Executive Summary

Introduction to Western Sydney Airport

On 15 April 2014 the Australian Government announced that the Commonwealth-owned land at Badgerys Creek will be the site for a second Sydney airport. The Badgerys Creek airport site was selected following extensive studies completed over a number of decades and culminating in the release of the *Joint Study on Aviation Capacity in the Sydney Region* (Joint Study) (Department of Infrastructure and Transport 2012) in March 2012 *and A Study of Wilton and RAAF Base Richmond for Civil Aviation Operations* (DIT 2013) (the Wilton and Richmond Study) in April 2013.

The proposed Western Sydney Airport (proposed airport) will cater for ongoing growth in demand for air travel, particularly in the rapidly expanding Western Sydney region, as well as providing additional aviation capacity in the Sydney region more broadly. An airport in Western Sydney would also provide long term economic and employment opportunities in the surrounding area and accelerate the development of critical infrastructure and urban development. The proposed airport is planned to be operational by the mid-2020s and would service both domestic and international markets. Development would be staged in line with ongoing growth in aviation demand.

- Catering for increasing demand for air travel in Western Sydney and the broader Sydney region, the proposed Western Sydney Airport will be capable of handling initially around 10 million passengers per year, similar to Adelaide Airport today, increasing to 82 million by about 2063. It would also provide critical additional aviation capacity within the Sydney basin as Sydney Airport becomes increasingly constrained over the coming decades.
- The estimated workforce during construction of Stage 1 would be expected to peak at around 700 to 800 jobs in the 2020s. Cumulatively, construction of the proposed airport would generate approximately 3,200 person- years[1] of direct employment. In addition, there would be indirect and induced employment in Western Sydney for approximately 8,000 person-years over the construction period to the commencement of operations in the mid-2020s. During the same period, the proposed airport would generate an additional 2,200 person-years of indirect and induced employment in the Greater Sydney Metropolitan region.
- There would be an estimated 8,730 direct jobs generated during operations at the proposed airport in the early 2030s.
- Over the long term, by around 2063, the airport is anticipated to deliver about an estimated 61,500 direct jobs at the airport site.

The airport site covers an area of approximately 1,780 hectares at Badgerys Creek in Western Sydney, as shown in Figure ES–1. The airport site is located within the Liverpool local government area (LGA), around 50 kilometres west of Sydney's central business district (CBD) and 15 to 20 kilometres from major population centres including Liverpool, Fairfield, Campbelltown and Penrith, and 30 kilometres from Parramatta.

[1] *Person-years is a measure of employment which accounts for the employment of one person in a full-time capacity for one year. It provides a consistent basis for accounting for employment where, for example, one person might be employed full time for five years or five different people working in different roles of one year each (both of which would be 5 person years).*

The Northern Road transects the western end of the airport site and Elizabeth Drive borders the airport site to the north. Badgerys Creek flows in a north-easterly direction and forms the south-eastern boundary of the airport site. The airport site is located on undulating land that has been extensively cleared, with the exception of stands of remnant vegetation located predominantly along Badgerys Creek and in the south-western portion of the site.

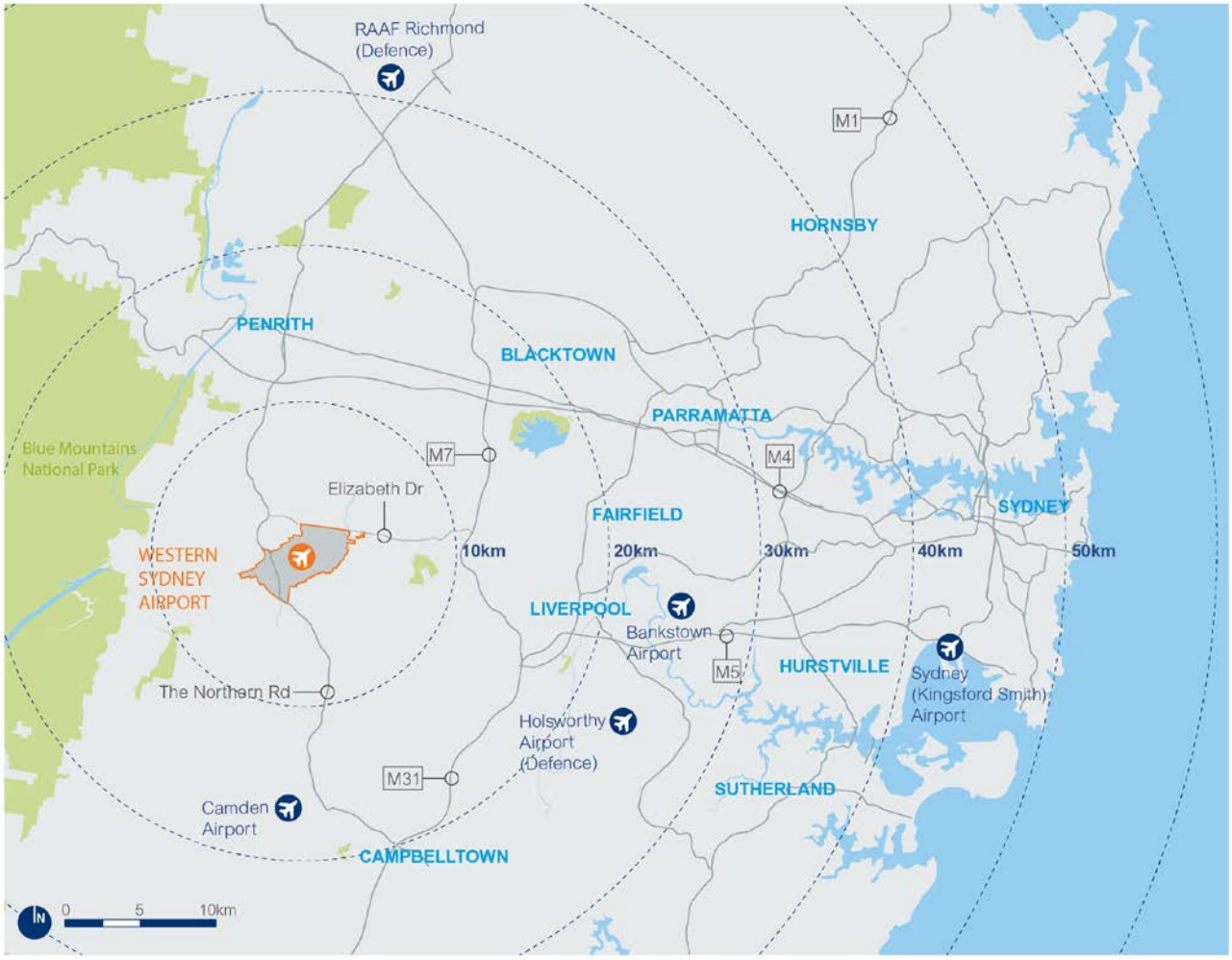


Figure ES–1 Location of the proposed Western Sydney Airport

Historical context

The need and potential location for a second airport in the Sydney region have been considered periodically since 1946. A summary of the major studies and key milestones in the selection of Badgerys Creek as the location of the proposed airport is shown in Figure ES–2.

Badgerys Creek was first identified as a preferred site in the *Major Airport Needs of Sydney* (MANS) study (MANSSC 1979). The MANS study assessed sites within a number of zones including a northern zone (near Scheyville, Nelson and Galston), north-western zone (near Richmond and Londonderry), south-western zone (near Badgerys Creek and Bringelly) and a southern zone (in the Holsworthy Military Area). The study identified Badgerys Creek as the preferred site on environmental, economic and financial grounds.

Badgerys Creek was again identified as the preferred site for a second airport in the *Second Sydney Airport Site Selection Programme Draft Environmental Impact Statement* (Kinhill Stearns 1985) (1985 EIS). The programme evaluated 10 sites: Badgerys Creek, Bringelly, Darkes Forest, Goulburn, Holsworthy, Londonderry, Scheyville, Somersby, Warnervale and Wilton. Badgerys Creek and Wilton were short listed through this process and the two sites were subsequently assessed in an environmental impact statement (EIS), with Badgerys Creek again identified as the preferred site.

Badgerys Creek was first formally announced as the site for a major airport by the Australian Government in 1986. Land acquisitions made at Badgerys Creek from the mid-1980s form the basis of the current airport site. The land acquired has remained in Commonwealth ownership since that time.

In January 1996, the Australian Government announced that an EIS would be prepared for the construction and operation of a second Sydney airport at Badgerys Creek. The scope of the environmental assessment process was broadened to include an alternative to the Badgerys Creek site at Holsworthy Military Area, but this was subsequently ruled out as an option on environmental grounds. The *Environmental Impact Statement Second Sydney Airport Proposal* (PPK 1997) (1997–99 EIS) assessed the environmental, social and economic impacts of constructing and operating a second major airport at Badgerys Creek. In providing recommendations and advice on the 1997–99 EIS, the then Minister for the Environment found that there were no insurmountable challenges to developing an airport at Badgerys Creek.

More recently, Badgerys Creek was identified as the preferred site in the Joint Study (Department of Infrastructure and Transport 2012). The study assessed 80 sites across 18 locations including Wilberforce, Somersby, Wilton, Luddenham and Badgerys Creek. An airport at Wilberforce was discounted as it would likely require closure of RAAF Base Richmond, while Somersby was discounted due to conflict with Sydney Airport airspace. Wilton was considered too far from most airport users to justify the development of an airport. Both Luddenham and Badgerys Creek were considered to be geographically well placed in relation to growth areas, with Badgerys Creek the preferred choice. The Wilton and RAAF Base Richmond Study (Department of Infrastructure and Transport 2013) subsequently supported these findings, noting a ‘clear preference’ within the aviation industry for an airport at Badgerys Creek.

1946
First investigation into the best site for further airport development in/around Sydney considers three options including a site at Towra Point and expansions of existing airports at Bankstown and Mascot.

1969
Advisory committee to the Australian Government considers 11 potential sites for a second airport, including a site at Badgerys Creek.

1971
Advisory committee narrows potential locations to sites in Richmond, Somersby, Duffys Forest and Wattamolla.

1972
Benefit-cost analysis undertaken of an additional 106 sites. Assessment reduces the number of sites to five potential sites: Towra Point, Rouse Hill/Nelson, Long Point, Marsden Park and Bringelly.

1973
Government announces that Galston has been selected as the site for a potential second airport (decision reversed in 1974 following further consideration).

1976
Major Airport Needs of Sydney Study Committee convened as a joint initiative by the Federal and State governments. Study considers six sites including Londonderry, Scheyville, Austral, Long Point, Bringelly and Badgerys Creek.

1979
Preliminary report released by the Major Airport Needs of Sydney Study Committee. Scheyville and Badgerys Creek shortlisted as potential sites, but development could not be justified before a third runway at Sydney Airport.

1982
Third runway at Sydney Airport announced (decision reversed in 1983).

1983
New programme announced to identify a site for a second airport in Sydney (the Second Sydney Airport Site Selection Programme). Ten sites re-examined: Bringelly, Darkes Forest, Goulburn, Holsworthy, Londonderry, Scheyville, Somersby, Warnervale, Wilton and Badgerys Creek.

1985
Wilton and Badgerys Creek assessed in detail in Second Sydney Airport Site Selection Programme Draft Environmental Impact Statement.

1986
Badgerys Creek announced as the site of the second airport. Acquisition of land begins (completed by 1991).

1991
Decision made to proceed with the construction of a third runway at Sydney Airport and an initial development of a general aviation airport at Badgerys Creek.

1994
Third runway at Sydney Airport opens and the plans to develop the Badgerys Creek site are expanded to provide an international standard airport in time for the Sydney 2000 Olympics.

1996
Government announces that an EIS will be prepared for the development of a second Sydney airport at Badgerys Creek. Scope subsequently broadened to include a potential site at Holsworthy Military Area.

1997
Holsworthy Military Area ruled out on environmental grounds and draft EIS released for public comment prior to finalisation in 1999.

2000
Further development of a potential second airport at Badgerys Creek put on hold.

2004–08
Further consideration of other potential sites by the Australian and NSW governments, including Well's Creek, Camden, RAAF Base Richmond and expansion of the existing Canberra Airport.

2009
Joint Australian and NSW government steering committee appointed to guide a Joint Study on Aviation Capacity for the Sydney Region (the Joint Study).

2012
The Joint Study is released and concludes that an additional airport would be needed from around 2030 and that out of 80 sites considered, Badgerys Creek would be the most logical and cost effective site.

2013
Study into the suitability of Wilton as a second airport and limited civil operations at RAAF Base Richmond supported previous findings that Badgerys Creek would be the most economically viable options for further development.

2014
Australian government announces that Badgerys Creek will be the site for a second airport for Sydney. Department of Infrastructure and Regional Development start preparing EIS.

2015
EIS public exhibition

2016
Publication of final EIS

Figure ES–2 Key milestones in the development of the proposed Western Sydney Airport

Most recently, on 15 April 2014, the Australian Government announced that the Commonwealth owned land at Badgerys Creek will be the site for a second Sydney airport. The announcement was followed by the Western Sydney Infrastructure Plan, committing $3.6 billion over ten years to major road upgrades in Western Sydney to relieve pressure on existing infrastructure and provide connectivity to the airport before operations commence.

The need for a new airport

The need for development of the proposed airport is driven by the continued growth in demand for aviation services in Western Sydney and the Sydney region more broadly and physical constraints at the existing Sydney Airport.

Aviation services are critical to a well-functioning developed country like Australia. Efficient access to air services for passenger travel and high-value freight is essential to ensure that Sydney remains an international commercial and financial centre and keeps its place as Australia's foremost tourist destination.

Sydney Airport has limited ability to handle further passenger growth due to the physical constraints at the existing site. The limitations of existing infrastructure are becoming apparent at peak times and are expected to become more pronounced over the coming decades.

According to the 2012 *Joint Study on Aviation Capacity in the Sydney Region* (Joint Study) (Department of Infrastructure and Transport), in the absence of additional aviation capacity in the Sydney region:

- by 2020, all weekday slots for periods at Sydney Airport between 6.00 am and 12 noon and between 4.00 pm and 7.00 pm would be fully allocated;
- by around 2027, all slots at Sydney Airport would be allocated, so new entrants cannot be accommodated, unless another service were cancelled; and
- by around 2035, there would be practically no scope for further growth of regular passenger services at Sydney Airport.

Demand for aviation services is anticipated to continue to increase to service Sydney's ongoing growth in population and business activities. Any shortfall in capacity to meet demand would affect future economic growth, productivity, employment, lifestyle and amenity. Notably, the Joint Study found that the economic cost of not meeting the expected increased demand would be substantial.

By 2060, the economy-wide (direct and flow-on) impacts of failing to meet the expected demand across all sectors of the Australian economy could total $59.5 billion in foregone expenditure and $34.0 billion in foregone gross domestic product (based on 2010 dollars). The NSW economy would be especially heavily affected, with losses across all industries totalling $30.6 billion in foregone expenditure and $17.5 billion in foregone gross state product.

Strategic alternatives to developing a new airport in Western Sydney have been assessed over a long period of time. Commonly referenced alternatives include increasing the capacity of Sydney Airport or other existing airport facilities, establishing a new airport outside the Sydney basin or using high speed rail as a substitute for aviation services. While these alternatives have demonstrated potential to provide marginal capacity benefits, they would not replace the need for the proposed airport. Detailed studies have been undertaken over a number of decades to assess these alternative options and have consistently found that the most effective way to address increased aviation demand, while mitigating environmental and social impacts, is to develop a new airport at Badgerys Creek.

Growth in Western Sydney

As well as providing additional aviation capacity in the Sydney region, an airport at Badgerys Creek would provide access to aviation infrastructure and significant economic benefits for the fast growing Western Sydney region. Development of the proposed airport is expected to provide the current and future community with improved access to aviation services by reducing travel times, increasing destination choice and increasing competition.

Western Sydney is a dynamic multicultural region and is currently home to around 47 per cent of Sydney's population and nine per cent of Australia's population. Over the next 20 years, the population in Western Sydney will grow faster than other parts of Sydney, with almost one million more people expected to live west of Homebush by 2031 (DP&E 2014).

There are a number of key industries in the area that depend on access to air transport services and the development of a new airport is likely to trigger further growth in aviation dependent industry sectors given the availability of land, labour and transport linkages.

The south-west district is the fastest growing district in Sydney and a new airport would be a major catalyst for growth in investment, infrastructure and jobs throughout this area.

The need for a new EIS

Development of an airport at Badgerys Creek has been assessed through the preparation of two previous environmental impact statements. The 1997-99 EIS (PPK 1997) is the most recent comprehensive environmental assessment; it considered three separate options for the development of the airport site. Option A included a 50/230 degree runway orientation and location, substantially the same as currently proposed; however, the capacity of the airport site was limited to 30 million passengers annually.

In September 2014, SMEC Australia was commissioned by the Department of Infrastructure and Regional Development (the Department) to undertake an environmental field survey of the Commonwealth owned land at Badgerys Creek. The purpose of the field survey was to update the Australian Government's knowledge of flora and fauna, European and Aboriginal heritage and hydrology aspects of the site. The resulting report, *Environmental Field Survey of Commonwealth Land at Badgerys Creek* (SMEC 2014) found that the previous EISs, although comprehensive and useful as background information, were outdated due to changes in legislative requirements and obligations, best-practice and industry standard assessment methods, and threatened flora and fauna listings.

In addition, there have been substantial changes to the indicative design and operational parameters of the proposed airport, reflecting the changing nature of airports as centres of economic activity. As such, the Australian Government commenced a new environmental assessment for the proposed airport.

This EIS has been developed to assess the proposed airport in the context of an updated concept design, demand forecasts, regulatory framework (as outlined below) and the contemporary regional setting for Western Sydney. Where relevant, information from previous assessments such as the 1997-99 EIS (PPK 1997) has been used to support technical information required for this EIS. This EIS represents a comprehensive assessment of the likely environmental impacts of the proposed airport.

The proponent

The proponent for the development and operation of the proposed airport is the Australian Government Department of Infrastructure and Regional Development.

The Department is responsible for national policies and programmes that promote, evaluate, plan and invest in infrastructure and regional development, and foster an efficient, sustainable, competitive, safe and secure transport system for Australia. The Department administers the *Airports Act 1996* (Airports Act) (and its associated regulations) and the Infrastructure Minister is responsible for the approval of all major developments at federally leased airport facilities across Australia as defined by the Airports Act. The proposed airport would be developed and operated under the Airports Act. An airport lease would be granted by the Australian Government to an Airport Lessee Company (ALC), which would then become responsible for developing and operating the proposed airport.

The Australian Government is required to meet its obligations in relation to Sydney Airport Group's right of first refusal to develop and operate a second Sydney airport. This right was granted as part of the Government's sale of Sydney Airport in 2002 and is applicable to the proposed airport. The right of first refusal consists of a number of phases, including a consultation phase and a contractual phase.

If the Government decides to proceed with the project, a contractual offer (a 'Notice of Intention') would first be issued to Sydney Airport Group. Sydney Airport Group would then have the opportunity to exercise its option to develop and operate the airport. The Notice of Intention would set out the detailed terms for the development and operation of an airport at Badgerys Creek, including technical specifications, contractual terms and development timetables.

Should Sydney Airport Group decline the opportunity, the Australian Government may approach the market, or develop the proposed airport itself.

Regulatory framework

The proposed airport is one of the largest infrastructure projects considered in Australia in recent years and would be the first major new Australian airport development in decades.

Development of the proposed airport is subject to a Commonwealth environment and development approvals framework. Major airport developments at existing federally leased airports require approvals under the Airports Act, through the approval of major development plans submitted by an ALC.

As this process did not appropriately cater for development of an airport at a new site, the Australian Parliament passed amendments (*Airports Amendment Act 2015* – 'Airports Act amendments') to provide for a single and transparent mechanism to authorise Stage 1 of the proposed airport. The Airports Act amendments provide for the preparation of an 'Airport Plan' to guide the development of the airport, which is to be determined by the Infrastructure Minister. The finalisation of this EIS is a pre-condition to the determination of the Airport Plan under the Airports Act.

The Airports Act amendments strengthen the Environment Minister's role under the Airports Act in relation to the Airport Plan. This EIS has been prepared and will be finalised under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Department of the Environment, now called the Department of the Environment and Energy, issued guidelines for the content of a draft EIS for the proposed airport in January 2015.

A draft EIS was prepared to address the requirements of the EPBC Act and the EIS guidelines and released for public exhibition. This EIS has been finalised to take into account submissions received during the public exhibition period and provide any additional information that may be relevant to the Environment Minister's consideration of the environmental impacts of the proposal.

The revised draft Airport Plan sits alongside this EIS as a companion document. The revised draft Airport Plan specifies how Stage 1 of the proposed airport is to be developed on the airport site, while this EIS assesses the environmental, social and economic impacts associated with the Stage 1 development. This process is shown in Figure ES–3.

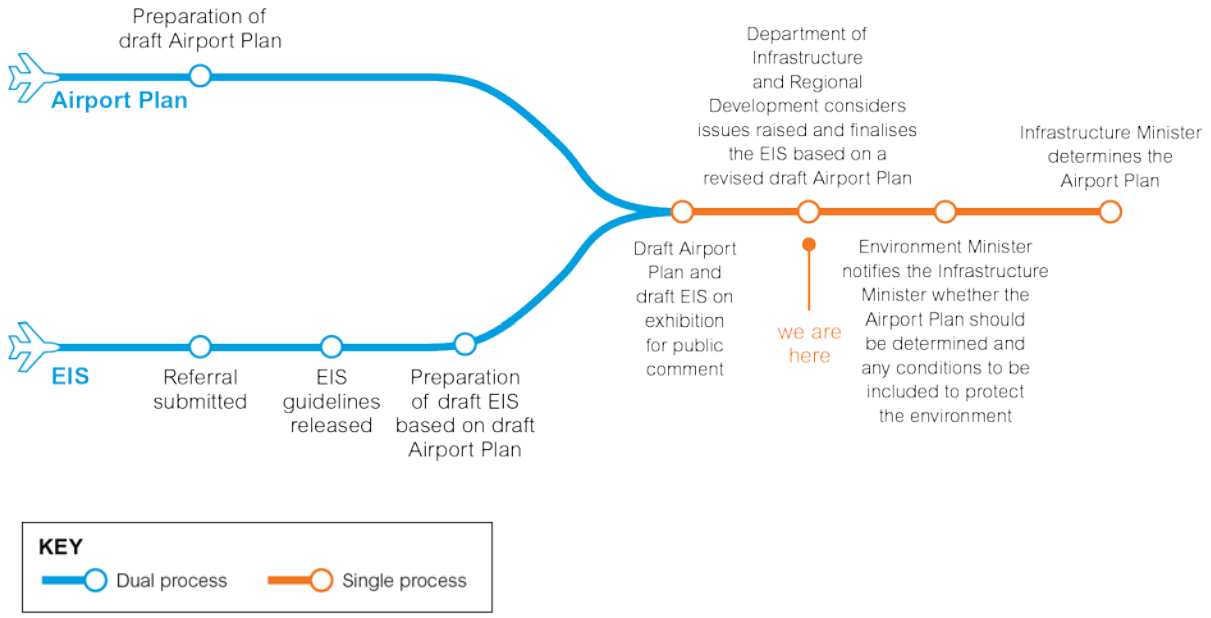


Figure ES–3 Proposed Western Sydney Airport approval process

This EIS, together with copies of comments received during the public exhibition period, will be given to the Environment Minister in accordance with section 104 of the EPBC Act. Before determining an Airport Plan, the Infrastructure Minister is required to provide a draft to the Environment Minister under section 96B of the Airports Act. The Environment Minister would then consider the finalised EIS and draft plan from an environmental perspective and notify the Infrastructure Minister whether the Airport Plan should be determined and, if it is determined, whether any specific conditions or provisions should be included for the purpose of protecting the environment. The Infrastructure Minister will then consider whether to determine the Airport Plan and, if determined, will include any specific conditions or provisions notified by the Environment Minister. The Infrastructure Minister in determining the Airport Plan may also impose conditions.

The role of an Airport Lessee Company

Once an airport lease is granted, the ALC would be responsible for implementing the proposal in accordance with the Airport Plan. The ALC would also be responsible for all future planning and development of the proposed airport in accordance with the Airports Act and other regulatory requirements.

Within the first five years of an airport lease being granted by the Commonwealth, or such longer period as allowed by the Infrastructure Minister, the ALC is required to submit for approval a master plan. Airport master plans provide a broad strategic overview of the intended development and use of an airport, and are subject to public consultation under the Airports Act. The Infrastructure Minister is able to refuse to approve a master plan that is not consistent with the Airport Plan.

All future development for the proposed airport must be consistent with the master plan and existing regulatory requirements contained in the Airports Act, including requirements for public consultation and approval of major development plans for major airport developments.

The Airport Plan

Stage 1 of a Western Sydney Airport would be constructed and operated in accordance with the Airport Plan, as determined, which provides for the Stage 1 development and a transitional planning instrument under the Airports Act. The Airport Plan can only be varied in accordance with the Airports Act. Under the Act, the Airport Plan consists of three main parts:

- Part 1 is the title section;
- Part 2 outlines the concept design for the airport; and
- Part 3 details the specific developments authorised by the Airport Plan.

The concept design outlined in Part 2 of the revised draft Airport Plan sets out the Government's development objectives, detailing the Stage 1 development and setting out the long term vision for the proposed airport. The Stage 1 development would establish airport facilities to provide an operational capacity for approximately 10 million domestic and international passengers per year, as well as freight traffic. This would cater for the predicted demand on opening as well as growth capacity for the first five years of operations.

The revised draft Airport Plan also refers to the potential long term development of the proposed airport. As aviation demand increases beyond 10 million annual passengers, additional aviation infrastructure and aviation support precincts would be developed as required.

It is anticipated that the proposed airport may eventually expand to include a second parallel runway on the same north-east/south-west orientation as the Stage 1 runway, with associated expansion in aviation support facilities. A second runway is expected to be required when the operational capacity approaches 37 million annual passengers, which is forecast to occur around 2050. Following development of the second runway, additional infrastructure, such as taxiways and increased terminal capacity, would be developed to support the long term passenger demand of approximately 82 million annual passengers, forecast to occur around 2063.

The Land Use Plan as presented in the revised draft Airport Plan (presented in Figure ES–4) would be applicable in the period between an airport lease being granted to an ALC and a master plan being developed by the ALC and approved by the Infrastructure Minister. The Land Use Plan regulates the types of development, in terms of permissible land uses, that can occur within the airport site. It also outlines land uses and indicative developments that would facilitate long term growth.

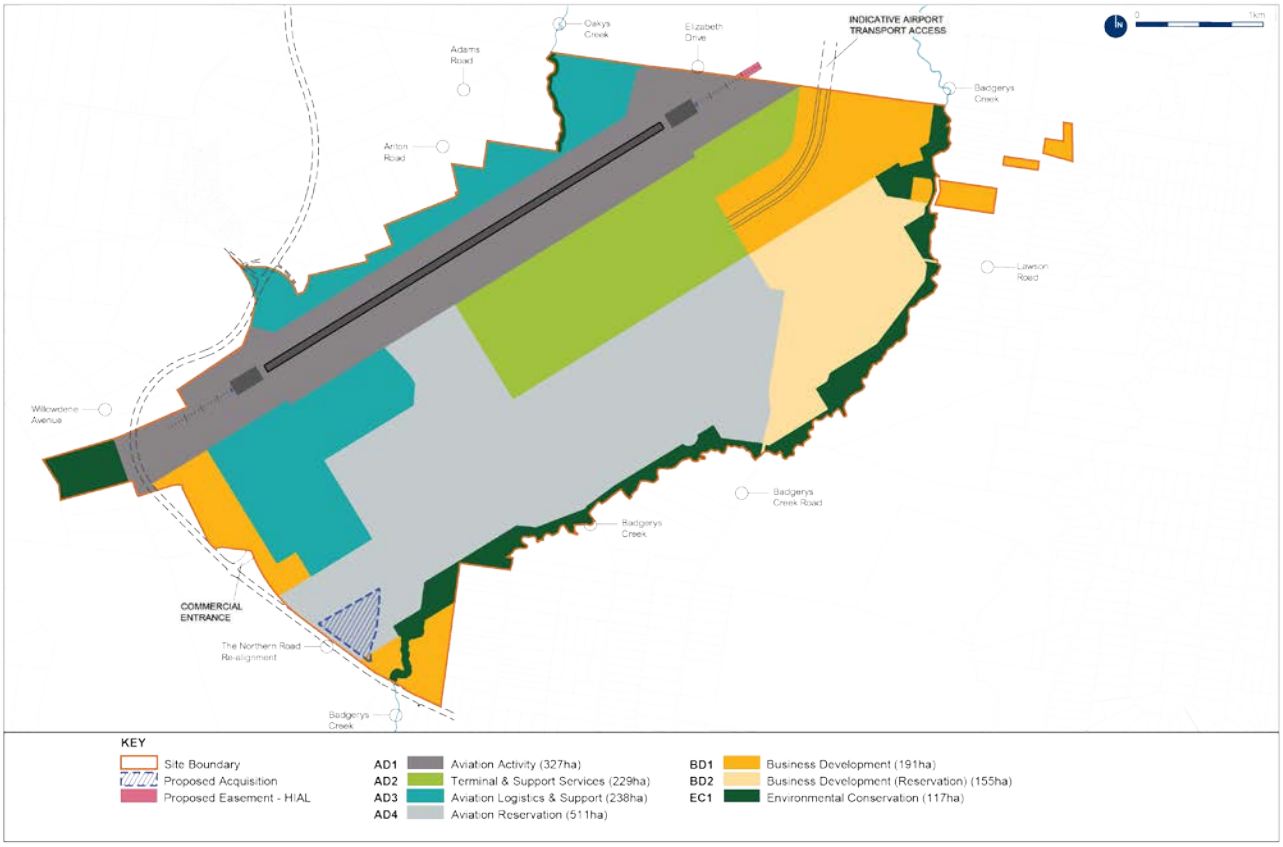


Figure ES–4 Land use zones (Stage 1)

Part 3 of the revised draft Airport Plan provides details of the developments for which authorisation is being sought under the Airports Act. Determination of the Airport Plan would authorise the Stage 1 development encompassing the initial design, construction and operation of the proposed airport (that is, the activities described in Part 3 of the Airport Plan). The EIS provides a detailed consideration of likely environmental impacts arising from the Stage 1 development based upon the defined design and operational parameters described in the revised draft Airport Plan.

The EIS also provides a strategic level environmental assessment of a possible long term development of the proposed airport. However, Part 3 does not authorise or require any longer term development which would, if it occurred, be undertaken under the planning framework in Part 5 of the Airports Act as it applies to existing federally leased airports. Providing a strategic level assessment enables preliminary consideration of the extent of potential long term impacts (such as noise exposure) and, in particular, can help inform land use planning decisions in the vicinity of the airport site. Future developments would be subject to separate approval processes through master planning and major development plan requirements under the Airports Act.

Stage 1 airport

The proposed Stage 1 development would include a 3,700 metre runway, positioned in the northern portion of the site on an approximate north-east/south-west or 50/230 degree orientation, as shown on Figure ES–5. The Stage 1 development also includes a single, full-length taxiway parallel to the runway, and a range of aviation support facilities including passenger terminals, cargo and maintenance areas, car parks and navigational aids.

The Stage 1 development is designed to be capable of facilitating the safe and efficient movement of approximately 10 million domestic and international passengers per year, which is equivalent to approximately 63,000 air traffic movements annually, including freight movements, while also allowing sufficient space for future expansions.

The proposed airport would operate without a curfew to maximise its economic capacity. The revised draft Airport Plan also sets aside areas for a range of commercial uses (as set out in the Land Use Plan) outside the airport terminal, such as retail and business parks. Any such commercial uses not provided for in Part 3 of the revised draft Airport Plan would be subject to separate consideration and approval requirements under the Airports Act.

The airport site is approximately 1,780 hectares in size. The area that would be directly impacted by construction of the Stage 1 development (the construction impact zone) covers approximately 1,150 hectares. The construction impact zone includes the area of bulk earthworks in the northern portion of the airport site and other areas of disturbance outside of the bulk earthworks boundary that would be used for ancillary infrastructure, including drainage swales and detention ponds as part of the proposed water management system developed for the site. The existing terrain is characterised by rolling hills and substantial earthworks will be required to achieve a level surface and allow construction of the runway, taxiways and support services. This will involve the excavation of around 22 million cubic metres of soil and rock. The southern sector of the airport site would remain largely undisturbed, with the exception of drainage works for the management of water on site. This area of the site is zoned for future aviation use, business development or environment protection in accordance with the Airport Plan.

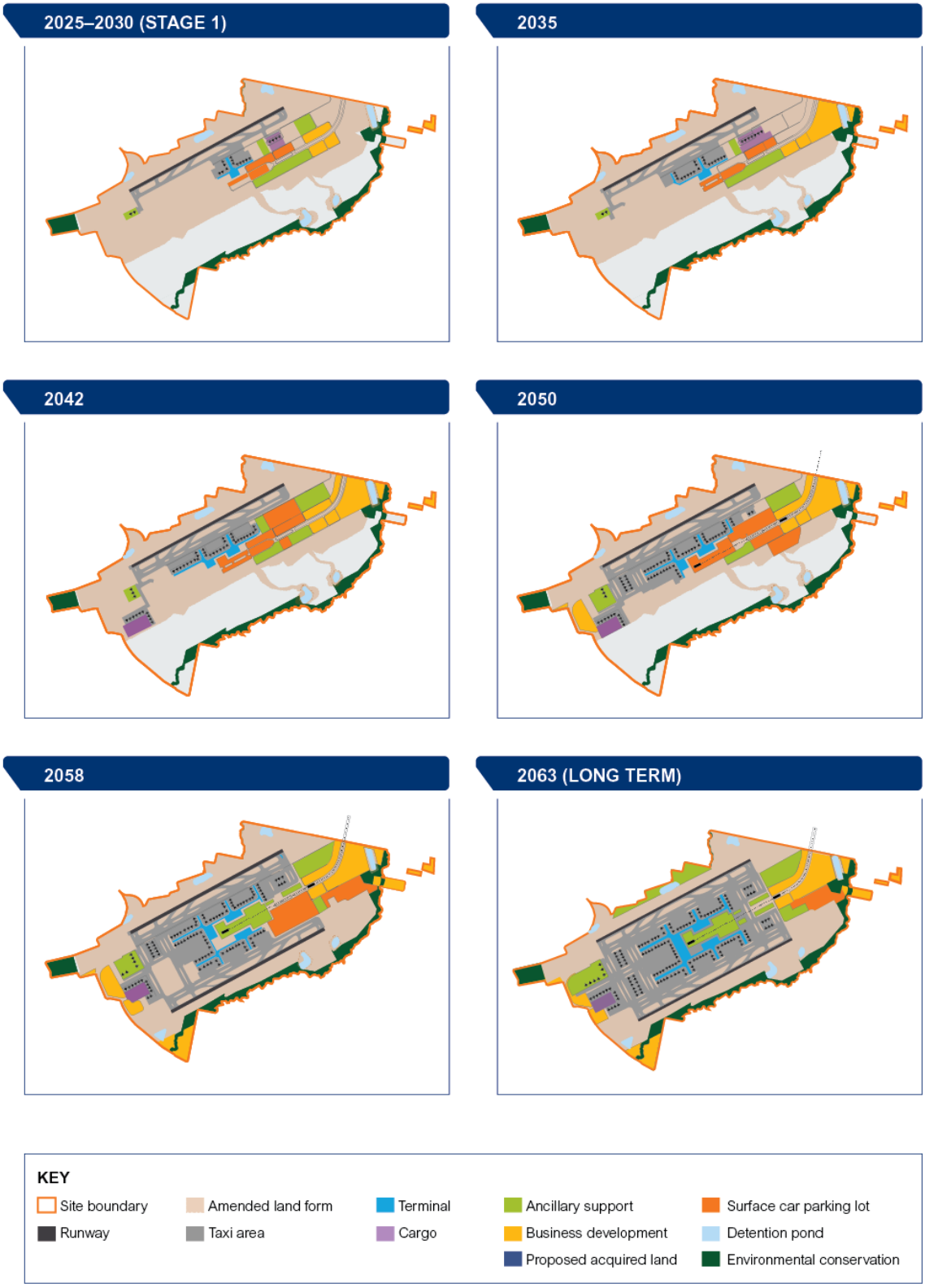


Figure ES–5 Indicative Stage 1 development and long term concept designs

Long term development

It is expected that the proposed airport would be progressively developed as demand increases beyond 10 million annual passengers. Additional aviation infrastructure and support services such as taxiways, aprons, terminals and support facilities would be required to service the growing demand. Future developments beyond the scope of Stage 1 would be subject to the requirements of the Airports Act.

A second runway is expected to be required when the operational capacity approaches 37 million annual passengers, which is equivalent to approximately 185,000 air traffic movements per year. A second runway is forecast to be required around 2050 and would be located parallel to the first runway with a centre line separation distance of approximately 1,900 metres.

The indicative long term airport concept considered in this EIS is forecast to service approximately 82 million passengers annually, which is equivalent to approximately 370,000 air traffic movements per year. This is expected to occur around 2063. The layout for the Stage 1 development will be finalised as part of the detailed design process for the airport. Figure ES–5 provides indicative layouts as the proposed airport expands operations beyond the Stage 1 development. The layout of the long term airport development will form part of subsequent master plans in accordance with the requirements of the Airports Act.

Operation of the airport and initial airspace design

Capacity and activity forecasts

Airservices Australia has assessed the airspace implications and air traffic management approaches for Sydney region airspace associated with the introduction of services at the proposed Western Sydney Airport. The proposed airport is expected to be used as a high capacity airport to accommodate any aircraft fleet mix. Airfield capacity analysis was completed based on the long term, parallel runway scenario.

This analysis indicates that an airport development at Badgerys Creek with parallel runway operations could potentially achieve 103 total aircraft movements per hour, consisting of:

- 45 landing operations per hour; and
- 58 departure operations per hour.

The major functional areas of the airport such as terminal facilities, runways, taxiways and roadways would be designed to accommodate the peak hour passenger or peak hour aircraft demand. The peak hour activity represents the greatest level of demand being placed on facilities required to accommodate passenger and aircraft movements. Consideration of the peak hour activities during planning allows facilities to be sized appropriately so that they are neither underutilised nor overcrowded too often, and ensures that users consistently receive a satisfactory level of service and are not subject to significant congestion.

The Stage 1 and long term capacity requirements for the proposed airport, based on the indicative activity forecasts and the predicted peak hour[2] activity, are presented in Table ES–1. The Stage 1 airport layout would be designed so as not to preclude future works to accommodate expected long term capacity requirements.

Table ES–1 Summary of activity forecasts

	Stage 1 operations	First runway at capacity (c. 2050)	Long term (c 2063)
Annual passengers (arrivals and departures)	10 million	37 million	82 million
Peak hour passengers (international and domestic)	3,300	9,500	18,700
Total annual air traffic movements (passenger and freight)	63,000	185,000	370,000
Total peak hour air traffic movements	21	49	85

The volume and profile of passengers using the proposed airport is expected to evolve over time in response to growing demand and the airport's relative market position. It is expected that in the early years, around 80 per cent of passenger demand at the proposed airport would involve regional and domestic travel. Domestic demand is likely to be focused on travel between capital cities, including Melbourne, Brisbane and Perth, as well as the Gold Coast.

Over time, it is expected that demand would grow, particularly in international passenger movements, as residual capacity at Sydney Airport is used. It is predicted that the Stage 1 development could serve approximately two million annual international passengers within five years of opening. Passenger demand is predicted to grow to approximately 19.5 million annual international passengers by 2050. By this time, the domestic-international passenger split could be approximately 47 per cent domestic and 53 per cent international. In the long term, the proposed airport is expected to serve all types of aviation traffic including low cost carriers, full service carriers, international, domestic, connecting and regional traffic.

Freight aircraft are also expected to operate at the proposed airport, with the Stage 1 development accommodating approximately 7,000 dedicated freight air traffic movements per year. The number of freight operations is predicted to increase to 30,000 annual aircraft movements in long term development.

[2] Reference to peak hour activity is equivalent to busy hour activity as described in the revised draft Airport Plan

Operating modes

Aircraft departures and arrivals are allocated to a runway, which determines both the physical runway to be used for take-off and landing and the direction in which that runway is to be used (while the airport operates with a single runway, this would only determine the direction). Allocation of the runway to be used is normally determined by air traffic control personnel and is based on a combination of weather conditions and airport operating policy.

The design of the runways at the proposed airport has been developed around a 50/230 degree (magnetic) heading as illustrated in Figure ES–6. This orientation is referred to as 05/23.

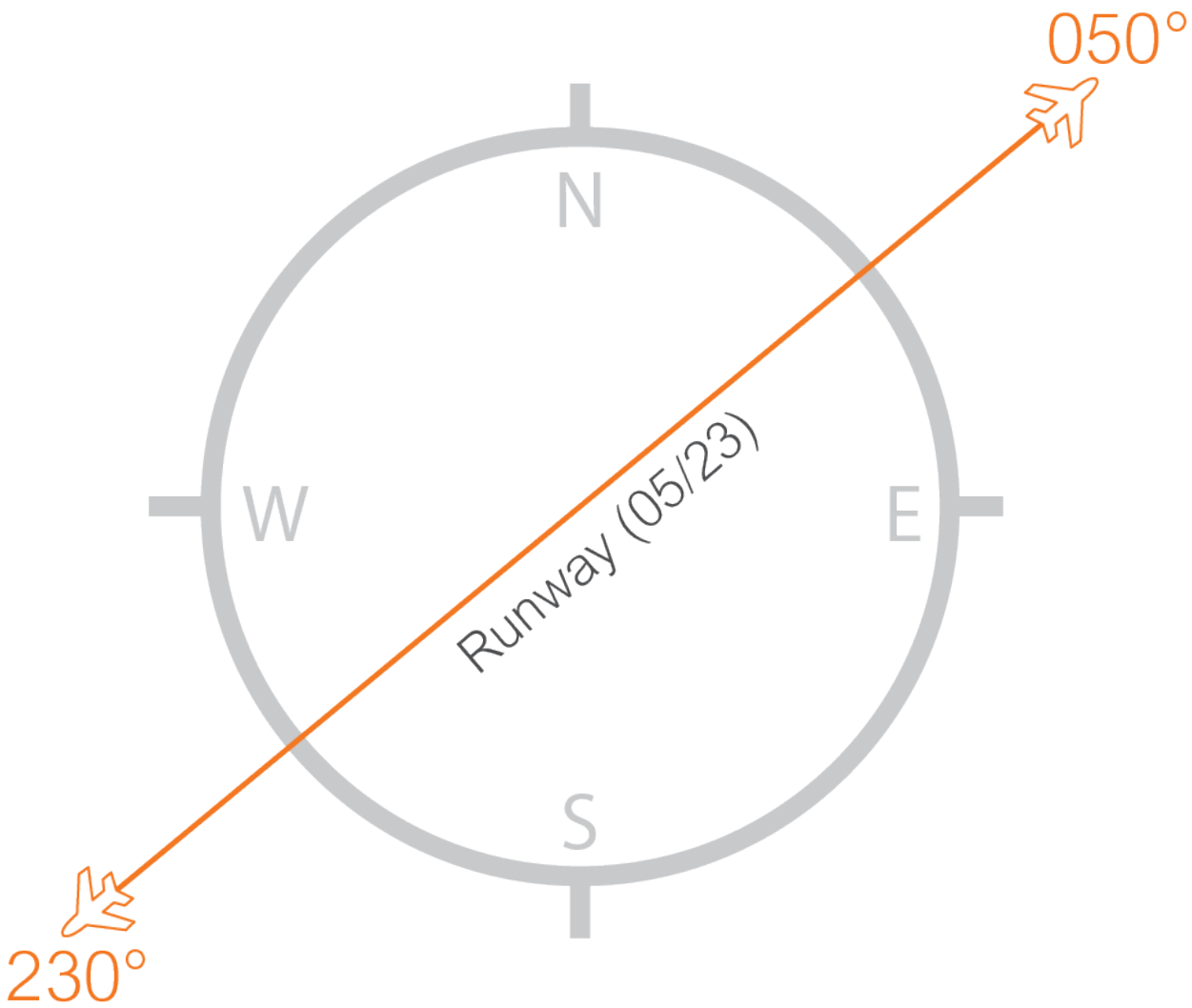


Figure ES–6 Runway orientation

Based on the 05/23 runway orientation, the two main operating modes for Stage 1 operations that would be used depending on the prevailing weather conditions are:

- ‘Operating mode 05’ operations, whereby aircraft would take-off and land in the 05 direction. Under this operating mode, all aircraft would be directed to approach the proposed airport to land from the south-west and directed to take-off to the north-east before redirecting towards their ultimate destination; and
- ‘Operating mode 23’ operations, whereby aircraft would take-off and land in the 23 direction. Under this operating mode, all aircraft would be directed to approach the proposed airport to land from the north-east and directed to take-off to the south-west before redirecting towards their ultimate destination.

The concept of 05 and 23 operations is illustrated in Figure ES–7.

A third operating mode, ‘head-to-head’ (also known as reciprocal runway operations) may be feasible following further detailed assessment before the start of operations. This would involve all take-offs and landings occurring in opposing directions, either to and from the south-west; or to and from the north-east. Under this mode all aircraft operations would occur only on one end of the airport site for a period of time and therefore offer a period of no aircraft operations for other areas during that time.

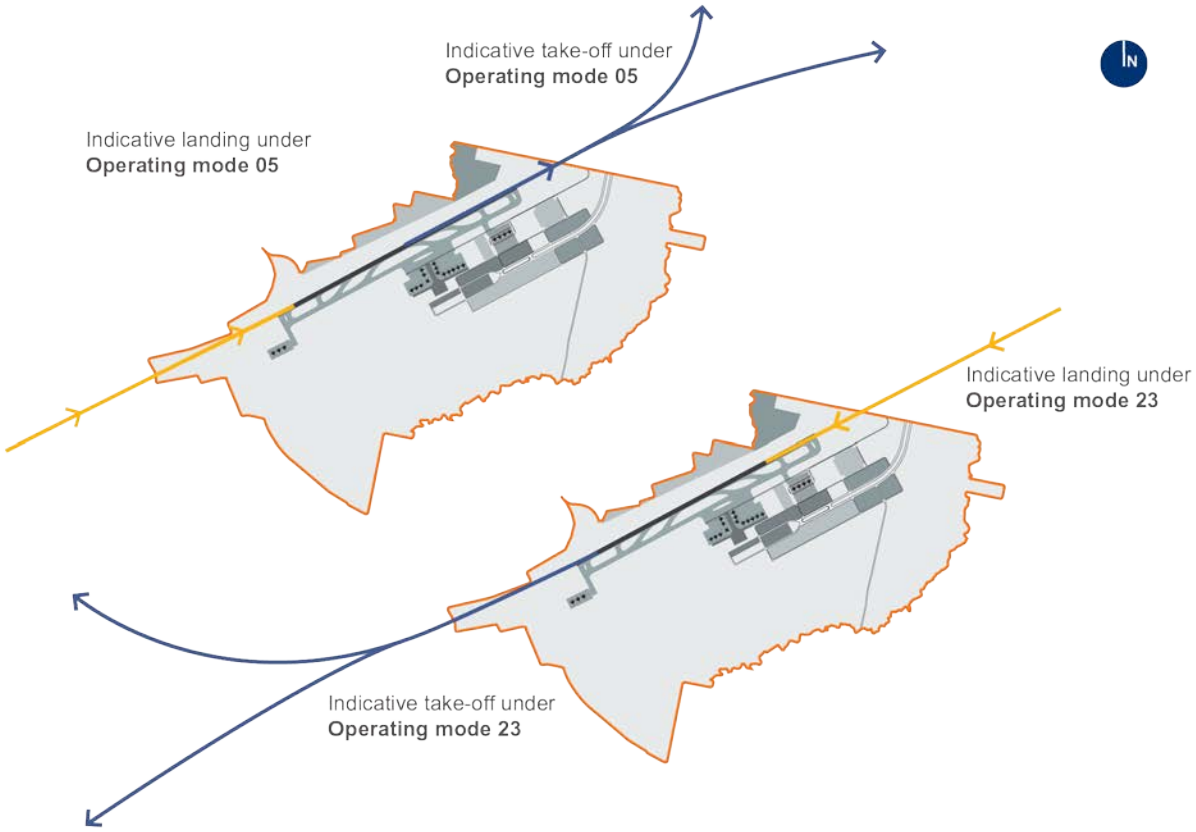


Figure ES–7 ‘05’ and ‘23’ operating modes

Airspace architecture

A preliminary airspace management analysis was conducted to establish whether safe and efficient operations could be introduced at the proposed Western Sydney Airport through the development of indicative air traffic management designs and flight paths. The analysis indicates there are no known physical impediments that would prevent safe and efficient operations for aircraft arriving at or departing from the proposed airport.

Indicative concept designs for approach and departure flight paths demonstrate that the Stage 1 Western Sydney Airport and Sydney (Kingsford Smith) Airport could safely operate independently as high capacity airports. They also show that an airspace design could be implemented for single runway operations at the proposed airport without changing the current design and flight path structure for Sydney Airport or Bankstown Airport. However, as demand for aviation services grows beyond that expected for Stage 1 operations, instrument flight rule operations at Bankstown Airport are expected to be incrementally constrained. This is because aircraft arriving into the proposed airport on Runway 23 and aircraft arriving at Bankstown Airport on Runway 11 would operate on overlapping flight paths and would need to be sequenced between the two airports.

The indicative flight paths developed through the preliminary analysis used to model and assess the potential impacts of aircraft operations at a Western Sydney Airport were in the EIS. Figure ES–8 and Figure ES–9 present indicative flight paths for aircraft operations in both the 05 and 23 directions.

The flight paths assessed in the EIS represent one possible airspace design – aircraft operations on different flight paths would result in different noise outcomes from those presented. For the purposes of an EIS, the use of indicative flight paths is a valid approach for identifying and assessing the nature and scale of impacts arising from operations at the proposed airport and is generally consistent with the environmental assessment approach for runway infrastructure developments at other airports.

The process of preparing this EIS has provided the opportunity for the community and stakeholders to consider the design of the indicative flight paths and express views about their assessed impacts. While the analysis based on the modelled flight paths found that peak aircraft noise levels in the lower Blue Mountains would be below generally accepted thresholds for day and night time operations, comments in response to the draft EIS indicated significant community concern about the potential for flight paths to concentrate over a single point above the town of Blaxland.

Future airspace design process

The Australian Government has announced that the airspace design to be implemented for the proposed Western Sydney Airport will not converge arriving aircraft at a single point over the community of Blaxland. There is substantial scope to develop flight paths for arrivals and departures that minimise the overflight of residential areas and reduce the impact of aircraft noise on the communities of Western Sydney and the Blue Mountains. Consistent with the Government's announcement, the detailed airspace and flight path design for the proposed airport will apply international best practice for managing airspace design and its associated environmental impacts.

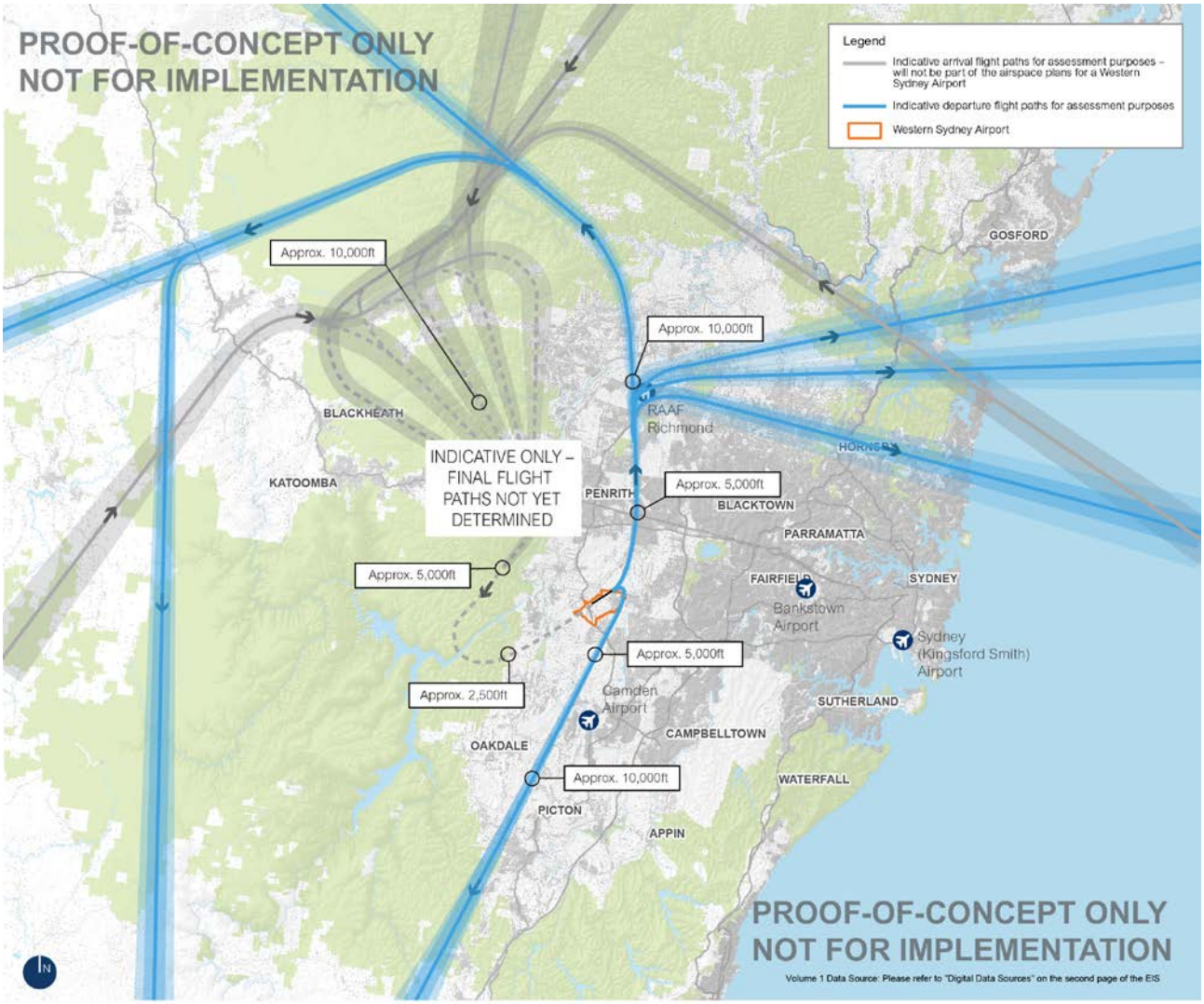
Extensive community and stakeholder engagement will occur throughout the planning and design phases of the flight path design process, which will commence after the Airport Plan is determined by the Infrastructure Minister. The Forum on Western Sydney Airport, a community and stakeholder reference group, will be established to ensure community views are taken into account in the airspace and flight path design process.

An overview of the design process and key principles is presented in Chapter 7, Section 7.8. Key principles that will apply to the comprehensive airspace and flight path design process for single runway operations include:

- overflights of residential areas and noise sensitive facilities will be avoided to the maximum extent possible;
- aircraft arrivals will not converge through a single merge point over any single residential area;
- the use of head-to-head operations to and from the south-west, when it is safe to do so, is an important preferred option for managing aircraft noise at night. This preferred option will be thoroughly evaluated through further detailed assessment; and
- in determining the final flight paths, the community, aerodrome operators and airspace users will be consulted extensively and flight path designs will be subject to referral under the EPBC Act.

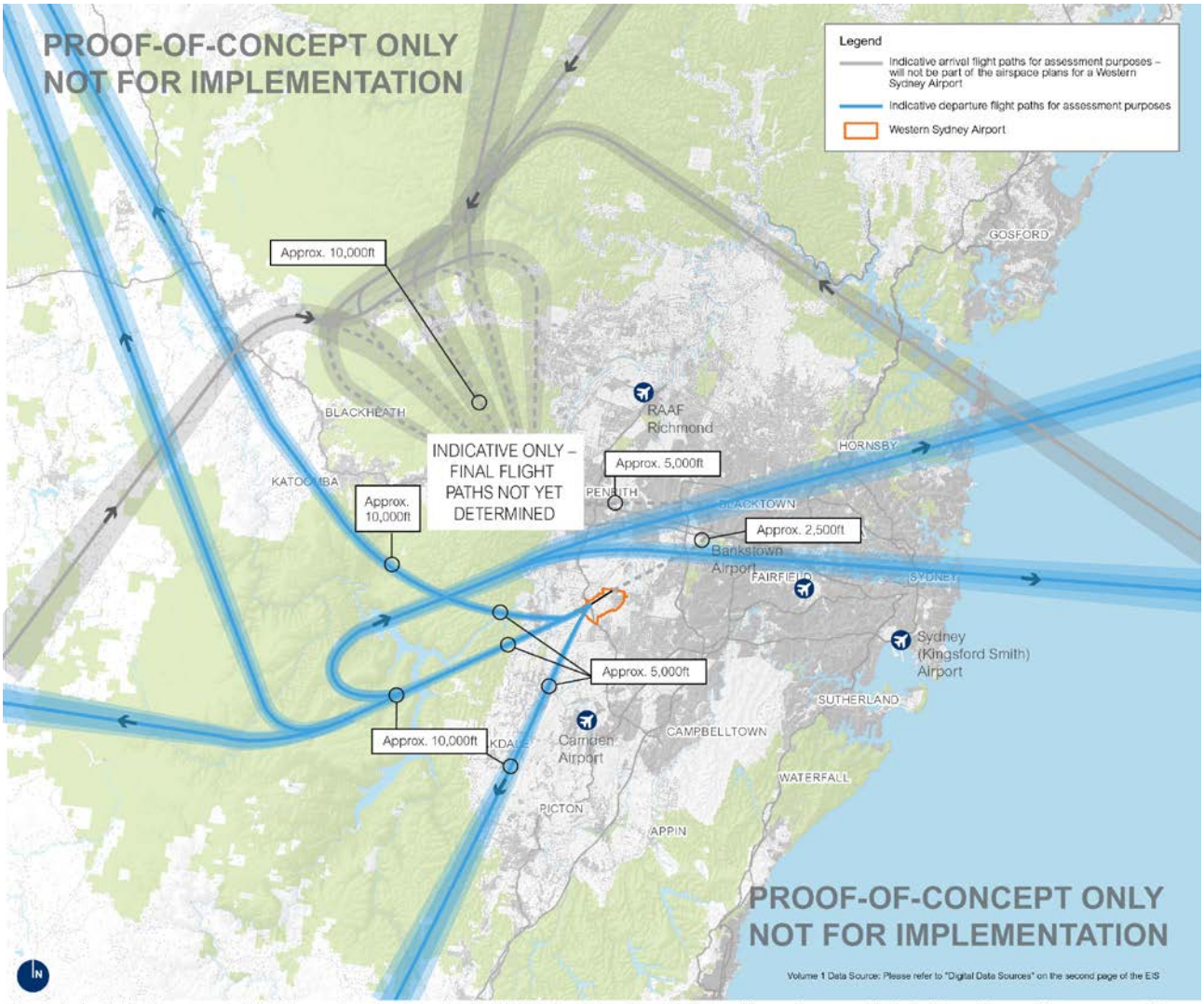
The process will optimise flight paths on the basis of safety, efficiency, capacity, and noise and environmental considerations, while minimising changes to existing airspace arrangements in the Sydney basin. The use of relatively new satellite-based navigation technologies at the proposed airport will provide greater flexibility in planning flight paths and will allow a larger range of options to be considered for managing noise from both night and daytime operations.

The Department will be responsible for delivering the flight path design for the proposed airport, working in close collaboration with Airservices Australia and the Civil Aviation Safety Authority (CASA). The proposed airspace design arrangements will be formally referred under the EPBC Act. CASA would ultimately approve the proposed airspace management arrangements, including final flight paths, before the commencement of operations.



Note: Indicative flight paths as presented in this figure are based on Airservices Australia's Western Sydney Airport: Preliminary Airspace Management Analysis, that provides a preliminary assessment at a conceptual level of airspace management design. The Australian Government has announced that aircraft arrivals for the proposed Western Sydney Airport will not converge through a single merge point over Blaxland or any other single residential area. The formal flight path design process will start from determination of the Airport Plan and optimise flight paths on the basis of safety, efficiency, capacity, and noise and environmental considerations.

Figure ES–8 Indicative flight paths for the 05 operating mode



Note: Indicative flight paths as presented in this figure are based on Airservices Australia's Western Sydney Airport: Preliminary Airspace Management Analysis, that provides a preliminary assessment at a conceptual level of airspace management design. The Australian Government has announced that aircraft arrivals for the proposed Western Sydney Airport will not converge through a single merge point over Blaxland or any other single residential area. The formal flight path design process will start from determination of the Airport Plan and optimise flight paths on the basis of safety, efficiency, capacity, and noise and environmental considerations.

Figure ES–9 Indicative flight paths for the 23 operating mode

Table 7–1 summarises the phases, activities and outputs of the formal airspace design process. The table also shows the current proposed timing for the different stages of the process. Further details about the future airspace design process are presented in Section 7.8 of Chapter 7.

Table ES–2 Airspace design process

Phase	Key activities	Key outcomes	Timing
Planning	• Establish expert steering group • Collect stakeholder views on system requirements, including community and environmental inputs • Confirm Sydney basin airspace and air route requirements and constraints • Establish community and stakeholder reference group • Develop and undertake a preliminary environmental assessment of airspace concept options (i.e. standard arrival and departure routes)	• Consultation conducted with interested parties, including regulatory authorities, government agencies, airlines, other Sydney basin aerodrome operators and airspace users, and the community • Review of airspace concept options and potential noise abatement procedures including identification of a preferred high-level airspace concept option	Approx. 2 years starting from determination of Airport Plan
Preliminary design and environmental assessment	• Evaluate the preliminary airspace design	• Preferred airspace design concept	Approx. 1 year
	• Refer preferred airspace design to the Environment Minister under the EPBC Act • Prepare and submit any formal environmental assessment documentation required by the Environment Minister • Public exhibition and community consultation • Policy on property acquisition and noise insulation announced		Approx. 2 years (c. 2019-2021)
Detailed design	• Evaluate, validate and refine the detailed design taking account of the EPBC Act process	• Final airspace design and noise abatement procedures for implementation • Long term ANEF chart	Approx. 1 year
Implementation	• Notify airspace and air route changes	• Airspace change proposal approved by CASA.	Approx. 2 years
		• Commencement of air operations at Western Sydney Airport in accordance with specific noise abatement procedures and noise management measures identified in the airspace design process	Mid-2020s

Community consultation

The Australian Government committed to providing multiple opportunities for the community to provide feedback and receive information on the proposed airport. Community consultation was undertaken in three phases, including:

- Phase 1: the preparation of the draft EIS and draft Airport Plan, from September 2014 to October 2015;

- Phase 2: the public exhibition of the draft EIS and draft Airport Plan, from 19 October 2015 to 18 December 2015; and
- Phase 3: the finalisation of the EIS and preparation of the revised draft Airport Plan, from 19 December 2015 onwards, including after publication of the finalised EIS.

These three phases include activities undertaken in order to raise awareness, provide information and listen and respond to comments or concerns regarding the proposed Western Sydney Airport. Activities were held at locations across Western Sydney and the Blue Mountains, and the project website also provided a comprehensive, clear and accessible source of information.

The principles for the engagement process were guided by the Core Values and Code of Ethics of the International Association for Public Participation.

Community members were able to have their say and make submissions on the draft EIS and draft Airport Plan during the exhibition period (Phase 2). In total, 4,975 submissions were received from 3,973 unique submitters. More information on the consultation and engagement activities undertaken can be found in Chapter 8 in the EIS.

Issues raised during the exhibition of the EIS include:

- the changing face of Western Sydney;
- proposed flight paths and aircraft overflight noise impacts;
- the Greater Blue Mountains World Heritage Area;
- potential for increased pollution levels in Western Sydney and general health impacts;
- impacts of the Western Sydney Infrastructure Plan;
- local traffic and transport changes; and
- employment opportunities from the proposed airport.

As required by the EPBC Act, Volume 5 of this EIS outlines the feedback received from the community and stakeholders. It provides responses to the issues raised and describes how these were addressed in finalising the EIS and revised draft Airport Plan, where relevant.

As part of Phase 3 of the community consultation, activities are ongoing to keep the community and stakeholders informed about the proposed airport as the EIS and the Airport Plan are finalised. These activities include community market pop up stalls, an online noise modelling tool, regular newsletters and a dedicated project website with fact sheets and up-to-date project information.

EIS process

The Department submitted a referral under the EPBC Act for the development of the proposed airport on 4 December 2014. On 23 December 2014, a delegate of the Minister for the Environment determined the proposed airport to be a ‘controlled action’. The referral decision instrument identifies the following controlling provisions under the EPBC Act as being relevant to this proposal:

- world heritage properties (sections 12 and 15A);
- national heritage places (sections 15B and 15C);

- listed threatened species and communities (sections 18 and 18A); and
- Commonwealth actions (section 28).

At the same time, the delegate decided that the proposed airport development would be assessed by preparation of an EIS. The *Guidelines for the Content of a Draft Environmental Impact Statement – Western Sydney Airport* (EIS guidelines) were issued on 29 January 2015.

This EIS addresses the guidelines by assessing the potential environmental, social and economic impacts associated with the Stage 1 development as described in Part 3 of the revised draft Airport Plan. The intent and objectives of the New South Wales legislative framework and assessment guidelines were also considered, where appropriate, for each environmental value. The EIS also considers the potential impacts over the long term, by providing a separate strategic level environmental impact assessment.

The framework for the impact assessment has been designed to provide a structured and objective approach to identifying the proposed airport's environmental, social and economic impacts, and to developing effective mitigation, management and offset measures. The approach has generally involved:

- project definition including analysis of the need and alternatives to address the growing aviation demand in the Sydney region;
- identifying key issues through reviewing previous investigations, preparation of an EPBC Act referral and a gap analysis and risk assessment process;
- identifying existing environmental, social and economic baseline conditions;
- completing impact assessments for the airport proposal based on the broad parameters presented in the revised draft Airport Plan, having regard to the baseline conditions;
- refinement of the airport proposal having regard to the impact assessments; and
- identifying appropriate mitigation, management, monitoring measures and (where appropriate) offset measures for the identified potential impacts.

The baseline (or existing environment) conditions for the airport site and surrounding locality were derived using a combination of desktop and field investigations relevant to each environmental aspect or value. Where possible, the investigations built on previous studies that have been completed at the airport site.

Mitigation and management measures were applied to reduce the level of identified potential impacts. These measures aim to protect the identified environmental values and would be applied as required during the planning and design, construction and operation phases of the project.

The following sections present a summary of each issue assessed in the EIS.

Aircraft overflight noise

Operation of the Stage 1 development would change the pattern of aircraft movements in the airspace above Western Sydney. Communities in Western Sydney and the Blue Mountains would be impacted by noise from aircraft during take-off, landing and when in flight. Noise modelling shows that the highest noise exposure levels are predicted to be experienced in those locations closer to the airport under or near the indicative aircraft departure and arrival routes.

The assessment completed in this EIS is based on the indicative flight paths prepared by Airservices Australia. The pattern of noise impacts that would result from operation is complex and depends on the time of day or night, season, airport operating mode and other factors. The availability of each operating mode at any given time would depend on weather conditions, particularly wind direction and speed, the number of presenting aircraft and the time of day. Operational strategies were developed based upon the preferred direction for landing and take-off when weather and operating conditions permit their use. Operating strategies include Prefer 05, Prefer 23 and, where traffic and weather conditions permit, 'head-to-head', (also known as reciprocal runway) operations at night in combination with the preferred daytime direction.

Individuals show varying sensitivity to noise. Experience at existing airports in Australia has shown that, while aircraft noise contours based on cumulative noise exposure measures such as the Australian Noise Exposure Forecast (ANEF) are useful for land use planning purposes near airports, they are not necessarily an indicator of the full extent of community reaction to, or individual annoyance from, aircraft noise or the total spread of noise impacts. The EIS assessment of aircraft noise is based on measures outlined in Australian Standard (AS) 2021:2015 and the National Airports Safeguarding Framework. These guidelines emphasise the challenge of communicating the complex nature and extent of aircraft noise and advocate using a number of different measures to aid interpretation of predicted noise exposure levels. While this EIS has used a range of measures for describing noise exposure, it is important to note that aircraft noise impacts would be experienced outside of the areas depicted by the various noise exposure contours. Individuals and communities newly exposed to aircraft noise are likely to show an enhanced sensitivity to changes in the noise environment.

The loudness of a sound depends on its sound pressure level, which is expressed in decibels. Most sounds we hear in our daily lives have sound pressure levels in the range of 30-90 decibels. A-weighted decibels (dBA) are generally used for the purposes of assessment and have been adjusted to account for the varying sensitivity of the human ear to different frequencies of sound. The main effect of the adjustment is that low and very high frequencies are given less weight.

In terms of sound perception 3 dBA is the minimum change that most people can detect and every 10 dBA increase in sound level is heard as a doubling of loudness. However, many individuals may perceive the same sound differently. Figure ES–10 illustrates indicative dBA noise levels in typical situations.

The loudest aircraft operations (long-range departures by a Boeing 747 or equivalent aircraft), are predicted to produce maximum noise levels of over 85 dBA at a small number of rural residential locations in Badgerys Creek close to the airport site. External noise levels of 70 to 75 dBA would infrequently be experienced over a greater area and could be expected within built-up areas in St Marys and Erskine Park. At these noise levels, a person may need to raise their voice to be properly heard in conversation when indoors with a window open. However, the Boeing 747 is being phased out of operations. Maximum noise levels due to more common aircraft types such as

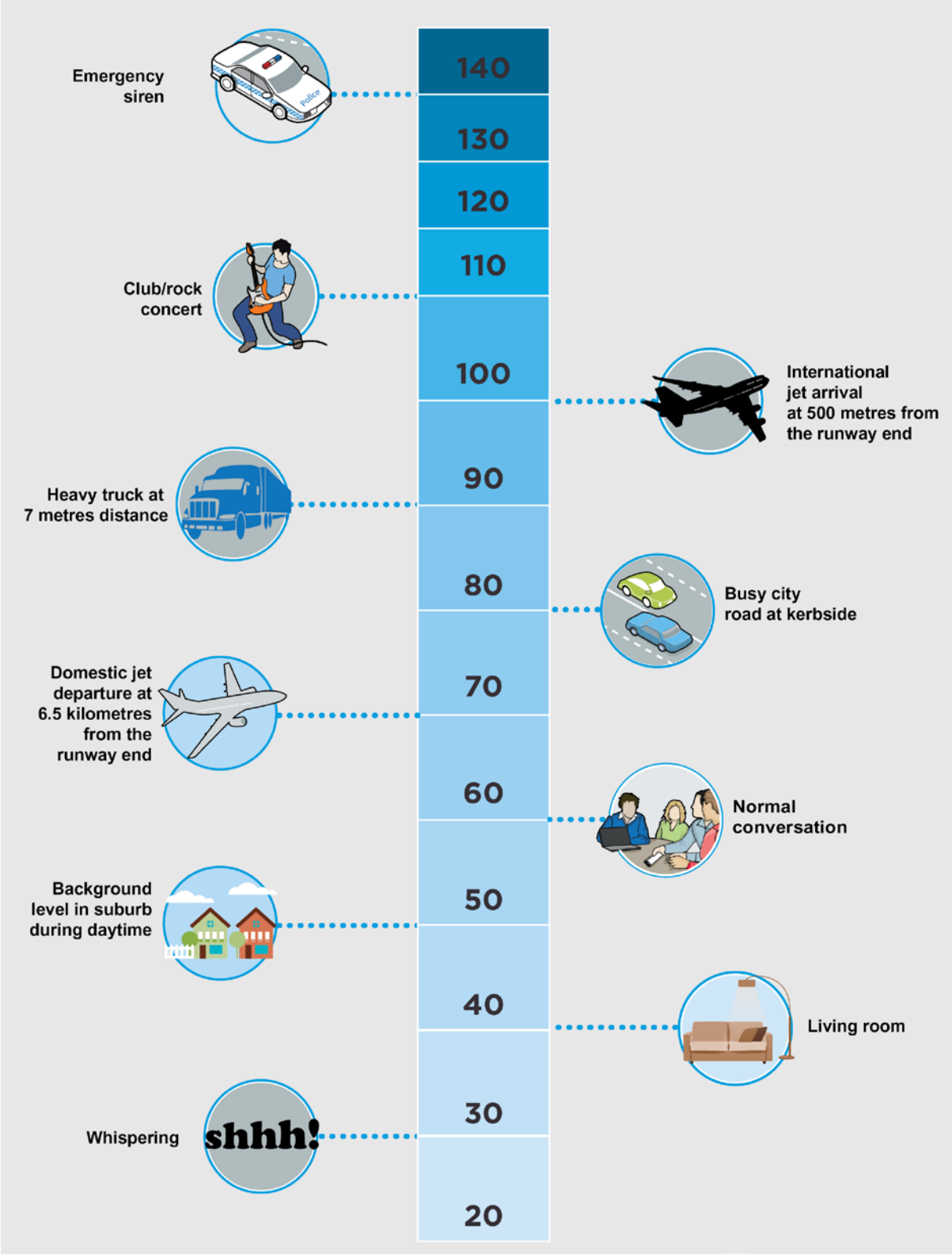
the Airbus A320 or equivalent are predicted to be between 60 to 70 dBA in built-up areas around St Marys and Erskine Park and over 70 dBA in some adjacent areas to the south-west of the proposed airport, such as Greendale and Luddenham.

Over an average 24-hour period, between 1,500 and 1,600 residents would experience five or more aircraft noise events above 70 dBA. The number of residents affected by different levels of aircraft noise depends on the runway operating strategy adopted. Comparison of the two key strategies assessed in this EIS indicates that while there is limited variability of noise exposure levels in close proximity to the airport, the choice of runway operating strategy has a more pronounced effect on communities further away.

At night, the Prefer 05 operating strategy (with aircraft typically approaching and departing the proposed airport in a south-west to north-east direction) would result in an estimated 48,000 people experiencing more than five events above 60 dBA. With an operating strategy in the opposite direction (Prefer 23), approximately 6,000 people are expected to experience more than five events above 60 dBA per night. The exposed population would reduce to 4,000 if a 'head-to-head' operating mode were implemented, in which aircraft would both approach and depart at the south-west end of the runway.

The noise impact associated with take-offs in both directions and aircraft reverse thrust during landing would primarily affect Luddenham and Greendale.

Figure ES–11 presents the single event maximum noise level contours for the arrival and departure of an Airbus A320 which is expected to be one of the more common types of aircraft used at the proposed airport.



Note: Noise levels adapted from Melbourne Airport website

Figure ES–10 Indicative dBA noise levels in typical situations

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

LEGEND

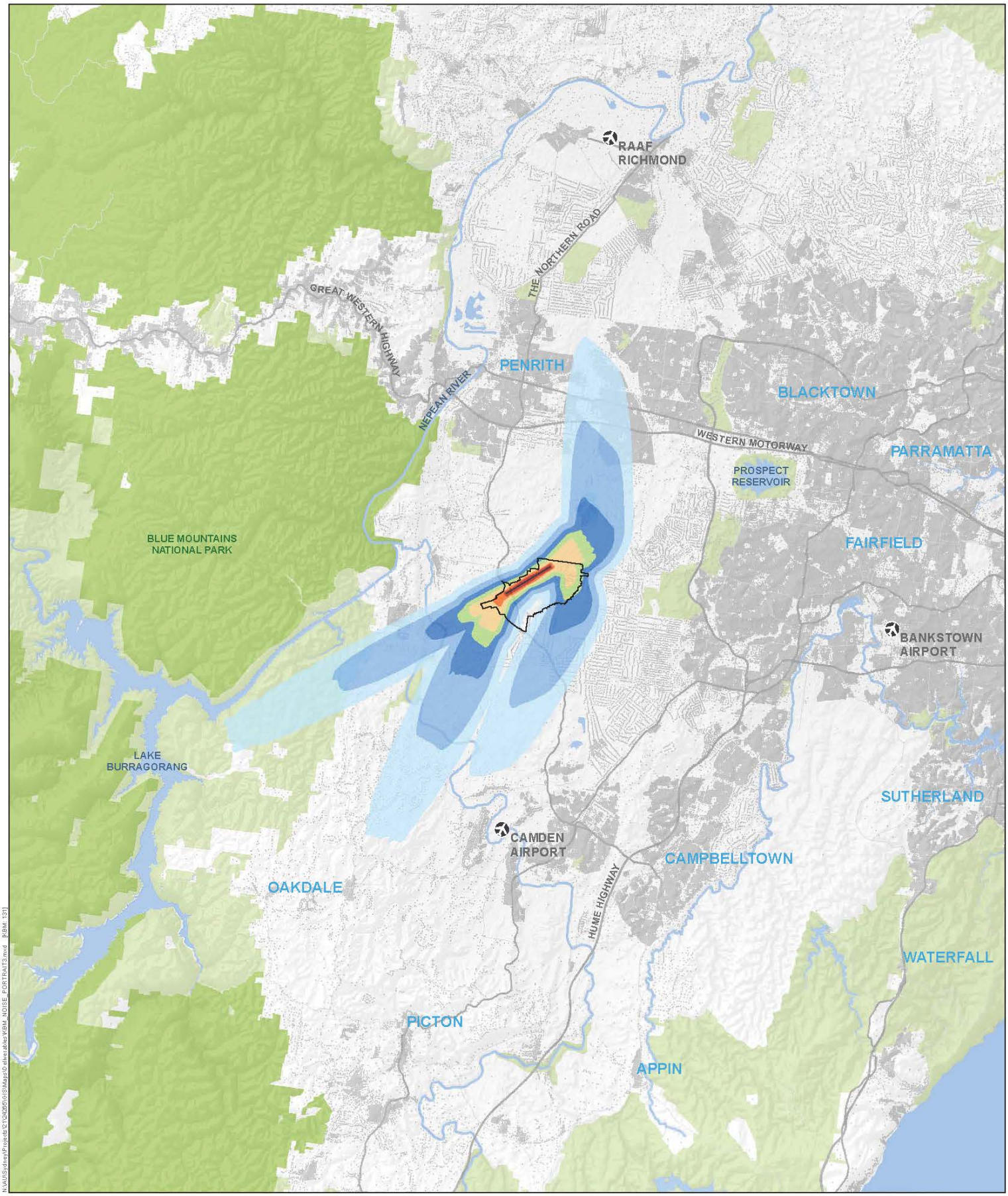
- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

LAmax

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

ES 11 - Single event noise level for an A320 arrival (left) and departure (right)

0 2.25 4.5 9
Kilometres



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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 2.25 4.5 9
Kilometres

N

ES 12 - Single event noise level for an A320 arrival (left) and departure (right)

Most recreational areas in the vicinity of the airport site would not be subject to aircraft overflight noise events exceeding 70 dBA, or their exposure would be less than one event per day on average. Aircraft overflight noise levels at Twin Creeks Golf and Country Club would be noticeable and at times a raised voice would be required for effective communication. At this location, predicted noise exposure would be significantly reduced under a Prefer 23 operating strategy. Bents Basin State Conservation Reserve and Gulguer Nature Reserve would be subject to a number of events with noise levels exceeding 60 dBA, which would be noticeable to passive users of these areas.

It is expected that future land use planning around the proposed airport would be influenced by final Australian Noise Exposure Forecast (ANEF) contours once flight paths and operating modes are finalised and approved. The ANEF system is intended for use as a land use planning tool for controlling encroachment on airports by noise sensitive buildings. The system underpins AS 2021 *Acoustics- Aircraft noise intrusion- Building siting and construction*, 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.

Land use planning controls based on a hypothetical Australian Noise Exposure Concept (ANECs) developed for the 1985 EIS (Kinhill Stearns 1985) have been adopted by councils surrounding the airport site. These controls have protected the area around the airport site from incompatible development for nearly three decades. ANEC contours calculated for Stage 1 operations are shown on Figure ES–13. These contours combine predicted noise exposure levels for both the Prefer 05 and Prefer 23 operating strategies. They are generally less geographically extensive than those developed for the 1985 EIS.

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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
- ANEC = 20-25
- ANEC = 25-30
- ANEC = 30-35
- ANEC = 35+

ES 13 - ANEC contours for Prefer 05 and Prefer 23 operating strategy (2030)

0 1 2 4
Kilometres

N

It is important to note that the noise exposure contours for Stage 1 operations are presented for comparative purposes only and any change to current land use planning instruments should be based on long term forecasts of noise exposure.

A number of organisations, including the ALC, the Australian, NSW and local governments, airlines, aircraft and engine manufacturers, and regulators would all share the responsibility for managing noise impacts of the proposed airport. Approaches to mitigating aircraft overflight noise generally focus on reducing noise emissions from the aircraft themselves, planning flight paths and airport operating modes in a way that minimises potential noise and environmental impacts, and the implementation of land use planning or other controls to ensure that future noise-sensitive uses are not located in noise-affected areas. Consideration of potential noise abatement opportunities would form an essential part of the formal airspace design process. Further detail is provided in Chapter 7.

Ground operations noise

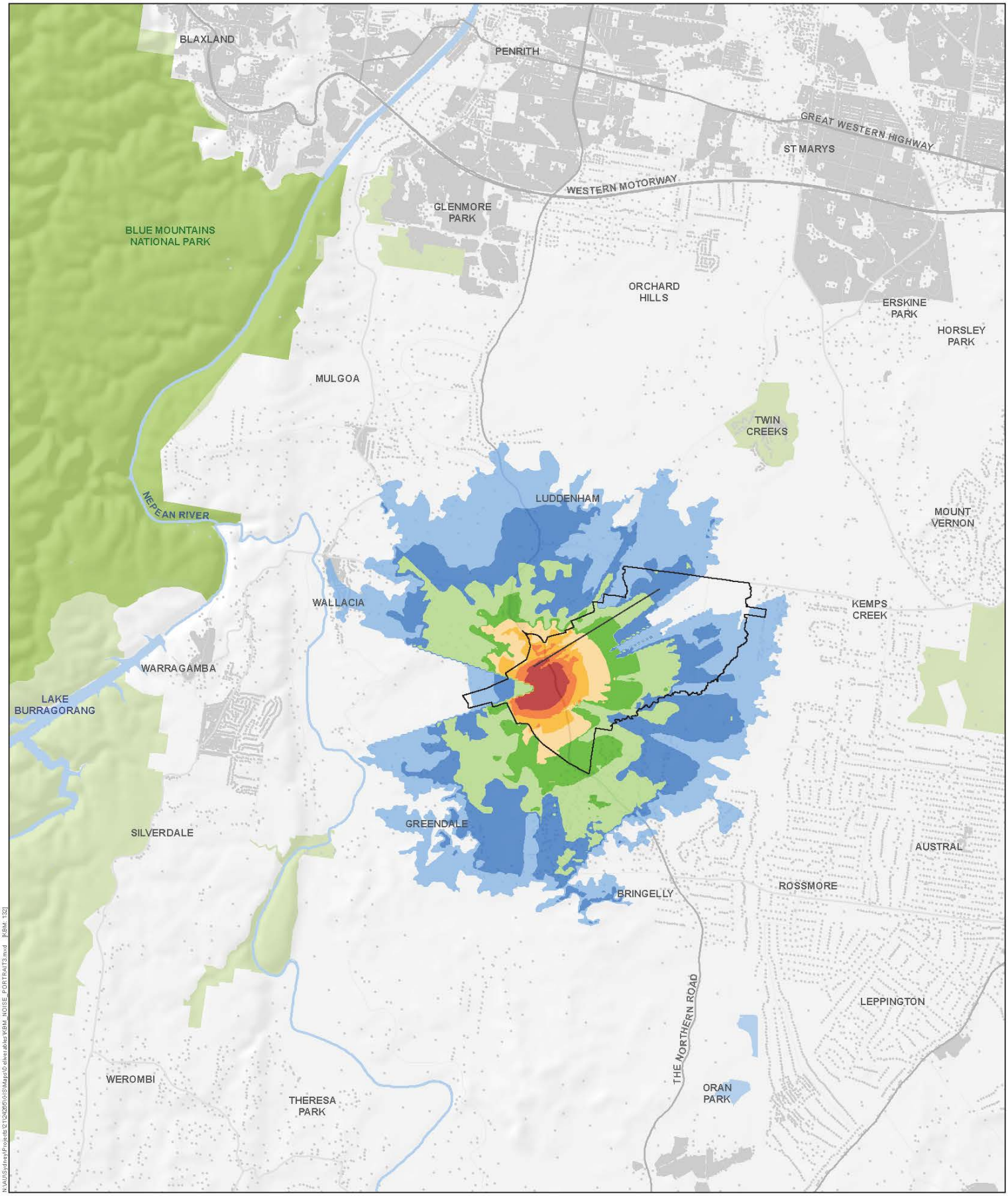
For the purposes of this EIS, airport ground operations noise is defined as noise generated from on-site sources, including aircraft taxiing and the ground running of aircraft engines for maintenance testing. Airport traffic on the surrounding road network and airport construction activities are other sources of ground operations noise assessed in the EIS.

Monitoring was undertaken in areas surrounding the airport site to determine existing background noise levels and identify assessment criteria for the construction and operational phases of the proposed airport development. Dominant noise sources include road traffic noise and local industry, reflecting the predominantly rural residential nature of the area. Construction and operation of the proposed airport would introduce new noise sources.

Noise during construction of the proposed airport would be largely confined within the airport site, although there would be some impacts on Luddenham and Badgerys Creek under worst case meteorological conditions. Construction vehicles would need to access the airport site during the construction stage. Modelling indicates that the resulting increase in traffic noise would not be audible. Vibration and airblast levels have been assessed in the event that blasting is required during construction. The assessment identifies precautionary measures that would likely be required to avoid significant vibration and airblast levels at surrounding sensitive receivers. Vibration generated by other construction activities and equipment is unlikely to cause building damage outside the airport site.

The primary sources of ground operations noise would be generated by aircraft engine maintenance testing and taxiing. Under worst case meteorological conditions, noise associated with engine maintenance testing may exceed the noise criteria established for the EIS assessment in Luddenham, Badgerys Creek, Bringelly, Wallacia and Greendale. The impact of noise from taxiing would extend over a much smaller area and would primarily affect Luddenham. The potential for exceedance of the noise criteria at these locations would depend on prevailing background noise levels in the area at the time.

The predicted worst case extent of noise contours (L_{Amax}) associated with engine run-up and taxiing are presented in Figure ES–14 and Figure ES–15. The noise contours in Figure ES–14 show noise shielding to the west of the airport site due to the location of an aircraft maintenance hangar that is assumed to be adjacent to the engine run-up area based on a preliminary airport design.



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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

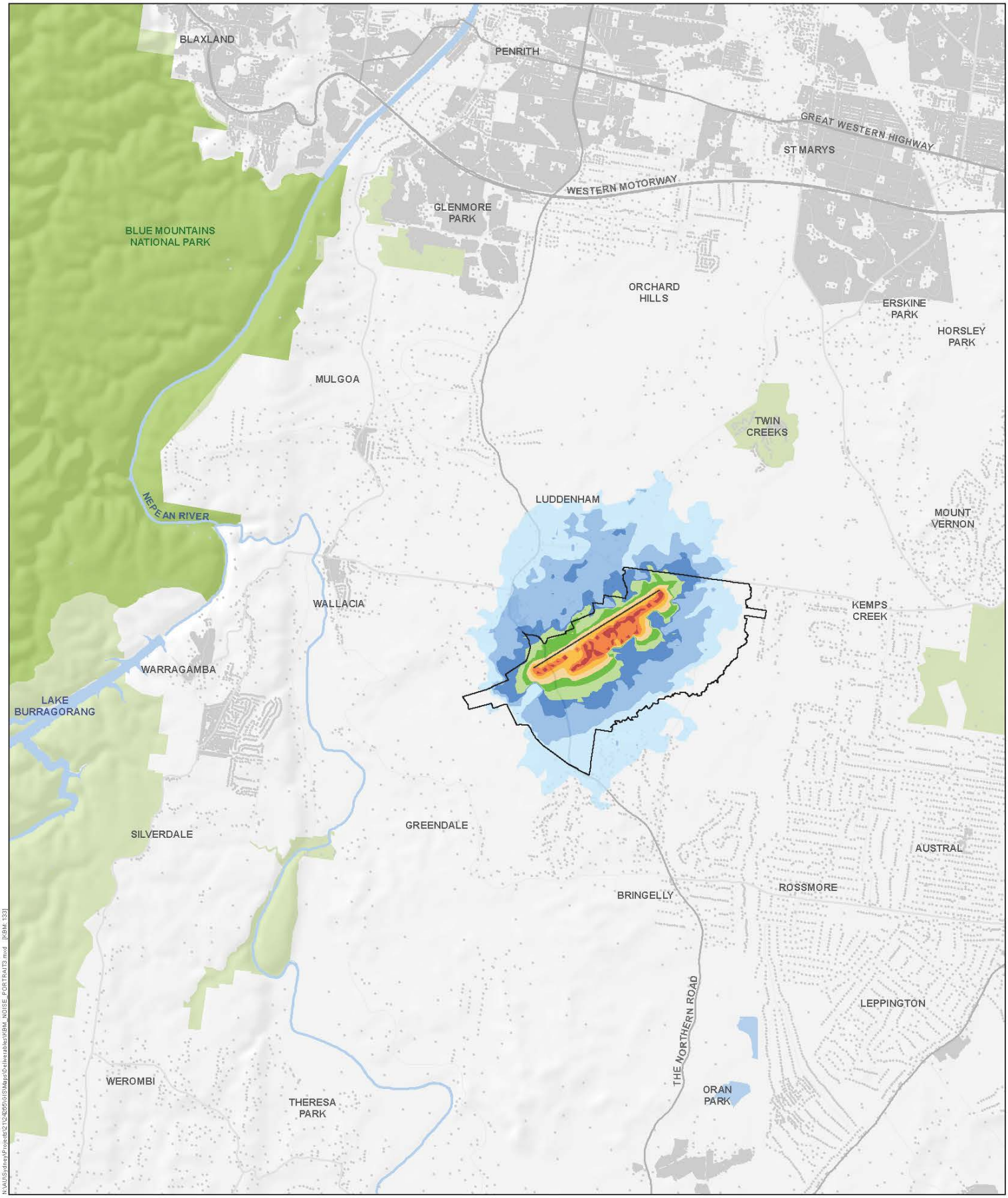
LAeq, 15min

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

ES 14 - Worst case engine ground run noise contours (LAmax) (2030)

0 0.75 1.5 3
Kilometres

N



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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

LAeq, 15min

- 40-45 dBA
- 45-50 dBA
- 50-55 dBA
- 55-60 dBA
- 60-65 dBA
- 65-70 dBA
- 70-75 dBA
- 75-80 dBA
- >80 dBA

ES 15 - Worst case taxiing noise contours (2030)

0 0.75 1.5 3
Kilometres

N

During Stage 1 operations, road traffic generated by the airport would increase local noise levels. Apart from a section of the proposed M12 Motorway and Elizabeth Drive, noise level increases attributable to airport traffic would be less than 2 dBA, which are unlikely to be noticeable. Any new road construction or realignments as part of the Western Sydney Infrastructure Plan (or other road improvements over time) would be subject to separate environmental assessment and approvals processes including any necessary noise mitigation.

Mitigation measures have been proposed to address noise during construction and operation of the proposed airport. Alternate locations for the engine run-up facility may be considered during detailed design. Other mitigation measures include implementing a Noise and Vibration Construction Environment Management Plan (CEMP) and a Noise Operational Environment Management Plan (OEMP) to manage other ground operations noise.

The Noise OEMP, to be prepared by the ALC, would identify residences and other sensitive receivers surrounding the airport site and any reasonable and feasible noise mitigation measures to protect their amenity. Preparation of the plan would include:

- engagement with residents and occupants of other facilities regarding potential noise impacts and amelioration measures;
- development of aircraft ground running operating procedures, including investigations of feasible measures to reduce noise impacts;
- noise modelling to examine the effectiveness of any proposed noise mitigation measures;
- other specific measures to address noise exceedances where physical noise mitigation is ineffective; and
- noise monitoring and reporting arrangements.

Air quality and greenhouse gases

The air quality and greenhouse gas assessment included a review of climatic data and an analysis of ambient air quality based on data collected from monitoring stations in the vicinity of the airport site. Air quality impacts associated with the construction of the proposed airport (particularly construction dust) were modelled, as were emissions and air quality impacts associated with the operation of the proposed airport. The air quality parameters assessed were nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), sulphur dioxide (SO_2) and air toxics, as well as odour (from aircraft exhaust and the on-site wastewater treatment plant), regional air quality impacts (ozone) and greenhouse gas emissions.

Construction would result in dust emissions. The results of the air dispersion modelling show that the predicted dust impacts during construction would be below the air quality assessment criteria at all sensitive residential receptors. Odour from the asphalt plant would also be below the relevant criteria at all sensitive residential receptors and would be largely contained within the airport site.

Stage 1 operations would result in an increase in emissions of nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), sulphur dioxide (SO_2) and air toxics. Odour emissions would also be produced from exhaust and the onsite wastewater treatment plant. The highest offsite concentrations of these pollutant emissions are generally predicted to occur at receptors located to the north and north-east of the airport site which is generally consistent with the predominant winds.

Background traffic associated with the broader urbanisation of Western Sydney, on surrounding road infrastructure was found to be a significant contributor to predicted offsite ground level concentrations of air pollutants, particularly for those receptors located close to proposed roadways. Despite this, there are almost no predicted exceedances of the air quality assessment criteria at any of the sensitive residential receptors investigated as part of the assessment of the Stage 1 development. The exceptions are the 99.9th percentile one-hour maximum for formaldehyde, which shows one exceedance at an on-site receptor and $PM_{2.5}$ which exceeds a proposed future air quality objective at a number of sensitive receivers. This is primarily attributed to background concentrations. Predicted offsite odour concentrations are below odour detection limits for both aircraft exhaust emissions and odours from the onsite wastewater treatment plant.

Only marginal ozone impacts would result from the Stage 1 operations, in the context of predicted background regional ozone levels around 2030. These emissions would be managed using best available techniques and/or emission offsets.

Greenhouse gas emissions produced at the airport site during Stage 1 operations have been estimated to comprise 0.13 Mt CO_2-e/annum, with the majority of emissions associated with purchased electricity. The Scope 1 and Scope 2 greenhouse gas emissions estimated from the proposed Stage 1 development would represent approximately 0.1 per cent of Australia's projected 2030 transport-related greenhouse gas emission inventory.

Mitigation and management measures would be implemented to reduce potential air quality impacts during both construction and operation of the Stage 1 development. In particular, a dust management plan would be developed and implemented to address potential impacts from dust generated during construction. The management plan would incorporate existing airport regulations which set air quality criteria and provide for a system of monitoring, reporting and auditing.

Human health

The health risk assessment considers the risks associated with construction and operation of the Stage 1 development on the health of the community. The assessment was undertaken in five stages comprising: issue identification, hazard assessment, exposure assessment, risk characterisation and uncertainty assessment.

The assessment focuses on the chronic health risks associated with changes to air quality, noise (overflights and ground operations), and surface and groundwater quality, as these are the primary pathways for health risks to occur. The health risk assessment considers impacts from particulate matter, nitrogen dioxide, sulphur dioxide, air toxics (benzene), diesel and ozone. Water contaminants considered include petroleum hydrocarbons, heavy metals, polyaromatic hydrocarbons, chlorinated hydrocarbons and perfluorinated compounds. The noise health risks assessed include sleep disturbance, increases in heart disease and impacts on cognitive development and learning in children. Other perceived and non-chronic health effects such as anxiety are considered as part of the social impact assessment.

The health risk assessment reviews any increased risk of mortality, hospital admissions for respiratory and cardiovascular diseases, and asthma in children as a result of air quality impacts. Overall, the health risk assessment found:

- the health risk from exposure to diesel and particulate matter during construction would be low;
- emissions of nitrogen dioxide and ozone will increase health risks, particularly when taking into account background road traffic associated with other developments in the region;
- emission of diesel during airport operations will increase health risks but these increased risks will largely occur on the airport site itself; and
- the health risks from exposure to other pollutants during airport operations such as sulphur dioxide, carbon monoxide and benzene will be low or very low.

Based on the findings of the local and regional air quality assessments, the air quality health risk assessment found in detail that:

- Levels of airborne particulates generated by construction would be low overall and less than those during operation. The highest risk is predicted to be associated with $PM_{2.5}$ during construction of aviation infrastructure which could result in a maximum of two additional deaths per 100 years. The most affected areas would be Luddenham and Bringelly.
- Health risks due to PM_{10} and $PM_{2.5}$ particulate matter would be low for the Stage 1 development. The highest predicted risk attributed to PM_{10} is for all-cause mortality from long-term exposures with between four additional deaths per 1,000 years and six additional deaths per 100 years. The highest predicted risk attributed to $PM_{2.5}$ is for all-cause mortality and cardiopulmonary mortality from long-term exposures with between two additional deaths per 1,000 years and six additional deaths per 100 years.
- Exposure to nitrogen dioxide would be the highest risk category resulting from airport operation. The highest predicted risk is for long-term mortality in people over 30 years of age with a maximum predicted risk of 1.1 additional deaths per year for the Stage 1 development. When traffic emissions on the external road network are excluded (which accounts for some 69 per cent of the NO_x emissions inventory), the maximum risk would reduce to four additional deaths every 10 years.
- The health risk due to exposure to sulphur dioxide from the airport operations would be very low. The highest risk is for hospital admissions from respiratory causes with approximately between seven additional admissions per thousand years and seven additional admissions per hundred years.
- The health risk arising from exposure to carbon monoxide would be negligible. The highest risk is predicted for hospital admissions for cardiovascular disease in people 65 years of age and older with a maximum of an additional four additional hospital admissions in 1,000 years.
- The risk from exposure to benzene during airport operations would result in a very small increase in cancer risk which is within levels considered acceptable by national and international regulatory agencies.
- The risk from exposure to diesel particulates falls at the upper bound of the levels of risk considered acceptable by national and international regulatory agencies. The highest risk

occurs at an onsite location, which is relevant for the consideration of exposure of onsite workers.

- The maximum risk increase resulting from exposure to ozone is 4.5 in 100,000 for emergency department attendances for asthma in children which is marginally above the levels of risk considered acceptable by national and international regulatory agencies.

Overall, the air quality health risk assessment found that the predicted health risks from Stage 1 operations would generally be within or at the upper bound of national and international standards of acceptability, with the exception of NO_2. A significant contributor to air quality emissions, and therefore the health risks identified above, are background emissions from urban development and particularly road vehicles external to the airport site. This is reflected in the assessment which found the highest risks are predicted for Bringelly, Rossmore and Kemps Creek which are located next to planned major roads and will experience significant urban development.

The health risk assessment for noise found that the risks from Stage 1 operations are low overall but may lead to an increase in sleep disturbance (assessed as awakenings) and delays in childhood learning and cognitive development at some locations in close proximity to the airport site. These impacts would vary depending on the operating strategy in use at the airport site. In particular:

- there would be an increase in electroencephalography (EEG) awakenings (a measure of sleep disturbance) with between zero and 40 additional EEG awakenings per person per year due to aircraft overflight and between zero and 75 awakenings per person per year due to ground operation noise. This is small given that individuals typically exhibit about 24 EEG awakenings per eight hours of sleep (European Environment Agency 2010);
- the number of full awakenings would be very low with between zero and five additional full awakenings per person per year due to aircraft overflight noise and an additional zero to 4 full awakenings per person per year due to ground-based operations noise;
- aircraft overflight noise and ground-based operations noise is not predicted to lead to an increased risk of myocardial infarction (heart attacks); and
- the predicted risk of learning and cognitive development in children would be very low for both aircraft overflight and ground-based operations noise, except at Luddenham where indoor noise is predicted to be higher. This does not mean that there will be an impact on children's learning and cognitive development but that there is an increased risk, albeit very low.

These effects are more likely for suburbs closest to the airport site, in particular Luddenham. Further work would be undertaken in future stages of the airport design to identify and, where necessary, implement feasible mitigation measures to reduce these impacts, noting that the two noise sources, overflights and ground-based operations, may need to be addressed separately.

While there are potential risks to surface and groundwater resources from construction and operation of the proposed airport, most of these are not specific to airport developments and a range of standard industry design and precautionary measures would be implemented to reduce these risks. It is considered unlikely that emergency fuel jettisoning would result in impacts to surface water bodies including potable water storages given the rarity of its occurrence and strict guidelines enforced by Airservices Australia for managing these contingency events.

Overall, the assessment found that potential risks to community health are generally low, with the exception of nitrogen dioxide. Following the implementation of the measures proposed in this EIS, the community health risks from the Stage 1 development will be further reduced.

Hazards and risks

A number of hazards and risks may arise from the construction and operation of the proposed airport. These hazards and risks are divided into those associated with airspace operations and those associated with ground-based operations. Hazards and risks associated with airspace operations include bird and bat strike, airspace obstruction, aircraft collisions, adverse meteorology, aircraft crashes and terrorism incidents. Those associated with ground-based operations include fire, flooding, contamination of land and dangerous goods transport. These hazards and risks are associated with airports generally and are not unique to the proposed airport.

A number of important airspace considerations would be resolved during detailed design closer to the commencement of operations. Certification of the aerodrome by CASA would be required before operations can commence, as well as implementation of the requirements of the existing safety regulatory framework. Satisfying these regulatory requirements will necessitate detailed design studies of various and specific aspects of the airports design and associated inclusions.

Based on the design information currently available, no insurmountable risks associated with the Stage 1 airport development are considered likely. Key issues that would be considered prior to the operation of the proposed airport include:

- storage of jet fuel;
- identification and/or reservation of a pipeline corridor to secure future fuel supply by means other than road transport, in conjunction with relevant authorities;
- additional bird and bat surveys to confirm the preliminary low strike risk identified;
- a study to identify stack emissions in the proposed airspace; and
- implementation of appropriate development controls on public safety zones outside of Commonwealth owned land.

Before the start of airport operations, a safety review would need to be undertaken in accordance with the requirements of applicable work, health and safety legislation.

Traffic, transport and access

The road network in the vicinity of the airport site is relatively uncongested, with only sections of Narellan Road and Camden Valley Way experiencing congested conditions in peak periods. While there is currently spare capacity on much of the network near the airport site, there is congestion on the broader strategic network including the M4 Motorway, M5 Motorway, M7 Motorway and M31 Hume Highway.

Construction of the Stage 1 development would generate an estimated 1,254 additional vehicle movements per day on the surrounding road network during the construction period. This includes approximately 150-160 additional peak hour vehicle movements during the AM and PM peak periods. The forecast AM peak traffic volume equates to about an eight per cent increase in traffic on this road, which would not be expected to lower the level of service on Elizabeth Drive. In the context of the broader Western Sydney region, this would not be considered a significant increase. A community awareness programme would be implemented during construction, to ensure that the local community and road users are kept informed about construction activities and expected delays, if any. A Traffic and Access CEMP would also be implemented and provide the overall plan and staging for managing traffic through and around each work site.

Stage 1 operations are expected to result in approximately 21,562 vehicles entering the airport site in the AM peak period and 21,556 leaving the airport site in the PM peak period. With the introduction of the M12 Motorway, this additional traffic is not likely to affect significantly the operation of the surrounding road network but is expected to result in small increases in congestion at The Northern Road/M4 intersection and on Mamre Road.

Significant road improvement works are underway as part of the Western Sydney Infrastructure Plan in addition to those identified in planning for the Western Sydney Employment Area, Western Sydney Priority Growth Area and South West Priority Growth Area. These are expected to provide sufficient capacity to cater for the expected passenger and employee traffic demand associated with Stage 1 operations. A Ground Transport Operational Environment Management Plan (OEMP) would be prepared prior to the commencement of operations to manage impacts on the local and internal airport road networks.

The public transport, walking and cycling systems proposed by the NSW Government and local councils in the region are expected to provide sufficient capacity for the predicted airport passenger and employee demand.

While no rail connection to the proposed airport is currently confirmed for the Stage 1 development, planning for the proposed airport preserves flexibility for several possible rail alignments including a potential express service. To meet future needs, the Australian Government and NSW governments are undertaking a Joint Scoping Study on the rail needs for Western Sydney, including the proposed airport. The study will consider the best options for future rail links, including decisions about timing and rail service options, both directly to the airport site and within the Western Sydney region.

Biodiversity

The airport site features remnant patches of grassy woodland and narrow corridors of riparian forest within extensive areas of derived (exotic) grassland, cropland, and cleared and developed

land. The condition of native vegetation is generally poor and there is moderate to severe weed infestation throughout the site. The main land uses have been agriculture and low density rural-residential development. Notwithstanding the generally poor condition of the airport site, it has conservation significance as a result of the presence of threatened species and ecological communities, and the generally limited extent and quality of similar environments in the Western Sydney region.

Construction of the Stage 1 development would result in the removal of approximately 1,153.8 hectares of vegetation. The majority of this vegetation consists of exotic grassland and cleared land or cropland, dominated by exotic species and noxious and environmental weeds. About 318.5 hectares of native vegetation are expected to be removed for the Stage 1 development. The removal of vegetation at the airport site would result in the loss of fauna foraging, breeding, roosting, sheltering and/or dispersal habitat. Construction of the Stage 1 development would also result in indirect impacts on terrestrial and aquatic flora and fauna, including potential impacts associated with increased fragmentation, altered hydrology, erosion and sedimentation, dust, light, noise and vibration. Indirect impacts may also include fauna displacement, injury and mortality.

Operation of the Stage 1 development would pose a risk of fauna strike from contact with aircraft and ground transportation vehicles. Indirect impacts may include those associated with light, noise and vibration and the introduction of exotic species.

The Stage 1 development is expected to affect threatened species, populations and ecological communities listed under the EPBC Act and the *Threatened Species Conservation Act 1995* (TSC Act). Assessments of significance have been prepared for matters of national environmental significance protected under the EPBC Act in accordance with significant impact guidelines prescribed by the Act. The outcome of these assessments is that the Stage 1 development is likely to have a significant impact on Cumberland Plain Woodland, the Grey-headed Flying-fox and other plants, animals and their habitat (including a number of species, populations and ecological communities listed as threatened under NSW legislation) in an area of Commonwealth land.

Mitigation and management measures would be implemented to reduce the potential impacts on biodiversity. These measures include staged vegetation removal during construction, pre-clearing surveys and plans for the salvage of fauna and habitat resources, translocation programmes for threatened flora and fauna species/populations, and designing the airport to minimise its attractiveness to fauna in order to minimise bird, bat and terrestrial fauna strike. In addition, a 117.1 hectare environmental conservation zone would be established along the southern perimeter of the airport site.

Biodiversity offsets are required to compensate for significant residual impacts arising from the proposed airport. An offset package has been prepared to compensate for the removal of about 104.9 hectares of Cumberland Plain Woodland, the removal of about 141.8 hectares of foraging habitat for the Grey-headed Flying-fox, and other features of the natural environment including plant populations, fauna populations and several species and communities listed under NSW legislation. The offset package is intended to conserve habitat in suitable offset sites in the surrounding region in perpetuity.

Biodiversity offsets are expected to be delivered primarily through the procurement of biodiversity credits to offset the proposed airport's impacts on affected EPBC Act-listed biota as calculated by the offsets assessment guide. Additional biodiversity credits would be purchased to offset impacts

on other plants, animals and their habitat. The biodiversity credits are generated through a system which includes establishing a form of conservation covenant over the area of land from which they are generated. Procurement of the biodiversity credits will provide funds for management of that area in perpetuity.

Due to the scale and nature of the biodiversity offsets required for the proposed airport, the process of identifying and securing suitable offset areas will continue after the Airport Plan is determined by the Infrastructure Minister. This process would include identification of further offset areas for Cumberland Plain Woodland in addition to the areas which have been identified at the time of this EIS. Potential offset sites would be subject to targeted surveys to confirm their qualities and their value in terms of biodiversity credits or other offsetting potential. A biodiversity offset delivery plan will be developed to set out the specific actions to be taken to meet offset requirements for the Stage 1 development and will be guided by the framework established in the offset package.

The Department of Infrastructure and Regional Development will be responsible for delivering this plan that will require approval from the Environment Minister or an SES officer (an appointed official) in the Department of the Environment and Energy (DoEE) prior to the commencement of Main Construction Works for the Stage 1 development, ensuring that biodiversity offsets have been identified (and secured where possible) prior to substantial impacts occurring.

While conservation of offset sites through the NSW BioBanking Scheme is expected to form the primary component of the biodiversity offsets, a variety of other conservation actions will also be considered that would assist in meeting overall offset requirements. These may include additional funding to a variety of existing and future programmes, projects, and policies and where such alternative options are more practical, or achieve greater strategic benefits for biodiversity conservation in the region. Examples of other conservation mechanisms which could be used to deliver offsets are presented in Section 16.8 of Chapter 16 (Volume 2a) of this EIS. The Department will consult closely with DoEE and relevant NSW authorities, organisations and stakeholder groups on these and other potential offsetting opportunities.

Topography, geology and soils

Soils at the airport site are characterised by primarily firm residual clays with areas of alluvial gravels, sands, silts and clays associated with Badgerys Creek.

A major bulk earthworks programme would be carried out for the construction of the Stage 1 development. The earthworks programme would essentially involve the redistribution of about 22 million cubic metres of soil across the construction impact zone at the airport site, to achieve a level surface suitable for the construction of airport facilities. The modified landform and indicative Stage 1 layout is presented in Figure ES–16.

Construction and operation would also involve the controlled storage, treatment and handling of fuel, sewage and other chemicals with the potential to contaminate land.

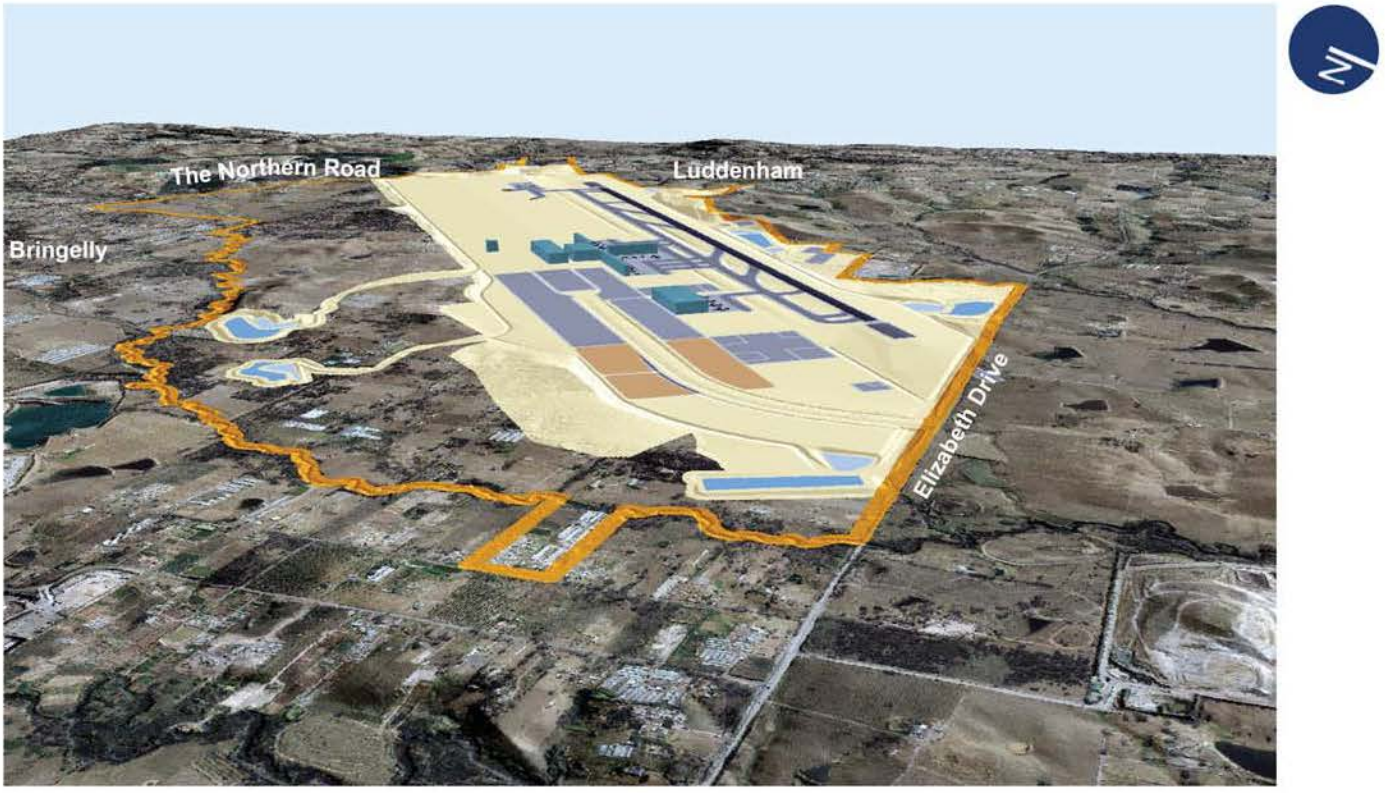
Measures including erosion control structures, sediment basins and stockpile management are required to mitigate and manage potential soil erosion and degradation associated with a large and complex earthworks operation. Fuel and other chemicals would be stored and handled in accordance with relevant standards and regulations, minimising the potential for contamination to occur.

Due to existing land use at the airport site including agriculture, light commercial and building demolition, there is potential for contaminated land to be present. Any contamination discovered during construction would be managed and mitigated to make the land suitable for its intended use and to prevent impacts on human health and the environment.

The potential impacts of the operation of the proposed airport are typical of a large-scale infrastructure project and would be managed with the implementation of stormwater, erosion and dust controls and adherence to relevant industry standards for the storage and handling of chemicals. Sewage would be treated and irrigated in accordance with an irrigation scheme that maintains the receiving soil in a stable and productive state.

view to the north-east

view to the south-west



LEGEND

- Airport site
- Terminal buildings and support facilities
- Runways
- Taxiways and aprons
- Landscape area
- Detention basin
- Bio retention basin
- Business park

ES 16 - Indicative Stage 1 Landform

Surface water and groundwater

The airport site contains about 64 kilometres of mapped watercourses and drainage lines (notably Badgerys Creek, Cosgroves Creek, Oaky Creek and Duncans Creek) and overlies the Bringelly Shale aquifer as well as unconfined areas of alluvial groundwater. Water quality sampling indicates that existing water quality is relatively degraded, with high levels of phosphorous and nitrogen in surface water that is attributable to land uses at the proposed airport site and within the broader catchment.

Site preparation and construction of the Stage 1 development would transform approximately 60 per cent of the airport site from a rolling grassy and vegetated landscape to essentially a built environment with some landscaping. These changes would alter the catchment areas within the airport site and the permeability of the ground surface, which would in turn alter the duration, volume and velocity of surface water flow.

An estimated 1.36 megalitres of water would be required per day for site preparation activities for the proposed airport, including potable water for drinking and ablutions plus raw water for soil conditioning and dust suppression. Water supply options include water sourced from existing assets operated by Sydney Water and stormwater runoff captured in the drainage system or existing farm dams.

The design of the Stage 1 development includes a water management system to control the flow of surface water and improve the quality of water before it is released back into the environment. The water management system would include a series of grassed swales to convey runoff from the developed areas within the airport site to a series of bio-retention and detention basins. Each basin includes provision for water quality treatment by a bio-retention system and a flood detention basin to control the volume of discharges from the site in a way that mimics natural flows. The assessment indicates that this system would be generally effective at mitigating flooding and water quality impacts.

Existing water quality at the airport site is in a degraded condition due to land clearing and previous land use. To take into account these existing conditions, local standards for water quality will be developed in accordance with the Airports (Environment Protection) Regulations 1997, with due consideration to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC). The development of local standards will be based on the results of baseline water quality monitoring, derived from a minimum of 24 months of data collected prior to the commencement of Main Construction Works.

The excavation and increase in impervious surfaces due to the development of the airport site would alter groundwater levels and recharge conditions. Bulk earthworks and excavations at the airport site would also receive some groundwater inflows, which would require management during construction and operation. Impacts on groundwater levels, including impacts on dependent vegetation or watercourses, are unlikely to be significant given the existing low hydraulic conductivity and water quality of the Bringelly Shale aquifer. Registered bores near the airport site are understood to target the Hawkesbury Sandstone aquifer, which is significantly deeper than the Bringelly Shale aquifer and not considered to be connected. As such, impacts on groundwater users are not expected.

The identified impacts would likely be further reduced during detailed design of the surface water management system. Baseline and ongoing monitoring of surface water and groundwater would be undertaken to characterise any residual impacts and prompt corrective action where necessary.

Aboriginal heritage

Since the early 1800s, land use at the airport site has consisted of varying phases of stock grazing, cropping, orcharding, dairying, market gardening, poultry farming and some light industrial activities. Consequently, most of the original native vegetation has been cleared and the airport site is now dominated by agricultural grasslands or cultivated fields with small pockets of open eucalypt woodland or shrubland. These activities are expected to have had a substantial impact on the Aboriginal archaeological resource of the airport site, especially in the top soil and the plough zone.

The airport site has been the subject of a number of previous archaeological assessments as part of work towards a second Sydney airport. These previous assessments date back to 1978, with the most recent being undertaken in 2014. Fifty-one Aboriginal heritage sites have been recorded during these surveys, consisting of surface artefact occurrences and a modified tree. Twenty-three additional sites were recorded at the airport site during the course of the current assessment, which focused on test excavation and characterising the sub-surface archaeological resource. The new recordings comprise nine sites with surface artefacts (including a grinding groove site) and 14 sites where subsurface artefacts were confirmed through test pit excavations.

The test excavation programme included a representative sample of landform types and zones within the airport site. It was determined that a relatively high average artefact incidence occurred across valley floors, basal slopes, first-order spurlines and within 100 metres of second, third and fourth order streams. These findings are generally consistent with numerous other investigations in the vicinity of the airport site that have confirmed that Aboriginal heritage sites occur widely across the landscape, but particularly on elevated level ground and slopes in the proximity of a water source. These investigations also indicate that larger sites with higher artefact densities are more likely to be found near permanent water.

Aboriginal stakeholder consultation undertaken for this EIS identified the airport site as a place of cultural significance and continuing cultural connection. The reasons for this include the site's material evidence of occupation, its cultural landscape values, and culturally significant plants, animals and resources. All of these contribute to a sense of place and cultural identity, and are considered to be a valuable educational resource.

In addition, the remaining Aboriginal sites across the Sydney hinterlands may be considered to have an intrinsic value because of their endurance amid concerns about disappearing heritage. The cumulative impacts on Aboriginal heritage sites caused by continuing urban and industrial development of the Cumberland Plain effectively impose a greater significance on those sites that remain.

All of the Aboriginal heritage sites recorded at the airport site are considered to have significance. Many sites contain archaeological material which has both cultural and scientific value, and all sites, irrespective of their scientific or other values, are considered to be culturally significant by the Aboriginal community. The predicted archaeological resource of the airport site, as revealed by the test excavation programme, is also assessed to be significant.

Construction of the proposed Stage 1 development would affect at least 39 sites recorded at the airport site, all of which comprise artefact occurrences. Construction activities would also affect approximately 500 hectares of archaeologically sensitive landforms. Impacts during operation of the proposed airport would be limited to indirect impacts on adjacent and nearby sites. The heritage values of these sites are unlikely to be vulnerable to indirect impacts such as loss of context. Consequently, the operational impacts of the proposed Stage 1 development would be low.

Mitigation and management measures would be implemented to minimise the impacts on Aboriginal cultural heritage. These measures would include the conservation of heritage sites in situ, the recording of heritage sites and salvage of heritage items, the commemoration of cultural heritage values at the airport site, curation and repatriation of heritage items and protocols for the discovery of artefacts and human remains.

European heritage

The assessment of European heritage identified 20 European heritage items at the airport site and an associated site and an additional 22 heritage items in the surrounding area. The identified European heritage items reflect the historical context of the airport site and European settlement more generally, including early attempts to develop local agricultural and pastoral economies and the emergence of settled village communities.

Construction of the proposed Stage 1 development would involve substantial clearing and earthworks, which would preclude the preservation of European heritage items in situ. All existing structures on the airport site will be removed as part of the Stage 1 development.

Mitigation and management measures would be implemented to minimise the impacts on European cultural heritage. These measures include further archaeological investigations, archival recording, creating an inventory of moveable items, cultural planting investigations, potentially relocating structures and relocating remains located in grave sites and the staged demolition of structures.

Heritage awareness training would be provided to all workers involved in site preparation and construction of the proposed airport. This would include training in the procedure to be followed if European heritage items are discovered during site preparation or construction. The potential presence of unmarked graves at the airport site also necessitates a procedure for the discovery of human remains. These procedures would have regard to the relevant legislation and guidelines.

The preparation of an oral history would be considered as a measure to preserve the heritage value of the airport site. The heritage value of the airport site would also be considered through the detailed design of the proposed airport.

Planning and land use

In developing the Western Sydney Priority Growth Area (previously part of the South West Priority Growth Area and the Broader Western Sydney Employment Area), the NSW Government and local councils have taken into consideration the potential opportunities and impacts from the proposed airport, including the opportunity to capitalise on the economic growth and investment the proposed airport could bring. Implementation of these strategic planning approaches is expected to result in land uses surrounding the airport site transitioning from rural-residential and agricultural to urban.

Existing rural residential, agricultural, recreational, community and extractive industry land uses on the airport site would be also removed where required to support the development of the airport. Infrastructure improvements at the airport site, rail and road, would also facilitate land use change in the broader region.

Measures to manage land use and planning impacts are proposed, including mitigation measures for employment land use conflict, zoning rationalisation, integration of operational airspace controls and aircraft noise protection as well as infrastructure corridor protection. Coordination of government land use planning activities, policies and programmes across the local, state and national level will facilitate an integrated approach to zoning land in and around the airport site. Through successful implementation of these measures, the proposed airport and its surrounds would become a focus for employment generating land uses in Western Sydney, creating jobs for the new residents of the Western Sydney Priority Growth Area and the broader Western Sydney area. This would also ensure that airport operations are not impeded by noise sensitive developments.

Landscape and visual amenity

The airport site and surrounds are typified by gently undulating landform within a highly modified landscape. The overall landscape character is open and rural with expansive views possible from surrounding hill tops and higher elevations to the west. The area's character is also defined by cleared pastureland, and large-lot residences (both single and double storey) set back from the road network. Patches of remnant vegetation exist within the airport site, particularly along creek lines, road edges and near farm dams.

Construction of the proposed airport is likely to have temporary visual impacts for the nearest sensitive receivers in Luddenham and Bringelly. This would be largely due to the visibility of earthworks and the presence of construction plant, equipment, stockpiling areas and storage areas. Viewpoints that are further away would have more restricted views of the airport site and would, therefore, be less affected.

During operation, the potential for moderate to high visual impacts as a result of overflights has been identified for Luddenham and Mount Vernon, and also along Elizabeth Drive and Lawson Road. Lower level impacts as a result of overflights were identified for areas to the south of the airport site including along Silverdale Road and Dwyer Road, and within Bents Basin State Conservation Area. Operational lighting would have low impacts on sensitive receivers due to topography, existing vegetation, building design, lighting design and runway configuration.

Mitigation measures are proposed to minimise visual impacts during construction and operation. These include design measures as well as investigating opportunities for retaining existing vegetation and revegetating suitable areas.

Social

The Western Sydney region is diverse, with densely populated and highly urbanised areas, to semi-rural and recreational/natural areas. The region is also culturally diverse, with strong heritage values (both Indigenous and non-Indigenous), cohesive communities, natural and recreational values, and connections to the employment hubs of Parramatta and Sydney Central Business District developments.

As part of this, the proposed airport is expected to result in both positive and negative social impacts. In particular, the proposed airport has the potential to bring significant benefits to the people and economy of Western Sydney through increased economic development and employment opportunities. As a facilitator of growth and change in Western Sydney, the proposed airport would stimulate further development in local and regional centres, contributing to better quality social infrastructure, amenities and services for local communities. The construction and operation of the Stage 1 development would create jobs for many types of workers of various skills and qualifications, contributing to increased incomes across the Western Sydney region. When considered with other developments taking place in the region, the opportunities for positive change and improved socio-economic outcomes for Western Sydney are significant.

Negative social impacts would largely result from changes in social amenity and lifestyle as a result of other impacts. In particular, aircraft noise, changes in air quality, increased road vehicle movements, and visual impacts are expected to reduce social amenity and impact on the existing lifestyle of residents. These impacts will be the most prevalent in communities close to the airport site, particularly in Luddenham. The implementation of mitigation measures proposed for these impacts will also reduce the expected negative social impacts. Additionally, the implementation of major planning initiatives by the NSW Government, in particular the Western Sydney Priority Growth Area, will help to plan for these changes and ensure land uses around the airport site are compatible with airport operations.

To maximise employment opportunities for local residents an Australian Industry Participation Plan and an equal opportunity policy would be prepared by or on behalf of the ALC to promote the utilisation of local labour, goods and services during the construction and operation of the proposed airport.

Economic

Construction and operation of the proposed airport is expected to generate significant economic and employment effects for the local and regional economy. These benefits will grow commensurately with the forecast increase in passenger demand over time.

Overall, the Western Sydney region is expected to benefit from these effects and would experience a significant share of the increased economic activity and employment opportunities generated by the proposed airport. Over the construction period, the Stage 1 development is forecast to create employment opportunities and value-add for the economy. In particular, construction of the Stage 1 development would:

- create about 3,180 full-time equivalent (FTE) jobs directly and indirectly in Greater Sydney during the peak of construction activity. Approximately 84 per cent of these jobs would be created in Western Sydney. In the peak year of construction about 760 FTE direct onsite jobs would be created,1,240 FTE jobs in the supply chain and 660 FTE jobs created through consumption effects; AND
- create about $2.3 billion in value-add across Greater Sydney during the construction period, with approximately $1.9 billion or 83 per cent of that value-add being created in Western Sydney.
- During Stage 1 operations, the proposed airport is expected to continue its role as a substantial source of economic and employment opportunities in the region. In particular, Stage 1 operations would:
- create about 8,730 FTE direct onsite jobs;
- potentially create a further 4,440 FTE onsite jobs within business parks on the airport site;
- generate about $77 million in value-add for Western Sydney;
- generate about $145 million in value-add for the rest of Greater Sydney; and
- drive growth in business profits, productivity and household income.

As a major infrastructure project, the proposed airport has the potential to redistribute employment and population growth toward Western Sydney. While this may result in relatively slower employment and population growth in other parts of Sydney, it will also contribute to more balanced and sustainable growth. Similarly, the proposed airport is expected to result in a slight reduction in value-add, business profits and worker productivity in areas outside of NSW as economic activity is redistributed towards Western Sydney.

Resources and waste

Construction of the proposed airport would involve clearing and a major bulk earthworks programme to achieve a level surface suitable for the construction of airport facilities, along with the use of a range of construction materials. As with any large infrastructure project, construction and operation of the proposed airport would involve the consumption of natural resources and has the potential to generate substantial quantities of waste.

Peak waste generation would occur during construction, when an estimated 202,500 tonnes of waste vegetation and construction materials such as concrete and timber would be generated. During Stage 1 operations, an estimated 5,251 tonnes of waste would be generated each year, and would include general waste, food, packaging waste from terminals and waste oils, paints and cleaners from maintenance activities.

Resources and waste from the airport would be sustainably managed by maximising waste avoidance, reduction, reuse and recycling (in accordance with a waste management hierarchy), while mitigating and managing impacts on human health and the environment. A Waste and Resources CEMP would be prepared prior to construction and a Waste and Resources OEMP prior to operation of the proposed airport, which would guide the management of waste during construction and Stage 1 operations.

The waste management market in Western Sydney is mature and handles significant volumes of waste from various domestic, commercial and industrial sources across all of Sydney. Waste facilities in Western Sydney have sufficient capacity to handle wastes of the types and volumes expected to be generated at the airport site.

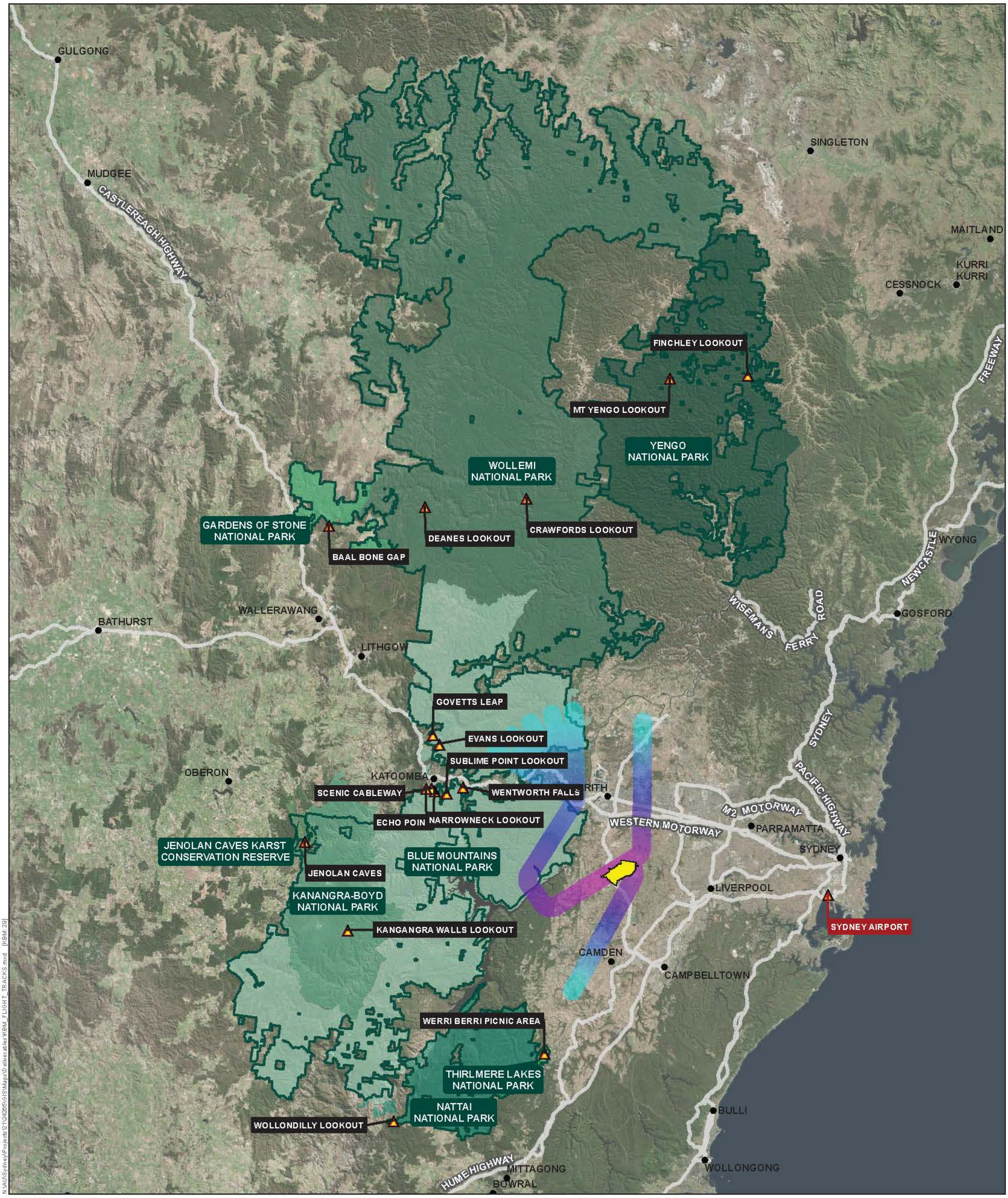
Greater Blue Mountains

The Greater Blue Mountains World Heritage Area (GBMWHA) covers 1.03 million hectares or 10,300 square kilometres of sandstone plateaus, escarpments and gorges dominated by temperate eucalypt forest. The boundary of the GBMWHA is approximately seven kilometres from the proposed airport at its closest point. The area is one of the largest and most intact tracts of protected bushland in Australia and is noted for its representation of the evolutionary adaption and diversification of eucalypts in post-Gondwana isolation on the Australian continent.

The Greater Blue Mountains Area is listed on the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List for its outstanding universal value, including representative examples of the evolution of Eucalyptus species (Criterion ix) and diversity of habitats and plant communities (Criterion x). In addition to the features recognised by the World Heritage Committee as having World Heritage values, the GBMWHA has a number of other important values, which complement and interact with these including: recreation, tourism, wilderness, scenic, cultural heritage, scientific and aesthetic values. The Greater Blue Mountains Area was added to the National Heritage List in 2007 in recognition of its national heritage significance.

Potential impacts on the World Heritage, National Heritage and other values of the Greater Blue Mountains Area from the construction and operation of the proposed airport were assessed against the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DoE 2013a). The assessment found that there would be no direct impacts on the values of the GBMWHA associated with the construction of the airport. Indirect noise, air quality and visual amenity impacts on the GBMWHA are predicted from aircraft overflights. Stage 1 operations are not expected to have an adverse impact on the World Heritage values or integrity of the GBMWHA.

Based on the preliminary airspace design, almost all flights would be at an altitude greater than 5,000 feet and most would be more than 10,000 feet above sea level when passing over locations within the GBMWHA (Figure ES–17 and Figure ES–18). No flights are expected to occur below 6,500 feet above ground level in the vicinity of identified sensitive areas. At these altitudes, aircraft are likely to be difficult to discern from ground level and are not considered to be visually obtrusive. Indicative flight tracks at altitudes of less than 5,000 feet are limited to the eastern boundary of the Blue Mountains National Park, which would experience 50 to 100 flights per day.



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

LEGEND

Airport site

Greater Blue Mountains World Heritage Area

Flight track altitude below 10,000 feet

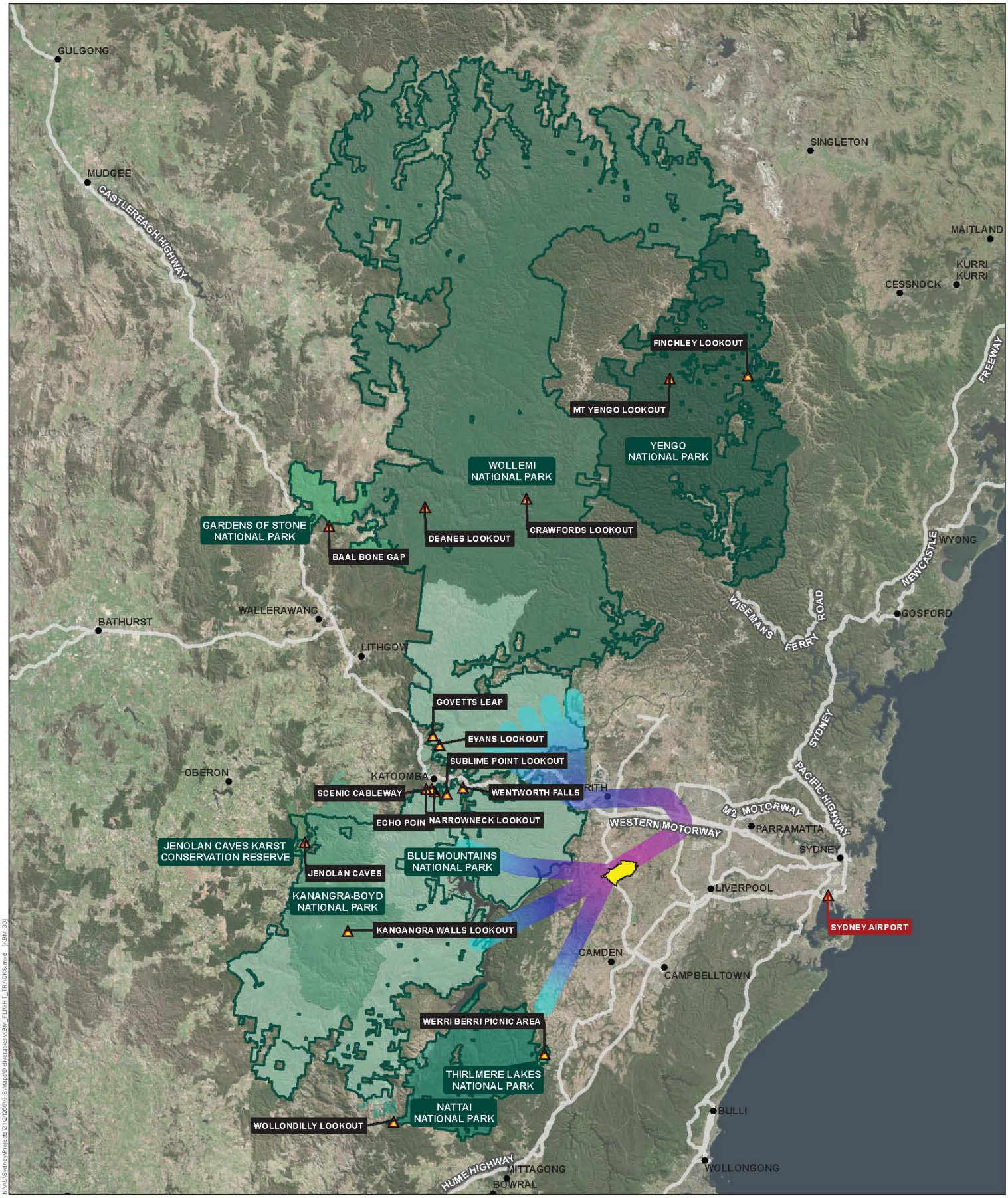
10,000 ft

5,000 ft

0 ft

ES 17 - Flight track altitude below 10,000 feet above sea level, 05 operating mode single runway

0 5 10 20
Kilometres



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LEGEND

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

Airport site

Greater Blue Mountains World Heritage Area

Flight track altitude below 10,000 feet

10,000 ft

5,000 ft

0 ft

ES 18 - Flight track altitude below 10,000 feet above sea level, 23 operating mode single runway

0 5 10 20

Kilometres

N

Generally across the GBMWHA, maximum aircraft noise levels are not expected to exceed 55 dBA. Echo Point at Katoomba would not experience aircraft noise levels above 50 dBA and the majority of other selected sensitive areas are predicted to only be affected by aircraft noise levels above 55 dBA during the infrequent operation (predicted to be once every two days) of the Boeing 747 (or equivalent), noting that this aircraft type is being phased out of operations.

Emergency fuel jettisoning is very unlikely to impact the GBMWHA due to the rarity of such events, the inability of many aircraft to jettison fuel, the rapid vaporisation and wide dispersion of jettisoned fuel and the strict regulations enforced by Airservices Australia for managing these contingency events.

Mitigation and management of potential noise impacts would be achieved through the formal airspace design process. All relevant factors, including potential environmental impacts on sensitive areas such as the GBMWHA, would be taken into account in determining operating procedures for the proposed airport.

The current assessment based on the indicative flight paths shows that impacts on the Greater Blue Mountains, including the World Heritage values and integrity of the GBMWHA, from operation of the proposed airport are not likely to be significant. Opportunities to further reduce the noise and visual impact from aircraft flying over wilderness and other areas of the GBMWHA would be considered in finalising formal airspace and operational arrangements.

Long term airport strategic environmental assessment

Volume 3 of this EIS provides a strategic level assessment of the indicative long term development of the proposed airport. Volume 3 reflects the difficulty in undertaking an assessment within the context of uncertainty relevant to the long term development of an airport. The assessment's approach provides flexibility in the master planning process for the airport site to allow land use changes, technological improvements and changes in operational practices to be reflected in future development scenarios.

The assessment of the potential long term development focuses on potential impacts of the expanded operations on the amenity of the surrounding community. Key issues considered in the assessment include noise, air quality, human health, traffic and transport, landscape and visual amenity, and socio-economic impacts. Direct physical impacts are also discussed, including those associated with biodiversity, water resources, heritage, and planning and land use.

The key findings of the assessment of the long term development are outlined below.

Noise

Aircraft noise is one of the most sensitive issues associated with the development of the proposed airport and an increase in air traffic movements has the potential to increase the level of noise disturbance experienced by the surrounding community. Taking this into account, aircraft noise impacts were considered for a 2050 scenario in which the single runway is operating close to capacity and for a long term scenario (around 2063) in which the airport layout incorporates two runways.

The assessment of noise impacts associated with the long term development of the proposed airport considers aircraft noise (based on indicative flight paths) and ground-based noise.

For the loudest aircraft operations (long-range departures by Boeing 747 aircraft or equivalent), maximum noise levels over 85 dBA would be experienced at residential locations close to the airport site, in the area of Badgerys Creek. Maximum noise levels of 75 to 80 dBA are predicted for built-up areas in St Marys and Erskine Park under these worst case operating conditions. Maximum noise levels due to more common aircraft types such as the Airbus A320 or equivalent are predicted to be 60 to 70 dBA in built-up areas around St Marys and Erskine Park, and above 70 dBA in some adjacent areas to the south-west of the airport site, including Greendale.

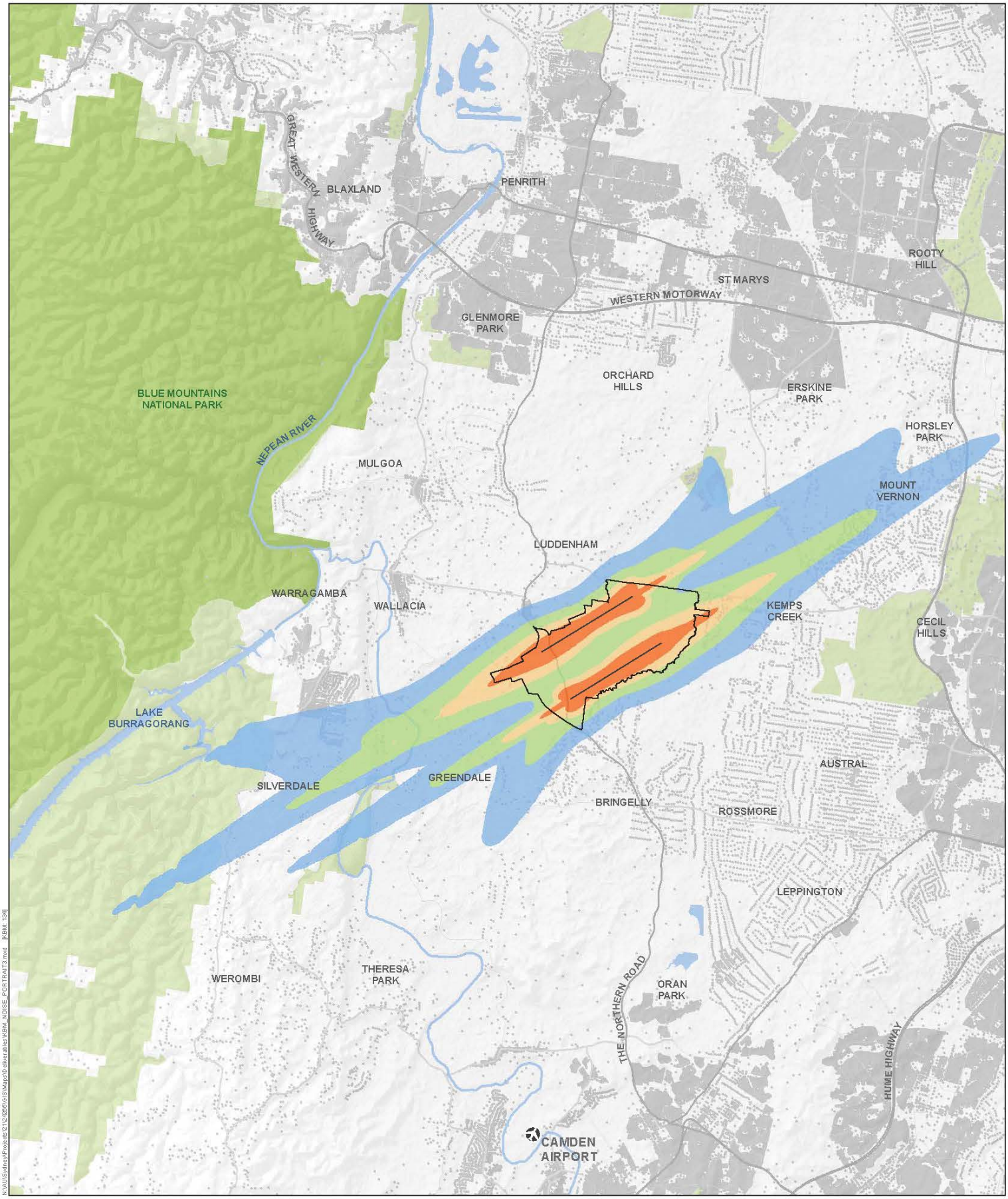
The extent to which particular areas would be potentially exposed to aircraft noise would be strongly influenced by the airport operating strategies especially when operating a single runway at maximum capacity (around 2050). In terms of total population, the Prefer 05 operating strategy (which gives preference to approaches and departures in a south-west to north-east direction) is predicted to have a greater 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. The less populated, predominantly rural-residential areas to the south-west, including Greendale and parts of Silverdale would be most affected under the Prefer 23 strategy. Adoption of 'head-to-head' operations would reduce the number of residents affected when aircraft movements are low and weather conditions permit.

For night-time operations in around 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 is predicted to result in large parts of St Marys experiencing more than 20 aircraft noise events per night on average 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 located within the noise affected areas for the indicative flight path design, particularly under the Prefer 05 operating strategy. This is because movements can be spread between two runways and the locations of flight paths are less constrained in the two runway scenario. The continuation of existing land use planning controls will limit the potential for new residential development to be impacted by a progressive increase in airport operations. The modelled 2063 ANEC contours for the long term development are shown on Figure ES–19. This figure combines the noise exposure contours calculated for both the 05 and 23 operating strategies. The 2063 ANEC is 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.

The 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.

Approaches to mitigating aircraft overflight and runway noise would generally focus on reducing noise emissions from the aircraft themselves, adjusting flight paths and airport operating modes, and developing land use planning or other controls to ensure that future noise-sensitive uses are not located in noise-affected areas.



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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
- ANEC = 20-25
- ANEC = 25-30
- ANEC = 30-35
- ANEC = 35+

ES 19 - ANEC contours for Prefer 05 and Prefer 23 operating strategy (2063)

0 1 2 4
Kilometres

N

Air quality

Operation of the long term development would result in an increase in emissions of nitrogen dioxide, PM_{10}, $PM_{2.5}$, carbon monoxide, sulfur dioxide and air toxics. Given the uncertainty regarding the future reduction in ground vehicle and aircraft engine emissions, and the anticipated general reduction in background emissions over time, ground level concentration predictions were assessed only for the key criteria pollutants (NO_X, PM_{10}, and $PM_{2.5}$) for the long term development. Several exceedances were predicted at sensitive receptors for these indicators.

The progressive increase in aircraft movements and site based activities would increase the level of emissions during the long term operations. However, no improvement in aircraft emissions, either due to improvements in fuel or engine emissions was incorporated into the modelling. As a result, actual air emissions from the operating long term development may be lower than predicted given the use of mains powered auxiliary power units at the airport gates (instead of on-board auxiliary power units), increased use and optimisation of proposed rail connections (instead of motor vehicles) and progressive improvements in aircraft technology.

Traffic

The long term development is expected to result in around 103,000 additional vehicle trips to and from the airport each day by 2063. These additional trips would be generated in the context of substantial urban growth in Western Sydney, particularly the development of the Greater Macarthur Land Release Investigation Area. Travel demand generated by the proposed airport and the substantial forecast development growth in Western Sydney would have a significant combined effect on the road and public transport systems.

Significant road improvement works, including a new M12 Motorway, are being delivered as part of the Western Sydney Infrastructure Plan to cater for this demand. The long term development is also likely to require additional transport infrastructure. To this end, the Australian Government and NSW governments are undertaking a Joint Scoping Study on the rail needs for Western Sydney, including the proposed airport. The Study will consider the best options for future rail links, including decisions about timing and rail service options, both directly to the airport site and within the Western Sydney region.

Visual

Future development of the areas surrounding the airport site, under provisions of the Western Sydney Employment Area, Western Sydney Priority Growth Area and the South West Priority Land Release Area, would lead to a significant transition from an environment that is predominantly rural in character to one that has a more urban form. In general terms, this is expected to reduce the visual impact of the proposed airport development, including night-time lighting effects, as the proposed airport is integrated into the changing urban visual character of the area.

Conclusions

The proposed airport would be developed on Commonwealth-owned land at Badgerys Creek in Western Sydney and would cater for ongoing growth in demand for air travel, servicing both domestic and international markets. This EIS has been prepared in accordance with Part 3 of the EPBC Act and the Department of the Environment guidelines for the assessment of the airport proposal (EPBC 2014/7391). This EIS will inform the determination of the Airport Plan.

An Airport Plan will provide the strategic direction for development of the proposed airport, forming the basis of the authorisation for the project under the Airports Act. The revised draft Airport Plan includes a specific proposal for Stage 1 to establish the proposed airport with a single 3,700 metre runway on a north-east/south-west orientation and aviation support facilities to provide an operational capacity of approximately 10 million annual passengers as well as freight traffic.

Development of the proposed airport would act as a catalyst for investment and job creation in the region by accelerating the delivery of important infrastructure and the release of employment and housing land, and providing a long term and diverse source of local jobs and economic activity. Additionally, the proposed airport would improve access to aviation services for the growing population of Western Sydney and ease existing aviation capacity constraints within the broader Sydney region.

This EIS has found that the proposed airport would result in some adverse impacts on the environment and the community. Mitigation measures have been proposed including the need for further design, both for the airport site and airspace operations, to reduce these potential impacts during construction and operation.

The environmental performance of the proposal would be managed through the implementation of environmental management plans and monitoring programmes. This would aid in ensuring compliance with relevant legislation and any conditions set out in the Airport Plan.

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