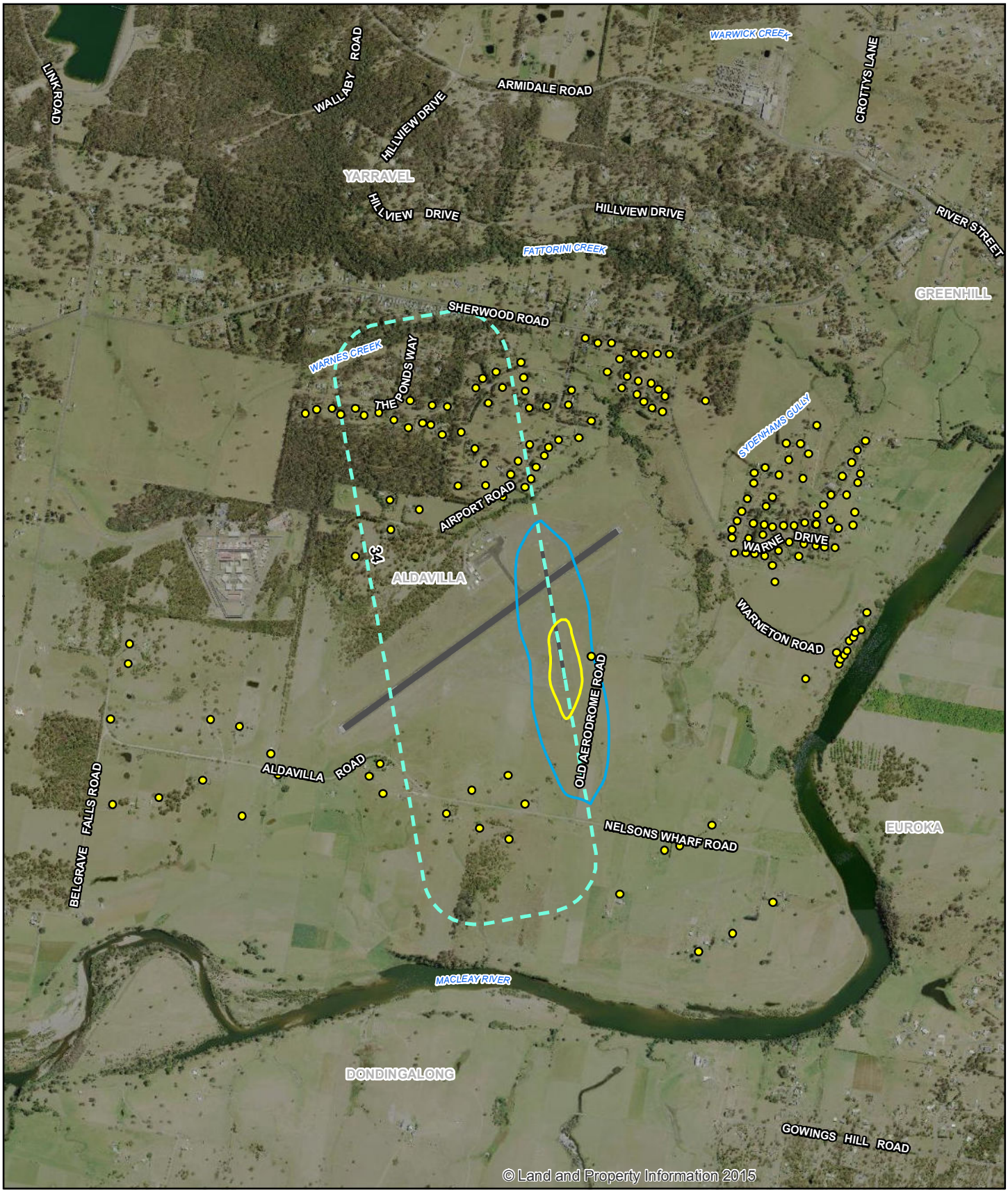
Runway 16 Circuit L_{Amax}

Figure 8

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA007_NoiseLevels_Runway16Circuit_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay



LEGEND

Receiver	Noise level
Runway	60 dBA , LAmax
Circuit track 34	70 dBA, LAmax

Paper Size A4

0 90 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Australian International Aviation College Pty Ltd
Kempsey Airport Noise Assessment

Job Number 22-18739
Revision 1
Date 31 Jan 2017

Runway 34 Circuit L_{Amax}

Figure 9

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18739\GIS\Maps\Deliverables\NoiseAssessment\2218739_NA008_NoiseLevels_Runway34Circuit_1.mxd

Data source: LPI: DTDB / DCDB, 2012, Aerial Imagery, 2016. Created by: fmackay

5. Discussion

Predicted noise model results indicate the 40 dB(A) $L_{Aeq24hr}$ contours for the current, worst case 2017, and worst case 2018 scenarios do not extend to any populated areas. The contours are limited to the runway thresholds where the most noise occurs upon touch down and where the throttle is increased to full power in preparation for the next take-off. The 30 dB(A) $L_{Aeq24hr}$ contour for the 2017 and 2018 scenarios does extend to populated areas, however, according to the WHO, there are no substantial biological effects observed from exposure to this level of noise. From GHD's experience, background noise levels in rural environments such as this are usually in the vicinity of 30 to 35 dB(A), therefore any aircraft noise experienced will most likely be masked by ambient background noise (assuming a typical rural area).

The 70 dB(A) L_{Amax} contours for circuit operations on all runways, as shown in Figure 6, Figure 7, Figure 8, and Figure 9 are also limited to the runway thresholds. These results indicate residents in the surrounding townships will not experience noise levels from individual aircraft operations which will interfere with normal conversation.

As a result of this assessment, it is expected the increase in aircraft movements resulting from the expansion of the AIAC at Kempsey Airport will not adversely impact the townships surrounding the airport.

6. Conclusion

GHD has conducted an assessment of noise impacts associated with circuit operations for the proposed expansion of AIAC at Kempsey Airport, NSW.

Based on the noise assessment results, the following conclusions are made with consideration to the assumptions and limitations outlined in this report:

- 40 dB(A) $L_{Aeq24hr}$ contours for the current, worst case 2017, and worst case 2018 scenarios do not extend to any populated areas, and therefore adverse health impacts are highly unlikely to occur as a result of AIAC flight training operations.
- Surrounding townships will not experience noise capable of interfering with normal conversation.

7. References

Port Macquarie Airport – *Master Plan 2010.*

Australian Standard 2021:2015: *Acoustics – Aircraft noise intrusion – Building siting and construction.*

World Health Organisation - *Night Noise Guidelines for Europe, 2009.*

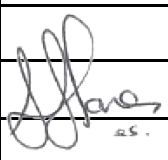
Department of Transport and Regional Services - *Discussion Paper – Expanding Ways to Describe and Assess Aircraft Noise.*

GHD

Level 3, GHD Tower
24 Honeysuckle Drive
T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com

2218739-7893/https://projects.ghd.com/OC/Newcastle/aiacnoisereport/Delivery/Documents/2218739-REP-1_AIAC_NIA.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	E Potoczny	B Barber		S Keevil-Jones		10/01/2017
1	E Potoczny	B Barber		S Keevil-Jones		01/02/2017

www.ghd.com