31. Noise

31.1. Introduction

This chapter provides a review of the predicted aircraft and ground-based noise impacts associated with the potential long term development of the proposed airport. The chapter draws on comprehensive assessments of aircraft overflight and ground-based noise undertaken for the proposed airport which are included as Appendices D1 and D2 in Volume 4.

The assessment addresses two operational scenarios including a single runway operating at or near capacity and a predicted long term development of the airport comprising two parallel runways. The following operating scenarios were considered:

- 37 million annual passengers – this represents a stage of development, which could be reached in 2050, at which time the single runway would likely be approaching its maximum capacity and further demand growth would require construction of a second runway; and
- 82 million annual passengers – this represents a stage of development, assumed to be reached in 2063, when the airport comprises two operating runways and both runways are operating close to capacity.

Incremental expansion of airport infrastructure between these key time periods is assumed to be undertaken but would be subject to separate approvals under the Airports Act.

Considerations of the findings of the assessment in relation to social amenity, world heritage values and human health have been addressed in Chapters 37, 38 and 39 respectively.

31.2. Approach to aircraft noise assessment

31.2.1. Methodology

The methodology for the assessment of aircraft overflight noise is described in detail in Chapter 10 of Volume 2. The Integrated Noise Model was used to calculate noise exposure levels. Inputs to the modelling included the predicted numbers of aircraft operations by different aircraft types, airport operating modes, indicative aircraft flight paths and schedules, topography and meteorology.

For each aircraft type, flight path and stage length (for departures), custom-designed software was used to calculate noise levels at each point on a 185 metres by 185 metres size grid covering the assessment area. This was used to develop noise contours for each of the airport operating strategies.

31.2.1.1. Flight paths and operating modes

The flight paths and procedures used for the assessment of the long term noise assessment are indicative, which introduces uncertainty in regards to predicting the anticipated noise impacts. A future airspace design process is expected to be undertaken closer to the commencement of operations and would be expected to evolve in time throughout the life of the proposed airport. Other issues that are difficult to forecast for the long term scenario include noise emission levels from future aircraft types, which are expected to get progressively quieter and more efficient with ongoing technological advances.

Three primary operating modes were considered for the single runway 2050 scenario including:

- Mode 05 – aircraft arrive from the south-west and depart to the north-east;
- Mode 23 – aircraft arrive from the north-east and depart to the south-west; and
- Head-to-head – all landings and take off movements occur in opposing directions, to and from the south-west.

The availability of each operating mode at any given time would depend on meteorological conditions, particularly wind direction and speed, the number of presenting aircraft and the time of day. Due to the relatively low and consistent wind speeds at Badgerys Creek, it is likely that the preferred operating mode would be in place over 80 per cent of the time. However, the assumed order for selection of the operating modes has a notable effect on the overall noise impact from the airport. In this context, the preferred strategies that were considered are described below:

- Prefer 05 – all aircraft would be directed to approach and land from the south-west and directed to take-off to the north-east. If this is not possible for meteorological or operating policy reasons, then second priority would be given to operations in the opposite direction (i.e. the 23 direction);
- Prefer 23 – all aircraft would be directed to approach and land from the north-east and take-off to the south-west. If this is not possible for meteorological or operating policy reasons, then second priority would be given to operations in the opposite direction (i.e. the 05 direction);
- Prefer 05 with head-to-head – as per Prefer 05, except that during the night hours of 10.00 pm and 7.00 am, head–to-head operating mode to the south-west would be used when:
  - there are no more than a total of 20 aircraft movements in the hour following the relevant time; and
  - wind conditions allow the use of both runway directions;
- Prefer 23 with head-to-head – as per Prefer 05 with head-to-head, except that when head-to-head operating mode is not in use, Prefer 23 applies rather than Prefer 05.

If Prefer 05 or Prefer 23 is in use during the night-time period, the operating mode would revert to head-to-head under the following conditions:

- the use of head-to-head has been allowed for at least two hours before the change time; and
- the use of head-to-head would be allowed for at least two hours after the change time.

For the long term 2063 scenario, a number of alternative airport operating modes are also possible. However, it is difficult to accurately to determine the likely availability, capacity and usage of such modes at this point in time and therefore only the Prefer 05 and Prefer 23 strategies were considered for the two-runway 2063 scenario.

31.2.1.2. Predicted future aircraft movements

Predicted future numbers of aircraft movements (one movement consists of an aircraft either taking off or landing) were developed in the form of 'synthetic schedules'. For each aircraft movement in the synthetic schedule the aircraft family, operation type (arrival or departure), time of operation and port of origin or destination is identified.

Predicted total aircraft movements for a typical busy day for the indicative long term development (refer to Section 2.5 in Appendix E1) are summarised in Table 31–1.

Table 31–1 – Predicted daily aircraft movements in 2050 and 2063 by aircraft family (busy day)

Aircraft	Daily movements 2050	Daily movements 2063
Passenger Movements		
Airbus A320	176	378
Airbus A330	128	286
Airbus A380	4	8
Boeing 737	104	196
Boeing wide-body general	20	40
Boeing 777	26	78
DeHaviland DHC8	12	10
Saab 340	10	10
Freight Movements		
Airbus A330	2	2
Boeing 737	6	6
Boeing 747	28	38
Boeing 767 – 400	8	10
Boeing 767-300	4	6
Boeing 777-300	2	4
Boeing 777-200	4	6
Small Freight	20	32

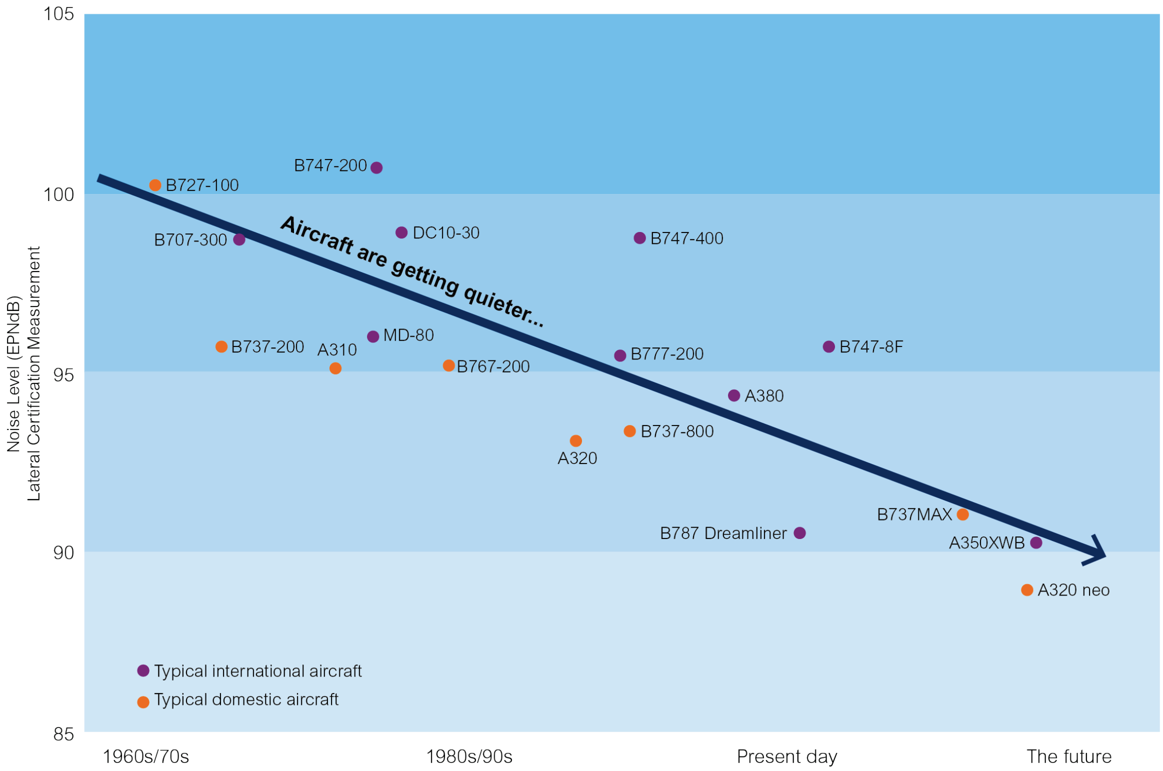
31.2.2. Understanding noise

31.2.2.1. Sources of aircraft noise

A long term development of the proposed airport would result in changes to the pattern of aircraft movements in the airspace above Western Sydney due to the progressive increase in capacity of the initial runway and the introduction of new aircraft flight paths following the proposed commissioning of the second runway. The pattern of noise impacts is complex and depends on the time of day, season, airport operating mode and the changing land use in Western Sydney.

The type of engine, the operational stage and the height of the aircraft influence the amount of noise generated by aircraft operations. Engines are the dominant noise source for the majority of a flight cycle and engine noise can be particularly pronounced when aircraft are operating on the ground as a result of elevated thrust during take-off and reverse thrust during landing. Reverse thrust involves the diversion of the engine exhaust to assist with deceleration upon landing and the noise levels produced by this procedure are typically higher than those from an aircraft take-off.

Advances in aviation technology are resulting in a reduction in noise generated by aircraft. As shown on Figure 31-1, aircraft have become progressively quieter with the adoption of new models into service. It is expected that quieter aircraft like the Airbus 350XWB, Airbus 320neo, and Boeing 737 MAX would be introduced during the operation of the proposed airport and the louder aircraft such as the Boeing 747 are likely to be progressively retired. Despite the likely introduction of these next generation aircraft, the assessment of noise impacts has been based on aircraft types that are commonplace today, including the louder Boeing 747 and the Airbus A320.



Source: ICAO and Federal Aviation Administration (USA) as included in Sydney Airport Master Plan 2033

Figure 31-1 – Reduction in aircraft noise over time

31.2.2.2. Land use planning

For land use planning around airports, Australia has adopted the Australian Noise Exposure Forecast (ANEF) system, which describes cumulative aircraft noise for an annual period. The system underpins Australian Standard 2021 *Acoustics—Aircraft noise intrusion—Building siting and construction (*AS2021), which contains advice on the acceptability of building sites based on ANEF zones. The acceptability criteria vary depending on the type of land use, with an aircraft noise exposure level of less than 20 ANEF considered acceptable for the building of new residential dwellings. An Australian Noise Exposure Concept (ANEC) is a noise exposure chart produced for a hypothetical future airport usage pattern, and is useful for considering the land use planning consequences of alternative operating strategies. ANEC noise exposure contours are calculated using the same methods as the ANEF; however, they use indicative data on aircraft types, aircraft operations and flight paths.

A series of ANECs were developed for the 1985 *Second Sydney Airport Site Selection Programme: Draft Environmental Impact Statement* (1985 Draft EIS) (Kinhill Stearns 1985). These contours were adopted as an "ANEF" for land use planning purposes and have guided subsequent planning controls implemented by the NSW Government and relevant local councils in the vicinity of the airport site. These planning controls serve to limit the types of development permitted to occur within particular noise exposure zones.

The key planning decision made subsequent to the 1985 EIS is the ministerial direction under section 117(20) of the *Environmental Planning and Assessment Act 1979* (NSW). The direction applies to all land within the ANEF in the local government areas of Fairfield, Liverpool, Penrith and Wollondilly and requires that planning proposals not contain provisions enabling development which could hinder the potential for development of a Second Sydney Airport. The direction has subsequently been enforced through the *Penrith Local Environmental Plan 2010* and *Liverpool Local Environmental Plan 2008*.

31.2.2.3. Measuring noise

Consistent with for the assessment of the proposed Stage 1 development, the following noise measures were used for assessment of 2050 and 2063 scenarios:

- ANEC – a measure of noise exposure levels for an 'annual average day' that uses indicative data on aircraft types, aircraft operations and flight paths to provide a measure of aircraft noise impacts using the same methods as the ANEF;
- N70 – the average number of aircraft noise events per day with maximum noise levels exceeding 70 dBA. A noise level of 70 dBA outside a building would generally result in an internal noise level of approximately 60 dBA, if windows are open to a normal extent. This noise level is sufficient to disturb conversation, in that a speaker would generally be forced to raise their voice to be understood, or some words may be missed on television or radio;

- N60 – the average number of aircraft noise events per day with maximum noise levels exceeding 60 dBA during the night-time period of 10 pm to 7 am. An external noise level of approximately 60 dBA represents an internal level of 50 dBA if windows are open. An internal noise level of 50 dBA is commonly used as a design criterion for noise in a bedroom to protect against sleep disturbance. A criterion of 60 dBA was considered appropriate for recreation areas, both passive and active, on the basis that at this level a person may need to raise their voice to be properly heard in conversation;
- The 90th percentile is a statistical category representing noise values that would be exceeded on only 10 per cent of days. Hence the 90th percentile N70 and N60 values represent 'worst case' days where there would be a particularly high number of movements; and
- L_{Amax} – the maximum A-weighted noise level predicted or recorded over a period. In this assessment, L_{Amax} denotes the maximum level of noise predicted at a location during a single overflight occurring at any time.

Existing and forecast population estimates were developed based on the September 2014 release of the NSW Bureau of Transport Statistics population forecasts. These forecasts take into account metropolitan planning development forecasts for future land use in Sydney as well as NSW Department of Planning and Environment population forecasts. The limit of these forecasts is currently 2041. In order to project to 2063 and beyond, Series B population growth rate estimates used by the Australian Bureau of Statistics in their long-term population forecasts were applied to determine the number of receivers expected to be impacted by the long term development.

31.3. Aircraft noise in 2050

This section considers aircraft noise impacts for a 2050 scenario where the single runway is is at or near its predicted maximum capacity servicing around 37 million annual passengers or approximately 185,000 aircraft movements per year.

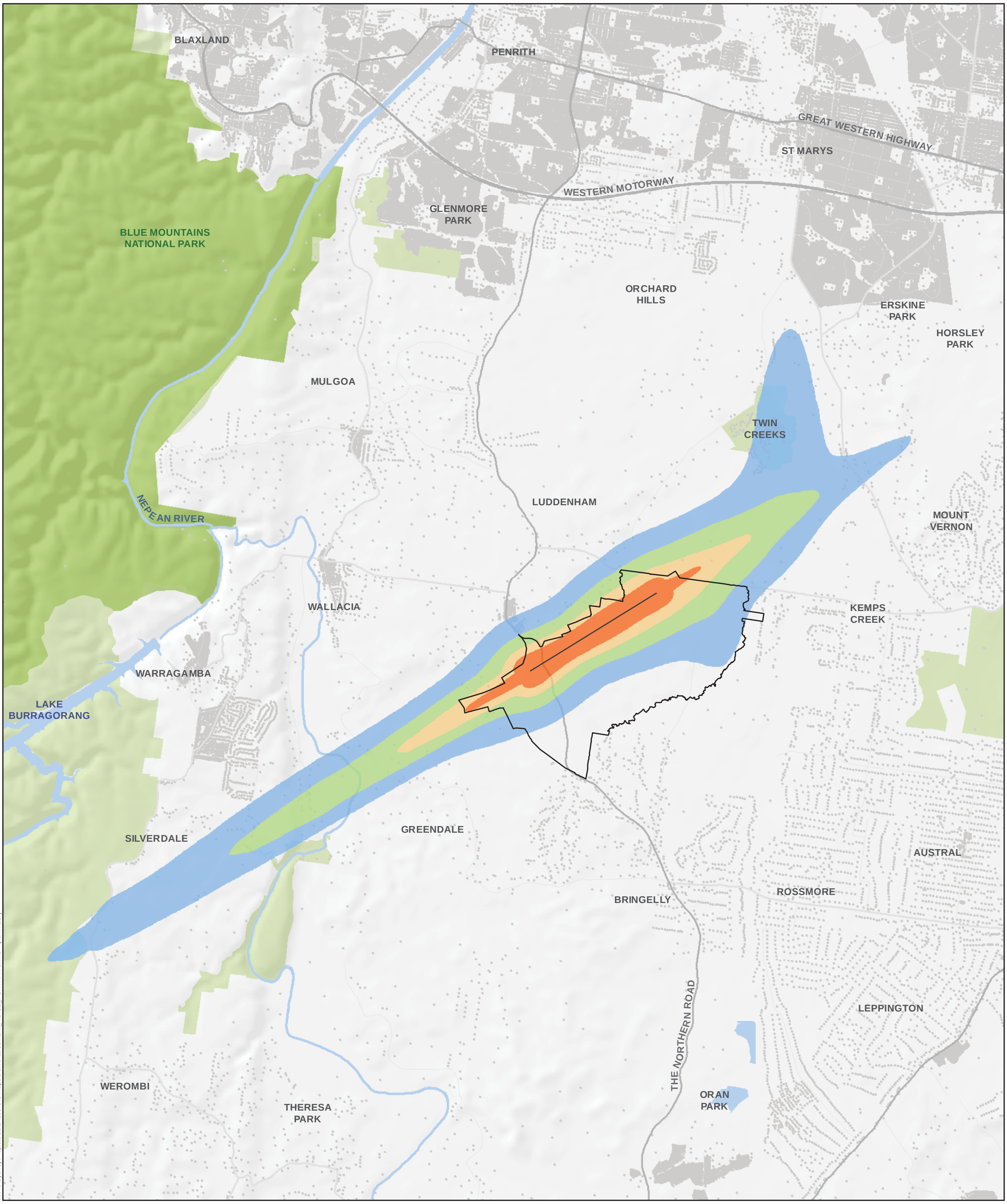
31.3.1. ANEC contours

ANEC contours based on indicative flight paths are considered in this section for environmental assessment comparison purposes. Predicted ANEC contours for Prefer 05 and Prefer 23 operating strategies are presented in Figure 31-2 and Figure 31-3. The 20 ANEC contour represents the area where new residential development is described as conditionally acceptable and the 25 ANEC contour represents the area within which new residential development becomes unacceptable under AS 2021:2015 *Acoustics – Aircraft noise intrusion – Building siting and construction*.

The area enclosed by the 20 ANEC is largely rural residential in nature and the estimated population within these contours in 2050 is shown in Table 31–2.

Table 31–2 – Estimated population within ANEC contours (2050)

ANEC	Operating strategy			
	Prefer 05	Prefer 23	Prefer 05 with head-to-head	Prefer 23 with head-to-head
20–25	1,173	1,255	1,014	1,293
25–30	261	313	315	302
30–35	34	72	38	72
>35	0	4	0	4
Total	**1,468**	**1,645**	**1,367**	**1,672**



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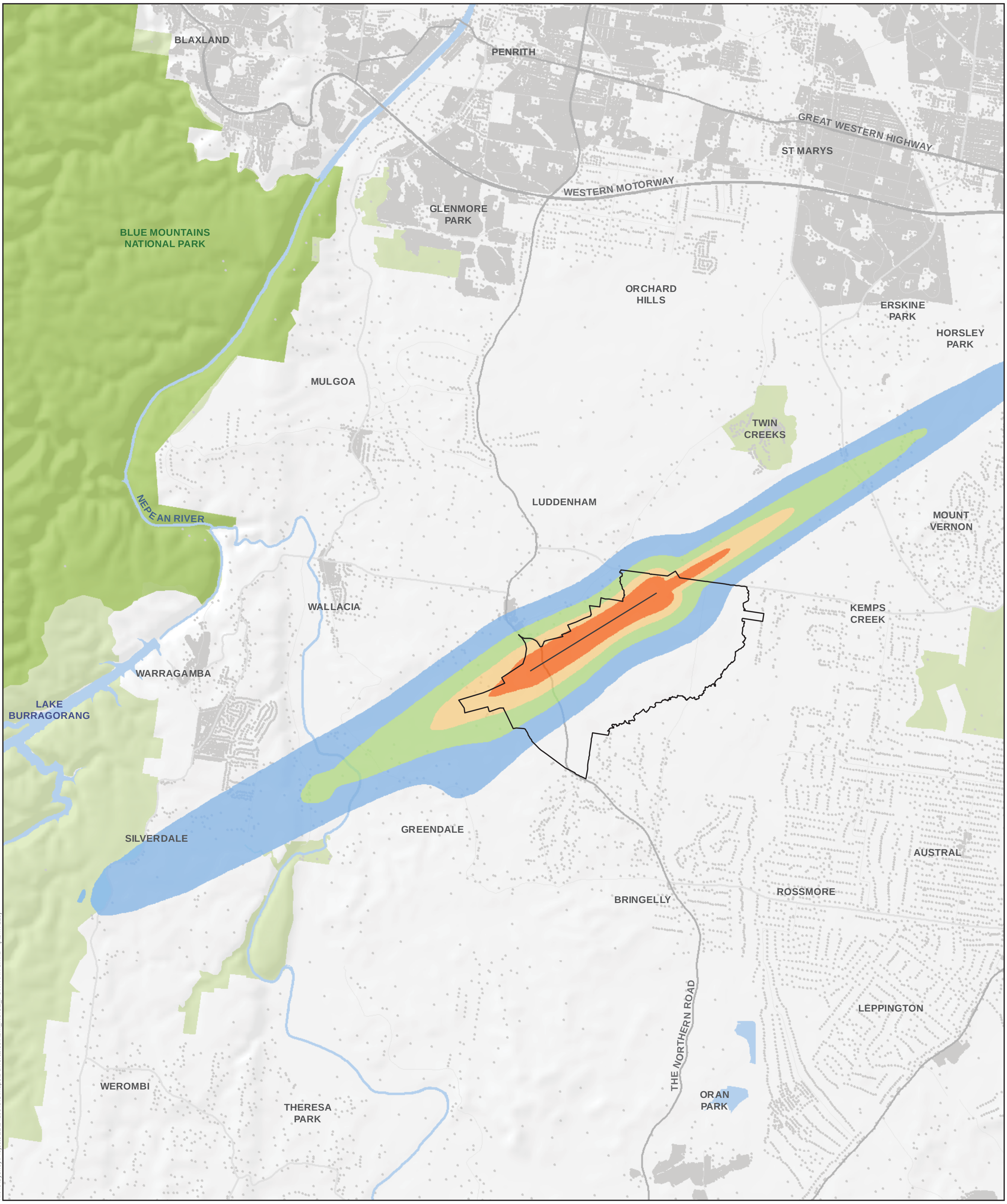
Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area	ANEC = 20-25
Runway	Parks and reserves	ANEC = 25-30
Buildings		ANEC = 30-35
		ANEC = 35+

0 0.75 1.5 3
Kilometres

N

Figure 31-2 ANEC contours for Prefer 05 operating strategy (2050)



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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area	ANEC = 20-25
Runway	Parks and reserves	ANEC = 25-30
Buildings		ANEC = 30-35
		ANEC = 35+

Figure 31-3 ANEC contours for Prefer 23 operating strategy (2050)

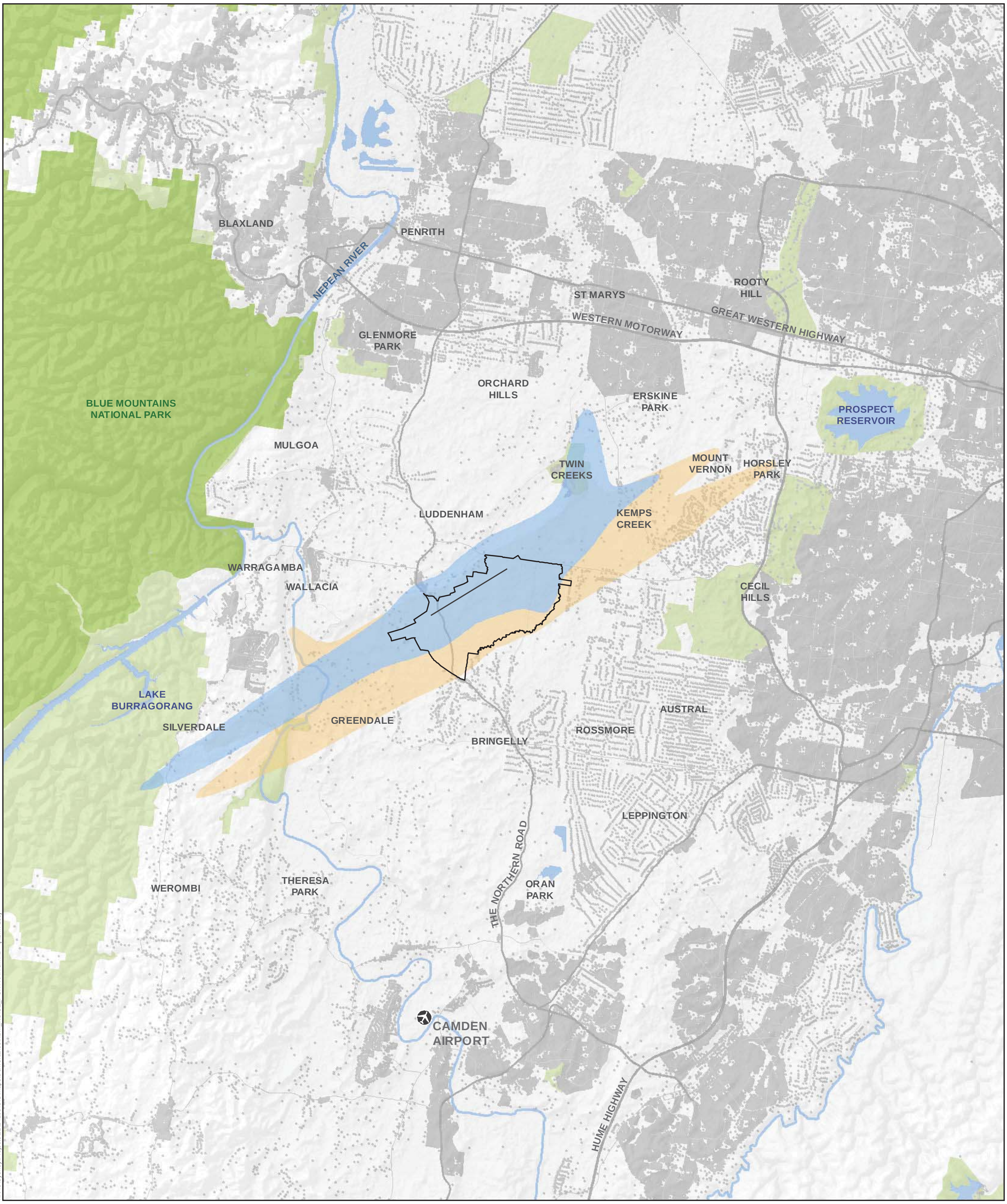
0 0.75 1.5 3
Kilometres

The total population within the 20 ANEC contour is similar for both the Prefer 05 and Prefer 23 operating strategies, however certain areas surrounding the airport site may be exposed to different noise levels depending upon the selected strategy. The increased usage of the single runway under the 2050 scenario also extends the boundaries of the ANEC contours to new areas compared to the proposed Stage 1 development.

While there are differences between the Prefer 05 and Prefer 23 operating strategies, the introduction of head to head operations at night does not greatly influence the contours (refer to Section 4.5 of Appendix E1). This is because even with an additional 6 dBA weighting for night-time noise events, as included in the ANEF formula, overall noise exposure is still dominated by daytime events.

Figure 31-4 and Figure 31-5 show the year 2050 ANEC contours compared to those presented in the 1985 Draft EIS (Kinhill Stearns 1985). The 1985 ANEC was prepared for a dual runway airport and have been used for land use planning purposes to date. The 2050 ANEC contours for the single runway are generally comparable to the northern half of the 1985 ANEC with slight extensions to the north and the south-west. These differences reflect revised modelling assumptions including updated forecasts for the number of aircraft movements, new indicative flight paths and changes in the assignment of aircraft to particular flight paths. The 2050 ANEC contours cover considerably less land to the east and south of the airport site than the 1985 ANEC contours.

The existing planning controls arising from the 1985 ANEC contours have restricted development for the majority of the land area captured within the modelled 2050 ANEC contours.



LEGEND

Western Sydney Airport	Greater Blue Mountains World Heritage Area
Runway	Parks and reserves
Airfields	
Buildings	

ANEC Contours 2050 Prefer 05

20 ANEC

1985 EIS ANEC Contours

20 ANEC

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

0 1.25 2.5 5
Kilometres

Figure 31-4 1985 Draft EIS combined ANEC contours compared to 2050 Prefer 05

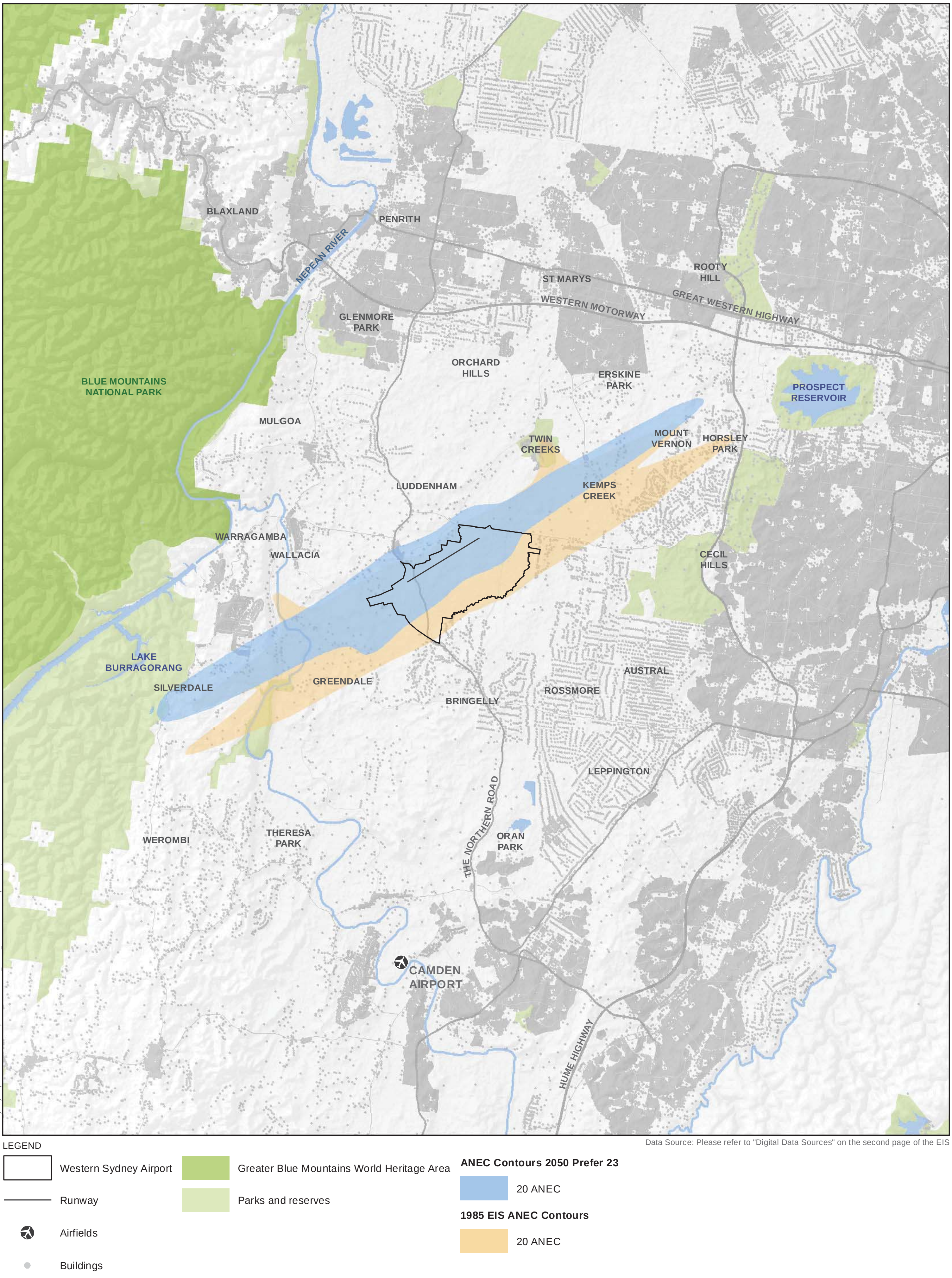


Figure 31-5 1985 Draft EIS combined ANEC contours compared to 2050 Prefer 23

31.3.2. Maximum noise levels

Single-event noise contours depict the maximum noise levels (L_{Amax}) resulting from a single operation of a specific aircraft type on all applicable arrival or departure flight paths. The aircraft types used in modelling for the 2050 scenario are generally the same as those used for the proposed Stage 1 development and therefore the single event contours would typically remain unchanged.

One exception is that the predicted schedule for the Stage 1 development included assessment of the Boeing 747 (or equivalent) as the noisiest aircraft with a maximum stage length of 5 (corresponding to a departure for Singapore) whereas the 2050 scenario includes stage 9 departures (corresponding to departures for Los Angeles). As noted in Chapter 10, the Boeing 747 is being phased out of passenger services by airlines and it is unlikely that any operations by this aircraft type would occur at the proposed airport in 2050.

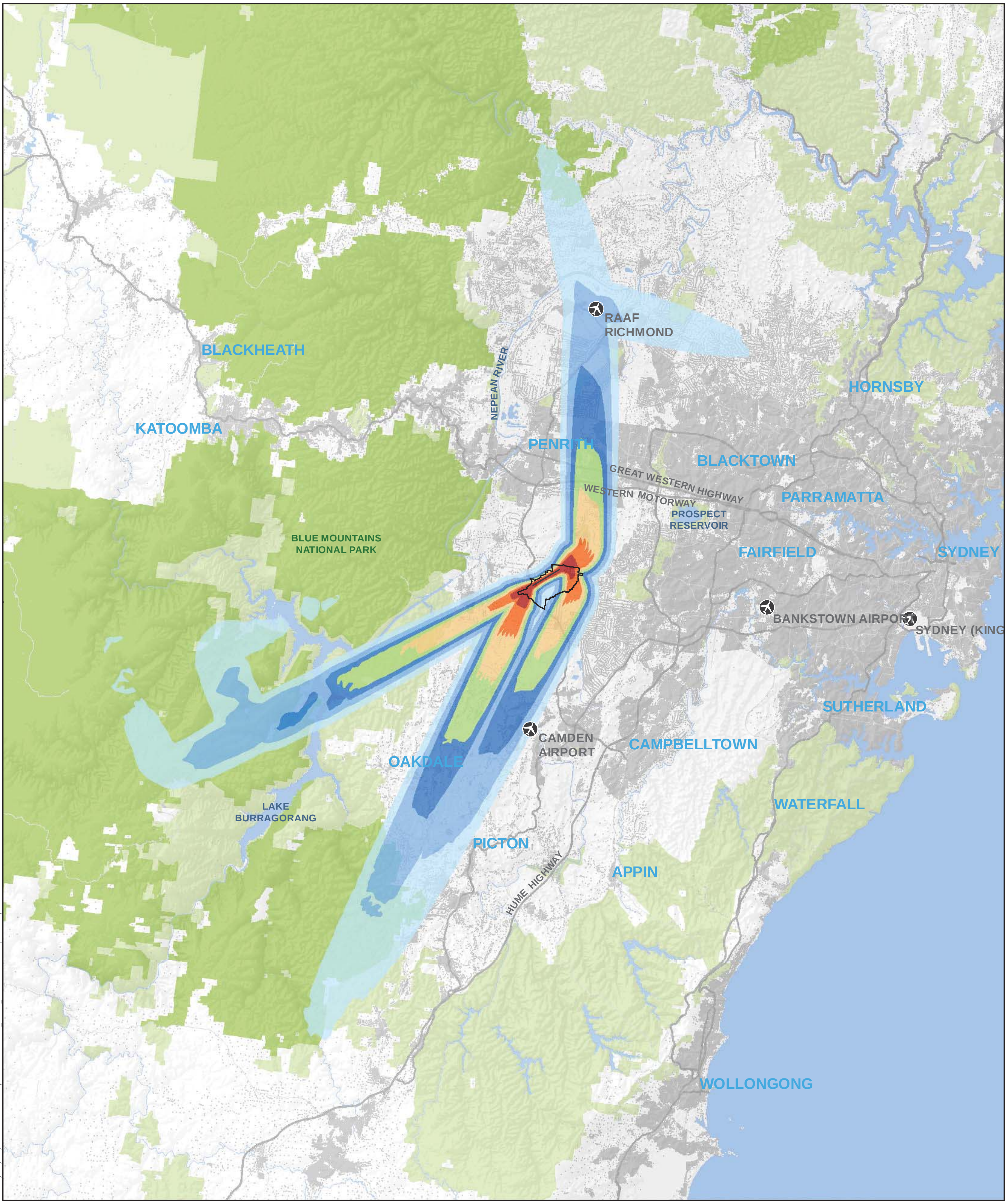
According to the predicted schedule, stage 9 departures by Boeing 747 aircraft are predicted to occur an average of once every two days by 2050 and may occur on any of a number of tracks. Although contours are shown for these events on tracks heading south from the airport, it is very unlikely that a stage 9 departure would occur on these tracks as there are no destinations for which this would be a preferred departure direction.

The additional fuel load required to reach stage 9 destinations results in an elevated engine noise level to achieve take-off. Maximum noise level contours for this additional event type are shown in Figure 31-6 and Figure 31-7. At the most-affected residences, close to the airport, L_{Amax} noise levels from these events would be in the range 85 – 95 dBA. There are less than ten existing residences within the 90 dBA L_{Amax} contour for these events, located to the south-west of the airport.

When these events occur on the indicative track leading north in the 05 direction, L_{Amax} noise levels exceeding 75 dBA could be experienced in densely-populated areas around St Marys, with levels above 80 dBA in some parts of Erskine Park.

Figure 31-8 and Figure 31-9 show L_{Amax} noise levels from a B747 arrival on any track. Noise levels in this case are identical to those experienced during the proposed Stage 1 development. Noise levels of 60 to 70 dBA are predicted over sections of Erskine Park and St Marys, extending to parts of Blacktown. Noise levels from this event would also reach 60 dBA at Blaxland, beneath the merge point for arrivals.

Maximum noise levels from other more common aircraft operations would be as described in Chapter 10 for the Stage 1 development as the aircraft type and stage length would remain consistent.



LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area	**LAmax**	
Runway	Parks and reserves	60-65 dBA	75-80 dBA
Airfields		65-70 dBA	80-85 dBA
Buildings		70-75 dBA	85-90 dBA
			>90 dBA

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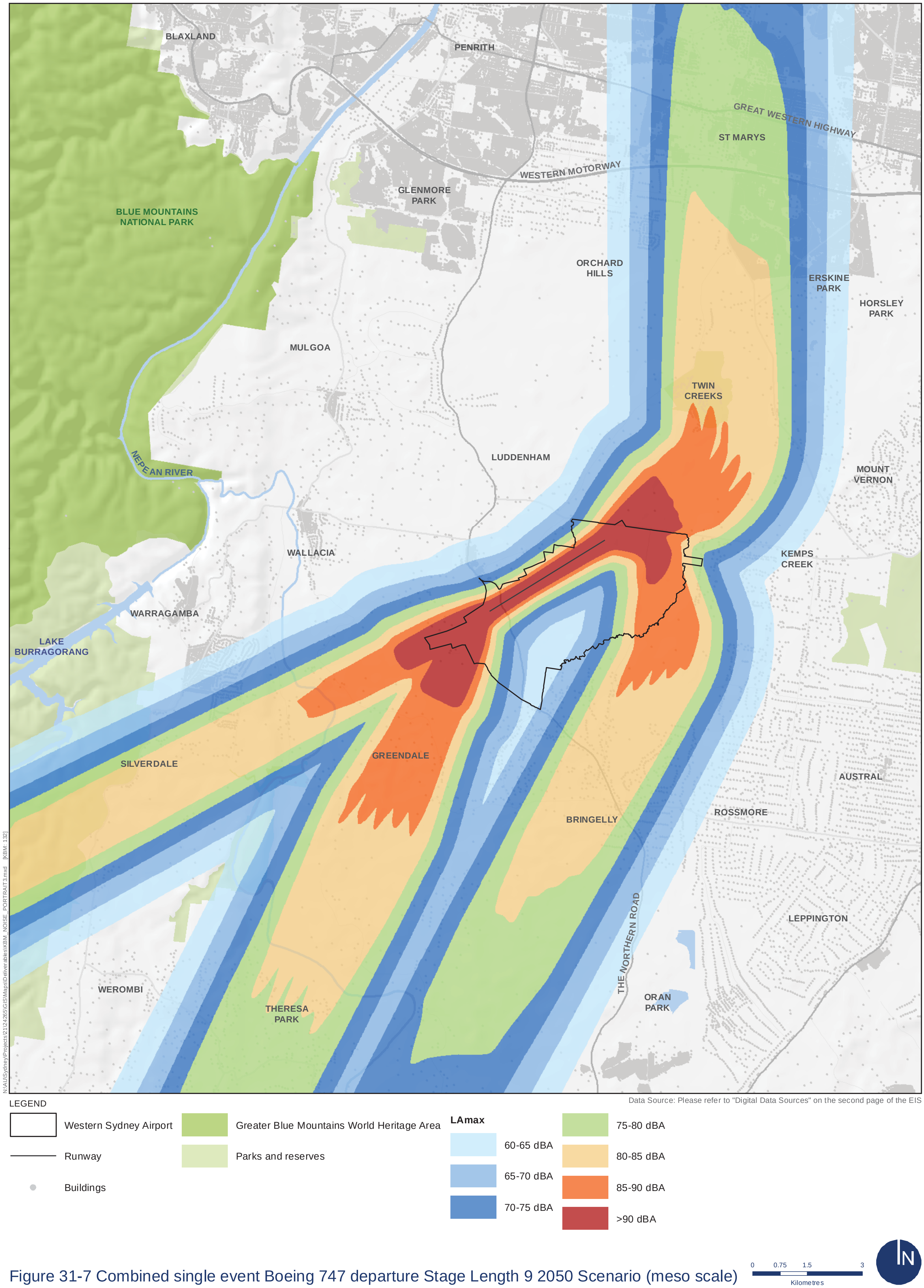
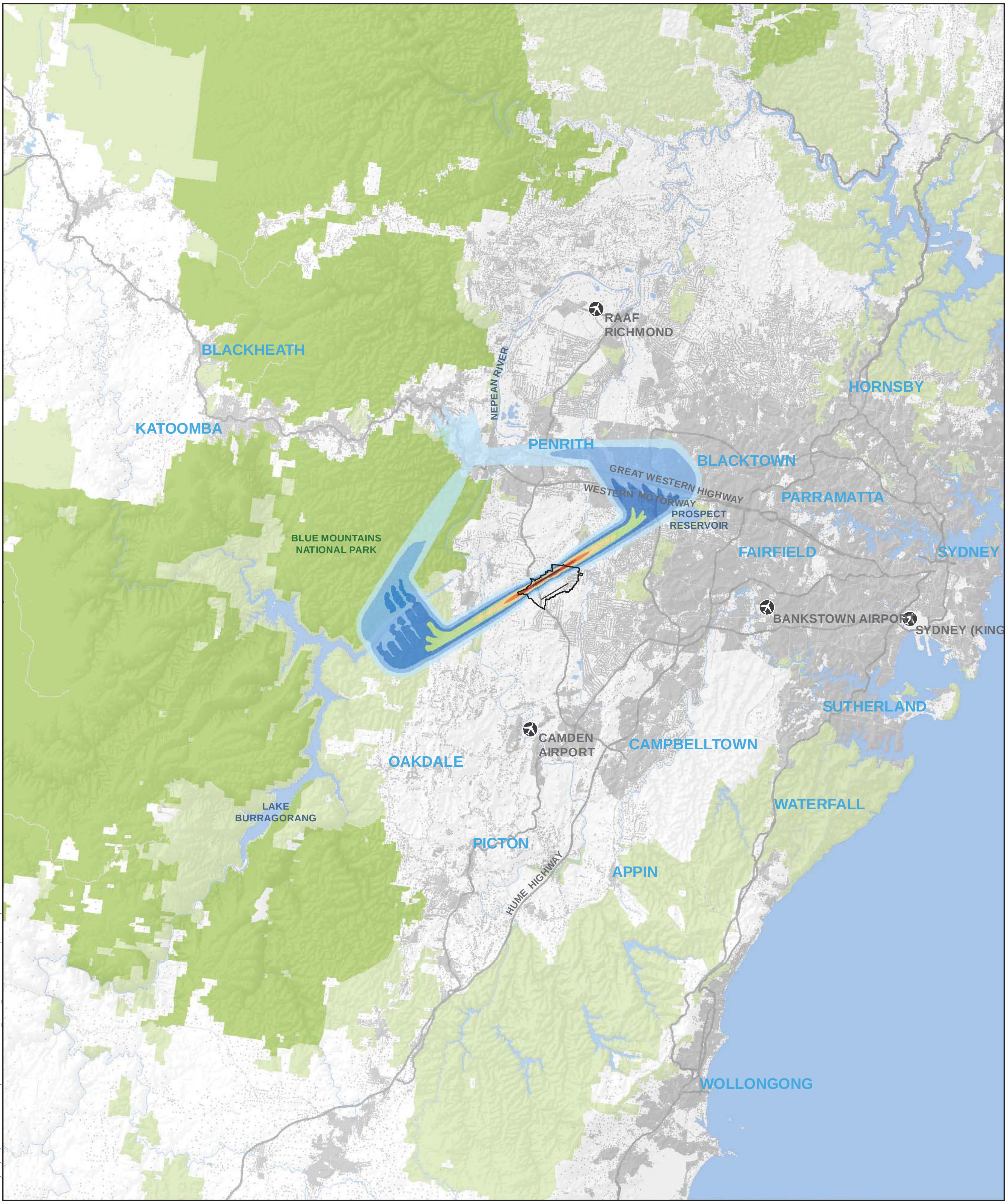
Figure 31-6 Combined single event Boeing 747 departure Stage Length 9 2050 Scenario

0 3.5 7 14
Kilometres



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 31-7 Combined single event Boeing 747 departure Stage Length 9 2050 Scenario (meso scale)



LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area
Runway	Parks and reserves
Airfields	
Buildings	

LAmax

60-65 dBA	75-80 dBA
65-70 dBA	80-85 dBA
70-75 dBA	85-90 dBA
	>90 dBA

0 3.5 7 14
Kilometres

N

Figure 31-8 Single event B747 arrival on all flight paths

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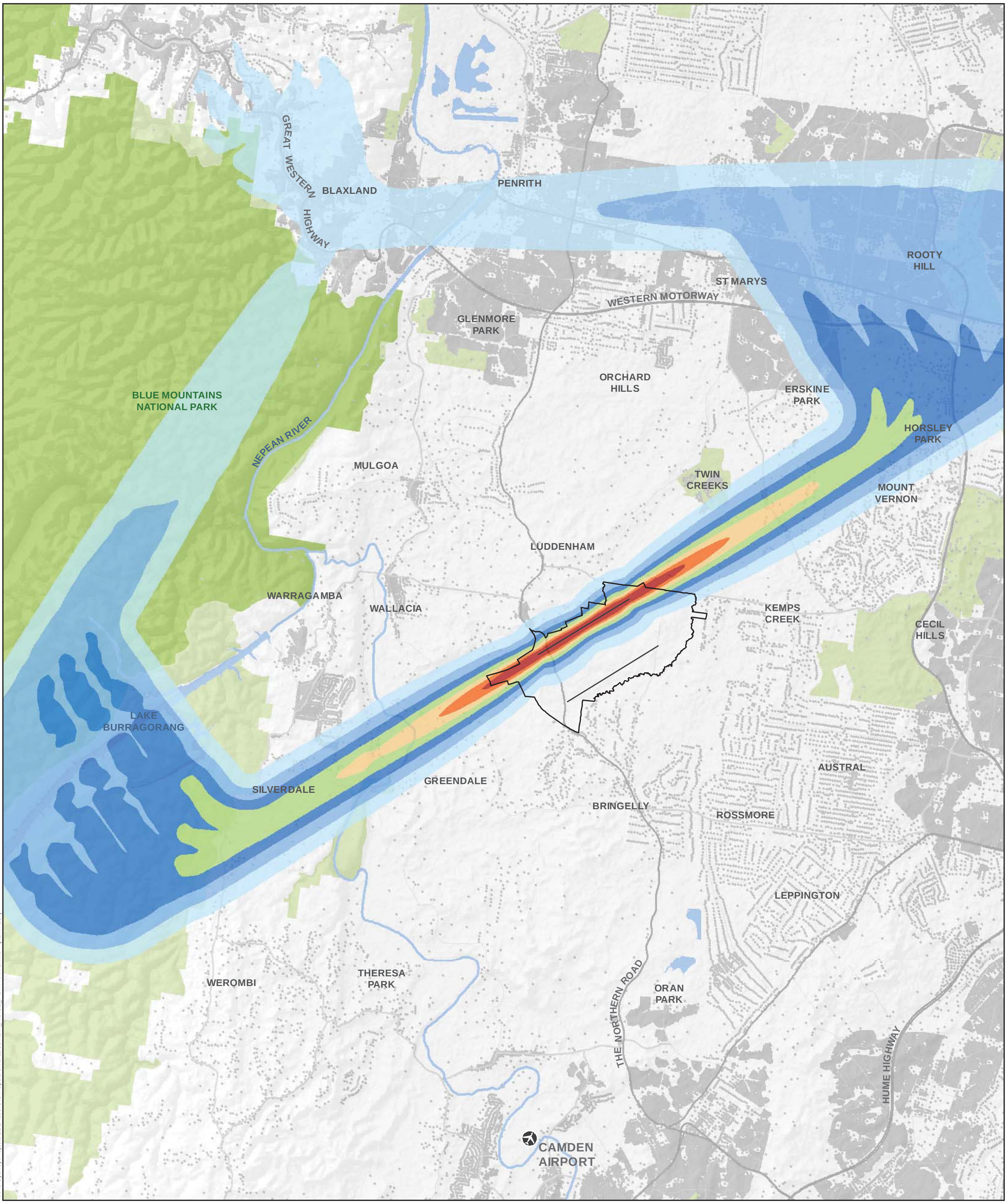

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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Legend		LAmax	
Western Sydney Airport	Greater Blue Mountains World Heritage Area	60-65 dBA	75-80 dBA
Runway	Parks and reserves	65-70 dBA	80-85 dBA
Airfields		70-75 dBA	85-90 dBA
Buildings			>90 dBA

0 1 2 4
Kilometres

Figure 31-9 Single event B747 arrival on all flight paths (meso scale)

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31.3.3. Noise over 24 hours

31.3.3.1. N70 results – 2050 scenario

As the volume of air traffic increases beyond 2030, the extent of predicted noise impact would also gradually increase. Based on current forecasts, aircraft movements at the proposed airport would approach capacity for the single runway configuration by about 2050. The predicted N70 contours for the 2050 scenario for four operating strategies are presented in Figure 31-10 to Figure 31-13. These represent the predicted annual average number of movements per day with L_{Amax} noise levels exceeding 70 dBA.

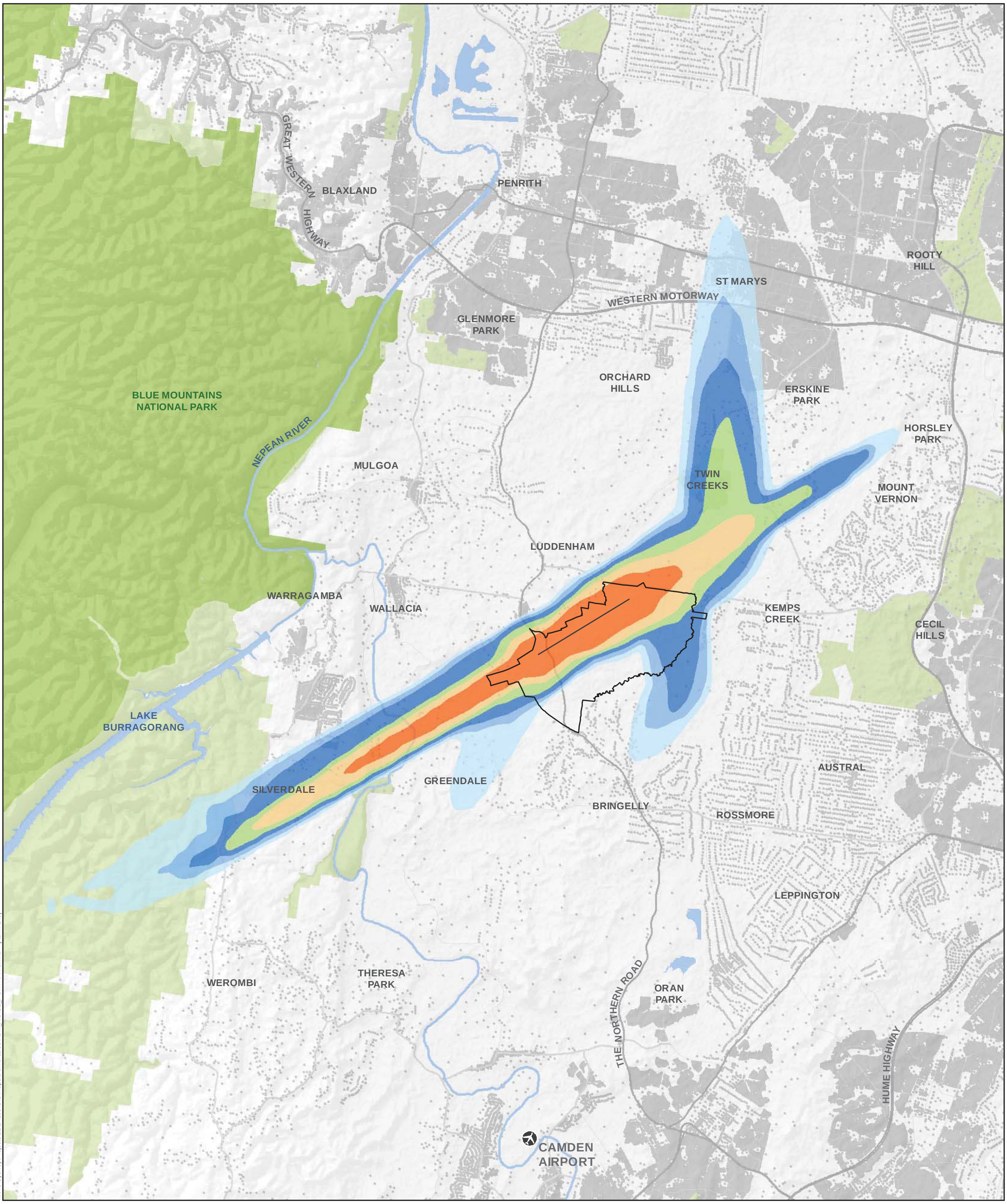
The Prefer 05 operating strategy results in greater impact on residents in densely-populated areas to the north-east of the airport site, with a predicted 5 to 10 events per day above 70 dBA over developed areas around St Marys.

In comparison, the Prefer 23 operating strategy is predicted to result in an impact of less than five events per day in these areas. The predicted impact would be greater in less densely populated areas to the north of Horsley Park, and also in rural residential areas around Greendale. The Prefer 23 operating strategy also results in somewhat higher predicted impacts in some parts of the lower Blue Mountains near Warragamba.

The residential population estimated to be affected by aircraft noise above 70 dBA by 2050 is outlined in Table 31–3. Larger areas of existing built up residential development would be exposed to aircraft noise compared to the proposed Stage 1 development. The Prefer 05 operating strategy results in approximately 30,000 people being exposed to at least five noise events per day above 70 dBA. In the Prefer 23 operating strategy, this number is substantially lower at approximately 5,000 people. However, it is notable that Prefer 23 still results in rural residential areas to the south and west of the proposed airport being exposed to a greater number of noise events above 70 dBA.

Table 31–3 – Estimated population within N70 contours – 2050

N70	Operating strategy			
	Prefer 05	Prefer 23	Prefer 05 with head-to-head	Prefer 23 with head-to-head
5–10	20,193	2,232	17,358	2,262
10–20	7,101	1,024	5,425	992
20–50	1,448	636	1,392	649
50–100	767	590	685	594
100–200	265	662	228	665
>200	139	145	180	141
Total	**29,912**	**5,288**	**25,268**	**5,303**



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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area	N70 = 5-10
Runway	Parks and reserves	N70 = 10-20
Airfields		N70 = 20-50
Buildings		N70 = 50-100
		N70 = 100-200
		N70 = 200+

Figure 31-10 - N70 contours for Prefer 05 operating strategy (2050)

0 1 2 4
Kilometres

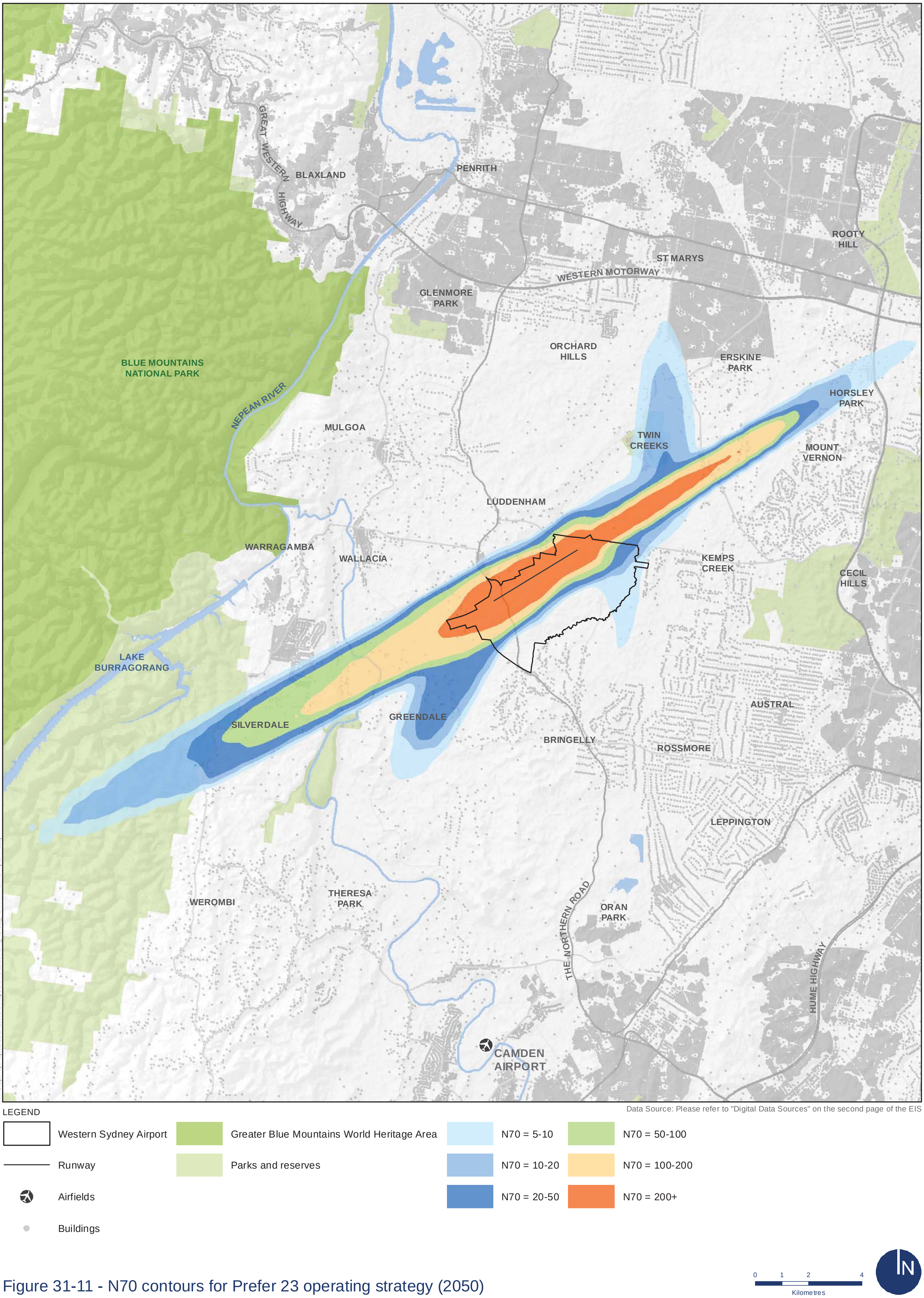
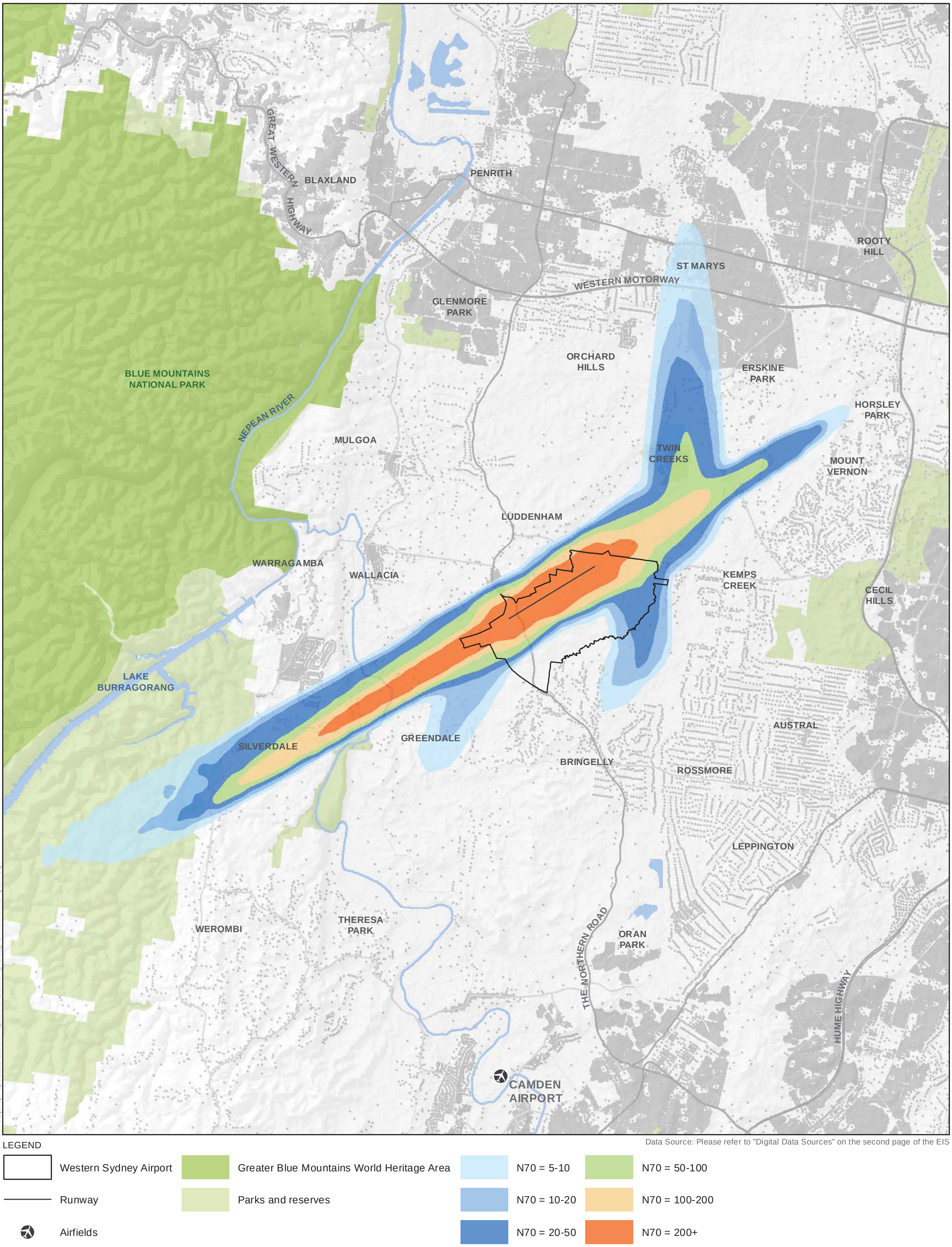
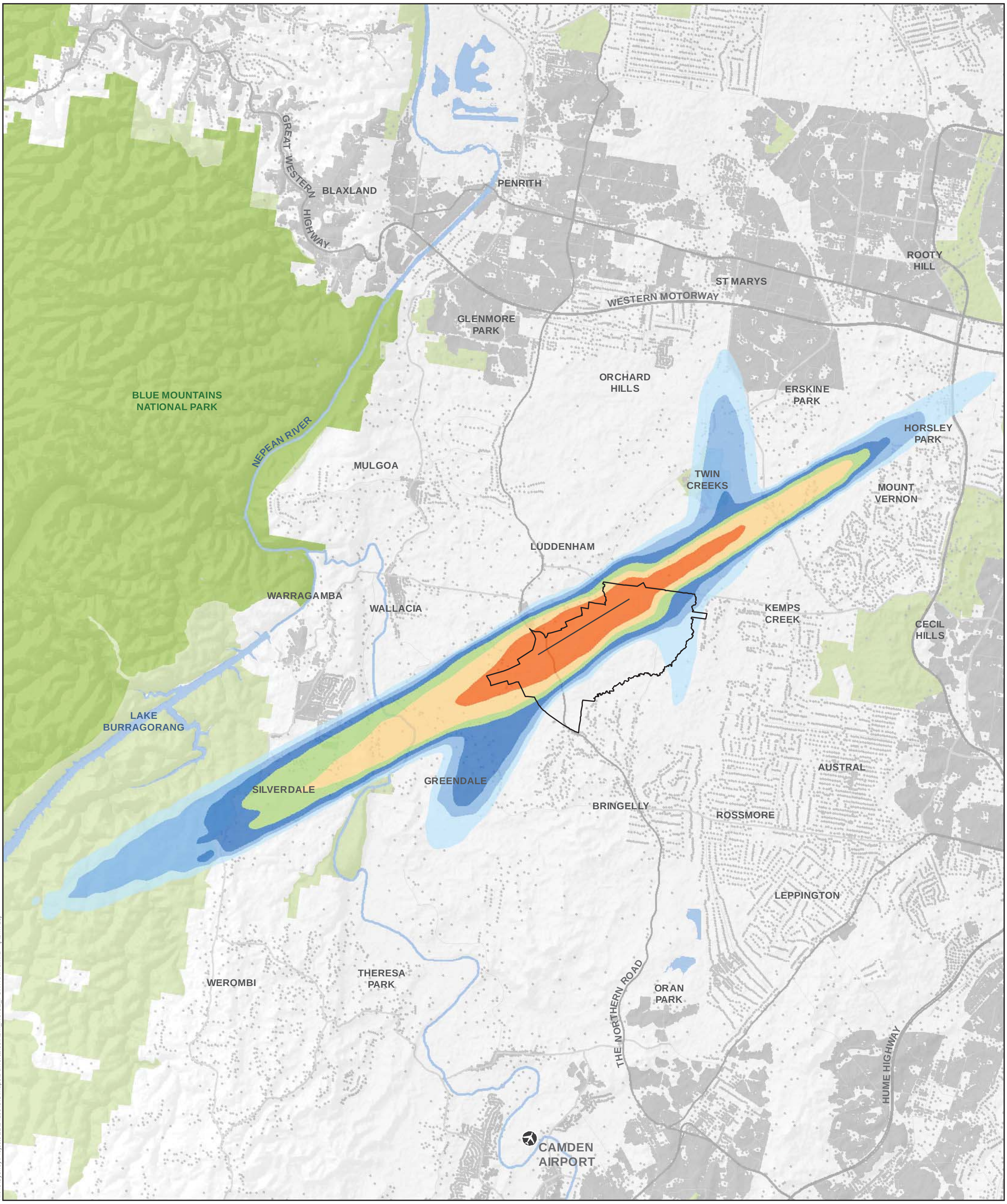


Figure 31-11 - N70 contours for Prefer 23 operating strategy (2050)



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 31-12 - N70 contours for Prefer 05 with head to head operating strategy (2050)



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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area	N70 = 5-10
Runway	Parks and reserves	N70 = 10-20
Airfields		N70 = 20-50
Buildings		N70 = 50-100
		N70 = 100-200
		N70 = 200+

0 1 2 4
Kilometres

Figure 31-13 - N70 contours for Prefer 23 with head to head operating strategy (2050)

31.3.3.2. 90th percentile N70 results – 2050 scenario

The 90th percentile values of N70 calculated over all days for the 2050 scenario are shown on Figure 31-14 and Figure 31-15. The N70 values represent the number of daily aircraft noise events over 70 dBA that would be exceeded on only 10 per cent of days. This can be thought of as a typical 'worst case' day for airport operations in each operating strategy. The figures also show the average day N70 values for comparison. Head-to-head operations are not shown as this strategy makes very little difference to the results.

The most noticeable feature of these figures is that generally the predicted difference between noise impact on average and worst case days would not be large. This is due to the relatively low and consistent wind speeds at the airport site, which mean the preferred mode of operation could be selected over 80 per cent of the time for any given strategy.

Although established built-up areas are not predicted to experience more than five events per day over 70 dBA on an average day for the Prefer 23 operating strategy, there are areas to the south of St Marys that would do so on a typical worst case day. In fact, in these areas a typical worst case day for the Prefer 23 operating strategy would be similar to an average day for the Prefer 05 operating strategy.

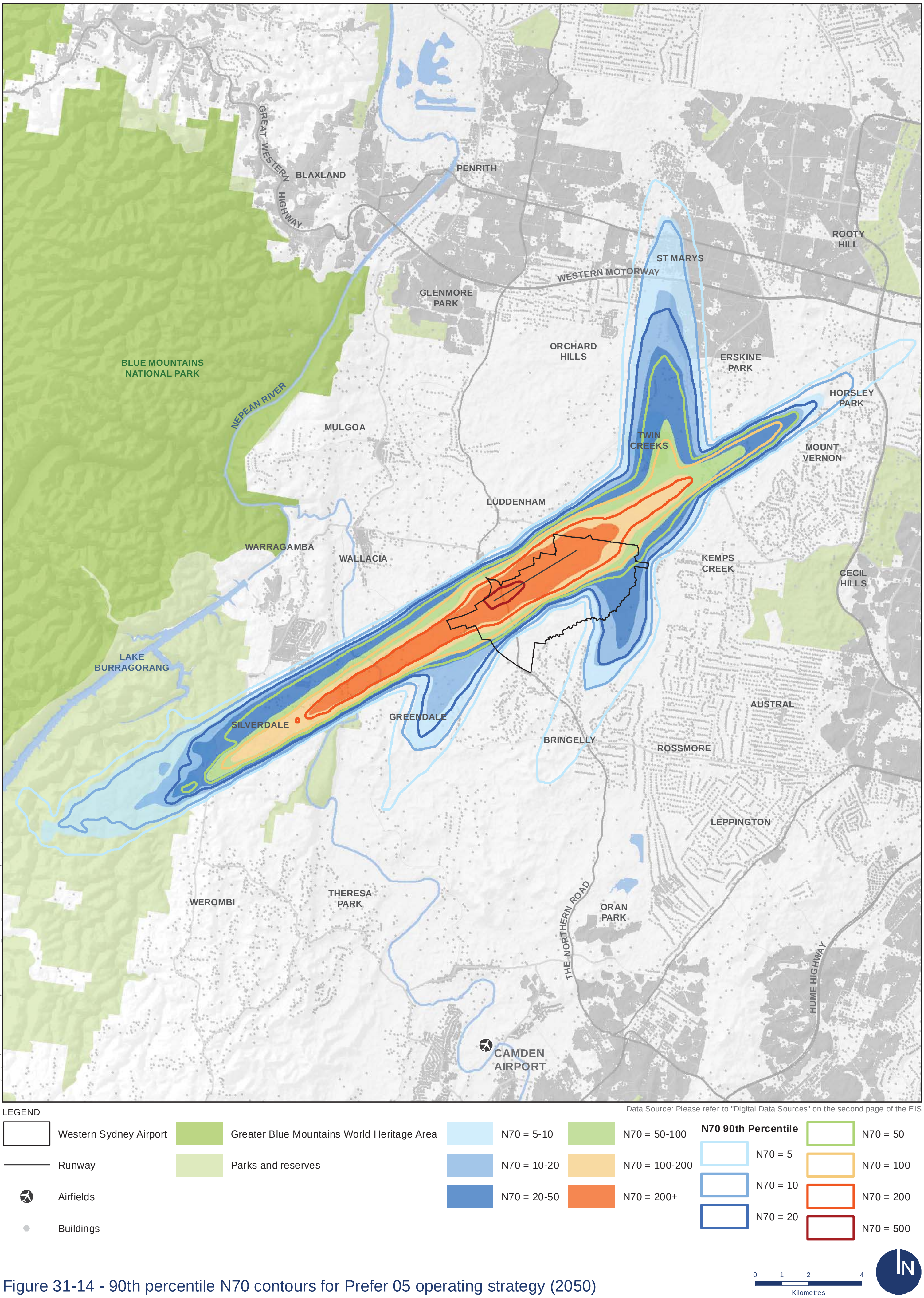
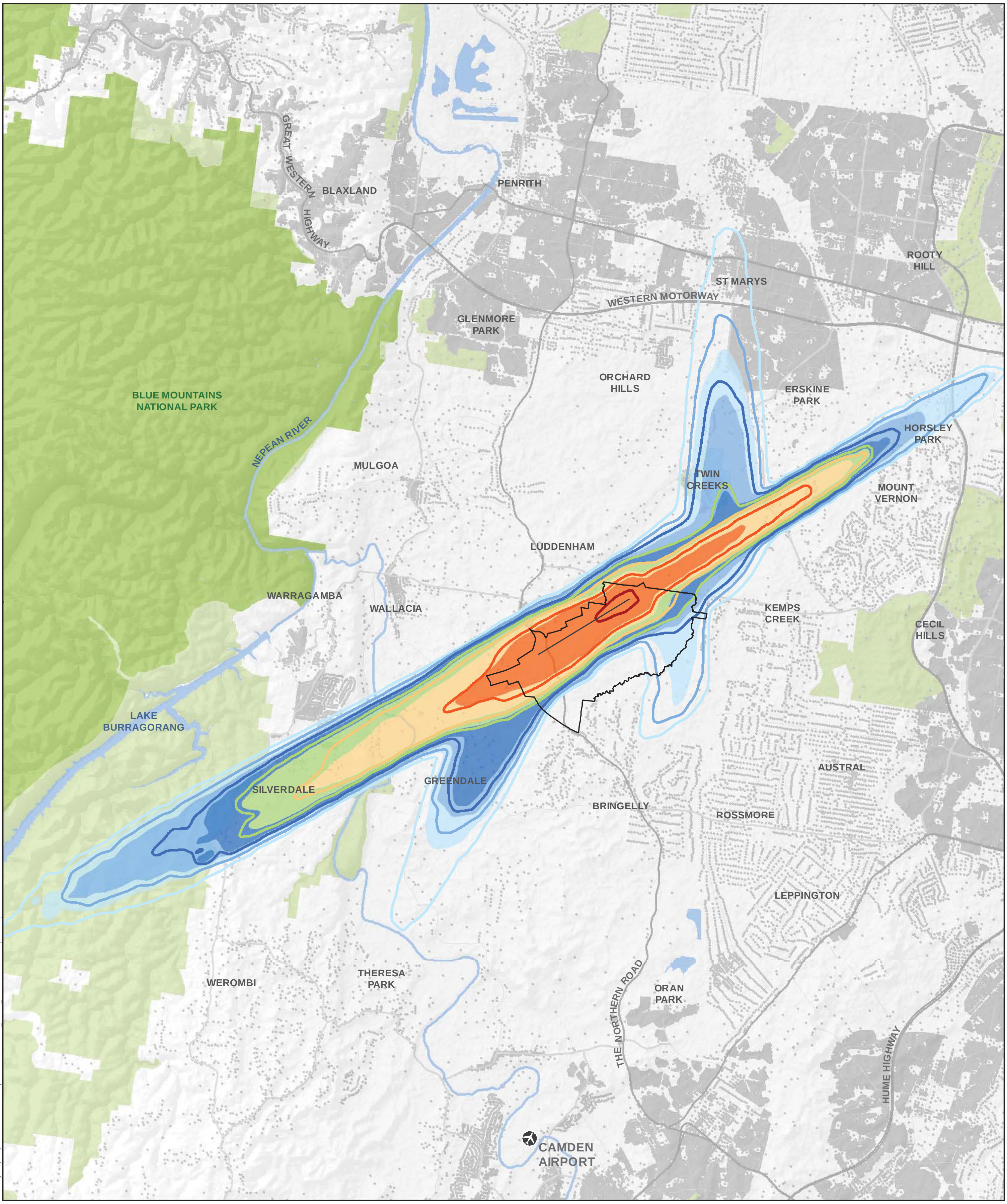


Figure 31-14 - 90th percentile N70 contours for Prefer 05 operating strategy (2050)



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LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves
- N70 = 5-10
- N70 = 10-20
- N70 = 20-50
- N70 = 50-100
- N70 = 100-200
- N70 = 200+

N70 90th Percentile

- N70 = 5
- N70 = 10
- N70 = 20
- N70 = 50
- N70 = 100
- N70 = 200
- N70 = 500

Figure 31-15 - 90th percentile N70 contours for Prefer 23 operating strategy (2050)

31.3.4. Night-time noise

31.3.4.1. N60 results – 2050

The number of noise events exceeding 60 dBA (N60) has been used to describe the impact of noise at night. Predicted N60 values in 2050 are shown for the standard night period 10 pm – 7 am in Figure 31-16 to Figure 31-19 for the four operating strategies.

Under the 2050 assessment scenario, large areas with high population densities are predicted to experience over 20 noise events per night exceeding 60 dBA under the Prefer 05 operating strategy, particularly to the north of the airport site around St Marys and Erskine Park. Large areas of residential development to the north-east are also predicted to experience night-time noise impacts under the Prefer 23 operating strategy, but at a lower frequency of 5–10 events per night.

Areas in close proximity to the airport site including Luddenham and rural residential areas south-west of the site are predicted to experience a high number of noise events per night under all operating modes.

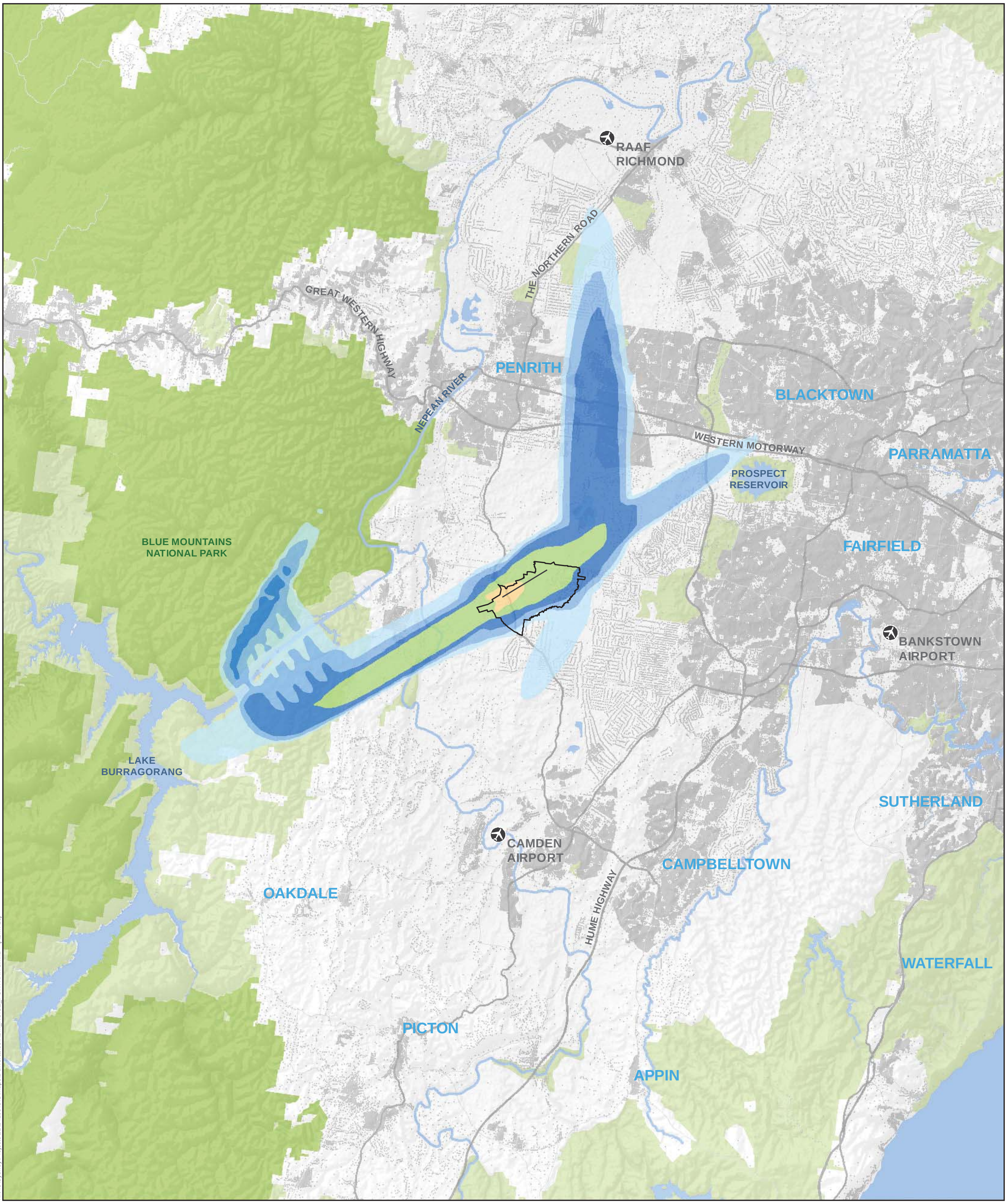
The night-time noise impact towards the north-east could be reduced by the use of the head-to-head mode where available. This would result in almost no built-up residential areas being exposed to more than five events above 60 dBA per night. The head to head operating mode would have minimal effect on the level of disturbance to residents in close proximity to the site.

Table 31–4 shows the number of people predicted to be affected by night-time noise above 60 dBA in 2050. By this time, the population experiencing night-time noise impacts at some level is predicted to increase substantially. At 2050 levels of aircraft traffic, the use Prefer 23 with head-to-head operating strategy offers clear benefits in terms of the number of residents exposed to night-time noise.

Table 31–4 – Estimated population within N60 contours – 2050

N60	Operating strategy			
	Prefer 05	Prefer 23	Prefer 05 with head-to-head	Prefer 23 with head-to-head
5–10	29,128	143,827	81,187	30,560
10–20	34,552	18,211	15,513	1,987
20–50	72,138	4,953	3558	4,111
50–100	1,600	3,395	2,664	3,440
>100	13	5	1,44	0
Total	**137,431**	**170,390**	**103,067**	**40,099**

The 90th percentile night-time N60 values, representing the predicted number of events per night exceeding 60 dBA on a ‘worst case’ night, are presented in Appendix E2 in Volume 4. Differences between average and worst case days are generally not large. However, particularly with head-to-head operations, more developed residential areas would be exposed to more than five events per night on a worst case night than on an average night.



N:\AU\Sydney\Projects\21\24265\GIS\Maps\Deliverables\KBM_NOISE_PORTRAIT3.mxd [KBM: 18]

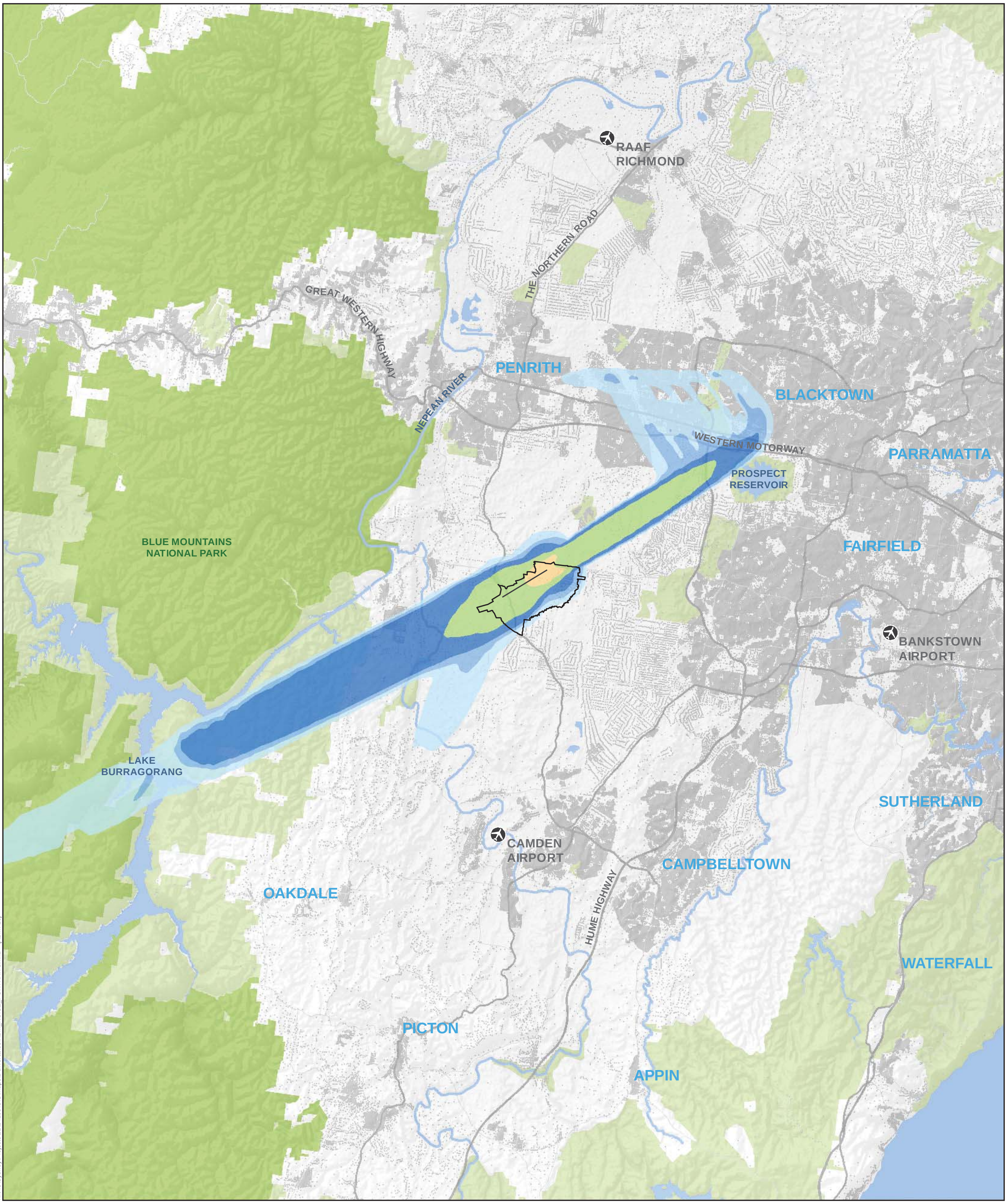
LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport
Runway
Airfields
Buildings
Greater Blue Mountains World Heritage Area
Parks and reserves
N60 = 5-10
N60 = 10-20
N60 = 20-50
N60 = 50-100
N60 = 100+

0 2.25 4.5 9
Kilometres

Figure 31-16 - N60 contours for Prefer 05 operating strategy (2050)

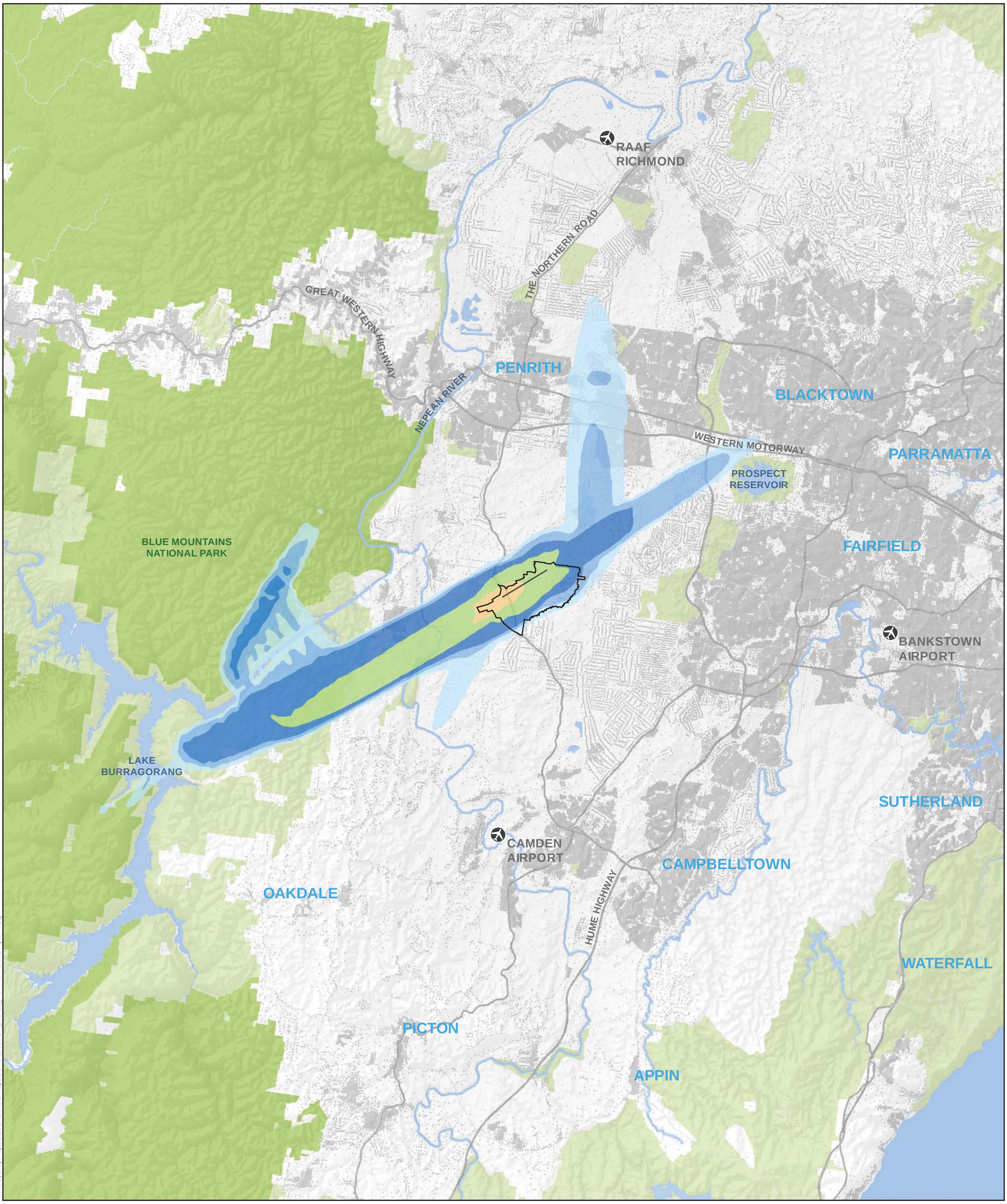


LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area
Runway	Parks and reserves
Airfields	
Buildings	
N60 = 5-10	N60 = 50-100
N60 = 10-20	N60 = 100+
N60 = 20-50	

Figure 31-17 - N60 contours for Prefer 23 operating strategy (2050)



LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area	N60 = 5-10
Runway	Parks and reserves	N60 = 10-20
Airfields		N60 = 20-50
Buildings		N60 = 50-100
		N60 = 100+

Figure 31-18 - N60 contours for Prefer 05 operating strategy with head to head (2050)

0 2.25 4.5 9
Kilometres

N

LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport		Greater Blue Mountains World Heritage Area		N60 = 5-10		N60 = 50-100	
Runway		Parks and reserves		N60 = 10-20		N60 = 100+	
Airfields				N60 = 20-50			
Buildings							

0 2.25 4.5 9
Kilometres

N

Figure 31-19 - N60 contours for Prefer 23 operating strategy with head to head (2050)

31.3.5. Recreational areas

A number of relatively small recreational areas, located near to the airport site, have been identified within the area potentially affected by aircraft overflight noise. These range from sports areas used for active pursuits (such as horse riding, bowling or golf) to nature reserves which may be used for more passive activities.

The impact of aircraft noise in recreational areas can be quantified by the number of events per day with maximum noise levels exceeding 60 and 70 dBA. Where a noise level exceeds 60 dBA, a person may need to raise their voice to be properly heard in conversation, but this level would be unlikely to cause disruption to active sporting pursuits. However, it would be noticeable and could impact on the acoustic amenity of areas used for passive recreation for the duration of the aircraft overflight. Noise levels above 70 dBA would require increased voice effort (although not shouting) for conversation to be understood, and would likely be considered to be acoustically intrusive in passive recreation areas for the duration of the overflight.

Table 31–5 and Table 31–6 show the identified recreation areas and the predicted values of N60 and N70 for the Prefer 05 and Prefer 23 operating strategies. The values shown are for the period 7 am – 6 pm, representing the times when these areas would most likely be used.

Table 31–5 – Average daily noise events with L_{Amax} exceeding 60 dBA (N60) at recreational receivers (2050)

Recreational receiver	2050 scenario	
	Prefer 05	Prefer 23
Bents Basin State Conservation Area / Gulguer Nature Reserve	24	49
Kemps Creek Nature Reserve	0	0
Rossmore Grange	11	2
Horsley Park Reserve	0	0
Twin Creeks Golf & Country Club	78	27
Sydney International Equestrian Centre	0	0
Whalan Reserve, St Marys	4	10

Table 31–6 – Average daily noise events with L_{Amax} exceeding 70 dBA (N70) at recreational receivers (2050)

Recreational receiver	2050 scenario	
	Prefer 05	Prefer 23
Bents Basin State Conservation Area / Gulguer Nature Reserve	0	0
Kemps Creek Nature Reserve	0	0
Rossmore Grange	0	0
Horsley Park Reserve	0	0
Twin Creeks Golf & Country Club	28	11
Sydney International Equestrian Centre	0	0
Whalan Reserve, St Marys	0	0

The results indicate that most of the identified recreational receivers would not be subject to aircraft overflight noise events with maximum levels exceeding 70 dBA.

Aircraft overflight noise levels from aircraft at Twin Creeks Golf & Country Club would be noticeable and at times a raised voice effort would be required for effective communication. At this location the predicted noise exposure would be significantly reduced under a Prefer 23 operating strategy.

Bents Basin State Conservation Area / Gulguer Nature Reserve, Rossmore Grange and Whalan Reserve would be subject to a number of flyover events with noise levels exceeding 60 dBA which would be noticeable to users of these areas. At Bents Basin State Conservation Area and Gulguer Nature Reserve and Whalan Reserve noise exposure levels would be lower under a Prefer 05 operating strategy while at Rossmore Grange they would be lower under a Prefer 23 strategy.

31.4. Aircraft noise in 2063

This section considers aircraft noise impacts for a long term development scenario where the airport is handling around 82 million annual passengers by around 2063. This scenario represents an assessment of noise exposure at a point in time when the airport has two runways, which are both operating close to their theoretical capacity.

The flight paths and operating procedures to be used by aircraft in the long term are indicative and would be subject to further detailed consideration before being finalised. There is also considerable uncertainty regarding noise emission levels from future aircraft, although generally they can be anticipated to be lower than the current aircraft types used in this assessment.

A number of alternative airport operating modes may be available under conditions of low traffic volume that may potentially result in reduced noise impacts. However, it is not possible to accurately ascertain which modes would be possible at a time so far into the future and therefore only the Prefer 05 and Prefer 23 operating strategies have been considered.

31.4.1. ANEC contours

ANEC contours for the two operating strategies considered in this assessment are shown in Figure 31-20 and Figure 31-21. The contours cover a larger area than compared to the 2050 scenario, extending to the south and east of the airport site following commissioning of the second runway. The estimated population within the ANEC contours for 2063 operations is shown in Table 31–7.

Table 31–7 – Estimated population within ANEC contours (2063)

N70	Operating mode	
	Prefer 05	Prefer 23
20-25	5,803	7,832
25-30	1,486	1,934
30-35	570	527
>35	0	26
Total	**7,858**	**10,319**

Figure 31-22 and Figure 31-23 show the year 2063 ANEC contours compared to those presented in the 1985 Draft EIS (Kinhill Stearns 1985). The 1985 ANEC was prepared for a dual runway airport and has been used for land use planning purposes to date.

The modelled 2063 ANEC contours for the long term development are generally comparable to the 1985 ANEC with slight extensions to the north and the south-west. These differences primarily reflect revised modelling assumptions including updated forecasts for the number of aircraft movements, new indicative flight paths and changes in the assignment of aircraft to particular flight paths. Compared to the 1985 ANEC, the modelled 2063 ANEC extends further to the south-west of the proposed airport site into the Burragorang State Conservation Area.

Existing planning controls based on the 1985 ANEC contours have restricted development within the majority of the land area covered by the modelled 2063 ANEC contours.

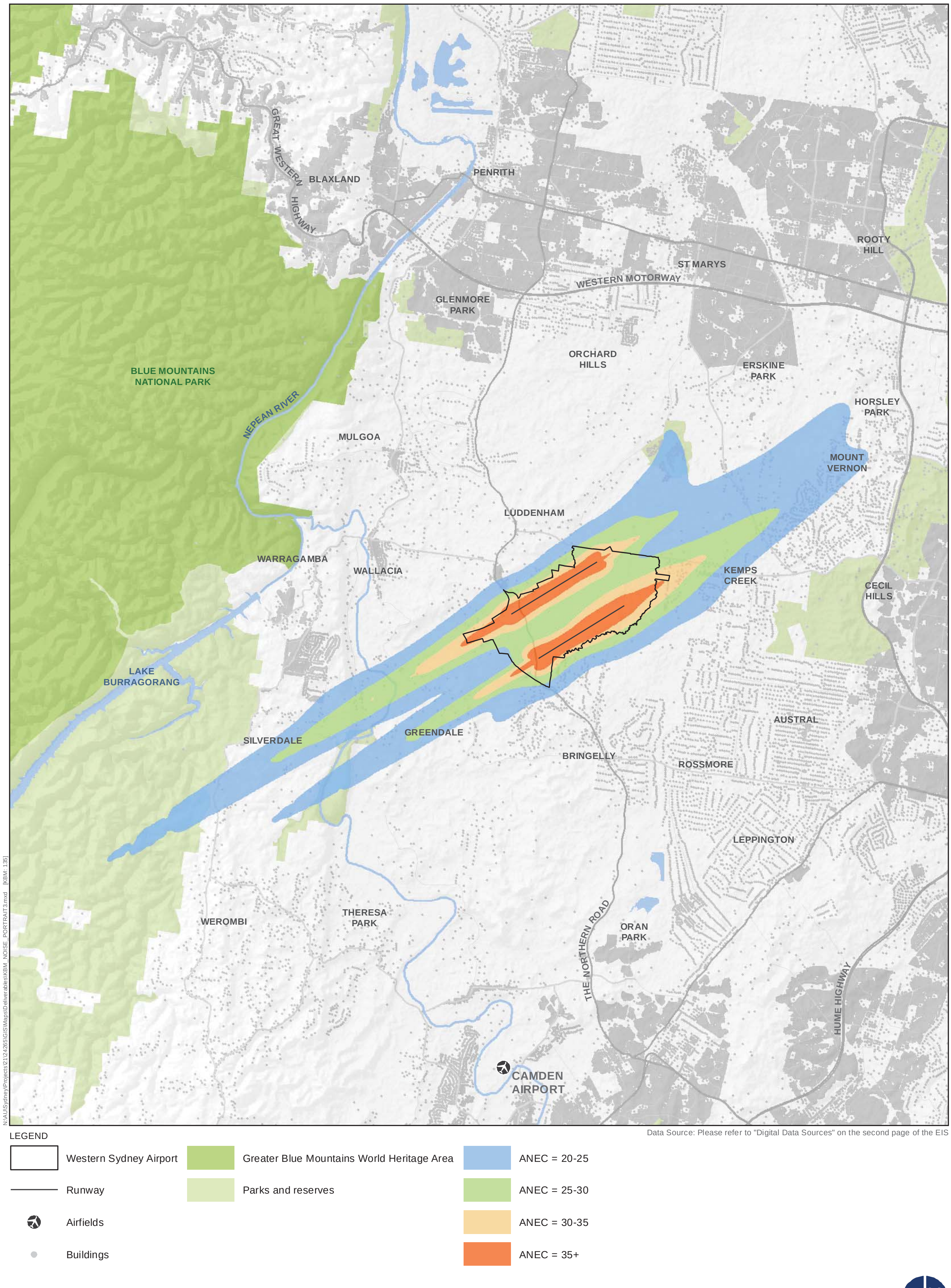
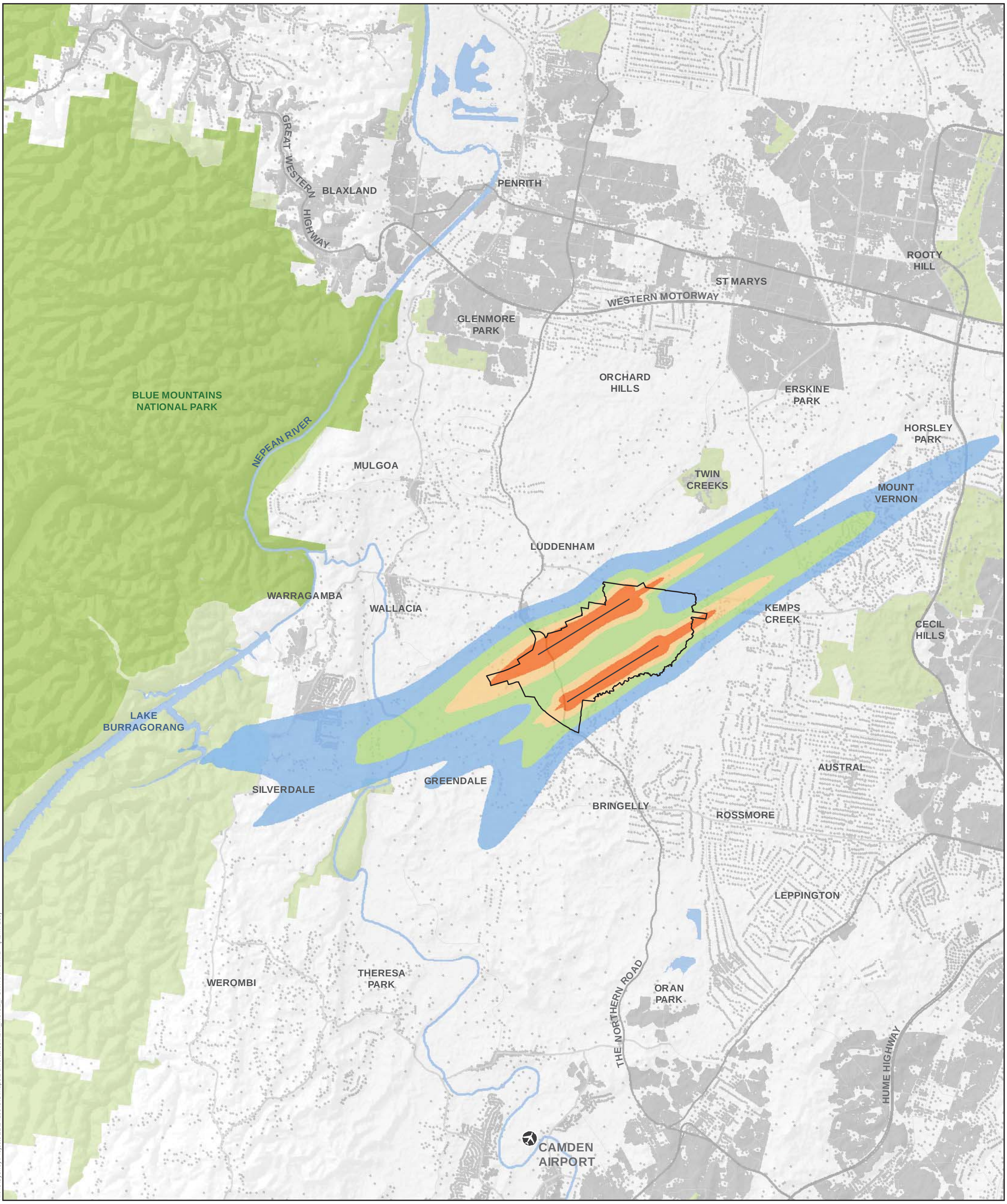


Figure 31-20 ANEC contours for Prefer 05 operating strategy (2063)



LEGEND

Western Sydney Airport	ANEC = 20-25
Runway	ANEC = 25-30
Airfields	ANEC = 30-35
Buildings	ANEC = 35+
Greater Blue Mountains World Heritage Area	
Parks and reserves	

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

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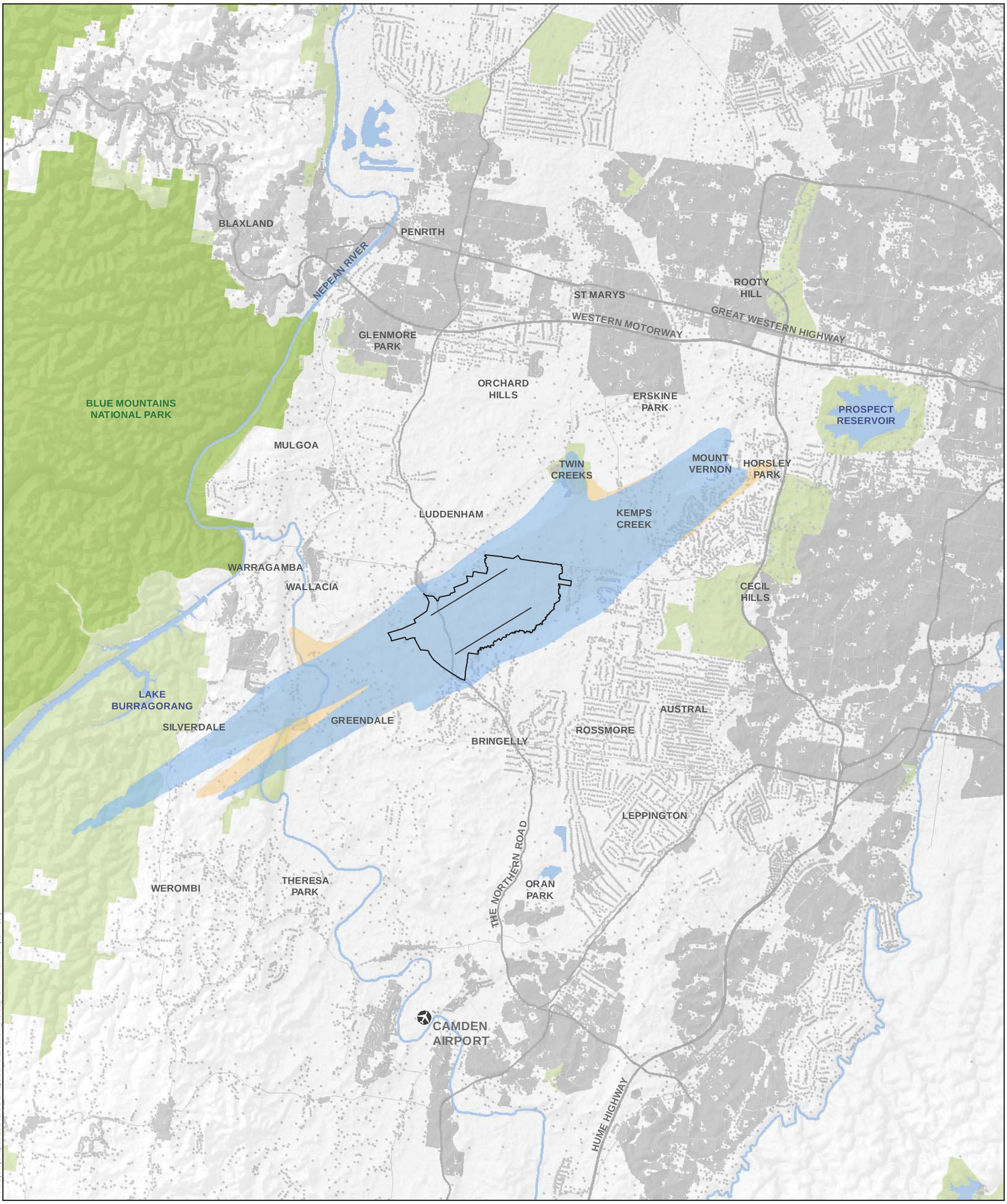
Figure 31-21 ANEC contours for Prefer 23 operating strategy (2063)



LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Western Sydney Airport	Greater Blue Mountains World Heritage Area
Runway	Parks and reserves
Airfields	
Buildings	

ANEC Contours 2063 Prefer 05

20 ANEC

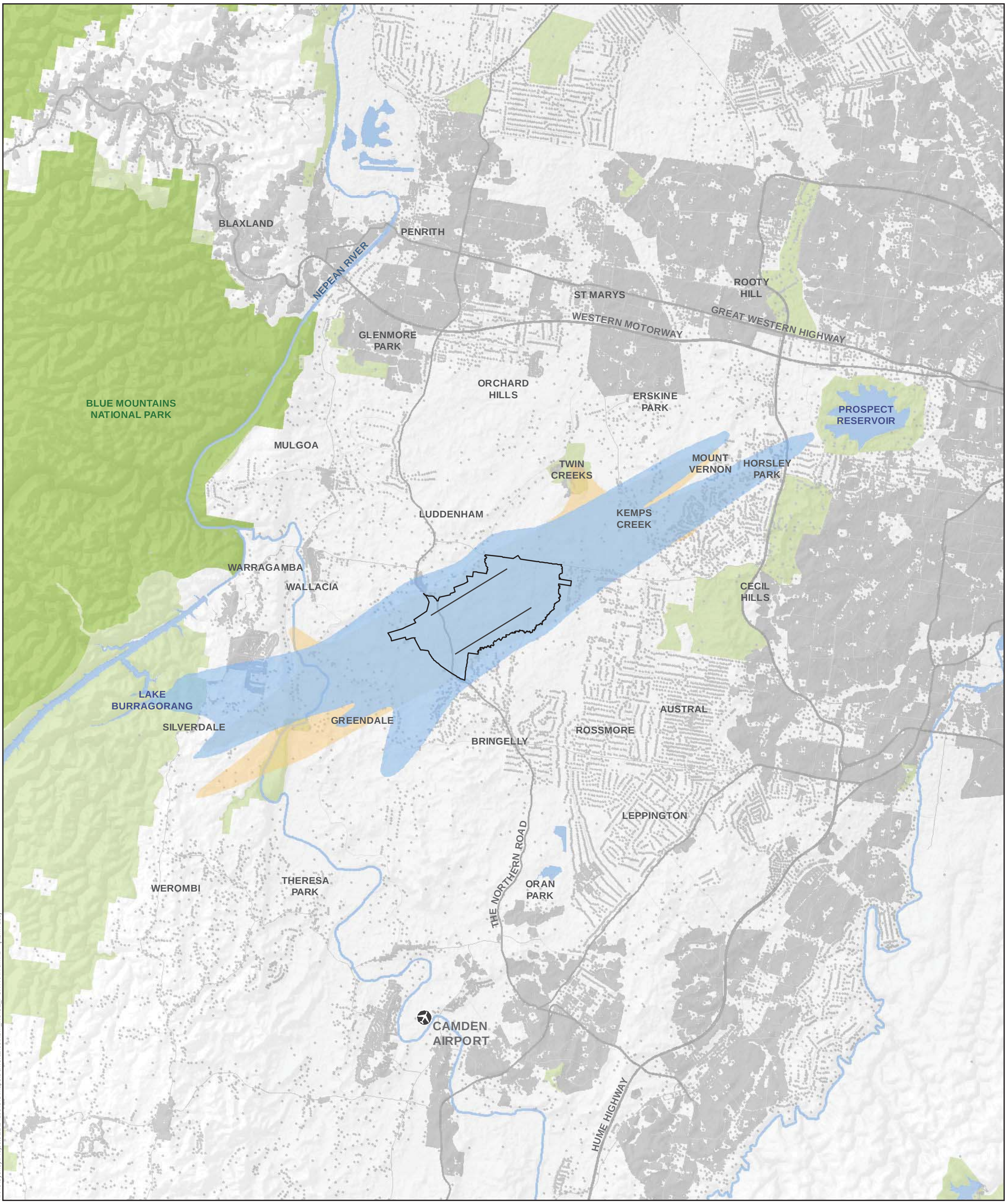
1985 EIS ANEC Contours

20 ANEC

0 1.25 2.5 5
Kilometres

N

Figure 31-22 1985 Draft EIS combined ANEC contours compared to 2063 Prefer 05



LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

ANEC Contours 2063 Prefer 23

- 20 ANEC

1985 EIS ANEC Contours

- 20 ANEC

0 1.25 2.5 5
Kilometres

N

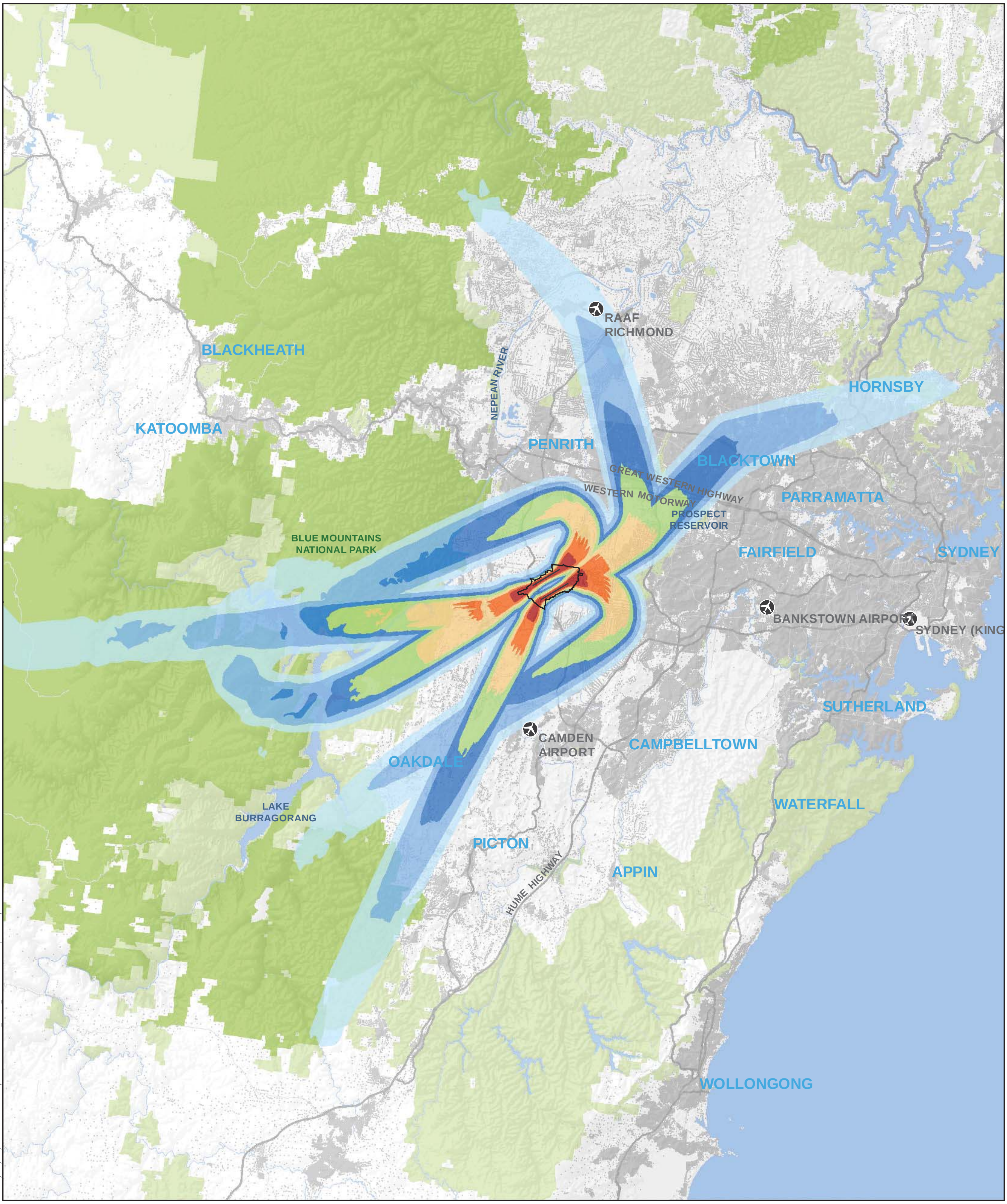
Figure 31-23 1985 Draft EIS combined ANEC contours compared to 2063 Prefer 23

31.4.2. Maximum noise levels

Single-event noise contours depict the maximum noise levels (L_{Amax}) resulting from a single operation of a specific aircraft type on all applicable arrival or departure flight paths. Figure 31-24 to Figure 31-29 show composite, single event L_{Amax} noise level contours for departures and approaches by Boeing 747 (the loudest noise event predicted to occur at the airport) and Airbus A320 aircraft (a more common aircraft type), based on indicative flight paths for the indicative long term development scenario. These figures show that noise events above 60 dBA would be experienced over a wider area, compared to a single runway, due to the additional flight paths associated with the operation of the second runway.

In particular, a Boeing 747 (or a future type with equivalent noise emission) operating on certain departure paths would result in noise levels exceeding 60 dBA over more areas of the Blue Mountains National Park, and in some areas, the maximum noise level would exceed 70 dBA. As previously noted, the Boeing 747 is being phased out of passenger services and it is unlikely that any operations by this aircraft type would occur at the proposed airport in 2063.

Maximum noise levels from other operations would affect similar numbers of residents to the proposed Stage 1 development, but the pattern of exposure would be extended with additional residential areas newly exposed to noise levels exceeding 60 dBA and some, notably in Silverdale, to noise events over 70 dBA from A320 departures.



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LEGEND

Western Sydney Airport

Runway

Airfields

Buildings

Greater Blue Mountains World Heritage Area

Parks and reserves

LAmax

60-65 dBA

65-70 dBA

70-75 dBA

75-80 dBA

80-85 dBA

85-90 dBA

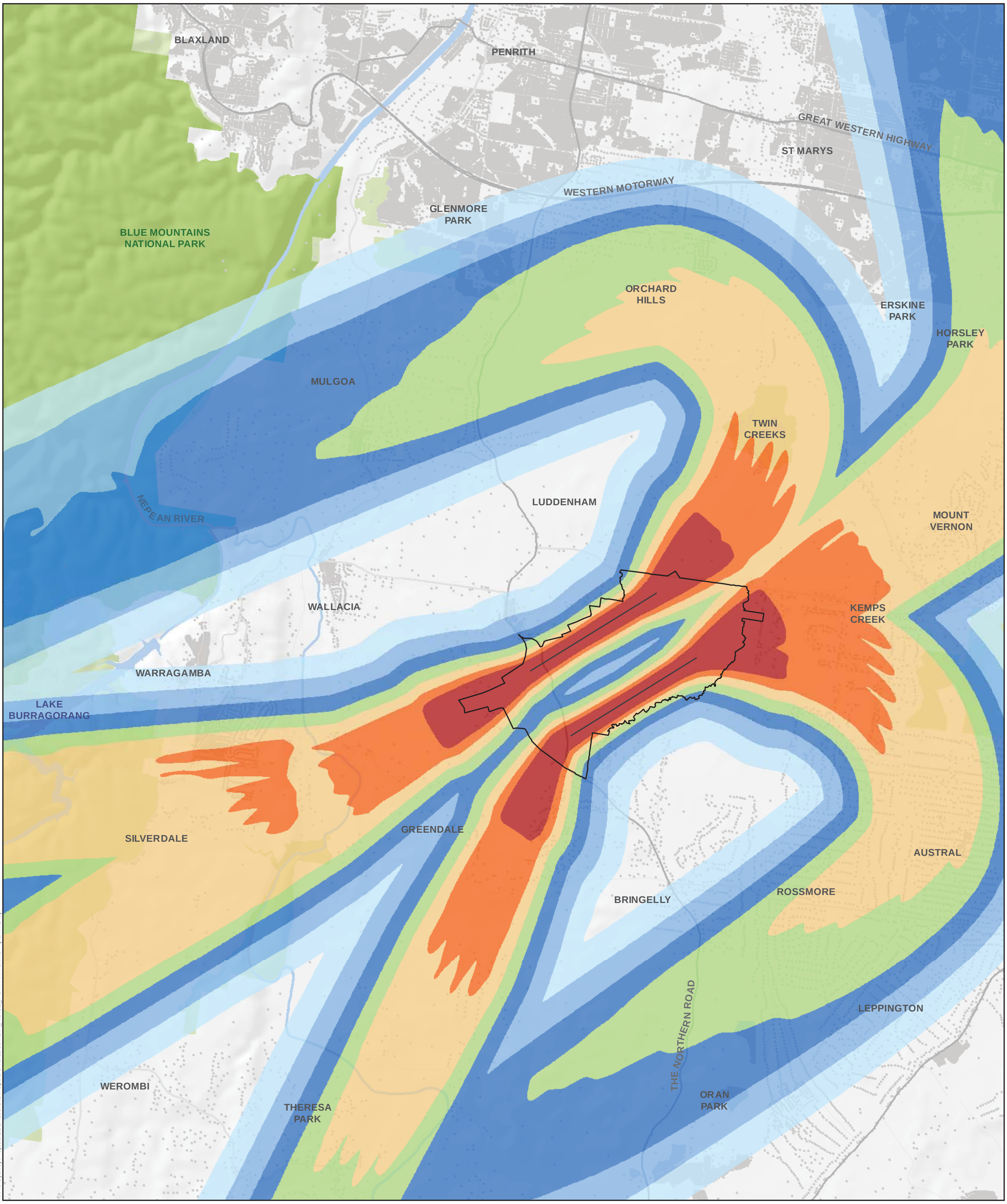
>90 dBA

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

0 3.5 7 14
Kilometres

N

Figure 31-24 Combined single event Boeing 747 departure (stage length 9) 2063



LEGEND

Western Sydney Airport
Runway
Buildings
Greater Blue Mountains World Heritage Area
Parks and reserves

LAmax
60-65 dBA
65-70 dBA
70-75 dBA
75-80 dBA
80-85 dBA
85-90 dBA
>90 dBA

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

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0 0.75 1.5 3
Kilometres

Figure 31-25 Combined single event Boeing 747 departure (stage length 9) 2063 (meso scale)

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

LEGEND

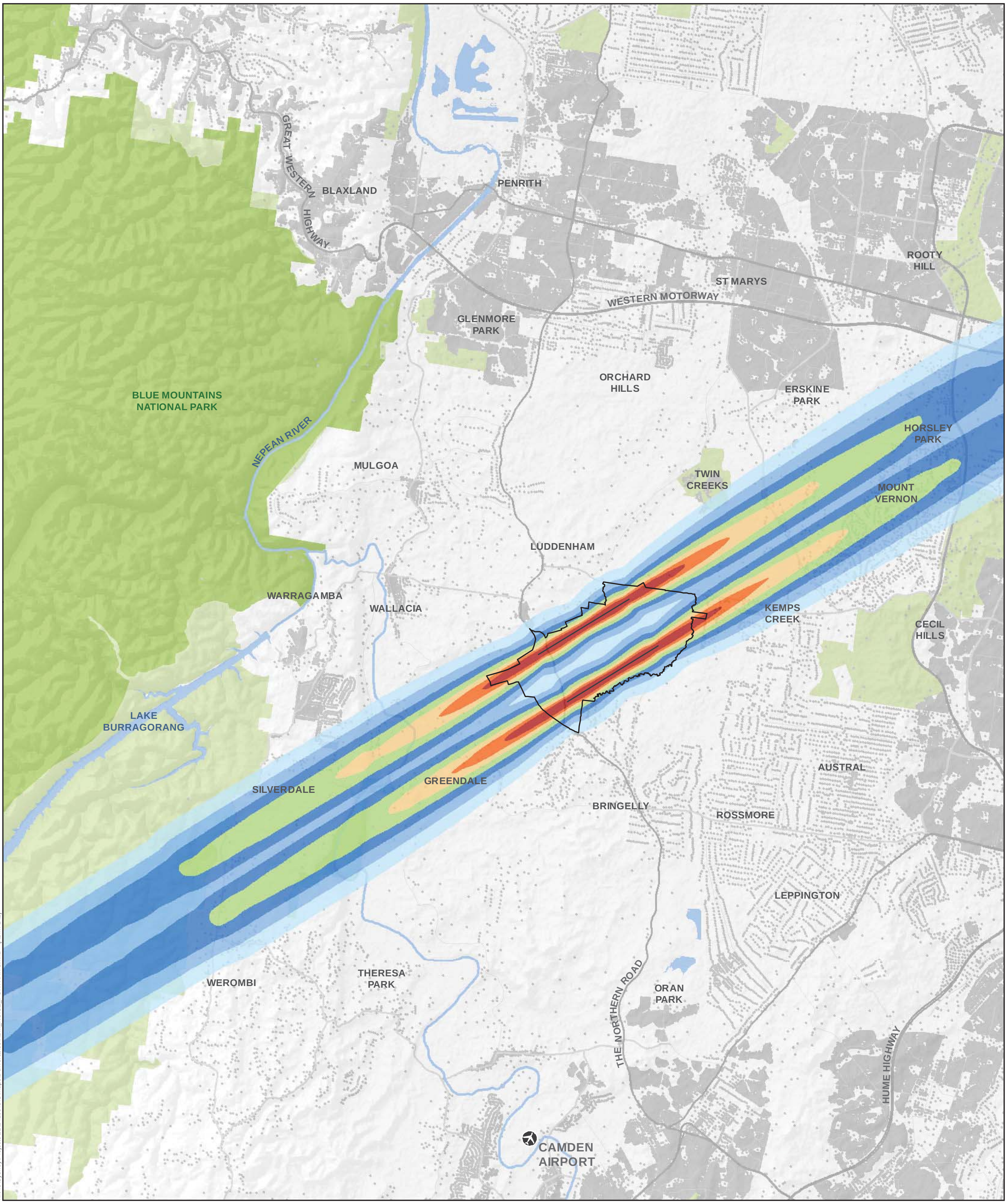
- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

LAmax

- 60-65 dBA
- 65-70 dBA
- 70-75 dBA
- 75-80 dBA
- 80-85 dBA
- 85-90 dBA
- >90 dBA

Figure 31-26 Combined single event 747 arrival 2063

0 3.5 7 14
Kilometres



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

LEGEND

- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

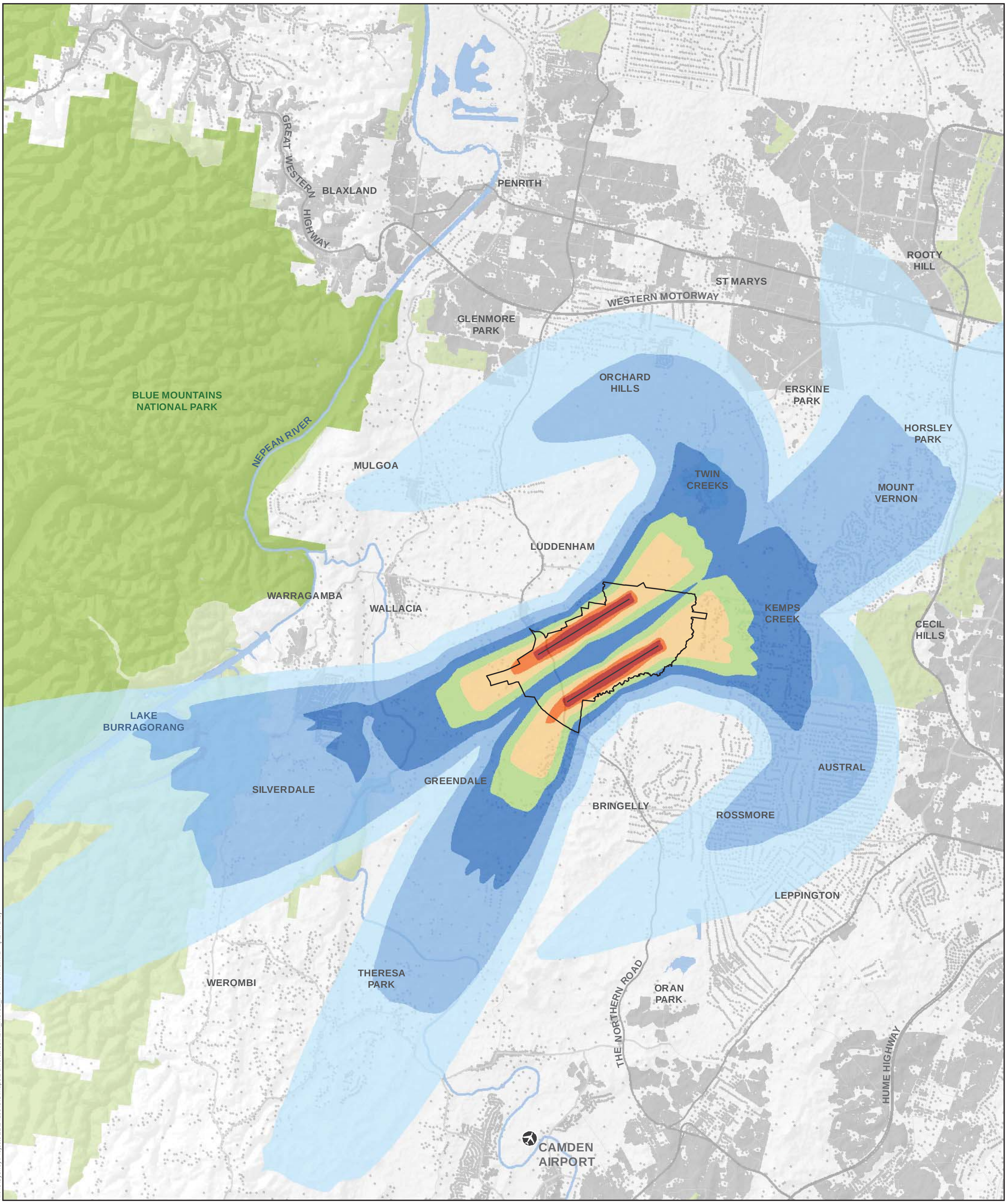
LAmax

- 60-65 dBA
- 65-70 dBA
- 70-75 dBA
- 75-80 dBA
- 80-85 dBA
- 85-90 dBA
- >90 dBA

0 1 2 4
Kilometres

N

Figure 31-27 Combined single event 747 arrival 2063 (meso scale)



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

LEGEND

Western Sydney Airport

Runway

Airfields

Buildings

Greater Blue Mountains World Heritage Area

Parks and reserves

LAmax

60-65 dBA

65-70 dBA

70-75 dBA

75-80 dBA

80-85 dBA

85-90 dBA

>90 dBA

0 1 2 4

Kilometres

N

Figure 31-28 Combined single event Airbus A320 departure (stage length 4) 2063

LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

LAmax

- 60-65 dBA
- 65-70 dBA
- 70-75 dBA
- 75-80 dBA
- 80-85 dBA
- 85-90 dBA
- >90 dBA

0 2.25 4.5 9
Kilometres

N

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Figure 31-29 Combined single event Airbus A320 arrival 2063

31.4.3. Noise over 24 hours

31.4.3.1. N70 results – 2063 scenario

N70 contours for the Prefer 05 and Prefer 23 strategies in 2063 are shown in Figure 31-30 and Figure 31-31. Compared with the results for 2050, there are fewer densely-populated areas within the N70 = 5 – 10 contour, despite a predicted doubling in the number of aircraft movements at the proposed airport between 2050 and 2063. This is particularly true for the Prefer 05 operating strategy, where movements can be spread across two runways and the locations of flight paths are less constrained. However, additional residential areas including Horsley Park would be impacted by infrequent noise events and Kemps Creek and Mount Vernon would be subject to an increased frequency of noise events.

For the 2063 scenario with two runways operating, there would be little expected difference in the number of residents experiencing various numbers of noise events between the Prefer 05 and Prefer 23 strategies. Table 31–8 shows the estimated population within N70 contours for the Prefer 05 and Prefer 23 strategies.

Table 31–8 – Estimated population within N70 contours (2063)

N70	Operating strategy	
	Prefer 05	Prefer 23
5–10	3,493	3,738
10–20	3,926	2,988
20–50	4,454	3,807
50–100	2,542	3,106
100–200	1,920	2,511
>200	1,083	1,321
Total	**17,417**	**17,472**

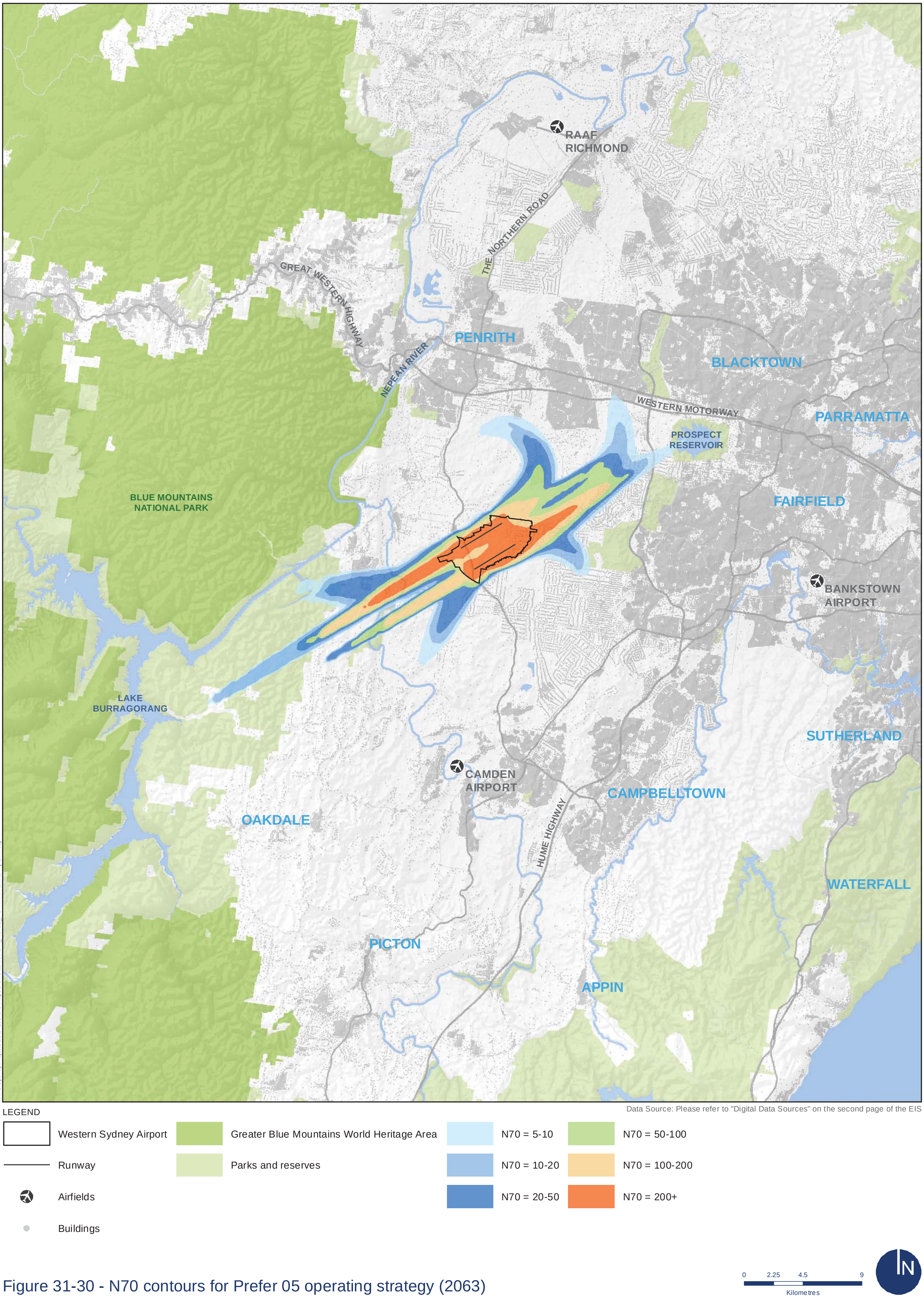


Figure 31-30 - N70 contours for Prefer 05 operating strategy (2063)

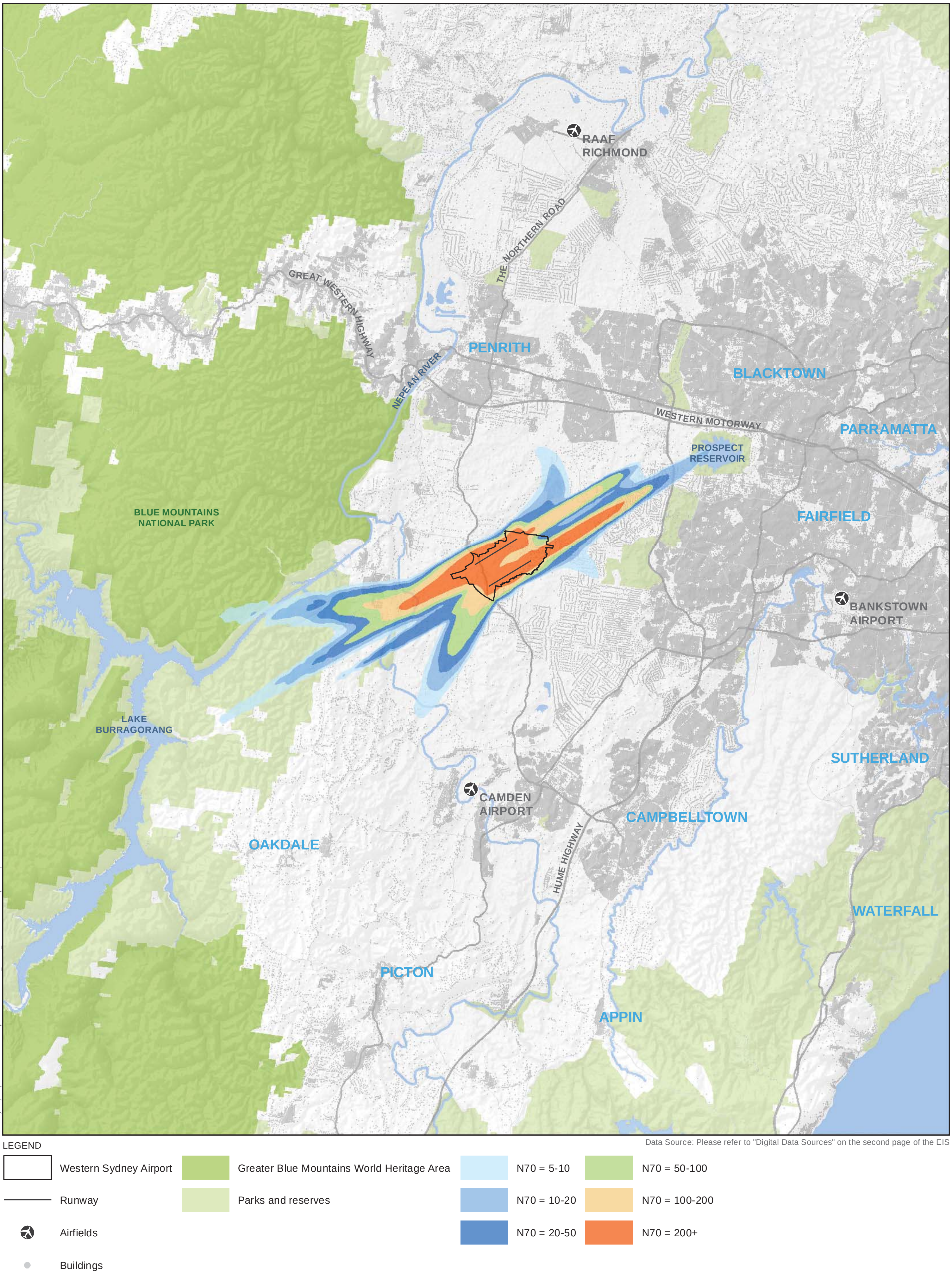
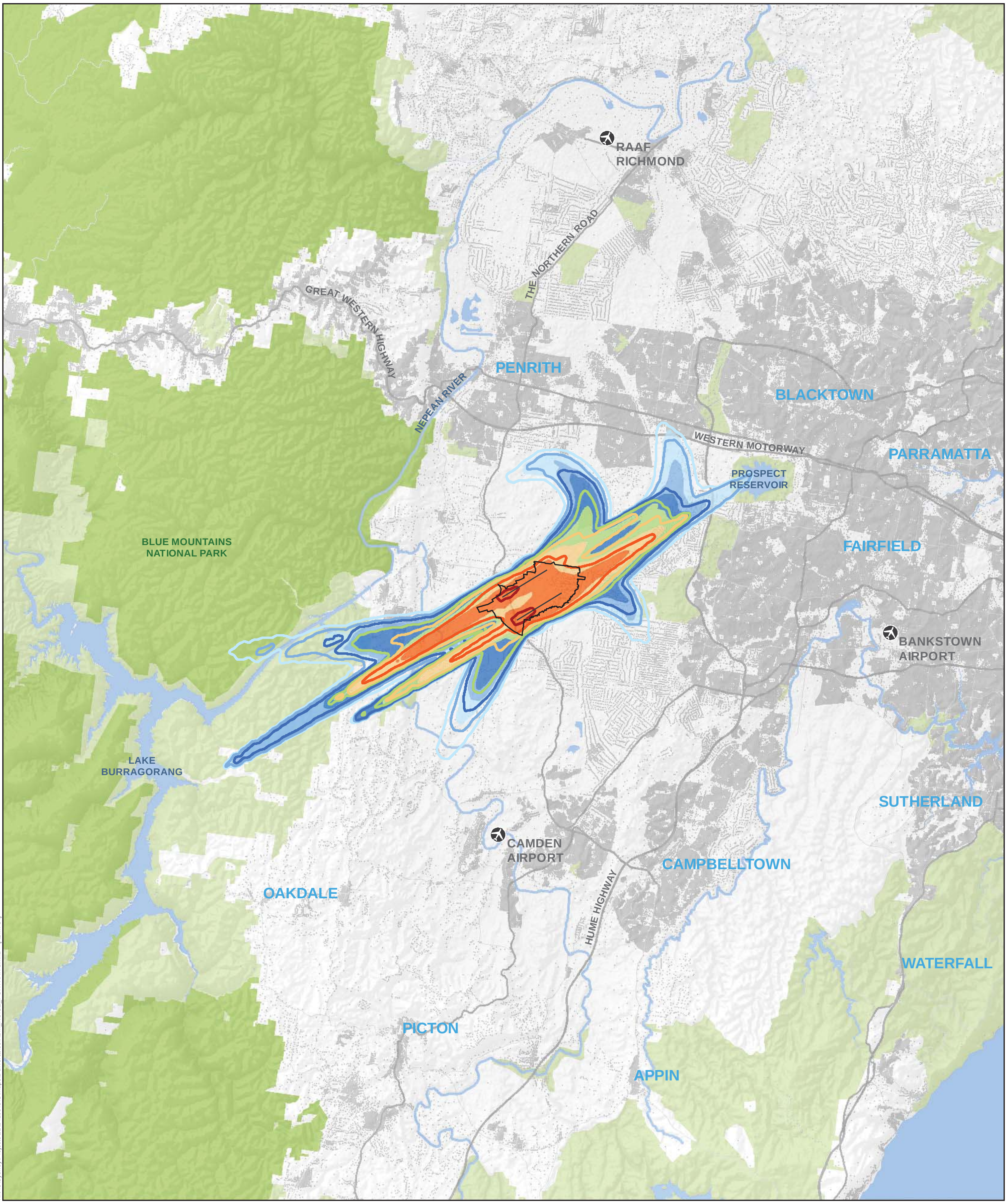


Figure 31-31 - N70 contours for Prefer 23 operating strategy (2063)

31.4.3.2. 90th percentile N70 results – 2063 scenario

Figure 31-32 and Figure 31-33 show calculated 90th percentile N70 contours for the Prefer 05 and Prefer 23 operating strategies in 2063. The difference between the two modes is much less significant than when comparing average days, and also less significant when compared to the results for the 2050 scenario.



LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

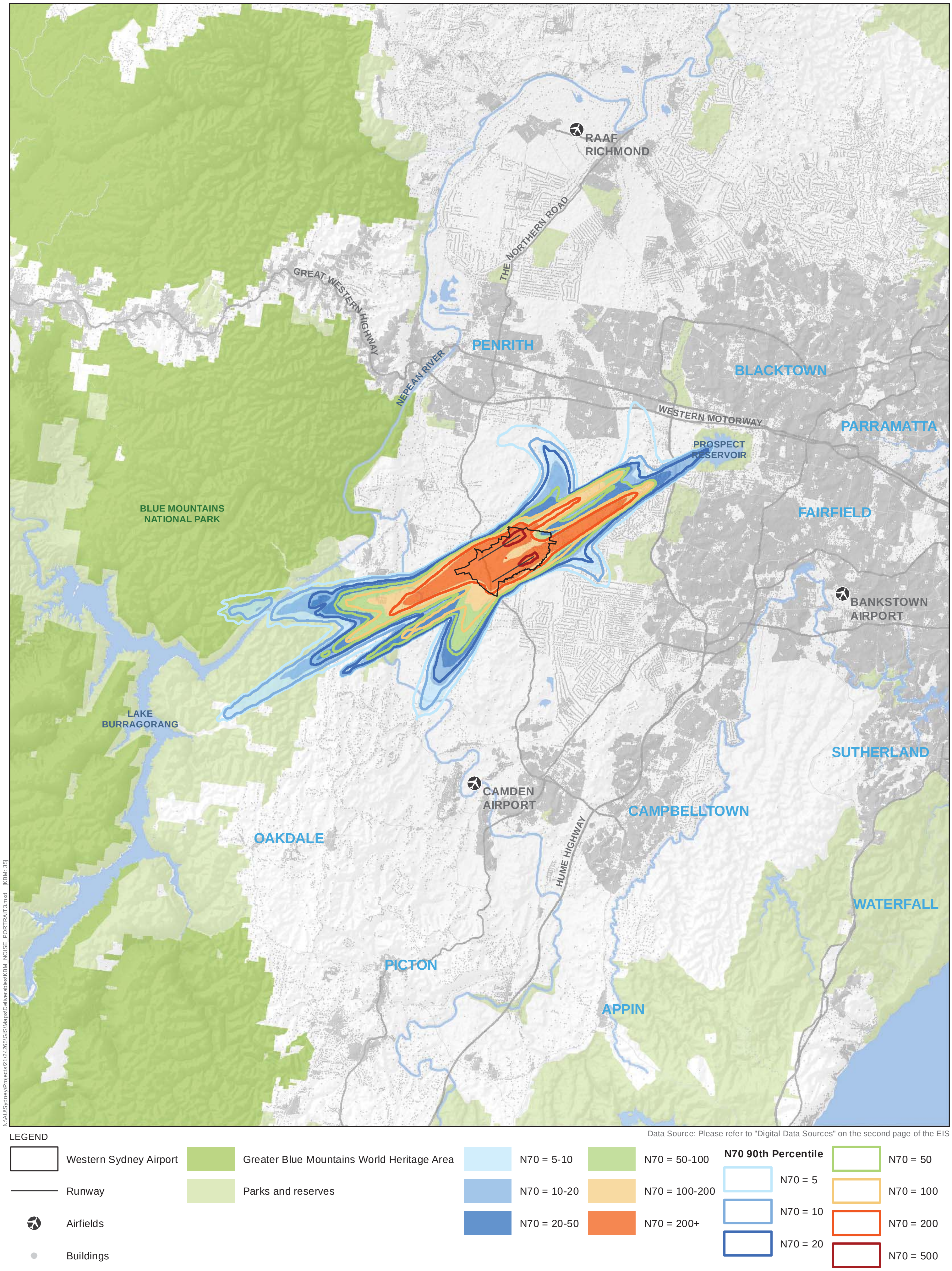
- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves
- N70 = 5-10
- N70 = 10-20
- N70 = 20-50
- N70 = 50-100
- N70 = 100-200
- N70 = 200+

N70 90th Percentile

- N70 = 5
- N70 = 10
- N70 = 20
- N70 = 50
- N70 = 100
- N70 = 200
- N70 = 500

0 2.25 4.5 9
Kilometres

Figure 31-32 - 90th percentile N70 contours for Prefer 05 operating strategy (2063)



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 31-33 - 90th percentile N70 contours for Prefer 23 operating strategy (2063)

31.4.4. Night-time noise

31.4.4.1. N60 results – 2063

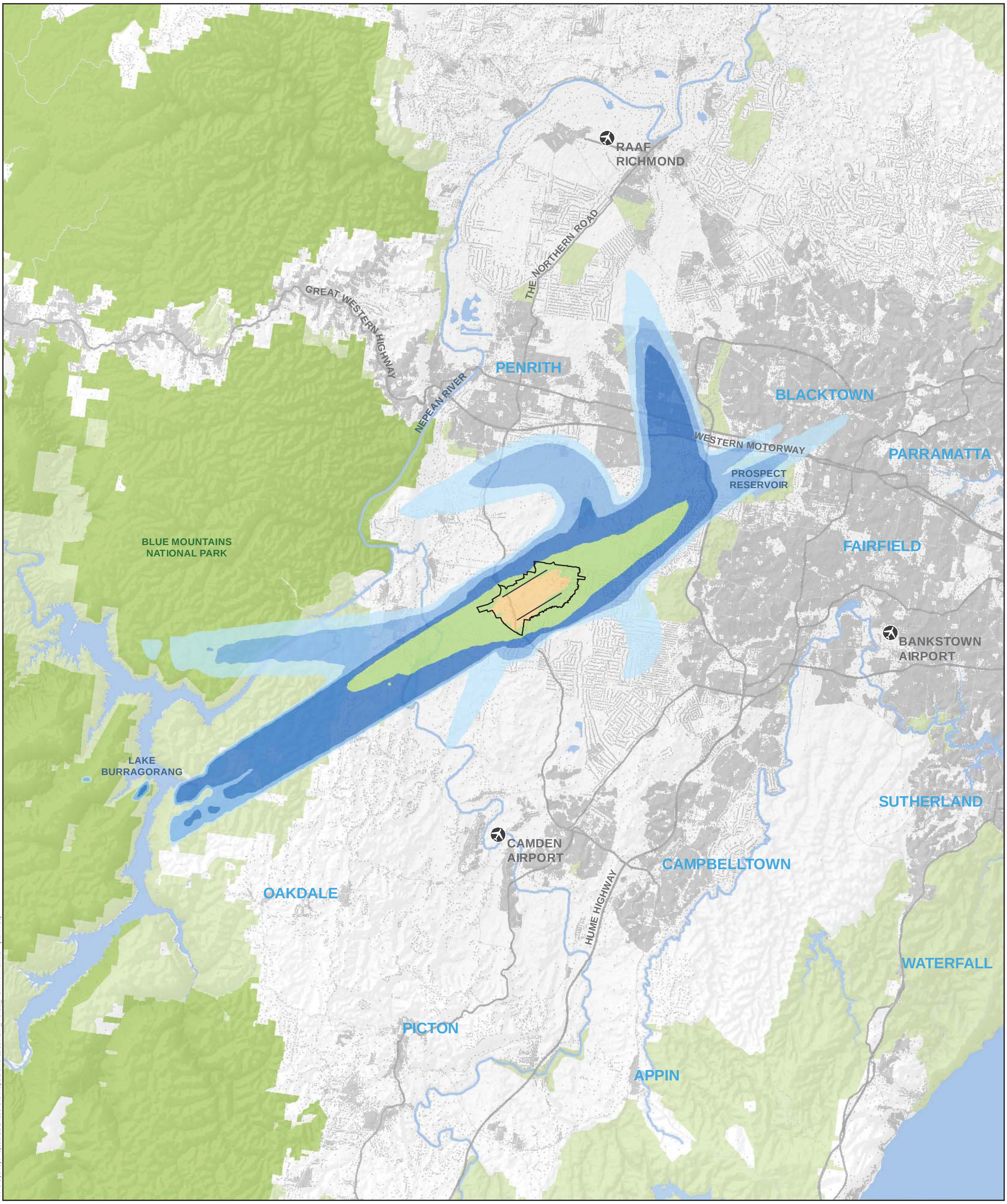
The average 2063 night-time N60 contours for operating strategies Prefer 05 and Prefer 23 respectively are shown on Figure 31-34 and Figure 31-35. In either operating strategy, built-up residential areas would be affected by more than 10 events per night exceeding 60 dBA, but the extent of impact is greater in the Prefer 05 case. Additional areas to the north of the airport site including Mount Vernon and Kemps Creek are included within the N60 = 50 – 100 contour under the Prefer 05 operating strategy. Conversely, rural residential areas to the south and west of the airport such as Silverdale would be more affected under the Prefer 23 strategy. Areas in close proximity to the airport site including Luddenham and Greendale remain affected largely in accordance with the 2050 scenario.

Table 31–9 shows the number of people estimated to be affected by night time noise above 60 dBA in 2063. More residents are predicted to be affected by noise events above 60 dBA under the Prefer 05 operating strategy. However, it should be noted that analysis for 2063 does not consider the use of alternative night time operating modes for noise mitigation purposes. As noted at Section 1.2, the use of alternative operating modes, such as a “Head to Head”, may result in a lower number of residents exposed to noise levels above 60 dBA.

Table 31–9 – Estimated population within N60 contours – 2063

N60	Operating strategy	
	Prefer 05	Prefer 23
5–10	81,333	10,509
10–20	45,372	43,963
20–50	68,963	42,097
50–100	5,313	8,236
>100	0	0
Total	**200,981**	**104,805**

The 90th percentile night-time N60 values for 2063 are presented in Appendix E1 of Volume 4 and show the number of events per night exceeding 60 dBA on a worst case night. For the Prefer 05 operating strategy, the worst case contours cover substantially more area than the average contours, while in the Prefer 23 strategy, the impacted areas are almost the same.



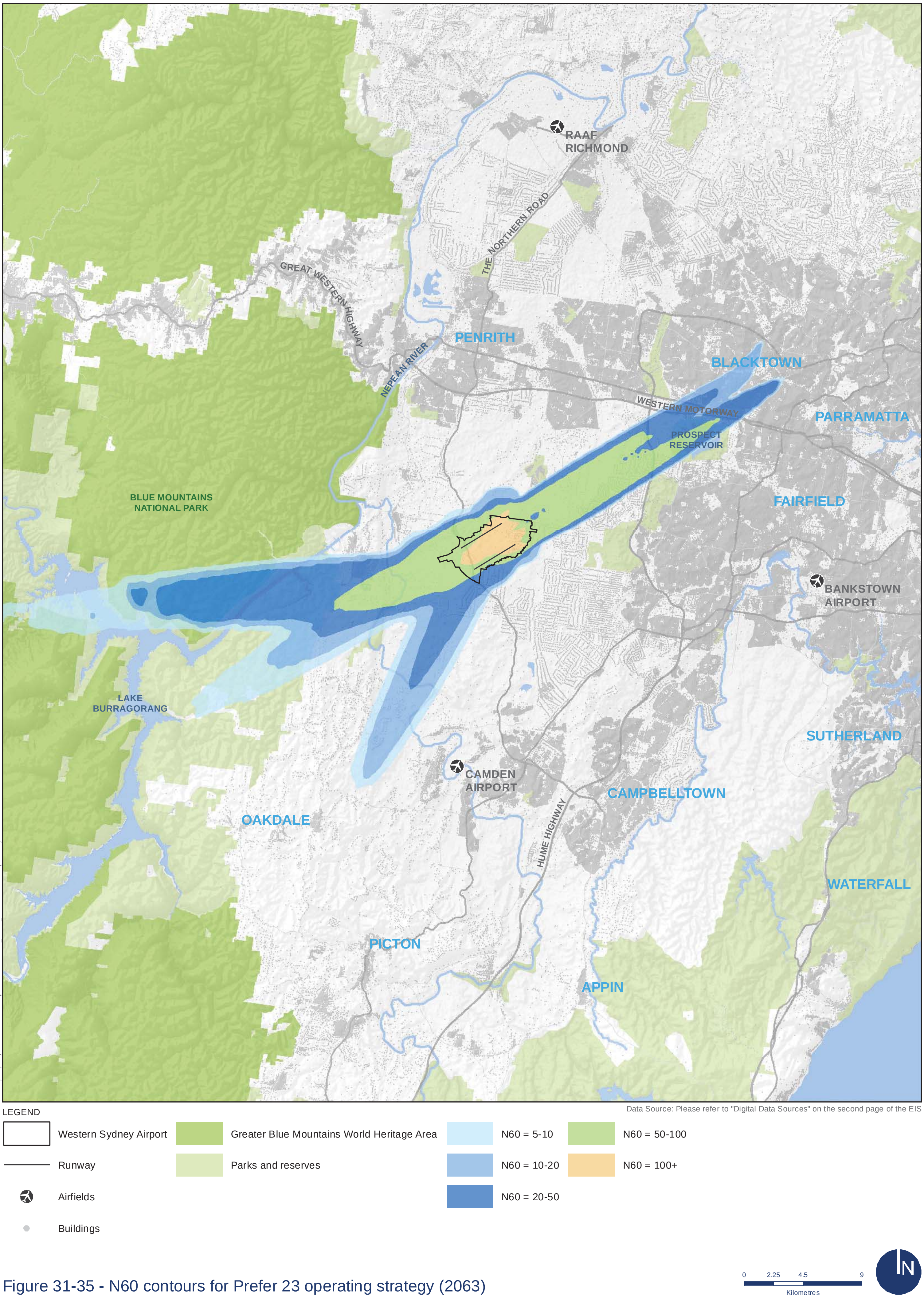
LEGEND

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves
- N60 = 5-10
- N60 = 10-20
- N60 = 20-50
- N60 = 50-100
- N60 = 100+

0 2.25 4.5 9
Kilometres

Figure 31-34 - N60 contours for Prefer 05 operating strategy (2063)



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

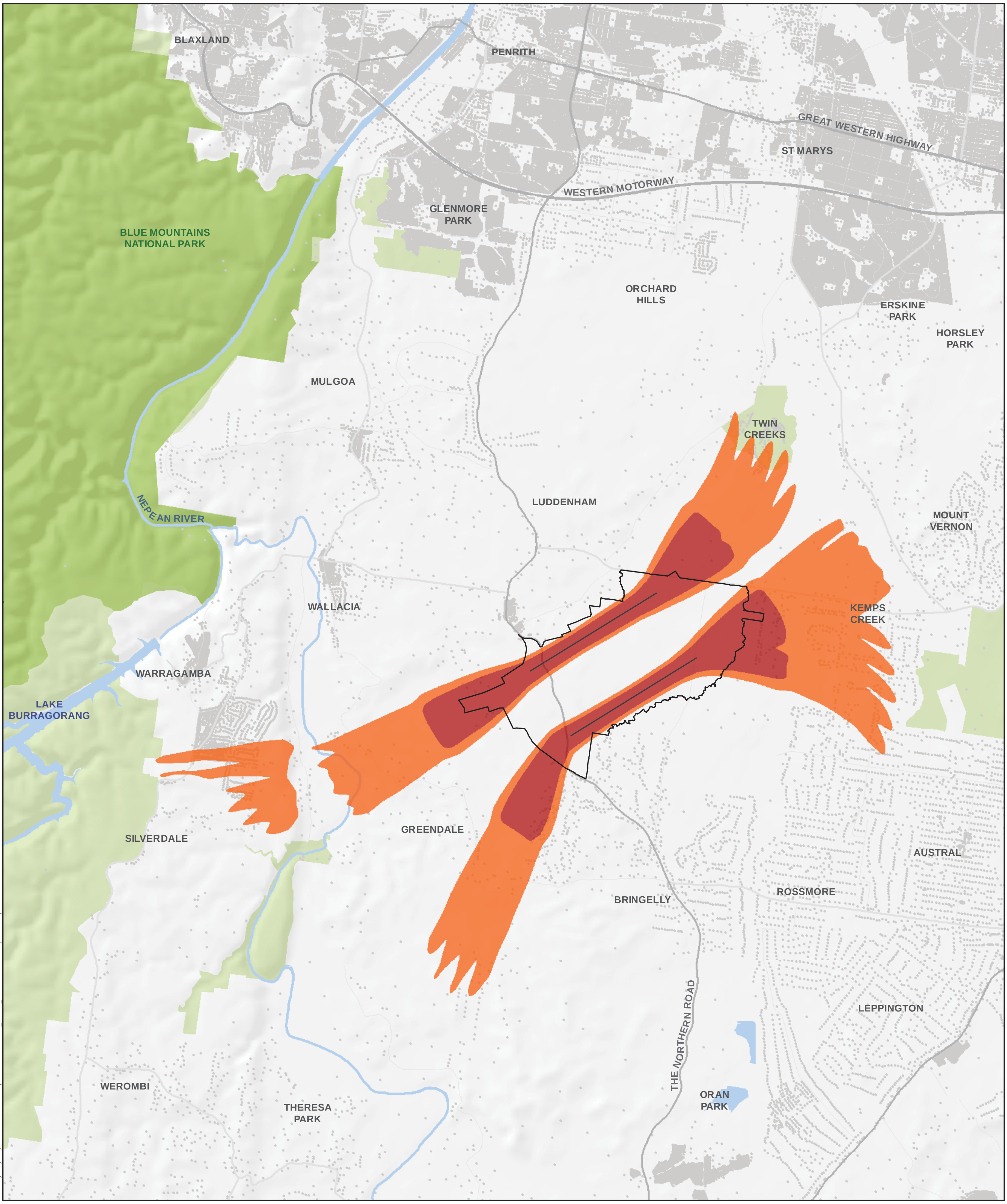
Figure 31-35 - N60 contours for Prefer 23 operating strategy (2063)

31.4.5. Noise induced vibration

At high noise levels, the low frequency components of aircraft noise can cause vibration in loosely fixed building elements, such as windows.

Even at the highest expected noise levels the levels of vibration due to low frequency noise would be well below those which may cause structural damage to buildings. With typical light building structures, noise induced vibration may begin to occur where the maximum external noise level reaches approximately 90 dBA. The effect is more common on take-offs than for landings because the noise spectrum for a take-off near the airport has stronger low frequency components.

Figure 31-36 shows 85 dBA and 90 dBA noise level contours for a Boeing 747 aircraft departure (maximum stage length). Only areas within the 90 dBA contour could expect to experience any noise-induced vibration of building structures, and even then only during the departure of a Boeing 747 aircraft with maximum stage length. Although modelled for assessment purposes, this aircraft type is not expected to be operating at a Western Sydney Airport in 2063.



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

LEGEND

- Western Sydney Airport
- Runway
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

LAmax

- 85-90 dBA
- >0 dBA

0 0.75 1.5 3
Kilometres

Figure 31-36 85 dBA and 90 dBA LAmax contours B747 Departure 2063 long term development

31.5. Ground-based noise

31.5.1. Approach

Ground based operational noise is primarily associated with aircraft engine ground running which is required infrequently for maintenance purposes and aircraft taxiing between the terminal building and the departure or arrival runway. Other sources of noise from within the airport are not considered to significantly contribute to potential noise impacts at nearby receivers.

Ground-based noise levels are not expected to change significantly between the proposed Stage 1 development and the maximum single runway scenario in 2050. It is not anticipated that taxiing and engine run-up noise levels would increase, but these types of noise may become more frequent in the 2050 scenario. The assessment for the proposed Stage 1 development discussed in Chapter 11 of Volume 2 is also considered generally appropriate for the 2050 scenario.

The long term development anticipates the commissioning of a second runway some time before 2063. A second runway would be accompanied by increased aircraft activity and additional noise sources in the south-eastern portion of the site as shown in Figure 31-37. The assessment of ground-based noise for a long term development has therefore focused on the 2063 scenario.

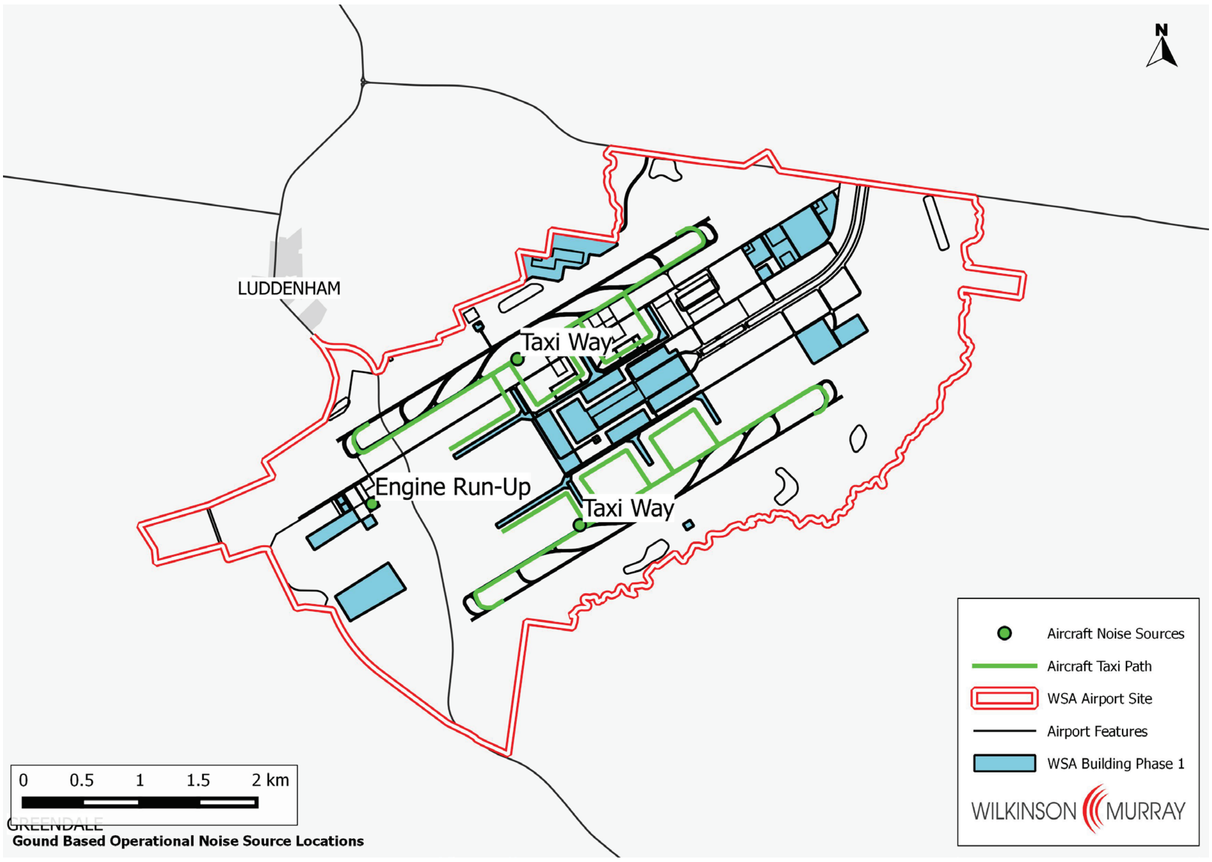


Figure 31-37 – Ground-based noise sources

The approach to the assessment of ground-based noise involves consideration of typical worst case conditions, including a ground-based temperature inversion. It should also be noted that no allowance has been made for any potential reduction in aircraft noise levels over time and the predictions discussed are based on known aircraft noise levels. The methodology for the assessment of airport operational noise presented in Chapter 11 of Volume 2 is applicable to the long term development.

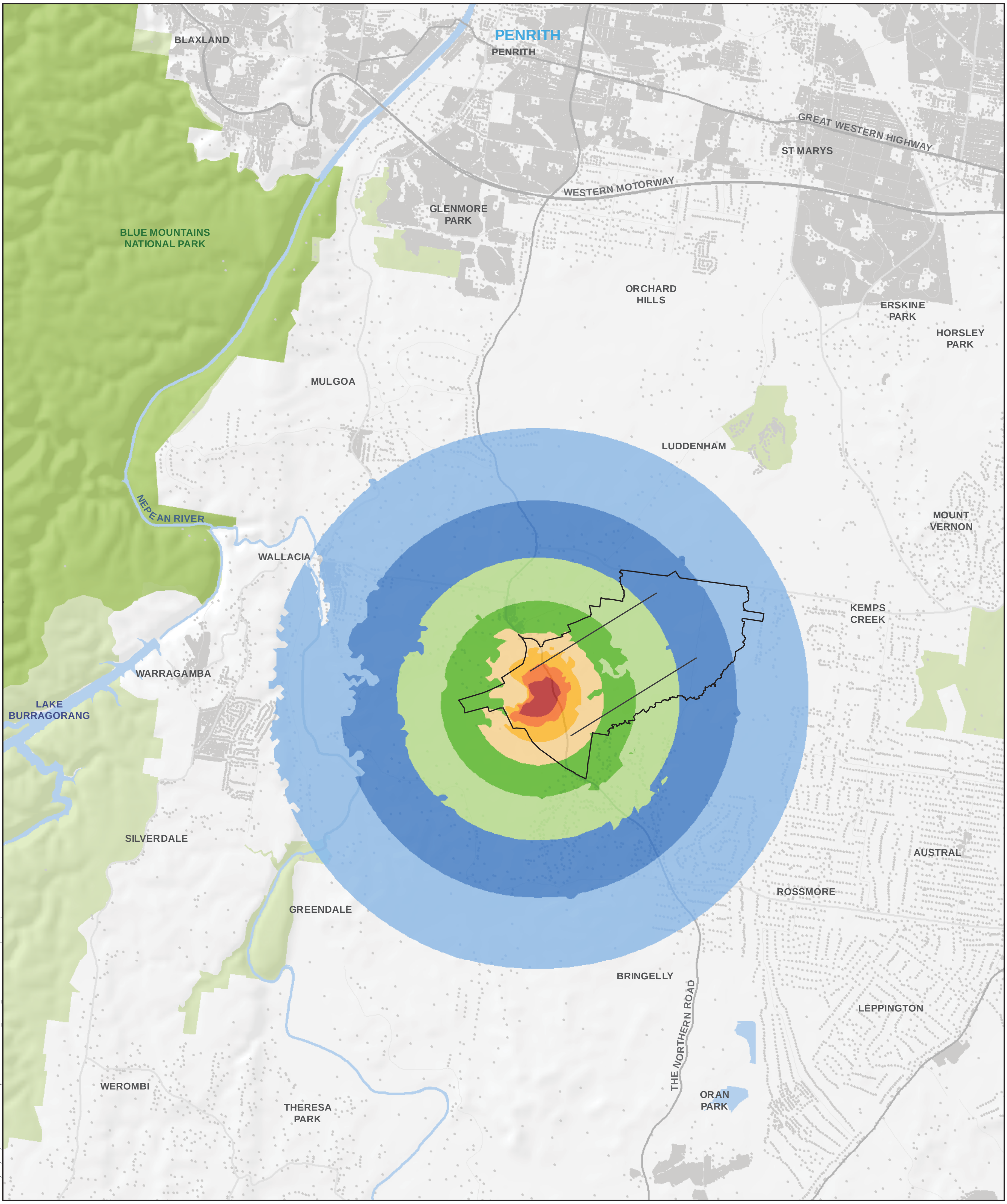
Potential construction noise and vibration impacts associated the expansion of the airport beyond the proposed Stage 1 development have not been assessed. Construction beyond the Stage 1 development would be progressive and noise assessed as part of the approval process for any future major airport development under the Airports Act. It is however noted that construction beyond 2030 would occur in the context of an operating airport and that the background noise environment would be substantially different compared to today.

31.5.2. Assessment

The indicative long term development of the proposed airport would involve the construction of a second parallel runway, most likely around 2050 when annual passenger movements reach approximately 37 million. Availability of a second runway would facilitate the adoption of different airport operating modes as well as a larger number of aircraft movements, resulting in more ground-based activity at the airport. Ground-based noise levels have been predicted and the resulting contours are shown in Figure 31-38 and Figure 31-39.

Engine ground running noise is not predicted to change substantially over time and may be shielded by additional buildings that would be constructed for the long term development. The 2063 aircraft taxiing noise contours reflect the increased number of aircraft movements and would extend further south as a result of the commissioning of the second runway. Ground run-up noise would also likely occur more frequently in the long term, although the noise contours are not predicted to change based on the modelling assumptions adopted for this assessment. For example, the assessment is based on aircraft types that are commonplace today and does not account for new generation quieter aircraft that would be introduced well before 2063. The assessment can therefore be considered conservative.

Figure 31-38 and Figure 31-39 show that elevated noise levels would be experienced in the immediate vicinity of the proposed airport, particularly around Luddenham.



LEGEND

Western Sydney Airport

Runway

Buildings

Greater Blue Mountains World Heritage Area

Parks and reserves

LAeq, 15min

- 45-50 dBA
- 50-55 dBA
- 55-60 dBA
- 60-65 dBA
- 65-70 dBA
- 70-75 dBA
- 75-80 dBA
- >80 dBA

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 31-38 - Maximum noise level for engine run up (2063)

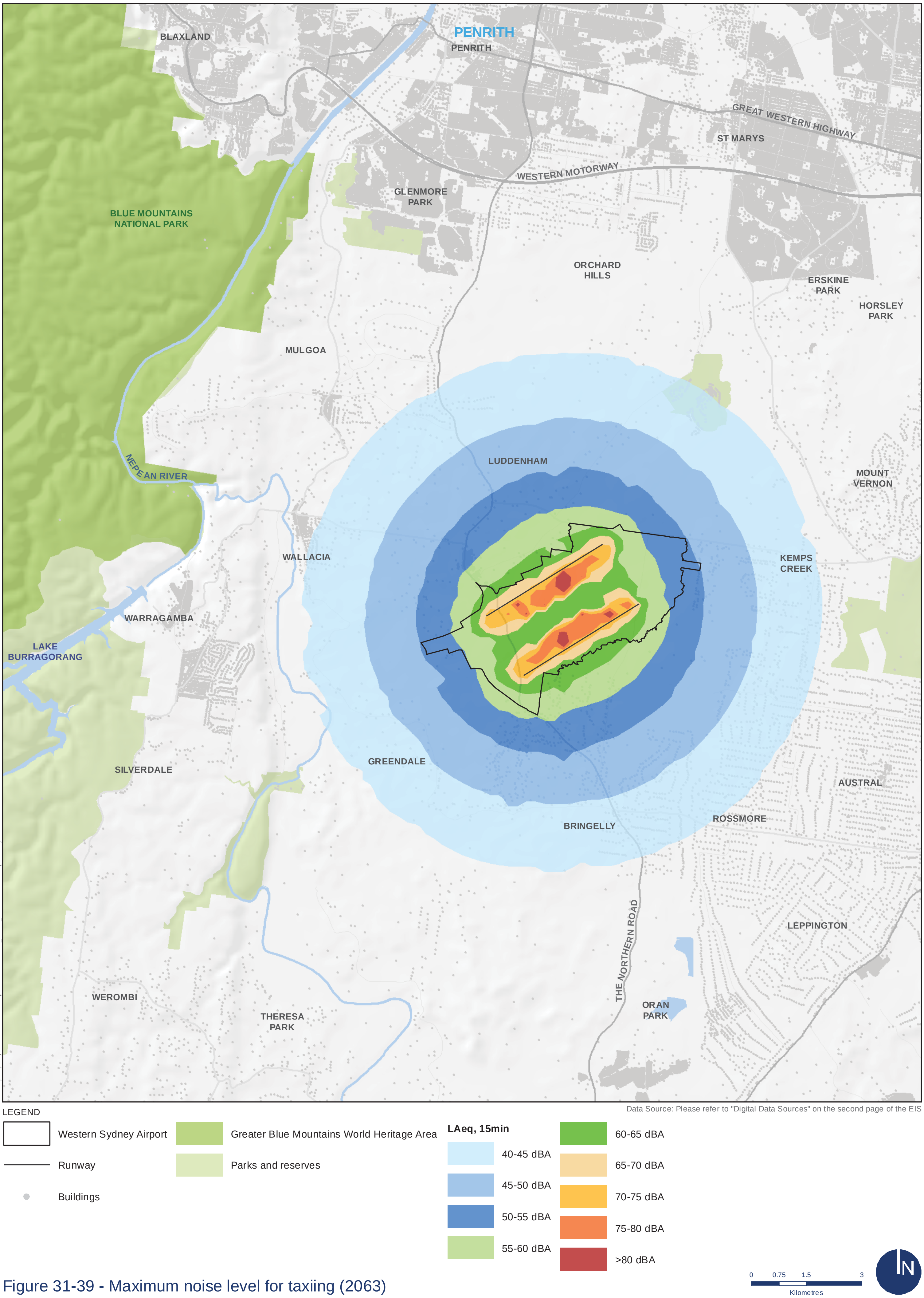


Figure 31-39 - Maximum noise level for taxiing (2063)

31.6. Considerations for future development stages

The identification of potential airport operating modes, including noise abatement opportunities, would be an important consideration in the future formal airspace design process to be undertaken closer to the proposed commencement of operations. Other approaches to mitigating aircraft overflight noise generally focus on reducing noise emissions from the aircraft themselves, planning flight paths in a way that minimises potential noise and environmental impacts and provides respite periods, together with implementing land use controls and other operating practices (e.g. use of continuous descent approaches, restrictions on use of reverse thrust at night, etc.).

It is expected that land use and planning around the proposed airport would be influenced by the development of an official ANEF chart as part of the future airspace design process. It is envisaged that planning controls based on a long term development scenario would be implemented prior to the introduction of dual runway operations in order to promote appropriate development in the vicinity of the proposed airport.

The National Airports Safeguarding Framework (NASF) provides land use planning guidance and principles and guidelines in order to:

- improve community amenity by minimising aircraft noise-sensitive developments near airports including through the use of additional noise metrics and improved noise-disclosure mechanisms; and
- improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety-related issues.

31.7. Summary of findings

Assessment of the noise impacts associated with a long term development scenario for the proposed airport has considered both aircraft overflight and ground based noise.

The flight paths and procedures to be used by aircraft using the proposed airport (either the single runway or the long term two-runway configuration) are indicative and would require further detailed consideration before being finalised. Other sources of uncertainty, such as noise emission levels from future aircraft types, and the role and pattern of movements at a dual runway airport, also reduce the certainty in predicting future impacts. The assessment does however broadly indicate the areas that may be impacted by aircraft noise in the long term.

For aircraft overflight noise, the following assessment scenarios were considered:

- 37 million annual passengers – which could be reached in about 2050 when the initial runway would likely be approaching its maximum capacity; and
- 82 million annual passengers – assumed to be reached in 2063, when the airport comprises two operating runways and both runways are operating close to capacity.

For the loudest aircraft operations (long-range departures by a Boeing 747 aircraft or equivalent), maximum noise levels over 85 dBA would be experienced at residential locations near the airport site. Maximum noise levels of 75–80 dBA are predicted within built-up areas in St Marys and Erskine Park. Maximum noise levels from more common aircraft types such as Airbus A320 or equivalent are predicted to be 60–70 dBA in built-up areas around St Marys and Erskine Park, and over 70 dBA in some areas to the south-west of the airport such as around Greendale.

The extent to which particular areas would be potentially exposed to aircraft noise would be strongly influenced by the airport operating strategies adopted, especially when operating a single runway at maximum capacity. In terms of total population, the ‘Prefer 05’ operating strategy (which gives preference to approaches and departures in a south-west to north-east direction) is predicted to have substantially more impact on existing residential areas than the ‘Prefer 23’ operating strategy, in which the opposite direction is preferred. Most residents that would be affected under the ‘Prefer 05’ strategy are in suburbs to the north of the airport site, including St Marys and Erskine Park. Predominantly rural-residential areas to the south-west, including Greendale and parts of Silverdale would be affected under the ‘Prefer 23’ strategy. Adoption of ‘Head to Head’ operations would also slightly reduce the number of residents affected.

For night-time operations in 2050, the operating strategy with least impact is ‘Prefer 23 with Head-to-Head’. Other operating strategies are predicted to result in substantially greater numbers of residents being affected by night-time noise, and in particular, a ‘Prefer 05’ strategy would result in large parts of St Marys experiencing more than 20 aircraft noise events per night above 60 dBA.

The operating strategies would have less influence following the implementation of operations on the second runway. Despite the forecast number of movements at the airport approximately doubling between 2050 and 2063, there are fewer densely populated areas currently located within the noise affected areas for the 2063 scenario, particularly for the Prefer 05 operating strategy. The reason is that movements can be spread between two runways and the locations of flight paths are less constrained in the two runway scenario. The total number of residents affected may increase in the future as a result of population growth and ongoing housing development over the next 50 years. The continuation of existing planning controls will limit the potential for new residential development to be impacted by a progressive increase in usage of the airport.

Australian Noise Exposure Concept (ANEC) contours for the indicative long term development are similar to those for the single runway airport in 2050, although they extend over a somewhat larger area to the south as a result of operation of the second runway. For the 2063 scenario, the 20 ANEC contour does not enclose any existing built-up residential areas, such as townships of Warragamba and Silverdale.

The identification of potential noise abatement operating strategies would be an important consideration in the future formal airspace design process to be undertaken closer to the proposed commencement of operations. Within five years of an airport lease being granted, the ALC will be required to submit for approval a draft master plan including a ANEF and an environment strategy to manage noise emissions from the operation of the proposed airport. The masterplan is required to be updated on a five yearly basis and will involve ongoing consideration of strategies to manage noise emissions from the site.

Other approaches to mitigating aircraft overflight noise generally focus on reducing noise emissions from the aircraft themselves, planning flight paths in a way that minimises potential noise and environmental impacts and provides respite periods, together with implementing land use planning controls and other relevant operating practices.

Noise impacts associated with aircraft operations at the proposed airport would likely be monitored using the noise and flight path monitoring system operated by Airservices Australia.