



KEMPSEY AIRPORT

MASTER PLAN NOISE MODELLING

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PREPARED FOR

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GLOSSARY OF TERMS

L _{Amax}	The maximum noise level over a sample period is the maximum level measured during the sample period. For aircraft noise, the maximum noise level is measured using slow response.
N-above	'Number-above', or 'N-above', describe the number of aircraft noise events that exceed a particular noise threshold. The most common 'N-above' are N70 and N60, describing the number of events above 70 dB(A) and 60 dB(A) respectively.
ANEF	Australian Noise Exposure Forecast (ANEF). An ANEF chart is a set of land-use planning contours for a specific airport that has been formally endorsed for technical accuracy by Airservices Australia.
ANEC	Contours that have been calculated in the same way as ANEF contours, but not formally endorsed by Airservices Australia, are known as Australian Noise Exposure Concept (ANEC) contours.
RNP-AR	Required Navigation Performance Authorisation Required (RNP-AR) is a precision arrival or departure procedure which uses satellite navigation. RNP-AR is typically developed to provide a shortened arrival procedure (as is the case at Brisbane Airport).
ILS	Instrument Landing System is a radio navigation system. ILS is typically available in most weather conditions, including poor conditions that may prohibit some other navigation methods. ILS require a long, straight arrival path.
AHD	The Australian Height Datum (AHD) is the official national vertical datum for Australia.

1 INTRODUCTION

SoundIN Pty Ltd (SoundIN) has been engaged by Aviation Projects to undertake noise modelling in support of the Kempsey Airport Master Plan.

Noise modelling has given regard to “*Noise Management Plan and Fly Neighbourly Advice Final Report 2019*”, including noise measurements detailed therein.

This report presents a summary of the noise modelling.

2 AVIATION ENVIRONMENTAL DESIGN TOOL (AEDT)

The AEDT aircraft noise and emissions prediction program, produced by the United States Federal Aviation Administration (FAA), was used to predict noise levels. AEDT Version 3e was used.

The AEDT program is a computer model that calculates aircraft noise exposure in the vicinity of airports. It was developed based on the algorithm and framework from SAE-AIR-1845 *Procedure for the Calculation of Airplane Noise in the Vicinity of Airports* (Society of Automotive Engineers (SAE), 1986), which used noise-power-distance (NPD) data to estimate noise accounting for specific operation modes, thrust settings, source-receiver geometry, acoustic directivity and other environmental factors. AEDT succeeds the Integrated Noise Model (INM).

3 METEOROLOGICAL CONDITIONS AT KEMPSEY AIRPORT

AEDT contains a database of meteorological data for airports around the world. However, data for Kempsey Airport is not included in the current AEDT database.

Maximum daily temperatures for 2021 were obtained from the Bureau of Meteorology Meteorological. The annual average daily maximum for 2021 was 25 degrees Celsius. Other meteorological conditions were set to conservative values. In general, increasing the modelled temperature and relative humidity, and decreasing the headwind results in higher predicted noise levels.

The modelled meteorological conditions are:

- Temperature 25.0 degrees Celsius
- Sea level pressure 1013 hectopascals
- Relative humidity 75%
- Headwind 0.0 knots

4 AEDT AIRCRAFT TYPES MODELLED

Table 4-1 presents the AEDT aircraft types that were used to model each of the aircraft in the forecast.

Each aircraft selected for modelling in AEDT is representative of a type of aircraft that is currently or is forecast to operate at Kempsey Airport. In many cases a single modelled aircraft may be representative of numerous actual aircraft of a similar type.

Table 4-1 Aircraft Types Modelled

Aircraft Type (forecast)	Aircraft Class	AEDT Equipment ID	AEDT ANP Airframe
A-22	Non-Jet	PA28 ¹	3128 ¹
AT802	Non-Jet	GASEPV	1505
B350	Non-Jet	DHC6	3054
C208	Non-Jet	CNA208	2106
C210	Non-Jet	CNA182	1262
PA31	Non-Jet	BEC58P	1196
C525	Jet	CNA525C	6067
A119	Helicopter	EC130	3806
A139	Helicopter	SA330J / B430 ²	9 / 4126 ²
AS350	Helicopter	EC130	3806
R44	Helicopter	R44	3161

- Notes:
1. Aeroprakt A-22 Foxbat is modern light aircraft. No comparable aircraft is available in AEDT. PA28 represents one of the lightest, least powerful and quietest aircraft available in AEDT. The PA28 is expected to be louder than the A-22.
 2. AEDT contains EPNL data a limited number of helicopters. SA330J was selected to represent the A139 for L_{Amax} calculations (i.e. N-above), based on the comparable size and power of the SA330J to the A139. AEDT does not contain EPNL data for the SA330J (EPNL is necessary for the calculation of the ANEF/C metric). B430 was selected as the best-available substitute for the ANEF calculation.

5 FLIGHT TRACKS

Flight tracks were provided by Aviation Projects. The tracks include departures and arrival routes off each runway.

Owing to the relatively low number of daily movements forecast, dispersion around the flight tracks was not modelled.

The modelled flight tracks are presented in **Figure 5-1**.

Figure 5-1 Modelled Flight Tracks – Runway 04

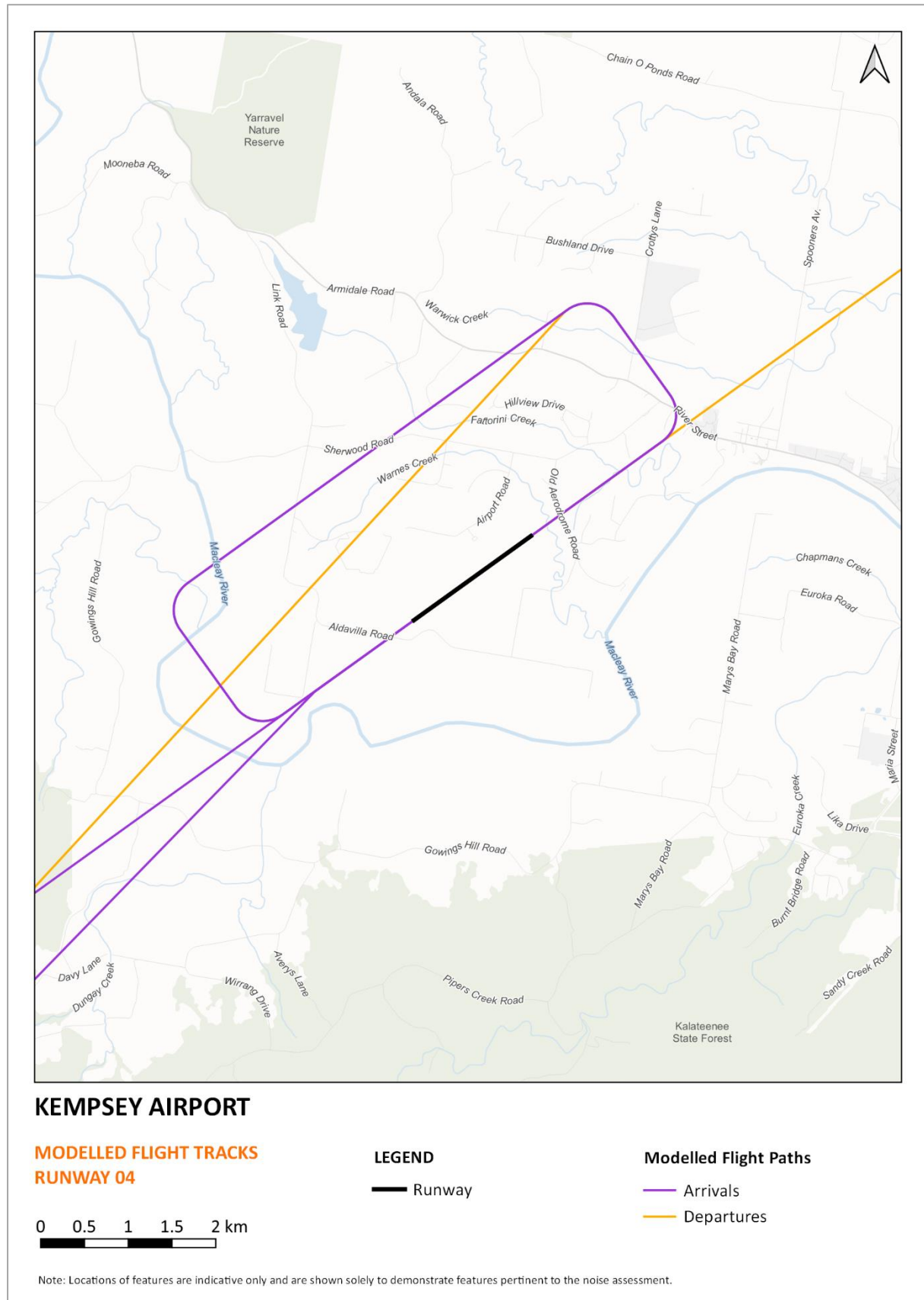


Figure 5-2 Modelled Flight Tracks – Runway 22

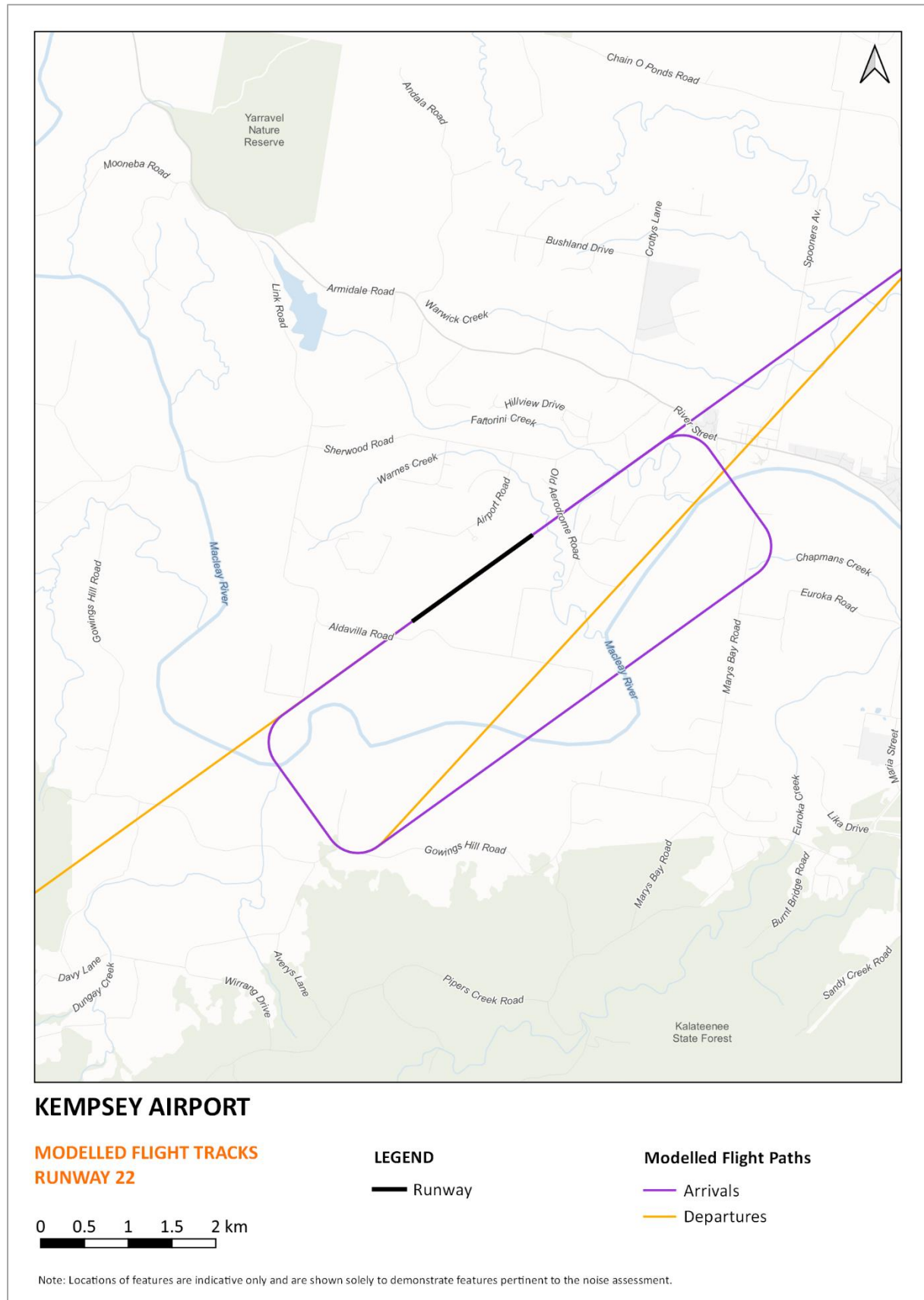
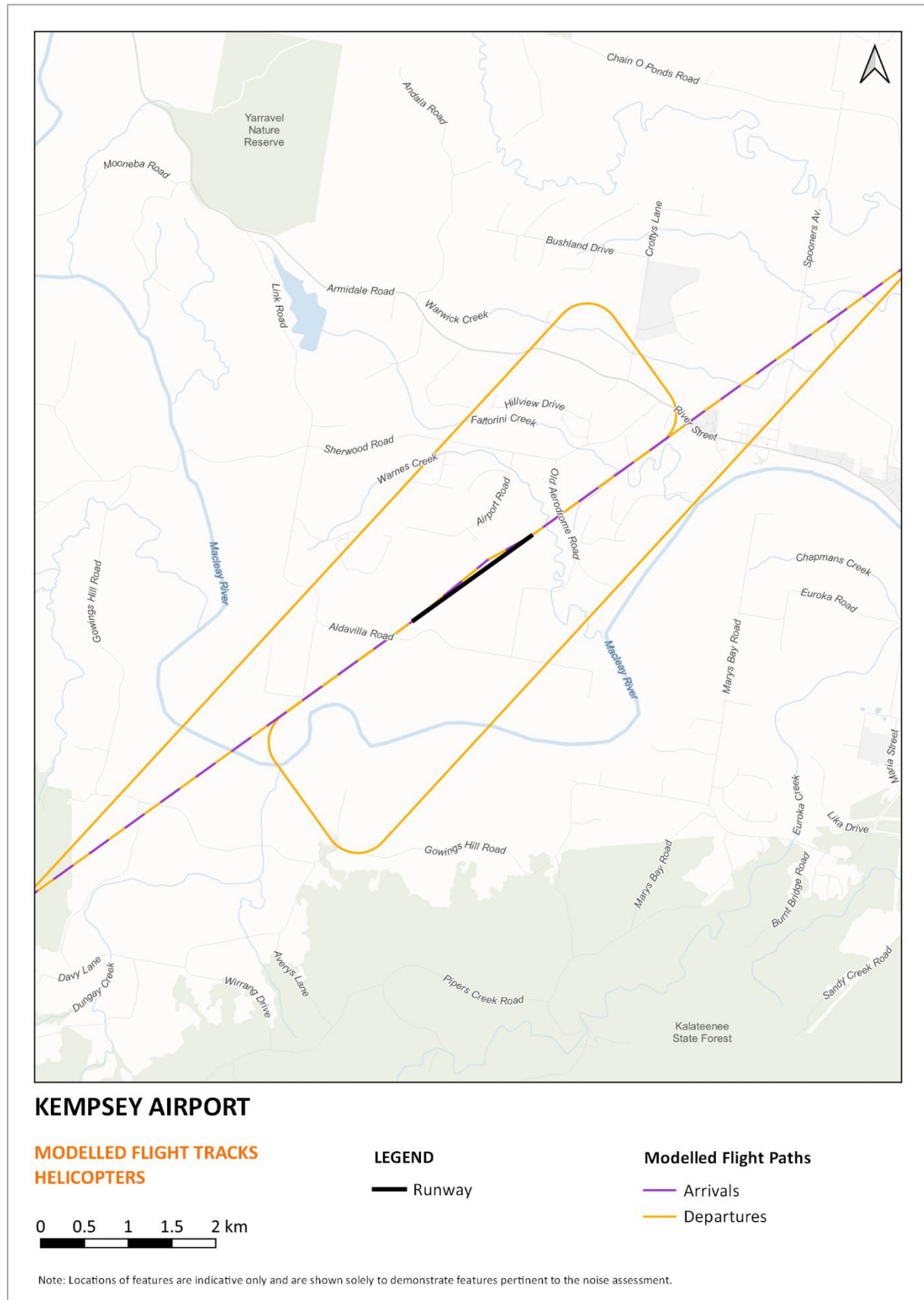


Figure 5-3 Modelled Flight Tracks - Helicopters



6 AIRCRAFT PROCEDURES AND HEIGHT-VS-DISTANCE PROFILES

AEDT includes several procedures for departures, arrivals and touch-and-go (circuit) operations. Default “STANDARD” procedures were modelled for all operations.

7 FORECAST MOVEMENTS

Forecasts were provided by Aviation Projects. The forecast annual movements are presented by aircraft type, operation, runway and time-period in **Table 7-1**.

Day and night periods refer to the ANEC-defined time periods – day 7am to 7pm and night 7pm to 7am.

Table 7-1 Forecast Annual Movements

Aircraft	Operation	Runway	Track	Operations – Day	Operations - Night
A119	A	H	04_ARR_4	91.750	0.000
A119	A	H	22_ARR_4	91.750	0.000
A119	D	H	04_DEP_1	45.877	0.000
A119	D	H	04_DEP_2	45.877	0.000
A119	D	H	22_DEP_1	45.877	0.000
A119	D	H	22_DEP_2	45.877	0.000
A139	A	H	04_ARR_4	9.735	5.015
A139	A	H	22_ARR_4	9.735	5.015
A139	D	H	04_DEP_1	4.869	2.508
A139	D	H	04_DEP_2	4.869	2.508
A139	D	H	22_DEP_1	4.869	2.508
A139	D	H	22_DEP_2	4.869	2.508
AS350	A	H	04_ARR_4	70.109	0.142
AS350	A	H	22_ARR_4	70.109	0.142
AS350	D	H	04_DEP_1	35.055	0.069
AS350	D	H	04_DEP_2	35.055	0.069
AS350	D	H	22_DEP_1	35.055	0.069
AS350	D	H	22_DEP_2	35.055	0.069
AT802	A	04	04_ARR_1	2.011	0.004

Aircraft	Operation	Runway	Track	Operations – Day	Operations - Night
AT802	A	04	04_ARR_4	2.011	0.004
AT802	A	04	04_ARR_6	36.190	0.037
AT802	A	22	22_ARR_1	2.011	0.004
AT802	A	22	22_ARR_4	2.011	0.004
AT802	A	22	22_ARR_6	36.190	0.037
AT802	D	04	04_DEP_1	20.104	0.022
AT802	D	04	04_DEP_2	20.104	0.022
AT802	D	22	22_DEP_1	20.104	0.022
AT802	D	22	22_DEP_2	20.104	0.022
C525	A	04	04_ARR_1	3.464	1.486
C525	A	04	04_ARR_4	0.193	0.084
C525	A	04	04_ARR_5	0.193	0.084
C525	A	22	22_ARR_1	3.464	1.486
C525	A	22	22_ARR_4	0.193	0.084
C525	A	22	22_ARR_5	0.193	0.084
C525	D	04	04_DEP_1	1.924	0.825
C525	D	04	04_DEP_2	1.924	0.825
C525	D	22	22_DEP_1	1.924	0.825
C525	D	22	22_DEP_2	1.924	0.825
B350	A	04	04_ARR_1	50.921	8.705
B350	A	04	04_ARR_1	5.030	0.818
B350	A	04	04_ARR_4	2.829	0.485
B350	A	04	04_ARR_4	0.281	0.047
B350	A	04	04_ARR_5	2.829	0.485
B350	A	04	04_ARR_5	0.281	0.047
B350	A	22	22_ARR_1	50.921	8.705
B350	A	22	22_ARR_1	5.030	0.818

Aircraft	Operation	Runway	Track	Operations – Day	Operations - Night
B350	A	22	22_ARR_4	2.829	0.485
B350	A	22	22_ARR_4	0.281	0.047
B350	A	22	22_ARR_5	2.829	0.485
B350	A	22	22_ARR_5	0.281	0.047
B350	D	04	04_DEP_1	28.288	4.836
B350	D	04	04_DEP_1	2.796	0.456
B350	D	04	04_DEP_2	28.288	4.836
B350	D	04	04_DEP_2	2.796	0.456
B350	D	22	22_DEP_1	28.288	4.836
B350	D	22	22_DEP_1	2.796	0.456
B350	D	22	22_DEP_2	28.288	4.836
B350	D	22	22_DEP_2	2.796	0.456
C208	A	22	22_ARR_1	918.001	0.000
C208	A	22	22_ARR_4	51.001	0.000
C208	A	22	22_ARR_5	51.001	0.000
C208	A	04	04_ARR_1	918.001	0.000
C208	A	04	04_ARR_4	51.001	0.000
C208	A	04	04_ARR_5	51.001	0.000
C208	D	22	22_DEP_1	510.000	0.000
C208	D	22	22_DEP_2	510.000	0.000
C208	D	04	04_DEP_1	510.000	0.000
C208	D	04	04_DEP_2	510.000	0.000
C182	A	22	22_ARR_1_0	6.001	0.000
C182	A	22	22_ARR_4_0	6.001	0.000
C182	A	22	22_ARR_6_0	108.000	0.000
C182	A	04	04_ARR_1_0	6.001	0.000
C182	A	04	04_ARR_4_0	6.001	0.000

Aircraft	Operation	Runway	Track	Operations – Day	Operations - Night
C182	A	04	04_ARR_6_0	108.000	0.000
C182	D	22	22_DEP_1_0	59.999	0.000
C182	D	22	22_DEP_2_0	59.999	0.000
C182	D	04	04_DEP_1_0	59.999	0.000
C182	D	04	04_DEP_2_0	59.999	0.000
C210	A	04	04_ARR_1	27.689	0.500
C210	A	04	04_ARR_4	27.689	0.500
C210	A	04	04_ARR_6	498.393	8.979
C210	A	22	22_ARR_1	27.689	0.500
C210	A	22	22_ARR_4	27.689	0.500
C210	A	22	22_ARR_6	498.393	8.979
C210	D	04	04_DEP_1	276.885	4.990
C210	D	04	04_DEP_2	276.885	4.990
C210	D	22	22_DEP_1	276.885	4.990
C210	D	22	22_DEP_2	276.885	4.990
PA28	A	04	04_ARR_1	6.300	0.000
PA28	A	04	04_ARR_4	6.300	0.000
PA28	A	04	04_ARR_6	113.402	0.000
PA28	A	22	22_ARR_1	6.300	0.000
PA28	A	22	22_ARR_4	6.300	0.000
PA28	A	22	22_ARR_6	113.402	0.000
PA28	D	04	04_DEP_1	62.999	0.000
PA28	D	04	04_DEP_2	62.999	0.000
PA28	D	22	22_DEP_1	62.999	0.000
PA28	D	22	22_DEP_2	62.999	0.000
PA31	A	04	04_ARR_1	3.989	0.124
PA31	A	04	04_ARR_4	3.989	0.124

Aircraft	Operation	Runway	Track	Operations – Day	Operations - Night
PA31	A	04	04_ARR_6	71.803	2.219
PA31	A	22	22_ARR_1	3.989	0.124
PA31	A	22	22_ARR_4	3.989	0.124
PA31	A	22	22_ARR_6	71.803	2.219
PA31	D	04	04_DEP_1	39.891	1.234
PA31	D	04	04_DEP_2	39.891	1.234
PA31	D	22	22_DEP_1	39.891	1.234
PA31	D	22	22_DEP_2	39.891	1.234
R44	A	H	04_ARR_4	1.752	0.000
R44	A	H	22_ARR_4	1.752	0.000
R44	D	H	04_DEP_1	0.876	0.000
R44	D	H	04_DEP_2	0.876	0.000
R44	D	H	22_DEP_1	0.876	0.000
R44	D	H	22_DEP_2	0.876	0.000

8 CALCULATION DETAILS

ANEC and N-above values were calculated across a fixed grid. ANEC contours were calculated from that grid, within AEDT. N-above contours were calculated from the grid by custom developed software.

Contouring employed a smoothing algorithm to reduce ‘anomalies’ arising from the use of a fixed-grid spacing.

Table 8-1 details the modelling data used in the AEDT calculations.

Table 8-1 Modelling Data Used in AEDT Calculations

Parameter		Value
AEDT Version:		3e
Topography:		SRTM derived 1 arc second data (https://elevation.fsd.org.au/)
Temperature:		25.0 degrees Celsius
Pressure:		1013 hectopascals
Humidity:		75%
Headwind:		0.0 knots
Grid type:		Fixed spacing
Grid spacing:		0.01 NM (ANEC); 0.025 NM (N-above)
Co-ordinate System:		WGS84 (EPSG:4326)
Airport Reference Point (Lat/Lon/Elevation):		-31.074444 152.769722, 54 ft
Existing Runway Ends (Lat/Lon/Elevation):	Runway End 04	-31.076538 152.758438, 53 ft
	Runway End 22	-31.067894 152.772461, 50 ft
	Helipad	-31.070349 152.767277, 50 ft

8.1 Forecast Noise Exposure

The resulting ANEC and N-above contours are shown in **Figure 8-1** and **Figure 8-2**.

N-above thresholds presented in **Figure 8-2** are lower than those promulgated by NASF Guideline 'A'. NASF Guideline 'A' promulgates the use of the following for consideration of land-use planning:

- N70 equals 20
- N65 equals 50
- N60 equals 100
- N60 equals 6 at night.

The minimum number of movements required to produce the above contours is 20 (N70 equals 20, noting that N60 equals 6 only applies to events between 11 pm and 6 am). Average forecast daily movements at Kempsey Airport approximately equal 24. Splitting these by runway and operation, the only potential for the 20-movement threshold to be exceeded is in the region where all operations are predicted to exceed the noise level threshold (70 dBA). In this instance, that region is nil or negligible. Thus, the forecast daily operations are insufficient to generate any of the above N-above thresholds coinciding with the NASF Guideline 'A' advice.

The N-above in **Figure 8-2** are presented to indicate the regular presence of aircraft noise at levels that would likely be noticeable and could temporarily interrupt some activities.

Figure 8-1 ANEC

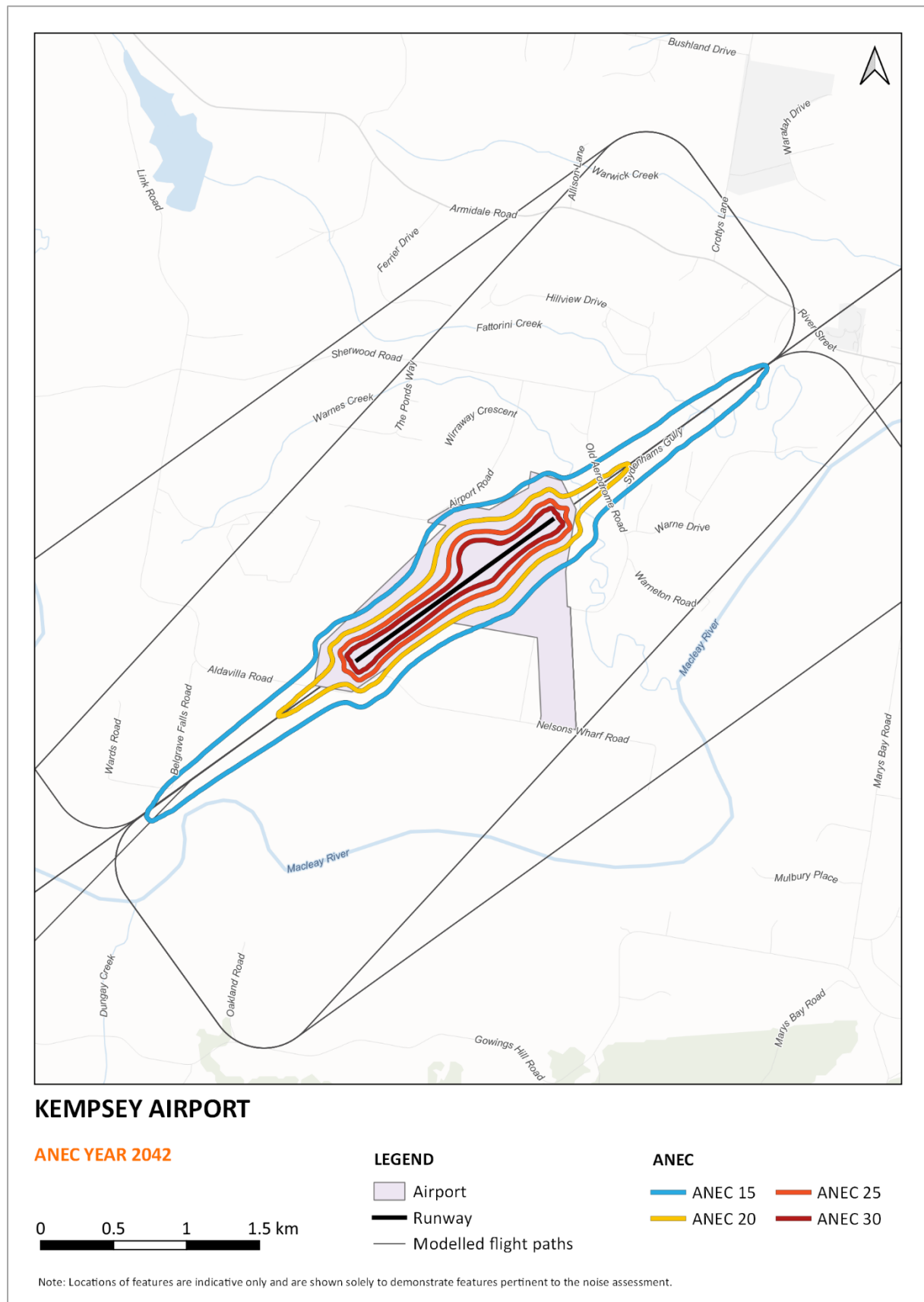


Figure 8-2 Number Above Noise Contours (N-above)

